



**Maintenance Library**

**7441-1/1980-9  
Buffered Terminal  
Maintenance Manual**



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## Preface

This publication contains the information required to install and to maintain the IBM 7441-1/1980-9 Buffered Terminal. A description of operations is included with detailed maintenance information. It is assumed that the reader is familiar with teleprocessing principles.

This publication contains four major sections:

- *Section 1* contains instructions for installing and testing the terminal.
- *Section 2* gives a brief description of terminal functions and features.
- *Section 3* describes the operations for the terminal. This section also contains the Maintenance Analysis Procedures (MAPs), which are designed to locate the failing components. The MAPs should always be entered at Part 2.
- *Section 4* contains parts catalog information for the 7441-1.

The Appendix contains the schematic diagram of the 1980-9. This diagram should be used for point-to-point continuity checks referred to by the MAPs.

### *Associated Publications:*

*IBM 7441-1/1980-9 Buffered Terminal: Functional Characteristics, Operating Procedures, and Physical Planning, GL22-7015*

*IBM SELECTRIC<sup>®</sup> I/O Keyboard-Printer, Field Engineering Maintenance Manual, S225-1726.*

### CAUTION

When storing this publication beneath the logic board, be careful not to dislodge any bus connector or not to bend any pins on the board.

### *Fourth Edition (May 1973)*

This edition, SY22-6913-3, is a major revision of SY22-6913-2, making it obsolete. Technical changes to the text and illustrations are indicated by a vertical line to the left of the change. Changes are periodically made to the information herein; any such changes will be reported in subsequent revisions.

This manual has been prepared by the IBM System Products Division, Product Publications, Dept. B97, PO Box 390, Poughkeepsie N.Y. 12602. A form for readers' comments is provided at the back of this publication. If the form has been removed, comments may be sent to the above address. Comments become the property of IBM.

# Abbreviations

## a

A ampere  
addr address

## b

bksp backspace  
BPS bits per second  
brd broadcast

## c

CA control address  
CAS control address selected  
CASS control address selected slave  
char character  
cm centimeter  
CPU central processing unit  
CR carriage return, control receive  
CS control selected  
CSS control selected slave  
ctrl control

## e

EOB end of block  
EOT end of transmission

## f

FDX full duplex

## g

gnd ground  
grp group

## i

IA/LA/TA interchange address/line  
(or IQT) address/terminal address  
IC invalid character, incorrect  
case  
ID identification  
I/O input/output  
IP intermediate polling

## k

kybd keyboard

## l

LC lowercase

## m

MAPs maintenance analysis  
procedures

mm millimeter  
ms millisecond  
 $\mu$ F microfarad

## n

NC normally closed  
NO normally open

## o

osc oscillator

## p

PARS/ Passenger Airline Reservation  
Financial System/Financial  
PC parity check  
pF picofarad  
POR power-on reset

## r

RCAB receive check answerback  
regen regenerate  
RPQ request for price quotation  
RT receive text  
RTS receive text slave

## t

TCAB transmit check answerback  
term terminal  
TNS text nonselect  
TPAB transmit poll answerback  
TSAB transmit status answerback  
TT transmit text  
TTY Teletype\*

## u

UC uppercase

## v

V volt

\*Trademark of Teletype Corporation

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# Safety Procedures

Safety cannot be overemphasized. To ensure personal safety and the safety of co-workers, each CE should make it an everyday practice to observe safety precautions at all times. All CEs should be familiar with the general safety practices and procedures for performing artificial respiration that are outlined in *CE Safety Practices*, S229-1264. For convenience, this form is duplicated below.

## DANGER

All voltages are present with 7441-1 cover off.

### 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 area of power supplies, performing mechanical inspection of power supplies and installing changes in machine circuitry.
3. Wall box power switch when turned off should be locked or tagged in off position. "Do not Operate" tags, form 229-1266, affixed when applicable. 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, the following precautions must be followed:
  - a. Another person familiar with power off controls must be in immediate vicinity.
  - b. Rings, wrist watches, chains, bracelets, metal cuff links, shall not be worn.
  - c. Only insulated pliers and screwdrivers shall be used.
  - d. Keep one hand in pocket.
  - e. When using test instruments be certain controls are set correctly and proper capacity, insulated probes are used.
  - f. Avoid contacting ground potential (metal floor strips, machine frames, etc. — use suitable rubber mats purchased locally if necessary).
5. Safety Glasses must be worn when:
  - a. Using a hammer to drive pins, riveting, staking, etc.
  - b. Power hand drilling, reaming, grinding, etc.
  - c. Using spring hooks, attaching springs.
  - d. Soldering, wire cutting, removing steel bands.
  - e. Parts cleaning, using solvents, sprays, cleaners, chemicals, etc.
  - f. All other conditions that may be hazardous to your eyes. **REMEMBER, THEY ARE YOUR EYES.**
6. Special safety instructions such as handling Cathode Ray Tubes and extreme high voltages, must be followed as outlined in CEM's and Safety Section 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. All safety devices such as guards, shields, signs, ground wires, etc. shall be restored after maintenance.

KNOWING SAFETY RULES IS NOT ENOUGH  
AN UNSAFE ACT WILL INEVITABLY LEAD TO AN ACCIDENT  
USE GOOD JUDGMENT — ELIMINATE UNSAFE ACTS

S229-1264-1

12. Each Customer Engineer is responsible to be certain that no action on his part renders product unsafe or exposes hazards to customer personnel.
13. Place removed machine covers in a safe out-of-the-way place where no one can trip over them.
14. All machine covers must be in place before machine is returned to customer.
15. Always place CE tool kit away from walk areas where no one can trip over it (i.e., under desk or table).
16. Avoid touching mechanical moving parts (i.e., 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 CE's and customer personnel are not in a hazardous position.
21. Maintain good housekeeping in area of machines while performing and after completing maintenance.

### 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 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.

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#### Rescue Breathing for Adults Victim on His Back Immediately

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

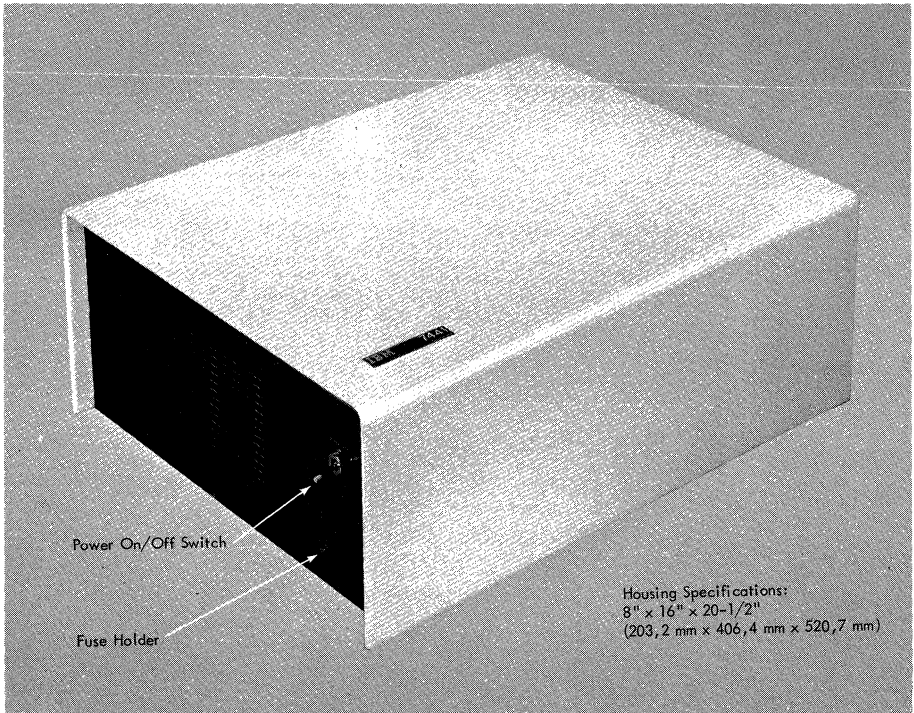


Thumb and finger positions



Final mouth to mouth position





IBM 7441-1 Buffered Terminal Control Unit

# Section 1. Installing the 7441-1

## Procedure

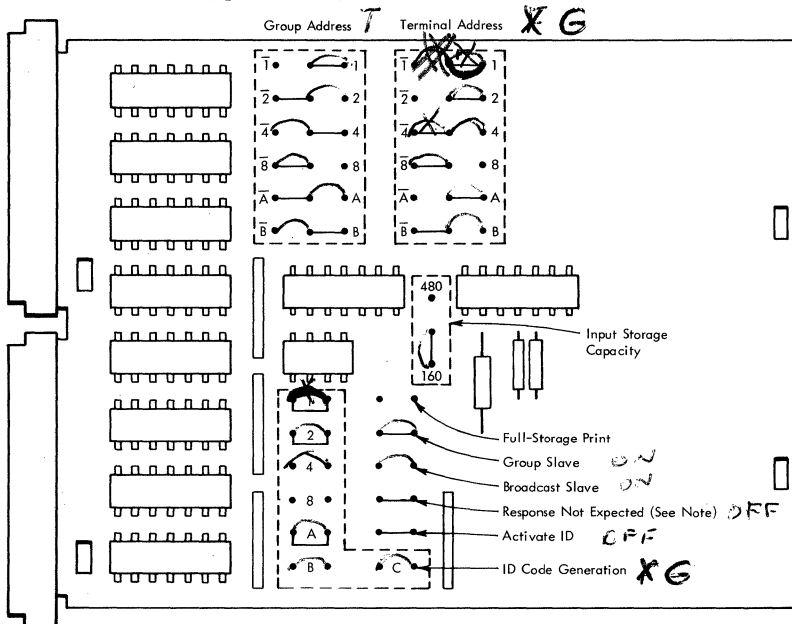
*Note:* Review all RETAIN TIPS that apply to the 7441-1 or 1980-9 before performing the following installation steps.

### 1. Check (Visual)

Remove the cover and inspect the unit for loose or damaged components. Be sure that the bus connectors on the pin side of the logic board are seated properly, and be sure that the CE mode switch is OFF.

### 2. Install the Jumpers

Remove the jumper card from socket location K2 and install the jumpers for your configuration. The following illustration defines the pins on the jumper card and shows a typical configuration:

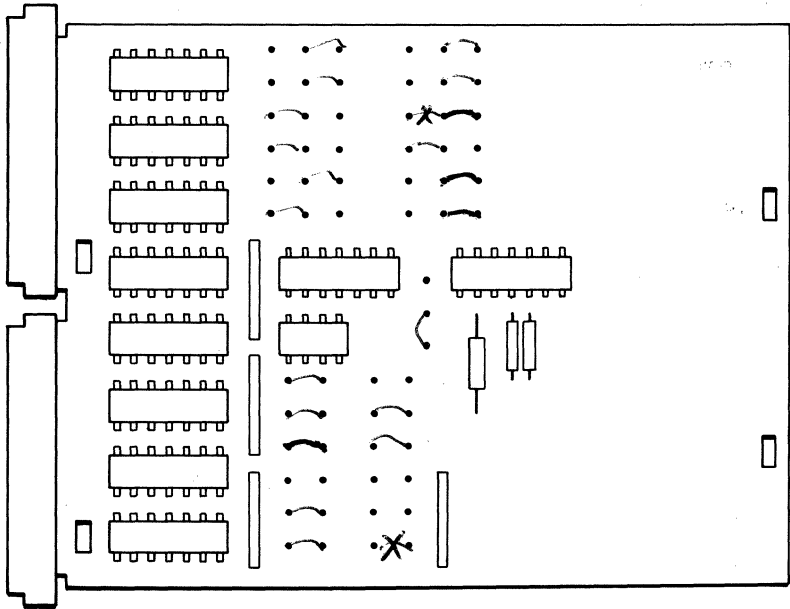


*Note:* 'Response not expected' should not be wired for Teletype configuration.

**Configuration shown:**

Terminal Address	B A 8 4 2 1 (T)	Activate ID	On
ID Code Generation	B A 8 4 2 1 (T)	Group Slave	On
Group Address	B A 8 4 2 1 (N)	Broadcast Slave	Off (Master)
Input Storage Capacity	160 Characters	Full-Storage Print	Off (Dynamic Print)
		Response Not Expected	On

After the jumpers have been installed, draw your configuration on the following illustration. The illustration can then serve as a reference when replacing the jumper card.



### 3. *Check for -12V*

- a. Install the -12V power supply regulator card in the vacant socket location on the power supply, with the heat sink side facing the logic board.
- b. Connect the I/O typewriter cable and turn 7441-1 power on.
- c. Remove the card from socket location D2.
- d. Connect the CE meter as follows:
  - Red (+) lead to ground (0V)
  - Black (-) lead to D5D06.

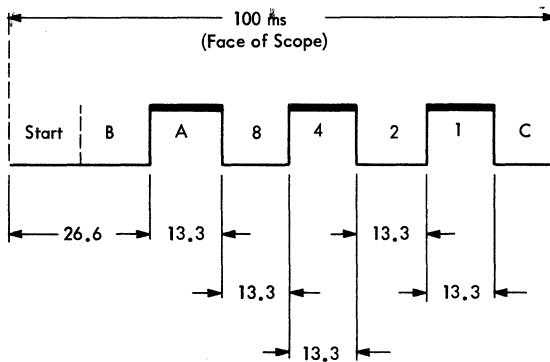
Refer to Figure 3, in Section 4, for the location in the power supply of the -12V adjusting potentiometer and adjust it for  $-12V \pm 0.5V$ .

#### 4. *Check the Receive Relay (TTY Adapter Only)*

- a. Connect the TTY line to the 7441-1.
- b. Prepare the oscilloscope as follows:
  - (1) Sync on internal minus (-).
  - (2) Horizontal time base on 10 ms/cm.
  - (3) Channel 1 probe on TB7 (+TTY receive data).
- c. Prepare an input test message to transmit many alternate mark/space bits, such as a message of all V's (BĀ842Ī).

*Note:* The PARS/Financial message (ZDIAG 05) may be used with V's in the variable-length data field. Refer to "Terminal Diagnostic Program (PARS/Financial)" in Section 3.

- d. When the central processing unit (CPU) sends the message back to the terminal, observe the scope as the message is received. Adjust the receive potentiometer so that the mark and space bits are of equal duration. The pulse length should be 13.3 ms/bit. The following should appear on the face of the oscilloscope:



#### 5. *Perform the Maintenance Analysis Procedures (MAPs)*

Refer to "Maintenance Analysis Procedures" in Section 3 and perform the tests outlined there. Then return to this section and perform steps 6 and 7 of the installation procedure.

## 6. Check the CE Switches

Refer to "CE Switches" in Section 3 to become familiar with the function of the CE mode, the CE data, and the cycle switches. Then perform the following polling sequence to be sure that the CE switches are working properly:

- Poll without bid (input message was not stored).
- CE mode switch is ON.

Action	Each column represents one operation of the cycle switch.									Comments	
	Start	B	A	8	4	2	1	C	Stop		
CPU sends:											
Ⓒ	0	0	0	1	1	1	1	1	1	1	Ready light is on at start of operation. No change in keyboard indicators.
Terminal address (See Note)	0			C				C		1	Ready light goes off; receive light comes on.
Space	0	0	0	0	0	0	0	1	1	1	Receive light goes off; send light comes on.
Terminal sends:											
Ⓓ	0	1	0	0	0	0	0	0	0	1	Transmit light comes on for each mark bit. Send light goes off; ready light comes on.

Note: Put your terminal address in the blank area.

On completion of this check, be sure that the CE mode switch is OFF.

### CAUTION

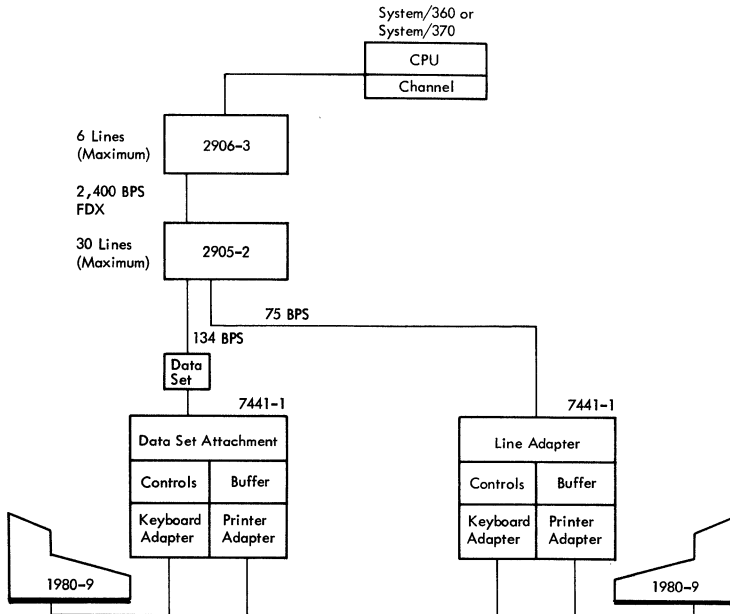
To prevent transmitting extraneous bits over the transmission line, turn the 7441-1 power on/off switch OFF before switching the terminal on-line.

## 7. Install the Top Cover

When installing the top cover, be sure that the nameplate on top of the cover is toward the front of the unit (near the power on/off switch). This ensures that the foam, card-retaining pad inside the cover is over the cards.

## Section 2. Description of Terminal Functions and Features

The IBM 7441-1/1980-9 Buffered Terminal transmits or receives data via a communication line that is attached to an IBM System/360 or System/370 CPU. (See the accompanying illustration.)



The 7441-1 Buffered Terminal Control Unit contains the control circuits and a buffer storage that can hold either 160 or 480 data characters, depending on customer requirements.

The 1980-9 Buffered Terminal is a modified IBM SELECTRIC<sup>®</sup> typewriter that prints messages transmitted from the CPU. It can also be used off-line as a standard office typewriter. A split platen and a document insertion device allow the use of various paper forms in the 1980-9.

The control unit and the typewriter are connected by a cable. A main power on/off switch is on the right-hand side of the control unit. The power on/off switch on the typewriter is in the lower right section of the keyboard. An online/offline switch is in the lower left section. For the terminal to send or to receive messages, the power switches on both units must be ON and the control unit must be on-line.

# Format for Data and Line Control Characters

Rotate				Bit				Symbol	Issuing Unit	Purpose	Remarks				
R2A	R2	R1	R5	Configuration											
0	0	0	0	—	—	—	—	SP	*	(N)	▽	(S)	CPU	Start of address	CPU has an output message.
1	1	1	0	—	—	—	—	SP	*	z	▽				
0	0	0	1	—	—	—	1	1	/	J	B	(D)	Term	Positive response to a poll by CPU	Text for input message follows.
1	1	1	1	—	—	—	1	1	/	B	z				
0	0	1	0	—	—	—	2	2	S	K	B	(D)	CPU	End of address	Text for output message follows.
1	1	0	0	—	—	—	2	2	#	d	(D)				
0	0	1	1	—	—	—	2	3	T	L	C	(B)	Term	End of block of text	End of text for input message.
1	1	0	1	—	—	—	2	3	?	m	⊥				
0	1	0	0	—	—	—	4	4	U	M	D	(Y)	Term	End of block of text	End of text for output message.
1	0	1	0	—	—	—	4	4	@	!	=				
0	1	0	1	—	—	—	4	5	V	N	E	(C)	Term	End of transmission	End of transmission
1	0	1	1	—	—	—	4	5	f	∞	∞				
0	1	1	0	—	—	—	4	6	W	∅	F	(Y)	Term	Positive response to an address by CPU	Terminal can accept the output message.
1	0	0	0	—	—	—	4	6	↓	⊕	⊕				
0	1	1	1	—	—	—	4	7	X	P	G	(N)	Term	Positive answer to an EOB	Output message was received without error.
1	0	0	1	—	—	—	4	7	∅	Sp	%				
1	1	0	1	8	—	—	—	8	Y	Q	H	(Y)	CPU	Positive answer to an EOB	Input message was received without error.
0	0	1	1	8	—	—	—	8	⊕	↑	∅				
1	1	0	0	8	—	—	—	9	Z	R	I	(N)	Term	Negative response to an address by CPU	Terminal has no input message or is off-line.
0	0	1	0	8	—	—	—	9	\$	z	c				
1	1	1	1	8	—	—	—	0	/	IC	IC	(S)	Term	Negative response to a poll by CPU	An error was detected in output message.
0	0	0	1	8	—	—	—	0	/	IC	IC				
1	1	1	0	8	—	—	—	0	/	—	·	(Y)	Term	Negative answer to an EOB	An error was detected in input message.
0	0	0	0	8	—	—	—	0	/	—	·				
Latch Magnet				8	4	—	—	IC	IC	IC	IC	(d)	CPU	Positive answer to an EOB	Input message was received without error. Terminal switches to receive mode.
				8	4	—	—	IC	Index	CR	Tab				
				8	4	2	—	UC Shift	(B) EOB	Bksp	LC Shift	(C)	CPU	Positive answer to an EOB	Input message was received without error. Terminal switches to receive mode.
				8	4	2	1	(C) EOT	IC	Idle IC	IC				
Tilt								0	1	2	3				
Magnets								T <sub>1</sub> T <sub>2</sub>	T <sub>2</sub>	T <sub>1</sub>	—				
								—A	B	—	BA				

▣ Check bit (C) required.  
 IC Invalid character (code to bypass the document switch).

Note: BA8421C is a printable (D).  
 BA8421C is the control character (D).

