

123 -9521 0

PRELIMINARY  
INSTALLATION MANUAL  
for the  
IBM 7631 FILE CONTROL  
IBM 1301/2302 M1,2 DISK STORAGE  
IBM 7320 DRUM STORAGE

Prepared by  
IBM CE Installation Publications  
Department B-97  
Systems Development Division  
Poughkeepsie, New York

Revised: June 1, 1965

8/24/65

Revised pages for the 7631-1301/2302/7320 CE Installation Manual:

Title page, dated August 23, 1965

4-1

AII-2

AII-3

Order Additional Copies From:  
IBM Corporation  
Systems Development Division  
P. O. Box 390  
Poughkeepsie, New York 12602  
Attention: Dept. B97, Bldg. 961

PRELIMINARY  
INSTALLATION MANUAL  
for the  
IBM 7631 FILE CONTROL  
IBM 1301/2302 M1, 2 DISK STORAGE  
IBM 7320 DRUM STORAGE

Order Additional Copies From:  
IBM Corporation  
Systems Development Division  
P.O. Box 390  
Poughkeepsie, New York 12602  
Attention: Dept. B97, Bldg. 961

Revised: August 23, 1965

## 1. PRELIMINARY INSTRUCTIONS 1301

Prior to any mechanical preparation (disk and head cleaning, drawer installation and adjustment, perform a five-minute purge to insure removal of airborne foreign particles from the disk array chamber. The purge can be done by powering the 1301 independently.

### 1.1 Power-On Preparation

#### DANGER

Check phasing before power-on. (See Chapter 1). Also, make sure that the ground connection between 7631/1301/7320 is common and electromechanically stable.

To bring up power on the 1301, without power on the 7631, (all cables connected on both units, 7631 connected to customer power), temporarily jumper EPO plugs C1 and C2 on the 7631, using EPO cable, if an EPO cable is not available, use two jumper plugs, PN 553298; one in C1 and one in C2. See Figure 3-4. If only one I/O Channel on the 7631 is being used, (EPO cable plugged into C1), it will also be necessary to have a terminating jumper plug PN 553298, installed in Emergency Off plug C2. Installing this jumper will complete the Emergency Off circuit, enabling power to be brought up on the 1302.

#### NOTE

Transformer taps must be changed if supply is 230 V. AC. (Ref. 1302 Maintenance Manual, 227-5864, Sec. 1.1).

#### CAUTION

Running the 1301 independently may result in arcing between head and disk. Before loading heads, make sure that AC and DC grounds are common in the 1301 at only one point, by placing a jumper between any "J" pin and any unpainted panel mounting screw. Be sure to remove this jumper upon completion of test.

### 1.2 Five-Minute Purge

- A. Make sure that the power cable is connected to customer's 208-volt receptacle. If not, set CB1 and CB2 on the AC distribution panel of the 1301, to Off, and connect power.

3. PRELIMINARY INSTRUCTIONS - 2302 (continued)

- B. After 2302 is assembled and before external cables are plugged, check for receiver isolation by connecting an ohmmeter from "J" pin to frame ground. Resistance reading should be 5 megohms or greater. If resistance is less than 5 megohms, the circuit may be analyzed by removing paddle connector 01A5B07, for Mod. 1 machine. For a Mod II, remove connector 01A5B06 also.

If the proper reading is observed with paddle connector(s) removed there is a short circuit in the receiver. If reading is still incorrect with the connector(s) removed; short is in the machine panel.

- C. Refer to Tables 3-1 and 3-2 for I/O cable connections between the 7631 and Data Channels, and between 7631 and 1301/2302/7320. Note, however, that tailgate information is slightly different from 1301. For tailgate information see Figure AII-7.
- D. Refer to Figure 3-5 for external cable routing. Before cleaning heads or installing and adjusting drawers, perform a five-minute purge to insure removal of airborne particles from the disk array chamber. The purge can be done by powering the 2302 independently.

3.1 Power-On Preparation

DANGER

Check phasing before power-on. (See chapter 1). Also, make sure that the ground connection between 7631/2302/7320 is common and electromechanically stable. Also, turn off power to the machine (wall CB) before making the following connections.

To bring up power on the 1302, without power on the 7631, (all cables connected on both units, 7631 connected to customer power), temporarily jumper EPO plugs C1 and C2 on the 7631, using the EPO cable, if an EPO cable is not available, use two jumper plugs, PN 553298; one in C1, and one in C2. See Figure AII-1. If only one I/O Channel on the 7631 is being used, (EPO cable plugged into C1), it will also be necessary to have a terminating jumper plug, PN 553298, installed in Emergency Off plug C2. Installing this jumper will complete the Emergency Off circuit, enabling power to be brought up on the 2302.

3.1 Power-On Preparation (continued)

NOTE

Transformer taps must be changed if supply is 230 V. AC. (Ref. 2302 Maintenance Manual, 227-5864, Sec. 1.1)

CAUTION

Running the 2302 independently may result in arcing between head and disk. Before loading heads, make sure that AC and DC grounds are common in the 2302 at only one point, by placing a jumper between any "J" pin and any unpainted panel mounting screw. Be sure to remove this jumper upon completion of test.

3.2 Five-Minute Purge

- A. Make sure that the power cable is connected to customer's 208-volt receptacle. If not, set CB1 and CB2 on the AC distribution panel of the 2302, to Off, and connect power.
- B. Set CB 1 and CB2 to On.
- C. Set Auto Control switch to Local.  
Set Sequence Control to Manual.
- D. Remove paper cover from over access aperture.
- E. Press Auto Start switch.
- F. Press Disk Drive On button. Disk Drive On indicator will light and disks will rotate in a counter-clockwise direction, in accordance with the directional arrow on the machine.

WARNING

Clock-wise rotation of the disks will result in having no hydraulic pressure. Manual loading of heads may result in damage to the disks.

- G. With covers on, allow the file to run for five minutes, then proceed to the next step.

This publication is intended to serve as a guide for the installation of the IBM 7631 File Control, and the IBM 1301 Disk Storage and/or 7320 Drum Storage Unit, in a 7000/1410 series IBM system. It presents mechanical data and preliminary test procedures relevant to making the equipment operational in the customer's office.

For detailed maintenance and test procedures, refer to the IBM CE Reference Manuals for that particular system.

Other manuals that pertain to the 7631/1301 are:

CE Reference Manual	1301 Disk Storage	227-5581
CE Manual of Instructions	1301 Disk Storage	227-5582
CE Manual of Instructions	7631 File Control	R23-2606

# CONTENTS

Chapter	Title	Page
	PREFACE	ii
	CONTENTS	iii
	TABLES AND ILLUSTRATIONS	v
	SAFETY	vi
1	CHECK LIST	1-0
	INTRODUCTION	
	1. General Information	1-1
	2. CE Machine Room Checks	1-2
2	CHECK LIST	2-0
	PLACEMENT AND MECHANICAL ASSEMBLY - GENERAL	
	1. Unpacking	2-1
	1.1 Mechanical Inspection and Leveling	2-2
	2. End Base-Covers and Step Covers - 7631	2-3
	3. Preliminary Checks - 7631	2-5
	4. General Information - 1301	2-7
	4.1 Safety - 1301	2-7
	4.2 Special Equipment Required	2-8
	4.3 Unpacking - 1301 Electronic Unit	2-9
	4.4 Unpacking - 1301 Mechanical Module	2-9
	5. Assembly - 1301	2-11
3	CHECK LIST	3-0
	CABLING	
	1. General Information	3-1
	2. Cable Identification	3-2
	3. External Cables - 7631	3-3
	4. Interframe Cables - 1301	3-13
4	CHECK LIST	4-0
	TESTING	
	1. Preliminary Instructions - 1301	4-1
	1.1 Power On Preparation	4-1
	1.2 Five Minute Purge	4-1
	2. Mechanical Preparation - 1301	4-2
	2.1 Receiver Swing-Out	4-2
	2.2 Disk Cleaning	4-3
	2.3 Drawer Installation and Head Cleaning	4-4
	2.4 Receiver Swing-In	4-5



# CONTENTS

Chapter	Title	Page
4	TESTING (continued)	
3.	Unit Testing	4-5
	3.1 Power On - 7631	4-5
	3.2 Power On - 1301	4-6
	3.3 Voltage Checks	4-8
	3.4 Bias Checks	4-10
4.	Diagnostic Testing	4-10
	4.1 Factory-Written Format Track	4-10
	4.1.1 Writing Addresses at Location 8888	4-12
5.	Use-Meter Check	4-13
	5.1 IBM 1301	4-13
	5.2 IBM 7631	4-13
APPENDIX I IBM 7320 DRUM STORAGE UNIT		
	CHECK LIST	AI-0
1.	INTRODUCTION	AI-1
2.	GENERAL INFORMATION	AI-1
3.	SAFETY	AI-3
4.	UNPACKING	AI-6
5.	MECHANICAL PREPARATION	
	5.1 Mechanical Inspection	AI-7
	5.2 Cabling	AI-8
	5.3 Power-On Checks	AI-10
	5.4 Cleaning Drum Surface	AI-14
	5.5 Dynamic Check of Components	AI-16
	5.5.1 Local Status	AI-16
	5.5.2 Remote Status	AI-17
	5.6 Replace Covers	AI-18
6.	PRELIMINARY TESTS	
	6.1 Attachment feature, Single-Shot Timing	AI-19
	6.2 Format and Delay-Line Adjustment	AI-21
	6.3 Command Channel Test	AI-22
	6.4 Format Write Switch	AI-23
7.	DIAGNOSTIC TESTING	
	7.1 Format, Home Address, and Surface Analysis Test	AI-23
	7.2 Vibration Test	AI-24
	7.3 Bias Test	AI-24
	7.4 Reliability Test	AI-25

<u>Chapter</u>	<u>Title</u>	<u>Page</u>
	APPENDIX II IBM 2302 DISK STORAGE	
	CHECK LIST	AII-0
1.	INTRODUCTION	AII-1
2.	GENERAL INFORMATION	AII-1
3.	PRELIMINARY INSTRUCTIONS - 2302	AII-1
	3.1 Power On Preparations	AII-2
	3.2 Five Minute Purge	AII-3
4.	MECHANICAL PREPARATION - 2302	AII-4
	4.1 Receiver Swing-Out	AII-4
	4.2 Disk Cleaning	AII-5
	4.3 Drawer Installation and Head Cleaning	AII-5
	4.4 Receiver Swing-In	AII-6
5.	UNIT TESTING	AII-7
	5.1 Power On - 7631	AII-7
	5.2 Power On - 2302	AII-8
	5.3 Voltage Checks	AII-10
	5.4 Bias Checks	AII-11
6.	DIAGNOSTIC TESTING	AII-11
	6.1 Factory-Written Format Track	AII-11
	6.1.1 Writing Addresses at Location 8888	AII-11
	6.1.2 VFO Adjustment	AII-12
	6.1.3 Separation Circuit Adjustments	AII-12
7.	USE-METER CHECKS	AII-14
	7.1 IBM 2302	AII-14
	7.2 IBM 7631	AII-15

## LIST OF ILLUSTRATIONS

<u>Figure</u>	<u>Title</u>	<u>Page</u>
1-1	Typical Power System	1-6
2-1	Step Covers--7631	2-4
2-2	Placement of Base Covers and Air Filters	2-6
3-1	Cable Labels	3-2
3-1.1	7631 Cable Grounding Clamp	3-8
3-2	Component Locations--7631 (Front)	3-9
3-3	Component Locations--7631 (Rear)	3-10
3-4	7631 Tailgate Configurations	3-11
3-5	External Cable Routing, 7631--1301/2302/7320	3-12
3-6	1301 Tailgate Cabling	3-15
3-7	1301 Component Locations (Front)	3-16
3-8	1301 Component Locations (Rear)	3-17
3-9	1301 Plugging Locations, Mech. Frame, Right Side	3-18
4-1	Cylinder 222 Format Track Pattern	4-11
4-1	Cylinder 222 Format Track Pattern	4-11
AI-1	Component Location--7631 with DSU Adapter (Front)	AI-2
AI-2	Component Location--7631 with DSU Adapter (Rear)	AI-4
AI-3	Component Location--7320 DSU	AI-5
AI-4	Component Location--7320 I/O Connectors	AI-9
AI-5	Drum Cage and Conduit Location--7320	AI-13
AI-6	Single-Shot Timing--7320	AI-19
AI-7	Probe Timing--7320	AI-21
AI-8	Read Data Delay-Line Timing--7320	AI-22
AII-1	Component Location--7631 with 2302/7320 Adapter (Front)	AII-17
AII-2	Component Location--7631 (Serial No. 12000 and above)(Rear)	AII-18
AII-3	Component Location--2302 (Front)	AII-22
AII-4	Component Location--2302 (Rear)	AII-23
AII-5	Interframe Cable Routing--2302 Electronic Frame	AII-24
AII-6	Interframe Cable Routing--2302 Mechanical Frame	AII-25/26
AII-7	2302 Tailgate Cabling	AII-27
AII-8	TCK Terminator Card Placement--1301/2302	AII-28
AII-9	Format Track Pattern--2302	AII-29

## LIST OF TABLES

<u>Table</u>	<u>Title</u>	<u>Page</u>
3-1	I/O Cable Connections, 7631 to Data Channels	3-4

## LIST OF TABLES

<u>Table</u>	<u>Title</u>	<u>Page</u>
3-2	I/O Cables--7631/2302/7320	3-7
3-3	1301 Interframe Cable Connections	3-14
4-1	1301 Voltage Checks	4-8
AI-1	Power Supply Voltages--7320	AI-14
AI-2	Single-Shot Adjustments--3202 and Drum Storage Unit	AI-19
AII-1	2302 Voltage Checks	AII-10
AII-2	Interframe Cables--2302	AII-19

All Customer Engineers are thoroughly indoctrinated in IBM Safety practices during the early phases of their training. It is expected that this training has become a part of routine practice. However, personal safety cannot be over-emphasized. Follow the safety practices outlined in the CE Safety Practices card, IBM Form 124-0002-1, issued to all Customer Engineers. This section contains some reminders of general safety practices as well as some items peculiar to 7000 series packaging.

As a safety precaution, no man should work alone on the machine whenever power is on. At least two men should be present in the room whenever work is performed on the machine.

Every man should wear safety glasses.

Don't use ungrounded tools or test equipment. They can kill! Also, ungrounded wire-wrap guns have caused extreme SMS card damage when used to install Engineering Changes.

Check to see that there are fire extinguishers available in each room where frames of the system are set up. These should be of the CO<sub>2</sub> type, which are recommended for electrical fires.

Specific items for SMS modules are:

- A. Keep fingers clear of gate slides when sliding a gate into the module, to prevent pinching of fingers between the gate and slide frame members. Also, when unlocking a slide, remove the Allen wrench after turning the latch to prevent catching your finger between the wrench and the slide.
- B. Use caution when lowering a tailgate. When unlatched, the gate will free-fall to the stop limit.

## SAFETY

- C. On "cube" type SMS modules, open flip-covers all the way before pulling down swinging gates, to prevent skinned knuckles.
- D. Watch your head. When working on the lower part of a frame, or a B module, don't forget that an overhanging gate may be in your way when you arise.
- E. Turn DC power off when removing or inserting an SMS card. It is possible to cause component damage by shorting to an adjacent card during this process.
- F. When sliding a gate in or out, alternately observe each side to avoid hitting the laminar bus connections.
- G. 208 volts, 400 cycles, and 120 volts, 60 cycles are still present inside the SMS frame on Power-Off. If it is necessary to work near live power connectors, convenience outlets, or inside the MG unit or Core Storage Control, disconnect the power cables, or turn off the wall circuit breakers.
- H. Discharge capacitors before working on DC power supplies.
- J. Always turn off power before replacing any fuse.
- K. Replace any safety covers that have been removed before going on to another operation. Hazardous voltages are present in this equipment; forgetfulness could be fatal.
- L. Always use fuse pullers to remove or insert fuses. Replace the protective covers as soon as possible.
- M. Before adjusting any power supply, remove the line cord from the power receptacle and wait at least 15 seconds.

CHAPTER 1 CHECK LIST

1 INTRODUCTION

1. General Information

1-1



2. CE Machine Room Checks

1-2



## 1. INTRODUCTION

### 1. GENERAL INFORMATION

Each 7631 controls up to five 1301's Models 1 and 2 in any combination. In addition, 7631 Mod. 2 controls a combination of 1301's and 7320's\*\* While this manual is primarily concerned with the attachment of this feature to all 7000 series systems\*, some information pertaining to other systems has been included to provide a better overall understanding of this feature's adaptability. Installation of IBM 1302 Disk Storage is covered in Appendix II.

7631 Models: Model 1-- for a 1410 or 7010. Model 2--for any 7000 systems\*. Model 3--for shared use by a 1410 or 7010 and a 7000 system\*. Model 4--for shared use by two 7000 systems\*. Model 5--for shared use by two 1410's, two 7010's, or a 1410 and 7010.

Each system has its own adapter unit through which it is coordinated with the File Control and other I/O equipment.

Become familiar with the particular 7631 model which you are to install, and the configuration of the system to which it will be added. Pay particular attention to cabling instructions.

You should also be aware of any special features ordered for the system because they may require special instructions, not covered in this manual.

Cables and special equipment peculiar to the new units should be inventoried and checked so that any discrepancies or damaged items, should they occur, may be adjusted quickly.

Wherever practicable, this manual groups specific information; however, there are some intermediate areas that should be looked for. Seemingly unimportant procedures such as attaching corner brackets, trim installation,

\*Except 7010 and 7072 systems  
\*\*Refer to Appendix I, 7320 Drum Storage Unit



1. GENERAL INFORMATION (continued)

cabling and other mechanical detail, when not done at the proper time in the over-all installation, could result in loss of time and much irritation.

Preliminary operations consist chiefly of planning placement of individual units, checking power facilities, and supervising the placement of sub-floor cables.

When the units arrive at the site, the CE in charge advises the movers on the placement of machines so that they can be unpacked, checked, and repaired if necessary. At this time, install any hardware and trim that cannot be installed after modules are placed together.

Modules are then moved to final positions, leveled, and connected to external cables. Appendage frames are installed on those modules that require them, and the rest of the cabling operation is completed.

Auxiliary equipment may be unpacked and checked concurrently with module unpacking.

When the system check has been satisfactorily completed, using the added feature, the system may be considered ready for customer use.

2. CE MACHINE ROOM CHECKS

Installation time can be held to a minimum if site preparations are complete before the arrival of the system. IBM has specified certain minimum physical planning requirements that the customer must meet to assure proper operation of peripheral equipment. These basic requirements are set forth in the I/O Components Physical Planning Installation Manual, Form C22-6681. Also, an installation floor plan or layout has been drawn

2. CE MACHINE ROOM CHECKS (continued)

up as part of the physical planning procedure. Obtain a copy of the Physical Planning Manual and installation layout from your Branch Office or local Sales Engineering representative.

The customer is responsible for having the installation site properly prepared for the machine; however, you should familiarize yourself with the over-all requirements to insure that items which have been overlooked or need correction do not become last minute delays that hold up machine placement or other installation procedures. Note and report these items to local CE management.

Check the following items:

- A. See that proper sub-floor has been installed.
- B. External cables routed at floor level require protective ramps to prevent their being damaged. Also, provision must be made for them to be routed in the step-cover area and for them to exit through an opening provided in special end-covers at each end of the front base section.
- C. Secure wall circuit breakers in the OFF position:

NOTE

It is suggested that signs reading "DO NOT TURN ON POWER" be prepared and attached to each wall panel supplying machine power. They should be kept in place during installation until the CE is ready for power to be applied to a machine unit or the system.

2. CE MACHINE ROOM CHECKS (continued)

1. Check for common connection between receptacle ground pin, receptacle case and building ground.
2. Check for a high resistance (one megohm or more) between the points in the preceding paragraph and any voltage phase pin of the receptacle.

CAUTION

Conduit is not considered adequate grounding, according to IBM specifications. Also, some IBM installations require special grounding methods in order to meet the electrical requirements of a particular system. Refer to the I/O Components Physical Planning Installation Manual, Form C22-6681.

DO NOT turn power on at wall panel if the receptacle ground pin, receptacle case and building ground are not all commoned together, or if a low resistance exists between these points and any voltage phase pin in a receptacle.

DO NOT attempt to correct any improper ground or phase condition which exists in any building power outlets. These conditions must be corrected by the electrical contractor.

- D. Check all three-phase AC power receptacles for proper phasing,

CAUTION

The 7631 uses single-phase power, however, do not connect I/O equipment until phasing is correct.

1. Turn on power.
2. Check that correct voltage is supplied.

2. CE MACHINE ROOM CHECKS (continued)

3. Check the phase voltages on the receptacle pins. Phase 1, red wire; phase 2, white; phase 3, black; ground green. See Figure 1-1.
4. Turn off power, replace warning sign.

NOTE

If a phase meter is unavailable an oscilloscope can be used to check phasing. Make certain that it is grounded to the power receptacle. Connect the sync lead to phase 1 and adjust the oscilloscope for one wave form, phase 2 should occur  $120^{\circ}$  later than phase 1. Phase 3 should occur  $240^{\circ}$  later than phase 1.

- E. Mark the floor with removable tape to show frame locations.
- F. See that proper tools and test equipment (oscilloscopes, meters, etc.) are available, and in operating conditions. As a rule equipment normally found at a Data Processing installation is adequate to check out the 7631.

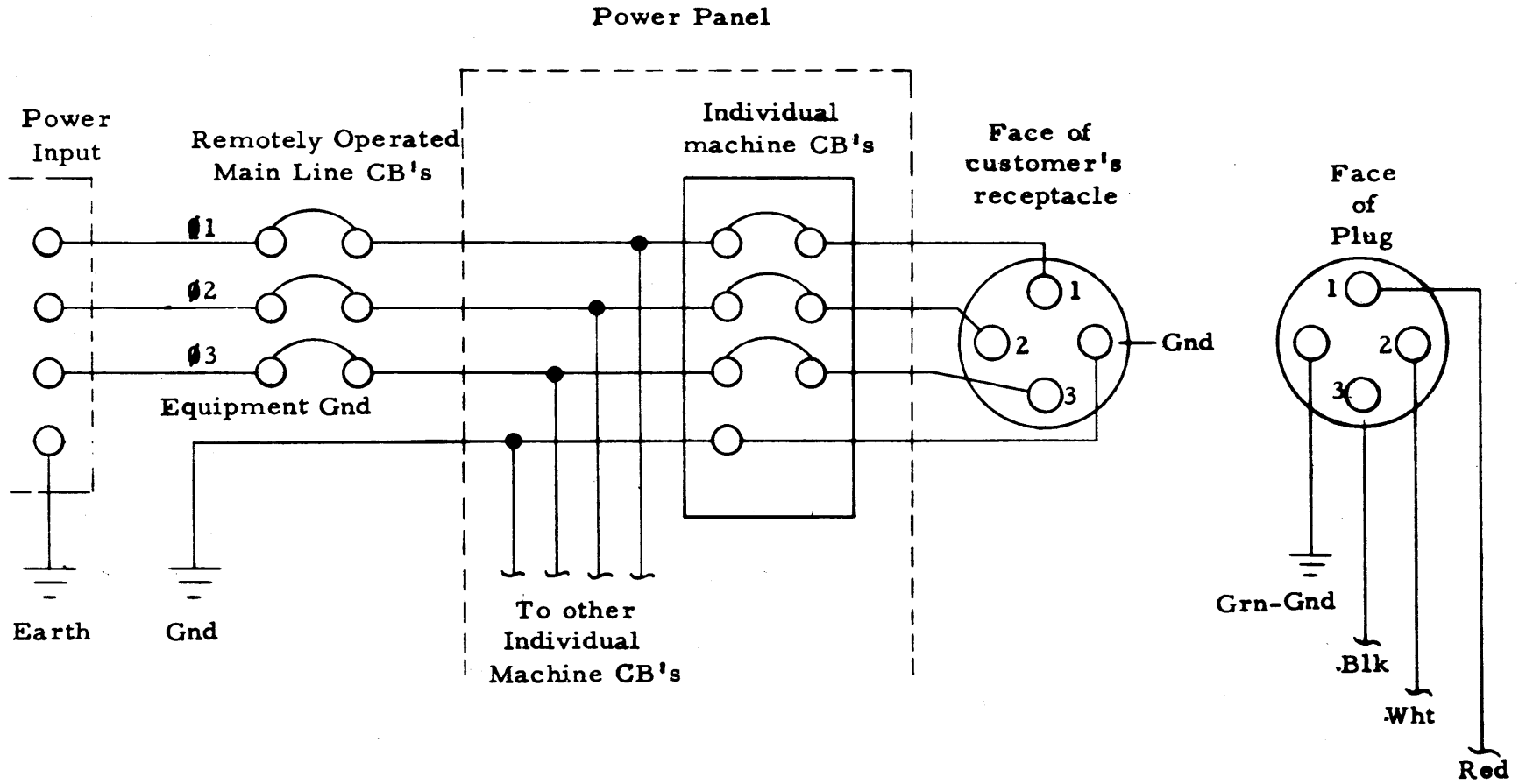


FIGURE 1-1 TYPICAL POWER SYSTEM

CHAPTER 2 CHECK LIST

2 PLACEMENT AND MECHANICAL ASSEMBLY-  
GENERAL

- |  |     |                          |
|--|-----|--------------------------|
| 1. Unpacking                           | 2-1 | <input type="checkbox"/> |
| 1.1 Mechanical Inspection and Leveling | 2-2 | <input type="checkbox"/> |
| 2. End Base-Covers and Step-Covers     | 2-3 | <input type="checkbox"/> |
| 3. Preliminary Checks - 7631           | 2-5 | <input type="checkbox"/> |
| 4. General Information - 1301          | 2-5 |                          |
| 4.1 Safety - 1301                      | 2-6 | <input type="checkbox"/> |
| 4.2 Special Equipment Required         | 2-7 | <input type="checkbox"/> |
| 4.3 Unpacking - 1301                   | 2-7 | <input type="checkbox"/> |
| 4.4 Unpacking - 1301 Mechanical Module | 2-7 | <input type="checkbox"/> |
| 5. Assembly - 1301                     | 2-9 | <input type="checkbox"/> |

## 2. PLACEMENT AND MECHANICAL ASSEMBLY - GENERAL

### 1. UNPACKING

Unpacking IBM equipment depends on how critical their internal adjustments are, the fragility of components and the manner in which they have been transported. Most modules are shipped with a minimum of packing in a padded van. However, critical items of Disk File mechanisms require special packaging. The carrier will normally provide movers to unload the frame from the van and move it into the machine area. To prevent injury to personnel, damage to equipment, and damage to the unit, check that the carrier is informed of the following requirements for handling the equipment:

#### CAUTION

- A. All machine movements are to be made on tempered masonite or plywood to prevent damage to floor areas. However, only plywood is recommended for a 1302 because of its additional weight-handling ability.
- B. Sufficient manpower must be used in handling and moving the frame to prevent injury to personnel and damage to equipment. Caution must be observed when moving the frame on ramps or where obstructions such as cables and cable floor holes exist. If a caster should drop into a floor opening or off the side of a ramp, it would be very difficult, because of the height and weight of the frame, to prevent it from tipping over, resulting in possible serious injury to personnel and damage to the frame.
- C. When moving a frame, avoid twisting it on its casters. When approaching or leaving a ramp, the frame must be aligned with the ramp. If not aligned, a twisting force is applied to the frame and weight may be absorbed on only three casters, causing caster damage.

