



Maintenance Library

MIM INTRO LGND GLOS START MLX PROG MSG LOC PWR CARR INDEX INST VOL. R10	PCM PARTS CATALOG VOL. R20	MDM CARD PLUG CHART CABLE LIST POWER DIAGRAM VOL. R30	MDM NET/PIN LISTS VOL. R31
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**Storage Control
Maintenance Information**

3880 MIM	AA0010 Side 1 of 2	8498267 Part No.	450900 13Jul79	450903 25Jan80	450905 11Ap80	.	.
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MAINTENANCE INFORMATION MANUAL ORDERING PROCEDURE (IBM Internal)

Individual pages of the IBM 3880 Maintenance Information Manual (MIM) can be ordered from the San Jose plant by using the Wiring Diagram/Logic Page Request, Order No. Z150-0130 (U/M 015). In the logic page columns, enter the page identifier information: sequence number and side number **1**, part number **2**, and engineering change (EC) number **3**.

	1	2	3	
3880 MIM	CA3456 Side	7654321 Part No.	437409 10 Aug 79	

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Groups of pages can be ordered by including a description (section, volume) and the machine serial number.

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HOW TO UPDATE THE MIM

The MIM is under normal logic engineering change controls. File pages by sequence number and side number **1**. The EC level and date are given in the EC history strip **3**.

RELATED PUBLICATIONS

Additional information about the 3880 or the devices that attach to it, can be found in the following reference manuals.

- *IBM 3880 Storage Control Description*, Order No. GA26-1661
- *IBM 3370 Direct Access Storage Description*, Order No. GA26-1657
- *IBM 3350 Direct Access Control*, Order No. GA26-1638.
- *IBM 3340 Disk Storage*, Order No. GA26-1619
- *IBM 3330 Disk Storage*, Order No. GA26-1615

EC LEVEL CONTROL

This page provides a convenient place to record the EC level of the maintenance package.

MAINTENANCE PACKAGE

Maintenance Information Manual (Vol R10)

ECA Number	EC Number

Maintenance Diagrams Manual (Vol R31)

ECA Number	EC Number

Maintennace Support Manual (Vol R60)

ECA Number	EC Number

Functional Microcode Manual (Vol R80)

ECA Number	EC Number

Parts Catalog Manual (Vol R20)

ECA Number	EC Number

Remote Communications Manual (Vol R40)

ECA Number	EC Number

Block Diagrams Manual (Vol R70)

ECA Number	EC Number

Maintenance Device Diskette (B/M 2342151)

ECA Number	EC Number

Maintenance Diagrams Manual (Vol R30)

ECA Number	EC Number

Diagnostic Code Manual (Vol R50)

ECA Number	EC Number

Block Diagrams Manual (Vol R71)

ECA Number	EC Number

This page provides a convenient place to record the EC level of the machine components and logic.

MACHINE

Mechanical

ECA Number EC Number

_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

Power

ECA Number EC Number

_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

Logic

ECA Number EC Number

_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

Functional Diskette

ECA Number EC Number

_____	_____
_____	_____
_____	_____
_____	_____
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_____	_____

Power

ECA Number EC Number

_____	_____
_____	_____
_____	_____
_____	_____
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_____	_____
_____	_____
_____	_____

Logic

ECA Number EC Number

_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

FIELD INSTALLED RPQs and FEATURES

Feature Device Code
or RPQ Number _____

EC Number _____

MES Order Number _____

Description _____

Feature Device Code
or RPQ Number _____

EC Number _____

MES Order Number _____

Description _____

Feature Device Code
or RPQ Number _____

EC Number _____

MES Order Number _____

Description _____

Feature Device Code
or RPQ Number _____

EC Number _____

MES Order Number _____

Description _____

Feature Device Code
or RPQ Number _____

EC Number _____

MES Order Number _____

Description _____

Feature Device Code
or RPQ Number _____

EC Number _____

MES Order Number _____

Description _____

Feature Device Code
or RPQ Number _____

EC Number _____

MES Order Number _____

Description _____

Feature Device Code
or RPQ Number _____

EC Number _____

MES Order Number _____

Description _____

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CE SAFETY PRACTICES

Be constantly aware of hazardous situations when working on this product. Take time to review the CE safety practices listed below which have been reprinted from the pocket-size card available from Mechanicsburg (Order No. S229-8124). The DANGER notice on a page indicates potential harm to the user of the manual. All Customer Engineers are expected to take every precaution possible and observe the following safety practices while maintaining IBM equipment.

1. You should not work alone under hazardous conditions or around equipment with dangerous voltage. Always advise your manager if you MUST work alone.
2. Remove all power, AC and DC, when removing or assembling major components, working in immediate area of power supplies, performing mechanical inspection of power supplies and installing changes in machine circuitry.
3. A wall box power switch, when turned off, should be locked or tagged in the Off position. The Do Not Operate tags (Form No. Z229-0237) should be affixed when applicable. Pull power supply cord whenever possible.
4. When it is absolutely necessary to work on equipment having exposed operating mechanical parts or exposed live electrical circuitry anywhere in the machine, the following precautions must be followed:
 - a. Another person familiar with power-off controls must be in the immediate vicinity.
 - b. Rings, wrist watches, chains, bracelets, metal cuff links, must not be worn.
 - c. Only insulated pliers and screwdrivers shall be used.
 - d. Keep one hand in pocket.
 - e. When using test instruments, be certain controls are set correctly and proper capacity, insulated probes are used.
 - f. Avoid contacting ground potential (metal floor strips, machine frames, etc. - use suitable rubber mats purchased locally if necessary).
5. Safety glasses must be worn when:
 - a. Using a hammer to drive pins, riveting, staking, etc.
 - b. Power hand drilling, reaming, grinding, etc.
 - c. Using spring hooks, attaching springs.
 - d. Soldering, wire cutting, removing steel bands.
 - e. Parts cleaning using solvents, sprays, cleaners, chemicals, etc.
- f. All other conditions that may be hazardous to your eyes. REMEMBER - THEY ARE YOUR EYES.
6. Special safety instructions such as handling cathode ray tubes and extreme high voltages must be followed as outlined in CEMs and the Safety section of the maintenance manuals.
7. Do not use solvents, chemicals, greases, or oils that have not been approved by IBM.
8. Avoid using tools or test equipment that have not been approved by IBM.
9. Replace worn or broken tools and test equipment.
10. The maximum load to be lifted is that which, in the opinion of you and management, does not jeopardize your own health or well-being or that of other employees.
11. All safety devices such as guards, shields, signs, ground wires, etc., shall be restored after maintenance. **Knowing safety rules is not enough. An unsafe act will inevitably lead to an accident. Use good judgement - eliminate unsafe acts.**
12. Each Customer Engineer is responsible to be certain that no action on his part renders a product unsafe or exposes hazards to customer personnel.
13. Place removed machine covers in a safe, out-of-the-way place where no one can trip over them.
14. All machine covers must be in place before a machine is returned to the customer.
15. Always place CE tool kit away from walk areas where no one can trip over it (i.e., under desk or table).
16. Avoid touching mechanical moving parts (i.e., when lubricating, checking for play, etc.).
17. When using a stroboscope, do not touch ANYTHING - it may be moving.
18. Avoid wearing loose clothing that may be caught in machinery. Shirt sleeves must be left buttoned or rolled above the elbow.
19. Ties must be tucked in shirt or have a tie clasp (preferably nonconductive) approximately 3 inches from end. Tie chains are not recommended.
20. Before starting equipment, make certain fellow CEs and customer personnel are not in a hazardous position.
21. Maintain good housekeeping in area of machine while performing and after completing maintenance.

ARTIFICIAL RESPIRATION

Rescue Breathing for Children

1. Clear throat of water, mucus, food, etc.
2. Place child's face down, to loosen foreign matter in air passage. **With head in down position, pat him firmly on the back.** This should take only a few seconds.
3. Lay child on his back.
4. Lift the neck and tilt the head back to open the air passage.
5. Place mouth firmly over child's mouth and nose to prevent air leakage when you blow.
6. Blow smoothly and gently at the same time until his chest rises.
7. Move your free hand to child's abdomen and apply continuous pressure to prevent stomach filling with air.
8. When lungs are filled, remove your lips from child's mouth and nose to allow his lungs to empty naturally.
9. Repeat mouth-to-mouth breathings 20 times per minute.
10. If you feel resistance - chest does not rise, repeat step number 2, then quickly resume mouth-to-mouth breathings. **Continue rescue breathing until he breathes for himself.**

Rescue Breathing for Adults

Victim on His Back Immediately

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



Mouth-to-Mouth Resuscitation Position

DANGER NOTICES

Various sections of the Maintenance Information Manual contain Danger notices. These notices are designed to show potential working hazards.

Observe the following notices when working on the 3880:

1. Turn off breaker CB401 whenever maintenance is performed on the primary power circuits or hardware. (PWR-22)
2. Treat all circuits as live until measured. Lethal voltages are present in the power servicing area. Capacitors can explode. (PWR-28, -29, and -32)
3. Wear safety glasses when working in the power area and always reinstall safety covers before powering on the machine. (PWR-28, -29, and -32)
4. Disconnect the primary power to the 3880 before removing the drive motor. (CARR-130)
5. Beware of high heat in the motor case. (CARR-130)
6. Use caution when replacing 60 Hz motors. Position the two holes in the drive motor to the top and bottom of the mounting bracket before clamping the motor to the bracket. (CARR-130)
7. Do not connect the power cord until instructed to do so. (INST-30)

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REFERENCES TO OTHER SECTIONS

See the PWR section for information about power-on and power-off sequences, and the operator and power switch panels.

See the START section for information about diskette drive and maintenance device starting procedures.

See the PROG section for operating instructions and descriptions of the online test.

See the INST section for setting the diskette load control switches during installation of the 3880.

ABBREVIATIONS IN THIS SECTION

ADT	automatic data transfer
ALU	arithmetic and logic unit
BDM	Block Diagrams Manual
BFR	buffer
CBI	channel bus in
CBO	channel bus out
CBP	channel buffer pointer
CCW	channel command word
CDX	channel data transfer
CHK	check
CHL-I	channel interface
CR	condition register

CRO	control interface checks
CSC	channel sequence control
CSR	channel search
CSW	channel status word
CTL-I	control interface
CTRL	control
CU	control unit
CXC	channel transfer control
DASD	direct access storage device
DBH	device buffer pointer high
DBI	data bus in
DBFR	data buffer
DBL	device buffer pointer low
DBO	data bus out
DBP	device buffer pointer
DCH	device count high
DCL	device count low
DCM	Diagnostic Code Manual
DCS	dynamic control storage
DCSR	dynamic control storage and refresh
DCT	device counter
DDC	director to device controller
DEV-I	device interface
DIR	data in register
DOR	data out register
DRC	dynamic refresh control
DRR	driver receiver
DTG	device tag gate
DTI	data tag in
DTO	data tag out
DXA	data transfer addressing card
DXC	data transfer control
DXD	data transfer data card
DXR	data transfer
EREP	environmental recording, editing, and printing error recovery procedure
ERP	error recovery procedure
FACR	four-channel additional condition register
FADT	four-channel additional driver and terminator
FADR	four-channel additional driver
FAPS	four-channel additional power sense
FASC	four-channel additional sequence control
FAST	four-channel additional switch terminator
FCA	four-channel additional
FMM	Functional Microcode Manual
FRU	field-replaceable unit
HA	home address
HDSCS	high density static control storage
IAR	instruction address register
IC	isolation code
ID	identification (identifier)
ILR	interrupt level register
IML	initial microcode load
IPL	initial program load
IRG	internal register group

JMP	jumper
LRC	longitudinal redundancy check
MAP	maintenance analysis procedure
MCS	maintenance control and/or sense
MD	maintenance device
MDM	Maintenance Diagrams Manual
MIM	Maintenance Information Manual
MNT	maintenance
MNT-C	maintenance connection
MSM	Maintenance Support Manual
OLT	online test
PCC	PSM control card
PCM	Parts Catalog Manual
PCR	pad counter
POR	power on reset
PSM	power sequencer and monitor
PSW	program status word
RMCKD	read multiple count, key, and data
RO	record 0 (zero)
ROS	read-only storage
SBP	select out bypass
SC	symptom code
SCK	switch clock
SCS	static control storage
SDM	storage director microcontroller
SDR	switch driver receiver
SDT	switch driver terminator
SMB	speed matching buffer (3380)
SMBU	speed matching buffer, unidirectional (3375)
SPC	channel speed control
SSW	string switch

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**ABBREVIATIONS IN THIS SECTION
(Continued)**

TACR	two-channel additional condition registers
TADT	two-channel additional driver terminator
TCR	two-channel condition register
TFR	toggle, FRU register
TRKO	track zero
TO	time 0 (zero)
Vol.	volume
XCS	transfer complete status
XES	transfer error status

The 3880 maintenance library contains eight manuals packaged in ten binders.

The first four binders contain the following three manuals:

- Maintenance Information Manual (MIM)
- Parts Catalog Manual (PCM)
- Maintenance Diagrams Manual (MDM)

The MIM, PCM, and MDM are used by the on-site CE along with the maintenance device (MD) to complete the maintenance tasks without going to other parts of the maintenance library.

The next two binders contain the following two manuals:

- Remote Communication Manual (RCM)
- Diagnostic Code Manual (DCM)

The RCM and DCM are used by the support CE to communicate to the on-site CE about specific error conditions.

The next four binders contain the following three manuals:

- Maintenance Support Manual (MSM)
- Block Diagrams Manual (BDM)
- Functional Microcode Manual (FMM)

The MSM, BDM, and the FMM are used by the support CE.

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MIM
Maintenance
Information
Manual
Vol. R10

Contains: Simple procedures for the installation, operation, and repair of the machine
User: On-site CE
Entry: Need to install, operate, or repair the machine.

PCM
Parts
Catalog
Manual
Vol. R20

Contains: Illustrations and listings of all parts in the machine (except cards and cables). List of where the parts are used. Microfiche
User: On-site CE
Entry: Physical part location

MDM Part 1
Maintenance
Diagrams
Manual
Vol. R30

Contains: Cable charts, card charts, and power diagrams. See note.
User: On-site CE
Entry: Card location, cable location, power component label, and MD MAP reference

MDM Part 2
Maintenance
Diagrams
Manual
Vol. R31

Contains: Net lists and pin lists. Microfiche
User: On-site CE
Entry: Card pin number

RCM
Remote
Communication
Manual
Vol. R40

Contains: Complex diagnostic procedures
User: On-site CE at the direction of the support CE
Entry: Error condition code

RCM
Remote
Communication
Manual
Vol. R41

Contains: Complex diagnostic procedures for speed matching buffers
User: On-site CE at the direction of the support CE
Entry: Error condition code

DCM
Diagnostic
Code
Manual
Vol. R50

Contains: Descriptions and sequence charts of diagnostic microcode. Microfiche
User: Support CE
Entry: Isolation codes (IC)

MSM
Maintenance
Support
Manual
Vol. R60

Contains: Theory and reference information. Microfiche
User: Support CE
Entry: Sense data and need for theory information

BDM Part 1
Block
Diagrams
Manual
Vol. R70

Contains: Diagrams of logic cards
User: Support CE
Entry: Card physical location

BDM Part 2
Block
Diagrams
Manual
Vol. R71

Contains: Descriptions of logic cards. Microfiche
User: Support CE
Entry: Card physical location

FMM
Functional
Microcode
Manual
Vol. R80

Contains: Descriptions of the functional microcode. Microfiche
User: Support CE
Entry: Trace printout

Note: The Maintenance Diagrams Manual (MDM), volume R30, contains the microfiche copies of the Parts Catalog Manual (PCM), volume R20, Maintenance Diagrams Manual Part 2 (MDM), volume R31, Diagnostic Code Manual (DCM), volume R50, Maintenance Support Manual (MSM), volume R60, Block Diagrams Manual (BDM), volume R71, and the Functional Microcode Manual (FMM), volume R80.

HOW TO USE THE MIM

The Maintenance Information Manual (MIM) can be used in three ways:

- As a problem-solving aid
- As an educational aid
- As a recall aid

As a problem-solving aid:

1. Enter the MIM in the START section.
2. Follow the instructions in the START section to progress to other sections

As an educational aid:

1. Complete reading assignments in the MIM necessary in the FE education course.
2. Use pages in the MIM as reference material.

As a recall aid:

1. The first page of each volume shows all sections of the MIM, highlighting the contents of the specific volume.
2. The first page of each section (the table of contents) lists the items in the section.
3. The INDEX section located in the back of this volume contains an alphabetic list of key words and phrases used in the MIM.

DESCRIPTION BY SECTION

The MIM is divided into sections identified by tabs.

The following is a description of the tab labels and the section content.

INTRO INTRODUCTION

The Introduction section describes the organization of the manual and the content of the manual sections. This section also includes a description of the 3880 subsystem and its maintenance plan.

This section is subdivided into three parts:

- Description of the 3880 subsystem
- Description of the content, organization, and use of the 3880 Maintenance Information Manual
- Description of the maintenance plan

LGND LEGEND

The Legend section contains descriptions and examples of all symbols used in the MIM.

GLOS GLOSSARY

The Glossary section contains definitions of abbreviations and technical terms used in the MIM.

START

The Start section is the starting point for all maintenance action.

The Maintenance Device (MD) part of the START section contains a description of the MD and its operating procedures.

MLX CROSS-REFERENCE

The Maintenance Library Cross-Reference section contains cross-references to and from this MIM to other maintenance library manuals.

PROG SYSTEM MAINTENANCE PROGRAMS

The System Maintenance Programs section contains the load, run, and interpretation procedures of the system level programs.

MSG SYSTEM MESSAGES

The System Messages section contains examples and descriptions of the operating system EREP (environmental recording, editing, and printing) program. The EREP program records, edits, and prints statistical and error data.

LOC LOCATIONS

The Locations section contains locations of all structural and assembly parts of the 3880. An index is included to find a part quickly.

PWR POWER, READY, PANEL

The Power section contains sequencing and distribution diagrams and power system theory.

This section also includes the following:

- Support information for cooling, drive, and frame assemblies
- Procedures for verifying repairs and checking voltages
- Support for maintenance analysis procedures (MAPs) used by the maintenance device
- Descriptions, operational procedures, and maintenance information for the operator and power switch panels

CARR CHECK, ADJUST, REMOVE, REPLACE

The CARR section contains all the checks, adjustments, removals, and replacements for the 3880.

INDEX INDEX

The Index section contains a complete alphabetic list of important subjects in the MIM.

INST INSTALLATION

The Installation section contains installation procedures for the 3880.

RCF READER'S COMMENT FORM

The Reader's Comment Form is used for comments and recommendations for changing the MIM.

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The main objective of the 3880 maintenance plan is to guide the CE to repair hardware failures quickly. To meet this objective, emphasis is placed on *how to repair* rather than *how it works*. For each failure, the *how to repair* method uses resources, fault isolation procedures, and analysis procedures.

PREREQUISITES

The CE should have completed the maintenance device (MD) education package and be familiar with the following pages in the MIM:

- INTRO-30 through INTRO-60
- PWR-1, 17, 18, 22, 27, 72, and 74
- START-10 through START-30

METHODS

The normal card-isolation method is to replace specified cards until the failing card is located. Visual inspection and measurement are also used to isolate power failures and determine the part that has failed.

MAINTENANCE PROCEDURES

Maintenance procedures aid the CE in isolating the failure to the smallest possible area. Sense data, diagnostic results, customer data, and visual indications are used to isolate the failure.

The maintenance procedures include the following:

- Start
- Maintenance analysis procedures (MAPs)
 - Entry
 - Maintenance programs
 - Isolation procedures
 - Replacement procedures
- Maintenance programs
 - Diagnostic microcode
 - Online test
- Support material and references

Start

The START section is the starting point for all maintenance action and directs the CE to continue this action or to connect the MD.

Maintenance Analysis Procedures (MAPs)

ENTRY AND MAINTENANCE PROGRAMS

Entry into the MAPs is made from the START section. The MAPs are located on the MD diskette provided with each 3880. These MAPs are run by loading the MD diskette into the maintenance device. Some of these MAPs execute maintenance programs that reside on the 3880 functional diskette. From the results of the program execution, examination of the 3880 registers, and questions of the CE, the MAPs can determine the set of field-replaceable units (FRUs) that may cause the failure.

The maintenance programs are also run to verify repairs after corrective action has been taken.

ISOLATION PROCEDURES

The MAPs usually list several possible field-replaceable units. There are three optional methods to follow when replacing FRUs.

- Replace the first FRU on the list and retest to see if the problem is resolved. If not, reinstall the original FRU, replace the second FRU, and so on, until the failing FRU is located.
- Replace the most probable group of FRUs and determine if the failing FRU is among that group. If it is, continue the isolation to the failing FRU. If the failing FRU is not among the first group, reinstall the original FRUs and replace the next group. Continue the isolation for the remaining groups.
- Replace all the FRUs, return the machine to the customer, and delay the isolation procedure until a more opportune time.

Use knowledge of the customer position, good fiscal management of the territory, and parts availability to determine the best method for each incident.

The FRU group for intermittent failures has a probable value assigned to each FRU. The farthest right-hand column of the MAPs contains these values. The convention used is as follows:

- 9 = The chances are greater than 9 out of 10 that this FRU fixes the problem.
- 8 = The chances are greater than 8 out of 10 that this FRU fixes the problem.
- .
- .
- .
- 0 = The chances are greater than 1 out of 100 that this FRU fixes the problem.

Blank = There is less than 1 chance out of 100 that this FRU fixes the problem.

REPLACEMENT PROCEDURES

The MAPs attempt to call out all possible FRUs for a given symptom. The MAPs list the FRUs with the most probable failing unit first, the next most probable failing unit second, and so on.

Maintenance Programs

DIAGNOSTIC MICROCODE

The diagnostic microcode is the primary tool to aid in recreating a failure and isolating it to a specific functional area. The diagnostic microcode is run automatically by the maintenance device.

ONLINE TEST

The online test (OLT) is a secondary test that tests the channel interface. The PROG section contains operating instructions and descriptions of the online test.

Support Material and References

Special references and information; environmental recording, editing, and printing (EREP) summaries; and locations are supplied in the following MIM sections:

- INDEX
- MLX
- LGND
- MSG
- LOC
- INST

A summary of the contents of these sections is located on INTRO-25.

The IBM 3880 Storage Control can connect to an IBM System/370 model 145 and above, 3031, 3032, 3033, 3042, 4331 Group 2, and 4341 processors.

SUBSYSTEM DESCRIPTION

The IBM 3880 contains two storage directors. Each storage director performs the following:

- Receives commands and data from the channel
- Generates control information from the commands and data
- Sends control information, commands, and data to the control module in a disk drive
- Receives control information, data, and status information from the control module in a disk drive
- Sends control information, data, and status information to the channel
- Controls the operation of the channel and the control interfaces

The two storage directors in the IBM 3880 exchange status information with each other and have a path available for error data transfer to the channel when one storage director fails.

The 3880 is controlled by the functional microcode that resides in control storage. The control storage is automatically loaded from the functional diskette during an initial microcode load (IML).

The functional diskette is placed in the diskette drive. The diskette drive is a read-only device and is included in the 3880. See the CARR section for details of the diskette drive. See INTRO-80 and INTRO-81 for a list of the channel commands.

DEVICE STRING DESCRIPTION

Each storage director can attach up to four strings of direct access storage devices (DASD) for a total of eight strings for each 3880.

A storage director can attach to one of the following types of disk storage only in the combinations shown:

- 3340 and 3344 (Model 1 or Model 2, storage director 1)
- 3330, 3333, and 3350 (Model 1 or Model 2, storage director 1)
- 3370 (Model 1 or Model 2, storage director 1 - 4341 Processor Only)
- 3375 (Model 1 or Model 2, storage director 1)

- 3380 (Model 3 or Model 2, storage director 2)

Control Module

Up to four control modules can be attached to each storage director. The control module contains the controller circuits for devices in the control module and in the satellite modules. The controller circuits:

- Respond to commands from the 3880
- Select one of up to eight devices
- Control the data read and write operations of the device
- Provide error detection and correction information
- Transmit control operations from the 3880 to the selected device
- Provide rotational position information on each device to the 3880

Satellite Modules

Up to eight devices can be attached to each control module. The device circuits:

- Position the access mechanism
- Select a read head
- Read or writes data
- Respond to the commands from the 3880

CHANNEL FEATURES

The channel features available for the 3880 are:

- Two-channel switch pair feature
- Two-channel switch pair, additional feature
- Eight-channel switch feature (named four-channel additional in the maintenance documentation)
- Remote switch feature

These features are shown on INTRO-40 except for the eight-channel switch feature, which is shown on INTRO-41. The remote switch feature is not shown.

Two-Channel Switch Pair

The two-channel switch pair feature provides logically separated switching facilities for both storage directors. It permits each storage director to be shared by two channels. The channels may be attached to the same processor or to different processors. Individual drives attached to a storage director may be reserved for the exclusive use of either of the channels.

Two-Channel Switch Pair, Additional

The two-channel switch pair, additional feature is similar to a two-channel switch pair feature except that it enables four channels to share a storage director and its attached drives.

Remote Switch

The remote switch feature removes the Enable and Disable switches from the 3880 operator panel and relocates them to a remote location. This allows an operator to reconfigure the system from a central point. This is a feature for the processors, not the 3880.

Eight-Channel Switch

The eight-channel switch feature is similar to a two-channel switch pair, additional feature except that it enables eight channels to share a storage director and its attached drives. This 3880 feature is only available for use with 3330, 3333, 3350, and 3380 disk storage. This feature is named four-channel additional (FCA) in the maintenance documentation.

SPEED MATCHING BUFFER FOR 3380 FEATURE

The speed matching buffer for 3380 feature (SMB) permits the attachment of a 3380 to block-multiplexer channels with a data rate less than 3 megabytes per second. When the speed matching buffer is installed in a 3880 Model 2 storage director, it must be installed in storage director 2. This feature may be installed in either one or both storage directors in a 3880 Model 3. This feature is required to attach a 3380 to System/370 Models 158 and 168 and to block multiplexer channels without data streaming on the 3031, 3032, 3033, and 3042.

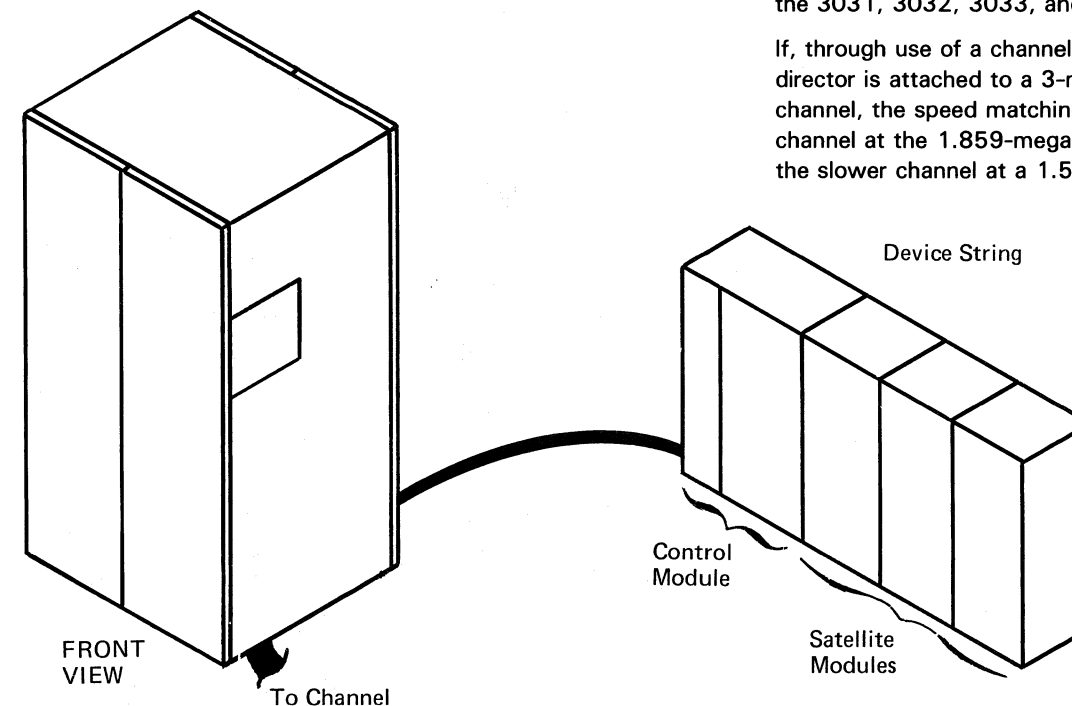
If, through use of a channel switch feature, a storage director is attached to a 3-megabyte channel and a slower channel, the speed matching buffer supports the 3-megabyte channel at a 3-megabyte data rate and the slower channel at a 1.5-megabyte data rate.

SPEED MATCHING BUFFER FOR 3375 FEATURE

The speed matching buffer for 3375 feature (SMBU) permits the attachment of a 3375 to block-multiplexer channels with a data rate less than 3 megabytes per second. When the speed matching buffer is installed in a 3880 Model 2 storage director, it must be installed in storage director 1. This feature may be installed in either one or both storage directors in a 3880 Model 1. This feature is required to attach a 3375 to System/370 Models 148, 158, and 168 and to block multiplexer channels without data streaming on the 3031, 3032, 3033, and 3042.

If, through use of a channel switch feature, a storage director is attached to a 3-megabyte channel and a slower channel, the speed matching buffer supports the 3-megabyte channel at the 1.859-megabyte data rate of the 3375 and the slower channel at a 1.5-megabyte data rate.

3880 Storage Control



3880	AC0030	8498082	See EC	450908	450911	450913
MIM	Side 2 of 2	Part No.	History	15Apr81	29Dec82	12Jan83

SUBSYSTEM DESCRIPTION

The IBM 3880 Storage Control connects an IBM channel to 3330, 3340, 3344, 3350, 3370, 3375, or 3380 disk storage devices.

The IBM 3880 contains two storage directors. Each storage director:

- Receives commands and data from the channel
- Generates control information from the commands and data
- Sends control information, commands, and data to the control module in a disk drive
- Receives control information, data, and status information from the control module in a disk drive
- Sends control information, data, and status information to the channel
- Controls the operation of the channel and the control interfaces

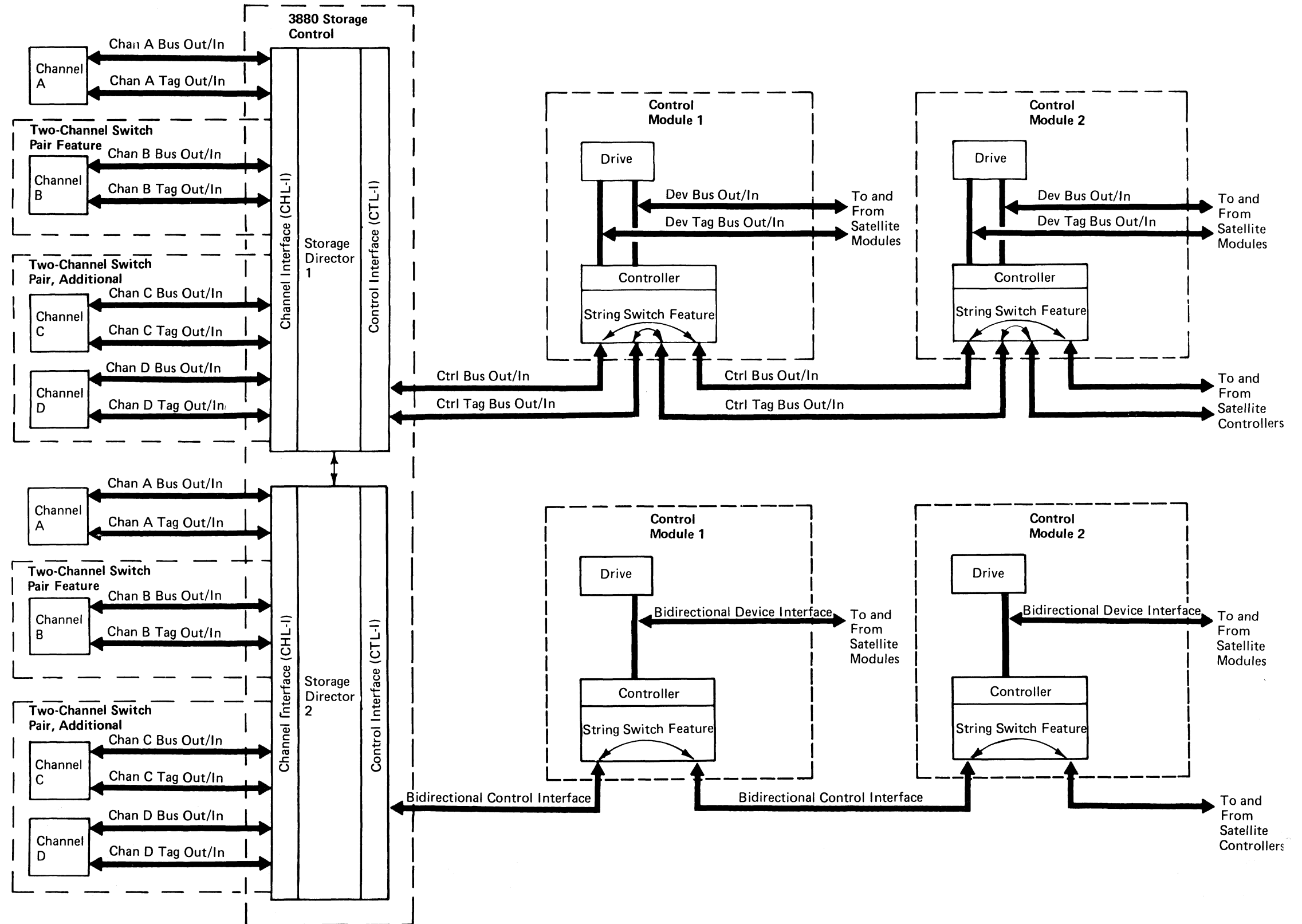
The two storage directors in the IBM 3880 exchange status information with each other. Each storage director provides a path for error information to the channel when the other storage director fails.

CONTROL INTERFACES

There are two control interfaces available for the 3880:

- A unidirectional (2-cable) bus in/out and tag in/out is used in the Model 1 and Model 2, storage director 1.
- A bidirectional (1-cable) bus/tag is used in the Model 3 and Model 2, storage director 2.

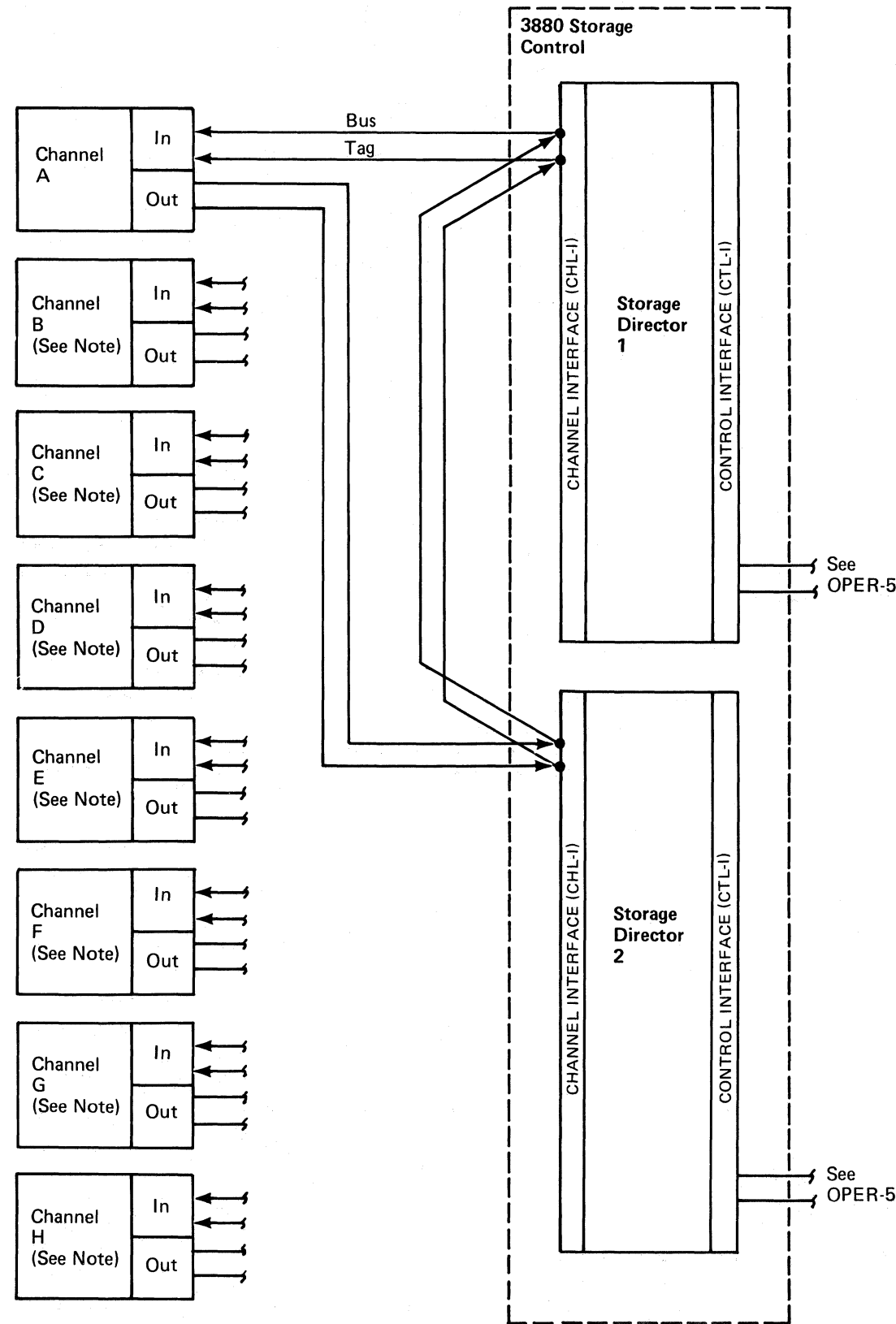
Storage director 1 shown in the figure shows the standard control interface. Storage director 2 has the bidirectional control interface.



AC0040	8498497	See EC	450907	450908	450913	450915
Side 1 of 2	Part No.	History	10Dec80	15Apr81	12Jan83	14Oct83

EIGHT-CHANNEL SWITCH FEATURE

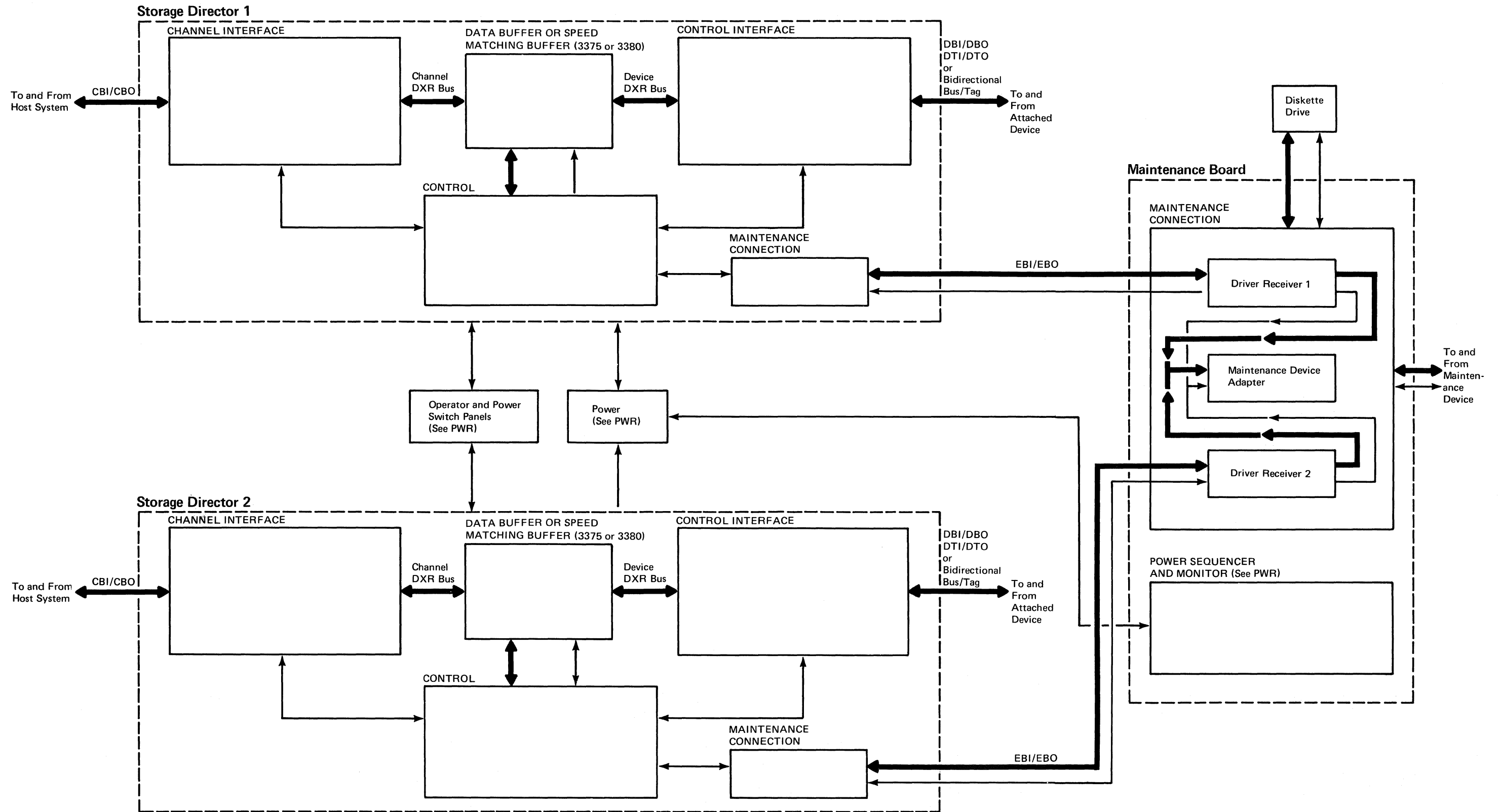
This feature provides each storage director in the 3880 with access to eight channels.



Note: The remaining channels (B-H) are wired as shown for channel A, giving either storage director access to eight channels.

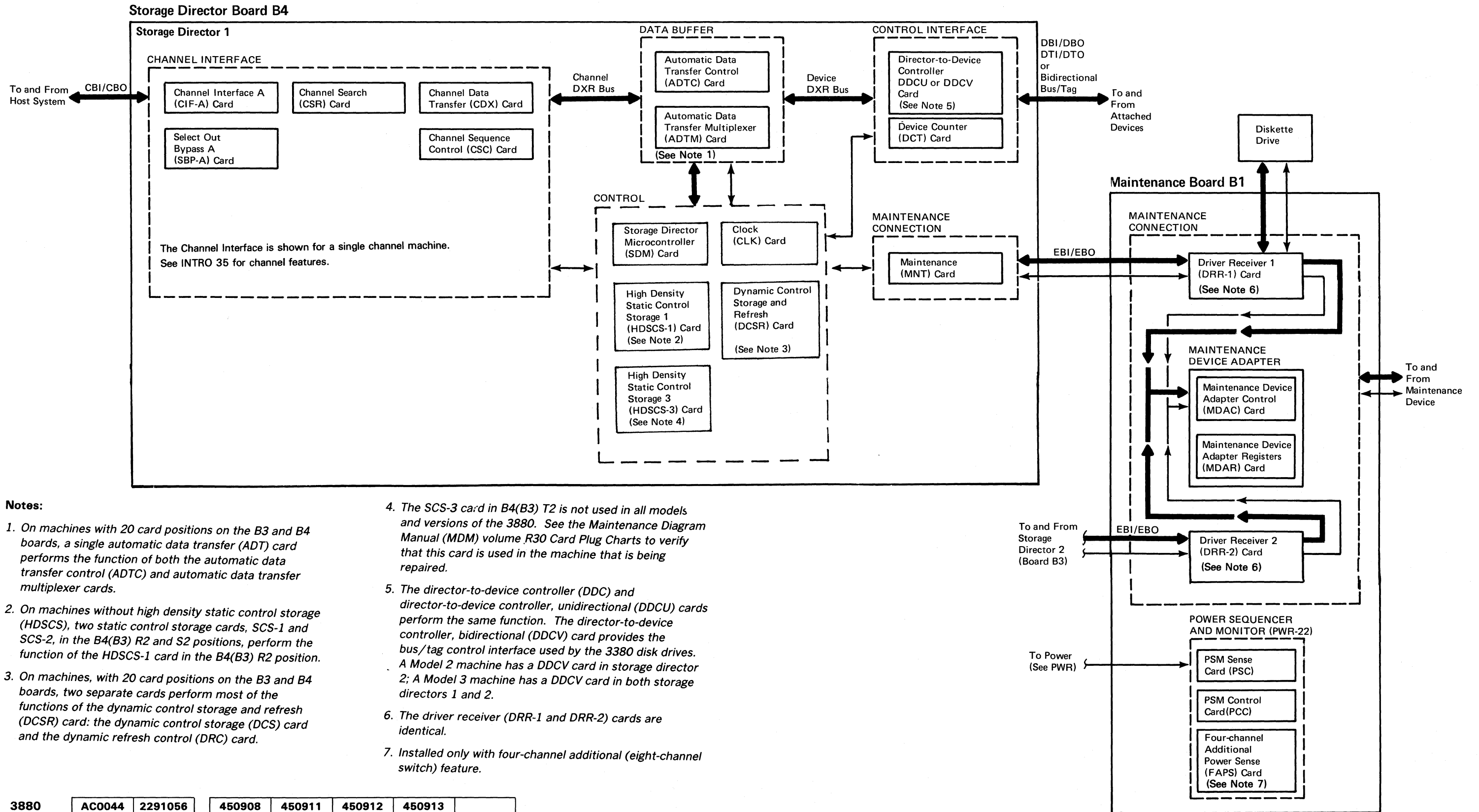
3880	AC0040	8498497	See EC	450907	450908	450913	450915
MIM	Side 2 of 2	Part No.	History	10Dec80	15Apr81	12Jan83	14Oct83

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3880 MIM	AC0044 Side 1 of 2	2291056 Part No.	450908 15Apr81	450911 29Dec82	450912 30Dec82	450913 12Jan83
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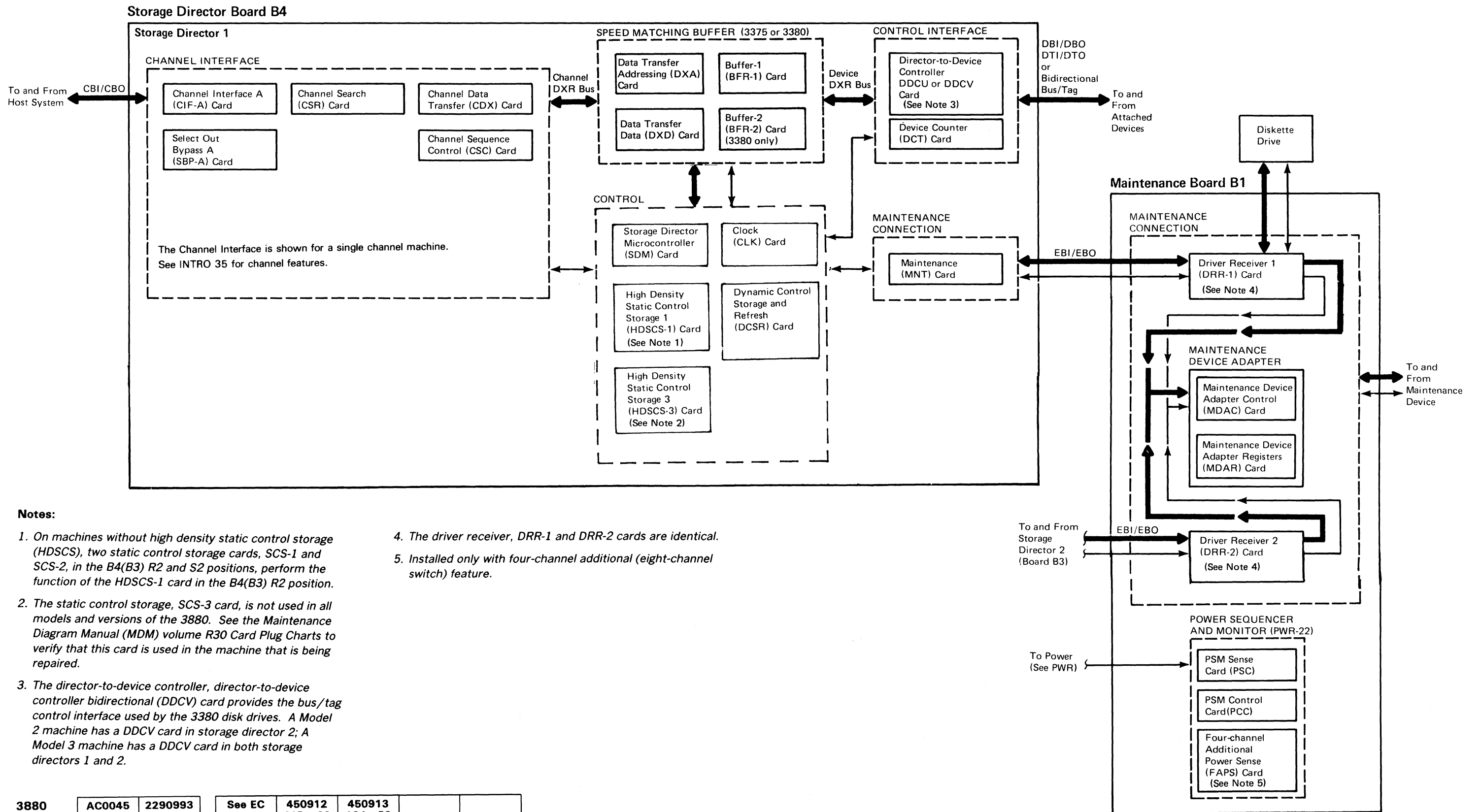
WITHOUT SPEED MATCHING BUFFER FEATURES



3880 MIM	AC0044 Side 2 of 2	2291056 Part No.	450908 15Apr81	450911 29Dec82	450912 30Dec82	450913 12Jan83
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STORAGE DIRECTOR FUNCTIONAL AREAS

WITH SPEED MATCHING BUFFER FEATURES



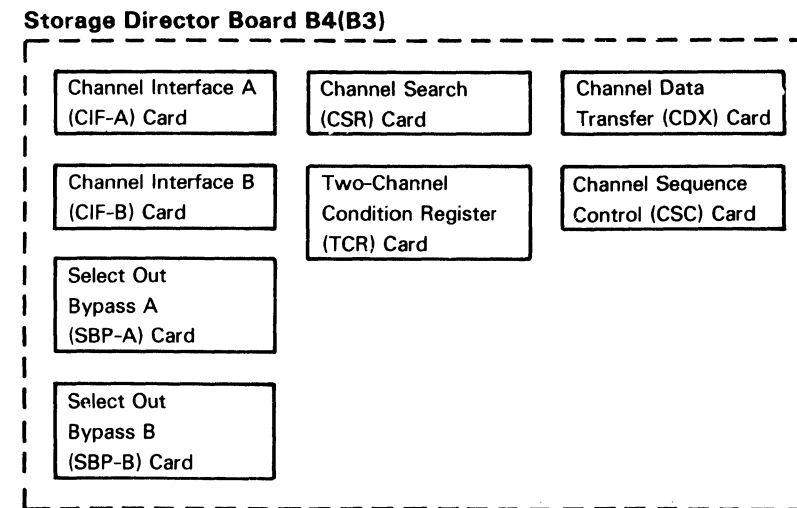
3880	AC0045	2290993	See EC	450912	450913		
MIM	Side 1 of 1	Part No.	History	30Dec82	12Jan83		

CHANNEL FEATURES

The figures on this page show the channel interface functional area of the 3880 for each of the channel features.

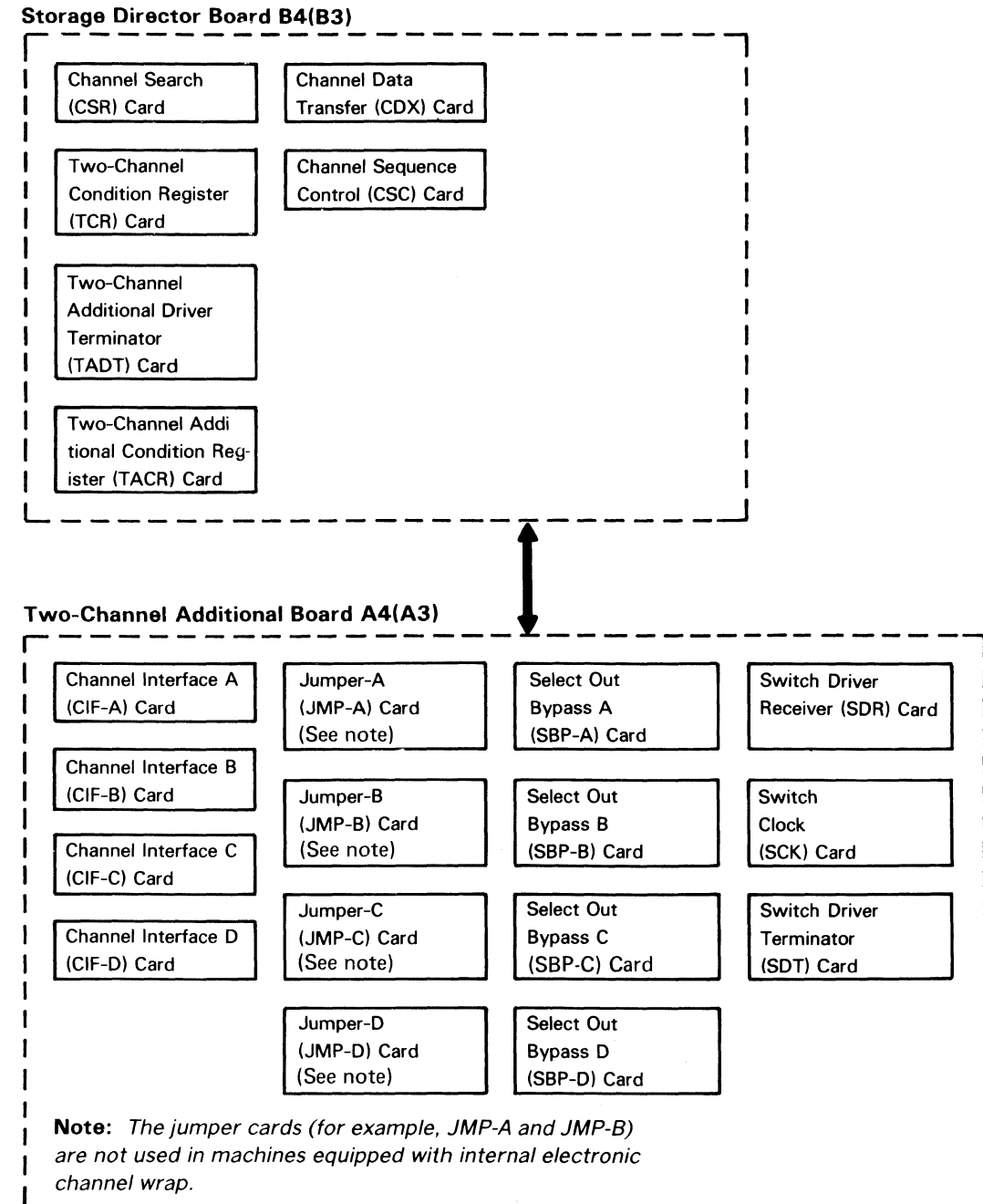
Two-Channel Switch Pair Feature

With the two-channel switch pair feature, an additional channel interface card and an additional select out bypass card are provided for channel B. In addition, the two-channel condition register (TCR) card is added. All cards are contained on the B4 board for storage director 1 and on the B3 board for storage director 2.



Two-Channel Switch Pair, Additional Feature

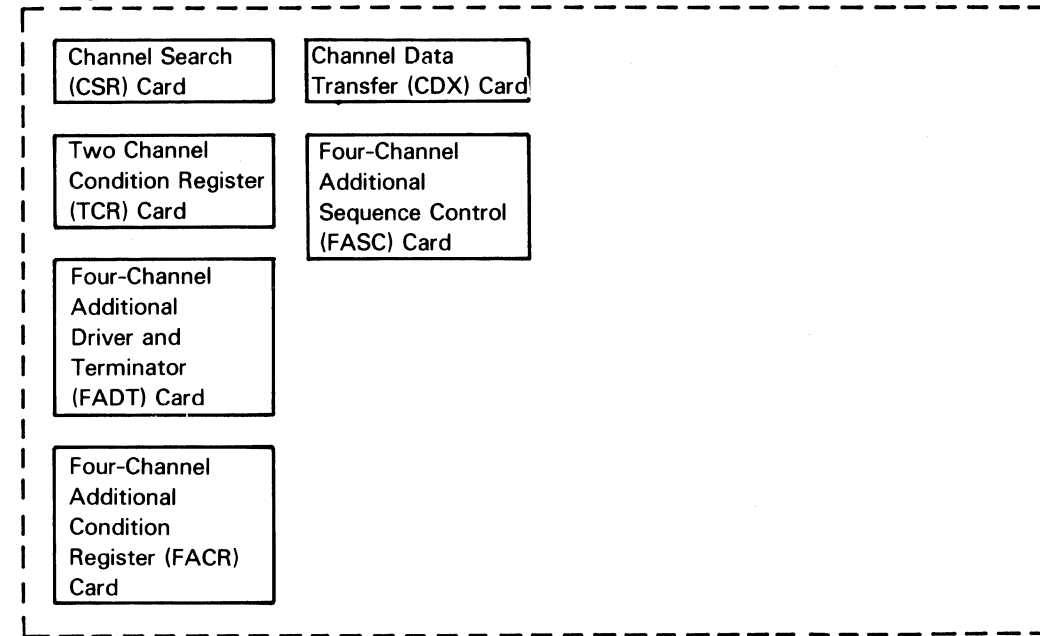
With the two-channel switch pair, additional feature, an additional board is required for each storage director; A4 for storage director 1, and A3 for storage director 2. The cards required for this feature, and the boards on which they are located, are shown in the figure.



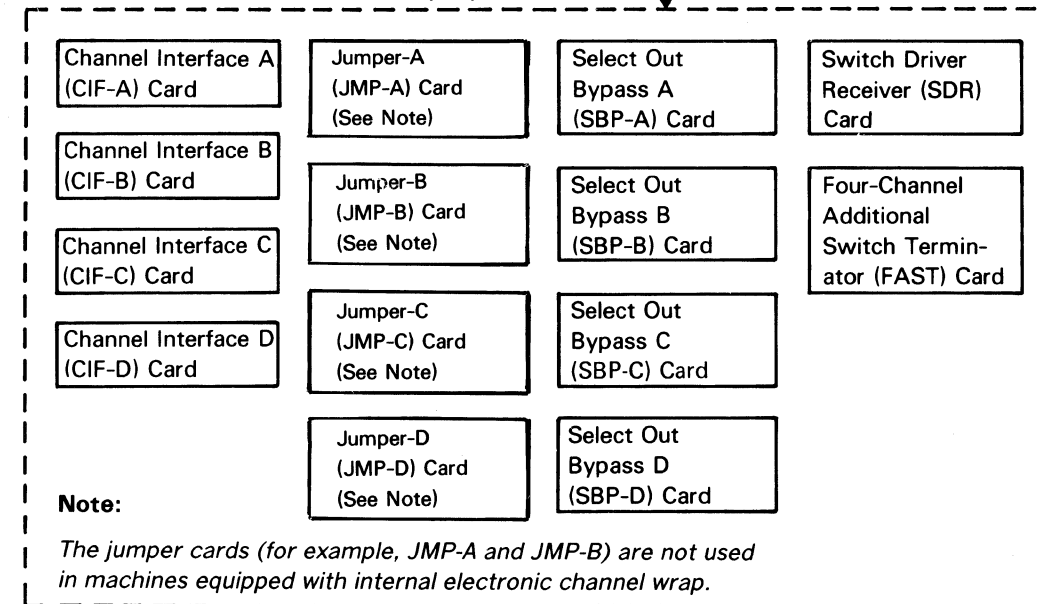
Eight Channel Switch Feature

The eight-channel switch feature is named the four-channel additional (FCA) in the maintenance documentation.

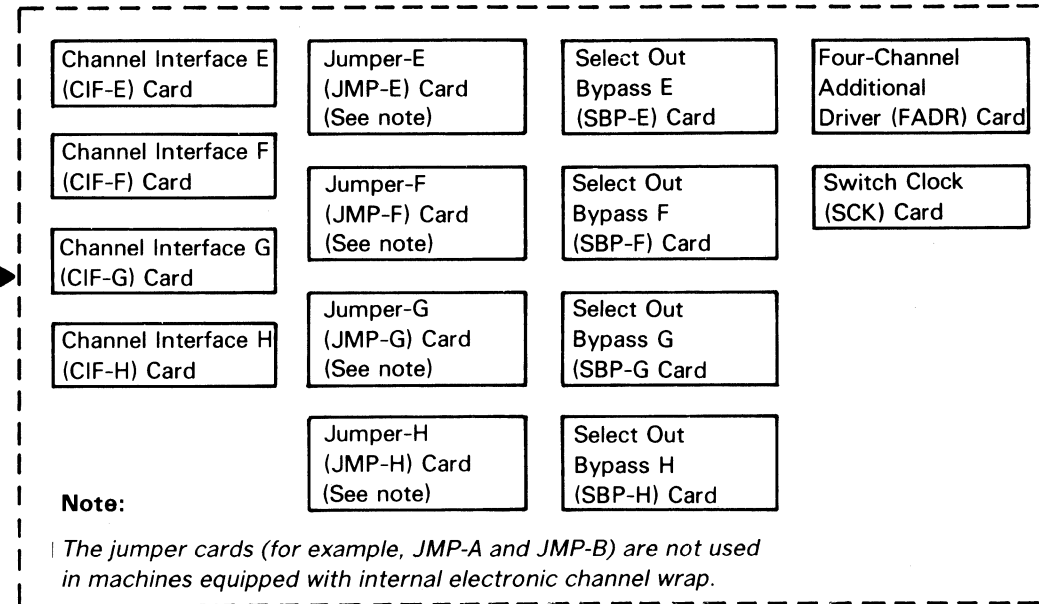
Storage Director Board B4(B3)



Two-Channel Additional Board A4(A3)



Four-Channel Additional Board A2(A1)



3880 MIM	AC0047 Side 2 of 2	2290994 Part No.	450906 15Aug80	450909 12Feb82	450910 14May82		
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STORAGE DIRECTOR FUNCTIONAL AREAS

The 3880 Storage Control contains functional areas either unique to each storage director or shared by both storage directors.

UNIQUE FUNCTIONAL AREAS

Each storage director in the 3880 Storage Control contains the following unique functional areas.

- Channel interface
- Data buffer
- Control interface
- Control
- Maintenance connection

See INTRO-55 for detailed information on unique functional areas.

Channel Interface

The channel interface (CHL-I) functional area:

- Transfers data between the channel and the data buffer functional area
- Sends control information from the channel to the control functional area
- Detects and informs the control functional area of the status of the control information lines

Data Buffer

The data buffer (DBFR) functional area provides a 512-byte buffer in machines without the speed matching buffer features and a 16-K or 32K-byte buffer in machines with the speed matching buffer for 3375 feature or 3380 feature.

The data buffer functional area transmits data between the channel interface and the following functional areas:

- Control interface
- Control

Control Interface

Two control interfaces are available on the 3880:

- A unidirectional (2-cable) bus in/out, tag in/out
- A bidirectional bus/tag

The control interface (CTL-I) functional area:

- Transmits data between the data buffer functional area and the attached device

- Sends control information from the control functional area to the attached device
- Detects and informs the control functional area of the status of the control information lines

Control

The control (CTRL) functional area controls the operation of the following functional areas:

- Data buffer
- Control interface
- Maintenance connection

Maintenance Connection

The maintenance connection (MNT-C) functional area:

- Connects the maintenance device to a storage director
- Supplies a storage director-to-storage director connection for transmitting sense data from a failing storage director to the channel interface

Part of the maintenance connection is shared by each storage director.

SHARED FUNCTIONAL AREAS

The following shared functional areas, as well as a part of the maintenance connection, are common to each storage director:

- Diskette drive
- Operator and power switch panels
- Power

Diskette Drive

The diskette drive contains the functional diskette. The functional diskette contains the functional and diagnostic microcode and the functional microcode loader (see the CARR section for details).

Operator And Power Switch Panels

OPERATOR PANEL

The operator panel contains:

- The subsystem Power On/Off switch for the 3880 Storage Control
- The channel Enable/Disable switches that connect each channel to a storage director

See the PWR section for a more detailed description of the operator panel.

POWER SWITCH PANEL

The power switch panel contains:

- The Power Select switch that is either in the Remote or Local position.
- The Device Power Sequencing switch that controls the power-on sequencing to the devices attached to the 3880.
- The Maintenance Power On switch that turns ac power on to the 3880.
- The Power System switch that controls the storage directors power supply during maintenance and resets the Power Check indicator.
- The Storage Director 1 switch that controls dc power to storage director 1.
- The Storage Director 2 switch that controls dc power to storage director 2.

See the PWR section for a more detailed description of the power switch panel.

Power

The power functional area supplies primary and secondary power to the 3880 Storage Control and to each storage director.

Power-on and power-off sequences are controlled by the power sequencer and monitor located on the maintenance board (see the PWR section for details).

CHANNEL INTERFACE

The channel interface (CHL-I) functional area contains the following cards:

- Channel interface A and B
- Channel interface C and D (TCA and FCA)
- Channel interface E, F, G, and H (FCA)
- Channel data transfer
- Channel search
- Channel sequence control
- Switch clock (TCA and FCA)
- Two-channel additional condition register (TCA only)
- Two-channel additional driver terminator (TCA only)
- Two-channel condition register
- Select out bypass A and B
- Select out bypass C and D (TCA and FCA)
- Select out bypass E, F, G, and H (FCA)
- Switch driver receiver
- Switch driver terminator (TCA and FCA)

Channel Interface Cards

Each channel interface (CIF) card contains:

- Channel drivers and receivers
- Storage director address switches
- Address comparator
- Bus out deskew register
- Bus in deskew register
- Longitudinal redundancy check register

Card A is for the basic machine and card B is added by the two-channel switch pair feature.

Cards C and D are added by the two-channel additional feature.

Cards E, F, G, and H are added by the eight-channel feature.

Channel Data Transfer Card

The channel data transfer (CDX) card controls the:

- Sequence of tag-in and tag-out lines
- Speed of data transfer

The CDX card contains the:

- Channel bus out register
- Speed control register

Channel Search Card

The channel search (CSR) card contains:

- Channel count high register
- Channel count low register
- Channel transfer control register
- Channel bus in register
- Byte compare circuit
- Longitudinal redundancy check circuit

Channel Sequence Control Card

The channel sequence control (CSC) card contains the:

- Channel select circuits
- External register address decoder
- Disconnect-in circuits
- Channel status 1, 2, and 3 registers
- Channel control 1 and 2 registers
- Chaining control circuits
- Data streaming channel select switches

Four-Channel Additional Sequence Control Card

With the eight-channel switch feature (four-channel additional), the CSC card is replaced by the four-channel additional sequence control (FASC) card. This card performs the same functions as the CSC card, but also performs them for the additional channels.

Switch Clock Card

The switch clock (SCK) card provides timing pulses to the CIF-A, B, C, and D cards. The SCK card is only added by the two-channel additional feature.

Two-Channel Additional Condition Register Card

The two-channel additional condition register (TACR) card contains channel condition registers (CR) 0, 1, 2, 3, and 6.

A storage director contains one TACR card for the CIF-C and the CIF-D cards.

Four-Channel Additional Condition Register Card

With the eight-channel switch feature (four-channel additional), the TACR card is replaced by the four-channel additional condition register (FACR) card. With the FACR card installed, each channel condition register contains six bits, 2 through 7. Bits 2 through 7 control channels C through H, respectively.

The FACR card receives signals from the FASC card, converts them from a 3-volt to a 5-volt level, and sends them to the SDR and four-channel additional switch terminator (FAST) cards on the A4(A3) board.

A storage director contains one FACR card for the CIF-C through CIF-H cards.

Two-Channel Additional Driver Terminator Card

The two-channel additional driver terminator (TADT) card receives signals from the following cards on the A3 board:

- Channel sequence control (CSC)
- Switch driver receiver (SDR)
- Switch driver terminator (SDT)

The TADT card contains resistors that terminate the signal lines connecting the TACR and TADT cards on the B3 board to the SDR and SDT cards on the A3 board.

Four-Channel Additional Driver Terminator Card

With the eight-channel switch feature (four-channel additional), the TADT card is replaced by the four-channel additional driver terminator (FADT) card.

The FADT card receives signals from the SDR card and the FAST card on the two-channel additional board, converts them from a 3-volt level to a 5-volt level, and sends them to the four-channel additional sequence control (FASC) card.

The FADT card also receives signals from the FASC card, converts them from a 3-volt level to a 5-volt level, and sends them to the SDR card and FAST cards on the two-channel additional board.

The FADT card contains resistors that terminate the signal lines connecting the FACR and FADT cards on the storage director boards.

Two-Channel Condition Register Card

The two-channel condition register (TCR) card:

- Generates request in
- Receives suppress out

The TCR card contains the channel condition registers (CR) 0, 1, 2, 3, and 6.

Select Out Bypass Cards

Each select out bypass (SBP) card contain circuits that:

- Trap the select-out or the select-in bypass signal
- Determine the storage director selection priority

There is one SBP card for each channel connected to the 3880 Storage Control.

Card A is for the basic machine and card B is added by the two-channel switch pair feature.

Cards C and D are added by the two-channel additional feature.

Cards E, F, G, and H are added by the eight-channel feature.

Switch Driver Receiver Card

The switch driver receiver (SDR) card receives signals from the CIF-A and B cards and sends the signals to the TACR and TADT cards on the B3 board.

The SDR card also receives signals from the TACR and TADT cards on the B3 board and sends them to the CIF-A and B cards.

Four-Channel Additional Switch Driver Receiver Card

With the eight-channel switch feature (four-channel additional), the four-channel additional driver and receiver (FADR) card is installed in addition to the SDR card. The SDR card is on the two-channel additional board and the FADR card is on the four-channel additional board.

The FADR card receives signals from the CIF-A, B, E, and F cards, converts them from a 3-volt level to a 5-volt level, and sends them to the FACR card and to the FADT card on the storage director board.

The FADR card also receives signals from the FACR and FADT cards on the storage director board, converts them from a 5-volt to a 3-volt level, and sends them to the CIF-A, B, E, and F cards.

AC0050	8498498	See EC	450907	450908	450913	
Side 2 of 2	Part No.	History	10Dec80	15Apr81	12Jan83	

Switch Driver Terminator Card

The switch driver terminator (SDT) card receives signals from the CIF-C and D cards and sends them to the TACR and TADT cards on the B3 board.

The SDT card also receives signals from the TACR and TADT cards on the B3 board and sends them to the CIF-C and D cards.

The SDT card contains resistors that terminate the signal lines connecting the SDR and SDT cards on the A3 board to the TACR and TADT cards on the B3 board.

Four-Channel Additional Switch Terminator

With the eight-channel switch feature (four-channel additional), the SDT card is replaced by the four-channel additional switch terminator (FAST) card.

The FAST card receives signals from the FACR and FADT cards, converts them from a 3-volt level to a 5-volt level, and sends them to the CIF cards.

DATA BUFFER

The data buffer (DBFR) functional area contains the automatic data transfer (ADT) card.

Automatic Data Transfer Card

The automatic data transfer (ADT) card is used in machines with a 20 card position B3- and B4-board. This card contains the following:

- Data buffer
- Longitudinal redundancy check (LRC) circuits
- Buffer (BFR) register
- Buffer ALU pointer (BAP)
- Buffer input pointer (BIP)
- Buffer output pointer (BOP)
- Buffer increment (BFI) register
- Check (CHK) register
- Data transfer control (DXC) register
- Transfer complete status (XCS) register
- Transfer error status (XES) register
- External register address decoder

Automatic Data Transfer Multiplexer Card

The automatic data transfer multiplexer (ADTM) card controls the flow of data to and from the automatic data transfer control (ADTC) card over the two bidirectional buses: Channel DXR Bus and Device DXR Bus.

In machines having B3- and B4-boards with only 20 card positions, the buses are organized differently, so that the multiplexing function is not required.

Automatic Data Transfer Control Card

The automatic data transfer control (ADTC) card transfers data between the channel search (CSR) card and the director-to-device controller (DDC) card during automatic data transfer. The ADTC card also sends data from the data buffer to the microcontroller.

In machines having B3- and B4-boards with only 20 card positions, a single card - the ADT card - performs the function of the ADTC and ADTM cards.

SPEED MATCHING BUFFER

There are two speed matching buffers for the 3880:

- A 16 K x 9-bit buffer for the 3375 (SMBU)
- A 32 K x 9-bit buffer for the 3380 (SMB)

The speed matching buffer, when installed, replaces the data buffer cards with the following:

- Data transfer address card
- Data transfer data card
- Buffer card 1 (3375 and 3380)
- Buffer card 2 (3380 only)

Data Transfer Address Card

The data transfer address (DXA) card generates addresses for storing into and fetching from the speed matching buffer. In addition, the DXA card contains the following internal registers:

- Control:
 - Data transfer control (DXC)
- Sense:
 - Transfer complete status (XCS)
 - Transfer error status (XES)
 - Check (CHK)
 - Toggle, FRU register (TFR)

Data Transfer Data Card

The data transfer data (DXD) card transfers data between the the buffer and the channel or between the buffer and the device. It performs the following operations:

- Transfers data to or from a device or channel.
- Matches data transfer speeds between a device and a channel.
- Edits data fields in the data stream during data transfer.

The DXD card is used during the 3880 Read, Write, and Search operations.

Buffer Cards

Each buffer card provides 16 K x 9 bits of storage. Two cards (BFR-1 and BFR-2) form a 32 K-byte speed matching buffer (SMB) for storing data being transferred between the channel and 3380 devices.

The speed matching buffer for the 3375 (SMBU) uses a single buffer card (BFR-1).

CONTROL INTERFACE

The control interface (CTL-I) functional area contains the following cards:

- Director-to-device controller
- Device counter

Director-to-Device Controller Card

The director-to-device controller card contains the:

- Device bus in register and device bus out register
- Device tag in register and device tag out register
- Device tag gate register

There are two types of director-to-device controller cards:

- Director-to-device controller, unidirectional (DDCU or DDC) 2-cable bus in/out and tag in/out
- Director-to-device controller, bidirectional (DDCV) bus/tag

Device Counter Card

The device counter (DCT) card contains the:

- Device count high and the device count low registers
- Maintenance control and/or sense register
- Address decoder for control interface external registers
- Pad counter register
- Storage director identification (ID) switches

CONTROL

The control functional area contains the following cards:

- Storage director microcontroller
- Static control storage 1 and 2
- Dynamic control storage
- Dynamic refresh control
- Clock

Storage Director Microcontroller Card

The storage director microcontroller (SDM) card contains the:

- Microcontroller
- Internal registers
- Internal register group register
- Interrupt levels

- Read-only storage

High Density Static Control Storage 1 and 3 Cards

Each high density static control storage (HDSCS) card contains microcode routines and control information that need quick execution.

The HDSCS-3 (or static control storage, SCS-3) card in B4(B3) T2 is not used in all models and versions of the 3880. See the Maintenance Diagram Manual (MDM) volume R3X Card Plug Charts to verify that this card is used in the machine that is being repaired.

Note: *On machines without high density static control storage (HDSCS), two static control storage cards, SCS-1 and SCS-2, in the B4(B3) R2 and S2 positions, perform the function of the HDSCS-1*

Dynamic Control Storage and Refresh

The dynamic control storage and refresh (DCSR) card is used to store functional microcode routines and control information not requiring high-speed execution. The DCSR card provides for the storage of 16K two-byte words. This storage must be periodically refreshed, and refresh timing and address generation circuits are contained on the card for this purpose.

The DCSR card has error detection and correction circuits enabling it to correct single bit errors.

The DCSR card performs the following functions:

- Array timing and data strobing
- Refresh address generation
- Refresh timing
- Address parity checking
- Error detection and correction

When an address parity check is detected, the DCSR card activates the CS Address Check line. When an uncorrectable data check is detected, the DCSR card activates the Uncorrectable Data Check line. The DCSR card also checks for the correct key bit during a Write operation and activates Key Bit Check if the key is not correct. This card is used in machines with a 22 card position B3/B4 board.

Note: *On early machines, two separate cards perform most of the functions of the dynamic control storage and refresh (DCSR) card: the dynamic control storage (DCS) card and the dynamic refresh control (DRC) card.*

Clock Card

The clock (CLK) card generates the storage director clock pulses. The clocks are hardware controlled to permit selective starting and stopping of the various functional areas.

MAINTENANCE CONNECTION

The maintenance connection (MNT-C) functional area contains the following cards:

- Maintenance
- Maintenance device adapter control
- Maintenance device adapter register
- Driver receiver 1
- Driver receiver 2

Maintenance Card

A maintenance (MNT) card is located on each storage director board and contains the:

- Command decoder
- External register address decoder
- Field-replaceable unit registers 1 through 4
- Check registers 1 and 2
- Maintenance control register
- Initial microcode load register
- External bus in register
- External bus out register
- Interrupt level register
- Maintenance sense register
- Diskette load control switches

Maintenance Device Adapter Control Card

The maintenance device adapter control (MDAC) card is located on the maintenance board and contains the:

- Initial microcode load selection register
- Initial microcode load busy register
- Storage director-to-storage director gate generator
- Diskette drive access driver control
- Storage director-to-maintenance device data, control, and status drivers
- Maintenance device-to-storage director data, control, and status drivers

- MDAC-to-MDAR control drivers

Maintenance Device Adapter Register Card

The maintenance device adapter register (MDAR) card is located on the maintenance board and contains the:

- MD serializer/deserializer
- Command register
- Control registers 1, 2, and 3
- External bus in register
- Address compare registers 1 and 2
- Address comparator
- Error and status registers

Driver Receiver 1 Card

The driver receiver 1 (DRR-1) card contains drivers and receivers that gate the external bus in and the external bus out lines to storage director 1.

When the maintenance device is not logically connected to storage director 1, the DRR-1 card sends storage director 1 status information to storage director 2 and receives status information about storage director 2.

Driver Receiver 2 Card

The driver receiver 2 (DRR-2) card contains drivers and receivers that gate the external bus in and the external bus out lines to storage director 2.

When the maintenance device is not logically connected to storage director 2, the DRR-2 card sends storage director 2 status information to storage director 1 and receives status information about storage director 1.

Channel switching and device reservation are made under control of the system programs. The first channel to activate the Select Out line switches the channel interface circuitry to that channel. The next channel receives Control Unit Busy if it attempts to activate Select Out.

The switch returns to neutral when the channel disconnects unless Unit Check occurs (contingent connection).

The Device Reserve command sets indicators to reserve a drive for the exclusive use of one channel. All devices can be reserved. The Device Release command resets the reserve indicators to a zero value.

A device address reserved to one channel or being used by one channel presents Device Busy status to another channel if selection is attempted.

TWO-CHANNEL SWITCH PAIR FEATURE

The two-channel switch pair feature enables two channels, channels A and B, to share a storage director. The feature allows individual drives to be reserved for the exclusive use of either channel.

The channels can be attached to the same or a different processing unit.

TWO-CHANNEL SWITCH PAIR, ADDITIONAL FEATURE

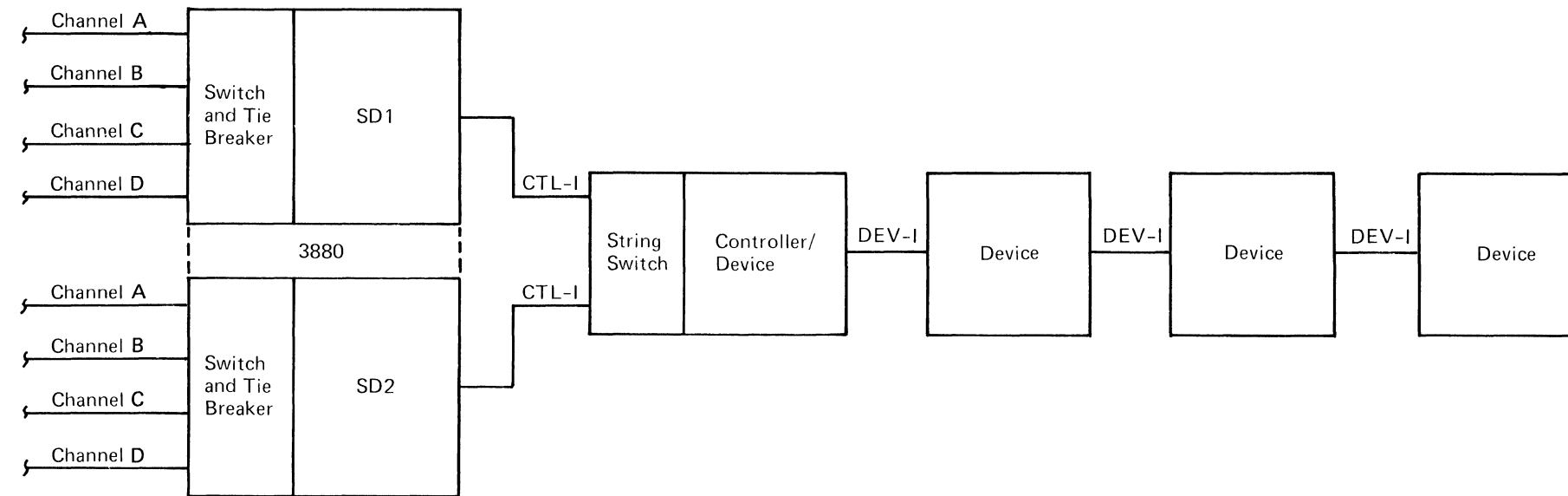
The two-channel switch pair, additional feature enables channels A, B, C, and D to share a storage director. The feature allows individual drives to be reserved for the exclusive use of one of the channels.

The channels can be attached to the same or a different processing unit.

EIGHT-CHANNEL SWITCH FEATURE

The eight-channel switch feature (four-channel additional) adds channels E, F, G, and H to the 3880. This feature provides a total of eight channels that are shared by both storage directors. The feature allows individual drives to be reserved for the exclusive use of one of the channels.

The channels can be attached to the same or a different processing unit.



Note: This example shows the 3880 with two-channel switch pair, additional feature.

3880	AC0065	8498352	450900	450901	450906	450907	
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The channel interface provides a common connection between the channel and the storage directors. Selection lines are routed serially through each storage director to allow sequential connection to the channel. The information format and signal sequence are common to all storage directors.

The storage director remains attached to the interface until it transfers all information or until the channel signals to disconnect.

The storage control is designed to be used with the block multiplexer channels. In a block multiplex operation, the channel forces burst mode until Channel End time, but does not force burst mode between Channel End and Device End. The channel, by deactivating Select Out, allows the storage director to disconnect following the presentation of Channel End alone even though command chaining is indicated.

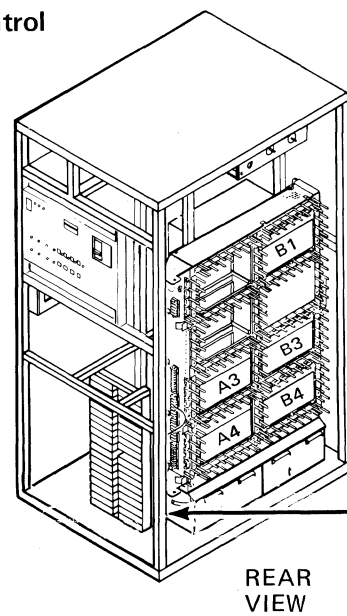
Operating on a block multiplexer channel in selector mode, when chaining, the channel remains selected until both Channel End and Device End are received.

Channel B is added by the two-channel switch pair feature.

Channels C and D are added by the two-channel switch pair, additional feature.

Channels E through H are added by the eight-channel switch feature.

Storage Control



**Model 1 Control Interface Connectors
Connector Locations – 1, 2 or 4 Channels**

	Storage Director 1	Storage Director 2	
CTL-I	BUS	BUS	CTL-I
	TAG	TAG	
CHANNEL A	BUS IN	BUS IN	CHANNEL A
	TAG IN	TAG IN	
	BUS OUT	BUS OUT	
	TAG OUT	TAG OUT	
CHANNEL B	BUS IN	BUS IN	CHANNEL B
	TAG IN	TAG IN	
	BUS OUT	BUS OUT	
	TAG OUT	TAG OUT	
CHANNEL C	BUS IN	BUS IN	CHANNEL C
	TAG IN	TAG IN	
	BUS OUT	BUS OUT	
	TAG OUT	TAG OUT	
CHANNEL D	BUS IN	BUS IN	CHANNEL D
	TAG IN	TAG IN	
	BUS OUT	BUS OUT	
	TAG OUT	TAG OUT	

Tailgate viewed from inside the machine.

Connector Locations – 8 Channels

	Storage Director 1	Storage Director 2	
CTL-I SD1	BUS	BUS	CTL-I SD2
	TAG	TAG	
CHANNEL A	BUS IN	BUS IN	CHANNEL E
	TAG IN	TAG IN	
	BUS OUT	BUS OUT	
	TAG OUT	TAG OUT	
CHANNEL B	BUS IN	BUS IN	CHANNEL F
	TAG IN	TAG IN	
	BUS OUT	BUS OUT	
	TAG OUT	TAG OUT	
CHANNEL C	BUS IN	BUS IN	CHANNEL G
	TAG IN	TAG IN	
	BUS OUT	BUS OUT	
	TAG OUT	TAG OUT	
CHANNEL D	BUS IN	BUS IN	CHANNEL H
	TAG IN	TAG IN	
	BUS OUT	BUS OUT	
	TAG OUT	TAG OUT	

Tailgate viewed from inside the machine.

The two following diagrams show the control interface cable connectors for the 3880 Models 2 and 3.

Model 2 Control Interface Connectors

	Storage Director 1	Storage Director 2	
CTL-I	BUS	NOT USED	CTL-I
	TAG	BUS/TAG	
CHANNEL A	BUS IN	BUS IN	CHANNEL A
	TAG IN	TAG IN	
	BUS OUT	BUS OUT	

Model 3 Control Interface Connectors

	Storage Director 1	Storage Director 2	
CTL-I SD1	NOT USED	NOT USED	CTL-I SD2
	BUS/TAG	BUS/TAG	

DESCRIPTION OF TAG OUT LINES

Information on the bus out lines is identified. This information remains active until an inbound tag responds.

Operational Out

Operational Out gates all outbound tag lines and is activated with processing unit power on reset. Operational Out is deactivated by the channel for system reset.

Hold Out

Hold Out controls the effect of Select Out, allowing additional channel control of polling. Hold Out is deactivated while Select Out is active which causes the polling sequence to be terminated.

Select Out

Select Out is used to select or poll a storage director. Selecting a storage director means activating Select Out and Address Out. Polling a storage director means activating Select Out without Address Out.

Select Out is connected serially through each storage director. Selection priority is determined by internal jumpering of a priority card in a storage director. If selected, a storage director activates Operational In. If not selected, Select Out is propagated to the next storage director.

Address Out

Address Out identifies information on bus out as being a device address. Deactivating Select Out while Address Out is active forces a Halt I/O and the storage director disconnects from the interface.

Command Out

Command Out identifies information on bus out as a command. Command Out terminates the current operation when used as a response to Service In/Data In.

Command Out causes a storage director to stack status when used as a response to Status In.

Service Out

Service Out indicates the channel has accepted data on Bus In (read operation).

Service Out indicates the channel has provided, on Bus Out, the data requested by Service In (write operation).

Service Out signals a storage director that status was accepted when used as a response to Status In.

Data Out

Data Out indicates the channel has accepted data on Bus In (read operation).

Data Out indicates the channel has provided, on Bus Out, the data requested by Data In (write operation).

Bus Out

Bus Out transfers data, control, or address information to the processing unit.

Bus Out signals are valid from the activation of the identifying outbound tag to the activation of the responding inbound tag.

Suppress Out

Suppress Out is used alone or with another tag to suppress status, suppress data transfer, chain command control, or cause a selective reset.

3880 MIM	AC0065 Side 2 of 2	8498352 Part No.	450900 13Jul79	450901 14Sep79	450906 15Aug80	450907 10Dec80	.
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CHANNEL INTERFACE

DESCRIPTION OF THE TAG IN LINES

Information on the bus in lines is identified. This information remains active until an outbound tag responds.

Request In

Request In invokes a reselection sequence from the channel. Request In is controlled by microcode.

Request In indicates the storage director is ready to present status.

Concurrent Request Ins from two or more storage directors are resolved by the channel.

Select In

Select In is the return path for Select Out. Select In indicates to the channel that a storage director was not selected (all storage directors propagated Select Out).

Operational In

Operational In signals the channel that a storage director is selected and prevents another storage director from connecting to the interface (blocks the propagation of Select Out).

Operational In remains active until all required information is transferred.

Address In

Address In identifies information on bus in as being the device address.

Status In

Status In identifies information on Bus In as a status byte. Status In remains active until the channel activates Service Out (accept) or Command Out (stack).

Service In

Service In signals the channel when the selected device wants to transmit or receive data.

Service In remains active until the channel responds with Service Out, Command Out, or Address Out.

Data In

Data In signals the channel when the selected device wants to transmit or receive data.

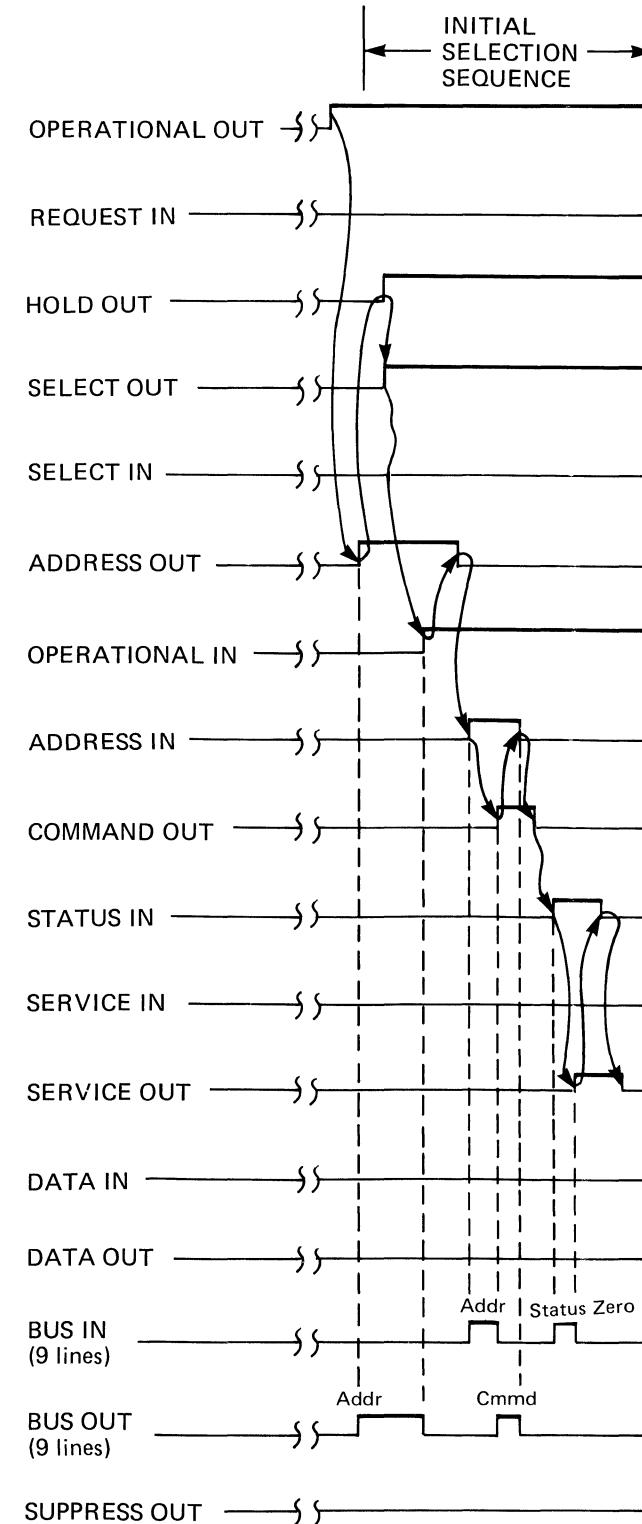
Data In remains active until the channel responds with Data Out, Command Out, or Address Out.

Bus In

Bus In transfers address, status, or data information to the channel.

Bus In signals are valid from 100 ns after the activation of an identifying inbound tag to the activation of the responding outbound tag.

Bus In signals are valid only when Operational In is active in control unit (CU) busy sequence.



3880 MIM	AC0071	8498353	450900	450901	450907	450915	.
	Side 1 of 2	Part No.	13Jul79	14Sep79	10Dec80	14Oct83	.

See INTRO 77 and 78 for the bidirectional bus. The control interface (CTL-I) is the communication link between the microcode and the device.

The CTL-I consists of the logic, board wiring, tri-leads, cables, and connectors required to perform the following:

- Transform bits in general purpose registers into signals on the interface cable to the device
- Receive signals placed on the interface cable by the device and gate them to the general purpose registers or convert them to branch conditions for use by the microcode
- Control operations that require communications between the storage director and the device
- Detect malfunctions during CTL-I operations and notify the microcode by setting the check 2 error

Two types of control interface are available for the 3880:

- A unidirectional, 2-cable bus in/out, tag in/out
- A bidirectional bus/tag

OUTBOUND LINES

Bus Out

Bus Out transmits one byte of data (bits 0-7,P). When Sync Out is present, Bus Out transmits write data to the device.

When Tag Gate is present, Bus Out transmits command information and tag modifiers.

Data must be valid before activating Sync Out, as the device may take the byte on Bus Out immediately.

Command information and tag modifiers must be valid before activating Tag Gate.

Tag Bus

The standard tag bus is six lines to the device (five bits plus parity).

When Tag Gate is present, the Tag Bus transmits control or instruction information to the device to define the operations to be performed.

Tag Gate

Tag Gate indicates to the device the presence of control or instruction information on the Tag Bus, and the presence of tag modifiers on Bus Out.

Sync Out

On a write data operation, Sync Out indicates to the device the presence of write data on Bus Out. On a read data operation, Sync Out indicates to the device when each data byte was received.

Response

Response indicates to the device the presence of Normal End or Check End on an extended operation.

Recycle

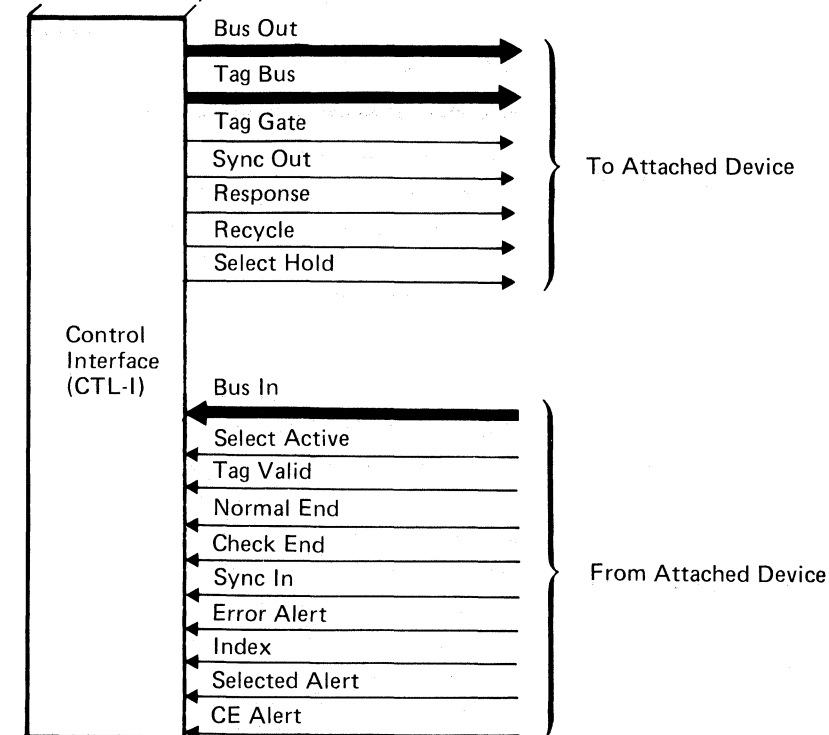
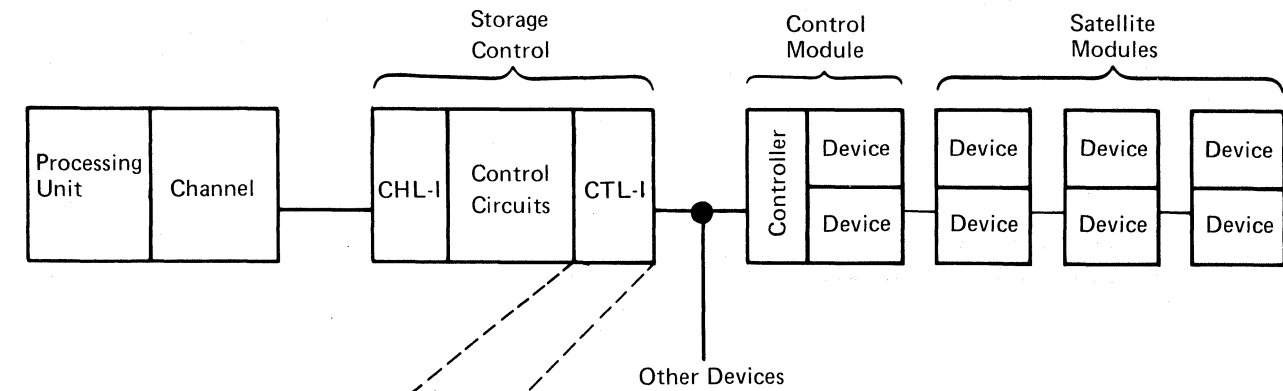
During a read, write, or error checking and correction operation, the storage control uses a 16-bit counter to indicate the number of bytes of data remaining to be transferred. The device also contains a byte counter, but it is only four bit-positions wide.

Recycle is used to inform the device that it should recycle its byte counter when it reaches zero because there are more bytes to be transferred. If Recycle is not active when the device counter reaches zero, the device initiates an end operation by raising Normal End or Check End.

At the beginning of a data transfer operation, the CTL-I byte counter is loaded with the number of bytes to be transferred, then the Recycle latch is set. Each time a byte of data is transferred, the byte counter is decremented. When the count reaches seven, the Recycle latch resets.

Select Hold

Select Hold is activated during any selection sequence. It remains active to maintain selection of the device and cannot deactivate until either Normal End or Check End signals that the last operation to be performed on the device was received and acknowledged.



3880 MIM	AC0071	8498353	450900	450901	450907	450915	.
	Side 2 of 2	Part No.	13Jul79	14Sep79	10Dec80	14Oct83	.

INBOUND LINES

Bus In

When Sync In is present, Bus In transmits read data from the device. Bus In transmits one byte of data (bits 0-7,P).

When Normal End is present, Bus In transmits a single byte describing the state of the device.

When Check End is present, Bus In transmits error information from the device.

When Tag Valid is present, Bus In transmits a byte of information from the device.

Select Active

Select Active activates as a result of a selection sequence to indicate to the CTL-I that the selected device is online to the storage control.

Select Active remains active to indicate proper selection as long as Select Hold is active and as long as selection of a device is correctly maintained by the controller.

Tag Valid

Tag Valid indicates to the CTL-I a response to Tag Gate and that proper reception of the Tag Bus and Bus Out was received.

Normal End usually is generated with Tag Valid, but Check End may result if Tag Bus and Bus Out could not be decoded properly.

When Tag Valid is present, Bus In may have information for the CTL-I to receive.

Normal End

Normal End indicates to the CTL-I that the normal ending point of an operation has been reached with the expected results being present.

Normal End activates with or before Tag Valid if the end of the operation is concurrent with tag acceptance (immediate operation). For the type of operation that causes the end condition to be reached after Tag Valid is activated (extended operation), Normal End must not be indicated until Tag Gate is absent. Information may be placed on Bus In with the activation of Normal End.

Check End

Check End indicates to the CTL-I that an abnormal end condition exists.

The abnormal condition is presented on Bus In. Bus In must have correct parity (odd) during the time that Check End is active.

The abnormal condition is presented in place of a Normal End sequence. Check End must remain active and Bus In must maintain valid parity (odd) until either (1) Tag Gate deactivates or (2) Response activates to acknowledge receipt of the status information on Bus In.

Sync In

On a read data operation, Sync In indicates to the CTL-I the presence of read data on Bus In.

On a write data operation, Sync In indicates to the CTL-I when each data byte was received.

Error Alert

Error Alert indicates to the CTL-I an error from the selected device. Error Alert is accepted by the CTL-I at any time.

Index

Index indicates to the CTL-I the index time of the selected device.

Selected Alert

Selected Alert indicates to the CTL-I that the execute switch is transferred in a controller. Normally this causes a polling sequence by the storage control to find out which device made the request.

CE Alert

CE Alert indicates to the CTL-I that the CE is using a particular device.

3880	AC0076	8498354	450900	450901	450907	.	.
MIM	Side 1 of 2	Part No.	13Jul79	14Sep79	10Dec80	.	.

The control interface (CTL-I) connects a storage director to a 3380 controller. The controller is connected to the storage director through the director-to-device controller (DDC) cable. The DDC cable contains 48 wires that are divided into 24 pairs. Each pair of wires carries one differential signal and are twisted together to suppress electromagnetic interference from the environment.

The control interface carries two bytes of read or write data.

BUS OUT / IN

The bus out/in lines carry signals from the storage director to a controller or from a controller to the storage director. The direction of the signals is determined by the operation.

Bus Out/In Byte 0 Bits 0-7,P

The Bus Out/In Byte 0 Bits 0-7,P lines carry:

- Read or write data between a controller and the storage director
- Control information from the storage director to the controller

Bus Out/In Byte 1 Bits 0-7,P

The Bus Out/In Byte 1 Bits 0-7,P lines carry:

- Read or write data between a controller and the storage director
- Status information from the controller to the storage director

TAG OUT

The Tag Out Bit 0, 1, and 2 lines carry signals from the storage director to the controller. The storage director uses these lines to:

- Indicate control data is on bus out, byte 0
- Start operational sequences
- Respond to operational sequences
- Respond to a Sync In tag in during a read or write operation

The tag out codes activated by the storage director are:

- 000 - Null Disconnect
- 001 - Select or Sync Out
- 010 - Request Connection Check 1 (RCC1)
- 011 - Selected Null
- 100 - Poll

- 101 - Request Connection Check 2 (RCC2)
- 110 - Hardware Immediate
- 111 - Command Gate or Sync Out Stop

Null Disconnect

Null Disconnect tag out (000) is activated by the storage director to disconnect a selected device.

Null Disconnect tag out is the starting and ending status of the tag out lines before and after all operational sequences.

Select or Sync Out

Select or Sync Out tag out (001) is activated by the storage director to indicate one of the following conditions to the controller:

- A device selection code is on bus out byte 0
- A command modifier code is on bus out byte 0
- The write data requested by a Sync In tag in code is on bus out bytes 0 and 1
- The read data was received and the storage director is ready for more read data

Request Connection Check 1

Request Connection Check 1 (RCC1) tag out (010) is activated by the storage director when an error is detected by either the controller or the storage director.

When a controller senses an error that prevents normal communications with the storage director, it signals the storage director. The storage director then activates the RCC1 tag out to collect error data from the controller.

Note: If the storage director receives no response to an RCC1 tag out, it activates an RCC2 tag out (101). This ensures the collection of error data if the Tag Out Bit 1 line is floating or shorted to an inactive voltage level.

Selected Null

Selected Null tag out (011) is activated by the storage director to indicate that a controller is selected.

Poll

Poll tag out (100) is activated by the storage director to indicate poll sequence has started and the device address is on the bus out byte 0 lines.

Request Connection Check 2

Request Connection Check 2 (RCC2) tag out (101) is activated when the storage director receives no response to an RCC1 tag out.

Hardware Immediate

Hardware Immediate tag out (110) is activated by the storage director to indicate to the controller that an immediate command is on the bus out byte 0 lines. This tag out is preceded by a Null Disconnect and a Poll tag out.

Command Gate or Sync Out Stop

The Command Gate or Sync Out Stop tag out (111) is activated by the storage director to

- Signal the start of a command sequence
- Replace Select or Sync Out tag out

During a normal command sequence, Command Gate tag out signals the controller that a byte of command data is on the DDC bus out byte 0 lines.

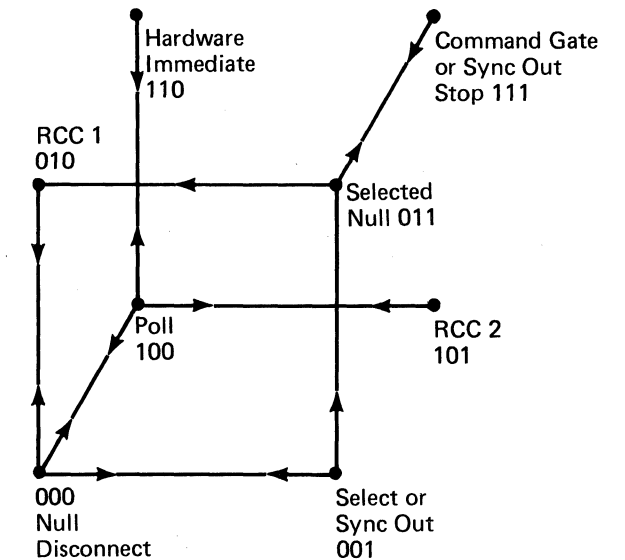
Note: A command sequence is only valid to a selected device.

During a write or read data sequence, Sync Out Stop tag out responds to a Sync In tag in when the remaining byte count equals eight. Seven more Sync Outs follow this Sync Out Stop tag out.

TAG OUT STATUS

The tag out lines change status from code to code in a specific sequence. Only one tag out line changes at one time. If two or more change at the same time, a connection check error is sensed by the controller.

The following figure shows the sequence in which the tag out lines change status.



Note: The only exception is that the RCC1 and the RCC2 states can be entered directly from any other tag out status without causing a Request Connection Check 1.

BIDIRECTIONAL CONTROL INTERFACE

TAG IN

The Tag In Bit 0 and 1 lines carry signals from the controller to the storage director. The controller uses these lines to:

- Indicate control data is on bus out byte 1 lines
- Respond to operational sequences
- Start operational sequences
- Respond to Sync Out tag out during a read or write operation

The tag in codes activated by the controller are:

- 00 - Null or Disconnect
- 01 - Valid or Sync In
- 10 - End Operation (End Op)
- 11 - Selected Null

Null or Disconnect

Null or Disconnect tag in (00) indicates that the controller is not connected.

Valid or Sync In

The Valid or Sync In tag in (01):

- Responds to tag out sequences
- Indicates response data is on bus out byte 1
- Indicates read data is on bus out bytes 0 and 1

During control sequences, Valid tag in indicates to the storage director that the preceding tag out was received and is being executed by the controller. For control sequences that need the controller to send response data to the storage director, Valid tag in indicates the data on the DDC bus out byte 1 lines is the needed response.

During a read data operation, the Sync In tag in indicates that read data bytes are on the DDC bus out bytes 0 and 1 lines.

End Operation

End Operation (End Op) tag in (10) indicates:

- Normal end of an extended operation
- Abnormal end of an extended or immediate operation
- End op status on bus out byte 1

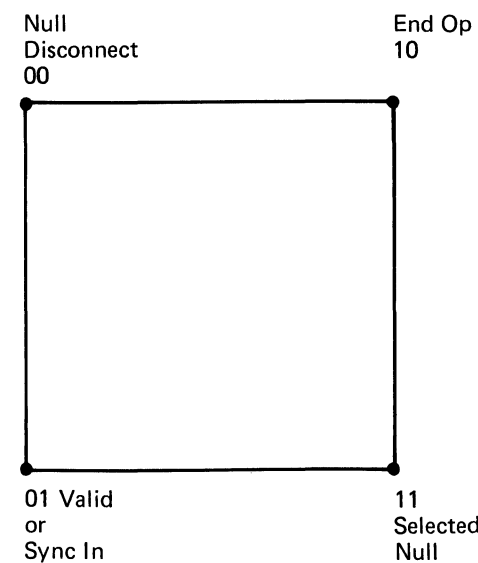
Selected Null

Selected Null tag in (11) indicates that the device is correctly selected and waiting for an operational sequence to continue.

TAG IN STATUS

The tag in lines change status from tag-to-tag in a specific sequence. Only one tag in line can change at one time. If two or more change, a connection check error is sensed by the storage director.

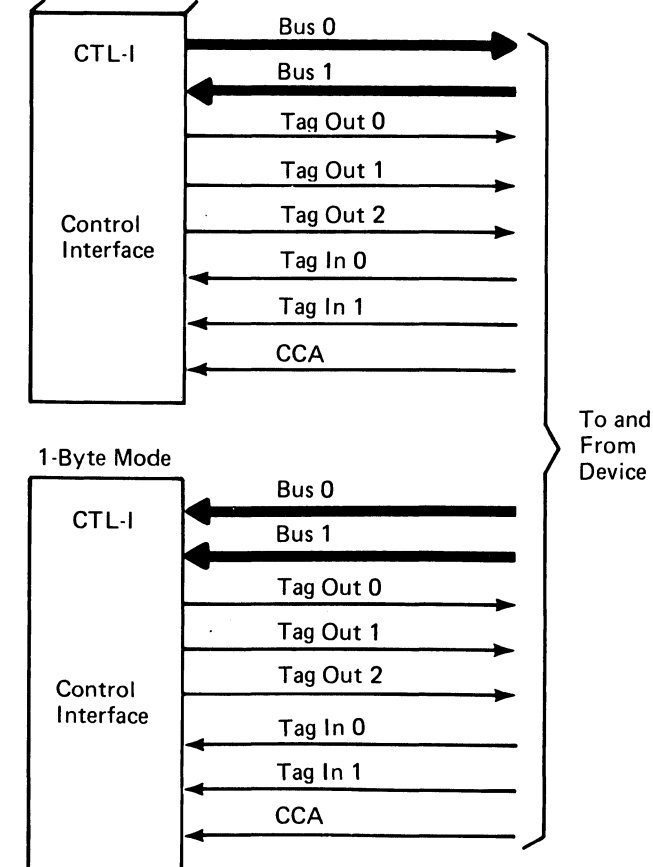
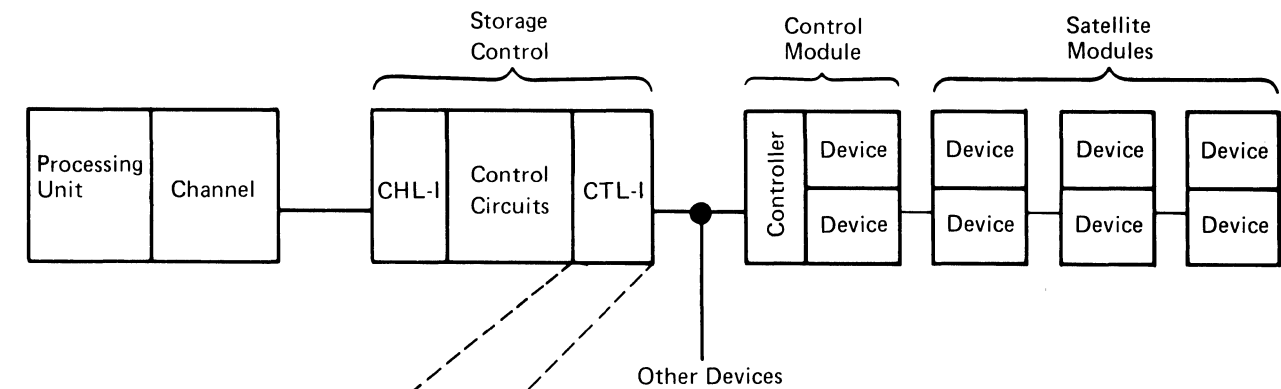
The following figure shows the sequence in which the tag in lines change status.



CONNECTION CHECK ALERT

Connection Check Alert (CCA) indicates to the storage director that the controller sensed a check 1 error.

Activating the CCA line causes the storage director to activate an RCC1 tag out to collect error data from the controller.



The count, key, and data command set is used with the 3330, 3333, 3340, 3344, 3350, 3375, and 3380 consists of control, sense, read, write, and search commands.

CONTROL COMMANDS

Control commands are used to start operations not involving data recorded (or to be recorded) on the disk pack. These operations include positioning the access mechanism and selecting the head.

For most control functions, the entire operation is specified by the command code. If the command code does not specify the entire control function, the data address field of the channel command word (CCW) designates a main storage location containing the additional information.

SENSE COMMANDS

Two sense commands, Sense and Read and Reset Buffered Log, transfer sense bytes of usage/error log information from the device to the channel.

Sense ID transfers device type information to the channel.

READ COMMANDS

Read commands transfer information from the device to the channel. On all read commands, the device checks (by means of correction code bytes) the validity of each area of a record as the record is read from a track. A parity bit is added to each byte as it is sent to the channel.

WRITE COMMANDS

Write commands transfer data from the channel to the device for recording on the disk pack. While writing data on the disk pack, the device appends the appropriate correction code bytes to each count, key, and data field as they are written.

Write commands can be grouped into (1) format write commands, used to establish records and (2) non-format write commands, used to update previously written records.

SEARCH COMMANDS

Search commands transfer a specific number of bytes from the channel to the storage control. The storage control compares these bytes with data read from a track record. When the condition specified in the search command is satisfied, the status modifier bit is set. The status bytes hold the condition of the status modifier bit until that bit is reset.

Type	Command Name
CONTROL	Diagnostic Load (not 3375 or 3380)
	Diagnostic Write (not 3375 or 3380)
	Define Extent
	Locate Record
	No Operation
	Recalibrate
	Restore
	Seek
	Seek Cylinder
	Seek Head
	Set File Mask
	Set Sector
	Space Count
	Set Path Group Identifier (3380)
Transfer In Channel	
SENSE	Device Release
	Device Reserve
	Diagnostic Sense (not 3375 or 3380)
	Diagnostic Sense/Read
	Read and Reset Buffered Log
	Sense
	Sense ID
	Unconditional Reserve
	Sense Path Group Identifier (3380)
READ	Read Count
	Read Count, Key, and Data
	Read Data
	Read Home Address
	Diagnostic Read Home Address
	Read Initial Program Load
	Read Key and Data
	Read Multiple Count, Key, and Data
	Read Record Zero
	Read Sector
	WRITE
Write Count, Key, and Data	
Write Data	
Write Update Data	
Write Update Key and Data	
Write Count, Key, and Data Next Track	
Write Home Address	
Diagnostic Write Home Address	
Write Key and Data	
Write Record Zero	
Write Special Count, Key, and Data	
SEARCH	
	Search Key Equal
	Search ID Equal or High
	Search Key Equal or High
	Search ID High
	Search Key High
	Search Home Address Equal

Note: Additional information about the count, key, and data command set can be found in the IBM 3880 Storage Control Description, GA26-1661.

3880	AC0078	2291002	450907	450908	.	.	.
MIM	Side 2 of 2	Part No.	15Dec80	15Apr81	.	.	.

FIXED BLOCK COMMAND SUMMARY

The fixed block command set is used with the 3370 and consists of control, sense, read, and write commands.

CONTROL COMMANDS

Control commands are used to start operations not involving data recorded (or to be recorded) on the disk pack. These operations include positioning the access mechanism and selecting the head.

For most control functions, the entire operation is specified by the command code. If the command code does not specify the entire control function, the data address field of the channel command word (CCW) designates a main storage location containing the additional information.

SENSE COMMANDS

Two sense commands, Sense I/O and Read and Reset Buffered Log, transfer sense bytes of usage/error log information from the device to the channel.

Sense I/O type transfers device type information to the channel.

Test I/O, which is a programmed instruction and not a CCW, causes the status byte to be sent to the channel in the initial selection sequence.

READ COMMANDS

Read commands transfer information from the device to the channel. On all read commands, the device checks (by means of correction code bytes) the validity of each area of a record as the record is read from a track. A parity bit is added to each byte as it is sent to the channel. The Read command can operate on overflow records and, except for Read IPL, can operate in multitrack mode.

WRITE COMMANDS

Write commands transfer data from the channel to the device for recording on the disk pack. While writing data on the disk pack, the device appends the appropriate correction code bytes to each fixed block field as they are written.

Command Summary

Type	Command Name
CONTROL	Define Extent
	Diagnostic Control
	Locate
	No-Operation
SENSE	Device Release
	Device Reserve
	Diagnostic Sense
	Read and Reset Buffered Log
	Read Device Characteristics
	Sense
	Sense I/O
	Test I/O
Unconditional Reserve	
READ	Read
	Read Initial Program Load (IPL)
WRITE	Write

Note: Additional information about the fixed block command set can be found in the IBM 3880 Storage Control Description, GA26-1661.

CHANNEL INITIATED SELECTION

Initial selection of a storage director is as follows:

1. The channel sends a device address to all storage directors.
2. Each storage director, in order of priority, compares its address to the address sent by the channel.
3. If the addresses compare, the storage director sends its address to the channel.
4. The channel checks to ensure that the address received compares to the address sent.
5. If the addresses compare, the channel sends a command to the storage director.
If the addresses do not compare, the channel turns on Interface Control Check.
6. The storage director accepts the command and sends the status to the channel.
7. If the status is zero, the channel responds with Service Out telling the storage director it is ready for data transfer.
If the status is not zero, the channel places this status into the Channel Status Word (CSW) and notifies the system.

STORAGE DIRECTOR INITIATED SELECTION

The storage director has status information to send to the channel as follows:

1. The storage director activates Request In to the channel.
2. The channel activates Select Out and Hold Out.
3. The storage director prevents propagation of Select Out, deactivates Request In, activates Operational In and Address In, and sends a device address on Bus In.
4. The channel saves the device address and activates Command Out.
5. The storage director deactivates Address In.
6. The channel deactivates Command Out.
7. The storage director sends the status on Bus In and activates Status In.
8. The channel stores the status, activates Service Out, and deactivates Select Out and Hold Out.
9. The storage director deactivates Status In.
10. The channel deactivates Service Out.

RESETS

The power-on sequence resets control circuitry and initiates initial microcode load (IML). Normal operation generates sense information on the status of the storage directors and other storage control circuitry, while IML diagnostics are available to generate further information on special error conditions. The sense information is assembled into sense formats that identify errors and unusual conditions. Sense formats also indicate error recovery procedures to be initiated by the system.

The interrupt mechanism determines the priority of concurrent requests per service from the storage director. Maintenance connection requests are given highest priority.

The 3880 Storage Control generates two general reset operations, special reset, and machine reset.

Special Reset

Special reset is initiated when any one of the following lines becomes active:

- Power On Reset
- Initial Microcode Load Reset
- Reset Command

Machine Reset

Machine reset is also initiated with special reset or when the Selective Reset or System Reset lines become active.

Therefore, machine reset occurs if any of the following lines becomes active:

- Power On Reset
- Initial Microcode Load Reset
- Reset Command
- Selective Reset
- System Reset

POWER ON RESET

The Power On Reset line becomes active automatically during the power on sequence and resets the control circuitry including reset of the Select Out Trapped line.

INITIAL MICROCODE LOAD RESET

The Initial Microcode Load Reset line becomes active with a CE entry into the maintenance device and resets the control circuitry including reset of the Select Out Trapped line in the same manner as the power on reset.

SELECTIVE RESET

The Selective Reset line becomes active only as a result of a:

- Time-out by the channel
- Malfunction detected at the channel
- Request for disconnect-in from the storage director
- Channel performing selective reset by activating Suppress Out and deactivating Operational Out.

Selective reset resets all reserve and status conditions stored in the storage control for the selected device. An operation in process continues to a normal stopping point with no further data transfer.

SYSTEM RESET

The System Reset line becomes active under one of the following conditions:

- The System Reset pushbutton is pressed.
- The system power is turned on.
- The channel is offline to the channel interface.
- Initial microcode loading is performed.
- The channel performs system reset by deactivating Operational Out while Suppress Out is not active.

All storage directors attached to the issuing channel are affected by a system reset. A system reset:

- Resets all reserve and status conditions stored in the storage control for the resetting channel
- Terminates all block multiplex command chains in progress on the resetting channel
- Resets all device interrupts associated with the resetting channel

COMMAND RETRY

Command retry recovers from device errors such as data checks, access errors (seek checks), and overruns. It is also used for write padding errors and defective alternate tracks. These errors are not detected by the microcode, but are logged in the 3880 usage and/or error counters. The retry consists of a '4A' tag (status modifier, channel end, and unit check) or a retry status which is generated by the 3880 and causes the channel to disconnect. The 3880 then reorients and repositions the device and generates device end. The channel replies to device end by re-issuing the command. This causes the operation to be retried. For seek checks, the retry is attempted up to ten times. If the retry is not successful, a permanent seek check is generated and sent to the system where the error recovery procedure (ERP) can be invoked.

ERROR RECOVERY

Sense bytes 0 through 2 are generated in the 3880 when unit check is presented. These bytes describe the error condition and identify the recovery action to be initiated by the system.

INTERRUPTS

Interrupts are controlled either by hardware or by microcode. The microcode controls the interrupt mechanism by setting appropriate bits in the interrupt level register (ILR). The interrupt levels and conditions are given below in order of priority from highest to lowest.

- Level 0 Maintenance interface
- Level 1 Timer overflow or channel check 1
- Level 2 Channel selection
- Level 3 Normal subsystem operation and levels 0, 1, and 2 are inactive

At the end of execution of every microinstruction, the microprocessor monitors the request for an interrupt level status. If an interrupt request exists, fetch and execution of microinstructions is stopped. The microcontroller automatically initiates a sequence to store the program status word (PSW) of the current level of program execution. Each PSW is stored in a specified area within the internal registers according to its interrupt level. When the current PSW is stored, the hardware automatically fetches the PSW for the level at which the program is to resume.

On machine reset, the ILR is reset to zero, placing program execution at level 3.

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MAINTENANCE DEVICE ERROR DISPLAYS

When the maintenance device (MD) is physically attached to the 3880, various formats are used to display errors to the CE depending on the operational readiness of the 3880 and the progress of the MD itself. The following describes the MD error displays that can be received.

1. When the IPL - Reset pushbutton is pressed, a read-only storage (ROS) checkout of the MD occurs. The MD then loads the functional microcode followed by a 3880 compatible user code. Errors received in this process display one of the following:

- | |
|---------|
| MCPC=XX |
|---------|

 (MCPC equals microcode program check)
- | |
|--------|
| MDH=XX |
|--------|

 (MDH equals maintenance device hardware check)

where XX equals the error code.

2. If the MD checkout and load procedures result in no errors, and a maintenance option is chosen, the MD checks out its ability to communicate with the maintenance device adapter (MDA) in the 3880. If an error occurs, the following display is received:

- | |
|---------|
| IC=XXXX |
|---------|

 (IC equals isolation code)

where XXXX equals the error codes from 0100 to 0900.

3. If no errors are detected in the MDA, the 3880 loads microcode in each storage director, one at a time, until the tie breaker determines the storage director to be selected and the following sequence occurs:
 - a. Hardcore diagnostics residing in the ROS are executed.
 - b. ROS microcode loads track 0 (TRK0) from the 3880 functional diskette into control storage and branches to it.
 - c. The remaining hardcore diagnostics resident on the 3880 functional diskette are executed.

Errors received in this process display:

- | |
|----------|
| IML=XX-Y |
|----------|

 (IML equals initial microcode load)

where XX equals the error code.

- | |
|----------|
| IML=FX-Y |
|----------|

 (IML equals initial microcode load)

where FX equals normal end

where Y equals 1 if a single storage director fails or 2 if both storage directors fail.

4. When the ROS and the remaining hardcore diagnostics execute error free, the functional microcode is loaded.

Errors received in this process give the following display:

- | |
|---------|
| SC=XXXX |
|---------|

 (SC equals symptom code)

where XXXX equals the error code from 2000 to 3FFF.

5. Diagnostics can be invoked to check the 3880 hardware. Errors give the following diagnostic isolation code display:

- | |
|-----------|
| IC=idYYZZ |
|-----------|

 (IC equals isolation code)

where id is the routine number 70, 71, 72, or 73

where YY is the first error display byte

where ZZ is the second error display byte.