## Features for 7441-1

Feature (Baud Rate)	RPQ No.	Line Type	Transmission Rate
75	8P0232	Telegraph	13,333 ms/bit 119,999 ms/char 8,333 char/sec
134	8P0233	Long-Distance Transmission	7,493 ms/bit 67,433 ms/char 14,830 char/sec

## Feature for 1980-9

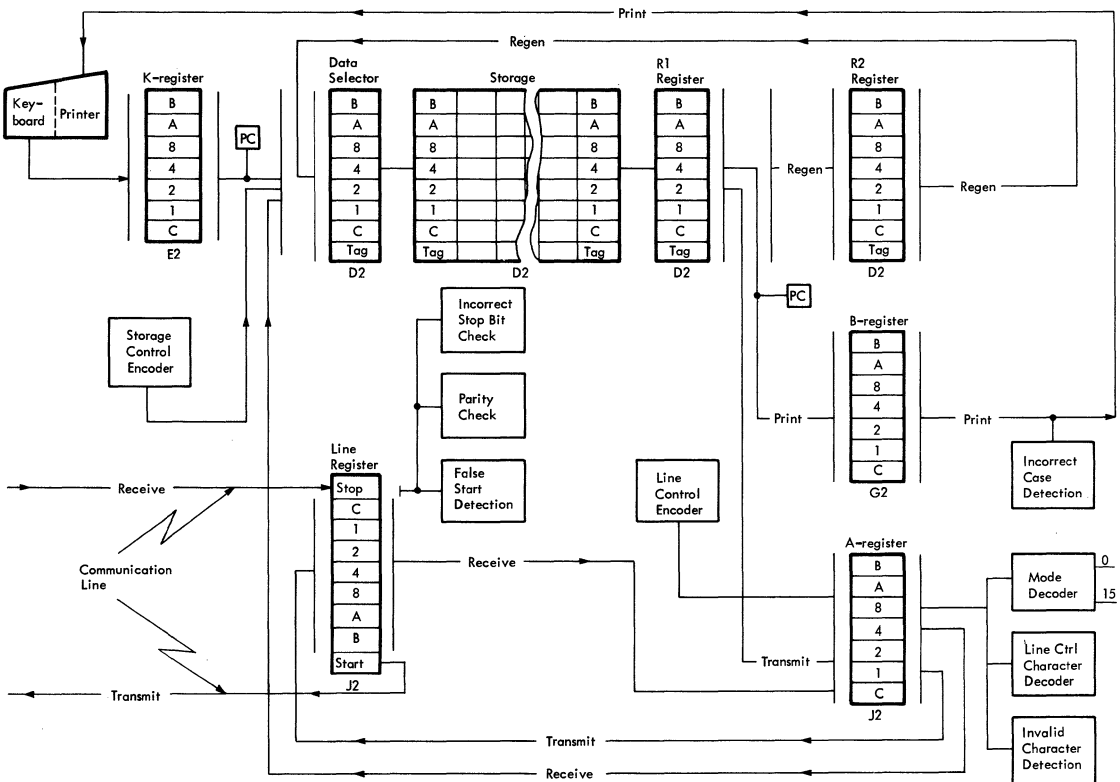
Feature	RPQ No.	Location	Purpose
Line Status Light	8P0235	To right of offline light	Comes on when receive data lead is at marking level





# Section 3. Operations and Maintenance

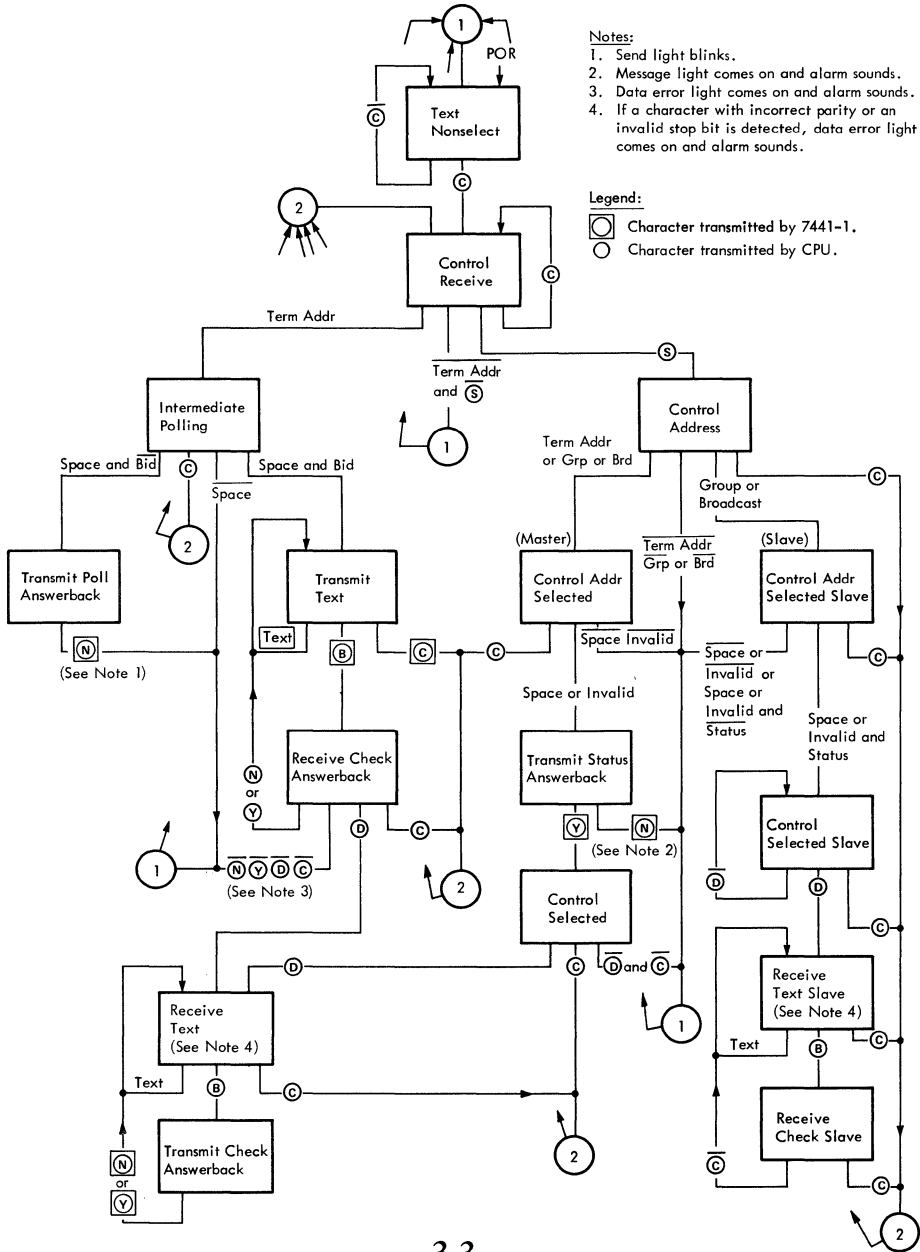
## Data Flow for 7441-1



# Modes of Operation

Mode	Description
Ready	The terminal can receive an output message from the CPU or can receive an input message from the operator.
Receive	The terminal has been addressed by the CPU and is receiving an output message.
Transmit	The CPU has polled the terminal, and an input message is being transmitted to the CPU.
Enter	The enter key has been pressed, taking the terminal out of ready mode. The terminal remains in enter mode until the send key is pressed. If the terminal is addressed by the CPU, the output message is not sent, the message light comes on, and the alarm sounds to alert the operator.
Bid	A message has been keyed and the send key has been pressed. However, the CPU has not polled the terminal.
Offline	The online/offline switch is in the offline position. The 1980-9 may function as a standard office typewriter (not connected to the communication line).
Machine Reset	One of the following conditions exists: 1. The power on/off switch on the control unit has been turned on, but the power-on reset sequence has not been completed. 2. The data error key is pressed while the control unit is in offline mode.

# Mode Control



### ***Text Nonselect (TNS)***

TNS mode is set by a power-on reset or, after an operation starts, by failure to receive the correct control character. In this mode, the 7441-1 does only one thing—it waits for a **(C)** from the CPU. If no **(C)** is received, the terminal remains in TNS mode.

### ***Control Receive (CR)***

CR mode is set when the terminal receives a **(C)**. The next character that is received should be a terminal address (polling sequence) or a **(S)** (addressing sequence). Failure to receive either character sets the terminal back into TNS mode.

### ***Intermediate Polling (IP)***

IP mode is set when the terminal receives a **(C)** followed by a valid terminal address. The next character that is received should be a space. The state of the bid latch then determines which mode the terminal enters.

**Transmit Poll Answerback (TPAB)** mode is set in response to a polling sequence when the terminal has no data to send to the CPU (bid latch is off). The terminal sends **(N)** to the CPU and returns to TNS mode.

**Transmit Text (TT)** mode is set in response to a polling sequence when the terminal has data to send to the CPU (bid latch is on). The terminal remains in TT mode until all data, up to and including a **(B)**, is transmitted.

**Receive Check Answerback (RCAB)** mode is set when the terminal has transmitted data and a **(B)** to the CPU. The CPU replies with one of the following:

**(Y)**—The message was received without error. The terminal returns to TT mode and the CPU sends a **(C)** to place the terminal back into CR mode.

**(N)**—The message that was received by the CPU contained an error. The terminal returns to TT mode and retransmits the message. If another **(N)** is sent by the CPU after it receives the retransmitted message, the terminal returns to TT mode, sends a **(C)**, and enters CR mode.

**(D)**—The CPU may or may not have received the data without error; it has a message to transmit. Therefore, the terminal enters RT mode.

**Receive Text (RT)** mode is set in response to a **(D)** from the CPU. In this mode, the terminal receives data from the CPU. The terminal remains in RT mode until all data, including a **(B)**, is received. The **(B)** sets the terminal to TCAB mode.

**Transmit Check Answerback (TCAB)** mode is set when the CPU has finished transmitting a message. The terminal replies to the CPU with one of the following:

Ⓨ—The terminal detected no error in the message that was received from the CPU. The terminal returns to RT mode. The CPU then sends a ⓐ to place the terminal into CR mode.

Ⓝ—The terminal detected an error in the message that was received from the CPU. The error condition is reset and the terminal returns to RT mode. The CPU may then either retransmit the message or send a ⓐ, placing terminal into CR mode.

### **Control Address (CA)**

CA mode is set when the CPU sends a Ⓢ during an addressing sequence. The next character that is transmitted by the CPU is an address for a single terminal, a group of terminals, or all terminals on the communication line.

**Control Address Selected (CAS)** mode is set in a single terminal when that terminal is addressed, or it is set in a master terminal when a group or a broadcast address is transmitted. The character that is transmitted after the address character should be either a space or an invalid character. If neither a space nor an invalid character is received, the terminal returns to TNS mode.

**Transmit Status Answerback (TSAB)** mode is set during an addressing sequence when a space or an invalid character follows an address character. The terminal responds to the CPU by sending one of the following:

Ⓨ—The terminal can receive an output message from the CPU and is set to CS mode.

Ⓝ—The terminal cannot accept an output message from the CPU and returns to TNS mode.

**Control Selected (CS)** mode is set when the terminal has been addressed and it has informed the CPU that it can accept an output message. The CPU responds by sending a ⓓ, telling the terminal that a message follows. The terminal is set to RT mode.

**Control Address Selected Slave (CASS)** mode is set in a slave terminal when it has received its group or broadcast address. No answerback is sent by the slave terminal. The CPU then sends either a space or an invalid character. If neither a space nor an invalid character is received, or if the slave terminal cannot receive a message, the terminal returns to TNS mode. If the terminal can receive a message and it has received a space or an invalid character, it is set to CSS mode.

**Control Selected Slave (CSS)** mode is set in a slave terminal during an addressing sequence when that terminal can receive a message and it has received a space or an invalid character. If the master terminal has sent a (Y) answerback, the CPU responds with a (D), placing the slave terminal into RTS mode. A (N) answerback by the master terminal causes the CPU to send a (C), and the slave terminal returns to CR mode.

**Receive Text Slave (RTS)** mode is set in a slave terminal by a (D) response from the CPU, telling the slave terminal that an output message follows. The slave terminal receives message characters until the CPU sends a (C) or a (B). The (C) sets the terminal to CR mode. The result of receiving the (B) depends on whether the 'response not expected' jumper is wired:

*'Response not expected' is wired*—Slave terminal does not exit from RTS mode because the next character it receives should be an output data character.

*'Response not expected' is not wired*—Slave terminal exits to RCS mode to receive the response character from the master terminal. (The response character is discarded by the slave terminal.)

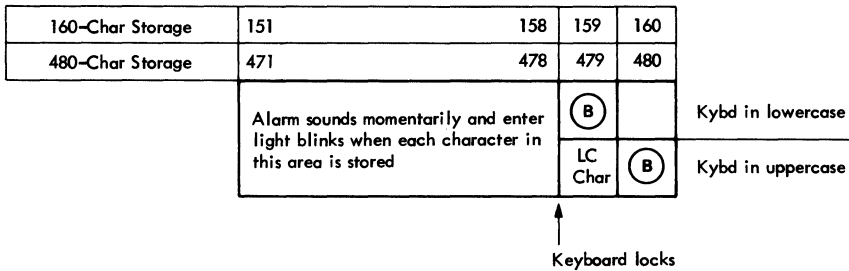
The slave terminal should not receive the response character from the master terminal while the slave terminal is in RTS mode.

**Receive Check Slave (RCS)** mode is set in a slave terminal when a (B) is received while the terminal is in RTS mode and when the 'response not expected' jumper is not wired. The slave terminal will be receiving the response character (either a (Y) or a (N)) from the master terminal. The first character that is received (other than a (C)) sets the terminal back into RTS mode and the response character is discarded. If a (C) is received in RCS mode, the slave terminal switches to CR mode.

## Control Keys

### *Enter*

By pressing the enter key prior to keying data, characters can be sent from the keyboard to the storage unit. When the enter key is pressed, all positions of storage are reset and loaded with a C-bit to create odd parity. The terminal goes into enter mode. If the limit of storage is approached while keying data, the enter light blinks and the alarm sounds each time a key is pressed. When the limit of storage is reached, the keyboard locks, preventing further keying. See the illustration on the following page.



When the 158th (or 478th) character is stored, the keyboard locks (the index key remains operative). If the entire message has not been entered, the operator can choose to:

1. Press the clear key, then the enter key, and then rekey the entire message, perhaps making it briefer, or
2. Press the send key and transmit the message as it is.

The operator cannot backspace to some point in the message and rekey from there because the backspace key is inoperative when the keyboard is locked.

Storage positions 159 and 160 (or positions 479 and 480) are set when the send key is pressed. Their contents depend on what case (lower or upper) the keyboard is in when the send key is pressed:

Lowercase -- ⓑ is stored in position 159 (or position 479).  
 Uppercase -- Lowercase character is stored in position 159 (or position 479). ⓑ is stored in position 160 (or position 480).

The enter key is active, except when:

- The clear key is pressed. The enter key becomes active when the clear key is released.
- The send key is pressed. The enter key remains inactive until the contents of storage have either been sent to the CPU or to the input/output (I/O) typewriter.
- A character has been keyed. When the enter key has been pressed, it becomes inactive until the send key or the clear key is pressed.
- The terminal is not in TNS or CR mode.
- A print or function (such as tab) cycle is in progress.
- The data error light is on.
- The send light is on.

If the terminal is addressed while it is in enter mode, it responds with a ⓓ. The message light comes on and the alarm sounds.



## ***Send***

Pressing the send key initiates data transmission to the CPU (on-line) or to the I/O typewriter (off-line). When the terminal is on-line and the send key is pressed, the terminal enters bid mode. The enter light goes off and the send light comes on. When the terminal is off-line and the send key is pressed, the enter light goes off and the contents of storage are printed on the I/O typewriter (the send light does not come on).

If the keyboard is in uppercase shift when the send key is pressed, a lowercase shift character followed by a (B) enters storage. If the keyboard is in lowercase shift, only the (B) enters storage.

The send key is active only in enter mode under all of the following conditions:

- The terminal is in TNS or CR mode.
- At least one data character has been stored from the keyboard.
- The terminal is not in bid mode. When the send key is pressed, it becomes inactive until the “send” operation has been completed.
- The data error light is off.
- An I/O typewriter cycle is not in progress.

## ***Data Error***

Pressing the data error key resets the data error light and the condition that caused the light to come on. Also, the keyboard unlocks.

If a data error is detected during an input (transmit) operation, the entire message can be retransmitted by pressing the data error key and then the send key.

If a data-error condition is detected during an output (receive) operation, the CPU should retransmit the message after the data error key is pressed. However, if the message is received correctly but the (C) that follows the response character from the terminal has incorrect parity or an incorrect stop bit, the message is not retransmitted by the CPU.

*Note:* Pressing the data error key when the terminal is off-line causes a machine reset, which could result in an incorrect character being transmitted to the CPU if the terminal is transmitting a response to either an addressing or a polling sequence.

## *Clear*

Pressing the clear key, which is operative only in enter mode, resets enter mode. To reenter the message, the enter key must be pressed and then the entire message must be rekeyed. The clear key does not reset a data-error condition.

## **Control Switches**

### *Online/Offline*

#### **Online Position**

The keyboard locks until the enter key is pressed. A stored message may be transmitted by pressing the send key.

#### **Offline Position**

The keyboard unlocks (if the offline light is on) and the 1980-9 may be used as a standard typewriter. If the enter key is pressed, the keyed data enters storage. This data may be printed out by pressing the send key. A message that is stored during offline mode may be transmitted by switching to the online position and by pressing the send key. If the CPU addresses the terminal with its assigned station address or, when the terminal is assigned as the master, with a broadcast or a group address, the message light comes on and the alarm sounds.

### *Power On/Off*

#### **7441-1**

This switch, which is on the control unit, controls power to all terminal components, except the motor in the 1980-9. (The switch does control power to the motor relay in the 1980-9.)

#### **1980-9**

This switch, which is in the lower right section of the keyboard, controls only the power to the motor in the 1980-9. If the terminal is addressed while this switch is OFF and while the 7441-1 power on/off switch is ON, the message light comes on and the alarm sounds.

## Lights (Indicators)

### *Ready*

When this light is on, the terminal can go into enter mode when the enter key is pressed. For the light to come on, the following conditions must be met:

- A print operation is not in progress.
- The terminal is not in enter mode.
- A data-error condition does not exist.
- The terminal is not in bid mode.
- The control unit is in either CR or TNS mode.
- The send key has not been pressed.
- An input message has not been entered.
- The clear key is not active.

### *Transmit*

This light comes on during transmit mode when a mark bit is transmitted to the CPU. The mark bit may be part of a text character, an output address, or a response to a polling sequence.

### *Receive*

When the terminal is in dynamic-storage-print mode, this light is on continuously (is not blinking with mark/space bits) from the time the first output character is received until the entire message has been printed.

When the terminal is in full-storage-print mode, this light comes on when a mark bit is received. It goes off when a space bit is received. When the print operation is initiated (a © is received), the light is on continuously while the text is being printed.

### *Message*

This light comes on when the terminal receives its station address (or its group or broadcast address and it is the master) and the terminal cannot accept the output message for any of the following reasons:

- The terminal is in a print or an enter operation.
- The terminal is off-line.
- The operator is inserting a document into the document chute.

- An input message is in storage.
- A data-error condition exists.
- An I/O cycle is in progress.
- The terminal is in bid mode.
- The 1980-9 power on/off switch is OFF.
- A document is not in the 1980-9 and a code to bypass the document switch has not been received.

The light remains on until the condition that caused the terminal not to accept the message is corrected.

### ***Platen Split L/C/M (Loans/Checks/Messages)***

When this light is on, the platen is mechanically divided into two parts, allowing the right-hand document to be spaced independently of the left-hand document.

The platen is divided (split) by pulling out the left platen knob.

### ***Offline***

This light comes on when the online/offline switch is in the offline position, and when:

- A print operation is not in progress.
- The terminal is in CR or TNS mode.

### ***Line Status***

This light is a feature and it is only available when RPQ 8P0235 is installed on the 1980-9. The light comes on when the receive data signal is at a marking level. The light goes off when a space bit is received.

### ***Data Error***

This light comes on when any of the following error conditions occurs:

- Transmission-line parity check.
- Transmission-line stop bit check.
- Storage parity check.
- Incorrect case error.
- Storage load error.

- Keyboard parity check.
- A **(N)** is received following a retransmitted message.
- An incorrect response character is received while the terminal is in RCAB mode.

When the data error light is on, the keyboard locks, the enter and the send keys are disabled, and the output messages are inhibited.

The light goes off and the condition that caused the light to come on is reset when the data error key is pressed or when a terminal control circuit is activated automatically.

### *Send*

This light comes on when either of the following conditions exists:

- The terminal is on-line, at least one data character has been stored during enter mode, no data error has been detected, and the send key has been pressed.
- The CPU polls the terminal, which does not have an input message ready to be transmitted. The light comes on (for one character time) each time the terminal is polled.

### *Enter*

This light comes on when either of the following conditions exists:

- The enter key is pressed and the control unit is able to go into enter mode. (See “Enter” under “Control Keys” in this section for the necessary conditions.)
- A **(B)** is read out of storage during an offline print operation. This allows the operator to enter a message, to print it out, and then to add to the message.

The enter light blinks (goes off for about 71 ms) when either of the following conditions exists:

- A character is being entered in any of the last eight positions of storage. (See “Enter” under “Control Keys.”)
- The terminal receives its output address and transmits a **(N)** to the CPU, because the terminal could not accept the output message while it was in enter mode.

The enter light goes off when any of the following conditions exists:

- The send key is pressed and the terminal is conditioned to switch either to bid mode or to an offline print operation. (Refer to “Send” under “Control Keys” for the necessary conditions.)
- The clear key is pressed. This resets enter mode; therefore, the bid mode cannot be entered and an offline print operation cannot be started.
- A parity error is detected in storage during enter mode.

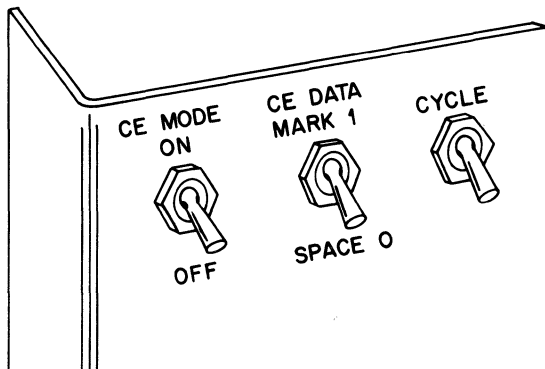
## Audible Alarm

The alarm indicates that manual intervention is required. The alarm sounds when:

- The terminal receives an output addressing sequence that it rejects for any of the following reasons:
  1. The terminal is in either a print or an enter operation.
  2. The terminal is off-line.
  3. The operator is inserting a document into the document chute.
  4. An input message is in storage.
  5. A data-error condition exists.
  6. The terminal is in bid mode.
  7. The 1980-9 power on/off switch is OFF.
  8. The paper contact on the platen is open (when addressed with a space code), or a code to bypass the document switch has not been received.
  
- A character has been entered in one of the last eight data positions of storage.
- The data error light comes on. The alarm sounds only once for a data-error condition. If repetitive errors are detected during an operation, the alarm sounds only when the first error is detected.

## CE Switches

The CE mode, the CE data, and the cycle switches allow the CE to simulate transmission from the CPU. Polling or addressing sequences and text data can be simulated. The CE must be sure that each character is entered correctly, including start bit, stop bit, and correct parity.