1. UNPACKING (continued)

- D. Check each frame as it is being unloaded, for obvious signs of physical damage.

Remove plastic and paper covering, and any nylon tape or wooden wedges securing the covers. Refer to Section 4 of this chapter for special unpacking instructions. Check all spare parts and other equipment against order forms and shipping bills.

1.1 Mechanical Inspection and Leveling

- A. Check power and signal connectors for:

1. Breakage, correct assembly.
2. Pins bent, pushed out or broken.
3. Loose strands where wires enter connector pins.
4. Frayed insulation.
5. Mechanical tightness.

- B. Check other mechanical components:

1. Accidental grounds or shorts on terminals.
2. Imperfect ground connections.
3. Do safety devices work?
4. Are casters or pads securely in place?
5. Check lubrication where indicated.

- C. Check the equipment for damage not readily observed with covers on.

1. Check cables for cuts.



## 2 PLACEMENT AND MECHANICAL ASSEMBLY - GENERAL

### 1.1 Mechanical Inspection and Leveling (continued)

2. Check SMS cards for proper placement, inter-card shorts, and breakage.
  3. Check laminar bus assemblies for bent, broken, shorted or loose pins.
- D. After unpacking and inspecting the 7631, move the unit to its final location and install the leveling pads, adjusting them so that the casters are just clear of the floor. (Refer to section 5 of this chapter for 1301 leveling.) Place a carpenter's level atop the frame, level the unit from side to side and front to rear, by further adjusting the leveling pads.

### 2. END BASE-COVERS AND STEP COVERS - 7631

These covers are part of the Shipping Group. Step covers are installed after the cables are in position and connected. Figure 2-1 shows early model, one-piece step covers. Figure 2-2 shows step covers used on current models.

- A. End base-covers are installed flush with the side covers. Each one has four threaded lugs welded to the inside, and must be installed before the step covers by inserting the four lugs into the proper holes on the lower frame and securing it in place with four nuts and lockwashers.

#### NOTE

It may be necessary to shim out the bottom lugs to properly align these covers.

Special end covers with openings to allow entry and exit of cables are ordered for installations whose cables run at floor level.

(See Figure 2-2).

- B. Install one-piece step covers as illustrated in Figure 2-1:

2 PLACEMENT AND MECHANICAL  
ASSEMBLY - GENERAL

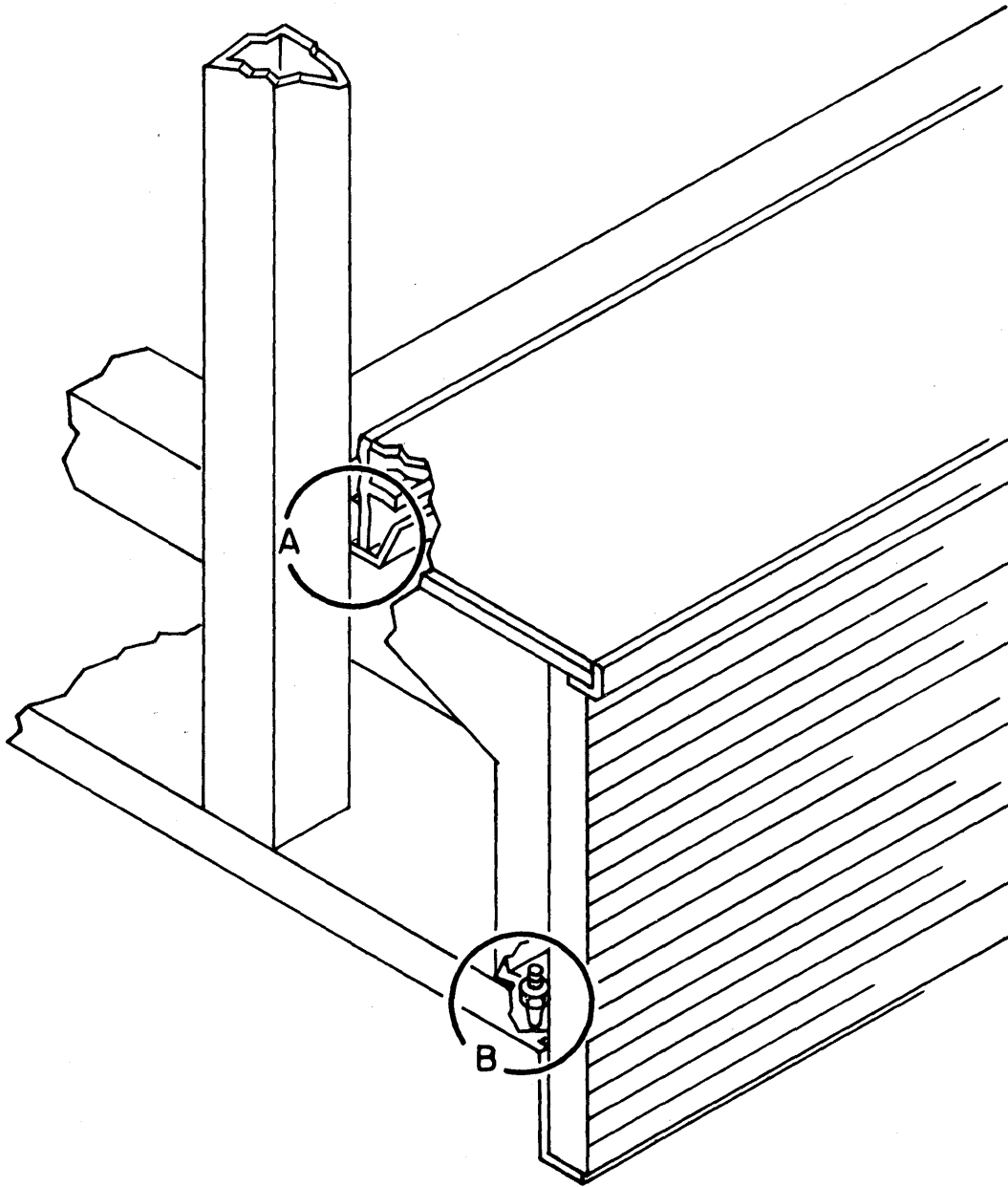


FIGURE 2-1 STEP COVERS - 7631

2 PLACEMENT AND MECHANICAL  
ASSEMBLY - GENERAL

2. END BASE-COVERS AND STEP COVERS - 7631

B. (continued)

1. Place the top inside edge of the cover in the channel groove (A), mounted on the frame.
2. Set two pins (B) located at either side of the cover, into the locating holes on the frame.
3. Apply a sharp push on the top of the cover snapping it into place.

C. Install two-piece step covers as illustrated in Figure 2-2:

1. Install louver screws A, pins and filter stops B, in frame.
2. Install air filters C and D (on rear of machine only).

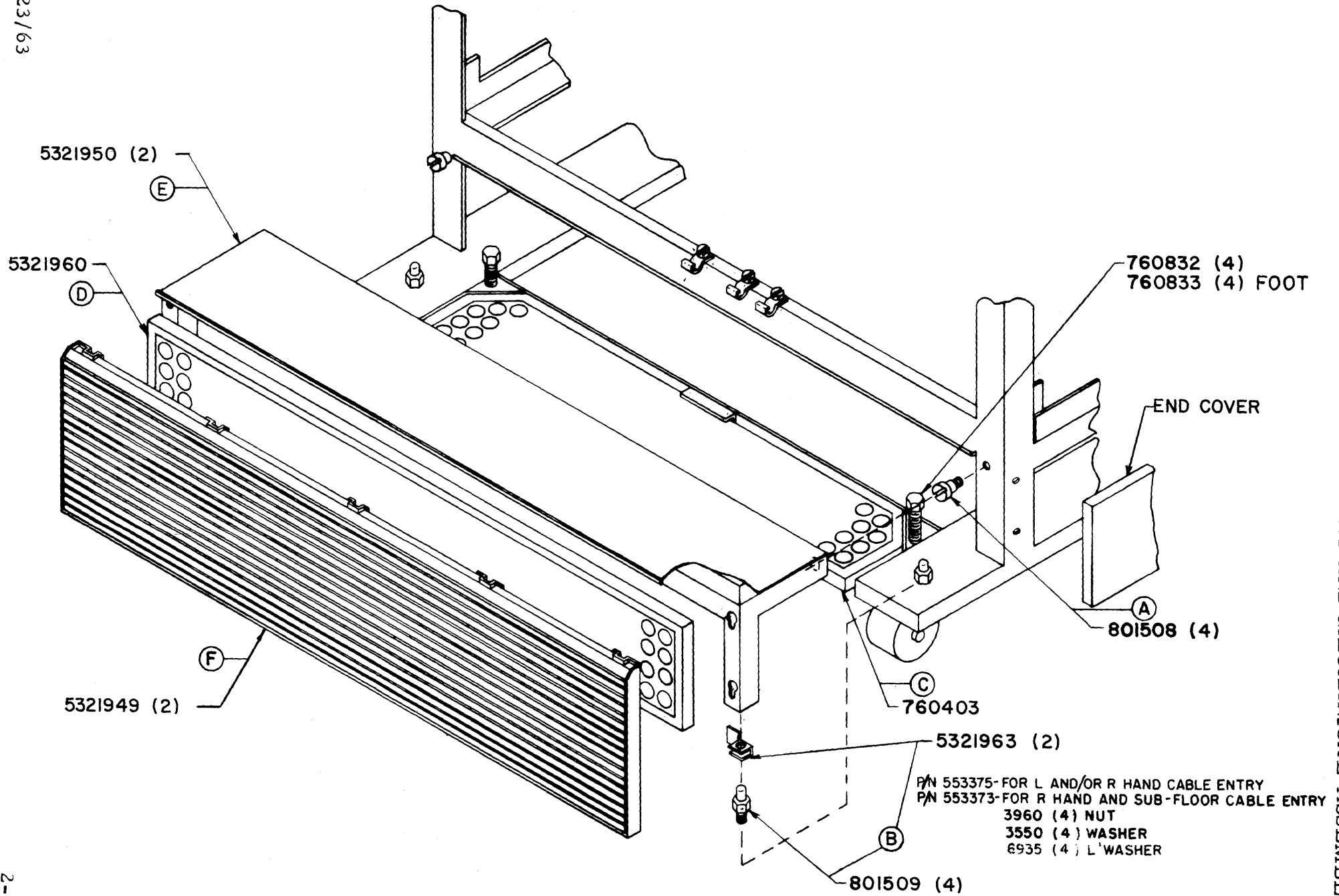
Filter D is inserted into top channel of step cover frame and rests against the filter stops.

3. Attach Step cover E, to louver screws A.
4. Attach louver F, to step cover frame.

3. PRELIMINARY CHECKS-7631

Prior to cabling the following checks should be made:

- A. Check that power has been turned off at the customer's receptacle.
- B. Using an ohmmeter, check that the resistance between frame ground and electronic ground is at least one megohm.
- C. Using an ohmmeter, check the laminar bus for possible shorts



2 PLACEMENT AND MECHANICAL ASSEMBLY

FIGURE 2-2 PLACEMENT OF BASE COVERS AND AIR FILTERS-7631

## 2 PLACEMENT AND MECHANICAL ASSEMBLY - GENERAL

### 3. PRELIMINARY CHECKS-7631

#### C. Continued

that may have occurred during shipment. Check for shorts between each segment and electronic ground. The -12 volt supply should read approximately 1.0 ohm.

### 4. GENERAL INFORMATION-1301

This section will guide you in the mechanical set-up of a 1301 Disk Storage, Model I or II. Subsequent chapters will complete the installation instructions in the following sequence:

- A. 1301 Mechanical Checkout
- B. 1301 Electrical Checkout
- C. 7631 Checkout - Note that most of this can be done concurrently with the 1301 Electrical Checkout.
- D. 7631 - 1301 System Checkout

For detailed servicing and test procedures consult the IBM 1301 CE Reference Manual, Form No. 227-5581-2, and the latest Disk Storage Devices CE Memos.

#### 4.1 Safety - 1301

The following advice is peculiar to the 1301 and is supplement to the safety information in the front of this manual. Read it! Heed it! The one thing you remember may save you from a painful injury.

Use caution when working around moving parts of the machine. Keep all parts of the body and loose clothing clear of areas where machine motion

## 2 PLACEMENT AND MECHANICAL ASSEMBLY - GENERAL

### 4.1 Safety - 1301 (continued)

can occur. Because of the unpredictable motion of the access mechanism, you can be injured if the machine starts unexpectedly.

High voltages exist in many areas of the machine; on transformers, terminal boards, convenience outlets, etc. Contactors carry high voltages and can be checked with power on only when absolutely necessary and with caution.

Potential difference within the power contactor gate is -48v DC to +208v AC. Potential difference within the electronic gates, printed cards, and display back panel is -48v DC to +30v DC.

When a DC failure is sensed, a DC off sequence is initiated; however, power remains on at the hydraulic power supply, convenience outlets, and disk drive motor. Do not depend on this feature as safety protection.

Shields and guards protect only when they are firmly in place. Do not short out or bypass safety features. One such item is the actuator shield safety switch. Never allow the access to run with this door open by manually energizing this cover safety switch. Also note that, although the actuator is electronically interlocked with this door open, if for any reason the solenoid DC power goes off, the actuator will attempt to go "home".

### 4.2 Special Equipment Required

Special equipment or supplies not normally found at an installation site is included in the 1301 Shipping Group.

2 PLACEMENT AND MECHANICAL  
ASSEMBLY - GENERAL

4.3 Unpacking - 1301 Electronic Unit

- A. Carefully remove all external tape, cardboard, and plastic cover from unit.
- B. Remove drawer shipping containers from inside unit and store them until the drawers are to be installed.
- C. Remove tape from logic gate latch and from bottom of gate and frame.
- D. Open gate and remove tape from air-baffle panels.
- E. Remove tape from latch of CE and power sequencing panel.

4.4 Unpacking - 1301 Mechanical Module

- A. Carefully remove cardboard hood from unit; use a small knife to cut tape between frame and hood to avoid damage to hood.
- B. Carefully remove plastic cover from unit. Do not remove insulating cover from actuator thermal switch.

NOTE

If disk file was shipped by van, proceed to next step; if shipped by air-freight, proceed to step F.

2 PLACEMENT AND MECHANICAL  
ASSEMBLY - GENERAL

4.4 Unpacking - 1301 Mechanical Module (continued)

- C. Remove glass door protector panels from front and rear of unit,
- D. use small knife to cut tape between panels and frame to avoid damage to panels.
- D. Remove tape used to secure glass doors together and remove filler pad from between edge of doors and frame.
- E. Remove all external tape.
- F. Cut steel bands holding hydraulic power supply to oil pan; remove felt padding and wooden block from top of power supply, and three rubber blocks from bottom of supply.
- G. Remove four rubber blocks from under the corners of the disk base casting. Return the seven rubber blocks to San Jose in the box provided.
- H. Remove tape from upper and lower module Format switch boxes; set Format switches to Read position.
- J. Remove plastic clock head cover; remove desiccant paper; remove supporting rubber block from clock head arm; replace cover.
- K. Remove tape from fuse and resistor panels.
- L. Remove tape from module shield latches; open module shield doors and remove desiccant paper from access units.
- M. Using vacuum cleaner, thoroughly clean interior and exterior of unit.



## 2. PLACEMENT AND MECHANICAL ASSEMBLY - GENERAL

### 5. ASSEMBLY--1301

Because it is easier to install the interframe cables before bolting the two modules together, we recommend the following procedure:

- A. Cut the lacing cord that secures the yoke to the actuator and remove foam rubber pad from between yoke and actuator housing of each module.
- B. Roll the open end of the electronic module to within 10 inches of the open end of the mechanical module and install the interframe cables. Refer to 1301 Interframe Cabling in Chapter 3.
- C. After cabling, move the electronic module up to the mechanical module and align the two by turning the caster head bolts in the electronic module with a 1/2 inch Allen wrench. Use a carpenter's level to check alignment.
- D. Insert the four bolts (in 1301 Shipping Group) through the two frames. Use the grounding washers between the frames, and be sure to tighten the nuts so that a good inter-frame electrical bond is formed.

#### WARNING

Before tightening interframe bolts, make sure that cables are not caught between the frames.

- E. Remove tape from power cable coiled at bottom of unit and route this cable under the mechanical and electronic frames, into the floor opening. Use clamp to secure cable to base of frame.
- F. Remove tape holding each module at inner track position.

## 2. PLACEMENT AND MECHANICAL ASSEMBLY - GENERAL

### 5. ASSEMBLY--1301 (continued)

- G. Loosen two nuts that secure hydraulic power supply (on lower right side, front and rear). Roll out supply, verify that oil level is between 1/2" and 3/4" below FULL mark on sight gage. Wipe supply and oil drip pan clean of excess oil, using a soft cloth. Tighten drip pan plug. Check underside of drain for seepage, then roll in supply. Tighten locking nuts.
- H. With a vacuum cleaner, thoroughly clean the inside and outside of the unit.
- J. Mount air duct (in 1301 shipping group) with opening down, to rear of hydraulic power supply, with wing nuts. Adjust the air shield upward, using a .010" shim between the shield and the air duct frame on the Hydraulic Power Supply, to insure maximum cooling efficiency in the system.

#### WARNING

Intake duct provides air circulation to cool power supply. Running machine with duct off may cause thermal failures. Also, make sure to clean heat-exchanger core regularly.

- K. Be sure to install the noise-reduction plates, PN 2163872, under the Electronic and Mechanical frames, (2302 only).
  - 1. Bolt the plates together and place them on the floor beneath the two units.
  - 2. Connect the ground strap (installed during manufacture and disconnected for shipment), from under the disk array area to the assembled plates.

CHAPTER 3 CHECK LIST

3 CABLING

- |                             |      |                          |
|-----------------------------|------|--------------------------|
| 1. General Information      | 3-1  |                          |
| 2. Cable Identification     | 3-2  |                          |
| 3. External Cables - 7631   | 3-3  | <input type="checkbox"/> |
| 4. Interframe Cables - 1301 | 3-12 | <input type="checkbox"/> |

### 3. CABLING

#### 1. GENERAL INFORMATION

This chapter provides information for the placement of external cables from the 7631 to the Data Channel of the using system and the 1301/7320. Cable connections between the mechanical and electronic frames of the 1301 are also included. (Appendix II has supplemental information on 1302 external and internal cables.)

External cable placement presents no problem if the machine-room floor is prepared and sufficient time allocated before the machine arrives.

The remaining operations are done during the various stages of mechanical assembly.

If external cables are to be installed at floor level, they should be unpacked and sorted, ready for quick installation when the machine arrives. Cables placed at floor level require protective ramps to prevent their being damaged. Contact the Physical Planning Engineer if more cables are required, or if any are the wrong length. Also, cable installations made at floor level require the 7631 to have special end-covers.

Y and Z dimensions, called out on cable charts, refer to the length of cables needed to reach from the floor cut-out to the cable plugging location on the machine. Y and Z dimensions are indicated by a one-inch tape band, placed the proper distance from the "FROM" and "TO" ends of the cable, respectively.

When placing the cables, see that the correct ends are in their proper locations. It is difficult and time consuming to reverse a cable after the modules are positioned and cable connection is in process.

## 2. CABLE IDENTIFICATION

To facilitate cabling, a red or white label is attached to each end of every cable.

Red identifies the "FROM" end of the cable; white, the "TO" end.

Each label carries a key or reference number. Key numbers identify external or sub-floor cables. Reference numbers identify interframe cables.

See Figure 3-1.

Part No. _____ Length _____	Part No. _____ Length _____
EC Level _____	EC Level _____
Key No. _____	Ref No. _____
From _____ To _____	From _____ To _____
Customer Code _____	Customer Code _____

FIGURE 3-1 CABLE LABELS

Both the "FROM" and "TO" labels are coded to show the cable designation, frame number, tailgate identification and plugging location. Thus, on a 7070 system, code K02H09C on a "FROM" label and KU09 (or 09U) on a "TO" label would indicate in the first case that this was an external cable from frame 02, tailgate H, plugging location 09C; and in the second case that the external cable was to be connected to a Simplex Interface tailgate (on the 7631) position 09, Upper section.

## 3. EXTERNAL CABLES-7631

Although there are few cables between the 7631 and 1301/7320, it is still good practice to connect an ohmmeter from electronic ground to frame ground so that any short circuits occurring between them during cabling may be detected immediately. However, this check does not apply to cabling between 7631/1301/7320 and other system components.

Inspect all cable connectors and tailgate pins before connecting them, to insure that none are broken or bent.

Use caution in aligning connectors and receptacles properly so that pins are not bent or pushed out of position. Also, make sure that cables are put into the proper locations.

Refer to Table 3-1 for cable connections between 7631 and Data Channels. Table 3-2 lists cable connections between 7631 and 1301; 1301 and next 1301 (or between 7320's, or 1301's and 7320's).

Figures 3-2 and 3-3 show 7631 component locations. Figure 3-4 illustrates 7631 tailgate configurations for the different models, and Figure 3-5 is a composite cable diagram of the 7631-1301/7320 features.

- A. EPO (Emergency Power Off) cables are plugged in C-1 connector located on the left end of the tailgate. See Figure 3-2.
- B. A dummy plug, IBM Part No. 553298, is in the Shipping Group. Plug it into EPO receptacle C-2 when only one system is being used with the File Control. The dummy plug is not used when a shared system is plugged into C-2.
- C. Cable K-406 is plugged into C-3 when two or more interface control units are used with the system.

TABLE 3-1 I/O CABLE CONNECTIONS-7631 TO DATA CHANNEL

Data Chan.	Channels	Cable Key No.	Tailgate Connectors	FROM 7631 - MODEL												Cable P/N	
				I			II			III			IV				
				L 09	U 09	U 11	L 09	U 09	L 13	U 13	U 15	L 09	U 09	L 09	U 13		L 13
7904		415	7106/07 EPO														352303
	Ch. 1 & 3	414	02A L01 (in)				X					X	X	X			587330
	Ch. 1 & 3	414a	02A L05 (out)			X				X		X	X	X			
	Ch. 2 & 4	414	02A L45 (in)				X					X	X	X			
7904	Ch. 2 & 4	414a	02A L49 (out)			X				X		X	X	X			587330
7907		402	7602 EPO														352303
	Ch. 1 Ext. 1	407	02H 13C				X					X	X	X			587330
	Ch. 1 Ext. 1	407a	09C			X				X		X	X	X			
	Ch. 1 Ext. 2	407	21C				X					X	X	X			
	Ch. 1 Ext. 2	407a	17C			X				X		X	X	X			
	Ch. 2 Ext. 1	407	01C				X					X	X	X			
	Ch. 2 Ext. 1	407a	01B			X				X		X	X	X			
	Ch. 2 Ext. 2	407	05C				X					X	X	X			
	Ch. 2 Ext. 2	407a	05B			X				X		X	X	X			
	Ch. 3 Ext. 1	407	21A				X					X	X	X			
	Ch. 3 Ext. 1	407a	17A			X				X		X	X	X			
	Ch. 3 Ext. 2	407	29A				X					X	X	X			
	Ch. 3 Ext. 2	407a	25A			X				X		X	X	X			
	Ch. 4 Ext. 1	407	05A				X					X	X	X			
	Ch. 4 Ext. 1	407a	01A			X				X		X	X	X			
7907	Ch. 4 Ext. 2	407	02H 13A				X					X	X	X			587330

(continued)

TABLE 3-1 (continued) I/O CABLE CONNECTIONS--7631 TO DATA CHANNELS

Data Chan.	Channels	Cable Key No.	Tailgate Connectors	FROM 7631 - MODEL												Cable P/N
				I			II			III			IV			
				L 09	U 09	U 11	L 09	U 13	L 13	U 15	L 09	U 09	L 09	U 13	L 13	
7907	Ch. 4 Ext. 2	407a	02H 09A			X				X	X	X		587330		
7908		403	7804 EPO											352303		
	Ch. 40	408	06A U05			X				X			X	587330		
	Ch. 40	408a	U01			X				X			X			
	Ch. 41	408	U13			X				X			X			
	Ch. 41	408a	U09			X				X			X			
	Ch. 44	408	U21			X				X			X			
	Ch. 44	408a	U17			X				X			X			
	Ch. 45	408	U29			X				X			X			
	Ch. 45	408a	U25			X				X			X			
	Ch. 46	408	U37			X				X			X			
	Ch. 46	408a	U33			X				X			X			
	Ch. 47	408	U45			X				X			X			
7908	Ch. 47	408a	06A U41			X				X			X	587330		
7909		404	7909 EPO											352303		
	Int. 1	409	05A L01			X				X			X	587330		
	Int. 1	409a	U01			X				X			X			
	Int. 2	409	L05													
7909	Int. 2	409a	05A U05											587330		
		406	7631 EPO C-3	To Other Control Unit										352303		

(continued)



6/1/65

TABLE 3-1 (continued) I/O CABLE CONNECTIONS-7631 TO DATA CHANNEL

Data Chan.	Channels	Cable Key No.	Tailgate Connectors	FROM 7631 - MODEL															Cable P-N	
				I			II			III			IV or			V or				
				L 09	U 09	U 11	L 09	U 09	U 13	L 13	U 15	L 09	U 09	L 09	U 13	L 13	U 09	U 11		U 13
1411		405	1411A EPO																	352303
	Ch. E	410	11D7 U03,L03*		X			X								X			X	553343
	Ch. E	410a	11C7 L27,28	X				X							X			X		
	Ch. E	410b	11D7 U01,02	X				X							X			X		
	Ch. F	410	U08,L11*		X			X								X			X	
	Ch. F	410a	U05,07	X				X							X			X		
1411	Ch. F	410b	11D7 U04,06	X				X							X			X		553343
NOTE: 410 cables have two paddle connectors on one end, stamped "A" and "B". On K410a, L27 is an "A" paddle, L28 is a "B" paddle. Cables showing only one plugging location use "A" paddles. (Tie back "B" paddles.) *"B" paddles for 2302 connection.																				
7114E		417	7114B EPO																	352303
	Ch. 1	416	14E U14		X			X											X	553343
	Ch. 1	416a	U13,12	X				X										X		
	Ch. 1	416b	U10,11	X				X										X		
	Ch. 2	416	U38		X			X											X	
	Ch. 2	416a	U36,37	X				X										X		
	Ch. 2	416b	14E U34,35	X				X										X		
	Ch. 3	420	14F U14		X			X									X		X	
	Ch. 3	420a	U13,12	X				X							X			X		
	Ch. 3	420b	U10,11	X				X							X			X		
	Ch. 4	420	U38		X			X									X		X	
	Ch. 4	420a	U36,37	X				X							X			X		
7114E	Ch. 4	420b	14F U34,35	X				X							X			X		553343