Note: Errors in the maintenance device-to-storage director communication path in steps 3, 4, or 5 give the following display:

- | |
|---------|
| IC=XXXX |
|---------|

 (IC equals isolation code)

where XXXX equals errors from 0100 to 0900.

6. If extended MDA tests are required, they occur at the end of the CE call and give the following display:

- | |
|---------|
| IC=XXXX |
|---------|

 (IC equals isolation code)

where XXXX equals the error code.

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SENSE FORMATS

Twenty-four bytes of sense information identify any condition that causes a unit check status while providing secondary information for system error recovery. Sense conditions are organized into nine formats. Sense bytes 0 through 7 have the same meaning for all formats.

SENSE BYTES 0 THROUGH 7, ALL FORMATS

Sense bytes 0 through 2 are generated only when unit check is presented. These bytes describe the error condition in general terms and identify the specific action affecting subsystem error recovery.

Sense byte 3 identifies which operation was in progress when an interrupt occurred. As a result, the system error recovery procedure (ERP) corrects the unusual condition and causes the operation to continue.

Sense byte 4 identifies the device and controller from which the sense information is gathered.

Sense byte 5 identifies the low-order cylinder address of the most recent seek operation.

Sense byte 6 identifies the high-order cylinder and head address of the most recent seek operation.

Sense byte 7, bits 0 through 3 identify the specific sense format. The nine Sense formats are:

Format	General Category or Condition
0	Programming or system checks
1	Device equipment checks
2	3880 equipment checks
3	Storage director control checks
4	Data checks without displacement information
5	Data checks with displacement information
6	Usage and error overrun error statistics
7	Device connection control checks
8	Additional device equipment checks

Sense byte 7, bits 4 through 7 provide an encoded message describing the nature of the error condition. Messages are unique to the sense format and the type of device attached to the storage director.

SENSE BYTES 8 THROUGH 23

Sense bytes 8 through 23 are defined by the particular format. Formats 0, 2, 3, and 6 are storage control checks. The remaining formats (1, 4, 5, 7, and 8) are device errors and are described in the device maintenance library.

Format 0 is generated when an error or unusual condition is specified by Sense bytes 0 through 7.

The format 2 assembles check information relating to the equipment. Equipment error conditions do not result in a disconnect-in/selective reset sequence.

Format 3 assembles check information relating to the storage director and actually consists of two formats, one for checks that stop the main clock and one for checks that do not stop the main clock. Microcode detected checks occur in the channel area and are not hard failures.

All format 3 errors in a storage director cause:

- A control check to be sent to the alternate storage director
- The information to be assembled into one of the format 3 sense bytes.

After the alternate storage director has assembled the error information, the failing storage director is enabled to initiate a channel error alert sequence. This results in a disconnect-in followed by a selective reset. If the selective reset is unsuccessful, the channel interface connected to the storage director is disabled. The channel remains disabled until a system reset occurs, or a CE successfully executes a reset through the maintenance device.

Format 6 indicates a Read and Reset Buffered Log command is issued, or the usage and error statistics need to be offloaded due to a counter overflow condition.

Format 6 contains usage or error information that is divided between this Maintenance Information Manual (MIM) and the device maintenance library.

3330, 3340, 3344, AND 3350 MACHINES

The following messages are for all storage directors connected to all four machines except where indicated.

Message 0 – No Message

No additional information is needed.

Message 1 – Invalid Command

An invalid command is not in the device command set or it pertains to a feature that is not installed.

Message 2 – Invalid Sequence

An invalid sequence of commands has occurred. Included are the following:

- A Read Initial Program Load (IPL), Device Reserve, or Device Release, or Unconditional Reserve command was preceded by a Set File Mask command in the same chain.
- A write command has violated the write portion of a preceding Set File Mask command.
- A write command has not satisfied the prerequisites.
- A Write, Erase, Read IPL, Set File Mask, Device Reserve, or Device Release command was issued in the same chain following a Space Count command.
- An Unconditional Reserve command is preceded by a channel command word (CCW) in the same chain.

Message 3 – CCW Count Less Than Required

The CCW count of a command is less than required. Included are the following:

- Any seek command with a CCW count of less than 6
- A Diagnostic Write command with a CCW count of less than 512
- 3340 series only – a Write HA command with a CCW count of less than 3
- 3350 series only – Write HA command with a CCW count of less than 7

Message 4 – Invalid Argument

The data argument is invalid. Included are the following:

- A Seek command argument that is not a valid seek address
- A Set Sector command argument that is invalid
- A Set File Mask command argument that does not have bits 2 and 6 set to zero

Message 5 – Diagnostic Write Command Not Permitted By File Mask

A Diagnostic Write command is issued that violates bit 5 of the file mask.

Message 6 – Channel Discontinued Retry Operation

The channel does not indicate chaining when retry status is activated. See the START section of the Maintenance Information Manual (MIM) for the maintenance device (MD), option 5, to perform a checkout procedure.

Message 7 – Channel Returned With Incorrect Retry CCW

The channel retry commands are out of sequence. See the START section of the Maintenance Information Manual (MIM) for the maintenance device (MD), option 5, to perform a checkout procedure.

Message 8 – IML Device Not Ready

During a Diagnostic Load command, message 8 is activated if the initial microcode load (IML) device is not ready.

Message 9 – IML Device Permanent Seek Check

During a Diagnostic Load command, message 9 is activated if the operation cannot be completed because of an IML device permanent seek check.

Message A – IML Device Permanent Read Check

During a Diagnostic Load command, message A is activated if the operation cannot be completed because of an IML device permanent read check.

Message B (3330 and 3350) – Improper Alternate Track Pointer

The alternate track pointer in the record 0 (R0) count field of a defective track equals the track address of the defective track.

Message B (3340 and 3344) – Command Overrun

A command is received from the channel too late to be executed properly by the subsystem.

Message C (3330) – Unconditional Reserve

The string switch hardware is not modified for the Unconditional Reserve command or the hardware failed to function.

Message C (3340 and 3344) – Data Overrun

The response to a data request signal is not received by the storage control within the specified time.

Message C (3350) – Unconditional Reserve

The microcode was unable to get access to the string switch with the use of the Unconditional Reserve command.

Message D (3330) – Index Detected In Gap of Record

The index point is detected in the gap that precedes the key field or the data field.

Message D (3340 and 3344) – Defective Track

Byte 0, bit 6 (track condition check) is on if:

1. A single track command other than Search HA, Read HA, Read RO, Write HA, or Write RO is executed on a defective track.
2. A multitrack command (including Search HA, Read HA, or Read RO) or overflow record operation attempts to switch from a defective track.
3. A multitrack command or overflow operation other than Search HA, Read HA, or Read RO switches to a defective track.

Byte 1, bit 7 (operation incomplete) is on if during the processing of an overflow record, a defective track condition is detected after initiation of data transfer.

Message D (3350)

Message D is not used.

Message E (3330 and 3350)

Message E is not used.

Message E (3340 and 3344) – Alternate Track

Message E is used in conjunction with byte 0, bit 6 (track condition check). It is generated when any multitrack command (including Search HA, Read HA, or Read RO) or overflow record operation attempts to switch from an alternate track.

Message F

Message F is not used.

3370 MACHINES

The following messages are for any storage director connected to a 3370 machine.

Message 0 – No Message

No additional information is needed.

Message 1 – Invalid Command

An invalid command is not in the device command set or it pertains to a feature that is not installed.

Message 2 – Invalid Sequence

An invalid sequence of commands has occurred. Included are the following:

- A Locate command was not preceded by a Define Extent command or a Read IPL command in the same chain.
- A Read Data command was issued and the storage director was not read oriented.
- A Write Data command was issued and the storage director was not write oriented.
- A Locate command violates the write portion of the mask that was established by a preceding Define Extent command.
- A Diagnostic Sense command was issued that was not preceded by a Diagnostic Control command.
- A Device Reserve or Device Release command is preceded by a Define Extent command in the same chain.
- A Read IPL command is not the first command in a chain or was not chained from another Read IPL command.
- An Unconditional Reserve command is not the first command in a chain.

Message 3 – CCW Count Less Than Required

The CCW count of a command is less than required. Included are the following:

- A Define Extent command with a CCW count of less than 16
- A Locate command with a CCW count of less than 8

- A Diagnostic Control command with a CCW count of less than $4 + N$, where N is the number of additional parameters required by the command sub-ID. See the OPER section for a description of the Diagnostic Control command sub-ID.

Message 4 – Invalid Argument

The data argument is invalid. Included are the following:

- A Define Extent command where bits 2, 3, 6, and 7 of its mask byte are not set to zero or bits 0 and 1 are set to 1 and 0, respectively.
- A Locate command with an invalid operation code specified in byte 0
- A Define Extent command where byte 1 is not set to zero
- A Define Extent command with the extent limits outside the available storage
- A Diagnostic Control command with an invalid command sub-ID specified in byte 0. See the OPER section for a description of the Diagnostic Control command sub-ID.
- A Diagnostic Control command with an invalid argument for a specified command sub-ID. See the OPER section for a description of the Diagnostic Control command sub-ID.
- A Locate command with a block count equal to zero is specified.
- A Locate command with a replication count of less than, or not a multiple of, the block count

Message 5 – Diagnostic Control Command Not Permitted by Define Extent Mask

A Diagnostic Control command is issued that violates bit 5 of the define extent mask.

Message 6 – Channel Discontinued Retry Operation

The channel does not indicate chaining when retry status is activated. See the START section of the Maintenance Information Manual (MIM) for the maintenance device (MD), option 5, to perform a checkout procedure.

Message 7 – Channel Returned With Incorrect Retry CCW

The channel retry commands are out of sequence. See the START section of the Maintenance Information Manual (MIM) for the maintenance device (MD), option 5, to perform a checkout procedure.

Messages 8 through B

Messages 8 through B are not used.

Message C – Alternate Space Exhausted

A Locate command with a format defective block, specified in the operation byte, is issued when the alternate space was exhausted.

Message D – Data Overrun

A service overrun occurs in the data area.

Messages E and F

Messages E and F are not used.

3375 AND 3380 MACHINES WITHOUT SPEED MATCHING BUFFER

The following messages apply to storage directors connected to either a 3375 or 3380 machine without the speed matching buffer features.

Message 0 – No Message

No additional information is needed.

Message 1 – Invalid Command Or Sense Data Logged Device

INVALID COMMAND

An invalid command message indicates the device received a command that is not in the device command set. An invalid command can also pertain to a feature that is not installed.

SENSE DATA LOGGED FOR DEVICE

A sense data logged for device message indicates that byte 1, bit 3 (message to operator) and byte 2, bit 3 (environmental data present) are set. The code, SS-CC-DD, shown on the operator console is as follows:

SS = The storage director physical ID as found in sense byte 21

CC = The controller physical ID as found in byte 20

DD = The failing device physical ID as shown in bits 4 through 7 of byte 7

Message 2 – Invalid Sequence Or Sense Data Logged For Controller

INVALID SEQUENCE

An invalid sequence message indicates an invalid sequence of commands has occurred. Included are the following:

- A Read Initial Program Load (IPL), Device Reserve, or Device Release, or Unconditional Reserve command was preceded by a Set File Mask command in the same chain
- A write command has violated the write portion of a preceding Set File Mask command
- A write command has not satisfied the prerequisites
- A Write, Erase, Read IPL, Set File Mask, Device Reserve, or Device Release command was issued in the same chain following a Space Count command
- An Unconditional Reserve command is preceded by a channel command word (CCW) in the same chain

SENSE DATA LOGGED FOR CONTROLLER

A sense data logged for controller indicates that byte 1, bit 3 and byte 2, bit 3 are set. The code, SS-CC-XX, shown on the operator console is as follows:

SS = The storage director physical ID as found in sense byte 21

CC = The failing controller physical ID as found in byte 20

XX = A device physical ID connected to the failing controller, as shown in bits 4 through 7 of byte 4

Message 3 – CCW Count Less Than Required

The CCW count of a command is less than required. These conditions include:

- Any seek command with a CCW count of less than 6
- 3380 only – a Write HA command with a CCW count of less than 5

Message 4 – Invalid Data Argument

The data argument is invalid. Included are these general conditions:

- A Seek command argument that is not a valid seek address
- A Set Sector command argument that is invalid
- A Set File Mask command argument that does not have bits 2 and 6 set to zero

The following conditions are device specific:

- 3380 only – a Write HA or Diagnostic Write HA fails specified parameter checking.
- 3380 only – a Set Path Group ID argument is not valid.

Message 5 – Diagnostic Read or Write Command Not Permitted By File Mask

A Diagnostic Read or Write command is issued that violates bit 5 of the file mask.

Message 6 – Channel Discontinued Retry Operation

The channel does not indicate chaining when retry status is activated. Select maintenance device (MD) option 5 in the maintenance mode and perform a machine checkout.

Message 7 – Channel Returned With Incorrect Retry CCW

The channel retry commands are out of sequence. Perform a machine checkout by selecting maintenance device (MD) option 5 in the maintenance mode.

Messages 8 through A

Messages 8 through A are not used.

Message B – Defective or Alternate Track Pointer Points to Itself

The alternate track pointer in record 0 (R0) count field of a defective track equals the track address of the defective track.

Message C (3375)

Message C is not used.

Message C (3380) – Dynamic Path Selection or Device Installation Check

Message C indicates that:

- The cables to the controllers attached to a storage director are not correctly configured for the dynamic path selection feature, or
- The dynamic path selection feature is not installed or operating in one of the controllers, or
- Attached device indicators have changed and are different from those seen at the last IML.

Messages D through F

Messages D through F are not used.

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MIM

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3375 AND 3380 MACHINES WITH SPEED MATCHING BUFFER

The following messages are for storage directors connected to a 3380 machine with the speed matching buffer features.

Message 0 – No Message

No additional information is needed.

Message 1 – Invalid Command or Sense Data Logged for Device

INVALID COMMAND

An invalid command message indicates the device received a command that is not in the device command set. An invalid command can also pertain to a feature that is not installed.

SENSE DATA LOGGED FOR DEVICE

A sense data logged for device message indicates that byte 1, bit 3 (message to operator) and byte 2, bit 3 (environmental data present) are set. The code, SS-CC-DD, shown on the operator console is as follows:

SS = The storage director physical ID as found in sense byte 21

CC = The controller physical ID as found in byte 20

DD = The failing device physical ID as shown in bits 4 through 7 of byte 7

Message 2 – Invalid Sequence or Sense Data Logged for Device

INVALID SEQUENCE

An invalid sequence message indicates an invalid sequence of commands has occurred. Included are the following:

- A Read Initial Program Load (IPL), Device Reserve, or Device Release, or Unconditional Reserve command was preceded by a Set File Mask command in the same chain
- A write command has violated the write portion of a preceding Set File Mask command
- A write command has not satisfied the prerequisites
- A Write, Erase, Read IPL, Set File Mask, Device Reserve, or Device Release command was issued in the same chain following a Space Count command
- An Unconditional Reserve command is preceded by a channel command word (CCW) in the same chain
- A Define Extent command is followed by a Set File Mask or visa versa

- A command within the Locate Record channel command word is received that conflicts with the sequence dictated by the operation parameter
- A Locate Record command is received before a Define Extent or Read IPL command
- A Define Extent command follows a Space Count command in the same chain
- A Read IPL, Reserve, Release, or Unconditional Reserve command follows a Define Extent command in the same chain
- A Write command violates the file mask established by a Define Extent command
- The operation parameter of a Locate Record command violates the file mask in a Define Extent command

SENSE DATA LOGGED FOR CONTROLLER

A sense data logged for controller message indicates that byte 1, bit 3 and byte 2, bit 3 are set. The code, SS-CC-XX, shown on the operator console is as follows:

SS = The storage director physical ID as found in sense byte 21

CC = The failing controller physical ID as found in sense byte 20

XX = A device connected to the failing controller

Message 3 – CCW Count Less Than Required

The CCW count of a command is less than required. Included are the following:

- Any seek command with a CCW count of less than 6
- A Diagnostic Write command with a CCW count of less than 512
- A Define Extent command or a Locate Record command has a CCW count less than 16

Message 4 – Invalid Argument

The data argument is invalid. Included are the following:

- A Seek command argument that is not a valid seek address
- A Set Sector command argument that is invalid
- A Set File Mask command argument that does not have bits 2 and 6 set to zero

A define extent argument is invalid. Included are the following:

- Byte 0, bits 2 and 6 are not 0
- Byte 1 is not 'CO'
- Bytes 4 through 7 are not 0
- CCHH values in bytes 8 through 11 and in bytes 12 through 15 are not valid for the device
- CCHH value in bytes 12 through 15 is less than the value in bytes 8 through 11

A locate record parameter is invalid. Included are the following:

- Byte 0, bits 2 and 3 are not bot 0
- Byte 0, bits 4 through 7 are not '1', '3', '6', or 'B'
- Byte 0, bits 4 through 7 indicates a Write Track (B) command and bits 0 and 1 are not both 0
- Bits 1 through 7 of byte 1 are not 0
- Byte 2 is not 0
- Bytes 2 and 3 are not 0
- Bytes 4 through 7 do not contain a valid seek address for the device
- Byte 13 contains an invalid sector number for the device
- Bytes 14 through 15 are not 0 when byte 1 bit 0 is 0

Message 5 – Diagnostic Write Command Not Permitted By File Mask

A Diagnostic Write command is issued that violates bit 5 of the file mask.

Message 6 – Channel Discontinued Retry Operation

The channel does not indicate chaining when retry status is activated. Select maintenance device (MD) option 5 in the maintenance mode and perform a machine checkout.

Message 7 – Channel Returned With Incorrect Retry CCW

The channel retry commands are out of sequence. Select maintenance device (MD) option 5 in the maintenance mode and perform a machine checkout.

Messages 8 through A

Messages 8 through A are not used.

Message B – Improper Alternate Track Pointer

The alternate track pointer in record 0 (R0) count field of a defective track equals the track address of the defective track.

Message C – Dynamic Path Selection In One Controller

Message C indicates that a controller with the dynamic selection feature installed has attempted to communicate with a controller without this feature.

Messages D through F

Messages D through F are not used.

INITIAL MICROCODE LOAD

IML Diskette

The IML diskette is a flexible file used in read-only mode.

Two functional microcode loads (one per storage director), storage control diagnostics, and device diagnostics are on the diskette.

The IML diskette serves as the microcode residence file to store the functional microcode and a variety of diagnostic routines.

Each microcode load is selected according to the diskette load control switches on the maintenance (MNT) card, B4(B3)L2. These switches are set during installation. The label on the diskette, shipped with the 3880, indicates how these switches are to be set. (See INST-60 for setting of the diskette load control switches.)

IML Operation

The initial microcode load (IML) operation is initiated automatically by the power on reset, and is performed each time power is restored to the storage control.

The functional microcode must be loaded into control storage before the storage control can operate the devices.

Each time an IML is performed on a storage director, a series of read-only storage (ROS) and IML hardcore tests is initiated.

The first tests are executed from ROS in the microcontroller. The remaining hardcore tests are executed from the diskette and perform a more thorough checkout of the hardware.

DIAGNOSTICS

3880 Microdiagnostics

Diagnostic microcode resides on the functional diskette. Each time an IML is performed on a storage director, a series of hardcore tests is initiated. The first tests are executed from read-only storage (ROS) in the microcontroller. The remaining hardcore tests are executed from the functional diskette and perform a more thorough checkout of the hardware.

When an error occurs during the hardcore tests, the error code is latched and can be retrieved by using the maintenance device (MD). The device dependent inline tests, the control interface wrap tests, and the channel interface wrap tests are initiated by the CE using the MD.

Device Microdiagnostics

Although the 3880 microdiagnostics require an offline storage director, the device microdiagnostics can run concurrent with customer programs. The 3880 diagnostic monitor uses an algorithm to determine the share time between the device diagnostics and the functional microcode.

ONLINE TEST

There is one 3880 online test (OLT): channel interface OLT. The channel interface OLT tests hardware functions that can be completely verified only when online to a system. These functions include disconnect command chaining, control unit retry, contingent connection, disconnect in/selective reset, and halt I/O.

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LEGEND

LEGEND **LGND-1**

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REFERENCES TO OTHER SECTIONS

ABBREVIATIONS IN THIS SECTION

ALD	automated logic diagram
CB	circuit breaker
CP	circuit protector
LED	light-emitting diode
MDM	Maintenance Diagrams Manual
No.	number
Reg	register

LEGEND **LGND-1**

GRAPHIC SYMBOLS AND LINES

The legend contains descriptions of symbols and conventions used throughout this Maintenance Information Manual.

Keys



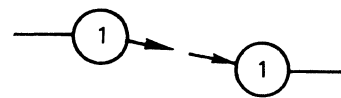
PRIMARY KEY

Reverse number in a black square. Used in text and illustrations.



SECONDARY KEY

Reverse letter in a black circle. Used in text when keying to a test point symbol in a diagram.



Connectors

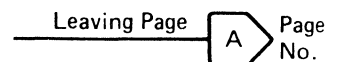
ON-PAGE CONNECTOR

Connection between parts of the same diagram. Line-of-sight arrows assist in locating other connectors and indicate flow direction of the line.



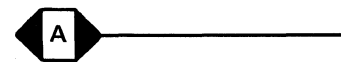
OFF-PAGE CONNECTOR

Connection between diagrams on separate pages. Letter keys are used to identify corresponding points.

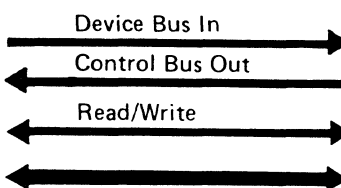


BIDIRECTIONAL CONNECTOR

Connection between diagrams on separate pages. Letter keys are used to show flow in both directions.

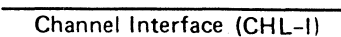


Bus, Interface, and Control Lines

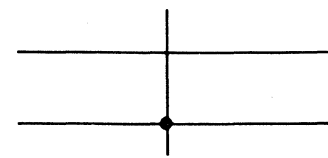
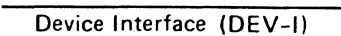
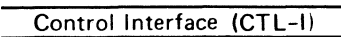


MINOR BUS LINES (Data Flow)

MAJOR BUS LINE



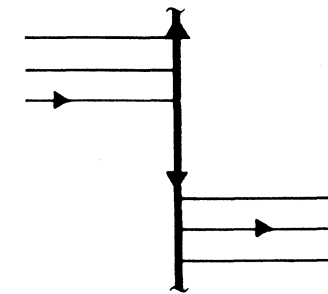
INTERFACE BETWEEN IBM MACHINES



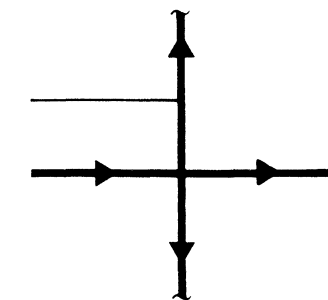
CONTROL LINES

Crossed lines, not connected

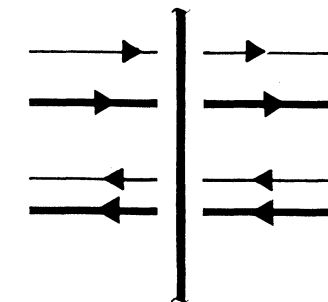
Crossed lines, connected



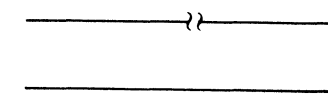
Bus or cable with multiple control lines entering and exiting.



Bus and control lines that connect to a bus.



Bus and control lines that do not connect to a bus.



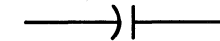
The standard line break is used when a line break is required.

ELECTRICAL SYMBOLS

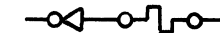
Capacitors

When required for safety or circuit operation, the use of the curved line represents the following:

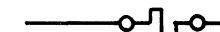
- The outside electrode in fixed paper dielectric, certain ceramic dielectric, plastic dielectric, and similar capacitors
- The moving element in variable capacitors
- The low potential element in feed-through capacitors



Circuit Breaker or Circuit Protector

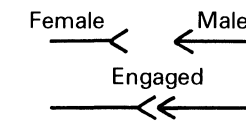


This symbol is used as a circuit breaker (CB) or a circuit protector (CP) that can be turned on or turned off as a switch.



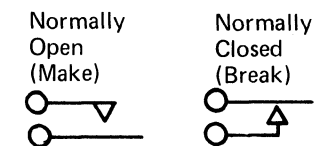
This symbol is used as a CB or a CP that can be reset after the CB or CP is tripped and cannot be used as a switch.

Connectors



MANUAL DISCONNECT

Contacts



RELAY

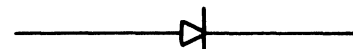
3880 MIM	AE0001	8498088	450900	450903	450905	.	.
	Side 2 of 2	Part No.	13Jul79	25Jan80	18Apr80	.	.

© Copyright IBM Corporation 1979, 1980

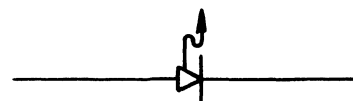
ELECTRICAL SYMBOLS

Diode, Rectifier (solid state)

Arrow shows direction of conventional current flow.



GENERAL



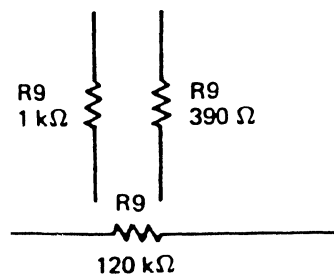
LIGHT-EMITTING DIODE (LED)



Ground

EARTH

Earth potential or a structure acting as a ground.

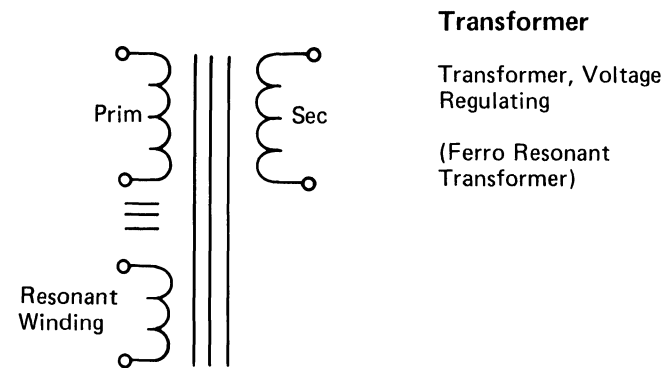


Resistors

FIXED

All resistance values will be specified as follows:

- Ω = ohm
- $k\Omega$ = kilohm
- $M\Omega$ = megohm



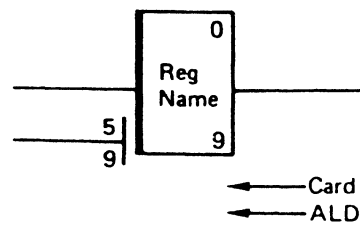
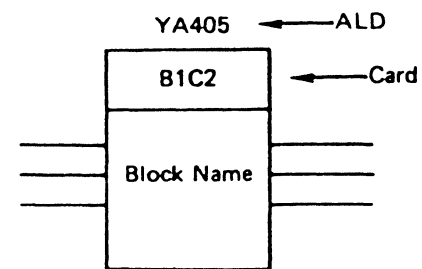
Transformer

Transformer, Voltage Regulating

(Ferro Resonant Transformer)

BLOCK AND LOGIC DIAGRAM SYMBOLS

Block Diagrams



Registers

Registers may be horizontal or vertical.

Input or output lines that pick up the entire register (all bit positions) are connected directly to the block.

Partial register transfer is shown with a numbered parallel line.

CARD PLUG CHART

The card plug chart shows the following:

- Cable locations **1**

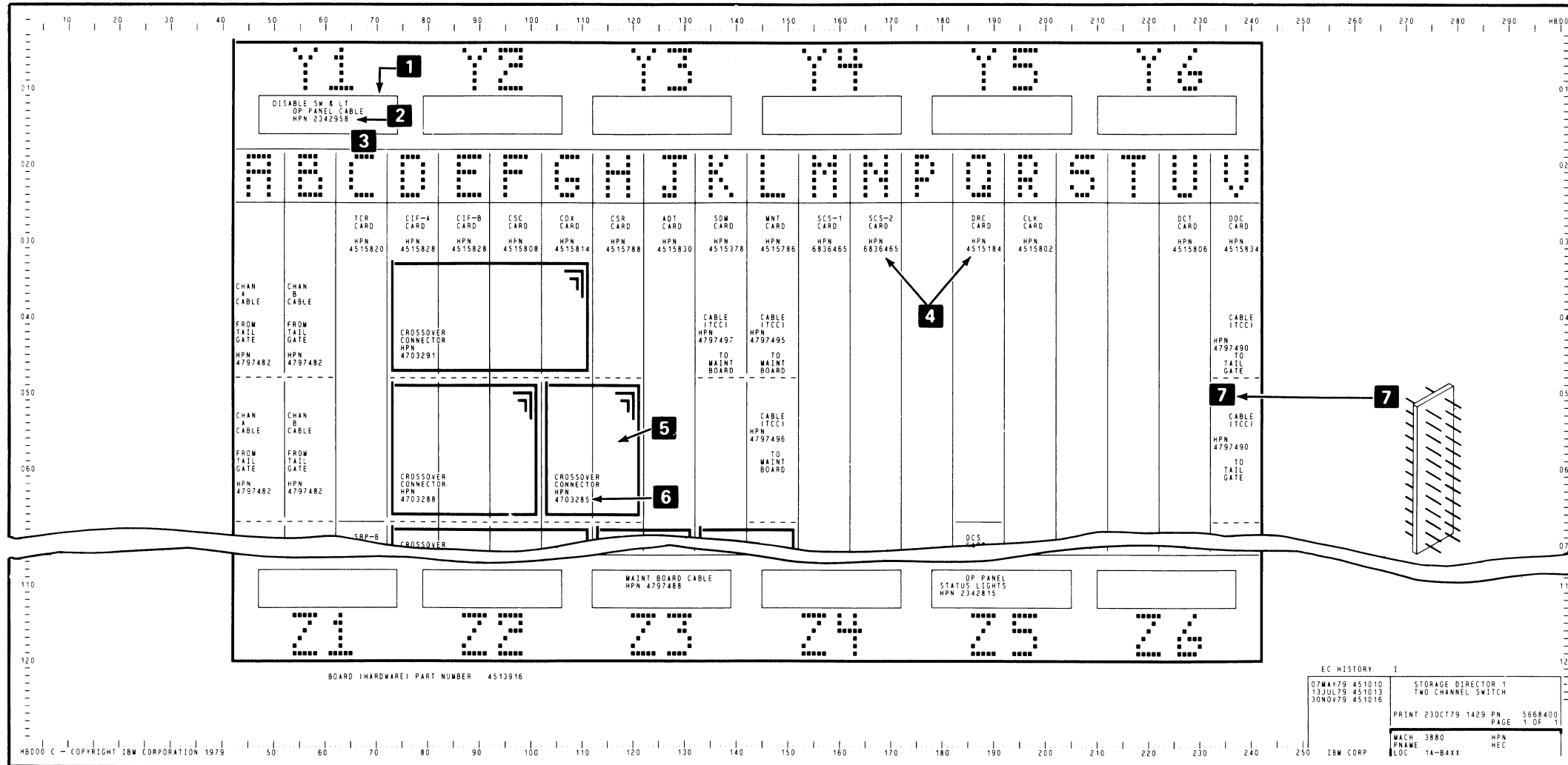
- Cable part numbers **2**
- Card positions **3**
- Card part numbers **4**

- Crossover locations **5**
- Crossover part numbers **6**
- Interposer **7**

Caution: When using the interposer **7** to connect cables to the top-card connector, be sure that all pins on the interposer are aligned with both the cable connector and top-card connector.

Some machines have 20-card boards in the B3 and B4 positions; others have 22-card boards in the B3 and B4 positions. The 22-card boards have an additional row of connectors at the top of the board. The information on this page applies to both the 20-card boards and the 22-card boards. See the Card Plug Charts in the Maintenance Diagrams Manual (MDM) for the specific board arrangements.

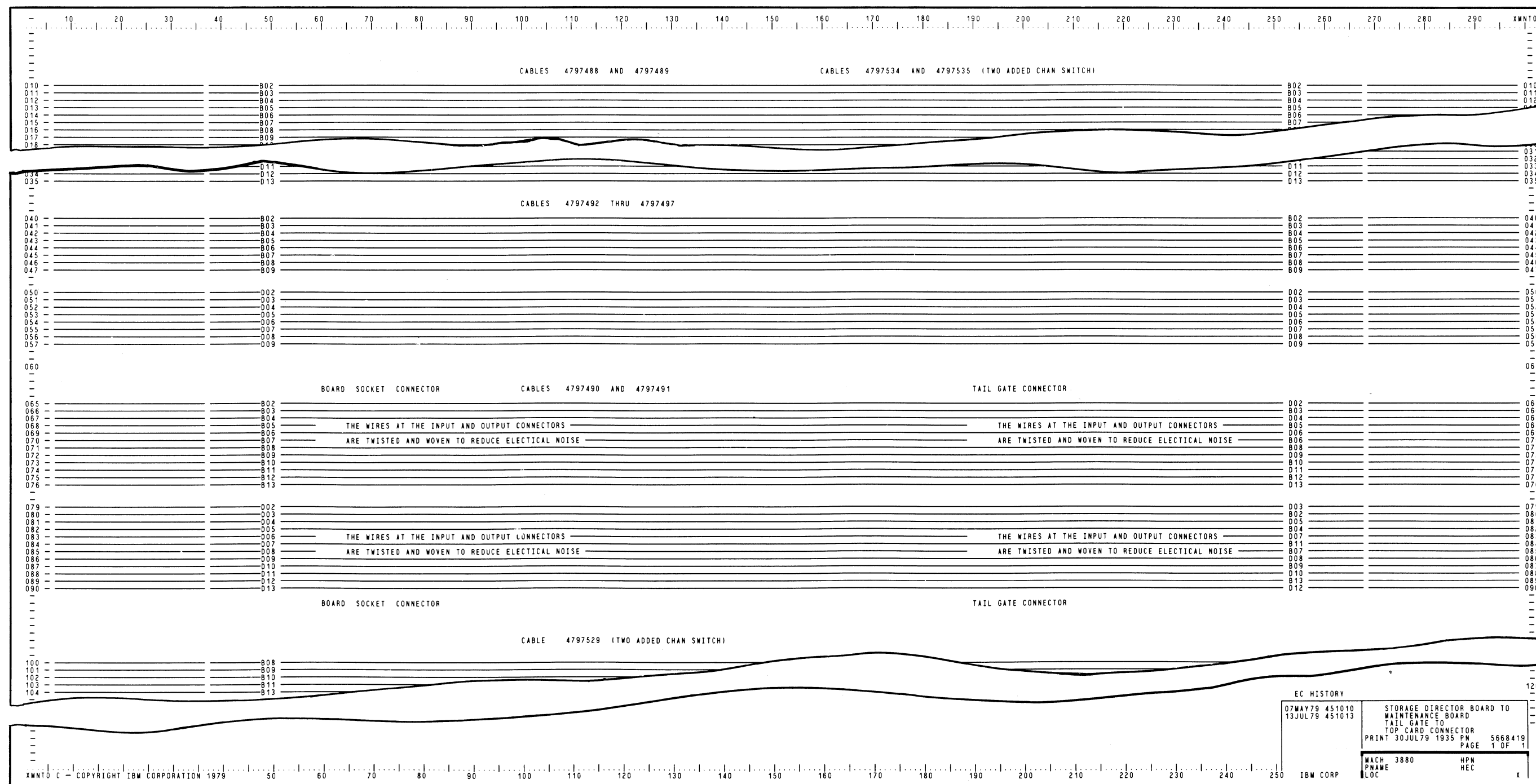
See the Maintenance Diagram Manual (MDM) for cable plug lists.



CABLE DIAGRAM

See the Maintenance Diagrams Manual (MDM) for cable diagrams.

The cable diagrams can be used to check the continuity of cables in the 3880. A cable diagram is provided for each cable part number in the 3880.



3880	AE0020	8498140	450900	450903	450905	450906	.
MIM	Side 2 of 2	Part No.	13Jul79	25Jan80	18Apr80	15Aug80	.

PIN/NET LISTS

The Maintenance Diagrams Manual (MDM) contains the following for each board:

- A pin-to-net list
- A net-to-pin list

To Find The Net Of A Pin

1. Find the pin number in the pin-to-net list in the column marked Node **1**.
2. Look in the column to the right of the pin number for the net number **2**.

To Find All Pins In A Net

1. Find the net number in the net-to-pin list in the column marked Eng. Net No. **3**.
2. Look in the From and To columns to the right for all pin numbers in the net **4**.

To Find The Plane Of The Board

1. Look in the plane column marked PL **5**.
2. There are three planes to a board:
 - 01 - The card side
 - 02 - The internal (voltage)
 - 03 - The pin side

PIN-TO-NET

DATE - 05/26/78 - WIRE NET LIST -

PART NO. 0004513850 TECH VTL NAME AC3Y30 M
 EC NO. 000450406A (41) SIZE SINGLE ORIGIN TLV L

1	2				
NODE	NET	NODE	NET	NODE NAME CROSS	
A1B14-	AA002AA12	A2A02-	AB002AA25		
A2B02-	AA002AA25	A2B03-	AA002AA12		
A2B06-	AA002AA23	A2B07-	AA002AA10		
A2B12-	PC000AA20	A2B13-	PC000AA18		
A2C05-	AA002AA16	A2C13-	AA002AC10		
A2D03-	AA002AA15	A2D04-	AA002AA22		
A2D07-	AA002AA18	V A2D08-	AA002AE10		
A2D14-	PC000AA19	A2E04-	AB002AA28		
A2E11-	AA002AA20	A3A02-	AA002AA30		
A3A13-	AA002AA22	A3B02-	AA002AA26		
A3B05-	AA002AB31	A3B08-	AA002AD10		
A3D02-	AA002AA27	A3D03-	AA002AA20		
A3D14-	AA002AA27	A3E03-	AA002AA20		
A3E14-	AB002AA23	A4A01-	AA002AA10		
A4A08-	AA002AA21	A4B01-	AA002AA10		
A4C03-	AA002AC10	A4C06-	PC000AA21		
A4D03-	AA002AC10	A4E03-	AB002AA10		
A5A13-	AB005AF10	A5B04-	AB005AE10		
A5B08-	PC000AA15	A5B09-	PC000AA14		
A5B12-	PJ000AA55	A5B13-	AB005AF10		
A5C12-	AB005AE10	A5D02-	AB005AE10		
A5D06-	AB005AE10	A5D07-	AB005AE12		
A5D13-	AB005AA14	A6B04-	AY002AC24		
A6D03-	NW000AB10	A6D04-	NW000AB10		
B2A05-	AB002AA16	B2A13-	PJ000AA18		
B2B04-	AB002AA28	B2B05-	AB002AA16		
B2B08-	AB002AA30	B2B09-	AB002AA11		
B2B14-	AB002AA26	B2C06-	AA002AA23		
B2D03-	AB002AA15	B2D04-	AB002AA22		
B2D07-	AB002AA18	V B2D08-	AB002AC10		
B2E02-	AA002AA25	B2E03-	AB002AA15		
B2E11-	AB002AA20	B3A03-	PJ000AA18		
B3A08-	PC000AA30	B3A13-	PC000AA30		
B3B03-	AB002AA14	B3B04-	AB002AA21		
B3B07-	AB002AB41	B3B08-	AB002AD10		
B3B11-	AB002AB43	B3B14-	AB002AA27		
B3C05-	AB002AB41	B3C09-	AB002AA1		
B3D02-	AB002AA27	B3D03-	AB002AA2		
B3D09-	PJ000AA19	B3D10-	AB002AD1		
B3D14-	AB002AB44	B3E03-	AB002AA2		
B3E08-	AB002AB42	B4A04-	AB005AA		
B4B01-	NJ000AA52	B4B02-	AB002AF		
B4B11-	AB002AE30	B4B14-	AB002A		
B4D01-	AB002AA13	B4D02-	AB002A		
B4D05-	PC000AA10	B4D06-	AB002		
B4D10-	AB002AF10	B4E02-	AA002		
B4E05-	AA002AA25	B4E06-	PC000		
B5A13-	AB005AA14	B5B01-	AB008		
B5E12-	PC000AA34	B6A01-	PC000		
B6A05-	PC000AA38	B6B02-	PC000		
C1B14-	AA002AA12	C1D14-	AY0		
C2B01-	AA002AA28	C2B04-	NW0		
C2B09-	AY004AA10	C2B10-	PE		
C2B13-	AA002AA26	C2B14-	A		
C2C04-	AA002AA28	C2C05-	A		
C2D01-	AA002AA24	C2D02-	A		
C2D06-	NW000AD10	C2D07-	P		
C2D11-	AA002AA20	C2D12-	P		
C2E06-	AA002AA29	C2E10-	P		
C3A08-	AB002AB42	C3A11-	P		
C3B02-	AA002AA30	C3B03-	P		
C3B06-	PC000AA34	C3B07-	P		
C3B10-	PE000AA24	C3B11-	P		
C3B14-	PC000AA36	C3C03-	P		
C3C09-	AA002AA14	C3C12-	P		
V C3D03-	AB005AF10	C3D04-	P		
C3D07-	PC000AA52	C3D09-	P		

NET-TO-PIN

DATE - 05/26/78 - WIRE NET LIST -

PART NO. 0004513850 TECH VTL NAME AC3Y30 M
 EC NO. 000450406A (41) SIZE SINGLE ORIGIN TLV L

3	4	5			
ENG. NET NO.	MFG. NET	FROM	TO	PL	WIR TYR
AA002AA10	0001	A4B01-	A4A01-	01	
.	.	A4A02-	C4D02-	01	
.	.	A2B07-	A4B01-	03	
.	.	A4A01-	A4A02-	03	
AA002AA11	0002	A2B09-	A2E09-	01	
.	.	A3E11-	C3D11-	01	
.	.	A2E09-	A3E11-	03	
AA002AA12	0003	A1B14-	C1B14-	0	
.	.	C1B14-	C3B11-	0	
.	.	A2B03-	A1B14-	0	
AA002AA13	0004	A2D09-	B2E09-		
.	.	B4E02-	C4B02-		
.	.	B2E09-	B4E02-		
AA002AA14	0005	A3B03-	C3C03-		
.	.	C3C09-	C3B09-		
.	.	C3C03-	C3C09-		
AA002AA15	0006	A2D03-	C2C03-		
.	.	C3C12-	C3D12-		
.	.	C2C03-	C3C12-		
AA002AA16	0007	A2B05-	A2C05-		
.	.	A3C07-	C3B07-		
.	.	A2C05-	A3C07-		
AA002AA18	0008	A2D07-	C2A07		
.	.	C3A05-	C3B05		
.	.	C2A07-	C3A05		
AA002AA19	0009	A2D05-	C2C0		
.	.	C3C04-	C3D		
.	.	C2C05-	C3		
AA002AA20	0010	C2D11-	A		
.	.	A3E03-	A		
.	.	A2E11-	A		
AA002AA21	0011	A3B04-	A		
.	.	A4A08-	A		
.	.	A3A04-	A		
AA002AA22	0012	A2D04-	A		
.	.	A3A13-	A		
.	.	A2A04-	A		
AA002AA23	0013	A2B06-	A		
.	.	B3C12-	A		
.	.	B2C06-	A		
AA002AA24	0014	A2D01	A		
.	.	C2D01	A		
.	.	A2D02	A		
AA002AA25	0015	A2B02	A		
.	.	C4A0	A		
.	.	B4E0	A		
.	.	B2E	A		
.	.	C4A	A		
AA002AA26	0016	C2	A		
.	.	C2	A		
.	.	A	A		

abnormal: Not normal or usual.	BAP: Buffer ALU pointer.	CBL: Channel buffer pointer low.	consult: See or request information.
abstract: Short description, summary, or an idea.	BAR: Buffer address register.	CBO: Channel bus out.	contamination: Contaminated or not clean.
accepts: Receives or takes.	basically: Fundamentally.	CBP: Channel buffer pointer.	contiguous: Sequential.
accomplished: Completed, done, or ended.	BC1: Buffer/channel register one.	CCW: Channel command word.	continuation: To continue.
account: A customer installation.	BC2: Buffer/channel register two.	CC1: Channel control 1.	convenience outlet: An ac outlet that is convenient for the CE to use.
accumulated: Collected.	BDM: Block diagrams manual.	CC2: Channel control 2.	conventions: Generally acceptable rules.
activity: An action or a process.	begin: Start.	CDS: Configuration data set.	cooling: Decreasing the temperature.
actual: Real.	BFI: Buffer increment.	CDX: Channel data transfer.	corporation: Organization.
addr: Abbreviation for address.	bfr: Abbreviation for buffer.	CECOM: An OLT subroutine.	correctable: Can be corrected.
ADT: Automatic data transfer.	BFR-1: Buffer card 1.	certain: Specific.	CP: Circuit protector, a circuit breaker used for other than the main ac power input to the 3880.
ADTC: Automatic data transfer control.	BFR-2: Buffer card 2.	ch: Abbreviation for channel.	CP: Control print in OLTSEP and OLTEP programs.
ADTM: Automatic data transfer multiplexer.	bias: The 24 Vdc control voltage for the voltage regulators.	chains, chained, chaining: Connect.	CPC: Central power control.
ALD: Automated logic diagram.	BIN: Part of the seek address field, always 0 in the 3880.	chan: Abbreviation for channel.	CR: Condition register or rectifier (diode).
alert: Attention or alarm.	binders: Covers for the manuals.	char: Abbreviation for character.	cross: Across.
allocate, allocated, allocating: Reserve for a specific purpose.	BIP: Buffer input pointer.	characteristics: Distinct qualities.	crossover: Connector between the top of two cards.
allow: Let or permit.	blocking: Blocks that hold parts in place during shipment.	checklist: A list of steps to perform.	CS: Control storage.
ALU: Arithmetic and logic unit.	blowers: Fans.	checkout: Check.	CS1: Channel status 1.
amplifier: A circuit that increases signal voltage or current.	BOP: Buffer output pointer.	chemicals: Cleaning fluids, adhesives, etc.	CS2: Channel status 2.
applicable: Suitable use.	brief: Short or quick.	chk: Abbreviation for check.	CS3: Channel status 3.
applied: Put.	buffer: A circuit to store data temporarily.	CHL-I: Abbreviation for channel interface.	CSC: Channel sequence control.
appropriate: Correct or suitable.	buffered: Temporarily stored.	chronological: Placed in the order of time.	CSR: Channel search.
arithmetic: Combining numeric quantities as described by rules and definitions.	built: Assembled, installed, or made.	CIF: Channel interface card.	CSW: Channel status word.
arranged: Placed in correct order.	bulk power supply: The main dc-power supply in the 3880.	CIF-A: Channel interface A card.	CTL-I: Abbreviation for control interface.
assignment: To assign.	butt: Connect back-to-back.	CIF-B: Channel interface B card.	ctr: Abbreviation for counter.
assist: To aid.	button: Pushbutton.	circuit protector: A circuit breaker.	CTRL: Abbreviation for control.
assistance: Aid.	cabling: Cables.	cleanup: A return to original status.	CU: Control unit.
Attack: Damage.	caked: Solid or hard.	clearly: Fully.	cutout: An opening in a panel for a switch, LED, meter, etc.
Automated: A process or device that functions without aid from an operator.	called: Named.	clk: Abbreviation for clock.	CXC: Channel transfer control.
aux: Abbreviation for auxiliary.	callout: A label in a figure used to identify a part.	cmd: Abbreviation for command.	cycled: Performed in a set sequence.
aware: Know.	CARR: Checks, adjustments, removals, and replacements, a section title in the MIM.	com: Abbreviation for common.	DASD: Direct access storage device.
backwards: Reverse.	caster: A wheel on the bottom corners of the machine that permits easy movement of the machine.	Comm Rejct: Abbreviation for command reject	dated: Has a date.
BAH: Buffer ALU pointer high.	CB: Circuit breaker.	compiled: Collected	DBFR: Data buffer register.
bail: A bar or handle.	CBH: Channel buffer pointer high.	component: An assembly, unit, or part of a machine.	DBH: Device buffer pointer high.
BAL: Buffer ALU pointer low.	CBI: Channel bus in.	conclusion: End.	DBI: Device bus in.
		cond: Abbreviation for condition or conditional.	DBL: Device buffer pointer low.
		conditional: Having conditions.	

DBO: Device bus out.

DBP: Device buffer pointer.

DCK: Data check.

DCH: Device count high.

DCL: Device count low.

DCM: Diagnostic code manual.

DCS: Dynamic control storage.

DCSR: Dynamic control storage and refresh.

DCT: Device counter.

DDC: Director-to-device controller.

DDCU: Director-to-device controller card, unidirectional.

DDCV: Director-to-device controller card, bidirectional.

deactivated: De-activated.

decoder: A circuit that decodes data.

decrement: Decrease.

defective: Failed, failing, or not correct.

define, defined, defining: Describe or specify.

demand: Request.

demount: Remove a disk pack from a disk unit.

department: An organization.

dependent: Needing or relying on.

depends: Needs or relies on.

deposits: Dirt.

derived: Obtained from.

descriptor: A name that describes something.

designed: Made.

detect, detected, detecting: Find or sense.

DEV: Abbreviation for device.

DEV-I: Abbreviation for device interface.

diagram: Figure.

DIR: Data in register.

directed: Instructed.

director: Storage director, one half of the 3880 that controls a string or strings of devices.

director-to-device controller: One of the cards in the 3880.

directors: Storage directors, in the 3880.

directs: Instructs, or controls.

discontinue: Disconnect from the customer's system.

discovered: Found.

dispatcher: The branch office telephone operator.

dispose: Parts disposition.

disposition: Parts disposition.

DOR: Data out register.

DOS/VS: Disk Operating System/Virtual Storage.

DOS/VSE: Disk Operating System/Virtual Storage Extended.

DRC: Dynamic refresh control.

driver: A circuit that increases the power of a signal for transmission over long cables or to many circuits.

DRR: Driver receiver.

DRR-1: Driver receiver 1.

DRR-2: Driver receiver 2.

DTG: Device tag gate.

DTI: Data tag in.

DTO: Data tag out.

dump: A type of printout.

Dynamic control storage: A type of control storage in the 3880. This storage needs special controls (refresh) to maintain data in the storage matrixes when the 3880 is operating.

dynamic trace: A trace that occurs at the time of operation.

DXA: Data transfer addressing card.

DXC: Data transfer control.

DXD: Data transfer data card.

DXR: Data transfer.

ECC: Error condition code.

ECD: Error condition diagram.

edit, edited, editing: Format.

efficiently: Effectively.

EL: Error loop.

encoder: A circuit that encodes data.

energize, energized, energizing: Activate.

ENTER: A key on the MD that indicates that the requested data is ready for the MD to read in.

Environmental recording, editing, and printing: A program that records, formats, and prints the status of a machine when an error occurs.

EOB: End of block.

EOD: End of day.

EOF: End of field.

equip: Abbreviation for equipment.

equivalents: Values.

ERDS: Error recording data set.

EREP: Environmental recording, editing, and printing; a program that records, formats, and prints the status of a machine when an error occurs.

ERP: Error recovery procedure.

established: Used for some time.

examine: Analyze or inspect.

exceeds: Is more than.

excessive: Too much or more than is needed.

execution: Operation.

exercised: Run.

EXIO: Execute input/output.

exist: Are present.

exit: Leave or go from.

ext: Abbreviation for external.

extent: A continuous space on a direct access storage volume that has been reserved for a specific data set.

facility: An installation that has a specific purpose.

FACR: Four-channel additional condition register.

FADT: Four-channel additional driver and terminator.

FADR: Four-channel additional driver.

FAPS: Four-channel additional power sense.

FASC: Four-channel additional sequence control.

FAST: Four-channel additional switch terminator.

fault: Error or failure.

faulty: Bad, not good, not correct, or in error.

FB: Fixed block.

FCA: Four-channel additional (Eight-Channel Switch Feature).

FE: First error communication (OLTSEP or OLTEP).

ferro-resonant supply: A self-adjusting power supply.

finish: Complete.

fix: Repair.

fluff: Brush until soft.

FMM: Functional Microcode Manual.

FRU: Field-replaceable unit.

further: More.

FWD: Abbreviation for forward, a key on the MD that steps to the next frame.

gathers: Collects.

GLOS: Glossary, a section title in the MIM.

gnd: Abbreviation for ground.

grab: A subroutine in OLTSEP.

greater: More than.

GTB: Gate terminal board.

guidance: Instructions.

HA: Home address.

halt: Stop.

handling: Touching.

hardcore tests: A series of tests to ensure that the 3880 can load and execute microcode.

helpful: Useful.

hex: Abbreviation for hexadecimal.

HDSCS: High density static control storage.

hidden: Cannot be seen.

highly: Very.

hosts: Host processing units.

Hz: Hertz.

hub: Center.

IAR: Instruction address register.

IC: Isolation code.

ID: Abbreviation for identifier.

identifier: A name, title, or number used to identify an item.

ILR: Interrupt level register.

IML: Initial microcode load.

impacts, impacted, impacting: Affects.

inactive: Not active.

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inbound: Coming in.

incomplete: Not complete.

incorrect: Not correct.

indefinitely: Not positive or not specific.

indication: Indicator.

individually: Separately.

infinity: Open circuit.

initial: First.

initiate, initiated, initiating: Prepare or start.

INST: Installation, a section title in the MIM.

Int Req: Abbreviation for intervention required.

interchange: Exchange or swap.

interior: Inside or internal.

interposers: Linkage between parts.

intervention: Service.

Intf Dsbld: Abbreviation for interface disabled.

INTRO: Introduction, a section title in the MIM.

invalid: Not valid or illegal.

inventory: A list of items included in a package.

investigate: Observe.

invoked: Started or begun.

I/O: Input/Output.

IPL: Initial program load.

IR: Internal register.

IRG: Internal register group.

isolation: Being separated completely.

isopropyl alcohol: A cleaning fluid.

issuing: Sending or transmitting.

JCL: Job control language.

judgment: Be careful.

JMP: Jumper.

justified: Aligned.

labeled: Labels.

leadscrew: A precision threaded shaft for moving the read/write head in the diskette drive.

LGND: Legend, a section title in the MIM.

listed: To be included in a list.

listing: A printout.

LOC: Location, a section title in the MIM.

logically: Correctly.

LOGREC: Logical record.

LRC: Longitudinal redundancy check.

macro: A series of instructions.

maint: Abbreviation for maintenance.

majority: More than half.

management: Control.

MAP: Maintenance analysis procedure.

marginal: Close.

mask: A pattern of bits used to control data.

MCPC: Microcode program check.

MCS: Maintenance control and/or sense.

MD: Maintenance Device.

MDAC: Maintenance Device Adapter Control.

MDAR: Maintenance Device Adapter Register.

MDH: Maintenance device hardware check.

MDM: Maintenance diagrams manual.

MDR: Miscellaneous data record.

media: Cards or tape.

megabytes: Millions of bytes.

metering: Check with the CE meter.

microcontroller: A module that contains a controller.

microdiagnostic: A diagnostic program.

MIM: Maintenance information manual.

MLX: Cross reference.

MNT: Abbreviation for maintenance.

MNT-C: Maintenance connection.

modifier: Something that changes or defines.

molded: Shaped.

monitor: A program or circuit that controls other programs or circuits.

mot: Abbreviation for motor.

mount: Install a disk pack on the disk drive.

mounted: Installed.

movable: Something that can be moved.

ms: Millisecond.

MSG: Message, a section title in the MIM.

MSM: Maintenance Support Manual.

multilevel: More than one level.

multiple: Many or more than one.

mv: Millivolt.

NCP: No control print.

NEL: No error loop.

NEP: No error print.

net: Network.

NFE: No first error communication.

NMI: No manual intervention.

nominally: Usually or on the average.

noted: Observed.

NPP: No parallel print.

NRE: No remote FE control.

NSI: No spurious interrupt.

NTL: No test loop.

objective: Purpose.

OBR: Outboard record, or outboard recorder.

occurrence: Event.

offloads: Reads.

OI: Overcurrent.

OLT: Online test.

OLTEP: Online test executive program.

OLTS: Online tests.

OLTSEP: Online test standalone executive program.

OP: Abbreviation for operator.

operable: Something that can operate.

opt: Abbreviation for option.

option: Selection.

origin: Starting point.

originated: Started or came from.

OS: Operating system.

outboard recorder: Under DOS, a feature that records important data on the system recorder file when an unrecoverable I/O error occurs.

outbound: Going out or leaving.

outline: A line showing the outer limits of a figure.

OV: Overvoltage.

overall: Complete.

overcurrent: Too much current.

overvoltage: Too much voltage.

pairs: More than one group of two items.

parameter: A constant.

particular: Specific.

partition: A part of main storage used to perform a specific job.

PCC: PSM control card.

PCM: Parts Catalog Manual.

PCR: Pad counter.

pending: During, waiting, or while.

periodically: Occuring at regular intervals.

perm: Abbreviation for permanent.

places: Puts.

PLINK: An OLT subroutine title.

polished: Rubbed smooth.

POR: Power on reset.

portion: Part of a set.

PPN: Parallel Print N.

PR: Print.

preamp: Abbreviation for preamplifier, a circuit that increases voltage or current.

presence: Existing.

presented: Sent out.

previous: Before or earlier.

previously: Preceding.

prior: Before or earlier.

probability: Probable

proceed: Do, go, or move.

proctector: A circuit breaker.

productive: Can make or generate.

PROG: Program, section title in the MIM.

properly: Correctly.
provides: Gives.
PS: Power supply.
PSC: PSM sense card.
PSM: Power sequencer and monitor.
PSW: Program status word.
PS1: Power Supply 1.
purple: Blue-red color.
qty: Abbreviation for quantity.
raised: Activated.
RAP: Remote aid procedures, a section title in the MIM.
RCF: Reader's comment form
RCM: Remote communication manual
rcvd: Abbreviation for received.
rdr: Abbreviation for reader.
RE: Remote FE control.
readings: Results.
recalibrate: To set or adjust a circuit.
receiver: A circuit that terminates a cable and restores the data transmitted over the cable.
recent: Latest or newest.
recorder: Cassette recorder.
recovery: Correction.
rectifier: A device that changes a signal.
refer: See.
referenced: Included in an information source.
refresh cycle: A storage cycle performed at specific intervals to ensure that data is valid in the dynamic control storage matrixes.
reg: Abbreviation for register.
regardless: Despite.
register: A circuit that stores data.
reissue: Send again.
relating: Pertaining to.
relevant: With meaning or importance.
relocating: To place in a new location.
replace: Exchange a bad part for a new part.

replaces: Takes the place of.
reply: Respond.
replying: Answering
req: Abbreviation for required.
require, required, requiring: Need.
rerun: Run again.
reselect: Select again.
resident: Permanently located in storage when the machine is operational.
responsible: Answer for
restoring: Reset or store again
resulted: Caused.
resumes: Starts again or continues.
ret: Abbreviation for return.
RETAIN: Remote technical assistance network
retain: Keep.
retainers: Clips or fasteners.
retest: Test again.
retried: Attempted again.
retrieval: Collection.
retrieved: Collected.
retry: Attempt again.
ripple: Wave.
RMCKD: Read multiple count, key, and data.
ROS: Read-only storage.
rotate: Turn.
SBP: Select out bypass.
SBP-A: Select out bypass A
SBP-B: Select out bypass B
SC: Abbreviation for symptom code or storage control
scheduled: Planned.
scheme: Plan.
SCK: Switch clock.
SCR: Silicon controlled rectifier, a type of diode.
SCS: Static control storage.
SDI: Storage director identifier.
SDM: Storage director microcontroller.

SDR: Switch driver receiver.
SDT: Switch driver terminator.
SD1: Storage director 1.
SD2: Storage director 2.
sec: Abbreviation for second.
secure: Fasten, lock, or tighten.
sequenced: Turned on in a specified order.
sequencer: A Circuit that sequentially turns the power supplies on and off, the power sequencer and monitor.
sequencing: The process of sequentially turning the power supplies on and off.
serious: Major.
shaded: Darkened.
SI: Spurious interrupt
simplify: To make something easier.
sink: The terminating end of a circuit.
SMB: Speed matching buffer (3380).
SMBU: Speed matching buffer, unidirectional (3375).
SP: The space character.
SPC: Channel speed control.
spurious: False.
SSW: String switch.
stand-alone: Not controlled by an other device or machine.
state: Condition.
Static control storage: A type of storage matrix that retains stored data as long as power is on.
statistical: Pertaining to data grouping.
string: A series of direct access storage devices.
subfields: Minor fields in a main field.
subject to attack: Damaged.
success: Reaching an acceptable end.
successful: Acceptable or correct.
successfully: Correctly.
suffix: Ending characters of an instruction or an error message that specifically identify a function, error, or device.
summed: Added.
sure: Positive.
symbolic: Representative.

symcde: Symptom code.
TACR: Two-channel additional condition registers.
TADT: Two-channel additional driver terminator.
TCR: Two-channel condition register.
TAG: A line name.
tailgate: Input/output connectors.
taping: Sealing a box with adhesive tape.
TB: Terminal board
TCR: Two-channel condition register
temp: Abbreviation for temporary or temperature.
termination: A resistor or plug that terminates a circuit.
terminator: A resistor or plug used to terminate a circuit.
TFR: Toggle, FRU register.
theory: Description of how a machine or program works or operates.
thermals: Temperature sensing devices.
threshold: Operating limit.
thumbscrew: A screw that can be turned with the fingers.
timeout: Time-out.
TLn: Test loop n.
tracing: The recording of a sequence of events as they occur.
transfer: Transmit or receive. The automatic data transfer card transmits data to and receives data from the devices.
TRKO: Track zero.
try, tried, trying: Attempt.
TTL: Transistor-to-transistor logic.
T0: Time 0 (zero).
UCB: Unit control block.
UCW: Unit command word.
UE: Unit emergency.
unchained: Not chained.
uncorr: Abbreviation for uncorrectable (not correctable).
uncorrectable: Not able to be corrected.
undervoltage: Less than normal voltage.
unexpected: Not expected.
unformatted: Not formatted.

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GLOSSARY

- unguided:** Not guided.
- unique:** One of a type or no other similar to it.
- unlike:** Not similar to.
- unnecessary:** Not needed.
- unreadable:** Not readable.
- unrecoverable:** Not able to be recovered.
- unshared:** Not shared.
- unspecified:** Not specified.
- unsuccessful:** Not successful.
- unsupported:** Not supported.
- UV:** Undervoltage.
- VAC:** Volts alternating current.
- validated:** Found to be valid.
- variety:** A number of items.
- vary:** Change
- VDC:** Volts direct current
- VER:** Abbreviation for verify
- verification:** Ensuring that something is valid.
- version:** Model, class, or type.
- via:** By.
- violate:** An illegal attempt to read or write in a data file.
- virtual Machine:** An operating program.
- VM:** Virtual machine.
- VOL:** Abbreviation for volume.
- VOLID:** Volume identifier.
- VS:** Virtual storage.
- VSE:** Virtual storage extended.
- WAITIO:** A subroutine identification.
- whenever:** At any time.
- within:** In or inside of.
- WRI:** Write inhibit.
- XCS:** Transfer complete status.
- XES:** Transfer error status.

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REFERENCES TO OTHER SECTIONS

See MIM sections referenced on START-10.

See INST-20 and MSG-33 for information about the storage director physical identifier.

See PWR-29 to correct the problem of no power at the convenience outlet.

See PWR-32 for voltage checks.

ABBREVIATIONS IN THIS SECTION

CHL-I channel interface

CTL-I control interface

DASD direct access storage device

EREP environmental recording, editing, and printing

FRU field-replaceable unit

FWD forward (MD key)

GLOS glossary

IC isolation code

ID identifier

IPL initial program load

IR incident report

INST installation

INTRO introduction

K/D keyboard/display

LGND legend

LOC location

MAP maintenance analysis procedure

MD maintenance device

MIM Maintenance Information Manual

MLX cross reference

MSG message

PROG program

PWR power

RCF reader's comment form

SC symptom code

SD storage director

SD-SD storage director to storage director

SDI storage director identifier

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To install or discontinue the machine:

Go to INST

To find latest service information:

Go to INST

To repair the machine:

Go to START-11

To check out machine:

Use MD option 5

To analyze a console message:

Go to MSG

To run online tests:

Go to PROG

To analyze a diagnostic error message:

Connect the maintenance device for the symptom code from the console error message or EREP.

Go to PROG for error messages from system maintenance programs.

To analyze an EREP printout:

Go to MSG

To power down the machine:

Go to PWR

To learn the machine names and symbols:

Go to INTRO, GLOS, LGND

To operate the panels:

Go to PWR

To review the maintenance plan:

Go to INTRO

To find a part of the machine:

Go to LOC

To recommend improvements to this MIM:

Go to RCF

To learn how to use this MIM:

Go to INTRO

To find information about a specific item:

Go to INDEX

To enter this manual from another manual:

Go to MLX

To perform preventive maintenance:

Perform preventive maintenance only during a machine repair End Call option.

To review the 3880 Maintenance Library:

Go to INTRO

To run the device microdiagnostics:

Use the 3880 Functional diskette (device diagnostics are on this diskette).

To replace logic boards:

Go to CARR-205

To enable or disable a channel on machines with the Remote Switch feature:

Go to CARR-229

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To efficiently and effectively repair the 3880, read the following.

Each storage director has a unique physical identifier (see INST-20). The physical identifier of the storage director generating an error is found in sense byte 21 and in EREP Statistical and Error Data Summary (see MSG-33).

Symptom codes (SCs) located in sense bytes 22 and 23, define the type of error sensed in the DASD subsystem.

Note: Sense information is normally displayed by the system to which the failing storage director is attached. However, when a SC 3XXX is sensed, the storage director that is not failing reports the failure sensed by the failing storage director.

The physical identifier of the failing storage director is always shown in sense byte 21.

When one channel is detecting failures on many control units, the problem may be in the channel. If the channel is not the cause, the control unit causing the failure may be isolated by disabling its channel interfaces or by butting the channel cables to bypass the control units.

3880 failures usually cause:

- Symptom codes 0XXX, 2XXX, or 3XXX
- Power Check indicator to light on the operator panel

Symptom codes other than 0XXX, 2XXX, or 3XXX are usually caused by the attached device.

3880 failures sometimes cause:

- Channel or processor-sensed errors such as Interface Control Check (sense data is usually presented through the other storage director)
- Drive sensed errors such as 49XX

A condition code 3 processor-sensed symptom can be caused by the following:

- An unrecoverable clock-stopped check 1 or channel check 1 that disables the channel interface
- A 3880 that is not operational
- A device controller that is not operational

MD OPTION RESTRICTIONS

Certain MD options are limited or cannot be used (Figure 1) if:

- The MD is not connected to the 3880 **1**.
- The desired storage director channel interface cannot be disabled **2**.

TO DETERMINE THE FAILURE IN THE 3880

Use the maintenance device (MD) diskette for the failing 3880. Examine the history record using MD option 3, to see if recent activity is relevant to this failure.

Select the symptom from Figure 2, and follow the action indicated.

Figure 1

Option (START-16)	MD Not Connected to 3880 1	Cannot Disable Interface 2	Can Disable Interface
0	Can Use	Can Use	Can Use
1	Cannot Use	Limited Use	Can Use
2	Cannot Use	Cannot Use	Can Use
3	Can Use	Can Use	Can Use
4	Can Use	Can Use	Can Use
5	Cannot Use	Cannot Use	Can Use
6	Limited Use	Can Use	Can Use
7	Can Use	Can Use	Can Use
8	Cannot Use	Limited Use	Can Use
9	Cannot Use	Can Use	Can Use

3880 Storage Control With Airline Buffer RPQ

The Airline Control Program (ACP) and the Transactional Processing Facility-2 (TPF-2) require maximum data throughput. To obtain maximum data throughput, the customer may require that the inline device diagnostics for the 3880 subsystem be run in one of the following ways.

- With the storage director offline
- On a maintenance system
- Concurrently with his operations only after permission is given.

Some system utilities, such as the Device Support Facilities and the Online Test (OLTs) programs, do not operate with the ACP or TPF-2 functional code.

Figure 2

Symptom	Description	Action
The 3880 is reporting a symptom code other than 0XXX, 2XXX, or 3XXX.	The attached 3880 has a failure that requires analysis.	Use MD option 1 to determine how to fix the 3880. Enter the symptom code when prompted. The MD must be connected to the 3880 (see START-15).
	The attached device reports a failure, but the CE suspects that the storage director is failing.	
	The attached device has a failure that requires analysis.	
The Check LED on the operator panel for storage director 1 or 2 is On.	The storage director IML operation failed or another failure exists in the 3880 that allows or requires offline analysis.	Use MD option 1 to determine how to fix the 3880. The MD must be connected to the 3880 (see START-15).
The 3880 has a failure and the failing storage director can be taken offline.		
Power check LED on 3880 operator panel is on.	A power problem has been sensed by the 3880.	
There is power at the convenience outlet, but the 3880 does not power on.	Basic power problem. The MD can be used.	Go to PWR-29.
No power at the 3880 convenience outlet	Basic power problem. The MD cannot be used.	
Excessive errors in the 3880 and the 3880 cannot be taken offline.	The 3880 indicates excessive errors. Analysis can be performed without affecting productive work.	Obtain the 3880 symptom code from: <ul style="list-style-type: none"> • operator console messages (MSG-5) • EREP (MSG-1) • MD maintenance option 8 (see read SD status on START-16) Use MD option 4 to determine the FRU group.
EREP summary report indicates that error information is stored in the 3880.	A non-functional error exists that impacts error reporting of the storage director. Analysis can be done without affecting 3880 operation.	Use MD option 9 to determine the FRU group. The MD must be connected to the 3880 (see START-15).
Intermittent errors with symptom indications from different FRUs.	A power problem such as noise, ripple, overvoltage, or overcurrent may exist.	Go to PWR-32. Check voltages and ripple. Repair as required. Display history records to see if the power sense register contains an indication of intermittent power problems.
The 3880 Status Pending Led is always on	More information is needed to determine failure.	Go to START-33, Entry A
Channel interface control checks	Problem may be in the 3880 or an attached channel.	Go to START-33, Entry B

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The maintenance device (MD) is the primary maintenance tool for the 3880.

For more information on the MD, review the instruction label inside the top cover of the MD and MIM pages START-15 through START-30.

Note: Using the MD at the 3880 can interfere with a device diagnostic in progress.

All 3880 maintenance analysis procedures (MAPs) are stored on the diskette. When the diskette is loaded in the MD diskette drive, the MAPs start running. The MAPs are used to:

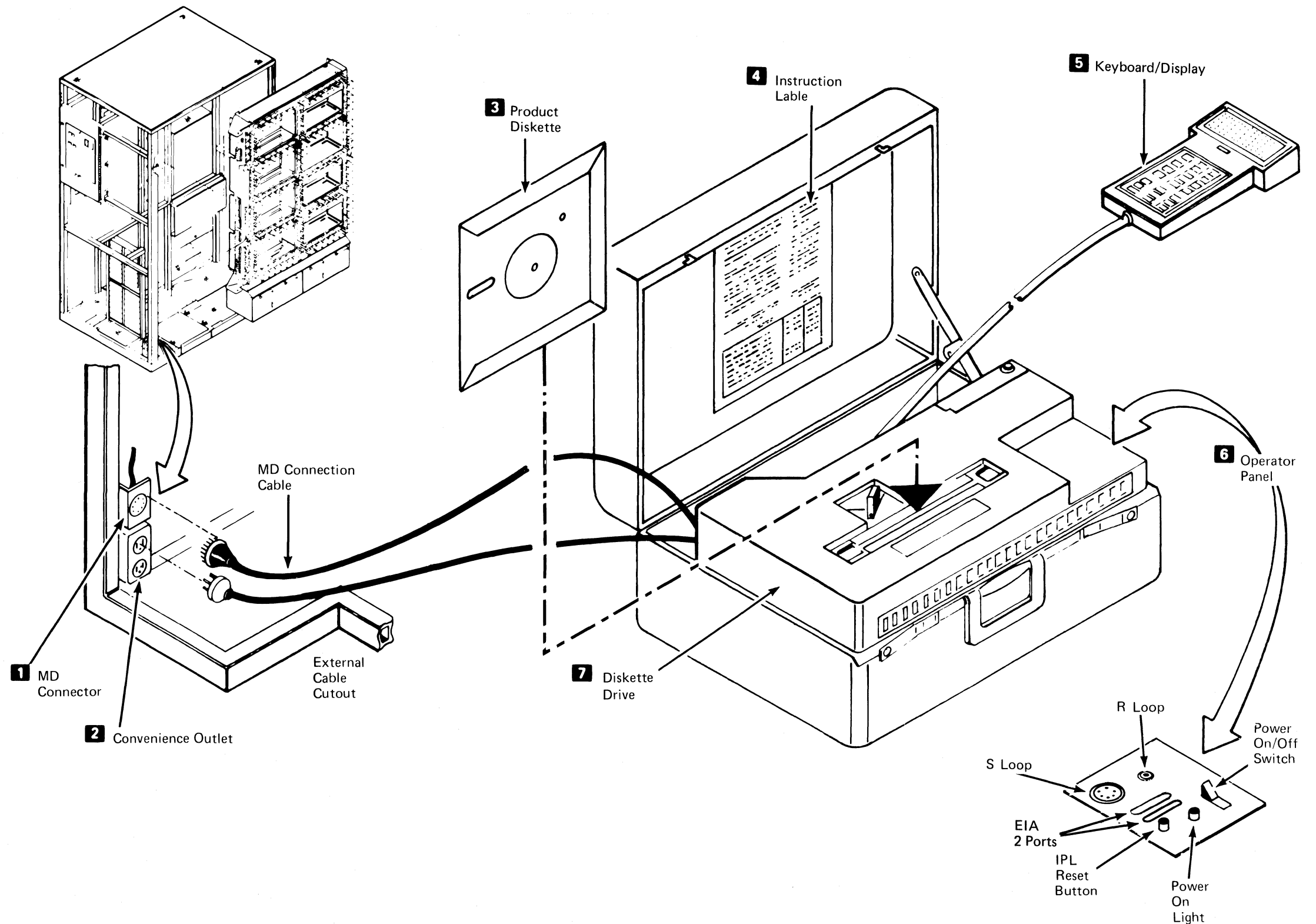
- Test the connection between the MD and the 3880.
- Start the diagnostic programs on the 3880 Storage Control Diskette.
- Request actions such as enter symptom information, answer questions, or exchange parts. The MAPs also give MIM page references.

The main parts of the MD are:

- Product diskette **3**. The product diskette must remain with the 3880 with which it was shipped.
- Instruction label **4**. The label describes how to start and use the MD and what to do when it fails.
- Keyboard/Display (K/D) **5**. The K/D is used to enter and display data.
- Operator panel **6**.
- MD diskette drive **7**.

Note: The 3880 MD connector **1** is in the lower-left, rear corner above the convenience outlet **2**.

If the MD drive motors fail to operate with power on, connect the MD to another outlet and see PWR 60 for instructions on how to diagnose the failure of the 3880 convenience outlet.



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After the MD is successfully initialized, the maintenance mode option list is displayed. This list of the commands is used to start a maintenance action. The following is a description of each option.

0 – END CALL

End Call (option 0) is used at the end of any maintenance action (even if the MD is not connected to the 3880 during the maintenance action).

Option 0:

- Runs the support CE function test on the offline storage director. This tests the logic normally used by the support CE.
- Allows entry of information about the repair and entry of a message for the next CE.
- Displays the error code and special code, if available, that is to be recorded on the back of the IPAR.

This option is entered automatically at the end of each option 1 or option 5.

1 – START REPAIR

Start Repair (option 1) is used to isolate, repair, and verify a hardware failure.

When option 1 is selected, the MD:

- Gathers symptom information directly from the 3880
- Selects and executes the needed diagnostic programs
- Requests any additional symptom information
- Determines the most probable cause of the failure
- Displays a list of the most probable FRUs that could cause the failure (in the order of probability)
- Directs the repair of the failure
- Verifies that the repair corrected the failure

2 – CONTINUE REPAIR

Continue Repair (option 2) allows the continuation of a repair action that was interrupted by an:

- MD power-off
- MD IPL

The original repair action may have been started by a:

- Start repair (option 1)
- Symptom analysis (option 4)
- Machine checkout (option 5)

When option 2 is selected, the MD resumes the interrupted repair action at the point where the last error was detected.

3 – DISPLAY HISTORY

Display History (option 3) allows the display of history information gathered on previous maintenance actions by the MD or by CE entry.

When option 3 is selected, as many as 10 history records are displayed sequentially in the order in which they were recorded on the MD diskette.

The main text contains a summary; reference text contains more detail.

4 – SYMPTOM ANALYSIS

Symptom Analysis (option 4) allows the analysis of hardware failures. This option can be used with or without connecting the MD to the 3880.

When option 4 is selected, symptom information must be entered manually by using the MD keyboard.

5 – MACHINE CHECKOUT

Machine Checkout (option 5) allows the verification of 3880 operation after initial installation or an engineering change.

6 – READ/SET SWITCHES

Read/Set Address Switches (option 6) aids the correct setting of the storage director address switches (on the CIF card) during initial installation. It also reads the settings of:

- Storage director address switches (on CIF cards)
- Diskette load control switches (on MNT card)
- Storage director physical identifier (on DCT card)

7 – FEATURE CHANGE

Feature Change (option 7) allows updates to the configuration record on the MD diskette after a feature change is made to the 3880.

8 – DIAGNOSTIC AIDS

Diagnostic Aids (option 8) permits the use of special diagnostic aids that are not part of the guided maintenance procedures. These are:

- Select and run device diagnostic (maintenance) programs.
- Set or reset forced logging mode.
- Read the power sense register. See PWR-39 for a description of the power sense register.
- Trace Options
 - Read trace status
 - Force trace save
 - Dump trace to MD diskette.
- Read SD status
 - The MD displays the following information:
 - The most current format 0, 1, 2, 4 or 5 sense data
 - The most current format 3 sense data for the alternate storage director
 - The part number and EC level of the functional microcode
 - The most current IML code
 - The contingent connection control block
 - The status of the interval timer
 - The status of forced logging
- Operator panel lamp test
- Read contingent connection control block

9 – SD-SD TEST ERROR ANALYSIS

SD-SD Test Error Analysis (option 9) is used to analyze information stored in control storage when an error is detected in the SD-SD connection test on the most recent IML. Analysis can be performed while both storage directors are being used by the customer. All SD-SD connection repairs and verifications require that both storage directors be offline.

The MD messages that indicate the SD-SD connection test was completed without error are:

0000 All OK
 0202 SD1 switches are set incorrectly
 8000 IML performed on SD1 only
 0080 IML performed on SD2 only

All other bit combinations are analyzed by option 9 and the MD presents a FRU group for the analyzed failure.

The design of the MD is such that the MD works basically in the same way on all products designed to use the MD. However, there are a few items that are different when using the MD on the 3880.

CONNECT THE MD

START-15 contains the procedure for physical connection of the MD to the 3880. Basic operating instructions for the MD are on the label on the inside of the MD cover.

SELECT AN OPTION

After the MD has completed its checkout procedure, it displays a list of eight optional maintenance procedures. These optional procedures are described on START-16. Press the numeric button on the MD keyboard that compares to the number in front of the procedure to be used.

CONTINUED FRAMES

Any frame of information with three dots (. . .) at the end of the last line is not a complete statement. Press the Enter key to display the remainder of the statement. The frame that follows has three dots at the start of the first line.

Frame 1

OBSERVE THE METER WHILE PRESSING THE POWER SYSTEM SWITCH TO POWER ON . . .

Frame 2

. . . (POWER SWITCH PANEL) .

MD FIX CODE

The MD Fix Code is the 7-digit code shown in the upper left-hand corner of the MD frame that describes the error. For example:

MD Fix Code

M130F04 31DEC78-0A
IC=06C3-1 MD ADAPTER
INTERRUPT DURING MD
RECEIVE FROM SD2.

Record the 7-digit maintenance device fix code right justified in the special block on the back of the IPAR. If the MD fix was not successful in FRU isolation, record an X in the high-order position. If no MD fix code was developed, record an N in the special block. For example:

SPECIAL

M	1	3	0	F	0	4
---	---	---	---	---	---	---

(successful FRU isolation)

SPECIAL

X	M	1	3	0	F	0	4
---	---	---	---	---	---	---	---

(unsuccessful FRU isolation)

SPECIAL

							N
--	--	--	--	--	--	--	---

(no MD fix code developed)

HISTORY LOG

A history log entry is recorded each time a fix statement (the MD frame that describes the error) is generated.

This dated statement is placed on the MD diskette for reference during maintenance actions that follow.

END CALL

End Call (option 0) should be selected at the end of each maintenance action. At this time, comments can be entered into the history log. This option is entered automatically at the end of each option 1 or option 5 activity.

UNGUIDED MAINTENANCE

When the maintenance procedures become unguided, the following information is displayed on the MD:

Frame 1

STOP END OF GUIDED MAINTENANCE PROCEDURES.

Frame 2

REQUEST DIAGNOSTIC AID (IF NEEDED) BEFORE CONTINUING THIS CALL.

PROBABILITY CODE

Some FRU lists contain probability codes. These codes (from blank to 9) are assigned to each FRU.

1. B*L2 MNT CARD 9
2. B1P2 MDA1 CARD 1
3. B1S2 DRR-1 CARD
4. B1T2 DRR-2 CARD

The code expresses the probability that the indicated FRU corrects the error condition that presented the FRU list. A 9 is the highest probability and a blank is the lowest.

ENTER KEY AND FWD KEY

The 3880 MD programs are designed to use the Enter key, not the forward (FWD) key. Use the Enter key to advance the MD display to the next frame.

PF KEY

The PF key normally causes the MD to return to the maintenance option list.

ENTRY A – STATUS PENDING HANG CONDITION

The status pending light is turned on when the channel fails to respond to one of the following conditions:

- The 3880 has retry reconnection status to present to the channel.
- Ending status has been presented, but was stacked.
- A contingent connection exists for one device (unit check was presented to the channel, but the channel failed to return a sense command).

Note: Every attempt should be made by the error recovery routine in the system program to reset this condition with software. (The device address associated with the CU End signal is the address of the contingent connection waiting for the sense command from the channel).

To reset the hang condition, proceed with Status Pending – Reset Procedure.

Status Pending – Reset Procedure

Warning: Because of the serious nature of a hardware reset, contact the customer's system problem determination representative. Be sure to work closely with the customer's representative to minimize the impact of the reset.

To reset the status pending hang condition, perform the following:

1. Determine the channel interface that is hung using the Channel Determination Procedure on this page.
2. Have the operator place the system associated with the failing channel in the wait state.
3. Perform one of the following resets. Use the one that will have the least impact on customer operations and data integrity:

CHANNEL RESET

Warning: Channel Reset resets all outstanding reservations for all devices on this channel.

Have the operator perform a Clear Channel instruction (provided the system has the capability).

SYSTEM RESET

Warning: System Reset resets all outstanding reservations for all devices on the system.

Have the operator perform a system reset or an IML operation.

3880 IML

Warning: The 3880 IML reset has the maximum exposure for data integrity and lost interrupts.

Use the following sequence to perform the 3880 IML operation.

Vary all devices offline that are attached to the failing storage director.

Note: Proceed with caution if a Vary Complete message is not received.

Turn the power switch on the failing storage director to the Off position and then to the On position.

Vary all devices, except those being repaired, online that are attached to the failing storage director.

4. Have the operator restart the programs to ensure that the status pending condition has been eliminated. If the hang condition returns, call for support and refer to the Problem Determination Aids section in the Maintenance Support Manual (MSM), Volume 60, for more information on the cause of the status pending condition.

Note: If a repair action was previously in progress, return to that procedure before giving the machine back to the customer.

Channel Determination Procedure

The 3880 indicates the channel interface that is hung by blinking the Wait and Process LEDs on the Operator panel. The following determines the channel that is hung:

1. The Status pending LED is continuously on.
2. The Wait and Process LEDs blink on and off at a 1-second rate to indicate the hung channel. The LEDs blink one time for channel A, two times for channel B, and so on (see the following table).

3. The blinking sequence is followed by a 5-second pause and then is repeated until the status pending hang condition is cleared.

Channel	Number of Blinks
A	1
B	2
C	3
D	4
E	5
F	6
G	7
H	8

The following is an example of a status pending hang for channel D:

1. The Status Pending LED is on.
2. The Wait and Process LEDs are on for one second.
3. The Wait and Process LEDs are off for one second.
4. Steps 2 and 3 are repeated three more times.
5. The Wait and Process LEDs are off for five seconds
6. Steps 2 through 5 are repeated until the status pending hang is cleared.

ENTRY B – CHANNEL INTERFACE CONTROL CHECK

A 3880 Check 1 error activates the Disconnect In line on the selected channel. If no channel is selected when the Check 1 error occurs, Request In is presented to all channels. The first channel that responds to the Request In then receives Disconnect In during the selection sequence. The interface control check (IFCC) is logged to the channel receiving the Disconnect In, but the Format 3 (Check 1) sense data is logged to the first channel selecting the alternate storage director. This can be a system other than the one to which the IFCC was logged. The channel receiving the Disconnect In (IFCC) responds with a Selective Reset and the operation is retried. If the retry operating is successful, processing continues. If a second failure occurs during the Selective Reset, the channel is disabled and the sequence is repeated until all channels are disabled. On Channel Check 1 (Format 3 messages 9 and A) the Selective Reset is normally successful, because the failure is in the 3880 channel interface area and much of this area is not used during the Selective Reset routine. The failure recurs during the channel connection routine and another IFCC occurs. These IFCCs continue until the system varies the failing path offline.

ENTRY C – HOW TO SELECT FORCED LOGGING MODE

Before the forced logging procedure can be invoked, three actions must be completed:

- The MD is connected to the 3880
- The correct diskettes are installed in the MD and 3880
- Power is on the MD and the 3880

Forced Logging Set – Reset Procedure

The procedure for setting or resetting forced logging mode is:

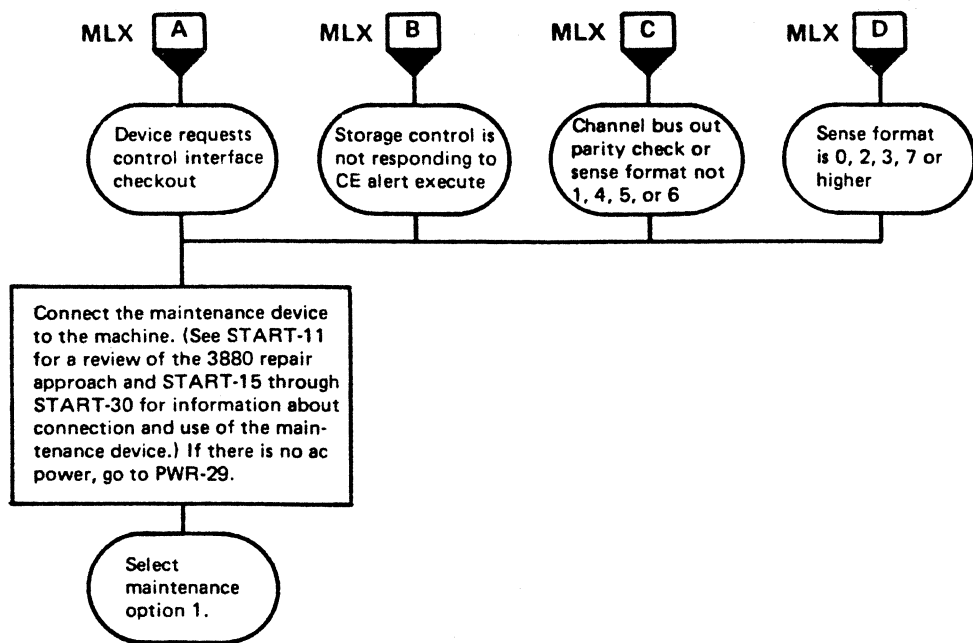
1. Press the Reset IPL pushbutton on the MD.
2. Advance the MD display to the Maintenance Action List. The following frame is then displayed.

ENTER NUMBER FROM THE FOLLOWING LIST TO SELECT A MAINTENANCE ACTION

3. Select maintenance option 8 (Diagnostic Aids).
4. Select Forced Logging Mode from the diagnostic aids list. (This action is performed with minimal interruption to normal customer operation.)
5. Specify the storage director (SD1 or SD2).
6. Specify set or reset of forced logging mode.
7. Disconnect the MD from the 3880 if no further actions are desired.

To determine if forced logging mode is set or not, select maintenance option 8G (Read SD Status).

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3880 STORAGE CONTROL WITH AIRLINE BUFFER RPQ

The Airline Control Program (ACP) and the Transactional Processing Facility-2 (TPF-2) require maximum data throughput. To obtain maximum data throughput, the customer may require that the inline device diagnostics for the 3880 subsystem be run in one of the following ways:

- With the storage director offline
- On a maintenance system
- Concurrently with his operations only after permission is given

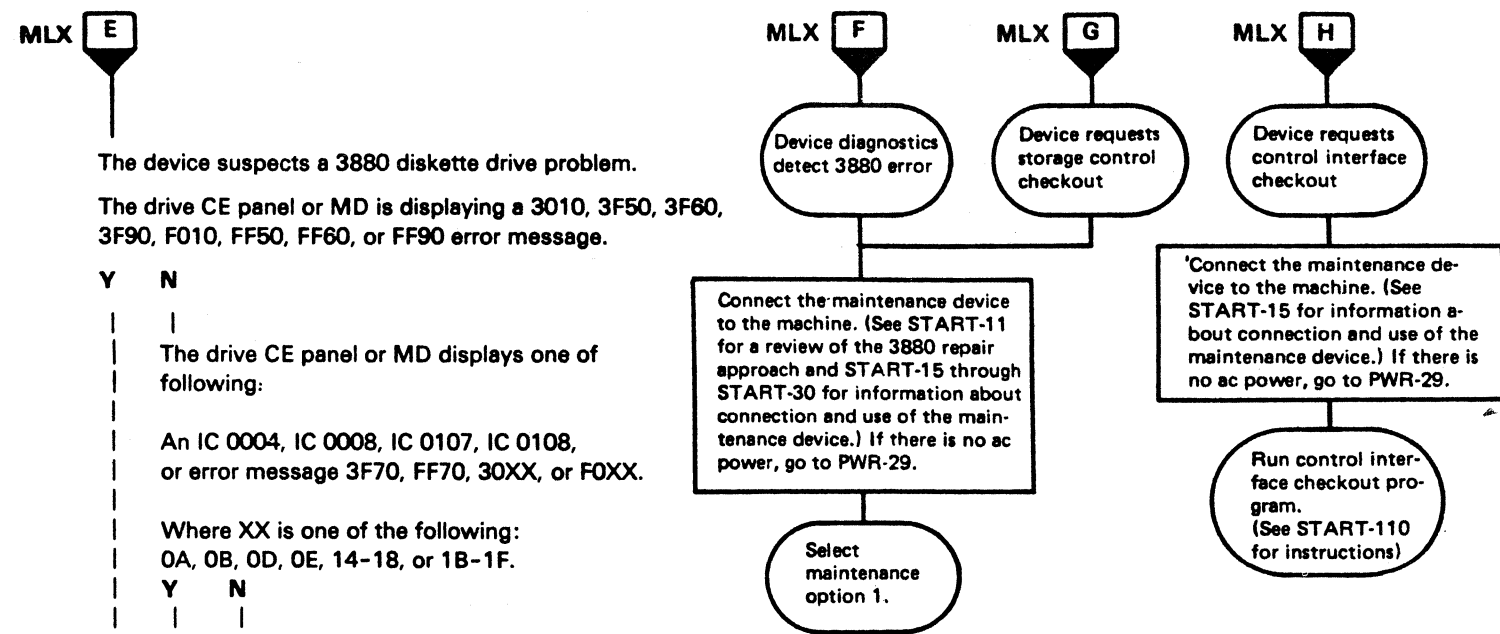
Some system utilities, such as the Device Support Facilities and the Online Test (OLTs) programs, do not operate with the ACP or TPF-2 functional code. Use the following procedure to run these tests.

For 3350 devices

1. Take the 3350 disk storage device or head and disk assembly (HDA) to be tested offline.
2. Install the disk drive or HDA on the test system or drive and perform the required tests.

For 3380 devices

1. Take the 3880 subsystem or the devices to be tested offline.
2. Remove the Airline Buffer functional microcode diskette (P/N 4518626) from the 3880.
3. Install the Speed Matching Buffer diskette (P/N 4518203) in the 3880.
4. Perform an IML operation on the storage director and devices under test and then perform the required tests.
5. Before returning the 3880 to the customer, reinstall the Airline Buffer functional microcode diskette (P/N 4518626) in the 3880.



The device suspects a 3880 diskette drive problem.

The drive CE panel or MD is displaying a 3010, 3F50, 3F60, 3F90, F010, FF50, FF60, or FF90 error message.

Y N
The drive CE panel or MD displays one of the following:

An IC 0004, IC 0008, IC 0107, IC 0108, or error message 3F70, FF70, 30XX, or FOXX.

Where XX is one of the following: 0A, 0B, 0D, 0E, 14-18, or 1B-1F.

Y N
Go to MLX Entry FF

Another 3880 diskette is available.

Y N
Go to MLX Entry F

Try to recreate the failure.

Failure still occurs.

Y N
Order a new 3880 diskette. Return to the device and continue the original call.

Go to MLX Entry F

These error messages normally indicate an attempt to run more than one of the following programs at a time.

Diagnostic programs, a trace occurred during an inline program, or a diagnostic was run during an inline program. See START-105 for a description of these error messages.

More than one of the following running at one time: inline program, trace, or diagnostic.

Y N
Go to MLX Entry F

Run only one program at a time.

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ENTRY FROM ANOTHER MACHINE

ENTRY FROM ANOTHER MACHINE **START-105**

DISKETTE DRIVE PROBLEM SUSPECTED

Error Messages 3010 or F010

Error messages 3010 or F010 indicate that drive controllers on both storage directors are trying to use the 3880 diskette drive at the same time.

Error Messages 3F50 or FF50

Error messages 3F50 or FF50 indicate that a trace save occurred during the execution of an inline program. The trace information is stored in the inline overlay area of control storage. If the inline programs are executed before the trace table is dumped, the trace information is lost.

Error Messages 3F60 or FF60

Error messages 3F60 or FF60 indicate that more than one drive controller on the same storage director is trying to use the 3880 diskette drive at the same time.

Error Messages 3F90 or FF90

Error messages 3F90 or FF90 indicate that a drive online test (OLT) is being run. Drive inline diagnostic programs cannot be run at the same time.

CTL-I CHECKOUT REQUESTED BY DRIVE

This program is run at the request of a drive maintenance analysis procedure (MAP) that suspects a control interface (CTL-I) failure.

1. Ensure that the storage director to be used is offline. Set all channel switches for the storage director to the disable position on the 3880 operator panel.
2. Connect the MD to the 3880 as shown on START-15.
3. Insert the 3880 MD diskette into the MD.
4. Power on the MD and press the IPL-reset pushbutton.
5. When the message

```
MD DISKETTE LOADED
FOR 3880
.
.
```

is received, press the Enter key.

6. Continue pressing the Enter key until

```
ENTER THE DATE
.
.
.
```

is received. Enter the date.

7. Enter the 3880 machine serial number located on the frame under the logic gate.
8. The following frame should then be displayed:

```
ENTER NUMBER
FROM THE FOLLOWING
LIST TO SELECT A
MAINTENANCE ACTION
```

Enter an 8 to select Diagnostic Aids (option 8).

9. Select Run Diagnostic Program from the Diagnostic Aids list (option D).
10. Enter the routine number and the run parameters when requested by the MD. Refer to the drive MIM for error-stop description and maintenance actions.
11. At the end of the call, ensure that the control interface diagnostic program is no longer executing.
12. Disconnect the MD from the 3880 if no further actions are desired.

CHL-I – ROUTINE 75

Routine 75 runs with online test T3880B (OLT-B) to test certain lines in the channel interface (CHL-I).

1. The MD must be connected to the 3880 (see START-15) and the MD IPL function completed.
2. In order to run a diagnostic routine, option 8 (Diagnostic Aids) must be selected from the maintenance action list. To get to this list:
 - a. Press the IPL Reset pushbutton on the MD and proceed to the maintenance action list.
 - b. If a maintenance action has already been selected, press the PF key. The MD then displays the list.
3. Select Run Diagnostic Program from the Diagnostic Aids list.
4. Enter the routine number (75) when requested. This routine has no run parameters.
5. Run OLT-B.
6. Perform an initial microcode load (IML) on the storage director by turning power off, then on to ensure that routine 75 is no longer executing at the end of the call.

**3880
MIM**

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MAINTENANCE LIBRARY CROSS REFERENCE

CONTENTS OF THIS SECTION

Entry From Other Maintenance Libraries	2
Definition of Entries From Other Maintenance Libraries	3
Definition of Exits to Other Maintenance Information Manuals	5

REFERENCES TO OTHER SECTIONS

MLX-2 refers to START-100 and MSG-30 for continuation of entries from another MIM.
MLX-5 refers to START-11 for error exit 5.

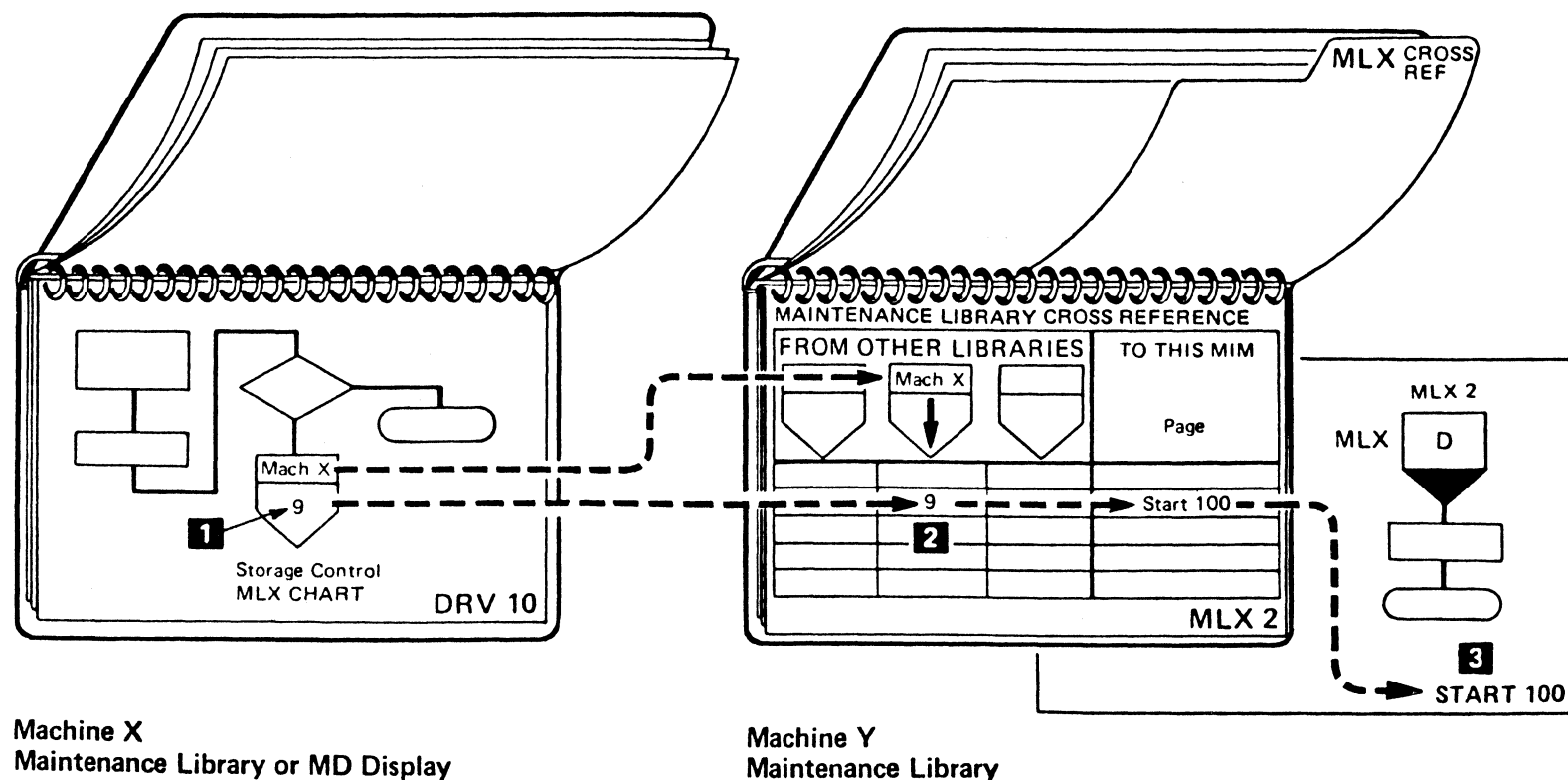
ABBREVIATIONS USED IN THIS SECTION

DBI	device bus in
DBO	device bus out
DDC	director-to-device controller
FRU	field-replaceable unit
MD	maintenance device
MIM	Maintenance Information Manual
MLX	maintenance library cross reference
SC	symptom code
XES	transfer error status

HOW TO USE THIS PAGE

1. Note the exit number on the page of the Maintenance Information Manual (MIM) or maintenance device (MD) display you are leaving **1**.
2. Find that exit number in the appropriate column of the chart on the maintenance library cross reference page (MLX-2) **2**.
3. Proceed to the referenced page in this MIM **3**.

See MLX-3 for information about the conditions that caused entry into this MIM.



Machine X
Maintenance Library or MD Display

Machine Y
Maintenance Library

	FROM OTHER MAINTENANCE LIBRARIES						TO THIS MIM
	3330/33	3340/44	3350	3370	3375	3380	
1-37	1	1	4,5,6,9	4,5,6,9	1	START-100, Entry A	
44-46	11		8	8		START-100, Entry B	
47	5	5	7	7	6	START-100, Entry C	
56,58	9	9		11,12		START-100, Entry D	
40	10	10	1	1	2	START-100, Entry E	
	2	2				MSG-30	
	7	7				MSG-30	
		3				START-100, Entry H	
49		4				START-33, Entry C	
50			2,10	2,10	3	START-100, Entry F	
			3	3		START-100, Entry G	
					7	START-33, Entry A	

DEFINITION OF ENTRIES FROM OTHER MAINTENANCE LIBRARIES

Use this page with the 3880 MIM entry page (MLX-2) to understand the condition that caused a given entry point.

Entry Condition	3330 3333	3340 3344	3350	3370	3375	3380
Entry to storage control interface analysis procedure. Check out procedure for control interface from storage control.	1-37	1	1	4,5 6,9	4,5 6,9	1
Entry to storage control when sense information indicates byte 0, bit 2, channel bus out parity is active. Also, enters storage control if sense byte 7 does not indicate that sense information is format 1, 4, 5, 6, 7, or 8.	47	5	5	7	7	6
Entry to storage control for sense format 6 information concerning overruns and/or when sense format 6 sense information is obtained.		7	7			
Entry to storage control if sense format 0, 2, or 3. This entry is also required if sense format 7 (or higher) is used for any reason.	56,58	9	9		11,12	
Entry to storage control when the device maintenance package suspects a failure in the 3880 diskette or 3880 diskette drive.	40	10	10	1	1	2
Entry to storage control to determine why the storage director is not recognizing or responding to the CE alert execute signal.	44,46	11		8	8	
Device requests information on sense format 6, sense bytes 5 and 6.		2	2			
Device requests that the 3880 run the control interface checkout program.			3			
Device requests that the 3880 be put in the forced logging mode.	49		4			
Device diagnostics found an error in the storage control. MD reference display contains error information.	50			2,10	2,10	3
Device diagnostics do not load and execute. Device requests storage control checkout.				3	3	
Device request status pending analysis.						7

Use this page when tracing back from other maintenance libraries to understand the condition that resulted in a given exit point and to locate the line in this Maintenance Information Manual (MIM).

To find the field-replaceable unit (FRU) table for a symptom code, use the maintenance device (MD) symptom analysis option.

Exit	Exit Condition	Page
1	SC 2004 (Sync In Check). Transfer error sense (XES) register bit 5 is on, indicating that +Sync In was detected after the byte count had gone to zero.	SC 2004 FRU Table
2	SC 2020 (DDC Interface Check). Transfer error sense (XES) register bit 2 is on, indicating that a Data Bus In (DBI) parity error or that +Sync In was detected after the byte count had gone to zero.	SC 2020 FRU Table
3	SC 2080 (Data Overrun). Transfer error sense (XES) register bit 0 is on, indicating that: <ul style="list-style-type: none"> • Data bus out (DBO) registers are not full prior to receiving +Sync In • Need Data is inactive with Take Data • Data Ready is inactive with Data Taken 	SC 2080 FRU Table
4	SC 2008, 2810, 2830, 28CC, or 292A Request Device Checkout	SC XXXX, FRU Table
5	Drive Symptom codes of 1XXX, 4XXX, 5XXX, 6XXX, 7XXX, 8XXX, 9XXX or 0F00 and byte 0 indicates device failures were reported by the 3880 control unit.	START-11 or use MD option 1 or 4
6	The 3880 does not sense a power sequence complete signal from the device.	Power Map
7	The device diagnostic routine D3 finds an error. The CTL-I internal wrap runs without errors when the wrap is performed at the 3880 tailgate and at the device end of the tag/bus signal cable. The CE exits with routine D3 error bytes.	MD MAP
8	The device diagnostic routine C0 finds an error. The CTL-I internal wrap runs without errors. Routine D3 runs without errors.	MD MAP
9	The device diagnostic routine D3 finds an error. The error indicates that the device controller is failing. The other CTL-I tests are not run.	MD MAP
10	The device diagnostic tests were run at the request of the device maintenance package and no errors were found. Return to the device maintenance package and continue testing.	MD MAP

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REFERENCES TO OTHER SECTIONS

ABBREVIATIONS IN THIS SECTION

CDS	configuration data set
CP	control print (OLTSEP, OLTEP)
CSW	channel status word
DOS	disk operating system
EL	error loop
ELn	error loop n
EL (I)	error loop (I-indefinite)
EOB	end of block
EP	error print
FE	first error communication (OLTSEP, OLTEP)
ID	identifier
IML	initial microcode load
I/O	input/output
JCL	job control language
MD	maintenance device
MI	manual intervention
NCP	no control print
NEL	no error loop
NEP	no error print
NFE	no first error communication (OLTSEP, OLTEP)
NMI	no manual intervention
NP	no print
NPP	no parallel print
NRE	no remote FE control (OLTSEP, OLTEP)
NSI	no spurious interrupt
NTL	no test loop
OLT	online test
OLTEP	online test executive program
OLTSEP	online test standalone executive program
OS	operating system
PPn	parallel print n
PR	print
RE	remote FE control (OLTSEP, OLTEP)
RET	return (OLTSEP, OLTEP)
RETAIN	remote technical assistance network
SC	storage control
SI	spurious interrupt
TLn	test loop n
UCW	unit command word
VM	virtual machine
VS	virtual storage

There are three 3880 online tests (OLTs):

- T3880A - Channel interface OLT 1
- T3880B - Channel interface OLT 2
- T3880C - Trace dump OLT

T3880A, T3880B, and T3880C are described in detail on PROG-40.

OLT PREREQUISITES

The following prerequisites are needed to run the 3880 online tests:

- Configuration data set (CDS) cards for each device and for each storage director
- Control program
- Attached device
- Error-free channel interface (CHL-I) wrap diagnostic, routine 73

Configuration Data Set Card For Each Device

A configuration data set (CDS) card must be prepared for each device attached to a storage director within a 3880. (See *CDS Guide*, Order No. D99-CDSGA.) Each device CDS card must be punched as follows:

Card Column	Punch	Meaning
1	Blank	Not used
2 to 4	CDS	Configuration data set
5 to 9	Blank	Not used
10 to 17	XXXXXXXX	Device address (right justified)
18 to 19	XX	Model code (device dependent)
20 to 21	02	Feature code
22 to 23	20 (or 21)	Class code (21 for fixed block devices)
24 to 25	09	3333/3330 Model 1, 2, or 3
	0A	3340/3344
	0D	3330 Model 11
	0B	3350
	02	3370
	0C	3375
	0E	3380
26 to 29	Blank	Not used
30 to 31 (flags)	04	Two-channel switch feature
	40	Shared by more than one string or by more than one channel.
	44	Shared two-channel switch
32 to 35	Blank	Not used
36 to 37	XX	A suffix identifying the storage director through which this device is addressed. This field must match card columns 42 and 43 on the 3880 CDS card that identifies the 3880 through which this device is addressed. The person running OLTs selects the suffix.
38	/	A slash indicates the end of the CDS entry.

Configuration Data Set Card For Each Storage Director

A configuration data set (CDS) card must also be prepared for each storage director within a 3880. (See *CDS Guide*, Order No. D99-CDSGA.) Each 3880 CDS card must be punched as follows:

Card Column	Punch	Meaning
1	Blank	Not used
2 to 4	CDS	Configuration data set
5 to 29	Blank	Not used
30 (flag)	4	Shared by another system.
	Blank	Not shared by another system.
31 (flag)	8	A symbolic indication of the CDS prefix and suffix.
32 to 35	Blank	Not used
36 to 41	CU3880	CDS name prefix
42 to 43	XX	CDS name suffix. This field must match card columns 36 and 37 on all device CDS cards that identify devices addressed through this storage director. The person running OLTs selects the suffix.
44 to 71		Addresses of the devices addressed through this storage director are punched in these card columns. The address of each channel interface is also punched. These address fields are called device address extent blocks. Note: One or several devices addressed by this storage director may be shared by another system. If so, do not punch the other system addresses for these devices in these card columns. The following is the format for columns 44 through 71: <div style="border: 1px solid black; padding: 5px; display: inline-block;"> 040130 * ** </div> * Two card columns indicating, in hexadecimal, the number of consecutive device addresses defined by this device address extent block.

		** Four card columns indicating, in hexadecimal, the first device address defined by this block. (01 = channel, 3 = storage director, 0 = physical device). The format is repeated for each block of contiguous device addresses. The preceding format example indicates that there are four consecutive device addresses starting at address 130, therefore indicating addresses 130 through 133. An even number of blank card columns (for example, 0, 2, and 4) may be used to separate device address extent blocks.
32, or any even column following the last device address, except columns 72-80	/	A slash must be on the card containing the last device address extent block for the storage director. Note: When there are more device addresses than can be punched in card columns 44 through 71, a continuation card must follow the CDS card. In this case, a continuation character selected by the person running the OLTs must be punched in column 72. See section 3 of <i>CDS Guide</i> , Order No. D99-CDSGA, for the continuation card format.

Control Program

Depending upon the operating system, one of the following control programs is needed to run the 3880 online tests:

- OLTSEP Online Test Standalone Executive Program
- VM/OLTSEP Virtual Machine/Online Test Standalone Executive Program
- OS/OLTEP Operating System/Online Test Executive Program
- DOS/OLTEP Disk Operating System/Online Test Executive Program
- OS/VS1 OLTEP Operating System/Virtual Storage 1 Online Test Executive Program
- OS/VS2 OLTEP Operating System/Virtual Storage 2 Online Test Executive Program

OLTSEP SUMMARY

The OLTSEP summary assumes that the user understands the detailed OLTSEP procedure in the *OLTSEP Users Guide*, Order No. D99-SEPDT. See also appendix B in *S/370 Diagnostic Reference Summary*, SY25-0512, for a bibliography of OLTSEP manuals.

LOAD OLTSEP

1. Install the OLTSEP tape, punched cards, or disk pack.
2. Enter the unit address.
3. Press the Load pushbutton.

OLTSEP causes the following printout:

```
XX SEP188D ENTER DATE ( AND TIME ) 'MM/DD/YY ,
HH/MM/SS '
XX contains 01, 04, or some other two-digit reply identifier.
```

START OLTSEP

1. Reply as follows to the preceding printout by entering the actual month/day/year, hour/minute/second:


```
r XX, 'MM/DD/YY, HH/MM/SS'
```

XX contains the same two-digit reply identifier as indicated under Load OLTSEP.

Note: When the level of the OLTSEP being used is 10 or higher or when running under VM, any reply can be entered without the r XX, the comma, and the single quotes. Therefore, the reply can be entered as:

```
MM/DD/YY, HH/MM/SS
```
2. OLTSEP causes the following printout in which V=version, L=level, and XX.Y=version.level number:


```
SEP392I OLT LOAD ADDRESS IS XXXXXX HEX.
SEP102I OLTs running V/L=XX.Y
SEP107I OPTIONS ARE NTL, NEL, EP, CP, NPP, PR,
FE, NMI, SI, NRE
01 SEP105D ENTER DEV/TEST/OPT/
```
3. When OLTs must be run from punched cards, the reader device must be varied from tape or disk to card. To do this, reply as follows to the preceding printout:


```
r 01, 'VARY RDR=XXX'
```

XXX contains the address of the card reader.
4. OLTSEP causes the following printout in reply to step 3:


```
SEP219I VARY COMPLETE
01 SEP105D ENTER DEV/TEST/OPT/
```
5. If remote technical assistance network (RETAIN) is to be used, reply as follows to the preceding printout:


```
r 01, 'REI'
```
6. OLTSEP causes the following printout in reply to step 5:


```
*RETAIN/370 READY
01 SEP105D ENTER DEV/TEST/OPT/
```

SELECT AND RUN AN OLT

An OLT can be selected and run with or without specific routines.

With Specific Routines

The OLT, selected and run with specific routines, can be run with or without specific options.

WITH SPECIFIC OPTIONS

Reply as follows to the printout in step 2, step 4, or step 6 under Start OLTSEP:

```
r 01, 'XXX/T3880Y,Z/MI,RE/'
```

The Xs contain the address of any device connected to the storage director to be tested. The Y contains the 3880 OLT identifier (ID) A, B, or C. The Z contains the routine to be run. See PROG-40 for a description of all 3880 OLT IDs and OLT routines.

MI,RE indicates that the MI and RE options are run instead of NMI and NRE. The following list contains all the options, their mnemonics, and indicates the default options. All default options are run when no specific option is indicated.

Option	Mnemonic	Default
Error loop	EL	
Error loop (I-indefinite)	EL (I)	
Error loop n	ELn	
No error loop	NEL	X
Test loop n	TLn	
No test loop	NTL	X

Note: Options followed by the letter n run as often as indicated by the person running the OLTs.

The error loop option runs 16 times. The error loop (I) option runs indefinitely or until stopped by the person running the OLTs.

Option	Mnemonic	Default
Control print	CP	X
No control print	NCP	
Error print	EP	X
No error print	NEP	
First error communication	FE	X
No first error communication	NFE	
Manual intervention	MI	
No manual intervention	NMI	X
Parallel print n	PPn	
No parallel print	NPP	X
Print	PR	X
No print	NP	
Remote FE control	RE	
No remote FE control	NRE	X
Spurious interrupt	SI	X
No spurious interrupt	NSI	

Note: Except where indicated by the letter n, all positive options run once.

The remote FE control (RE) option runs only when the remote technical assistance network (RETAIN) is active. To activate RETAIN, see step 5.

The options indicated by an X in the default column run when no specific option is specified.

Note: Once an OLT is selected, OLTSEP checks for the type of pack mounted on the selected device. If a CE pack is not mounted, OLTSEP causes the following printout:

```
CE PACK NOT ON XXX.
REPLY B TO BYPASS, R TO RETRY, P TO PROCEED
```

XXX contains the device address.

Since the 3880 OLTs do not read or write on DASD, reply with P.

If a CE pack is mounted, OLTSEP does not cause the previous printout.

If the label on a mounted pack cannot be read, OLTSEP causes the following printout:

```
UNREADABLE LABEL ON XXX
REPLY B TO BYPASS, R TO RETRY, P TO PROCEED
```

XXX contains the selected device address.

Since the 3880 OLTs do not read or write on DASD, reply with P.

See *OLTSEP Users Guide*, Order No. D99-SEPDT for details concerning the options.

WITHOUT SPECIFIC OPTIONS

Reply as follows to the printout in step 2, step 4, or step 6 under Start OLTSEP:

```
r 01, 'XXX/T3880Y,Z//'
```

The Xs contain the address of any device connected to the storage director to be tested. The Y contains the 3880 OLT identifier (ID) A, B, or C. The Z contains the routine to be run. The options (indicated in the default column under With Specific Options) are run. All routines contained in the OLT are run. See PROG-40 for a description of all 3880 OLT IDs and OLT routines.

Without Specific Routines

The OLT, selected and run without specific routines, can be run with or without specific options.

WITH SPECIFIC OPTIONS

Reply as follows to the printout in step 2, step 4, or step 6 under Start OLTSEP:

```
r 01, 'XXX/T3880Y/MI,RE/'
```

The Xs contain the address of any device connected to the storage director to be tested. The Y contains the 3880 OLT identifier (ID) A, B or C. See PROG-40 for a description of all 3880 OLT IDs and OLT routines.

MI,RE indicates that the MI and RE options are run instead of NMI and NRE. For other options, see With Specific Options under With Specific Routines.

WITHOUT SPECIFIC OPTIONS

Reply as follows to the printouts under Start OLTSEP:

```
r 01, 'XXX/T3880Y//'
```

The Xs contain the address of any device connected to the storage control to be tested. The Y contains the 3880 OLT identifier (ID) A, B or C. See PROG-40 for a description of all 3880 OLT IDs and OLT routines.

STOP A RUN

1. Press the Request key to stop a run.
2. OLTSEP causes the following printout:

```
SEP107I OPTIONS ARE  
01 SEP105D ENTER DEV/TEST/OPT/
```

After stopping a run, perform one of the following:

- Continue the OLT
- Restart the OLT
- Start another OLT
- Cancel the OLT

Continue the OLT

Continue the OLT in one of the following ways:

- Press the end-of-block (EOB) key
- Enter r 01, '///'

Restart the OLT

To restart the OLT, reply as follows to the printout in step 2 under Stop A Run:

```
r 01, '/3880Y//'
```

The Y contains the 3880 OLT identifier (ID) A, B, and C. See PROG-40 for a description of all 3880 OLT IDs.

Start Another OLT

1. Cancel the OLT by replying as follows to the printout in step 2 under Stop A Run:
r 01, 'cancel'
2. Select and run another OLT as described on PROG-10 under Select And Run An OLT.

Cancel the OLT

To cancel the OLT, reply as follows to the printout in step 2 under Stop A Run:

```
r 01, 'cancel'
```

See *OLTSEP Users Guide*, Order No. D99-SEPDT, for details on how to stop a run.

The VM/OLTSEP summary assumes that the user understands the VM/OLTSEP load procedure in the *IBM Virtual Machine Facility/370: OLTSEP and Error Recording Guide*, Order No. GC20-1809. See also appendix B in *S/370 Diagnostic Reference Summary*, Order No. SY25-0512, for a bibliography of OLTSEP manuals.

LOAD VM/OLTSEP

1. Mount the OLTSEP pack.
2. Request the operator attach the OLTSEP pack to the CE virtual machine (VM). This defines the CE pack virtual address.
3. Request the operator attach to the CE virtual machine any device connected to the storage director to be tested.
4. Enter:
IPLXXX
The Xs contain the address at which the OLTSEP pack was attached in step 2.

Start and stop are the same as indicated for OLTSEP on PROG-10.

The OS/OLTEP summary assumes that the user understands the detailed OS/OLTEP procedure in the *IBM System/360 Operating System, Online Test Executive Program*, Order No. GC28-6650. See also appendix B in *S/370 Diagnostic Reference Summary*, SY25-0512, for a bibliography of OLTEP manuals.

LOAD OS/OLTEP

OS/OLTEP is resident within the operating system.

START OS/OLTEP

Note: Before starting OS/OLTEP, get the operator to vary offline the devices connected to the storage director to be tested.

1. Enter the following:

SOLTEP

The S causes OS/OLTEP to start when a system contains a reader procedure. When a system does not contain a reader procedure, job control language (JCL) cards must be prepared to execute the program IFDOLT. OS/OLTEP is a part of IFDOLT.

2. OS/OLTEP causes the following printout:

IFD 102I OLTSRUNNING

Starting at this point, and throughout the running of OS/OLTEP, various messages may be generated. See *IBM System/360 Operating System, Online Test Executive Program*, Order No. GC28-6650 for examples. See also appendix B in *S/370 Diagnostic Reference Summary*, SY25-0512, for a bibliography of OLTEP manuals.

3. OS/OLTEP causes the following printout:

01 IFD 105D ENTER - DEV/TEST/OPT/

4. If RETAIN is to be used, reply as follows to the preceding printout:

r 01, 'REI'

5. OS/OLTEP causes the following printout:

01 '*RETAIN/370 READY'
01 SEP105D ENTER - DEV/TEST/OPT/

SELECT AND RUN OLT

An OLT can be selected and run with or without specific options.

With Specific Options

Reply as follows to the printout in step 3 or step 5 under Start OS/OLTEP:

r 01 'XXX/3880 Y, Z/MI, RE/'

The Xs contain the address of any device connected to the storage director to be tested. The Y contains the 3880 OLT identifier (ID) A, B or C. The Z contains the routine to be run.

See PROG-40 for a description of all 3880 OLT IDs and OLT routines.

MI, RE indicates that the MI and RE options are run instead of NMI and NRE. The following list contains all the options, their mnemonics, and indicates the default options. All default option run when no specific option is specified.

Option	Mnemonic	Default
Test loop n	TLn	
No test loop	NTL	X
Error loop	EL	
Error loop (I-indefinite)	EL (I)	
Error loop n	ELn	
No error loop	NEL	X

Note: Options followed by the letter n run as often as indicated by the person running the OLTs.

The error loop option runs 16 times. The error loop (I) option runs indefinitely or until stopped by the person running the OLTs.

Option	Mnemonic	Default
Error print	EP	X
No error print	NEP	
Control print	CP	X
No control print	NCP	
Parallel print n	PPn	
No parallel print	NPP	X
Print	PR	X
No print	NP	
First error communication	FE	X
No first error communication	NFE	
Manual intervention	MI	
No manual intervention	NMI	X
Spurious interrupt	SI	X
No spurious interrupt	NSI	
Remote FE control	RE	
No remote FE control	NRE	X

Note: Except where indicated by the letter n, all positive options run once.

The remote FE control (RE) option runs only when the remote technical assistance network (RETAIN) is active. To activate RETAIN, see step 4 under Start OS/OLTEP.

The options indicated by an X in the default column run when no specific option is specified.

See *IBM System/360 Operating System, Online Test Executive Program*, Order No. GC28-6650 for details concerning the options. See also appendix B in *S/370 Diagnostic Reference Summary*, SY25-0512, for a bibliography of OLTEP manuals.

Without Specific Options

Reply as follows to the printout in step 3 or step 5 under Start OS/OLTEP:

r 01, 'XXX/3880 Y//'

The Xs contain the address of any device connected to the storage director to be tested. The Y contains the 3880 OLT identifier (ID) A, B, or C. The options (indicated in the default column under With Specific Options) are run. All routines contained in the OLT are run. See PROG-40 for a description of all 3880 OLT IDs and OLT routines.

STOP A RUN

1. After an OLT is selected and run, OS/OLTEP causes the following printout:

00 IFD 104E TO FORCE COMMUNICATION WITH OLTEP EXECUTIVE, ENTER ANY CHARACTER.

2. To stop OS/OLTEP, reply as follows to the preceding printout:

r 00 IFD104E, 'X'
'X' represents any character.

3. OS/OLTEP causes the following printout:

01 IFD105D ENTER DEV/TEST/OPT/

After stopping a run, perform one of the following:

- Continue the OLT
- Start another OLT
- Cancel the OLT

Unlike OLTSEP, the OLT cannot be restarted.

Continue the OLT

To continue the OLT, reply as follows to the printout in step 3 under How To Stop OS/OLTEP:

r 01, '///'

To continue the OLT with different options, reply as follows:

r 01, '//XYZ/'

XYZ represent the different options.

For other options, see the option list under With Specific Options.

Start Another OLT

To start another OLT, see With Specific Options or Without Specific Options.

Cancel the OLT

To cancel the current OLT, reply as follows to the printout in step 3 under Stop A Run.

r 01, 'cancel'

The current OLT can also be cancelled by pressing the Request key and then entering the following:

C OLTEP

See *IBM System/360 Operating System, Online Test Executive Program*, Order No. GC28-6650 for details on how to stop OS/OLTEP. See also appendix B in *S/370 Diagnostic Reference Summary*, SY25-0512, for a bibliography of OLTEP manuals.

The DOS/OLTEP summary assumes that the user understands the detailed DOS/OLTEP procedure in *Systems DOS/VS OLTEP*, Order No. GC33-5383. See also appendix B in *S/370 Diagnostic Reference Summary*, SY25-0512, for a bibliography of OLTEP manuals.