### *CE Mode*

When this switch is ON, the terminal is off-line and the common-carrier interface lines are disabled. Logic circuits within the 7441-1 produce pseudo-interface lines to operate the terminal in CE mode.

### *CE Data*

The setting of this switch determines whether a mark bit (mark 1 position) or a space bit (space 0 position) is set into the line register during CE mode when the cycle switch is pressed. The terminal must be in receive mode for the CE data switch to function. In transmit mode, the setting of the switch has no effect on the operation of the terminal.

### *Cycle*

This switch is spring-loaded OFF. It is active only in CE mode, and it functions as follows:

Terminal Mode	Cycle Switch Function
Receive (CPU sends data)	The bit (mark or space) provided by the setting of the CE data switch is gated to the line register. Each operation of the switch gates one bit.
Transmit (Terminal sends data)	One bit is shifted out of the line register. Therefore, nine operations of the cycle switch are required to shift an entire character out of the line register. The data is discarded; it is not sent to the common-carrier interface.

# Polling Sequences

## *Poll without Bid*

- Input message was not stored.
- CE mode switch is ON.

Action	Each column represents one operation of the cycle switch.									Comments
	Start	B	A	8	4	2	1	C	Stop	
CPU sends:										
Ⓒ	0	0	0	1	1	1	1	1	1	Ready light is on at start of operation. No change in keyboard indicators.
Terminal address (See Note)	0								1	Ready light goes off; receive light comes on.
Space	0	0	0	0	0	0	0	1	1	Receive light goes off; send light comes on.
Terminal sends:										
Ⓓ	0	1	0	0	0	0	0	0	1	Transmit light comes on for each mark bit. Send light goes off; ready light comes on.

Note: Put your terminal address in the blank area.

### CAUTION

To prevent transmitting extraneous bits over the transmission line, turn the 7441-1 power on/off switch OFF before switching the terminal on-line.



## Poll with Bid

- Input message was stored.
- CE mode switch is ON.
- Terminal is on-line.
- Enter key is pressed.
- Numeric 1 is stored.
- Send key is pressed.

Action	Each column represents one operation of the cycle switch.								Comments	
	Start	B	A	8	4	2	1	C		Stop
CPU sends:										
Ⓒ	0	0	0	1	1	1	1	1	1	Send light is on at start of operation.
Terminal address (See Note)	0	1	1	0	1	1	0	1	1	Receive light comes on.
Space	0	0	0	0	0	0	0	1	1	Receive light goes off when CE data switch is set to space position for the start bit. It comes on again for a mark bit.
									↑	Receive light goes off; send light goes off.
Terminal sends:										
Ⓓ	0	0	0	1	0	1	1	0	1	Transmit light comes on for each mark bit.
1	0	0	0	0	0	0	1	0	1	Transmit light comes on for each mark bit.
Ⓑ	0	0	1	1	1	1	0	1	1	Receive light comes on.
									↑	Receive light comes on.
CPU sends:										
Ⓐ	0	1	1	1	0	1	1	0	1	Receive light comes on for each mark bit.
Terminal sends:										
Ⓒ	0	0	0	1	1	1	1	1	1	Transmit light comes on for each mark bit.
									↑	Ready light comes on.

Note: Put your terminal address in the blank area.

### CAUTION

To prevent transmitting extraneous bits over the transmission line, turn the 7441-1 power on/off switch OFF before switching the terminal on-line.

## Addressing Sequence

- Receive data (numeric 1).
- CE mode switch is ON.
- Terminal is on-line.
- Paper switch is closed.

Action	Each column represents one operation of the cycle switch.								Comments	
	Start	B	A	8	4	2	1	C		Stop
CPU sends:										
Ⓒ	0	0	0	1	1	1	1	1	1	Ready light is on at start of operation.
Ⓔ	0	0	1	1	0	1	1	1	1	Ready light goes off.
Terminal address (See Note)	0								1	Receive light comes on.
Space	0	0	0	0	0	0	0	1	1	Receive light comes on for each mark bit.
Terminal sends:										
Ⓐ	0	1	1	1	0	1	1	0	1	Transmit light comes on for each mark bit.
CPU sends:										
Ⓓ	0	0	0	1	0	1	1	0	1	Receive light comes on for each mark bit.  The 1980-9 prints a 1 (dynamic-print mode only). Receive light stays on in dynamic-print mode. In full-storage-print mode, the receive light comes on for each mark bit.
1	0	0	0	0	0	0	1	0	1	
Ⓑ	0	0	1	1	1	1	0	1	1	
Terminal sends:										
Ⓐ	0	1	1	1	0	1	1	0	1	
CPU sends:										
Ⓒ	0	0	0	1	1	1	1	1	1	Receive light goes off; ready light comes on. The 1980-9 prints a 1 (full-storage-print mode only).

Note: Put your terminal address in the blank area.

### CAUTION

To prevent transmitting extraneous bits over the transmission line, turn the 7441-1 power on/off switch OFF before switching the terminal on-line.

## Checking for Errors

Logic circuits in the 7441-1 check for errors in:

- The text that is received from the CPU.
- The storage unit.
- The 1980-9 keyboard.

### *Text*

Each data character that is received is checked to ensure that it contains odd parity and a stop bit that is at the marking level. If an error is detected, the data error light comes on and the alarm sounds. The character in error is discarded, and  $\overline{BA8421}$  (  $\_$  or  $\text{Z}$  ) is stored in its place. The entire message is stored and printed; but, at the end of the message, the terminal responds with a  $\textcircled{N}$ . This alerts the CPU that an error was detected.

The message is monitored continuously in storage. If a parity error is detected in storage, the data error light comes on, the alarm sounds, and the terminal responds at the end of the message with a  $\textcircled{N}$ .

As each character is received, the storage unit is checked to ensure that the previous character was stored. If it was not stored, an overrun condition is detected. An overrun could mean that either:

- The character rate exceeds the storage cycle time, or
- The storage unit is full.

The data error light comes on when the overrun condition is detected. The alarm sounds and the terminal responds at the end of the message with a  $\textcircled{N}$ .

When an incorrect case shift is detected, the shift character is replaced with  $\_$  or  $\text{Z}$  ( $\overline{BA8421}$ ). In data that is received, an incorrect case shift is not detected until the shift character is read out of storage. Therefore, in dynamic-print mode, an incorrect case shift can be detected as the data is received and printed. The data error light comes on, the alarm sounds, and the terminal responds at the

end of the message with a (N). However, in full-storage-print mode, an incorrect case shift can be detected only after the entire message has been received and the terminal has responded with a (V) (if no other error was detected).

### ***Storage***

During enter mode, the contents of storage are monitored continuously for incorrect parity. If an error is detected, the terminal goes out of enter mode, the keyboard locks, the data error light comes on, and the alarm sounds. To correct the error condition, press the data error key and then the enter key. The enter key resets storage; therefore, the entire message must be rekeyed.

Data that is transferred from storage to the 1980-9 is parity-checked. If an error is detected, the character in error is discarded and is replaced by a \_ or / .

Data that is transferred from storage to the transmission line is not parity-checked. All characters are transmitted exactly as they are. However, a check is made to determine whether a character has been supplied by the storage unit. If no character has been supplied, the terminal sends a (C) .

### ***Keyboard***

Each time a key on the 1980-9 keyboard is pressed, the encoded data character is parity-checked. If a parity error is detected, nothing is set into storage and the storage address is not advanced. The data error light comes on and the alarm sounds. To correct the character in error:

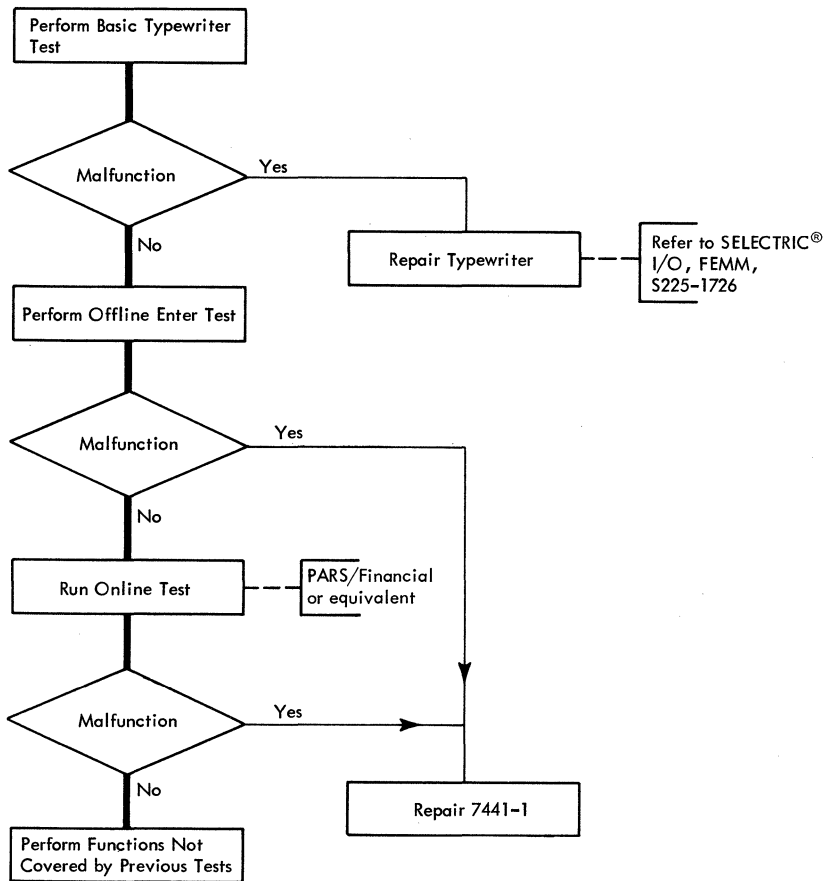
***Online***—Press the data error key and then the correct character key.

***Offline***—Set the online/offline switch to the online position. Press the data error key and then the correct character key. Then return the online/offline switch to the offline position.

If a backspace operation is required for form alignment (online or offline), press the backspace key *once*. The carrier moves back one space, but the contents of storage are not affected. If the backspace key is pressed again, the carrier moves back one more space and the last character that was entered into storage is erased.

# Maintenance Analysis Procedures (Part 1 of 22)

Part 1 is an overview of the MAPs. Test procedures start at Part 2. When troubleshooting, always start at Part 2.



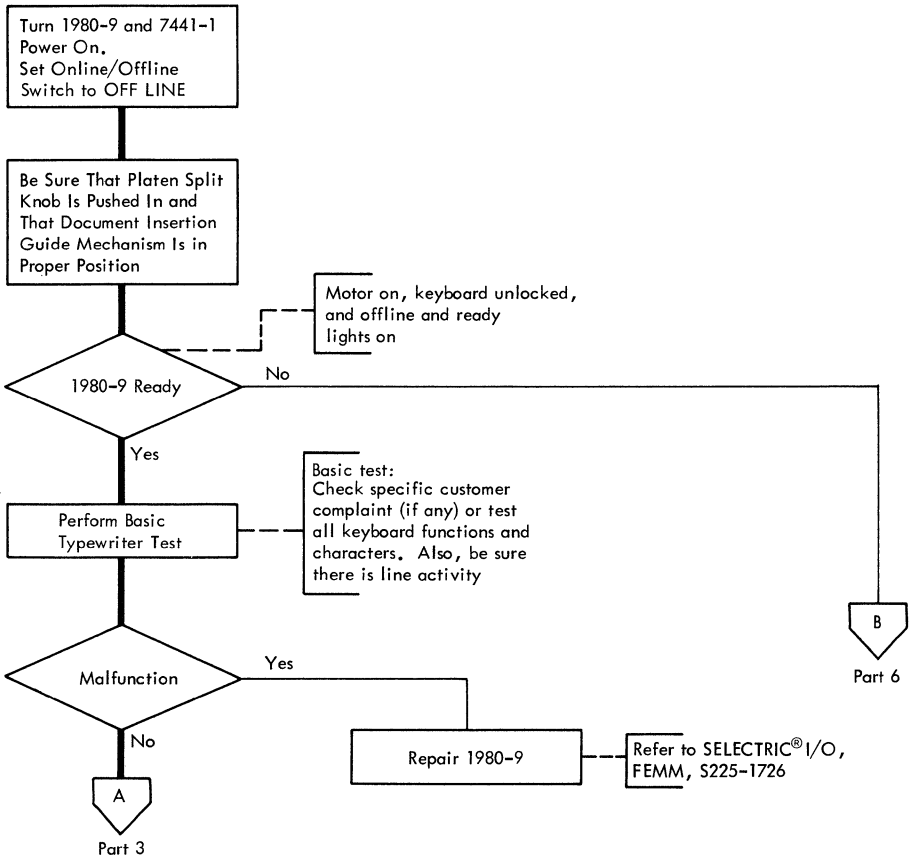
# Maintenance Analysis Procedures (Part 2 of 22)

## DANGER

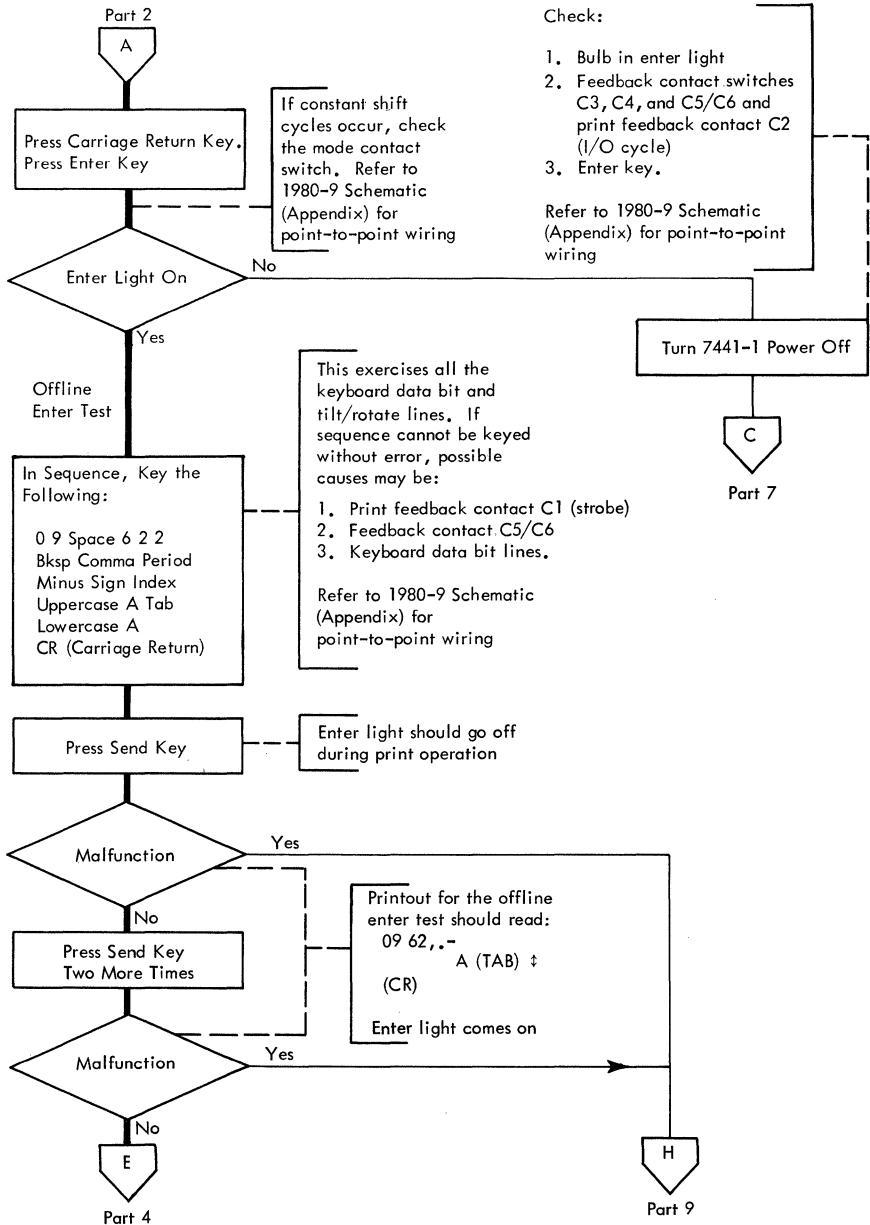
If the 7441-1 has a TTY interface, other than normal voltages may be present at any time.

**Note:** Additional tests are provided near the end of these charts for the following functions:

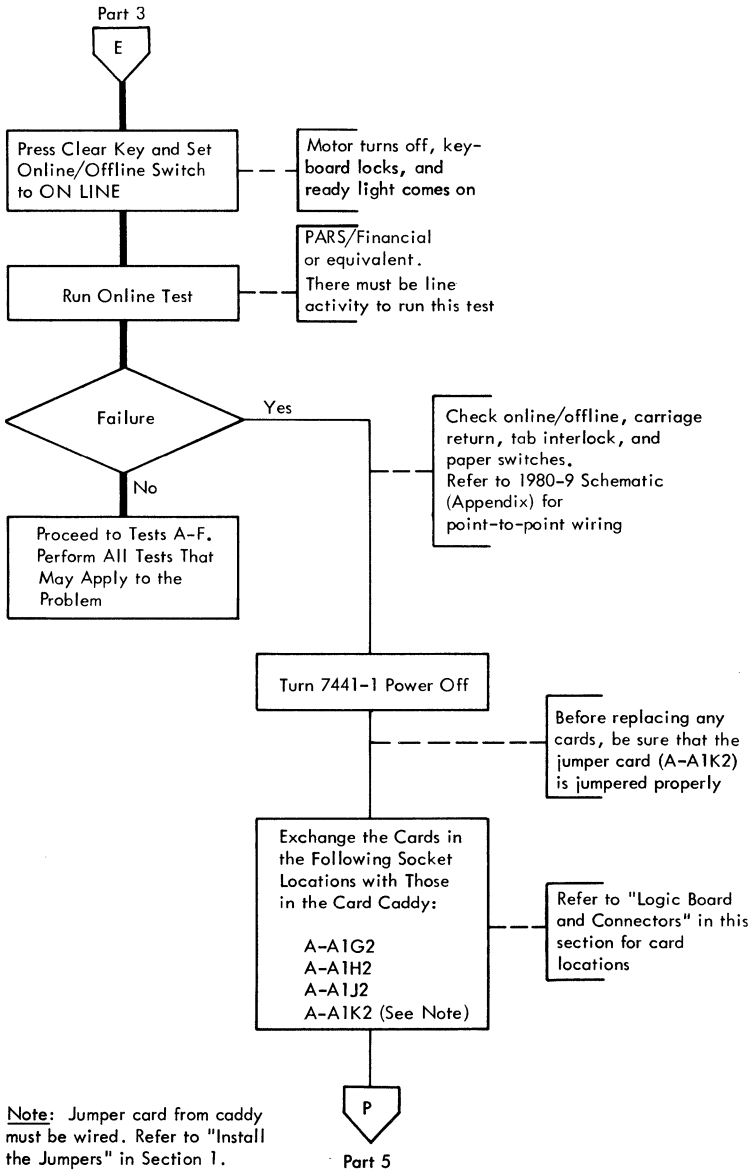
- Test A -- Input Message Length
- Test B -- Platen Split, Document Insertion, and Feed Rollers
- Test C -- Initial Lowercase
- Test D -- Clear Switch
- Test E -- Incorrect Case and Data Error Switch
- Test F -- Paper Switch, Message Light, and Alarm.