3-6

3 CABLING

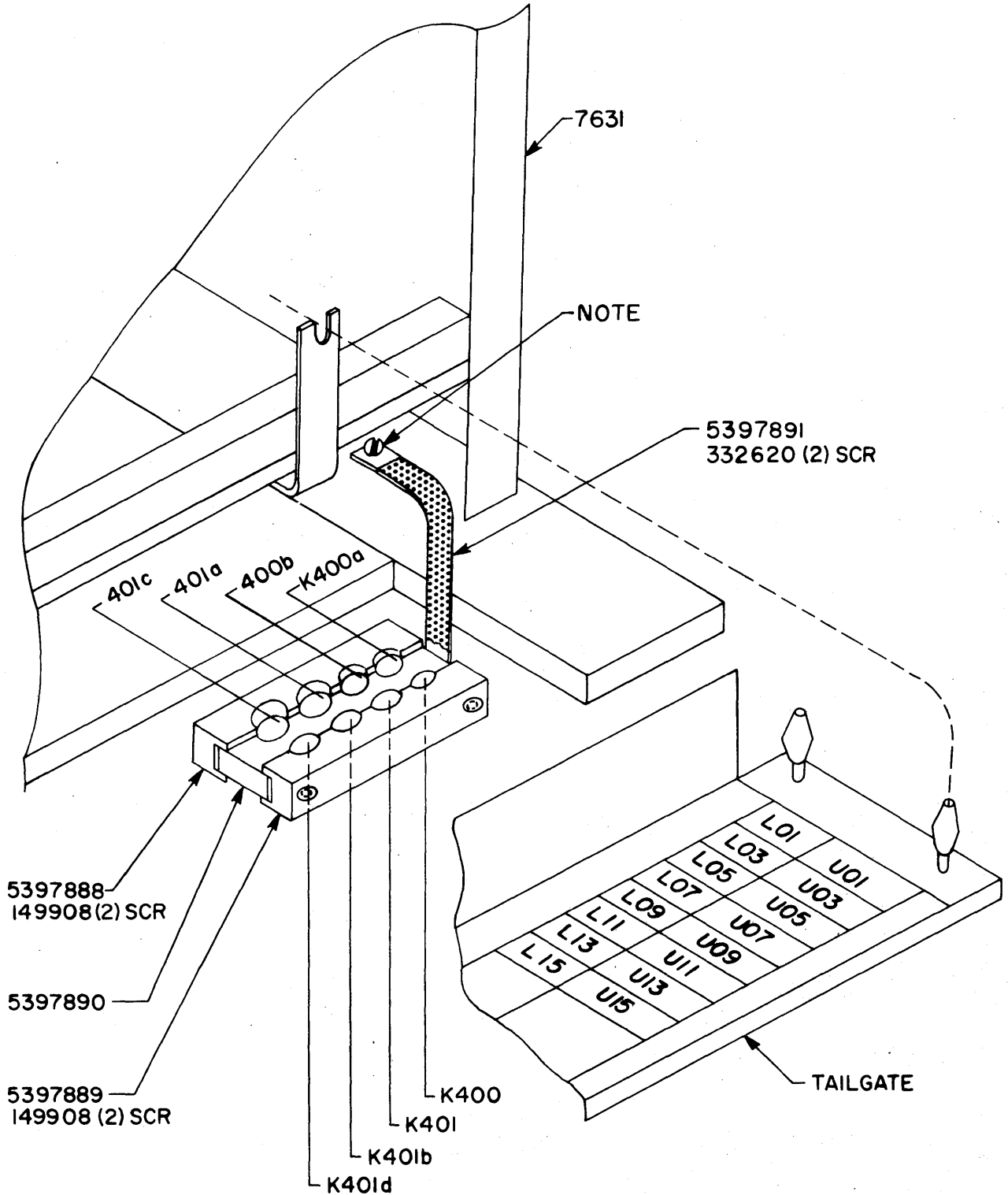
TABLE 3-2 I/O CABLES--7631 and 1301/2302/7320

CABLE KEY NO.	FROM	TO	CABLE PART NO.	REMARKS
400 ✓	7631 U01	1301 or 05D 7320 D11	553379 ** 5317772 ***	
400a ✓	L01	1301 or 09D 7320 D13	553379 ** 5317772 ***	
400b ✓	L03	1301 or 07D 7320 D09	553379 ** 5317772 ***	
401 ✓	U03	1301-1 or 11D 7320-1 D15	587387 ** 5317773 ***	
401a	L05	1301-2 or 7320-2		
401b	U05	1301-3 or 7320-3		
401c	L07	1301-4 or 7320-4		
401d	7631 U07	1301-5 or 11D 7320-5 D15	587387** 5317773 ***	
411, a, b, c	1301 or 05A 7320 D05	1301 or 05D 7320 D11	553379 ** 5317772 ***	
412, a, b, c	1301 or 09A 7320 D07	1301 or 09D 7320 D13	553379 ** 5317772 ***	
413, a, b, c	1301 or 07A 7320 D03	1301 or 07D 7320 D09	553379 ** 5317772 ***	
* 419 ✓	7631 P1	1301 or P1-In 7320 E02	5342370 *	
*419a, b, c, d	1301 or P2-Out 7320 E01	1301 or P1-In 7320 E02	5342370 *	

\* Only used on 7631, Serial No. 12000 and above.

\*\* Discontinued cables, still used on 1301/7320's.

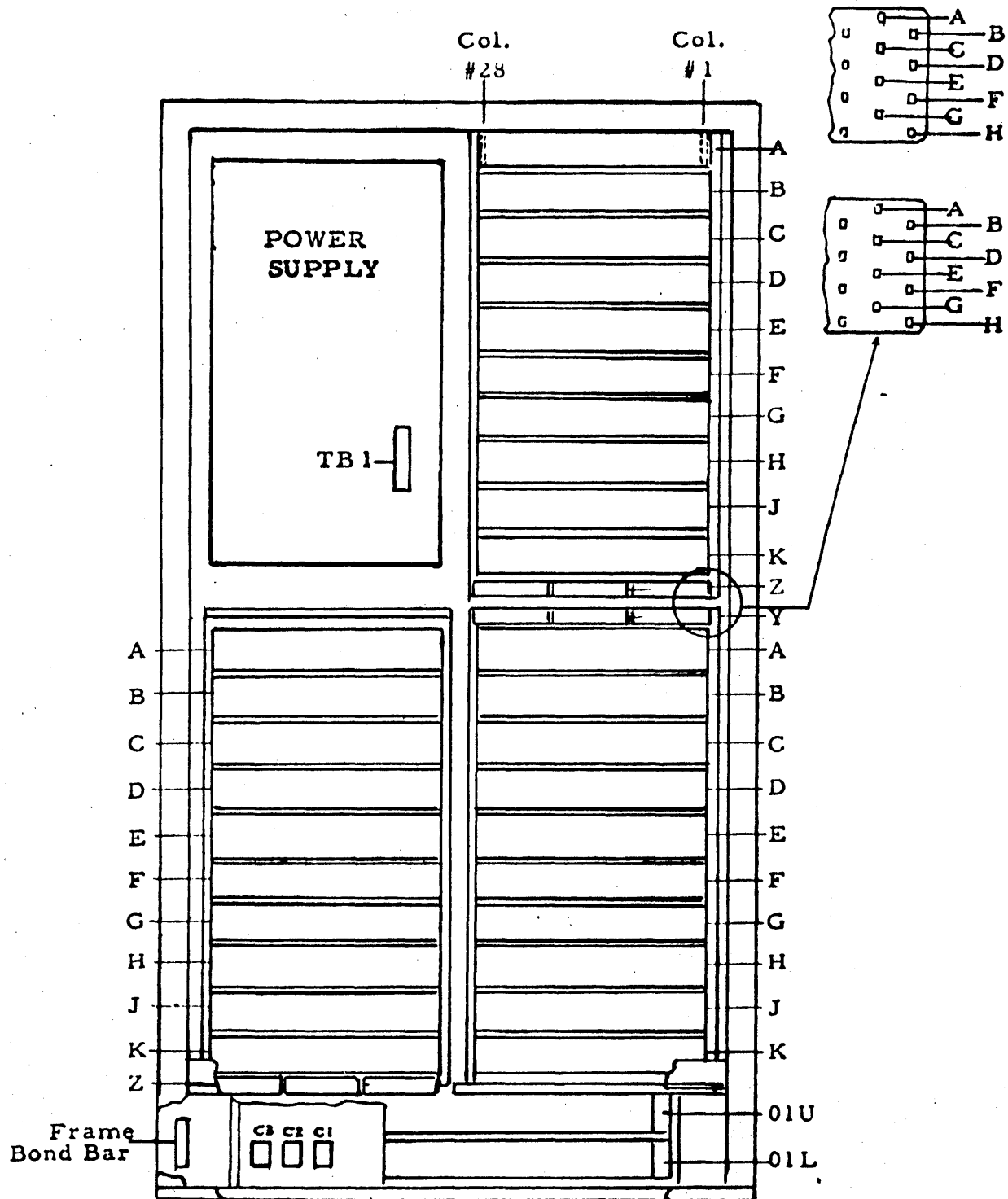
\*\*\* Shielded cables, mandatory for 2302's or when 1301/2302/7320's are inter-mixed. They require special grounding clamps, see Figure 3-1.1. HOWEVER, WHEN UNSHIELDED SIGNAL CABLES ARE USED, THEY MUST BE ROUTED AT LEAST SIX INCHES AWAY FROM ANY POWER CABLES OR CONDUIT.



NOTE: REMOVE TAPE FROM FRAME TO EXPOSE PAINT-FREE AREA AND TAPPED HOLE FOR ATTACHMENT OF BONDING STRAP.

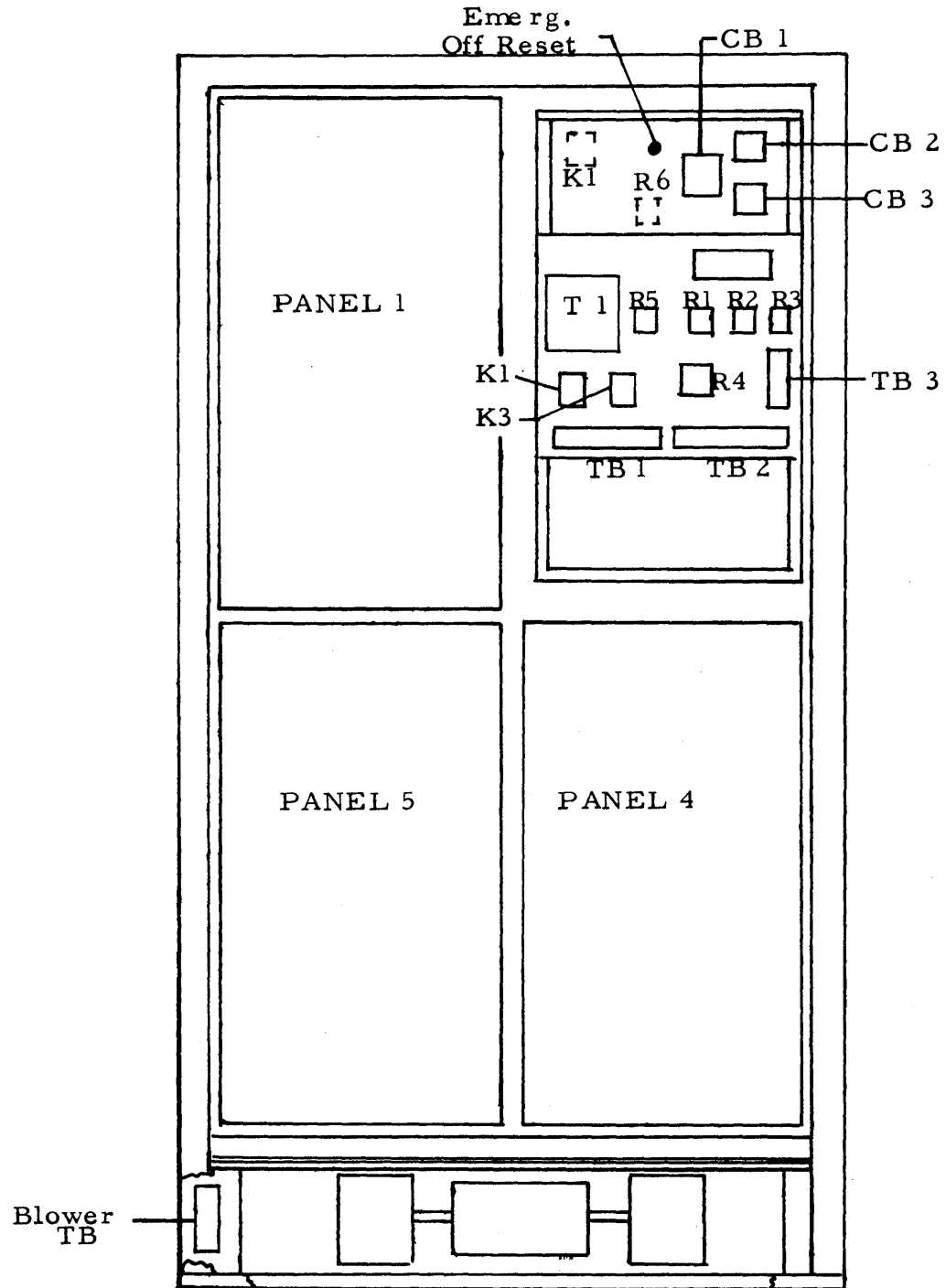
FIGURE 3-1.1 7631 GROUNDING CLAMP

### 3. CABLING



NOTE: 11,000 series only. See Appendix II for 12,000 series.

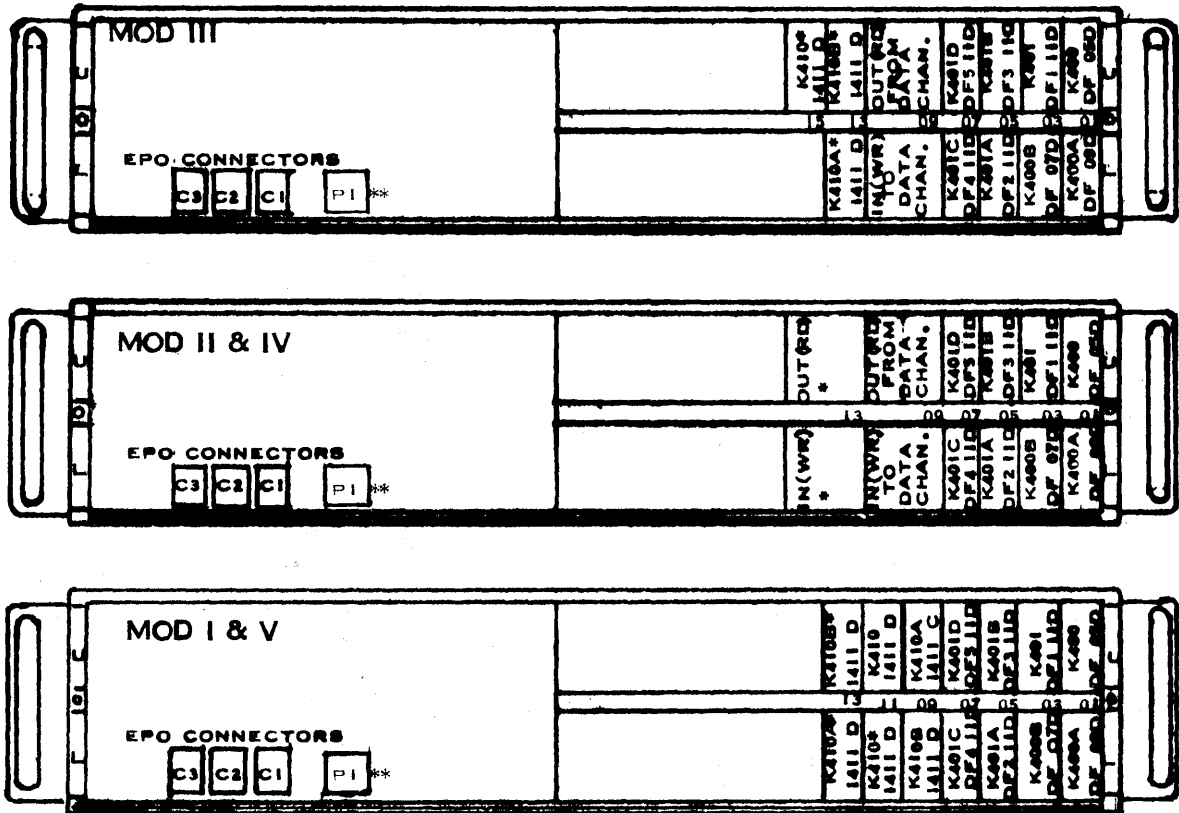
FIGURE 3-2 COMPONENT LOCATIONS--7631 (FRONT)



NOTE: 11,000 series only. For 12,000 series, see Appendix II.

FIGURE 3-3 COMPONENT LOCATIONS--7631 (REAR)

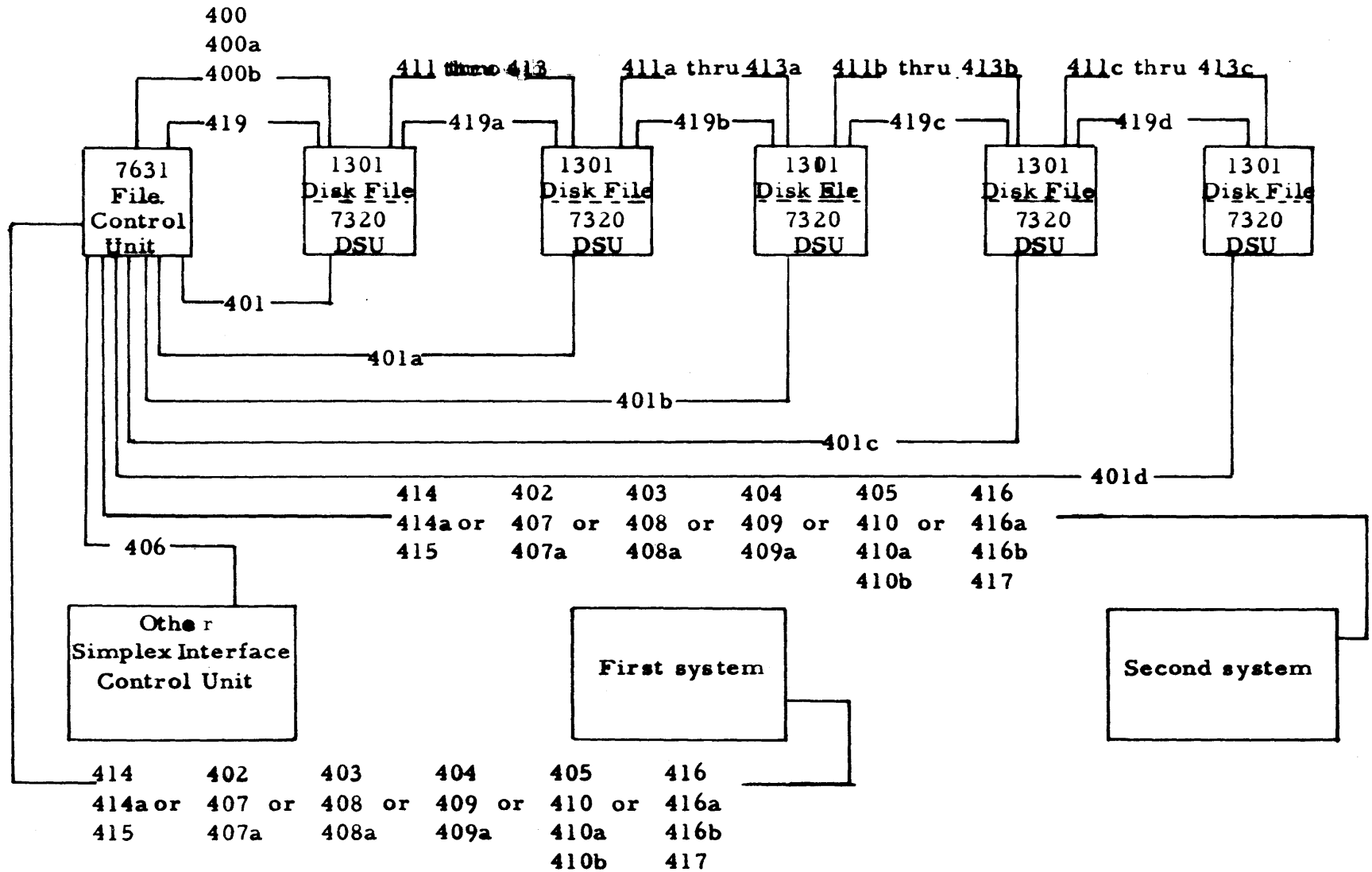
### 3. CABLING



\* THESE CONNECTORS ARE USED WHEN INSTALLING ADDITIONAL SYSTEMS.  
 40 POSITION CONNECTORS U13 AND L13 ARE NOT USED ON MODEL II.  
 32 POSITION CONNECTORS L11, U13 AND L13 ARE NOT USED ON MODEL I.  
 \*\* PI IS USED TO ATTACH CABLE K419 ON 7631, SERIAL NO. 12000 AND ABOVE.

FIGURE 3-4 7631 TAILGATE CONFIGURATIONS

3/8/65



NOTE: When second system is not used, insert dummy plug 553298 into EPO receptacles.  
 Cable key numbers 402, 403, 404, 405, or 415, are required only when the 7631 is attached directly to the system EPO.  
 K406 is required only when the 7631 is attached to other Simplex Interfaces Control Units EPO.  
 K419 is used with 7631, Serial No. 12000 and above.

FIGURE 3-5 EXTERNAL CABLE ROUTING--7631-1301/7320

3-12

3. CABLING

#### 4. INTERFRAME CABLES - 1301

The electronic and mechanical frames of the Disk Storage are separated for easier handling during shipment. Do not bolt them together before installing the interframe cables. Refer to Chapter 2 for mechanical assembly instructions. For 1302 interframe cables, see list in Appendix II.

Paddle connectors are stamped with information regarding frame, panel, and row. Other cable connectors have stick-on labels that correspond to the receptacle into which they are plugged.

- A. Refer to Table 3-3 for a list of interframe cables. Check off each cable on the list as it is plugged -- it is easy to overlook plugging some of them -- and embarrassing when the machine is closed up.
- B. Make sure that the terminators, shown in Figure 3-6, are in their proper positions.
- C. Refasten the 60 amp. power cable, P/N 2122396, located at the bottom left of the mechanical frame. The bracket, P/N 2122352, extends down from the frame and is removed for shipping but left secured to the cable. The mounting screws are left in the holes in the bottom of the frame.
- D. Figures 3-7, 3-8, and 3-9 show the plugging locations for the interframe cables.



TABLE 3-3 1301 INTERFRAME CABLE CONNECTIONS

CONNECTOR NUMBER	FROM FRAME	TO FRAME	CABLE NUMBER	REMARKS
S 302	Mech.	Electronic	2123481	For power supply blower. Bottom of Elect. Frame.
S 303	Mech.	Elect.	2122273 2122650	For gate A blower. For gate A & B blowers.
E 01, 02, 03	Mech.	Elect. gate A-5	2123297	Paddle Connector.
A 02	Mech.	Elect. gate A-5	2122267	Paddle Connector. Format Sw.
A 01 B 01, 02	Mech.	Elect. gate A-5	2122222	Paddle Connector.
E 01, 02, 03	Mech.	Elect. gate A-3	2123298	Paddle Connector.
* A 02	Mech.	Elect. gate A-3	2122037	Paddle Connector. Format Sw.
A 01 B 01, 02	Mech.	Elect. gate A-3	2122008	Paddle Conn.
H 03 H 04 H 06 H 07	Elect. Elect. Elect. Elect.	Mech. Mech. Mech. Mech.	2122007 (2122828)	Connections for Module 0 are shown here. Module 1 connections are: H 13, H 14, H 16, H 17. Plastic covers may have to be removed from H03, H13. Secure these cables with clamps already in place. Replace covers.
G 01 G 02	Elect. Elect.	Mech. Mech.	2122006 2122006	To Clock head, 5 pin conn. To Clock head, 7 pin conn.
S 08, 09	Mech.	Elect.	2122268	Route between 48V and sms power supplies.
S 301	Mech.	Elect.	2122269	From contactors to top of power supply.
Ground strap	Mech.	Elect.	2101376	Between bottoms of two frames.
Gnd. lead, Blk.	Elect.	Mech.	--	Single tie-out, to be affixed to file casting.
* <u>Not on ser. #500 and above.</u>				

3/8/65

3-14

3 CABLING

	D	C	B	A	
	From system		To next file		
1	*** P1 □ In	P2 □ Out	370756		
			370334**		
3			370334**		
			370334**		
5	K 400 7631 U 01		370334**		K411a, b, c to next 1301 05 D
7	K 400b 7631 L 03				K413a, b, c to next 1301 07 D
9	K 400a 7631 L 01				K412a, b, c to next 1301 09 D
11	K 401* 7631 U 03		To gate A	To gate B	
13			To gate A	To gate B	

---Terminator block 2123269 (Not used in 2302, nor in 1301 in series with 2302/7320.)

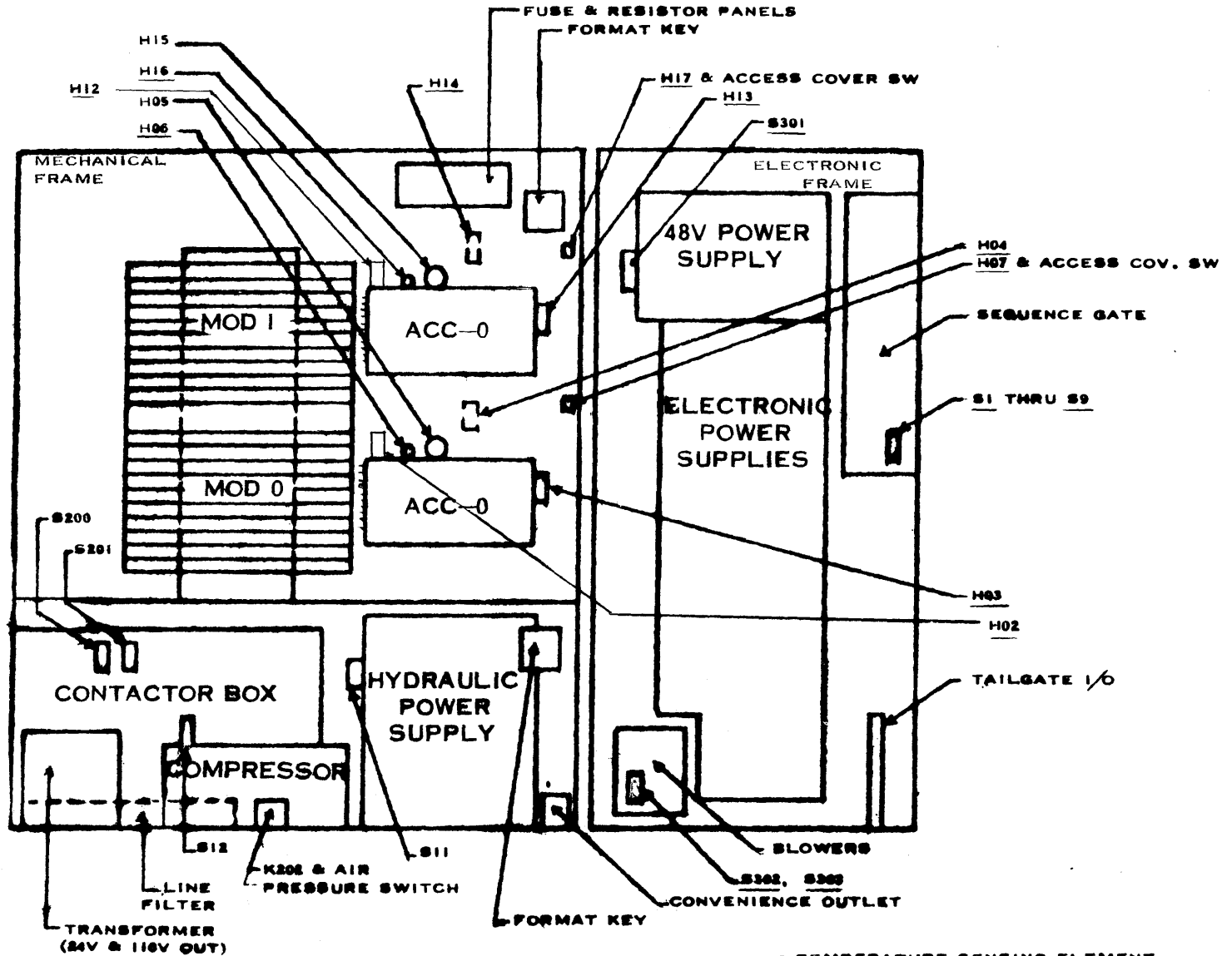
(Card side--card layout for last or only file on line.)