LOAD DOS/OLTEP

DOS/OLTEP is resident in the operating system.

START DOS/OLTEP

Before starting DOS/OLTEP, the job control language (JCL) must be entered using punched cards or the system console. See *Systems DOS/VS OLTEP*, Order No. GC33-5383, for details concerning the entering of the JCL.

1. After the JCL is entered, DOS/OLTEP causes the following printout:

```
E102I OLTSRUNNING
E102I OPTIONSARENTEL, NEL, EP, CP, NPP, PR,
FE, NMI, SI, NRE
01 E105D ENTERDEV/TEST/OPT/
```

2. If RETAIN is to be used, reply as follows to the preceding printout:

```
r 01, 'REI'
```

3. DOS/OLTEP causes the following printout:

```
01 '*RETAIN/370 READY'
01 SEP105DENTERDEV/TEST/OPT/
```

SELECT AND RUN AN OLT

An OLT can be selected and run with or without specific options.

With Specific Options

Reply as follows to the printout in step 1 or step 3 under Start DOS/OLTEP:

```
01 'XXX/3880 Y, Z/MI. RE/'
```

The Xs contain the address of the device to be tested. The Y contains the 3880 OLT identifier (ID) A, B or C. The Z contains the routine to be run. See PROG-40 for a description of all 3880 OLT IDs and OLT routines.

MI, RE indicates that the MI and RE options are run instead of NMI and NRE. The following list contains all the options, their mnemonics, and indicates the default options. All default options run when no specific option is specified.

Option	Mnemonic	Default
Test loop n	TLn	
No test loop	NTL	X
Error loop	EL	
Error loop (I-indefinite)	EL (I)	
Error loop n	ELn	
No error loop	NEL	X

Note: Options followed by the letter n run as often as indicated by the person running the OLTs.

The error loop option runs 16 times. The error loop (I) options run indefinitely or until stopped by the person running the OLTs.

Option	Mnemonic	Default
Error print	EP	X
No error print	NEP	
Control print	CP	X
No control print	NCP	
Parallel print n	PPn	
No parallel print	NPP	X
Print	PR	X
No Print	NP	
First error communication	FE	X
No first error communication	NFE	
Manual intervention	MI	
No manual intervention	NMI	X
Spurious interrupt	SI	X
No spurious interrupt	NSI	
Remote FE control	RE	
No remote FE control	NRE	X

Note: Except where indicated by the letter n, all positive options run once.

The remote FE control (RE) option runs only when the remote technical assistance network (RETAIN) is active. To activate RETAIN, see step 2 under Start DOS/OLTEP.

The options indicated by an X in the default column run when no particular option is specified. See *IBM System/360 Operating System*, Online Test Executive Program, Order No. GC28-6650, for details concerning the options. See also appendix B in *S/370 Diagnostic Reference Summary*, SY25-0512, for a bibliography of OLTEP manuals.

Without Specific Options

Reply as follows to the printout in step 1 or step 3 under Start DOS/OLTEP:

```
r 01, 'XXX/3880 Y//'
```

The Xs contain the address of the device to be tested. The Y contains the 3880 OLT identifier (ID) A, B or C. The options (indicated in the default column under With Specific Options) are run. All routines contained in the OLT are run. See PROG-40 for a description of all 3880 OLT IDs and OLT routines.

STOP A RUN

1. To stop DOS/OLTEP, press the Interrupt pushbutton on the operator panel of the system.

2. DOS/OLTEP, causes the following printout:

```
01 E105D ENTER - DEV/TEST/OPT/
```

3. Reply to the preceding printout as follows:

```
r 01 'cancel'
```

This cancels DOS/OLTEP.

OS/VS1 OLTEP, OS/VS2 OLTEP SUMMARY

The operating system/virtual storage online test executive program (OS/VS1 OLTEP) and OS/VS2 OLTEP are resident in the operating system.

Load, start, and stop are the same as indicated for OS/OLTEP on PROG-25.

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T3880A CHANNEL INTERFACE OLT 1

The T3880A channel interface OLT 1 provides a quick verification of the correct operation of the channel interface.

Before running the T3880A channel interface OLT, the channel interface wrap microdiagnostic must run error free.

The T3880A OLT contains four routines.

Routine 1

Routine 1 verifies that the storage director can execute a Sense I/O command and a chained Sense I/O command. The data received from the addressed storage director during the chained Sense I/O command is validated for correct data transfer.

Routine 2

Routine 2 verifies that the storage director can execute both a chained and an unchained Read and Reset Buffered Log command.

The log data received from the addressed storage director during the chained Read and Reset Buffered Log command is validated for correct data transfer.

The log data received from the addressed storage director during the unchained Read and Reset Buffered Log command is printed.

Routine 3

Routine 3 issues a Recalibrate channel command word (CCW) which ends with a seek complete. After the seek complete, the storage director initiates a selection sequence. Routine 3 verifies that the storage director can initiate a selection sequence, and that the selection sequence operates correctly.

SCOPE LOOPS

The Diagnostic Code Manual (DCM) contains sequence charts used for scope looping only during routines 1 and 3 of the T3880A OLT. To initiate the scope loop, specify the EL(I) option when selecting the OLT.

The following examples show how to initiate a scope loop for routines 1 and 3 of the T3880A OLT:

XXX/T3880A, 1/EL(I), YY, ZZ/
XXX/T3880A, 3/EL(I), YY, ZZ/

The Xs contain the address of any device connected to the storage director to be tested. YY, ZZ indicate other options which may be specified.

Routine 4

Routine 4 verifies that the channel Enable/Disable switch for the addressed storage director is operating correctly. This is done by issuing a Sense I/O command and then checking for a correct symptom code and channel status word (CSW).

T3880B CHANNEL INTERFACE OLT 2

The T3880B channel interface OLT 2 is an extension of the T3880A channel interface OLT 1. T3880B and support routine 75, the functional diagnostic, run concurrently under online test stand alone executive program (OLTSEP). Routine 75 is initiated from the maintenance device (MD) before running T3880B. Support routine 75 replaces the functional microcode in the storage director and processes special diagnostic CCWs issued by T3880B.

Before running T3880B, T3880A must run error free.

Note: After running OLT T3880B and routine 75, perform an IML operation in the 3880 storage director when running under support mode.

T3880B OLT Restrictions

T3880B OLT has the following restrictions:

- Equated device addresses cannot be used when executing this OLT. All device addresses used must be defined by a configuration data set (CDS) entry. See PROG-5 for CDS card preparation.
- The CPU that executes the OLT should not be in the hard stop mode.
- Routine 3 does not execute when running OLTSEP under virtual machine (VM).

The T3880B OLT contains three routines.

Routine 1

Routine 1 verifies that the mark-in circuits and the retry CCW are operating correctly. This is done by support routine 75, the functional diagnostic, causing the storage director to activate Mark In. Mark In causes the channel to retry the CCW. The retry CCW causes support routine 75 to send a data byte 'DA' to the system. When routine 2 detects 'DA', the retry CCW is successful.

Routine 2

Routine 2 verifies that the unit command word (UCW) plug is plugged unshared.

Routine 3

Routine 3 verifies that the disconnect-in circuits and the selective reset circuits in the storage director are operating correctly. This is done by support routine 75, the functional diagnostic, forcing a check 1 condition. This causes the storage director to activate Disconnect In, to which the channel responds by initiating a selective reset sequence. Initiating the selective reset sequence causes the storage director to reset.

T3880C TRACE DUMP OLT

The T3880C trace dump OLT reads, formats, and prints functional microcode trace data collected in the storage director. The printed trace dump can be either formatted or unformatted. The following information is printed in the order shown:

- Dynamic trace data (formatted)
 - Module identifiers (IDs)
 - Channel and storage director address
 - Channel commands
 - Status
- State save data (formatted)
 - Trace/save identifiers (IDs)
 - External registers
 - Internal registers
 - Maintenance connection trace data
 - Variable information tables and control blocks
 - Microcode EC and part numbers
- Hexadecimal dump (unformatted)

Before running this OLT, the trace should have been initiated, and then ended. Use the maintenance device option 8 for initiating and ending trace.

If the trace was not initiated, or if the trace did not end correctly, the T3880C trace dump OLT receives a condition code 1 and a unit exception in the channel status word (CSW).

3880 OLT ERROR MESSAGES

Section ID	Reference Number	Error Messages And Console Communications	Diagnostic Information	CE Action
3880A or 3880B	Any	Error code is-xx	An unexpected error occurred, resulting in a unit check. A Sense ('C4') command successfully read the symptom code.	See the CE action on PROG-51 through 80 for the message that this message follows.
3880A or 3880B	001	<p>*WAIT TIMEOUT ERROR=aaCdROUTINE-rr PASS-pp XPTDCC-x●●●</p> <p>● ● ●</p> <p>accd = Unit address entered in reply to the DEV/TEST/OPT/ printout aa = channel c = storage director d = device (not addressed) rr = OLT routine (test) number. 00 = OLT initialization FF = OLT termination or cleanup See routine (test) description on PROG-40. pp= Routines 01-0C are run 255 times unless the EXT=option is used. This count indicates if a failure is solid (PASS-01) or intermittent. This count is not present if the error does not occur in routines 01-0C, or if the EXT=1 or options are no used.</p>	The ending status was not received within 1 second after the start of an input/output (I/O) operation.	<ol style="list-style-type: none"> 1. Check following messages for additional details. 2. Go to the cable swap procedure on CARR-230.
3880A or 3880B	002	*CU CDS SUFFIX NOT IN CDS ENTRY FOR UNIT-xxxx	The 3880 suffix in card columns 36 and 37 is wrong on the configuration data set (CDS) card for unit xxxx.	Correct the 3880 suffix on the CDS card for unit xxxx. See PROG-5 under Configuration Data Set Card for Each Device.
3880A or 3880B	003	*UNIT ADDRESSES NOT IN CDS ENTRY CU3880XX	The CU3880 prefix in card columns 36 to 41 is wrong on the CDS card for the 3880.	Correct the CU3880 prefix on the CDS card for the 3880. See PROG-5 under Configuration Data Set Card for Each Storage Director.
3880A or 3880B	004	*TOO MANY UNIT ADDRESSES IN CDS ENTRY CU3880XX	<p>One of the following conditions has been detected:</p> <ul style="list-style-type: none"> • More than 32 unit addresses were specified in a unit address block. • More than 128 unit addresses were specified in the CDS entry. 	

Section ID	Reference Number	Error Messages And Console Communications	Diagnostic Information	CE Action
3880B	005	<p>WARNING - SYSTEM VOLUMES MUST BE ACCESSIBLE THROUGH SD NOT BEING TESTED THIS SD (aacd) MUST BE ASSGN' ED TO OLTEP PARTITION UNIT ADDRESSES ACCESSIBLE BY THIS SYSTEM AND SD XXXX XXXX . . . ENTER P TO PROCEED, C TO CANCEL</p> <p><i>See reference number 001 for explanation of storage director address (aacd).</i></p>	<p>Format 1 (DOS-OLTEP/Unshared CU)</p> <p>Packs required for the operation of DOS must not be mounted on a drive attached to the storage director to be tested. Subsequent actions block DOS access to all indicated units.</p>	<ol style="list-style-type: none"> 1. Except for the ASSGN-designated unit used at OLTEP " ENTER-DEV/TEST/OPT/" time, the units listed must be placed in an unassigned condition using the DVCDN command. 2. If action 1 is successful, reply p. 3. If action 1 is unsuccessful, reply c. To run this test, bring down DOS and perform an IPL of OLTEP with another storage director.
3880B	005	<p>WARNING - SYSTEM VOLUMES MUST BE ACCESSIBLE THROUGH SD NOT BEING TESTED THIS SD (aacd) MUST BE ASSGN' ED TO THE OLTEP PARTITION AND BE EITHER VARIED OFFLINE (OS) OR PHYSICALLY UNASSIGNED (DOS DVCDN) IN ALL SYSTEMS SHARING THIS SD UNIT ADDRESSES ACCESSIBLE BY THIS SYSTEM AND SD XXXX XXXX . . . ENTER P TO PROCEED, C TO CANCEL</p> <p><i>See reference number 001 for explanation of storage director address (aacd).</i></p>	<p>Format 2 (OLTSEP/Shared CU)</p> <p>See format 1 above.</p> <p>If packs required for the operation of a sharing system are accessible only through the storage director under test, either of those packs must be moved to another subsystem, or that system must be brought down in order to be tested.</p>	<ol style="list-style-type: none"> 1. If a sharing system is using OS, use the Vary command to place the indicated units in an offline status on the system. 2. If a sharing system is using DOS, use the DVCDN command to place the indicated physical units in an unassigned condition. 3. If actions 1 and/or 2 are successfully completed, reply p. If unsuccessful, reply c. <p>Note: Sharing systems may use different storage director addresses for these devices.</p>
3880B	006	<p>ENABLE THE SD (aacd) CHANNEL INTERFACE TO BE TESTED ENTER P TO PROCEED, C TO CANCEL</p> <p><i>See reference number 001 for explanation of storage director address (aacd).</i></p>		<ol style="list-style-type: none"> 1. Enable the storage director (aacd) channel interface to be tested (3880 operator panel). 2. The storage director/channel interfaces not being tested should be disabled at the operator panel.

3880 OLT ERROR MESSAGES

Section ID	Reference Number	Error Messages And Console Communications	Diagnostic Information	CE Action
3880B	007	<p>* ERROR, ROUTINE 75 OR SD NOT READY CONTROL UNIT-aacd ROUTINE-00 XPTDCC-1 XPTD STATUS-2C00 RCVDCC-x... . . . See reference number 001 for explanation of storage director address (aacd).</p>	<p>While attempting to determine if support routine 75 has been executed, an immediate control command received unexpected results. The storage director diagnostic presents channel end, device end, and unit check status to all commands unless a diagnostic command is received.</p>	<ol style="list-style-type: none"> 1. Check subsequent reference number 007 messages for additional details of this error. 2. Ensure that all actions required by reference number 006 messages were completed. 3. Reload routine 75. See START-110 in the MIM.
3880B	017	<p>RTN-xx BYPASSED. OLSTEP CNTRL MODE REQD</p>	<p>Either the OLT is running under an operating system OLTEP (OS or DOS), or the OLT is running under a stand-alone OLTEP (OLTSEP), but control mode is not available. Routine (xx) is skipped. The OLT proceeds to the next routine.</p>	<p>If this routine must be run, bring down the operating system and perform an IPL of OLTSEP through another control unit. Otherwise, no action is required.</p>
3880B	021	<p>* ERROR DURING DISCONNECT-IN TAG TEST CONTROL UNIT-aacd ROUTINE-03 PASS-pp XPTDCC-1 XPTD STATUS-0C00 RCVDCC-x... . . . See reference number 001 for explanation of storage director address, routine, number, and pass count.</p>	<p>Expected condition code or initial status was not received in response to a 'CF' command.</p>	<p>Go to the cable swap procedure on CARR-230.</p>
3880B	032	<p>OLT TERMINATED SUCCESSFULLY</p>	<p>The test ended without detecting any errors.</p>	<p>Return to the MD.</p>

Section ID	Reference Number	Error Messages And Console Communications	Diagnostic Information	CE Action
3880B	024	<p>* ERROR DURING MARK-IN TAG TEST CONTROL UNIT-aacd ROUTINE-01 PASS-pp XPTD CC-0 XPTD STATUS-0C00 RCVD CC-x...</p> <p>· · ·</p> <p>See reference number 001 for explanation of storage director address, routine number, and pass count.</p>	<p>Format 1 Expected condition code (initial status or ending status) was not received in response to a 'C2' command.</p>	<ol style="list-style-type: none"> 1. Suspect Mark-In tag line. 2. Perform reference number 001 CE action.
3880B	024	<p>* ERROR DURING MARK-IN TAG TEST CONTROL UNIT-aacd ROUTINE-01 PASS-pp XPTD DATA-DA RCVD DATA-xx</p> <p>· · ·</p> <p>See reference number 001 for explanation of storage director address, routine number, and pass count.</p>	<p>Format 2 Storage director retry is transparent to the processor. The storage director diagnostic signals the OLT on every other 'C2' command with 'DA' data when storage director retry was successfully performed.</p>	<ol style="list-style-type: none"> 1. Suspect Mark-In tag line. 2. Perform reference number 001 CE action.
3880B	025	<p>* ERROR DURING CHANNEL UNSHARED UCW TEST CONTROL UNIT-aacd ROUTINE-02 PASS-pp XPTD CC-1 XPTD STATUS-0800 RCVD CC-x...</p> <p>· · ·</p> <p>See reference number 001 for explanation of storage director address, routine number, and pass count.</p>	<p>Format 1 Command 'CB' was issued to cause posting of Channel End status. This test verifies unshared (block multiplex) channel operation.</p>	<ol style="list-style-type: none"> 1. Ignore this message if channel UCW for device under test is plugged for shared (not block multiplex) operation. 2. Check channel UCWs for correct unshared plugging for each device on this storage director if unshared (block multiplex) operation is failing.
3880B	025	<p>* ERROR DURING CHANNEL UNSHARED UCW TEST CONTROL UNIT-aacd ROUTINE-02 PASS-pp XPTD CC-1 XPTD STATUS-0C00 XPTD STATUS-0400 RCVD CC-x</p> <p>See reference number 001 for explanation of storage director address, routine number, and pass count.</p>	<p>Format 2 Command 'DB' was issued while Device End status was still outstanding for the previous 'CB' command.</p>	<ol style="list-style-type: none"> 1. Ignore this message if channel UCW for device under test is plugged for shared (not block multiplex) operation. 2. Check channel UCWs for correct unshared plugging for each device on this storage director if unshared (block multiplex) operation is failing.

Section ID	Reference Number	Error Messages And Console Communications	Diagnostic Information	CE Action
3880A or 3880B	069	T3880A CANNOT RUN ON UNIT-xxxx. UNSUPPORTED DEV TYPE-tt	Unit address xxxx, entered in reply to the ENTER-DEV/ TEST/OPT/printout, is assigned to device type tt. Supported device types include the following: Type Device 09 3333/3330 Model 1, 2, or 3 0D 3330 Model 11 0A 3340/44 02 3370 0B 3350 0C 3375 0E 3380	1. Ensure that the specified unit address is correct. 2. If the correct unit address is used, change the CDS entry for unit xxxx. See PROG-5 under Configuration Data Set Card for Each Device.
3880A	070	ENABLE CHANNEL SELECTED ON SD REPLY ANY CHARACTER WHEN DONE	None	1. See the operator panel on PWR-74 for the location of the Enable/Disable switch. 2. Place the selected Enable/Disable switch in the Enable position. 3. Reply with any character.
3880A	071	DISABLE CHANNEL SELECTED ON SD REPLY ANY CHARACTER WHEN DONE	None	1. See the operator panel on PWR-74 for the location of the Enable/Disable switch. 2. Place the selected Enable/Disable switch in the Disable position. 3. Reply with any character.
3880A	072	ERROR, CHANNEL APPEARS ENABLED, SHOULD BE DISABLED SD-XXXXRTN-03 PASS-XX XPTDCC-3 *RCVDCC-X*RCVD STATUS-0C00 X=0, 1, or 2	Received a normal status indication to a Sense I/O command. The channel seems to be enabled, but should be disabled.	Verify that the Enable/Disable switch for the selected channels is in the Disable position on the addressed storage director. If it is in the Disable position, suspect the switch, cable, and associated CIF card. The switch and CIF card can be swapped to isolate the problem. If the problem is not corrected, go to the cable swap procedure on CARR-230.
3880A	073	ERROR, CHANNEL APPEARS DISABLED, SHOULD BE ENABLED SD-XXXXRTN-03 PASS-XX XPTDCC-0XPTD STATUS-0C00 *RCVDCC-X X=0, 1, or 2	Received an abnormal status indication to a Sense I/O command. The channel seems to be disabled, but should be enabled.	Verify that the Enable/Disable switch for the selected channel is in the Enable position on the addressed storage director. If it is in the Enable position, go to cable swap procedure on CARR-230.

3880 OLT ERROR MESSAGES

Section ID	Reference Number	Error Messages And Console Communications	Diagnostic Information	CE Action
3880A	074	SD BUFFERED LOG DATA-00001000 80000060 00000000 000000	Storage control logs have been reset. The data displayed was not logged.	None
3880A	075	SENSE I/O COMMAND ERROR SD-XXXXRTN-01 PASS-01 XPTDCC-0 XPTD STATUS-0C00 *RCVDCC-X X=0, 1, 2, or 3	Failed to receive the expected condition code or status (0C00) after issuing a Sense I/O Command.	<ol style="list-style-type: none"> 1. Verify that the Enable/Disable switch for the selected channel is in the Enable position on the storage director. 2. Go to the cable swap procedure on CARR-230.
3880A	076	READ AND RESET BUFFERED LOG COMMAND ERROR SD-XXXXRTN-01 PASS-01 XPTDCC-0 XPTD STATUS-0C00 *RCVDCC-X X=1, 2, or 3	Failed to receive the expected condition code or status (0C00) after issuing a Read and Reset Buffered Log command.	<ol style="list-style-type: none"> 1. Verify that the Enable/Disable switch for the selected channel is in the Enable position on the storage director. 2. Go to the cable swap procedure on CARR-230.
3880A	077	CHAINED SENSE I/O COMMAND ERROR SD-XXXXRTN-01 PASS-01 XPTDCC-0 XPTD STATUS-0C00 *RCVDCC-X X=1, 2, or 3	Failed to receive the expected condition code or status (0C00) after issuing a chained Sense I/O command.	<ol style="list-style-type: none"> 1. Verify that the Enable/Disable switch for the selected channel is in the Enable position on the storage director. 2. Go to the cable swap procedure on CARR-230.

Section ID	Reference Number	Error Messages And Console Communications	Diagnostic Information	CE Action
3880A	078	SENSE I/O DATA RCVD ERROR	The sense data received during a chained Sense I/O command had an invalid message format or content.	Go to the cable swap procedure on CARR-230.
3880A	079	READ AND RESET BUFFERED LOG DATA RCVD ERROR	The sense data received during a chained Read and Reset Buffered Log command had an invalid message format or content.	Go to the cable swap procedure on CARR-230.
3880A	080	ENTER R TO RERUN TEST, T TO TERMINATE	None	Enter R to run the test again. Enter T to end the test.
3880C	081	EXIO DID NOT START - JOB TERMINATED	EXIO command failed during OLTSEP or OLTEP. Received a non-zero return code from the EXIO macro.	<ol style="list-style-type: none"> See the printer output for additional information. Check for the following possible failures: <ul style="list-style-type: none"> The trace program in the storage director did not end correctly. The attached storage control is not a 3880; it may be a 3830. Channel interface is disabled. Go to the cable swap procedure on CARR-230.
3880C	082	UNSPECIFIED I/O ERROR, SEE PRINTER OUTPUT	Wait I/O command failed during OLTSEP or OLTEP. Received a non-zero return code from the Wait I/O macro.	<ol style="list-style-type: none"> See the printer output for additional information. Check for the following possible failures: <ul style="list-style-type: none"> The trace program in the storage director did not end correctly. The attached storage control is not a 3880; it may be a 3830. The channel interface is disabled. Go to the cable swap procedure on CARR-230.

3880 OLT ERROR MESSAGES

Section ID	Reference Number	Error Messages And Console Communications	Diagnostic Information	CE Action
3880C	083	COND CODE 1 RCVD , POSSIBLE NO TRACE DATA	Received a condition code 1.	<ol style="list-style-type: none"> See the printer output for additional information. Check for the following possible failures: <ul style="list-style-type: none"> The trace program in the storage director did not end correctly. The attached storage control is not a 3880; it may be a 3830. Channel interface is disabled. Go to the cable swap procedure on CARR-230.
3880C	084	COND CODE 2 RECVD , RETRIES EXHAUSTED	Received a condition code 2.	<ol style="list-style-type: none"> See the printer output for additional information. Check for the following possible failures: <ul style="list-style-type: none"> The trace program in the storage director did not end correctly. The attached storage control is not a 3880; it may be a 3830. Channel interface is disabled. Go to the cable swap procedure on CARR-230.
3880C	085	CONDITION CODE 3 RECEIVED	Received a condition code 3.	<ol style="list-style-type: none"> See the printer output for additional information. Check for the following possible failures: <ul style="list-style-type: none"> The trace program in the storage director did not end correctly. The attached storage control is not a 3880; it may be a 3830. Channel interface is disabled. Go to the cable swap procedure on CARR-230.
3880A,B	000	T3880A , B CANNOT RUN ON UNIT-xxxx . UNSUPPORTED CU OR DEVICE TYPE .	None	Validate CDS entries for unit / device addresses specified. Refer to PROG-5 regarding CDS card formats.
3880A	086	CU INITIATED SELECTION COMMAND ERROR .	Failed to receive expected condition code or status (0C00) after issuing a recalibrate command.	See CE action for reference number 075 (PROG-60).

Section ID	Reference Number	Error Messages And Console Communications	Diagnostic Information	CE Action																																																																																																			
3880A or 3880B	099	UNXPCTD MACRO RET CODE-xx RCVD FROM yyyyyyyy	The OLT error print module yyyyyyyy indicates an error (macro return code xx). This type of error is usually caused by a failure in the OLT error print module (except in the case of error print modules EXIO and WAITIO).	<ol style="list-style-type: none"> Restart OLTEP or OLTSEP. Check the configuration data set (CDS) to ensure that it is correct for the system. See PROG-5 under Configuration Data Set Card for Each Device A return code of 04 means: <ol style="list-style-type: none"> The OLT and the OLT error print are not at compatible levels. The error print module has been removed from the OLT library. The device is shared by more than one 3880 storage control. This is indicated in the device address word. A shared device is not an error condition. 																																																																																																			
		<table border="1"> <thead> <tr> <th>Error Print Module (yyyyyyyy)</th> <th>Macro Return Code (xx)</th> <th>Termination Reason</th> <th>Termination Code</th> </tr> </thead> <tbody> <tr> <td rowspan="4">ALLOCATE</td> <td>04</td> <td>Module not available</td> <td>D</td> </tr> <tr> <td>08</td> <td>Device not in device entry list</td> <td></td> </tr> <tr> <td>0C</td> <td>Space allocated</td> <td></td> </tr> <tr> <td>0A</td> <td>Space not available</td> <td>D</td> </tr> <tr> <td rowspan="2">CECOM</td> <td>04</td> <td>Module not available</td> <td>C,D</td> </tr> <tr> <td>08</td> <td>Error executing module</td> <td>C,D</td> </tr> <tr> <td rowspan="2">CONVERT</td> <td>04</td> <td>Module not available</td> <td>D</td> </tr> <tr> <td>08</td> <td>Error from extended binary-coded decimal interchange code (EBCDIC) to hexadecimal conversion</td> <td>O,D</td> </tr> <tr> <td rowspan="3">DPRINT</td> <td>04</td> <td>Module not available</td> <td>D</td> </tr> <tr> <td>08</td> <td>Error while printing out line of data</td> <td>H</td> </tr> <tr> <td>0C</td> <td>Incomplete parameter list</td> <td>O</td> </tr> <tr> <td rowspan="5">EXIO</td> <td>04</td> <td>Module not available</td> <td>D</td> </tr> <tr> <td>08</td> <td>Device not available</td> <td>C,D,T</td> </tr> <tr> <td>08</td> <td>Device not primary or data protected</td> <td>O,D</td> </tr> <tr> <td>08</td> <td>Device busy</td> <td>T</td> </tr> <tr> <td>0C</td> <td>File protect violate-attempt running OLT vs. CE pack</td> <td></td> </tr> <tr> <td rowspan="3">GRAB</td> <td>04</td> <td>Device not in device entry list</td> <td></td> </tr> <tr> <td>08</td> <td>Entry list contains only one device</td> <td></td> </tr> <tr> <td>0C</td> <td>Device descriptors not available</td> <td>C</td> </tr> <tr> <td>PLINK</td> <td>04</td> <td>Module not available</td> <td>D</td> </tr> <tr> <td rowspan="3">WAITIO</td> <td>04</td> <td>Module not available</td> <td>D</td> </tr> <tr> <td>08</td> <td>Timed out</td> <td>T</td> </tr> <tr> <td>0C</td> <td>Error — device not valid</td> <td>O,C</td> </tr> <tr> <td rowspan="2">SCUTEST</td> <td>04</td> <td>Module not available</td> <td>C,H</td> </tr> <tr> <td>08</td> <td>OS/OLTEP: Unit address not varied offline DOS/OLTEP: Unit address not in OLTEP partition OLTSEP: Unit address is OLTSEP device</td> <td></td> </tr> </tbody> </table>	Error Print Module (yyyyyyyy)		Macro Return Code (xx)	Termination Reason	Termination Code	ALLOCATE	04	Module not available	D	08	Device not in device entry list		0C	Space allocated		0A	Space not available	D	CECOM	04	Module not available	C,D	08	Error executing module	C,D	CONVERT	04	Module not available	D	08	Error from extended binary-coded decimal interchange code (EBCDIC) to hexadecimal conversion	O,D	DPRINT	04	Module not available	D	08	Error while printing out line of data	H	0C	Incomplete parameter list	O	EXIO	04	Module not available	D	08	Device not available	C,D,T	08	Device not primary or data protected	O,D	08	Device busy	T	0C	File protect violate-attempt running OLT vs. CE pack		GRAB	04	Device not in device entry list		08	Entry list contains only one device		0C	Device descriptors not available	C	PLINK	04	Module not available	D	WAITIO	04	Module not available	D	08	Timed out	T	0C	Error — device not valid	O,C	SCUTEST	04	Module not available	C,H	08	OS/OLTEP: Unit address not varied offline DOS/OLTEP: Unit address not in OLTEP partition OLTSEP: Unit address is OLTSEP device		<p>The following list indicates possible causes of termination codes:</p> <table border="1"> <thead> <tr> <th>Termination Code</th> <th>Possible Cause</th> </tr> </thead> <tbody> <tr> <td>C</td> <td>Incorrect configuration data set</td> </tr> <tr> <td>D</td> <td>Faulty OLT error print driver</td> </tr> <tr> <td>H</td> <td>Faulty hardware including the console printer</td> </tr> <tr> <td>O</td> <td>Faulty OLT</td> </tr> <tr> <td>T</td> <td>Device under test, including channel and/or storage director hardware and software</td> </tr> <tr> <td>U</td> <td>User error</td> </tr> </tbody> </table>	Termination Code	Possible Cause	C	Incorrect configuration data set	D	Faulty OLT error print driver	H	Faulty hardware including the console printer	O	Faulty OLT	T
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Section ID	Reference Number	Error Messages And Console Communications	Diagnostic Information	CE Action
3880A	None	COND CODE=x, REPLY ANY CHAR TO RETRY	Condition code 2 (busy) or conditional code 3 (not operational) usually indicates a catastrophic failure not cleared by a previously issued Halt I/O command. Therefore, further testing is usually invalid.	<ol style="list-style-type: none"> 1. Before continuing, determine if the wait indicator is lighted on the operator panel. 2. If the Wait indicator is not lighted, run the 3880 channel interface (CHL-I) wrap diagnostic. If the Wait indicator is lighted, enter any character. (The wrap diagnostic must run error free before going to the next step.) 3. Go to the cable swap procedure on CARR-230. 4. If the Wait indicator is lighted, enter any character. 5. After replying with any character, the Start I/O command is retried once. A second failure causes 099 error message to be printed. See message 099 on PROG-75.
3880A	None	INTERVENTION REQUIRED, REPLY ANY CHAR TO RETRY	None	<ol style="list-style-type: none"> 1. If the Wait indicator is lighted on the operator panel, enter any character. 2. After replying with any character, the Start I/O command is retried once. A second failure causes 099 error message to be printed. See message 099 on PROG-75.

Section ID	Reference Number	Error Messages And Console Communications	Diagnostic Information	CE Action
OLTSEP	SEP1251 SEP1371 SEP1371 SEP139D	UNREADABLE LABEL ON xxxx CSW xxxxxxxxxxxxxxxxxxxx SNS xxx xxxxxxxxx REPLY B TO BYPASS, R TO RETRY, P TO PROCEED	OLTSEP may wait for approximately 30 seconds before presenting this message.	Reply p to start 3880A.
OS OLTEP	IFD1251 IFD1251 IFd1251 IFD139D	UNREADABLE LABEL ON xxxxxxxx CSW xxxxxxxxxxxxxxxxxxxx SNS xxx xxxxxxxxx REPLY B TO BYPASS, R TO RETRY, P TO PROCEED		
OLTSEP	SEP1381 SEP139D	DEV xxxx NOT OPERATIONAL, CC=3 REPLY B TO BYPASS, R TO RETRY, P TO PROCEED	If the channel interface switch is disabled when starting 3880A, this message will be presented.	Enable the storage director channel interface switch and reply p.
OS OLTEP	IFD1381 IFD139D	DEVICE xxx NOT OPERATIONAL CC=3 REPLY B TO BYPASS, R TO RETRY, P TO PROCEED (MAY DESTROY DATA)		

3880 OLT ERROR MESSAGES

Nine (9) standard error numbers have been reserved for errors encountered by the Start I/O routine used by the OLT sections. These error numbers are XX091 through XX099, where XX is the routine number.

Section ID	Reference Number	Error Messages And Console Communications	Diagnostic Information	CE Action
XXXXX	XX091	ENVIRONMENTAL ERROR	Some error occurred on a test CCW chain which established error logging mode or the storage director was in forced logging mode.	Go to the cable swap procedure on CARR-230.
XXXXX	XX092	CHANNEL CHECK	This error message is printed out in the Start I/O subroutine when any channel checks are found in the CSW status. The test is terminated when channel checks are found.	Go to the cable swap procedure on CARR-230.
XXXXX	XX093	WAIT TIMED OUT	This error message is printed out in the Start I/O subroutine when the test has timed out while waiting for ending status. The test is terminated when it times out.	Ending status not received from CCW chain printed with this message. Subsystem may have gone busy or not operational, which invalidates further testing. Look for messages to this effect following the reference number. Go to the cable swap procedure on CARR-230.
XXXXX	XX094	ERR ON SENSE	This error message is printed out in the Start I/O subroutine. When the sense is not posted, another Start I/O is tried.	Go to the cable swap procedure on CARR-230.
XXXXX	XX095	32 RETRIES	This message is printed prior to terminating a section if any of the following were received on Start I/O and retried 32 times: *CU Busy *Invalid Sense	Go to the cable swap procedure on CARR-230.
EXAMPLE		*T3880A-10 RTN001 DEV/LN0160 ECA0 REFERENCE NUMBER 00005 ERROR ON DIAGNOSTIC LOAD CHAIN CCW01 53 00B683 40 00 0001 CAW0000B880 *CCW02 44 00B6AD 40 00 0020 XPTD CC 0 RCVD CC 0 XPTD CSW1 00 00B890 0C00 0001 *RCVD CSW1 00 00B890 0200 0001	This is an example of the error message output whenever a status error occurs. This message includes: An * Error message 3880A OLT ID 10 OLT Version/Level RTN001 Routine in OLT DEV/LN Device address against which OLT was run REFNUM Provides index into error dictionary (PROG section) First Line Name of test An * on CCW02 Failing CCW An * on RCVD Failing status CSW	See reference number in this section and proceed, using diagnostic information and CE action.

MESSAGE

MESSAGE **MSG-1**

See the *IBM Disk Storage Management Guide, Error Handling*,
Order Number GA26-1672, for information on the
Environmental Recording, Editing, and Printing program.

3880
MIM

AO0001	8498123	See EC	450907	450908	450910	461517
Side 1 of 1	Part No.	History	10Dec80	15Apr81	14May82	27Jan84

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MESSAGE **MSG-1**

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REFERENCES TO OTHER SECTIONS

See the CARR section for the checks, adjustments, removals, and replacements of the diskette drive and its parts.

See the PWR section for information on the operator and power switch panels.

See the INST section for information on the channel interface and control interface cable connectors.

See the Maintenance Diagram Manual (MDM) for the gate board layout.

ABBREVIATIONS IN THIS SECTION

ADT	automatic data transfer
bd	board
C	cable, capacitor
CB	circuit breaker
CDX	channel data transfer
CH A	channel A
CH B	channel B
CHL-I	channel interface
CIF-A	channel interface A
CIF-B	channel interface B
CIF-C	channel interface C
CIF-D	channel interface D
CLK	clock
Com	common
CP	circuit protector
CPC	central power control
CR	rectifier
CSC	channel sequence control
CSR	channel search
CTL-I	control interface
D	device
DCS	dynamic control storage
DCT	device counter
DDC	director-to-device controller
DRC	dynamic refresh control
DRR-1	driver receiver 1
DRR-2	driver receiver 2
FCA	four-channel, additional (Eight-Channel Switch Feature)
GTB	gate terminal board
H	host
HDSCS	high density static control storage
I/O	input/output
J	connector
K	relay
L	light-emitting diode
maint	maintenance
MD	maintenance device
MDAC	maintenance device adapter control
MDAR	maintenance device adapter register
MNT	maintenance
N/C	normally closed
N/O	normally open
op	operator
OV	overvoltage
PCC	power control card
PS1	power supply 1
PSC	power sensor card
R	resistor
reg	regulator
S	switch
SBP-A	select out bypass A

SBP-B	select out bypass B
SBP-C	select out bypass C
SBP-D	select out bypass D
SCS-1	static control storage 1
SCS-2	static control storage 2
SCS-3	static control storage 3
SD1	storage director 1
SD2	storage director 2
SDM	storage director microcontroller
SDR	switch driver receiver
SDT	switch driver terminator
T	transformer
TACR	two-channel additional condition register
TADT	two-channel additional driver terminator
TB	terminal board
TCC	top-card connector
TCR	two-channel condition register

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 Storage Director 2 LOC-10,75
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 Storage Director 1 LOC-10,75
 B1 Board, Maintenance Board
 LOC-10,75
 B3 Board, Storage Director 2
 Board LOC-10,75
 B4 Board, Storage Director 1
 Board 1 LOC-10,75
 B1 Board Thermal Switch LOC-92,95
 B3 Board Thermal Switch LOC-92,95
 Bulk Power Panel LOC-30
 Bulk Power Supply, DC LOC-10,30

C

Cable Connector Description LOC-92,93,95,100,101
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 C2XX LOC-30,35
 C3XX LOC-40,45
 C4XX LOC-55
 C7XX LOC-60
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 Central Power Control (CPC) Board
 LOC-10,60
 Circuit Card Connector Assignments LOC-80
 Connectors
 Board LOC-80
 Cable LOC-85
 Channel Interface Cable LOC-10,92,95
 Control Interface Cable LOC-10,92,95
 Control Unit Cable LOC-101
 Device Cable LOC-92,95
 Host Cable LOC-92,95
 Remote Cable LOC-92,95
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 J2 LOC-25
 J4 LOC-25

J5 LOC-25
 J1XX LOC-70
 J4XX LOC-50,55
 J5XX LOC-92,95
 J7XX LOC-60
 J8XX LOC-65
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 Serpent Connector Blocks LOC-101
 Tailgate Pin Identification LOC-101
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 Convenience Outlet LOC-55,92,95
 CPC Board LOC-60
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 CP3XX LOC-40,45
 CP4XX LOC-55
 Crossovers LOC-90
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 DC Power System Switch, S103 LOC-70
 Device Interface Power Board LOC-10,65
 Device Power Sequencing Switch, S105 LOC-70
 Diode Assembly LOC-50,55
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 Diskette Drive AC Switch, S401 LOC-50,55
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G
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 Hinge End, Gate LOC-10,92,95
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 Power Status LOC-70
 Processing Unit Power-Up Sequence
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 Isolation Transformer Assembly (T401)
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Maintenance Board, B1 Board LOC-10,75
 Maintenance Power On Switch, S104 LOC-70
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 Maintenance Power Supply - 50 Hz LOC-20,40
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Operator Panel LOC-10

P

Power Select Switch, S106 LOC-70
 Power Stack Label LOC-10,15
 Power Status Indicators LOC-70
 Power Supply Fan LOC-10
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 CR3XX LOC-40,45
 CR4XX LOC-50,55
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 and +3.0 V Multilevel LOC 10,25
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 Relays
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 K7XX LOC-60
 K8XX LOC-65
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 Serpent Connector Blocks LOC-101
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 Storage Director 1 (SD1) Board LOC-75
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 TB1 through TB5 LOC-20
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 TB3XX LOC-40,45
 TB4XX LOC-50,55
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 PS1 Thermal Switch LOC-20
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 T3XX LOC-40,45
 T4XX LOC-50,55

V

Voltage Adjustment Potentiometers
 +5 V Regulator LOC-20
 Regulator Cards LOC-25

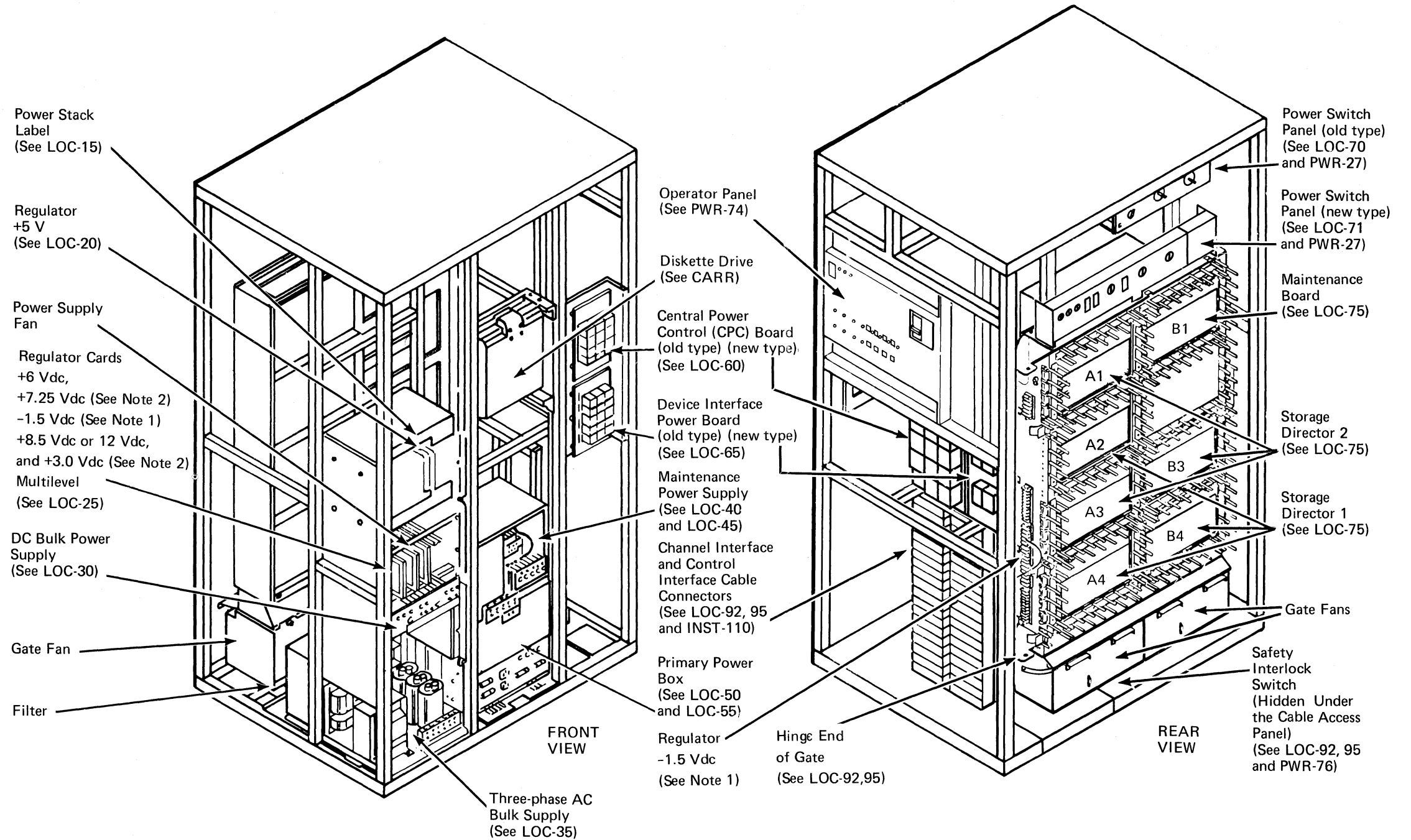
The front and rear storage control figure shows the location of specific parts called out. Each callout also indicates where more information can be found.

The following is the numbering scheme for specific areas in the storage control:

- 1XX Power switch panel
- 2XX DC bulk power supply
- 3XX Maintenance power supply
- 4XX Primary power box
- 5XX Operator panel
- 7XX Central power control (CPC) board
- 8XX Device interface board

Notes:

1. If CP207 is installed on the bulk power panel, the -1.5 Vdc regulator is part of the multilevel regulator. When CP207 is not installed, the -1.5 Vdc regulator is installed on the gate between GTB3 and GTB4.
2. On machines with high density static control storage (HDSCS), the +7.25 Vdc regulator is not installed and the +3.0 Vdc regulator is not used.



3880
MIM

AQ0005	8498147
Side 2 of 2	Part No.

See EC History	450907 10Dec80	450908 15Apr81	450913 12Jan83	450915 14Oct83
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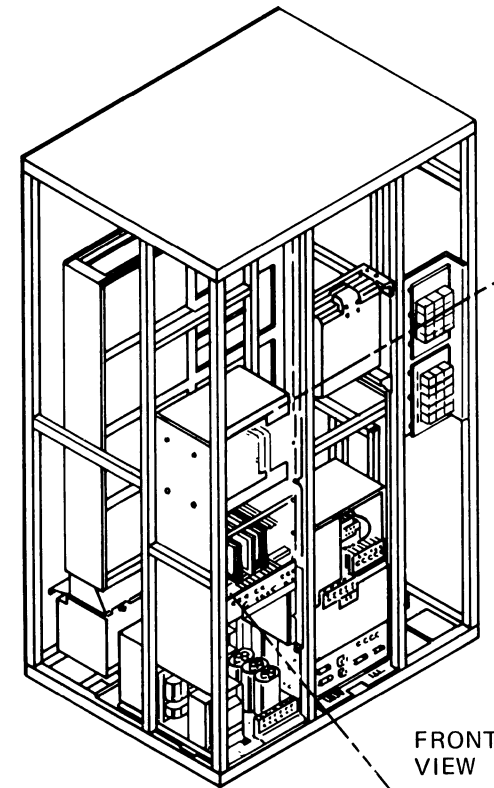
POWER STACK LABEL

The following parts are shown on the power stack label in this figure:

- 5 Vdc regulator
- 6 Vdc, 7.25 Vdc, (see note) and multilevel regulator cards
- C204 through C207 capacitors
- CP201, CP203 through CP210 circuit protectors
- CR201 through CR211 rectifiers
- TB202 and TB203 terminal boards
- Fan

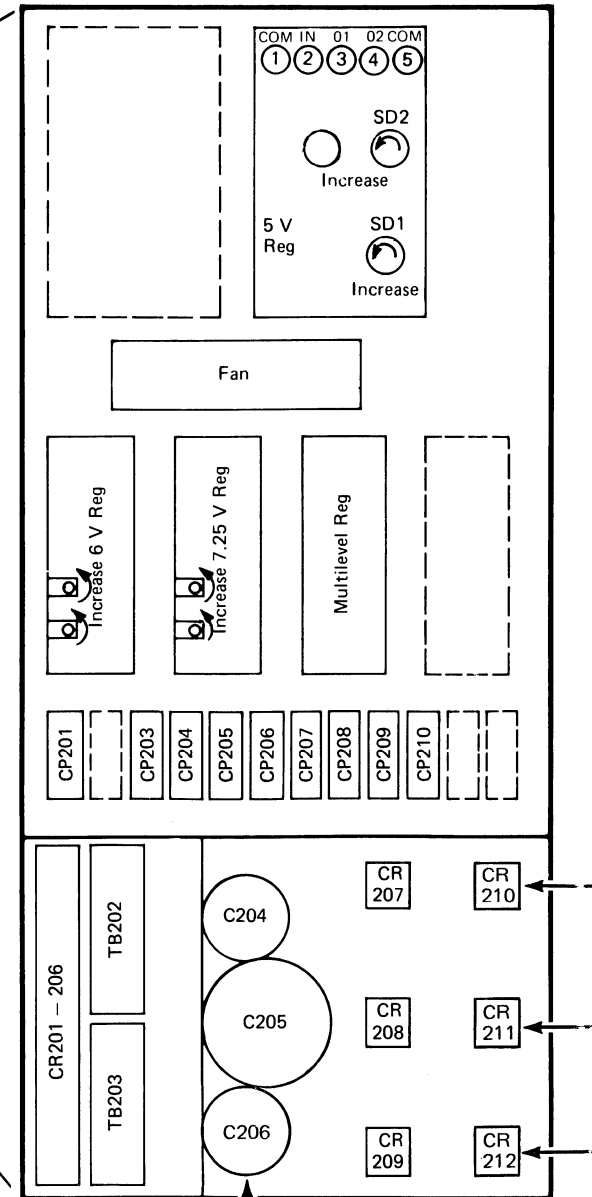
Note: When the +7.5 Vdc regulator is removed, the +3.0 Vdc and +7.25 Vdc voltages are not used.

Storage Control

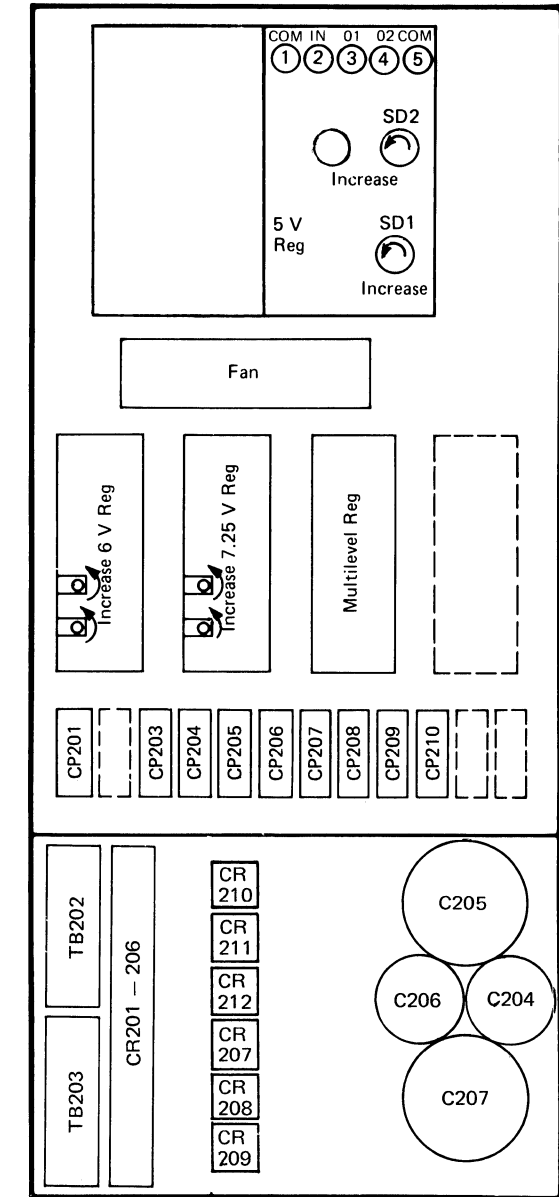


FRONT VIEW

One, two, or four channels (TCA)



Eight Channels (FCA)



Rectifiers CR210 through CR212 and capacitor C206 are installed in machines with 22-card position B3/B4 boards.

3880	AQ0015	8498148	450900	450906	450913	450915	
MIM	Side 1 of 2	Part No.	13Jul79	15Aug80	12Jan83	14Oct83	.

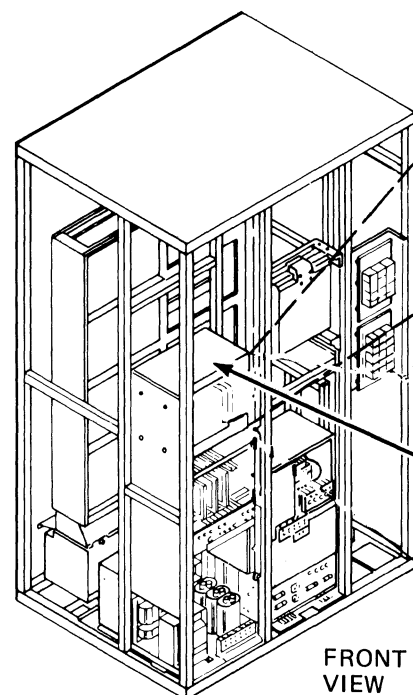
The +5 Vdc regulator contains the following parts:

- +5 Vdc regulators
- J1 connector
- PS1 thermal switch
- TB1 through TB5 terminal board
- Voltage adjustment potentiometers

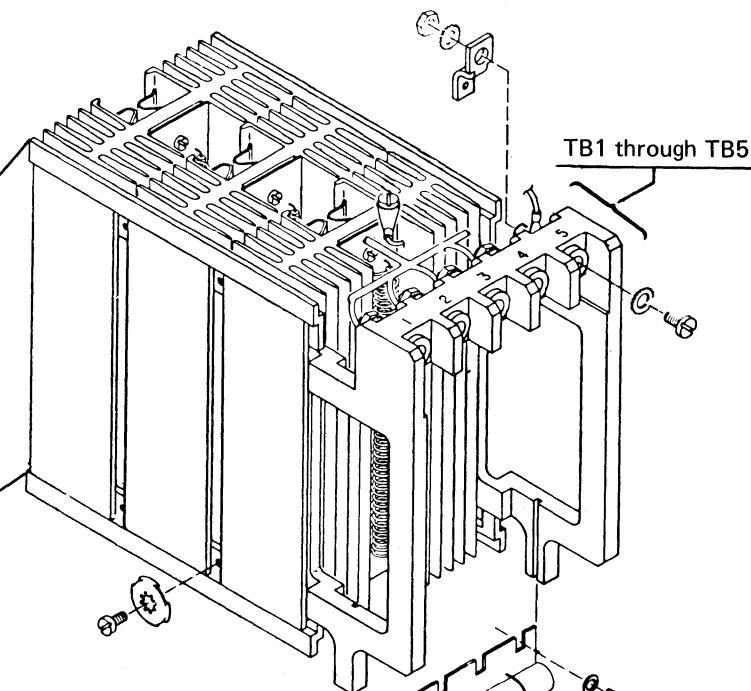
+5 Vdc Regulator for one, two, or four channels (TCA)

+5 Vdc Regulator for eight channels (FCA) and high density static control storage (HDSCS)

Storage Control



PS1 Thermal Switch (Manual reset)

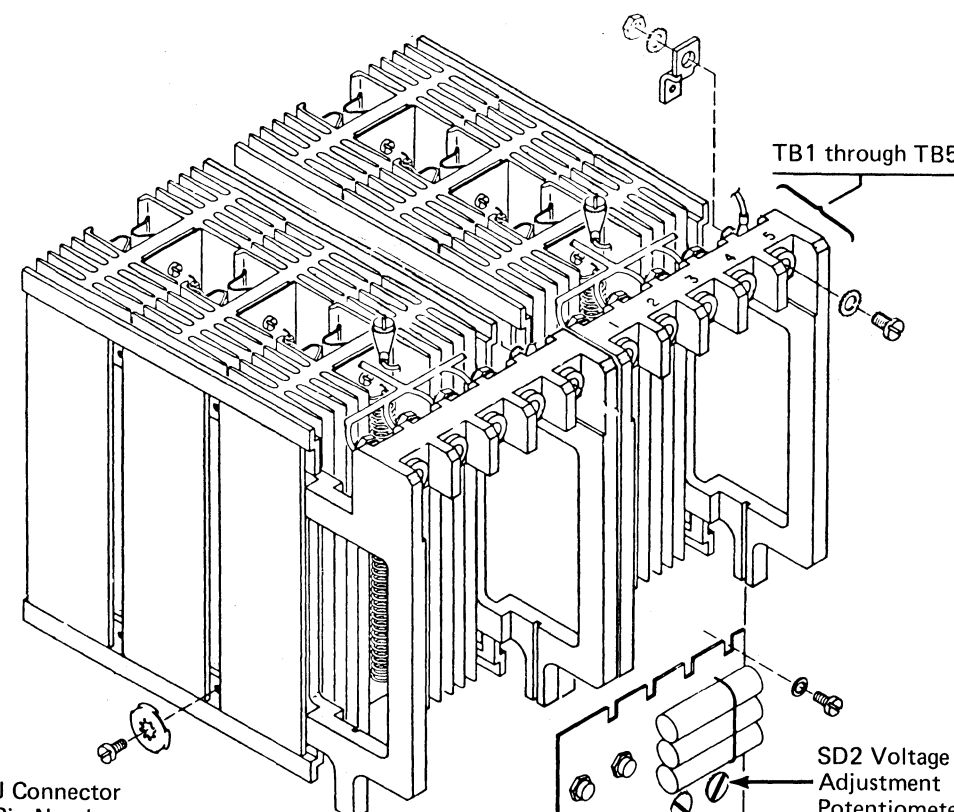
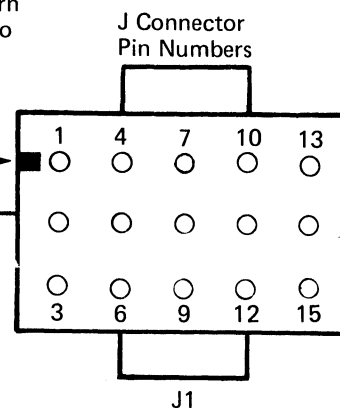


Overvoltage Potentiometer (Factory adjust only)

SD1 Voltage Adjustment Potentiometer (Turn counterclockwise to increase voltage.)

SD2 Voltage Adjustment Potentiometer (Turn counterclockwise to increase voltage.)

Raised bar is at pin number 1



Overvoltage Potentiometer (Factory adjust only)

SD2 Voltage Adjustment Potentiometer (Turn counterclockwise to increase voltage.)

SD1 Voltage Adjustment Potentiometer (Turn counterclockwise to increase voltage.)

AQ0015	8498148	450900	450906	450913	450915	.
Side 2 of 2	Part No.	13Jul79	15Aug80	12Jan83	14Oct83	.

REGULATOR CARDS

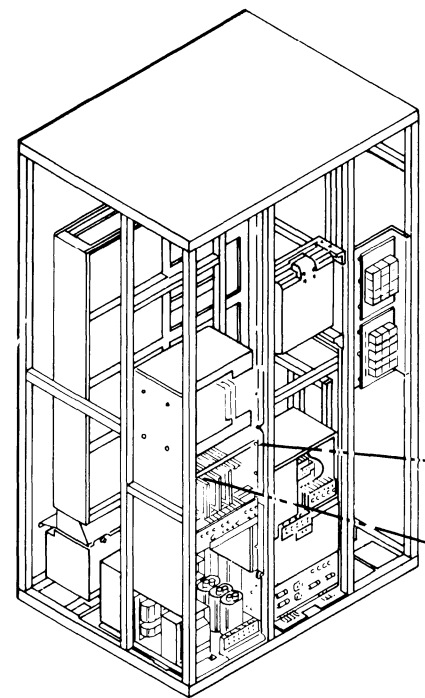
The following regulator cards and their parts are shown in the figure:

- -1.5 Vdc, +8.5 Vdc or 12 Vdc, and +3.0 Vdc (see note) multilevel regulator card
- +6 Vdc regulator card
- +7.25 Vdc regulator card (see note)
- J1, J2, J4, and J5 connectors
- Voltage adjustment potentiometers

Notes:

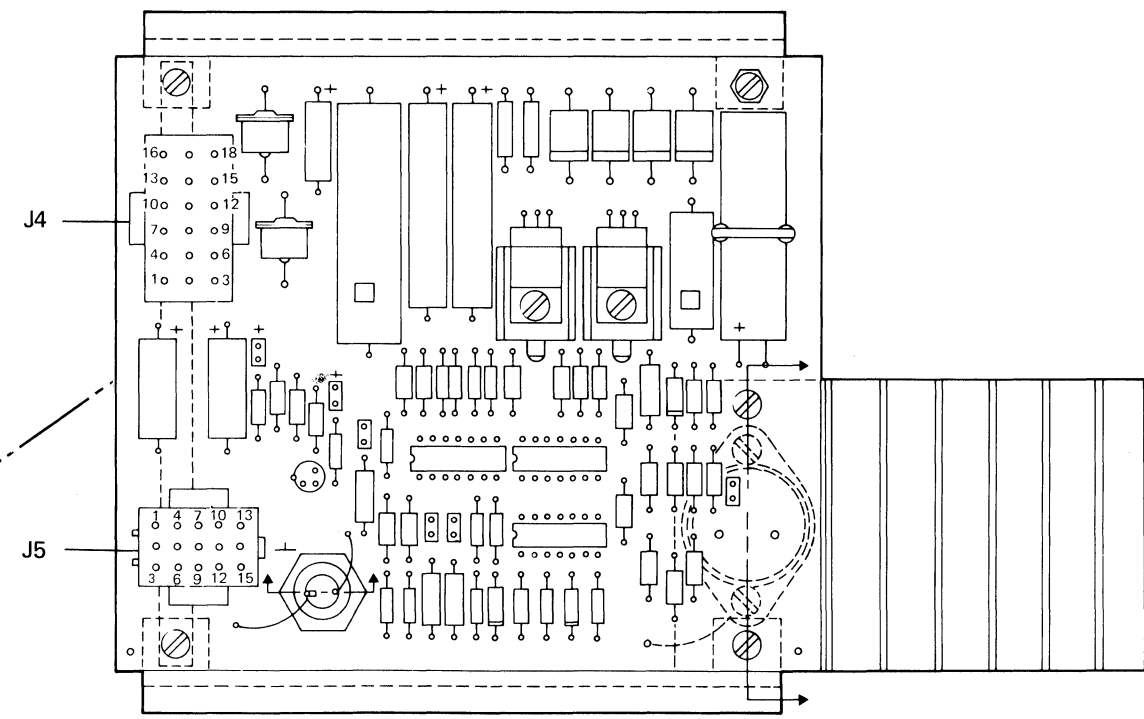
1. When the +7.5 Vdc regulator is removed, the +3.0 Vdc and +7.25 Vdc voltages are not used.
2. When CP207 is not installed, the -1.5 Vdc regulator is installed on the gate between GTB3 and GTB4.

Storage Control

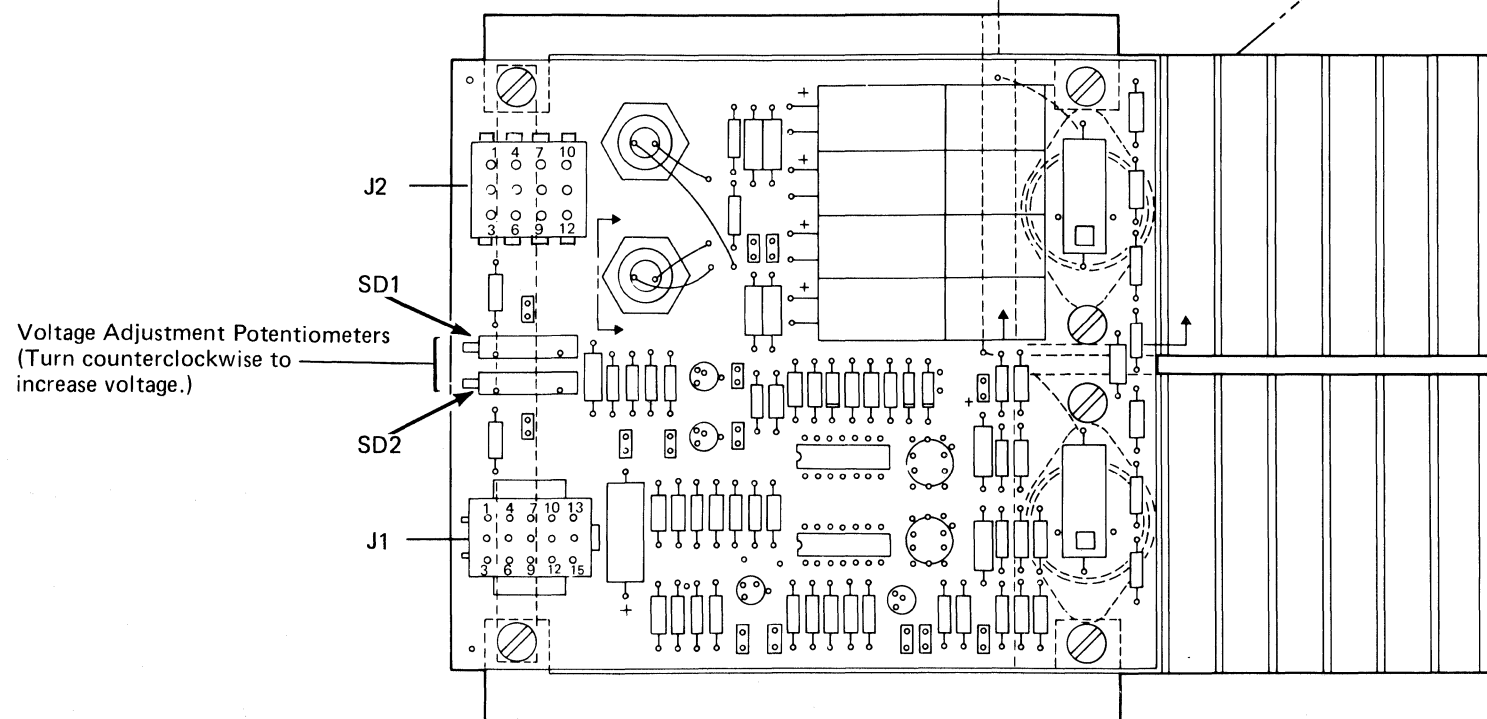


FRONT VIEW

**-1.5 Vdc (see note 2), +8.5 Vdc or 12 Vdc, and +3.0 Vdc (see note 1)
Multilevel Regulator Card**

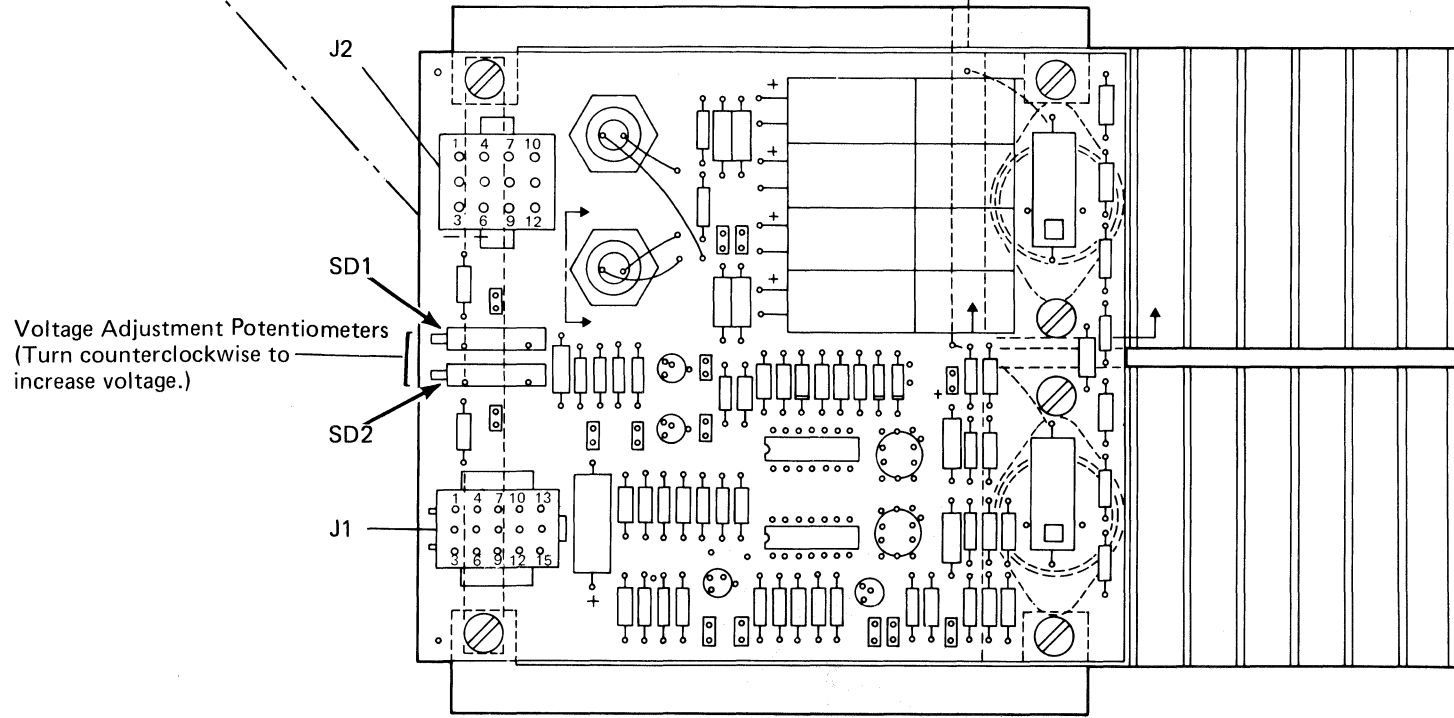


+6 Vdc Regulator Card



Voltage Adjustment Potentiometers
(Turn counterclockwise to increase voltage.)

+7.25 Vdc Regulator Card (see note)



Voltage Adjustment Potentiometers
(Turn counterclockwise to increase voltage.)

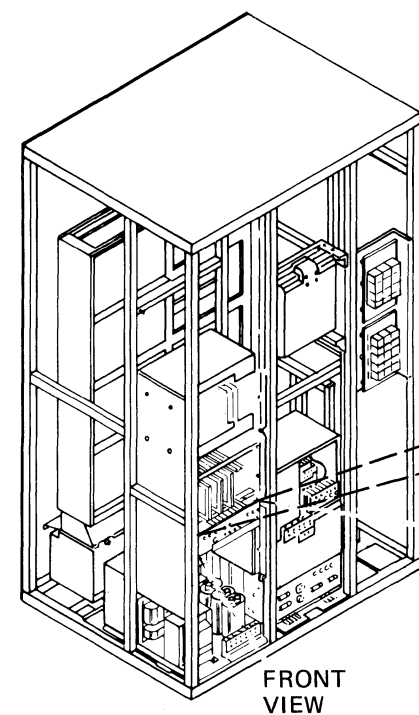
3880	AQ0025	8498149	See EC	450913	450915	.	.
MIM	Side 1 of 2	Part No.	History	12Jan83	14Oct83	.	.

The DC bulk power supply contains the following parts:

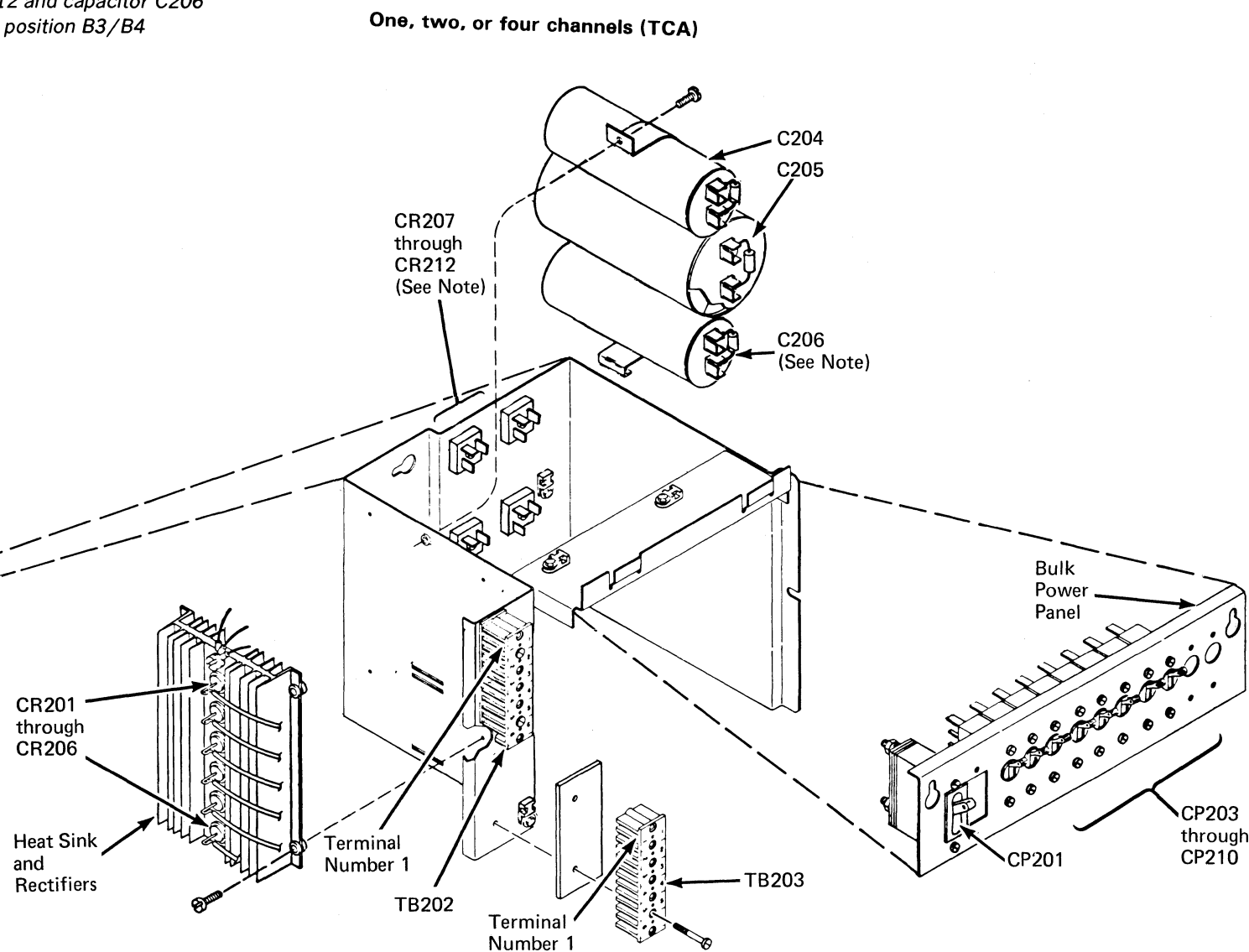
- C204 and C207 capacitors
- CP201, CP203 through CP210 circuit protectors
- CR201 through CR212 rectifiers
- Heat sink and rectifiers
- TB202 and TB203 terminal boards

Note: Rectifiers CR210 through CR212 and capacitor C206 are installed in machines with 22-card position B3/B4 boards.

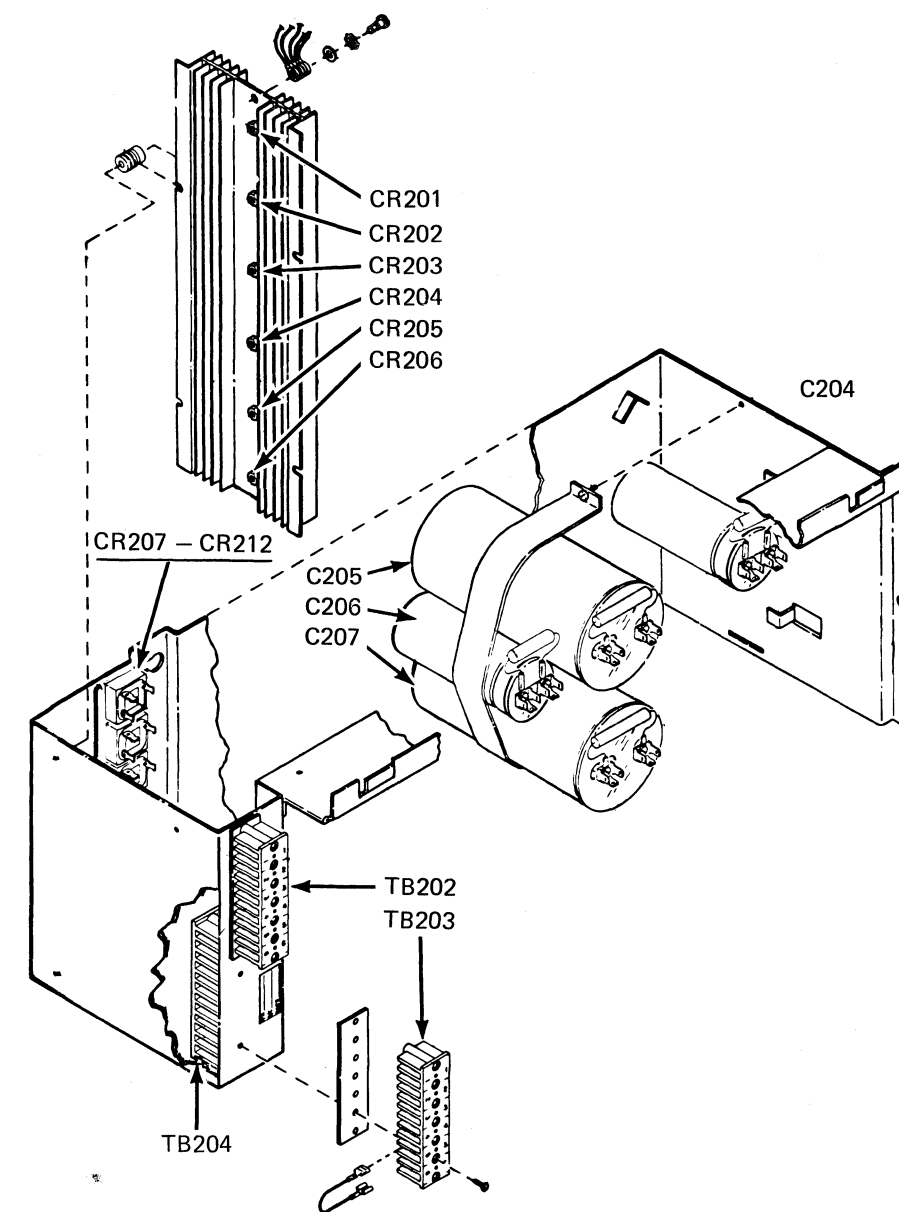
Storage Control



FRONT VIEW



Eight Channels (FCA)



3880
MIM

AQ0025	8498149
Side 2 of 2	Part No.

See EC	450913	450915		
History	12Jan83	14Oct83	.	.

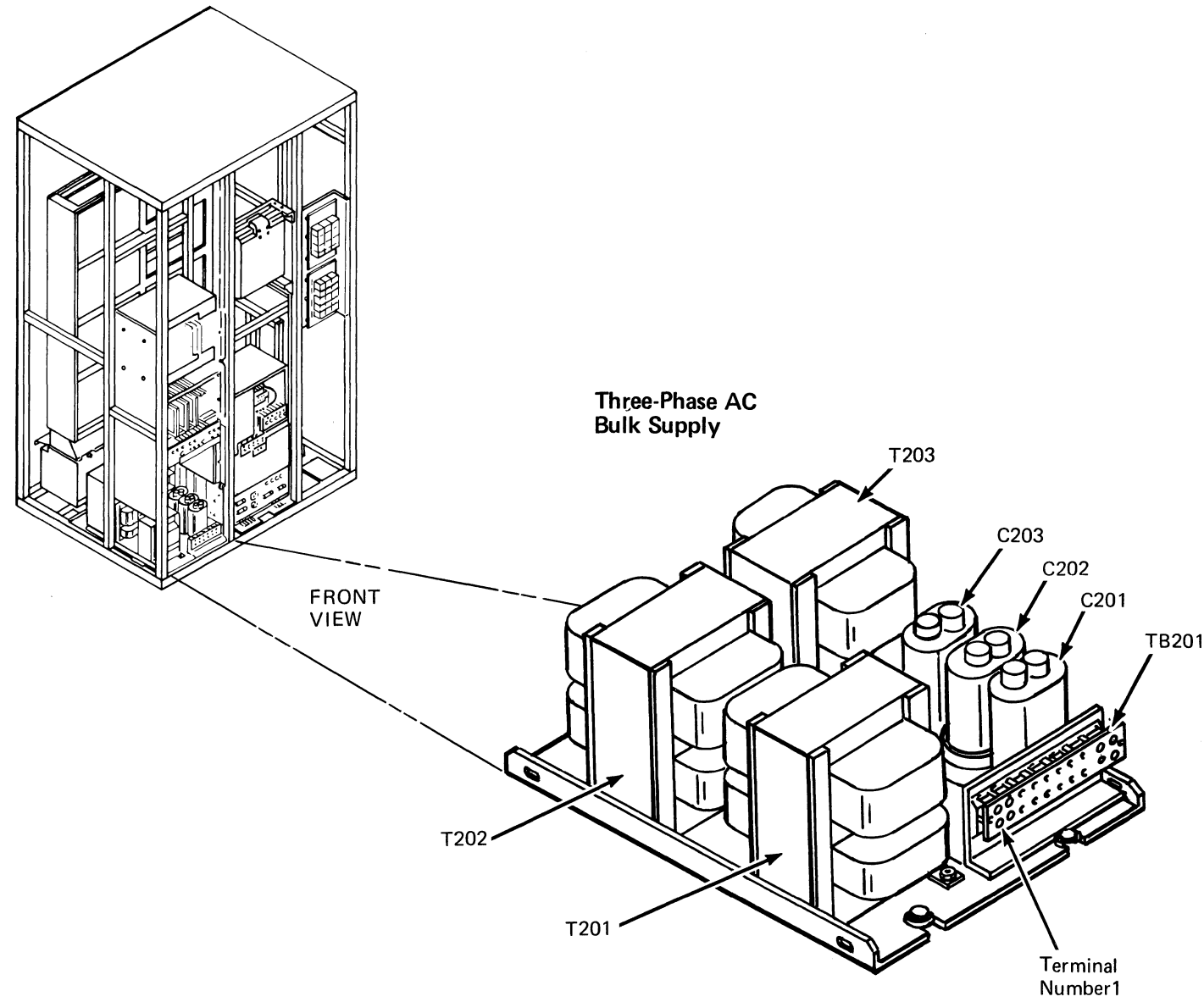
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THREE-PHASE AC BULK SUPPLY

The three-phase AC bulk supply contains the following parts:

- C201 through C203 capacitors
- T201 through T203 transformers
- TB201 terminal board

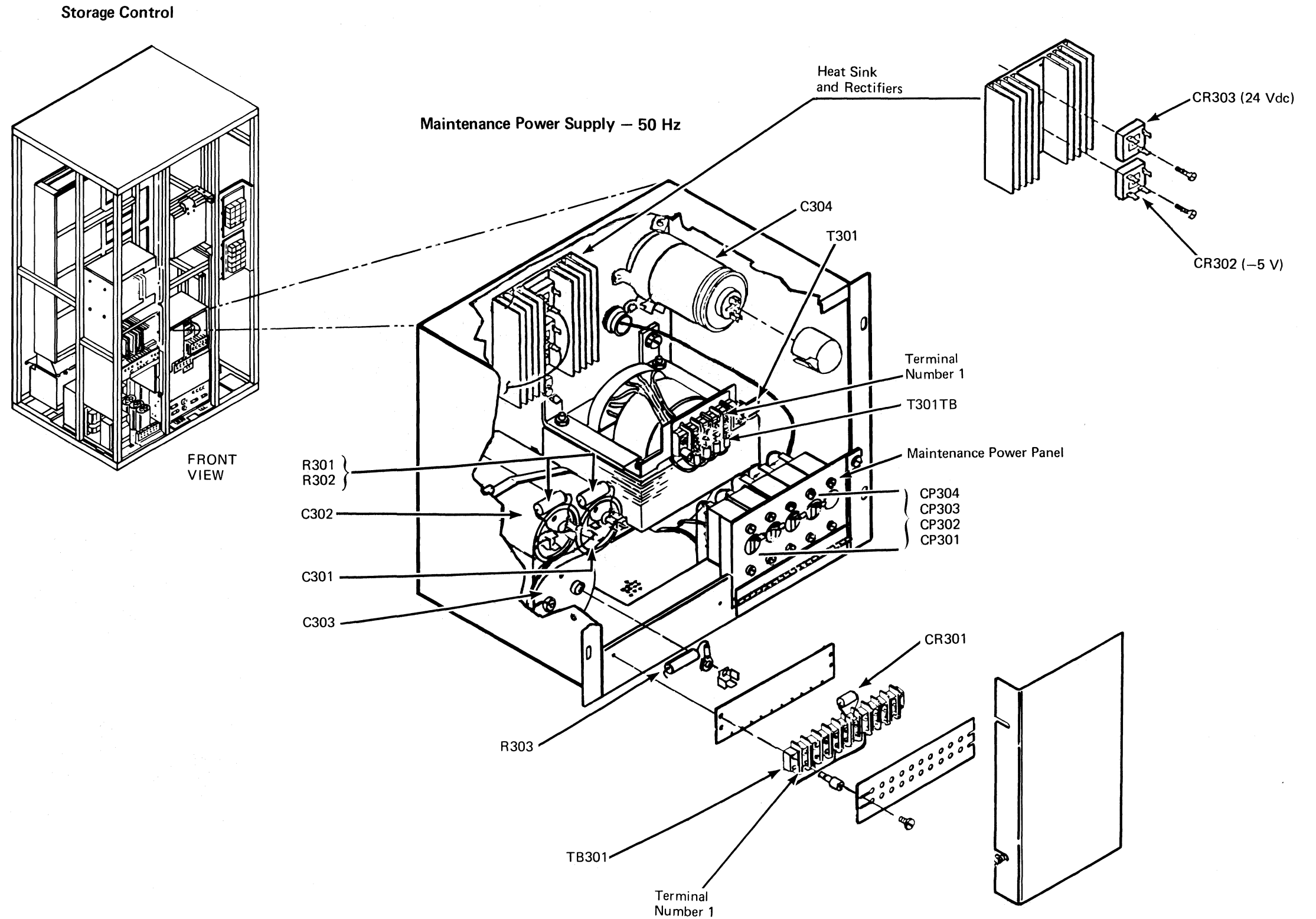
Storage Control



3880	AQ0035	8498150	450900	450905	.	.	.
MIM	Side 1 of 2	Part No.	13Jul79	18Apr80	.	.	.

The maintenance power supply contains the following parts:

- C301 through C304 capacitors
- CP301 through CP304 circuit protectors
- CR301 through CR303 rectifiers
- T301 transformer
- T301TB terminal board
- TB301 terminal board
- R301 through R303 resistors
- Heat sink and rectifiers



3880
MIM

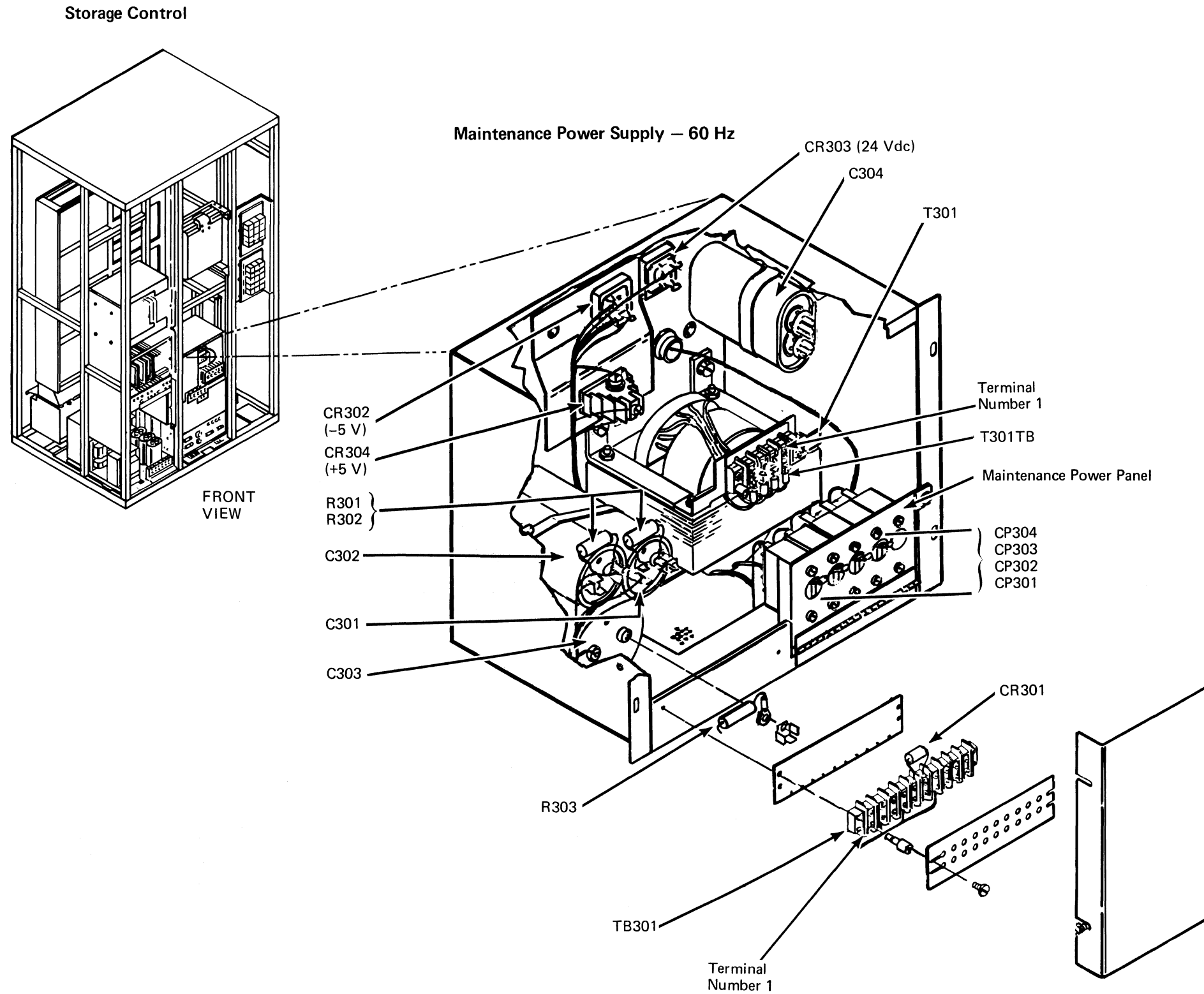
AQ0035	8498150	450900	450905	.	.	.
Side 2 of 2	Part No.	13Jul79	18Apr80	.	.	.

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MAINTENANCE POWER SUPPLY – 60 Hz

The maintenance power supply – 60 Hz contains the following parts:

- C301 through C304 capacitors
- CP301 through CP304 circuit protectors
- CR301 through CR304 rectifiers
- T301 transformer
- T301TB terminal board
- TB301 terminal board
- R301 through R303 resistors



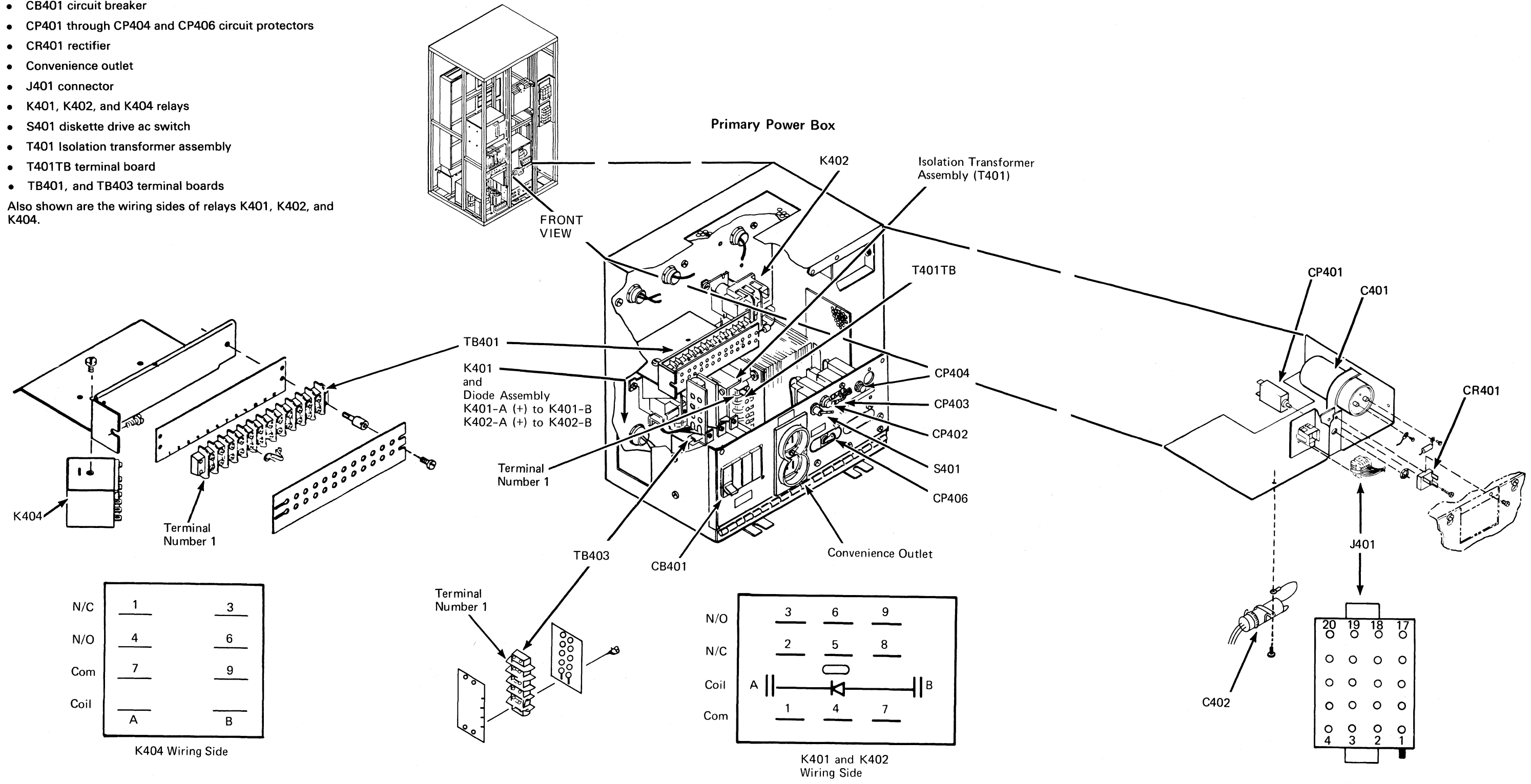
3880 MIM	AQ0045	8498151	450900	450901	450905		
	Side 1 of 2	Part No.	13Jul79	14Sep79	18Apr80	.	.

The primary power box contains the following parts:

- C401 and C402 capacitors
- CB401 circuit breaker
- CP401 through CP404 and CP406 circuit protectors
- CR401 rectifier
- Convenience outlet
- J401 connector
- K401, K402, and K404 relays
- S401 diskette drive ac switch
- T401 Isolation transformer assembly
- T401TB terminal board
- TB401, and TB403 terminal boards

Also shown are the wiring sides of relays K401, K402, and K404.

Storage Control



3880	AQ0045	8498151	450900	450901	450905	.	.
MIM	Side 2 of 2	Part No.	13Jul79	14Sep79	18Apr80	.	.

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PRIMARY POWER BOX – 60 Hz and 50 Hz Japan

PRIMARY POWER BOX – 60 Hz and 50 Hz Japan

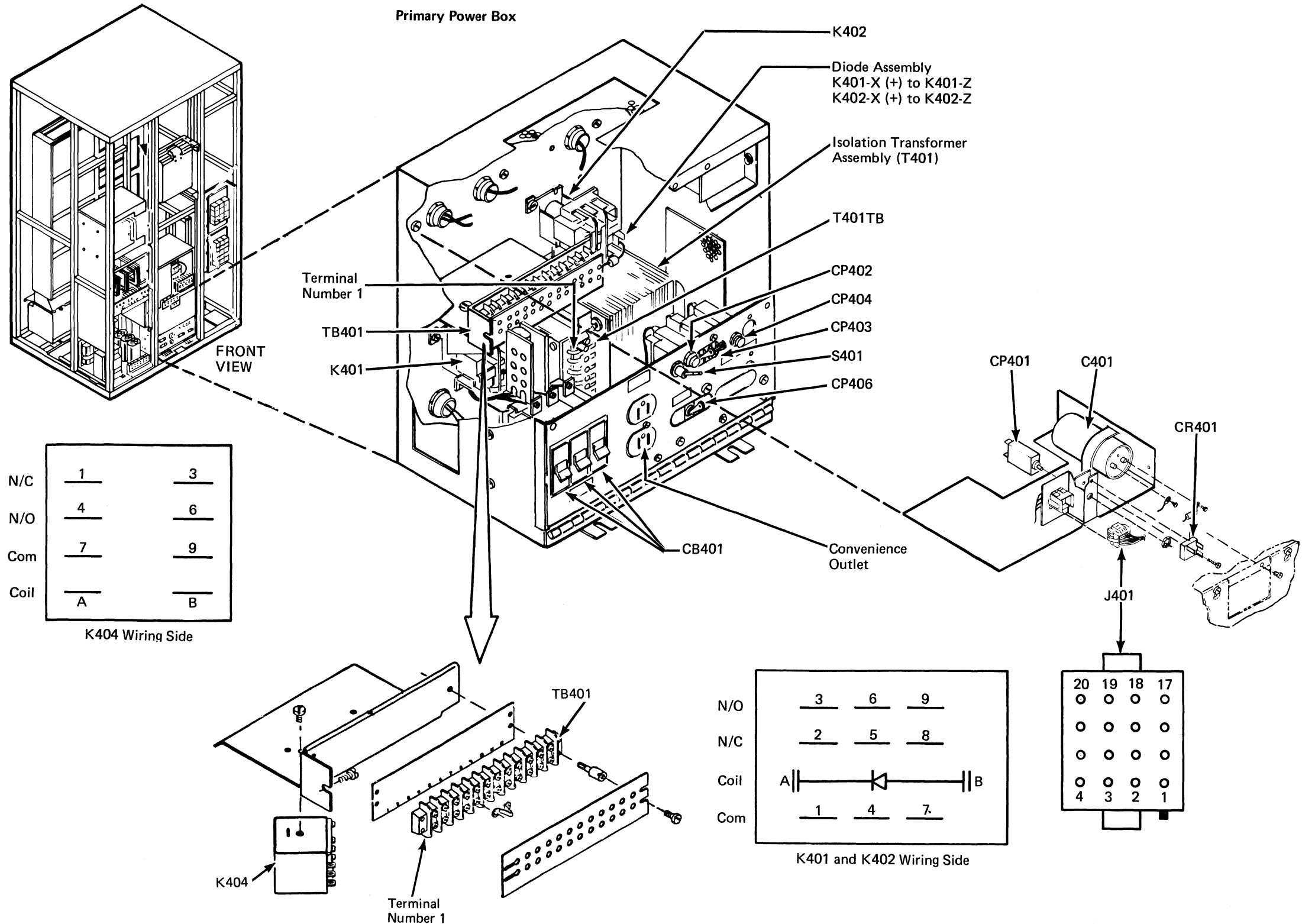
LOC-55

The primary power box contains the following parts:

- C401 capacitor
- CB401 circuit breaker
- CP401 through CP404 and CP406 circuit protectors
- CR401 rectifier
- Convenience outlet
- Diode assembly
- J401 connector
- K401, K402, and K404 relays
- S401 diskette drive ac switch
- T401 Isolation transformer assembly
- T401TB terminal board
- TB401 terminal board

Also shown are the wiring sides of relays K401, K402, and K404.

Storage Control

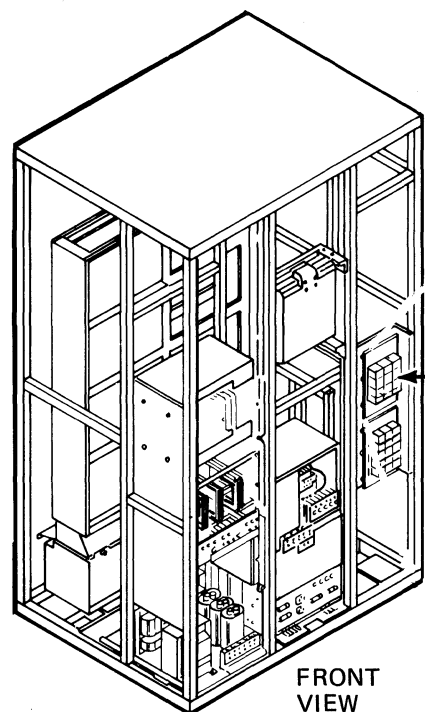


The following parts of the central power control (CPC) board are shown in the figure:

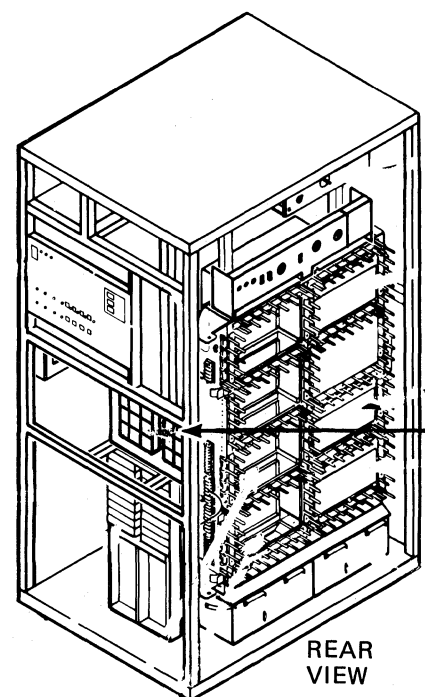
- C701 capacitor
- J701 through J709 connectors
- Hold, pick, and 24 Vdc processing unit power up sequence indicators
- CR701 through CR705 rectifiers
- K701 through K704 relays
- R701 through R705 resistors

Also shown is the wiring side of relays K701 through K704.

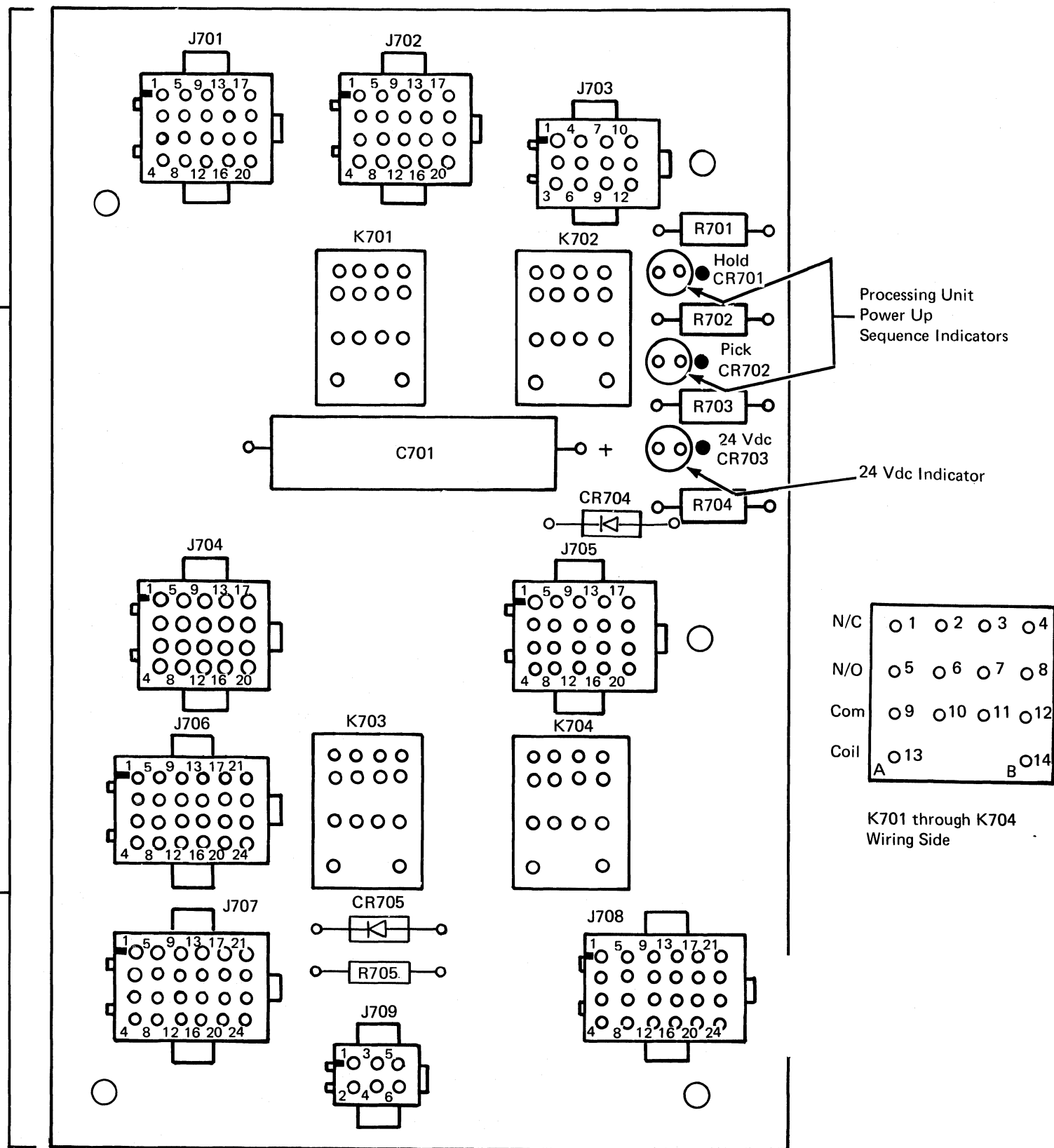
Storage Control



Central Power Control Board (Old Type)



Central Power Control Board (New Type)



N/C	○ 1	○ 2	○ 3	○ 4
N/O	○ 5	○ 6	○ 7	○ 8
Com	○ 9	○ 10	○ 11	○ 12
Coil	○ 13			○ 14
	A			B

K701 through K704 Wiring Side

3880 MIM	AQ0055 Side 2 of 2	8498152 Part No.	450900 13Jul79	450901 14Sep79	450907 10Dec80	450911 29Dec82	450912 30Dec82
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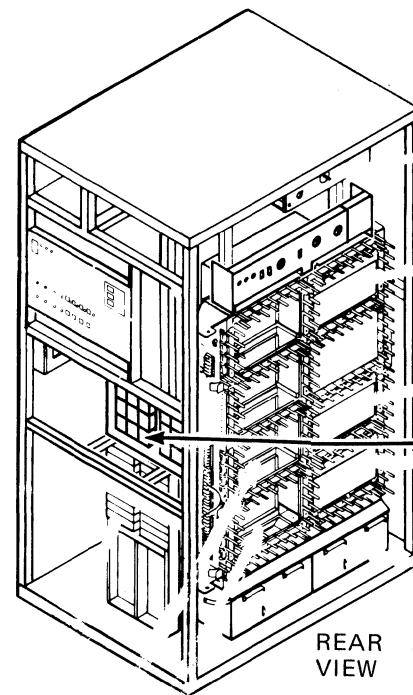
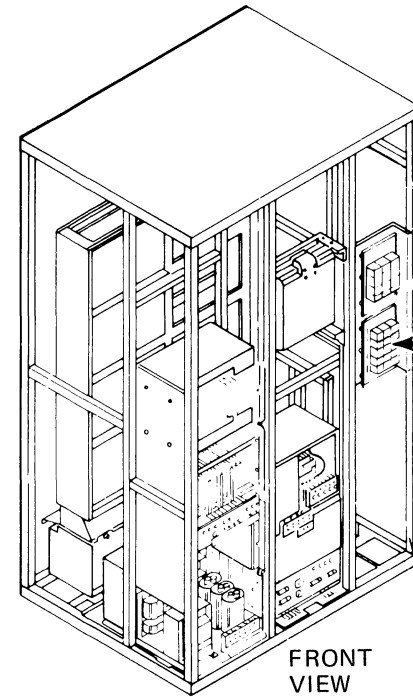
DEVICE INTERFACE POWER BOARD

The following parts of the device interface power board are shown in the figure:

- J801 through J804 connectors
- K801 through K811 relays
- L801 through L804 and L806 through L810 relay indicators
- R1 through R9 resistors

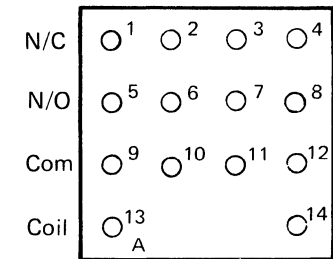
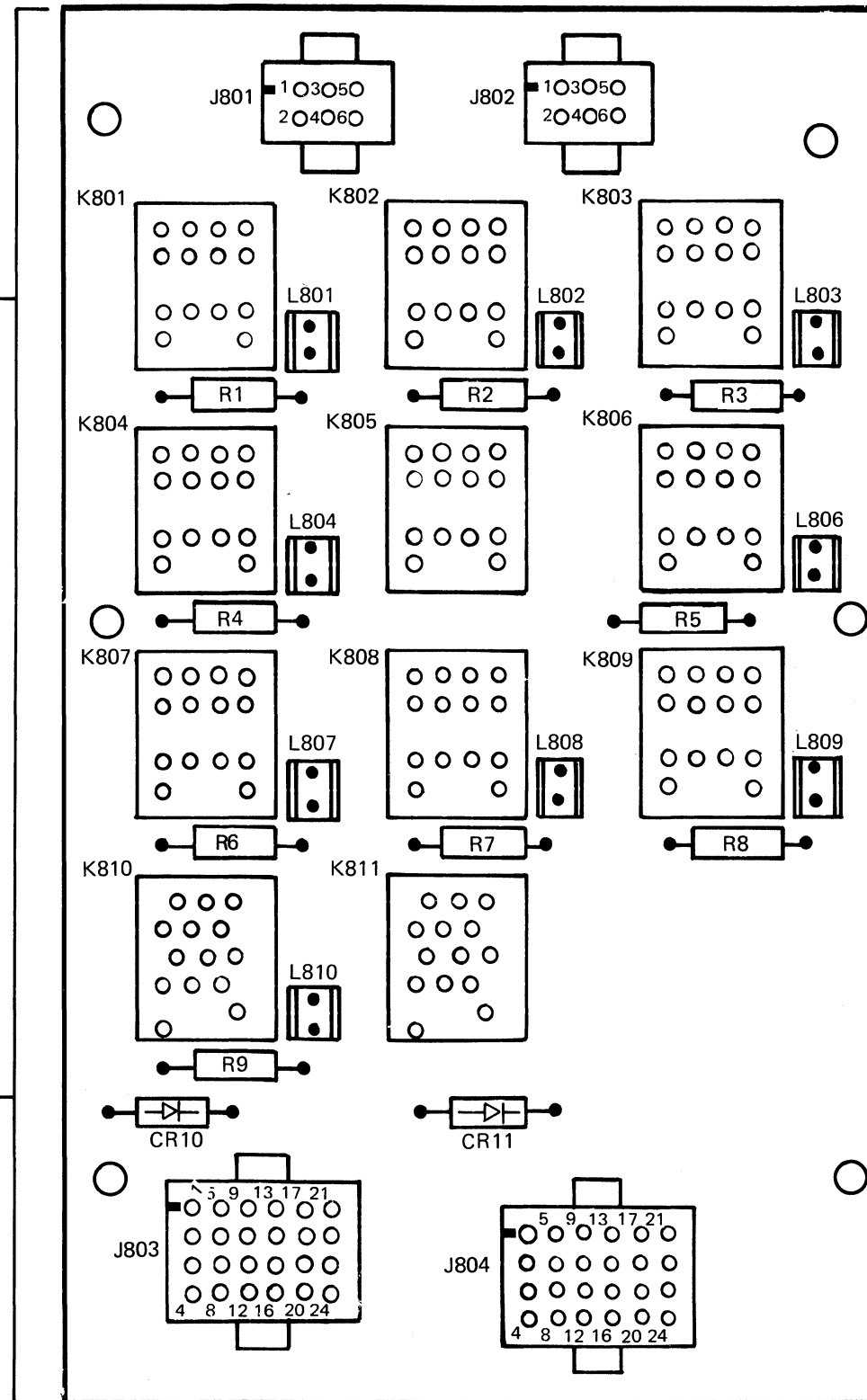
Also shown is the wiring side of relays K801 through K811

Storage Control

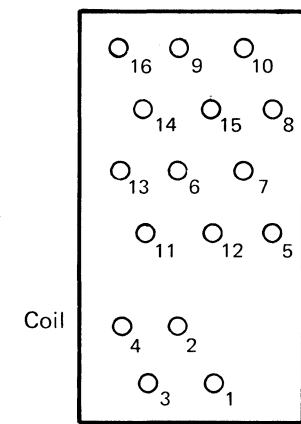


Device Interface Power Board (Old Type)

Device Interface Power Board (New Type)



K801 through K809 Wiring Side



K810 and K811 Wiring Side

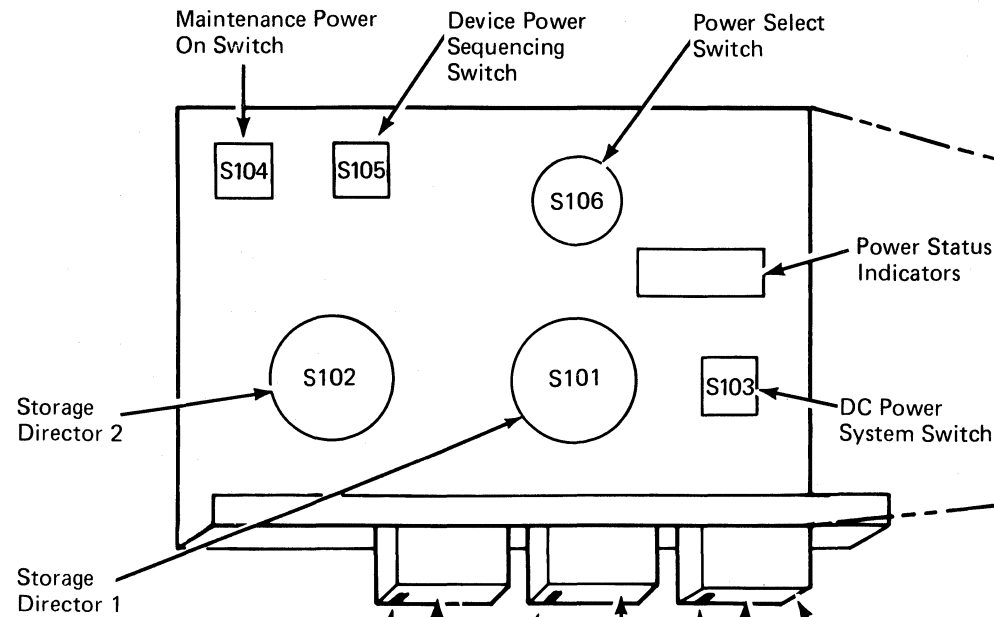
Note: Wires 5, 7, 9, 11, 13, and 15 are common (Com) and wires 6, 8, 10, 12, 14, and 16 are normally open (N/O).

The back side of the power switch panel is accessible from the front of the storage control. The following parts are shown in the figure:

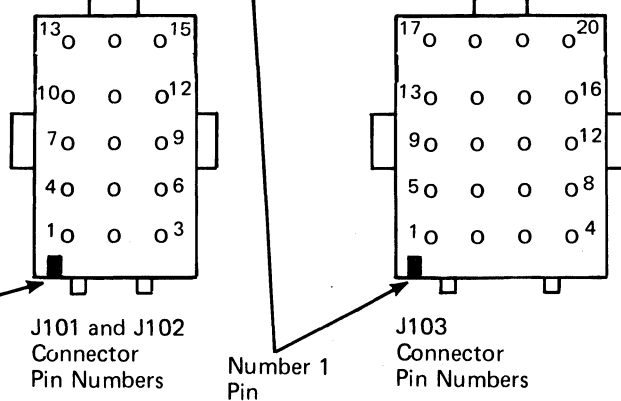
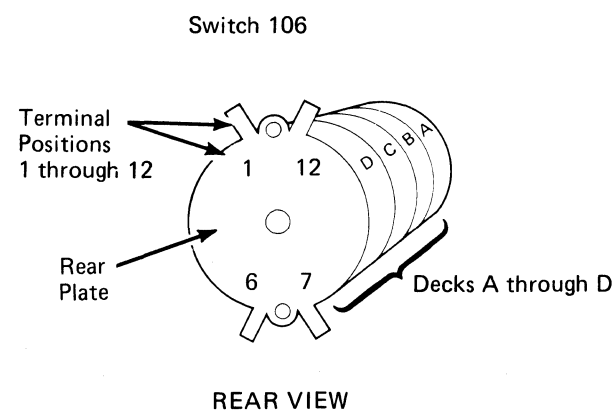
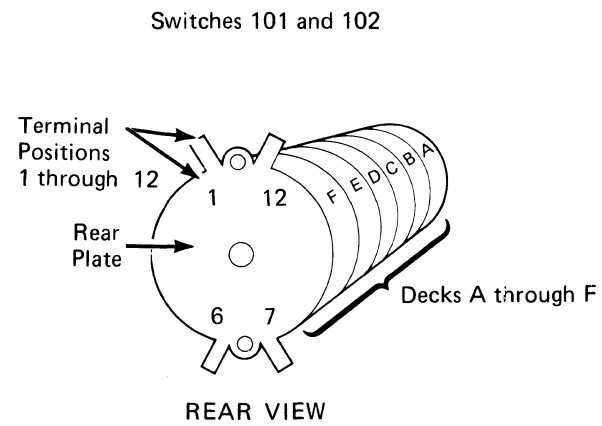
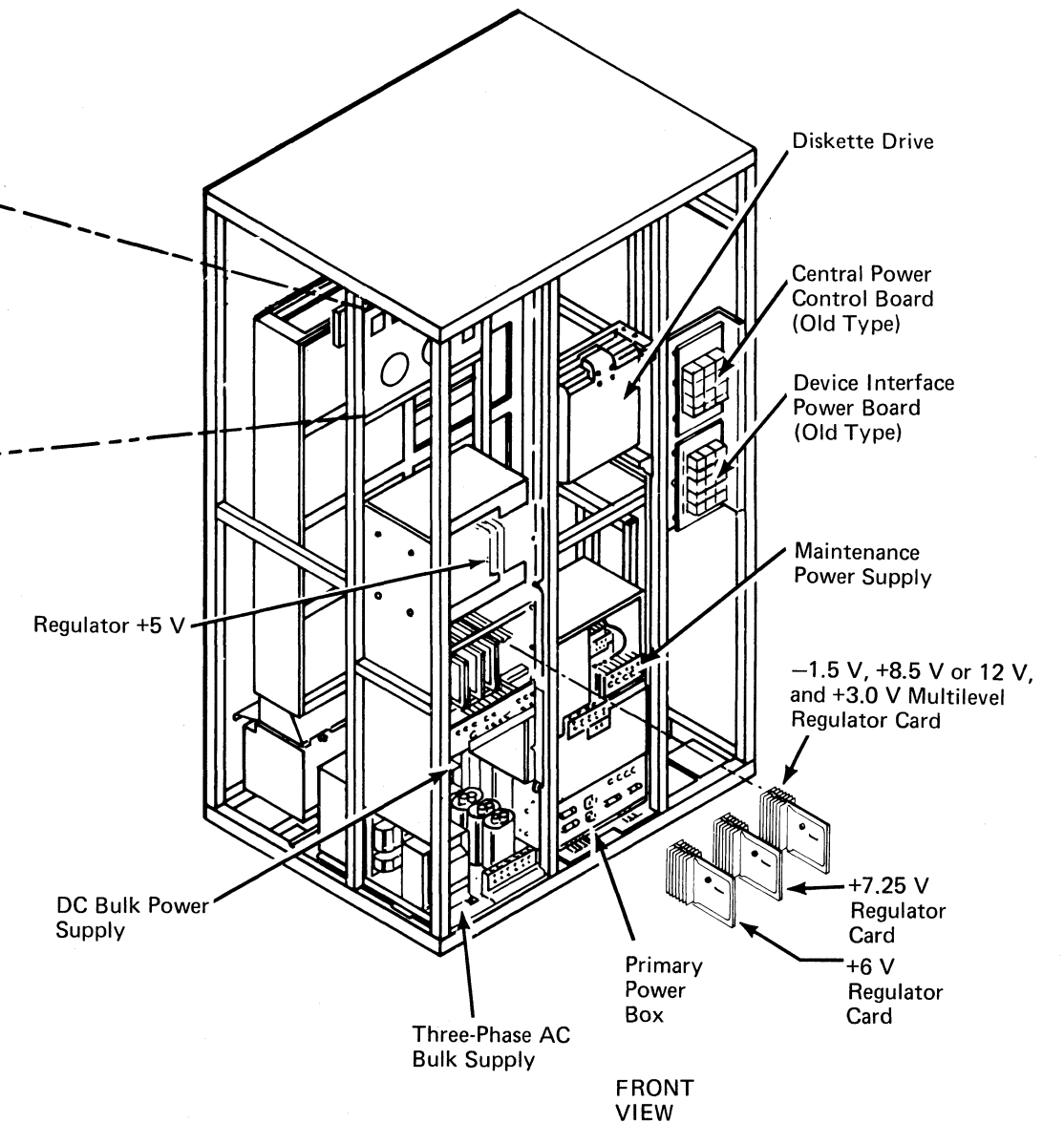
- J101 through J103 connectors
- S101, Storage Director 1 switch
- S102, Storage Director 2 switch
- S103, DC Power System switch
- S104, Maintenance Power On switch
- S105, Device Power Sequencing switch
- S106, Power Select switch
- Power Status indicators

See PWR-27 for a front view and description.

Power Switch Panel



Storage Control



Bottom View

3880
MIM

AQ0065	8498153	450900	450901	450906	450907	450911
Side 2 of 2	Part No.	13Jul79	14Sep79	15Aug80	10Dec80	29Dec82

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POWER SWITCH PANEL – REAR VIEW

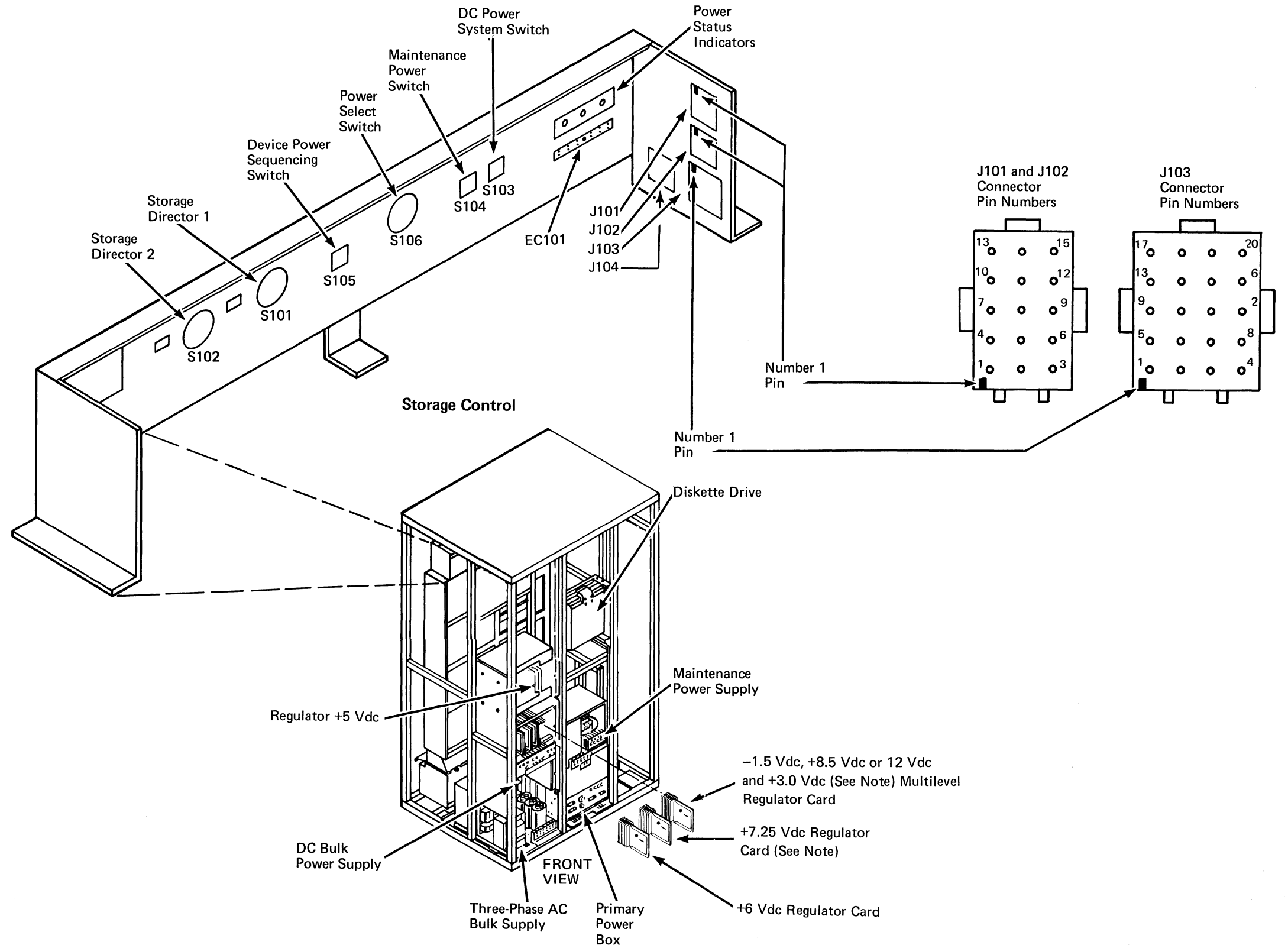
The back of the new type power switch panel is accessible from the rear of gate 1. The following parts are shown in the figure:

- J101 through J104 connectors
- S101, Storage Director 1 switch
- S102, Storage Director 2 switch
- S103, DC Power System switch
- S104, Maintenance Power switch
- S105, Device Power Sequencing switch
- S106, Power Select switch
- Power Status indicators
- EC101 Edge Connector

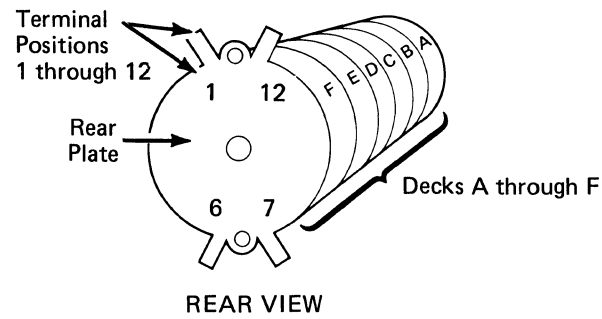
See PWR-27 for a front view and description.