# Maintenance Analysis Procedures (Part 3 of 22)

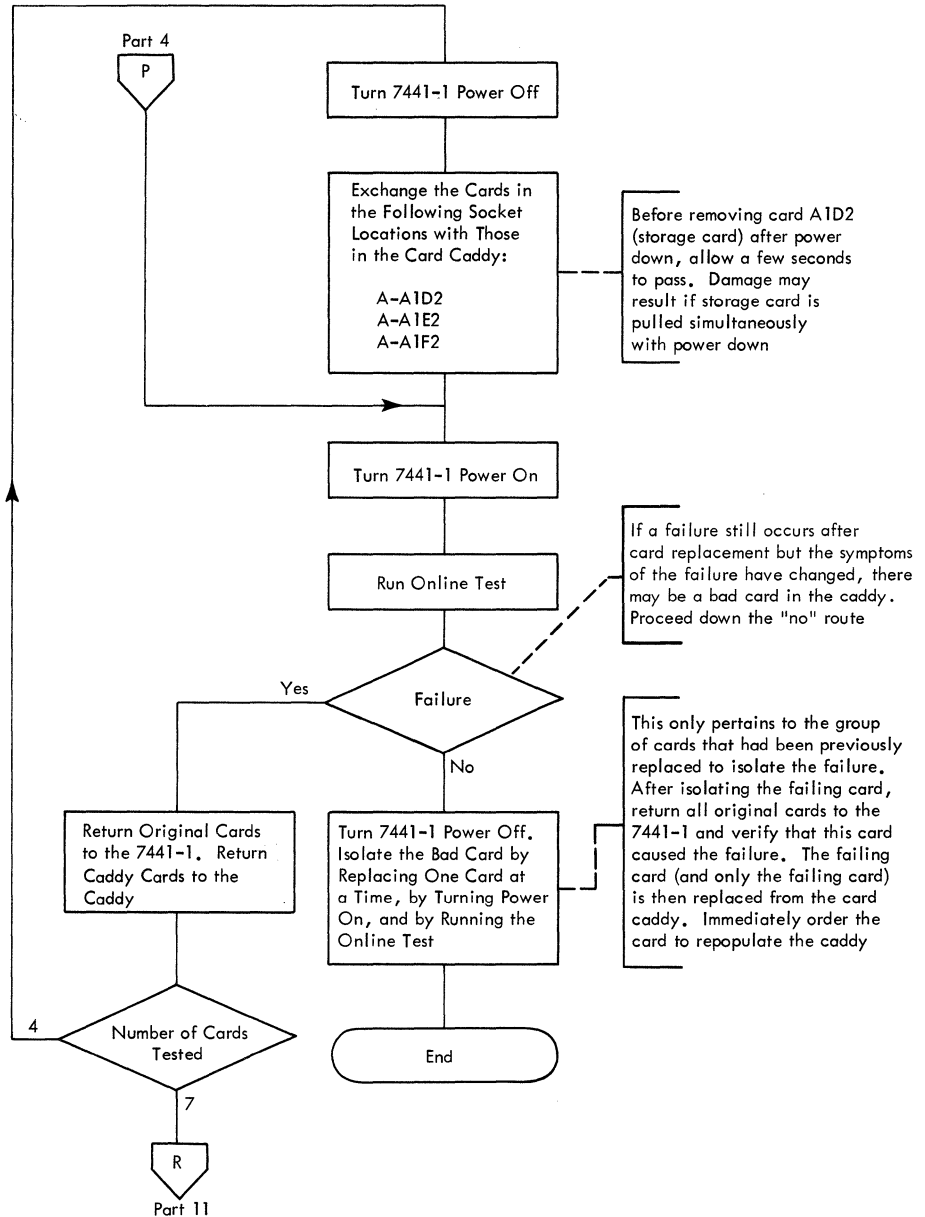


# Maintenance Analysis Procedures (Part 4 of 22)

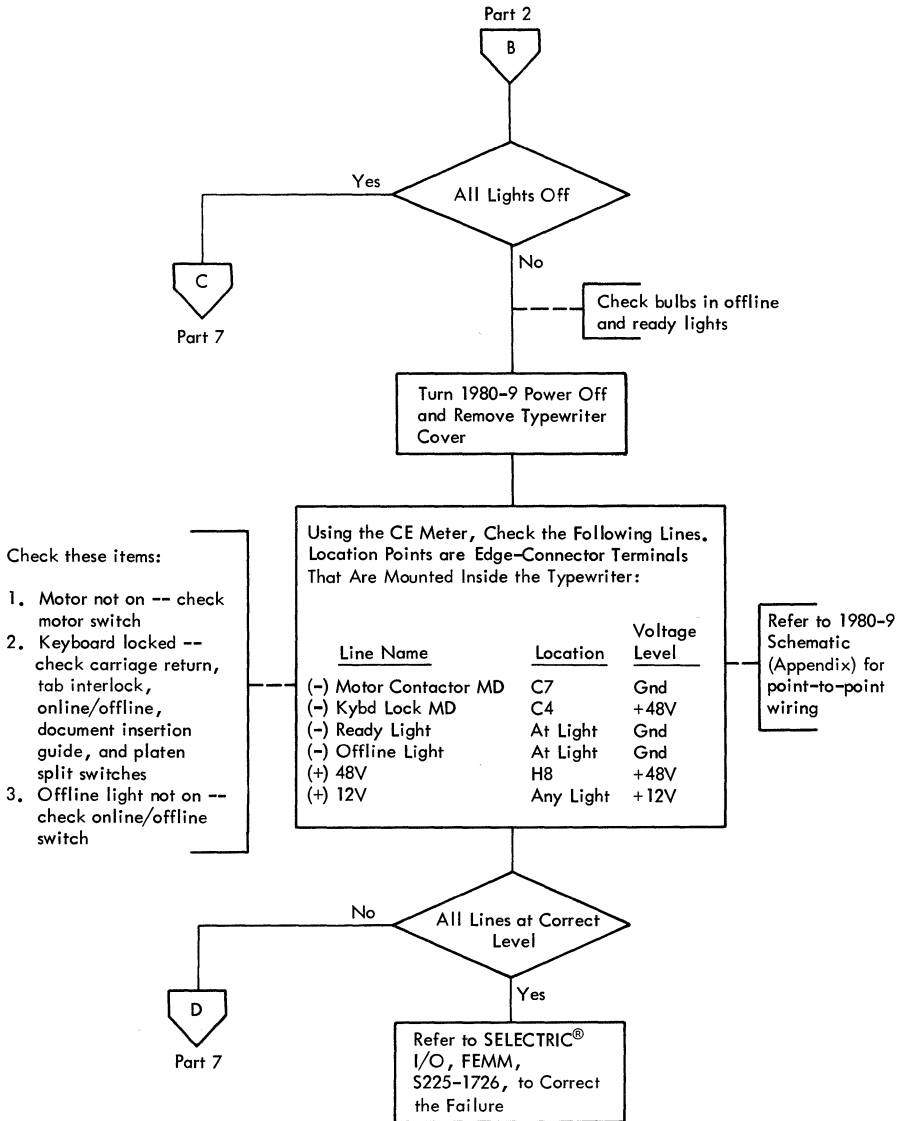




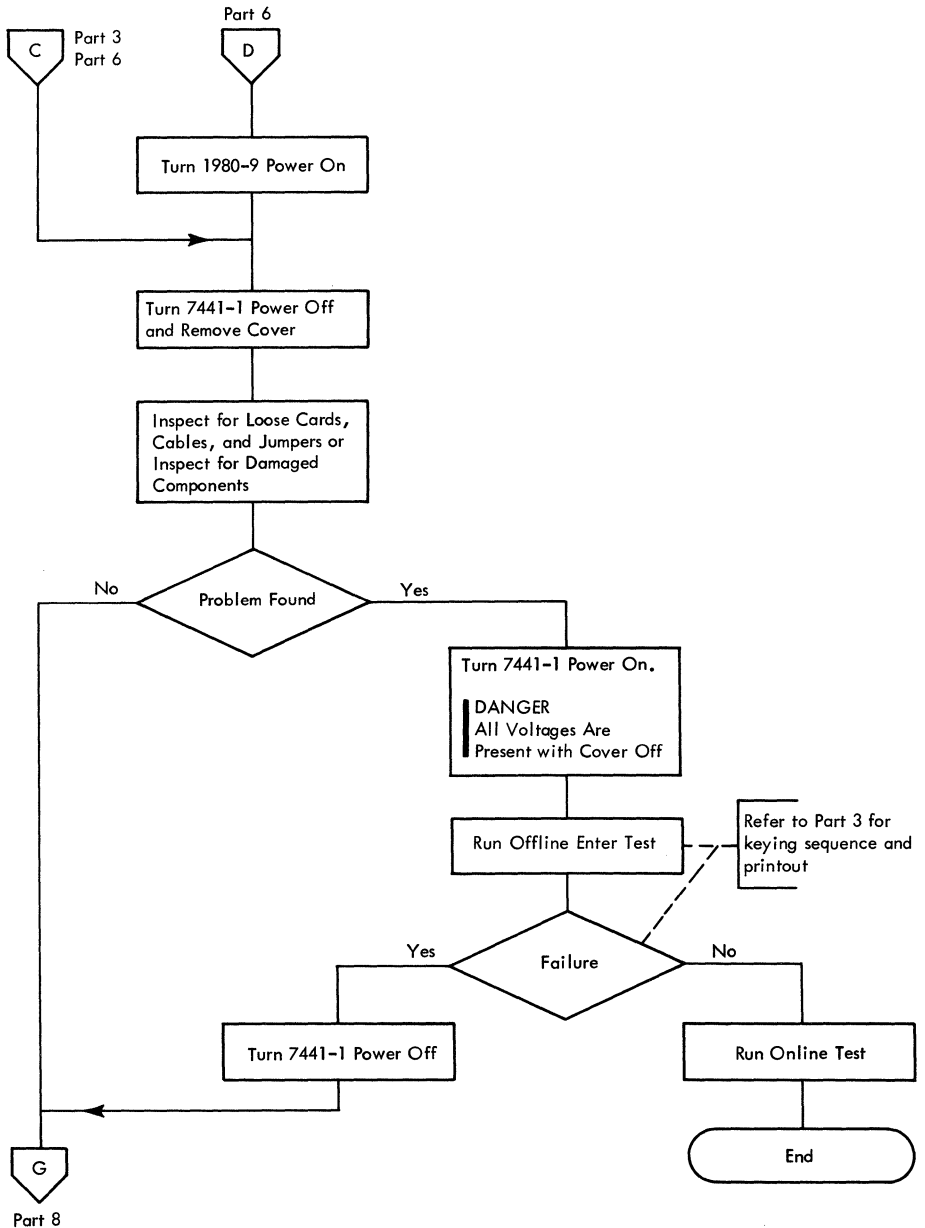
# Maintenance Analysis Procedures (Part 5 of 22)



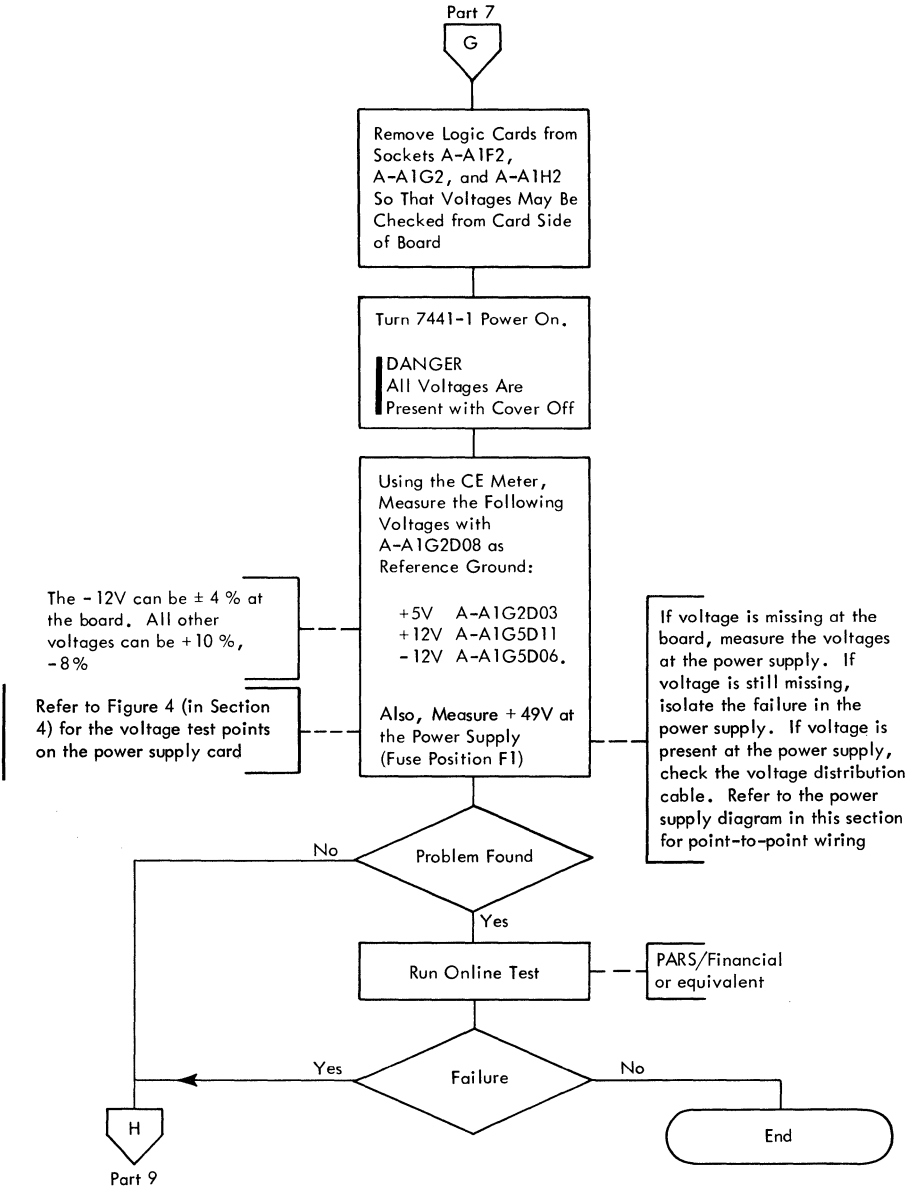
# Maintenance Analysis Procedures (Part 6 of 22)



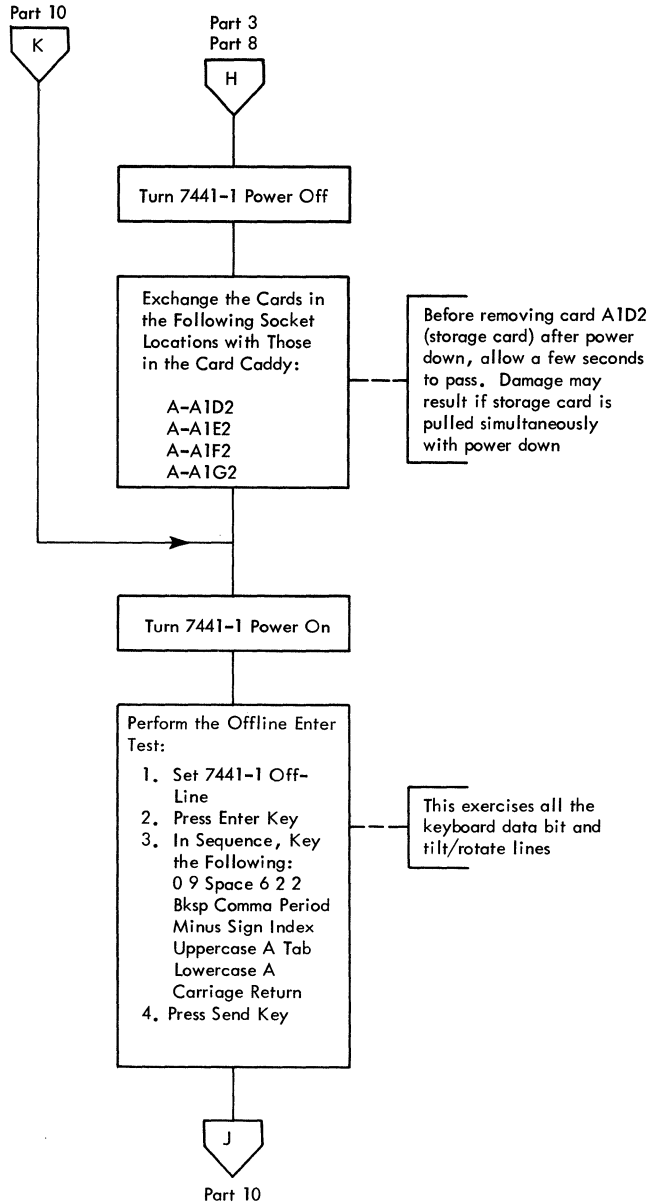
# Maintenance Analysis Procedures (Part 7 of 22)



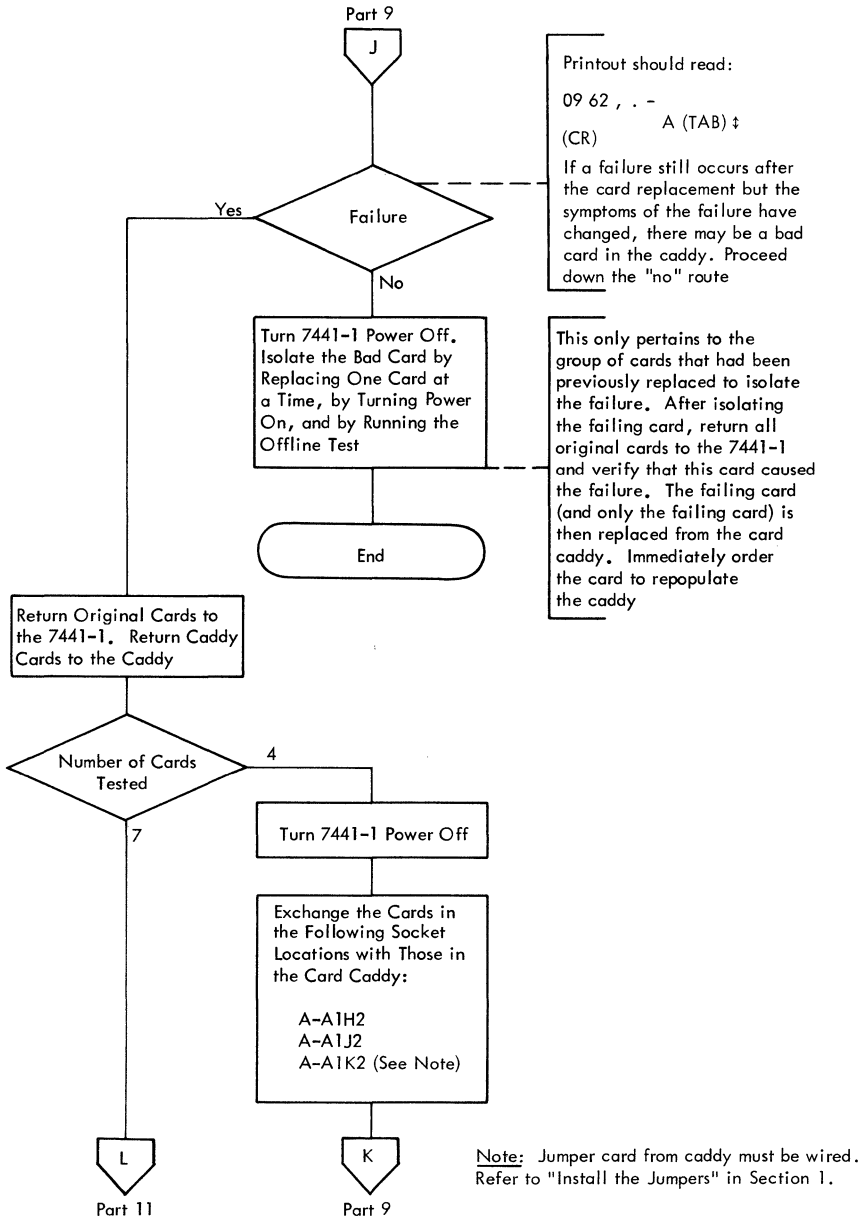
# Maintenance Analysis Procedures (Part 8 of 22)



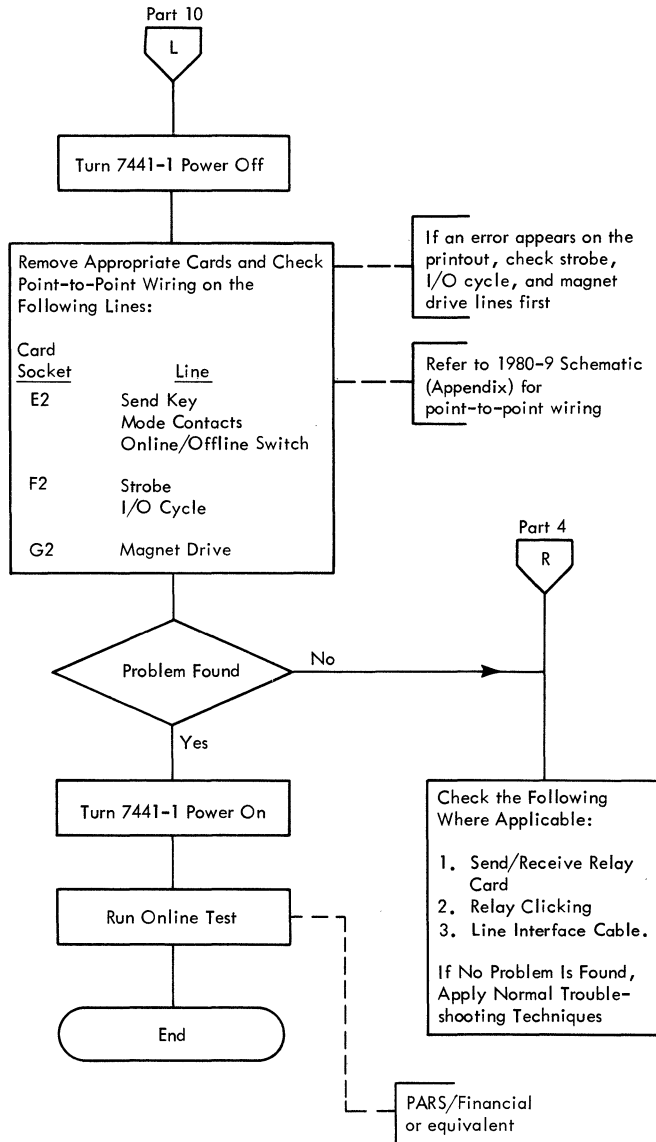
# Maintenance Analysis Procedures (Part 9 of 22)



# Maintenance Analysis Procedures (Part 10 of 22)

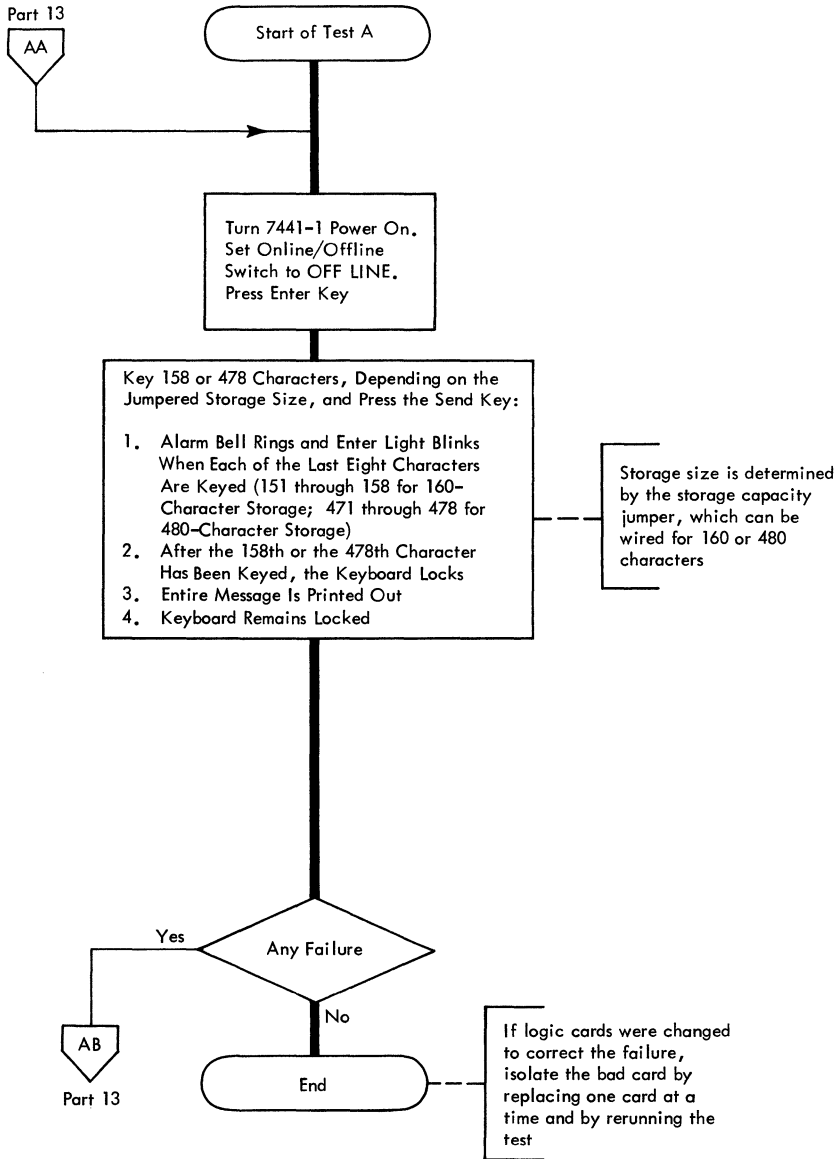


# Maintenance Analysis Procedures (Part 11 of 22)



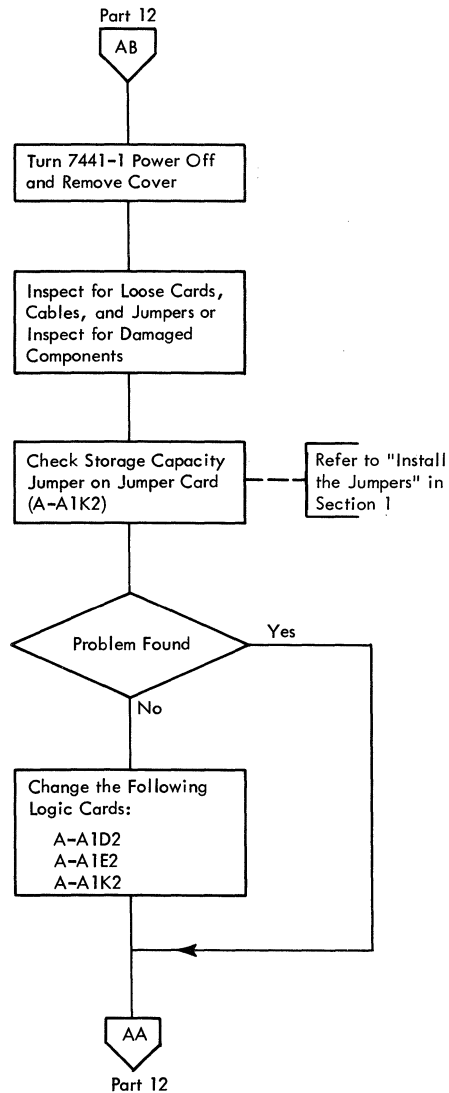
# Maintenance Analysis Procedures (Part 12 of 22)