\*K401 is for the first 1301. K401a, b, or c, are plugged into the same connector (11 D), on 2nd, 3rd, 4th, and 5th 1301, but come from 7631--L05, U05, L07, U07, respectively.

\*\*These are TCK terminator cards. Three are sent in the 7631 Shipping Group; they are used only in the last file in line. In addition, each 1301 shipped from San Jose will have a card in position 5C; this card must remain in place on all 1301's. If file is first in line, remove cards in C2, C3, C4.

\*\*\*K419, used with 7631, Serial No. 12000 and above.

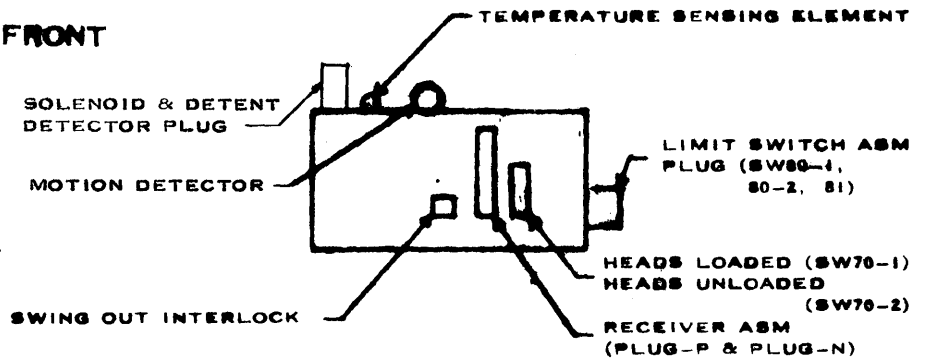
FIGURE 3-6 1301 TAILGATE CABLING



PLUGS THAT ARE IDENTICAL BUT ARE SHOWN ONLY ON LOGIC WITH THE  $M_0 A_0$  DESIGNATION CONVERSION MUST BE MADE WHEN WORKING ON SECOND ACCESS.

$M_0 A_0$	$M_1 A_1$
G03	G13
H02	H12
H03	H13
H04	H14
H05	H15
H06	H16
H07	H17

FRONT



TYPICAL ACTUATOR

FIGURE 3-7 1301 COMPONENT LOCATIONS (FRONT)

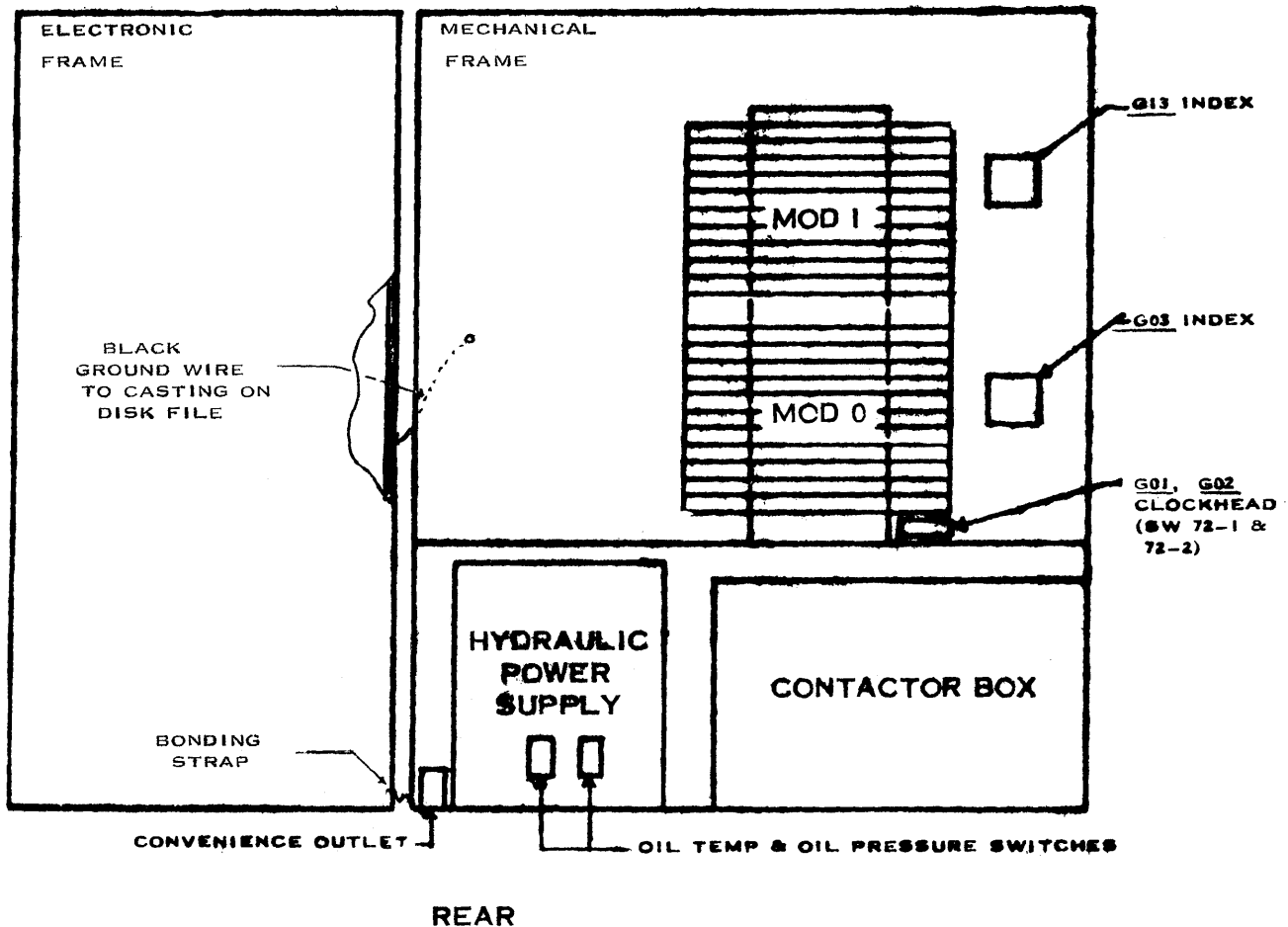


FIGURE 3-8 COMPONENT LOCATIONS



## CHAPTER 4 CHECK LIST

4 TESTING	Page	
1. Preliminary Instructions - 1301	4-1	
1.1 Power On Preparation	4-1	<input type="checkbox"/>
1.2 Five Minute Purge	4-1	<input type="checkbox"/>
2. Mechanical Preparation - 1301	4-2	<input type="checkbox"/>
2.1 Receiver Swing-Out	4-2	<input type="checkbox"/>
2.2 Disk Cleaning	4-3	<input type="checkbox"/>
2.3 Drawer Installation and Head Cleaning	4-4	<input type="checkbox"/>
2.4 Receiver Swing-In	4-5	<input type="checkbox"/>
3. Unit Testing	4-5	
3.1 Power On - 7631	4-5	<input type="checkbox"/>
3.2 Power On - 1301	4-6	<input type="checkbox"/>
3.3 Voltage Checks	4-8	<input type="checkbox"/>
3.4 Bias Checks	4-10	<input type="checkbox"/>
4. Diagnostic Testing	4-10	
4.1 Factory-Written Format Track	4-10	<input type="checkbox"/>
5. Use Meter Check	4-13	
5.1 IBM 1301	4-13	<input type="checkbox"/>
5.2 IBM 7631	4-13	<input type="checkbox"/>

## 1. PRELIMINARY INSTRUCTIONS 1301

Prior to any mechanical preparation (disk and head cleaning, drawer installation and adjustment, perform a five-minute purge to insure removal of airborne foreign particles from the disk array chamber. The purge can be done by powering the 1301 independently.

### 1.1 Power-On Preparation

#### DANGER

Check phasing before power-on. (See Chapter 1).  
Also, make sure that the ground connection between 7631/1301/7320 is common and electromechanically stable.

To bring up power on the 1301, without power on the 7631, (all cables connected on both units, 7631 connected to customer power), temporarily jumper EPO plugs C1 and C2 on the 7631, using EPO cable. See Figure 3-4. If only one I/O Channel on the 7631 is being used, (EPO cable plugged into C1), it will also be necessary to have a terminating jumper plug PN 553298, installed in Emergency Off plug C2. Installing this jumper will complete the Emergency Off circuit, enabling power to be brought up on the 1302.

If it is impractical to use an EPO cable, or if one is not available, use two jumper plugs, PN 553298; one in C1 and one in C2.

#### NOTE

Transformer taps must be changed if supply is 230 V. AC. (Ref. 1302 Maintenance Manual, 227-5864, Sec. 1.1).

#### CAUTION

Running the 1301 independently may result in arcing between head and disk. Before loading heads, make sure that AC and DC grounds are common in the 1301 at only one point, by placing a jumper between any "J" pin and any unpainted panel mounting screw. Be sure to remove this jumper upon completion of test.

### 1.2 Five-Minute Purge

- A. Make sure that the power cable is connected to customer's 208-volt receptacle. If not, set CB1 and CB2 on the AC distribution panel of the 1301, to Off, and connect power.

1.2 Five-Minute Purge (cont'd)

- B. Set CB1 and CB2 to On.
- C. Set Auto Control switch to Local.  
Set Sequence Control to Manual.
- D. Remove paper cover from over access aperture.
- E. Press Auto Start switch.
- F. Press Disk Drive On button. Disk Drive On indicator will light and disks will rotate in a counter-clockwise direction, in accordance with the directional arrow on the machine.

**WARNING**

Clock-wise rotation of the disks will result in having no hydraulic pressure. Manual loading of heads may result in damage to the disks.

- G. With covers on, allow the file to run for five minutes, then proceed to the next step.
- H. Depress Disk Drive Off switch.  
Depress Auto Stop switch.
- I. Set CB1 and CB2 to OFF.

2. MECHANICAL PREPARATION 1301

This section contains the procedures relevant to the mechanical preparation of drawer assemblies, disk and head cleaning, and receiver operation. A more detailed description with photographs can be found in the IBM 1301 C. E. Reference Manual (Form #227-5581-2).

**WARNING**

Use extreme care in handling of the receiver, drawer assemblies and heads during the mechanical preparation of the disk storage. They are easily damaged. Also dust and debris in the machine and its environment can damage the disks.

2.1 Receiver Swing Out

- A. Remove module receiver shields.



2.1 Receiver Swing Out (cont'd)

- B. Push carriage to outer track limit stop and retract upper and lower locking pins.
- C. Move linkage release lever to unlocked position toward receiver hinge shaft. Move rail linkage so that it clears roller on rack assembly.
- D. Carefully swing out receiver.
- E. Use the stabilizing arm provided in the 1301 Shipping Group to hold the receiver in the swung-out position. Place the stud end of the arm into the actuator diamond-pin hole. The hole on the other end of the arm engages the receiver diamond-pin.
- F. Check locknuts on yoke and tie rods for security. Check motion transducer, with a non-magnetic feeler gauge, for a clearance of  $.006 \pm .002$ ". Check inner, center and outer positions.
- G. Check carriage-ways and actuator housings for proper lubrication.
- H. Check to insure that all E rings are in place.

2.2 Disk Cleaning

- A. Use disk cleaning paddle, Part No. 2108474 wrapped in lint-free tissue, Part No. 2123106, and moistened with isopropyl alcohol, Part No. 2155966. Place paddle (through access aperture in plastic shield) between disks, and rotate array manually; work from the top down.
- B. Replace tissue on paddle as oxide pickup shows on tissue.

(continued on  
next page)

2.2 Disk Cleaning (continued)

- C. Replace paper covering over access aperture until heads are ready for installation.

2.3 Drawer Installation and Head Cleaning

NOTE:

Do not discard data drawer shipping containers. You will need them to store spare drawers.

- A. Inspect drawer assemblies for proper engagement of torsion spring fingers with arms. Head signal cable should not interfere with gimbal action of head.
- B. Take pitch and roll torque measurements of each head. The CE Reference Manual describes this procedure in detail. CEM Service Aid No. 13 contains the latest torque specifications and supplements information in the CE Manual concerning pitch and roll torque measurements. (Does not apply to 1302)
- C. Clean head assemblies with lint-free tissue moistened with isopropyl alcohol. Clean and lubricate paddle connectors,
- D. Insert drawer assemblies and drawer retaining pins, in accordance with instructions in the CE Reference Manual.

NOTE

Avoid embarrassment, do not interpose Format and Data drawers.

## 2.4 Receiver Swing-In

- A. Raise the diamond pin and swing the receiver. Insure that the nylon roller is engaged in the channel and that the locking lever is forward.
- B. Secure diamond pins while pressing in on front of receiver. Do not apply pressure to drawer assemblies.
- C. Insure that clock head is in an unload position.
- D. Load heads manually. Then unload heads and manually rotate disk array while checking for an even amount of clearance between disks and drawer assemblies. Be sure heads are not cocked.
- E. Return carriage to outer track limit stop. Install module receiver shields. Carefully push carriage to inner CE track.

## 3. UNIT TESTING

## 3.1 Power on 7631

- A. Assure that power cables for both the 1301 and 7631, are connected to customer's 208 volt receptacle.
- B. On the 1301:
  - 1. Set CB1 and CB2 ON.
  - 2. Set Auto Control switch to LOCAL.
  - 3. Set Sequence Control to MANUAL.

3.1 Power on 7631 (continued)

## C. On the 7631:

1. Set CB1 to ON.
2. Depress Power On switch. Power On and DC On indicators will light.
3. After DC On indicator lights, the 7631 will receive an automatic reset and the following indicators will light:

Availability 1 and Availability 2\*

Digit Ring On

5 + 6 and

Bit Rings BS + O and B7 + 8

3.2 Power On 1301

With the 7631 powered, perform the following operations on the 1301:

- A. Depress Auto Start switch. The following indicators will light:
  1. Remote Stop
  2. Air Press Normal
  3. Heads Unloaded
- B. Depress Disk Drive On switch. The following indicators will light:
  1. Timer
  2. Disk Drive

\* On mod III, IV and V only.

## 3.2 Power On 1301 (continued)

- C. Depress the following switches. Their respective indicators will light:
1. Elec DC On
  2. Sol DC On
  3. Oil Pump
- D. At this point, allow to purge for one hour. During this time, all voltage, oil pressure and temperature checks can be performed.

## WARNING

Inspect fittings for oil leakage.

(Sect. 3.3 and 3.4). Upon completion of the purge, proceed:

- E. Depress Head Load switch. The following will occur:
1. Heads Unloaded indicator will go off.
  2. Access Retracted indicator will light. (This indicator will be lit only as long as Head Load switch is depressed).
- F. Depress HL Check switch. Observe the following indicators:
1. Heads Loaded
  2. File Ready
- G. Set Auto Control switch to REMOTE and Sequence Control to AUTO.

## WARNING

The unit should be left in "AUTO" when unattended so that a partial machine failure will cause the machine to turn off.

## 3.2 Power on 1301 (continued)

- H. At this point, allow unit to run for 30 minutes with heads loaded. Any off-line file operations may be performed during this time. Upon completion, continue:
- I. Depress Power Off switch on the 7631. Indicators on both units should go off. Check to be sure all heads unload.
- J. Check and record the coast-down time against that measured at the factory. That information is noted on a sticker located on the CE panel door, behind the right-side cover of the electronic module.
- K. Clean the heads and array. Check for oxide build-up. Perform another purge for 30 minutes with heads unloaded. Upon completion of this, continue sequencing file completely.
- L. Prior to systems testing, check that EPO cables and connectors are in place. Refer to Chapter 3, Section 3 for cabling information.

## 3.3 Voltage Checks

- A. 7631. Check all back Panel DC voltages measured at the laminar bus. The voltages should be within - 2% of the given value.
- B. 1301. (Continued on next page).

3.3 Voltage Checks (continued)

B. 1301. Check voltages measured at the laminar bus for a tolerance of  $\pm 2\%$  of the values. Table 4-1 gives the voltage requirements.

TABLE 4-1 1301 VOLTAGE CHECKS

Terminal	Color	Voltage	Remarks
1	Black	GND	
2	Blue	-6	
3	Orange	+6	
4	Black	GND	
5	Violet	-12	
6	Black	GND	
7	White	+12M	
8	Brown	-36	
9	Gray	+12	
10	Pink	+30	

### 3.4 Bias Checks

- A. 7631. Plug Bias Box (P/N 210860) into AC outlet and insert jack into the +12M receptacle. The receptacle is located below the power supply C. B. Check the +12M volts on the SMS panel for a maximum variation of  $\pm 1.5$  volts.
- B. 1301. The +12M receptacle is located above the power supply blower. Check the +12M volts on the SMS panel for a maximum variation of  $\pm 3$  volts.
- C. Check Read and Format amplifiers in 1301. Adjust only if necessary, referring to read amplifier adjustment procedure, page 2-44 of the CE Reference Manual, Form 227-5581.

#### NOTE

Clock head signal amplitude must be checked before proceeding with diagnostic testing. Refer to instructions in the CE Reference Manual.

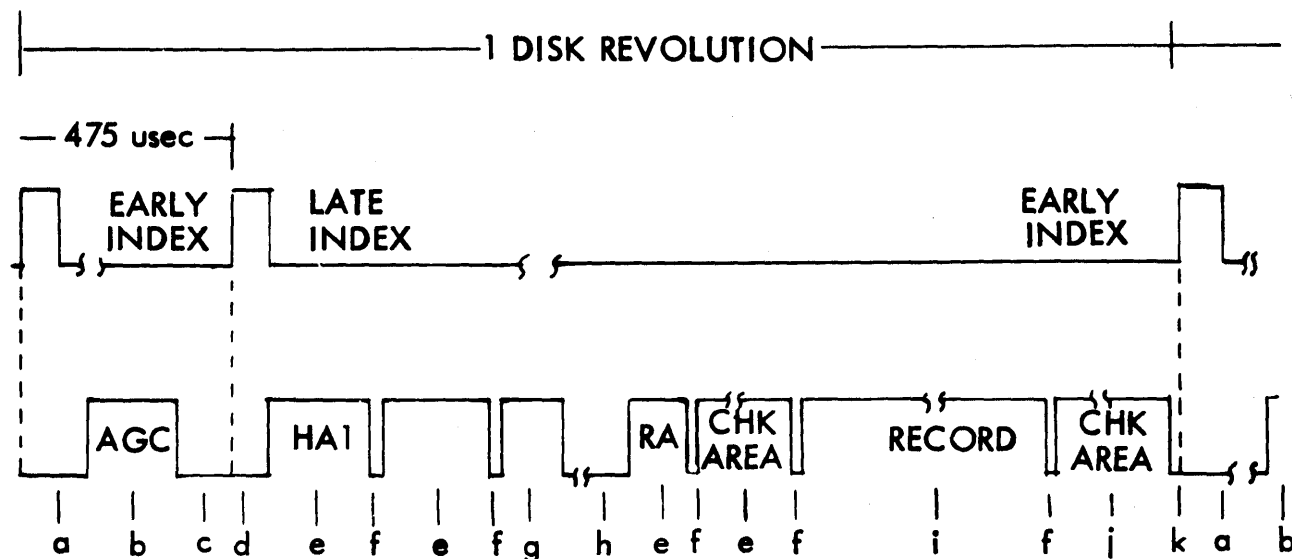
## 4. DIAGNOSTIC TESTING

Refer to the respective Data Channel CE Installation Manual (7907, 7908, 7909), or the 1410 system CEIM for diagnostic programs to be run.

### 4.1 Factory-Written Format Track

All 1301's shipped after September 1, 1963 have a format track written on cylinder 222. This format track (see Figure 4-1), permits testing from the 7631 CE panel during the installation of the 1301, reducing the system hours required for preliminary testing.





Note: 2288 characters are written in an 8-bit mode (9 bits per character), 1.6 microseconds per bit. This includes "no bit" characters.

Code: a - 300 microseconds from early index to AGC burst.  
 b - 100 microseconds AGC burst  
 c - 75 microseconds  $\pm$  15 microseconds  
 d - 27 "no bits"  
 e - 90 bits (character 1 through 10, 12-21, 41-50 and 52-61)  
 f - 9 "no bits" (character 11, 22, 51, 62 and 2203)  
 g - 54 bits (character 23 through 28)  
 h - 108 "no bits" (character 29 through 40)  
 i - 19, 260 bits (character 63 through 2202)  
 j - 765 bits (character 2204 through 2288)  
 k - approximately 10 microseconds (disk speed and early index to late index relationship will affect this timing)

NOTE:

For 1302, see Appendix II.

FIGURE 4-1 CYLINDER 222 FORMAT TRACK PATTERN -1301

## 4.1.1 Writing Addresses at Location 8888

Use the following procedure, from the CE panel, to write HA1, HA2, RA and record at location 8888. RUN THE FOLLOWING IN 8-BIT MODE:

- A. Jumper the following positions on the 7631:  
  
From 01B1E03D to 01B1E03J for 11000 Series Serial Numbers  
From 01B1A10D to 01B1A10J for 12000 Series Serial Numbers
- B. Seek to address 8888.
- C. Turn on "CE" HAO and customer HAO switches.
- D. Perform a write HAO with the "4" bit switch On.
- E. Turn off "CE" HAO switch.
- F. Perform a write HAO with the "2, 3, and 5" bit switches On.
- G. Turn off customer HAO switch.
- H. Load address of 8888DD and perform a write TRO with the "6" bit switch On.
- J. Address 8888 now has an HA1 containing 8's, an HA2 containing D's and a record address containing 2's. All 7631 read and write operations can now be tested, using address 8888. e. g. , An SRO operation may be performed using a record address of all 2's.
- K. REMOVE JUMPER THAT WAS INSTALLED IN STEP "A".

## NOTE

This procedure will allow only the use of head 8 on cylinder 222. Using any other address results in an error because of the absence of HA1's and HA2's. Refer to disk storage devices CEM Service Aid #7 for detailed operating instructions of the 7631 CE panel.

## 5. USE METER CHECK

## 5.1 IBM 1301

- A. With the Customer Switch on the 1301 Meter Box in the OFF position, the file must be INOPERABLE from the System.
- B. With the Customer Switch ON, check that the file programs run properly, and that the meter runs and accumulates time as long as the CPU is running, and the 7631 is ON LINE.
- C. With the Customer Switch OFF, and with the CPU running (any program that does not use the file), check that the meter on the file does not run.
- D. With the Customer Switch OFF and the CPU running, as in C above, turn the Customer Switch ON, check that the meter on the file does not run until the CPU halts and then starts again.
- E. With the Customer Switch ON, start the CPU and check that meter is running. With the meter running, turn the Customer Switch OFF. Check that the meter continues to run until the CPU stops. Restart the CPU and check that the meter on the file does not restart.

## 5.2 IBM 7631

- A. With the 7631 in TEST MODE 1, perform any control operation (i. e. Seek) for approximately one minute. The meter must not record time.

## 5.2 IBM 7631 (continued)

- B. Switch the 7631 Mode Switch to NORMAL and the meter switch to DISABLE. Run any file diagnostic program. (The CPU meter should NOT be in CE MODE). When attempting to run the diagnostic program, the system should receive a NOT READY or NOT OPERATIONAL signal from the 7631.
- C. Halt CPU, turn 7631 meter switch to the ENABLE position. Start program and observe that the meter on 7631 is recording.
- D. While the program is running, turn 7631 meter switch to DISABLE. Observe that the meter still records until the CPU is halted.
- E. Turn CPU meter switch to the CE position and the 7631 meter switch to ENABLE. Start program and observe that the 7631 meter does not record.

## NOTE

For more detailed procedures, refer to  
CE Meter Manual, Form No. 223-2728.

APPENDIX I CHECK LIST

1	INTRODUCTION	AI-1	
2	GENERAL INFORMATION	AI-1	
3.	SAFETY	AI-3	
4	UNPACKING	AI-6	<input type="checkbox"/>
5	MECHANICAL PREPARATION		
	5.1 Mechanical Inspection	AI-7	<input type="checkbox"/>
	5.2 Cabling	AI-8	<input type="checkbox"/>
	5.3 Power-On Checks	AI-10	<input type="checkbox"/>
	5.4 Cleaning Drum Surface	AI-14	<input type="checkbox"/>
	5.5 Dynamic Check of Components	AI-16	<input type="checkbox"/>
	5.5.1 Local Status	AI-16	<input type="checkbox"/>
	5.5.2 Remote Status	AI-17	<input type="checkbox"/>
	5.6 Replace Covers	AI-18	<input type="checkbox"/>
6	PRELIMINARY TESTS		
	6.1 Attachment feature, Single-Shot Timing	AI-19	<input type="checkbox"/>
	6.2 Format and Delay-Line Adjustment	AI-21	<input type="checkbox"/>
	6.3 Command Channel Test	AI-22	<input type="checkbox"/>
	6.4 Format Write Switch	AI-23	<input type="checkbox"/>

(continued)

APPENDIX I  
IBM 7320 DRUM STORAGE UNIT

APPENDIX I CHECK LIST (continued)

7 DIAGNOSTIC TESTING

7.1 Format, Home Address, and Surface

Analysis Test AI-23

7.2 Vibration Test AI-24

7.3 Bias Test AI-24

7.4 Reliability Test AI-25

1. INTRODUCTION

This section provides instructions for installing an IBM 7320 Drum Storage Unit with a 7090/94 data processing system.