Note: When the +7.5 Vdc regulator is removed, the +3.0 Vdc and +7.25 Vdc voltages are not used.

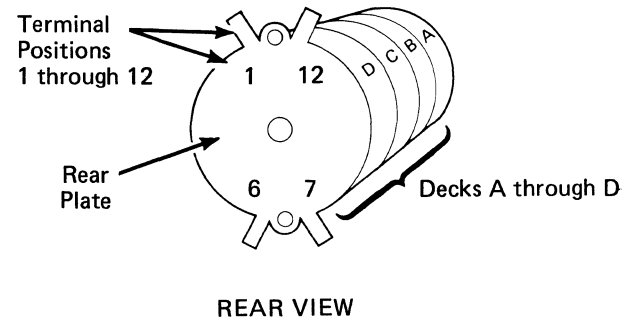
Power Switch Panel



Switches 101 and 102



Switch 106



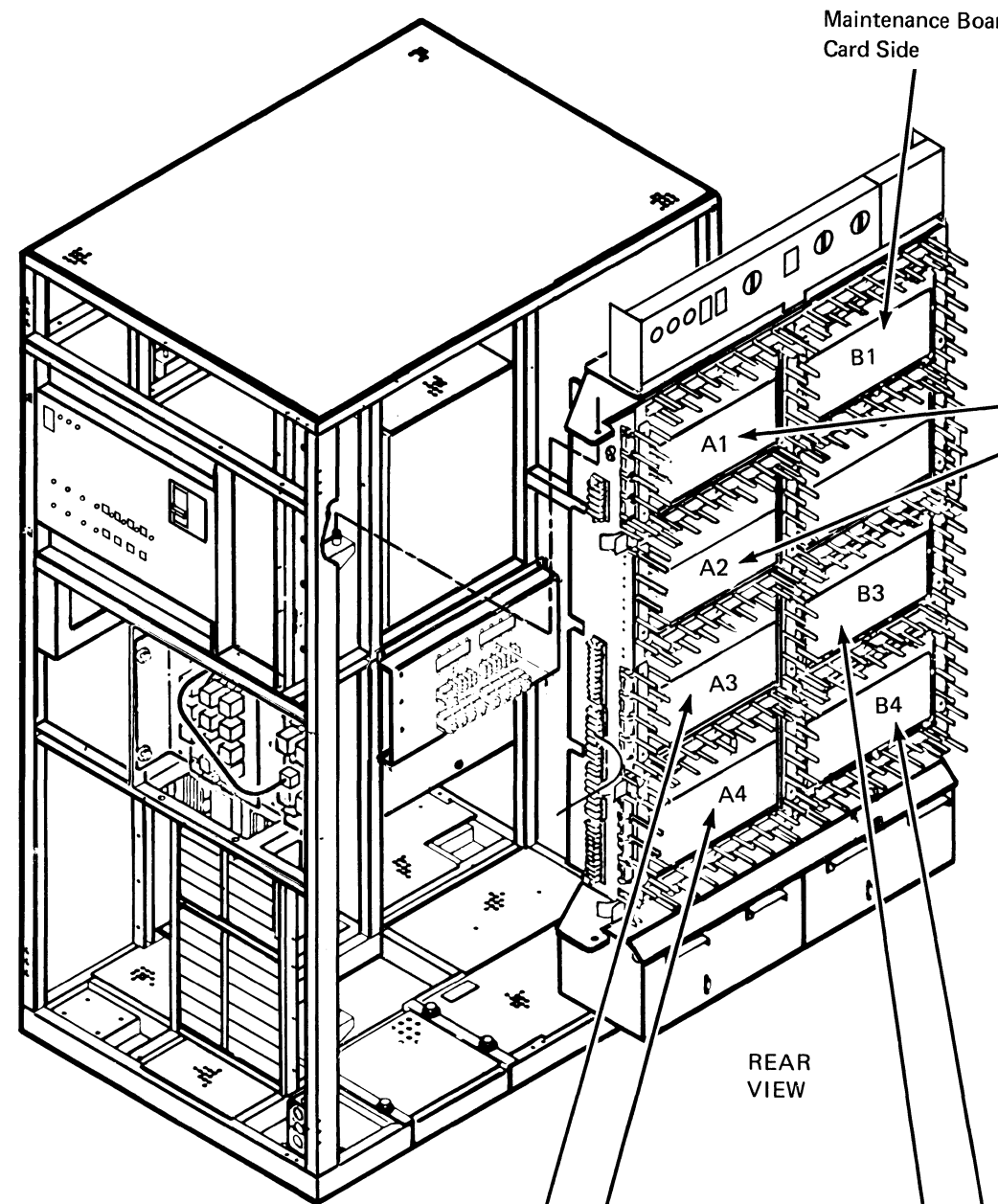
GATE BOARDS

The gate contains the following boards:

- A1, Four-Channel Switch for storage director 2
- A2, Four-Channel Switch for storage director 1
- A3, Two-Channel Pair Additional for storage director 2
- A4, Two-Channel Pair Additional for storage director 1
- B1, maintenance board
- B3, storage director 2
- B4, storage director 1

See the Maintenance Diagram Manual (MDM) for the correct board layout.

Storage Control



A1 Board is Four-Channel Additional (FCA) for Storage Director 2, Card Side
 A2 Board is Four-Channel Additional (FCA) for Storage Director 1, Card Side

A3 Board is Two-Channel Pair, Additional (TCA) for Storage Director 2, Card Side
 A4 Board is Two-Channel Pair, Additional (TCA) for Storage Director 1, Card Side

B3 Board is Storage Director 2, Card Side
 B4 Board is Storage Director 1, Card side

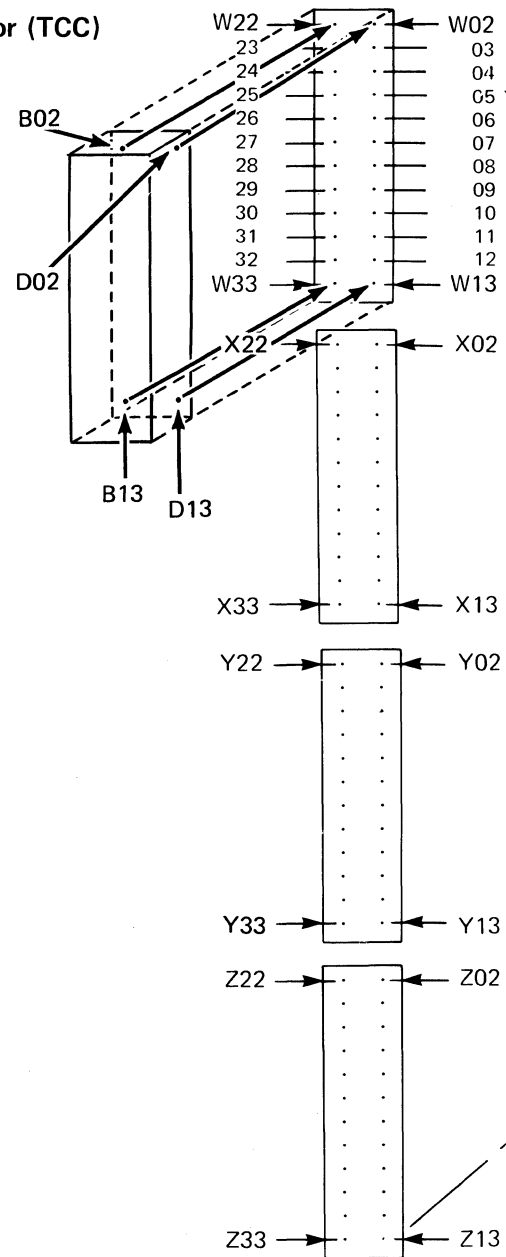
AQ0075	8498154	See EC	450907	450913		
Side 1 of 2	Part No.	History	10Dec80	12Jan83		

CIRCUIT CARD CONNECTOR ASSIGNMENTS

The figure shows the location for a top-card connector end and a board connector end on a circuit card and their ground pins. A circuit card may be one-wide, two-wide, or four-wide.

A top-card connector (TCC) cable connector is shown. The TCC cable connector also plugs into the TCC end of the card at the W, X, Y, or Z position. For example, if a TCC cable connector is plugged into the Y TCC end of the card, the D13 pin would connect with the Y13 pin.

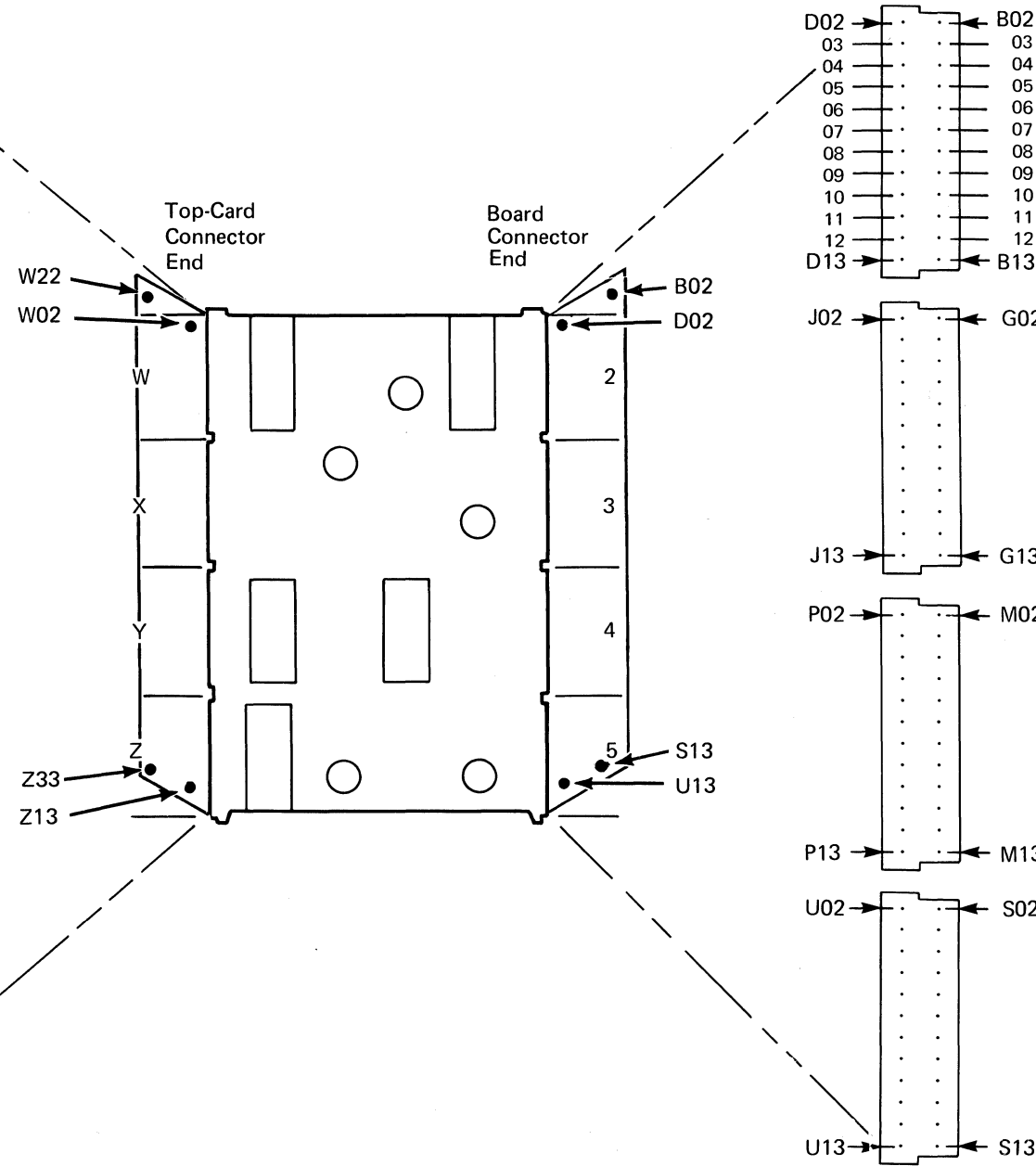
Top-Card Connector (TCC) Cable Connector



Ground Pins

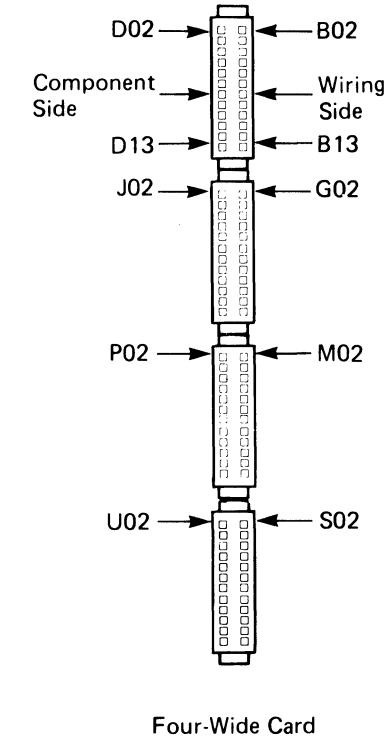
- W23 W04
- W27 W08
- W31 W12
- X23 X04
- X27 X08
- X31 X12
- Y23 Y04
- Y27 Y08
- Y31 Y12
- Z23 Z04
- Z27 Z08
- Z31 Z12

Circuit Card



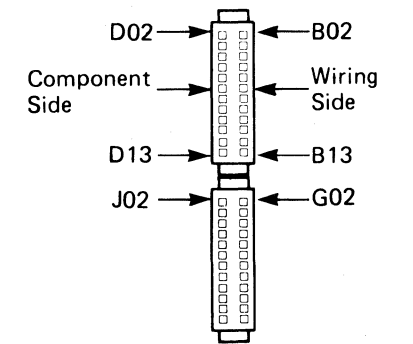
Card Contact Assignments

(Viewed from bottom of card)

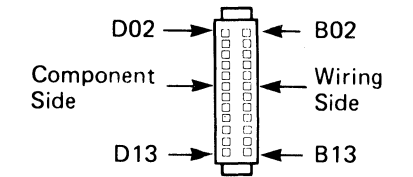


Ground Pins

- D08
- J08
- P08
- U08



Two-Wide Card



One-Wide Card

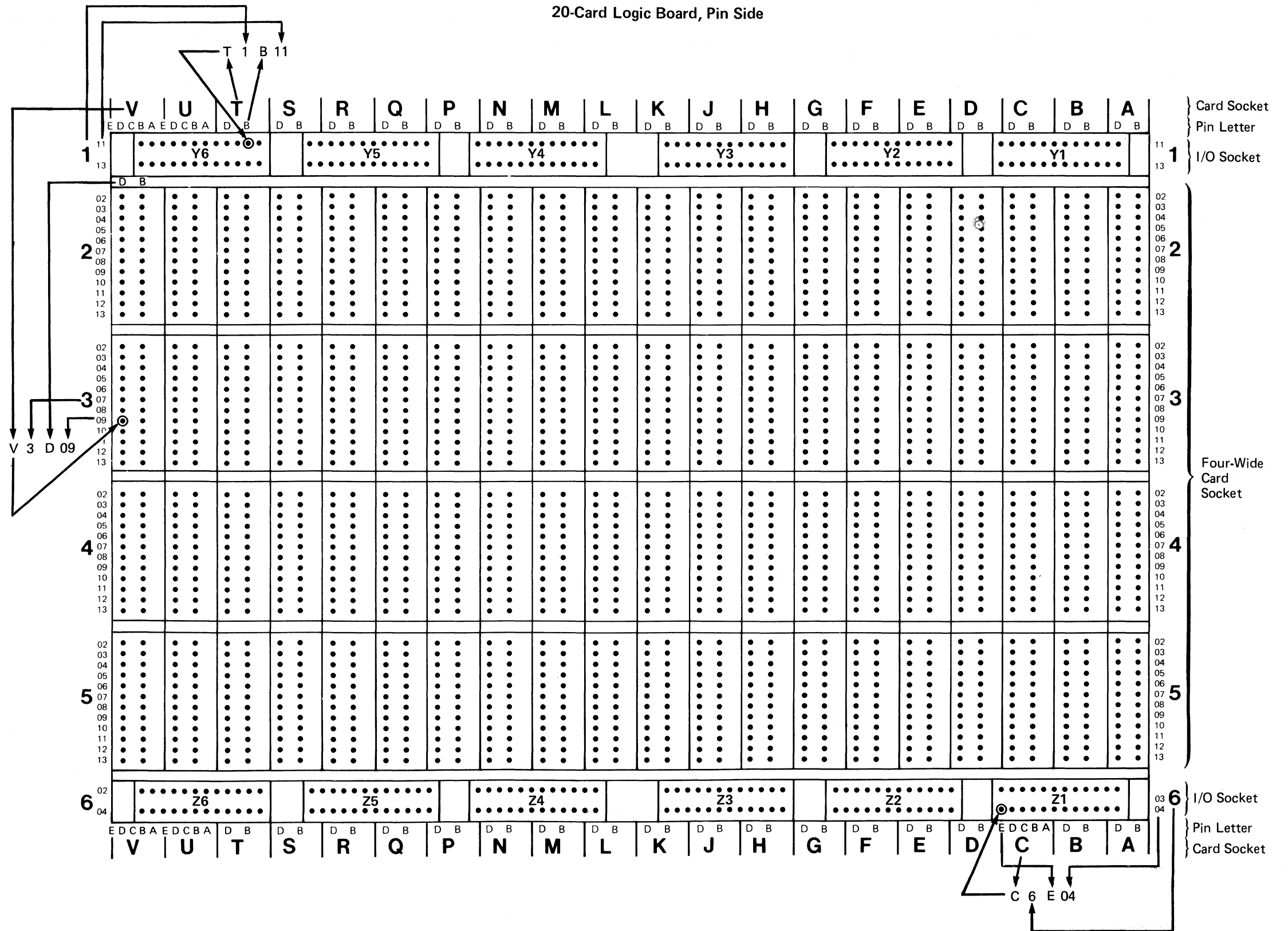
3880	AQ0075	8498154	See EC	450907	450913		
MIM	Side 2 of 2	Part No.	History	10Dec80	12Jan83		

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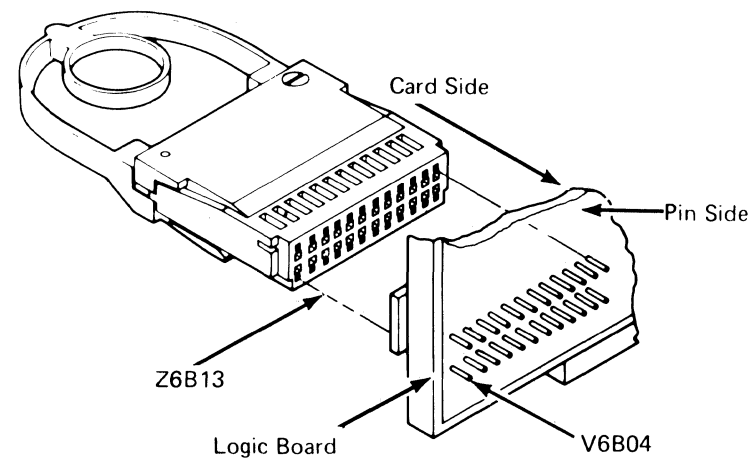
The figure shows examples of pins located on I/O sockets, rows 1 and 6, and on a four-wide card socket.

An example of a cable connector is also shown.

20-Card Logic Board, Pin Side



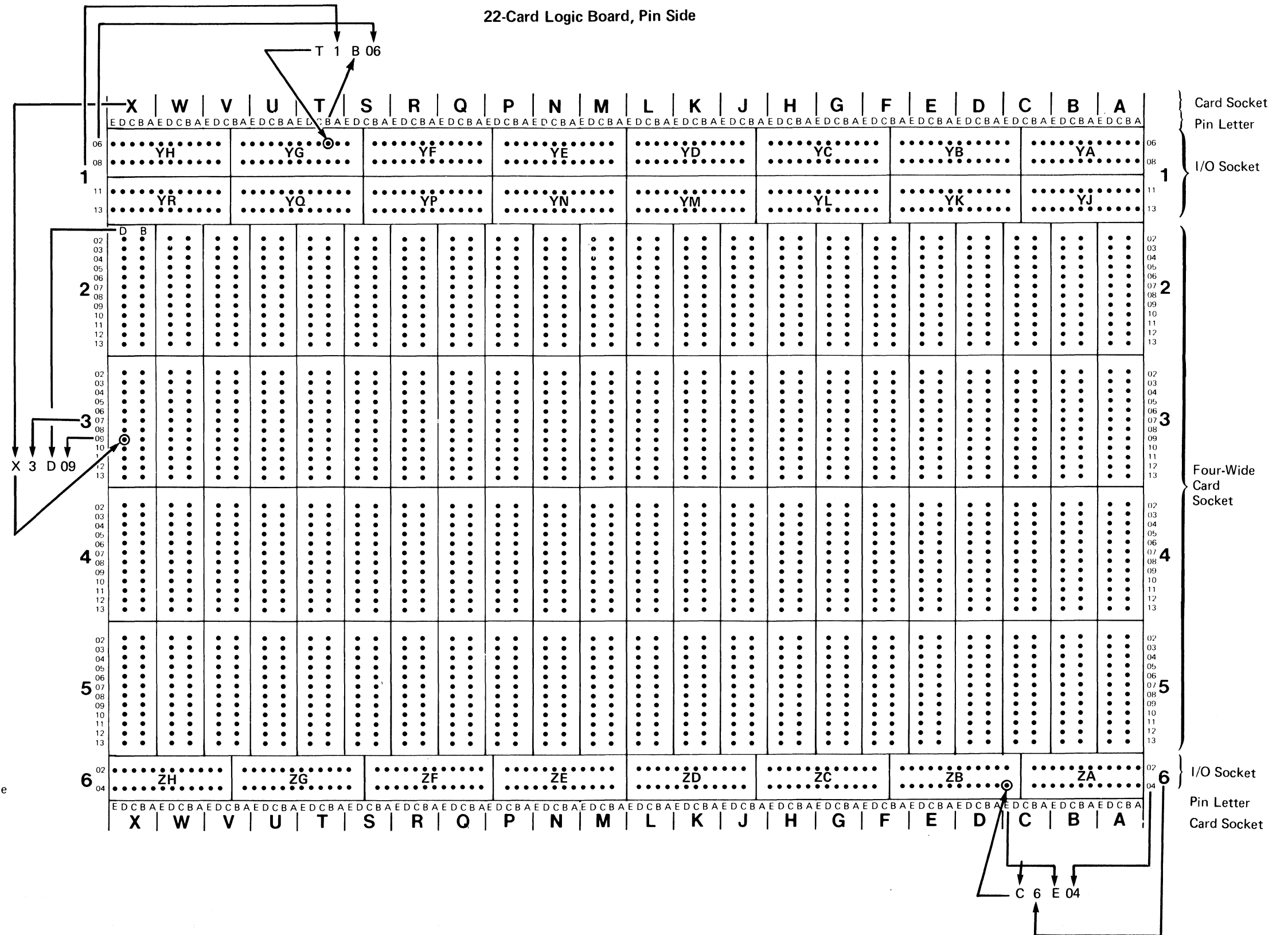
Cable Connector



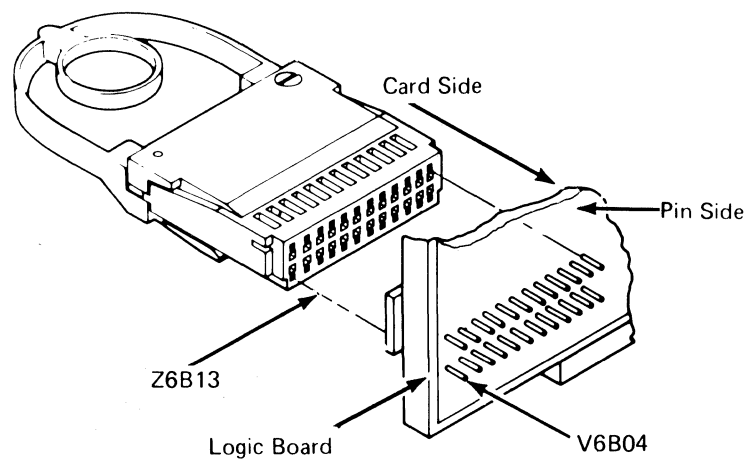
LOGIC BOARD PIN IDENTIFICATION

The figure shows examples of pins located on I/O sockets, rows 1 and 6, and on a four-wide card socket.

An example of a cable connector is also shown.



Cable Connector



3880 MIM	AQ0085 Side 1 of 2	8498155 Part No.	450900 13Jul79	450903 25Jan80	450905 18Apr80	450906 15Aug80	450908 15Apr81
---------------------------	------------------------------	----------------------------	--------------------------	--------------------------	--------------------------	--------------------------	--------------------------

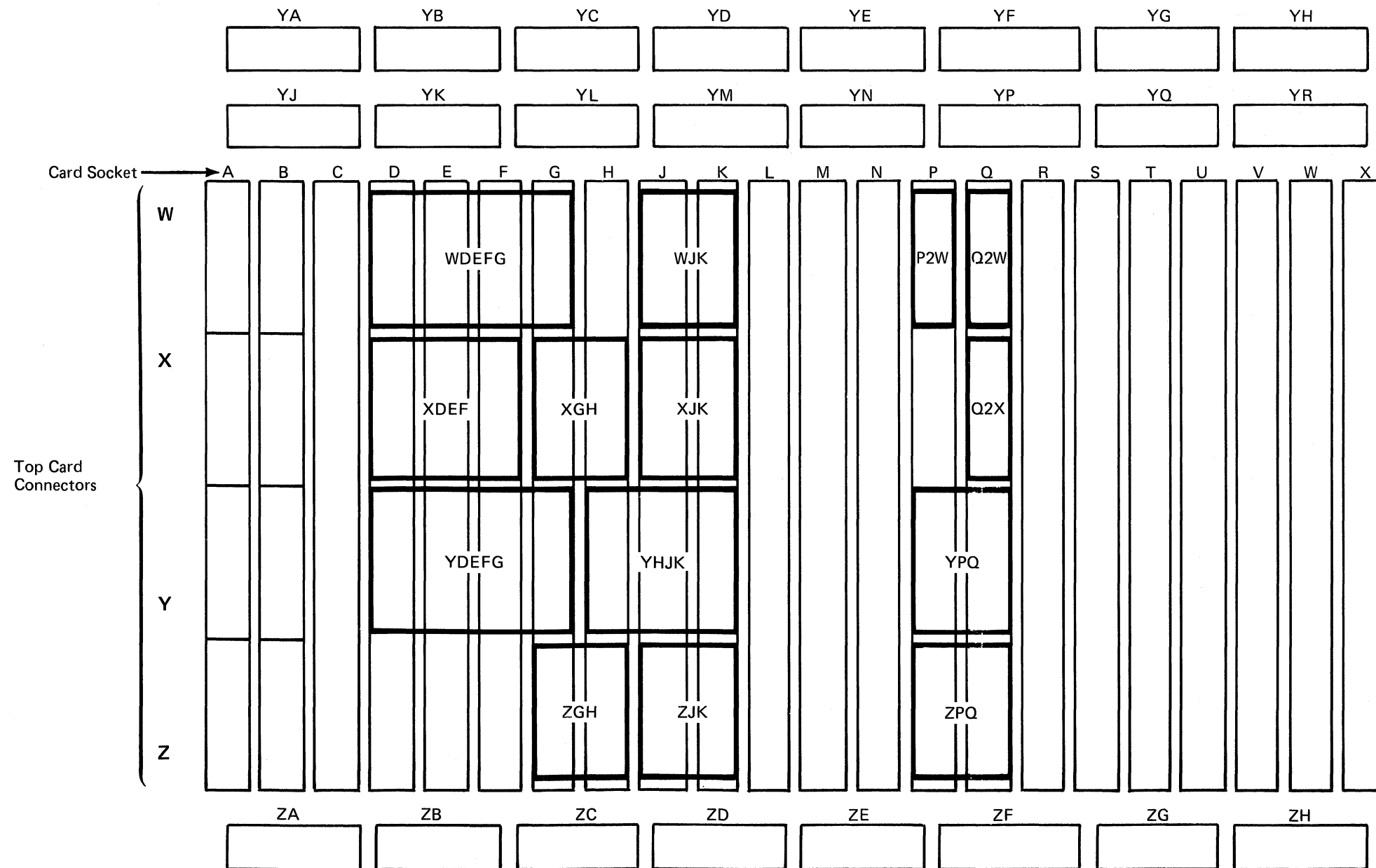
The Maintenance Device Manual (MDM) card-plug cable-list PLD, Vol. R30, contains a complete set of diagrams showing the boards and top-card connectors for the 3880.

A 22-card storage director board is used as an example. The crossovers can be recognized by the heavy outline and the crossover name inside the box.

The crossover name is a combination of the following:

1. Top-card connector identification W, X, Y, or Z
2. The card sockets on the gate board, A through X (A through V for 20-card boards)

CAUTION
When disconnecting or reconnecting top-card connectors, always pull or push the connector straight out or in to prevent breaking the logic card shroud.

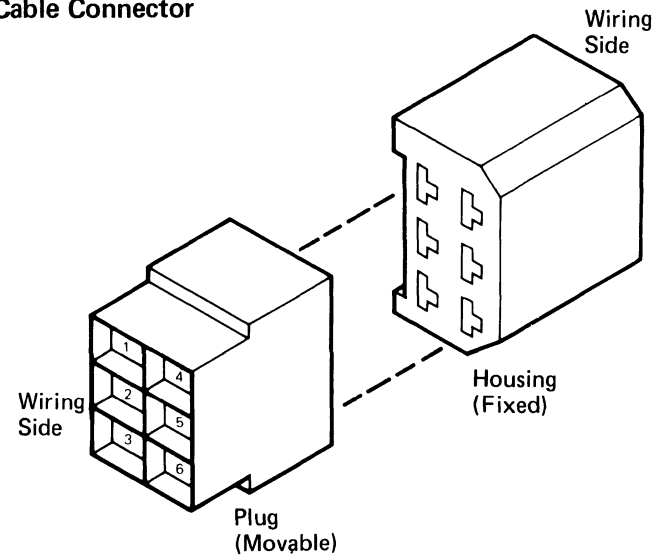


CONNECTORS, CONVENIENCE OUTLET, FRAME, AND GATE PARTS

The figure shows the following parts:

- A1 gate
- B1 board and B3 board thermal switches
- D1 through D8 device cable connectors
- GTB1, GTB3, and GTB4 gate terminal boards
- H1, H2, H5, and H6 host cable connectors
- Channel interface cable connectors
- Control interface cable connectors
- Convenience outlet
- Device, host, and remote cable connector
- Maintenance device (MD) connector
- Remote enable/disable switch cable connectors
- Safety interlock switch

Device, Host, and Remote Cable Connector

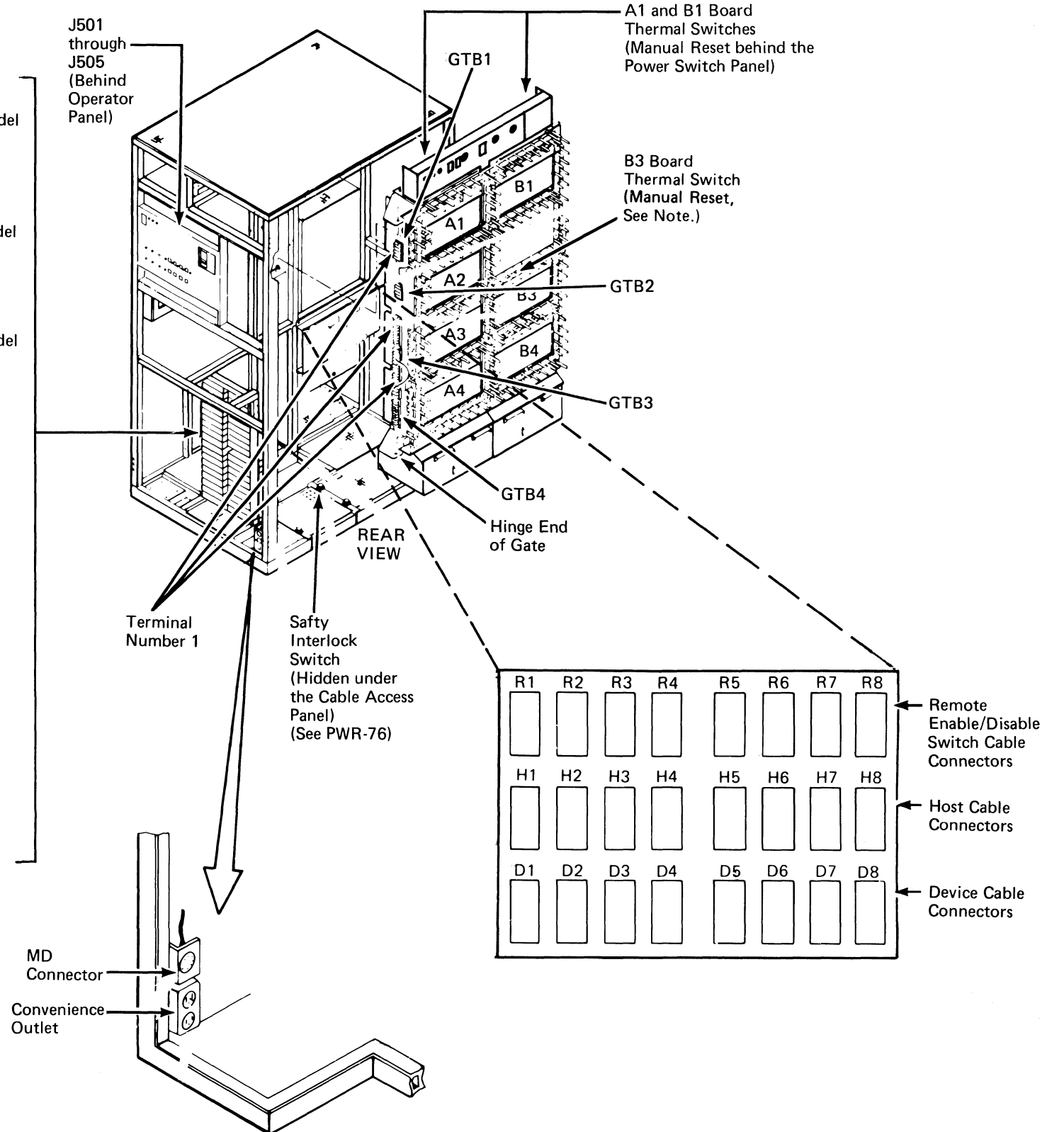


Channel Interface and Control Interface Cable Connectors

CTL-I SD1	BUS	BUS	CTL-I SD2	Model 1
	TAG	TAG		
CTL-I SD1	BUS	NOT USED	CTL-I SD2	Model 2
	TAG	BUS/TAG		
CTL-I SD1	NOT USED	NOT USED	CTL-I SD2	Model 3
	BUS/TAG	BUS/TAG		
CHANNEL A	BUS IN	BUS IN	CHANNEL E	
	TAG IN	TAG IN		
CHANNEL B	BUS OUT	BUS OUT	CHANNEL F	
	TAG OUT	TAG OUT		
CHANNEL C	BUS IN	BUS IN	CHANNEL G	
	TAG IN	TAG IN		
CHANNEL D	BUS OUT	BUS OUT	CHANNEL H	
	TAG OUT	TAG OUT		

Tailgate viewed from inside the machine.

Storage Control



Note: Remove B2 board cover from wiring side of gate. The thermal switch is located on top of the B3 board.

CONNECTORS, CONVENIENCE OUTLET, FRAME, AND GATE PARTS

The figure shows the following parts:

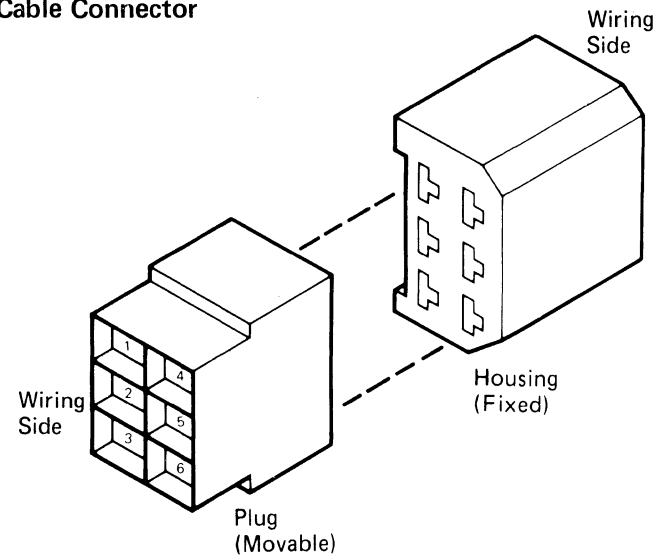
- A1 gate
- B1 board and B3 board thermal switches
- D1 through D8 device cable connectors
- GTB1, GTB3, and GTB4 gate terminal boards
- H1, H2, H5, and H6 host cable connectors
- Channel interface cable connectors
- Control interface cable connectors
- Convenience outlet
- Device, host, and remote cable connector
- Maintenance device (MD) connector
- Remote enable/disable switch cable connectors
- Safety interlock switch

Channel Interface and Control Interface Cable Connectors

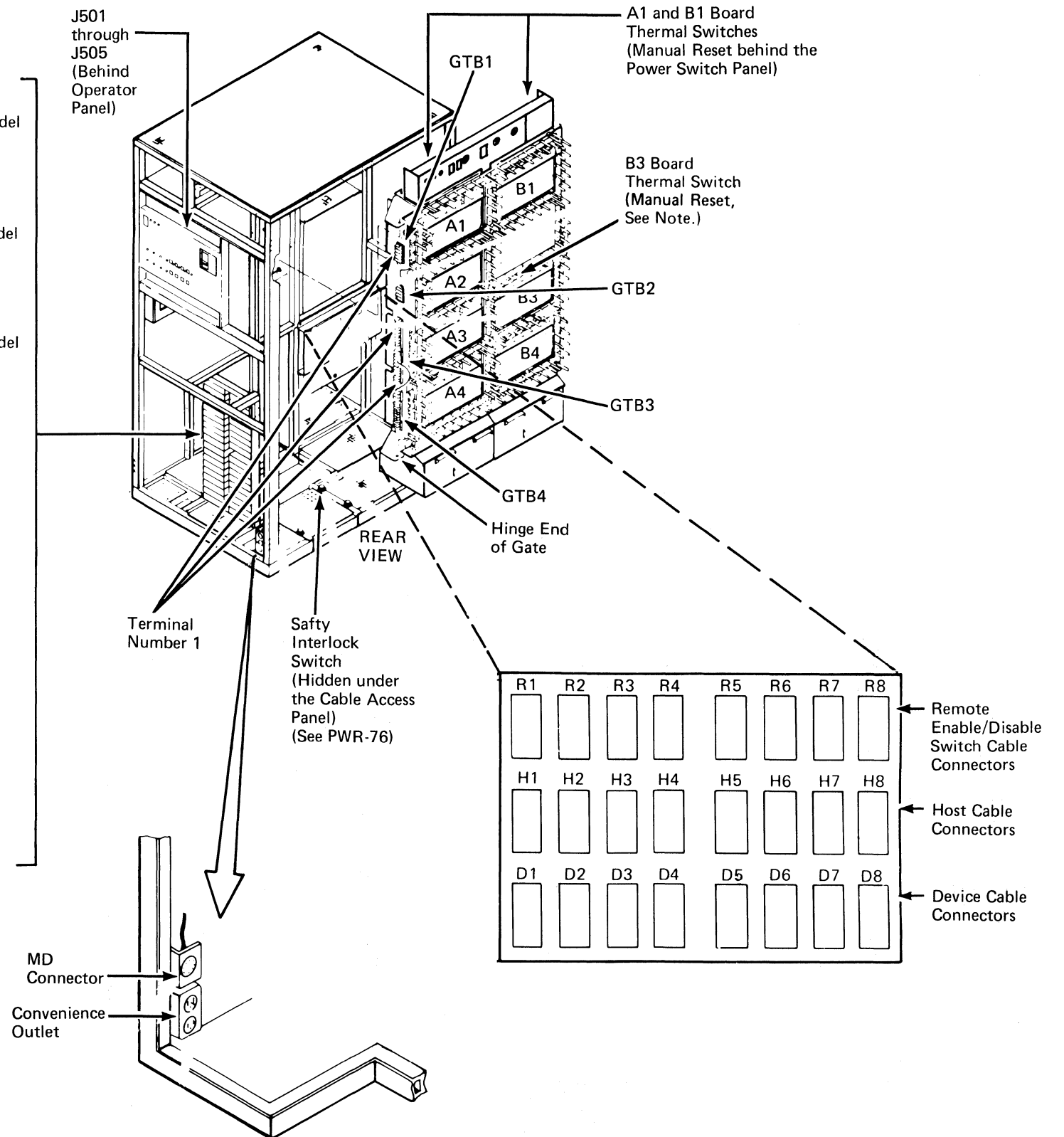
	Storage Director 1	Storage Director 2	
CTL-I SD1	BUS	BUS	CTL-I SD2
	TAG	TAG	
Model 1			
CTL-I SD1	BUS	NOT USED	CTL-I SD2
	TAG	BUS/TAG	
Model 2			
CTL-I SD1	NOT USED	NOT USED	CTL-I SD2
	BUS/TAG	BUS/TAG	
Model 3			
CHANNEL A	BUS IN	BUS IN	CHANNEL A
	TAG IN	TAG IN	
CHANNEL B	BUS IN	BUS IN	CHANNEL B
	TAG IN	TAG IN	
CHANNEL C	BUS IN	BUS IN	CHANNEL C
	TAG IN	TAG IN	
CHANNEL D	BUS IN	BUS IN	CHANNEL D
	TAG IN	TAG IN	

Tailgate viewed from inside the machine.

Device, Host, and Remote Cable Connector



Storage Control



Note: Remove B2 board cover from wiring side of gate. The thermal switch is located on top of the B3 board.

3880	AQ0095	8498156	See EC	450906	450907	450908	
MIM	Side 1 of 2	Part No.	History	15Aug80	10Dec80	15Apr81	

CHANNEL INTERFACE AND CONTROL INTERFACE CABLE CONNECTORS DESCRIPTION

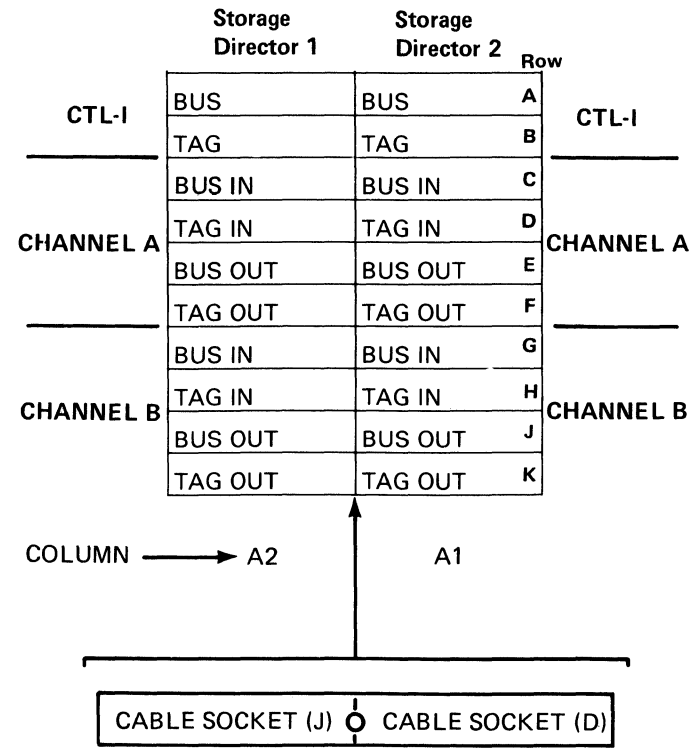
The figure shows how to locate a cable connector for the channel and control interfaces using the following identifiers:

- Frame
- Tailgate
- Column
- Row
- Socket

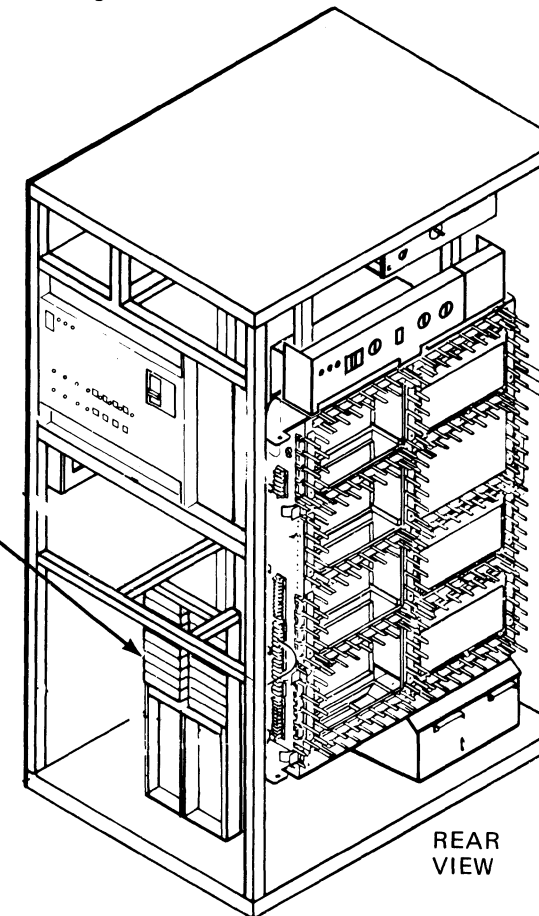
See the example **1** to locate 01T-A1KD.

Note: This example is for a 3880 Model 1. The procedure for identifying a cable location in the 3880 Model 2 and Model 3 machines is identical.

Channel Interface and Control Interface Cable Connectors



Storage Control



1 Example:

FRAME	TAILGATE	COLUMN	ROW	SOCKET
01	T	A1	K	D

View from outside the machine.

TAILGATE CABLE CONNECTOR PIN IDENTIFICATION

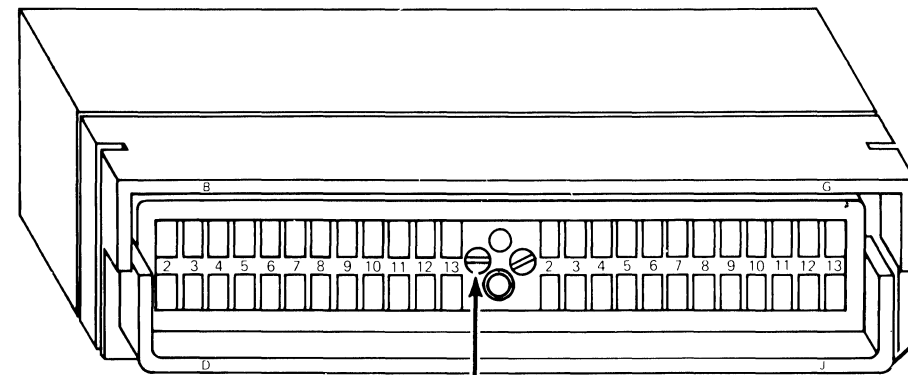
TAILGATE CABLE CONNECTORS

The figure shows pin identification for the following:

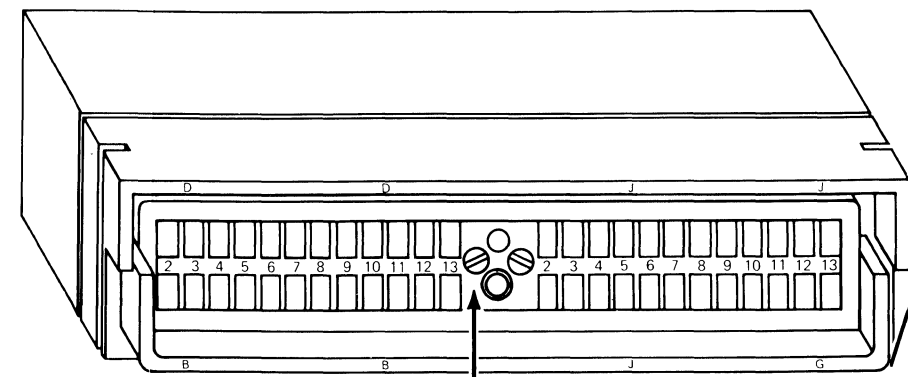
- Light gray serpent connector block
- Dark gray serpent connector block
- Control unit cable connectors

The letters and numbers used for pin identification are molded on the connectors.

Serpent Connector Blocks

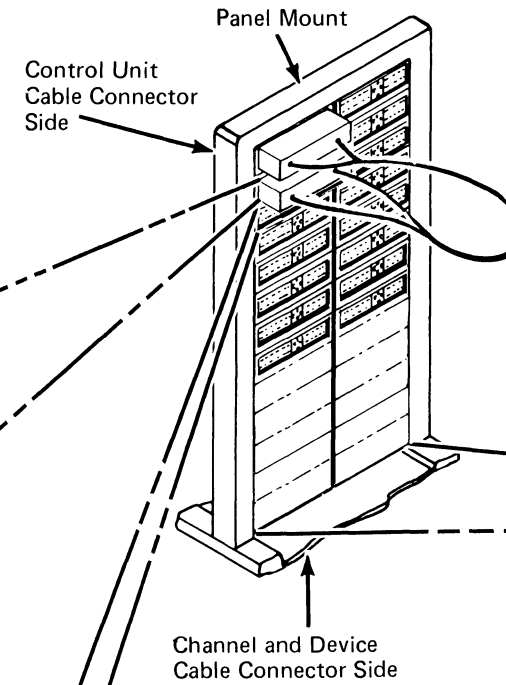


Light Gray Serpent Connector Block

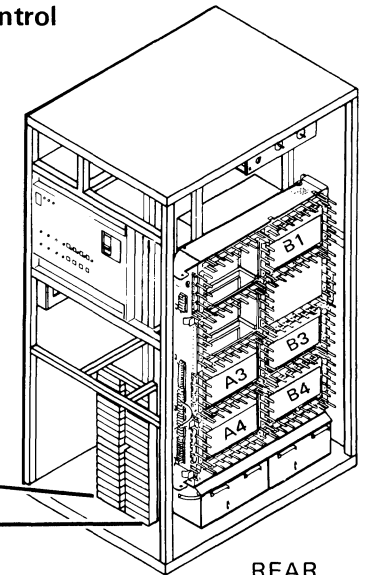


Dark Gray Serpent Connector Block

Viewed From Inside the Machine

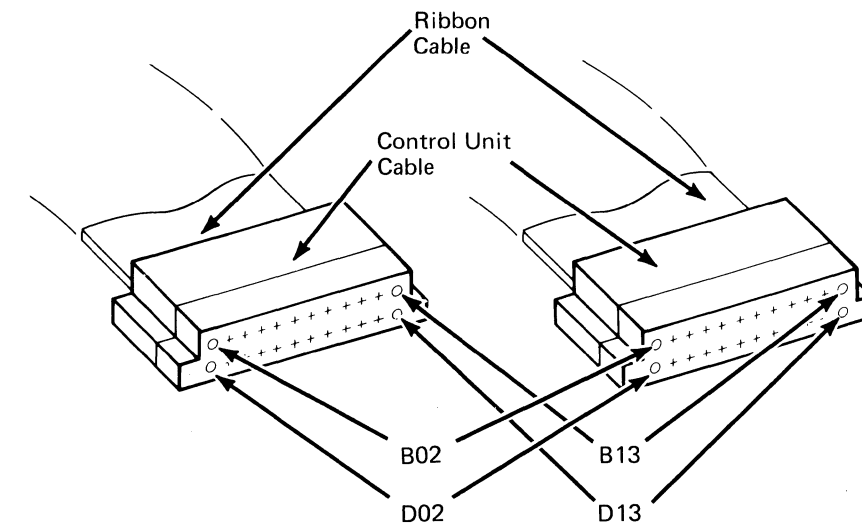


Storage Control



REAR VIEW

Control Unit Cable Connectors



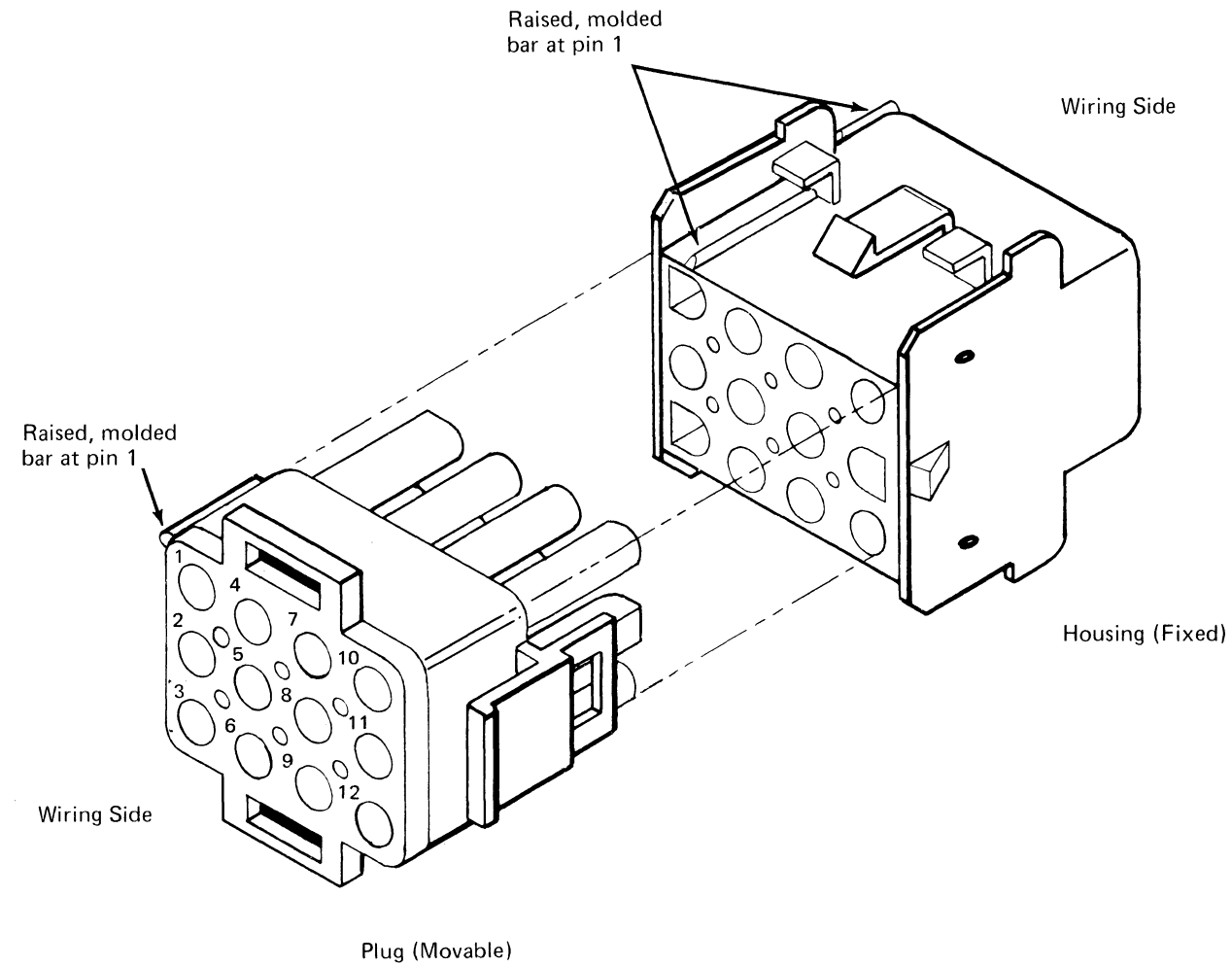
Viewed From Outside the Machine

3880 MIM	AQ0101	8498453	450901	450905	450907		
	Side 1 of 1	Part No.	14Sep79	18Apr80	10Dec80	.	.

J-CONNECTOR DESCRIPTION

The figure shows the parts of a J connector. Pin numbers are molded on the wiring sides of the plug and housing. Pin numbers read from top to bottom, left to right.

The raised, molded bar at the number 1 pin on the plug and housing is the key to find any pin number required.



AQ0105	8498157	450900	450905	.	.	.
Side 1 of 1	Part No.	13Jul79	18Apr80	.	.	.

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REFERENCES TO OTHER SECTIONS

See the LOC section for information on regulators and regulator cards, bulk power supply assembly, three-phase bulk supply, maintenance power supply, and primary power supply.

ABBREVIATIONS IN THIS SECTION

AUX	auxiliary
CB	circuit breaker
CMD	command
CP	circuit protector
CPC	central power control
CR	rectifier
DCSR	dynamic control storage and refresh
FCAS	FCA sense card
FRU	field-replaceable unit
FWB	flat wire board
LED	light-emitting diode
MOT	motor
N/C	normally closed
N/O	normally open
OI	overcurrent
OP	operator
OV	overvoltage
PCC	PSM control card
POR	power on reset
PS	power supply
PSC	PSM sense card
PSM	power sequencer and monitor
R	resistor
S	switch
SD1	storage director 1
SD2	storage director 2
TB	terminal block
TTL	transistor-to-transistor logic
UE	unit emergency
UV	undervoltage
V	volt
YA	ALD power wiring reference page

The 3880 power circuits and components are divided into three major groups:

- Primary Power
- Logic Power (PS1)
- Maintenance Power

PRIMARY POWER

Input voltage for the 3880 power control system is 200/208/220/240 Vac at 60 Hz or 200/220/380/400/415 Vac at 50 Hz. Output from the primary power box is +24 Vdc control voltage, which is supplied to the power controls.

AC input voltage is distributed through the primary power box to the diskette drive, gate blowers, maintenance power supply, and logic power supplies.

LOGIC POWER

The logic power supply includes:

- Three-phase bulk supply
- DC bulk supply
- Regulators and cards

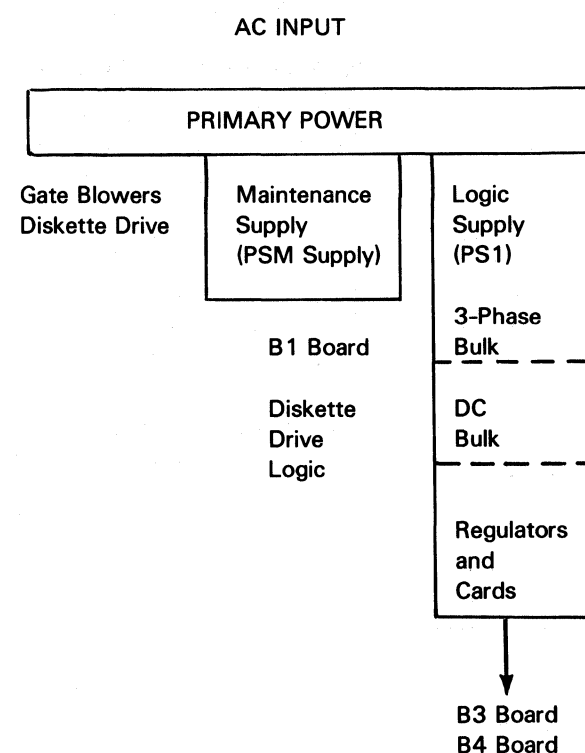
The logic power supply (PS1) distributes power to logic boards B3 (SD2) and B4 (SD1).

Power to each of the two storage directors can be individually controlled by switches on the power switch panel.

The logic power supply output voltages are: +5 Vdc, -1.5 Vdc, +3 Vdc, -5 Vdc, +6 Vdc, +7.25 Vdc, and +8.5 Vdc or +12 Vdc. The +3 Vdc and +7.25 Vdc are not used if the +7.25 Vdc regulator card is removed (see LOC-25).

MAINTENANCE POWER

The maintenance power supply (PSM) is used to power the maintenance board (B1) and the diskette drive logic. The maintenance power supply outputs are: +5 Vdc, +24 Vdc, and -5 Vdc.



POWER OFF PROCEDURE TO REMOVE OR REPLACE LOGIC CARDS

CAUTION
The Power On indicator (operator panel) must be off.

B1 Board (Maintenance Board)

CAUTION
This action removes power from both storage directors. Ensure that both storage directors can be taken offline.

1. Press the Device Power Sequencing switch (power switch panel) to the Disable position.
2. Turn the Power Select switch (power switch panel) to the Local position.
3. Press the Subsystem Power switch (operator panel) to the Off position.
4. Press the Device Power Sequencing switch to the Enable position.

A1, A2, A3, A4, B3, B4 Boards (Storage Directors 1 and 2)

CAUTION
To prevent damage to the power supply, always use the DC Power System switch (power switch panel) to remove dc power from both storage directors.

1. Turn the Power Select switch (power switch panel) to the Local position.
2. Press the DC Power System switch (power switch panel) to the Off position.

A1, A3, B3 Board (Storage Director 2 Only)

Turn the Storage Director Power SD2 switch (power switch panel) to the Off position.

A2, A4, B4 Board (Storage Director 1 Only)

Turn the Storage Director Power SD1 switch (power switch panel) to the Off position.

RESETTING THE SUBSYSTEM POWER CHECK INDICATOR (OPERATOR PANEL)

1. Press the Device Power Sequencing switch (power switch panel) to the Disable position.
2. Press the Subsystem Power switch (operator panel) to the Off position.
3. Reset any tripped circuit breakers or circuit protectors.
4. Turn the Power Select switch (power switch panel) to the Local position.
5. Press the DC Power System switch (power switch panel) to the On position.
6. Press the Device Power Sequencing switch to the Enable position.

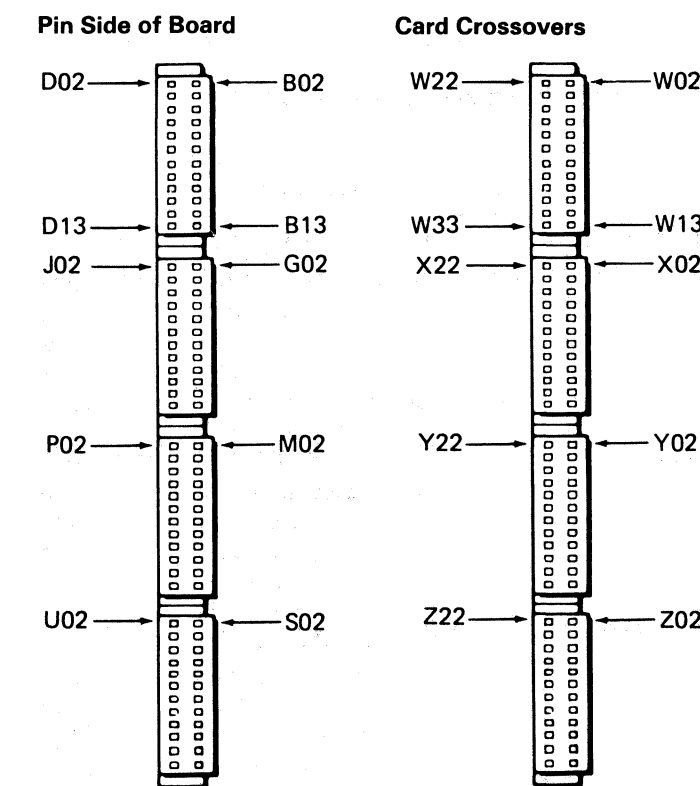
SCOPING INFORMATION

Use an oscilloscope (X 10 probe) to measure the DIF/VTL levels. Do not use a volt-ohmmeter.

Use the INDEX and OPER sections in the Maintenance Support Manual (MSM) to assist in locating high-level circuit diagrams and descriptions of machine functions.

Use the LGND section in the Maintenance Information Manual (MIM) for a description of the symbology used in the MIM circuit diagrams. Use the GLOS section in the MIM for a definition of technical terms and for explanations of abbreviations.

CARD CONTACT ASSIGNMENT



3880 MIM	AS0001 Side 2 of 2	8498393 Part No.	See EC History	450913 12Jan83	450915 14Oct83	450916 07Dec84	.
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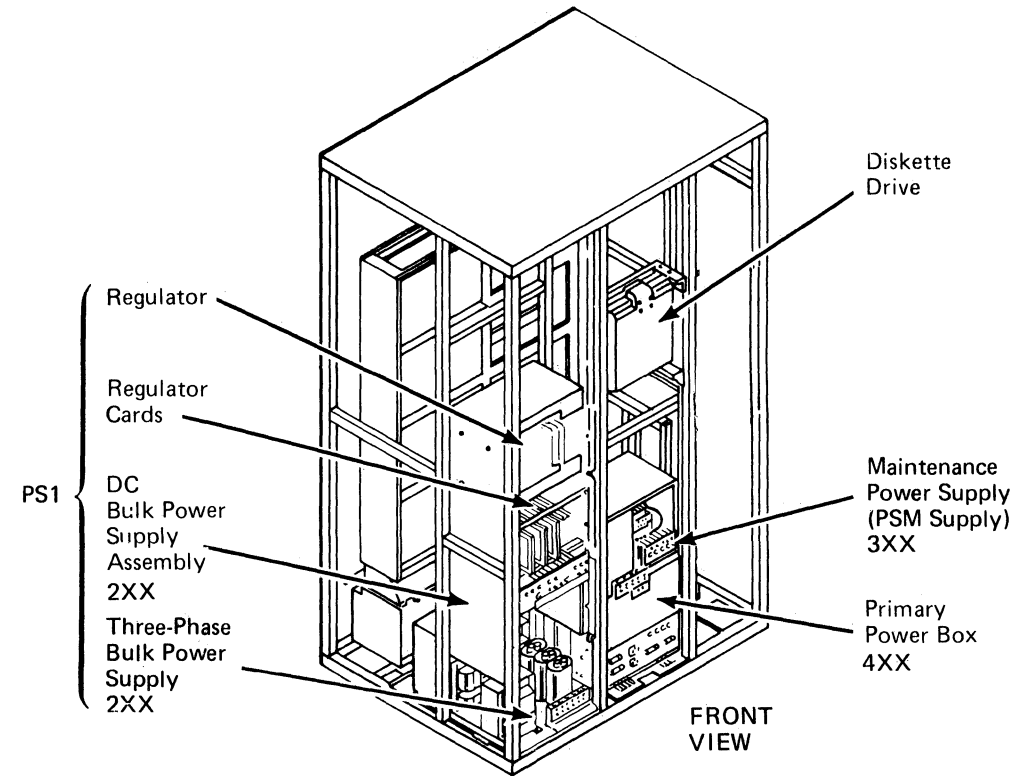
INTRODUCTION

Part Numbering System

The following part numbering system shows specific storage control power areas:

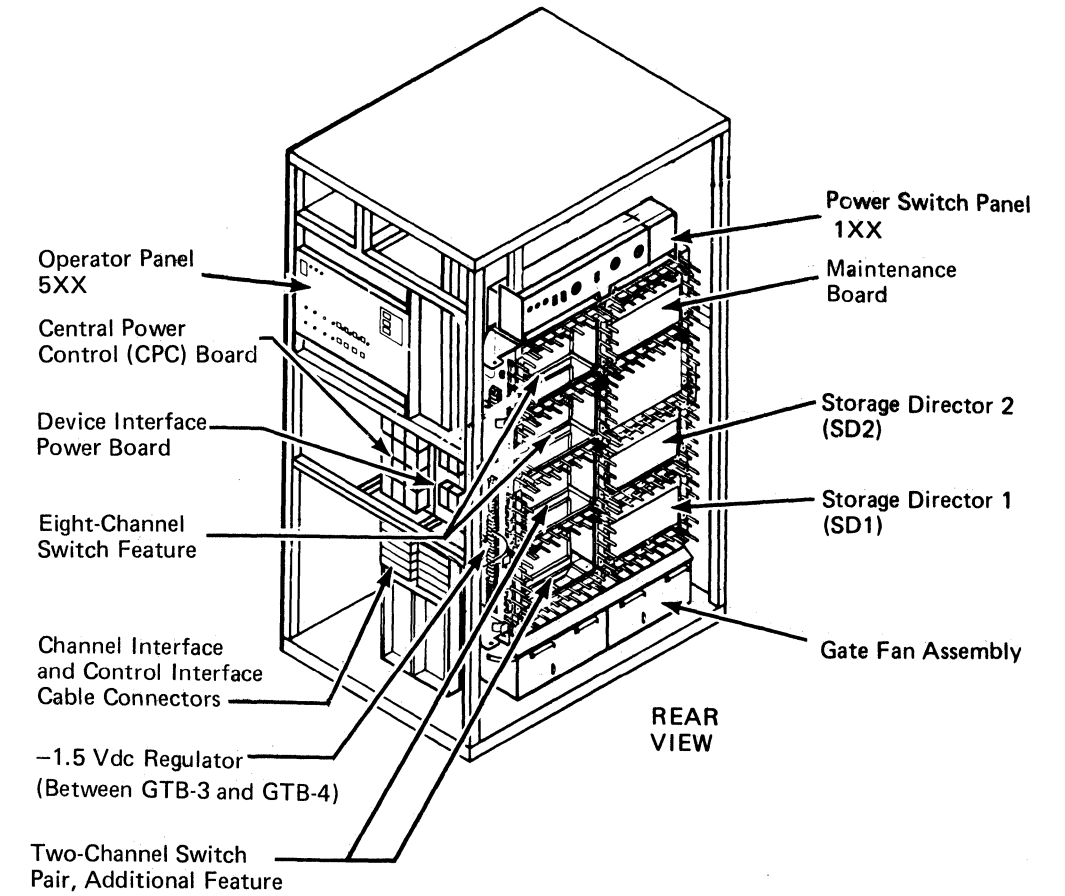
- 1XX Power switch panel
- 2XX Bulk power supplies
- 3XX Maintenance power supply
- 4XX Primary power box
- 5XX Operator panel
- 7XX Central power control (CPC) board
- 8XX Device interface board

Storage Control



Note: This figure is for reference only. See the LOC section for detailed locations.

Storage Control



AS0018	8498394	See EC	450908	450913	450915	
Side 1 of 2	Part No.	History	15Apr81	12Jan83	14Oct83	.

CIRCUIT OBJECTIVE

See PWR-23 and PWR-24 for the power-on sequence. The power control circuits control voltage sequencing and distribution to the 3880.

CIRCUIT THEORY

Primary Power Control

Overall power to the complete machine is controlled by the service disconnect, CB401 1.

DANGER

Circuit breaker CB401 must be turned off whenever maintenance is performed on the primary power circuits or hardware.

Circuit protector CP402 2 protects the primary winding of bootstrap transformer T401, which supplies power for the convenience outlet 9 (60 Hz and 50 Hz for Japan) and the 24 Vdc bootstrap power supply 6. Convenience outlet power in a 50 Hz (except for Japan) 3880 is supplied between a phase wire and a neutral wire from a wye power source and between two phase wires from a delta power source.

The 24 Vdc bootstrap power supply is on unless circuit protectors CP401, CP402, or circuit breaker CB401 are tripped. The 24 Vdc power is used to start and maintain power to the remaining 3880 circuits.

The Power Sequence Complete indicator on the operator panel turns on after all devices attached to the 3880 are on.

The 3880 is powered on by one of the following actions:

- In remote mode (while the Local/Remote switch 14 and 15 is in the Remote position), power can be turned on from either the host system or the 3880 operator panel.
- In local mode under CE control (while the Local/Remote switch is in the Local position), the 3880 can be powered on only from the power switch panel located under the covers and above the logic gate.

Power is turned off at the operator panel regardless of the Power Select switch position (remote or local).

Unit Emergency

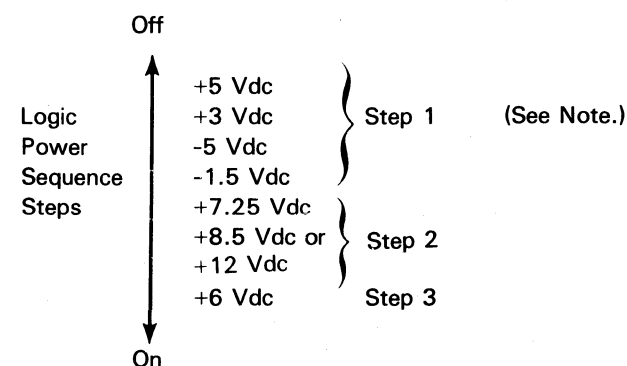
The Unit Emergency switch 10 and 13 located on the operator panel, is used to power off the 3880 in case of an emergency. When the Unit Emergency (UE) switch is set to the Enable position, relay K404 17 is energized, providing power to the outlet 9. This safety switch removes power from any device connected to the convenience outlet and the majority of 3880 circuits.

Primary Power Indicators

The Power On indicator 18 on the operator panel comes on whenever power on is started from any source. Primary power control makes ac power available to the remaining 3880 circuits by picking relay K401 (AC On) 19, which is indicated by the Power-On indicator on the operator panel. Activating K401 also activates the maintenance power supply 7 shown by the Maintenance or PSM indicator 8 on the power switch panel. The maintenance power supply is the only supply with an indicator, and it provides logic voltage for the power sequencer and monitor control and sense circuits and the diskette drive. Loss of any other voltage is sensed by the power sequencer and monitor circuits and indicated by turning the Power Check indicator 20 on.

Power Sequencer And Monitor

When maintenance power is on, the power sequencer and monitor control card 16 turns on the logic power supply (PS1) 3 by picking relay K402 11. Power is turned on in three logic-power sequence steps.



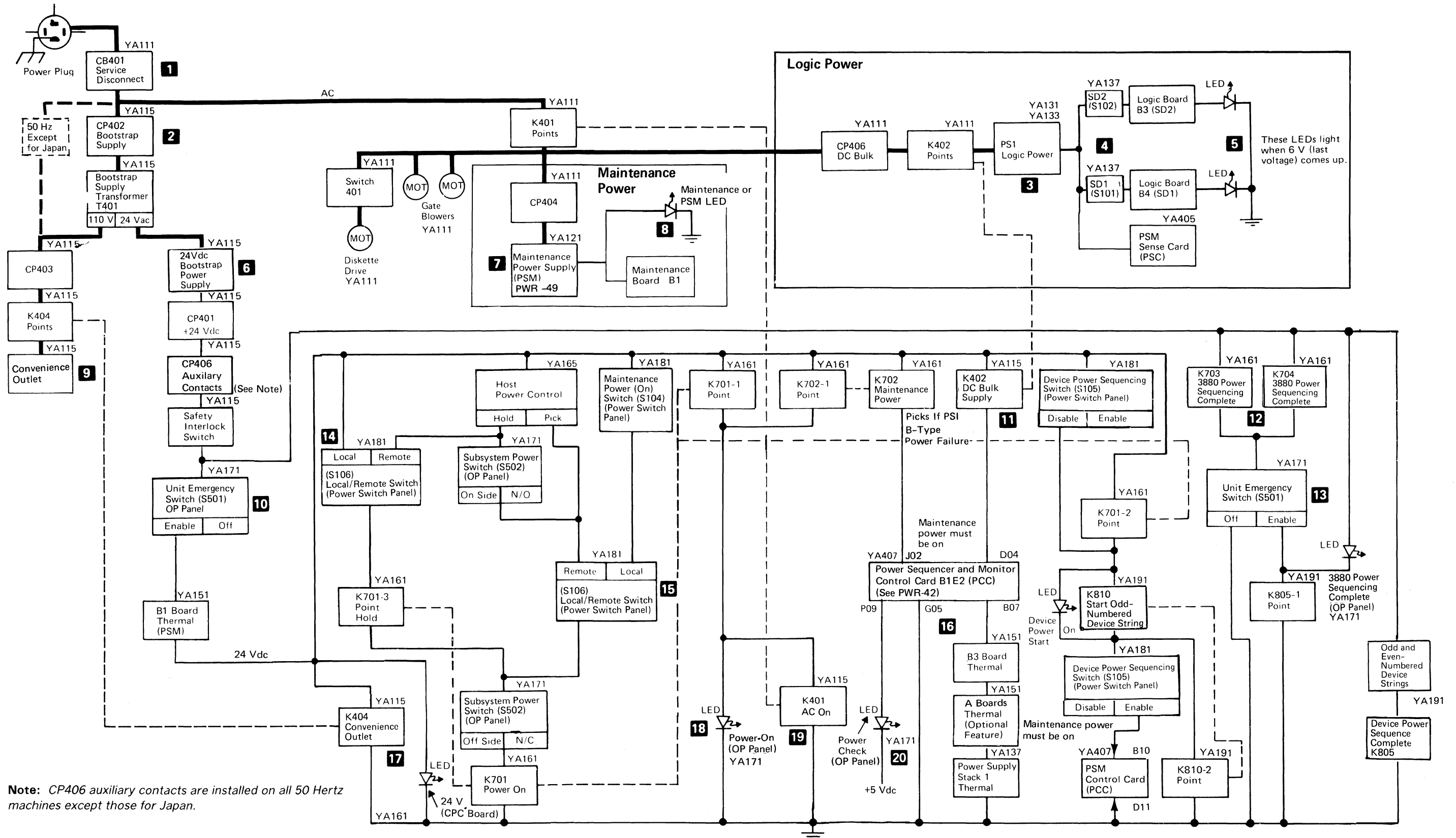
Each step is checked, and if correct, the next logic power sequence step is performed. When the 6 Vdc power is on, the storage director power indicators 5 located on the power switch panel are on.

Switches 101 and 102 4, which are the Storage Director 1 and 2 switches on the power switch panel, are used to remove dc power from one storage director without affecting the other storage director. If both switches 101 and 102 are turned off, the power sequencer and monitor senses the condition and powers off PS1 3. When one of these switches is used to remove power from the storage director, the power sequencer and monitor senses the switch, issues a power on reset (POR) to the appropriate board, and inhibits the power failure sensors with a service mask signal to prevent false error conditions. See PWR-39 for additional information about the power sequencer and monitor functions.

Any failure occurring in the primary power function can be isolated to a small area of the 3880 by observing the LED indicators.

Note: When the +7.25 Vdc regulator is removed (see LOC-25), the +3 Vdc and +7.25 Vdc voltages are not used.

3880 MIM	AS0018 Side 2 of 2	8498394 Part No.	See EC History	450908 15Apr81	450913 12Jan83	450915 14Oct83	.
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Note: CP406 auxiliary contacts are installed on all 50 Hertz machines except those for Japan.

3880 MIM	AS0023 Side 1 of 1	8498395 Part No.	See EC History	450907 10Dec80	450908 15Apr81	450913 12Jan83	450914 10Jun83
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POWER-ON SEQUENCE


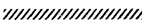
Legend:  The bar indicates the active condition of the signal, not its level.
 The shaded area indicates variable timing.

Chart Line No.	Signal Name	Logic Page Number	
1	+24 Vdc Control Voltage	YA115	Without this voltage, nothing below this line can take place.
2	24 V Indicator on CPC Panel	YA161	1
3	Unit Emergency Switch	YA171	
4	Pick Relay K404	YA115	1, 2
5	Power To Convenience Outlet	YA115	4
6	Power On Request (See Note)	YA171	Local or Remote
7	Pick Relay K701	YA161	6
8	Pick Relay K401	YA115	7
9	Power On Indicator	YA171	7
10	Maintenance Power On	YA121	8 +5 Vdc, 24 Vdc Maintenance Power LED On
11	Pick Relay K402 (Logic Power)	YA111	10
12	±5 Vdc, +3 Vdc*, -1.5 Vdc	YA133	11
13	+8.5 Vdc, or +12 Vdc, +7.25 Vdc*	YA105	12
14	+6 Vdc	YA105	13
15	Storage Director Power LED	See PWR-27	14

* When the +7.25 Vdc regulator is removed (see LOC-25), the +3 Vdc and +7.25 Vdc voltages are not used.

Note: If in remote mode, a power-on request can come from the system or operator panel switches. If in local mode, a power-on request can come only from the power switch panel.

POWER SWITCH PANEL

The power switch panel has the following controls and indicators:

- Power Select switches
- Device Power Sequencing switch
- Power On Status indicators
- Storage Director Power switches

POWER SELECT SWITCHES

The Power Select switches control the following:

- DC Power System
- Maintenance Power
- Local/Remote power switching

Local/Remote Switch (S106)

In the Remote position, the 3880 power-on sequence is controlled by either the system or the Subsystem Power On/Off switch on the 3880 operator panel. In the Local position, the 3880 power is turned on by the Maintenance Power switch on the power switch panel and is turned off by the Subsystem Power On/Off switch on the operator panel. The Local position prevents the system power-on sequence and the Subsystem Power On/Off switch (on the operator panel) from turning on 3880 power during maintenance.

DC Power System Switch

The DC Power System switch (S103), with the Power Select switch in the Local position, controls dc power to all boards (except the B1 board). This switch should be used when it is necessary to remove dc power from both storage directors at the same time. DC power to all boards (except B1) is turned off by pressing this switch to the Off (down) position. Power is turned on again by pressing this switch to the On (up) position.

The DC Power System switch also resets the power-check register. Pressing this switch to the On position resets the power-check register and the Subsystem Power Check indicator on the operator panel. Any time that 3880 power cannot be turned off, use the DC Power System switch to reset the power-check register and then turn power on or off as needed.

Maintenance Power Switch

The Maintenance Power switch (S104) turns power on to the 3880 and lights the Power On indicator on the operator panel. This switch is enabled by turning the Power Select switch to the Local position.

DEVICE POWER SEQUENCING SWITCH

The Device Power Sequencing switch (S105) controls power-on sequencing to the devices attached to the 3880. In the Enable position, devices attached to the 3880 storage directors are turned on and off by the system power on/off sequence.

In the Disable position, the present power status of the devices attached to the 3880 is maintained. If the devices are on, the system cannot turn them off; if the devices are off, the system cannot turn them on.

POWER ON STATUS INDICATORS

The Power On Status indicators give a visual indication of 3880 power.

SD1 Indicator

Power On Status indicator SD1 (storage director 1) lights when all voltages are present on storage director 1.

SD2 Indicator

Power On Status indicator SD2 (storage director 2) lights when all voltages are present on storage director 2.

Maintenance (PSM) Indicator

The Maintenance (PSM) indicator lights when +5 volt power to the maintenance board (B1) is on. The +5 voltage is needed to generate the power symptom codes.

STORAGE DIRECTOR POWER SWITCHES

The power sequencer and monitor senses the position of both storage director switches and turns power supply 1 off if both switches are off. However, the power supply can be damaged if both Storage Director Power switches SD1 and SD2 are in the Off position and there is a failure in the power sequencer and monitor.

Storage Director 1 Switch

CAUTION

To prevent damage to the power supply, always use the DC Power System switch to remove dc power from both storage directors.

The Storage Director Power SD1 switch (S101) controls dc power to storage director 1. In the Normal position, dc power is sequenced on and off by the power sequencer and monitor. In the Off position, dc power is turned off only to storage director 1.

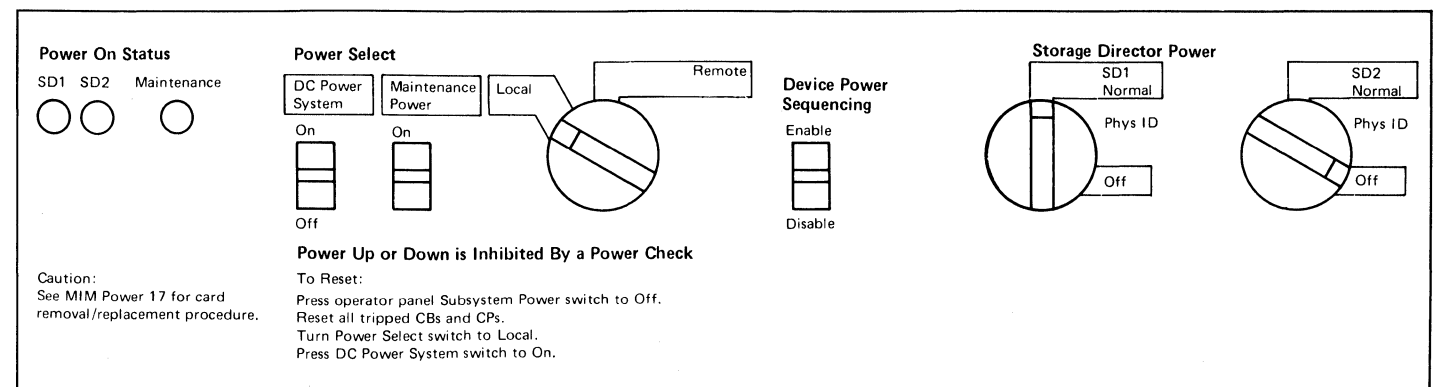
Storage Director 2 Switch

CAUTION

To prevent damage to the power supply, always use the DC Power System switch to remove dc power from both storage directors.

The Storage Director Power SD2 switch (S102) controls dc power to storage director 2. In the Normal position, dc power is sequenced on and off by the power sequencer and monitor. In the Off position, dc power is turned off only to storage director 2.

Power Switch Panel



Note: The power On Status Maintenance indicator is the same as the PSM indicator on old style panel. The circuits for these switches are located on logic page YA181 or YA137.

3880 MIM	AS0026 Side 2 of 2	8498738 Part No.	450906 15Aug80	450913 12Jan83	.	.	.
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POWER SWITCH PANEL

The power switch panel has the following controls and indicators:

- Power Select switch
- Device Power Sequencing switch
- Maintenance Power switch
- Power On Status indicators
- DC Power switches

POWER SELECT SWITCH

In the Remote position, the 3880 power-on sequence is controlled by either the system or the Subsystem Power On/Off switch on the 3880 operator panel. In the Local position, the 3880 power is turned on by the Maintenance Power switch on the power switch panel and is turned off by the Subsystem Power On/Off switch on the operator panel. The Local position prevents the system power-on sequence and the Subsystem Power On/Off switch (on the operator panel) from turning on 3880 power during maintenance.

DEVICE POWER SEQUENCING SWITCH

The Device Power Sequencing switch (S105) controls power-on sequencing to the devices attached to the 3880. In the Enable position, devices attached to the 3880 storage directors are turned on and off by the system power on/off sequence.

In the Disable position, the present power status of the devices attached to the 3880 is maintained. If the devices are on, the system cannot turn them off; if the devices are off, the system cannot turn them on.

MAINTENANCE POWER SWITCH

The Maintenance Power switch (S104) turns power on to the 3880 and lights the Power On indicator on the operator panel. This switch is enabled by turning the Power Select switch to the Local position.

POWER ON STATUS INDICATORS

The Power On Status indicators give a visual indication of 3880 power.

SD1 Indicator

Power On Status indicator SD1 (storage director 1) lights when all voltages are present on storage director 1.

SD2 Indicator

Power On Status indicator SD2 (storage director 2) lights when all voltages are present on storage director 2.

Maintenance (PSM) Indicator

The Maintenance (PSM) indicator lights when +5 volt power to the maintenance board (B1) is on. The +5 voltage is needed to generate the power symptom codes.

DC POWER SWITCHES

DC Power System Switch

The DC Power System switch (S103), with the Power Select switch (S106) in the Local position, controls dc power to all boards (except the B1 board). This switch should be used when it is necessary to remove dc power from both storage directors at the same time. DC power to all boards (except B1) is turned off by pressing this switch to the Off (down) position. Power is turned on again by pressing this switch to the On (up) position.

The DC Power System switch also resets the power-check register. Pressing this switch to the On position resets the power-check register and the Subsystem Power Check indicator on the operator panel. Any time that 3880 power cannot be turned off, use the DC Power System switch to reset the power-check register and then turn power on or off as needed.

Storage Director 1 Switch

CAUTION

To prevent damage to the power supply, always use the DC Power System switch to remove dc power from both storage directors.

The Storage Director Power SD1 switch (S101) controls dc power to storage director 1. In the Normal position, dc power is sequenced on and off by the power sequencer and monitor. In the Off position, dc power is turned off only to storage director 1.

The power sequencer and monitor senses the position of both storage director switches and turns power supply 1 off if both switches are off. However, the power supply can be damaged if both Storage Director Power switches SD1 and SD2 are in the Off position and there is a failure in the power sequencer and monitor.

Storage Director 2 Switch

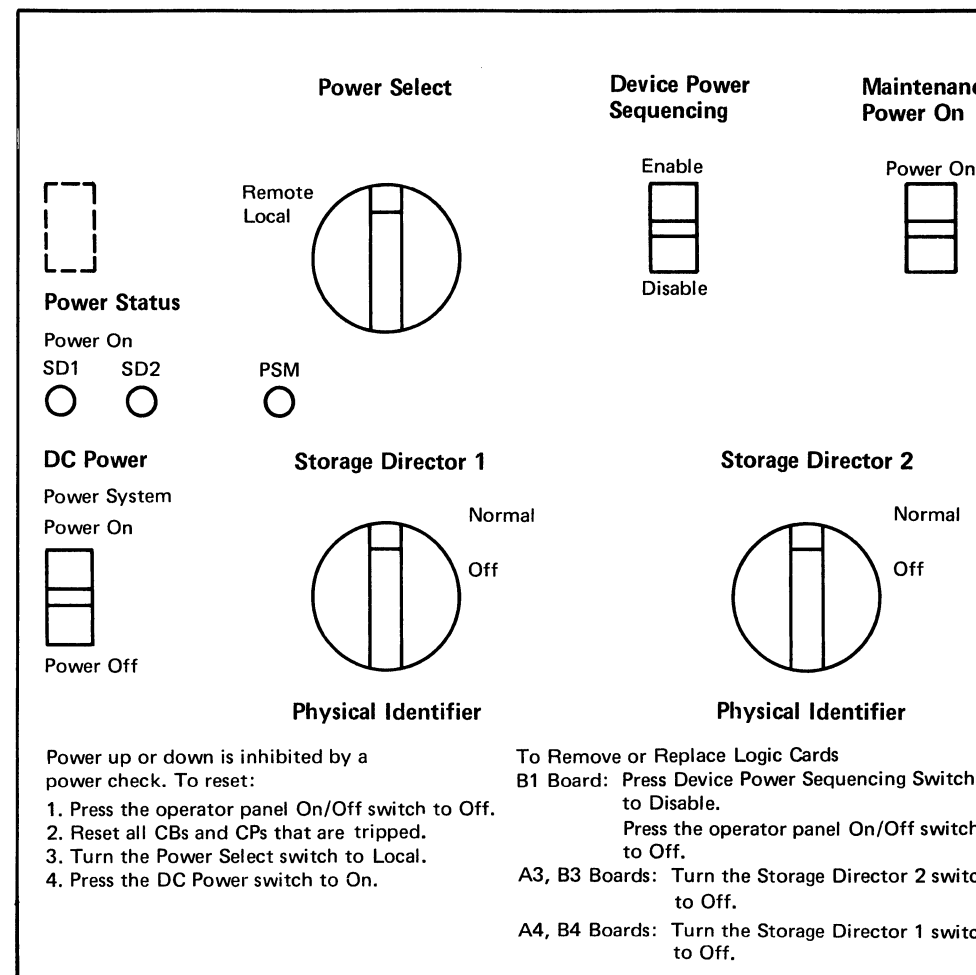
CAUTION

To prevent damage to the power supply, always use the DC Power System switch to remove dc power from both storage directors.

The Storage Director Power SD2 switch (S102) controls dc power to storage director 2. In the Normal position, dc power is sequenced on and off by the power sequencer and monitor. In the Off position, dc power is turned off only to storage director 2.

The power sequencer and monitor senses the position of both storage director switches and turns power supply 1 off if both switches are off. However, the power supply can be damaged if both Storage Director Power switches SD1 and SD2 are in the Off position and there is a failure in the power sequencer and monitor.

Power Switch Panel



Note: The circuits for these switches are located on logic page YA181 or YA137.

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AC DISTRIBUTION AND +24 Vdc SUPPLY

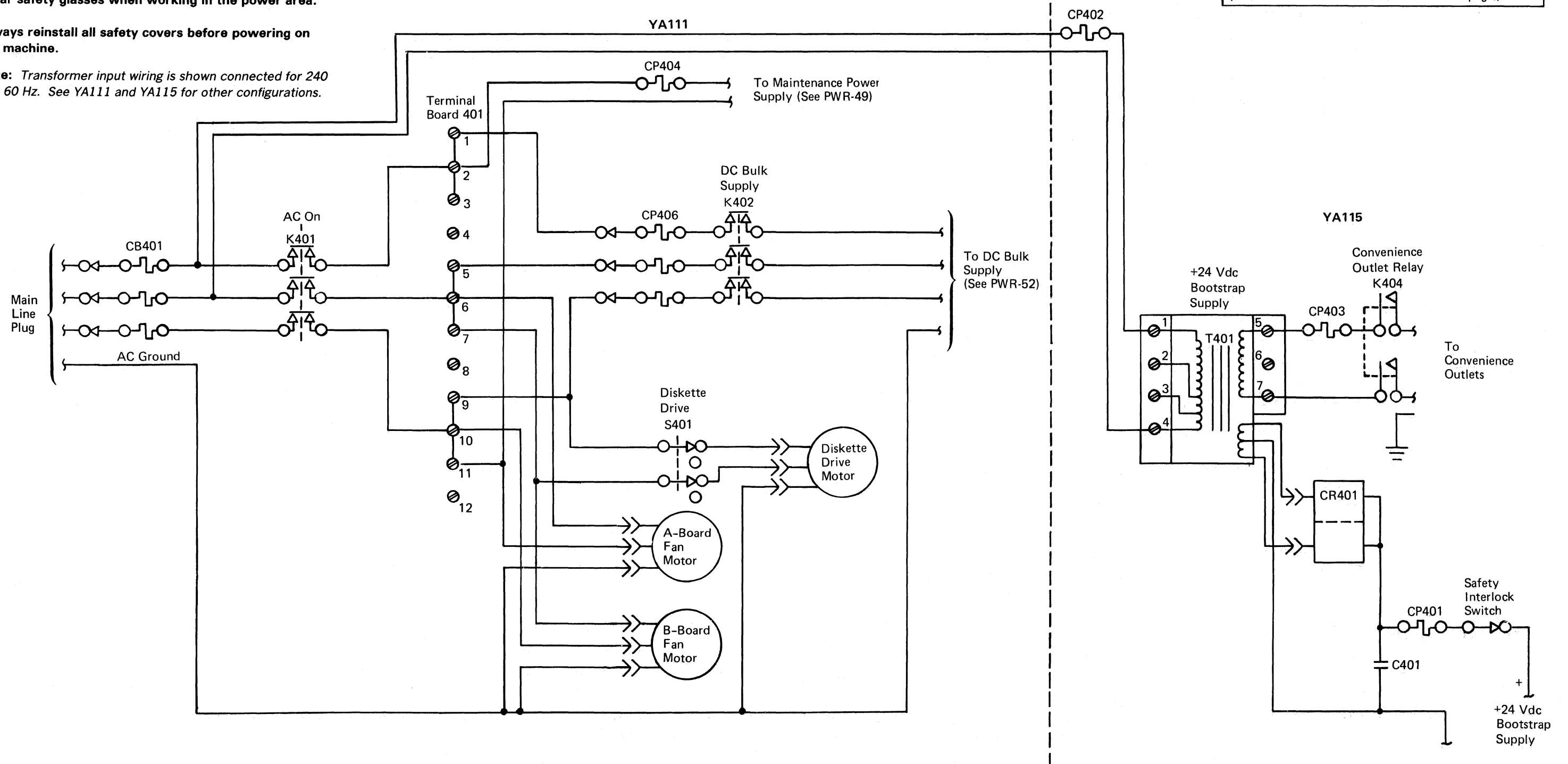
See LOC-50 (50 Hz) or LOC-55 (60 Hz and 50 Hz for Japan) for the location of the primary power box.

DANGER
 Lethal voltages are present in the power servicing area. Safety is most important. Treat all circuits as live until measured. Capacitors are possible exploding devices. Wear safety glasses when working in the power area.

Always reinstall all safety covers before powering on the machine.

Note: Transformer input wiring is shown connected for 240 Vac 60 Hz. See YA111 and YA115 for other configurations.

This diagram is logically correct, but not point-to-point. See the MDM power diagrams for point-to-point wiring. (Use YAXXX reference to find the correct page.)



3880 MIM	AS0027	8498396	See EC	450908	450913		
	Side 2 of 2	Part No.	History	15Apr81	12Jan83		

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NO POWER AT THE CONVENIENCE OUTLET

DANGER
Lethal voltages are present in the power servicing area. Safety is most important. Treat all circuits as live until measured. Capacitors are possible exploding devices. Wear safety glasses when working in the power area.

Always reinstall all safety covers before powering on the machine.

001
Is the Unit Emergency switch in the Power Off position?
Y N

002
Is the 24V LED on (CPC board)?
Y N

003
Trip and reset main CB401.
Is CB401, CP301, CP401, CP402, CP403, or CP406 tripped?
Y N

004
Measure the DC voltage across C401 (see LOC-55 and YA115).
Is it between 19.2 Vdc and 30.9?
Y N

005
Measure the line voltage at the input to T401 (see LOC-55 and YA115).
Is line voltage present?
Y N

006
There is an open circuit to T401. See PWR-28, YA115, and YA111. CB401 or CP402 could be bad, or a power phase voltage could be missing.

007
Measure the 24 Vac input to CR401 (see LOC-55 and YA115).
Is it between 13.5 Vac and 22 Vac?
Y N

008
Replace T401. Verify that ac power at the convenience outlet is correct.

009
Replace CR401 and C401.

010
There is an open circuit in the 24 Vdc distribution. See PWR-76 and YA105. CP401, CP406, and the Safety Interlock switch, the Unit Emergency switch, CP301, or the B1 board thermal could be bad.

A B C
1 1 1

A B C
1 1 1

011
Reset the tripped CB or CP.
Turn the subsystem power switch (on the operator panel) to the On position.
Does the CB or CP trip again?
Y N

012
If there was an earlier machine problem, continue with the MD diagnostics. If not, return the machine to the customer.

013
Check cables and connectors to find the cause of the tripped CB or CP. The CB or CP could be bad or the output could be shorted (see PWR-84 to analyze CP401 problems; see PWR-23 for a Power Control summary).

014
Is K404 picked?
Y N

015
K404 is bad or the circuit to K404 is bad. See PWR-76, YA105, and YA115.

016
Check for power at the convenience outlet.
Is the power OK?
Y N

017
Is this a 60 Hz or 50 Hz for Japan 3880?
Y N

018
There is an open circuit between the convenience outlet and CB401. This circuit includes TB403, CP403, K404 points, and the connecting wires. See YA111, YA115, and LOC-50.

019
There is an open circuit between T401 and the convenience outlet. See PWR-28 and YA115. K404 points, CP403, or T401 could be bad.

A B
2 2

NO POWER AT THE CONVENIENCE OUTLET PWR-29

A B
2 2
020
The MD or the MD power cord could be bad.

021
Press the Unit Emergency switch to the Power Enable position. If the switch is locked in the Power Off position, see INST-60 for the reset procedure.

If there was an earlier machine problem, continue with the MD diagnostics. If not, return the machine to the customer.

3880 MIM	AS0029 Side 1 of 2	8498397 Part No.	See EC History	450910 14May82	450913 12Jan83	450915 14Oct83	.
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REPAIR ACTION AND CHECKOUT PROCEDURE

Complete the following checklist to ensure the machine problem has been corrected. If a check cannot be completed, start the maintenance device (MD) again.

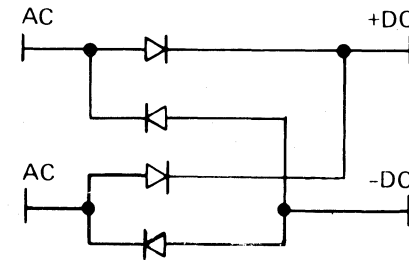
Note: *It is not always necessary to check each step. Use your judgment in skipping all unnecessary steps.*

1. Set the Power Select switch to the Remote position on the power switch panel, then set the Device Power Sequencing switch to the Disable position. Power off from the operator panel. Are all power lamps on the operator panel off? (Ignore the Power On Status indicators.) If not, start the MD again.
2. Reset the machine to normal operating conditions. (Remove all diagnostic jumpers and replace wiring, connectors, or parts that were removed.) Set the Device Power Sequencing switch to the Enable position.
3. Power on from the operator panel.
4. Verify that all power lights on the operator panel and power switch panel are on. The Power On Status indicator will not be on until all of the attached devices have had their power turned on. The Power System lamp should be off. If the above conditions are not met, start the MD again.
5. Check that all fans are on.
6. Check power supply voltages as shown in the Voltage Checks chart on PWR-33.
7. Disconnect the maintenance device.
8. Replace all covers.

SERVICE AIDS

1. Capacitor Check with CE Meter
 - a. With power off, discharge the capacitor by shorting the terminals.
 - b. Open the circuit to one capacitor terminal.
 - c. Set the meter range to R x 10.
 - d. Touch the meter leads to the two capacitor terminals and observe that the needle nearly goes to zero, then returns toward infinity.
 - e. Reverse the leads and repeat the check. Because of the charge built up by the first check, the needle should deflect beyond zero, then go back toward infinity. For large capacitors, set range to R x 1 to speed up the process.

2. Rectifier Check with CE Meter



- a. Disconnect leads to rectifier assembly.
 - b. Set the meter to R x 1, and measure the forward resistance. The resistance should be from 5 to 15 ohms.
 - c. Set the meter to R x 1000 and reverse the meter leads. The resistance should be near infinity.
3. To ensure a solid connection when making voltage checks on J-type connectors, use an IBM Miniprobe (P/N 453718).

INTERMITTENT LOGIC ERRORS

Use this procedure for intermittent logic errors caused by power problems. For intermittent power problems, use the procedure on PWR-91.

Intermittent logic errors that indicate different FRU groups can be caused by power problems such as wrong dc voltage levels, too much ac ripple, or noise. Perform the following actions to verify good power.

1. Perform the voltage checks. Replace parts and adjust the regulators as needed.
2. Check that screws and connectors on the power supplies and the gate TBs are tight.
3. Replace the cards at B1C2 and B1E2 if wrong voltage levels are not detected by the power sequencer and monitor sense circuits.
If eight-channel switch feature is installed, replace B1H2.
4. Check that the ac input voltage is correct and that all three phases are present at TB401 (see PWR-28).

OVERLOAD ISOLATION

Board Isolation Procedure

Use the following procedure to isolate the failing board:

1. Turn the Local/Remote switch (Power Switch panel) to the Local position.
2. Press the DC Power System switch (Power Switch panel) to the Off position.
3. Isolate one board from the voltage distribution net by removing the flat wire bus (FWB) cable from the gate TB.
4. Press the DC Power System switch to the On position.
5. Use MD Option 8 to read the Power Sense Registers (see PWR-39, MD Sense Register Display).
6. If the power sense information no longer indicates an overload (overcurrent) condition, go to the Card Isolation Procedure.
7. If the power sense information still indicates an overload (overcurrent) condition, reconnect the FWB at the gate TB and perform steps 1 through 7 until all boards are checked.
8. If the problem cannot be isolated to a failing board, suspect the regulator and the distribution line to the gate TB.

Card Isolation Procedure

Use the following procedure to isolate the failing card:

1. Reconnect the FWB cable at the gate TB and verify that the FWB is plugged correctly at the board.
2. Press the DC Power System switch (Power Switch panel) to the Off position.
3. Remove two cards at a time from the failing board.
4. Press the DC Power System switch to the On position.
5. If the Subsystem Power Check LED (Operator panel) is off, the failing card has been found.
6. If the Subsystem Power Check LED is on, repeat steps 1 through 6 until the failing card is found or all the cards are checked.
7. If the problem cannot be isolated to a failing card, suspect the board.
8. Restore power to the 3880 when the repair has been completed.
9. Verify the repair using MD option 1.

VOLTAGE CHECKS

DANGER
 Lethal voltages are present in the power servicing area. Safety is most important. Treat all circuits as live until measured. Capacitors are possible exploding devices. Wear safety glasses when working in the power area.
 Always reinstall all safety covers before powering on the machine.

DC Voltage Checks

Measure each dc voltage in the order listed in the Voltage Checks table. Measure both the dc level and the ac ripple of each voltage before going on to the next voltage. Only three voltages can be directly adjusted (+5 Vdc, +6 Vdc and +7.25 Vdc) for the logic boards. If adjustments are necessary, measure with a digital voltmeter. The adjustment potentiometers for +5 Vdc, +6 Vdc and +7.25 Vdc regulators are accessible when the power stack cover is opened. Ensure that only the voltage adjustment potentiometer on the regulator assembly is adjusted. (See label on cover.) The overvoltage potentiometer on each card is adjusted at the plant and should not be changed.

The +24 Vdc bootstrap supply has no output voltage adjustment. However, it is possible to change the transformer primary input taps. The primary taps at T401 determine the ac input to the +24 Vdc bootstrap supply. If this supply is not within specification, check the main 3-phase ac power and ensure that the machine is wired for the correct input voltage, as shown on YA131.

If the voltage checks are not completed correctly, go to the appropriate diagram indicated in the Voltage Checks chart.

If this page is entered because of a known dc voltage problem, and the voltage checks are correct, the problem must be in the voltage distribution. Use the appropriate reference page shown in the table to isolate the problem.

AC Ripple Checks

If the peak-to-peak ac ripple is more than the maximum noted in the chart, it is probable that a power supply part has failed.

Ripple can be caused by a bad capacitor, an open diode in the power supply, or by a missing phase (3-phase input power).

To measure the ac ripple, use the ac input on an oscilloscope set for 0.01 volt per centimeter vertical deflection, and use a X1 probe placed on the test points shown in the voltage checks chart. The frequency of ac ripple associated with input voltage is less than 500 Hz.

Place the probe ground on any convenient ground point.

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REGULATOR REPLACEMENT

Before replacing any regulator, remove all power by tripping CB401. Note that this also removes power from the MD, which must be restarted after the regulator is replaced and CB401 is reset.

+5 Vdc Regulator

Unplug the pluggable cable and disconnect and label all wires from the terminal board.

Replace the bad regulator by sliding it out and sliding a new one in. Plug the pluggable cable and reconnect all wires to the terminal board.

CAUTION
Never change the overvoltage adjustments on the regulator.

Power on the machine. If the Subsystem Power Check indicator on the operator panel lights, a power problem exists. Use the MD to diagnose the problem. An overvoltage or undervoltage condition could exist.

If the system powers off, use the MD sense registers display procedure on PWR-39 to determine the problem. Then turn the suspected regulator adjustment 1/4 turn in the correct direction and try to power on the system again.

Complete the regulator replacement by adjusting both SD1 and SD2 for +5 Vdc.

+6 Vdc or +7.25 Vdc Regulator

Slide the regulator out a portion of the way and unplug the cables. Remove the regulator and replace it with a new one.

Power on the machine and adjust voltages for correct values. Sensing circuits detect overvoltage or undervoltage conditions.

If the system powers off, use the MD sense registers display procedure on PWR-39 to determine the problem. Then turn the suspected regulator adjustment 1/4 turn in the correct direction and try to power on the system again.

Multilevel Regulator

Slide the regulator out a portion of the way and unplug the cables. Remove the regulator and replace it with a new one.

Power on the machine. This regulator has no voltage adjustments. If the new regulator is good, no power problem should exist.

Voltage Checks

DC Supply	Test Point See Note 3	Acceptable Range **	Maximum AC Ripple	Reference Page	
				MIM	ALD
+24 Vdc Bootstrap Supply	CPC Board J704-1 J704-2 Ground	+19.2 Vdc to +30.9 Vdc (See Note 4)	800 MVdc	PWR-76	YA161
+5 Vdc Maintenance	Board B1 E2D03 E2D08 Ground	+4.5 Vdc to +5.5 Vdc (See Note 4)	300 MVdc	PWR-49	YA407
-5 Vdc Maintenance	Board B1 E4D10 E2D08 Ground	-4.5 Vdc to -5.5 Vdc (See Note 4)	300 MVdc	PWR-49	YA407
+24 Vdc Maintenance	Board B1 E3D07 E2D08 Ground	+21.2 Vdc to +26.8 Vdc (See Note 4)	600 MVdc	PWR-49	YA407
+8.5 Vdc SD1/SD2 20-Card B4/B3 Boards	Board B4/B3 Q4B11 (20) K4D08 Ground	+7.74 Vdc to +9.26 Vdc (See Note 4)		PWR-67	YA151
+12 Vdc SD1/SD2 22-Card B4/B3 Boards	Board B4/B3 U4B11 (22) K4D08 Ground	+11.4 Vdc to +12.6 Vdc (See Note 4)		PWR-68	YA151
+7.25 Vdc SD1/SD2*	Board B4/B3 M2D10 (20) T2D10 (22) K4D08 Ground	+7.04 Vdc to +7.46 Vdc (See Notes 1, 4, and 5.)		PWR-65	YA151
+6 Vdc SD1/SD2*	Board B4/B3 V2D12 (20) X2D12 (22) K4D08 Ground	+5.76 Vdc to +6.24 Vdc (See Note 4)		PWR-64	YA151
+5 Vdc SD1/SD2*	Board B4/B3 T5D03 (20) V5D03 (22) K4D08 Ground	+4.85 Vdc to +5.15 Vdc (See Note 2 for adjusting voltage and Note 4.)		PWR-62	YA151
+3 Vdc SD1/SD2	Board B4/B3 M2B05 (20) R2B05 (22) K4D08 Ground	+2.91 Vdc to +3.09 Vdc (See Notes 4 and 5.)		PWR-59	YA151
-1.5 Vdc SD1/SD2	Board B4/B3 V3B13 (20) X3B13 (22) K4D08 Ground	-1.35 Vdc to -1.65 Vdc (See Note 4)		PWR-58	YA151
-5 Vdc SD1/SD2	Board B4/B3 V2B09 (20) U4B06 (22) K4D08 Ground	-4.55 Vdc to -5.45 Vdc (See Note 4)		PWR-58	YA151

* Adjustable regulator
**Undervoltage sensing is below the lower limit of the acceptable range.

Voltage Checks (Additional Features)

DC Supply	Test Point	Acceptable Range **	Maximum AC Ripple	Reference Page	
				MIM	ALD
+6 Vdc SD1/SD2*	Board A4/A3/A2/A1 R2D12 K4D08 Ground	+5.76 Vdc to +6.24 Vdc (See Note 4)		PWR-64	YA151
+5 Vdc SD1/SD2*	Board A4/A3/A2/A1 R4D03 K4D08 Ground	+4.85 Vdc to +5.15 Vdc (See Note 2 for adjusting voltage and Note 4.)		PWR-62	YA151
-1.5 Vdc SD1/SD2	Board A4/A3/A2/A1 R3B13 K4D08 Ground	-1.35 Vdc to -1.65 Vdc (See Note 4)		PWR-58	YA151

* Adjustable regulator
**Undervoltage sensing is below the lower limit of the acceptable range.

Notes:

1. If a +7.25 Vdc regulator card is installed (see Loc-25), adjust the SD1/SD2 +5 Vdc regulator before adjusting the +7.25 Vdc regulator. The +3 Vdc and +7.25 Vdc voltages are referenced to the +5 Vdc voltage. The +5 Vdc and +7.25 Vdc regulators track one another and should have a voltage difference of 2.18 Vdc minimum and 2.36 Vdc maximum when both regulators are correctly adjusted. Any change in +5 Vdc affects the +3 Vdc and +7.25 Vdc regulators. Always check the +5 Vdc regulator and adjust this voltage, if needed, before adjusting the +7.25 Vdc regulator or before replacing the +3 Vdc or +7.25 Vdc regulators.
2. Adjust the SD1/SD2 +5 Vdc regulator for +5.07 Vdc measured between gate TB4-1 and -4 for SD1 and measured between Gate TB3-1 and -4 for SD2. If the +5 Vdc regulator is adjusted, see note 1.
3. The numbers (20) and (22) indicate that the card-pin reference is to either a 20- or 22- card B4/B3 board.
4. The dc voltage and the peak ac ripple voltage must not be more than the maximum acceptable dc voltage.
5. When the +7.25 Vdc regulator is removed (see LOC-25), the +3 Vdc and +7.25 Vdc voltages are not used.

See PWR-32 for voltage check procedures.


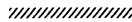
Legend:  The bar indicates the active condition of the signal, not its level.
 The shaded area indicates variable timing.

Chart Line No.	Signal Name	Logic Page Number	Level																
1	K401	YA115																	
2	5 V Maintenance Supply	YA121	+																
3	Power Sequencer and Monitor Reset																		
4	Pick K402, Turn On +3 Vdc, 5 Vdc, - 1.5 Vdc, -5 Vdc Bulk Supply	YA111, YA115 YA133																	
5	Turn Off Sequence Mask 1																		
6	Test Sequence 1																		
7	Turn On 7.25 Vdc and 12 Vdc Series Regulators	YA133	+																
8	Turn Off Sequence Mask 2																		
9	Test Sequence 2																		
10	Turn On 6 Vdc Regulator	YA133																	
11	Turn Off Sequence Mask 3																		
12	Test Sequence 3																		
13	Power On Reset (POR) to Storage Director Boards																		

Note: Description of failure conditions are located on PWR-39.

FUNCTIONAL DESCRIPTION

The power sequencer and monitor sense card (PSC) tests distinct sense points in the power system for both storage directors.

The PSC checks digital and analog signals and switch contact conditions. The dc voltages from the maintenance power supply, which are indicated by the maintenance or PSM indicator on the power switch panel, are necessary for the operation of the power sequencer and monitor.

When a sensed point is determined to be out of acceptable range, a latch is set to store the information in a power sense register. The stored information is analyzed for severity, and the power sequencer and monitor control card (PCC) responds to the failure. The severity of the failure determines one of following responses:

- No action
- Action A: One, and only one, storage director is issued a power on reset. If the same failure is detected concurrently on both storage directors, an action B occurs.
- Action B: Both storage directors are powered off.

To reset the power sense registers:

- Action A is reset by pressing the Power Off switch at the operator panel or by moving the DC Power System switch to the On position.
- Action B is reset by moving the DC Power System switch to the On position. A failure condition caused by a tripped circuit protector (CP) or thermal cannot be reset until the CP or thermal is reset.

Power Sense Registers

Each power sense register contains four bit positions. The meanings of the bits are specified in the Sense Condition column of the Power Symptom Code Table. Bits are set when the described conditions occur while the bits are not masked.

Sequence Masks

Sequence masks (1, 2, and 3) are used to prevent setting false indications while the logic power supplies are being powered on and off. Before the start of the power-on sequence, all three masks are active. When the power-on sequence begins, sequence mask 1 is turned off. Next, sequence mask 2 is turned off, and last, sequence mask 3. (See PWR-37 for the sequence chart.)

Service Masks

Service masks are used to prevent setting false indications while one of the storage directors is powered off.

The 1s in the Service Mask column indicate the bits that are kept from being set when the Storage Director Power SD1 switch on the power switch panel is in the Off position. The

2s in the Service Mask column indicate the bits that are inhibited when the Storage Director Power SD2 switch on the power switch panel is in the Off position.

Power Sense Action

The action taken in response to detected failures is indicated in the Power Symptom Code table. A blank in the Action column means that no action is taken by the PSM control card. The As and Bs identify the failures that cause action A or action B.

Power Sense Conditions And The MD

The sense registers are read and analyzed by the maintenance device (MD) during maintenance analysis procedures (MAPs). The results are used to direct the CE in maintenance activity.

The MD can also be used in manual control mode to display the contents of all the power sense registers.

When the MAPs have failed to isolate the problem or the problem is an intermittent power problem, use the Power Symptom Code Table for additional analysis. Then use the End of Guided Maintenance procedures on PWR-91.

MD Sense Registers Display

The MD must be connected to the 3880, powered-on, and loaded with the maintenance diskette. Then, the following procedure can be used to display the contents of the power sense registers.

1. Enter PF to display the maintenance option list.
2. Enter 8 to select diagnostic aids.
3. Enter C to select Read Power Sense from the diagnostic aids option list.

The following figure is an example of the MD display.

POWER SENSE BYTES :				
10	20	30	40	50
60	70	8C	90	A0
B0	C0	D0	E0	F0

The left digit of each pair identifies the register and the right digit is the register contents.

In the example, register 8 contains hexadecimal C, and all other registers contain zeroes. The Sense Condition column shows that an undervoltage condition was sensed on the +6 Vdc supply to both storage directors.

To repeat the reading and displaying of the sense registers, press the Enter key on the MD. Then repeat step 3 of the procedure.

To return to the maintenance option list, press the Enter key on the MD to return to the diagnostic aids option list, and then enter X.

POWER SYMPTOM CODE TABLE

Display Code (MD)		Sense Condition	Sequence Mask	Service Mask	Action	Reference
Register Address	Register Data Bit					
1	8	K402 CMD PSM CP Chain Thermals 24.0 V Bias	1		B B	PWR-42 PWR-44 PWR-42 PWR-49
	4					
	2					
	1					
2	8	+6.0 V Regulator turn-on signal is missing +7.25 V and +8.5 V or 12 V Regulator turn-on signal is missing Not used Stack CP Chain	3			PWR-46 PWR-46 PWR-44
	4		2			
	2		0			
	1					
3	8	+6.0 V Overvoltage +5.0 V Overvoltage +7.25 V Overvoltage +8.5 V or 12 V Overvoltage	3			PWR-63 PWR-61 PWR-65 PWR-67, 68
	4		1			
	2		2			
	1		2			
4	8	Not used +6.0 V Overcurrent +5.0 V Overcurrent +7.25 V Overcurrent	3			PWR-63 PWR-61 PWR-65
	4		1			
	2		2			
	1					
5	8	+8.5 V or 12 V Overcurrent Not used +10.7 V Regulator Bulk Undervoltage +12 V Regulator Bulk Undervoltage	2			PWR-67, 68 PWR-52, 61 PWR-68
	4		1			
	2		1			
	1					
6	8	+3.0 V Undervoltage Storage Director 1 +3.0 V Undervoltage Storage Director 2 -5.0 V Undervoltage Storage Director 1* -5.0 V Undervoltage Storage Director 2*	1	1	B	PWR-59 PWR-59 PWR-57 PWR-57
	4		1	2	B	
	2		1	1	B	
	1		2	2	B	
7	8	+5.0 V Undervoltage Storage Director 1 +5.0 V Undervoltage Storage Director 2 +5.0 V Undervoltage A4 Board +5.0 V Undervoltage A3 Board	1	1	B	PWR-61 PWR-61 PWR-61 PWR-61
	4		2	B		
	2		1	B		
	1		2	B		
8	8	+6.0 V Undervoltage Storage Director 1* +6.0 V Undervoltage Storage Director 2* -1.5 V Undervoltage Storage Director 1 -1.5 V Undervoltage Storage Director 2	3	1	A	PWR-63 PWR-63 PWR-57 PWR-57
	4		3	2	A	
	2		1	1	A	
	1		2	2	A	
9	8	+7.25 V Undervoltage Storage Director 1* +7.25 V Undervoltage Storage Director 2* +8.5 V or 12 V Undervoltage Storage Director 1* +8.5 V or 12 V Undervoltage Storage Director 2*	2	1	A	PWR-65 PWR-65 PWR-67, 68 PWR-67, 68
	4		2	2	A	
	2		2	1	A	
	1		2	2	A	
A	8	-1.5 V Undervoltage A4 Board -1.5 V Undervoltage A3 Board +6.0 V Undervoltage A4 Board +6.0 V Undervoltage A3 Board	1	1	A	PWR-57 PWR-57 PWR-63 PWR-63
	4		2	2	A	
	2		3	1	A	
	1		3	2	A	
B	8	-5 V Undervoltage Maintenance Power* Not used +5 V Undervoltage A2 Board** +5 V Undervoltage A1 Board**			A	PWR-49 PWR-61 PWR-61
	4					
	2		1	1	B	
	1		2	2	B	
C	8	-1.5 V Undervoltage A2 Board** -1.5 V Undervoltage A1 Board** +6.0 V Undervoltage A2 Board** +6.0 V Undervoltage A1 Board**	1	1	A	PWR-57 PWR-57 PWR-63 PWR-63
	4		1	2	A	
	2		3	1	A	
	1		3	2	A	
D-F		Not used				

Action A = Power On Reset to board.
Action B = Power off the logic supply.

* The sensors are located on the power control card (B1E2).
** The sensors are located on the power control card (B1H2).

The Power Select switch must be in the Local position before the DC Power System switch can be effective.

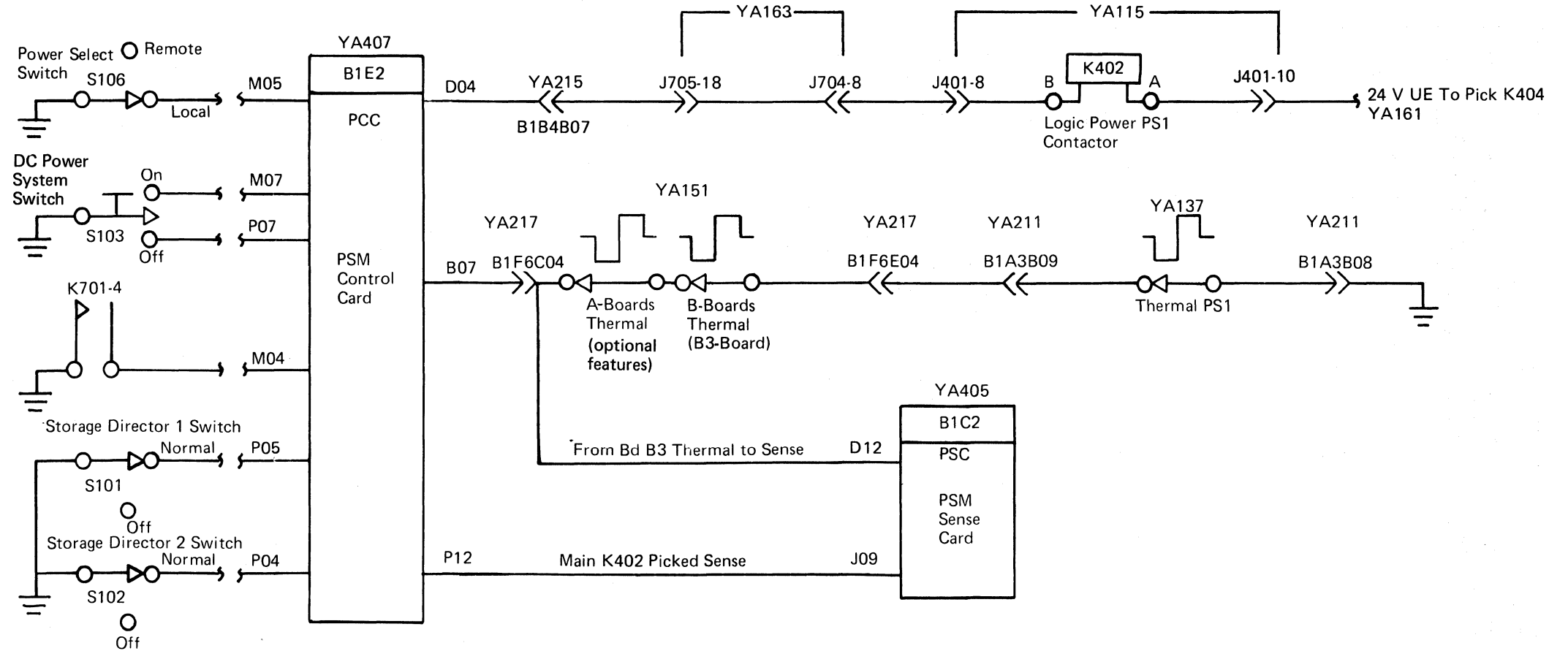
While the Power Select switch is in the Local position, pressing the DC Power System switch to the On position resets the power-check register and picks relay K402. Picking K402 turns on the logic power supply (PS1) to SD1 and SD2.