## Test A: Input Message Length



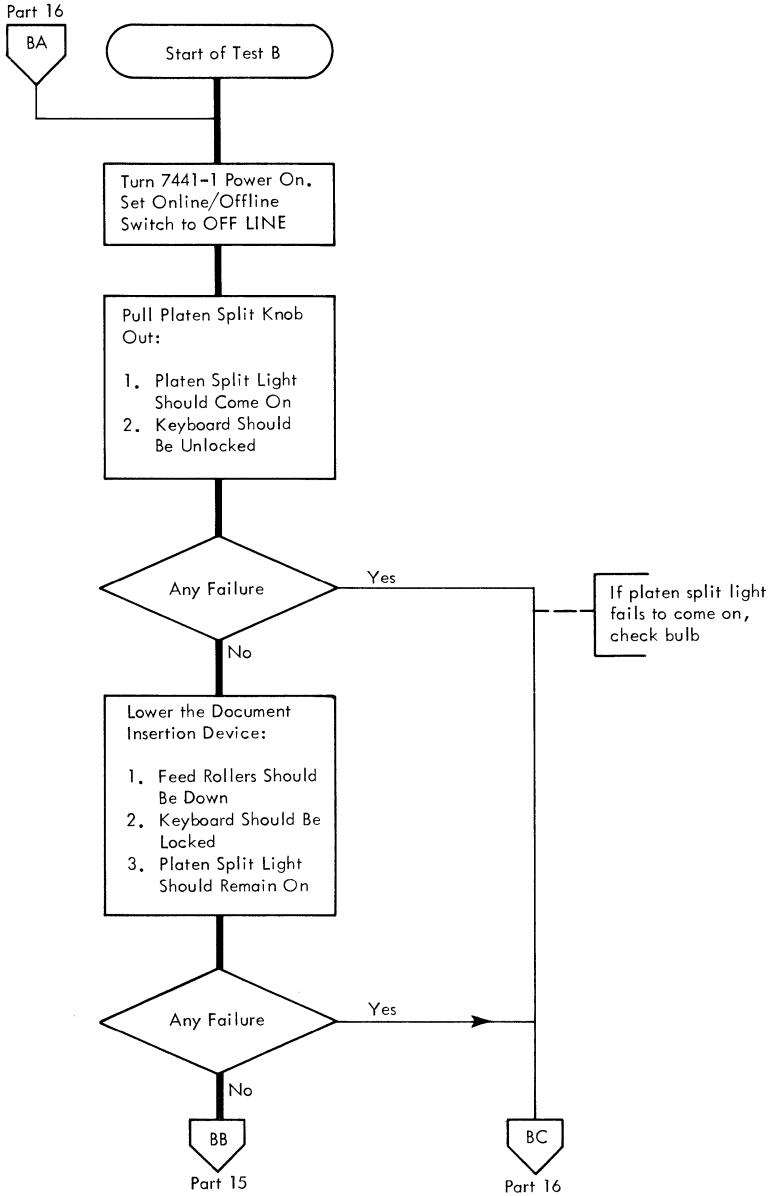


# Maintenance Analysis Procedures (Part 13 of 22)

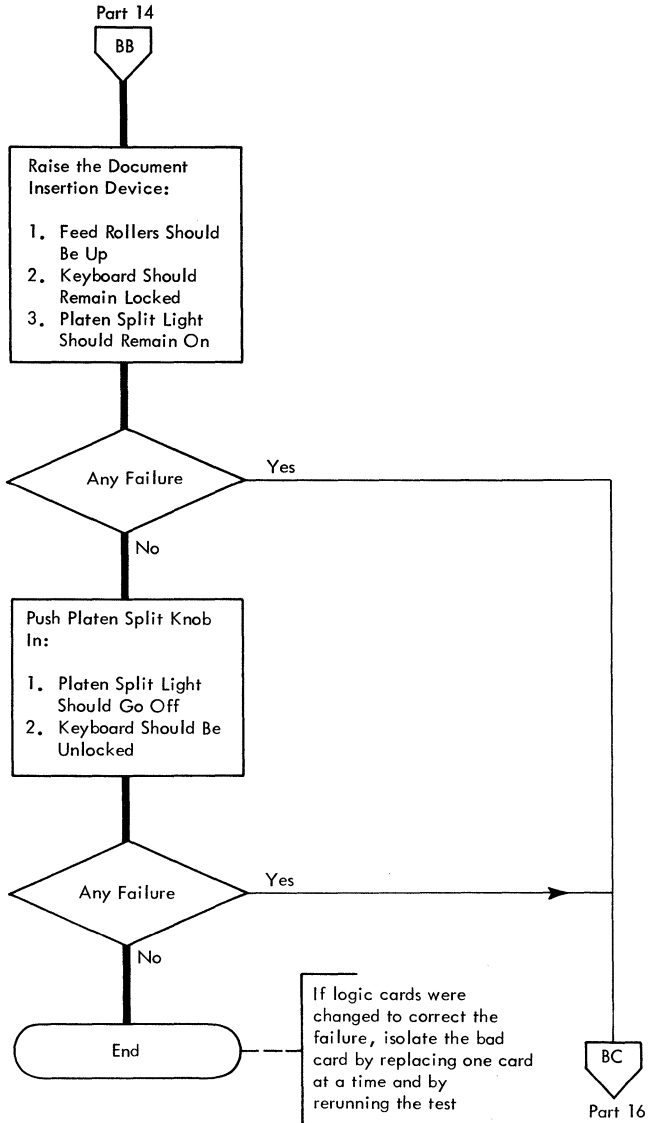


# Maintenance Analysis Procedures (Part 14 of 22)

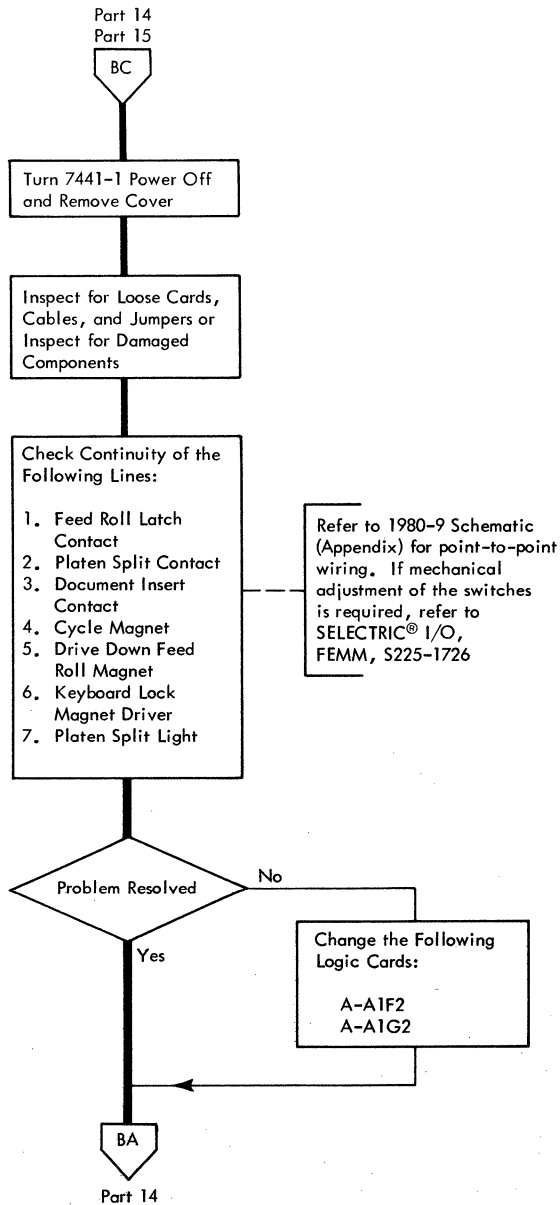
## Test B: Platen Split, Document Insertion, and Feed Rollers



# Maintenance Analysis Procedures (Part 15 of 22)

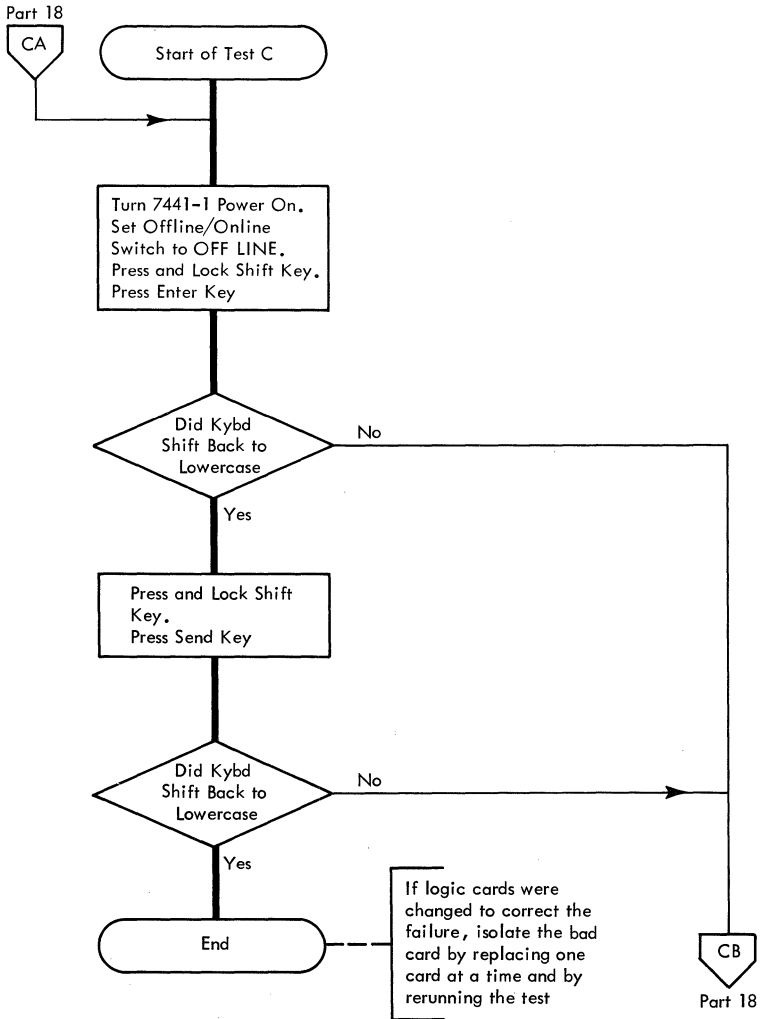


# Maintenance Analysis Procedures (Part 16 of 22)

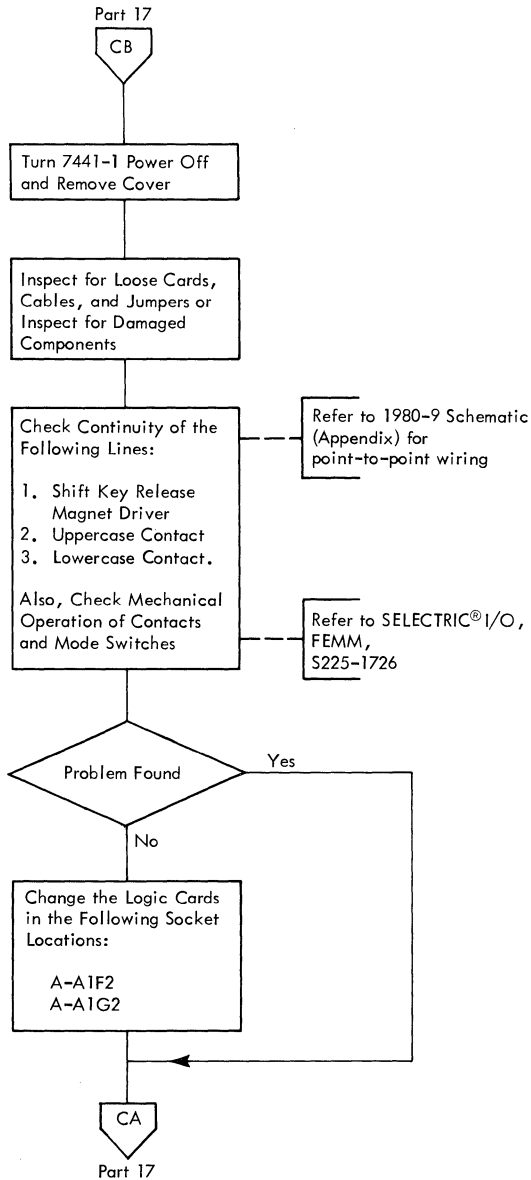


# Maintenance Analysis Procedures (Part 17 of 22)

## Test C: Initial Lowercase

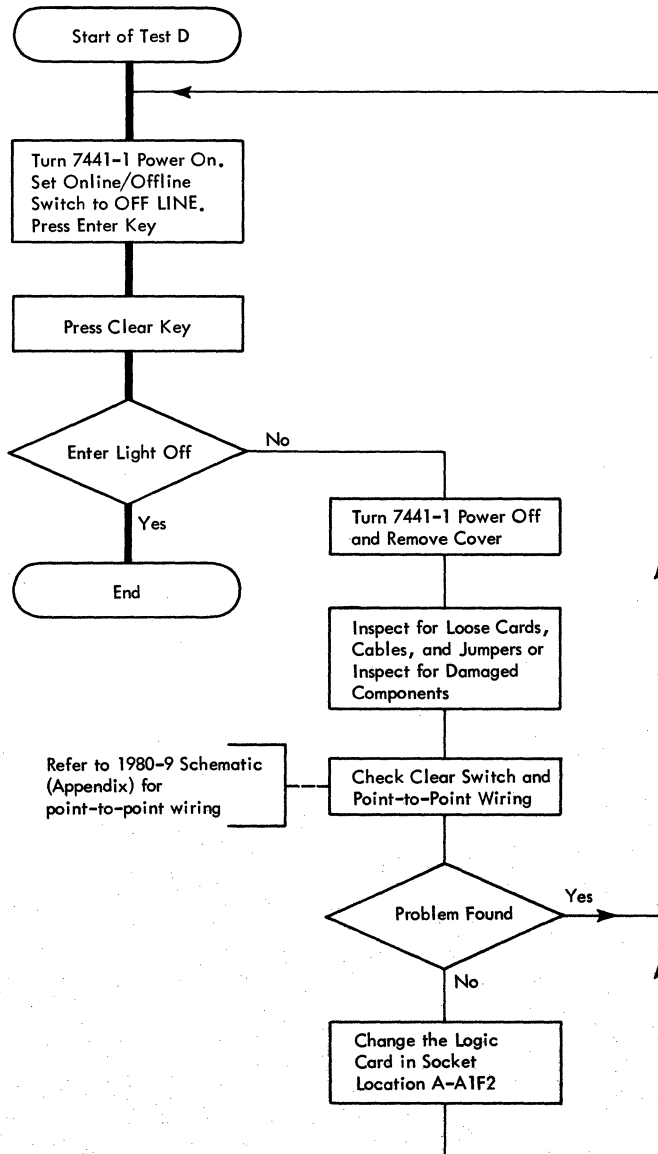


# Maintenance Analysis Procedures (Part 18 of 22)



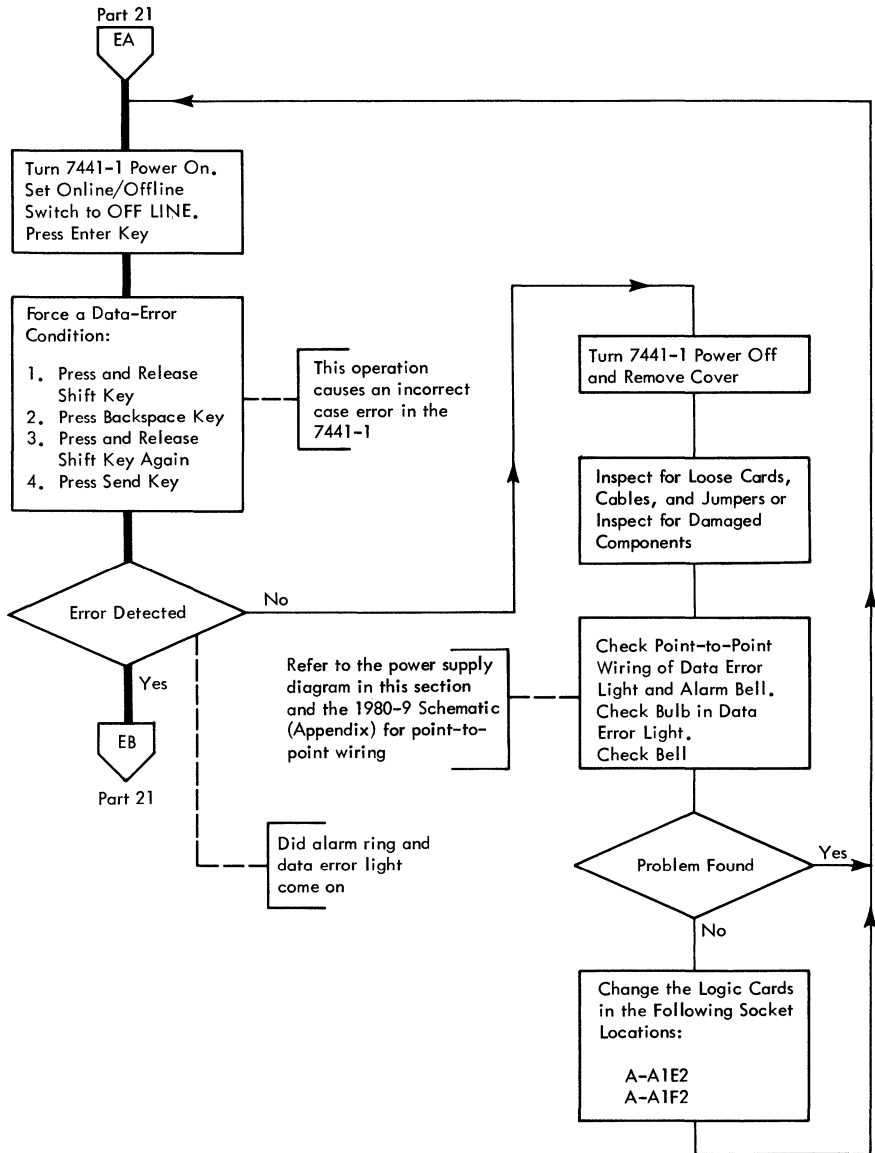
# Maintenance Analysis Procedures (Part 19 of 22)

## Test D: Clear Switch



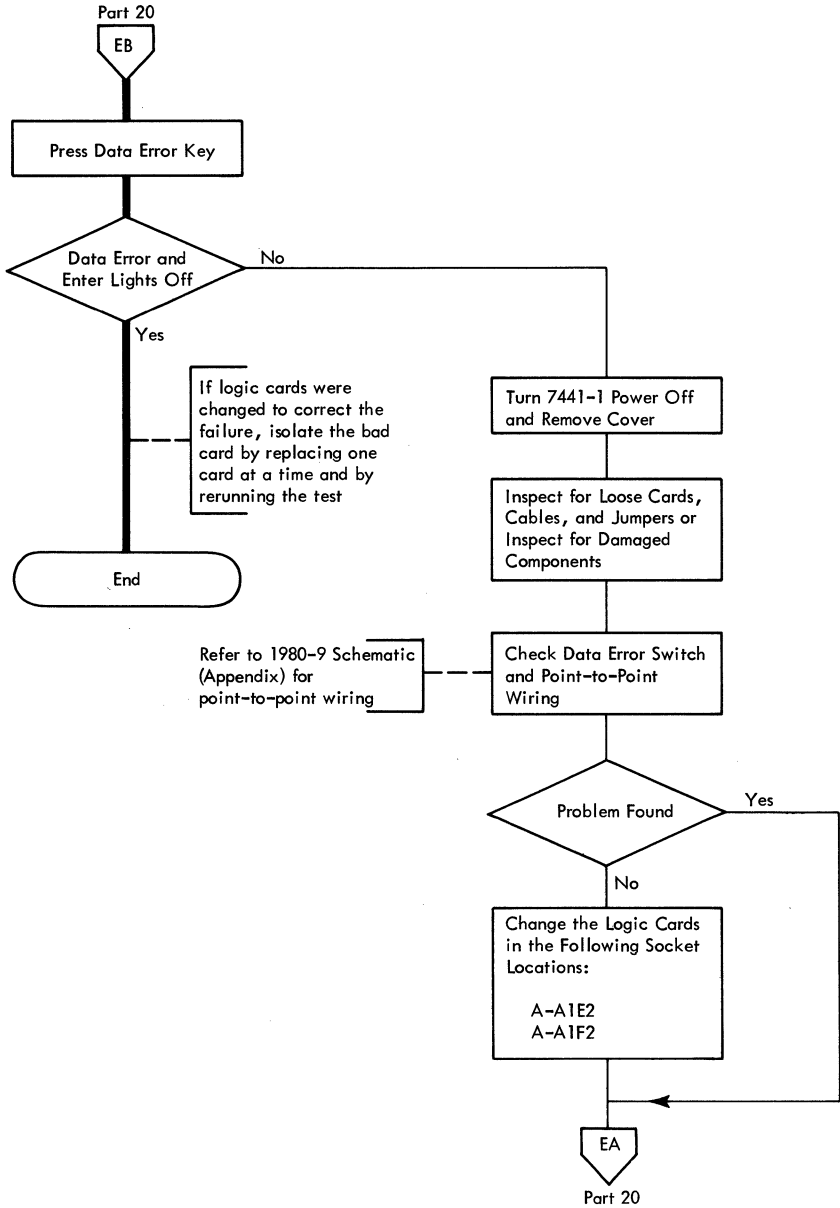
# Maintenance Analysis Procedures (Part 20 of 22)