The 7320 feature communicates with the system through a 7631 Mod. 2 serial no. 12000 and above, with a Drum Storage Adapter (#3451). See Figure AI-1.

2. GENERAL INFORMATION

The 7320 is easy to install and operate; however, great stress is placed on the need for operating the drum in a dust-free environment. If construction work is being done near where the unit is to be tested, e. g., floor sanding, paint spraying, or any condition which exists that could contaminate the upper enclosure, do not unpack the unit.

Additional information about the 7320 will be found in:

CE Reference Manual	G22-6717
Physical Planning Bulletin	J22-6727
System Diagrams	5247320
7320 Drum Storage Bulletin and Newsletter	A22-6747 N22-0089

APPENDIX I  
 IBM 7320 DRUM STORAGE UNIT

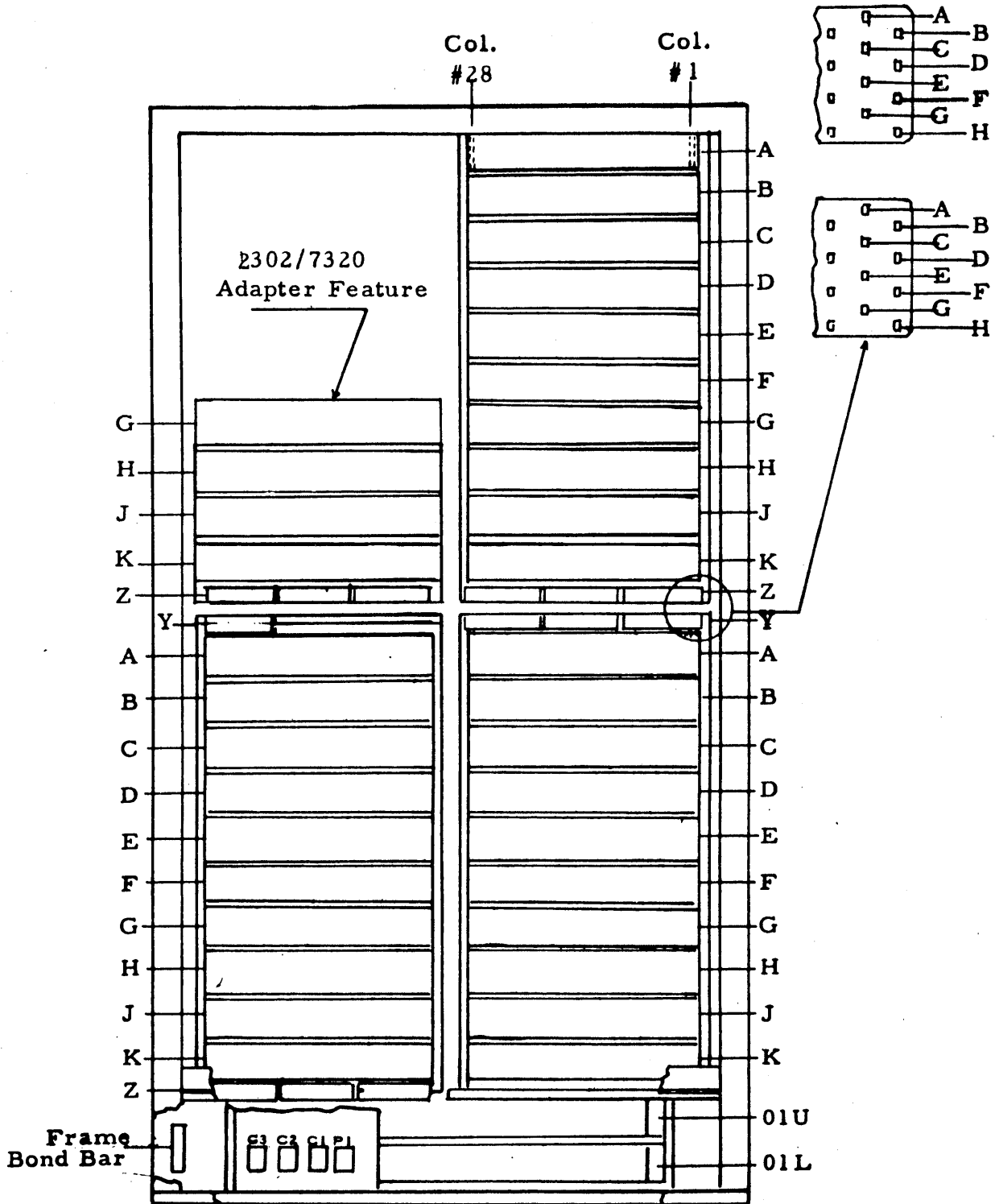


FIGURE AI-1 COMPONENT LOCATION 7631 WITH DSU ADAPTER  
 (FRONT) (12000 Series and above.)



### 3. SAFETY

Be careful when working around moving parts of the machine, specifically at the drum assembly. The safety cover, located on top of the drum assembly, must not be removed or installed unless the drum rotor has come to a complete stop. If service or maintenance is necessary in this area, turn drum motor circuit breaker (CB 2) to Off and tag. See Figure AI-2.

Air pressure which is used to load the drum heads is stored in a pressure tank. There can be as much as 58 psig \* present, from the tank to the head air solenoid. Before servicing this area, slowly exhaust air out of tank by using petcock located at bottom of tank. See Figure AI-3.

Potential difference within the power gate can be as high as 253V AC. Potential difference within the logic gate can be 24V DC and as high as 290V AC in the gate blower area. Do not remove "High Voltage" or "Line Voltage Present With Machine Power Off" safety covers; or any other covers before determining what potentials exist and how they may be normally de-energized. If there is any doubt, remove AC line cord.

On Emergency Off, 24 volts AC can be present at I/O panel C04H and at K1-Y on the power gate )if the signal cables to the File Control Unit are plugged in) with line cord removed. Checking these points may be done only if absolutely necessary and with caution.

With Main Line switch (CB 1) off, 209V AC is still present at: input and output terminals of line filters; input terminals L1, L2, and L3 of CB 1.

With Local Power Off, 208V AC is still present at points mentioned

\* Psi--as indicated on gauge.

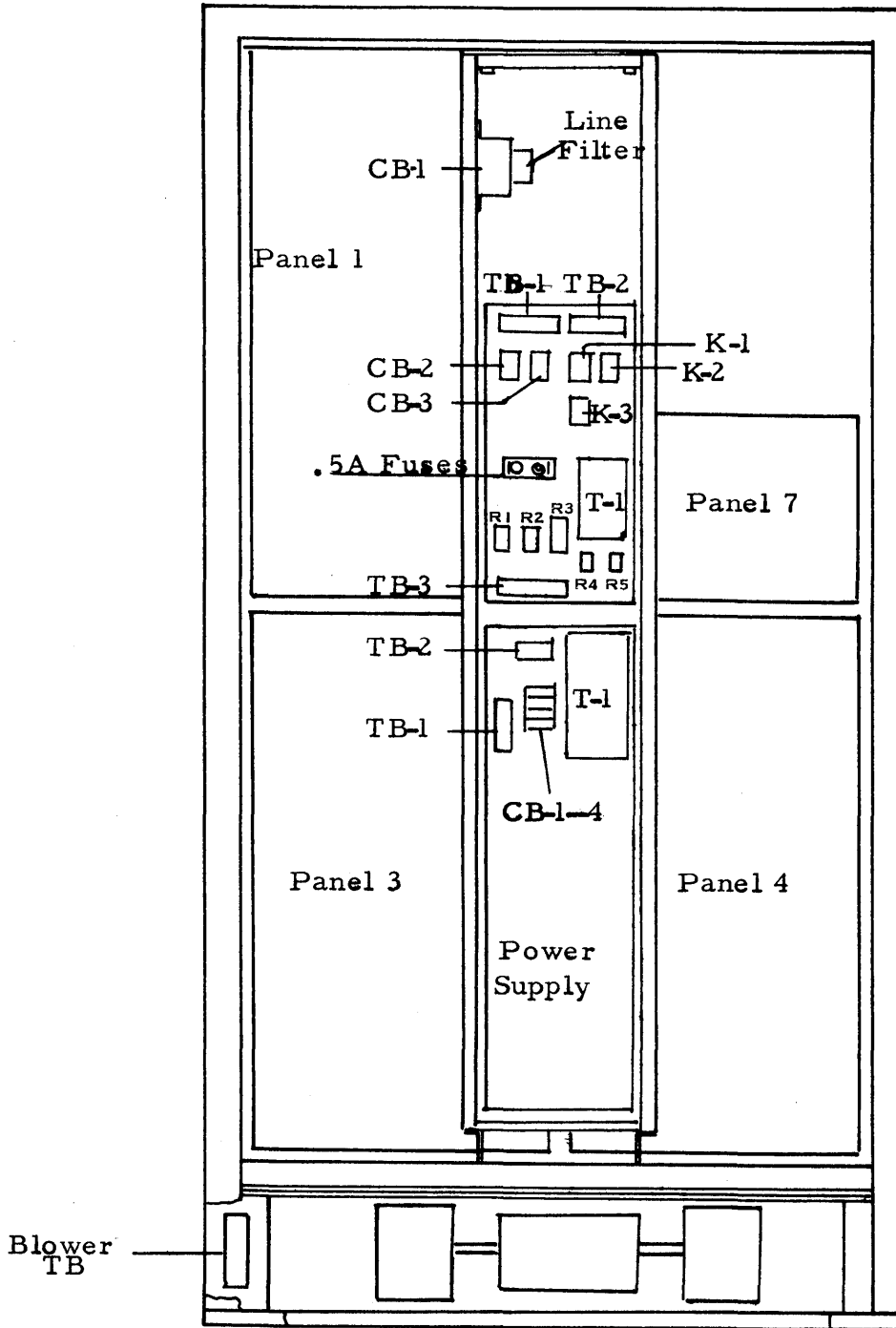


FIGURE AI-2 COMPONENT LOCATION--7631 WITH DSU ADAPTER  
 (REAR)

6/28/63

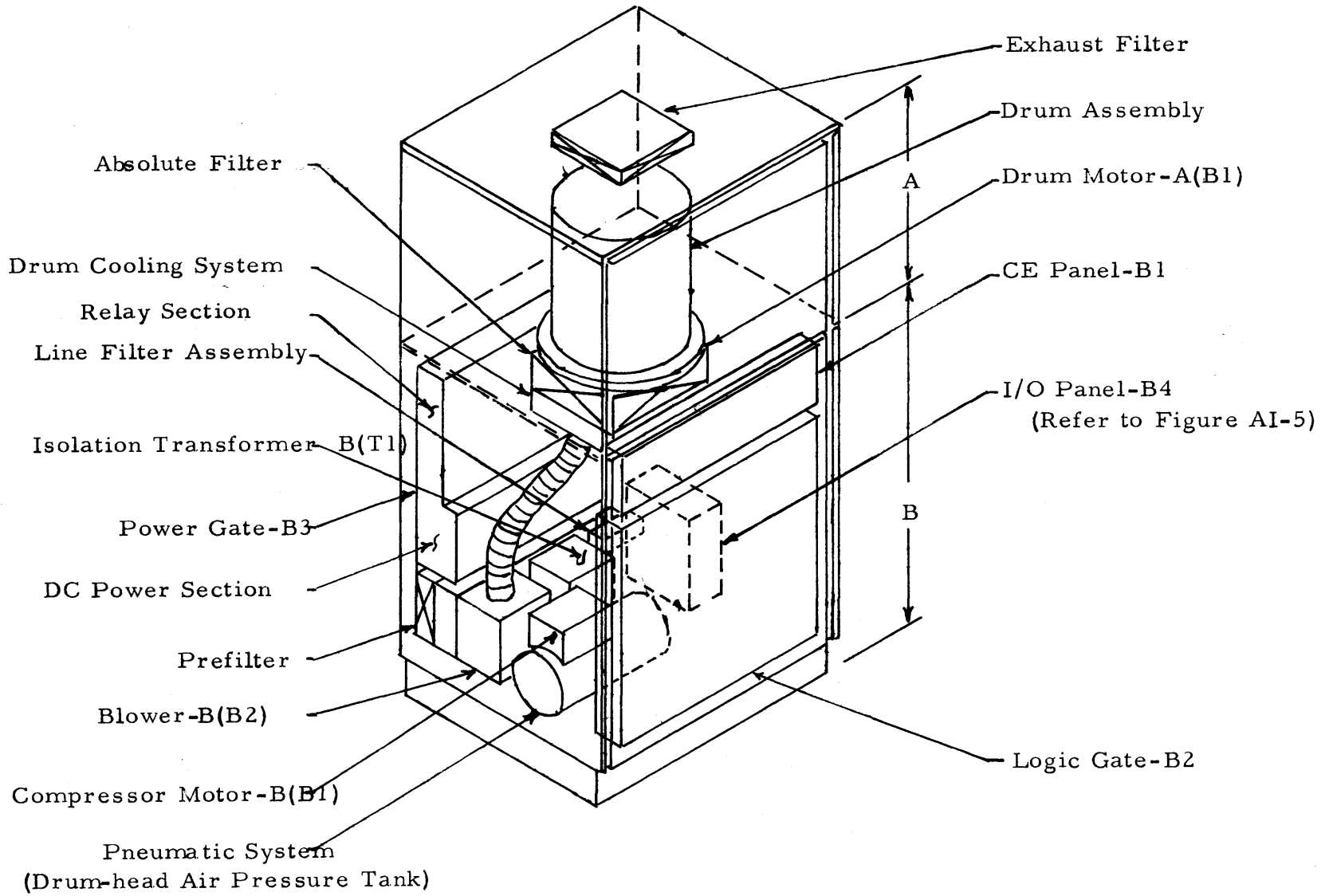


FIGURE AI-3 COMPONENT LOCATION-7320 DSU

AI-5

APPENDIX I  
IBM 7320 DRUM STORAGE UNIT

3. SAFETY (continued)

above; output terminals of CB 1; input and output terminals of K1; input terminals of K4; input terminals of T1; terminals A and B of fuses F1 and F3.

110 V AC is present at: convenience outlet; output terminal 5 of T1; TB3-1; TB3-2; TB3-3; B(TB 1)1; terminals 1-a and 1-c of B1D19 and B1D24; terminals 3-b and 5-b of K4; terminals a and b of fuses F5 and F7.

24 V AC is present throughout the power gate and associated circuits.

A voltage which can be in excess of 300V RMS is present at TB 1 which has a safety warning tag on the protective cover.

4. UNPACKING

WARNING

Inspect protective plastic shipping cover on top of the unit for damage. If it is torn, perform step D of Section 5.3 in the proper sequence.

NORMAL PROCEDURE

1. Remove shipping tape and outer plastic cover.
2. Vacuum clean top of unit.
3. Do not open top enclosure doors until performing step D of Section 5.3.

CAUTION

Drum rotor is locked with shipping bolts. Do not remove these bolts until the proper time in the installation sequence, to prevent injury or damage to personnel or to the machine.

5. MECHANICAL PREPARATION

The upper enclosure of the drum unit cannot tolerate any dirt or moisture. Keep a clean environment at all times. Upper enclosure doors must be kept closed unless the drum blower is ON. With drum blower ON, doors can be opened (one at a time) for service only. A Drum Maintenance Blower switch is provided to allow the drum blower to operate with normal Local Power switch OFF. See component locations on Figures AI-1, AI-2, AI-3.

- A. Open lower doors and remove shipping pin on the latches of power gate and logic gate.
- B. Drop CE Panel by unlocking fasteners located at the top corners of the panel, with a screw driver.
- C. Reach inside through CE Panel opening and rotate the latch handle located at the upper corners of the side panel.
- D. Swing out power gate, again rotate the latch handles located at the top corners of the side panel while holding the panel to prevent it from falling.
- E. Remove side panels by lifting out and upward.

5.1 Mechanical Inspection

Visually inspect entire unit for loose components, wire and hardware.

- A. Vacuum clean lower interior.
- B. Check the prefilter and logic gate filter to insure they are intact.
- C. Check the absolute filter and assembly by exerting hand pressure to assembly. This must be tight; if loose, tighten the two nuts holding the plenum and filter assembly.

5.1 Mechanical Inspection (continued)

- D. Check seal from prefilter chassis to drum blower.
- E. Check hose from blower to filter assembly for tight connection.

5.2 Cabling

- A. Remove the cable entrance plate at the bottom of the drum unit in front of the I/O panel. Refer to Figure AI-4.
- B. Remove the AC Line Cord from its shipping position and feed it down through the cable entrance.  
  
DO NOT PLUG INTO AC POWER AT THIS TIME.
- C. Remove the cable clamp bar from the I/O panel assembly, and install the following key-numbered cables, feeding them up through the entrance slot and around the clamp bar before plugging them in.

<u>Key</u>	<u>From</u>	<u>To</u>
400	7631 U01	7320 D11
400a	7631 L01	7320 D13
400b	7631 L03	7320 D09
401	7631 U03	7320 D15
*419	7631 P1	7320 E02

\*Power cannot come on 7320 unless this cable is in place. For cabling information when a DSU is intermixed with 1301/2302's, refer to Table 3-2 and Figure 3-5.

Replace the clamp bar and bottom plate. Tighten the bottom plate as much as possible, making sure that the line cord does not make contact with the signal cable. Also, if the drum is the last or only unit in line, plug the TCK terminator cards (PN 370334, in 7631 Shipping Group), into card receptacles C05, 06, 07, 08. If the drum is intermixed with other units, remove and re-install these cards in the last drum or file in line. (Or store them, if the last unit is already terminated). The YEQ card, PN 370756, comes plugged into C01 and must remain in place. See Figure AI-4.

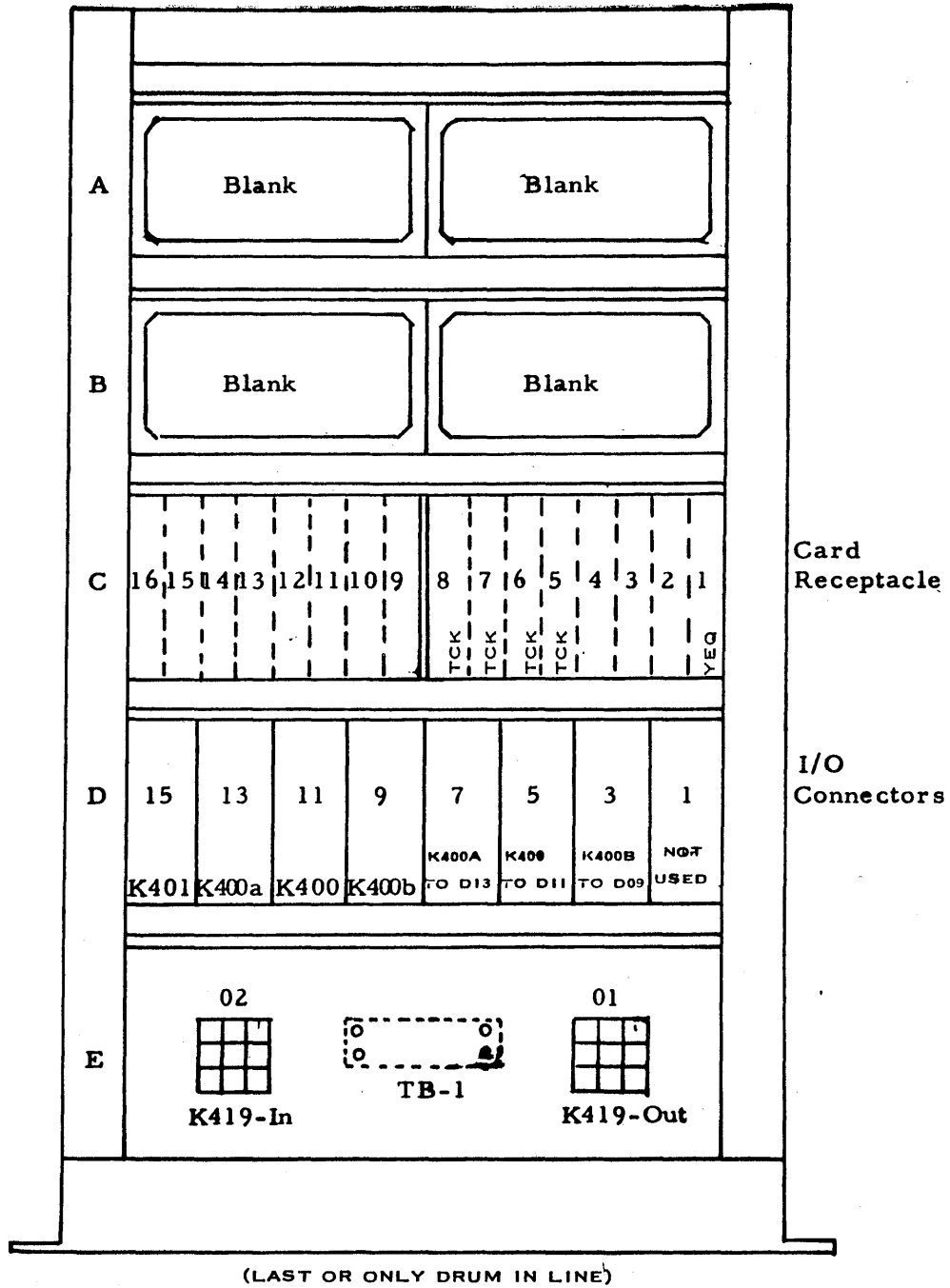


FIGURE AI-4 COMPONENT LOCATION-7320 I/O CONNECTORS

### 5.3 Power-On Checks

#### CAUTION

When installing a 7320 in-line with 1301's temporarily disconnect cable K401 from U03 on 7631 until assured that only the DSU is being selected as required. This will prevent inadvertent writing on disk.

- A. Set switches on the service panel to the Off position, set Local/Remote switch to Local position.
- B. Turn DC Brake switch and circuit breakers CB 1 and CB 2, located on power gate panel to Off.
- C. On the 7631, turn CB 1 and CB 2 to OFF.
- D. Open one upper enclosure door and remove masking tape from bottom of plastic cover. Close door.

#### NOTE

If outer cover was damaged as noted in Section 3, remove exhaust filter assembly and thoroughly vacuum clean housing and filter prior to removing tape from plastic cover.

- E. Connect line cord to 208 3 $\phi$  AC and close main line circuit breakers CB 1 and CB 2.
- F. Connect the 7631 power line cord to 208 volt. 60 cycle, single phase, and turn CB 1 and CB 2 to ON.
- G. Turn Drum Blower and Drum Maintenance Blower switches ON. The "Voltage Present Indicator" should be ON. "Drum Blower" indicator should be ON.

#### NOTE

If any malfunctions occur, refer to index of reference manual for information regarding type of failure. With drum blower ON, open one door of the upper enclosure and remove plastic cover.



5.3 Power-On Checks (continued)

- H. Remove safety cover from upper drum assembly by removing one screw from middle of cover. Place cover on top of drum unit.

CAUTION

Do not drop or leave anything in rotor. Do not jostle the rotor in a vertical direction. This movement may damage index slugs, and require installation of a new rotor.

Remove the two tagged rotor locks by first loosening and removing the inner bolts. Then unscrew and remove the two large bolts. Inspect top of drum for contamination and vacuum-clean if required. Reach through top end-bell and slowly rotate drum rotor several revolutions to insure it is free of any obstruction. Replace safety cover and secure.

- J. Vacuum-clean interior of upper enclosure, then close door.
- K. Insure that Drum Motor switch (CB 2) and DC Brake switch (S3) are OFF.

WARNING

Drum must rotate in a clockwise direction when viewed from the top or severe damage to drum recording surface and heads will occur.

- L. Check for proper drum rotation as follows: Turn Head Air switch Off. Open upper enclosure door and observe rotor surface through slot S. (Refer to Figure AI-5). While observing drum surface, switch CB 2 On momentarily and Off. THIS IS THE ONLY POSITIVE CHECK OF ROTATION. A supplementary method of checking rotation is to scope the Early and Late indexes (A33H and A32H respectively) at the transducer output as follows:

5.3 Power-On Checks

L. (continued)

1. Set up scope to sync on the Early Index.
2. Set the Local-Remote switch to Local.
3. Set all other switches in the rear of the 7320 to On.
4. Switch CB 2 momentarily On and Off and observe at least one cycle on the scope.

CAUTION

Do not use the supplementary (scope) check exclusively, during installation. Obviously, a wiring or phasing error can result in a misleading interpretation of the signal observed. Early Index must occur before Late Index. If Late Index occurs first, drum is rotating backwards. Check power phasing.

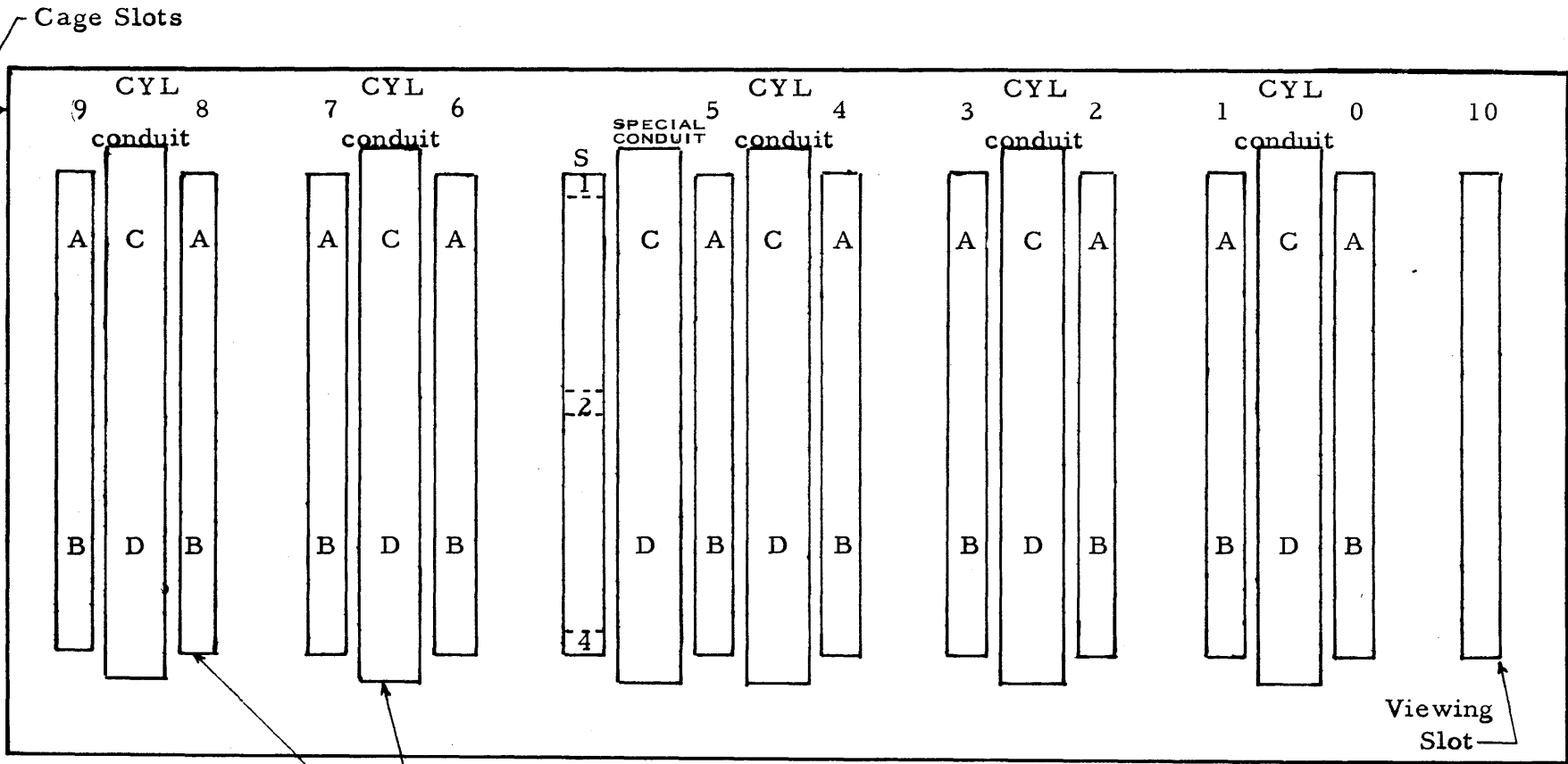
5. When assured of clockwise rotation, close door, turn Local File Switch to Off and leave CB 2 On.