Pin M04 must be at electrical ground before relay K402 can be activated. The path for ground is through the normally open relay point K701-4.

If both Storage Director switches 1 and 2 are off, relay K402 is de-activated and cannot be activated.

Maintenance power supply must be on to supply voltages to the maintenance board and provide a pick to K402 through card B1E2.

This diagram is logically correct, but not point-to-point. See the MDM power diagrams for point-to-point wiring. (Use YAXXX reference to find the correct page.)



Note: This maintenance analysis page is used for maintenance device reference only. See PWR-27 for additional descriptions of the switches shown on this page.

3880 MIM	AS0039	8498399	See EC	450906	450908	450910	.
	Side 2 of 2	Part No.	History	15Aug80	15Apr81	14May82	.

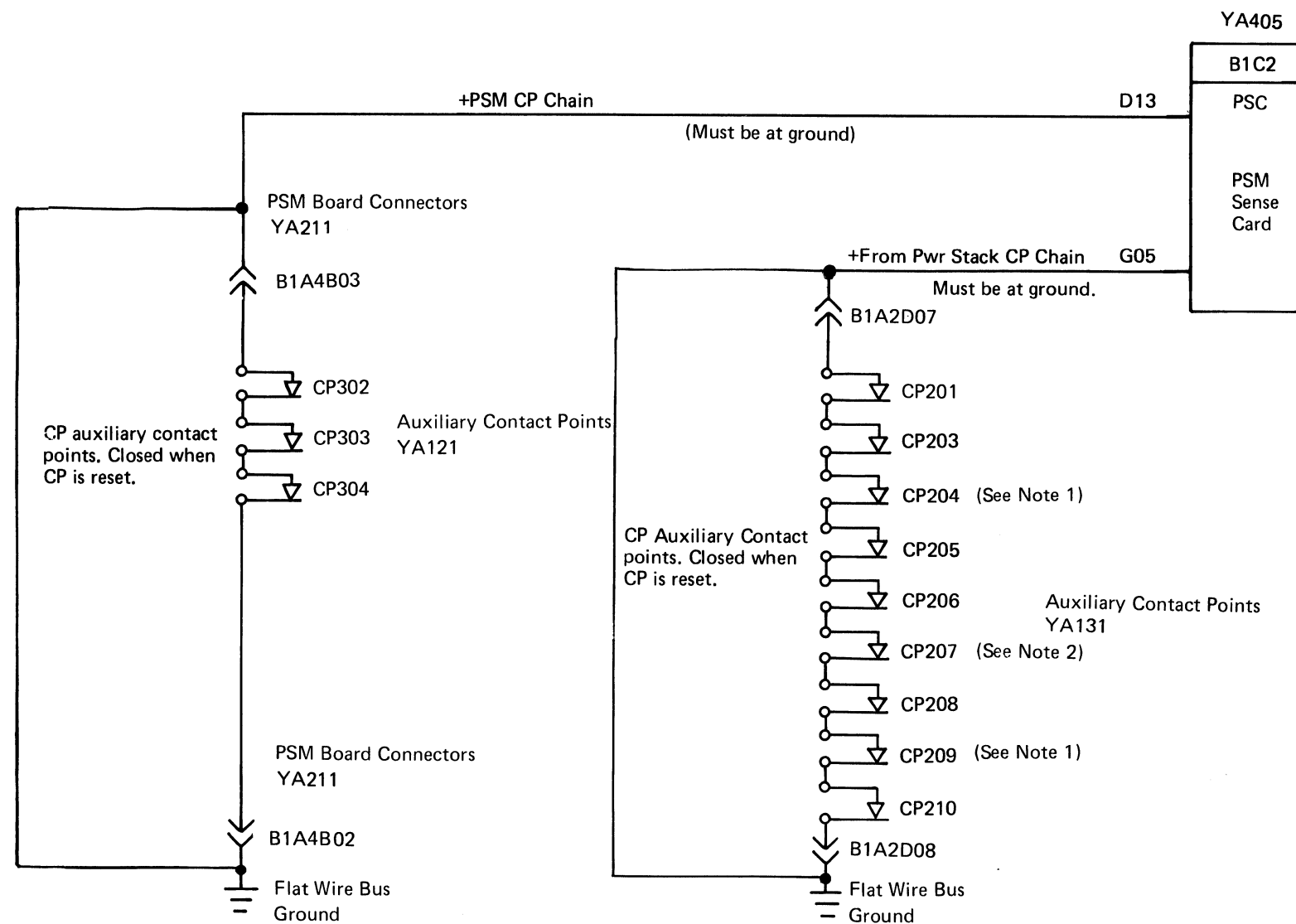
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CIRCUIT PROTECTOR SENSE CIRCUIT

SERVICE AIDS

An open circuit or tripped circuit protector (CP) can activate the sense circuit. If an auxiliary contact is suspected, shorting the points at the PSM board connectors helps to check the condition.

The wires that short the circuit protector auxiliary contacts should be installed to prevent 3880 failures caused by the intermittent opening of the auxiliary contacts. These wires may be imbedded into the board or connected from B1A4D02 to B1A4D03 and B1A2D08 to B1A2D07.



This diagram is logically correct, but not point-to-point. See MDM power diagrams for point-to-point wiring. (Use YAXXX references to find correct page.)

Notes:

1. When the +7.25 Vdc regulator is removed (see LOC-25), circuit protectors CP204 and CP209 are also removed.
2. Circuit protector CP207 is removed when the -1.5 Vdc regulator box is installed between GTB-3 and GTB-4.

3880 MIM	AS0044	8498400	See EC	450914	450915	461517	:
	Side 1 of 2	Part No.	History	10Jun83	14Oct83	27Jan84	

REGULATOR TURN-ON AND SENSE CIRCUITS

This maintenance analysis procedure page is only for use with the maintenance device.

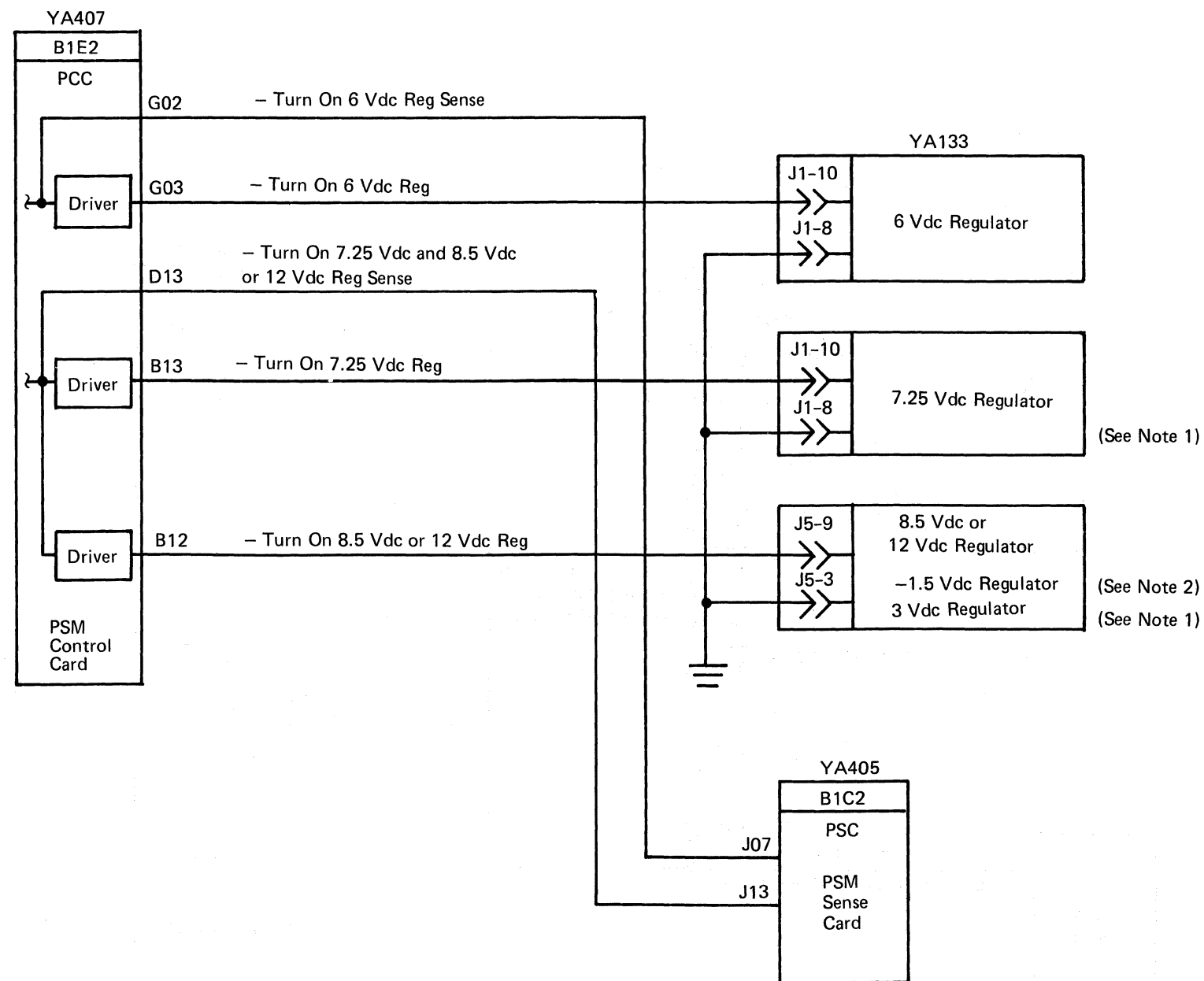
This diagram is logically correct, but not point-to-point. See the MDM power diagrams for point-to-point wiring. (Use YAXXX references to find the correct page.)

CIRCUIT THEORY

Circuits on the PSM control card (B1E2) turn on the series regulator. The PSM sense card (B1C2) senses the turn-on level.

Sensing the loss of a turn-on signal does not power off the 3880. A latch is set on the PSM sense card for information display only. If a power check occurs, the problem may be caused by a loss of the turn-on signal or voltage level.

Regulator turn-on lines must remain at ground to have output from the regulators. The 7.25 Vdc regulator and the 6 Vdc regulator can be turned on by grounding J1-10. The multi-level regulator can be turned on by grounding J5-9.



Notes:

1. When the +7.25 Vdc regulator is removed (see LOC-25), the +3 Vdc and +7.25 Vdc voltages are not used.
2. When CP207 is removed, the -1.5 Vdc regulator is installed on the gate between GTB-3 and GTB-4.

3880 MIM	AS0044 Side 2 of 2	8498400 Part No.	See EC History	450914 10Jun83	450915 14Oct83	461517 27Jan84	.
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MAINTENANCE POWER PANEL

MAINTENANCE POWER PANEL **PWR-48**

The maintenance power panel contains the circuit protectors for the diskette drive and the 3880 maintenance board. This panel contains the following circuit protectors:

- CP301, 5 Vdc to diskette drive and maintenance board
- CP302, -5 Vdc to diskette drive
- CP303, 24 Vdc to diskette drive
- CP304, 24 Vdc to maintenance board and regulator bias

CP301, DISKETTE DRIVE AND MAINTENANCE BOARD, 5 Vdc

Circuit protector 301 distributes 5 Vdc to the diskette drive and the maintenance board logic circuits (see YA121).

CP302, DISKETTE DRIVE, -5 Vdc

Circuit protector 302 distributes -5 Vdc to the diskette drive logic circuits (see YA121).

CP303, DISKETTE DRIVE, 24 Vdc

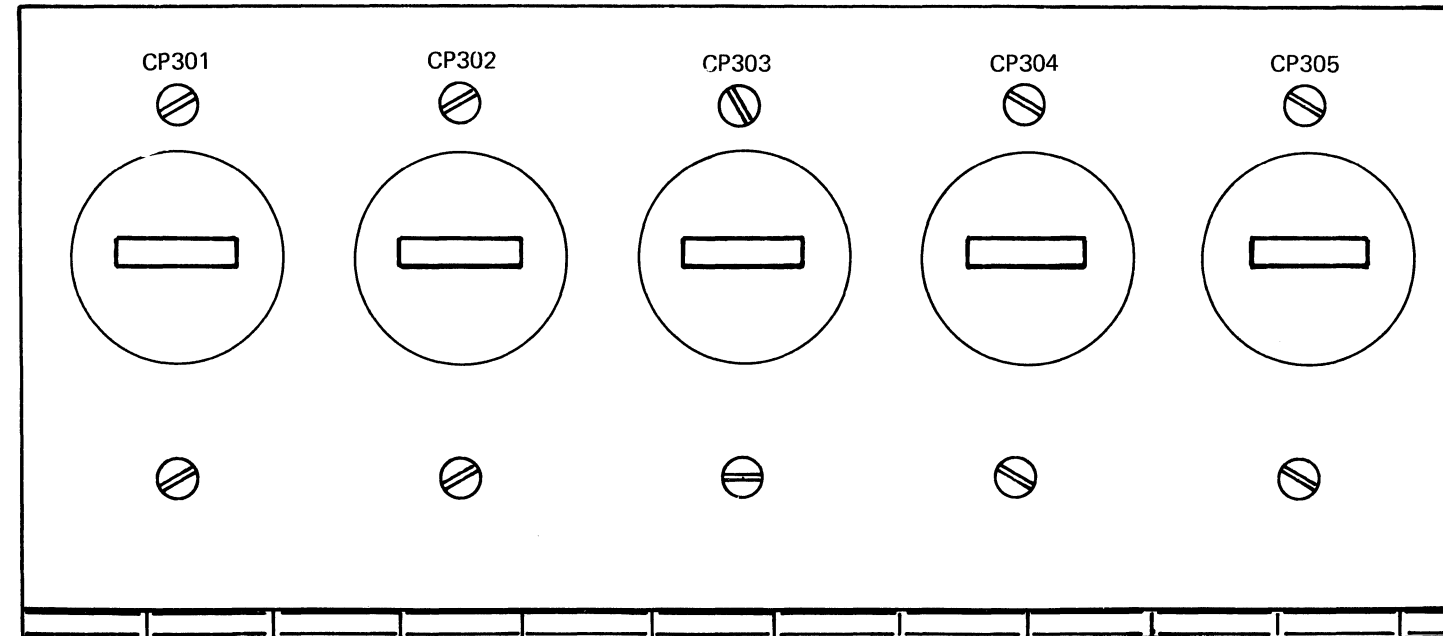
Circuit protector 303 distributes 24 Vdc to the diskette drive (see YA121).

CP304, MAINTENANCE BOARD AND REGULATOR BIAS, 24 Vdc

Circuit protector 304 distributes 24 Vdc to the maintenance board. This voltage is also the bias voltage for all voltage regulators in the 3880 (see YA121).

CP305

Circuit protector 305 is not used.



3880
MIM

AS0048	8498401
Side 1 of 1	Part No.

450900	450901	450913
13Jul79	14Sep79	12Jan83

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MAINTENANCE POWER PANEL **PWR-48**

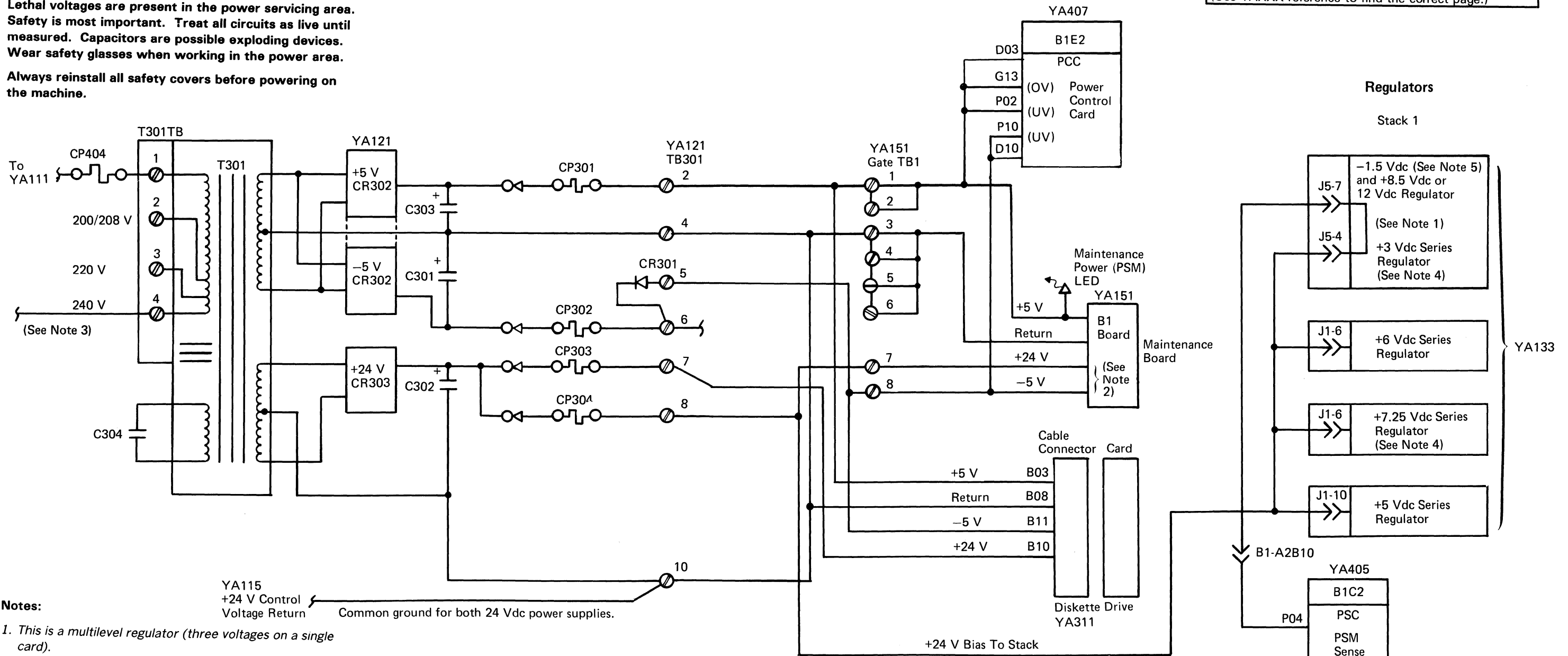
MAINTENANCE POWER DISTRIBUTION

See LOC-40 (50 Hz) or LOC-45 (60 Hz and 50 Hz for Japan) for the location of the maintenance power supply.

DANGER
Lethal voltages are present in the power servicing area. Safety is most important. Treat all circuits as live until measured. Capacitors are possible exploding devices. Wear safety glasses when working in the power area.

Always reinstall all safety covers before powering on the machine.

This diagram is logically correct, but not point-to-point. See the MDM power diagrams for point-to-point wiring. (Use YAXXX reference to find the correct page.)



Notes:
 YA115 +24 V Control Voltage Return Common ground for both 24 Vdc power supplies.

1. This is a multilevel regulator (three voltages on a single card).
2. See YA151 for pin locations of the +24 V and -5 V special voltage jumpers.
3. Wiring is shown for 240 Vac 60 Hz. See YA121 for information on other configurations.
4. When the +7.25 Vdc regulator is removed (see LOC-25), the +3 Vdc and +7.25 Vdc voltages are not used.
5. When CP207 is removed, the -1.5 Vdc regulator is installed on the gate between GTB-3 and GTB-4.

3880 MIM	AS0049	8498402	See EC History	450907	450908	450913	450915
	Side 1 of 2	Part No.		10Dec80	15Apr81	12Jan83	14Oct83

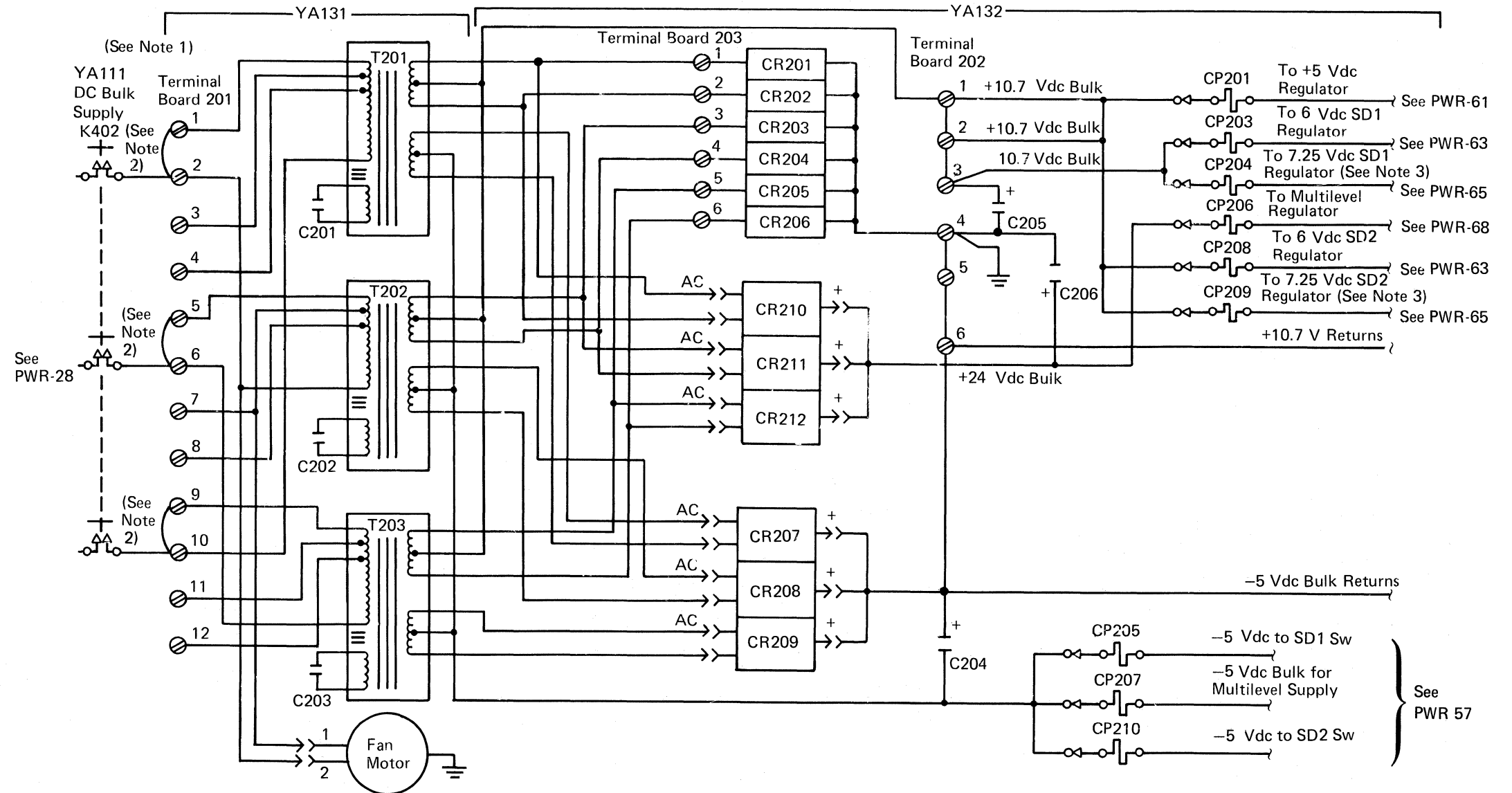
22-Card B4/B3 Boards Without Eight-Channel Switch Feature

See LOC-30 for the location of the DC bulk power supply.

DANGER
Lethal voltages are present in the power servicing area. Safety is most important. Treat all circuits as live until measured. Capacitors are possible exploding devices. Wear safety glasses when working in the power area.

Always reinstall all safety covers before powering on the machine.

- Notes:**
1. See PWR-53 for machines with the Eight-Channel Switch feature installed. See PWR-54 for machines with 20-Card B4/B3 Boards.
 2. Jumpers are shown connected for 240 Vac 60 Hz. See YA131 for wiring information on other configurations.
 3. When the +7.25 Vdc regulator is removed (see LOC-25), the +3 Vdc and +7.25 Vdc voltages are not used.



This diagram is logically correct, but not point-to-point. See the MDM power diagram for point-to-point wiring. (Use YAXXX reference to find the correct page.)

3880 MIM	AS0049	8498402	See EC History	450907	450908	450913	450915
	Side 2 of 2	Part No.		10Dec80	15Apr81	12Jan83	14Oct83

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BULK POWER DISTRIBUTION

22-Card B4/B3 Boards With Eight-Channel Switch Feature

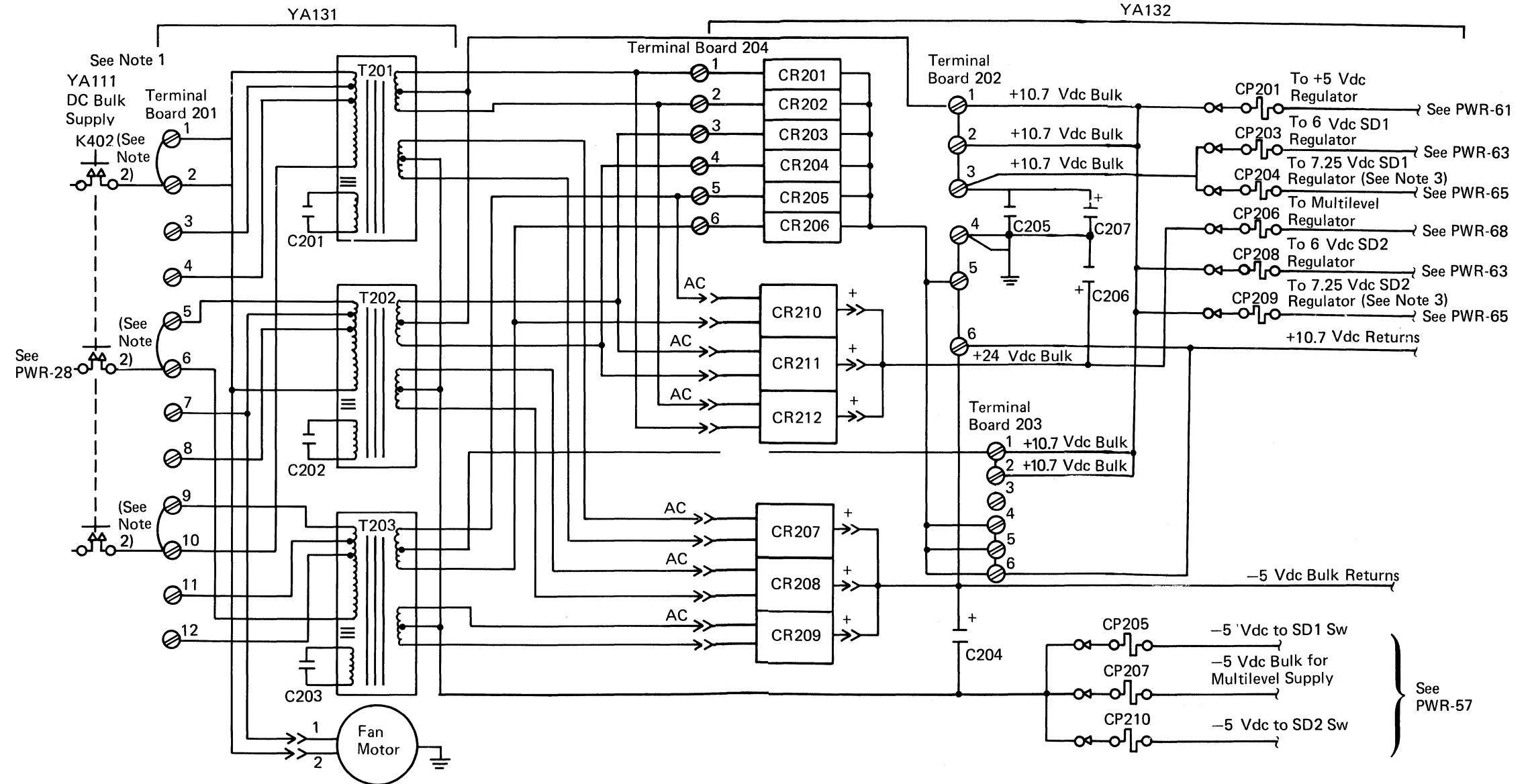
See LOC-30 for the location of the DC bulk power supply.

DANGER
Lethal voltages are present in the power servicing area. Safety is most important. Treat all circuits as live until measured. Capacitors are possible exploding devices. Wear safety glasses when working in the power area.

Always reinstall all safety covers before powering on the machine.

Notes:

1. See PWR-52 for machines with 22-card B4/B3 boards and without the Eight-Channel Switch feature. See PWR-54 for machines with 20-card B4/B3 boards.
2. Jumpers are shown connected for 240 Vac 60 Hz. See YA131 for wiring information on other configurations.
3. When the +7.25 Vdc regulator is removed (see LOC-25), the +3 Vdc and +7.25 Vdc voltages are not used.



This diagram is logically correct, but not point-to-point. See the MDM power diagrams for point-to-point wiring. (Use YAXXX reference to find the correct page.)

3880 MIM	AS0053 Side 1 of 2	2290981 Part No.	450906 15Aug80	450907 10Dec80	450908 15Apr81	450913 12Jan83
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20-Card B4/B3 Boards

See LOC-30 for the location of the DC bulk power supply.

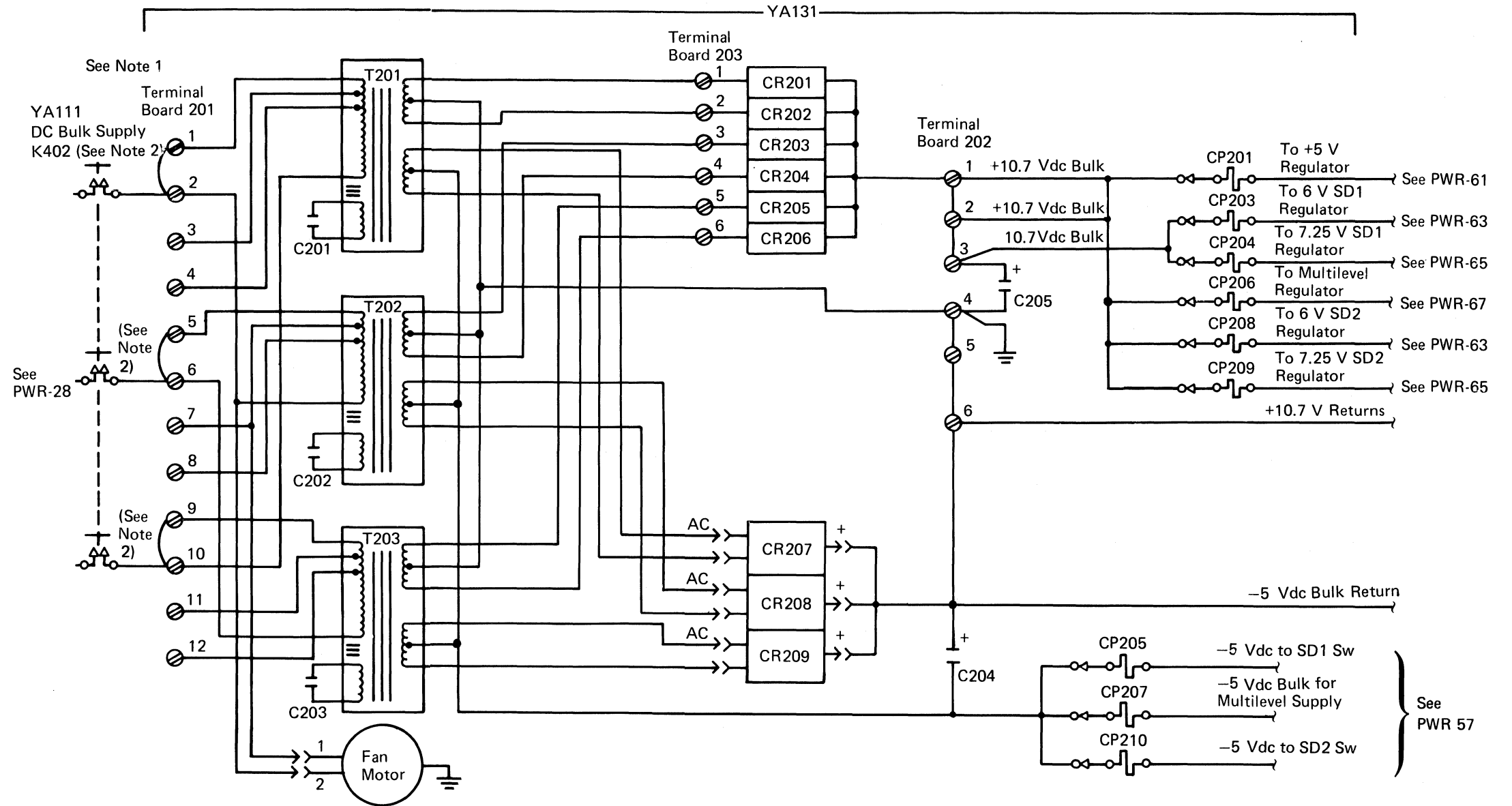
DANGER

Lethal voltages are present in the power servicing area. Safety is most important. Treat all circuits as live until measured. Capacitors are possible exploding devices. Wear safety glasses when working in the power area.

Always reinstall all safety covers before powering on the machine.

Notes:

1. See PWR-52 for machines with 22 card B4/B3 boards and without the Eight-Channel Switch feature installed. See PWR-53 for machines with 22 card B4/B3 boards and the Eight-Channel Switch Feature installed.
2. Jumpers are shown connected for 240 Vac 60 Hz. See YA131 for wiring information on other configurations.



This diagram is logically correct, but not point-to-point. See the MDM power diagrams for point-to-point wiring. (Use YAXXX reference to find the correct page.)

3880 MIM	AS0053	2290981	450906	450907	450908	450913
	Side 2 of 2	Part No.	15Aug80	10Dec80	15Apr81	12Jan83

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The bulk power panel circuit protectors control the distribution of dc power to the voltage regulators in the 3880. Circuit protectors, CP203 through CP205, control the regulators for storage director 1 and circuit protectors, CP208 through CP210, control the regulators for storage director 2. The following circuit protectors are on the bulk power panel:

- CP201, 10.7 Vdc input to 5 Vdc regulator
- CP203, 10.7 Vdc input to 6 Vdc regulator
- CP204, 10.7 Vdc input to 7.25 Vdc regulator
- CP205, -5 Vdc to storage director 1
- CP206, 10.7 or 24 Vdc input to the multilevel regulator
- CP207, -5 Vdc input to the multilevel regulator (see Note 1)
- CP208, 10.7 Vdc input to 6 Vdc regulator
- CP209, 10.7 Vdc input to 7.25 Vdc regulator
- CP210, -5 Vdc to storage director 2

CP201, 5 Vdc REGULATOR

Circuit protector 201 distributes 10.7 Vdc bulk power to the 5 Vdc regulator. This regulator supplies 5 Vdc to both storage directors (see YA132).

CP203, STORAGE DIRECTOR 1, 6 Vdc REGULATOR

Circuit protector 203 distributes 10.7 Vdc bulk power to the 6 Vdc regulator for storage director 1 (see YA132).

CP204, STORAGE DIRECTOR 1, 7.25 Vdc REGULATOR

Circuit protector 204 distributes 10.7 Vdc bulk power to the 7.25 Vdc regulator for storage director 1 (see YA132).

CP205, STORAGE DIRECTOR 1, -5 Vdc

Circuit protector 205 distributes -5 Vdc bulk power to storage director 1 (see YA132).

CP206, MULTILEVEL REGULATOR

Circuit protector 206 distributes 10.7 or 24 Vdc bulk power to the multilevel regulator (see YA132). This circuit protector supplies 8.5 Vdc or 12 Vdc to both storage directors in the 3880.

CP207, MULTILEVEL REGULATOR

Circuit protector 207 (see Note 1) distributes -5 Vdc bulk power to the multilevel regulator (see YA131). This circuit protector supplies -1.5 Vdc to both storage directors in the 3880.

CP208, STORAGE DIRECTOR 2, 6 Vdc REGULATOR

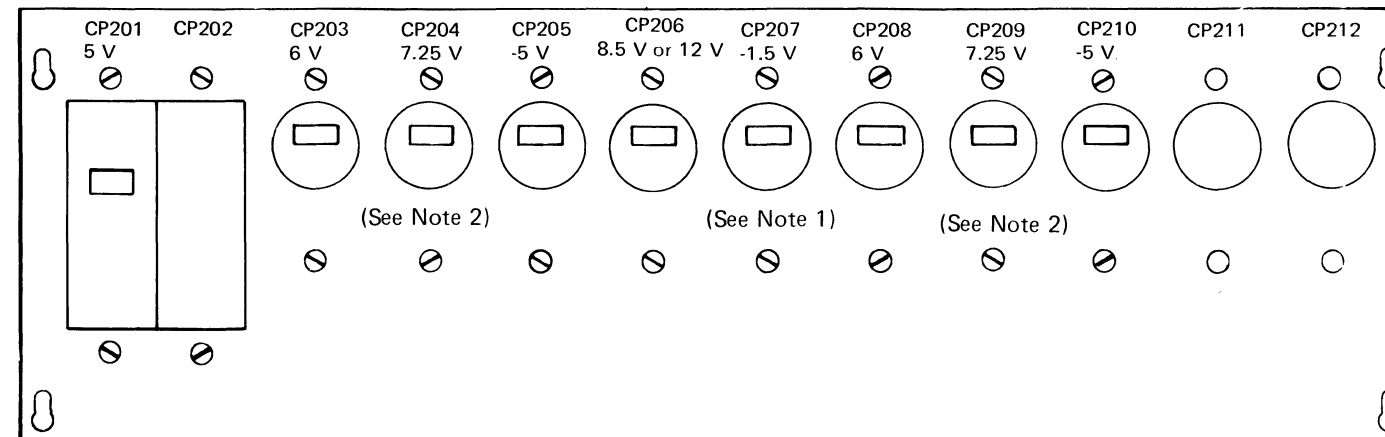
Circuit protector 208 distributes 10.7 Vdc bulk power to the 6 Vdc regulator for storage director 2 (see YA132).

CP209, STORAGE DIRECTOR 2, 7.25 Vdc REGULATOR

Circuit protector 209 distributes 10.7 Vdc bulk power to the 7.25 Vdc regulator for storage director 2 (see YA132).

CP210, STORAGE DIRECTOR 2, -5 Vdc

Circuit protector 210 distributes -5 Vdc bulk power to storage director 2 (see YA131).



Notes:

1. When CP207 is removed, the -1.5 Vdc regulator is installed on the gate between GTB-3 and GTB-4.
2. When the +7.25 Vdc regulator is removed (see LOC-25), circuit protectors CP204 and CP209 are also removed.

3880	AS0054	8498403	450900	450901	450906	450913	450915
MIM	Side 1 of 2	Part No.	13Jul79	14Sep79	15Aug80	12Jan83	14Oct83

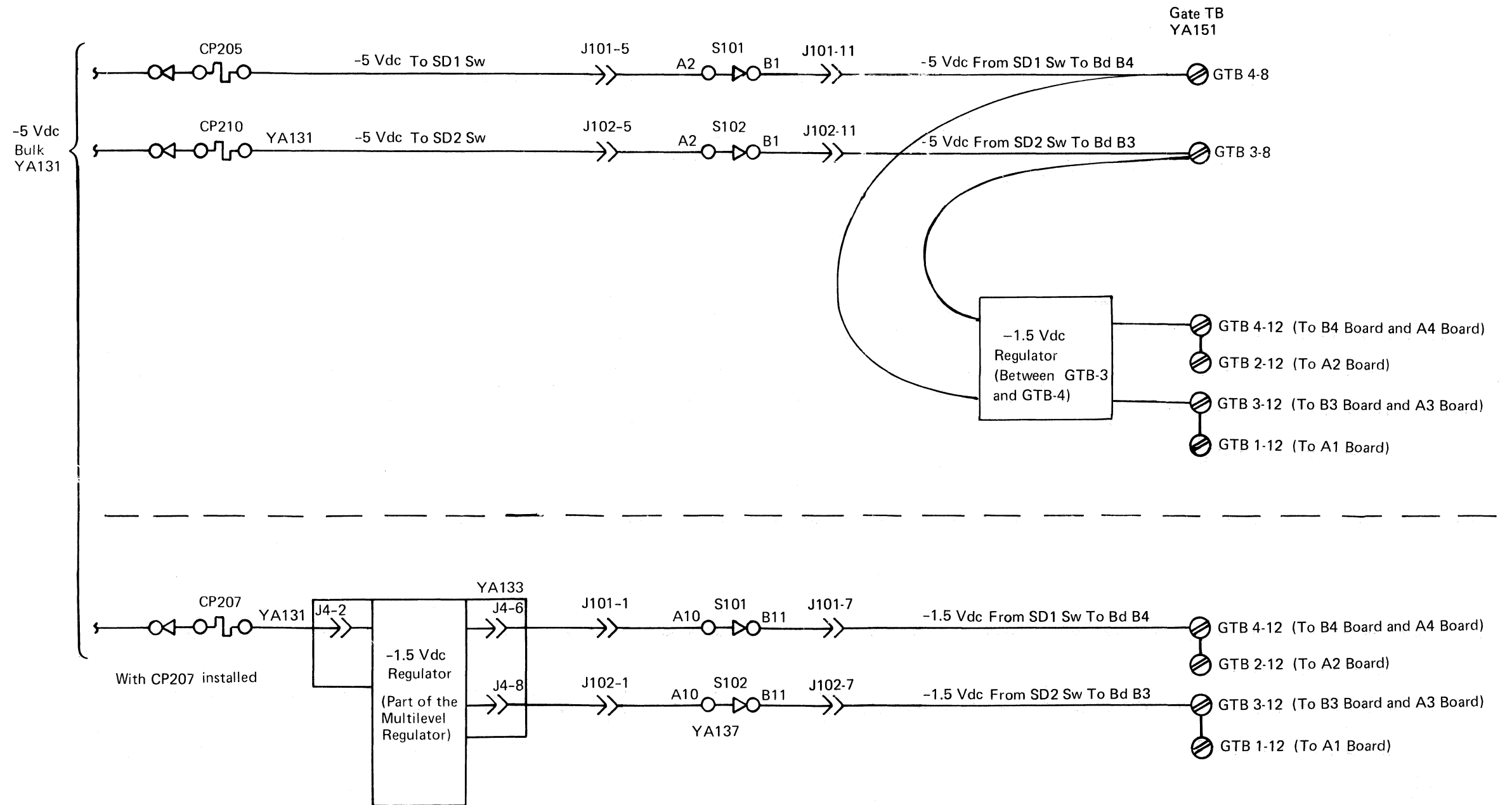
See LOC-25 for the location of the -1.5 Vdc regulator.

SERVICE AIDS

An open or short circuit in the sensing logic can cause an undervoltage symptom. A short circuit can overload the regulator causing a drop in the output voltage. An open circuit can cause a failure to sense a good voltage level.

When performing continuity checks with an ohmmeter, isolate the line being checked from the power supply or the logic boards to prevent inaccurate findings. (Parallel paths through electronic circuits can be misleading, causing ohmmeter readings that are difficult to interpret.)

This diagram is logically correct, but not point-to-point. See MDM power diagrams for point-to-point wiring. (Use YAXXX references to find correct page.)



AS0054	8498403	450900	450901	450906	450913	450915
Side 2 of 2	Part No.	13Jul79	14Sep79	15Aug80	12Jan83	14Oct83

-1.5 Vdc AND -5 Vdc DISTRIBUTION AND SENSE

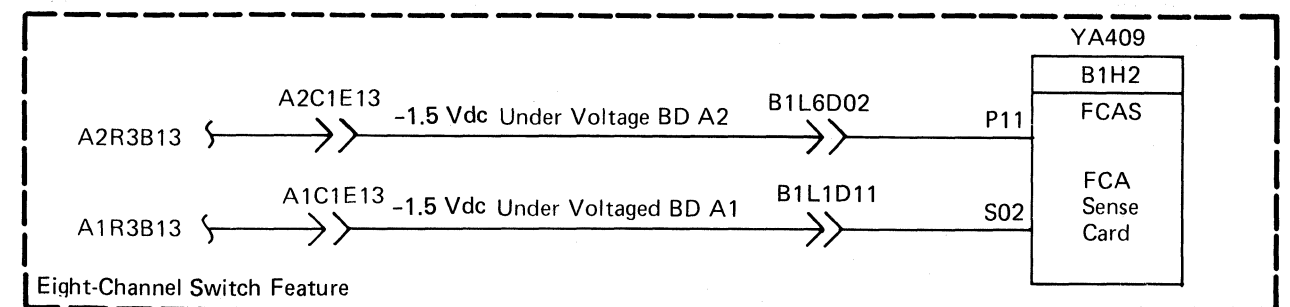
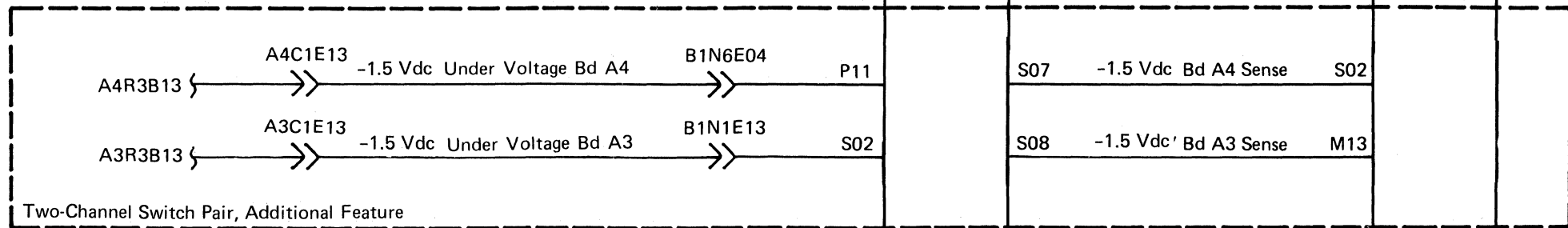
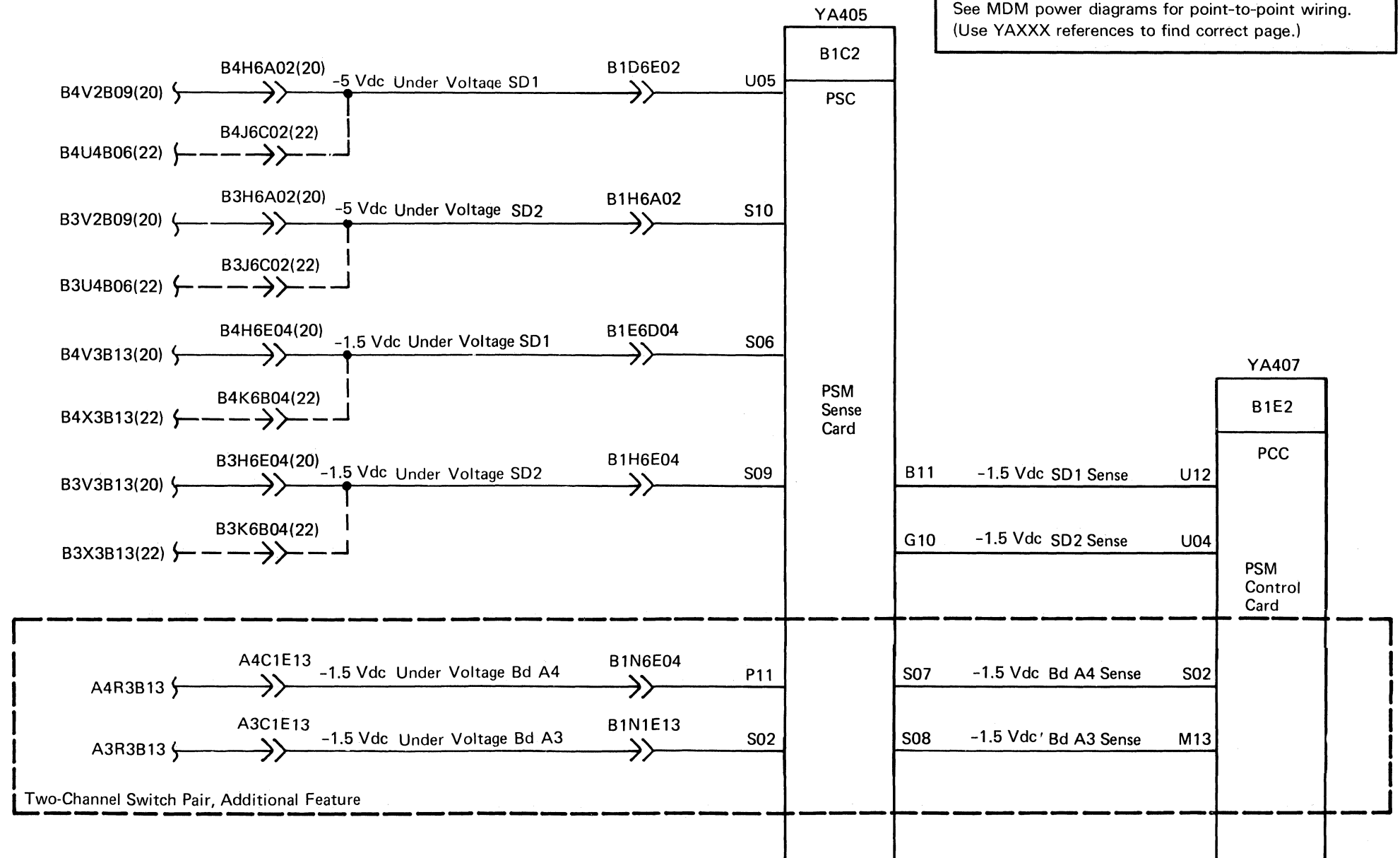
SERVICE AIDS

An open or short circuit in the sensing logic can cause an undervoltage symptom. A short circuit can overload the regulator causing a drop in the output voltage. An open circuit can cause a failure to sense a good voltage level.

When performing continuity checks with an ohmmeter, isolate the line being checked from the power supply or the logic boards to prevent inaccurate findings. (Parallel paths through electronic circuits can be misleading, causing ohmmeter readings that are difficult to interpret.)

The numbers (20) and (22) indicate that the card-pin reference is to either a 20- or 22-card B4/B3 board.

This diagram is logically correct, but not point-to-point. See MDM power diagrams for point-to-point wiring. (Use YAXXX references to find correct page.)



3880 MIM	AS0058 Side 1 of 1	8498739 Part No.	450906 15Aug80	450913 12Jan83	.	.	.
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+3 Vdc DISTRIBUTION AND SENSE

This page is not used if the +7.25 Vdc regulator is removed (see LOC-25). See LOC-25 for the location of the +3 Vdc regulator.

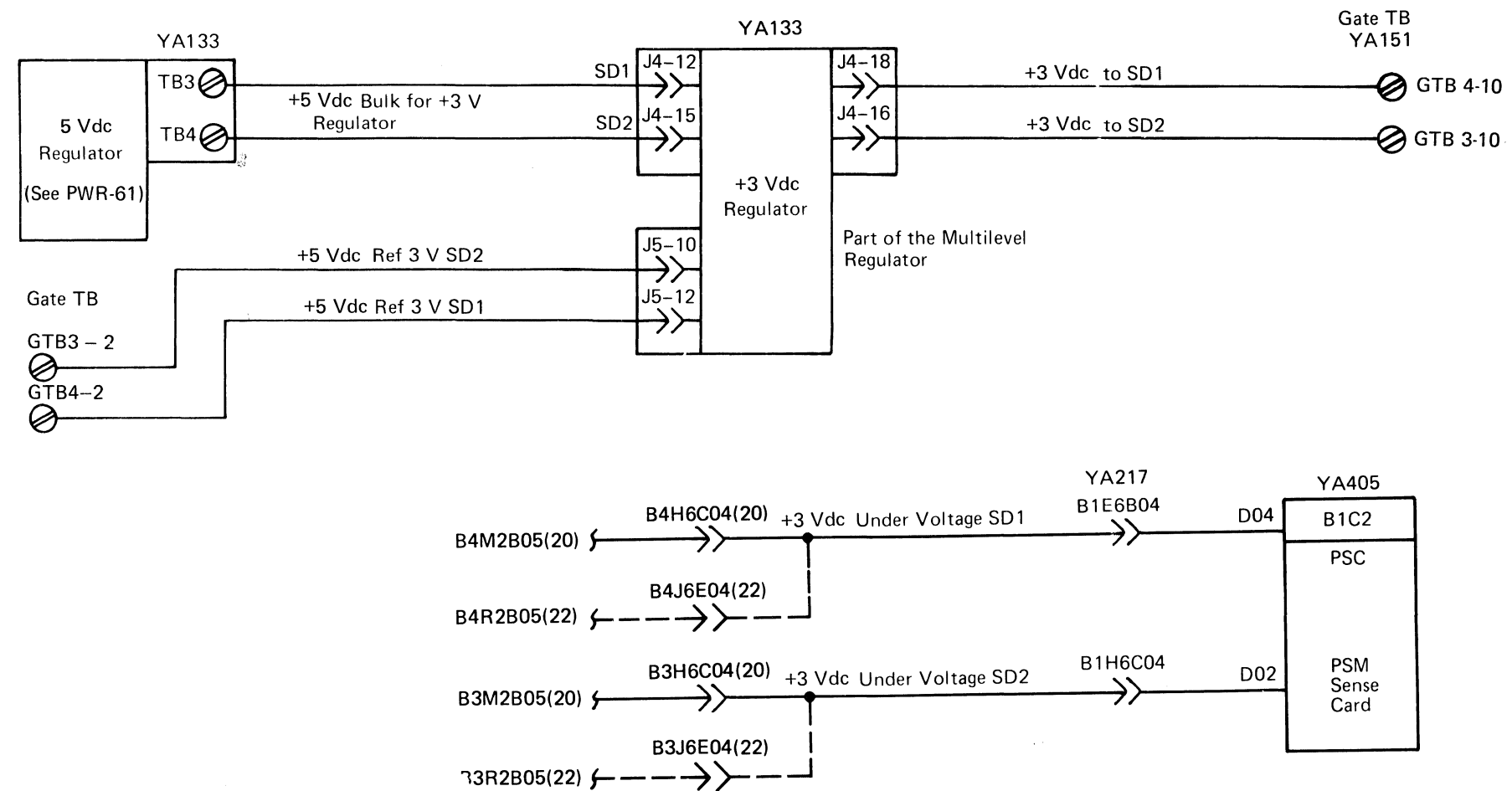
This diagram is logically correct, but not point-to-point. See MDM power diagrams for point-to-point wiring. (Use YAXXX references to find correct page.)

SERVICE AIDS

An open or short circuit in the sensing logic can cause an undervoltage symptom. A short circuit can overload the regulator causing a drop in the output voltage. An open circuit can cause a failure to sense a good voltage level.

When performing continuity checks with an ohmmeter, isolate the line being checked from the power supply or the logic boards to prevent inaccurate findings. (Parallel paths through electronic circuits can be misleading, causing ohmmeter readings that are difficult to interpret.)

The numbers 20 and 22 indicate that the card-pin reference is to either a 20- or 22-card B4/B3 board.



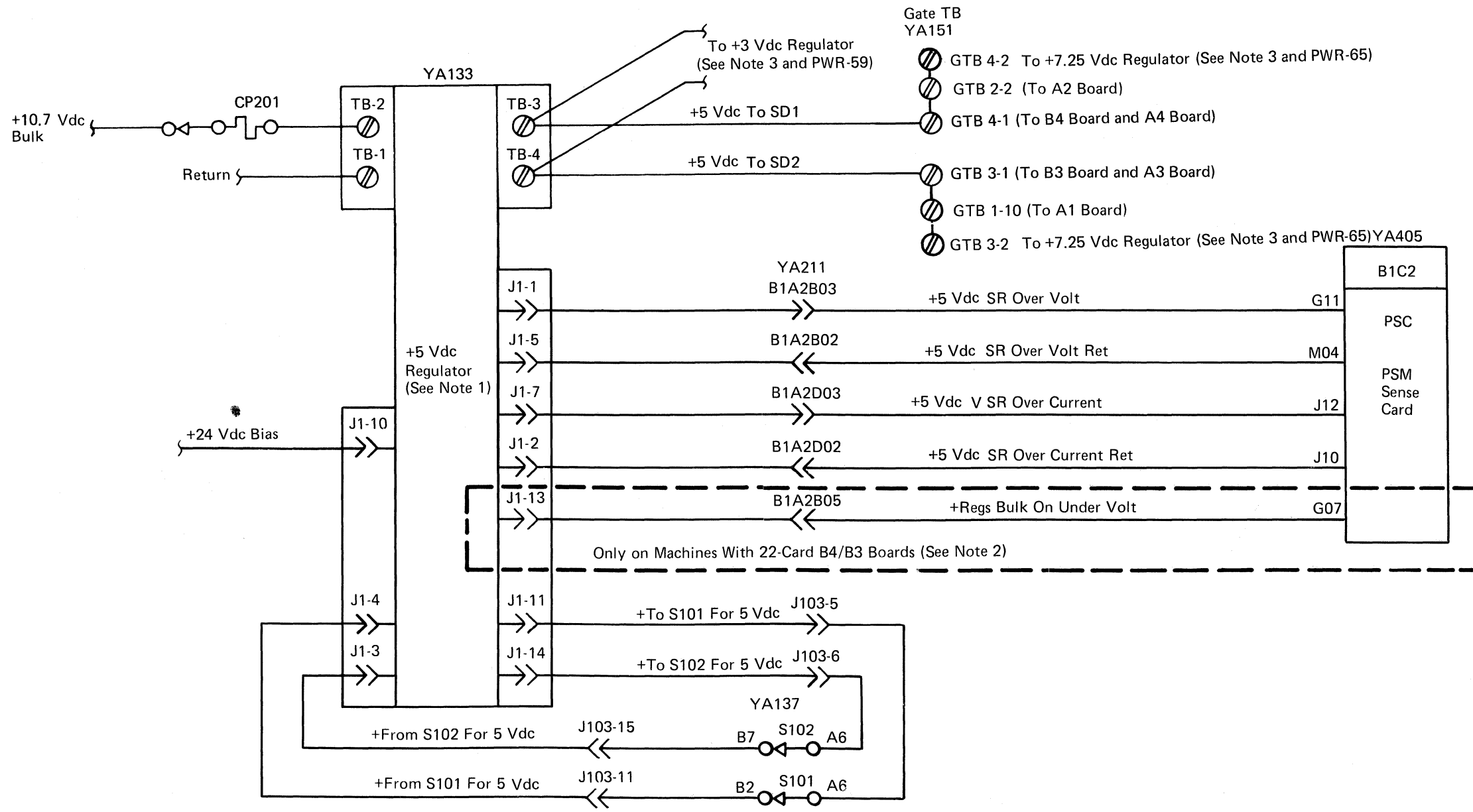
See LOC-20 for the location of the +5 Vdc regulator.

SERVICE AIDS

An open or short circuit in the sensing logic can cause an undervoltage symptom. A short circuit can overload the regulator causing a drop in the output voltage. An open circuit can cause a failure to sense a good voltage level.

When performing continuity checks with an ohmmeter, isolate the line being checked from the power supply or the logic boards to prevent inaccurate findings. (Parallel paths through electronic circuits can be misleading, causing ohmmeter readings that are difficult to interpret.)

This diagram is logically correct, but not point-to-point. See MDM power diagrams for point-to-point wiring. (Use YAXXX references to find correct page.)



1. The +7.25 Vdc regulator is referenced to the +5 Vdc regulators to maintain a +2.25 Vdc voltage difference. Loss of the 5 Vdc reference turns off the 7.25 Vdc regulator.

The 7.25 Vdc regulator must be checked and adjusted if necessary following any change in adjustment or replacement of the 5 Vdc regulator.

2. See PWR-67 for bulk sensing on machines with 20-card B4/B3 boards.

3. When the +7.25 Vdc regulator is removed (see LOC-25), the +3 Vdc and +7.25 Vdc voltages are not used.

The wires from GTB4-2 and GTB3-2 have been removed if the +7.25 Vdc regulator card is removed (see LOC-25).

+5 Vdc DISTRIBUTION AND SENSE

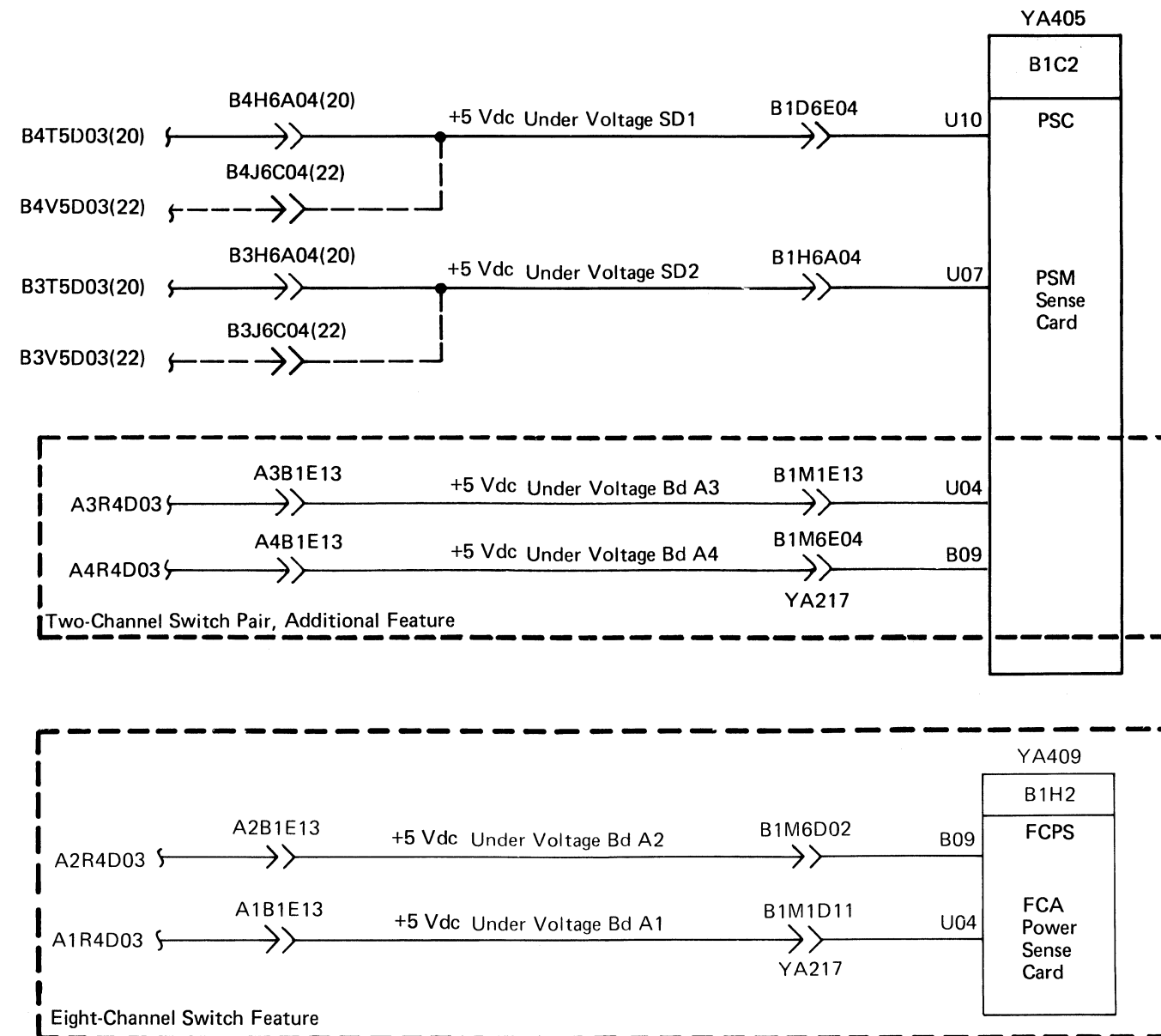
SERVICE AIDS

An open or short circuit in the sensing logic can cause an undervoltage symptom. A short circuit can overload the regulator causing a drop in the output voltage. An open circuit can cause a failure to sense a good voltage level.

When performing continuity checks with an ohmmeter, isolate the line being checked from the power supply or the logic boards to prevent inaccurate findings. (Parallel paths through electronic circuits can be misleading, causing ohmmeter readings that are difficult to interpret.)

The numbers (20) and (22) indicate that the card-pin reference is to either a 20- or 22-card B4/B3 board.

This diagram is logically correct, but not point-to-point. See MDM power diagrams for point-to-point wiring. (Use YAXXX references to find correct page.)



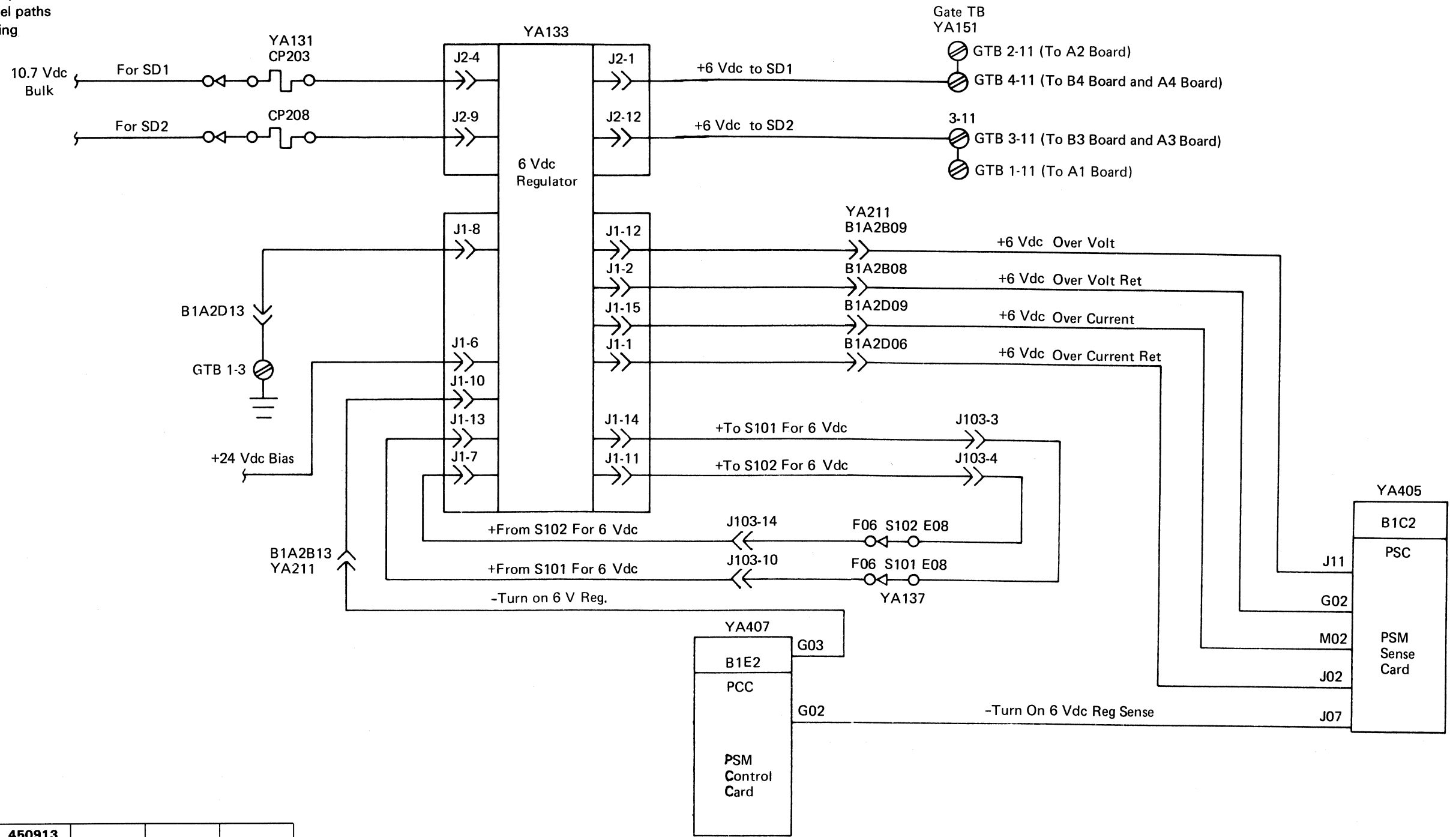
See LOC-25 for the location of the +6 Vdc regulator.

SERVICE AIDS

An open or short circuit in the sensing logic can cause an undervoltage symptom. A short circuit can overload the regulator causing a drop in the output voltage. An open circuit can cause a failure to sense a good voltage level.

When performing continuity checks with an ohmmeter, isolate the line being checked from the power supply or the logic boards to prevent inaccurate findings. (Parallel paths through electronic circuits can be misleading, causing ohmmeter readings that are difficult to interpret.)

This diagram is logically correct, but not point-to-point. See MDM power diagrams for point-to-point wiring. (Use YAXXX references to find correct page.)



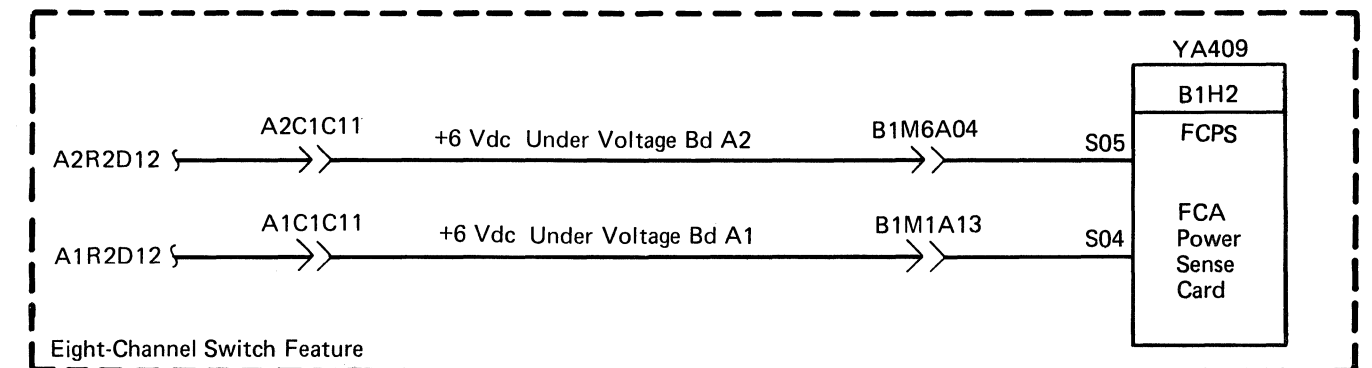
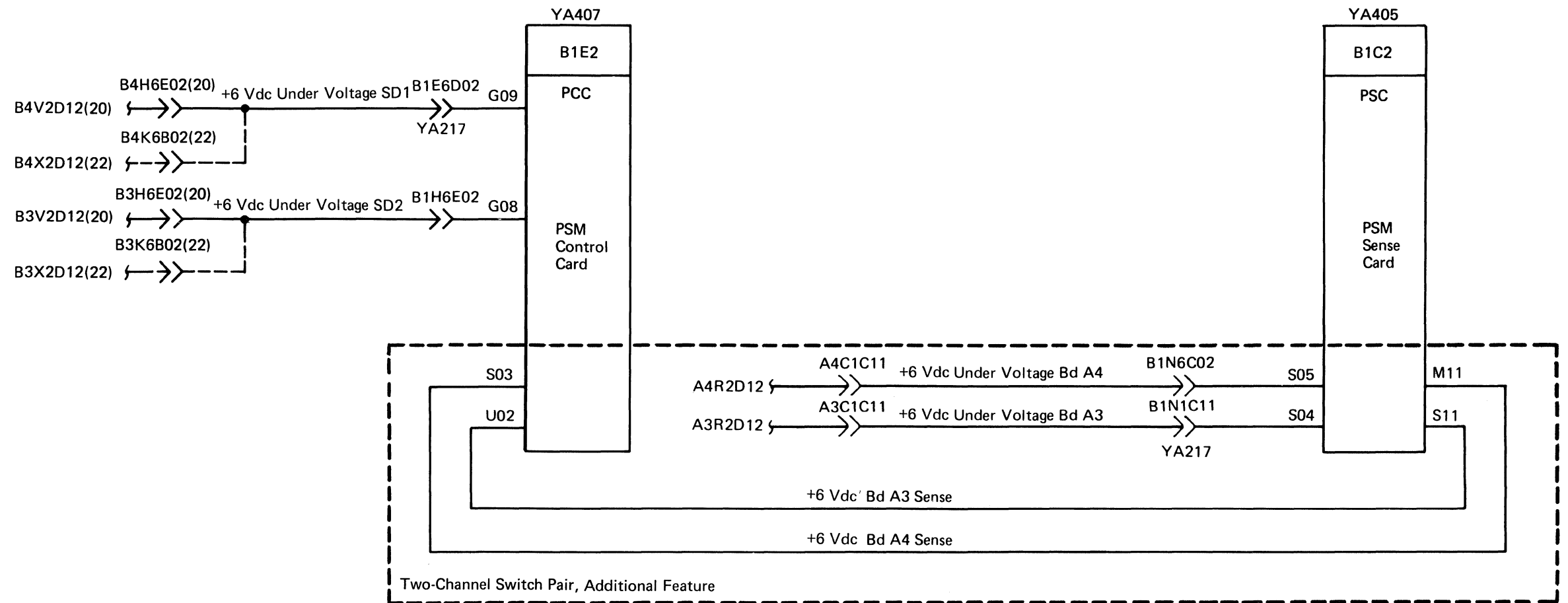
+6 Vdc DISTRIBUTION AND SENSE

SERVICE AIDS

An open or short circuit in the sensing logic can cause an undervoltage symptom. A short circuit can overload the regulator causing a drop in the output voltage. An open circuit can cause a failure to sense a good voltage level.

When performing continuity checks with an ohmmeter, isolate the line being checked from the power supply or the logic boards to prevent inaccurate findings. (Parallel paths through electronic circuits can be misleading, causing ohmmeter readings that are difficult to interpret.)

The numbers (20) and (22) indicate that the card-pin reference is to either a 20- or 22-card B4/B3 board.



3880	AS0063	8498405	450900	450901	450903	450906	450913
MIM	Side 1 of 2	Part No.	13Jul79	14Sep79	25Jan80	15Aug80	12Jan83

+7.25 Vdc DISTRIBUTION AND SENSE

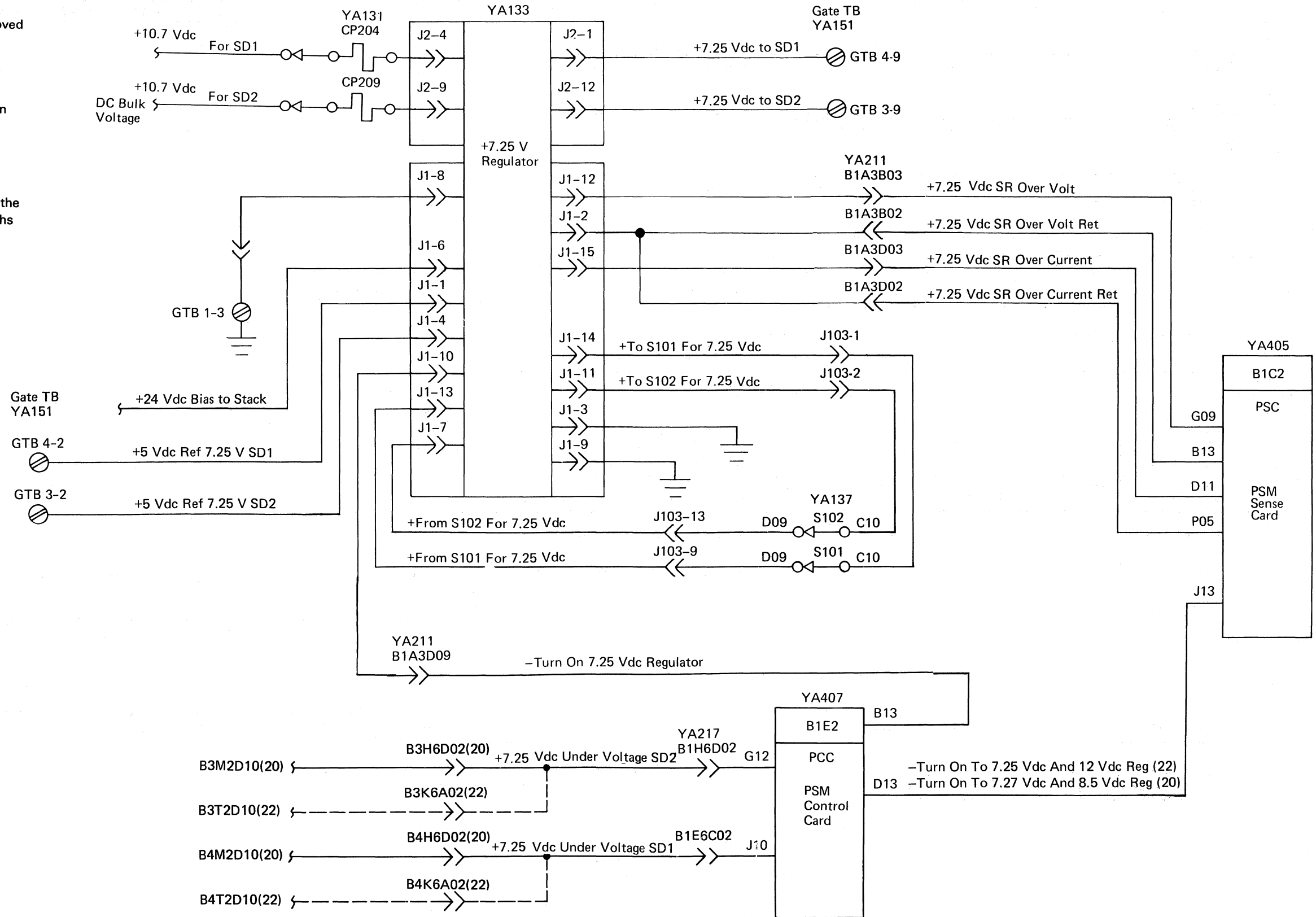
This page is not used if the +7.25 Vdc regulator is removed (see LOC-25).

SERVICE AIDS

An open or short circuit in the sensing logic can cause an undervoltage symptom. A short circuit can overload the regulator causing a drop in the output voltage. An open circuit can cause a failure to sense a good voltage level.

When performing continuity checks with an ohmmeter, isolate the line being checked from the power supply or the logic boards to prevent inaccurate findings. (Parallel paths through electronic circuits can be misleading, causing ohmmeter readings that are difficult to interpret.)

The numbers (20) and (22) indicate that the card-pin reference is to either a 20- or 22-card B4/B3 board.



3880
MIM

AS0063	8498405	450900	450901	450903	450906	450913
Side 2 of 2	Part No.	13Jul79	14Sep79	25Jan80	15Aug80	12Jan83

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+8.5 Vdc AND BULK DISTRIBUTION AND SENSE (20-Card B4/B3 Boards)

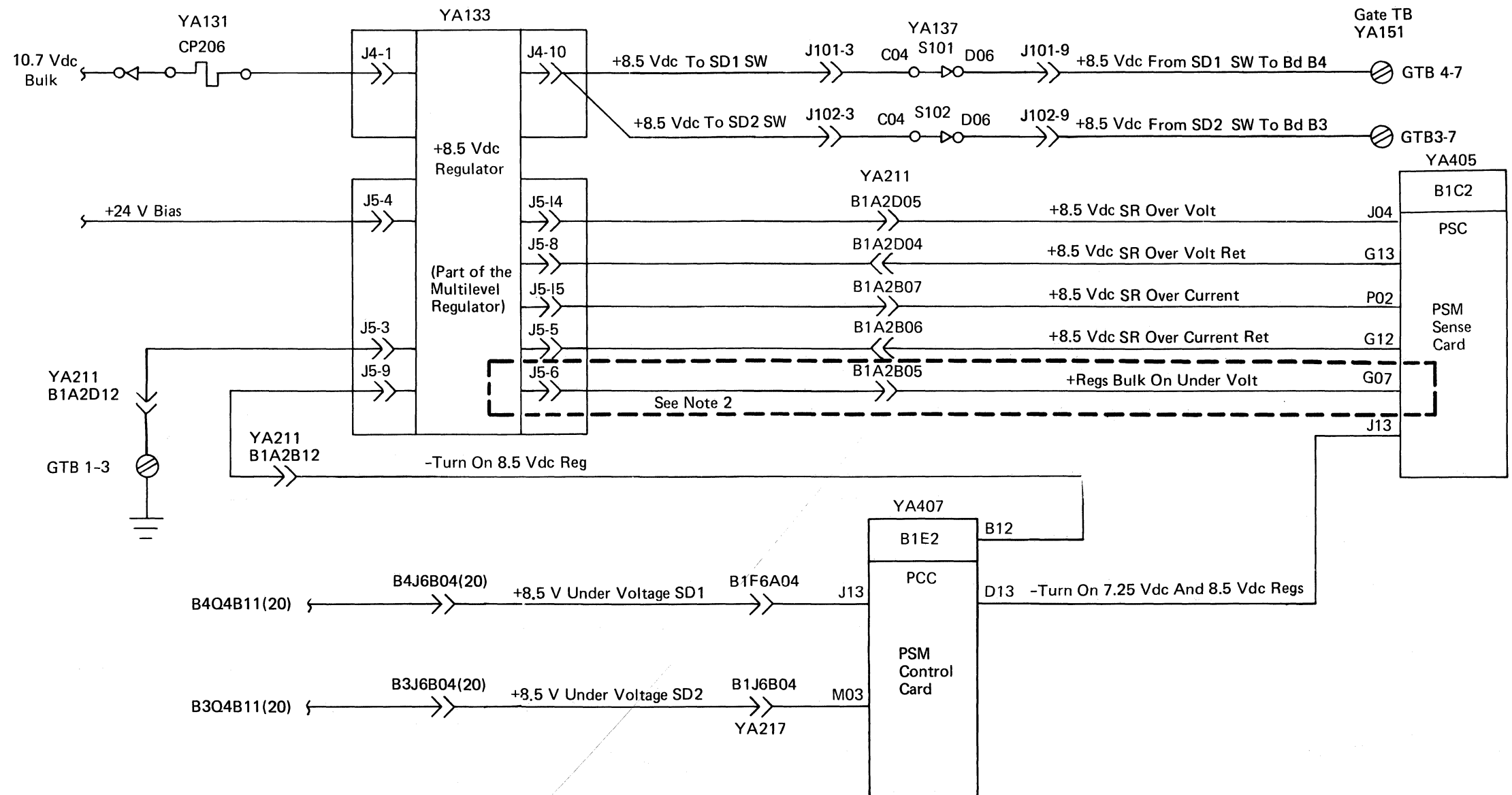
See LOC-25 for the location of the +8.5 Vdc regulator.

SERVICE AIDS

An open or short circuit in the sensing logic can cause an undervoltage symptom. A short circuit can overload the regulator causing a drop in the output voltage. An open circuit can cause a failure to sense a good voltage level.

When performing continuity checks with an ohmmeter, isolate the line being checked from the power supply or the logic boards to prevent inaccurate findings. (Parallel paths through electronic circuits can be misleading, causing ohmmeter readings that are difficult to interpret.) **Notes:**

This diagram is logically correct, but not point-to-point. See MDM power diagrams for point-to-point wiring. (Use YAXXX references to find correct page.)



Notes:

1. See PWR-68 for machines with 22-card B4/B3 boards.
2. See PWR-61 for bulk sensing on machines with 22-card B3/B4 boards.

3880 MIM	AS0067 Side 1 of 2	8498406 Part No.	See EC History	450908 15Apr81	450913 12Jan83		
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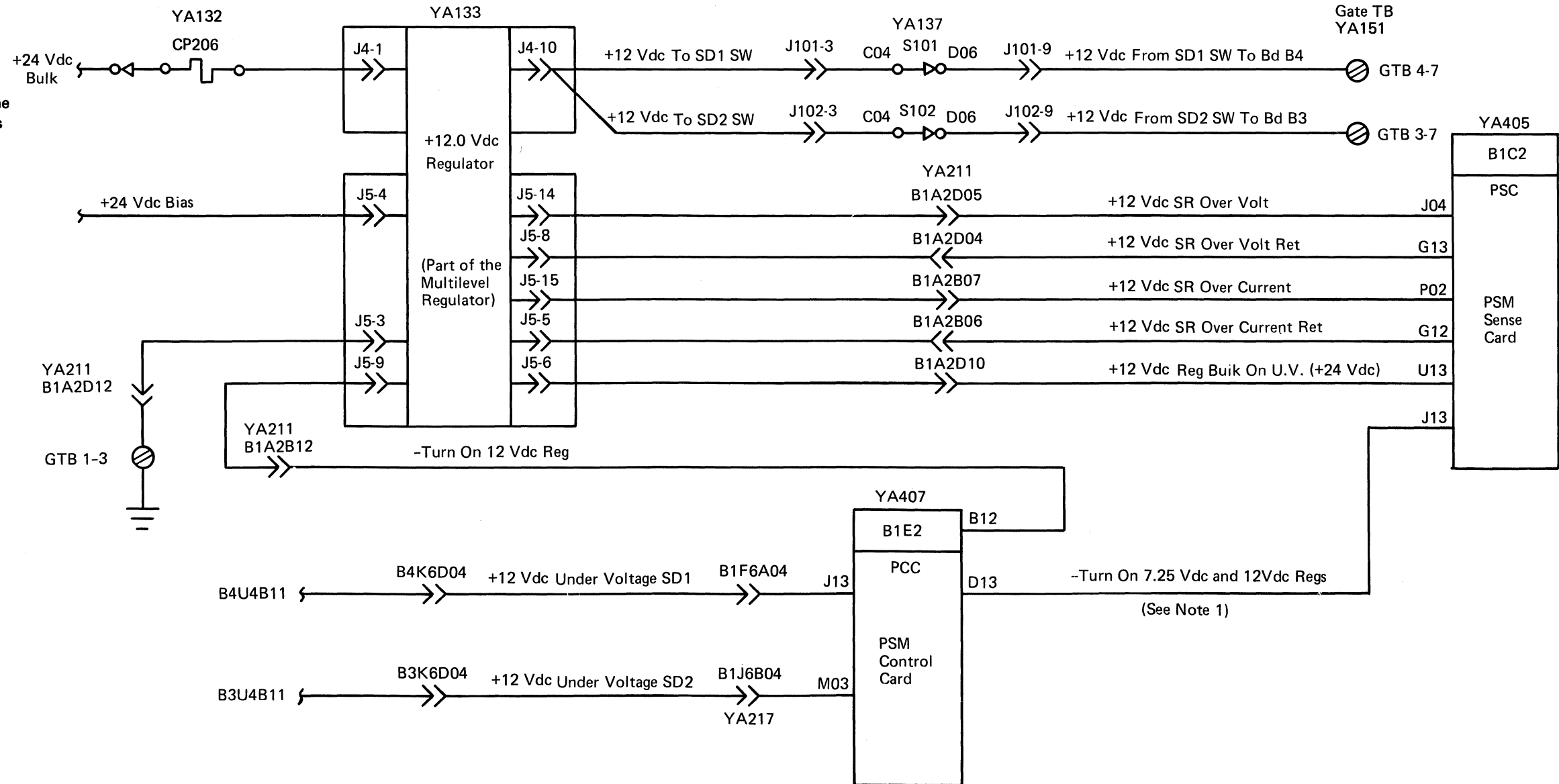
See PWR-67 for machines with 20-card B4/B3 boards. See LOC-25 for the location of the +12 Vdc regulator.

This diagram is logically correct, but not point-to-point. See MDM power diagrams for point-to-point wiring. (Use YAXXX references to find correct page.)

SERVICE AIDS

An open or short circuit in the sensing logic can cause an undervoltage symptom. A short circuit can overload the regulator causing a drop in the output voltage. An open circuit can cause a failure to sense a good voltage level.

When performing continuity checks with an ohmmeter, isolate the line being checked from the power supply or the logic boards to prevent inaccurate findings. (Parallel paths through electronic circuits can be misleading, causing ohmmeter readings that are difficult to interpret.)



Notes:

1. The -Turn On 7.25 Vdc and 12 Vdc Regs is a line name. It is used even if the +7.25 Vdc regulator card is removed (see LOC-25).

3880 MIM	AS0067 Side 2 of 2	8498406 Part No.	See EC History	450908 15Apr81	450913 12Jan83		
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PRIMARY POWER PANEL

See LOC-50 (50 Hz) or LOC-55 (60 Hz and 50 Hz for Japan) for the location of the primary power panel.

The primary power panel contains the primary ac circuit breaker (CB), ac circuit protectors (CPs), and the diskette drive switch. On this panel are:

- CB401, primary ac circuit breaker
- CE convenience outlet.
- SW401, diskette drive ac power switch
- CP401, 24 Vdc bootstrap
- CP402, input for 24 Vac transformer
- CP403, CE convenience outlet
- CP404, ac input for maintenance power supply
- CP406, ac input for storage director power supply

CB401, PRIMARY AC CIRCUIT BREAKER

Circuit breaker 401 is the main ac circuit breaker in the 3880 (see YA111). In the Off position, ac power is removed from every power supply in the 3880. Main ac power is present in this box.

SW401, DISKETTE DRIVE AC

Switch 401 controls power to the diskette drive motor (see YA111).

CP401, 24 Vdc BOOTSTRAP

Circuit protector 401 distributes 24 Vdc to the power control circuits and the cover interlock switches (see YA115).

CP402, INPUT FOR 24 Vac TRANSFORMER

Circuit protector 402 distributes input ac power to the +24 Vdc bootstrap transformer (see YA115).

CP403, CE CONVENIENCE OUTLET

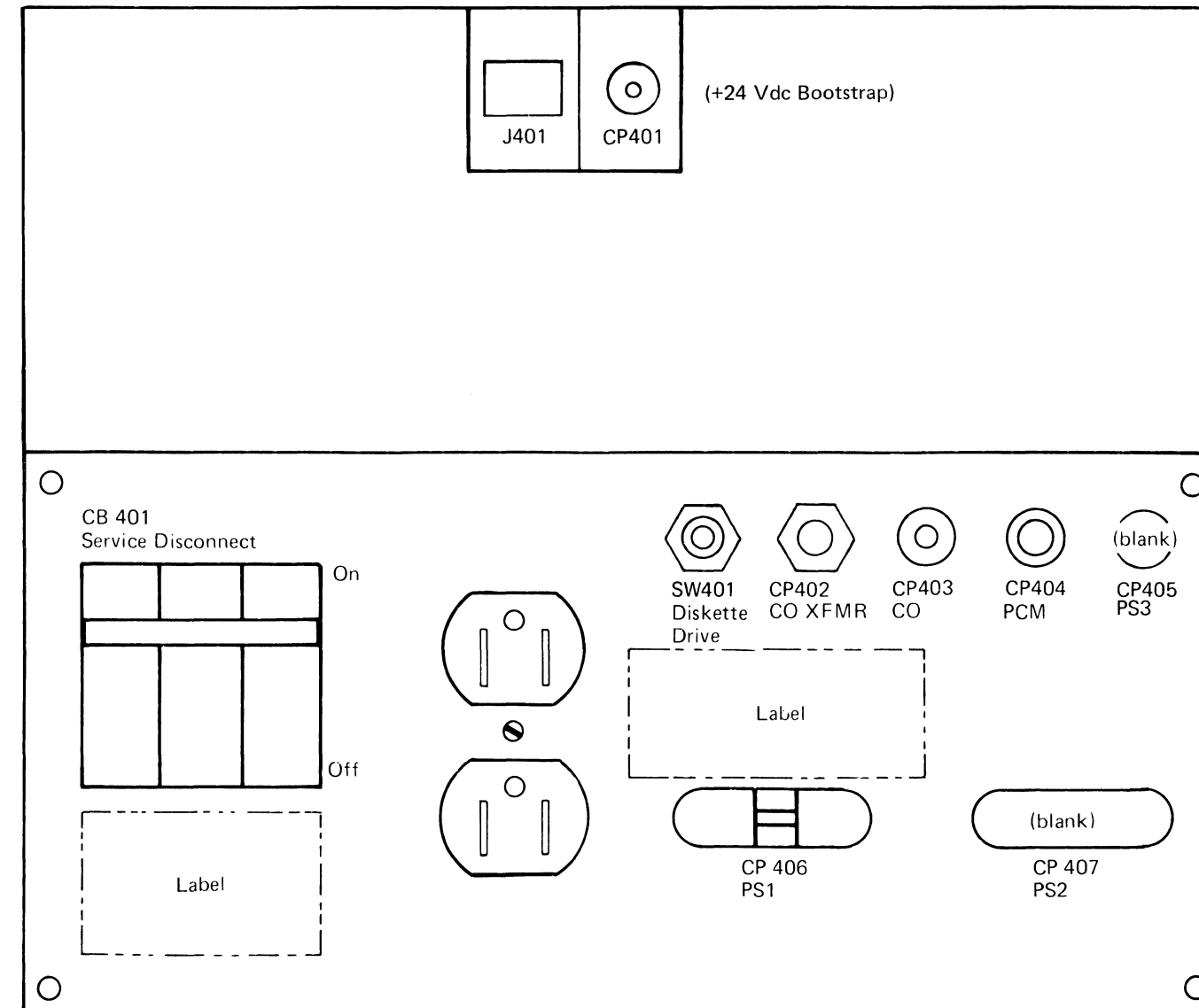
Circuit protector 403 distributes ac power to the CE convenience outlet (see YA115).

CP404, MAINTENANCE POWER AC INPUT

Circuit protector 404 distributes ac power to the maintenance power supply (PSM power supply). See YA111.

CP406, STORAGE DIRECTOR POWER SUPPLY AC INPUT

Circuit protector 406 distributes ac power to the storage director power supply (PS1). See YA111.



3880 MIM	AS0074	8498407	See EC	450913	450915		
	Side 1 of 2	Part No.	History	12Jan83	14Oct83	.	.

The operator panel has the following controls and indicators:

- Unit Emergency switch
- Subsystem Power switch and indicators
- Subsystem Configuration indicators and switches

UNIT EMERGENCY SWITCH

The Unit Emergency switch is normally in the Power Enable (up) position (see YA171). In this position, subsystem power is controlled by either the system, the Subsystem Power On/Off switch on the operator panel or the Maintenance Power On switch on the power switch panel.

The Power Off (down) position removes power from the 3880, disables all other 3880 power switches, and inhibits the subsystem power-on sequence. The normal power-off sequence is not performed, and all 3880 operations and attached devices are stopped.

CAUTION

The Unit Emergency switch does not cycle off subsystem power. Because the power is not cycled off, customer data can be lost and devices attached to the 3880 can be damaged.

SUBSYSTEM POWER SWITCH AND INDICATORS

The Subsystem Power switch turns 3880 power on and off. The indicators show the status of the power-on sequence and the power supplies.

Subsystem Power On/Off Switch

The Subsystem Power On/Off switch turns ac power on or off to the 3880 subsystem (see YA171). Pressing the top of this switch turns ac power on; pressing the bottom of this switch turns ac power off. The power-on function of this switch is disabled when the Unit Emergency switch is in the Power Off position or when the Power Select switch (on the power switch panel) is in the Local position. The power-off function is not disabled by the Local position of the Power Select switch.

The Subsystem Power On/Off switch does not have to be used to turn 3880 power on when the Power Select switch is in the Remote position. The system power-on sequence of an enabled processing unit can start the 3880 power-on sequence.

Power On Indicator

The Power On indicator lights when the ac power is turned on to all power supplies in the 3880 (see YA171).

Power Seq Complete Indicator

The Power Seq (Sequence) Complete indicator lights when the 3880 subsystem (including the attached devices) power-on sequence is completed (see YA171).

Check Indicator

The Subsystem Power Check indicator lights when a failure is sensed in the 3880 power supplies (see YA171). The Check indicator and the Power Check register are reset by pressing the DC Power System switch on the power switch panel to the On position.

SUBSYSTEM CONFIGURATION INDICATORS AND SWITCHES

The subsystem configuration portion of the operator panel contains a set of indicators and switches for each storage director. The storage director indicators display the status of the 3880 storage director.

The channel switches enable or disable the processing unit channel to the storage directors.

Check Indicator

The storage director Check indicator lights when the storage director senses any check condition (see YA171).

Wait Indicator

The Wait indicator lights when the storage director is not processing information and is waiting for a request from the channel, drive, or MD (see YA171).

Status Pending Indicator

The Status Pending indicator lights when the storage director is not processing information and is waiting for either a channel to accept status information (in contingent connection) or a device to respond during a storage director device retry. See YA171.

Process Indicator

The Process indicator lights when the storage director is processing information (see YA171).

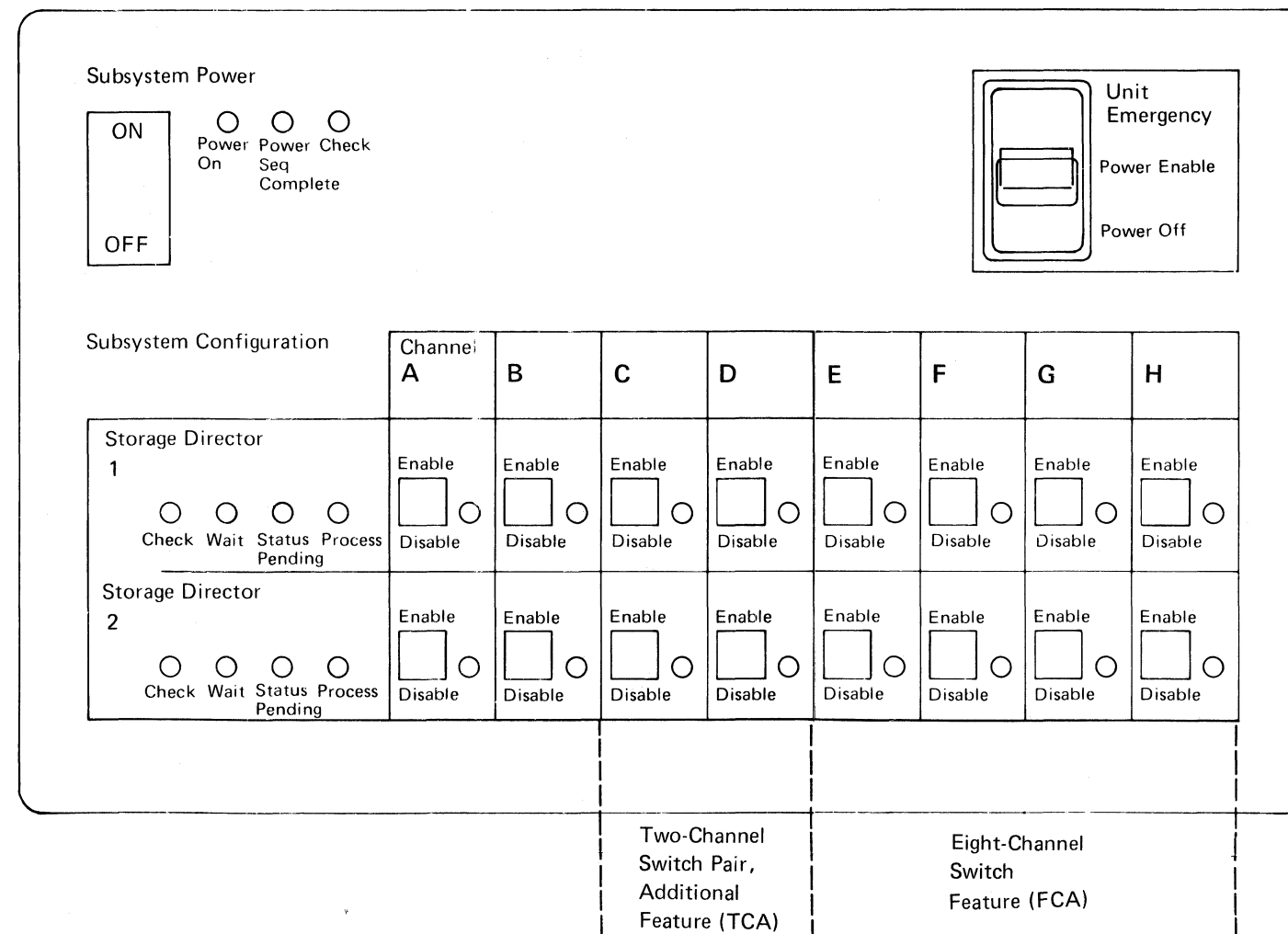
Channel Switches

The channel switches in the Enable position permit data flow between the indicated channel and the storage director (see YA171 or YA173).

The channel switches in the Disable position stop the flow of data between the indicated channel and the storage director.

Disable Indicators

The Disable indicator for each channel switch lights to indicate that the channel is disabled. See YA171 or YA173.



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CIRCUIT OBJECTIVES

This circuit gives support to power on/off control by the 3880 or by the supporting system.

SEQUENCING PREREQUISITES

When the Power Select switch on the power switch panel is set to the Remote position, the sequence-complete relays, K703 and K704 **1** must be picked to return the Power Sequence Complete line to the host system **4**. When the Power Select switch is set to the Local position, the K703 and K704 relay points are bypassed. If the Unit Emergency (UE) **2** switch is in the Off position, K703 and K704 are picked immediately. This condition prevents a system hang if the storage director has been turned off by the Unit Emergency switch.

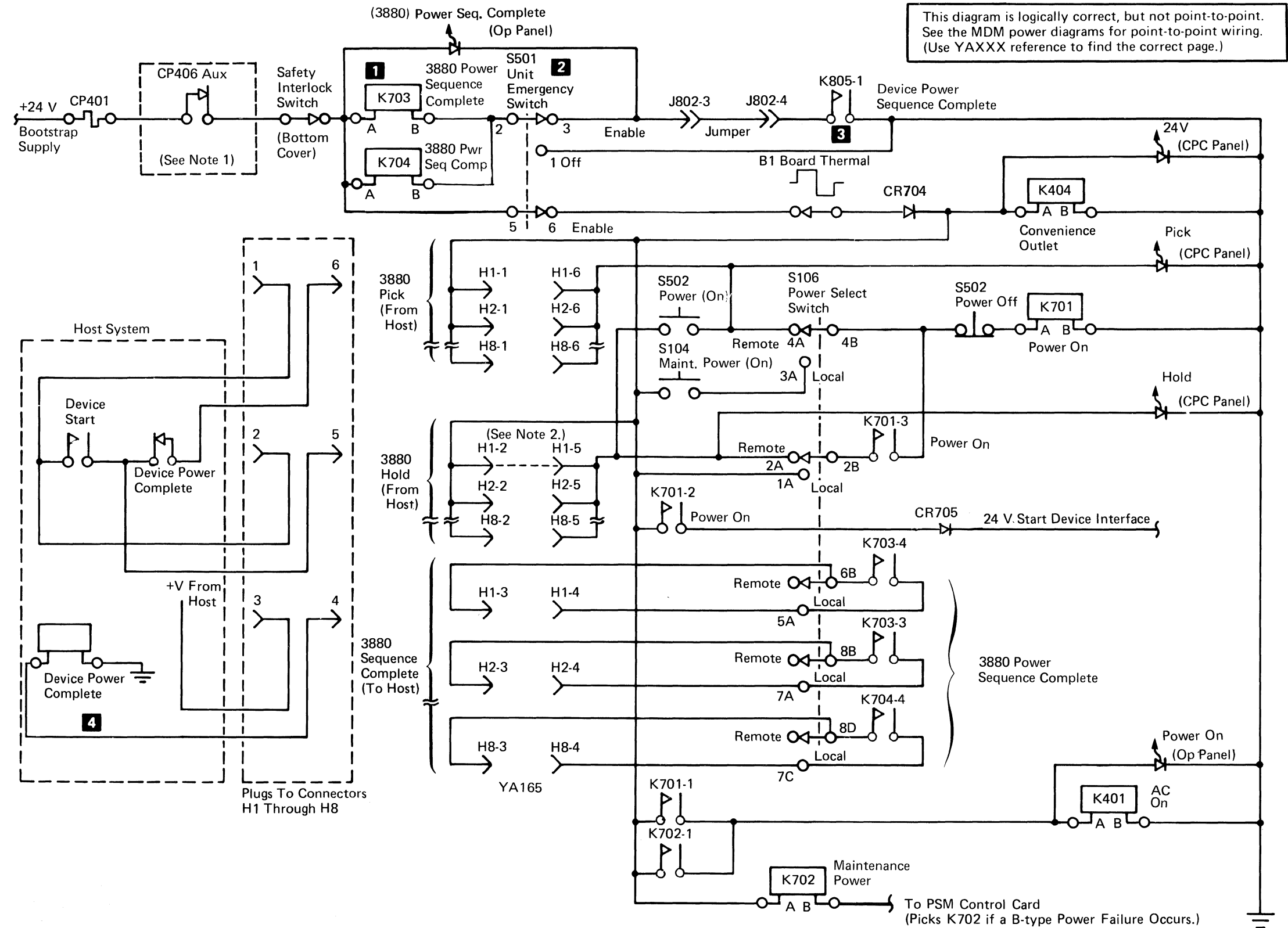
Relay K805 must be picked first to supply a ground return **3** so that relays K703 and K704 can be picked. Relay K805 is picked when all attached device strings return their power sequence complete levels to the storage director (see PWR-82).

Parts with 3-digit numbers are found on the following pages.

- 1XX on YA137 and YA181
- 2XX on YA131
- 3XX on YA121
- 4XX on YA111 and YA115
- 5XX on YA171
- 7XX on YA161 and YA163
- 8XX on YA191

Notes:

1. CP406 Aux contacts are installed on all 50 Hertz machines except those for Japan.
2. A jumper must be installed between the 2 pin and the 5 pin of an H connector to power-on with the Power Select switch in the Remote position and no host selection.



3880 MIM	AS0076 Side 1 of 2	8498408 Part No.	See EC History	450913 12Jan83	450914 10Jun83	.	.
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SEQUENCING ATTACHED DEVICE STRINGS

Up to eight attached device strings (controller and attached devices) are started in two groups of four each. If there are less than eight device strings, dummy plugs must be used so all sequencing relays can be energized.

Note: If the Device Power Sequencing switch is in the Disable position, the Power Sequence Complete indicator turns on when +24 Vdc is applied to the device interface board. Relay K810 does not pick. All power sequencing relays pick as soon as the device strings are powered on or if dummy plugs are installed.

Odd-Numbered Device Strings

The first group of four device strings is started by energizing relay K810 (Start Odd-Numbered Device Strings). Primary power relay K701 must be picked and a start request received from the power sequencer and monitor (PSM) control card to pick relay K810. The start request is actually a logical ground return for relay K810. Once K810 is picked, it holds power by the K810 contacts. The pick signal from the PSM control card is no longer needed.

Device Power Control Connectors	Device Power String Relays	
	Start Device	Device Complete
D1	K810-13/14	K807-2
D2	K811-11/12	K804-2
D3	K810-5/6	K801-2
D4	K811-7/8	K808-2
D5	K810-9/10	K802-2
D6	K811-13/14	K809-2
D7	K810-15/16	K806-2
D8	K811-5/6	K803-3

Note: Each of the relays has an LED across its coil signifying the device string is powered on.

When relay K810 is picked, device strings 1, 3, 5, and 7 are started. The corresponding Device Complete relays K801, K802, K806, and K807 pick because the device strings are powered on or a dummy plug is in the cable connector. Also, the correct LED on the device interface board is lighted as each hold relay is picked. Each hold relay has its own hold point to prevent powering off the subsystem if any of the devices power off. Relay K811 (Start Even-Numbered Device Strings) picks when all of the odd-numbered device strings are powered on.

Even-Numbered Device Strings

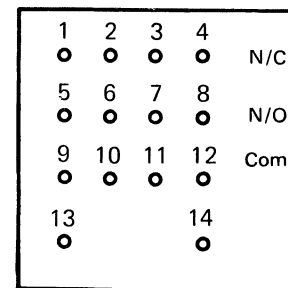
Relay K811 (Start Even-Numbered Device Strings) starts device strings 2, 4, 6, and 8. The comparable hold relays K803, K804, K808, and K809 are picked when the device strings are powered on or a dummy plug is in the cable connector. Also, the correct LED is lighted on the device interface board as each of the hold relays is picked.

If the even-numbered (last group of four) device strings are all successfully powered on, relay K805 can pick. The K805-1 contact point causes relays K703 and K704 to pick and complete the power sequence; the indicator turns on at the operator panel.

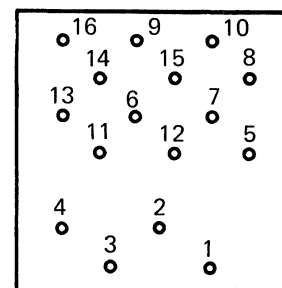
Relay Terminal Locations

The relay terminal locations, K801 through K809, K810 and K811 (wiring side) are shown in the following illustration.

K801 through K809



K810 and K811



Relays K701 through K704 are interchangeable with relays K801 through K809.

Note: Common relays can be swapped to verify failing relays.

Start Power Device Sequence Driver

The start device power sequence driver circuit is located on the power sequencer and monitor B1E2 control card and is turned on after power on reset is dropped. If the attached device string is connected to two 3880s, either 3880 can power up the string. If one 3880 powers up the string, the second 3880, when powered on, receives an immediate Device Power Sequence Complete and the Power Sequence Complete indicator comes on. This occurs even if the second 3880 has an action-B failure while powering on.

An action-B failure powers off the 3880 because of a failure in its power system.

3880 MIM	AS0076	8498408	See EC History	450913	450914	.	.
	Side 2 of 2	Part No.		12Jan83	10Jun83	.	.

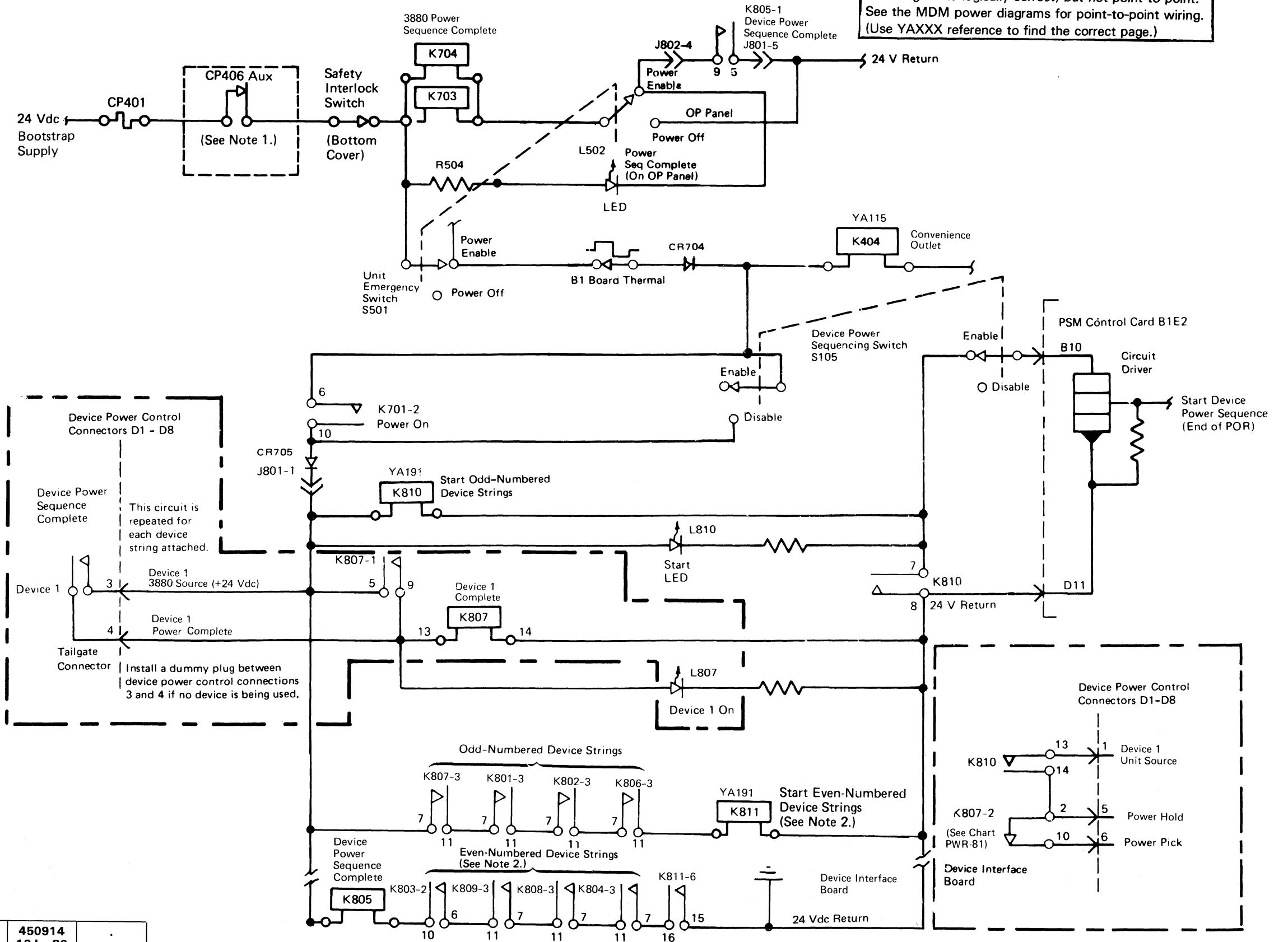
POWER-ON SEQUENCE FOR ATTACHED DEVICE STRINGS

SERVICE AIDS

Relays K810 and K811 can be swapped to aid in diagnosis. K801 through K809 are all the same kind of relay and can be swapped.

The status (activated or de-activated) of the relays on the device interface board can be easily determined during diagnosis. With 3880 power on, observe a relay as you remove and re-install it. You can feel and hear the relay as it releases and picks.

This diagram is logically correct, but not point-to-point. See the MDM power diagrams for point-to-point wiring. (Use YAXXX reference to find the correct page.)



Note:

1. CP406 Aux contacts are installed on all 50 Hertz machines except those for Japan.
2. If all even-numbered strings have dummy plugs, failure to pick K805 could be caused by K811 not being picked.

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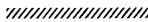
Legend:  The bar indicates the active condition of the signal, not its level.
 The shaded area indicates variable timing.

Chart Line No.	Signal Name	Logic Page Number	Level	Key	
1	End of POR for Storage Directors	YA407	+	4	PWR Sequence Start Driver
2	Pick K810 Start Odd-Numbered Device Strings	YA191	+	2	1
3	Relay K810-7, 8	YA191	+	3	2 Hold K810 Relay
4	Relay K810-13/14, 5/6, 9/10, and 15/16 (See PWR-84)	YA191	+		3 Start Power Up For Controllers 1, 3, 5, 7
5	Relays K807, K801, K802, and K806	YA191		5	4 Picked By Controllers
6	Relays K801, K802, K806, K807 #3 N/O	YA191		6	5 Pick K811 Start Even-Numbered Device Strings
7	Relay K811-11/12, 7/8, 13/14, and 5/6 (See PWR-84)	YA191			6 Start Power Up For Controllers 2, 4, 6, 8
8	Relays K804, K808, K809, and K803	YA191			7 Picked By Controllers Device Complete
9	Relays K803, K804, K808, and K809 #2 or 3 N/O +K811 15/16	YA191		7	8 Pick K805 Device Pwr Seq Comp
10	Relay K805-1 picks sequence complete relay and turns on the indicator	YA191		1	9 Relays K703 and K704 3880 Pwr Seq Comp (to Host System)

Note: Circuit diagram is on PWR-84.

3880 MIM	AS0082 Side 2 of 2	8498409 Part No.	See EC History	450911 29Dec82	450913 12Jan83	450914 10Jun83	.
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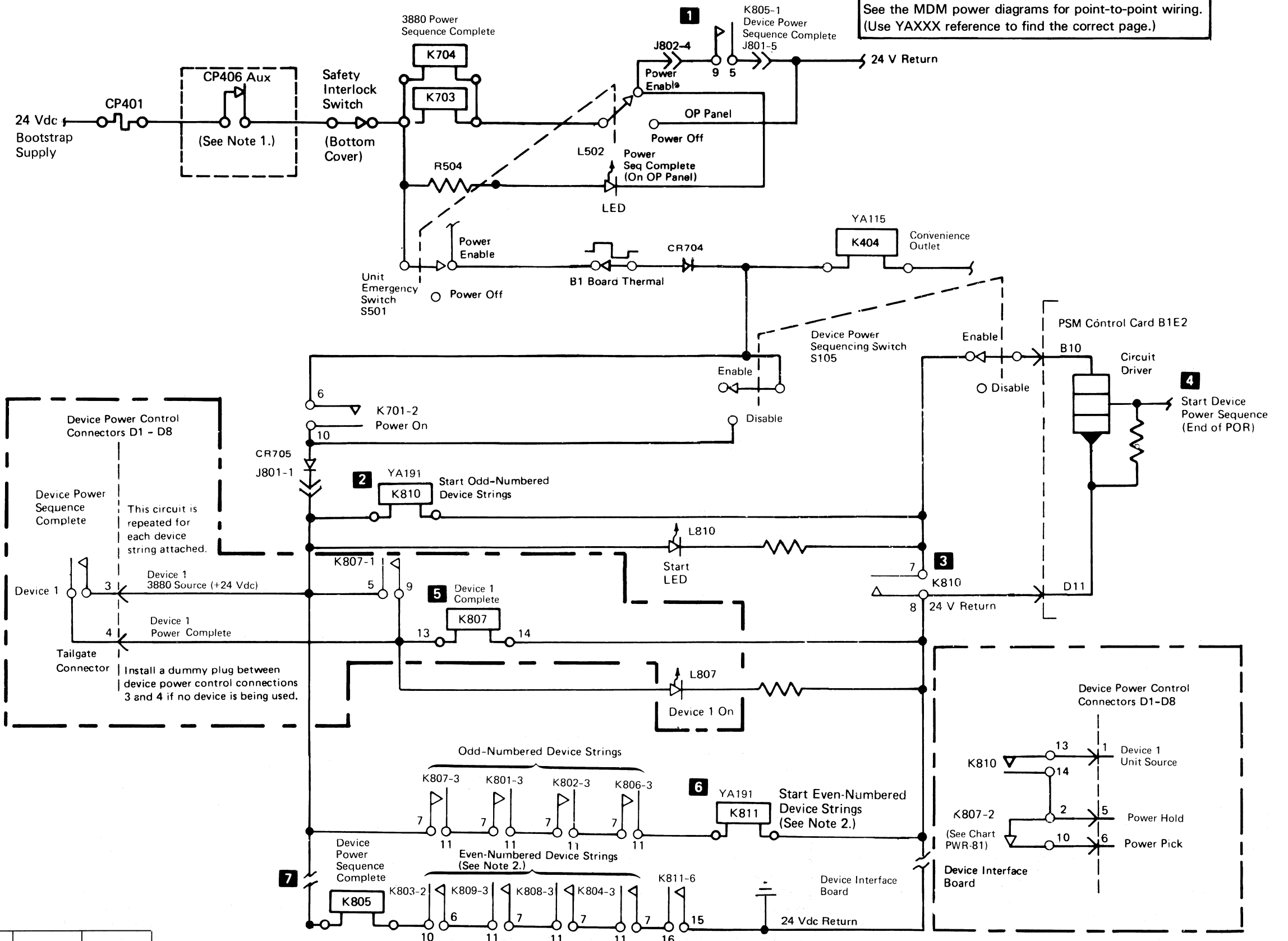
POWER-ON SEQUENCE FOR ATTACHED DEVICE STRINGS

SERVICE AIDS

Relays K810 and K811 can be swapped to aid in diagnosis. K801 through K809 are all the same kind of relay and can be swapped.

The status (activated or de-activated) of the relays on the device interface board can be easily determined during diagnosis. With 3880 power on, observe a relay as you remove and reinstall it. You can feel and hear the relay as it releases and picks.

This diagram is logically correct, but not point-to-point. See the MDM power diagrams for point-to-point wiring. (Use YAXXX reference to find the correct page.)



- Notes:**
1. CP406 Aux contacts are installed on all 50 Hertz machines except those for Japan.
 2. If all even-numbered strings have dummy plugs, failure to pick K805 could be caused by K811 not picked.

3880 MIM	AS0084 Side 1 of 2	8498410 Part No.	See EC History	450913 12Jan83	450914 10Jun83	.	.
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If the power problem is not solved by the MD or an intermittent power problem is indicated, complete the following procedures. The steps are listed from most probable to least probable for repair of the machine. Perform the following steps in the procedures if they have not already been done.

After performing each step, determine whether the repair has been accomplished. If it has, restore the machine to normal operating condition and return it to the customer; otherwise, go to the next step:

POWER ANALYSIS (WITH SYMPTOMS)

If the power sense registers are currently being displayed by the MD, copy the register contents, since data can be lost if the problem is intermittent.

Note: Use MD option 8 to display the power sense registers if the register contents or a power symptom code is not known.

Use the power symptom code table on PWR-39 and the available power sense information to determine the reference diagram of the failing area. Always reference the lowest-order power code (that is, 1X before 2X).

Note: Use PWR-33 to determine acceptable voltage ranges in the following steps.

Use the reference diagram to isolate to the failing component by checking for incorrect:

1. Voltage sense levels at the card input (determines defective sense cards)
2. Voltage distribution (use test points on PWR-33 pins to determine open distribution lines)
3. Regulator input voltages
4. Regulator turn-on signals
5. Regulator reference voltages
6. Regulator grounds

Some hints to aid in isolation are:

- For undervoltage indications, check the level of the voltage pulses as the machine attempts to power up (use PWR-17 for power up and down procedures).
- Overcurrent and undervoltage indications together mean there is a short in the voltage distribution.

Alternately remove power from SD1 and SD2 to help isolate the circuit with the overcurrent. Separate the distribution to isolate the circuits.

Notes: This is particularly important with +5 Vdc problems as the short could exist in the +3 Vdc or +7.25 Vdc circuits.

When the +7.25 Vdc regulator is removed (see LOC-25), the +3 Vdc and +7.25 Vdc voltages are not used.

Use the overload isolation procedure on PWR-32 once the defective circuit has been isolated.

- Always suspect the maintenance power supply (PWR-49) when the power check LED (operator panel) is on and no power sense information is available.
- Overcurrent or overvoltage indications alone do not turn on the power check LED (operator panel) and do not drop machine power.
- An overvoltage indication is usually caused by a defective regulator or sense card.

Verify that the power problem has been corrected; if it has not been corrected, continue with Power Analysis (Without Symptoms).

POWER ANALYSIS (WITHOUT SYMPTOMS)

1. Replace the cards at B1C2 and/or B1E2. Replace the B1H2 card if the eight-channel switch feature is installed. Verify that the power problem has been corrected; if it has not been corrected, go to the next step.
2. Ensure that all power cable connectors are seated tightly on the device interface and central power control boards. Verify that the power problem has been corrected; if it has not been corrected, go to the next step.

Ensure that connectors on the regulators and the gate boards, including the flat wire bus cables, are tightly seated. Verify that the power problem has been corrected; if it has not been corrected, go to the next step.
3. See PWR-32 and 33 and check all voltages. Adjust voltages exactly.

Check the ac ripple and replace the rectifiers and/or capacitors as needed. Verify that the power problem has been corrected; if it has not been corrected, go to the next step.
4. Check for loose screws and terminals in the maintenance power supply (see PWR-49). Verify that the power problem has been corrected; if it has not been corrected, go to the next step.
5. Check that the ac input voltage is correct.

DANGER
 Lethal voltages are present in the power servicing area. Safety is most important. Treat all circuits as live until measured. Capacitors are possible exploding devices. Wear safety glasses when working in the power area.

 Always reinstall all safety covers before powering on the machine.

- Check that all three phases are present at TB401 as shown on PWR-28. Verify that the power problem has been corrected; if it has not been corrected, go to the next step.
6. Call for assistance.