## Test E: Incorrect Case and Data Error Switch



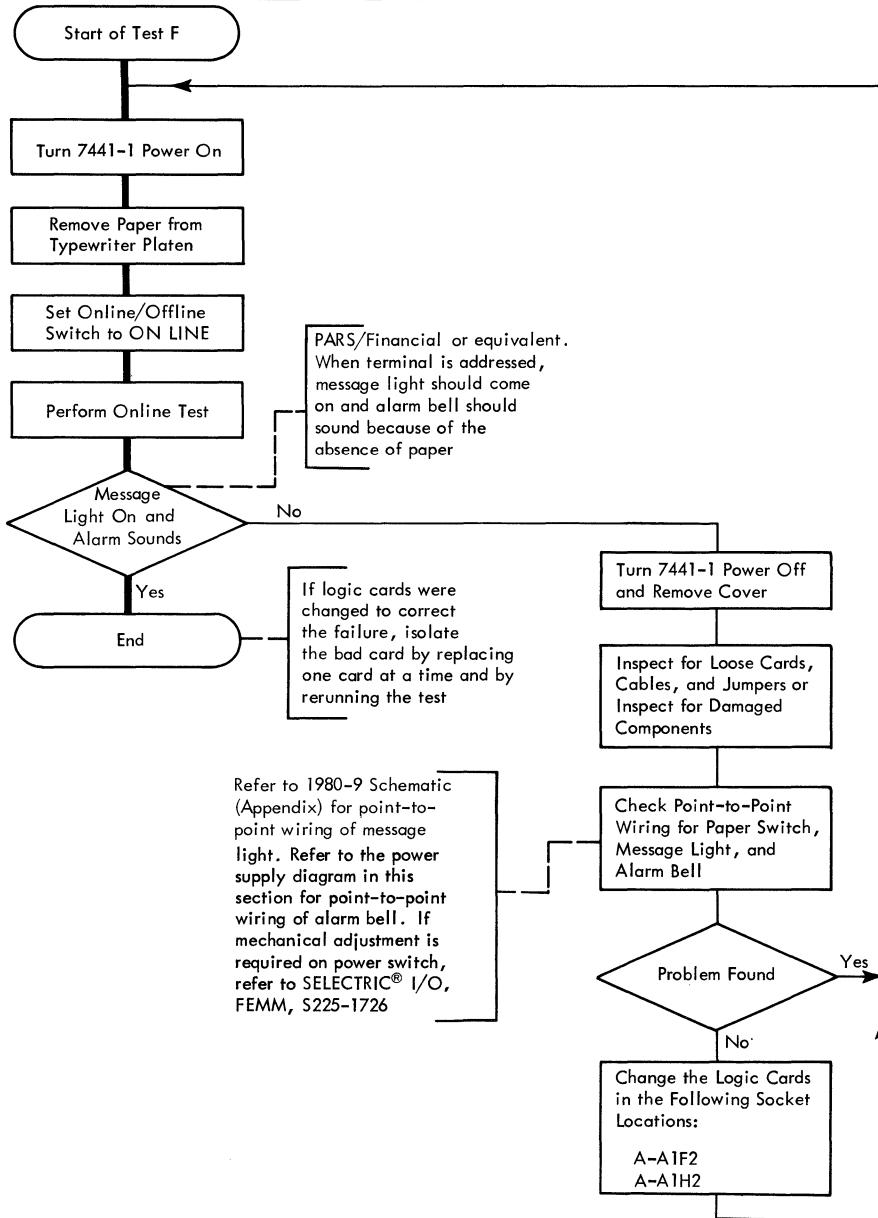


# Maintenance Analysis Procedures (Part 21 of 22)

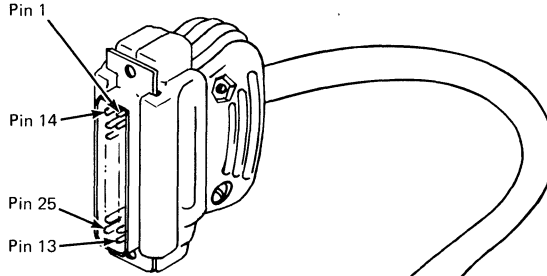


# Maintenance Analysis Procedures (Part 22 of 22)

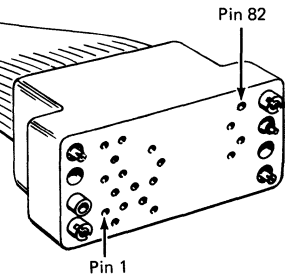
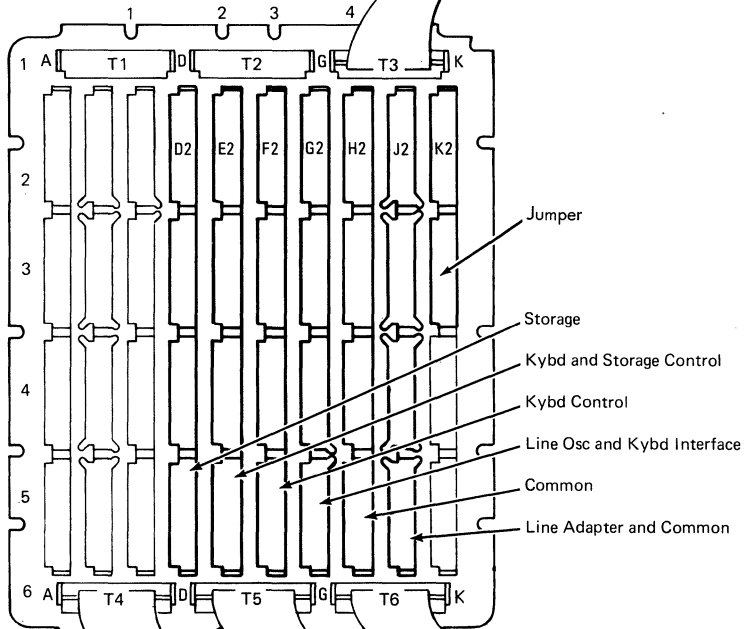
## Test F: Paper Switch, Message Light, and Alarm



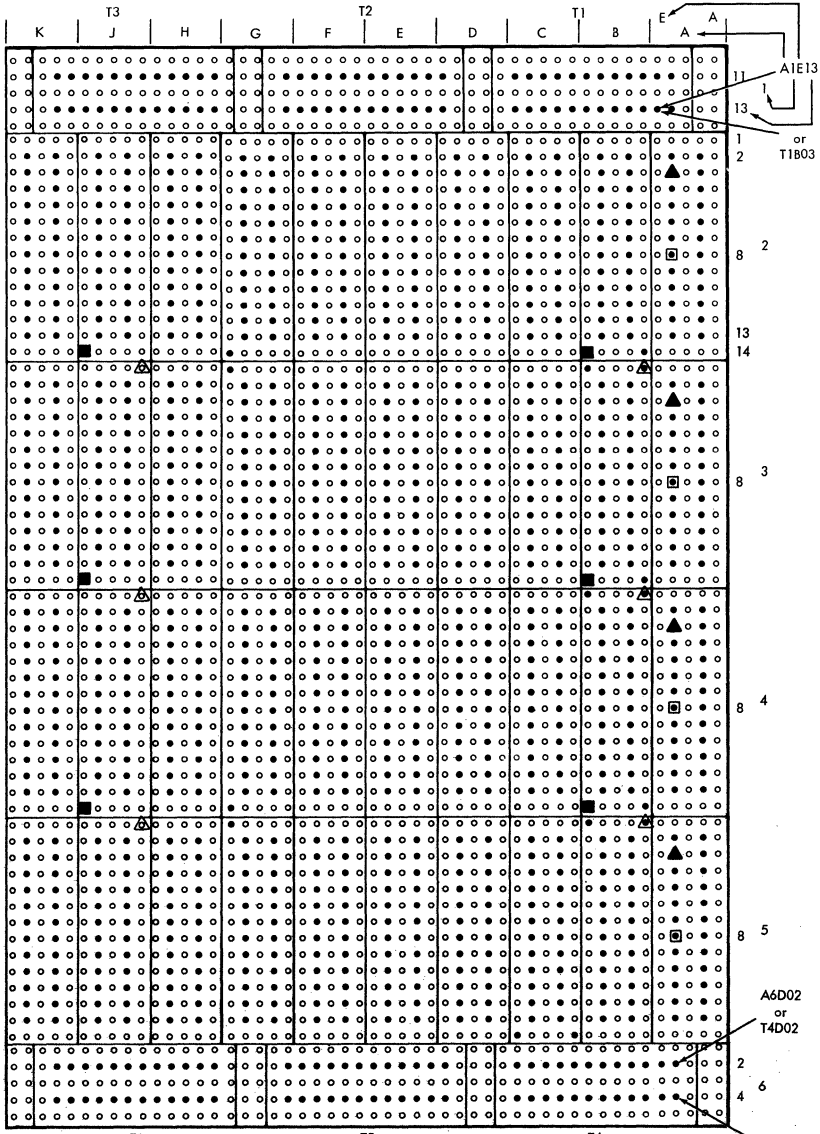
# Logic Board and Connectors (Card Side)



Card	Part
D2	8522272
E2	8522942
F2	8522992
G2	8521818 (75 BPS) 8522991 (134 BPS)
H2	8522815
J2	8522943
K2	8522271



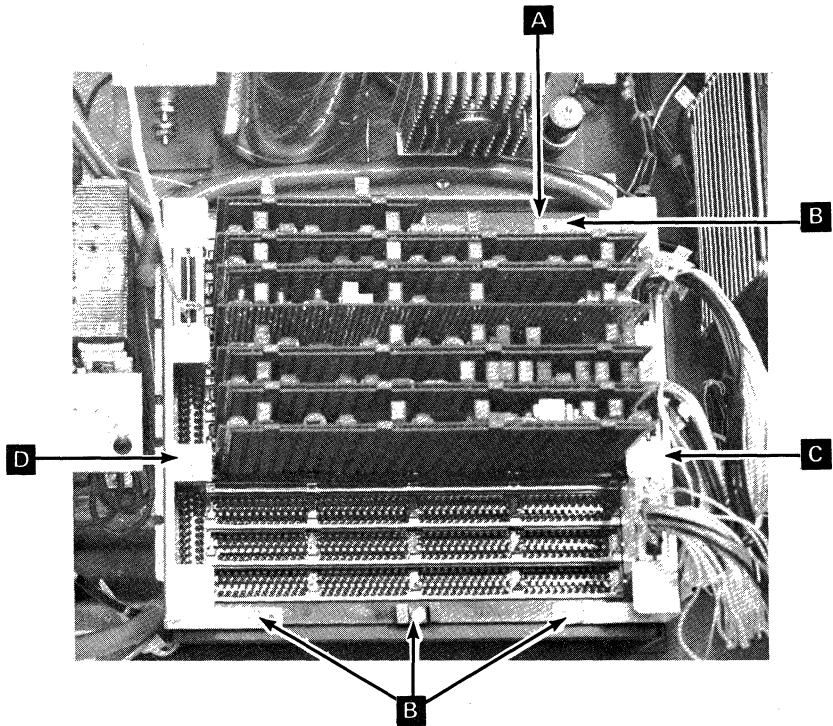
# Logic Board and Connectors (Pin Side)



**Legend:**

- |   |     |       |       |       |
|---|-----|-------|-------|-------|
| ▲ | D03 | +5V   | J5E01 | J3E01 |
| ◻ | D08 | Gnd   | G5D06 | G5D11 |
| △ | +5V | Plane | D5D06 | C6C04 |
| ■ | Gnd | Plane | E2D06 |       |
|   |     |       | A6E02 |       |

## Repositioning of Logic Board

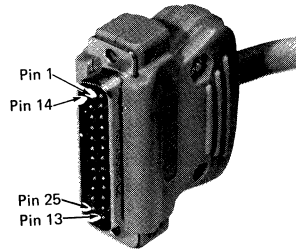


The logic board can be repositioned for test purposes as follows:

1. Remove the retaining clips from the minibus connectors on the pin side of the board.
2. Remove the six screws at **B** and the T-connector retainer at **D**.
3. Lift the logic board at side **D** until it is perpendicular. The T-connector retainer at **C** becomes the base, which can be positioned over the middle pair of holes in the card frame (where the screws at **B** were removed).
4. Install one pair of screws and tighten the retainer **C** to the card frame.
5. Install one screw into each side of retainer **C** at **A** from the pin side of the board. This holds the board to the retainer.

*Note:* When testing is completed, be sure to install the retaining clips on the minibus connector.

## Connector for Data Set



Data Set Connector Pin	Function	T-connector Pin	Card Pin	Description
1	Not used			
2	Transmitted data	H1A11	G5B09	Serial data is transmitted on this line. When not transmitting, the 7441-1 holds this lead at a marking level.
3	Received data	H1B11	G5B04	Signals are produced by the receiving data set in response to signals from the remote data set.
4	Request to send	H1C11	G5B07	A signal on this lead indicates that the 7441-1 is ready to transmit. A carrier signal is sent to the remote data set.
5	Clear to send	H1D11	G5D05	The transmitting data set produces a signal on this lead to indicate that it is ready to transmit. The 7441-1 will not transmit, unless both the clear to send and the data set ready leads are active.
6	Data set ready	H1E11	G4B13	This lead is active when the data set is conditioned so that it can transmit or receive data.
7	Signal ground	J1B11		This lead establishes the common ground-reference potential. It is connected to dc common (0V) in the 7441-1.
8	Data carrier detector	J1C11	G5B05	This lead is turned on by the receiving data set in response to the carrier signal from the remote data set.
9	Not used			
10	Not used			
11	Originate mode	J1D11	G5D13	This lead always presents an off condition to the data set.
12	Local mode	J1E11	G5B13	This lead always presents an off condition to the data set.
13-25	Not used			

## Terminal Diagnostic Program (PARS/Financial)

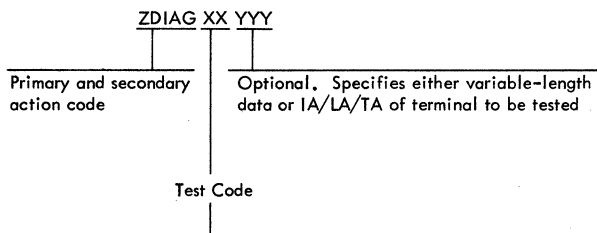
The PARS/Financial diagnostic program transmits data (fixed-length or variable-length) or terminal status information to a terminal to aid in detecting malfunctions. The program is invoked by keying the following message from either the terminal being tested or from another terminal:

ZDIAG 04 YYY

where YYY is the symbolic interchange address/line address/terminal address (IA/LA/TA or IQT) of the terminal to be tested if it is not this one.

The diagnostic program responds by sending a message that contains the sending terminal's IA/LA/TA.

Any message that is keyed after the IA/LA/TA has been received must be in the following format:



XX	Test	Description
04	Send terminal IA/LA/TA	Send a message that contains the originating terminal's IA/LA/TA.
05	Turnaround text	The entire message, starting with an uppercase shift character and then the primary action code, is wrapped to the originating terminal. No check is made for an IA/LA/TA; the message is always wrapped to the originating terminal.
06	7441-1 roll test	These tests are sent to the IA/LA/TA and the message DIAG MSG XX SENT, where XX is the same test code as that in the input message, is sent to the originating terminal. If no IA/LA/TA is specified in the input message, only the test is sent to the originating terminal.
07	7441-1 rock test	
08	7441-1 twist test	
09	7441-1 SELECTRIC <sup>®</sup> analyzer test	

## Error Messages

Message	Description
DIAG MESSAGE INVALID	The input message from the originating terminal is not in the correct format. The ZDIAG 04 input message must be entered again, even if the diagnostic program had proceeded beyond that point.
DIAG IA/LA/TA YYY INVALID	YYY is the IA/LA/TA from the input message and it is not valid.

### Notes:

1. The entire message, when entered from a 7441-1/1980-9, must be in uppercase.
2. It is recommended that the data portion of a code 05 message be entered in uppercase.
3. If the output of a code 06, 07, 08, or 09 message is destined for the originating terminal, no data should follow the code portion of the input message; such data would be interpreted as an IA/LA/TA.

## PARS Printout (Sample)

PARS FINANCIAL DIAGNOSTICS

LINE 1 -REQUEST  
LINE 2 -RESPONSE

ZDIAG 04  
IQT THIS TERM IS B7S

ZDIAG 05 NOW IS THE TIME FOR ALL GOOD MEN TO COME TO THE AID OF THEIR COUNTRY.  
ZDIAG 05 NOW IS THE TIME FOR ALL GOOD MEN TO COME TO THE AID OF THEIR COUNTRY.

ZDIAG 06  
R0LL TEST  
\*1D/L3m?#5#f%7#9038+0\*0+@2d#=4!@T16##+c9L\$.+,-,  
+,-,9c\$26m4##4=@12@#d0\*4+800+7%0\*5#f03Lm?1#B

ZDIAG 07  
R0CK TEST  
\*\$.Lc#P#-20+B-mL3##\*1td%/,?Sf4@00#01+39567482  
+1936547280,/S?+f@#04-B2m##1#d++.#cL#=#02\*

ZDIAG 08  
TWIST TEST  
A+J,-9.2cT&L\$C9E6N4V#0#B=X!P@G4H20#Yd6@,\* /V7550  
\*1-/4B1&LZmR?13F50fW03#.Sf#007B8K0S1V0,\* /V7550

ZDIAG 09  
SELECTRIC ANALYZER  
123456C890 SPACE&BKSP  
C

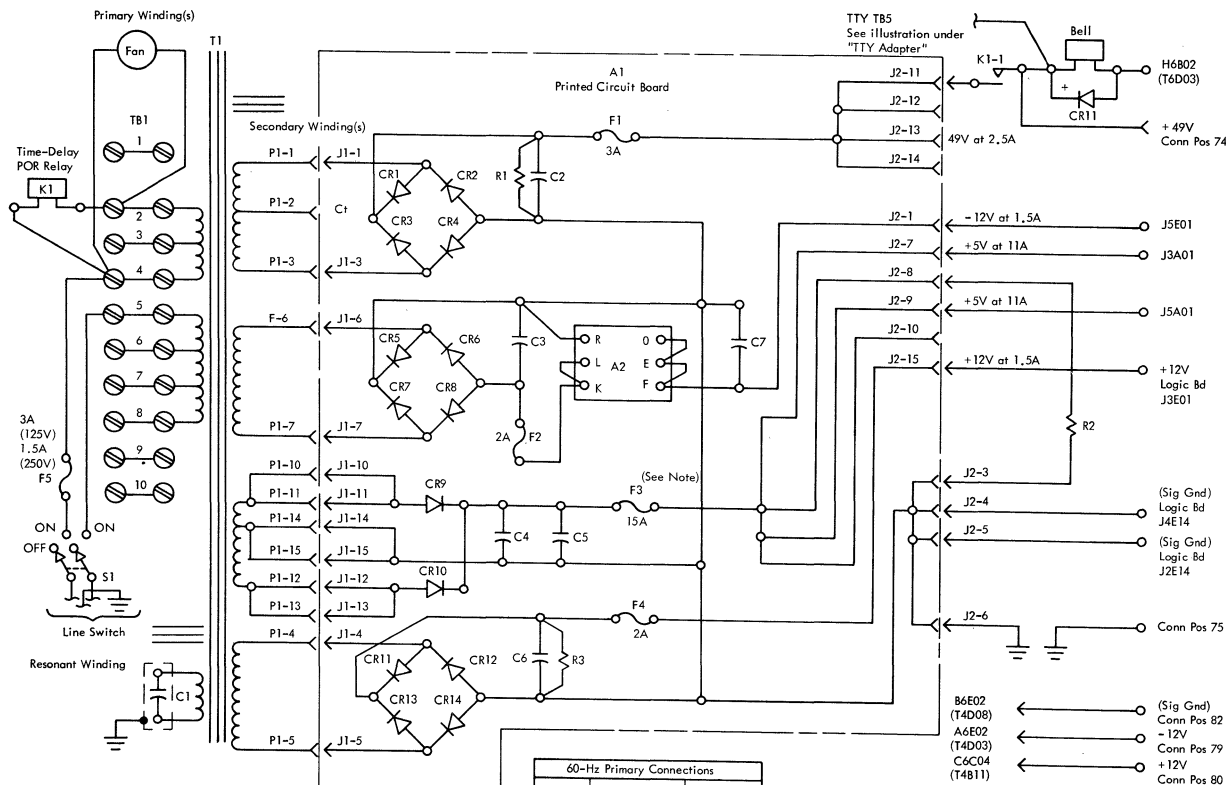
LF  
1  
2  
3

NOW IS THE TIME FOR ALL GOOD MEN TO COME TO THE AID OF THEIR COUNTRY. 1234567890  
NOW IS THE TIME FOR ALL GOOD MEN TO COME TO THE AID OF THEIR COUNTRY. 1234567890

99  
GOOD  
MORNING



# Power Supply

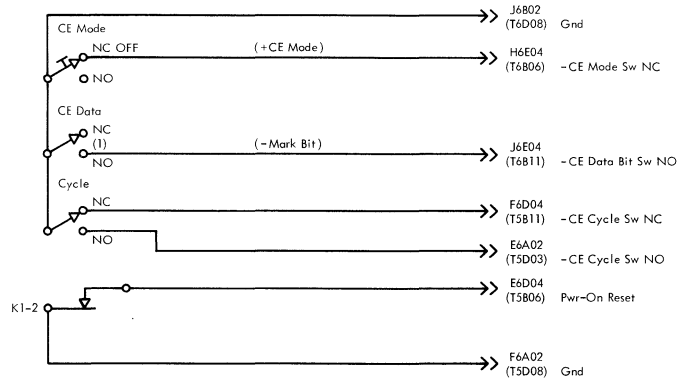


3-48

60-Hz Primary Connections		
Voltage	TB1 Input Terminal	TB1 Jumpers
100	4 and 5	3-5, 4-6
115	4 and 5	2-5, 4-8
200	4 and 5	3-6
208	4 and 5	3-7
230	4 and 5	2-8

Note: F3 is replaced by a jumper on later level power supplies.