M. Allow the drum to run without heads loaded while adjusting all power supplies to their prescribed voltages. All measurements are taken using B2Z46-1 as a DC ground reference point. Refer to 7320 logic page 02.05.40.0 and 02.01.50.1.

1. Place drum in Local status.
2. Turn On: local power, local file, and local DC switches.
3. Measure the service voltages between the points indicated in Table AI-1 and the J pin on the same card. (For -10.4v, measure between the two points indicated).

← ROTATION

7/15/63



Typical coding for a pin on the top half, right side of this conduit is A6C-01

Typical coding for a pin on the top half, left side of this conduit is A7C-01

Typical coding for a head rack in this slot is (FR) A8A or A8B

FIGURE AI-5 DRUM CAGE AND CONDUIT LOCATION  
(Detail of Figure AI-3)

5.3 Power-On Checks (continued)

TABLE AI-1 SUPPLY POWER VOLTAGES

-6V $\pm$ .24 (Blue)	-----	B2C21K
+6V $\pm$ .24 (Orange)	-----	B2C17L
-12V (A) $\pm$ .48 (Violet)	-----	B2C21M
-12V (8) $\pm$ .48 (Violet)	-----	B2D21M
+12V $\pm$ .48 (Gray)	-----	B2C21N
-10.4V $\pm$ .40	-----	B2A12M Ground @ B2A13J

4. If a power supply requires adjustment refer to the procedures in the CE Instruction and Reference Manual.

5.4 Cleaning Drum Surface

A. Remove viewing window from slot 10.

**WARNING**

When removing or inserting drum head racks, single heads and/or plastic windows, drum rotor must be completely stopped. Remove screws with 3/32 Allen wrench. Hold window with one hand, so that the window cannot twist and fall into slot. Any contact with the drum surface can result in damage. The same applies in handling tools that are used inside the enclosure.

B. With Head Air Off, turn Local File switch On for 15 seconds, then Off, letting drum coast for 60 seconds. Turn Local File On for 15-20 sec. Use lint free paper (Kingston Raw Material code 72-0-504-047), rubber block (P/N 5246316), and Freon\* (these items are part of shipping group), in the following manner:

\* TM - E. I. DuPont Corporation.

5.4 Cleaning Drum Surface (continued)

Fold paper into a suitable size pad that can be wrapped around rubber block, and will cover the edge of the block that will be used against the drum surface. Rubber block must not touch rotor surface; paper area that will come in contact with rotor surface must not be wrinkled. Saturate paper with prescribed Freon (P/N 5246313); then, holding rubber block and paper firmly, insert in slot and exert a few pounds pressure on a portion of the drum surface, while the drum is coasting. Remove and reapply pad to all areas of the drum surface. DO NOT SLIDE PAD VERTICALLY ON DRUM SURFACE. Repeat cleaning procedure three times, using a new sheet of paper each time. Drum should be "restarted" during cleaning process to insure it is rotating during actual cleaning. Examine paper after third cleaning, if not clean repeat until paper is clean. After drum is clean, repeat process with drum operating at nearly full speed. Close upper enclosure door, leave drum running. Freon will evaporate rapidly; very little time should be taken from saturating paper to applying to surface. DO NOT SPILL FREON ON DRUM UNIT.

- C. Turn Local File switch Off, DC Brake On. When drum stops (approximately four minutes) reinstall slot 10 cover and turn DC Brake Off.

5.5 Dynamic Check of Components

5.5.1 Local Status

- A. Turn on Gate and DC Blowers, then Local DC switch. DC indicator should be On. Using a DC voltmeter with a tolerance better than 1%, measure the DC supply voltages and adjust if necessary. See Section 5.3 M of Appendix.

NOTE

-6 and +6 indicators will glow less than the -12, +12 and -10.4 indicators.

- B. Switch Compressor to On. If compressor fails to start because of high tank pressure, bleed air by slowly opening petcock on tank until compressor starts, then close tightly. Observe Tank and Head Air Pressure gauge after compressor stops. Pressures indicated should coincide with pneumatic system specifications.
- C. PURGE DRUM BY ALLOWING IT TO RUN FOR 15 MINUTES. Make sure that the Head Air switch is Off. Turn Local File switch On, allow drum to run for 15 minutes to purge. After purging, open upper door and observe the surface through slot 10 for any existing polish or scratch marks on the surface. While observing the surface, turn Head Air switch On. If any new marks appear, turn Head Air switch Off immediately, refer to CE Reference Manual for corrective action.

5.5.1 Local Status (continued)

D. Turn off all Track Address Register Head and Cylinder switches. Depress Head Deselect, and then Head Select. File Off-Line and Head Select should light. All head address and cylinder indicators should be Off.

Check Track Address Register by manually selecting head and Cylinder. Depress Deselect, then Select when changing selection.

E. Check Write Control by depressing Deselect, then Select push-buttons. Turn Write Control switch On. Write Gate indicator should go On. Turn Write Control Off.

5.5.2 Remote Status

A. With power on at 7631, depress and hold Local/Remote Interlock. Switch File Statue to Remote, then release interlock, File Off-Line and Local indicator should be Off, Remote indicator should be On. Turn off Local Power, File and DC switches. Drum Operative indicator should stay On.

B. Turn DC Off at 7631; Drum Operative and DC On indicators should go Off. Restore DC at 7631.

C. Turn Power Off at 7631; all 7320 indicators should be Off except "Voltage Present".

5.5.2 Remote Status (continued)

- D. Drop main line CB at 7631; (Emergency Off condition) no components in the 7320 unit should be operating and Voltage Present indicator is Off.

NOTE

Drum surface must be checked at least every hour until "Head Air On" time equals eight hours. The first few hours of operation after installation are the most critical in regard to head failure as a result of contamination. Refer to CE Manual for further maintenance instructions on surface check.

5.6 Replace Covers

- A. Insure unit is in desired physical location.
- B. Lock casters by tightening hex bolt on side of each wheel.
- C. Install kick plates, referring to instructions or drawings included in shipping group.
- D. Replace side panels, insuring locks are properly engaged.
- E. Close all hinged gates and covers.



6. PRELIMINARY TESTS

6.1 Attachment Feature Single Shot Timing

NOTE:

The setting of a gap sensor is to be measured from the fall of the last pulse of a series of pulses, at the input to the rise of the output of the gap sensor.

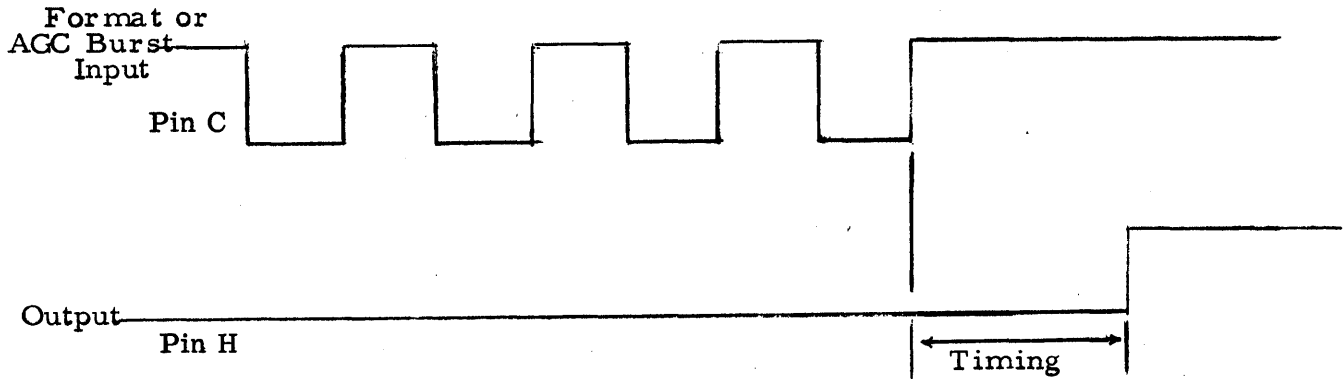


FIGURE AI-6 SINGLE SHOT TIMING

TABLE AI-2 SINGLE -SHOT ADJUSTMENTS

Input=C		Output = H	
S. S.	Drum	Location 1302 & Drum	Nominal Limits
Data Gap	B 7	H 22	3.0 usec ± 0.1 usec
Long Gap	B 7	H 21	10.0 usec ± 0.2 usec
Short Gap	B 7	H 20	3.4 usec ± 0.1 usec

6.1 Attachment Feature Single Shot Timing (continued)

- A. Run in Format Write operation, using the appropriate diagnostic program; perform the format operation and loop on format write check while adjusting long and short gap single shots, refer to Figure AI-6 and Table AI-2. Sync scope on index holdover at B1-C17-B.
- B. Proceed with Format Write and loop on write check of HAO while adjusting data gap. Refer to Figure AI-6 and Table AI-2.

6.2 Format and Data Delay Line Adjustment

The following adjustment procedure should always be followed after:

**Initial Installation**

Any change in the cables between the 7631 and the 7320.

Any circuit changes, or logic card replacements that could affect delays in the read or write paths of the 7631 and 7320.

**NOTE**

Refer to logic pages 02.02.20.1 in the 7320 logics and 01.10.15.1 in the 7631 logics.

- A. Run in Format Write Program; perform the Format Write operation and loop on Format Write Check.
- B. Sync scope "+" on Early Index at 1D16C; observe output of Data Trigger A at 1G09F with probe A, and -Y Sample Data Trigger signal at 1G09E with probe B in the middle of a long burst of one bits. Both are negative going signals.
- C. Adjust the Format Data Delay Line on 7320 at B2 C24, C25 and C28 so the leading edge of the Data Trigger A signal

6.2 Format and Data Delay Line Adjustment

C. (continued)

(probe A) is  $450 \pm 30$  nanoseconds before the trailing edge of the -Y Sample Data Trigger signal (probe B). Use the 10% transition point as the time reference as shown in Figure AI-7.

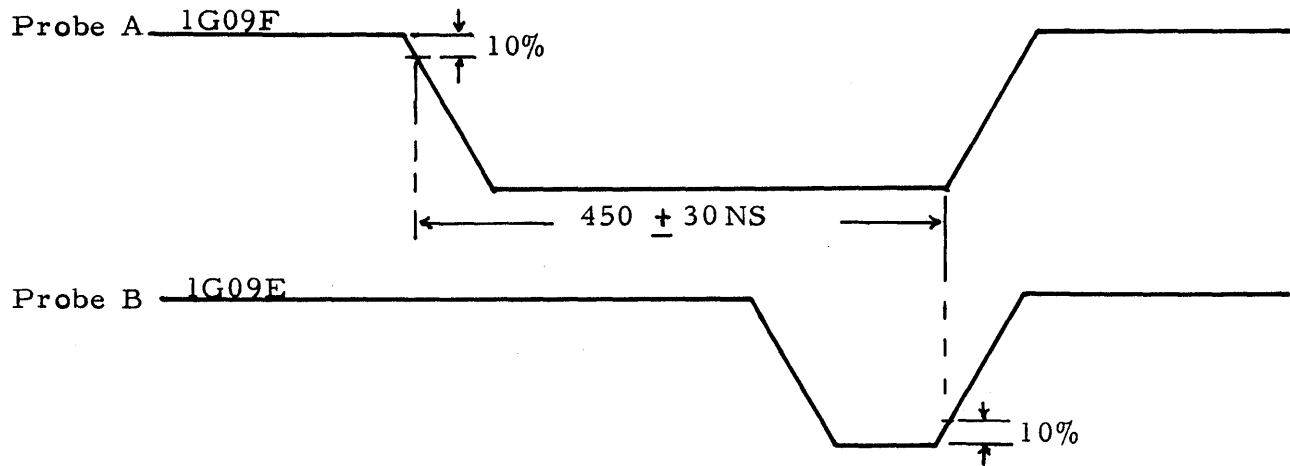
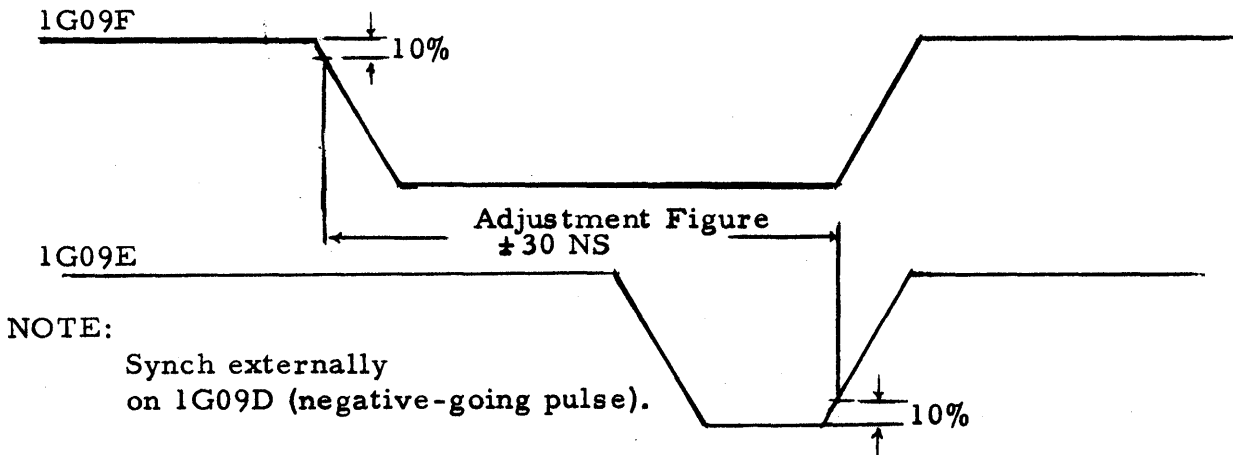


FIGURE AI-7 PROBE TIMING

D. Referring to the 7320 logic page 02.01.63.0, obtain the maximum head-to-head delay variation and divide by 2 to get the midpoint head delay time. Obtain the delay time of any one of the heads given in the table, subtract this delay from the midpoint delay and add the difference to 450 NS to obtain the adjustment figure. (If head delay is greater than the midpoint delay, subtract the difference from 450 NS to obtain the adjustment figure as follows:

6.2 Format and Data Delay Line Adjustment (continued)

- E. Loop the program on read HAO using the selected head.
- F. Observing the same points as above (1G09F and 1G09E) in the 7631 adjust the Read Data Delay Lines at 2B24, 2B25, and 2B26 in the 7320 for the adjustment figure obtained in step D,  $\pm 30$  NS from the leading edge of Data Trigger A to the trailing edge of Sample Data Trigger signal. Refer to Figure AI-8.



NOTE:  
 Synch externally  
 on 1G09D (negative-going pulse).

FIGURE AI-8 READ DATA DELAY LINE TIMING

6.3 Command Channel Test

Reference logics for 7320 - 02.01.25.1 and for 7631 - 01.70.15.1 and 01.09.23.1.

- A. Jumper B 2-E 40A to B2-E 19E, on 7320.

6.3 Command Channel Test (continued)

- B. Jumper B1-A12E to B1-A10E on 7631.
- C. Place scope probe in Test jack; with internal sync On, index pulse should be seen approximately every 17 milliseconds.

6.4 Format Write Switch Test

- A. With scope free-running, probe B2-D14D.
- B. Place the Format switch to Write; the scope should indicate a +Y condition.

7. DIAGNOSTIC TESTING

7.1 Format, Home Address, and Surface Analysis Test

- A. Run appropriate program, as determined by the using system, and proceed as per program instructions.
- B. Depress the Interlock Local/Remote pushbutton on the 7320 CE panel while transferring the File Status gang switch to Local.
- C. Turn off, in sequence, the switches marked Head Air, DC, File, and Power.
- D. Turn on Drum Maint Blower and DC Brake; when drum comes to rest, turn off DC Brake.

WARNING

The doors in the upper section should never be opened unless the drum blower is on, and then only one at a time. After closing door, assure a purge time of 5 minutes prior to loading heads.

**7.1 Format, Home Address, and Surface Analysis Test (continued)**

- E. Exchange Slot S drum leads as follows:
  - Position S1 - 1 with 4 and 2 with 5.
  - Position S2 - 1 with 4 and 2 with 5.
- F. Close upper doors and turn drum maint. blowers Off.
- G. Turn on, in sequence, the switches marked Power, File, DC, and Head Load.
- H. Depress Interlock Local/Remote pushbutton while transferring the File Status gang switch to Remote.
- J. Rerun the diagnostic, one pass, error free on each drum in the configuration.
- K. Repeat steps (B) through (D).
- L. Replug to their original positions, the leads exchanged in steps (E) and (F).
- M. Repeat steps (G) through (K) to conclude Surface Analysis.

**7.2 Vibration Test**

- A. Run the appropriate diagnostic and proceed as per program instructions.
- B. During the first part of this program vibrate SMS cards in the 7320 and 7631 panels with a felt mallet.

**7.3 Bias Test**

- A. Run the appropriate diagnostic and proceed as per program instructions.

7.3 Bias Test (continued)

- B. Bias the 7631 to  $\pm 1.5V$  from nominal. This program shall run error free for 5 minutes at each extreme.
- C. Repeat steps A and B using supplementary program, if required.

7.4 Reliability Test

Run diagnostic appropriate for the using system.

APPENDIX II CHECK LIST

		Page	
1	INTRODUCTION	AII-1	
2	GENERAL INFORMATION	AII-1	
3	PRELIMINARY INSTRUCTIONS - 2302	AII-1	
	3.1 Power-On Preparation	AII-2	<input type="checkbox"/>
	3.2 Five Minute Purge	AII-3	<input type="checkbox"/>
4	MECHANICAL PREPARATION - 2302	AII-4	
	4.1 Receiver Swing-Out	AII-4	<input type="checkbox"/>
	4.2 Disk Cleaning	AII-5	<input type="checkbox"/>
	4.3 Drawer Installation and Head Cleaning	AII-5	<input type="checkbox"/>
	4.4 Receiver Swing-In	AII-6	<input type="checkbox"/>
5	UNIT TESTING	AII-7	
	5.1 Power On - 7631	AII-7	<input type="checkbox"/>
	5.2 Power On - 2302	AII-8	<input type="checkbox"/>
	5.3 Voltage Checks	AII-10	<input type="checkbox"/>
	5.4 Bias Checks	AII-11	<input type="checkbox"/>
6	DIAGNOSTIC TESTING	AII-11	
	6.1 Factory-Written Format Track	AII-11	<input type="checkbox"/>
	6.1.1 Writing Addresses at Location 8888	AII-11	<input type="checkbox"/>
	6.1.2 VFO Adjustment	AII-12	<input type="checkbox"/>
	6.1.3 Separation Circuit Adjustments	AII-12	<input type="checkbox"/>
7	USE-METER CHECK	AII-14	
	7.1 IBM 2302	AII-15	<input type="checkbox"/>
	7.2 IBM 7631	AII-15	<input type="checkbox"/>



## 1. INTRODUCTION

This section supplements the instructions in the 7631/1301 CE Installation Manual, for installing an IBM 2302 Disk Storage.

The 2303 (Mod. 1 or 2), communicates with the using system through the IBM 7631 Disk Storage Control, Mod. 2, Serial No. 12000 and above, with a 2302 Attachment #7950.

### NOTE

Effective 2/9/65, the IBM 1302 was renumbered IBM 2302. As further revisions are made, "2302" will gradually replace "1302" throughout the manual.

## 2. GENERAL INFORMATION

The 2302 takes a little longer to install than the 1301 because it has more interframe cables and more drawer assemblies. The same introductory remarks and assembly instructions in chapters 1 and 2, for the 1301, apply also to the 2302.

Cabling instructions given in chapter 3 of this manual are adequate for external cabling of the 2302 (Refer to Table 3-1). However, some mechanical and logical changes plus a variation in numbering interframe cable connectors on the 2302, required several revised drawings and checkout procedures, which you will find here.

Note particularly, that Figure AII-1 shows a new panel on the 7631, for the 2302/7320 feature. Table AII-1 is a voltage check-list for the 2302. Figure AII-2 is the rear view of the 7631. Figures AII-3 and AII-4 show component locations and cable connector designations for the 2302. Table AII-2, Figures AII-5, AII-6 and AII-6(EF), are concerned with interframe cabling. Figure AII-7 is a 2302 tailgate drawing showing cable and terminator locations, while Figure AII-8 shows the placement of TCK terminator cards for 1301/2302 when the files are intermixed and when they are last in line. Figure AII-9 shows the Format Track Layout for the 2302.

With the exception of Table AII-1, which is part of paragraph 5.3, Tables and Figures are located at the end of this appendix.

## 3. PRELIMINARY INSTRUCTIONS - 2302

- A. Refer to Chapter 2 for information on placement and mechanical assembly.

3. PRELIMINARY INSTRUCTIONS - 2302 (continued)

- B. After 2302 is assembled and before external cables are plugged, check for receiver isolation by connecting an ohmmeter from "J" pin to frame ground. Resistance reading should be 5 megohms or greater. If resistance is less than 5 megohms, the circuit may be analyzed by removing paddle connector 01A5B07, for Mod. I machine. For a Mod II, remove connector 01A5B06 also.

If the proper reading is observed with paddle connector(s) removed there is a short circuit in the receiver. If reading is still incorrect with the connector(s) removed; short is in the machine panel.

- C. Refer to Tables 3-1 and 3-2 for I/O cable connections between the 7631 and Data Channels, and between 7631 and 1301/2302/7320. Note, however, that tailgate information is slightly different from 1301. For tailgate information see Figure AII-7.
- D. Refer to Figure 3-5 for external cable couting. Before cleaning heads or installing and adjusting drawers, perform a five-minute purge to insure removal of airborne particles from the disk array chamber. The purge can be done by powering the 2302 independently.

3.1 Power-On Preparation

DANGER

Check phasing before power-on. (See chapter 1). Also, make sure that the ground connection between 7631/2302/7320 is common and electromechanically stable. Also, turn off power to the machine (wall CB) before making the following connections.

To bring up power on the 1302, without power on the 7631, (all cables connected on both units, 7631 connected to customer power), temporarily jumper EPO plugs C1 and C2 on the 7631, using the EPO cable. See Figure AII-1. If only one I/O Channel on the 7631 is being used, (EPO cable plugged into C1), it will also be necessary to have a terminating jumper plug, PN 553298, installed in Emergency Off plug C2. Installing this jumper will complete the Emergency Off circuit, enabling power to be brought up on the 2302.

3.1 Power-On Preparation (continued)

If it is impractical to use an EPO cable, or if one is not available, use two jumper plugs, PN 553298; one in C1 and one in C2.

NOTE

Transformer taps must be changed if supply is 230 V. AC.  
(Ref. 2302 Maintenance Manual, 227-5864, Sec. 1.1)

CAUTION

Running the 2302 independently may result in arcing between head and disk. Before loading heads, make sure that AC and DC grounds are common in the 2302 at only one point, by placing a jumper between any "J" pin and any unpainted panel mounting screw. Be sure to remove this jumper upon completion of test.

3.2 Five-Minute Purge

- A. Make sure that the power cable is connected to customer's 208-volt receptacle. If not, set CB1 and CB2 on the AC distribution panel of the 2302, to Off, and connect power.
- B. Set CB1 and CB2 to On.
- C. Set Auto Control switch to Local.  
Set Sequence Control to Manual.
- D. Remove paper cover from over access aperture.
- E. Press Auto Start switch.
- F. Press Disk Drive On button. Disk Drive On indicator will light and disks will rotate in a counter-clockwise direction, in accordance with the directional arrow on the machine.

WARNING

Clock-wise rotation of the disks will result in having no hydraulic pressure. Manual loading of heads may result in damage to the disks.

- G. With covers on, allow the file to run for five minutes, then proceed to the next step.

3.2 Five-Minute Purge (continued)

- H. Depress Disk Drive Off switch.  
Depress Auto Stop switch.
- I. Set CBI and CB2 to OFF.

4. MECHANICAL PREPARATION - 2302

This section deals with drawer installation, disk and head cleaning, and receiver operation. It is not concerned with general assembly and mechanical preparation, which you will find in chapter 2 of this manual. More detailed descriptions of the following operations, if needed, can be found in the IBM 2302 CE Maintenance Manual, Form #227-5864-, and the IBM CE Manual of Instruction for the 2302, Form #227-5863-0.

WARNING

Use extreme care in handling the receiver, drawer assemblies, and heads during the mechanical preparation of the disk storage. They are easily damaged. Also, dust and debris in the machine and its environment can damage the disks.

4.1 Receiver Swing Out

- A. Remove module receiver shields.
- B. Move carriage to the outer limit stop. For the rear actuator, remove the dummy rear crash stop.
- C. Loosen the two set screws at the rear of the carriage swing-out shaft housing. Loosen the outermost screw on the swing-out pivot shaft plate. Remove screw and disengage cable bracket before swinging receiver to prevent cable damage.
- D. Depress carriage locking-levers. Apply a slight inboard pressure on the receiver to make unlocking easier. Do not press on drawer stiffeners.
- E. Swing receiver out carefully. Make sure that flex-rings clear the disk array shield.
- F. Cover the access entry port with the long door.

4.1 Receiver Swing Out (continued)

- G. Remove the actuator shield.
- H. Use the swing-out brace, PN 2164240, provided in the 2302 Shipping Group, to hold the receiver in position. Place the stud end of the arm into the actuator locking-level pin hole. The hole on the other end of the brace engages the receiver locking-lever pin.
- I. Check that locknuts on yoke and tie rods are secure. Check motion transducer, with a non-magnetic feeler gauge, for a clearance of  $.006 \pm .002$ . (IBM card stock is approximately .005 in.) Check inner, center and outer positions.
- J. Check carriage-ways and actuator housings for proper lubrication. Refer to PM schedule and CEM Service Aids.