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REFERENCES TO OTHER SECTIONS

ABBREVIATIONS IN THIS SECTION

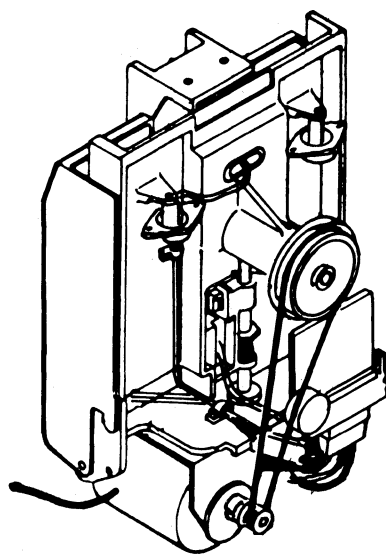
AC	alternating current
CBI	channel bus in
CDX	channel data transfer
Chan	channel
CHL-I	channel interface
CIF-A	channel interface A card
CIF-B	channel interface B card
CP	circuit protector
CPU	central processing unit
CTL-I	control interface
CXC	channel transfer control
DDC	director-to-device controller
DRR	driver receiver
DTG	device tag gate
EBO	external bus out
Ext	external
Gnd	ground
Hd	head
IML	initial microcode load
LED	light-emitting diode
MD	maintenance device
MDAC	maintenance device adapter control
MDAR	maintenance device adapter register
MDM	Maintenance Diagrams Manual
MNT	maintenance
MSR	maintenance sense register
OLT	online test
P/N	part number
Req	required
SD1	storage director 1
SD2	storage director 2
TACR	two-channel additional condition register
TADT	two-channel additional driver terminator
TB	terminal board
TCA	two-channel additional
TP	test point
Vdc	volts direct current

3880 MIM	AU0001 Side 1 of 2	8498070 Part No.	See EC History	450906 15Aug80	450907 10Dec80	450908 15Apr81	450909 12Feb82
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INTRODUCTION

The diskette drive reads data from the magnetic surface of a diskette in the following applications:

- Loading the initial control program
- Microcode storage backup
- Diagnostic microcode storage
- Any location where data-interchange media (cards, tapes) are used by the data processing industry
- Data entry
- Data exchange
- Data storage



REAR
VIEW

Maintenance Procedure

The diskette drive requires no scheduled maintenance. The success of this maintenance method depends on correct care of diskettes and head carriage assemblies.

Offline Servicing

The 3880 need not be powered off to repair the diskette drive. Maintenance of the diskette drive includes:

- Diagnosis
- Offline repair, checkout, and adjustment
- Online verification

Tools

CE ALIGNMENT TOOL

The CE alignment tool (P/N 2200698) is used to adjust the phototransistor assembly by mechanical alignment

HEAD CLEANING TOOLS

- Brush (P/N 2200106)
- Isopropyl alcohol (P/N 2200200)
- Cloth (P/N 2108930)

Personal Safety

Because the diskette drive obtains its ac and dc power from the 3880, voltage is present on the terminals and connectors whenever the drive motor is energized.

Motor housing temperature may be more than safe handling limits.

Danger notices in this manual warn of personal safety hazards.

Machine Safety

The diskette drive can be damaged by wrong operation or repair actions. *Caution* notices in this manual warn of actions that could damage the machine or diskette.

The diskette drive contains plastic materials that are subject to attack by a wide variety of chemicals, including IBM cleaning fluid.

To prevent serious damage to the leadscrew and carriage, lubricate the leadscrew only with IBM No. 6 oil when the head carriage is reinstalled.

To prevent serious damage to the read/write head, clean the head only with isopropyl alcohol and a clean cloth after removing the diskette (see CARR-150 for head and pressure pad cleaning).

Diskette Safety

To prevent diskette damage, observe recommended diskette handling and storage procedures.

DISKETTE DRIVE ADJUSTMENTS

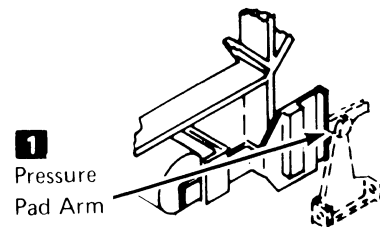
DISKETTE COVER

Removal

1. **Warning: Do not let the pressure pad arm 1 hit against the head.**
Remove the two cover screws 2 while holding the cover.
2. Remove the cover carefully to prevent damage to the wires.
3. Remove the wires from the light-emitting diode (LED) and actuator. (The yellow wire goes to the LED terminal marked Y.)
4. Remove the wires from the clips on the cover.

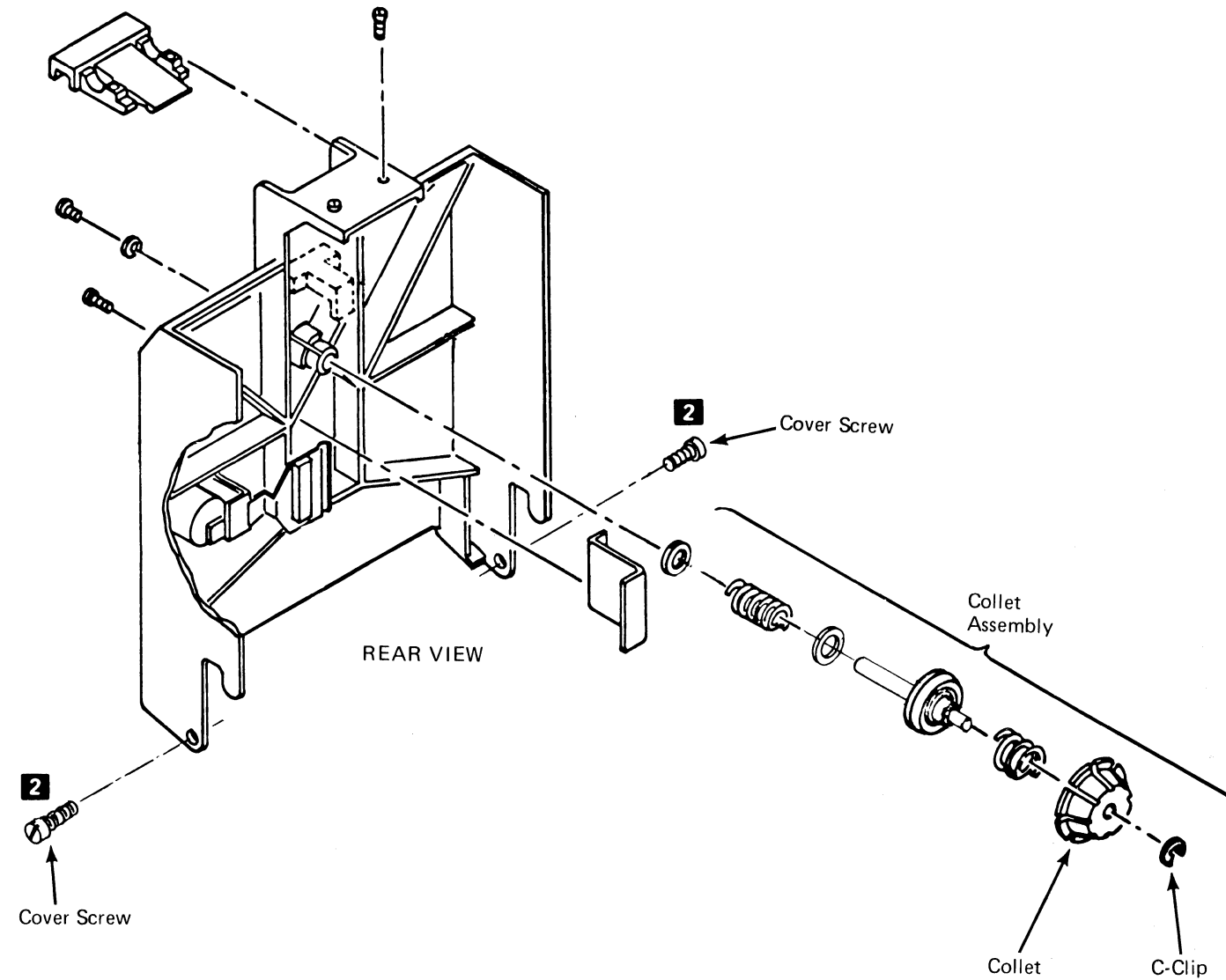
Replacement

Warning: Before reinstalling the cover screws, position the actuator bail under the pressure pad arm.



To reinstall the diskette drive cover, reverse the removal procedure.

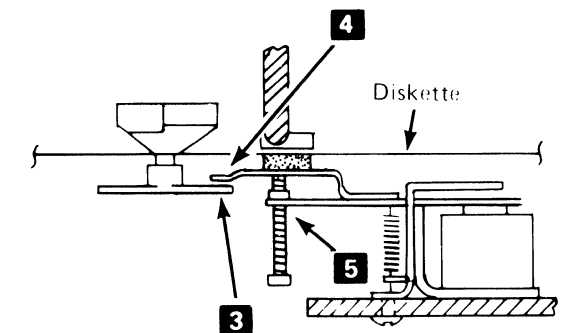
Diskette Drive Cover



PRESSURE PAD ACTUATOR

Adjustment

1. Install the diskette.
2. Activate the coil by installing a jumper between the head load pin (B05) and the ground pin (J08) on the file control card (see CARR-200 for pin locations).
3. Turn the adjusting screw 5 until the pressure pad arm 3 and the bail 4 just touch.



4. Turn the adjusting screw 5 clockwise 1/2 to 3/4 of a turn, and check for a gap between the arm 3 and bail 4 on all tracks.

DRIVE MOTOR

The 3880 need not be powered down to perform this procedure.

Removal

DANGER

Remove ac power from the diskette drive.

1. Turn off switch SW401 on the primary power panel.
2. Disconnect the cable **3** leading to the drive motor **4**.
3. **DANGER**
The motor case temperature may be more than safe handling limits.
Remove the belt
4. Loosen the two motor mounting clamps and remove the drive motor **4**.
5. Remove the drive pulley **6**.

Replacement

1. Reinstall the drive pulley. (Align the setscrew **5** with the flat surface of the shaft.)
2. **DANGER**
For 60 Hz motors – to prevent personal injury, position the two large holes in the motor frame to the top and bottom of the mounting bracket **2**.
Clamp the drive motor to the mounting bracket.
3. Reinstall the belt.
4. Plug in the cable **3** leading to the drive motor **4**.
5. Check the belt tracking and adjust if necessary.

BELT TRACKING

The idler pulley **1** must be on the outside of the belt.

Adjustment

Warning: The drive pulley setscrew **5** must be aligned with the flat surface on the motor shaft.

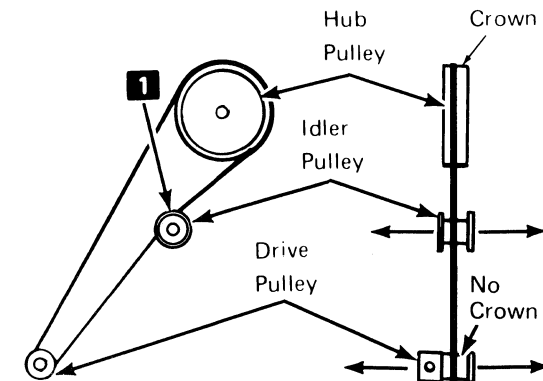
To adjust the belt tracking, loosen the idler assembly screw **9**, and slide the idler until the belt rides in the center of the hub pulley. Since the drive pulley does not have a crown, the belt does not have to be exactly centered on the drive pulley.

IDLER ASSEMBLY

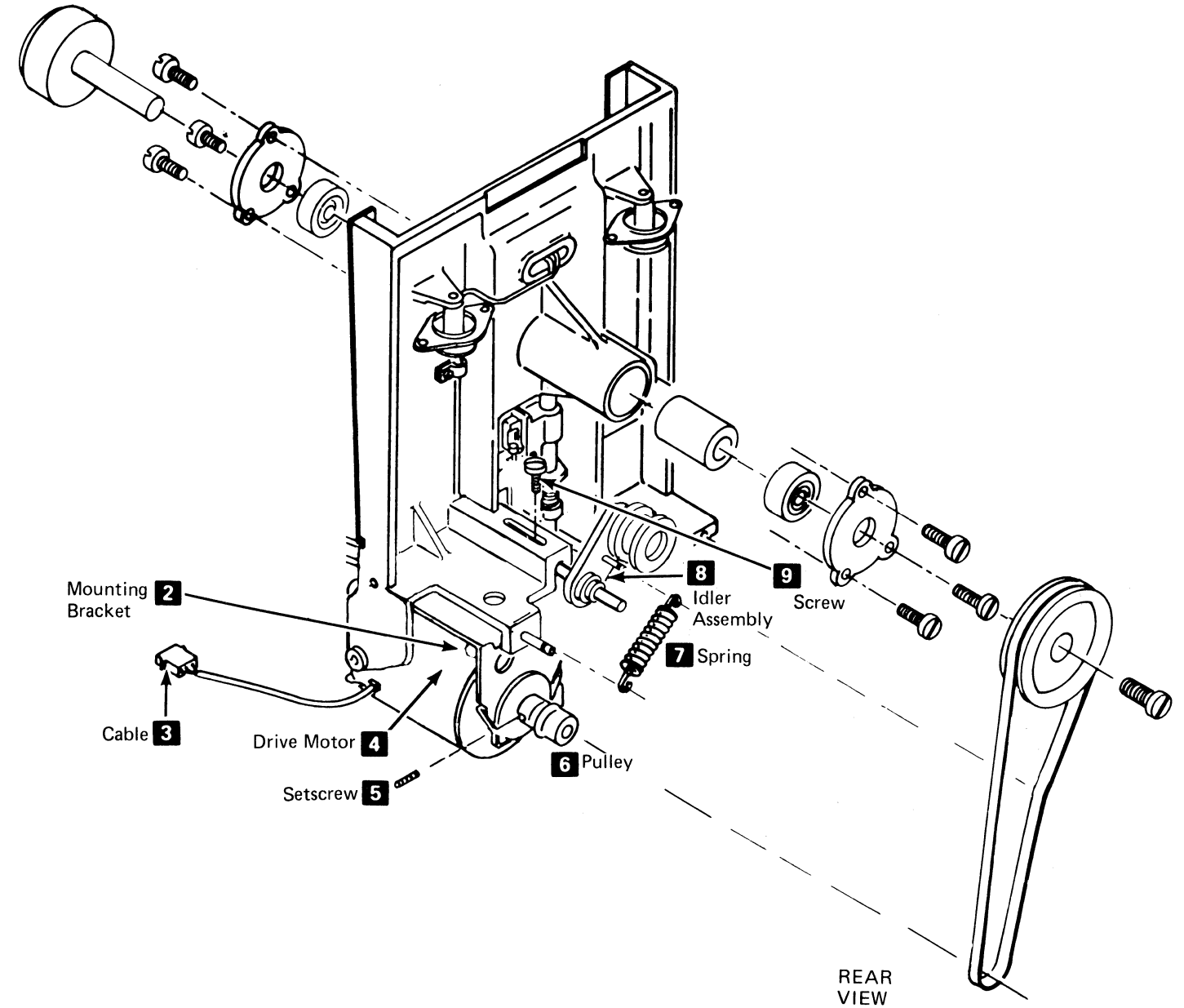
Removal

1. Remove the belt and spring **7**.
2. Remove the screw **9** and idler assembly **8**.
3. To replace the idler assembly, reverse the procedure and check the belt tracking.

Belt Path



Diskette Drive Casting



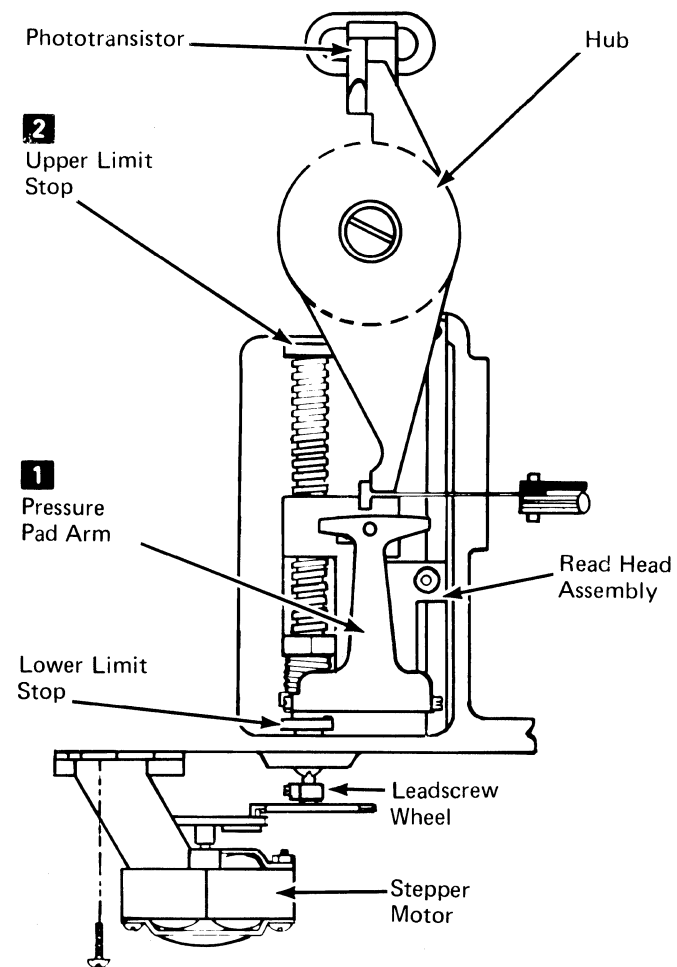
AU0120	8498071	450900	450903	450907	450908	.
Side 2 of 2	Part No.	13Jul79	25Jan80	10Dec80	15Apr81	.

HEAD AND PRESSURE PAD CLEANING

HEAD AND PRESSURE PAD

Cleaning

1. With the diskette cover open, turn the leadscrew wheel by hand until the carriage assembly is at the upper limit stop **2**.
2. **Warning: Do not let the pressure pad arm **1** hit the read head.**
Pivot the pressure pad arm **1** away from the read head and check the pad for contamination. If the pad is contaminated, use a dry brush (P/N 2200106) to remove the caked deposits and to fluff the pad.
Warning: Be sure the cloth moistened with isopropyl alcohol does not touch the pressure pad while cleaning the read head surface.
3. Holding the pressure pad arm **1** out, clean the polished head surface with isopropyl alcohol (P/N 2200200) applied to a clean cloth (P/N 2108930).



3880
MIM

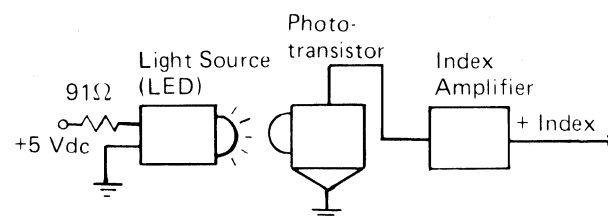
AU0150	8498072	450900	450903	450907	450908	450910
Side 1 of 2	Part No.	13Jul79	25Jan80	10Dec80	15Apr81	14May82

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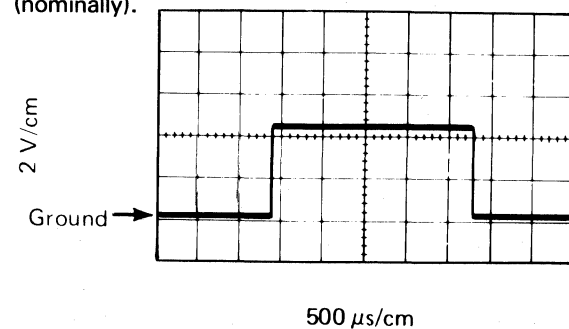
PHOTOTRANSISTOR

Service Check

1. Remove the diskette.
2. Turn off switch SW401 on the primary power panel to remove ac power from the drive motor.
3. Attach the positive probe of the CE meter (15 Vdc scale) to the +5.0 Vdc test point B07 or card pin J03 on the file control card. (See CARR-197, for test points or CARR-200 for card pin locations.)
4. Attach the negative probe of the CE meter to Phototransistor Current line test point B05 or card pin B08 on the file control card. (See CARR-197 for test points or CARR-200 for card pin locations.)
5. Close the cover. (Do not insert a diskette.) The CE meter should read more than 3.5 Vdc.
6. Open the cover, insert a diskette backwards, then close the cover. The CE meter should read less than 0.5 Vdc.
7. Remove the diskette and turn on switch SW401 on the primary power panel.



8. If a scope is available, check for an index pulse width of 1.7 to 8.0 ms occurring every 166.6 ms (nominally).



See CARR-197 for +Index (Diskette) test point (B 14) or CARR-200 for +Index (Diskette) card pin (G13).

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MIM

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PHOTOTRANSISTOR

The 3880 need not be powered down to perform this procedure.

Removal

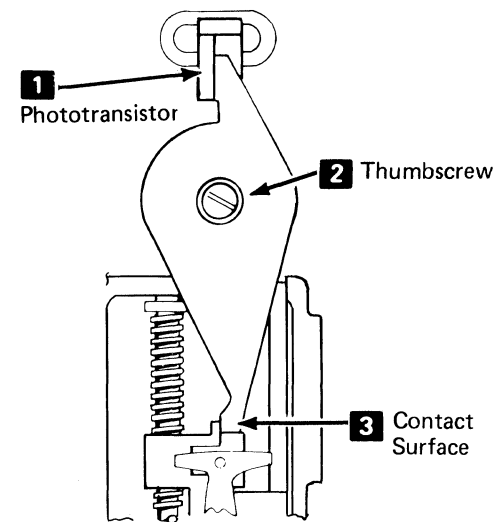
1. Move the head carriage assembly to track 0.
2. Turn off switch SW401 on the primary power panel.
3. Remove the diskette drive cover.
4. Remove the mounting screw **8**.
5. Remove the leads.

Replacement

1. Reinstall the leads. (The yellow wire goes to the terminal marked Y.)
2. Reinstall the mounting screw, but do not tighten.
3. Perform the adjustment starting at step 4.

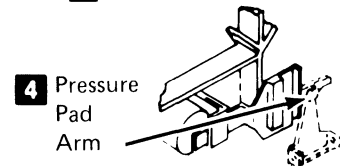
Adjustment

1. Move the head carriage assembly to track 0.
2. Remove the diskette drive cover.
3. Loosen the mounting screw **8** and move the phototransistor to the left.
4. Install the CE tool **7** (P/N 2200698) by screwing the thumbscrew **2** into the drive hub.



5. Rotate the CE tool so that it contacts the surface shown **3**.

6. Adjust the phototransistor **1** so that the raised edge is in contact with the CE tool **7**.
7. Tighten the mounting screw **8**.
8. Remove the CE tool
9. **Warning: Before reinstalling the cover screws, position the actuator bail under the pressure pad arm **4**.**



Replace the cover.

10. Do the Phototransistor Service Check (see CARR-180).

LIGHT-EMITTING DIODE (LED)

The 3880 need not be powered down to perform this procedure.

Service Check

Attach the positive probe of the CE meter to the light-emitting diode (LED) **6** current test pin (D07) on the file control card and the negative probe to the ground test pin (D08) on the file control card. The correct meter reading is 1.0 to 2.0 Vdc.

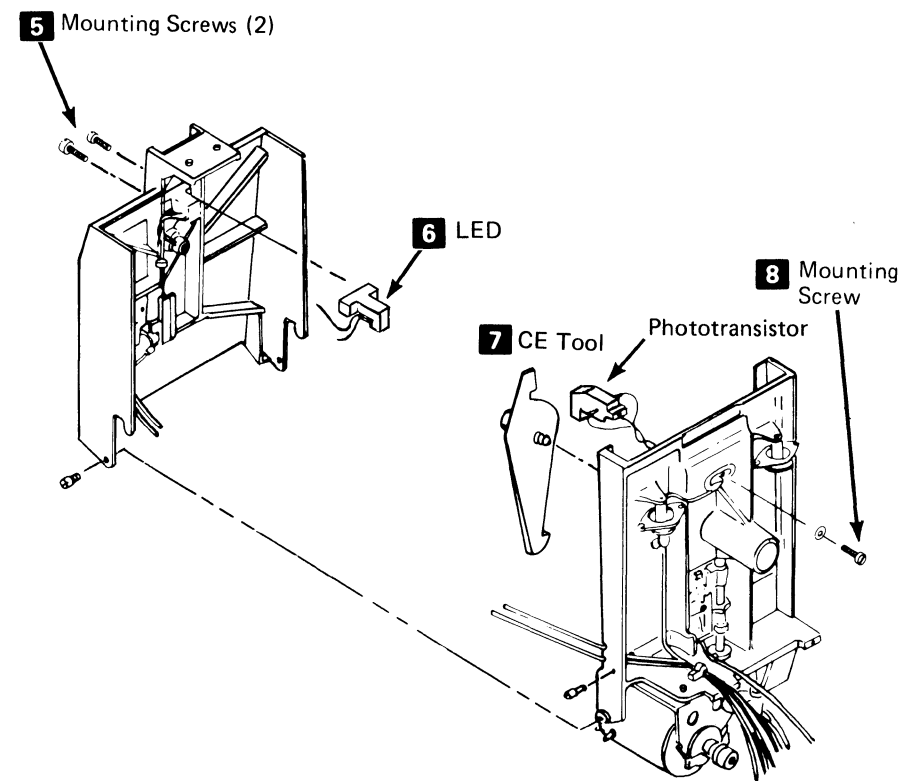
Removal

1. Turn off switch SW401 on the primary power panel.
2. Remove the diskette drive cover.
3. Remove the two mounting screws **5**.
4. Remove the leads. (The yellow wire goes to the terminal marked Y.)

Replacement

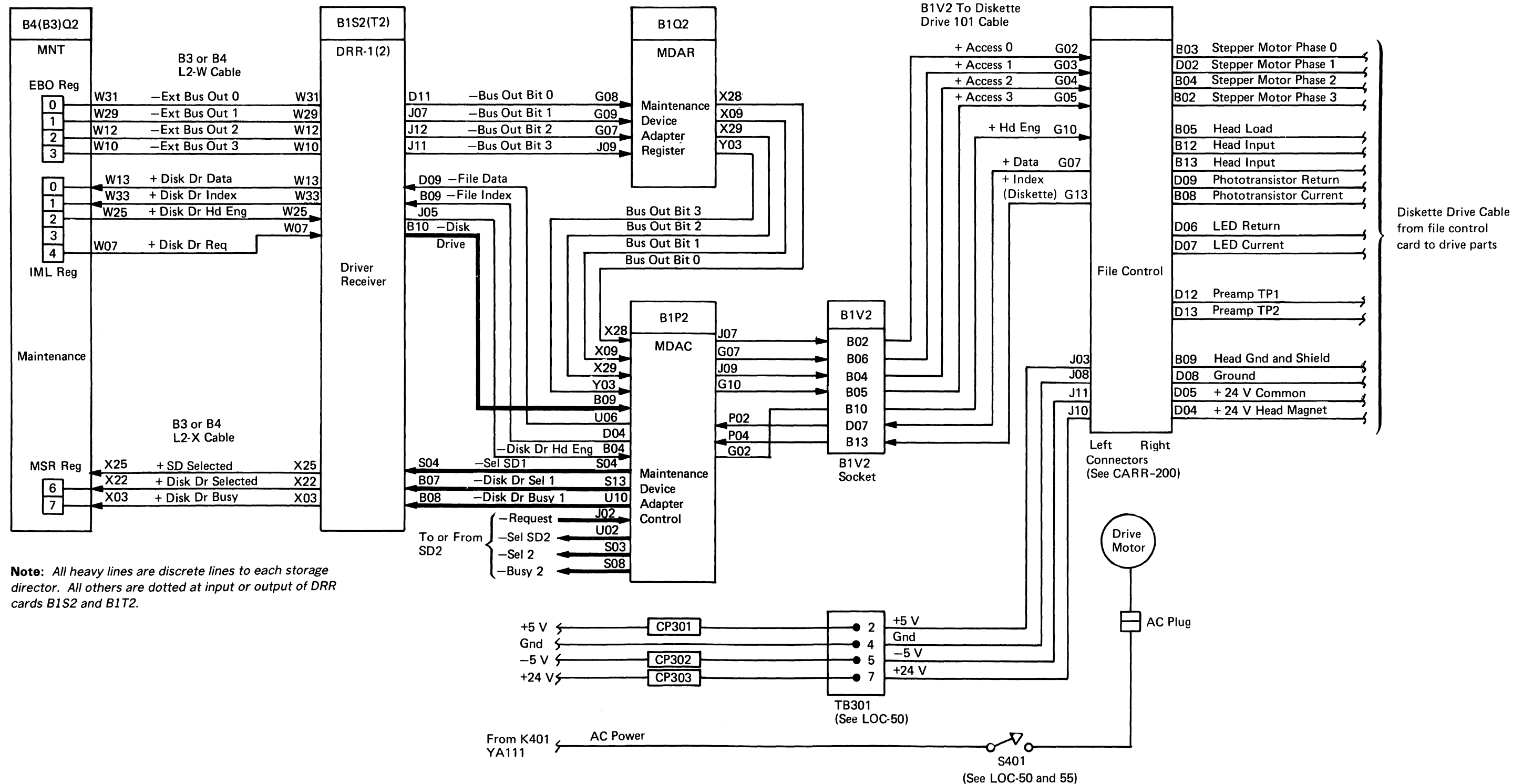
Warning: Before reinstalling the cover screws, position the actuator bail under the pressure pad arm.

To reinstall the cover, reverse the removal procedure.



3880	AU0190	8498073	See EC	450907	450908		
MIM	Side 1 of 1	Part No.	History	10Dec80	15Apr81	.	.

IML CONTROL AND DATA LINES



Note: All heavy lines are discrete lines to each storage director. All others are dotted at input or output of DRR cards B1S2 and B1T2.

3880 MIM	AU0195 Side 1 of 2	8498707 Part No.	450905 18Apr80	450908 15Apr81	450914 10Jun83	.	.
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FILE CONTROL CARD

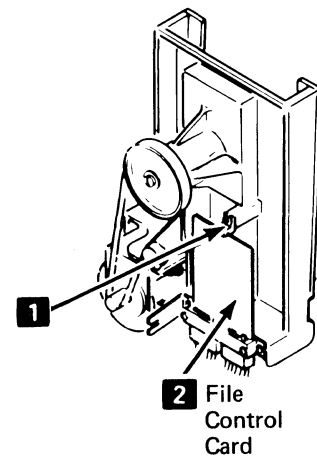
The new style (two-high) and the old style (three-high) file control cards have the same card pin assignments (see CARR-200). Both style cards are interchangeable. The 3880 need not be powered off to perform this procedure.

Removal

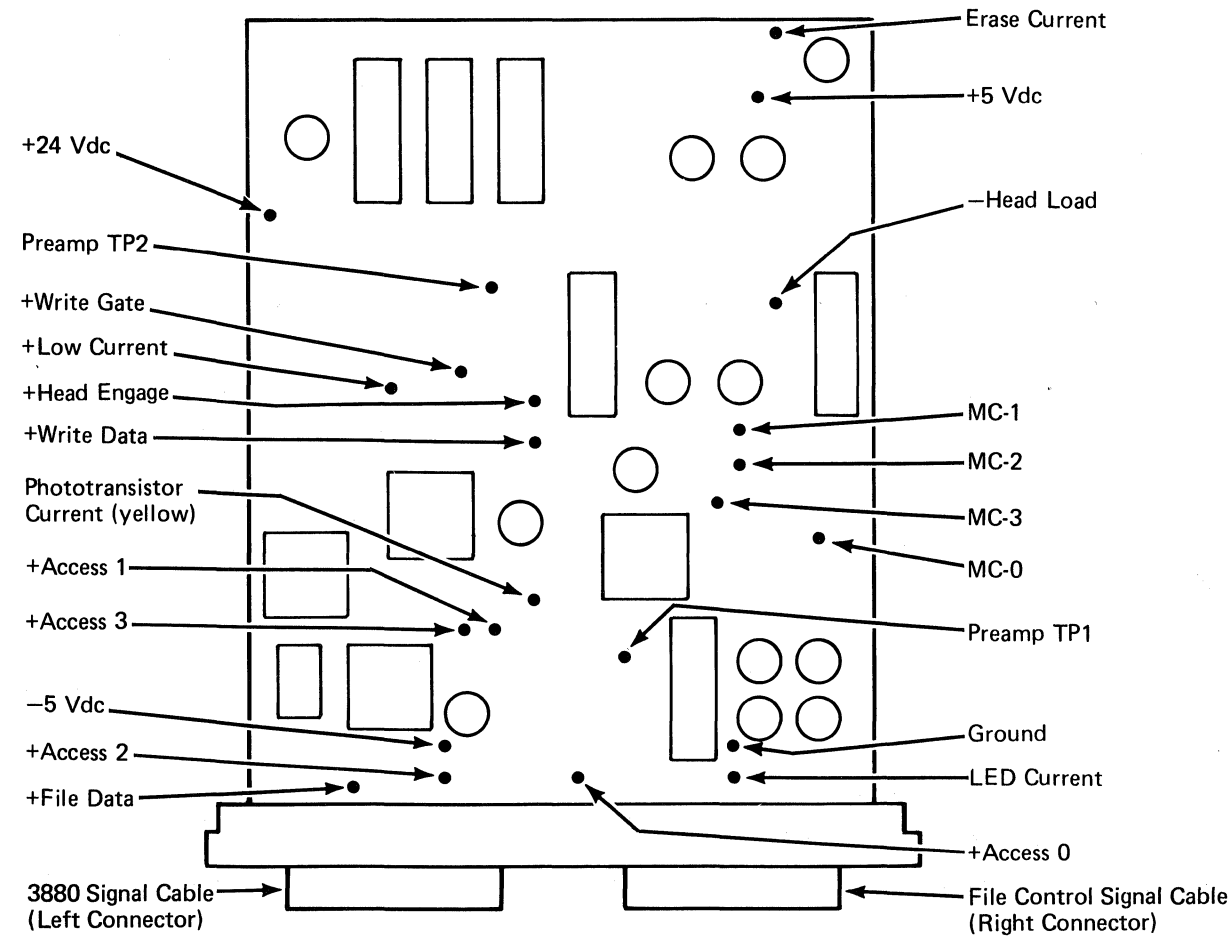
1. Turn off switch SW401 on the primary power panel.
2. Remove the diskette from the diskette drive.
3. Remove the 3880 signal cable connector from the file control card.
4. Loosen the screw and turn the bracket (if present) 90 degrees. Tighten the screw **1**.
5. Remove the file control card **2**.

Replacement

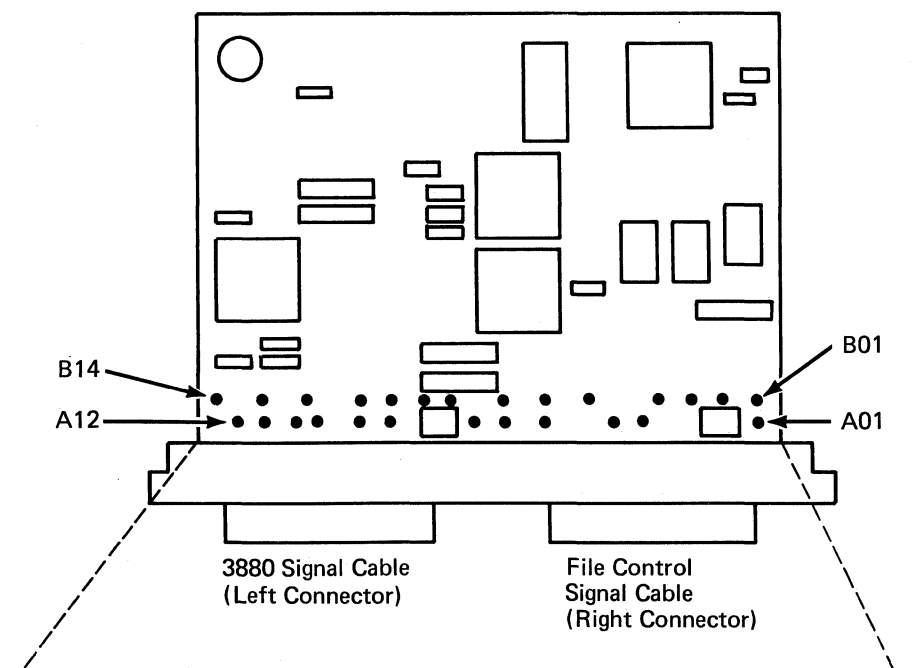
To reinstall the file control card, reverse the removal procedure. Ensure that the file control card is correctly seated in the socket and the bracket.



File Control Card Test Points (Old Style)



File Control Card (New Style)



CARD TEST POINTS			
Line Name	Test Point	Line Name	Test Point
Stepper Motor MC-0 (Phase 0)	B02	+Index (Diskette)	B14
		Preamp TP1	A04
Stepper Motor MC-1 (Phase 1)	A01	Preamp TP2	A05
		Ground	A10
Stepper Motor MC-2 (Phase 2)	B03	+Access 0	B08
		+Access 1	B09
Stepper Motor MC-3 (Phase 3)	B01	+Access 2	B10
		+Access 3	B11
+Write Gate	A08	+File Data	B12
+Low Current	A09	+Head Engage	B13
+Write Data	A06	+18 Vdc	B06
-Head Load	B04	+24 Vdc	A11
+Erase Gate	A07	+5 Vdc	B07
Phototransistor Current	B05	-5 Vdc	A12
		Ground	A03

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450914 10Jun83

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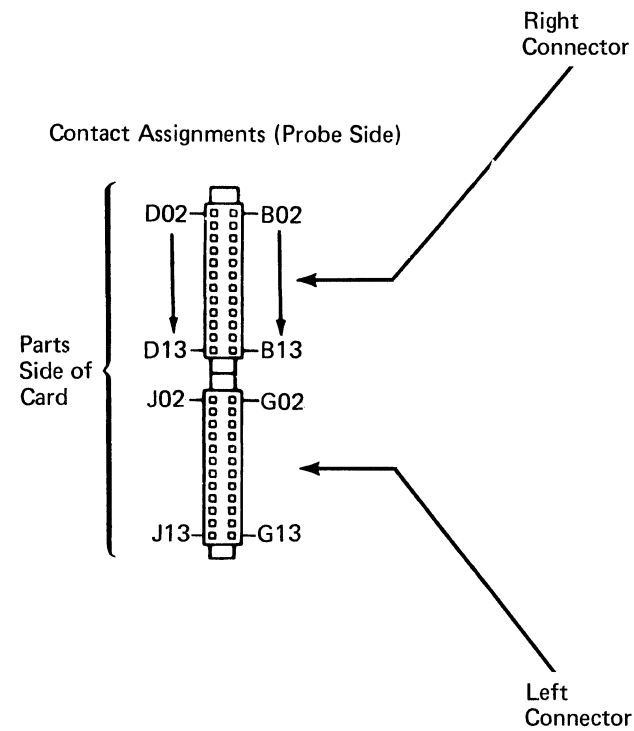
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FILE CONTROL CIRCUIT MAINTENANCE

FILE CONTROL CARD PIN ASSIGNMENT

See CARR-197 for test point assignment and CARR-195 for IML control and data lines diagram.

Card Pin Assignment



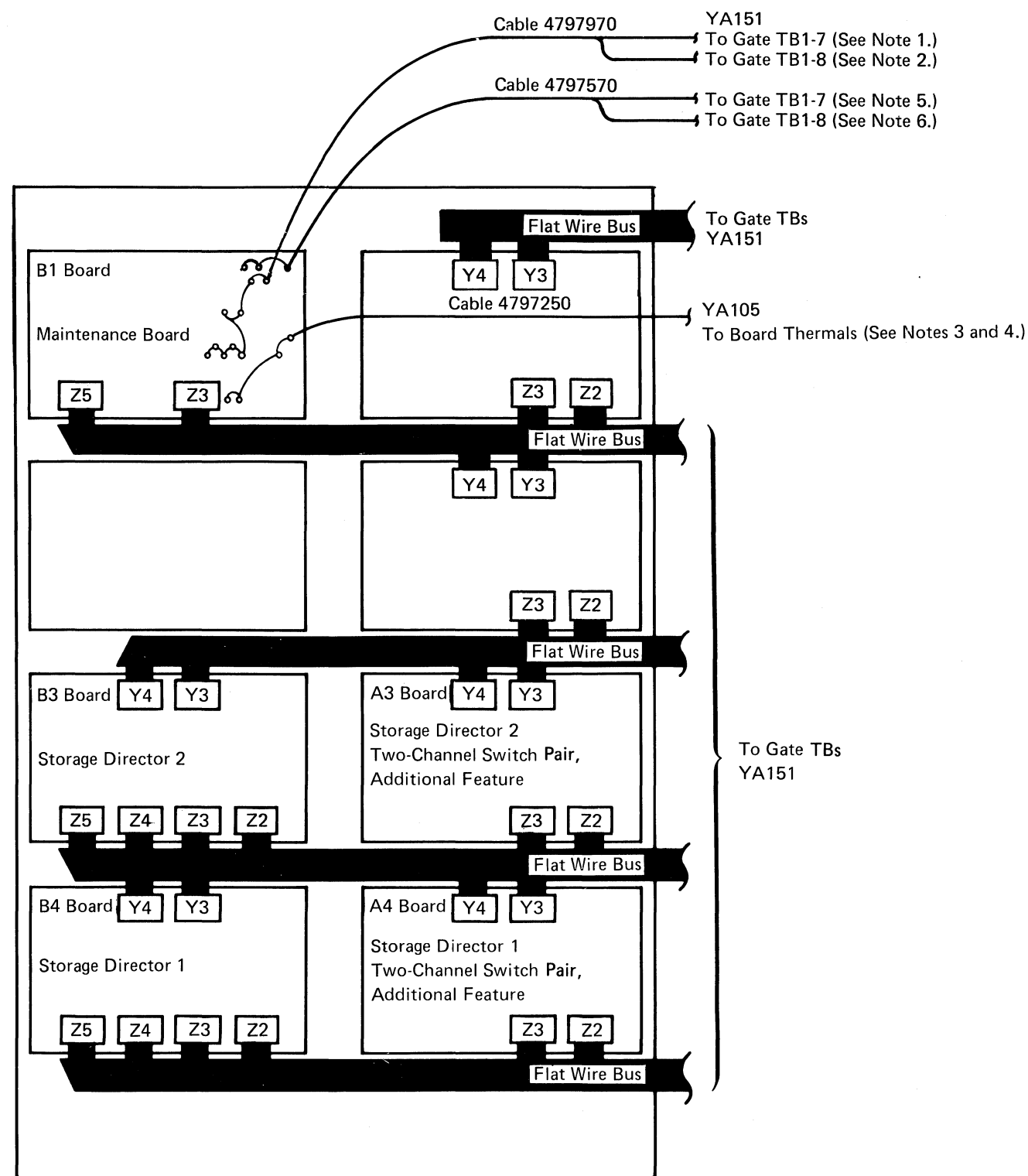
Line Name	Wire Color	Card Pin	Cable Pin
Stepper Motor MC-0 (Phase 0)	White	B03	B03
Stepper Motor MC-1 (Phase 1)	Red	D02	D02
Stepper Motor MC-2 (Phase 2)	Yellow	B04	B04
Stepper Motor MC-3 (Phase 3)	Black	B02	B02
Stepper Common +24 Vdc (See Note)	Blue	D05	D05
Head Magnet +24 Vdc (See Note)	Yellow	D04	D04
-Head Load	Black	B05	B05
LED Return	Black	D06	D06
LED Current	Yellow	D07	D07
Phototransistor Return	Black	D09	D09
Phototransistor Current	Yellow	B08	B08
Head Input	Black	B12	B12
Head Input	White	B13	B13
Erase Current	Red	B10	B10
Head Ground and Shield	Green	B09	B09
Preamp TP1		D12	D12
Preamp TP2		D13	D13
Ground	Black	D08	D08
+ Access 0		G02	B02
+ Access 1		G03	B03
+ Access 2		G04	B04
+ Access 3		G05	B05
+ File Data		G07	B07
+ Head Engage		G10	B10
+ Index (Diskette)		G13	B13
+24 Vdc		J10	D10
+5 Vdc		J03	D03
-5 Vdc		J11	D11
Ground		J08	D08

Note: These voltages are not present if the head is not loaded or the drive is not being addressed.

Logic boards for the 3880 are stocked at the emergency parts centers. The boards should be ordered by part number only. The EC level of the board is not needed because functional changes cause new part numbers to be issued. Board part numbers are located on the edge of the board and can also be found in the board plug charts (in the MDM).

Before removing a board, label the connectors that connect to the pin side of the board.

The machine feature wires were installed on early machines using purple wire; new boards can have the machine feature wires installed using yellow wire. Ensure that all feature wires are installed on the new boards by comparing them with those on the old board or use the card plug charts in the Maintenance Diagrams Manual (MDM), Volume R30. The card plug charts list the feature wires for each board and give alternate part numbers for the board and the cards.



Flat Wire Bus and Cable Connections (pin side of gate)

Notes:

- Cable 4797970 connects TB1-7 to the following pins on machines with 20-card storage director boards:
 - B1C2D09
 - B1D2D09
 - B1E2J07
 - B1F2J07
 - B1E2M11
 - B1F2M11
 - B1G2M11
- Cable 4797970 connects TB1-8 to the following pins on machines with 20-card storage director boards:
 - B1E2P10
 - B1F2P10
- Cable 4707250 connects the B1 board thermal to the following pins:
 - B1A4B02
 - B1B4B10
- Cable 4797250 connects the B3 board thermal to the following pins:
 - B1F6C04
 - B1F6E04
- Cable 4797570 connects TB1-7 to the following pins on machines with 22-card storage director boards:
 - B1B1C11
 - B1C1C11
- Cable 4797570 connects TB1-8 to the following pins on machines with 22-card storage director boards:
 - B1C1E11

CTL-I WRAP TEST DESCRIPTION

The test for the control interface (CTL-I) wrap, tests the storage director to device control interface logic. Special wrap cables connect the outbound to the inbound (CTL-I) lines. This is done by removing the CTL-I bus and tag cables and installing a special cable between the bus and tag.

OPERATING PREREQUISITES

1. All devices attached to the storage director to be tested must be made not available to the operating system by Vary commands.
2. All channel switches (operator panel) for the storage director to be tested must be in the Disable position.

INSTALLATION, MODEL 1

Use this test for all Model 1 machines and for storage director 1 on Model 2 machines.

Warning: Before removing cables, check that the machine and cable connectors are correctly labeled because bus and tag connectors can be swapped by mistake.

Ensure that the channel interface wrap cables are not plugged into the top of the DDC card.

Determine the cable length for the following test by adding:

- 50 feet for a switching unit (if used)
- 20 feet for each device tailgate
- The length of the device cable

Note: If the CTL-I wrap cable is to be connected at a device tailgate, ensure that the cable length from the 3880 to the last controller is not more than 200 feet. Cable lengths longer than 200 feet can generate bad test results.

Perform the following steps when directed by the maintenance device (MD).

1. Disconnect the CTL-I bus and tag cables from the storage director to be tested or from the device tailgate. See Figure 1.
2. Install the wrap cable (P/N 2346604) in the storage director tailgate, between the bus and tag cables removed from the device tailgate (see Figure 1); or in the tag and bus out connectors in the device tailgate. Turn the controller logic power off when installing the wrap cables in the device tailgate.
3. Run CTL-I wrap test.

To return the machine to normal operation, reverse the procedure.

INSTALLATION, MODELS 2 AND 3

Use this procedure for all Model 3 machines and for storage director 2 on Model 2 machines.

Warning: Before removing cables, check that the machine and cable connectors are correctly labeled because bus and tag connectors can be swapped by mistake.

Ensure that the channel interface wrap cables are not plugged into the top of the DDC card.

Determine the cable length for the following test by adding:

- 50 feet for a switching unit (if used)
- 20 feet for each device tailgate
- The length of the device cable

Note: If the CTL-I wrap tool is to be connected at a device tailgate, ensure that the cable length from the 3880 to the last controller is not more than 200 feet. Cable lengths longer than 200 feet can generate bad test results.

Perform the following steps when directed by the maintenance device (MD).

1. Disconnect the CTL-I bus/tag cable from the storage director to be tested or from the device tailgate. See Figure 2. Turn the controller logic power off when installing the wrap tool in the device tailgate.
2. Install the wrap tool (P/N 4299863) in the tailgate connector socket with the arrow from 1 pointing to the tailgate, (see Figure 2).
3. Run CTL-I wrap test.
4. Remove the wrap tool from the tailgate and reinstall with the arrow from 2 pointing to the tailgate when directed to do so by the MD.

To return the machine to normal operation, use the following procedure.

- Remove the wrap tool from the tailgate connector socket.
- Reinstall the CTL-I bus/tag cable in the tailgate.
- Turn on the controller logic power if it is turned off.

Figure 1. Control Interface Connectors (Model 1)

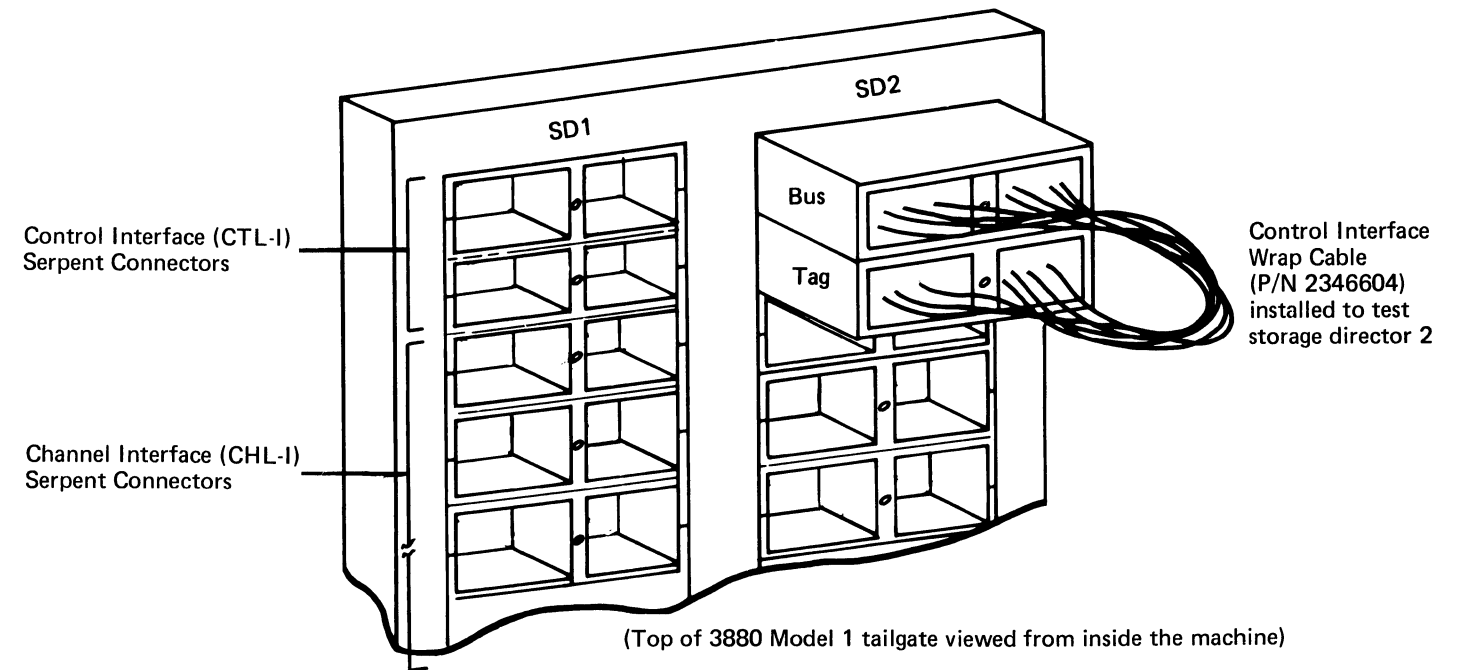
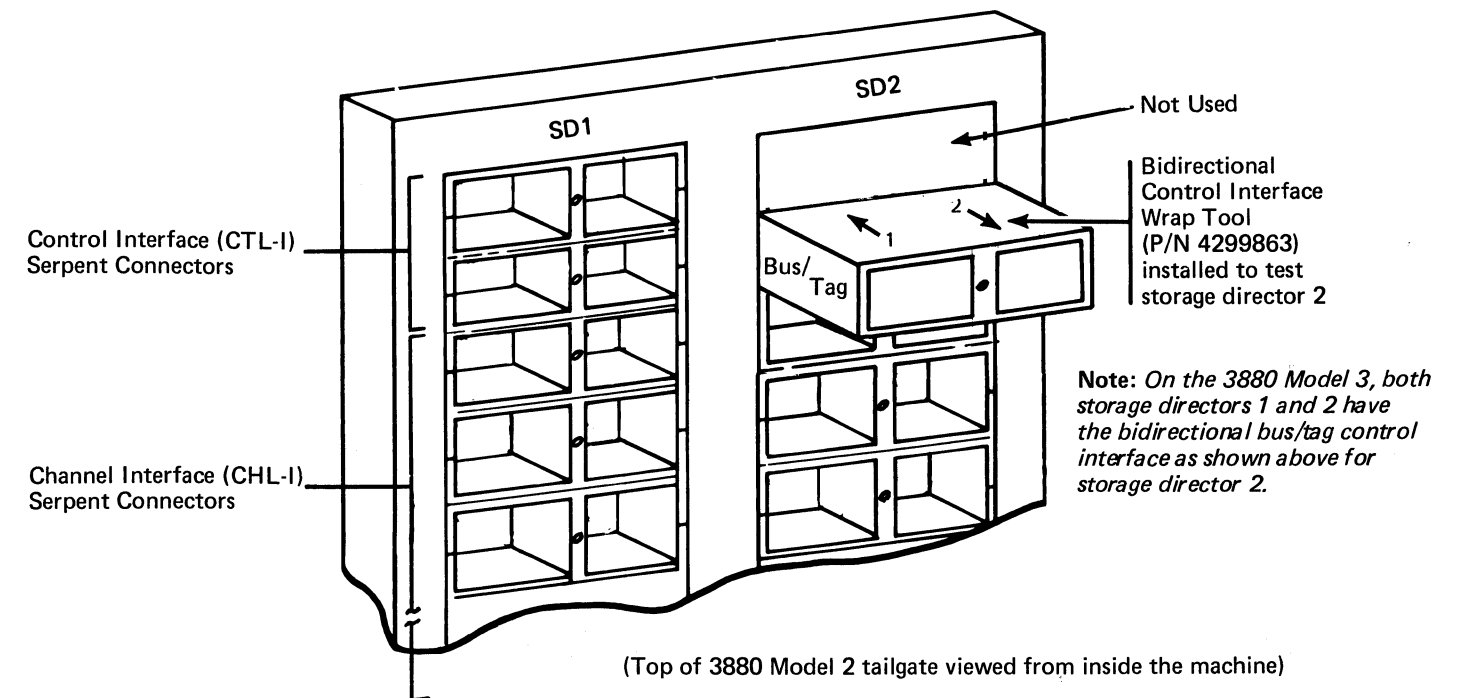


Figure 2. Control Interface Connectors (Model 2)



These instructions apply to machines with internal electronic channel wrap. Check for the following label on any of the B-board covers.

This 3880 is equipped with internal electronic channel wrap. No cables are required.

If you do not have internal electronic channel wrap, go to CARR-220, 320, or 420.

ELECTRONIC CHANNEL WRAP TEST DESCRIPTION

There are two electronic channel wrap diagnostic routines that test the channel interface:

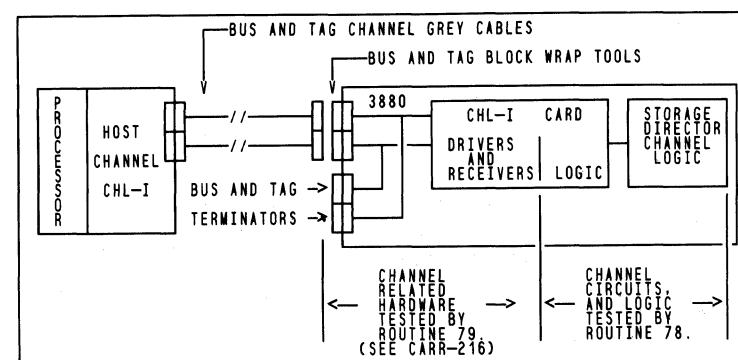
- Routine 78
- Routine 79

Routine 78 does not require the channel wrap cables, the block wrap tool, or manual intervention to run. The routine tests the logic of the channel interface hardware. A complete description of routine 78 is contained in the 3880 Diagnostic Code Manual (DCM).

Routine 79 requires installing the block wrap tool in the tailgate of the 3880. The routine tests the following items (see Figure 1):

- Channel interface card drivers and receivers
- Twisted pair cables from the board to tailgate
- Serpent connectors
- Terminators

Figure 1. Circuits tested by routines 78 and 79



Channel Wrap Diagnostic (Routine 78)

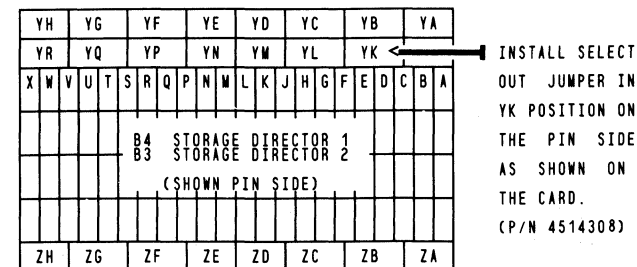
Routine 78 is performed each time an initial microcode load (IML) is executed on the 3880. The results of the diagnostic test are stored in control storage for retrieval after the IML is completed. When a power on IML takes place and the stored information for a channel indicates that the diagnostic test detected a failure, the channel is forced to the disable state.

When the maintenance device (MD) is used to diagnose channel failures, it performs an IML and reads the results of the diagnostic tests for each channel from control storage. Then, depending on the number of failing channels, the MD either isolates to a failing pair of channels or presents a list of FRUs.

CAUTION

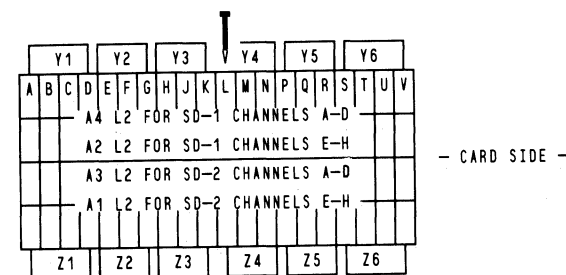
To ensure that the customer is not affected by removing cards from active channels in the 3880, install the select-out bypass jumper card or cards as follows:

1- or 2-channel 3880



4- or 8-channel 3880

Install the select-out bypass jumper in the L2 position on each channel board installed for the failing storage director. (P/N 2679478 or P/N 4515064).



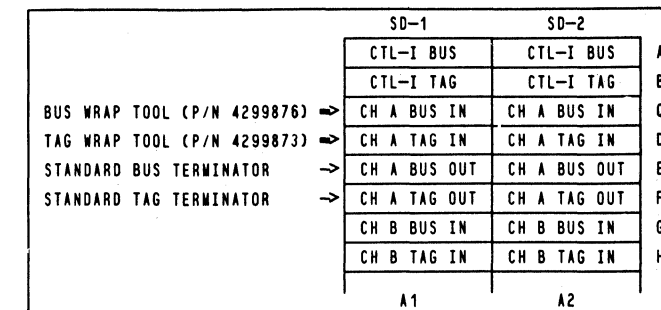
Channel Block Wrap Diagnostic (Routine 79)

Routine 79 performed only when invoked by the maintenance device and requires the following manual intervention:

- The bus and tag block wrap tools must be installed in the tailgate and terminated with standard bus and tag terminators when prompted to do so by the maintenance device, as shown in Figure 2.

See CARR-216 for channel cable checkout using routine 79.

Figure 2. Example of the block wrap tools installed in channel A of SD1 on a 1-, 2-, or 4-channel 3880.



3880 MIM	AU0210	8498075	See EC	461517	450916	.	.
	Side 2 of 2	Part No.	History	27Jan84	07Dec84	.	.

INTERNAL ELECTRONIC CHANNEL WRAP BLOCK TOOL CONNECTION

Routine 79 tests the channel path of all bus and tag lines in a circuit between the electronic channel wrap block tools and the channel interface terminators (see Figures 2, 3, and 4).

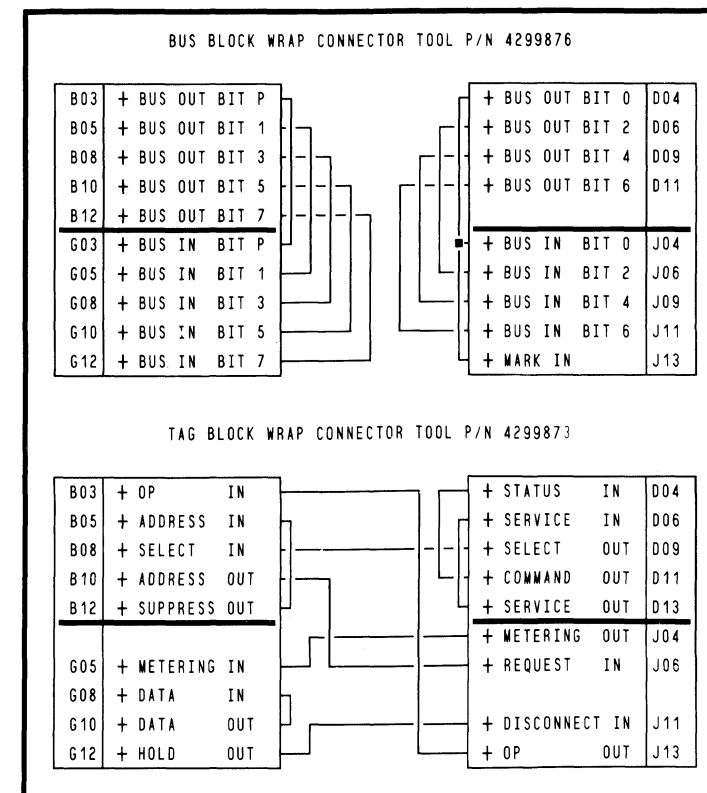
PREREQUISITES

1. The 3880 must have electronic wrap installed (if not, see CARR-220, 320, or 420).
2. Routine 78 must run error-free on the suspected channel. (Routine 78 is automatically invoked by the MD before routine 79.)

PROCEDURE

To test a line, use Figure 4 as a reference while moving the probe from point to point. When checking select-in and select-out, see the example in Figure 3. Use Figure 1 for an additional reference.

Figure 1. Circuit Diagrams for Bus and Tag Block Wrap Tools.



CHANNEL CABLE CHECKOUT USING ROUTINE 79

Routine 79 is also used to check the channel grey cables. This test is accomplished by installing the bus and tag block wrap tools at various connector positions along the subsystem channel path. Routine 79 must run error-free before proceeding to the next location in the subsystem channel path (see Figure 2).

Figure 2. Possible Combination of Channel Bus and Tag Codes Tested by Routine 79.

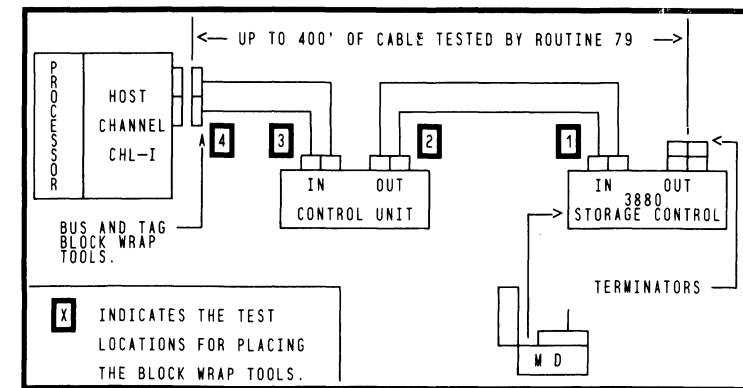


Figure 3. Example of Block Wrap, Routine 79, Channel A, Storage Director 2, of 8-Channel 3880 (Both High- and Low Priority Possibilities).

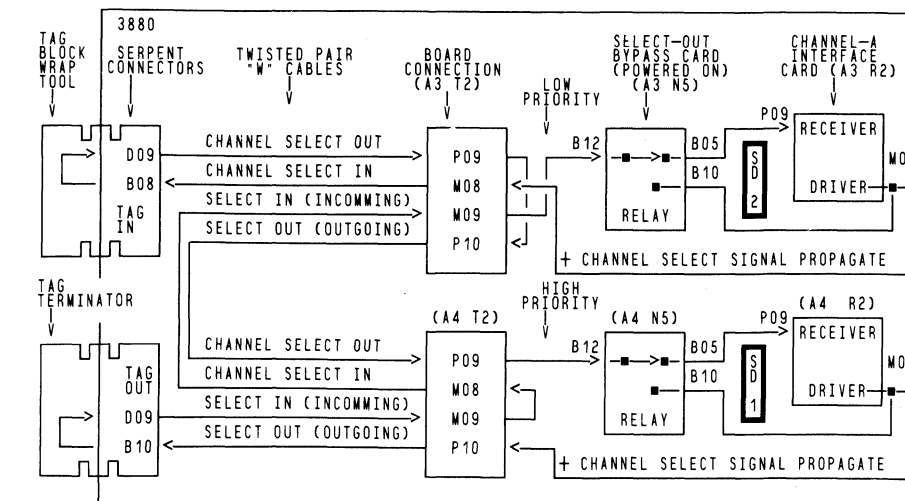
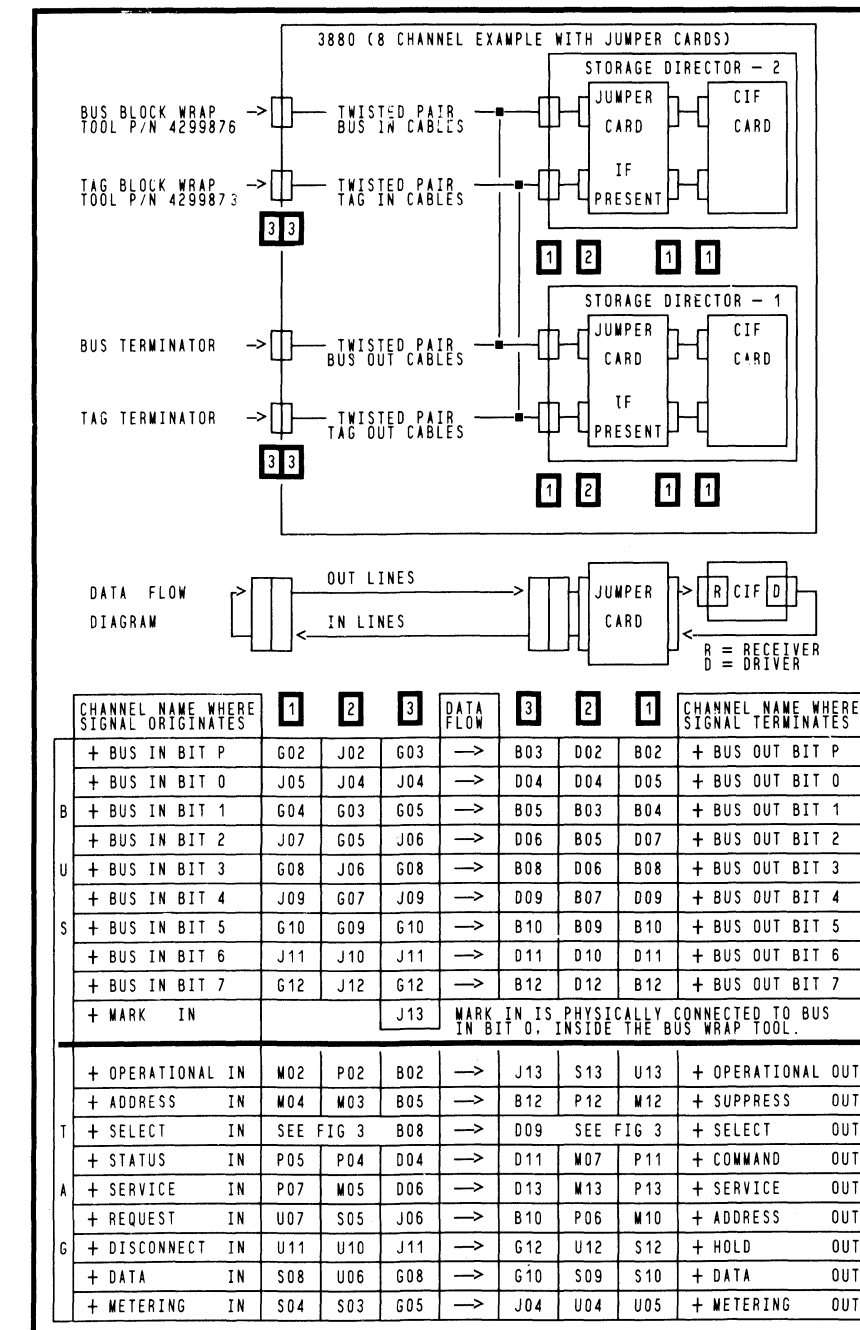


Figure 4. Example of Block Wrap Configuration for 8-Channel 3880.



Use channel interface (CHL-I) wrap test (Models 2 and 3) on CARR-221 for storage director 2 on a Model 2 machine and all Model 3 machines.

If the two-channel additional feature is installed, go to CARR-320. If the eight-channel switch feature is installed, go to CARR-420.

CHL-I WRAP TEST DESCRIPTION

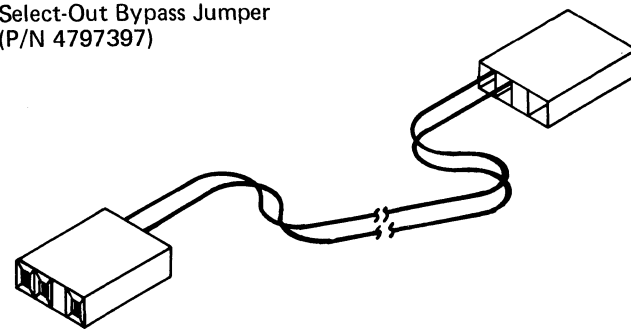
The test for the channel interface (CHL-I) wrap, tests the channel interface by using the control interface (CTL-I) as a channel simulator. The special wrap card and its attached cable connectors connect the channel interface to the control interface.

Note: Control interface wrap must run without errors before the channel interface wrap can be run.

CHL-I WRAP TEST PREREQUISITES

1. All devices attached to the storage director to be tested must be made not available to the operating system by Vary commands.
2. All channel switches (operator panel) for the storage director to be tested must be in the Disable position.
3. Select-out bypass jumpers must be installed for ALL channels of the storage director to be tested.

Select-Out Bypass Jumper (P/N 4797397)



CHL-I WRAP CABLE INSTALLATION

1. **Warning:** Install select-out bypass jumpers only on the storage director to be tested. If the storage director to be tested is connected to an operational system, install select-out bypass jumpers (P/N 4797397) on all channels of the storage director. See Figure 1.
2. Power off the storage director to be tested from the power switch panel.

3. **Warning:** Removal of cards or cables from the **WRONG** storage director can cause the customer jobs to fail.

Remove cable retainers and cable paddle connectors from rows A and B of the storage director board to be tested (B3 board for SD2 or B4 board for SD1).

4. **Warning:** Ensure the B4(B3) V2 or X2 card is correctly seated in the socket and the interposers are in place.

Carefully remove the four cables from the top of the card in the V or X-row of the same storage director.

5. Install the channel wrap cable assembly (P/N 2342699) in either the A-row position for channel A test or the B-row position for the channel B test. See Figure 2 for channel wrap cable assembly.
6. Install the channel wrap cable connectors (W,X,Y, and Z) onto the top of the card in the V2 or X2 position, on the storage director to be tested.
7. Check for loose connections on the channel wrap card and cable connectors.
8. Power up the storage director.
9. Run the channel wrap test using the maintenance device.
10. **Warning:** Remove all select-out bypass jumpers before returning the storage director to customer operation.

To return the machine to normal operation, reverse the above procedure.

Figure 2

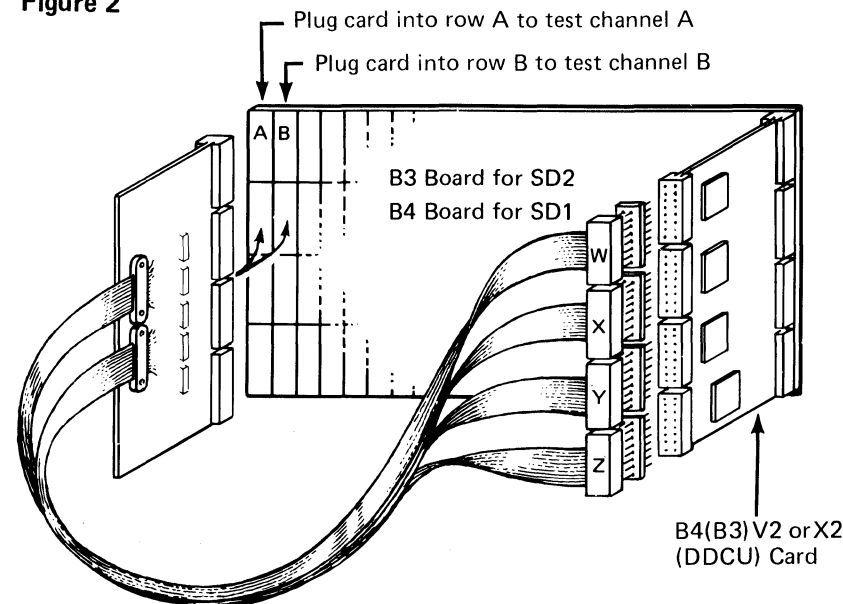
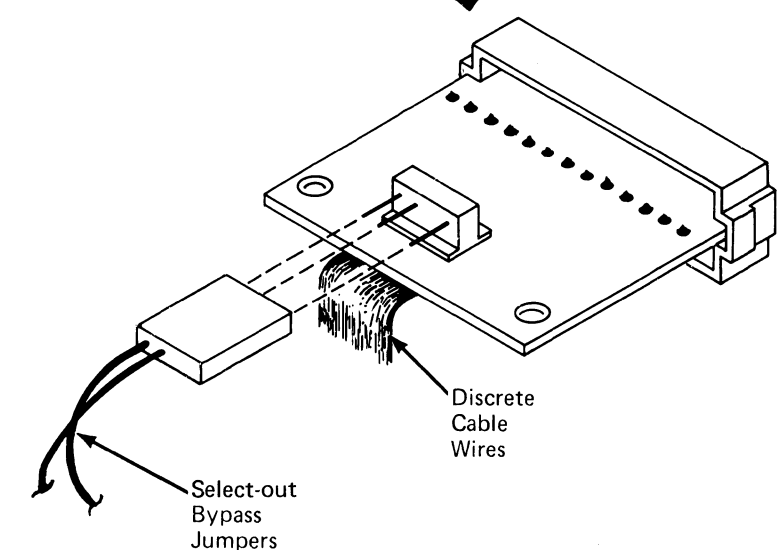
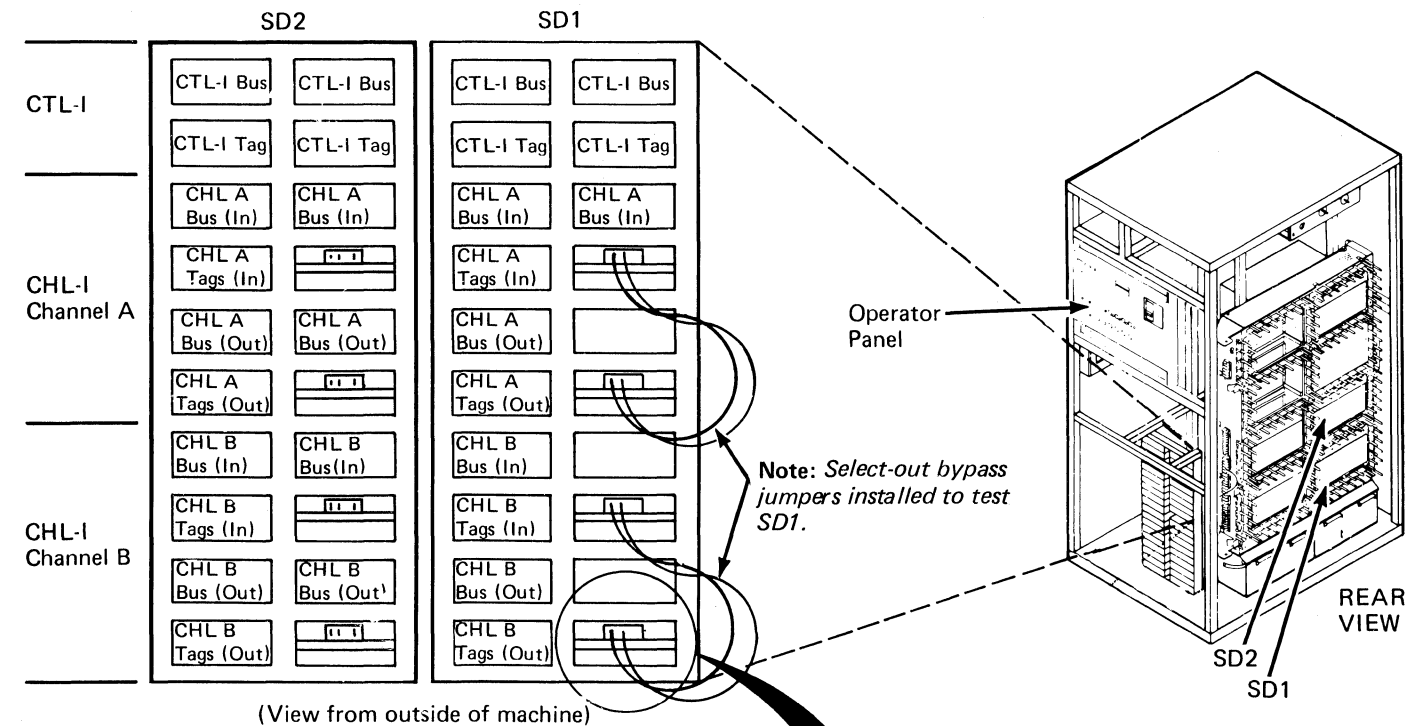


Figure 1



CHANNEL INTERFACE WRAP TEST (Models 2 and 3)

Use channel interface (CHL-I) wrap test (Model 1) on CARR-220 for storage director 1 on a Model 2 machine and all Model 1 machines.

If the two-channel additional feature is installed, go to CARR-321. If the eight-channel switch feature is installed, go to CARR-421.

CHL-I WRAP TEST DESCRIPTION

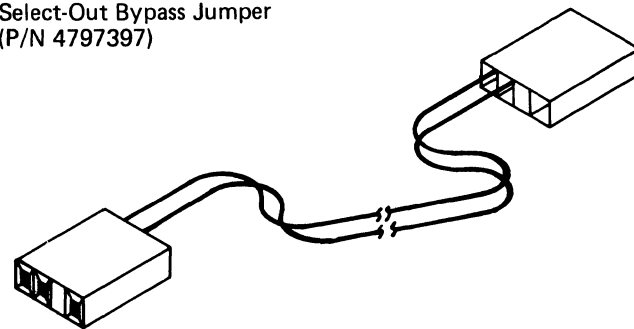
The test for the channel interface (CHL-I) wrap, tests the channel interface by using the control interface (CTL-I) as a channel simulator. The special wrap card and its attached cable connectors connect the channel interface to the control interface.

Note: Control interface wrap must run without errors before the channel interface wrap can be run.

CHL-I WRAP TEST PREREQUISITES

1. All devices attached to the storage director to be tested must be made not available to the operating system by Vary commands.
2. All channel switches (operator panel) for the storage director to be tested must be in the Disable position.
3. Select-out bypass jumpers must be installed for ALL channels of the storage director to be tested.

Select-Out Bypass Jumper
(P/N 4797397)



CHL-I WRAP CABLE INSTALLATION

1. **Warning: Install select-out bypass jumpers only on the storage director to be tested.**
If the storage director to be tested is connected to an operational system, install select-out bypass jumpers (P/N 4797397) on all channels of the storage director. See Figure 1.
2. Power off the storage director to be tested from the power switch panel.

3. **Warning: Removal of cards or cables from the WRONG storage director can cause the customer jobs to fail.**

Remove cable retainers and cable paddle connectors from rows A and B of the storage director board to be tested (B3 board for SD2 or B4 board for SD1).

4. **Warning: Ensure the B4(B3) V2 or X2 card is correctly seated in the socket and the interposers are in place.**

Carefully remove the two cables from the top of the card in the V or X-row of the same storage director. Remove the DDCV card from B4(B3) V2 or X2 and install the DDCU (DDC) card in B4(B3) V2 or X2.

5. Install the channel wrap cable assembly (P/N 2342699) in either the A-row position for channel A test or the B-row position for the channel B test. See Figure 2 for channel wrap cable assembly.
6. Install the channel wrap cable connectors (W, X, Y, and Z) onto the top of the card in the V2 or X2 position, on the storage director to be tested.
7. Check for loose connections on the channel wrap card and cable connectors.
8. Power up the storage director.
9. Run the channel wrap test using the maintenance device.
10. **Warning: Before returning the storage director to customer operation, the select-out bypass jumpers must be removed and the DDCU card reinstalled in B4(B3)V2 or X2.**

To return the machine to normal operation, use the following procedure.

- Remove all select-out bypass jumpers.
- Remove the DDCU card from B4(B3)V2 or X2, reinstall the DDCV card, and the two top-card cables.

Figure 1

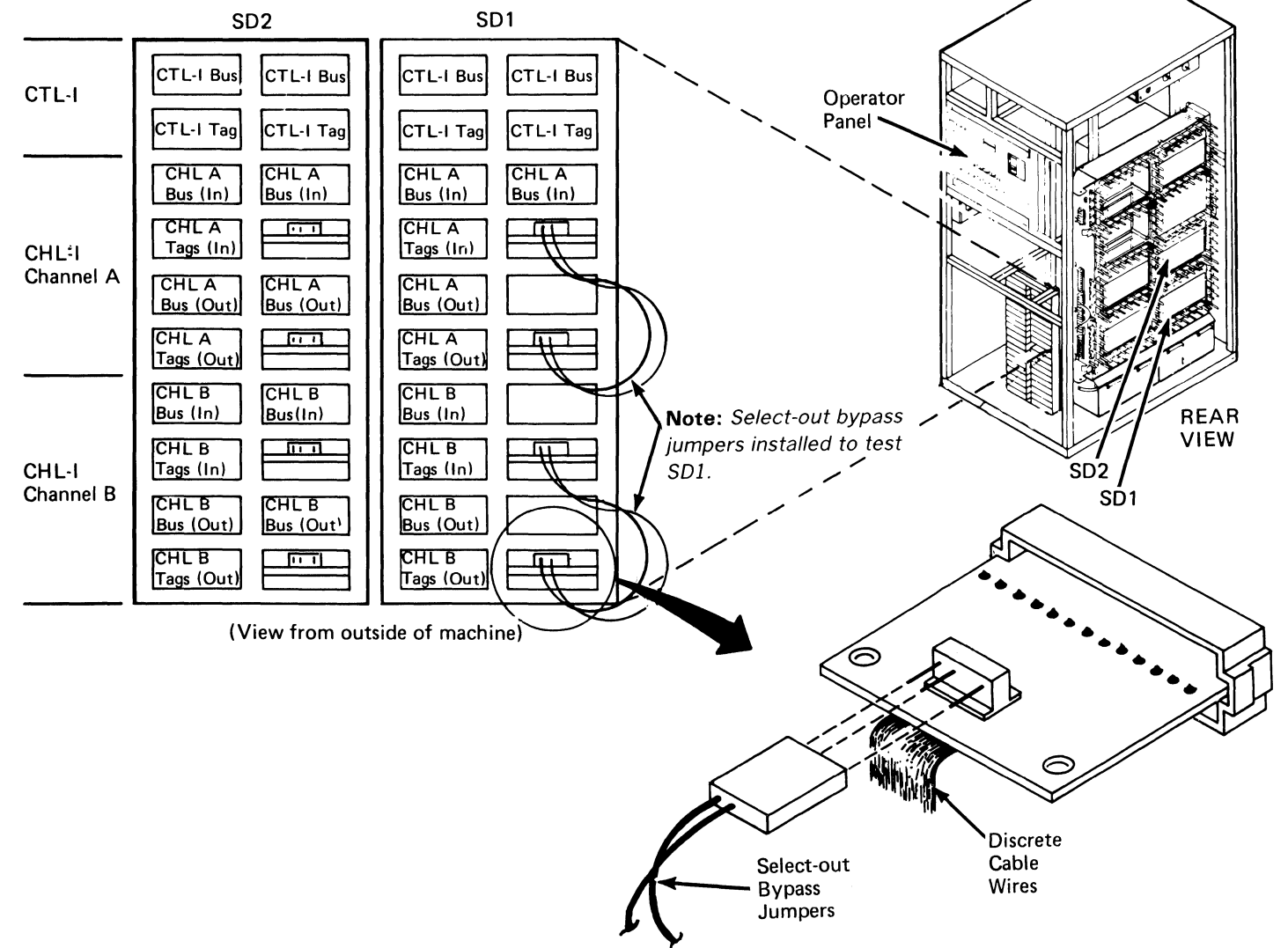
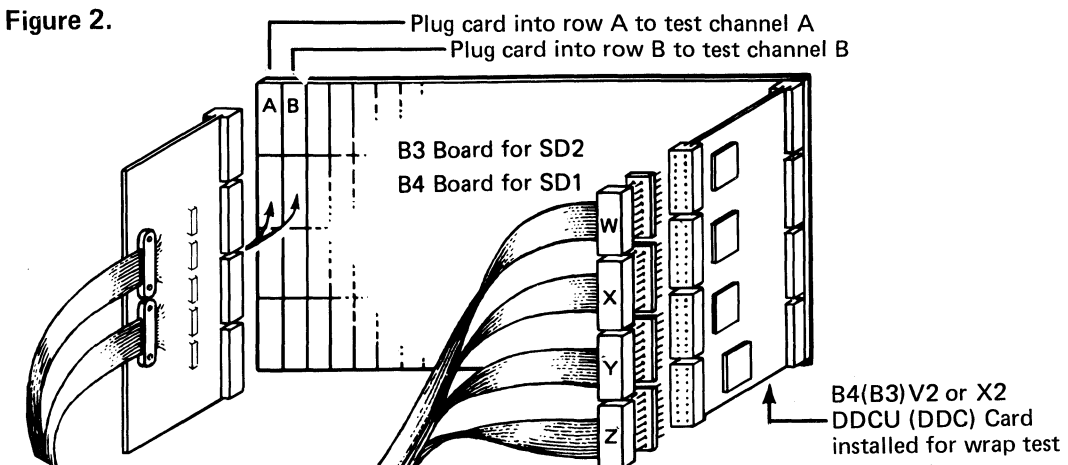
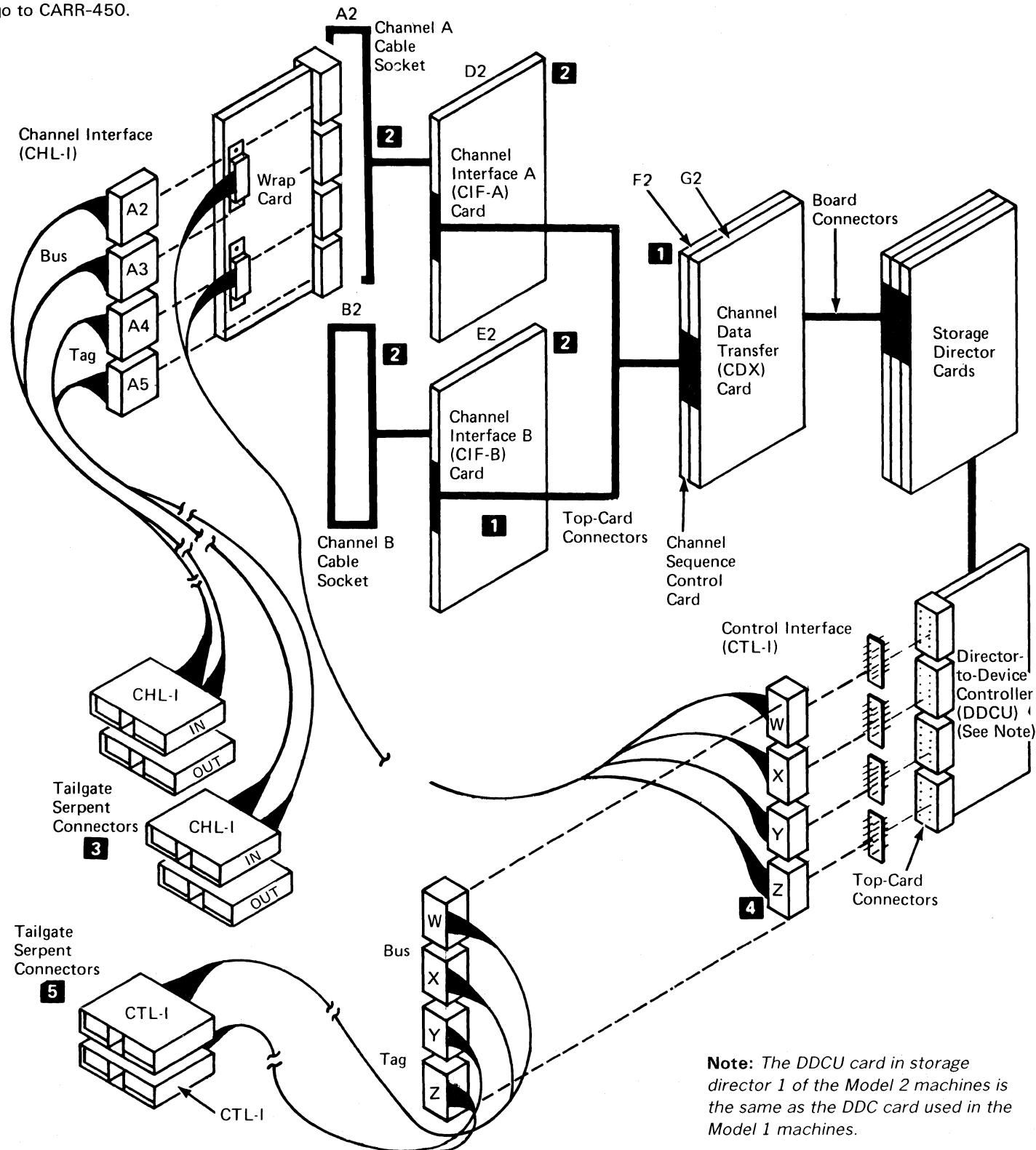


Figure 2



If the two-channel additional feature is installed, go to CARR-350. If the eight-channel switch feature is installed, go to CARR-450.



Channel Interface Lines	1	2	3	Data Flow	Control Interface Lines	4	5
Address Out	W32	M10	B10	←	CTL-I Tag Bus Out Bit 4	Y25	B05
Data Out	Y33	S10	G10	←	CTL-I Tag Bus Out Bit 7	Y26	D06
Hold Out		S12	G12	←	Tag Gate	Y30	B10
Select Out		P09	D09	←	Select Hold	Y31	D11
Command Out	Y30	P11	D11	←	Response	Y32	B12
Service Out	Y32	P13	D13	←	CTL-I Tag Bus Out Bit 6	Y28	B08
Supress Out		M12	B12	←	CTL-I Tag Bus Out Bit 5	Y24	D04
Operational Out		U13	J13	←	CTL-I Tag Bus Out Bit 0	Y23	B03
Operational In	W33	M02	B03	→	CE Alert	Z32	G12
Address In	X24	M04	B05	→	Sel Alert 3	Z30	G10
Select In		M08	B08	→	Index	Z29	J09
Data In	Y25	S08	G08	→	Check End	Z26	J06
Status In	X25	P05	D04	→	Error Alert	Z28	G08
Service In	Y24	P07	D06	→	Normal End	Z25	G05
Request In		U07	J06	→	Select Active	Z23	G03
Disconnect In	X26	U11	J11	→	Tag Valid	Z24	J04
Chan X Bus In Bit P	Y02	G02	G03	→	CTL-I Bus In Bit P	X23	G03
Chan X Bus In Bit 0	Y03	J05	J04	→	CTL-I Bus In Bit 0	X24	J04
Chan X Bus In Bit 1	Y05	G04	G05	→	CTL-I Bus In Bit 1	X25	G05
Chan X Bus In Bit 2	Y06	J07	J06	→	CTL-I Bus In Bit 2	X26	J06
Chan X Bus In Bit 3	Y07	G08	G08	→	CTL-I Bus In Bit 3	X28	G08
Chan X Bus In Bit 4	Y09	J09	J09	→	CTL-I Bus In Bit 4	X29	J09
Chan X Bus In Bit 5	Y10	G10	G10	→	CTL-I Bus In Bit 5	X30	G10
Chan X Bus In Bit 6	Y11	J11	J11	→	CTL-I Bus In Bit 6	X31	J11
Chan X Bus In Bit 7	Y13	G12	G12	→	CTL-I Bus In Bit 7	X32	G12
Mark In		J13	J13	→	(Dotted With Index Line)		
Chan X Bus Out Bit P	W02	B02	B03	←	CTL-I Bus Out Bit P	W23	B03
Chan X Bus Out Bit 0	W03	D05	D04	←	CTL-I Bus Out Bit 0	W24	D04
Chan X Bus Out Bit 1	W05	B04	B05	←	CTL-I Bus Out Bit 1	W25	B05
Chan X Bus Out Bit 2	W06	D07	D06	←	CTL-I Bus Out Bit 2	W26	D06
Chan X Bus Out Bit 3	W07	B08	B08	←	CTL-I Bus Out Bit 3	W28	B08
Chan X Bus Out Bit 4	W09	D09	D09	←	CTL-I Bus Out Bit 4	W29	D09
Chan X Bus Out Bit 5	W10	B10	B10	←	CTL-I Bus Out Bit 5	W30	B10
Chan X Bus Out Bit 6	W11	D11	D11	←	CTL-I Bus Out Bit 6	W31	D11
Chan X Bus Out Bit 7	W13	B12	B12	←	CTL-I Bus Out Bit 7	W32	B12

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REMOTE SWITCH FEATURE

CHANNEL ENABLE/DISABLE WITHOUT SWITCHES

To enable or disable channels on a 3880 with the remote switch feature installed, and with the feature cables not connected in R1 through R9, perform the following:

To enable: Insert a jumper wire between the enable pin and the ground pin in the remote switch cable connector for the channel and storage director desired.

To disable: Insert a jumper wire between the disable pin and the ground pin for the correct channel and storage director.

Storage Director 1	Chan A	Chan B	Chan C	Chan D	Chan E	Chan F	Chan G	Chan H
Channel Enable	R1(1)	R1(4)	R2(1)	R2(4)	R5(1)	R5(4)	R6(1)	R6(4)
Channel Ground	R1(2)	R1(5)	R2(2)	R2(5)	R5(2)	R5(5)	R6(2)	R6(5)
Channel Disable	R1(3)	R1(6)	R2(3)	R2(6)	R5(3)	R5(6)	R6(3)	R6(6)
Storage Director 2								
Channel Enable	R3(1)	R3(4)	R4(1)	R4(4)	R7(1)	R7(4)	R8(1)	R8(4)
Channel Ground	R3(2)	R3(5)	R4(2)	R4(5)	R7(2)	R7(5)	R8(2)	R8(5)
Channel Disable	R3(3)	R3(6)	R4(3)	R4(6)	R7(3)	R7(6)	R8(3)	R8(6)

Legend: Figure 1 Figure 2

Figure 1. Remote Enable/Disable Switch connector positions.

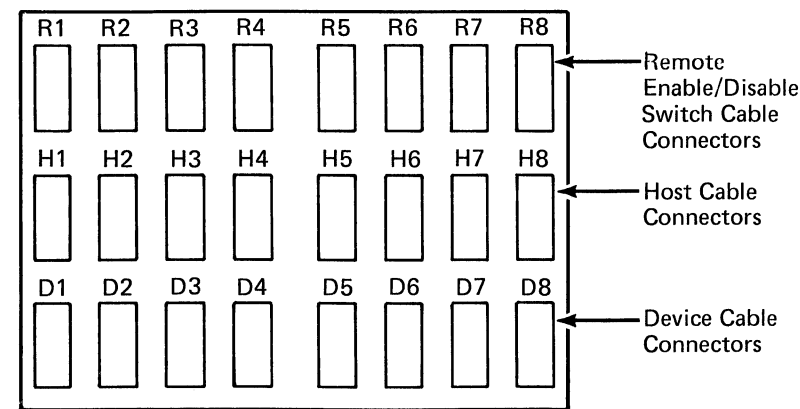
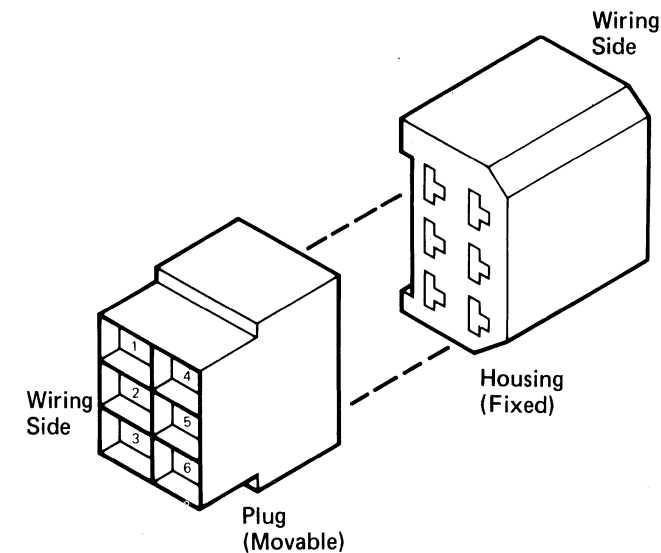


Figure 2. Remote Cable Connector pin identifier.



If the two-channel additional feature is installed, go to CARR-370. If the eight-channel switch feature is installed, go to CARR-490.

The channel interface cable swap procedure is used to determine if the cause of a channel type failure is within the 3880 or in another part of the system.

The channel interface cables should be swapped only if all MD diagnostics run without errors, and a failure can be repeatedly duplicated by running a 3880 OLT, FRIEND, or a customer job.

Note: A customer job should be used only if there is no other way to repeat the failure.

Before performing a cable swap, ensure that the channel wrap test runs without errors on all channels of the storage director. The MD and the channel wrap test verify most of the 3880 channel circuits as shown in Figure 1. The cable swap procedure changes the connection of the system cables from the 3880 channel that is suspected of failing to a known good 3880 channel in the same storage director (see CARR-231).

PROCEDURE

Swap Cables

Use the following procedure to swap the cables attached to the failing channel:

1. Swap the channel interface bus in and tag in cables with the bus in and tag in cables of a good channel within the same storage director.
2. Swap the channel interface bus out and tag out cables with the bus out and tag out cables of the same channel as in step 1.

Note: If terminators are used on any out connectors, swap them as if they were cables.

3. Swap the channel interface (CIF) card address switch settings of the failing channel with the CIF card address switch settings of the same channel used in step 2.

Note: Do not swap the CIF cards.

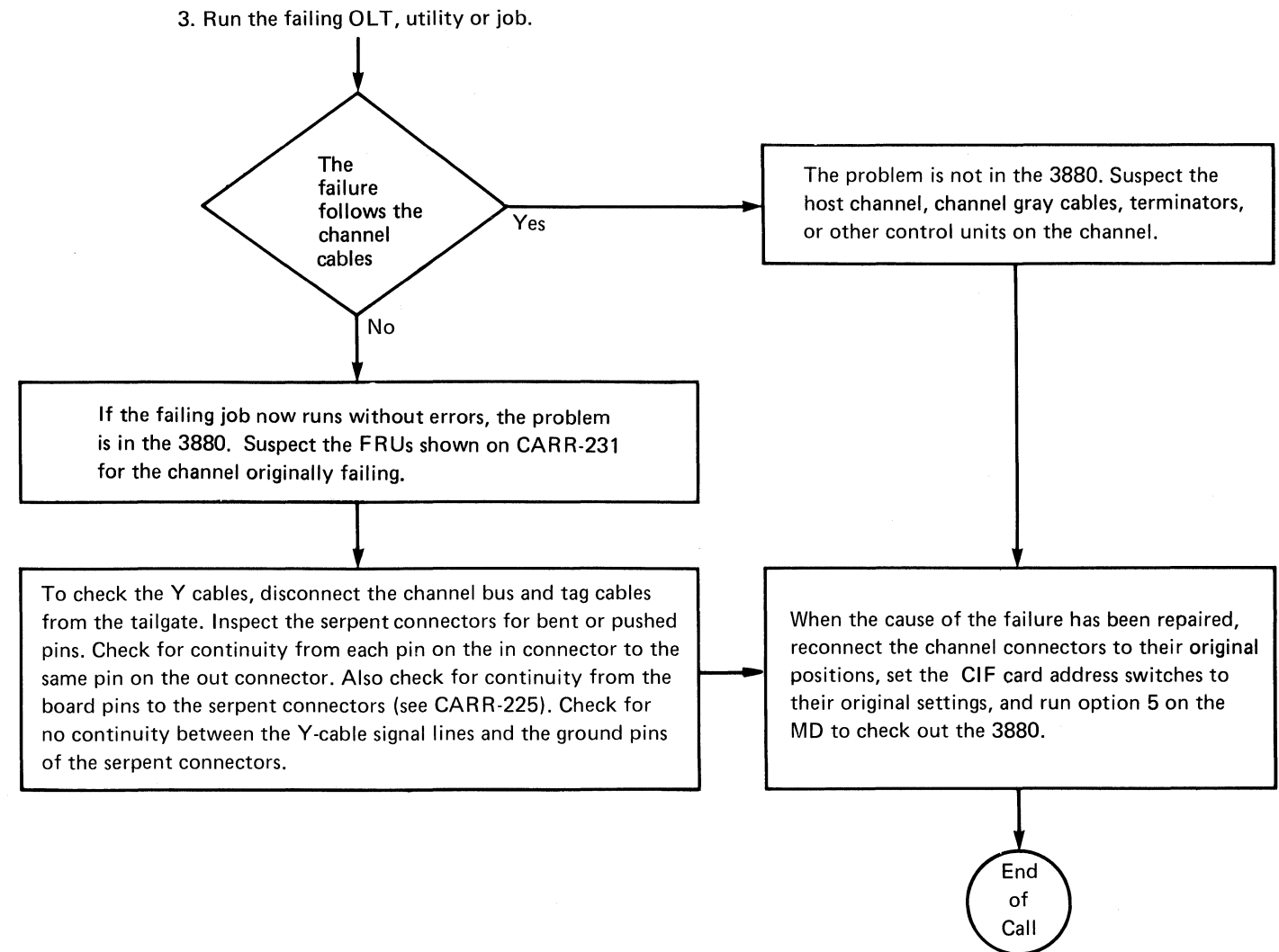
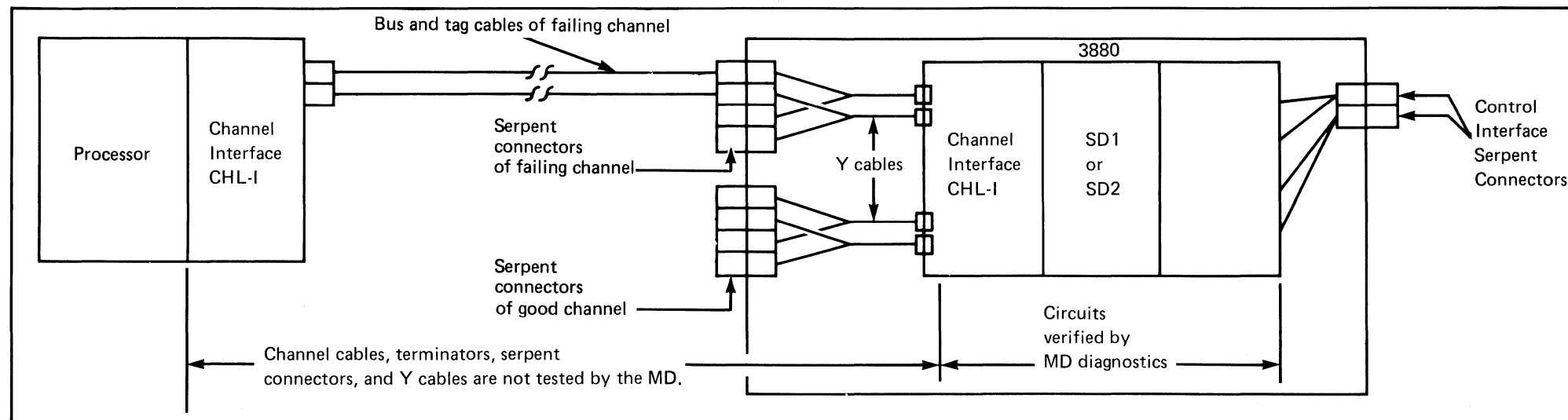


Figure 1. Channel Circuits and Y-Cables



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CHANNEL INTERFACE CABLE SWAP

If the two-channel additional feature is installed, go to CARR-380. If the eight-channel switch feature is installed, go to CARR-490:

Channel and Device Connectors (Model 1)

	Storage Director 1	Storage Director 2	
CTL-I	BUS	BUS	CTL-I
	TAG	TAG	
CHL-I CHANNEL A	BUS IN	BUS IN	CHL-I CHANNEL A
	TAG IN	TAG IN	
	BUS OUT	BUS OUT	
CHL-I CHANNEL B	TAG OUT	TAG OUT	CHL-I CHANNEL B
	BUS IN	BUS IN	
	TAG IN	TAG IN	
	BUS OUT	BUS OUT	
	TAG OUT	TAG OUT	

(Tailgate viewed from inside the machine)

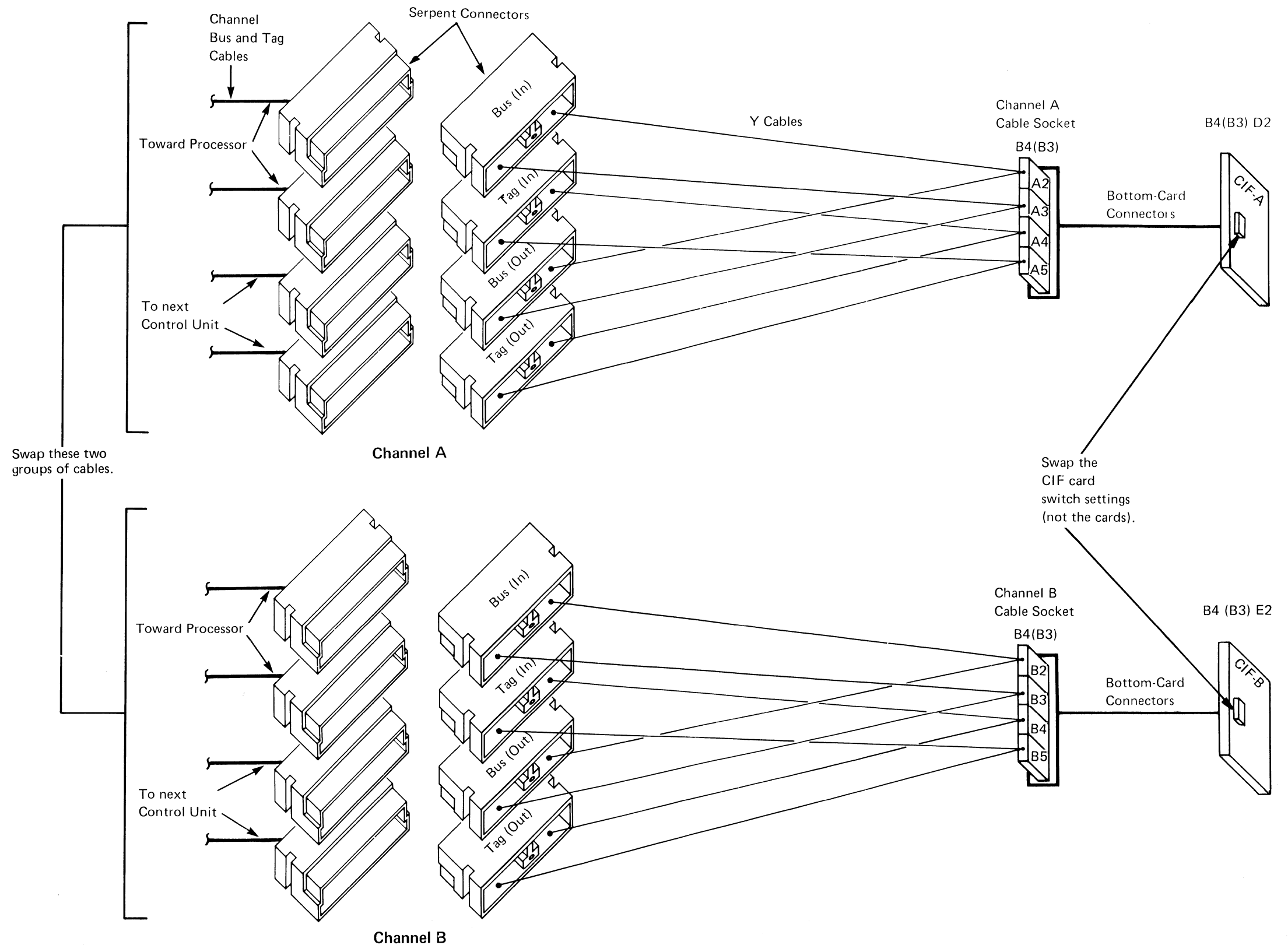
Channel and Device Connectors (Model 2)

	Storage Director 1	Storage Director 2	
CTL-I	BUS	NOT USED	CTL-I
	TAG	BUS/TAG	
	BUS IN	BUS IN	

Channel and Device Connectors (Model 3)

	Storage Director 1	Storage Director 2	
CTL-I	NOT USED	NOT USED	CTL-I
	BUS/TAG	BUS/TAG	
	BUS IN	BUS IN	
	TAG IN	TAG IN	

(Tailgate viewed from inside the machine)



Swap these two groups of cables.

Swap the CIF card switch settings (not the cards).

Use channel interface (CHL-I) wrap test (Models 2 and 3) on CARR-321 for storage director 2 on a Model 2 machine and all Model 3 machines.

CHL-I WRAP TEST DESCRIPTION

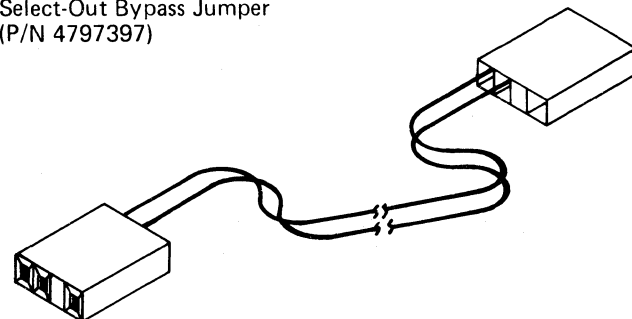
The test for the channel interface (CHL-I) wrap, tests the channel interface by using the control interface (CTL-I) as a channel simulator. The special wrap card and its attached cable connectors connect the channel interface to the control interface.

Note: Control interface wrap must execute successfully before channel interface wrap can be run.

CHL-I WRAP TEST PREREQUISITES

1. All devices attached to the storage director to be tested must be made not available to the operating system by Vary commands.
2. All channel switches (operator panel) for the storage director to be tested must be in the Disable position.
3. Select-out bypass jumpers must be installed for ALL channels of the storage director to be tested.

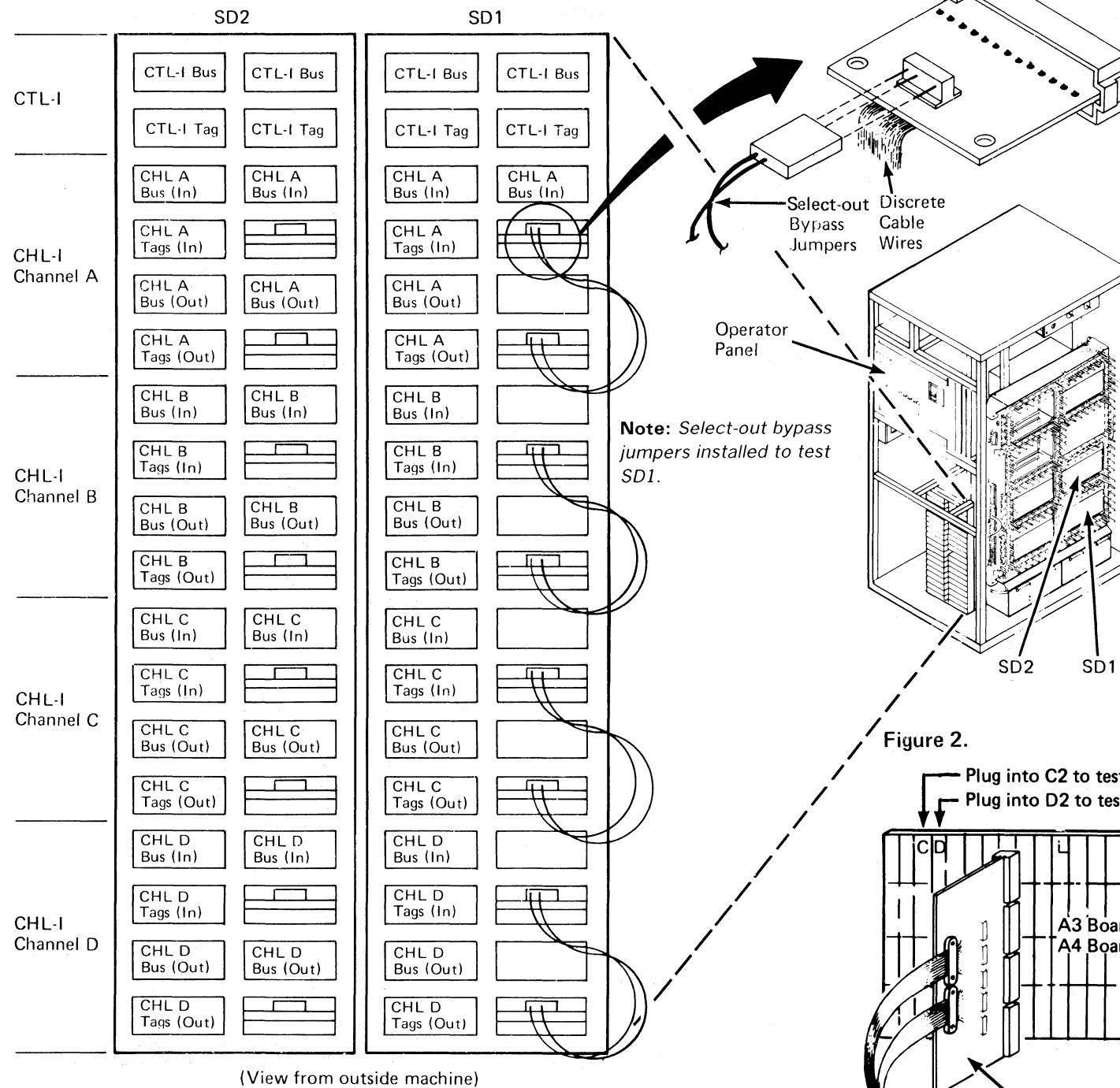
Select-Out Bypass Jumper (P/N 4797397)



CHL-I WRAP CABLE INSTALLATION

1. **Warning:** Install select-out bypass jumpers only on the storage director to be tested. If the storage director to be tested is connected to an operational system, install select-out bypass jumpers (P/N 4797397) on all channels of the storage director. See Figure 1.
2. Power off the storage director to be tested from the power switch panel.
3. **Warning:** Removal of cards or cables from the **WRONG** storage director can cause the customer jobs to fail.

Figure 1.

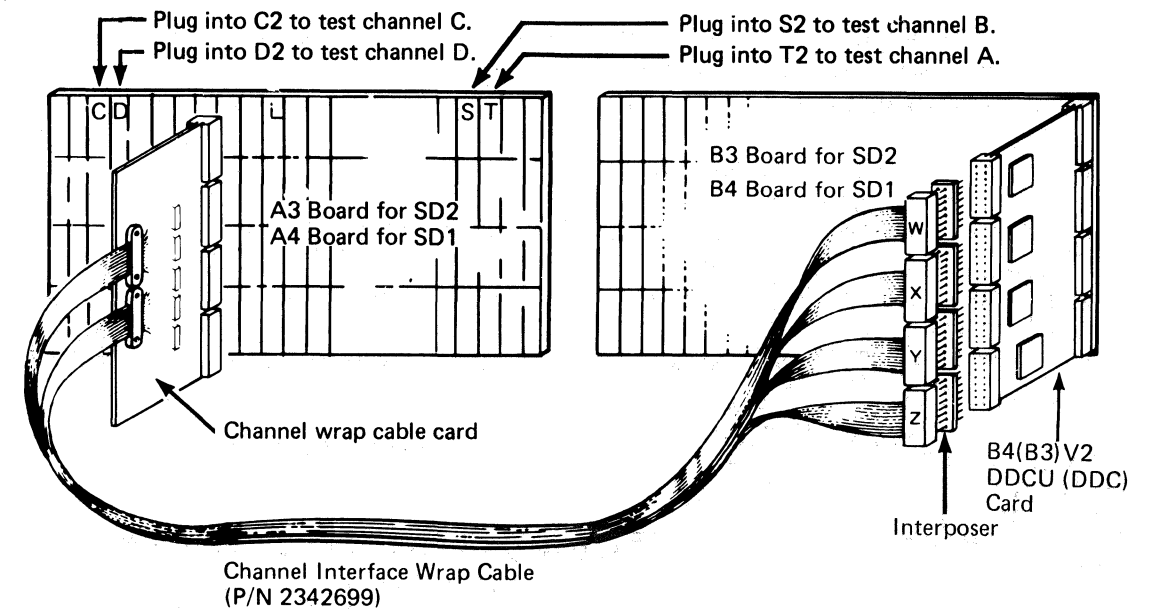


(View from outside machine)

Remove the four jumper (JMP) cards for the storage director to be tested. The JMP cards for SD1 are in locations A4C2, A4D2, A4S2, and A4T2. The JMP cards for SD2 are in locations A3C2, A3D2, A3S2, and A3T2.

4. **Warning:** Ensure the B4(B3)V2 card is correctly seated in the socket and the interposers are in place. Carefully remove the four cables from the top of the card in the V-row of the same storage director.
5. Install the channel wrap cable card. See Figure 2 for the location.
6. Install the channel wrap cable connectors (W, X, Y, and Z) onto the top of the card in the V2 position, on the storage director to be tested.
7. Check for loose connections on the channel wrap card and cable connectors.
8. Power up the storage director.
9. Run the channel wrap test using the maintenance device.
10. **Warning:** Remove all select-out bypass jumpers before returning the storage director to customer operation. To return the machine to normal operation, reverse the above procedure.

Figure 2.



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CHANNEL INTERFACE WRAP CABLE INSTALLATION (Models 2 and 3 with 20-Card B4/B3 Boards)

CHANNEL INTERFACE WRAP CABLE INSTALLATION (Models 2 and 3 with 20-Card B4/B3 Boards)

CARR-321 TCA

Use channel interface (CHL-I) wrap test (Model 1) on CARR-320 for storage director 1 on a Model 2 machine and all Model 1 machines.

CHL-I WRAP TEST DESCRIPTION

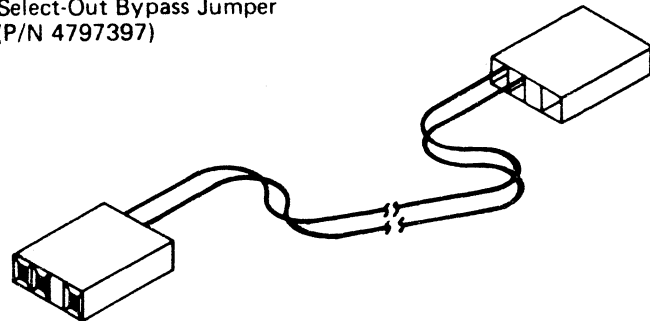
The test for the channel interface (CHL-I) wrap, tests the channel interface by using the control interface (CTL-I) as a channel simulator. The special wrap card and its attached cable connectors connect the channel interface to the control interface.

Note: Control interface wrap must execute successfully before channel interface wrap can be run.

CHL-I WRAP TEST PREREQUISITES

1. All devices attached to the storage director to be tested must be made not available to the operating system by Vary commands.
2. All channel switches (operator panel) for the storage director to be tested must be in the Disable position.
3. Select-out bypass jumpers must be installed for ALL channels of the storage director to be tested.

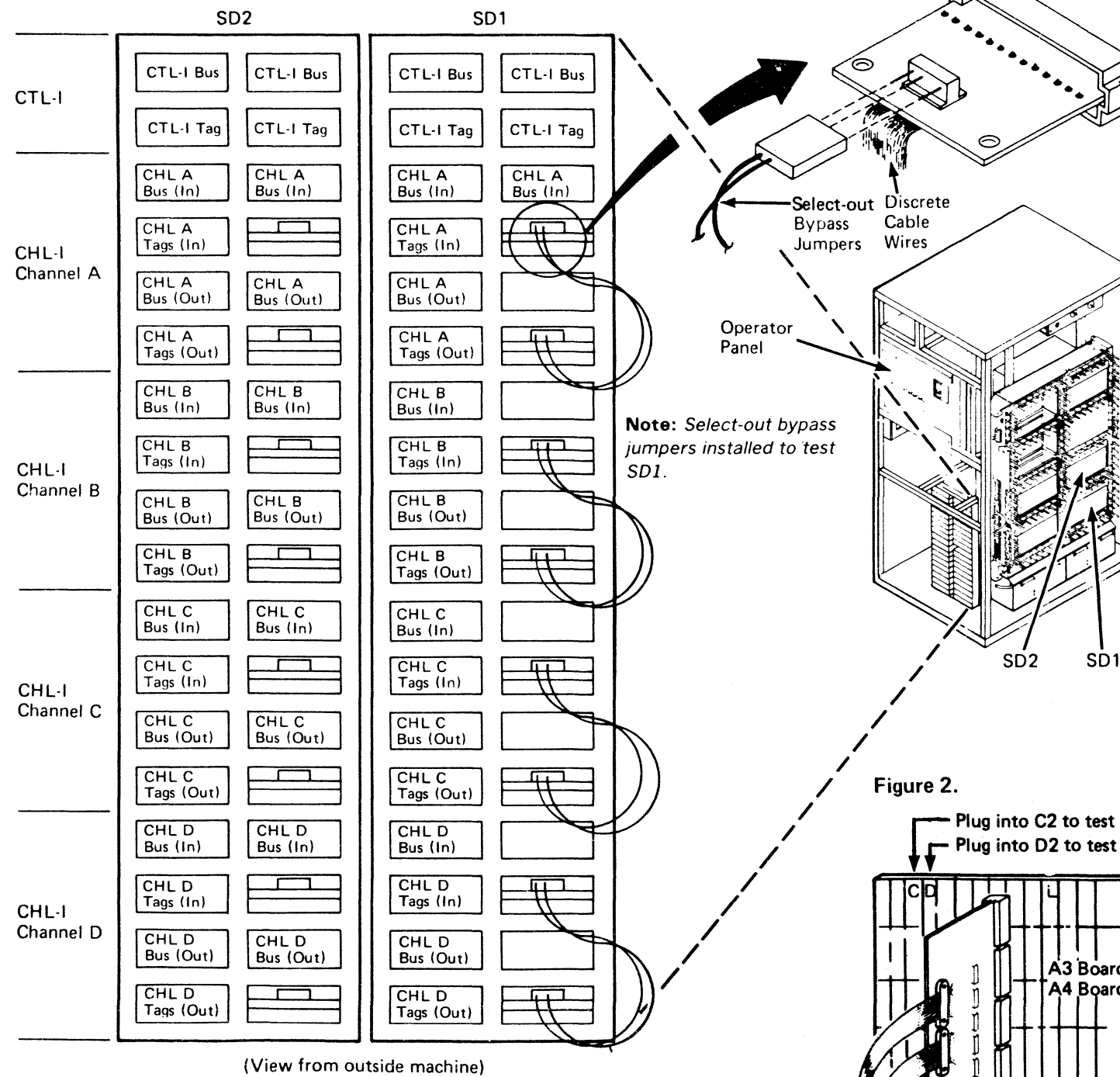
Select-Out Bypass Jumper (P/N 4797397)



CHL-I WRAP CABLE INSTALLATION

1. **Warning:** Install select-out bypass jumpers only on the storage director to be tested. If the storage director to be tested is connected to an operational system, install select-out bypass jumpers (P/N 4797397) on all channels of the storage director. See Figure 1.
2. Power off the storage director to be tested from the power switch panel.
3. **Warning:** Removal of cards or cables from the **WRONG** storage director can cause the customer jobs to fail.

Figure 1.



Remove the four jumper (JMP) cards for the storage director to be tested. The JMP cards for SD1 are in locations A4C2, A4D2, A4S2, and A4T2. The JMP cards for SD2 are in locations A3C2, A3D2, A3S2, and A3T2.