# TTY Adapter



**DANGER**  
Because of transmission line, other than normal voltage may be present at any time.

Note:

Connector Type	Cable Part	Negative Lead(-)	Positive Lead(+)
Plug	5354436	White wire (tip)	Black wire (ring)
Ring Lug	1186358	Black wire	Red wire

3-49

Orange Term C

White + Orange Term A

Telegraph Line  
Shield Ground (Only on Cable with Ring Lugs)

Telegraph Line (See Note)

+Telegraph Line (See Note)

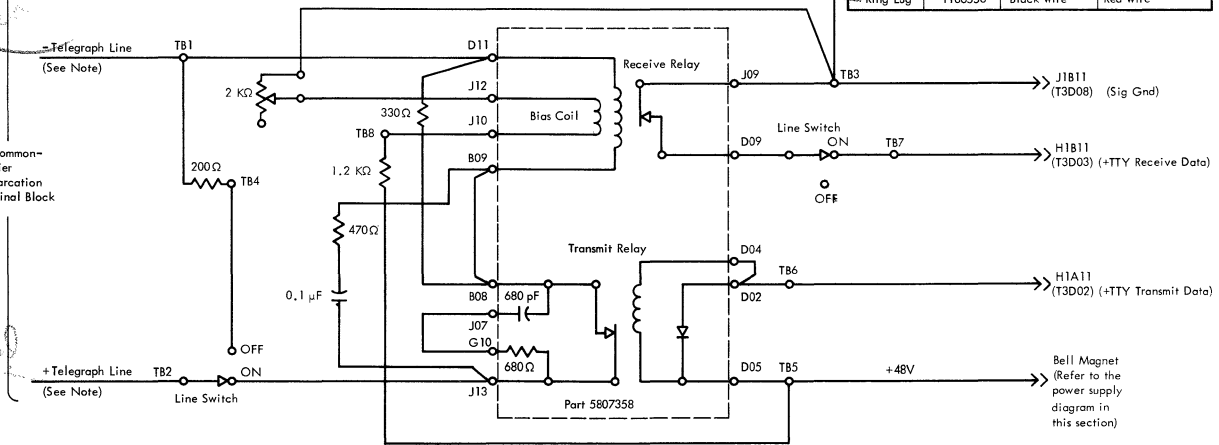
To Common-Carrier Demarcation Terminal Block

Black

Red

Tip - Orange + White + Black - Term A - Pos

Ring - Orange - Term C - Neg



Bell Magnet  
(Refer to the power supply diagram in this section)



## Section 4. 7441-1 Parts Catalog

### GENERAL

The Parts Catalog in this section lists and illustrates all of the replaceable parts for the 7441-1 Control Unit; and is intended for use in ordering and identifying parts and illustrating their relationship to the equipment.

### GROUP ASSEMBLY PARTS LIST

The Group Assembly Parts List is comprised of illustrations of the 7441-1 Control Unit with associated parts listings. When an assembly is not broken down immediately after being listed, a reference is made to the listing where the breakdown is made.

#### List and Index Number Column

This column provides the cross reference between the parts list and the associated illustration. The list number is followed by a hyphen and numbers preceded by a hyphen are index numbers and correspond to those on the associated illustration.

#### Part Number Column

All part numbers shown in this column are IBM part numbers.

#### Description Column

The Description Column lists the name and descriptive information for all parts. Each listed assembly is immediately followed by its subassemblies and parts, indented to show relationship. For example:

1	2	3	4	DESCRIPTION
				MAJOR UNIT
			●	Assemblies and Detail Parts of Unit
			●	Attaching Parts
			● ●	Detail parts of Assembly
			● ●	Attaching Parts

*ATT PT* This notation is used to denote hardware that attaches assemblies, sub-assemblies, and detail parts to each other.

#### Units Per Asm Column

The Units Per Asm column gives the total quantity of the listed part required in its immediate assembly.

*AR* This notation indicates that the quantity of the part listed is used as required.

*REF* This notation indicates that the listing of the assembly is repeated and reference should be made to its previous listing for the quantity required.

### NUMERICAL INDEX

The Numerical Index cross references every item in this Parts Catalog section to its figure and index number in the Group Assembly Parts List. All numbers are listed in numerical order.

Figure 1. 7441-1 Control Unit Assembly (Sheet 1 of 2)  
 Index Nos. 1-26. See List 1

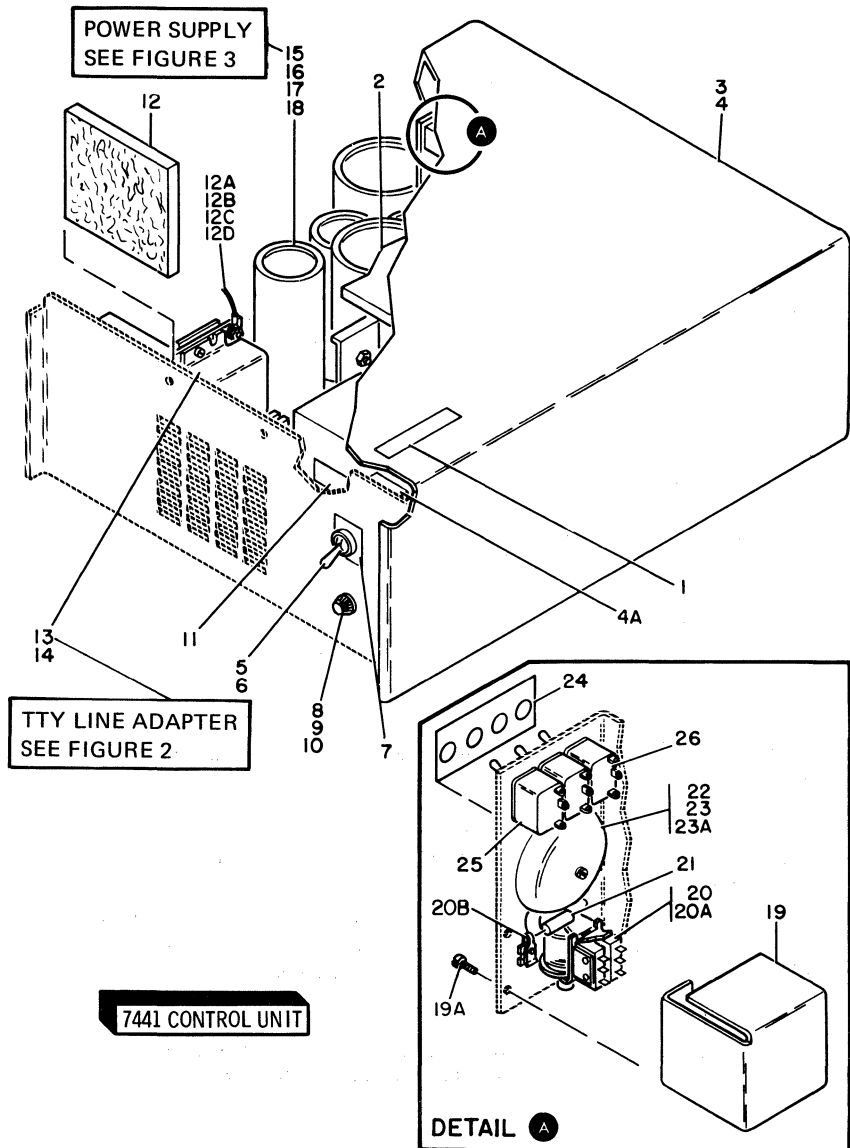
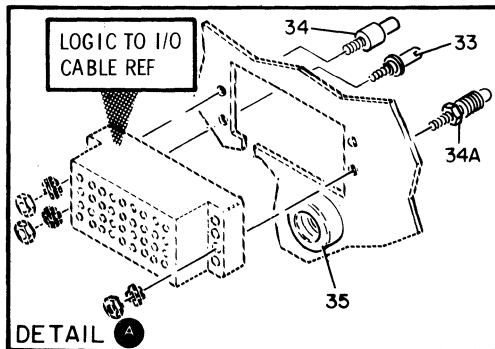
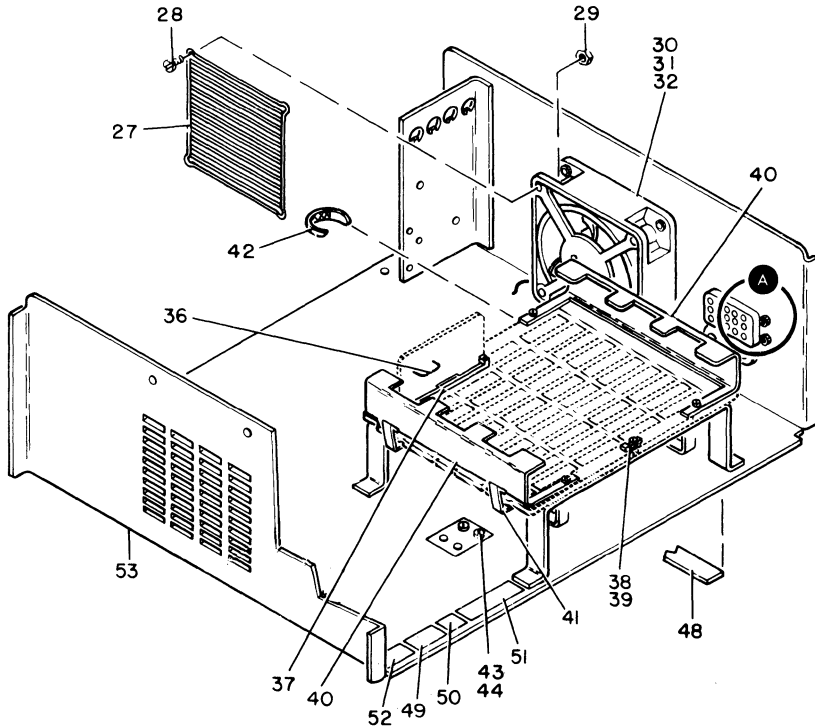


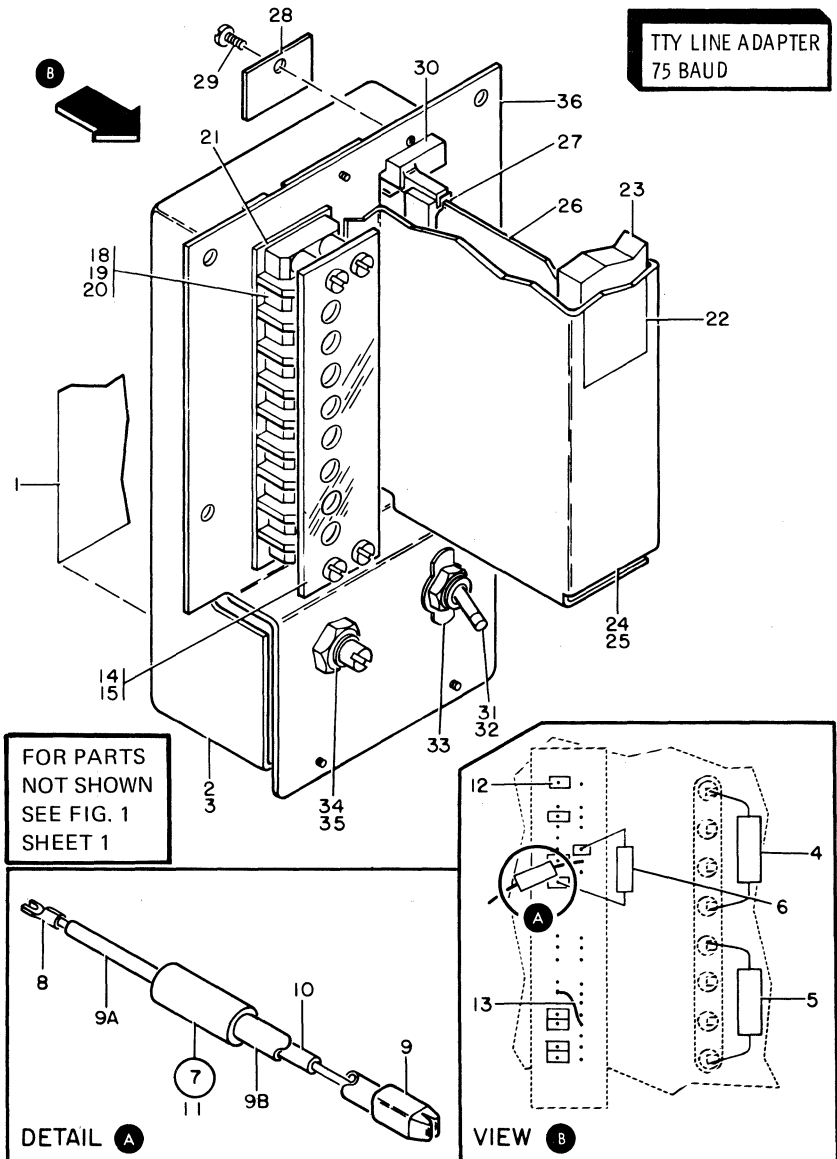
Figure 1. 7441-1 Control Unit Assembly (Sheet 2 of 2)  
 Index Nos. 27-53. See List 1



LIST AND INDEX NUMBER	PART NUMBER	DESCRIPTION				UNITS PER ASM
		1	2	3	4	
1-	5525771	7441 CONTROL UNIT				REF
		For illustration, see Figure 1				
- 1	5525807	.	NAMEPLATE-7441 CONTROL UNIT		1	
- 2	815263	.	BACKING, Foam		1	
- 3	5525785	.	COVER-White		1	
- 3	5525786	.	COVER-Black		1	
- 4	5369706	.	SCREW, Bind hd 10-32 x 3/8 lg	ATT PT	4	
- 4A	5525824	.	COVER, Safety		1	
- 5	421497	.	SWITCH, Toggle-dpst maintained action		1	
- 6	216323	.	NUT, Dress, knurl- 15/32-32 x 41/64	ATT PT	1	
- 7	5525806	.	DECAL-MAIN POWER ON/OFF		1	
- 8	338165	.	FUSE-125v, 3a (115v) - OLD PS		1	
- 9	179946	.	HOLDER-Fuse		1	
- 10	631810	.	TUBING-Flexible-non-metallic		1	
- 11	369207	.	LABEL		1	
- 12	5525820	.	FILTER		1	
- 12A	2193974	.	JUMPER ASM		1	
- 12B	34512	.	SCREW, Bind hd 8-32 x .375 lg	ATT PT	1	
- 12C	55901	.	WASHER, Lock, ext teeth-No. 8	ATT PT	1	
- 12D	257189	.	Nut, hex-8-32	ATT PT	1	
- 13	1186602	.	TTY LINE ADAPTER ASSEMBLY- 75 BAUD		1	
		For detail breakdown, see Figure 2				
- 14	58207	.	SCREW, Undrct bind hd 8-32 x .250 lg	ATT PT	2	
- 15	2611740	.	POWER SUPPLY, MULTI-VOLTAGE-60 HZ		1	
		For detail breakdown, see Figure 3				
- 16	28413	.	SCREW, Bind hd 10-32 x 5/16 lg	ATT PT	4	
- 17	56079	.	WASHER, Lock-ext t .195 id .410 od	ATT PT	5	
- 18	25627	.	SCREW, Bind hd 8-32 x .500 lg	ATT PT	4	
- 19	5525805	.	COVER, Relay		1	
- 19A	5319854	.	SCREW	ATT PT	2	
- 20	734551	.	RELAY, Time delay - 2 sec 15v		1	
- 20A	81693	.	SCREW, Bind hd 8-32 x .375	ATT PT	4	
- 20B	483122	.	NUT		2	
- 21	2106333	.	SEMICONDUCTOR DEVICE - Diode		1	
- 22	1176711	.	BELL, Signal		1	

LIST AND INDEX NUMBER	PART NUMBER	DESCRIPTION				UNITS PER ASM
		1	2	3	4	
1- 23	58207	.	SCREW, Bind hd 8-32 x .250	ATT PT	2	
- 23A	345887	.	NUT	ATT PT	1	
- 24	5525794	.	DECAL		1	
- 25	479320	.	SWITCH, Toggle-spdt		1	
- 26	479319	.	SWITCH-Toggle		2	
- 27	177946	.	GUARD-Fan		1	
- 28	322065	.	SCREW, Bind hd 6-32 x 5/8 lg	ATT PT	4	
- 29	257187	.	NUT, Plain, hex- 6-32	ATT PT	4	
- 30	5252642	.	FAN, Venturi 110/115v		1	
- 31	325496	.	NUT, Speed	ATT PT	4	
- 32	1203393	.	TUBING		2	
- 33	2122637	.	PIN, Guide-corner 75 and 104 pos conn		2	
- 34	2123028	.	JACK SCREW, Socket-fixed		1	
- 34A	2123029	.	PIN		1	
- 35	2571362	.	BUSHING, Strain relief		2	
- 36	1794401	.	JUMPER		1	
- 37	813590	.	GUIDE, Card 2 hi 4 wide		6	
- 37	811804	.	GUIDE, Card 12 pac		1	
- 38	813179	.	CLAMP-Board		2	
- 39	322550	.	SCREW, Bind hd 6-32 x 1/2 lg	ATT PT	6	
- 40	5525819	.	RETAINER		2	
- 41	5525793	.	RETAINER		2	
- 42	5420242	.	TIE, Cable		3	
- 43	32042	.	SCREW, Bind hd 10-32 x 3/8 lg		2	
- 44	56079	.	WASHER, Lock-ext t .195 id .410 od		2	
- 48	5525809	.	PLATE, Power rating		1	
- 49	855282	.	PLATE-Serial number LT		1	
- 50	855283	.	PLATE-Serial number RT		1	
- 51	855266	.	PLATE, Manufacturers		AR	
- 52	855286	.	PLATE, U/L		1	
- 53	5525795	.	PLATE, Base		1	

**Figure 2. TTY Line Adapter  
Assembly—75 Baud. See List 2**

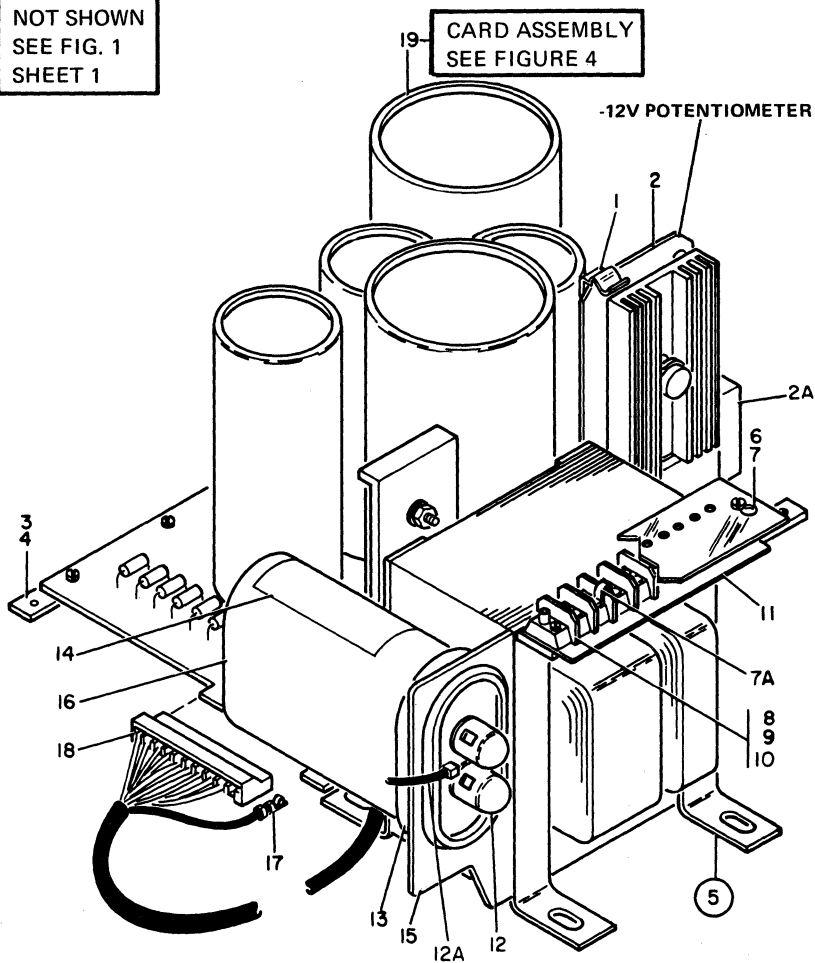




LIST AND INDEX NUMBER	PART NUMBER	DESCRIPTION				UNITS PER ASM
		1	2	3	4	
2 -	1186602	TTY LINE ADAPTER ASSEMBLY-75 BAUD For next higher asm, see Figure 1-13 And for illustration, see Figure 2				REF
- 1	461017	.	LABEL, Warning			1
- 2	1186553	.	COVER, Safety			1
- 3	731626	.	SCREW, Thd ctg-pan hd 6-32 x 1/4 lg	ATT PT		3
- 4	335138	.	RESISTOR, Fxd- 200 ohms p/m 5% 2w			1
- 5	317083	.	RESISTOR, Fxd 1.2k p/m 5% 2w			1
- 6	5162725	.	RESISTOR ASM-330 ohms			1
- 7	5525818	.	ARC SUPPRESSION ASM- 470 ohm/0.1 mfd			1
- 8	813195	.	CONNECTOR, Discrete 26-24-22 awg			2
- 9	813197	.	HOUSING-Terminal			1
- 9A	113819	.	SLEEVE			1
- 9B	113821	.	TUBING			1
- 10	317011	.	RESISTOR, Fxd- 470 ohms p/m 5% 1/2w			1
- 11	219641	.	CAPACITOR-0.1mfd,400v			1
- 12	5162742	.	HOUSING, Discrete wire connector			9
- 13	811425	.	WIRE-Conductor, insulated			1
- 14	186945	.	SHIELD, Terminal board- 8 position			1
- 15	210984	.	SCREW, Rd hd-6-32 x .250 lg	ATT PT		1
- 18	502588	.	TERMINAL BOARD- 8pos			1
- 19	210986	.	STUD-Shield mounting	ATT PT		3
- 20	210985	.	STUD, Ext-int 6-32 ext 8-32 x 0.900 lg	ATT PT		1
- 21	1186546	.	STRIP, Marker- 8 pos			1
- 22	1127426	.	LABEL			1
- 23	1186564	.	BACKING, Foam			1
- 24	1186552	.	COVER, Card			1
- 25	257187	.	NUT, Plain, hex- 6-32	ATT PT		2
- 26	5807358	.	CARD ASM			1
- 27	811804	.	GUIDE, Card			1
- 28	1186543	.	STOP, Socket			1
- 29	731626	.	SCREW, Thd ctg-pan hd 6-32 x 1/4 lg	ATT PT		1
- 30	813329	.	CARD, Interface asm			1
- 31	734879	.	SWITCH, Toggle, dpdt			1
- 32	179743	.	NUT, Plain, hex- 15/32-32 x 9/16	ATT PT		1
- 33	122685	.	DECAL-ON/OFF			1
- 34	303627	.	RESISTOR, Var-ww 2k p/m 1% 2w			1
- 35	824486	.	NUT, Hex .375-32	ATT PT		1
- 36	1186556	.	BRACKET			1