4.2 Disk Cleaning

- A. Use disk cleaning paddle, PN 2108474, wrapped in lint-free tissue, PN 2123106, and moistened with 91% isopropyl alcohol, PN 2155966. Place paddle between the disks, (through access aperture in plastic shield), and rotate array manually; work from the top down.
- B. Replace tissue on paddle as oxide pickup shows on tissue.
- C. Replace paper covering over access aperture until heads are ready for installation.

4.3 Drawer Installation and Head Cleaning

Do not discard data drawer shipping containers. You will need them to store spare drawers. Also note, that when a drawer is removed from the receiver and reinstalled or a new drawer substituted, you must read out the entire area serviced by both heads and then rewrite, or the information will be lost. If it has not been possible to read out the data before removing the drawer, try to recover the information with the new one, or use the tool drawers PN's 2164250 and 2164251. After recovery, the data must be rewritten with the new drawer.

- A. During unpacking, inspect drawer assemblies for mechanical damage and for proper engagement of torsion spring fingers with arms.

4.3 Drawer Installation and Head Cleaning (continued)

- B. Clean head assemblies with lint-free tissue moistened with (91%) isopropyl alcohol.
- C. Remove drawer retaining rod.
- D. Check markings on drawer, to see if it belongs in front or rear.
- E. Make sure that drawer retaining screw in receiver is out far enough to permit drawer insertion.
- F. Install drawer, with care, according to the location chart in the ILD manual. Never handle assembly by stiffeners or arms. Also, check for proper position of torsion rod.
- G. Seat drawer firmly by tightening the retaining screw.
- H. Insert retaining pin through holes in drawers until cotter pin rests against the top drawer.
- I. Re-clean heads as in "B" above.

4.4 Receiver Swing-In

- A. Remove the swing-out brace, and swing receiver in far enough to allow installation of actuator shield. Install shield.
- B. Remove long door.
- C. With carriage against outer stop, swing receiver in carefully.
- D. Press on receiver to lock wedges. Do not put any pressure on drawer stiffeners. Apply slight pressure on levers in direction of spring force.
- E. Tighten the outer screw on the pivot shaft plate.
- F. Tighten the two carriage swing-out shaft set screws.
- G. Install rear actuator dummy outer limit stop.
- H. Install actuator shield door and access short door.

4.4 Receiver Swing-In (continued)

- I. Make sure that the clock head is in an unload position.

Load heads manually. Then unload heads and manually rotate disk array while checking for an even amount of clearance between disks and drawer assemblies. Be sure heads are not cocked.

5. UNIT TESTING

5.1 Power on 7631

- A. Assure that power cables for both the 2302 and 7631, are connected to customer's 208 volt receptacle. Refer to Table AII-2 and Figure AII-7 for internal and external cable connections.
- B. On the 2302:
1. Set CB 1 and CB 2 ON.
  2. Set Auto Control switch to LOCAL.
  3. Set Sequence Control to MANUAL.
  4. Set Head Load interlock switches to ON.
- C. On the 7631:
1. Set CB 1 to ON.
  2. Depress Power On switch. Power On and DC On indicators will light.
  3. After DC On indicator lights, the 7631 will receive an automatic reset and the following indicators will light.

Availability 1 and Availability 2\*

Digit Ring On

5 + 6 and

Bit Rings BS + O and B7 + 8

\*On mod III, IV, and V only.

5.2 Power On 2302

With the 7631 powered, perform the following operations on the 2302:

- A. Depress Auto Start switch. The following indicators will light:
  - 1. Remote Start
  - 2. Air Press Normal
  - 3. Heads Unloaded
  
- B. Depress Disk Drive On switch. The following indicators will light
  - 1. Timer
  - 2. Disk Drive
  
- C. Depress the following switches. Their respective indicators will light.
  - 1. Elec DC On
  - 2. Sol DC On
  - 3. Oil Pump
  
- D. At this point, allow to purge for one hour. During this time, all voltage, oil pressure, and temperature checks can be performed (Section 5.3 and 5.4).

WARNING

Inspect fittings for oil leakage.

- E. Upon completion of the purge, proceed:  
Depress Head Load switch. The following will occur:
  - 1. Access Retracted indicator will light. (This indicator will remain lit only while the Head Load switch is depressed.)
  - 2. Heads Unloaded indicator will turn off.
  - 3. Head Load indicator will turn on.



5.2 Power On 2302 (continued)

F. Depress Head Load Check switch. For a Model I machine, the following will occur:

1. Heads Loaded indicator will turn on.
2. File Ready indicator will turn on.

For a Model II machine, the following will occur:

1. Head Load indicator will turn off.
2. Heads Loaded indicator will turn on.

G. Depress Head Load switch a second time.

1. Heads Loaded indicator will turn off.
2. Head Load indicator will turn on.

H. Depress Head Load Check switch a second time.

1. Heads Loaded indicator will turn on.
2. File Ready indicator will turn on.

Set Auto Control switch to REMOTE and Sequence Control to AUTO.

I. At this point, allow unit to run for 30 minutes with heads loaded. Any off-line file operations may be performed during this time. Upon completion, continue:

J. Depress Power Off switch on the 7631. Indicators on both units should go off. Check to be sure all heads unload.

K. Check and record the coast-down time against that measured at the factory. That information is noted on a sticker located on the CE panel door, behind the right-side cover of the electronic module.

L. Clean the heads and array. Check for oxide build-up. Perform another purge for 30 minutes with heads unloaded. When this is done, continue sequencing file completely.

5.2 Power On 2302 (continued)

M. Prior to systems testing, check that EPO cables and connectors are in place. Refer to Chapter 3, Section 3 for cabling information.

5.3 Voltage Checks

A. 7631. Check all back Panel DC voltages measured at the laminar bus. The voltages should be within -2% of the given value.

B. 2302. Check voltages measured at the laminar bus for a tolerance of  $\pm 2\%$  of the values. Table AII-1 gives the voltage requirements.

TABLE AII-1 2302 VOLTAGE CHECKS

Terminal	Color	Voltage	Remarks
1	Black	GND	
2	Blue	-6	
3	Orange	+6	
4	Black	GND	
5	Violet	-12	
6	Black	GND	
7	White	+12M	
8	Brown	-36	
9	Gray	+12	
10	Pink	+30	

5.4 Bias Checks

- A. 7631. Plug Bias Box (P/N 210860) into AC outlet and insert jack into the + 12M receptacle. The receptacle is located below the power supply C.B. Check the + 12M volts on the SMS panel for a maximum variation of  $\pm 1.5$  volts.
- B. 2302. The + 12M receptacle is located to the left of the power supply--above the gate blower. Check the + 12M volts on the SMS panel for a maximum variation of  $\pm 3$  volts.

NOTE

Clock head signal amplitude must be checked before proceeding with diagnostic testing. Refer to instructions in the CE Reference Manual.

6. DIAGNOSTIC TESTING

Refer to the respective Data Channel CE Installation Manual (7907, 7908, 7909), diagnostic listings in CEM Service Aids, or the 1410 system CEIM for diagnostic programs to be run.

6.1 Factory-Written Format Track

All 2302's shipped have a format track written on cylinder 222. This format track (see Figure AII-8), permits testing from the 7631 CE panel during the installation of the 2302, reducing the system hours required for preliminary testing.

6.1.1 Writing Addresses at Location 8888

Use the following procedure, from the CE panel, to write HA1, HA2, RA and record at location 8888. RUN THE FOLLOWING IN 8-BIT MODE.

- A. Turn power on. 7631 in test mode one.
- B. Perform a Seek operation to address 888888 (track 222) of access zero. Turn on WR Inhibit switch.

NOTE

Before any successful WR op can be performed, the following Single-Shots and VFO (Variable Frequency Oscillator) have to be adjusted.

### 6.1.2 VFO Adjustment (7631)

- A. Gain Adjustment: Loop Mode switch off. Connect a voltmeter to pins 7K13A and 7K13D. Adjust the 200-ohm potentiometer at 7J13 for 1.0 V DC (Syst. Page 01.10.16.2).  
*PV - prepare to verify.*
- B. Frequency Adjustment: Load a PV-HAO with HAO-CE Switch on. Use 00888888 address. This will select ~~track~~<sup>cylinder</sup> 222, head 8. Turn on loop mode, Bit Switch 4 and WR. Sync scope on the positive shift of "first Index" trigger in the 7631 at 01B13D. Use a dual-trace input unit and observe the clock pulses at 1H04A (+Y Phase One, Page 01.40.19.1) on one sweep, and VFO Binary Trigger (7K12F, Page 01.10.16.2) on the other sweep. Double-sync internally on positive transition of phase one. Delay sweep by 400us to observe an area before the end of the index.

Adjust the horizontal speed of the scope so that ten clock-pulses appear on the screen (one for each vertical line). Observing the VFO binary trigger output at 7K12F, adjust the 1K - ohm potentiometer at 7J13 so that exactly two positive transitions appear for every vertical marking. For best accuracy, use the entire screen. (Syst. Page 01.10.16.2)

- C. Adjust format gap Single-Shots (Syst. 01.40.05.2):
1. Adjust Single-Shot at 7H20H for 3.4 us.
  2. Adjust Single-Shot at 7H21H for 10 us.

Refer to CE manual for adjustment procedure of Gap Detectors' Single-Shot.

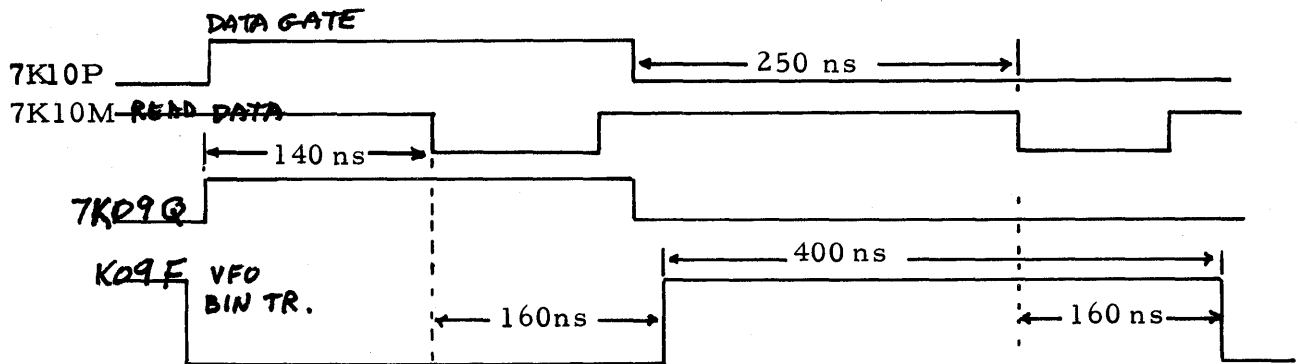
- D. Turn off WR INHIBIT Switch, add temporary jumper from 01B1A10D to 01B1A10J. Perform a WR HAO CE, without errors, using bit switch 4.

### 6.1.3 Separation Circuit Adjustments

Perform a RD HAO CE. Before a successful RD can be performed, the following circuits have to be adjusted:

6.1.3 Separation Circuit Adjustments (continued)

- A. Delay Line Adjustment: Observe the unseparated read data at 7K10M and the VFO binary trigger DIF output at 7K09F. (DIF levels swing from 0 to +3V. See Page 01.10.16.4). Delay a sweep until the 2F AGC character of the HA1 is observed. Double sync on the VFO binary trigger. Adjust the delay line at 7K11 so that the leading edge of each data bit occurs 160 ns before the next transition of the VFO binary trigger. The delay line contains three optional delays: 20 ns between pins B and C, 10 ns between pins D and E, and 5 ns between F and G. Using wire jumpers on the backpanel, connect the required delays in series between output pin A and load-resistor P. Example: To add 25 ns of delay, connect jumpers from 7K11A to 7K11B, from 7K11C to 7K11D, and from 7K11E to 7K11P. Use the 50% transition points for time reference.
- B. Gate Generator Adjustments: Observe pins 7K10M (-F Raw Data) and 7K10P (+F Data Gate). Adjust the top potentiometer at 7J14 so that the trailing edge (negative transition) of the data gate precedes the leading edge (negative transition) of the following clock bit by 250 ns. Move the probe from 7K10P to 7K09Q. Adjust the lower potentiometer at 7J14 so that the leading edge (positive transition) of data gate precedes the leading edge of the following data bit by 140 ns, as illustrated here:



6.1.3 Separation Circuit Adjustments (continued)

- C. Adjust data gap Single-Shot, (Page 01.40.05.2) at 7H22H to be 3 us.

NOTE

This single-shot should be adjusted at the end of the AGC area. Upon completion of the above adjustments, RD HAO should perform without error.

- D. Turn off CE HAO switch and perform RD HAO, error free. This will insure that we can successfully compare address.
- E. Perform a write HAO with the "2, 3, and 5" bit switches On.
- F. Turn off customer HAO switch.
- G. Load address of 8888DD and perform a write TRO with the "6" bit switch On.
- H. Address 8888 now has an HA1 containing 8's and HA2 containing D's, and a record address containing 2's. All 7631 read and write operations can now be tested, using address 8888. e.g., an SRO operation may be performed using a record address of all 2's.
- I. REMOVE JUMPER THAT WAS INSTALLED IN STEP 6.1.2 D.

NOTE

This procedure will allow only the use of head 8 on cylinder 222. Using any other address results in an error because of the absence of HA1's and HA2's. Refer to disk storage devices CEM Service Aid #7 for detailed operating instructions of the 7631 CE Panel.

7. USE METER CHECK

7.1 IBM 2302

- A. With the Customer Switch on the 2302 Meter Box in the OFF position, the file must be INOPERABLE from the System.

7.1 IBM 2302 (continued)

- B. With the Customer Switch ON, check that the file programs run properly, and that the meter runs and accumulates time as long as the CPU is running, and the 7631 is ON LINE.
- C. With the Customer Switch OFF, and with the CPU running (any program that does not use the file), check that the meter on the file does not run.
- D. With the Customer Switch OFF and the CPU running, as in C above, turn the Customer Switch ON, check that the meter on the file does not run until the CPU halts and then starts again.
- E. With the Customer Switch ON, start the CPU and check that meter is running. With the meter running, turn the Customer Switch OFF. Check that the meter continues to run until the CPU stops. Restart the CPU and check that the meter on the file does not restart.

7.2 IBM 7631

- A. With the 7631 in TEST MODE 1, perform any control operation (i. e. Seek) for approximately one minute. The meter must not record time.
- B. Switch the 7631 Mode Switch to NORMAL and the meter switch to DISABLE. Run any file diagnostic program. (The CPU meter should NOT be in CE MODE). When attempting to run the diagnostic program, the system should receive a NOT READY or NOT OPERATIONAL signal from the 7631.
- C. Halt CPU, turn 7631 meter switch to the ENABLE position. Start program and observe that the meter on 7631 is recording.
- D. While the program is running, turn 7631 meter switch to DISABLE. Observe that the meter still records until the CPU is halted.
- E. Turn CPU meter switch to the CE position and the 7631 meter switch to ENABLE. Start program and observe that the 7631 meter does not record.

7.2 IBM 7631 (continued)

NOTE

For more detailed procedures, refer to CE Meter  
Manual, Form No. 223-2728.





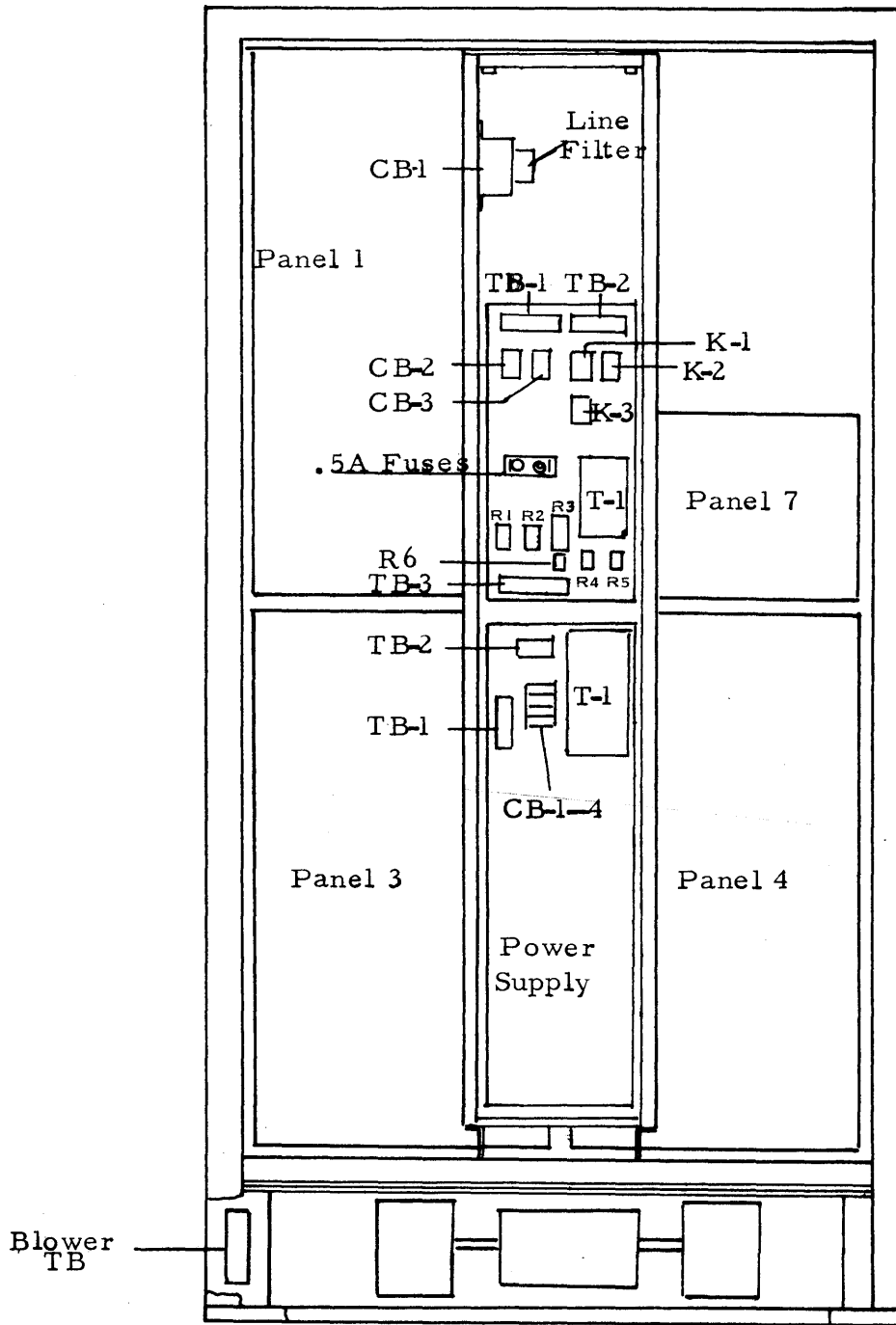


FIGURE AII-2 COMPONENT LOCATION--7631 (SERIAL NO. 12000 & ABOVE)

(REAR)

TABLE AII-2 INTERFRAME CABLES - 2302

Model	Connector Number	From Mechanical Frame	To Electronic Frame	Cable Part Number	Remarks
I & II	Write Drivers	C2-A10 D2-A10 C3-A10 D3-A10 M	A1-E08	2176718	Write Drivers to Gate A, Panel 1.
I & II	S 200 S 201	x x	S-8 S-9	2122268	Contactor Box to Sequence Gate (Route behind Power Supply Rack).
I & II	Receiver	x	A5-B01	2163808	Receiver of M0A0 to Gate A, Panel 5.
I & II	Receiver	x	B5-B01	2163808	Receiver of M0A1 to Gate B, Panel 5.
I & II	Receiver	x	A5-B03 A5-B07	2163809	Receiver of M0A0 to Gate A, Panel 5.
I & II	Receiver	x	B5-B03 B5-B07	2163809	Receiver of M0A1 to Gate B, Panel 5.
I & II	Format Sw.	x	A5-E06	2163821	Format Switch <u>front</u> , to Gate A.
I & II	Format Sw.	x	B5-E06	2163821	Format Switch <u>rear</u> , to Gate B.
I & II		G-01 G-02 G-04	Seq. Gate and Gate A	2176610	Clockhead to Gate A and Sequence Gate (CABLE GOES FROM <u>ELECT. TO MECH. FRAME</u> in this case.) G-04 is near area between Format Key boxes.
I & II	G03, H02, H05, Fuses	x	A5-E01 A5-E02 A5-E03	2176702	Index, Actuator 0-M0 & Fuses to Gate A, Panel 5.
I & II	H22, H25 Fuses	x	B5-E01 B5-E02 B5-E03	2176704	Actuator 1-M0 & Fuses to Gate B, Panel 5.
I & II		TB 203 & Fuse Panels	S-301	2176707	Contactor Box & Fuse Panels to Power Supplies

(continued)

6/11/65

AII-19

APPENDIX II  
IBM 2302 DISK STORAGE

TABLE AII-2 INTERFRAME CABLES - 2302 (continued)

Model	Connector Number	From Mechanical Frame	To Electronic Frame	Cable Part Number	Remarks
I & II	C3-WD All	x	A5-B02	2176713	Write Drivers M0A0 to Gate A, Panel 5.
I & II	D3-WD-All	x	B5-B02	2176713	Write Drivers M0A1 to Gate B, Panel 5.
I & II		TB 203, F3-4, F11-13	S-303 S-304	2176750	Contactor Box to Blowers, Gates A & B.
I & II		TB-203	S-302	2176751	Contactor Box to Power Supply Blower.
I & II	H-23, H-27	x	S-4 B5-E04	2176755	Actuator 1-M0 to Gate B, Panel 5. (Route under Hydraulic Manifold).
I & II	H-03, H-07	x	S-2 A5-E04	2176760	Actuator 0-M0 to Gate A, Panel 5.
II	Receiver	x	A3-B01	2163808	Receiver of M1A0 to Gate A, Panel 3.
II	Receiver	x	B3-B01	2163808	Receiver of M1A1 to Gate B, Panel 3.
II	Receiver	x	A3-B03 A5-B06	2163809	Receiver of M1A0 to Gate A, Panel 3.
II	Receiver	x x	B3-B03 B5-B06	2163809	Receiver of M1A1 to Gate B, Panel 3.
II	G-13, H-12, H-15, Fuses	x	A3-E01 A3-E02 A3-E03	217603	Index, Actuator 0-M1, & Fuses to Gate A, Panel 3.
II	H-32, H-35, Fuses	x	B3-E01 B3-E02 B3-E03	2176705	Actuator 1-M1 & Fuses to Gate B, Panel 3.
II	Write Driver Boxes	x	A1-E08	2176709	Write Drivers to Gate A, Panel 1.
II	C2-WD-All	x	A3-B02	2176713	Write Drivers M1A0 to Gate A, Panel 3.

(continued)

6/1/65

AII-20

APPENDIX II  
IBM 2302 DISK STORAGE

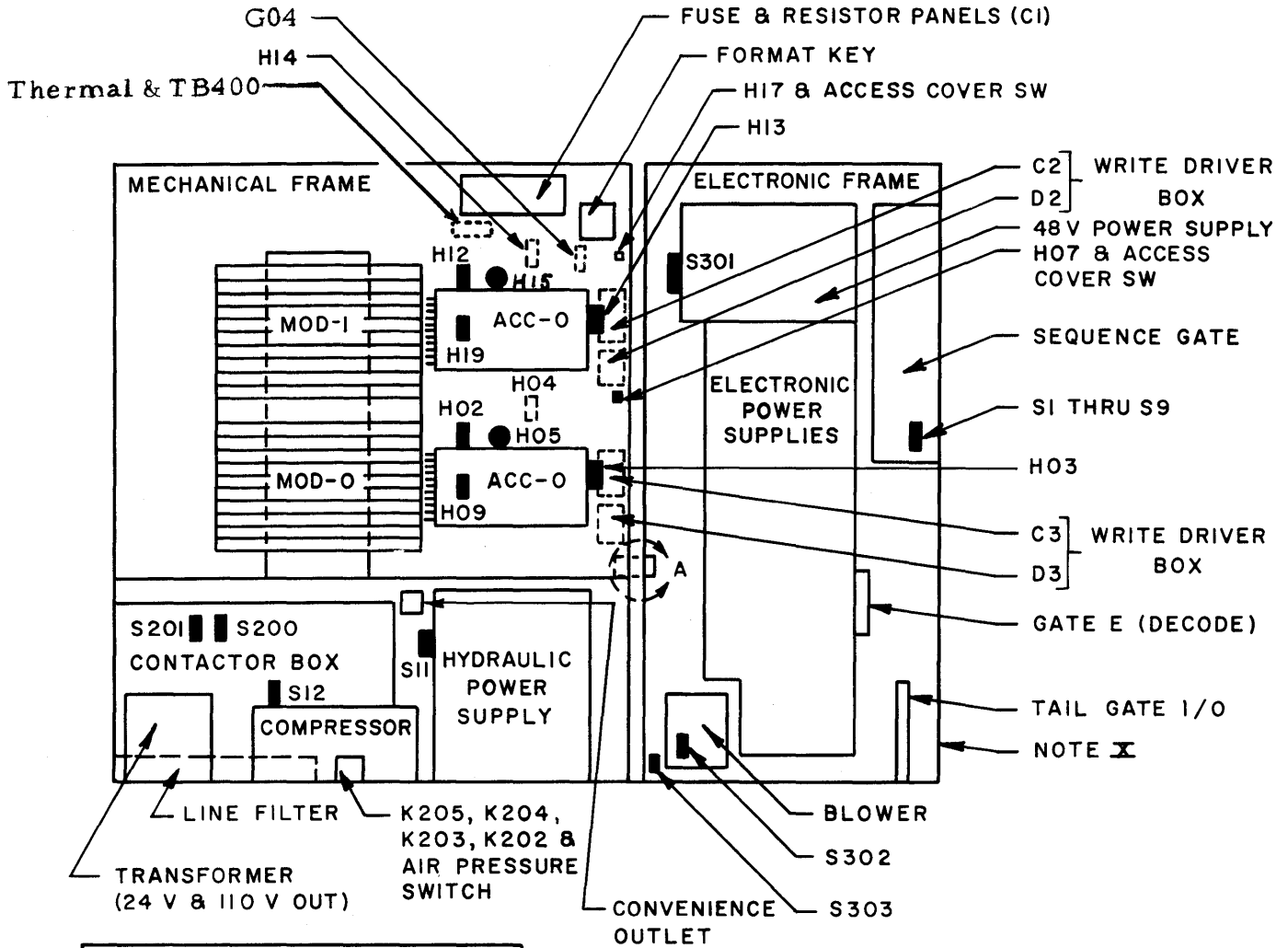
TABLE AII-2 INTERFRAME CABLES - 2302 (continued)

Model	Connector Number	From Mechanical Frame	To Electronic Frame	Cable Part Number	Remarks
II	C3-WDA11	x	B3-B02	2176713	Write Drivers M1A1 to Gate B, Panel 3.
II	H-13, H-17	x	S-3 A3-E04	2176754	Actuator 0-M1 to Gate A, Panel 3. (Route under Hydraulic Manifold)
II	H-33, H-37	x	S-5 B3-E04	2176759	Actuator 1-M1 to Gate B, Panel 3. (Route under Hydraulic Manifold)
I & II	Ground Strap	x	x	2101376	Between bottoms of frames.