4. **Warning:** Ensure the B4(B3) V2 card is correctly seated in the socket and the interposers are in place.

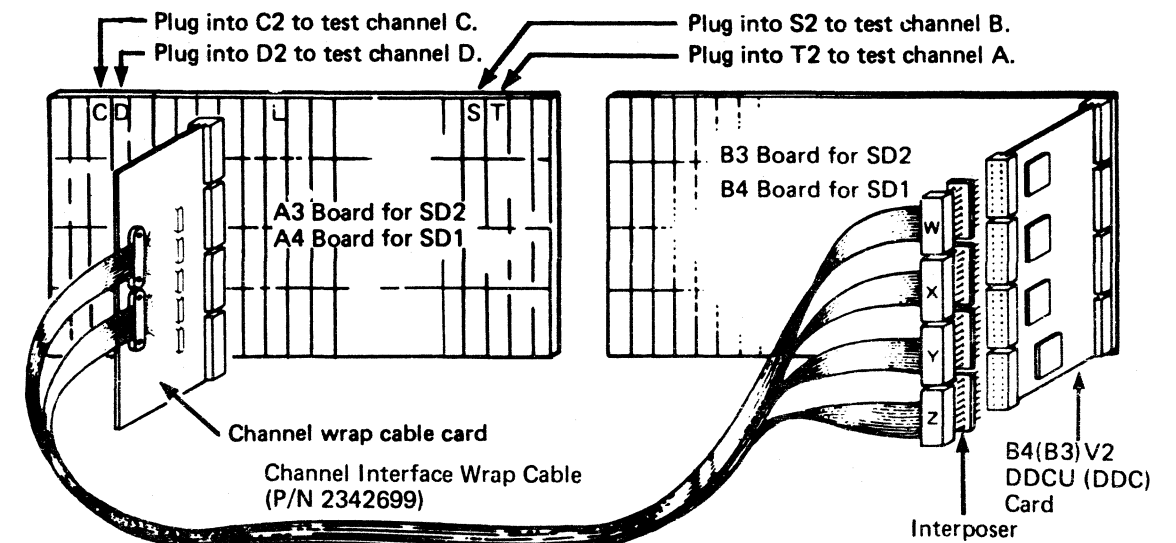
Carefully remove the two cables from the top of the card and the DDCV card in the V-row of the same storage director. Install a DDCU (DDC) card in the V-row.

5. Install the channel wrap cable card. See Figure 2 for the location.
6. Install the channel wrap cable connectors (W,X,Y, and Z) onto the top of the card in the V2 position, on the storage director to be tested.
7. Check for loose connections on the channel wrap card and cable connectors.
8. Power up the storage director.
9. Run the channel wrap test using the maintenance device.
10. **Warning:** Before returning the storage director to customer operation:

- Remove all select-out bypass jumpers
- Remove the DDCU card from B4(B3)V2, then reinstall the DDCV card and the two top-card cables.

To return the machine to normal operation, reverse the above procedure.

Figure 2.



Use channel interface (CHL-I) wrap test (Models 2 and 3) on CARR-323 for storage director 2 on a Model 2 machine and all Model 3 machines.

CHL-I WRAP TEST DESCRIPTION

The test for the channel interface (CHL-I) wrap, tests the channel interface by using the control interface (CTL-I) as a channel simulator. The special wrap card and its attached cable connectors connect the channel interface to the control interface.

Note: Control interface wrap tests must run without errors before the channel interface wrap test can be run.

CHL-I WRAP TEST PREREQUISITES

1. All devices attached to the storage director to be tested must be made not available to the operating system by Vary commands.
2. All channel switches (operator panel) for the storage director to be tested must be in the Disable position.
3. The select-out bypass jumper card must be installed for the storage director channels to be tested.

CHL-I WRAP CABLE INSTALLATION

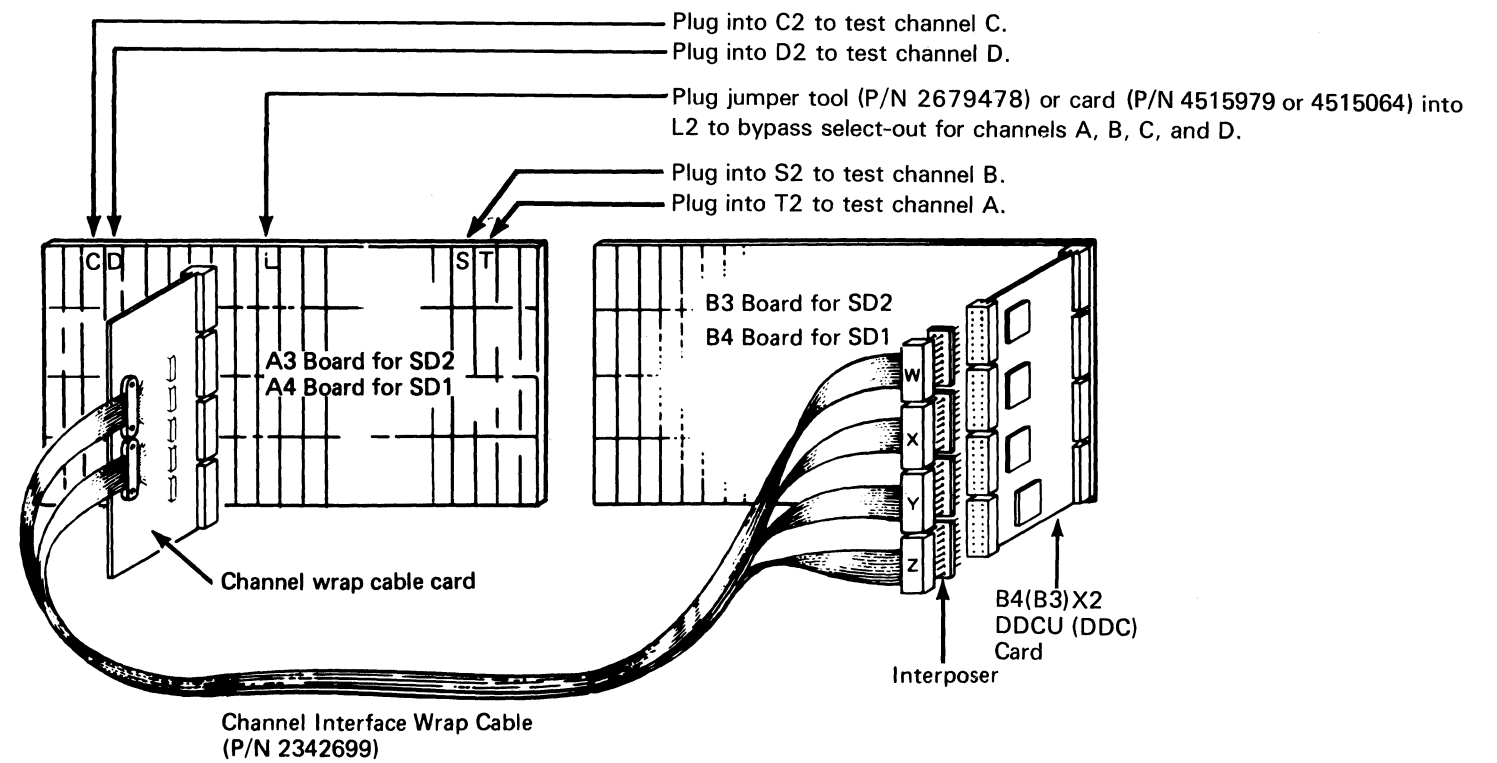
Warning: Removal of cards or cables from the WRONG storage director can cause the customer jobs to fail.

1. If the storage director to be tested is connected to an operational system, install the select-out bypass jumper tool (P/N 2679478) or card (P/N 4515064) in A4L2 for SD1 or A3L2 for SD2 (see Figure 1).
2. Power off the storage director to be tested from the power switch panel.
3. Remove the four jumper (JMP) cards for the storage director to be tested as follows:

Channel	SD1	SD2
A	A4T2	A3T2
B	A4S2	A3S2
C	A4C2	A3C2
D	A4D2	A3D2

4. Carefully remove the four cables from the top of the B4X2 card for SD1 or the B3X2 card for SD2.
Warning: Ensure that the B4X2 card for SD1 or the B3X2 card for SD2 is correctly seated in the socket and the interposers are in place.
5. Install the channel wrap cable card. See Figure 1 for the location.
6. Install the channel wrap cable connectors (W,X,Y, and Z) onto the top of the card in the X2 position, on the storage director to be tested.
7. Check for loose connections on the channel wrap card and cable connectors.
8. Power on the storage director.
9. Run the channel wrap test, using the maintenance device.
10. To return the machine to normal operation, perform the following steps:
11. Power off the storage director from the power switch panel.
12. Reinstall all jumper cards, that were removed from the machine.
13. Remove select-out bypass jumper cards from the machine.
14. Reinstall the CTL-I cables to the top of the X2 card.
15. Reinstall all other machine parts that were removed for testing.

Figure 1.



CHANNEL INTERFACE WRAP TEST (Models 2 and 3 with 22-Card B4/B3 Boards)

Use channel interface (CHL-I) wrap test (Model 1) on CARR-322 for storage director 1 on a Model 2 machine and all Model 1 machines.

CHL-I WRAP TEST DESCRIPTION

The test for the channel interface (CHL-I) wrap, tests the channel interface by using the control interface (CTL-I) as a channel simulator. The special wrap card and its attached cable connectors connect the channel interface to the control interface.

Note: Control interface wrap tests must run without errors before the channel interface wrap test can be run.

CHL-I WRAP TEST PREREQUISITES

1. All devices attached to the storage director to be tested must be made not available to the operating system by Vary commands.
2. All channel switches (operator panel) for the storage director to be tested must be in the Disable position.
3. The select-out bypass jumper card must be installed for the storage director channels to be tested.

CHL-I WRAP CABLE INSTALLATION

Warning: Removal of cards or cables from the WRONG storage director can cause the customer jobs to fail.

1. If the storage director to be tested is connected to an operational system, install the select-out bypass jumper tool (P/N 2679478) or card (P/N 4515064) in A4L2 for SD1 or A3L2 for SD2 (see Figure 1).
2. Power off the storage director to be tested from the power switch panel.
3. Remove the four jumper (JMP) cards for the storage director to be tested as follows:

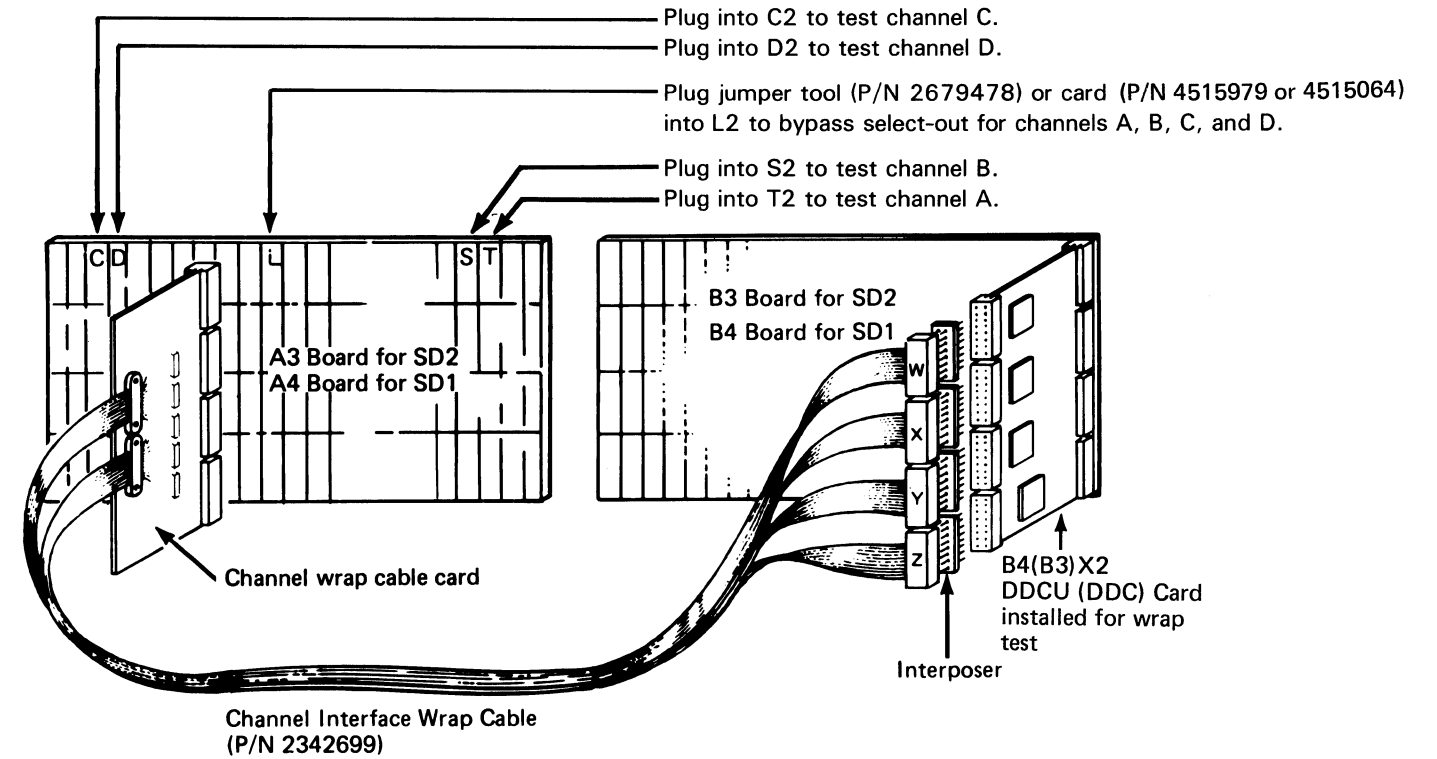
Channel	SD1	SD2
A	A4T2	A3T2
B	A4S2	A3S2
C	A4C2	A3C2
D	A4D2	A3D2

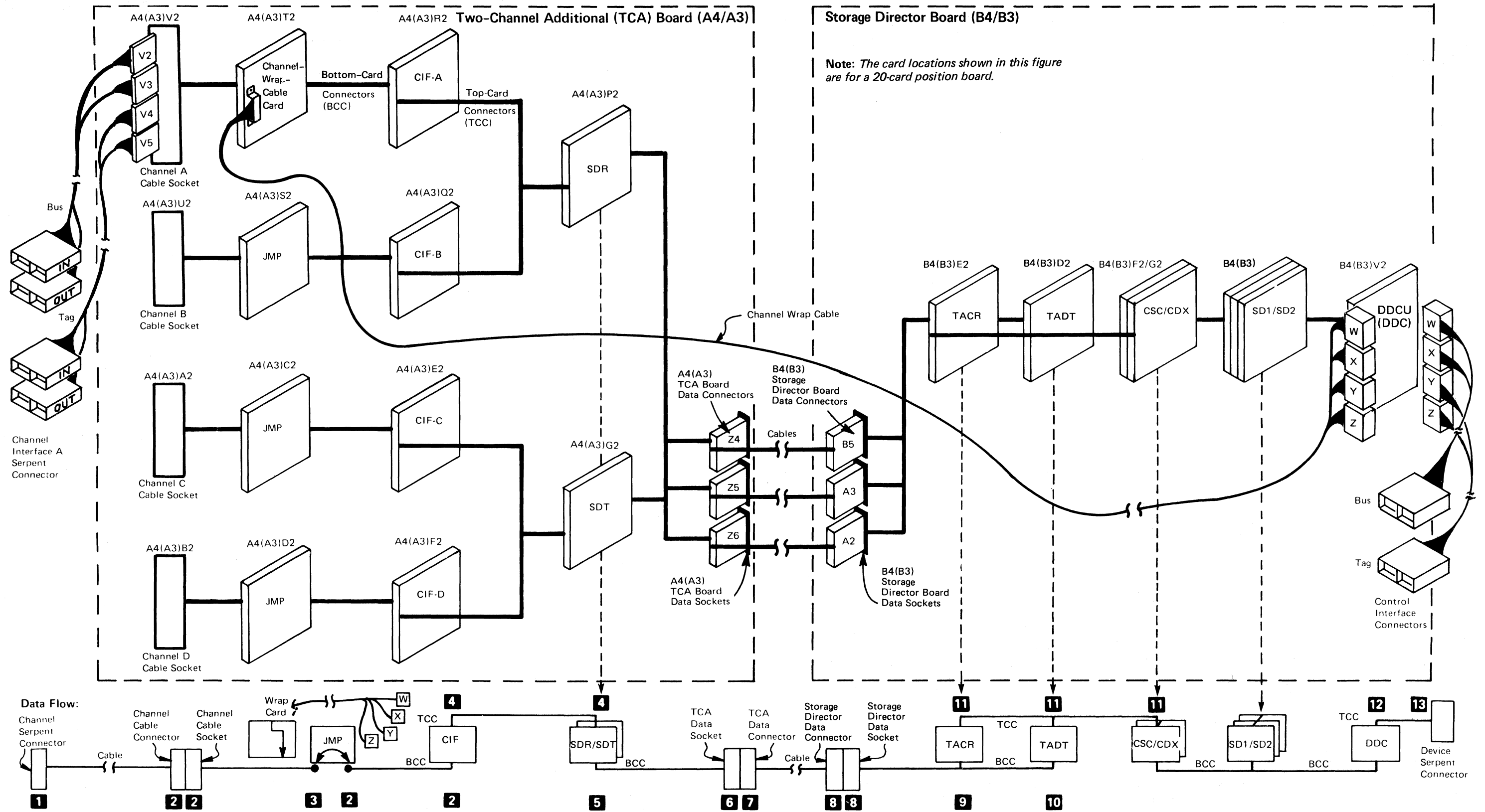
4. Carefully remove the two cables from the top of the B4X2 card for SD1 or the B3X2 card for SD2. Remove the DDCV card and install the DDCU (DDC) card.

Warning: Ensure that the B4X2 card for SD1 or the B3X2 card for SD2 is correctly seated in the socket and the interposers are in place.

5. Install the channel wrap cable card. See Figure 1 for the location.
6. Install the channel wrap cable connectors (W,X,Y, and Z) onto the top of the card in the X2 position, on the storage director to be tested.
7. Check for loose connections on the channel wrap card and cable connectors.
8. Power on the storage director.
9. Run the channel wrap test, using the maintenance device.
10. To return the machine to normal operation, perform the following steps:
11. Power off the storage director from the power switch panel.
12. Reinstall all jumper cards, that were removed from the machine.
13. Remove select-out bypass jumper cards from the machine.
14. Remove the DDCU card from B4(B3)X2 and reinstall the DDCV card.
15. Reinstall the two CTL-I cables to the top of the X2 card.
16. Reinstall all other machine parts that were removed for testing.

Figure 1.





Note: The card locations shown in this figure are for a 20-card position board.

3880	AU0330	8498534	450903	450905	450907	450908	461517
MIM	Side 2 of 2	Part No.	25Jan80	18Apr80	10Dec80	15Apr81	27Jan84

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CHANNEL INTERFACE WRAP CONNECTION

TWO-CHANNEL ADDITIONAL BOARD (A4/A3)								Data Flow	STORAGE DIRECTOR BOARD (B4/B3)							
Channel Interface Lines	1	2	3	4	5	6	7		8	9	10	11	Control Interface Lines	12	13	
T Address Out	B10	M10	P06	W32	B12	V6B02	Z6D13	←	A2D13	D13		W32	CTL-I Tag Bus Out Bit 4	Y25	B05	
Data Out	G10	S10	S09	Y33	M13	N6B02	Z4D10	←	B5D10		P13	Y33	CTL-I Tag Bus Out Bit 7	Y26	D06	
Hold Out	G12	S12	U12					←					Tag Gate	Y30	B10	
Select Out	D09	P09	P10					←					Select Hold	Y31	D11	
Command Out	D11	P11	M07	Y30	M10	M6C02	Z4D06	←	Z4D06		P07	Y30	Response	Y32	B12	
Service Out	D13	P13	M13	Y32	M12	N6E04	Z4B13	←	B5B13		M12	Y32	CTL-I Tag Bus Out Bit 6	Y28	B08	
Suppress Out	B12	M12	P12					←					CTL-I Tag Bus Out Bit 6	Y24	D04	
A Operational Out	J13	U13	S13					←					CTL-I Tag Bus Out Bit 6	Y23	B03	
Operational In	B03	M02	P02	W33	B13	P6E04	Z5B02	→	A3B02	G02		W33	CE Alert	Z32	G12	
G Address In	B05	M04	M03	X24	G03	Q6B04	Z5B04	→	A3B04	G04		X24	Sel Alert 3	Z30	G10	
Select In	B08	M08	M09					→					Index	Z29	J09	
Data In	G08	S08	U06	Y25	M05	S6A02	Z5D13	→	A3D13	J13		Y25	Check End	Z26	J06	
Status In	D04	P05	P04	X25	G04	Q6C04	Z5B05	→	A3B05	G05		X25	Error Alert	Z28	G08	
Service In	D06	P07	M05	Y24	M04	R6E04	Z5B12	→	A3B12	G12		Y24	Normal End	Z25	G05	
Request In	J06	U07	S05					→					Select Active	Z23	G03	
Disconnect In	J11	U11	U10	X26	G05	Q6D02	Z5D06	→	A3D06	G07		X26	Tag Valid	Z24	J04	
Chan X Bus In Bit P	G03	G02	J02	Y02	P02	L6D02	Z4D02	→	B5D02		P05	Y02	CTL-I Bus In Bit P	X23	G03	
Chan X Bus In Bit 0	J04	J05	J04	Y03	P04	M6B02	Z4D05	→	B5D05		U05	Y03	CTL-I Bus In Bit 0	X24	J04	
Chan X Bus In Bit 1	G05	G04	G03	Y05	P05	M6A04	Z4B04	→	B5B04		S04	Y05	CTL-I Bus In Bit 1	X25	G05	
Chan X Bus In Bit 2	J06	J07	G05	Y06	P06	M6D02	Z4D07	→	B5D07		U07	Y06	CTL-I Bus In Bit 2	X26	J06	
Chan X Bus In Bit 3	G08	G08	J06	Y07	P07	M6E04	Z4B08	→	B5B08		S08	Y07	CTL-I Bus In Bit 3	X28	G08	
Chan X Bus In Bit 4	J09	J09	G07	Y09	P09	N6C02	Z4D11	→	B5D11		U11	Y09	CTL-I Bus In Bit 4	X29	J09	
B Chan X Bus In Bit 5	G10	G10	G09	Y10	P10	N6B04	Z4B10	→	B5B10		S10	Y10	CTL-I Bus In Bit 5	X30	G10	
Chan X Bus In Bit 6	J11	J11	J10	Y11	P11	N6E02	Z4D13	→	B5D13		U13	Y11	CTL-I Bus In Bit 6	X31	J11	
U Chan X Bus In Bit 7	G12	G12	J12	Y13	P12	N6D04	Z4B12	→	B5B12		S13	Y13	CTL-I Bus In Bit 7	X32	G12	
Mark In	J13	J13	G13	Mark In line is wired to Index line at pin J09 in wrap cable.												
S Chan X Bus Out Bit P	B03	B02	D02	W02	D02	T6A04	Z6B02	←	A2B02	B02		W02	CTL-I Bus Out Bit P	W23	B03	
Chan X Bus Out Bit 0	D04	D05	D04	W03	D04	T6D02	Z6D05	←	A2D05	D05		W03	CTL-I Bus Out Bit 0	W24	D04	
Chan X Bus Out Bit 1	B05	B04	B03	W05	D05	T6C04	Z6B04	←	A2B04	B04		W05	CTL-I Bus Out Bit 1	W25	B05	
Chan X Bus Out Bit 2	D06	D07	B05	W06	D06	U6A02	Z6D07	←	A2D07	D07		W06	CTL-I Bus Out Bit 2	W26	D06	
Chan X Bus Out Bit 3	B08	B08	D06	W07	D07	U6B04	Z6B08	←	A2B08	B08		W07	CTL-I Bus Out Bit 3	W28	B08	
Chan X Bus Out Bit 4	D09	D09	B07	W09	D09	U6C02	Z6D09	←	A2D09	D09		W09	CTL-I Bus Out Bit 4	W29	D09	
Chan X Bus Out Bit 5	B10	B10	B09	W10	D10	U6D04	Z6B10	←	A2B10	B10		W10	CTL-I Bus Out Bit 5	W30	B10	
Chan X Bus Out Bit 6	D11	D11	D10	W11	D11	U6E02	Z6D11	←	A2D11	D11		W11	CTL-I Bus Out Bit 6	W31	D11	
Chan X Bus Out Bit 7	B12	B12	D12	W13	D12	V6A04	Z6B12	←	A2B12	B12		W13	CTL-I Bus Out Bit 7	W32	B12	

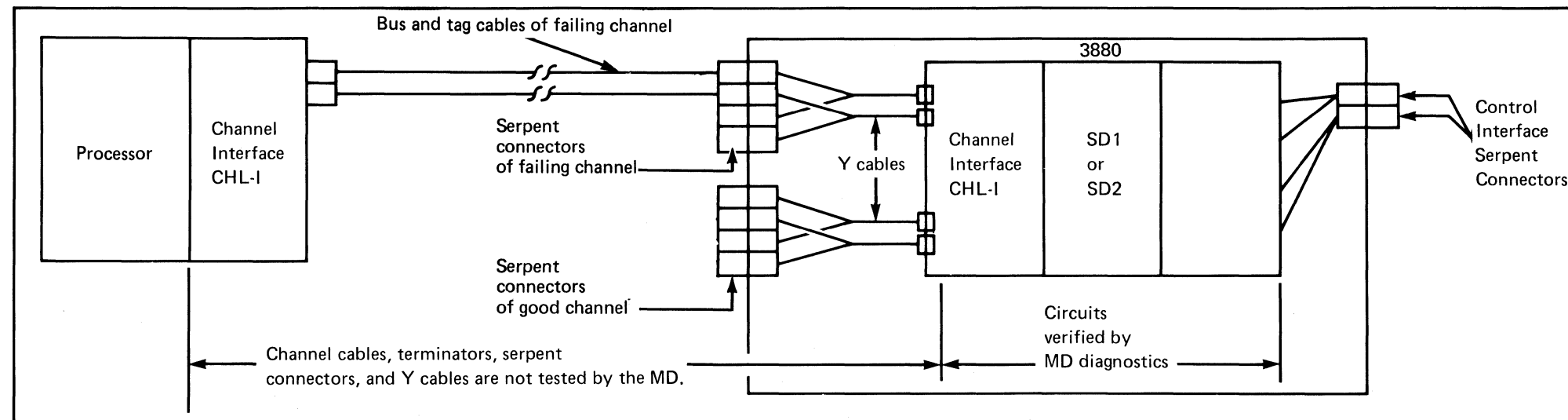
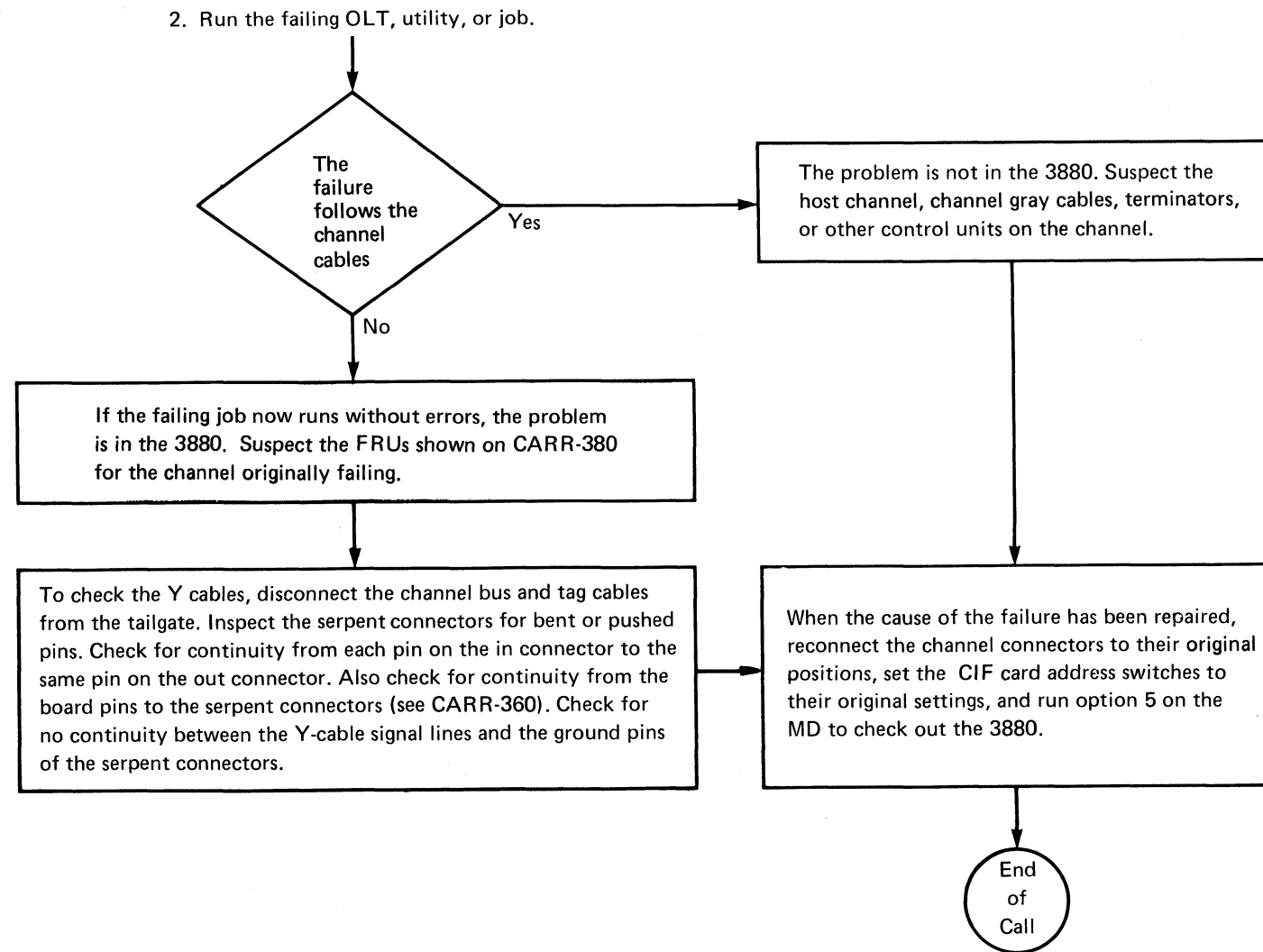
The channel interface cable swap procedure is used to determine if the cause of a channel type failure is within the 3880 or in another part of the system.

The channel interface cables should be swapped only if all MD diagnostics run without errors, and a failure can be repeatedly duplicated by running a 3880 OLT, FRIEND, or a customer job. **Note:** A customer job should be used only if there is no other way to repeat the failure.

Before performing a cable swap, ensure that the channel wrap test runs without errors on all channels of the storage director. The MD and the channel wrap test verify most of the 3880 channel circuits as shown in figure 1. The cable swap procedure changes the connection of the system cables from the 3880 channel that is suspected of failing to a known good 3880 channel in the same storage director (see CARR-380).

PROCEDURE

1. Swap the cables attached to the failing channel as follows:
 - a. Swap the channel interface bus in and tag in cables with the bus in and tag in cables of a good channel within the same storage director.
 - b. Swap the channel interface bus out and tag out cables with the bus out and tag out cables of the same channel as in step a. **Note:** If terminators are used on any out connectors, swap them as if they were cables.
 - c. Swap the channel interface (CIF) card address switch settings of the failing channel with the CIF card address switch settings of the same channel used in step b. **Note:** Do not swap the CIF cards.



3880 MIM	AU0360 Side 2 of 2	8498536 Part No.	450903 25Jan80	450905 18Apr80	450908 15Apr81	.	.
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CHANNEL INTERFACE CABLE SWAP

Swap two groups of channel cables (gray cables) at the tailgate, and swap the address switch settings of the associated CIF cards (not the cards).

Suspected FRUs are not tested by the MD. The FRUs for the failing channel are;

- The jumper (JMP) card
- The Y-cable assemblies
- The serpent connectors

Channel and Device Connectors (Model 3)

	Storage Director 1	Storage Director 2
CTL-I	NOT USED	NOT USED
	BUS/TAG	BUS/TAG
	BUS IN	BUS IN

(Tailgate viewed from inside the machine)

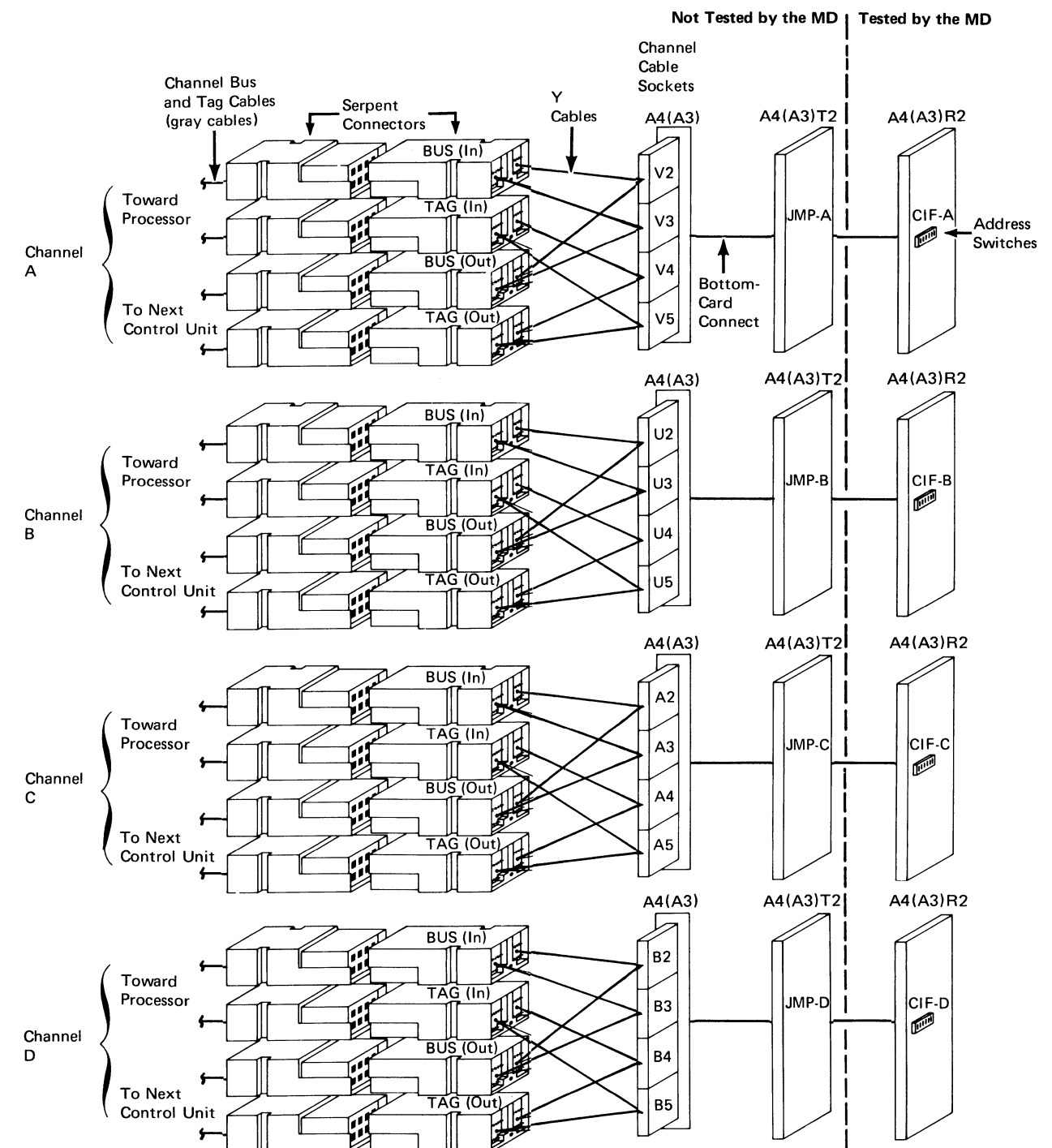
Channel and Device Connectors (Model 1)

	Storage Director 1	Storage Director 2
CTL-I	BUS	BUS
	TAG	TAG
CHL-I CHANNEL A	BUS IN	BUS IN
	TAG IN	TAG IN
	BUS OUT	BUS OUT
	TAG OUT	TAG OUT
CHL-I CHANNEL B	BUS IN	BUS IN
	TAG IN	TAG IN
	BUS OUT	BUS OUT
	TAG OUT	TAG OUT
CHL-I CHANNEL C	BUS IN	BUS IN
	TAG IN	TAG IN
	BUS OUT	BUS OUT
	TAG OUT	TAG OUT
CHL-I CHANNEL D	BUS IN	BUS IN
	TAG IN	TAG IN
	BUS OUT	BUS OUT
	TAG OUT	TAG OUT

(Tailgate viewed from inside the machine)

Channel and Device Connectors (Model 2)

	Storage Director 1	Storage Director 2
CTL-I	BUS	NOT USED
	TAG	BUS/TAG
	BUS IN	BUS IN



Use channel interface (CHL-I) wrap test (Models 2 and 3) on CARR-421 for storage director 2 on a Model 2 machine and all Model 3 machines.

WRAP TEST

The test for the channel interface (CHL-I) wrap, tests the channel interface by using the control interface (CTL-I) as a channel simulator. The special wrap card and its attached cable connectors connect the channel interface to the control interface.

Note: Control interface wrap tests must run without errors before the channel interface wrap test can be run.

CHL-I PREREQUISITES

1. All devices attached to the storage director to be tested must be made not available to the operating system by Vary commands.
2. All channel switches (operator panel) for the storage director to be tested must be in the Disable position.
3. The select-out bypass jumper card must be installed for the storage director channels to be tested.

CHL-I WRAP CABLE INSTALLATION

Warning: Removal of cards or cables from the WRONG storage director can cause the customer jobs to fail.

1. If the storage director to be tested is connected to an operational system, install the select-out bypass jumper tool (P/N 2679478) or card (P/N 4515064) as follows (see Figure 1):

Channel	SD1	SD2
A-D	A4L2	A3L2
E-H	A2L2	A1L2

2. Power off the storage director to be tested from the power switch panel.

3. Remove the eight jumper (JMP) cards for the storage director to be tested as follows:

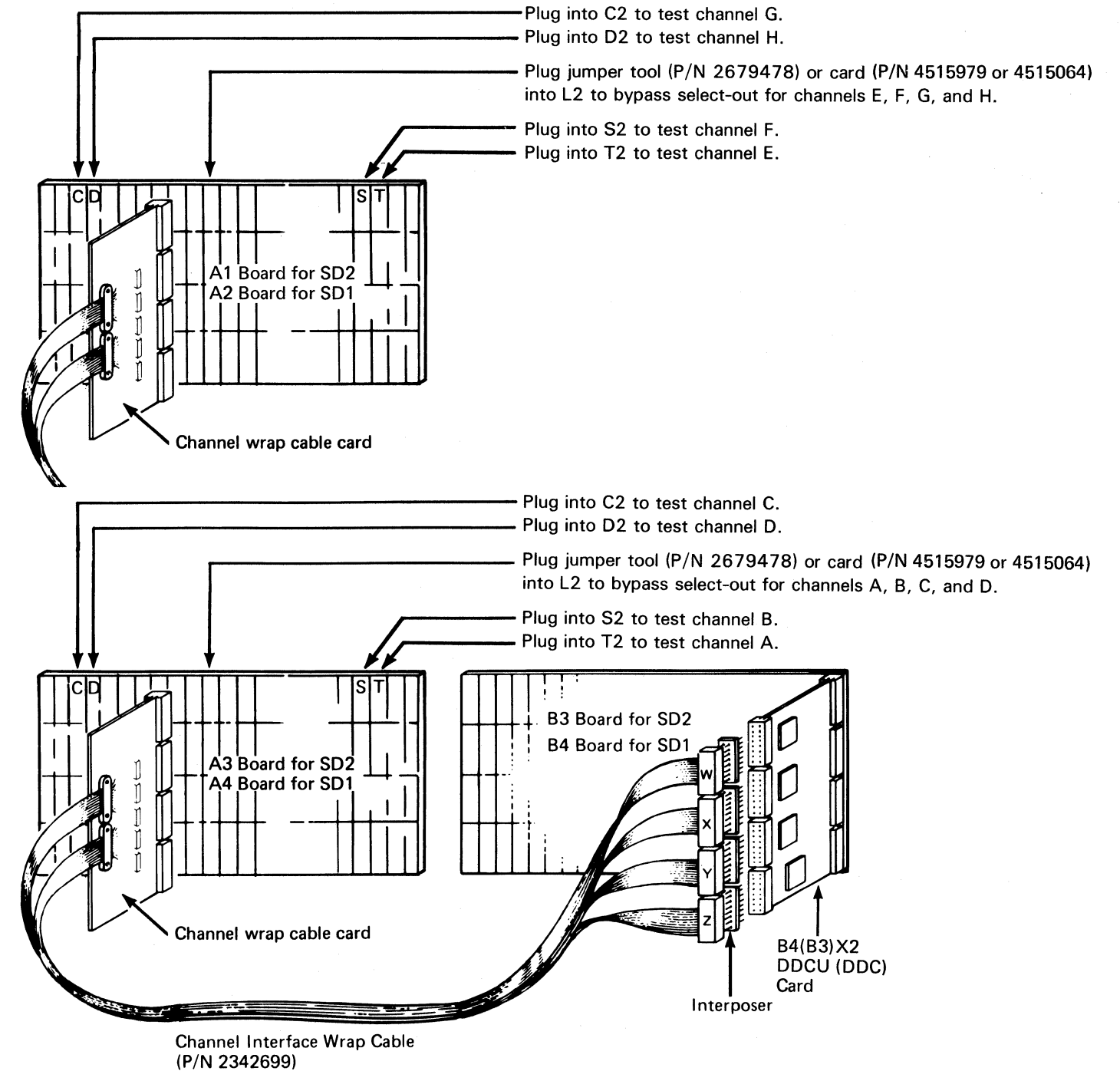
Channel	SD1	SD2
A	A4T2	A3T2
B	A4S2	A3S2
C	A4C2	A3C2
D	A4D2	A3D2
E	A2T2	A1T2
F	A2S2	A1S2
G	A2C2	A1C2
H	A2D2	A1D2

4. Carefully remove the four cables from the top of the B4X2 card for SD1 or the B3X2 card for SD2.

Warning: Ensure that the B4X2 card for SD1 or the B3X2 card for SD2 is correctly seated in the socket and the interposers are in place.

5. Install the channel wrap cable card. See Figure 1 for the location.
6. Install the channel wrap cable connectors (W,X,Y, and Z) onto the top of the card in the X2 position, on the storage director to be tested.
7. Check for loose connections on the channel wrap card and cable connectors.
8. Power on the storage director.
9. Run the channel wrap test, using the maintenance device.
10. To return the machine to normal operation, perform the following steps:
11. Power off the storage director from the power switch panel.
12. Reinstall all jumper cards, that were removed from the machine.
13. Remove select-out bypass jumper cards from the machine.
14. Reinstall the CTL-I cables to the top of the X2 card.
15. Reinstall all other machine parts that were removed for testing.

Figure 1.



CHANNEL INTERFACE WRAP TEST (Models 2 and3)

CHANNEL INTERFACE WRAP TEST (Models 2 and3)

CARR-421 FCA

Use channel interface (CHL-I) wrap test (Model 1) on CARR-420 for storage director 1 on a Model 2 machine and all Model 1 machines.

CHL-I WRAP TEST DESCRIPTION

The test for the channel interface (CHL-I) wrap, tests the channel interface by using the control interface (CTL-I) as a channel simulator. The special wrap card and its attached cable connectors connect the channel interface to the control interface.

Note: Control interface wrap tests must run without errors before the channel interface wrap test can be run.

CHL-I WRAP TEST PREREQUISITES

1. All devices attached to the storage director to be tested must be made not available to the operating system by Vary commands.
2. All channel switches (operator panel) for the storage director to be tested must be in the Disable position.
3. The select-out bypass jumper card must be installed for the storage director channels to be tested.

CHL-I WRAP CABLE INSTALLATION

Warning: Removal of cards or cables from the **WRONG** storage director can cause the customer jobs to fail.

1. If the storage director to be tested is connected to an operational system, install the select-out bypass jumper tools (P/N 2679478) or cards (P/N 4515064) for channels A through H as follows (see Figure 1):

Channel	SD1	SD2
A-D	A4L2	A3L2
E-H	A2L2	A1L2

2. Power off the storage director to be tested from the power switch panel.

3. Remove the eight jumper (JMP) cards for the storage director to be tested as follows:

Channel	SD1	SD2
A	A4T2	A3T2
B	A4S2	A3S2
C	A4C2	A3C2
D	A4D2	A3D2
E	A2T2	A1T2
F	A2S2	A1S2
G	A2C2	A1C2
H	A2D2	A1D2

4. Carefully remove the two cables from the top of the card and the DDCV card in the X-row of the same storage director. Install a DDCU (DDC) card in the X-row (B4X2 card for SD1 or the B3X2 card for SD2).

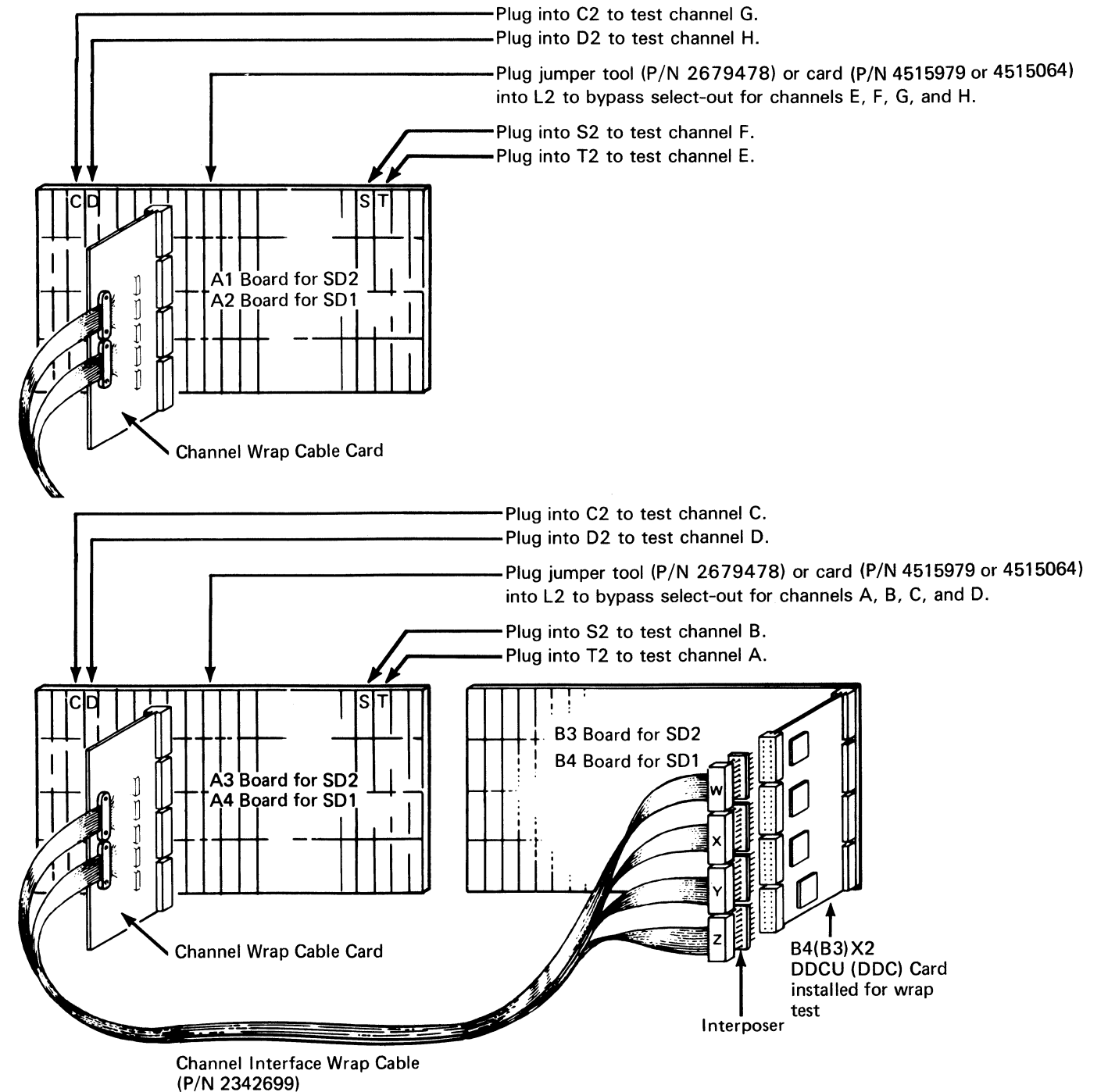
Warning: Ensure that the B4X2 card for SD1 or the B3X2 card for SD2 is correctly seated in the socket and the interposers are in place.

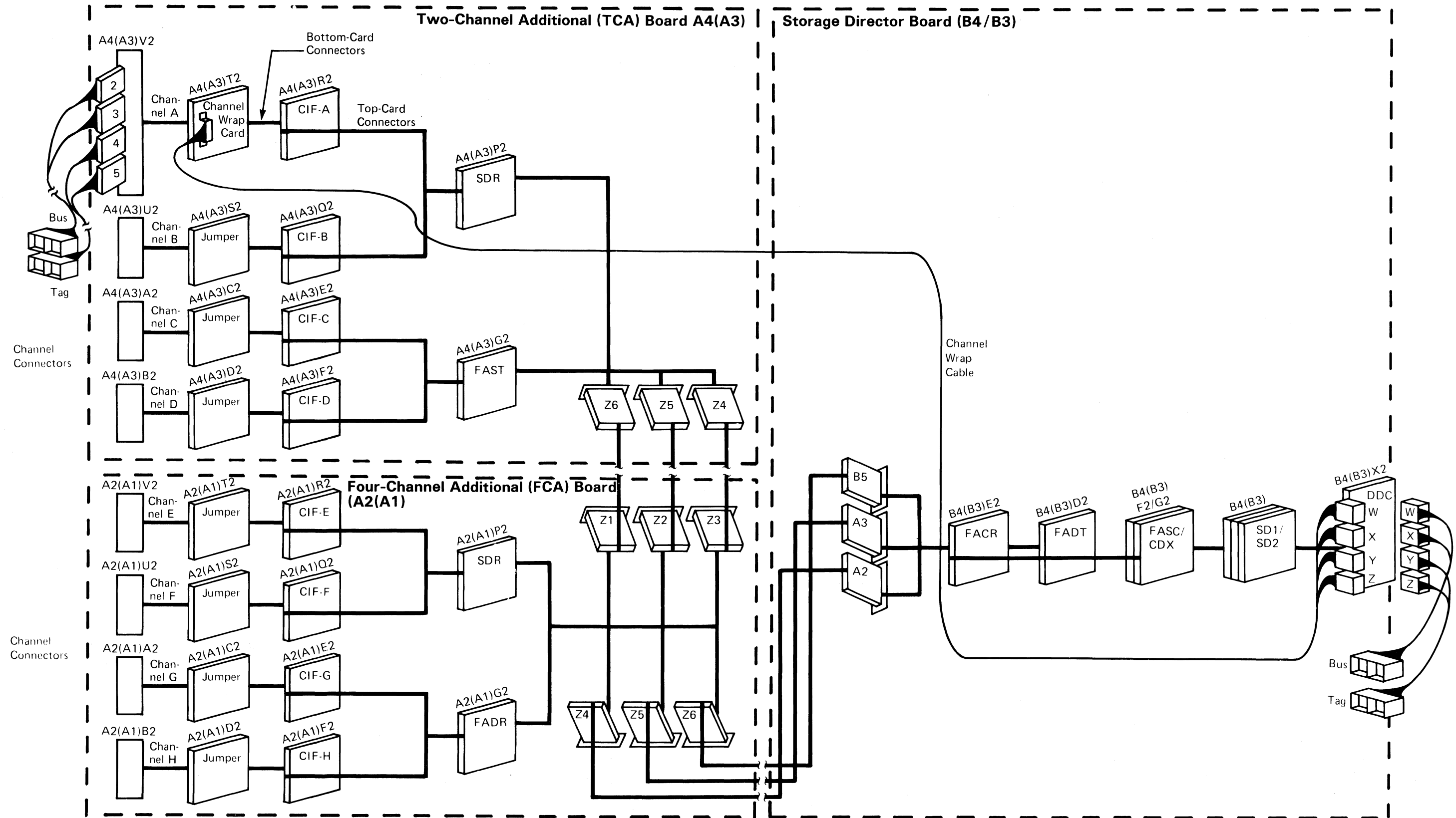
5. Install the channel wrap cable card. See Figure 1 for the location.
6. Install the channel wrap cable connectors (W,X,Y, and Z) onto the top of the card in the X2 position, on the storage director to be tested.
7. Check for loose connections on the channel wrap card and cable connectors.
8. Power on the storage director.
9. Run the channel wrap test, using the maintenance device.

To return the machine to normal operation, use the following procedure.

- Power off the storage director from the power switch panel.
- Reinstall all jumper cards that were removed from the machine.
- Remove the select-out bypass jumper cards from the machine.
- Remove the DDCU card from B4(B3) X2 and reinstall the DDCV card.
- Reinstall the two CTL-I cables to the top of the X2 card.
- Reinstall all other machine parts that were removed for testing.

Figure 1.





3880
MIM

AU0420 Side 2 of 2
2290990 Part No.

450906 15Aug80

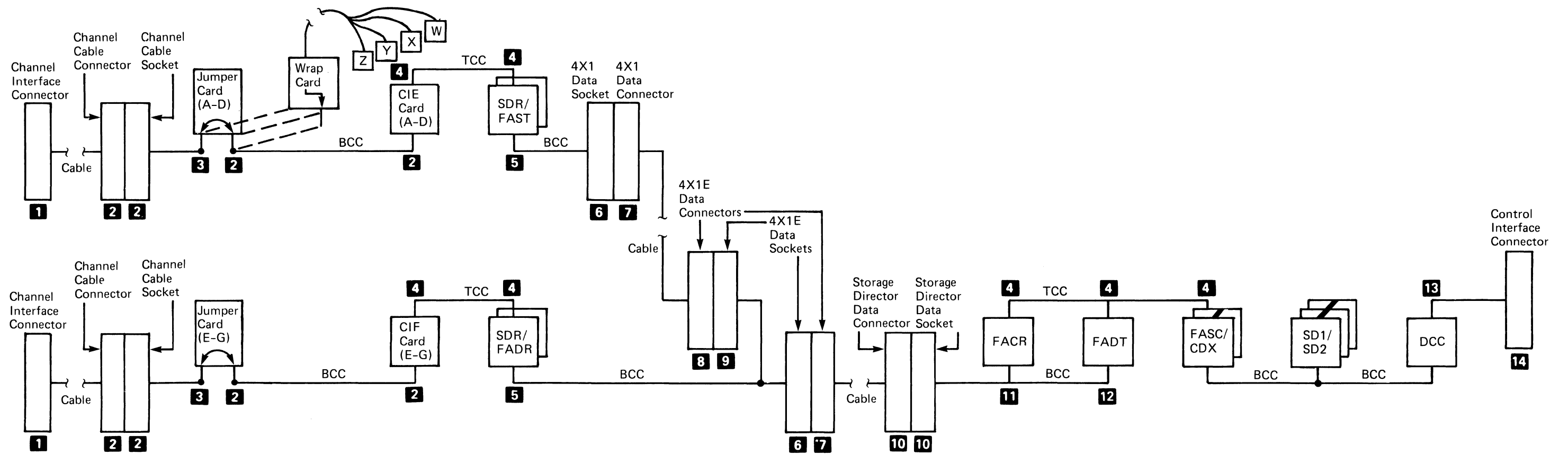
450907 10Dec80

450908 15Apr81

461517 27Jan84

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FCA CHANNEL INTERFACE WRAP CONNECTION



3880	AU0455	2290991	450906	450907	450908		
MIM	Side 1 of 2	Part No.	15Aug80	10Dec80	15Apr81	.	.

CHANNEL INTERFACE BOARDS, FCA A2(A1) AND TCA A4(A3)								Data Flow	STORAGE DIRECTOR BOARD (B3/B4)								
Channel Name	1	2	3	4	5	6	7		8	9	10	11	12	CTL-I Name	13	14	
TAG	Address	B10	M10	P06	W32	B12	V6B02	Z6D13	←	Z1D13	C6E02	A2D13	D13	CTL-I Tag Bus Out Bit 4	Y25	B05	
	Data Out	G10	S10	S09	Y33	M13	N6B02	Z4D10	←	Z3D10	J6D02	B5D10	P13	CTL-I Tag Bus Out Bit 7	Y26	D06	
	Hold Out	G12	S12	U12					←					Tag Gate	Y30	B10	
	Select Out	D09	P09	P10					←					Select Hold	Y31	D11	
	Command Out	D11	P11	M07	Y30	M10	M6C02	Z4D06	←	Z3D06	H6E02	B5D06	P07	Response	Y32	B12	
	Service Out	D13	P13	M13	Y32	M12	N6E04	Z4B13	←	Z3B13	K6B04	B5B13	M12	CTL-I Tag Bus Out Bit 6	Y28	B08	
	Suppress Out	B12	M12	P12					←					CTL-I Tag Bus Out Bit 5	Y24	D04	
	Operational Out	J13	U13	S13					←					CTL-I Tag Bus Out Bit 0	Y23	B03	
	Operational In	B03	M02	P02	W33	B13	P6E04	Z5B02	→	Z2B02	D6E04	A3B02	G02	CE Alert	Z32	G12	
	Address In	B05	M04	M03	X24	G03	Q6B04	Z5B04	→	Z2B02	D6E04	A3B04	G04	SEL Alert	Z30	G10	
	Select In	B08	M08	M09					→					Index	Z29	J09	
	Data In	G08	S08	U06	Y25	M05	S6A02	Z5013	→	Z2D13	G6A02	A3D13	J13	Check End	Z26	J06	
	Status In	D04	P05	P04	X25	G04	Q6C04	Z5B05	→	Z2B05	E6C04	A3B05	G05	Error Alert	Z28	G08	
	Service In	D06	P07	M05	Y24	M04	R6E04	Z5B12	→	Z2B12	F6E04	A3B12	G12	Normal End	Z25	G05	
Request In	J06	U07	S05					→					Select Active	Z23	G03		
Disconnect In	J11	U11	U10	X26	G05	Q6D02	Z5D06	→	Z2D06	E6D02	A3D06	G07	Tag Valid	Z24	J04		
BUS	Channel X Bus In Bit P	G03	G02	J02	Y02	P02	L6D02	Z4D02	→	Z3D02	H6A02	B5D02	P05	CTL-I Bus In Bit P	X23	G03	
	Channel X Bus In Bit 0	J04	J05	J04	Y03	P04	M6B02	Z4D05	→	Z3D05	H6D02	B5D05	U05	CTL-I Bus In Bit 0	X24	J04	
	Channel X Bus In Bit 1	G05	G04	G03	Y05	P05	M6A04	Z4B04	→	Z3B04	H6C04	B5B04	S04	CTL-I Bus In Bit 1	X25	G05	
	Channel X Bus In Bit 2	J06	J07	G05	Y06	P06	M6D02	Z4D07	→	Z3D07	J6A02	B5D07	U07	CTL-I Bus In Bit 2	X26	J06	
	Channel X Bus In Bit 3	G08	G08	J06	Y07	P07	M6E04	Z4B08	→	Z3B08	J6B04	B5B08	S08	CTL-I Bus In Bit 3	X28	G08	
	Channel X Bus In Bit 4	J09	J09	G07	Y09	P09	N6C02	Z4D11	→	Z3D11	J6E02	B5D11	U11	CTL-I Bus In Bit 4	X29	J09	
	Channel X Bus In Bit 5	G10	G10	G09	Y10	P10	N6B04	Z4B10	→	Z3B10	J6D04	B5B10	S10	CTL-I Bus In Bit 5	X30	G10	
	Channel X Bus In Bit 6	J11	J11	J10	Y11	P11	N6E02	Z4D13	→	Z3D13	K6B02	B5D13	U13	CTL-I Bus In Bit 6	X31	J11	
	Channel X Bus In Bit 7	G12	G12	J12	Y13	P12	N6D04	Z4B12	→	Z3B12	K6A04	B5B12	S12	CTL-I Bus In Bit 7	X32	G12	
	Mark In	J13	J13	G13	Mark In is physically wired to Index tag pin J09												
	Channel X Bus Out Bit P	B03	B02	D02	W02	D02	T6A04	Z6B02	←	Z1B02	A6D04	A2B02	B02	CTL-I Bus Out Bit P	W23	B03	
	Channel X Bus Out Bit 0	D04	D05	D04	W03	D04	T6D02	Z6D05	←	Z1D05	B6B02	A2D05	D05	CTL-I Bus Out Bit 0	W24	D04	
	Channel X Bus Out Bit 1	B05	B04	B03	W05	D05	T6C04	Z6B04	←	Z1B04	B6A04	A2B04	B04	CTL-I Bus Out Bit 1	W25	B05	
	Channel X Bus Out Bit 2	D06	D07	B05	W06	D06	U6A02	Z6D07	←	Z1D07	B6D02	A2D07	D07	CTL-I Bus Out Bit 2	W26	D06	
Channel X Bus Out Bit 3	B08	B08	D06	W07	D07	U6B04	Z6B08	←	Z1B08	B6E04	A2B08	B08	CTL-I Bus Out Bit 3	W28	B08		
Channel X Bus Out Bit 4	D09	D09	B07	W09	D09	U6C02	Z6D09	←	Z1D09	C6A02	A2D09	D09	CTL-I Bus Out Bit 4	W29	D09		
Channel X Bus Out Bit 5	B10	B10	B09	W10	D10	U6D04	Z6B10	←	Z1B10	C6B04	A2B10	B10	CTL-I Bus Out Bit 5	W30	B10		
Channel X Bus Out Bit 6	D11	D11	D10	W11	D11	U6E02	Z6D11	←	Z1D11	C6C02	A2D11	D11	CTL-I Bus Out Bit 6	W31	D11		
Channel X Bus Out Bit 7	B12	B12	D12	W13	D12	V6A04	Z6B12	←	Z1B12	C6D04	A2B12	B12	CTL-I Bus Out Bit 7	W32	B12		

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CHANNEL INTERFACE CABLE CHECKOUT

Do not perform this procedure on storage directors that have 3380 drives attached.

The channel interface cable checkout procedure determines if a channel failure is occurring in the 3880 or in another part of the system. This procedure should be used after determining that the following conditions have been met:

1. The MD diagnostics all run without errors.
2. The Control Interface Wrap Test runs without errors.
3. The Channel Interface Wrap Test runs without errors.
4. The channel failure can be repeatedly duplicated by running a 3880 OLT, FRIEND, or a customer job.

Note: A customer job should be used only when there is no other method that repeats the failure.

Figure 1 shows the areas in the 3880 that are tested by the MD diagnostics.

CHANNEL INTERFACE CHECKOUT PROCEDURE

This procedure checks W-cables, serpent connectors, bus and tag terminators, and channel jumper card.

1. Take the 3880 offline.
2. Remove the channel interface bus and tag cables from the failing channel. Install terminators in the bus and tag out connectors.
3. Remove the control interface bus and tag cables.
4. Install the branch office tailgate wrap cable (P/N 4797396) from the control interface bus and tag connectors to the bus and tag connectors of the failing channel.
5. Run the MD channel wrap test (option 5). Disregard the FRU list that the MD displays when a failure is found. The following is a list of the possible FRUs for this test:
 - The W-cable for the failing channel
 - The serpent connectors for the failing channel
 - The bus and tag terminators for the failing channel
 - The channel jumper card for the failing channel

Note: The internal connection of bus and tag cables in the W-cable configuration make it possible for the alternate storage director to cause the failure. Ensure that this does not occur by turning the alternate storage director off, removing the jumper card, installing select-out bypass cables, and repeating this test.

6. If this procedure does not isolate the failure, check the following:

- The channel cables and connectors
- The terminators
- The host channel
- Other devices on the failing channel

Figure 2. CHL-I Tailgate Wrap Connection Shown SD1, Channel A.

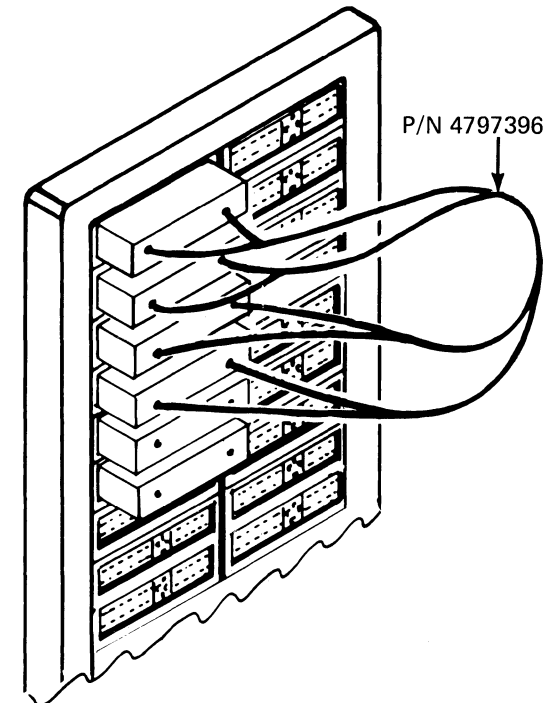
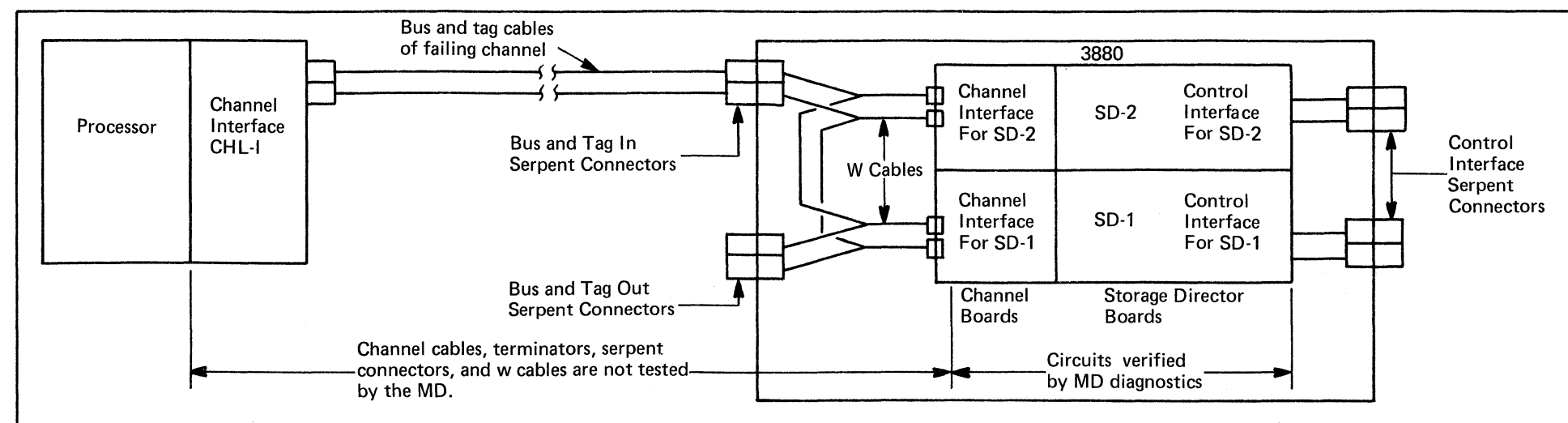


Figure 1. Four-Channel Additional W-Cables



This page and CARR-481 are used to locate the cables and connectors in the channel interface area for the A1, A2, A3, A4, B3, and B4 boards.

PROCEDURE

1. Use CARR-481 to find the IML code, fault symptom code, or isolation code in the left column of the charts.
2. Follow the row to the right. An asterisk (*) indicates a cable that is a part of the FRU group for that code.
3. Use the cable number (**1** through **12**) at the top of the column to locate the cable number in Figure 1 or 2.
4. Reseat, repair, or replace each cable indicated for that code.

Figure 1. Two-Channel Switch Pair, Additional Feature

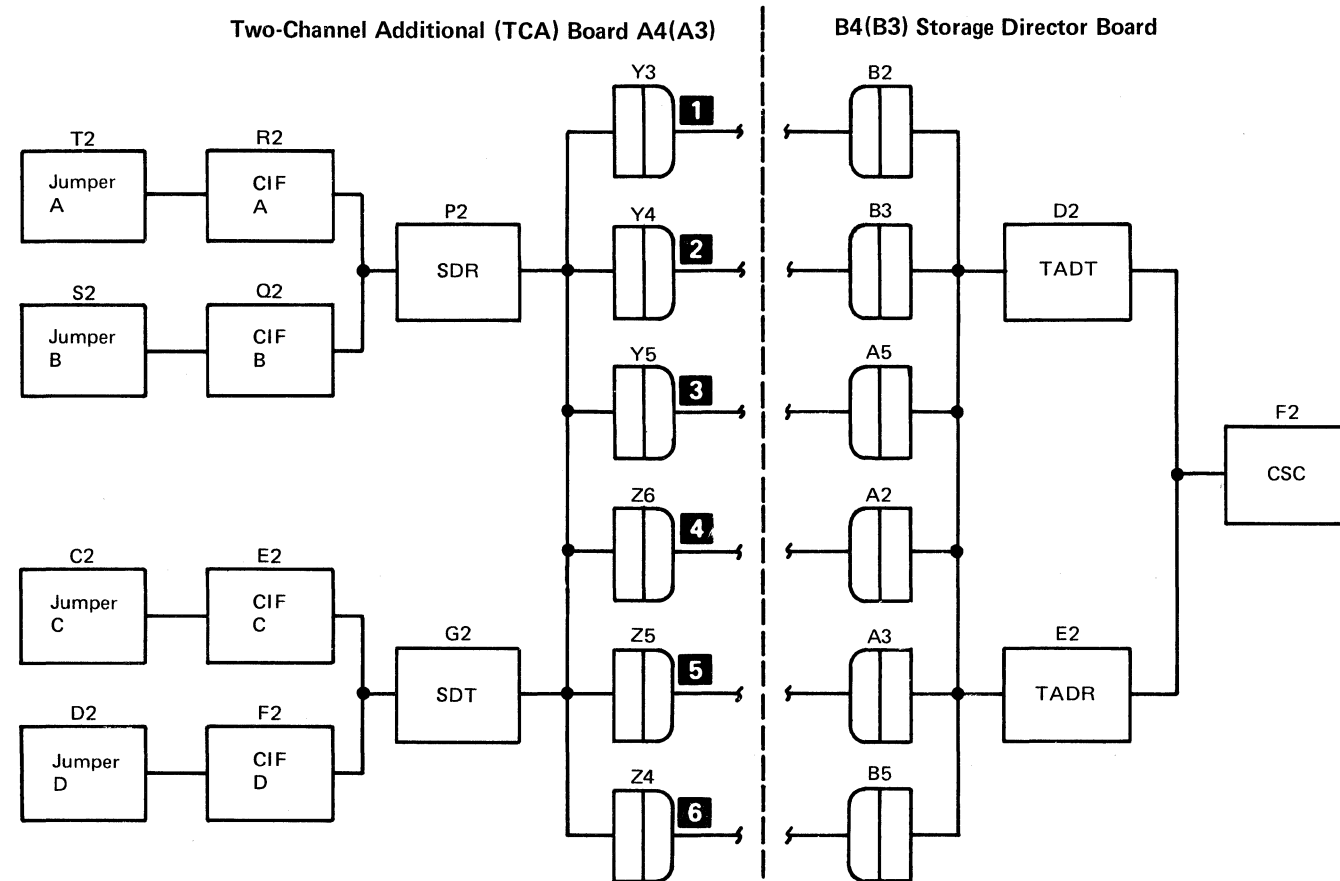
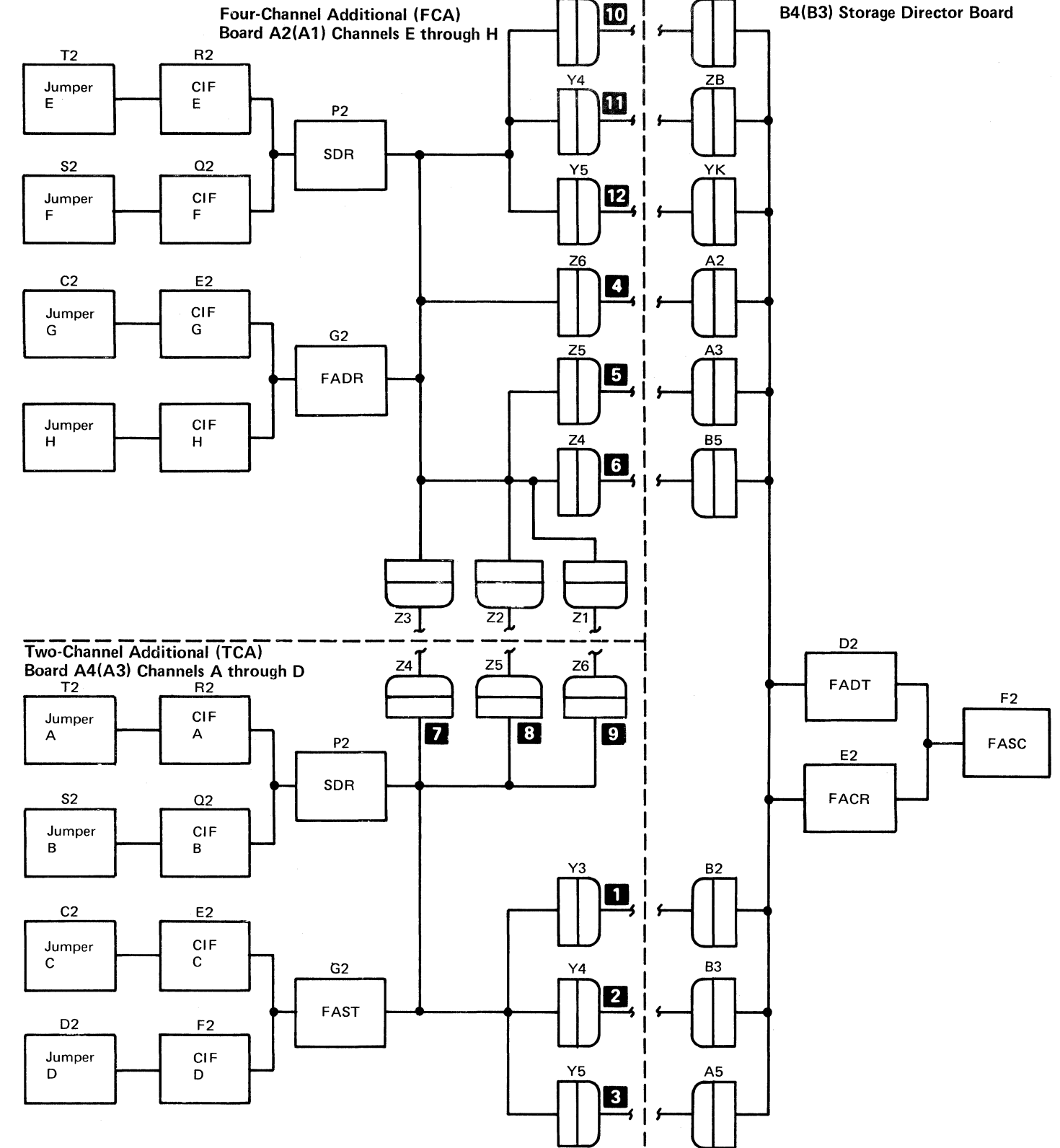


Figure 2. Eight-Channel Switch Feature



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MIM

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INTRABOARD CABLE LOCATOR

This page, CARR-482, CARR-483 and CARR-484 are used to locate the cable connectors in the 3880 that are not shown on CARR-480, or CARR-481.

Note: A # next to a code (for example, #7300) indicates more possible cables are included in the cable charts on CARR-482, CARR-483, and CARR-484.

Code	Eight-Channel Switch Feature Cables											
	Two-Channel Switch Pair, Additional Feature Cables											
	1	2	3	4	5	6	7	8	9	10	11	12
5C			*									*
5E												*
5F												*
62				*								
6C			*									*
95			*									*
0702	*	*	*	*	*	*	*	*	*	*		
0703	*	*	*	*	*	*	*	*	*			
0705				*	*	*				*	*	*
0706				*	*	*				*	*	*
2708			*		*			*				*
2709			*		*			*				*
270A			*		*			*				*
270B			*		*			*				*
270C					*			*				*
270D					*			*				*
270E					*			*				*
270F					*			*				*
#27F8			*		*	*		*				
#27F9			*		*	*		*				
#27FA			*		*	*		*				
#27FB			*		*	*		*				
#27FC					*			*				
#27FD					*			*				
#27FE					*			*				
#27FF					*			*				
3B08			*		*	*		*				
3B09			*		*	*		*				
3B0A			*		*	*		*				
3B0B			*		*	*		*				
3B0C					*	*		*				
3B0D					*	*		*				
3B0E					*	*		*				
3B0F					*	*		*				

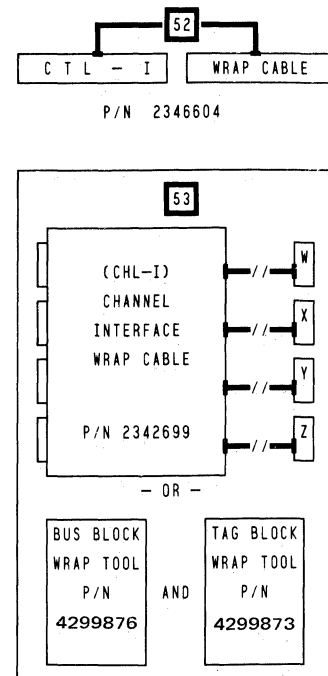
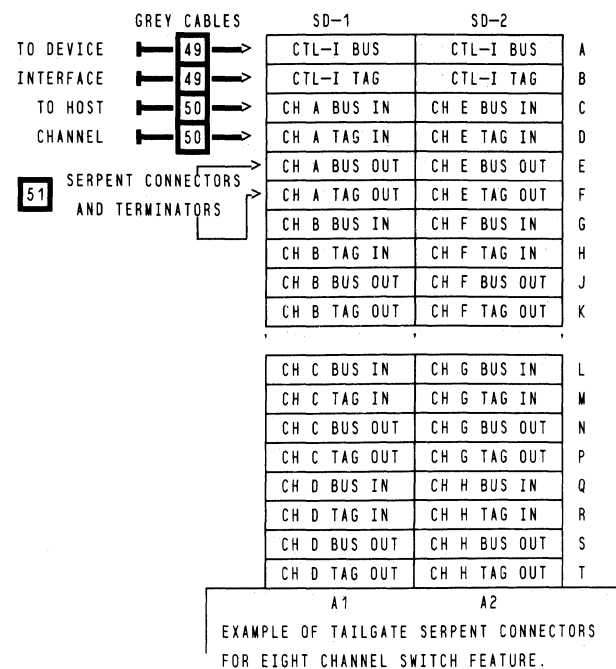
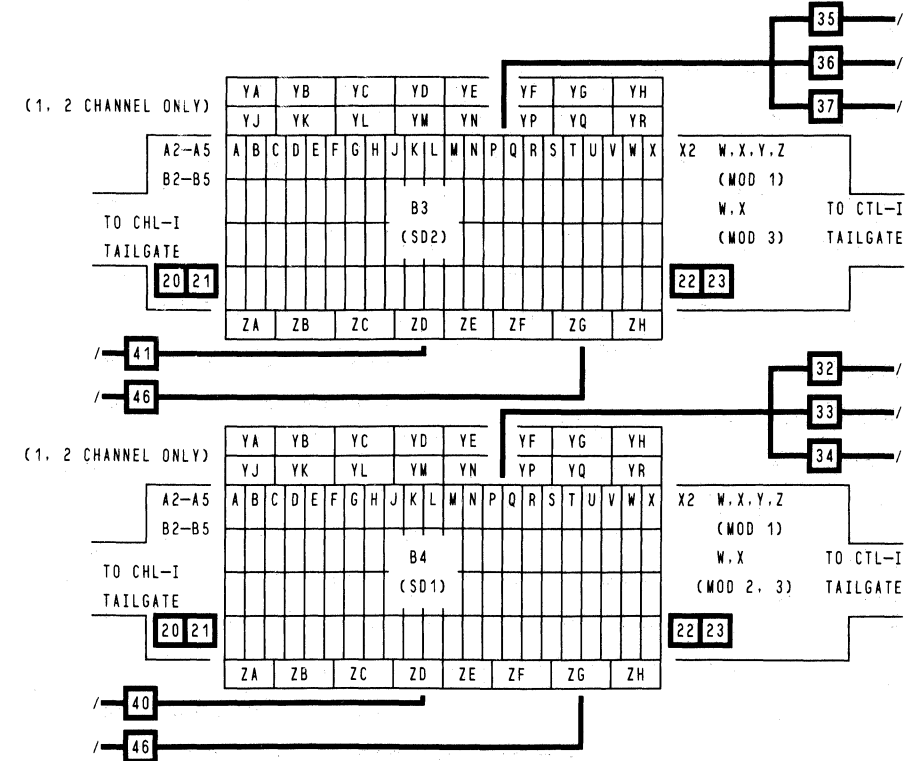
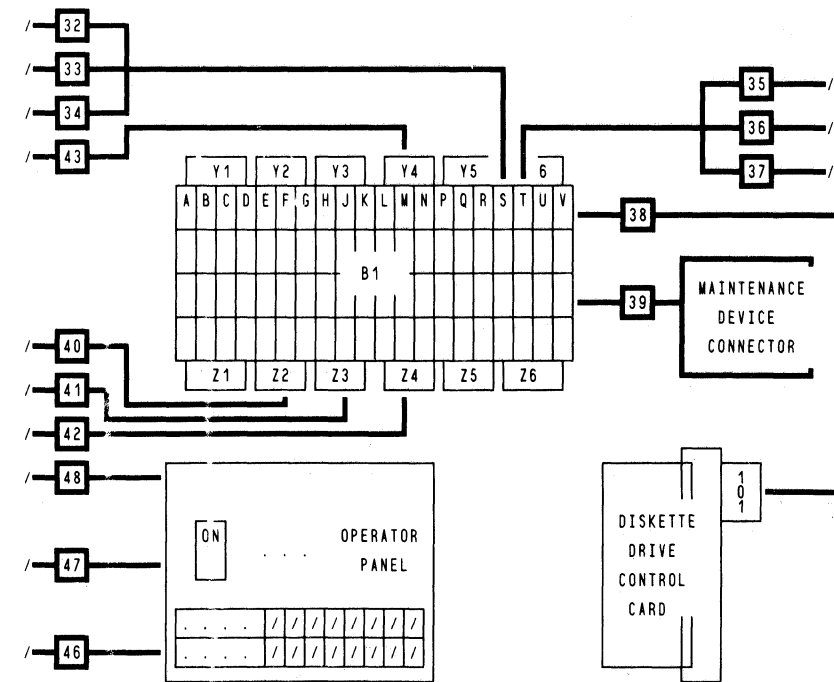
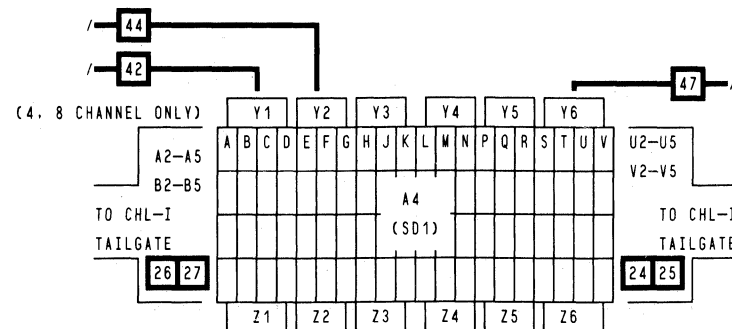
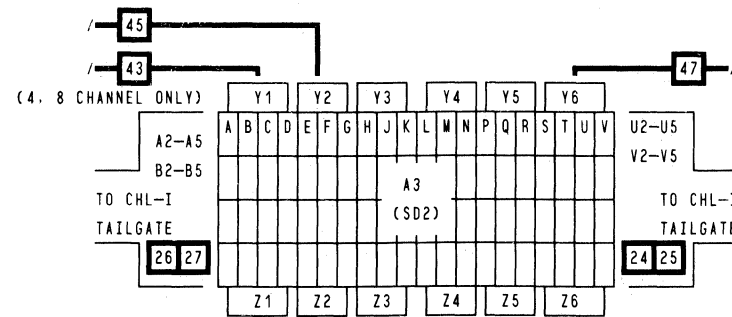
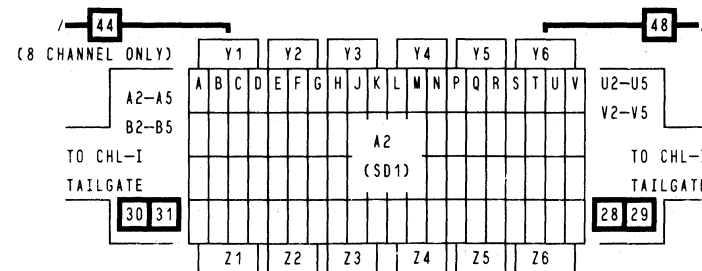
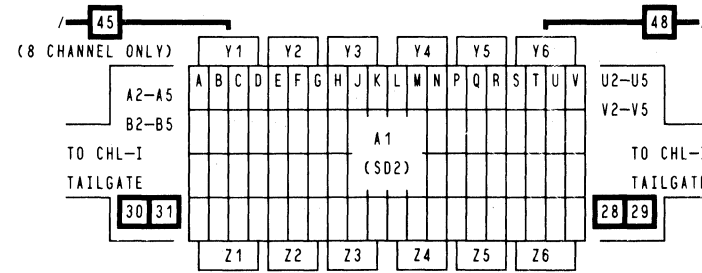
Code	Eight-Channel Switch Feature Cables											
	Two-Channel Switch Pair, Additional Feature Cables											
	1	2	3	4	5	6	7	8	9	10	11	12
#3B18			*	*	*		*	*				
#3B19			*	*	*		*	*				
#3B1A			*	*	*		*	*				
#3B1B			*	*	*		*	*				
#3B1C				*	*							*
#3B1D				*	*							*
#3B1E				*	*							*
#3B1F				*	*							*
#3B38		*	*	*				*				
#3B39		*	*	*				*				
#3B3A		*	*	*				*				
#3B3B		*	*	*				*				
#3B3C				*		*	*	*		*	*	*
#3B3D				*		*	*	*		*	*	*
#3B3E				*		*	*	*		*	*	*
#3B3F				*		*	*	*		*	*	*
3C48			*		*			*				
3C49			*		*			*				
3C4A			*		*			*				
3C4B			*		*			*				
3C4C					*			*				*
3C4D					*			*				*
3C4E					*			*				*
3C4F					*			*				*
3D48			*									
3D49			*									
3D4A			*									
3D4B			*									
3D5C												*
3D5D												*
3D5E												*
3D5F												*
3EXX					*			*				
#3FOX				*				*				
#FF01					*			*				
#FF03					*			*				
#FF04		*	*	*	*	*	*	*		*	*	*
#FF06				*	*	*	*	*		*	*	*
#FF07		*	*	*	*	*	*	*		*	*	*
#FF09				*	*	*	*	*		*	*	*
#FF0A				*	*	*	*	*		*	*	*

INTRABOARD CABLE LOCATOR CARR-481 TCA FCA

Code	Eight-Channel Switch Feature Cables											
	Two-Channel Switch Pair, Additional Feature Cables											
	1	2	3	4	5	6	7	8	9	10	11	12
#0F00-0				*		*		*		*		*
#0F00-2			*	*	*		*	*	*		*	*
#0F00-5			*				*	*	*		*	*
Note: For any 78XX code, see the corresponding 73XX listed below.												
#7300	*	*	*		*			*		*	*	*
7302	*	*	*		*			*		*	*	*
7303	*	*	*		*	*	*	*	*	*	*	*
7304	*	*	*	*	*	*	*	*	*	*	*	*
7305	*	*	*	*	*	*	*	*	*	*	*	*
7306	*	*	*	*	*	*	*	*	*	*	*	*
7307	*	*	*	*	*	*	*	*	*	*	*	*
7308	*	*	*	*	*	*	*	*	*	*	*	*
7309	*	*	*	*	*	*	*	*	*	*	*	*
730A	*	*	*	*	*	*	*	*	*	*	*	*
730B	*	*	*	*	*	*	*	*	*	*	*	*
730C	*	*	*	*	*	*	*	*	*	*	*	*
730D	*	*	*	*	*	*	*	*	*	*	*	*
7310	*	*	*	*	*	*	*	*	*	*	*	*
7311	*	*	*	*	*	*	*	*	*	*	*	*
7312	*	*	*	*	*	*	*	*	*	*	*	*
731A	*	*	*	*	*	*	*	*	*	*	*	*
7341	*	*	*	*	*	*	*	*	*	*	*	*
7342	*	*	*	*	*	*	*	*	*	*	*	*
#7343	*	*	*	*	*	*	*	*	*	*	*	*
7344	*	*	*	*	*	*	*	*	*	*	*	*
7348	*	*	*	*	*	*	*	*	*	*	*	*
#734C	*	*	*	*	*	*	*	*	*	*	*	*
7381	*	*	*	*	*	*	*	*	*	*	*	*
7382	*	*	*	*	*	*	*	*	*	*	*	*
#7383	*	*	*	*	*	*	*	*	*	*	*	*
7384	*	*	*	*	*	*	*	*	*	*	*	*
7388	*	*	*	*	*	*	*	*	*	*	*	*
#738C	*	*	*	*	*	*	*	*	*	*	*	*

CABLE	FROM	TO
20	B4(B3) A2-A5	CHL-A TAILGATE
21	B4(B3) B2-B5	CHL-B TAILGATE
22	B4(B3) X2 W-Z	CTL-I TAILGATE
23	B4(B3) X2 W.X	CTL-I TAILGATE
24	A4(A3) V2-V5	CHL-A TAILGATE
25	A4(A3) U2-U5	CHL-B TAILGATE
26	A4(A3) A2-A5	CHL-C TAILGATE
27	A4(A3) B2-B5	CHL-D TAILGATE
28	A2(A1) V2-V5	CHL-E TAILGATE
29	A2(A1) U2-U5	CHL-F TAILGATE
30	A2(A1) A2-A5	CHL-G TAILGATE
31	A2(A1) B2-B5	CHL-H TAILGATE
32	B4 P2 W TCCC	B1 S2 Y TCCC
33	B4 Q2 W TCCC	B1 S2 W TCCC
34	B4 Q2 X TCCC	B1 S2 X TCCC
35	B3 P2 W TCCC	B1 T2 Y TCCC
36	B3 Q2 W TCCC	B1 T2 W TCCC

CABLE	FROM	TO
37	B3 Q2 X TCCC	B1 T2 X TCCC
38	B1 V2 CABLE	IGAR DISKETTE
39	B1 V4 CABLE	MD CONNECTOR
40	B1 Z2 CABLE	B4 ZD CABLE
41	B1 Z3 CABLE	B3 ZD CABLE
42	B1 Z4 CABLE	A4 Y1 CABLE
43	B1 Y4 CABLE	A3 Y1 CABLE
44	A4 Y2 CABLE	A2 Y1 CABLE
45	A3 Y2 CABLE	A1 Y1 CABLE
46	B4(B3) Z6 CBL	OPERATOR PANEL
47	A4(A3) Y6 CBL	OPERATOR PANEL
48	A2(A1) Y6 CBL	OPERATOR PANEL
49	CTL-I CONN.	DEVICE INTF.
50	HOST CHANNEL	CHL-I CONN.
51	SERPENT CONNECTORS/TERMINATORS	
52	CONTROL INTERFACE WRAP CABLE	
53	CHANNEL INTERFACE WRAP TOOL(S)	



Note: For detailed cable plugging information for the 3880, see the cable plug charts in the Maintenance Diagram Manual (MDM), volume R30.

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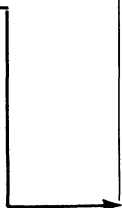
CABLE LOCATOR CHART

This page, CARR-482, and CARR-484 are used to locate the cables and connectors in the 3880 that are not shown on CARR-480, or CARR-481.

PROCEDURE

- Use the chart on this page to find the initial microcode load (IML) code, fault symptom code, or isolation code in the left column of the charts.
- Follow the row to the right; one of the three types of marks below, indicates the cables that are a part of the FRU group for that code:
 - * asterisk – should be suspected with any combination of features
 - ◇ diamond – should only be suspected if this cable is installed
 - square – should only be suspected if this channel is failing
- Use the cable number (20 through 53) at the top of the column to find the cable number on the following pages:
 - * CARR-482 for 22-card storage director boards
 - * CARR-484 for 20-card storage director boards
- Reseat, repair, or replace each cable indicated for that code.

Note: A # next to a code (for example, #0F00) indicates more possible cables are included in the cable charts on CARR-482, CARR-483, and CARR-484.



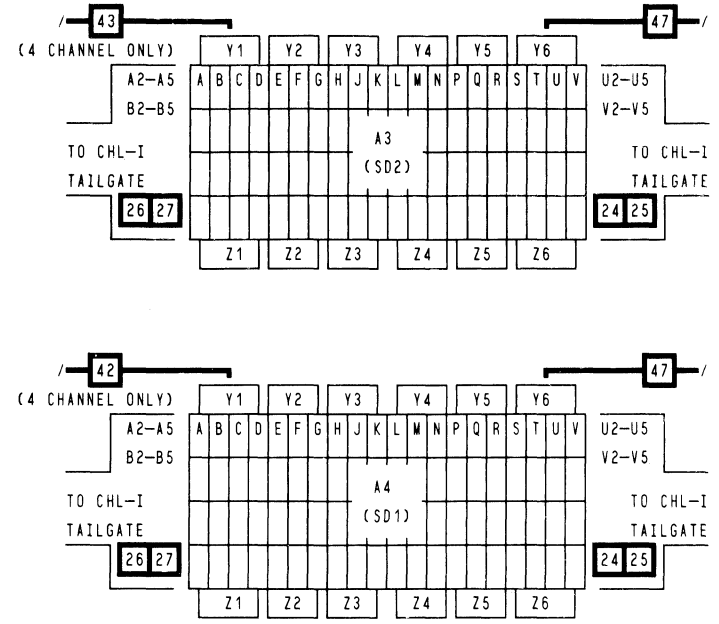
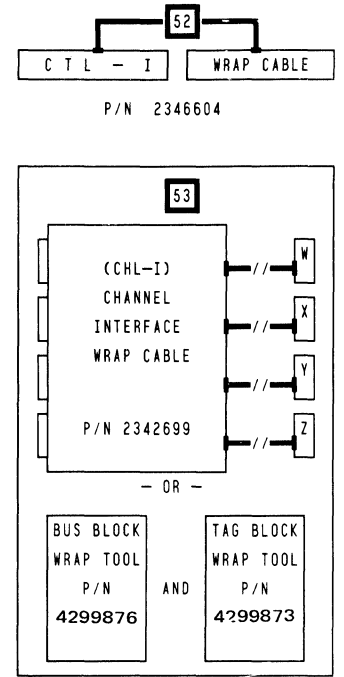
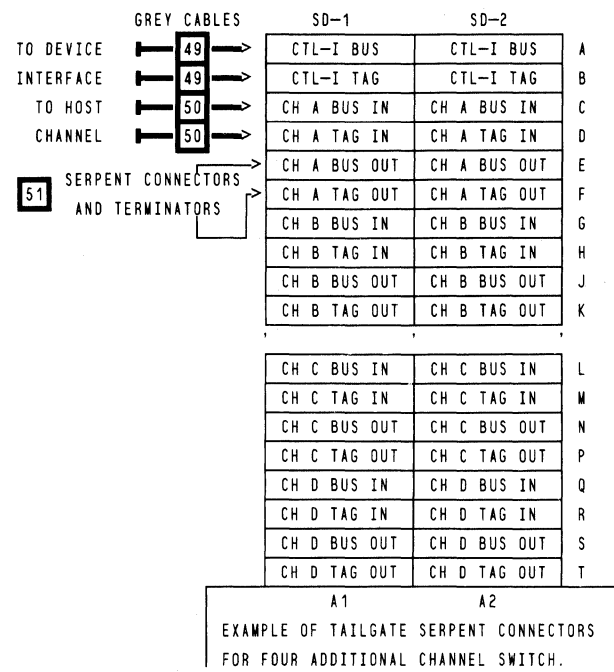
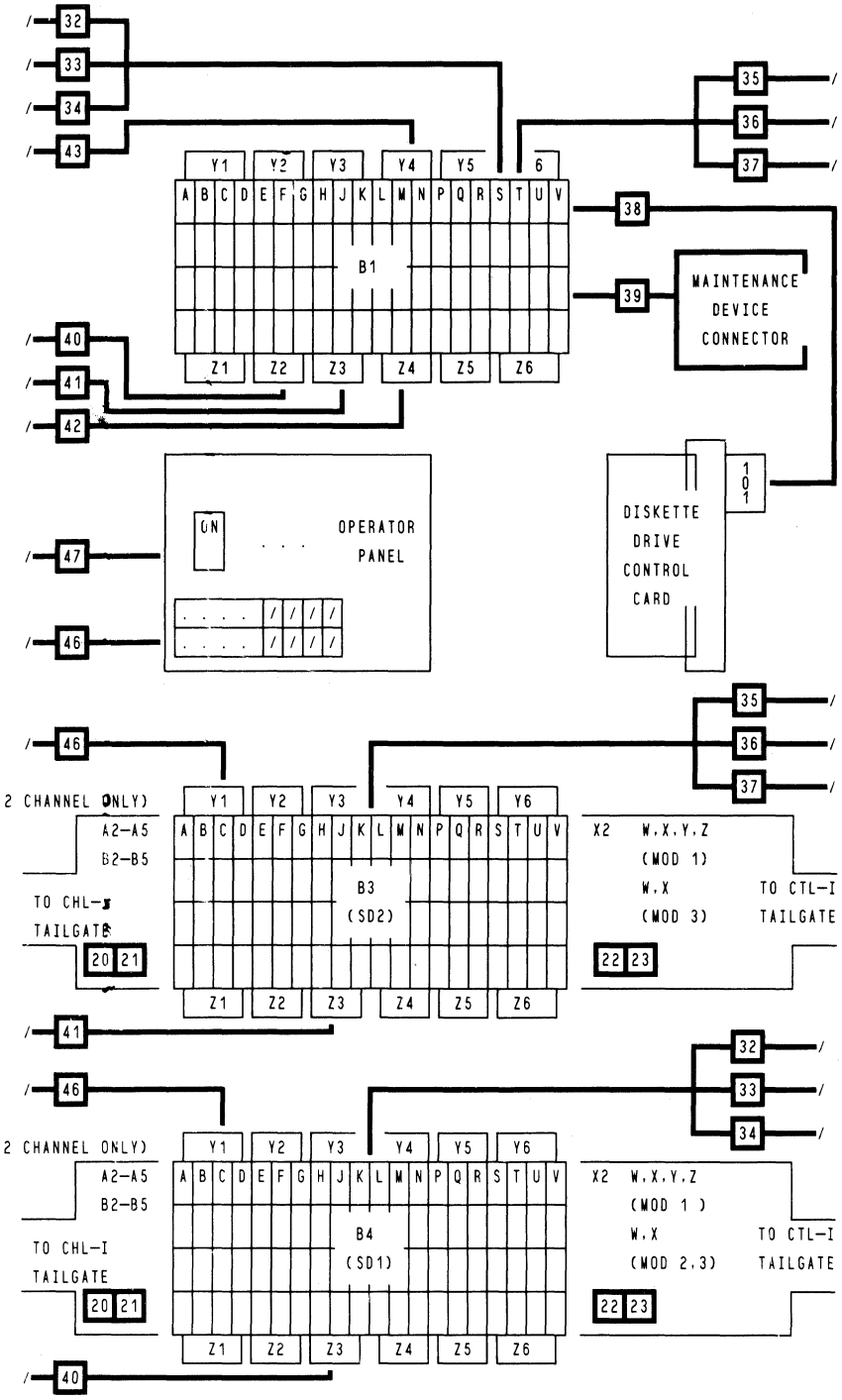
CODE	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
00-1												*	*	*	*	*	*	*	*	*	*
01-1												*	*	*	*	*	*	*	*	*	*
02-1												*	*	*	*	*	*	*	*	*	*
03												*	*	*	*	*	*	*	*	*	*
04												*	*	*	*	*	*	*	*	*	*
05												*	*	*	*	*	*	*	*	*	*
06												*	*	*	*	*	*	*	*	*	*
07												*	*	*	*	*	*	*	*	*	*
08												*	*	*	*	*	*	*	*	*	*
09												*	*	*	*	*	*	*	*	*	*
10-1												*	*	*	*	*	*	*	*	*	*
11-1												*	*	*	*	*	*	*	*	*	*
12												*	*	*	*	*	*	*	*	*	*
13												*	*	*	*	*	*	*	*	*	*
14												*	*	*	*	*	*	*	*	*	*
15												*	*	*	*	*	*	*	*	*	*
16												*	*	*	*	*	*	*	*	*	*
17												*	*	*	*	*	*	*	*	*	*
18												*	*	*	*	*	*	*	*	*	*
19												*	*	*	*	*	*	*	*	*	*
31	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
42												*	*	*	*	*	*	*	*	*	*
43-1												*	*	*	*	*	*	*	*	*	*
43-2												*	*	*	*	*	*	*	*	*	*
44												*	*	*	*	*	*	*	*	*	*
45-1												*	*	*	*	*	*	*	*	*	*
45-2												*	*	*	*	*	*	*	*	*	*
46												*	*	*	*	*	*	*	*	*	*
47-1												*	*	*	*	*	*	*	*	*	*
47-2												*	*	*	*	*	*	*	*	*	*
48-1												*	*	*	*	*	*	*	*	*	*
48-2												*	*	*	*	*	*	*	*	*	*
49-1												*	*	*	*	*	*	*	*	*	*
49-2												*	*	*	*	*	*	*	*	*	*
80												*	*	*	*	*	*	*	*	*	*
81												*	*	*	*	*	*	*	*	*	*
84-1												*	*	*	*	*	*	*	*	*	*
84-2												*	*	*	*	*	*	*	*	*	*
88												*	*	*	*	*	*	*	*	*	*
89												*	*	*	*	*	*	*	*	*	*
8C-1												*	*	*	*	*	*	*	*	*	*
8C-2												*	*	*	*	*	*	*	*	*	*
CODE	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40

CODE	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53		
0100																																			*	
0200																																			*	
0300																																			*	
0400-1												*	*	*	*	*	*	*	*	*	*	*													*	
0400-x												*	*	*	*	*	*	*	*	*	*	*													*	
0500-1												*	*	*	*	*	*	*	*	*	*	*													*	
0501-1												*	*	*	*	*	*	*	*	*	*	*													*	
0501-2												*	*	*	*	*	*	*	*	*	*	*													*	
0503												*	*	*	*	*	*	*	*	*	*	*													*	
0504												*	*	*	*	*	*	*	*	*	*	*													*	
0704												*	*	*	*	*	*	*	*	*	*	*													*	
#0F00-0	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	*	
#0F00-2	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	*
#0F00-5	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	*
0F01	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	*
0F02	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	*
0F03	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	*
0F04	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	*
0F05	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	*
0F06	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	*
0F07	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	*
0F08	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	*
0F0A	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	*
0F0B	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	*
0F0C	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	*
0F0D	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	*
2004			◇	*																															*	
2020			◇	*																															*	
2080			◇	*																															*	
27FX	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	*	
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2802			◇	*																															*	
2810			◇	*																															*	
2820			◇	*																															*	
2928			◇	*																															*	
3000																	*	*	*	*	*	*													*	
3001																	*	*	*	*	*	*														

CABLE	FROM	TO
20	B4(B3) A2-A5	CHL-A TAILGATE
21	B4(B3) B2-B5	CHL-B TAILGATE
22	B4(B3)V2 W-Z	CTL-I TAILGATE
23	B4(B3)V2 W.X	CTL-I TAILGATE
24	A4(A3) V2-V5	CHL-A TAILGATE
25	A4(A3) U2-U5	CHL-B TAILGATE
26	A4(A3) A2-A5	CHL-C TAILGATE
27	A4(A3) B2-B5	CHL-D TAILGATE
28	NOT USED	
29	NOT USED	
30	NOT USED	
31	NOT USED	
32	B4 K2 W TCCC	B1 S2 Y TCCC
33	B4 L2 W TCCC	B1 S2 W TCCC
34	B4 L2 X TCCC	B1 S2 X TCCC
35	B3 K2 W TCCC	B1 T2 Y TCCC
36	B3 L2 W TCCC	B1 T2 W TCCC

CABLE	FROM	TO
37	B3 L2 X TCCC	B1 T2 X TCCC
38	B1 V2 CABLE	IGAR DISKETTE
39	B1 V4 CABLE	MD CONNECTOR
40	B1 Z2 CABLE	B4 Z3 CABLE
41	B1 Z3 CABLE	B3 Z3 CABLE
42	B1 Z4 CABLE	A4 Y1 CABLE
43	B1 Y4 CABLE	A3 Y1 CABLE
44	NOT USED	
45	NOT USED	
46	B4(B3) Y1 CBL	OPERATOR PANEL
47	A4(A3) Y6 CBL	OPERATOR PANEL
48	NOT USED	
49	CTL-I CONN.	DEVICE INTF.
50	HOST CHANNEL	CHL-I CONN.
51	SERPENT CONNECTORS/TERMINATORS	
52	CONTROL INTERFACE WRAP CABLE	
53	CHANNEL INTERFACE WRAP TOOL(S)	

Note: For detailed cable plugging information for the 3880, see the cable plug charts in the Maintenance Diagram Manual (MDM), volume R30.



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CHANNEL ISOLATION

Certain errors detected in the 3880 require isolation to determine if the error is caused by FRUs in the channel interface area. When isolating, it is possible to cause interface control checks on other control units on the channels connected to the failing storage director. The following procedures eliminate this problem.

Warning: The A1, A2, A3, and A4 boards must be at EC 450526 level or higher to use this procedure. Performing this procedure on a board below this level can cause customer jobs to fail.

OPERATING PREREQUISITES

1. The maintenance device (MD) or error condition diagram (ECD) directed you here.
2. The failing storage director is offline.
3. One or more of the channels of the failing storage director is connected to an operational channel.

PROCEDURE

Warning: Removal of cards or cables from the WRONG storage director can cause customer jobs to fail.

1. Set all channel Enable Disable switches to the Disable position.
2. Install the select-out bypass jumper card as follows (see figure 1):

Channel	SD1	SD2
A-D	A4L2	A3L2
E-H	A2L2	A1L2

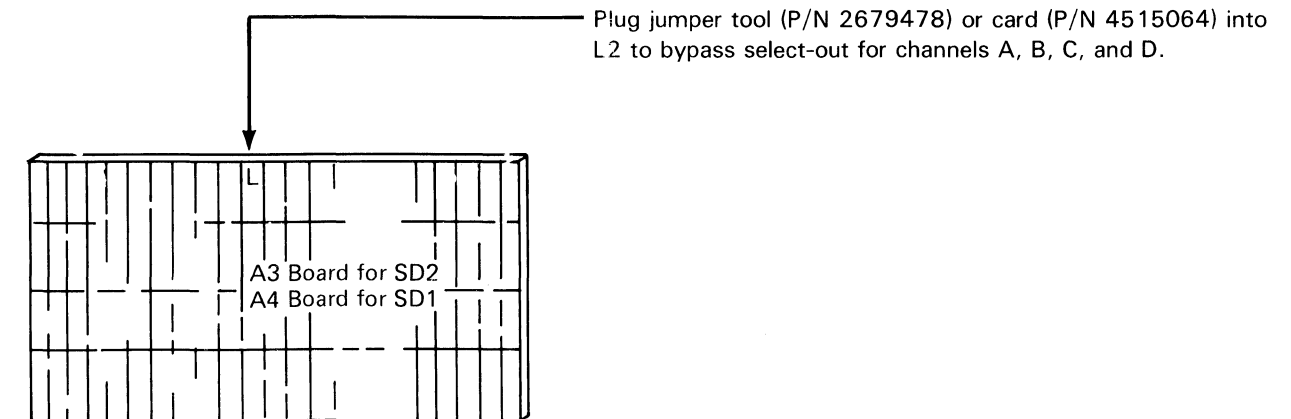
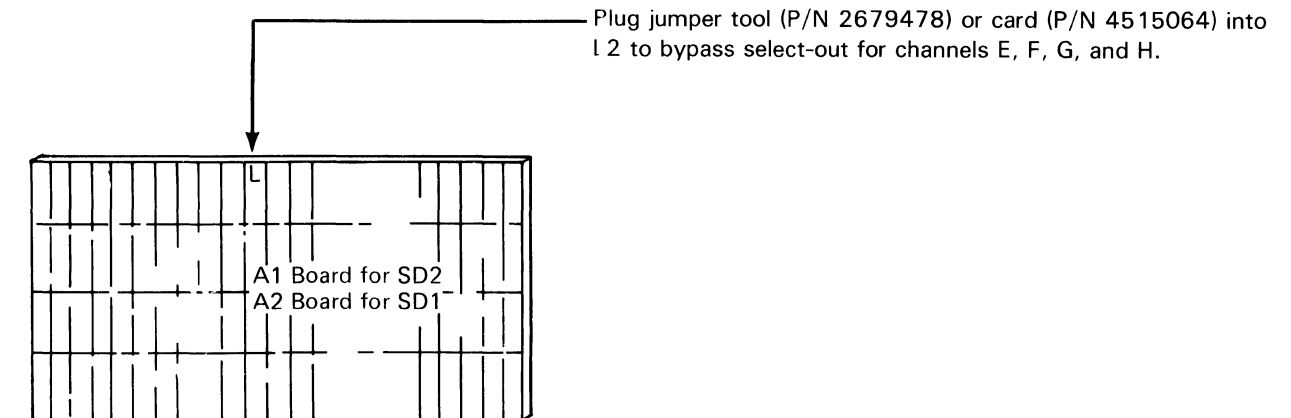
3. Return to the maintenance device to continue error isolation.

RESTORING THE 3880 TO THE CUSTOMER AFTER CHANNEL ISOLATION

Warning: Failure to follow these steps in the order presented can cause customer jobs to fail.

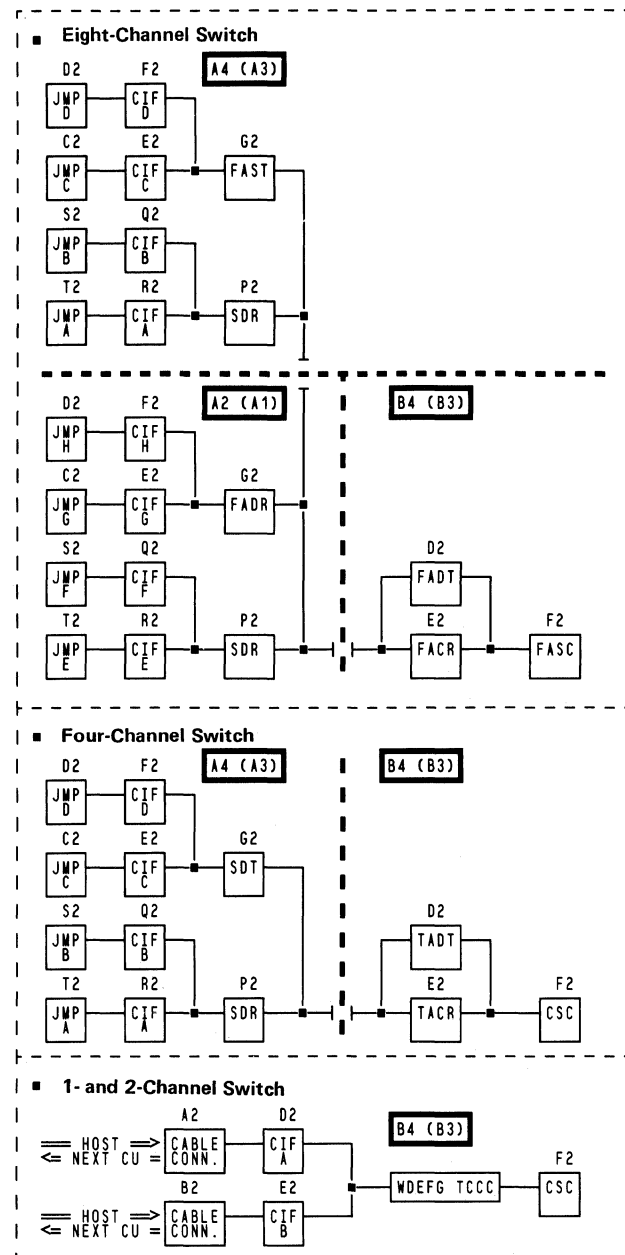
1. Remove select-out bypass jumpers installed during this procedure.
2. Return to the maintenance device for guidance.

Figure 1.



CHANNEL BLOCK DIAGRAMS

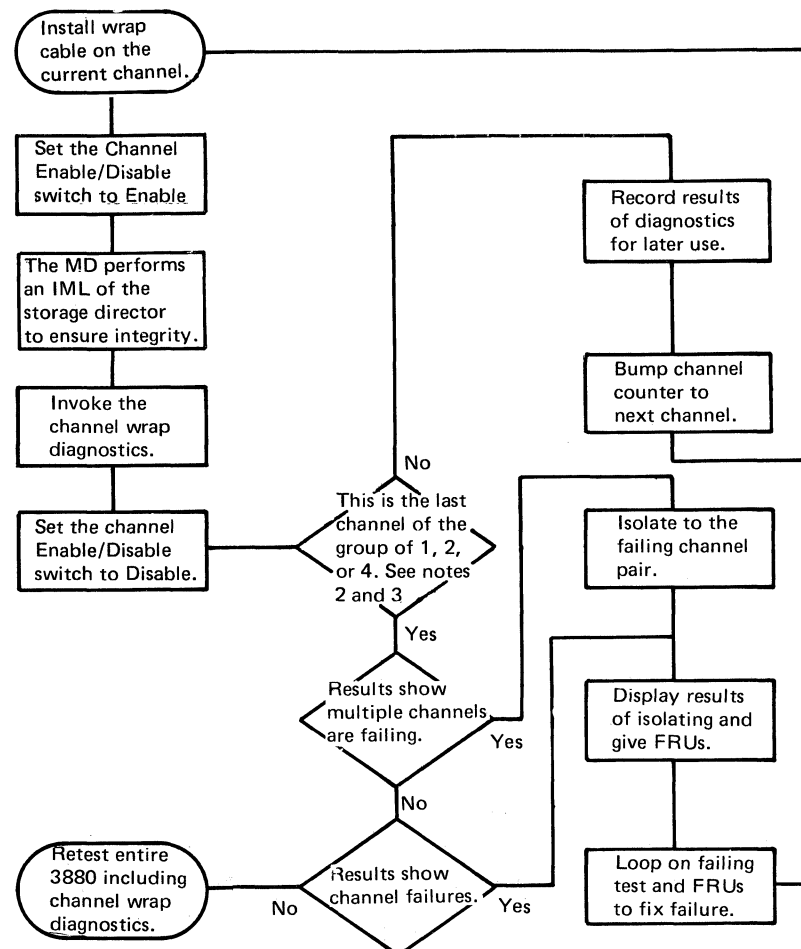
Errors caused by channel switch hardware require isolation to determine which channel interface paths are failing. The following figure shows the electrical dot ORs, and physical locations of the different channel configurations for the 3880. The isolation procedures physically and electrically remove channel paths from the 3880 to break the dot ORs isolating FRUs.



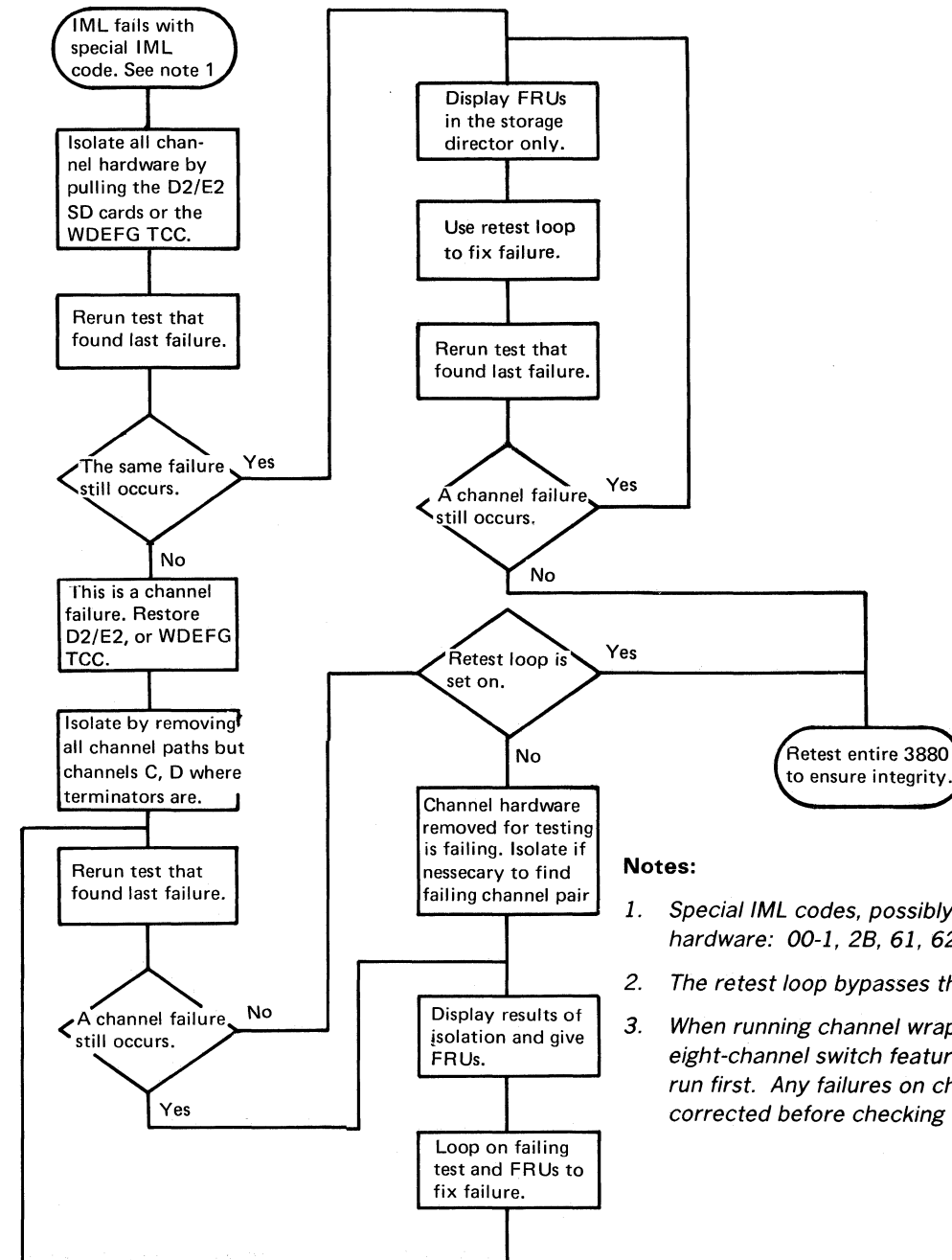
ISOLATION TECHNIQUES

1. During the running of channel wrap diagnostics, the following is the procedure the maintenance device uses in options 1 and 5 when running the channel wrap diagnostics on the 3880. This isolation technique handles and stores the results of each channel test for analysis, therefore, no display of the status of the channel hardware is made until:

- One Channel has been tested on a 3880 with a single channel
- Two Channels have been tested on a 3880 with two channels
- Four Channels have been tested on a 3880 with the two-channel switch pair, additional feature
- Four Channels have been tested on a 3880 with the eight-channel switch feature



After detection of certain storage director failures, the following is the procedure the maintenance device uses in options 1 and 5 when a special storage director failure is detected during an IML operation. For these failures, it is necessary to determine if the channel hardware is causing the failure, and if so, which interface needs repair. This is accomplished by isolating to the failing channel pair.



Notes:

1. Special IML codes, possibly caused by channel hardware: 00-1, 2B, 61, 62, 68, 6B, D1 or 3800.
2. The retest loop bypasses these steps.
3. When running channel wrap diagnostics on eight-channel switch feature, channels A through D are run first. Any failures on channels A through D must be corrected before checking channels E through H.

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REFERENCES TO OTHER SECTIONS

See START-10 for analysis and repair procedures of machine failures.

See the PROG section for instructions on running online test 3880A.

See PWR-33 for power supply adjustment test points.

See PWR-29 for analysis and repair procedures for power failures.

See PROG-5 for instructions on preparing CDS cards.

ABBREVIATIONS IN THIS SECTION

ac	alternating current
CB	circuit breaker
CDS	configuration data set
CE	customer engineer
CHL-I	channel interface
CIF	channel interface
CP	circuit protector
CTL-I	control interface
DASD	direct access storage device
dc	direct current
DC	direct current
DCT	device counter
DDCU	director-to-device controller, unidirectional
DDCV	director-to-device controller, bidirectional
DP	data processing
EREP	environmental recording, editing, and printing
GTB	gate terminal board
ID	identification
IML	initial microcode load
K/D	keyboard/display
MD	maintenance device
PF	program function (MD key)
P/N	part number
SD1	storage director 1
SD2	storage director 2
SYSGEN	system generation
T	transformer
TB	terminal board
UCW	unit control word

Before Installation

Machine Type

3880

Introduction

This procedure is written to make the installation of the 3880 as easy and as quick as possible. All necessary actions are contained in this procedure; no other manual sections are needed unless a machine failure occurs. If a failure prevents continuing the installation procedure, use START-10 to start the analysis and repair of the failure. After making the repair, return to the installation procedure and continue installing the 3880.

The procedure is written to be performed by one person. Two persons may work together, if desired. This results in a slightly shorter elapsed time, but increases the total CE hours.

Follow each step in sequence, and place a mark beside each step number as it is completed. If you have not installed a 3880 before, perform the Pre-Installation Check on this page and then go to INST-4.

Pre-Installation Check

All 3880s built in 1980 have 20 cards in the B3 and B4 boards. Later machines may have 22 cards in the B3 and B4 boards.

Because the location of some cards differs in the two board sizes, the CE must know the type machine he is installing.

The obvious method of identification is to count the cards. In a 20-card board the last socket location is V. In a 22-card board the last socket location is X. An additional method is to observe the number of cable rows at the top of the B3 and B4 boards. Machines with 20 cards have one row; machines with 22 cards have two.

Preparation

Before starting the installation process, determine the model number, the features on the machine, the channels assigned to the storage directors, and the address ranges assigned to the DASD units. Model number and machine features can be obtained from page 1 of the machine history form. Other information in Table 3 must be obtained from the customer or from the Account Management Plan.

Circle those Device Codes in Tables 1 and 2 that are installed in the 3880 Storage Director. This information can be found on page 1 of the machine history form.

CAUTION

When one controller interface of a dual controller 3380 is attached to a 3880 Model 3 with functional microcode bill of material 4518360 and the second controller interface of the 3380 is attached to another 3880 Model 2 or 3, the microcode for the 3880 Model 2 or 3 must be bill of material 4518522 or 4518360 at EC 461460 or later.

Table 1. Channel Features

Device Code	Name
8170	Two-Channel Switch Pair
8171	Two-Channel Switch Pair, Additional
8172	Eight-Channel Switch
6148	Remote Switch for Two-Channel Switch Pair
6149	Remote Switch for Two-Channel Switch Pair, Additional
6150	Remote Switch for Eight-Channel Switch
6550	Speed Matching Buffer for 3380 (SMB) See Note
6560	Speed Matching Buffer for 3375 (SMBU) See Note

Note: This device can be installed in one or both storage directors on a Model 1 (3375 SMBU) or Model 3 (3380 SMB). On a Model 2, the 3375 SMBU can be installed in storage director 1 and the 3380 SMB can be installed in storage director 2.

Programming

None.

Special Tools/ Test Equipment

Needed for installation:

- Electrical Safety Analyzer (Branch Office) P/N 1650792
- Digital voltmeter (Branch Office) P/N 453585
- Maintenance Device
- Metric Tool Set B/M 1749235
- Tailgate Wrap Cable non-electronic wrap only (Branch Office) P/N 4797396

Storage Director Identification

Each storage director should have a physical identifier assigned to ensure positive identification of the failed storage director if a malfunction occurs. Each 2-character hex identifier is assigned by the CE and must be used only once in each customer location.