Figure 3. Multivoltage Power Supply  
Assembly—60 Hz. See List 3

FOR PARTS  
NOT SHOWN  
SEE FIG. 1  
SHEET 1



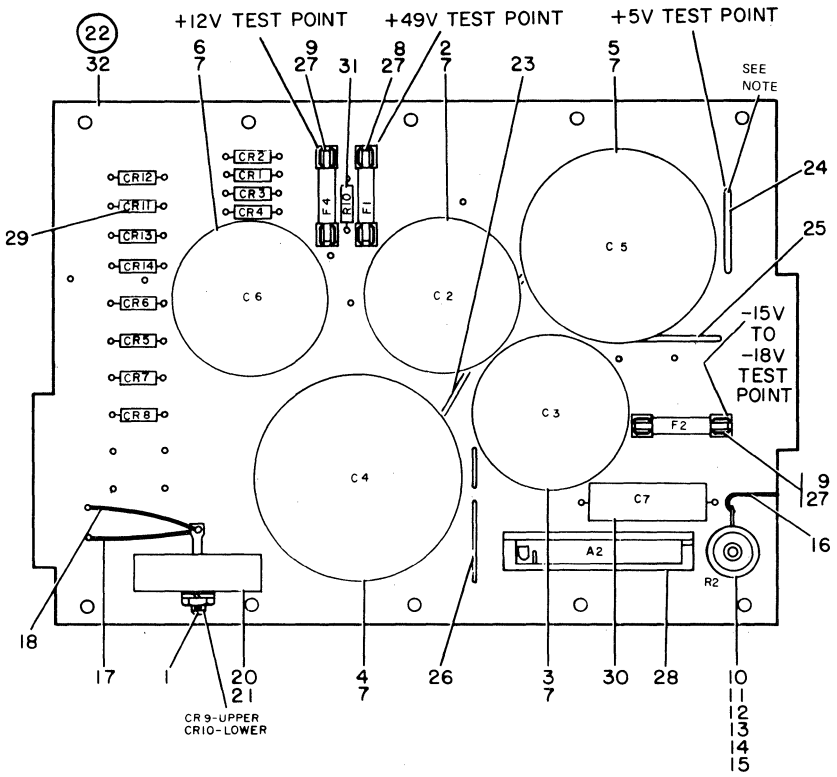
POWER SUPPLY ASSEMBLY

LIST AND INDEX NUMBER	PART NUMBER	DESCRIPTION				UNITS PER ASM
		1	2	3	4	
3 -	2611740	POWER SUPPLY, MULTI-VOLTAGE- 60 HZ For next higher asm, see Figure 1-15 And for illustration, see Figure 3				REF
- 1	2481202	.	.	RETAINER, Card		1
- 2	375386	.	.	CARD ASM		1
- 2A	5525831	.	.	COVER, Resistor		1
- 3	2625538	.	.	BAR, Board support		2
- 4	738378	.	.	SCREW, Thd ctg, pan hd, 8-32 x .250	ATT PT	10
- 5	2577529	.	.	TRANSFORMER ASM-224w		1
- 6	361537	.	.	COVER- 10pos		1
- 7	10170	.	.	SCREW, Bind hd 6-32 x 1/4 lg	ATT PT	2
- 7A	5759317	.	.	JUMPER- 115/208 v		1
- 7A	5759328	.	.	JUMPER- 230v		1
- 8	522850	.	.	TERMINAL BOARD-W/barr-10 pos		1
- 9	38354	.	.	SCREW, Fil h 6-32 x 1/2 lg	ATT PT	2
- 10	210883	.	.	STUD-Shield mtg, tapped, no. 6-32	ATT PT	2
- 11	522849	.	.	STRIP, Marker- 10pos		1
- 12	526378	.	.	CAP-Insulation		2
- 12A	5525823	.	.	JUMPER		1
- 13	2625533	.	.	RING, Rubber		1
- 14	2582954	.	.	LABEL, Safety		1
- 15	2625519	.	.	PLATE, Capacitor		1
- 16	5252657	.	.	CAPACITOR-6mf, 660v		1
- 17	5252582	.	.	TERMINAL		13
- 18	5252581	.	.	CONNECTOR- 15 pos		1
- 19	2625543	.	.	CARD ASSEMBLY		1
For detail breakdown, see Figure 4						

Figure 4. Card Assembly. See List 4

FOR PARTS  
NOT SHOWN  
SEE FIG. 3

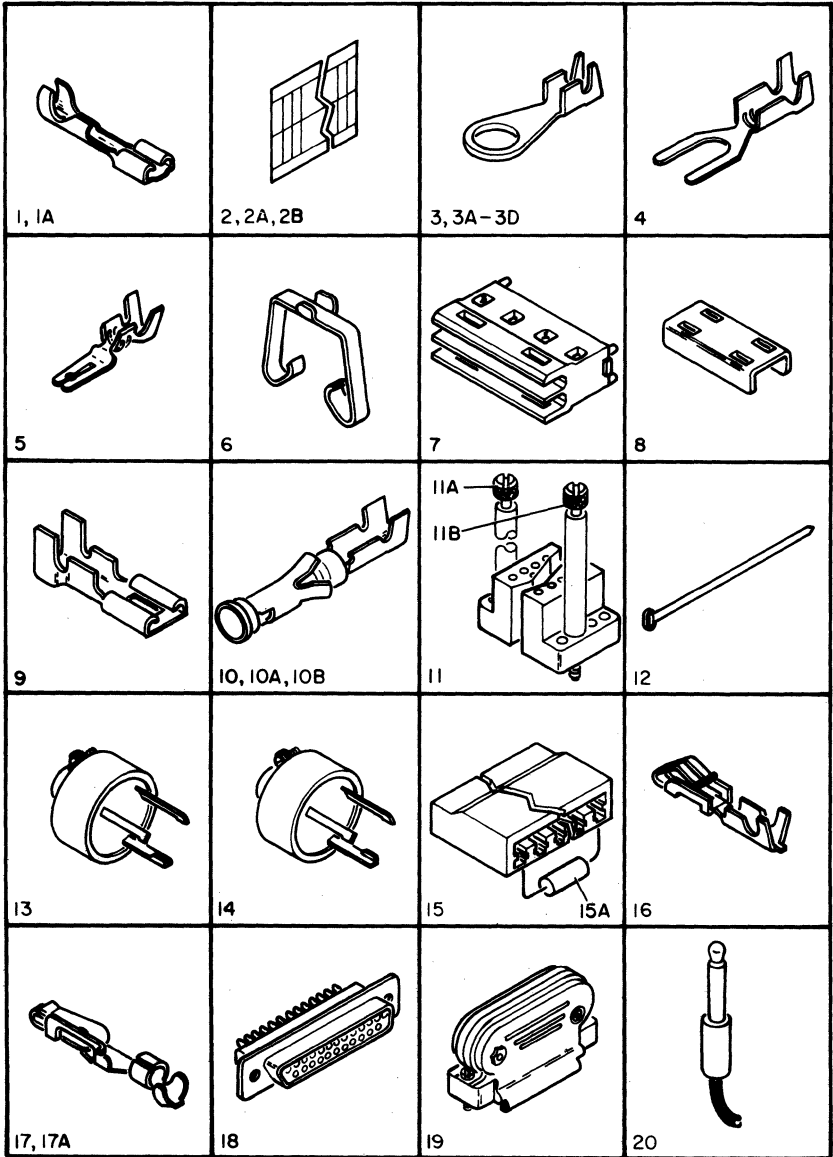
POWER SUPPLY  
CARD ASSEMBLY



NOTE:  
On some early 7441 shipments there  
is a 15A fuse in this location:  
Part Number 5252660.

LIST AND INDEX NUMBER	PART NUMBER	DESCRIPTION				UNITS PER ASM
		1	2	3	4	
4 -	2625543	CARD ASSEMBLY				REF
		For next higher asm, see Figure 3-19				
		And for illustration, see Figure 4				
- 1	598479	.	SEMICONDUCTOR DEVICE-Diode, 150v 10a		2	
- 2	5214962	.	CAPACITOR, Electrolytic- 10,000 uf		1	
- 3	5214372	.	CAPACITOR, Elect.- 18000mfd p75m10% 25vdc		1	
- 4	5252526	.	CAPACITOR-240kmf		1	
- 5	5709381	.	CAPACITOR, Fixed, elect-100,000 uf 6v		1	
- 6	5214180	.	CAPACITOR, Fxd, elect- 21,000uf p75m10%		1	
- 7	56079	.	WASHER, Lock-ext t .195 id .410 od ATT PT		10	
- 8	855252	.	FUSE- 3a		1	
- 9	855231	.	FUSE- 2a		2	
-10	736695	.	RESISTOR- 20 ohms, 25w		1	
-11	322556	.	SCREW, Rd hd- 6-32 x 2.500 lg ATT PT		1	
-12	257986	.	WASHER, Flat no. 6 ATT PT		1	
-13	38051	.	NUT, Plain, hex- 6-32 x 1/4 fl w stl ATT PT		1	
-14	507144	.	WASHER-Centering 0.173 id x 5/8 od		2	
-15	442958	.	INSULATOR, wash- 7/16 id 3/4 od 1/32 thk		2	
-16	5759739	.	JUMPER ASM		2	
-17	2481176	.	JUMPER		1	
-18	2481175	.	JUMPER		1	
-20	2624717	.	HEATSINK		1	
-21	5319854	.	SCREW, Thd ctg-hex hd 8-32 x 3/8 lg ATT PT		2	
-22	2625548	.	CARD ASM		1	
-23	5922547	.	BUS		1	
-24	5922605	.	BUS (SEE NOTE ON ART)		1	
-25	5922548	.	BUS		1	
-26	491296	.	JUMPER		1	
-27	2582977	.	CLIP, Fuse holder		6	
-28	737916	.	CONNECTOR ASM, Recp-cable to card		1	
-29	1149212	.	DIODE		12	
-30	482175	.	CAPACITOR- 200mf		1	
-31	483408	.	RESISTOR- 5k ohms, 2w		1	
-32	2625547	.	CARD		1	

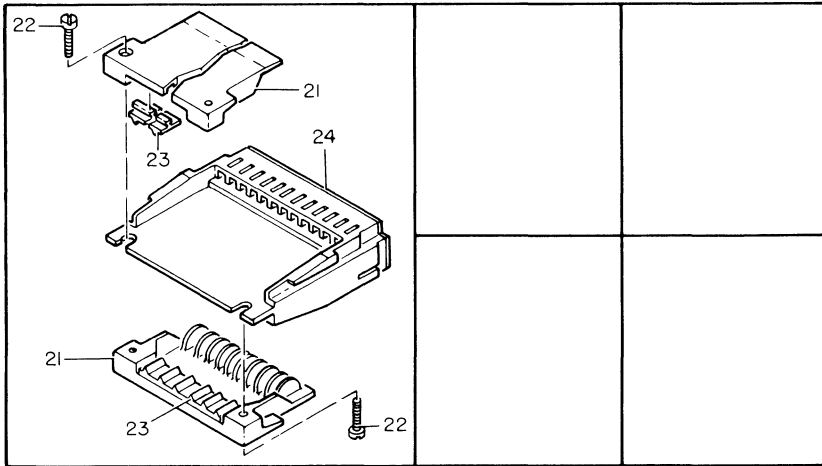
Figure 5. Cable Component Parts. See List 5



LIST AND INDEX NUMBER	PART NUMBER	DESCRIPTION	UNITS
			PER ASM
5 -	1186558	CABLE ASM- TTY Adapter (75 BAUD) For component parts, see indexes 2B, 3A, 4	AR
-	1186567	CABLE ASM- Line Adapter For component parts, see indexes 1A, 5	AR
-	5354436	CABLE ASM- TTY For component parts, see indexes 3D, 20	AR
-	5525800	CABLE ASM- Logic to I/O For component parts, see indexes 1, 2, 2A, 3, 3B, 4, 9, 10, 10A, 10B, 11, 12, 17, 17A , 21-24	AR
-	5525801	CABLE ASM- Power distribution For component parts, see indexes 3B, 6, 7, 8, 15, 15A, 16	AR
-	5525802	CABLE ASM- TTY Adapter (75 BAUD) For component parts, see indexes 2A,4,17A	AR
-	5525808	CABLE ASM- Data Set Adapter (134 BAUD) For component parts, see indexes 2A, 2B, 17, 18, 19	AR
-	5525810	CABLE ASM- 115v non locking 60 HZ For component parts, see indexes 3B, 9	AR
-	5525811	CABLE ASM- 208/230v non-lock 60 HZ For component parts, see indexes 3C, 9	AR
-	5525812	CABLE ASM- 115v 6ft non-lock 60 HZ For component parts, see indexes 3B, 9	AR
-	5525813	CABLE ASM- 208/230v 6ft non-lock 60 HZ For component parts, see indexes 3C, 9	AR
-	5525814	CABLE ASM- 115v 8 ft locking 60 HZ For component parts, see indexes 3C,9,14	AR
-	5525815	CABLE ASM- 208/230v 8 ft locking 60 HZ For component parts, see indexes 3C,9,14	AR
-	5525816	CABLE ASM- 115v 6ft locking 60 HZ For component parts, see indexes 3C,9,13	AR
-	5525817	CABLE ASM- 208v/230v 6ft locking 60 HZ For component parts, see indexes 3C,9,14	AR
-	5525832	CABLE ASM - 115v 15 ft locking - 60 HZ For component parts, see indexes 3C, 9, 13	AR

LIST AND INDEX NUMBER	PART NUMBER	DESCRIPTION				UNITS PER ASM
		1	2	3	4	
5-	5525833	CABLE ASM - 115v attachment - 10a For component parts, see indexes 3B, 9				AR
-	5525834	CABLE ASM - 208/230v 15 ft locking - 60 HZ For component parts, see indexes 3C, 9, 14				AR
-	5525835	CABLE ASM - 208v attachment - 7a For component parts, see indexes 3C, 9				AR
- 1	236915	.	TERMINAL	Slip on-20-18 awg		AR
- 1A	236916	.	TERMINAL-Contact	female 24-22 awg		AR
- 2	317296	.	LABEL-Numbering	L to R 1 thru 33		AR
- 2A	811825	.	LABEL-Cable			AR
- 2B	5161516	.	LABEL, Cable			AR
- 3	483677	.	TERMINAL-no. 6	stud		AR
- 3A	483681	.	TERMINAL-no. 8	stud		AR
- 3B	483685	.	TERMINAL-no. 10	stud, 18-24 awg		AR
- 3C	483686	.	TERMINAL-no. 10	stud, 14-16 awg		AR
- 3D	334921	.	TERMINAL, Ring	No 6		AR
- 4	483695	.	TERMINAL, Spade			AR
- 5	813195	.	TERMINAL, Discrete	26-24-22 awg		AR
- 6	813681	.	CONTACT			AR
- 7	813801	.	HOUSING-Miniature	bus double contact		AR
- 8	813802	.	COVER			AR
- 9	1127037	.	TERMINAL, Slip-on			AR
-10	2122259	.	TERMINAL, Socket	contact-22-20 awg		AR
-10A	2122261	.	SOCKET, Contact	18-16 awg		AR
-10B	2127890	.	SOCKET-Contact	awg 26-24		AR
-11	2127855	.	CONNECTOR, Recp,	elec-mini 75 female cont		AR
-11A	2122628	.	JACK SCREW, Socket	turnable long		AR
-11B	2122629	.	JACK SCREW, Stud	turnable long		AR
-12	5420242	.	TIE, Cable			AR
-13	1176508	.	PLUG-115v, 15a			AR
-14	1176563	.	PLUG, 227v, 15a			AR
-15	5252581	.	CONNECTOR - 15	pos		AR
-15A	5525821	.	RESISTOR, 7.5	ohm, 10 watt		AR
-16	5252582	.	TERMINAL			AR
-17	5486851	.	CONTACT-large			AR
-17A	5486853	.	CONTACT, Great	serpent		AR





LIST AND INDEX NUMBER	PART NUMBER	DESCRIPTION				UNITS PER ASM
		1	2	3	4	
5 - 18	765294	.	CONNECTOR, Receptacle, elect-	25	contacts	AR
- 19	764295	.	HOOD AND STRAIN RELIEF			AR
- 20	5318494	.	PLUG			AR
- 21	5466397	.	STRAIN RELIEF			AR
- 22	38264	.	SCREW		ATT PT	AR
- 23	5466393	.	CLAMP			AR
- 24	5447741	.	HOUSING			AR

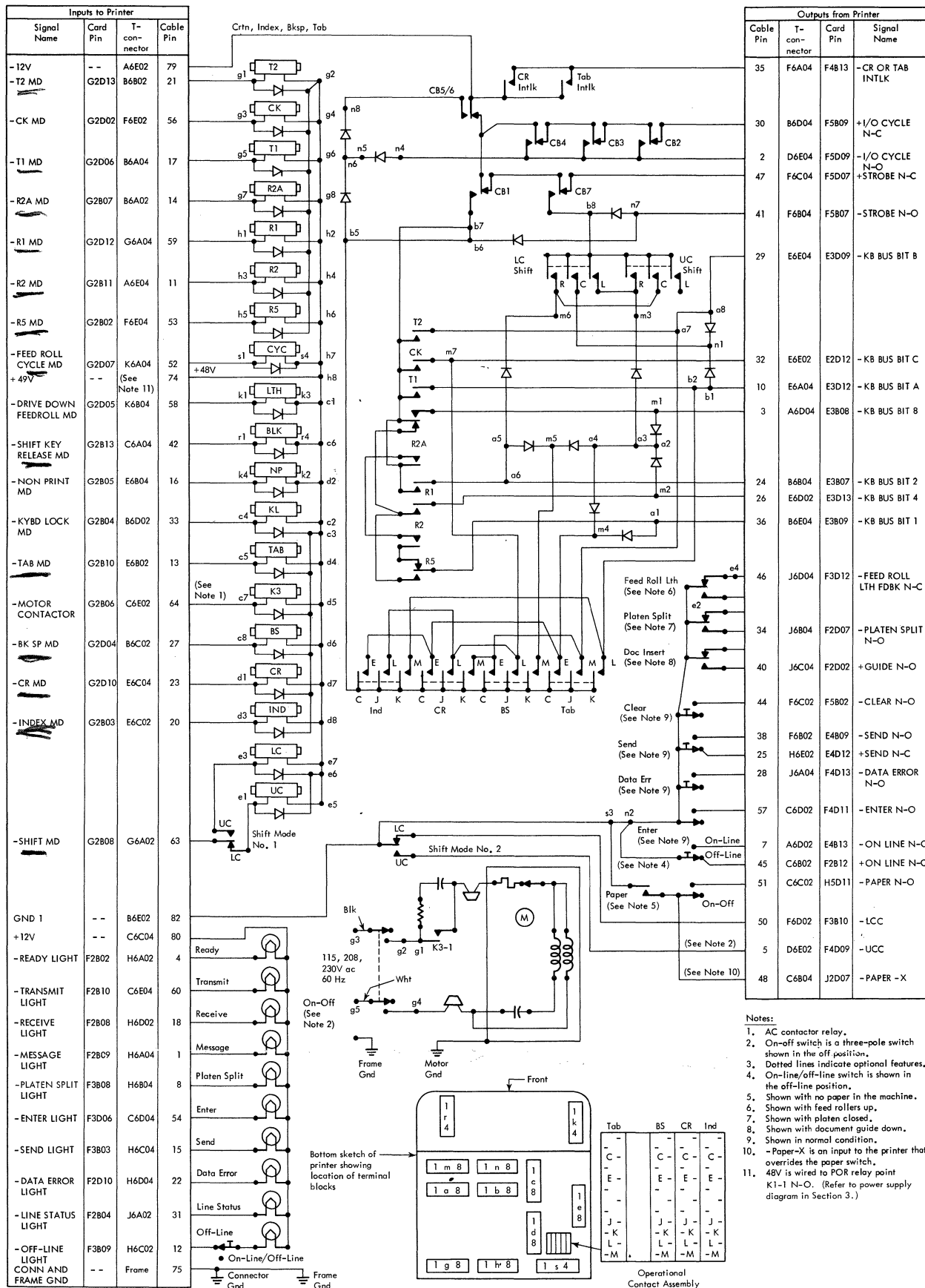


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813197	2 - 9
813329	2 - 30
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1127426	2 - 22
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- Notes:
- AC contactor relay.
  - On-off switch is a three-pole switch shown in the off position.
  - Dotted lines indicate optional features.
  - On-line/off-line switch is shown in the off-line position.
  - Shown with no paper in the machine.
  - Shown with feed rollers up.
  - Shown with platen closed.
  - Shown with document guide down.
  - Shown in normal condition.
  - Paper-X is an input to the printer that overrides the paper switch.
  - 49V is wired to POR relay point K1-1 N-O. (Refer to power supply diagram in Section 3.)

A-1

- Legend:
- CB1 Print strobe contact.
  - CB2 Print I/O cycle contact.
  - CB3 Uppercase shift contact.
  - CB4 Lowercase shift contact.
  - CB5/6 Tab, space, backspace, carriage return, and index contact.
  - CB7 Shift strobe contact.

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*Note:* A numerical index for the Parts Catalog is at the end of Section 4.

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