6/1/65

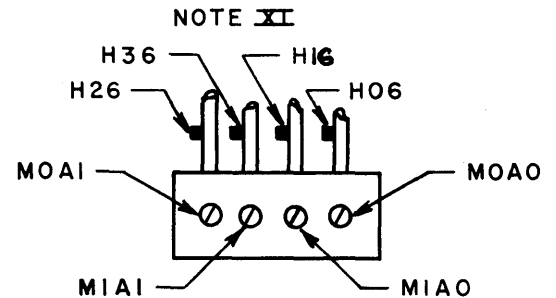
AII-21

APPENDIX II  
IBM 2302 DISK STORAGE



PLUGS THAT ARE IDENTICAL BUT ARE SHOWN ONLY ON LOGIC WITH THE M<sub>0</sub>A<sub>0</sub> DESIGNATION CONVERSION MUST BE MADE WHEN WORKING ON OTHER ACCESSES

M <sub>0</sub> A <sub>0</sub>	M <sub>1</sub> A <sub>0</sub>	M <sub>0</sub> A <sub>1</sub>	M <sub>1</sub> A <sub>1</sub>
G03	G13		
H02	H12	H22	H32
H03	H13	H23	H33
H04	H14	H24	H34
H05	H15	H25	H35
H06	H16	H26	H36
H07	H17	H27	H37
—	—	—	—
H09	H19	H29	H39



MANIFOLD DISTRIBUTOR  
VIEW A

NOTES:

- X VIEW OF INSIDE OF ELECTRONIC FRAME
- XI TEMPERATURE SENSING ELEMENTS

FIGURE AII-3 COMPONENT LOCATION - 2302 (FRONT)

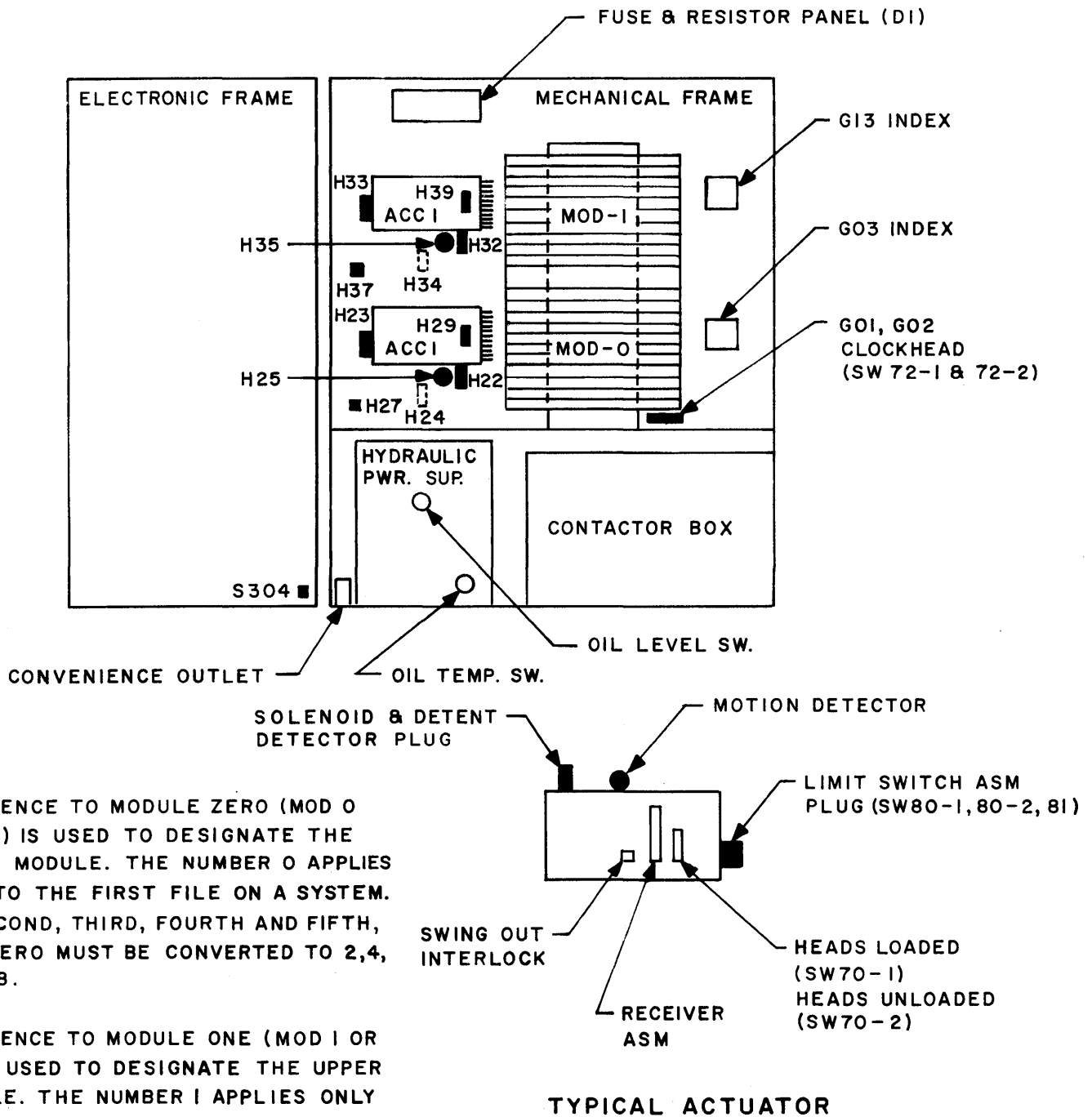


FIGURE AII - 4 COMPONENT LOCATION - 2302 (REAR)

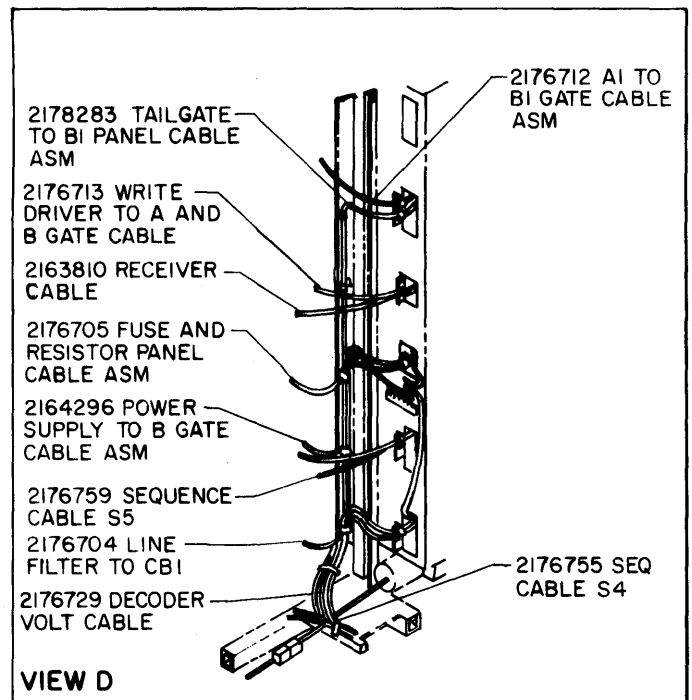
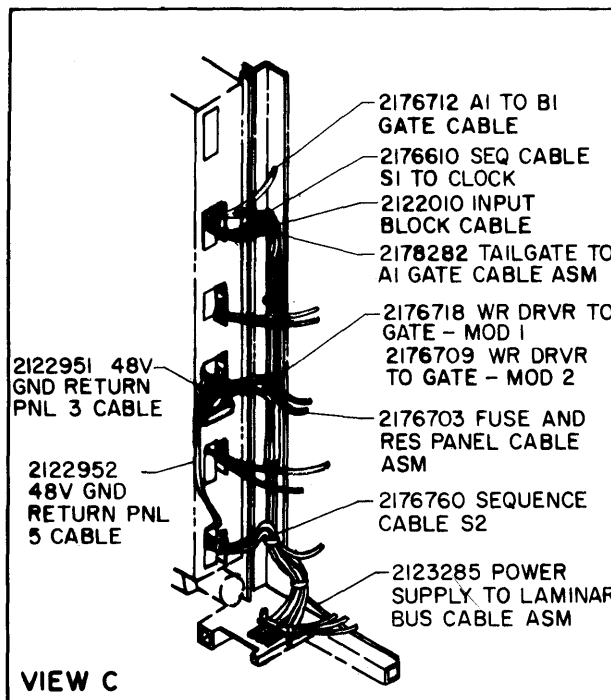
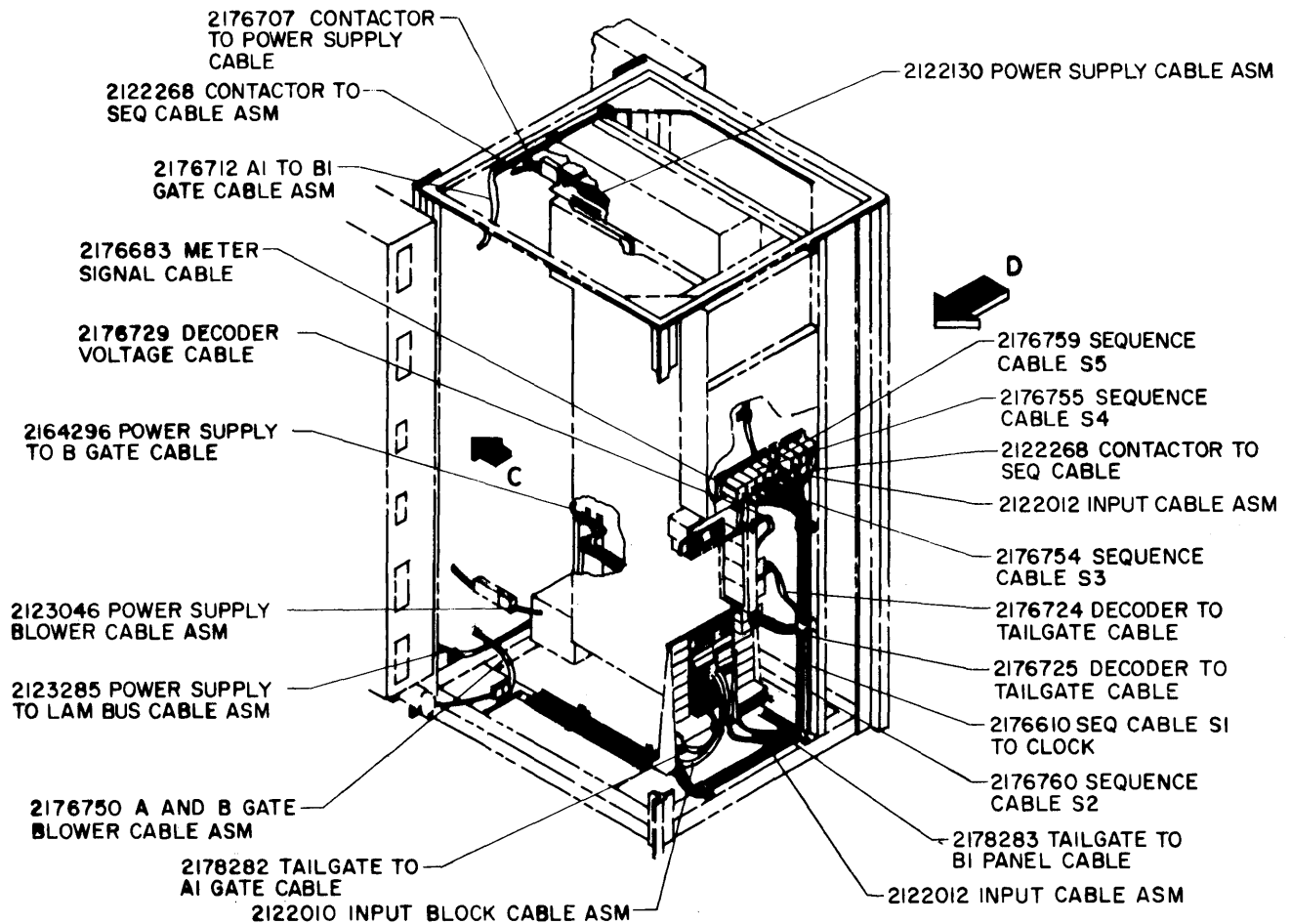


FIGURE AII-5 INTERFRAME CABLE ROUTING-ELECTRONIC FRAME



APPENDIX II  
IBM 2302 DISK STORAGE

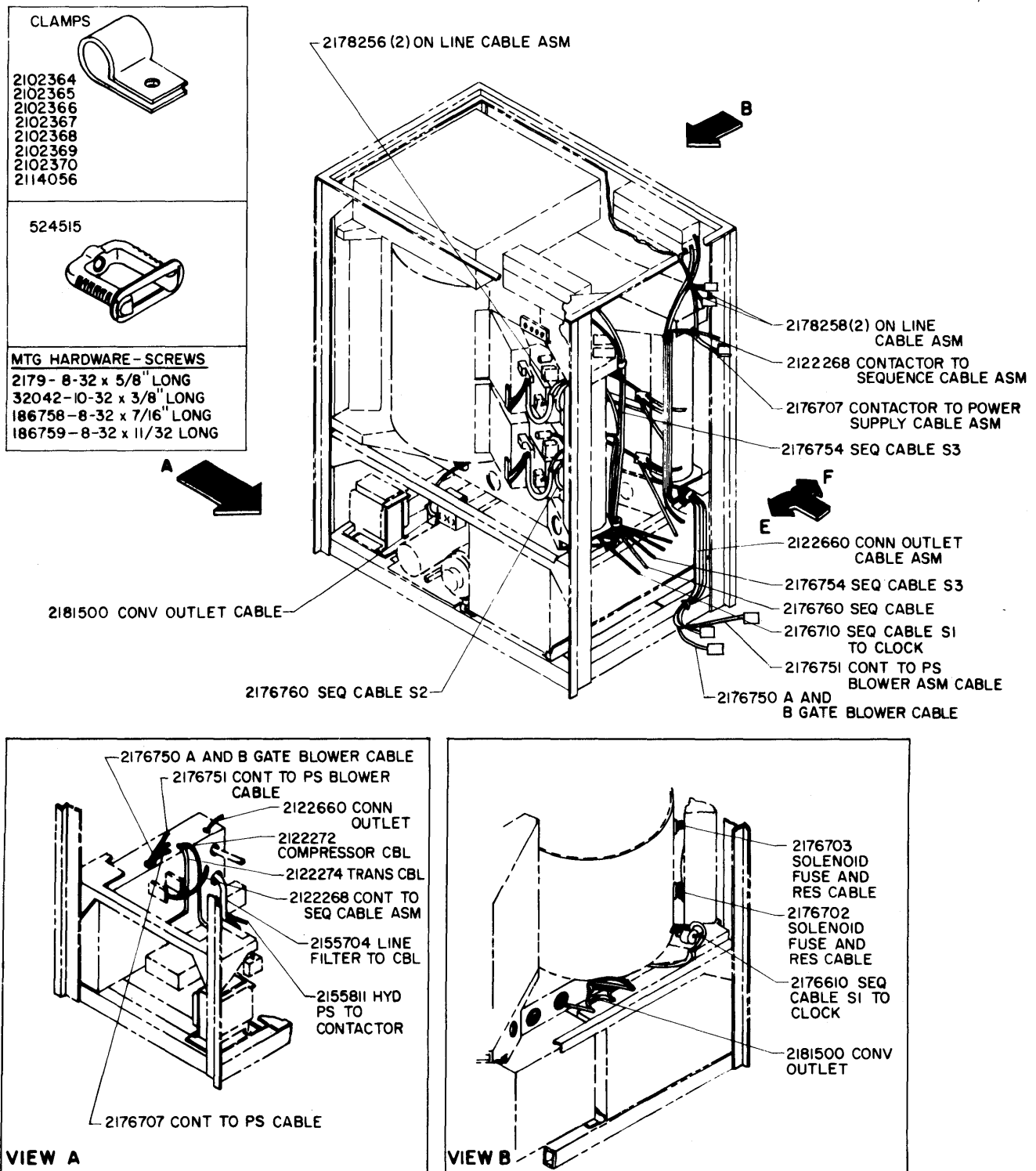


FIGURE AII-6 INTERFRAME CABLE ROUTING-MECHANICAL FRAME

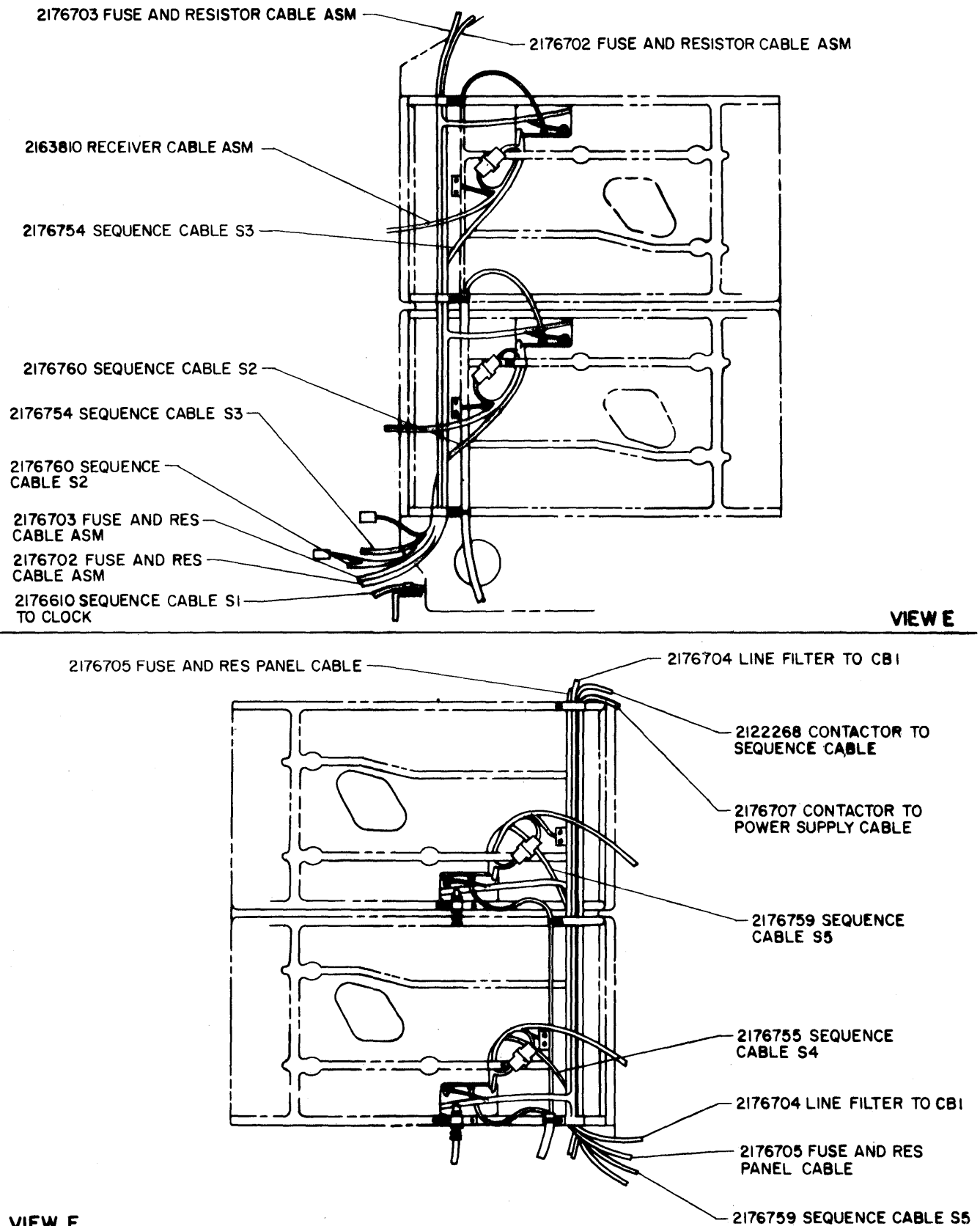
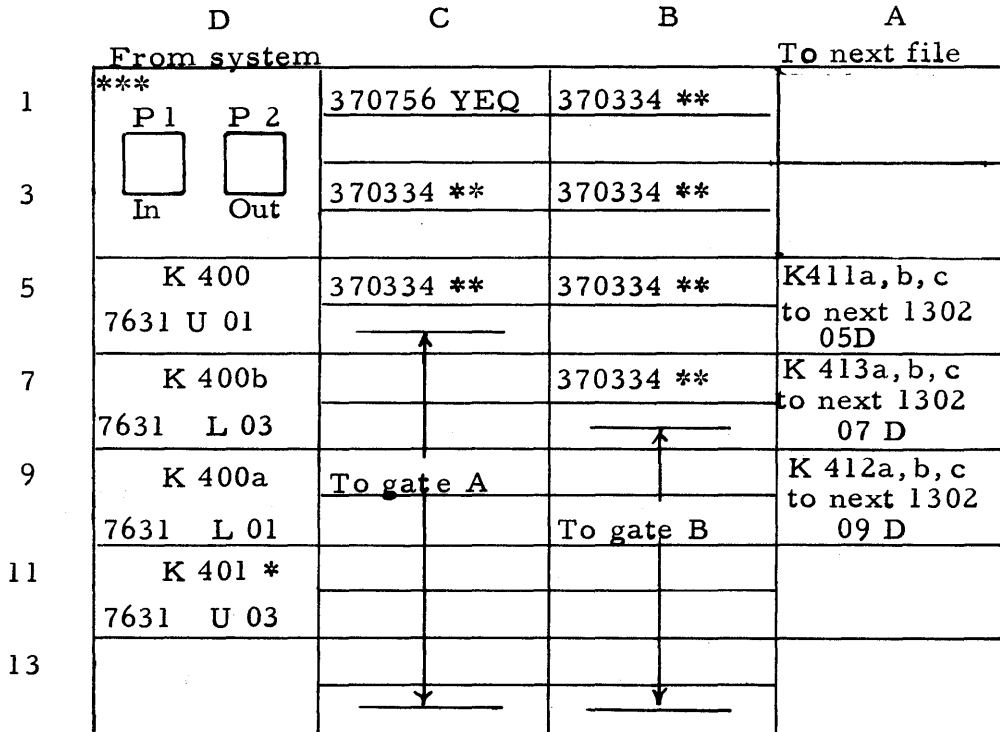


FIGURE AII-6 (E-F) INTERFRAME CABLE ROUTING- MECHANICAL FRAME



(Viewed from card side--last or only file in line)

\* K 401 is for the first 2302. K 401a, b, or c, are plugged into the same connector (11 D), on the 2nd, 3rd, 4th and 5th 1302, but come from 7631--L05, U05, L07, and U07, respectively.

\*\* These are TCK terminator cards. Four are sent in the 7631 Shipping Group; two, in positions B01 & B07, are installed in San Jose--these must always remain in place. Terminators C03, C05, B03, B05, are used only in the last file in line, as shown here. For first file in line, remove C03, C05, B03, B05, and terminate as shown in Figure AII-8.

\*\*\* K 419 is used with 7631, Serial No. 12000 and above.

FIGURE AII-7 2302 TAILGATE CABLING

APPENDIX II  
IBM 2302 DISK STORAGE

	D	C	B	A
1				
2				
3				
4				
5		X		
6				
7				

1301--NOT last file in line

	D	C	B	A
1				
2		X		
3		X		
4		X		
5		X		
6				
7				

1301--LAST file in line

	D	C	B	A
1			X	
2				
3				
4				
5				
6				
7			X	

2302--NOT last file in line

	D	C	B	A
1			X	
2				
3		X	X	
4				
5		X	X	
6				
7			X	

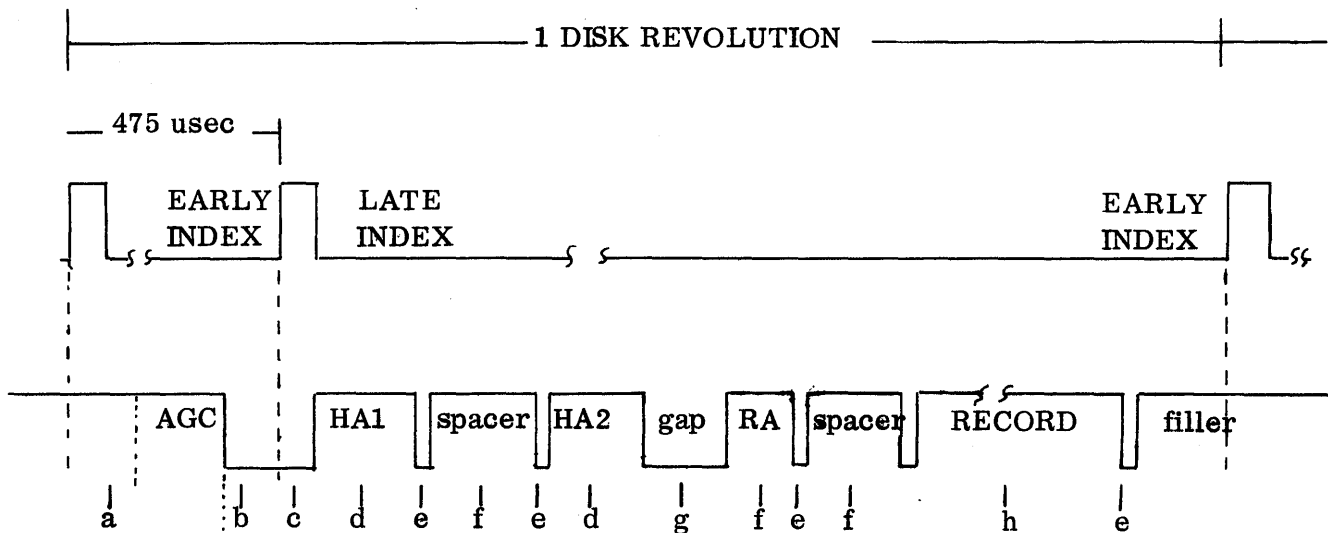
2302--LAST file in line

NOTES:

1301/2302's may be installed in any sequence; however, when they are intermixed in a multiple file installation, remove terminator plug, PN 2123269, from position A07 in 1301 tailgates.

This drawing shows the placement of TCK terminator cards, PN 370334 (indicated by X's), in 1301/2302 tailgates.

FIGURE AII-8 TCK TERMINATOR CARD PLACEMENT--1301/2302



Note: All characters are written in an 8-bit mode (9 bits per character),  
800 nanoseconds per bit, nominal.

- Code:
- a - 350 microseconds  $\pm$  25 usec, from early index to end of AGC burst
  - b - 125 microseconds  $\pm$  15 usec
  - c - 54 "no bits" (6 characters)
  - d - 108 bits (12 characters)
  - e - 9 "no bits" (one character)
  - f - 117 bits (13 characters)
  - g - 135 "no bits" (15 characters)
  - h - 18,432 bits (2048 characters)

FIGURE AII-9 FORMAT TRACK PATTERN - 2302