The storage director physical identifiers must be assigned in pairs in each 3880 Storage Control. The two numbers must be consecutive with the even number having the smaller value. For example: 02 and 03, 30 and 31 are valid pairs; 05 and 06, 23 and 24 are not valid pairs because they begin with odd numbers. It is recommended that storage directors be numbered starting with 02 and 03 and continuing in order as additional 3880 Storage Controls are installed. Do not use 00 and 01.

The physical identifier is included in sense byte 21 for sense formats 0, 2, and 3, and in sense byte 6 for format 6. It is printed in the heading of the EREP detail report (format 0, 2, 3) and summary report (format 6). In EREP reports it appears as physical ID.

When the physical identifier assignments have been made, write the assigned numbers on the labels inside the 3880 cover and on the end of the logic gate.

Table 2. Functional Microcode Features

Device Code	Name
9190	3340/3344 Disk Storage Attachment (See Note 1)
9191	3370 Disk Storage Attachment (See Note 2)
9192	3330/3350 Disk Storage Attachment (See Note 1)
9193	3380 Disk Storage Attachment (See Note 3)
9194	3380 Speed Matching Buffer (SMB) (See Note 4)
9195	3375 Disk Storage Attachment (See Note 2)
9198	3375 Speed Matching Buffer (SMBU) (See Note 4)
9208	3380 Extended Disk Storage Attachment (See Note 5)

Notes:

1. These functional microcode features can be used on both storage directors in a 3880 Model 1 (2 shipped) or on storage director 1 in a 3880 Model 2 (1 shipped).
2. The 3370 and 3375 functional microcode features can be used on both storage directors in a 3880 Model 1 (2 shipped) or on storage director 1 in a 3880 Model 2 (1 shipped). These devices require a 2- or 3-megabyte channel when attached to a 4341 processor. When 3375s are attached to the 3031, 3032, 3033, or 3042 Model 2, a 3-megabyte data streaming channel is required.
3. The 3380 functional microcode features can be used on both storage directors in a 3880 Model 3 (2 shipped) or on storage director 2 in a 3880 Model 2 (1 shipped). The 3380 devices require a 3-megabyte data streaming channel.
4. The 3375 and 3380 Speed Matching Buffer features permit attaching the 3375 and 3380 disk storage devices to channels with a data rate of less than 3 megabytes and without the data streaming mode.
5. The 3380 Extended Disk Storage Attachment functional microcode feature must be installed on both storage directors in a 3880 Model 3.

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INSTALLATION PROCEDURES

Using the information from Tables 1 and 2 on INST-2 and the Account Management Plan, complete Table 3. The information in Table 3 is used later in the installation procedure.

Table 3. System Information

Model Number				
Model 1	Device code 9193, 9194 or 9208 NOT installed (See Table 2)			
Model 2	1 Device code 9193 or 9194 installed (See Table 2)			
Model 3	2 Device code 9193, 9194, or 9208 installed (See Table 2)			
B3 and B4 Board Card Positions				
20-card board	Card locations A to V (See Pre-Installation Check on INST-2)			
22-card board	Card locations A to X (See Pre-Installation Check on INST-2)			
Remote Switch				
Installed	Device Codes 6148, 6149, and 6150 (See Table 1)			
	Storage Director 1		Storage Director 2	
DASD Address Range (See the Account Management Plan)				
Storage Director Physical ID (See the Account Management Plan)				
Disk Storage Types (See Table 2)				
Speed Matching Buffer for 3375 (See Table 2)				
Speed Matching Buffer for 3380 (See Table 2)				
Channel A (See Note)	Std	DS	Std	DS
Channel B (Device code 8170) (See Table 1)	Std	DS	Std	DS
Channel C (Device Code 8171) Channel D (See Table 1)	Std Std	DS DS	Std Std	DS DS
Channel E (Device Code 8172) Channel F (See Table 1)	Std Std	DS DS	Std Std	DS DS
Channel G	Std	DS	Std	DS
Channel H	Std	DS	Std	DS
Note: Circle the type of channel for each storage director. Std is a standard channel. DS is a data streaming channel.				

Installation

UNPACK AND LOCATE

- 1. Inspect the machine for shipping damage. If any damage is found, report it to the IBM branch office immediately.
- 2. Make an inventory of the parts in the shipping group (see parts list in the shipping group box).
- 3. Remove all tape and packing material used to secure internal parts during shipment.
- 4. Place the unit in its permanent location.

It may be helpful to remove the removable panel **2** to simplify placing the cables into the cable hole in the base of the 3880. (The bolts holding the panel have 10 mm metric heads.) **1**

- 5. Install four wheel locks **3** on the 3880 casters.

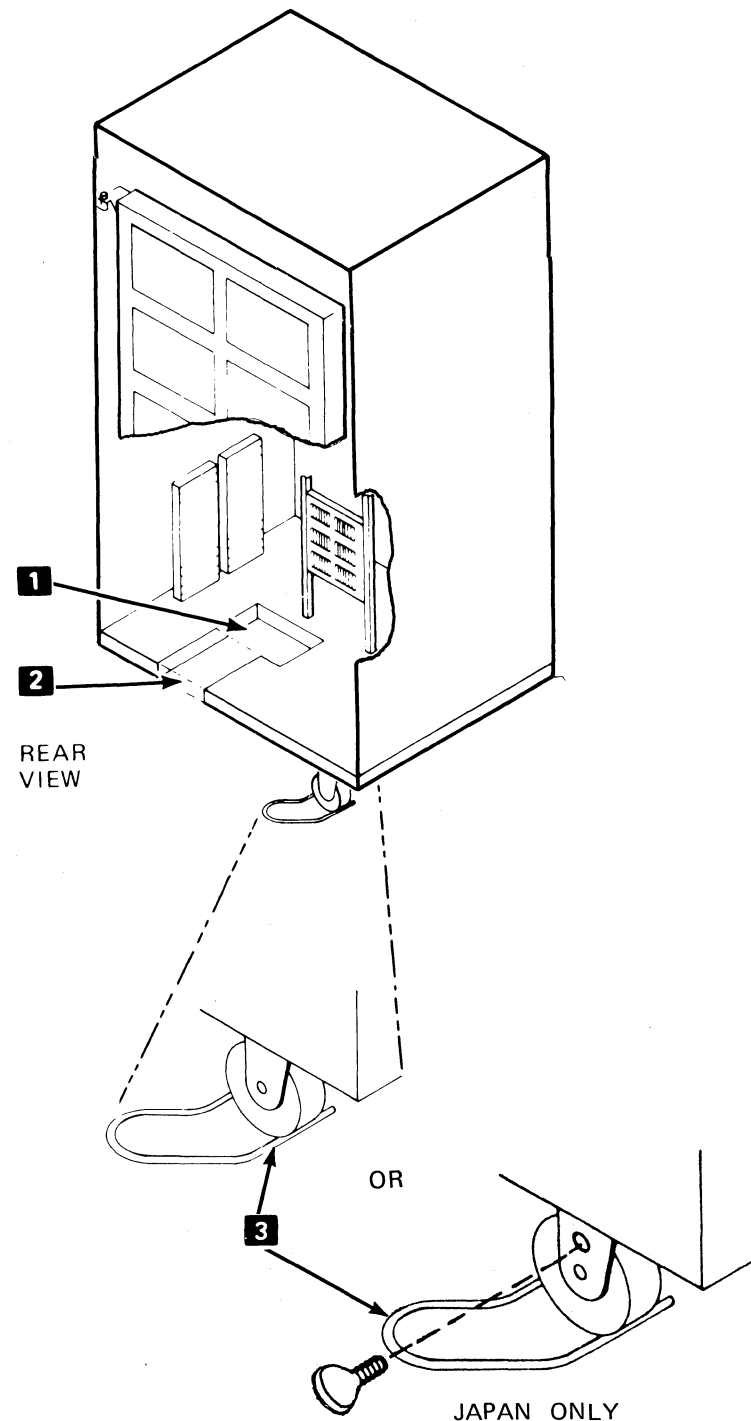
- 6. **Caution**
Do not connect the 3880 power cord until instructed to do so.

Leave the power cord inside the machine now. A safety check must be made (INST-6) before it is placed under the floor.

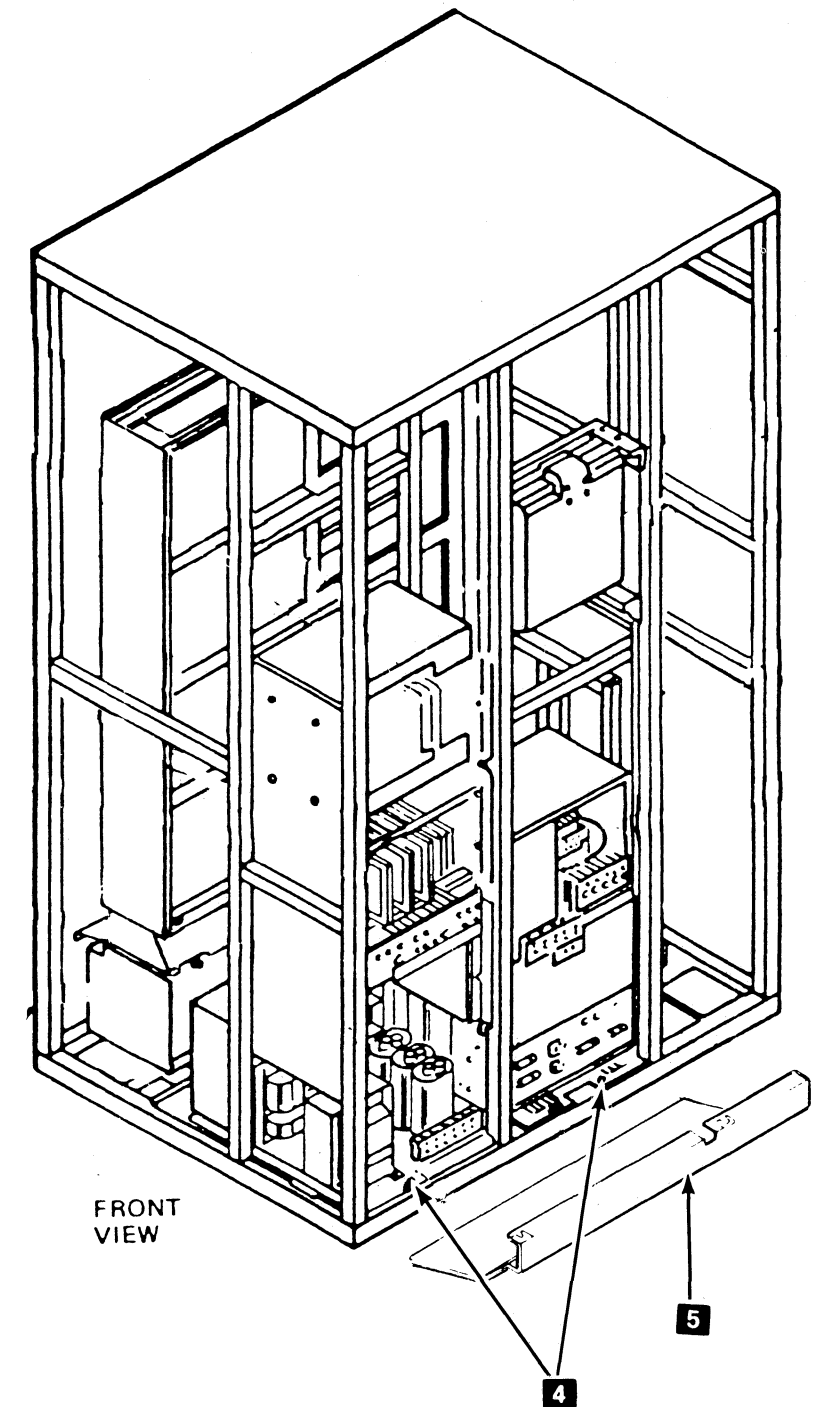
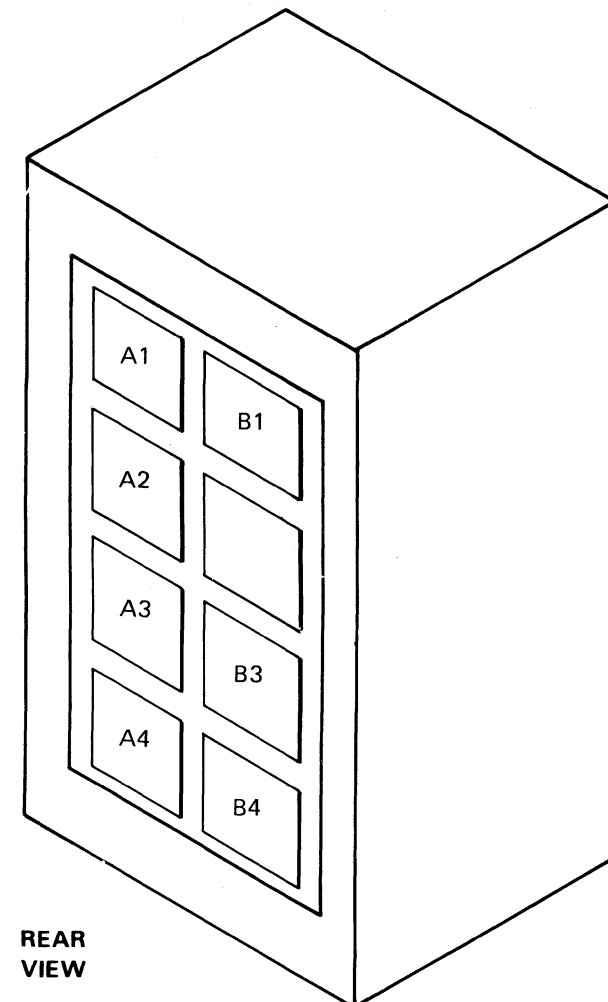
- 7. On all 60 Hz machines for the United States of America only, remove the two screws at **4** and install the EMC ground plate **5** (P/N 8499220). The EMC ground plate fits around the frame bar and extends under the machine. Reinstall the two screws **4**. Ensure that the ground lug is reinstalled at the left screw.

All new IBM 3880 Storage Controls are shipped from the factory wired for high priority.

- 8. If the machine is new and the customer wants it to operate with high priority, go to INST-5 (Primary Power).
- 9. If the machine is used or if the customer wants it to operate at low priority, go to INST-19 (Priority Jumper Locations).



3880 Logic Board Locations



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INSTALLATION PROCEDURES

PRIMARY POWER

- 1. Determine the nominal voltage at the customer outlet. If it agrees with the voltage tag **2** on the 3880, go to step 4.
- 2. If the customer voltage does not agree with the voltage tag, rewire the transformers as shown on the power logic pages. See the Power Logic Pages table for the correct pages to be used in this installation.

Power Logic Pages

Power Supply	Terminal Board	Logic Page No.
Primary Power Box	10 TB403	YA111*
	7 TB401	YA111*
Primary Power Box Controls	8 T401 TB	YA115
Power Sequencer and Monitor	9 T301 TB	YA121
DC Bulk Supply	6 TB201	YA131

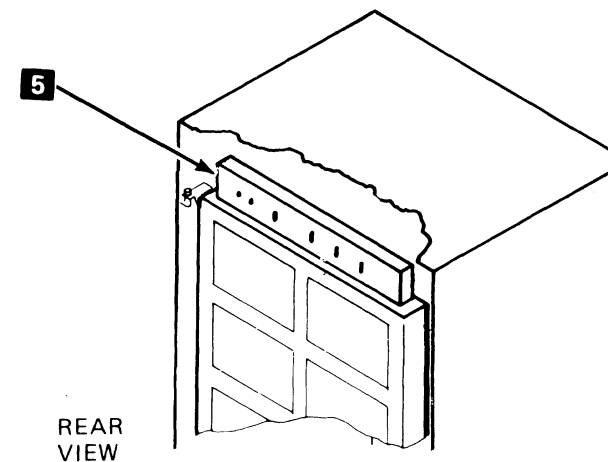
*Not applicable to 60 Hz and 50 Hz machines in Japan.

- 5. Set the following switches to the indicated positions. (All switches are located on the power switch panel **5** except as noted.)

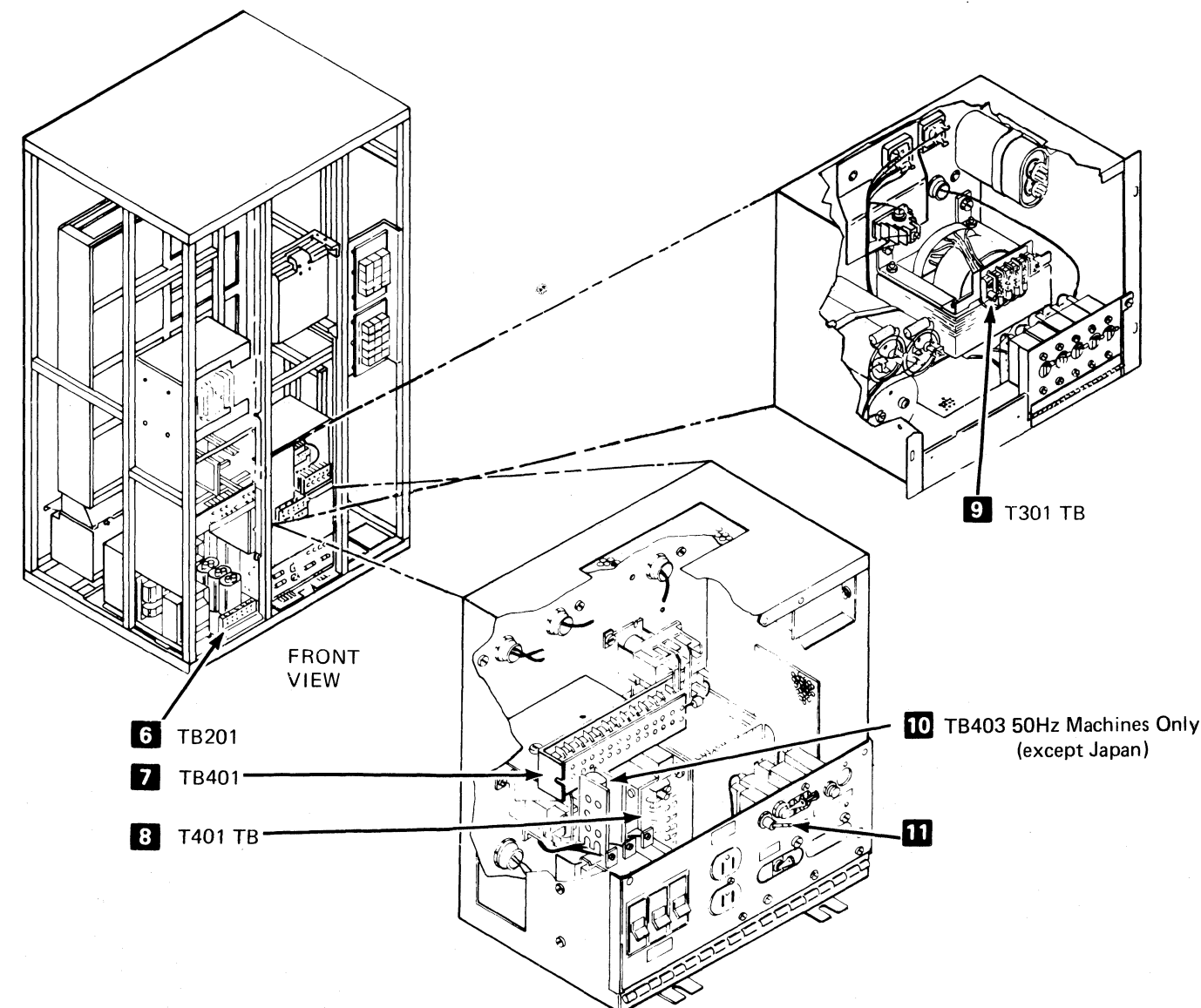
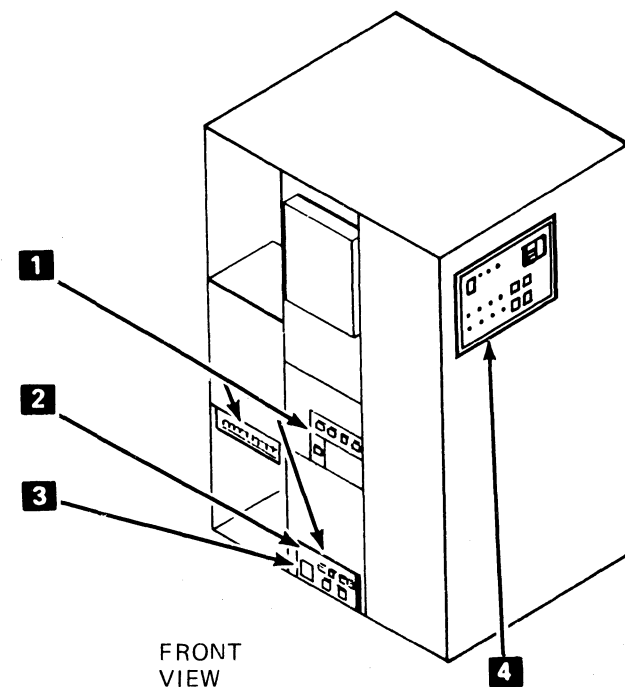
Switch Name	Position Setting
Power Select	Local
Device Power Sequencing	Disable
Storage Director 1	Normal
Storage Director 2	Normal
Unit Emergency (operator panel) 4	Enable
SW401 (CB panel) 11	On

Note: If the Unit Emergency switch cannot be set to the Enable position, go to INST-20 (Unit Emergency Switch).

- 6. Go to INST-6 (Safety Checks).



- 3. Change the voltage tag to show the correct voltage.
- 4. Check that all 3880 circuit protectors **1** are in the On position and that the mainline circuit breaker 401 **3** is in the Off position.



SAFETY CHECKS

- ___ 1. If this is a used 3880 that has not been previously maintained by IBM, perform the 3880 Safety Inspection Guide on INSP-5. The 3880 Safety Inspection Guide is located after the Installation Procedures at the end of this manual.
- ___ 2. Use the CE meter (P/N 1749231) or the Electrical Safety Analyzer (P/N 1650792) to ensure that the resistance between the machine frame and the ground pin on the power plug is less than 1.0 ohm. If the resistance is greater than 1.0 ohm, determine the cause and correct it before proceeding with the installation.
- ___ 3. Have the customer locate and turn off the branch circuit CB.

DANGER
Do not touch the outlet case with anything other than test probes until step 3 is completed.

- ___ 4. Check the voltage from the outlet case to the building ground for less than 1.0 Vac. (Begin with the meter scale that is appropriate for normal line voltage checks.)
- ___ 5. Check the voltage from the ground pin to the building ground for less than 1.0 Vac. The outlet is now safe to touch.
- ___ 6. Check the resistance from the ground pin to the outlet case. Use meters in step 1.

Check the resistance from the ground pin to the building ground. A reading of less than 1.0 ohm indicates the presence of a safe, continuous grounding conductor.

DANGER
Do not touch internal parts (pins and sockets) of the outlet until step 5 is completed.

- ___ 7. Measure the phase-to-phase voltage and the phase-to-ground voltage.

Measure the phase-to-neutral voltage (if present) and the neutral-to-ground voltage (if present).

All voltage values are to be less than 1.0 Vac.

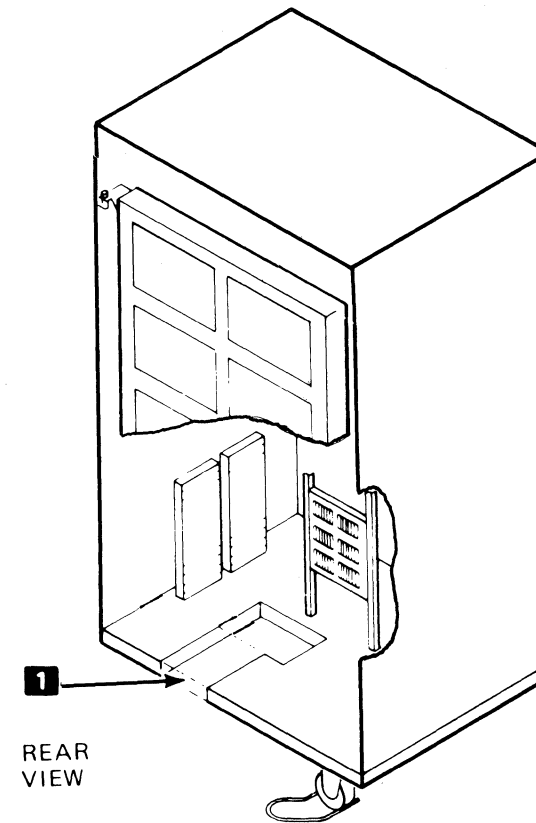
DANGER
Do not touch the outlet before meeting the following requirements of steps 7 and 8.

- ___ 8. Have the customer turn on the CB that supplies voltage to the receptacle.
- ___ 9. Measure the voltages from the shell to the building ground, the shell to the ground pin, and the building ground to neutral (if present). Voltage values are to be less than 1.0 Vac.

CAUTION
If measured voltage values are less than 1.0 Vac, the outlet can be touched. Avoid contact with the internal parts (pins and sockets) of the outlet.

- ___ 10. Measure the voltages from the ground pin and the neutral pin (if present) to all phases, and measure the voltages from phase to phase. This ensures that the outlet is wired correctly.
- ___ 11. Have the customer branch circuit CB turned off before connecting the 3880 power cord into the customer outlet.
- ___ 12. Reinstall the removable panel **1** after all cables are in place in the cable hole. The panel has an electrical interlock that prevents powering up unless the panel is in place.
- ___ 13. Connect the 3880 power cable to the ac outlet. Set the customer branch circuit CB and the 3880 mainline circuit breaker 401 to the On position.

This activates the 24 V supply and supplies power at the 3880 convenience outlets for operation of the maintenance device (MD). **Do not attempt to turn on the machine power at this time.**
- ___ 14. Go to INST-7 (Introduction to Maintenance Device).



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INTRODUCTION TO MAINTENANCE DEVICE

The installation steps to be performed next use the maintenance device (MD). The following paragraphs give an introduction to the MD and its use with the 3880.

MD Process

The first frames displayed on the MD keyboard/display (K/D) are self-explanatory; the CE should respond appropriately to the commands and questions as they appear. There are several frames, however, that request the CE to select the installation or test function to be performed next.

If an error occurs during the checkout tests, the MD displays guidance for repair. After the repair action is completed, the MD permits selection of the next test to be performed.

After a series of questions designed to initialize the 3880 diskette, the K/D displays a list of options that can be performed with the MD.

Possible options are:

- 0 - End Call
- 1 - Start repair
- 2 - Continue repair
- 3 - Display history
- 4 - Symptom analysis
- 5 - Machine checkout
- 6 - Set/read switches
- 7 - Feature change
- 8 - Diagnostic aids
- 9 - SD-SD test error analysis

Attaching The Maintenance Device

- 1. Place the MD on a table near the right end of the 3880 (operator panel end).
- 2. Open the MD cover and plug *only the power cord* into the convenience outlet **1** at the rear of the 3880, below the lower logic gate hinge. *Do not connect the signal cable now.* It will be connected later.
- 3. Turn MD power on.

Note: *If there is no power at the convenience outlet, see PWR-29 to diagnose and repair the failure.*

- 4. **CAUTION:**
Ensure that the latest level diskette is used in this step and all following procedures. Failure to do so can give the wrong test results.

Insert the MD diskette in the diskette reader, following the instructions inside the MD cover. The diskette is included in the shipping group.

- 5. Press the IPL RESET pushbutton.
- 6. Wait until the following message is displayed:

```

                MD DISKETTE
    LOADED FOR 3880
    PN = XXXXXXXX
    EC = XXXXXXXX
    
```

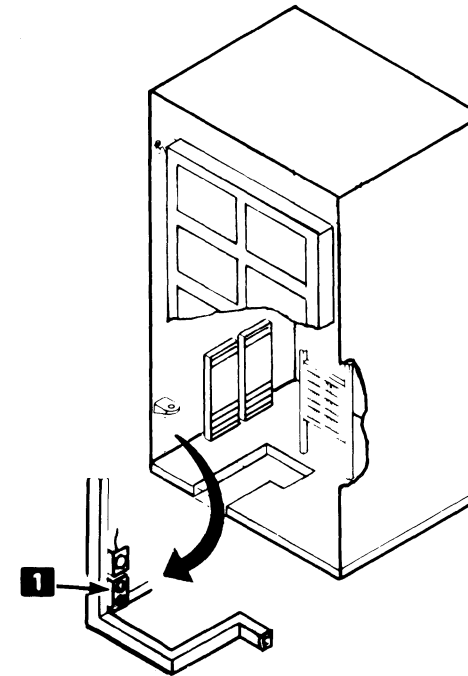
- 7. Press the ENTER key and follow the instructions on the keyboard/display until the following message is displayed.

```

    ENTER NUMBER
    FROM THE FOLLOWING
    LIST TO SELECT A
    MAINTENANCE ACTION
    
```

The initializing process is now completed and the MD is ready to be used with the installation procedure.

- 8. Go to INST-8 (DC Power Checks).



DC POWER CHECKS

— 1. Visually inspect all cards and cable connectors that may have become loose during shipment. Reseat any that are loose.

— 2. **CAUTION:**

Ensure that the latest level 3880 diskette is used in this and all following procedures. Failure to do so can give the wrong test results.

Insert the 3880 microcode diskette into the diskette reader.

— 3. Press the Maintenance Power On switch (on the power switch panel) to the Power On position. Power will be supplied to all boards in the 3880. Switches SD1 and SD2 on the power switch panel must be set to the Normal position.

Note: DC power may be turned off only with the Subsystem Power switch on the operator panel.

— 4. Check for the following conditions:

- The Power Sequence Complete indicator on the operator panel is on.
- The Power Check indicator on the operator panel is off.
- The SD1 and SD2 indicators on the power switch panel are on.
- Cooling air is flowing through the power supply **1** and the logic gate **9**.

— 5. **CAUTION:**

Ensure that the latest level MD diskette is used in this and all following procedures. Failure to do so can give the wrong test results.

If any of the conditions in step 4 do not exist:

- Plug the MD signal cable into the MD connector near the MD power outlet.
- Press the PF key to return to the maintenance mode option list.
- Select option 1 to start repair of the power failure.

Note: The MD may be connected to any ac outlet (other than on the 3880) of the correct voltage if power supply diagnosis requires setting the mainline CB (CB401) on and off repeatedly.

— 6. Measure the dc voltages at the gate terminal boards **10** with a digital voltmeter. Adjust or repair *only* if a voltage is not between the limits shown in the following table. If the adjustments do not correct the voltage problem, see PWR-33 for references to other MIM procedures and ALD logic pages that can aid in analyzing the problem.

Note: Open the logic gate and place the meter on the floor so that it can be seen while making adjustments at the regulator panel.

All test points are located on gate terminal boards 3 and 4 **10** located on the hinge edge of the logic gate. The ground reference point for all voltages is Gate Terminal Board 3-4 (GTB3-4) **10**. Other power supplies are not adjustable. They are checked by the power sequence monitor.

Voltage	Test Point	Acceptable Limits	If Outside Limits
+5.00 A	GTB3-1	5.05-5.15	Adjust at 6 to 5.1 Vdc (See Note)
+5.00 B	GTB4-1	5.05-5.15	Adjust at 7 to 5.1 Vdc (See Note)
+7.25 A	GTB3-9	7.30-7.45	Adjust at 5 to 7.37 Vdc (See Note)
+7.25 B	GTB4-9	7.30-7.45	Adjust at 4 to 7.37 Vdc (See Note)
+6.00 A	GTB3-11	6.05-6.20	Adjust at 3 to 6.12 Vdc
+6.00 B	GTB4-11	6.05-6.20	Adjust at 2 to 6.12 Vdc

Note: The +7.25 V regulator is not installed on machines with high density static control storage. The +7.25 V supply must always be checked after the +5 V supply. The +7.25 V supply is derived from +5 V; changing +5 V changes +7.25 V also.

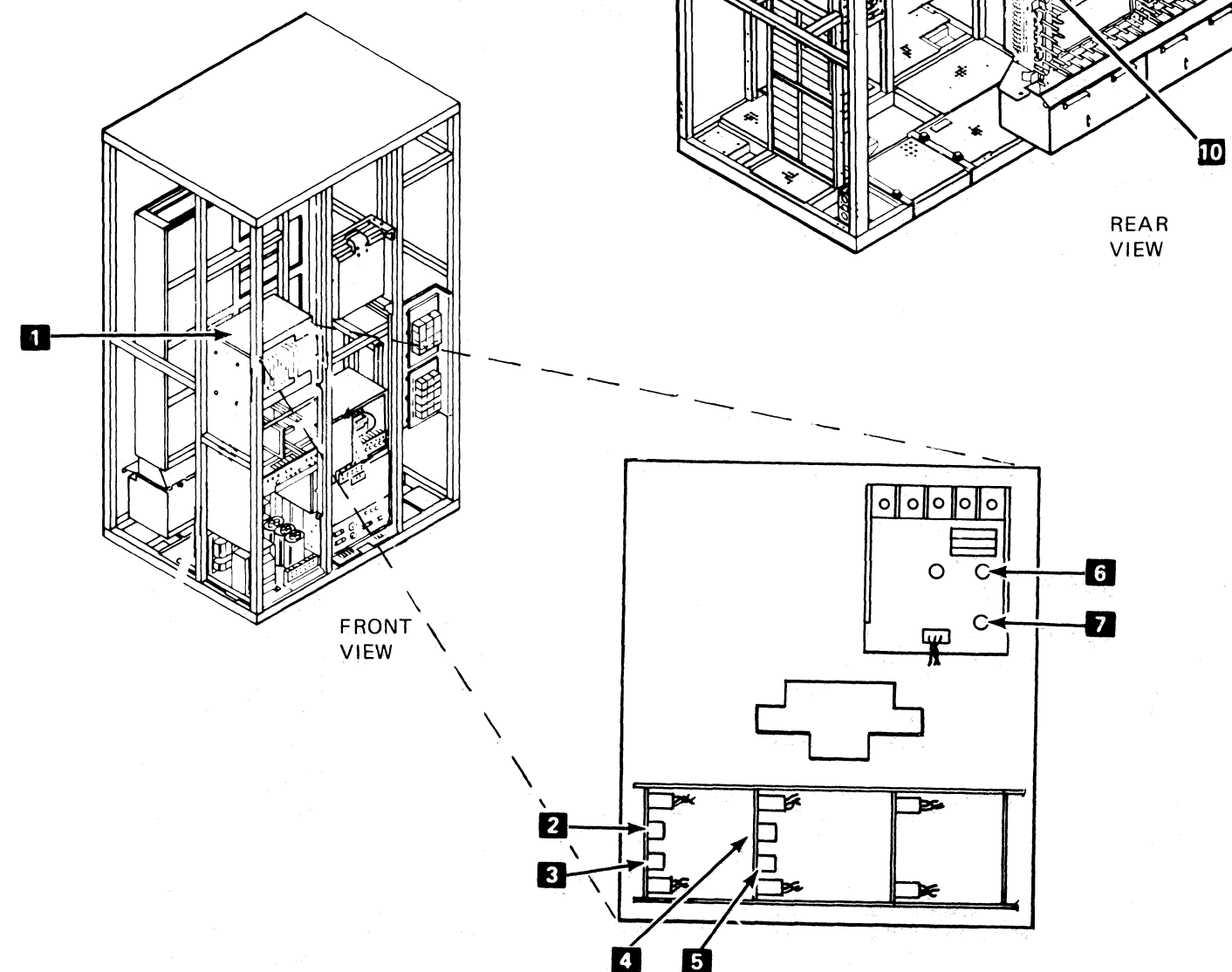
— 7. Turn power on at the operator panel. Wait for initial microcode load (IML) to be completed (approximately one minute). If both Wait LEDs (on the operator panel) light, the IML is successful. Turn power off at the operator panel and go to INST-9 (Control Switch Setting).

— 8. If the IML is not successful (one or both of the Wait LEDs fail to turn on), plug the MD signal cable into the MD connector on the 3880 near the MD power outlet.

— 9. Select option 5 on the MD keyboard/display.

— 10. The MD displays a series of questions and instructions that permits a complete diagnostic checkout of the 3880. Follow the instructions that are displayed and perform the necessary repairs.

— 11. Turn power off at the Operator panel. Go to INST-9 (Control Switch Setting).



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CONTROL SWITCH SETTING

Early production 3880s use card switches with the operating levers on the top of the switch body. It is necessary to remove the card to change the switch settings on these machines.

Later production 3880s use card switches with the operating levers on the side of the switch body. The switches are mounted at the edge of the card, in the Z position, and can be operated with a scribe point without removing the card (see Figures 1 and 2).

Warning: All 3370 and 3375 devices must be attached to high-speed channels (1.86 megabyte or greater). Failure to use high-speed channels for the 3370 and 3375 devices can result in the loss of customer data.

Warning: When removing or reinstalling crossovers, keep them square with the cards. Tilting them can break the logic card shrouds.

- 1. Remove covers from boards B3 and B4. (See INST-4 for logic board locations.)
- OK 2. Ensure that the Data Streaming feature is installed in the processor and is activated on the attaching channel when data streaming is enabled on the 3880.

CAUTION:

Failure to match the setting for each of the 3880 Data Streaming switches to the operating mode of the corresponding channels attached to the 3880 can cause data overruns, bus in and or bus out parity errors, and loss of customer data. If the unit control word for the channel indicates data streaming set the 3880 Data Streaming switch for that channel to the On position. If the unit control word for the channel does not indicate data streaming set the 3880 Data Streaming switch for that channel to the Off position.

- 3. Use the channel information from Table 3 on INST-3 to set the Data Streaming switches 2 on the channel sequence cards (CSC) in B4F2 and B3F2. The On position indicates the data streaming channels (see Figures 1, 2, and Table 1.)

Notes:

- 1. Switch 1 (channel A) is towards the top of the card and switch 8 (channel H) is towards the bottom of the card.
- 2. On some machines, the top card crossover in the Y row may have to be removed before the switches can be set.

See the table on INST-3 (or consult the Account Management Plan) for the two storage director physical ID numbers assigned to this 3880. The two numbers must be consecutive with the even number having the smaller value. For example, 02-03, 46-47 are valid pairs; 47-48 and A1-A2 are not valid pairs.

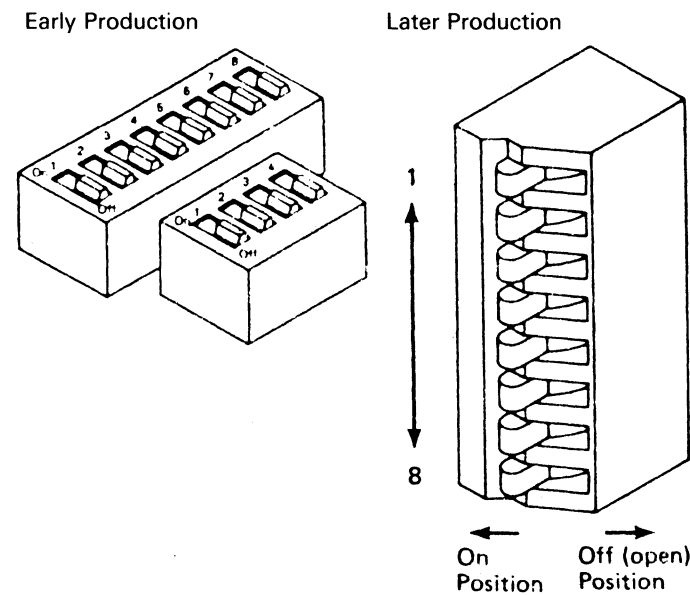
- 4. Convert the hex numbers to their binary equivalents.
- OK 5. Set the Physical ID switches on the device counter (DCT) cards located at B4V2 and B3V2 to represent the binary code developed in step 4. See the following example.

Switch Numbers	Switch Settings	Physical ID Number (example)	Switch Numbers	Switch Settings	Physical ID Number (example)
1	Off	'0'	1	Off	'0'
2	Off		2	Off	
3	Off	'2'	3	Off	'3'
4	Off		4	Off	
5	Off	0	5	Off	0
6	Off		6	Off	
7	On	1	7	On	1
8	Off		8	On	

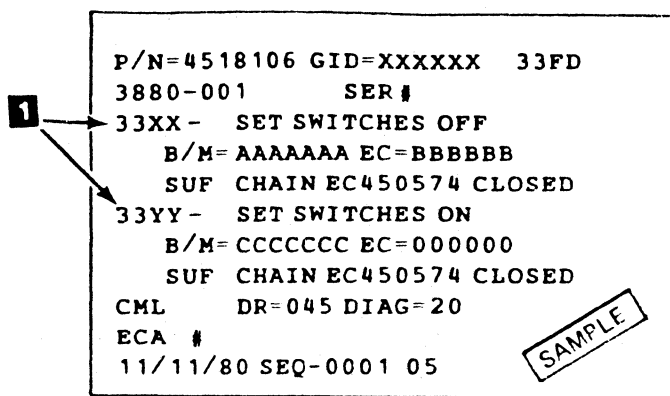
Storage Director 1
Card B4U2 (20-card board)
Card B4V2 (22-card board)

Storage Director 2
Card B3U2 (20-card board)
Card B3V2 (22-card board)

Figure 1. Card Switch Types



- 6. Determine the types of storage devices to be connected to each storage director. For information on switches, see 3880 Diskette Load Control Switches.
 - 7. Ensure that the device types printed on the diskette label 1 are the same as the devices to be attached to this 3880.
 - OK 8. Set the Diskette Load Control switches on the maintenance (MNT) cards as shown on the diskette label.
- SD1 Card B4L2 (20-card board)
Card B4Q2 (22-card board)
- SD2 Card B3L2 (20-card board)
Card B3Q2 (22-card board)



- 9. Go to INST-10 (Address Setting).

3880 Diskette Load Control Switches

The 3880 functional microcode diskette contains both functional and diagnostic microcode for the 3880 and for each type of attached device. It must be in place in the diskette reader whenever the 3880 is operating.

The specific portion of functional microcode to be loaded into each control storage during IML is determined by the types of storage devices attached to each storage director and is controlled by four switches on the maintenance (MNT) cards.

The 3880 diskette label carries the information necessary to set the maintenance card switches correctly. The instructions for setting the switches are on lines 3 and 6 1 of the label. All four switches on each card are to be set the same; the label on the diskette shipped with the 3880 indicates how they are to be set.

Figure 2. Channel Sequence Control Card Switches

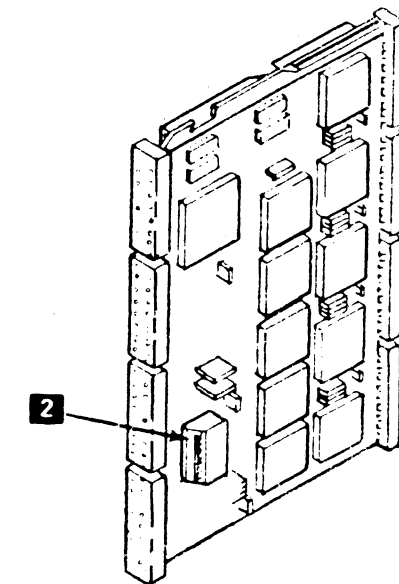


Table 1. Channel Switches for Data Streaming

CHANNEL	SWITCH NUMBER	
	SD1 (Card B4F2)	SD2 (Card B3F2)
A	1	1
B	2	2
C	3	3
D	4	4
E	5	5
F	6	6
G	7	7
H	8	8

ADDRESS SETTING

The address of the storage director is set by using switches on the channel interface (CIF) card. The switch setting contains the address of the storage director and reflects the address range, or the quantity, of storage devices attached (8, 16, 32, or 64).

To set the storage director address switches, it is only necessary to know the range of addresses of the attached devices. The storage director address is part of the address range. For example, for address range '88' to '8F' the storage director address is '88' (1000 1XXX).

CAUTION

Ensure that the addresses selected for this 3880 do not overlap any addresses used for other devices connected to the same channel.

For multi-channel 3880s, switches 4, 5 and 6 must be set the same on all CIF cards in a storage director. If they are not the same, the 3880 cannot enter the wait state after an IML.

On 8-channel machines, do not use overlapping address ranges for storage director 1 and storage director 2. For example, if storage director 1 uses address range 00 through 0F (16 addresses), storage director 2 should not use addresses 00 through 07 (8 addresses), or 08 through 0F (8 addresses), or 00 through 0F (16 addresses), or 00 through 1F (32 addresses), because all of these addresses overlap the addresses for storage director 1.

- ___ 1. On 4- or 8-channel 3880s, remove board covers and crossovers as follows:
 - 4-channel 3880 Boards A3 and A4
 - 8-channel 3880 Boards A1, A2, A3, A4
- ___ 2. Select option 6 (press 6, then press the ENTER key) and follow the instructions on the keyboard/display to set the channel addresses for SD1 and SD2. Do not attempt to read the switch settings now.
- ___ 3. Reinstall all crossovers removed while setting the switches. See the Crossover Locations charts.
- ___ 4. Reinstall the card cover panels to ensure correct gate cooling during power-on operations.
- ___ 5. Plug the MD signal cable into the MD connector on the 3880 near the MD power outlet.
- ___ 6. Select option 6 on the MD keyboard/display.
- ___ 7. Turn power on at the operator panel.

- ___ 8. Read and display the settings of the diskette load control switches, the address switches, and the storage director physical ID switches to ensure they are correct.

If a machine failure prevents displaying any of the switch settings, go to step 9, perform the 3880 checkout procedure, and then return to this step to check switch settings after the failure has been corrected.

Continue with step 9 and verify machine operation.

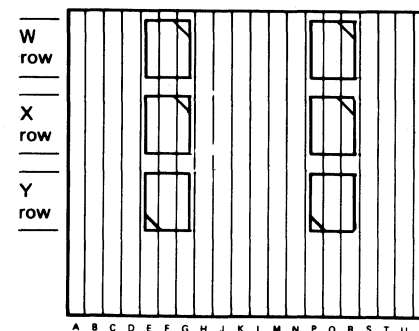
- ___ 9. Select option 5 on the MD keyboard/display.

The MD displays a series of questions and instructions that permits a complete diagnostic checkout of the 3880. Follow the instructions that are displayed.

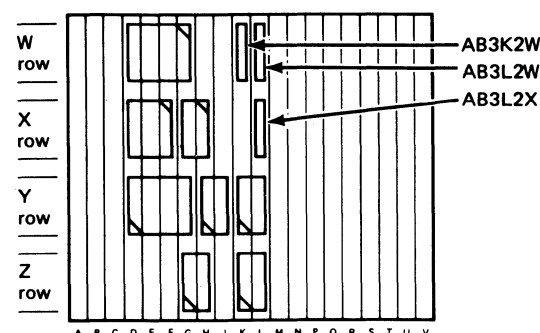
Note: When installing a 3880 with the remote switch feature (Enable/Display switches removed from operator panel), see Channel Enable/Disable Without Switches on INST-14.

- ___ 10. Look at the labels on the card cover panels. If there is a label that indicates that this 3880 is equipped with internal electronic channel wrap, go to INST-11 (Subsystem Machine Checkout, Electronic Wrap All Models).
- ___ 11. If the machine does not have internal electronic channel wrap and is a 3880 Model 2 (SD2) or a Model 3, go to INST-12 (Channel Interface Wrap).
- ___ 12. If the machine does not have internal electronic channel wrap and is a 3880 Model 1 or a Model 2 (SD1), go to INST-13 (Channel Interface Wrap).

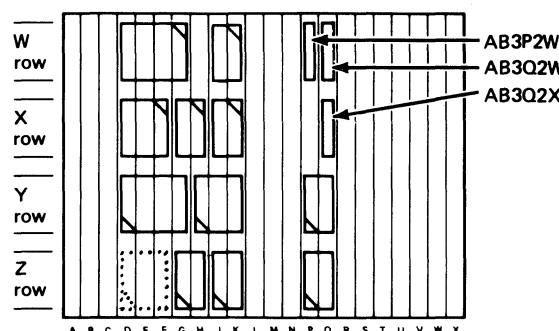
Crossover Locations – Boards A1, A2, A3 and A4



Crossover Locations – Boards B3 and B4 (20-card board)



Crossover Locations – Boards B3 and B4 (22-card board)



Notes:

1. Crossover location label is on the left edge of each crossover.
2. Dotted lines represent crossover on 8-channel machines only.

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INSTALLATION PROCEDURES

SUBSYSTEM MACHINE CHECKOUT, ELECTRONIC WRAP (All Models)

Read the following before starting the channel wrap tests.

The channel wrap test consists of two parts:

- CHL-I Electronic wrap test
- CHL-I Tailgate wrap test

The CHL-I electronic wrap test is run automatically each time an initial microcode load (IML) operation is performed.

The tailgate wrap test provides a test of the internal 3880 cables.

Note: When tailgate wrap test is performed, select out bypass jumpers must not be used.

The MD automatically runs maintenance device adapter tests and maintenance connection tests on both storage directors when option 5 is used. When these tests are completed, the MD permits the CE to run other tests. Although some 3880 configurations require additional special tests, the following are typical. All tests offered by the MD must be run on both storage directors.

Storage Refresh test
CTL-I Wrap test (see note)
CHL-I Tailgate wrap test (see note)
Operator Panel Lamp test

Note: See wrap connection procedures, this page.

If an error occurs during any of the tests, the MD gives guidance for repair, then permits all of the diagnostic programs to be repeated.

If no error is found, the MD displays:

DO YOU WANT TO
RUN OLTS?
.
.

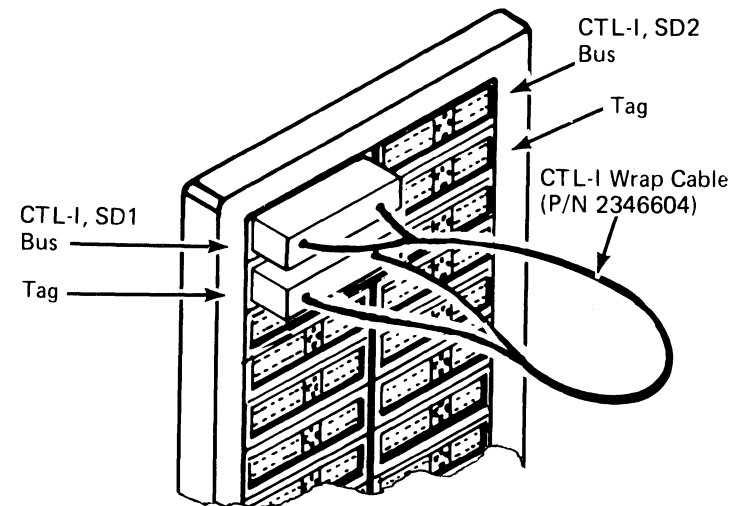
All 3880 standalone tests are complete. Respond yes to the MD question, but do not perform more MD steps now. Leave the MD connected for later use, and go to the Cable Installation on INST-14 to attach device and channel cables.

CONNECTING THE CTL-I WRAP CABLE MODEL 1, MODEL 2 (SD1 Only)

The control interface (CTL-I) wrap cable (P/N 2346604) connects the tag and bus connectors of the storage director to be tested.

1. Connect the CTL-I wrap cable as shown in Figure 1. Ensure that connections are made to the storage director being tested, as instructed by the MD display. If channel wrap tests have already been run, ensure that the channel wrap cable is disconnected.

Figure 1. CTL-I Wrap Connection Shown for SD1, Model 1 or 2

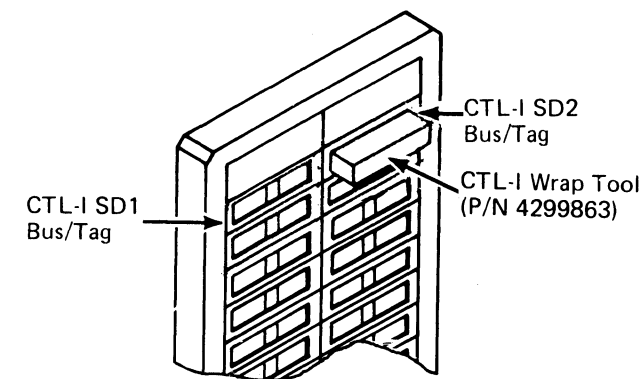


CONNECTING THE CTL-I WRAP TOOL, MODELS 2 (SD2 Only) AND MODEL 3

The control interface wrap tool (P/N 4299863) connects tag and bus lines in the control interface (CTL-I) connector of the storage director to be tested.

1. Connect the CTL-I wrap tool when instructed by the MD, as shown in Figure 2. Ensure that connections are made to the storage director being tested. If channel interface (CHL-I) wrap tests have already been run, ensure that the channel wrap cable is disconnected.

Figure 2. CTL-I Wrap Connection Shown for SD2 on a 3880, Model 2 or 3



CONNECTING THE CHL-I TAILGATE BLOCK WRAP TOOL

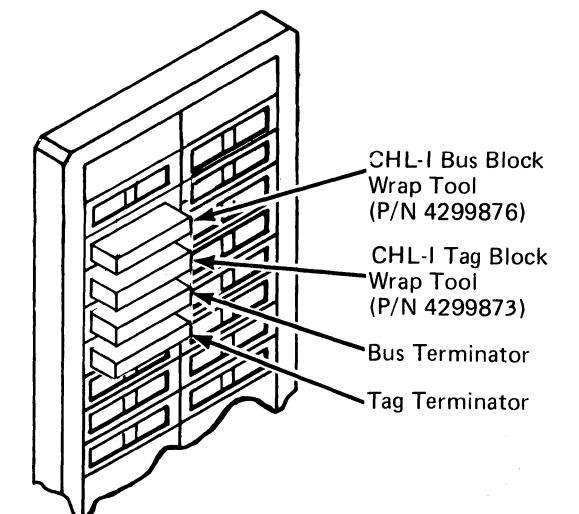
The channel interface (CHL-I) block wrap tool connects the channel bus and tag in lines to the channel bus and tag out lines.

The following describes the tailgate block wrap tool method using wrap tools (P/N 4299876 and P/N 4299873).

1. Connect the block wrap tool, as shown in Figure 3. See INST-14 for connector locations. Ensure blocks are installed, as instructed by the MD display.
2. Insert channel bus and tag terminators P/N 2282675 and P/N 2282676) in the channel bus out and tag out connectors for the channel being tested.

Note: If a failure occurs while running the wrap tests, and changing the FRUs listed by the MD does not correct the problem, the trouble may be in the board-tailgate cables, the tailgate connectors, the terminators, or the wrap tool itself.

Figure 3. CHL-I Tailgate Wrap Connection Shown for SD1, Channel A.



3. Go to INST-14 (Cable Installation).

**SUBSYSTEM MACHINE CHECKOUT
MODEL 2 (SD2 Only) AND MODEL 3,
WITHOUT ELECTRONIC WRAP**

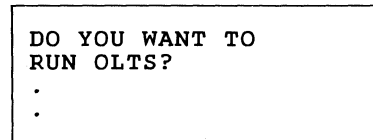
The MD automatically runs maintenance device adapter and maintenance connection tests on both storage directors when option 5 is used. When these tests are completed, the MD permits the CE to run other tests. Although some 3880 configurations require additional special tests, the following are typical. All tests offered by the MD must be run on both storage directors.

- Storage Refresh test
- CTL-I Wrap test (see note)
- CHL-I Wrap test (see note)
- Operator Panel Lamp test.

Note: See both wrap cable connection procedures, this page.

If an error occurs during any of the tests, the MD gives guidance for repair, then permits all of the diagnostic programs to be repeated.

If no error is found, the MD displays:



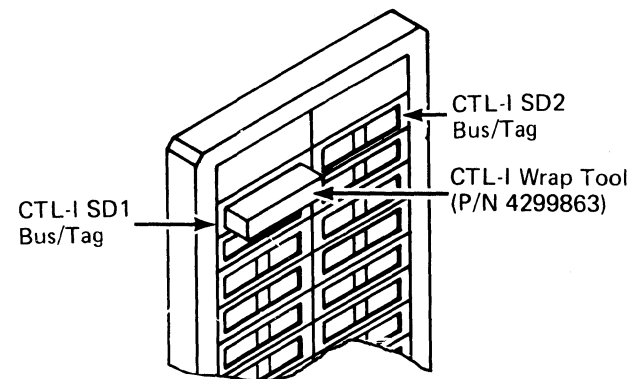
All 3880 standalone tests are now complete. Respond yes to the MD question, but do not perform more MD steps now. Leave the MD connected for later use, and go to the Cable Installation on INST-14 to attach device and channel cables.

**CONNECTING THE CTL-I WRAP TOOL,
MODELS 2 (SD2 Only) AND MODEL 3**

The control interface wrap tool (P/N 4299863) connects tag and bus lines in the control interface (CTL-I) connector of the storage director to be tested.

- 1. Insert the CTL-I wrap tool when instructed by the MD, as shown in the following Figure. Ensure that connections are made to the storage director being tested. If channel interface (CHL-I) wrap tests have already been run, ensure that the channel wrap cable is disconnected.

**CTL-I Wrap Connection Shown for SD1
on a 3880 Model 3**



**CONNECTING THE CHL-I BOARD WRAP
CABLE, MODEL 2 (SD2 Only) AND MODEL 3**

The channel interface (CHL-I) wrap cable connects the control interface of the storage director to be tested with the channel to be tested. Ensure that the correct step is being used for the number of channels on the 3880 being installed.

- 1. **For all 3880s**
Power off the storage director to be tested from the power switch panel.
- 2. **For 1- and 2-channel 3880s**
Remove cable retainers and cable paddle connectors from rows A and B of the storage director board to be tested (B3 board for SD2 or B4 board for SD1).
- 3. **For 4- and 8-channel 3880s**
Remove the jumper (JMP) cards for the storage director to be tested as follows:

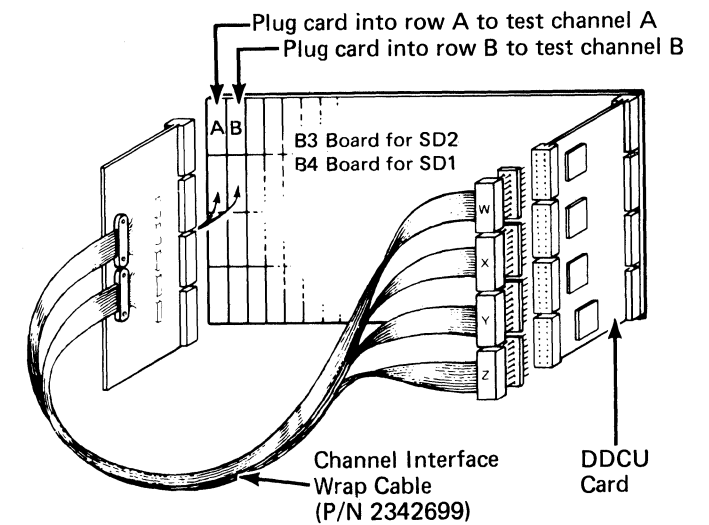
Channel	SD1	SD2
A	A4T2	A3T2
B	A4S2	A3S2
C	A4C2	A3C2
D	A4D2	A3D2
E	A2T2	A1T2
F	A2S2	A1S2
G	A2C2	A1C2
H	A2D2	A1D2

- 4. **For all 3880s**
Carefully remove the two cables from the top of the director-to-device controller, bidirectional (DDCV) card of the same storage director.

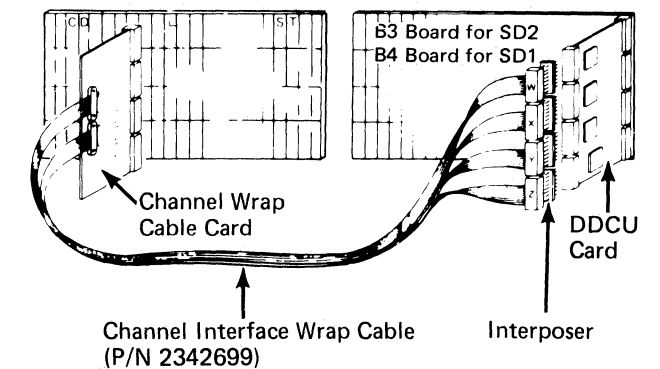
	SD1	SD2
20-card board	B4V2	B3V2
22-card board	B4X2	B3X2

- 5. **For all 3880s**
Remove the DDCV card from the same position and install the director-to-device controller, unidirectional (DDCU) card. (The DDCU card is a test card and is included in the 3880 shipping group.) Transfer the interposers from the DDCV card to the DDCU card.

- 6. **For 1- and 2-channel 3880s**
Install the channel wrap cable assembly (P/N 2342699) in either the A-row position for the channel A test or the B-row position for the channel B test. See the following Figure for channel wrap cable assembly.



- 7. **For 4- and 8-channel 3880s**
Insert the channel wrap cable card into the jumper card socket for the storage director and channel to be tested. See the following Figure and the table in step 3 for the correct locations.



- 8. **For all 3880**
Install the channel wrap cable connectors (W, X, Y, and Z) onto the top of the DDCU card, on the storage director to be tested.
- 9. Go to INST-14 (Cable Installation).

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INSTALLATION PROCEDURES

SUBSYSTEM MACHINE CHECKOUT MODEL 1, (MODEL 2 (SD1 Only), WITHOUT ELECTRONIC WRAP

Read the following paragraphs before starting the channel wrap tests.

Two methods of cabling for the channel wrap test are:

- Tailgate cabling
- Board cabling

Tailgate cabling, as shown in Figure 2, is recommended for use during 3880 installation. The tailgate wrap cable (P/N 4797396, a branch office tool) provides a complete wrap test including internal 3880 cables. The use of this wrap cable is preferable during installation because of the completeness of the test, and because the tailgate is free of channel and device cables.

Note: When tailgate cabling is used, select out bypass jumpers must not be used.

If the tailgate wrap cable is not available during installation, use the board wrap cable (P/N 2342699) that is included in the 3880 shipping group. Instructions for its use can be found in the CARR section of the MIM.

The MD automatically runs maintenance device adapter tests and maintenance connection tests on both storage directors when option 5 is used. When these tests are completed, the MD permits the CE to run other tests. Although some 3880 configurations require additional special tests, the following are typical. All tests offered by the MD must be run on both storage directors.

Storage Refresh test
CTL-I Wrap test (see note)
CHL-I Wrap test (see note)
Operator Panel Lamp test.

Note: See wrap cable connection procedures, this page.

If an error occurs during any of the tests, the MD gives guidance for repair, then permits all of the diagnostic programs to be repeated.

If no error is found, the MD displays:

DO YOU WANT TO
RUN OLTS?
.
.

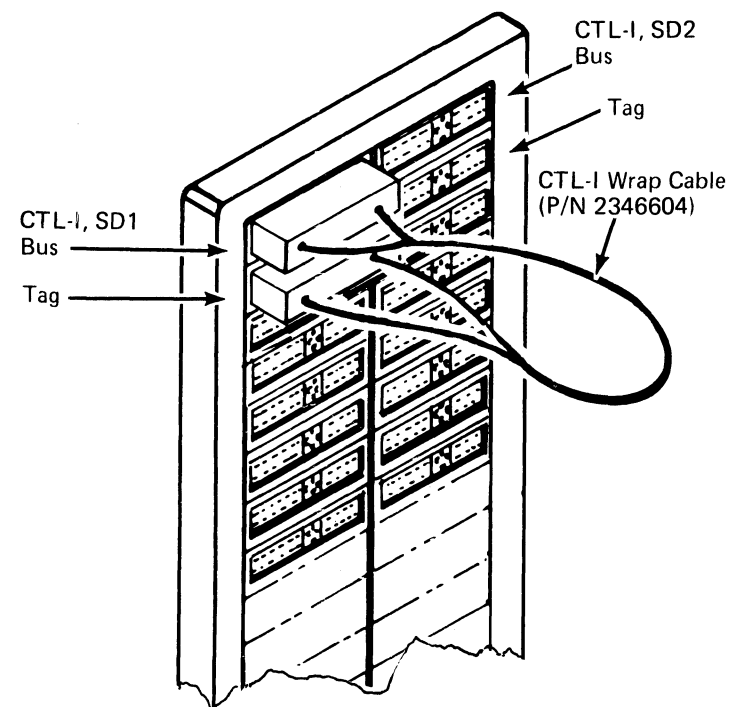
All 3880 standalone tests are now complete. Respond yes to the MD question, but do not perform more MD steps now. Leave the MD connected for later use, and go to the Cable Installation on INST-14 to attach device and channel cables.

CONNECTING THE CTL-I WRAP CABLE, MODEL 1, MODEL 2 (SD1 Only)

The control interface CTL-I wrap cable (P/N 2346604) connects the tag and bus connectors of the storage director to be tested.

1. Connect the CTL-I wrap cable as shown in Figure 1. Ensure that connections are made to the storage director being tested, as instructed by the MD display. If channel wrap tests have already been run, ensure that the channel wrap cable is disconnected.

Figure 1. CTL-I Wrap Connection Shown for SD1



CONNECTING THE CHL-I TAILGATE WRAP, CABLE MODEL 1, MODEL 2 (SD1 Only)

The channel interface (CHL-I) wrap cable connects the control interface of the storage director to be tested with the channel to be tested.

The following describes the tailgate wrap method, using wrap cable (P/N 4797396, a branch office tool).

1. Connect the cable, as shown in Figure 2, from bus and tag CTL-I connectors to bus in and tag in channel connectors. See INST-14 for connector locations.

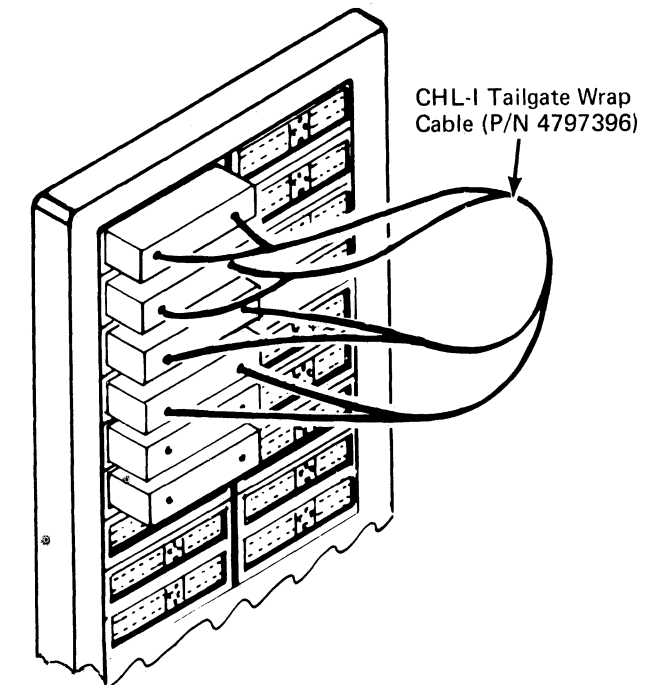
Ensure connections are made to the storage director and channel being tested, as instructed by the MD display.

2. Insert channel bus and tag terminators (P/Ns 2282675 and 2282676) in the channel bus out and tag out connectors for the channel being tested.

Note: If a failure occurs while running the wrap tests, and changing the FRUs listed by the MD does not correct the problem, the trouble may be in the board-tailgate cables, the tailgate connectors, the terminators, or the wrap cable itself.

3. Go to INST-14 (Cable Installation).

Figure 2. CHL-I Tailgate Wrap Connection Shown for SD1, Channel A.



CABLE INSTALLATION

1. Turn the power off at the operator panel.
2. Check all cables, terminators, and tailgate connectors for bent pins.
3. Plug the bus and tag terminators, P/Ns 2282675 and 2282676, (included in the channel shipping group) into bus out and tag out connectors for the last storage director (or other control unit) on the channel. Start from the bottom of the tailgate.
4. Connect the channel interface cables to the connectors. Start from the bottom of the tailgate.
5. **Note:** If this is a 3880 Model 2 or Model 3, perform the 3380 CTL-I Cable Installation procedure on Inst-15 and then return to this step.
Connect all the CTL-I bus and tag cables. If the CTL-I cables have ground leads near the connector, connect them to the ground terminal on the tailgate frame.
Note: The terminators included in the 3880 shipping group must be installed in the bus out and tag out connectors in the last device controller on each storage director. See INST-23 for the correct CTL-I terminator part number.
6. Connect the power control cables from the host processing units to the H (host power cable) connectors 2 in the 3880.
Note: If no host cables are connected, ensure that a dummy plug, P/N 2282264, is inserted in any host cable connector (this plug connects pins 1, 2, and 5). The 3880 is shipped with the plug in place.
7. Connect the power control cables from the device controllers to the D (device power cable) connectors 3 in the 3880.
Note: If a 3380 model AA4 with dynamic path selection (DPS) is being connected to the 3880, one power control cable from the 3380 model AA4 must connect to an odd-numbered connector (D1, D3, D5, or D7), the other power control cable must connect to an even-numbered connector (D2, D4, D6, or D8).
Note: All unused device power cable connectors must have a dummy plug, P/N 4797247, inserted (this plug connects pins 3 and 4). The 3880 is shipped with eight plugs in place.
8. Connect the remote switch cables from the host console to the remote switch cable connectors 1 in the 3880.
9. Go to INST-16 (System Test).

Connector Locations - 1, 2 or 4 Channels

	Storage Director 1	Storage Director 2	
CTL-I	See Figure 1		CTL-I
CHL-I CHANNEL A	BUS IN	BUS IN	CHL-I CHANNEL A
	TAG IN	TAG IN	
	BUS OUT	BUS OUT	
	TAG OUT	TAG OUT	
CHL-I CHANNEL B	BUS IN	BUS IN	CHL-I CHANNEL B
	TAG IN	TAG IN	
	BUS OUT	BUS OUT	
	TAG OUT	TAG OUT	
CHL-I CHANNEL C	BUS IN	BUS IN	CHL-I CHANNEL C
	TAG IN	TAG IN	
	BUS OUT	BUS OUT	
	TAG OUT	TAG OUT	
CHL-I CHANNEL D	BUS IN	BUS IN	CHL-I CHANNEL D
	TAG IN	TAG IN	
	BUS OUT	BUS OUT	
	TAG OUT	TAG OUT	

Tailgate viewed from inside the machine.

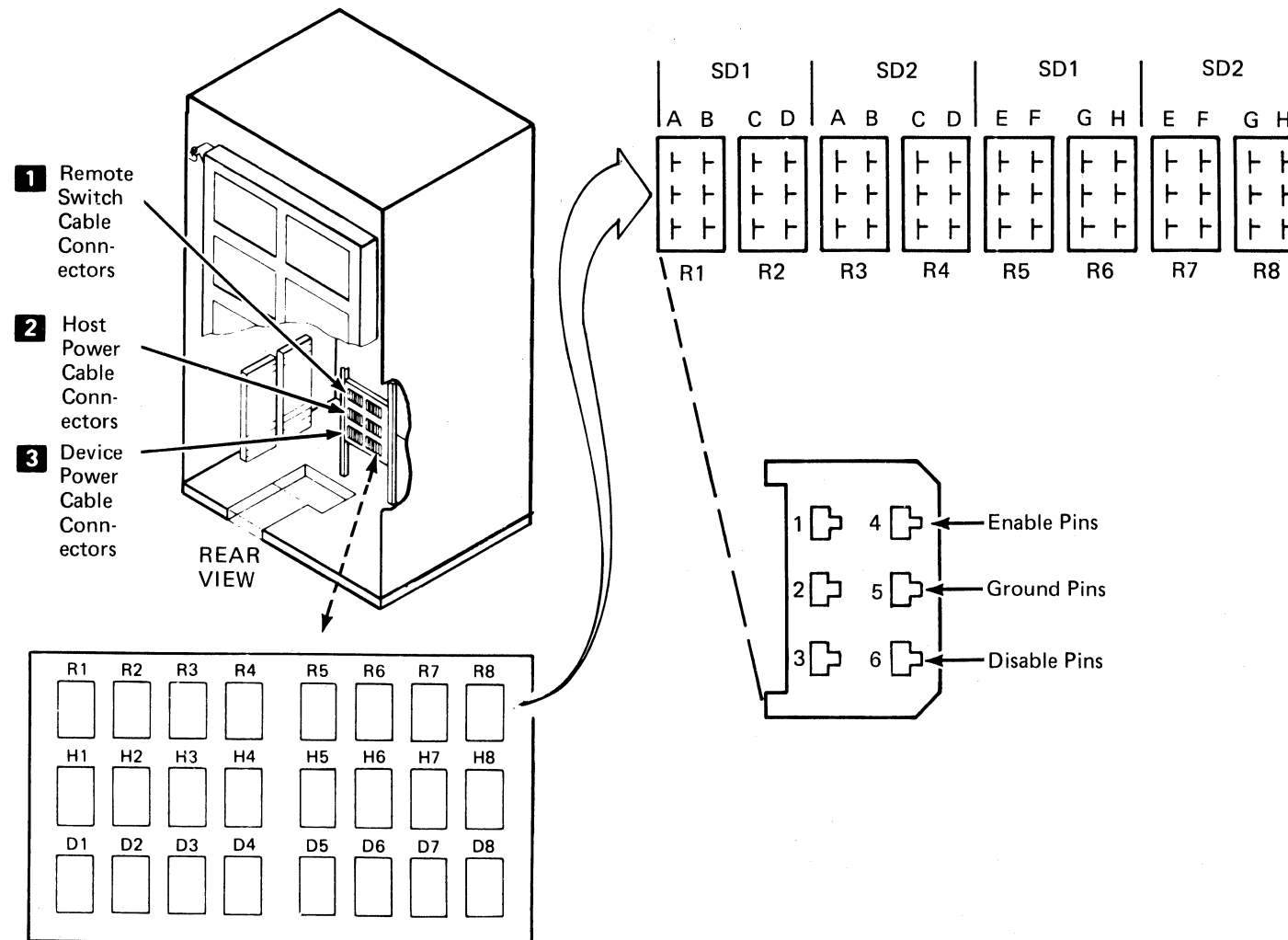
Connector Locations - 8 Channels

	Storage Director 1	Storage Director 2	
CTL-I SD1	See Figure 1		CTL-I SD2
CHL-I CHANNEL A	BUS IN	BUS IN	CHL-I CHANNEL E
	TAG IN	TAG IN	
	BUS OUT	BUS OUT	
	TAG OUT	TAG OUT	
CHL-I CHANNEL B	BUS IN	BUS IN	CHL-I CHANNEL F
	TAG IN	TAG IN	
	BUS OUT	BUS OUT	
	TAG OUT	TAG OUT	
CHL-I CHANNEL C	BUS IN	BUS IN	CHL-I CHANNEL G
	TAG IN	TAG IN	
	BUS OUT	BUS OUT	
	TAG OUT	TAG OUT	
CHL-I CHANNEL D	BUS IN	BUS IN	CHL-I CHANNEL H
	TAG IN	TAG IN	
	BUS OUT	BUS OUT	
	TAG OUT	TAG OUT	

Tailgate viewed from inside the machine.

Figure 1. CTL-I Connectors

MODEL	Storage Director 1	Storage Director 2
MODEL 1	BUS TAG	BUS TAG
MODEL 2	BUS TAG	NOT USED BUS/TAG
MODEL 3	NOT USED BUS/TAG	NOT USED BUS/TAG



Channel Enable/Disable Without Switches

To enable or disable channels on a 3880 with the remote switch feature installed, and with the feature cables not connected, perform the following:

To enable: Insert a jumper wire between the enable pin and the ground pin in the remote switch cable connector for the channel and storage director desired.

To disable: Insert a jumper wire between the disable pin and the ground pin for the correct channel and storage director.

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INSTALLATION PROCEDURES

3380 CTL-I CABLE INSTALLATION

If the cable clamp **1** (see Figure 1) is installed in the cable hole in the 3880 Models 2 or 3, perform this procedure. If there is no cable clamp **1**, return to step 5 on INST-14. Select one of the following tools to remove the insulation from the 3380 CTL-I tag and bus cable:

- An X-acto knife, P/N 452561 (this is the preferred tool)
- A pen knife or a pocket knife
- A pair of diagonal cutters (CE tool kit)

Locate the 3380 CTL-I tag and bus cable or cables (one cable for a 3880 Model 2 or two cables for a 3880 Model 3). Compare the 3880 end of the cable or cables to that in Figure 2.

If the insulation has been removed from the cable at **5** (see Figure 2), go to step 7.

If the insulation has been removed from the cable at **2** (see Figure 2), perform the following steps before installing the cable or cables in the 3880 tailgate.

If the diagonal cutters from the CE tool kit are used, perform step 1 and then go to step 5.

1. Measure 940 mm (37 inches) from the 3880 connector and mark the cable or cables with a pencil or pen.
2. Form the cable into a loop (see Figure 3).
3. Ensure that the cable shield is not damaged while cutting the insulation. Use an X-acto knife, a pen knife, or a pocket knife to make a cut in the insulation at the top of the loop in the cable or cables. Rotate the cable loop and continue cutting the insulation at the top of the loop until the cut circles the cable.
4. Slide the insulation towards the connector end of the cable. This can be accomplished by pushing and/or pulling on the section of insulation shown at **4** (see Figure 2). Go to step 7.
5. Ensure that the cable shield is not damaged while cutting the insulation. Using the diagonal cutters, start at **3** and cut the insulation to the mark previously made on the cable or cables **6** (see Figure 2).
6. Cut the insulation from around the cable and remove. This removes 635 mm (25 inches) of insulation from the cable or cables.
7. Install the cable or cables in the 3880 tailgate.

8. Clamp the cable or cables to the 3880 frame at **1** (see Figure 1) using the clamp, spacers, washers, and screws provided. Tighten the screws to hold the cable or cables securely, but do not crush the wires in the cable.
9. Return to step 5 on INST-14.

Figure 1. 3880 Tailgate

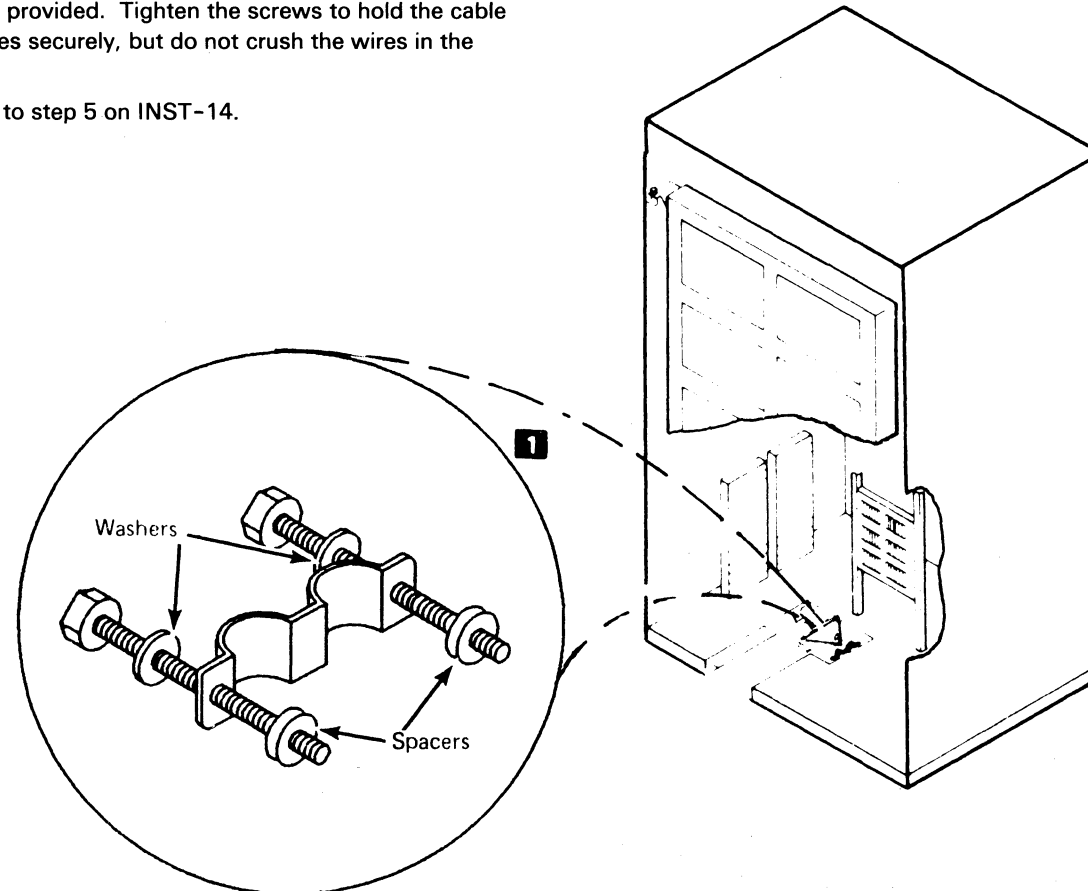
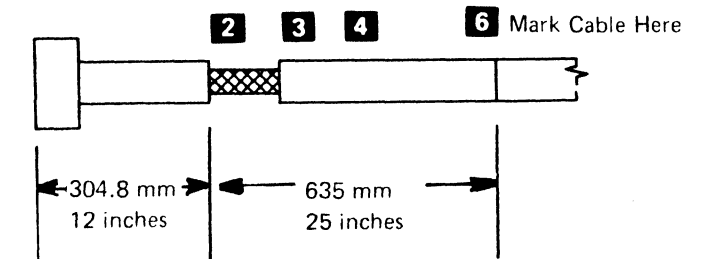


Figure 2. 3380 CTL-I Cable

Old CTL-I Cable



New CTL-I Cable

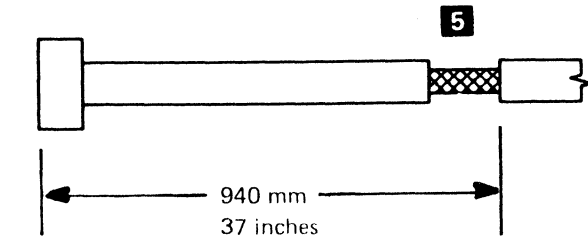
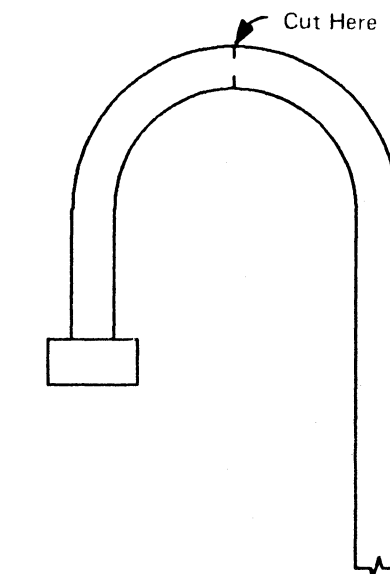


Figure 3. Cable Loop



SYSTEM TEST

Prerequisites

Warning: Before starting the system, observe the following prerequisites.

- 1. Ensure that the block multiplex feature and the data streaming feature (if installed) on the CPU or channel is activated.
- 2. Check that the unit control word (UCW) plugging in the processor or channel is for unshared 3880 addresses. System performance can be seriously degraded if 3880 addresses are plugged to share UCWs. Verify that the host processor or channel has the necessary unshared UCWs. See the processor or channel maintenance manuals.
- 3. Check to see if the customer wants to perform a new system generation (SYSGEN) after the 3880 is installed. It is recommended that the SYSGEN include all addresses within the range of the channel interface (CIF) card switch settings (8, 16, 32, or 64). If it is not possible to perform a SYSGEN on all addresses, at least the following must be included:
 - The addresses of all devices physically attached to the storage director.
 - The lowest address assigned to the storage director in the CIF card switches for which no device is attached.

To ensure the system recognizes all device interrupts, these addresses must be included even if all devices are not attached to the storage director.

- 4. Ensure that a configuration data set card has been prepared for each storage director and each attached device (see PROG-5 in the Maintenance Information Manual, volume R10, for more information).
- 5. Ensure that the correct level of system software is installed (verify with the program support representative or systems engineer).
- 6. If this is a 3880 Model 3 with functional microcode bill of material 4518360 installed, ensure that all other 3880 Models 2 or 3 that attach to any dual controller 3380 devices connected to this 3880 Model 3 have functional microcode bill of material 4518522 or 4518360 at EC 461460 or later.

Test Procedure

- 7. Set power control switches on all the subsystem storage units to the Power On or Enable position.
- 8. Set the following switches on the power switch panel to the indicated positions.

Switch Name	Position Setting
Storage Director 1	Normal
Storage Director 2	Normal
Power Select	Remote
Device Power Sequencing	Enable

- 9. Turn on the power to the 3880 at the operator panel.
- 10. Perform the following steps to ensure that the power control cables are installed correctly and that all power control circuits are functioning properly.
 - Verify that power is on at all units attached to the 3880
 - Power off the 3880 at the operator panel
 - Verify that power is off at all attached units
 - Power on the 3880

- 11. Return to the MD and run OLTs as instructed.
- Note:** Device diagnostics are on the 3880 functional microcode diskette and immediately available for use.

If no error is found, the MD displays:

```
NO FAILURE DETECTED
BY DIAGNOSTIC
PROGRAMS
.
```

- 12. Press the ENTER key; the MD displays:

```
DO YOU WANT TO END
THIS CALL
.
.
```

- 13. Respond no the the MD question. The MD returns to the option list.
- 14. Select option 9 shown on the MD display and run the SD-SD test error analysis.

- 15. Select option 6 and display the settings of the diskette load control switches, the address switches, and the storage director identification switches, if it was not done on INST-10.
- 16. Select option 0 shown on the MD display and follow the MD instructions for end-of-call.
- 17. Remove the diskette from the MD and place it in the storage pocket inside the rear cover of the 3880.
- 18. Go to INST-17 (After Installation).

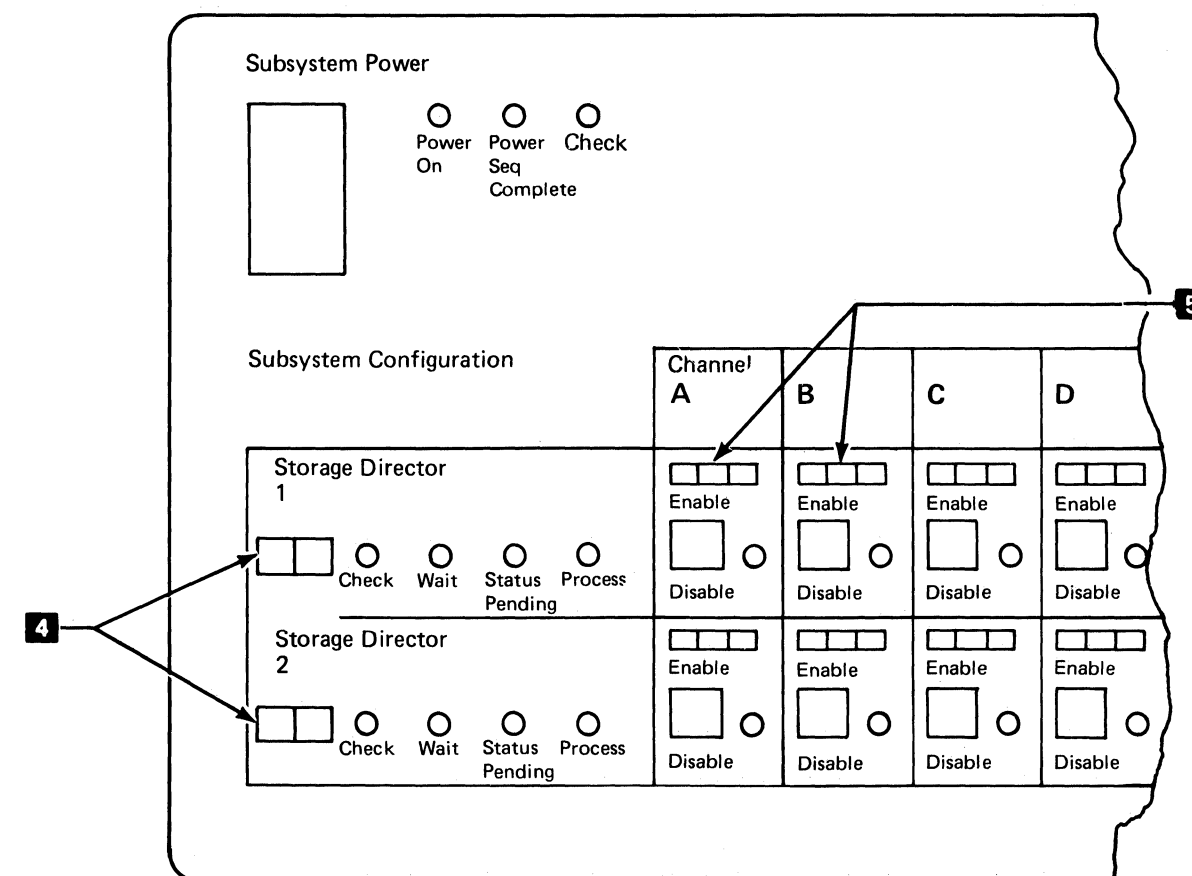
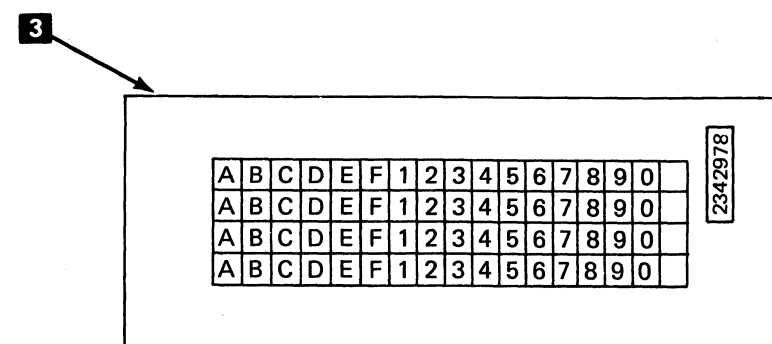
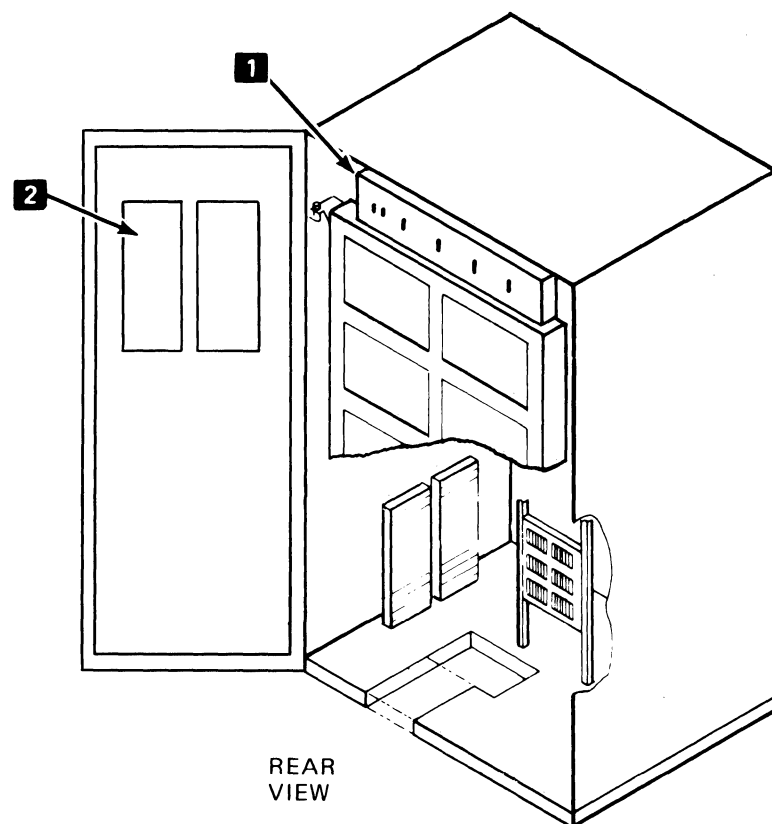
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INSTALLATION PROCEDURES

After Installation

RECORD UPDATING

- 1. Assist the customer with his checkout of the subsystem.
- 2. Write all the appropriate switch settings and other storage control information on the labels on the inside of the rear cover **2**.
- 3. Locate the sheet of hex labels **3** (P/N 2342978) in the 3880 shipping group. Select the characters to represent the physical identifier numbers assigned to the storage directors. Attach them to the operator panel in the locations shown **4**, and to the labeled spaces near the storage director switches on the power switch panel **1**.
- 4. Locate the label holders (P/N 4797298) in the 3880 shipping group and attach them to the operator panel as shown **5**, and on the label holder reference drawing (P/N 2342864, 3880 shipping group).
- 5. Select the characters from the hex label sheet (P/N 2342978) to represent the starting address for each channel on both storage directors and attach them to the correct label holders.
- 6. Complete all installation records and report that the installation is complete to the branch office dispatcher.
- 7. Keep these installation procedures in the Maintenance Information Manual for future reference.
- 8. Update the Account Management Plan to include the Physical ID numbers for this installation.



DISPOSITION OF SHIPPING MATERIAL

- 1. Dispose of the material locally.

FOR THE EXPERIENCED CE ONLY

Warning: If you have not installed a 3880 before, perform the Pre-Installation Check on INST-2 and then go to INST-4. Do not attempt to use this page unless you have already installed one or more 3880. It contains no information on how to perform any of the steps.

This page is a short version of the 3880 installation procedure. It is intended for the CE who has installed several 3880s and needs only a checklist, not detailed instructions.

Each step includes a reference to a page in the fully detailed procedure. If necessary, see that page for more information.

- ___ 1. Fill out the Feature Chart. (INST-2)
 - ___ 2. Unpack and remove the tape. (INST-4)
 - ___ 3. Place the 3880 in its permanent location. (INST-4)
 - ___ 4. Bring the cables up through the cable hole. (INST-4)
 - ___ 5. Change to low priority if necessary. (INST-19)
 - ___ 6. Change the transformer taps if necessary. (INST-5)
 - ___ 7. Set the switches on the power switch panel. (INST-5)
- | Switch Name | Position Setting |
|---------------------------------|------------------|
| Power Select | Local |
| Device Power Sequencing | Disable |
| Storage Director 1 | Normal |
| Storage Director 2 | Normal |
| Unit Emergency (operator panel) | Enable |
| SW401 (CB Panel) | On |
- ___ 8. Set all CPs on. (INST-5)
 - ___ 9. Set the mainline CB off. (INST-5)
 - ___ 10. Check the resistance of the ground wire in the power cord. (INST 6)
 - ___ 11. Perform the safety check on the ac outlet. (INST 6)
 - ___ 12. Connect the power cable and set the mainline CB on. (INST-6)

- ___ 13. **CAUTION:**
Ensure that the latest level diskette is used in this and all following procedures. Failure to do so can give the wrong test results.
Set up the MD and initialize the diskette. (INST-7)
- ___ 14. **CAUTION:**
Ensure that the latest level diskette is used in this and all following procedures. Failure to do so can give the wrong test results.
Insert the 3880 diskette and press Maintenance Power On. (INST-8)
- ___ 15. Check the power check light on the operator panel.
ON: Go to INST-8, step 5.
OFF: Go to step 16, following.
- ___ 16. Measure the dc voltages with a digital meter. Use GTB3-4 as the ground reference point. (INST-8)
- ___ 17. Turn power on at the operator panel and verify that the 3880 performs an IML. (INST-8)
- OK 18. Set the data streaming switches. (INST-9)

CHANNEL	SWITCH NUMBER	
	SD1 (Card B4F2)	SD2 (Card B3F2)
A	1	1
B	2	2
C	3	3
D	4	4
E	5	5
F	6	6
G	7	7
H	8	8

- OK 19. Set the physical ID switches. (INST-9)
SD1 Card B4U2 (20-card board)
Card B4V2 (22-card board) —
SD2 Card B3U2 (20-card board)
Card B3V2 (22-card board) —
- OK 20. Set the diskette load control switches. (INST-9). (See 3880 diskette label for instructions.)
SD1 Card B4L2 (20-card board)
Card B4Q2 (22-card board)
SD2 Card B3L2 (20-card board)
Card B3Q2 (22-card board)

- ___ 21. Select option 6 and set the address switches on the CIF cards. (INST-10)

CIF Card Locations			
Number of Channels	Channel	SD1	SD2
1 or 2 Channels	A	B4D2	B3D2
	B	B4E2	B3E2
4 or 8 Channels	A	A4R2	A3R2
	B	A4Q2	A3Q2
	C	A4E2	A3E2
	D	A4F2	A3F2
	E	A2R2	A1R2
	F	A2Q2	A1Q2
	G	A2E2	A1E2
	H	A2F2	A1F2

- ___ 22. Reinstall all crossovers and board covers. See the location labels on the left edge of crossovers. (INST-10)
- ___ 23. Plug the MD signal cable into the 3880 MD connector. (INST-10)
- ___ 24. Select option 6 and display the settings of the following switches. (INST-10)
Diskette load control switches
Address switches
SD identification switches
- ___ 25. Select option 5 and run all the tests as directed by the MD. (INST-10) For models 1 or 2, use the tailgate wrap cable, if obtainable, for the channel wrap tests.
- ___ 26. Switch off power at the 3880 operator panel. (INST-14)
- ___ 27. Check all tailgate connectors for bent pins. Then insert terminators if needed; connect all tag and bus cables and power control cables. (INST-14)

CAUTION:
When one controller interface of a dual controller 3380 is attached to a 3880 Model 3 with functional microcode bill of material 4518360 and the second controller interface of the 3380 is attached to another 3880 Model 2 or 3, the microcode for the 3880 Model 2 or 3 must be bill of material 4518522 or 4518360 at EC 461460 or later.

- ___ 28. Check the status of the block multiplex feature, the data streaming feature (if installed), UCW plugging, and whether SYSGEN is required. (INST-16)
 - ___ 29. Power on all attached storage units. (INST-16)
 - ___ 30. Set switches on the power switch panel. (INST-16)
- | Switch Name | Position Setting |
|-------------------------|------------------|
| Storage Director 1 | Normal |
| Storage Director 2 | Normal |
| Power Select | Remote |
| Device Power Sequencing | Enable |
- ___ 31. Power up the 3880 at the operator panel. (INST-16)
 - ___ 32. Check all attached storage units for correct power-on and power-off operations. (INST-16)
 - ___ 33. Run the OLTs as directed by the MD. (INST-16)
 - ___ 34. Run the SD-SD Test Error Analysis. (INST-16)
 - ___ 35. End the call if there are no errors. (INST-16)
 - ___ 36. Perform record updating procedures. (INST-17)

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Priority Jumpers

- 1. The 3880 is factory-wired for high priority of both storage directors on all channels. Wire color may be either purple or yellow. If any of the priorities are to be changed from high to low, see the Priority Jumper Locations table for the pin numbers of the three jumpers for each channel to be removed and installed. (Use wire included in the shipping group for the new jumpers.) For logic board pin locations, see LOC-84 and LOC-85.
- 2. After verifying or changing the priority jumpers, go to INST-5 (Primary Power).

Priority Jumper Locations (for 22-Card B4/B3 Boards) With Electronic Wrap

Number of Channels	Channel	Board		High-Priority Jumpers				Low-Priority Jumpers			
		SD1	SD2								
One or Two	A	B4	B3	A4D10 to D4B08	D4B08 to C5B10	C5B12 to A4D09	A4B08 to A4B09	A4B08 to C5B10	C5B10 to D4B08	C5B12 to A4B09	A4D09 to A4D10
	B	B4	B3	B4D10 to C4B10	C4B10 to E4B08	C4B12 to B4D09	B4B08 to B4B09	B4B08 to C4B10	C4B10 to E4B08	C4B12 to B4B09	B4D09 to B4D10
Four or Eight	A	A4	A3	V4D09 to N5B12	N5B10 to R4B08	V4D10 to R4B08	V4B08 to V4B09	V4B09 to N5B12	N5B10 to R4B08	V4B08 to R4B08	V4D09 to V4D10
	B	A4	A3	U4D09 to N4B12	N4B10 to Q4B08	U4D10 to Q4B08	U4B08 to U4B09	U4B09 to N4B12	N4B10 to Q4B08	U4B08 to Q4B08	U4D09 to U4D10
	C	A4	A3	A4D09 to H5B12	H5B10 to E4B08	A4D10 to E4B08	A4B08 to A4B09	A4B09 to H5B12	H5B10 to E4B08	A4B08 to E4B08	A4D09 to A4D10
	D	A4	A3	B4D09 to H4B12	H4B10 to F4B08	B4D10 to F4B08	B4B08 to B4B09	B4B09 to H4B12	H4B10 to F4B08	B4B08 to F4B08	B4D09 to B4D10
	E	A2	A1	V4D09 to N5B12	N5B10 to R4B08	V4D10 to R4B08	V4B08 to V4B09	V4B09 to N5B12	N5B10 to R4B08	V4B08 to R4B08	V4D09 to V4D10
	F	A2	A1	U4D09 to N4B12	N4B10 to Q4B08	U4D10 to Q4B08	U4B08 to U4B09	U4B09 to N4B12	N4B10 to Q4B08	U4B08 to Q4B08	U4D09 to U4D10
	G	A2	A1	A4D09 to H5B12	H5B10 to E4B08	A4D10 to E4B08	A4B08 to A4B09	A4B09 to H5B12	H5B10 to E4B08	A4B08 to E4B08	A4D09 to A4D10
	H	A2	A1	B4D09 to H4B12	H4B10 to F4B08	B4D10 to F4B08	B4B08 to B4B09	B4B09 to H4B12	H4B10 to F4B08	B4B08 to F4B08	B4D09 to B4D10

Priority Jumper Locations (for 22-Card B4/B3 Boards) Without Electronic Wrap

Number of Channels	Channel	Board		High-Priority Jumpers				Low-Priority Jumpers			
		SD1	SD2								
One or Two	A	B4	B3	A4D10 to D4B08	D4B08 to C5B10	C5B12 to A4D09	A4B08 to A4B09	A4B08 to C5B10	C5B10 to D4B08	C5B12 to A4B09	A4D09 to A4D10
	B	B4	B3	B4D10 to C4B10	C4B10 to E4B08	C4B12 to B4D09	B4B08 to B4B09	B4B08 to C4B10	C4B10 to E4B08	C4B12 to B4B09	B4D09 to B4D10
Four or Eight	A	A4	A3	V4D09 to T4D10		V4D10 to T4B09	V4B08 to V4B09	V4B09 to T4D10		V4B08 to T4B09	V4D09 to V4D10
	B	A4	A3	U4D09 to S4D10		U4D10 to S4B09	U4B08 to U4B09	U4B09 to S4D10		U4B08 to S4B09	U4D09 to U4D10
	C	A4	A3	A4D09 to C4D10		A4D10 to C4B09	A4B08 to A4B09	A4B09 to C4D10		A4B08 to C4B09	A4D09 to A4D10
	D	A4	A3	B4D09 to D4D10		B4D10 to D4B09	B4B08 to B4B09	B4B09 to D4D10		B4B08 to D4B09	B4D09 to B4D10
	E	A2	A1	V4D09 to T4D10		V4D10 to T4B09	V4B08 to V4B09	V4B09 to T4D10		V4B08 to T4B09	V4D09 to V4D10
	F	A2	A1	U4D09 to S4D10		U4D10 to S4B09	U4B08 to U4B09	U4B09 to S4D10		U4B08 to S4B09	U4D09 to U4D10
	G	A2	A1	A4D09 to C4D10		A4D10 to C4B09	A4B08 to A4B09	A4B09 to C4D10		A4B08 to C4B09	A4D09 to A4D10
	H	A2	A1	B4D09 to D4D10		B4D10 to D4B09	B4B08 to B4B09	B4B09 to D4D10		B4B08 to D4B09	B4D09 to B4D10

Priority Jumper Locations (for 20-Card B4/B3 Boards)

Number of Channels	Channel	Board		High-Priority Jumpers			Low-Priority Jumpers		
		SD1	SD2						
One or Two	A	B4	B3	A4D10 to C5B10	C5B12 to A4D09	A4B08 to A4B09	C5B10 to A4B08	C5B12 to A4B09	A4D09 to A4D10
	B	B4	B3	B4D10 to C4B10	C4B12 to B4D09	B4B08 to B4B09	C4B10 to B4B08	C4B12 to B4B09	B4D09 to B4D10
Four	A	A4	A3	V4D09 to T4D10	V4D10 to T4B09	V4B08 to V4B09	V4B09 to T4D10	V4B08 to T4B09	V4D09 to V4D10
	B	A4	A3	U4D09 to S4D10	U4D10 to S4B09	U4B08 to U4B09	U4B09 to S4D10	U4B08 to S4B09	U4D09 to U4D10
	C	A4	A3	A4D09 to C4D10	A4D10 to C4B09	A4B08 to A4B09	A4B09 to C4D10	A4B08 to C4B09	A4D09 to A4D10
	D	A4	A3	B4D09 to D4D10	B4D10 to D4B09	B4B08 to B4B09	B4B09 to D4D10	B4B08 to D4B09	B4D09 to B4D10

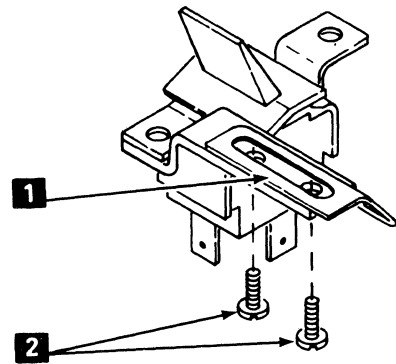
UNIT EMERGENCY SWITCH

Note: Perform this procedure ONLY if directed to do so. It is used only to release a locked switch, and is not part of the normal installation procedures.

The Unit Emergency switch has a lockout latch feature that prevents resetting the switch to the On position, after it has been set to the Off position, unless the CE releases the latch. U.S. machines are shipped from the plant with the feature disabled.

On machines with the feature enabled, proceed as follows to release the latch after it has been tripped.

1. Loosen the two screws **2** that hold the lockout spring **1** to the bracket.
2. Slide the spring away from the switch and set the switch to the On position.
3. Slide the spring toward the switch as far as it will go and tighten the mounting screws.



4. Go to INST-5 (Primary Power).

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ADDRESS TABLES

Note: On 8-channel machines, do not use overlapping address ranges for storage director 1 and storage director 2. For example, if storage director 1 uses address range 00 through 0F (16 addresses), storage director 2 should not use addresses 00 through 07 (8 addresses), or 08 through 0F (8 addresses), or 00 through 0F (16 addresses), or 00 through 1F (32 addresses), because all of these addresses overlap the addresses for storage director 1.

*Those 8-address ranges marked with an asterisk must not be used for 3380 devices. However, they may be used for other devices connected to the channel through a different storage director.

CIF Card Locations			
Number of Channels	Channel	SD1	SD2
1 or 2 Channels	A	B4D2	B3D2
	B	B4E2	B3E2
4 or 8 Channels	A	A4R2	A3R2
	B	A4Q2	A3Q2
	C	A4E2	A3E2
	D	A4F2	A3F2
	E	A2R2	A1R2
	F	A2Q2	A1Q2
	G	A2E2	A1E2
	H	A2F2	A1F2

8 Addresses			
Range	Switches 12345678	3333,3350,3370 3375 Controller Addresses	3380 Controller Addresses
00-07	00000100	0	0
08-0F	00001110	1	*
10-17	00010110	2	1
18-1F	00011100	3	*
20-27	00100110	0	0
28-2F	00101100	1	*
30-37	00110100	2	1
38-3F	00111110	3	*
40-47	01000110	0	0
48-4F	01001100	1	*
50-57	01010100	2	1
58-5F	01011110	3	*
60-67	01100100	0	0
68-6F	01101110	1	*
70-77	01110110	2	1
78-7F	01111100	3	*
80-87	10000110	0	0
88-8F	10001100	1	*
90-97	10010100	2	1
98-9F	10011110	3	*
A0-A7	10100100	0	0
A8-AF	10101110	1	*
B0-B7	10110110	2	1
B8-BF	10111100	3	*
C0-C7	11000100	0	0
C8-CF	11001110	1	*
D0-D7	11010110	2	1
D8-DF	11011100	3	*
E0-E7	11100110	0	0
E8-EF	11101100	1	*
F0-F7	11110100	2	1
F8-FF	11111110	3	*

16 Addresses			
Range	Switches 12345678	3333,3350,3370 3375 Controller Addresses	3380 Controller Addresses
00-0F	00001000	0, 1	0
10-1F	00011010	2, 3	1
20-2F	00101010	0, 1	0
30-3F	00111000	2, 3	1
40-4F	01001010	0, 1	0
50-5F	01011000	2, 3	1
60-6F	01101000	0, 1	0
70-7F	01111010	2, 3	1
80-8F	10001010	0, 1	0
90-9F	10011000	2, 3	1
A0-AF	10101000	0, 1	0
B0-BF	10111010	2, 3	1
C0-CF	11001000	0, 1	0
D0-DF	11011010	2, 3	1
E0-EF	11101010	0, 1	0
F0-FF	11111000	2, 3	1

32 Addresses			
Range	Switches	Controller Addresses	Controller Addresses
00-1F	00010000	0, 1, 2, 3	0, 1
20-3F	00110010	0, 1, 2, 3	0, 1
40-5F	01010010	0, 1, 2, 3	0, 1
60-7F	01110000	0, 1, 2, 3	0, 1
80-9F	10010010	0, 1, 2, 3	0, 1
A0-BF	10110000	0, 1, 2, 3	0, 1
C0-DF	11010000	0, 1, 2, 3	0, 1
E0-FF	11110010	0, 1, 2, 3	0, 1

64 Addresses			
Range	Switches	Controller Addresses	Controller Addresses
00-3F	00100000	For 3340 and 3344 machines only	
40-7F	01100010		
80-BF	10100010		
C0-FF	11100000		

3340 AND 3340/3344 CONFIGURATIONS

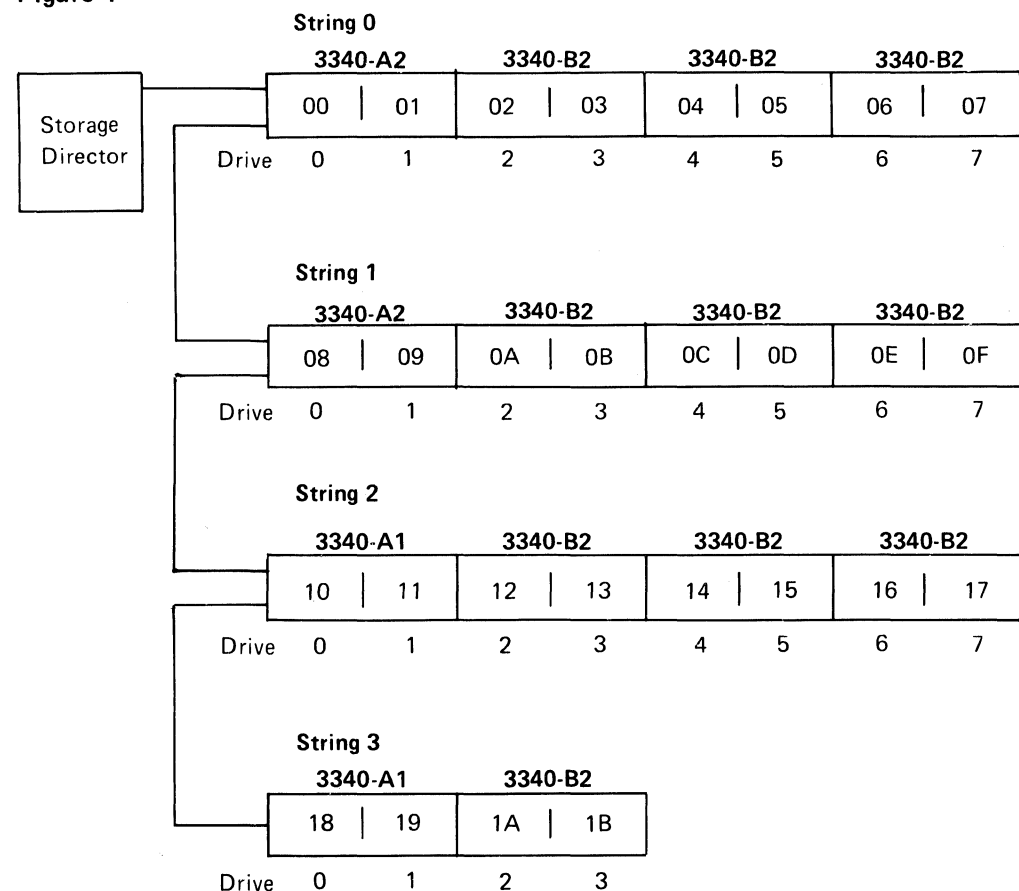
3340-only Configuration

For installations containing less than the maximum number of 3340s, any of the four controller addresses may be used. However, the controller address and the device addresses must correspond to each other, as shown in Figure 1.

Figure 1 illustrates a maximum configuration containing only 3340 units. Address range '00-1B' is shown. Other possible address ranges are '40-5B', '80-9B', and 'C0-DB'.

Although only 28 addresses may actually be used in a 3340-only configuration, 64 addresses must be assigned, as shown in the chart on INST-21.

Figure 1



3340/3344 Configuration

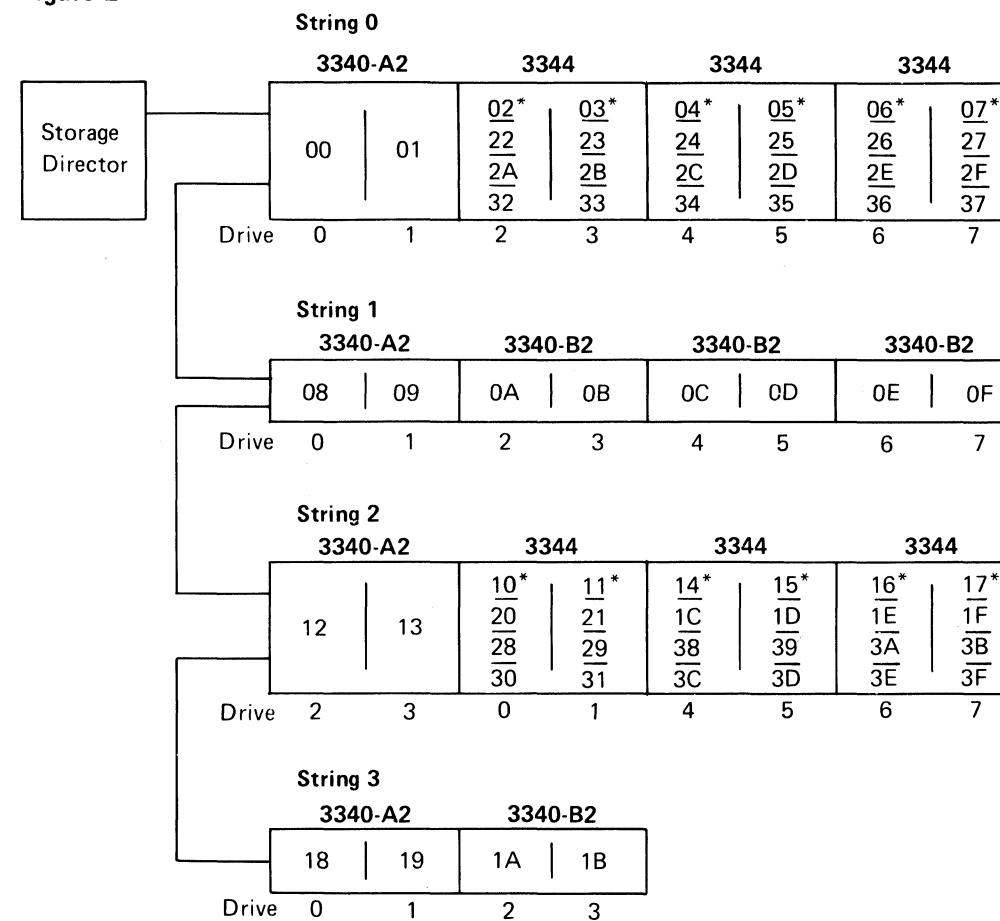
Figure 2 illustrates a maximum configuration containing a mix of 3340 and 3344 units. Address range '00-3F' is shown. Other possible address ranges are '40-7F', '80-BF', and 'C0-FF'.

Notes:

1. The 3344 B2 module can only be installed in strings 0 and 2, as indicated in Figure 2.
2. In string 2, if the 3340 A2 module is followed by a 3340 B2 module, the spindle numbering is 0 and 1 for the A2 module and 2 and 3 for the B2 module.

For additional 3340/44 addressing information, see the INST section of the 3344 Maintenance Information Manual (MIM).

Figure 2



*Primary Address

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INTRODUCTION

This section is a checklist and guide to be used for the removal of a 3880 Storage Control from the system and includes the preparation of the machine for shipment to another location.

The customer engineer is responsible for removing the 3880 from the system, for restoring the system to working order, and for any taping or blocking necessary inside the machine.

The customer is responsible for external packing and moving the machine.

FIELD PACKING

Before removing or relocating a 3880, contact the IBM DP Orders and Movements department to ensure that the packing materials and instructions have been ordered. To allow prompt shipment of the 3880 after it has been removed from the system, the packing materials should be immediately available.

The CE should clearly understand what the system configuration will be after the 3880 has been removed. The new configuration will determine what is to be done with the cables that are disconnected from the 3880.

CABLE REMOVAL

- ___ 1. Ensure that the 3880 has been taken offline and that the customer is aware that the 3880 is about to be removed from the system.
- ___ 2. Turn power off at the operator panel.
- ___ 3. Set the power control switches on all attached devices to the Power Off or Disable position.
Warning: Before performing steps 4, 5, and 6, stop the processing unit.
- ___ 4. Disconnect the power control cables (to both hosts and devices) from the cable connectors in the 3880.
- ___ 5. Disconnect the CTL-I bus and tag cables from the 3880 tailgate.
- ___ 6. Disconnect the CHL-I cables from the 3880 tailgate.
- ___ 7. If cables are not to be immediately reconnected to another control unit, terminate or butt the channel interface cables and install jumpers at the host in place of the power control cables. This allows the system to be restarted.
- ___ 8. Remove the bus and tag terminators from the tailgate if installed.

PRE-REMOVAL TEST

If the 3880 is to be returned to the plant, no testing is needed. Go directly to step 10.

If the 3880 is to be re-installed at another location, diagnostic tests should be run to verify that the machine is in good operating condition.

- ___ 1. Set the following switches to the indicated positions. (All switches are located on the power switch panel except as noted.)

Switch Name	Position Setting
Power Select	Local
Device Power Sequencing	Disable
Storage Director 1	Normal
Storage Director 2	Normal
Unit Emergency (operator panel)	Enable

- ___ 2. Connect the MD power and signal cables to the 3880, and insert the MD diskette.
- ___ 3. Press the Maintenance Power On switch to the Power On position.
- ___ 4. Select option 5 on the MD keyboard/display.
- ___ 5. Run all wrap tests as directed by the MD display. For instructions on how to connect wrap cables, see INST-12, INST-13, or INST-14.
- ___ 6. Repair any failures discovered by testing.
- ___ 7. Leave a message on the MD diskette indicating that all tests ran correctly before removal. (The MD diskette is shipped with the 3880.)
- ___ 8. Turn power off at the operator panel.
- ___ 9. Disconnect the MD from the 3880.
- ___ 10. Set the mainline circuit breaker 401 to the Off position.
- ___ 11. Set the customer's circuit breaker that supplies power to the 3880 to the Off position.
- ___ 12. Disconnect the 3880 power cable from the ac outlet.

ADDRESSING TERMINATION

See Cable Removal, step 7.

DISASSEMBLE

- ___ 1. Remove the removable panel located beside the cable hole in the base of the 3880.
- ___ 2. Pull the power cable up and out of the cable hole in the floor.
- ___ 3. Remove the EMC Ground Plate (see INST-4).
- ___ 4. Roll the 3880 away from the cable hole in the floor.
- ___ 5. Re-install the removable panel.
- ___ 6. If the cables are to be removed later, put them under the floor and close the cable hole.

PACKING FOR SHIPMENT

- ___ 1. Perform the steps on the packing instruction (P/N 7357959) that must be done inside the machine and close the covers.
- ___ 2. Instruct the customer to finish the external packing and prepare the machine for shipment according to the Packing Instruction.

SHIP GROUP ITEMS

The following items must be shipped with the 3880. Assemble them and ensure that the customer packs them with the machine.

Standard Group

Part	P/N	QTY
Caster Lock	280336	4
CTL-I Terminator		
3880 Model 1	2282675	4
3880 Model 2 (SD1)	2282675	2
3880 Model 2 (SD2)	2759398	1
3880 Model 3	2759398	2
CTL-I Wrap Cable (Models 1, 2)	2346604	1
CTL-I Wrap Tool (Models 2, 3)	4299863	1
3880 Diskette		1
MD Diskette	4518573	1
EMC Ground Plate	8499220	1
Maintenance Library Manuals (Without Microfiche)		10
Maintenance Library Manuals (With Microfiche)		4

Without Electronic Wrap

Part	P/N	QTY
CHL-I Wrap Cable	2342699	1
DDCU Test Card (Models 2, 3)		1
Select Out Jumper Wire 2-channel 3880	4797397	2
Select Out Jumper Card 4-channel 3880	2679478	1
	4515979,	
	or	
	4515064	1
8-channel 3880	2679478,	2
	4515979,	
	or	
	4515064	2

With Electronic Wrap

Part	P/N	QTY
CHL-I Block Wrap Tool, Bus	4299876	1
CHL-I Block Wrap Tool, Tag	4299873	1
Select Out Jumper Card 2-channel 3880	4514308	1
4-channel 3880	2679478	1
8-channel 3880	2679478	2

RECORD UPDATING

- ___ 1. Complete all necessary removal records and report that the removal is complete to the branch office dispatcher.
- ___ 2. Update the Account Management Plan to include this removal.

Models 1, 2, 3, 4, 11, and 13

Supplements Needed – None

Preparation

- Start the checklist with the machine power off and all electrical power removed from the machine.
- Completion of Electrical Safety Training Course for IBM Customer Engineers (FIS II course 70702 or existing level) is required.
- Reference items:
 - Copy of CEMs (ECAs and SAs) for this machine type.
 - Latest machine history if possible.
 - Complete set of product maintenance library manuals.
 - *Electrical Safety for IBM Customer Engineers* handbook (S229-8124).

General Guidelines

The intent of this inspection guide is to assist you in identifying potentially unsafe conditions on machines that are being inspected. Each machine, at the time of manufacture, had needed safety items installed to protect the owners/operators and service personnel from injury. This checklist addresses only those items. Good judgement should be used to identify possible safety conditions not covered by this inspection guide.

This checklist should be performed before powering on the machine. If any apparent unsafe conditions are present, a determination must be made on how serious the hazard could be and whether you can continue without first correcting the problem.

Consider the following conditions and the safety hazards they present.

- Electrical, especially primary power, for example: A hot frame can cause serious or lethal electrical shock.
- Explosive, for example: A damaged CRT face or bulging capacitor can cause serious injury.
- Mechanical hazards, for example: belt covers missing can cause bodily injury.
- Use of chemicals, solvents, etc., other than those specified by IBM.

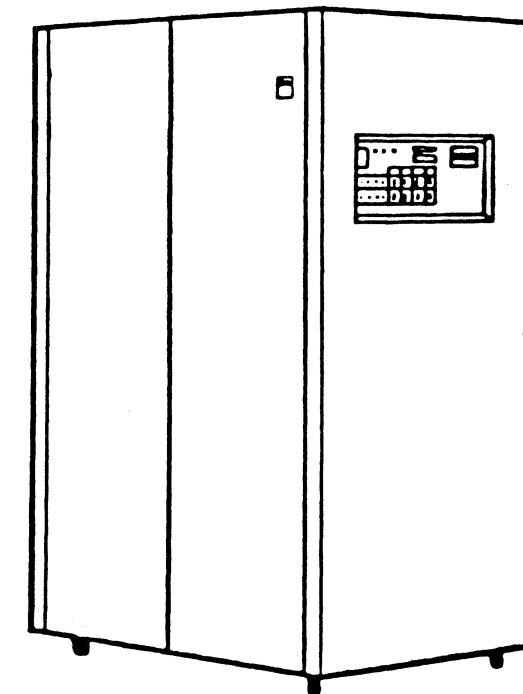
Portions of the checklist address features. Complete only the portions for the features installed.

The 3880 Models 11 and 13 are illustrated throughout this guide. Notes describing other models will be provided when necessary.

Machine Exterior

DANGER

Ensure that the machine is powered off and the 3880 control unit ac power cable is disconnected.



3880 Storage Control

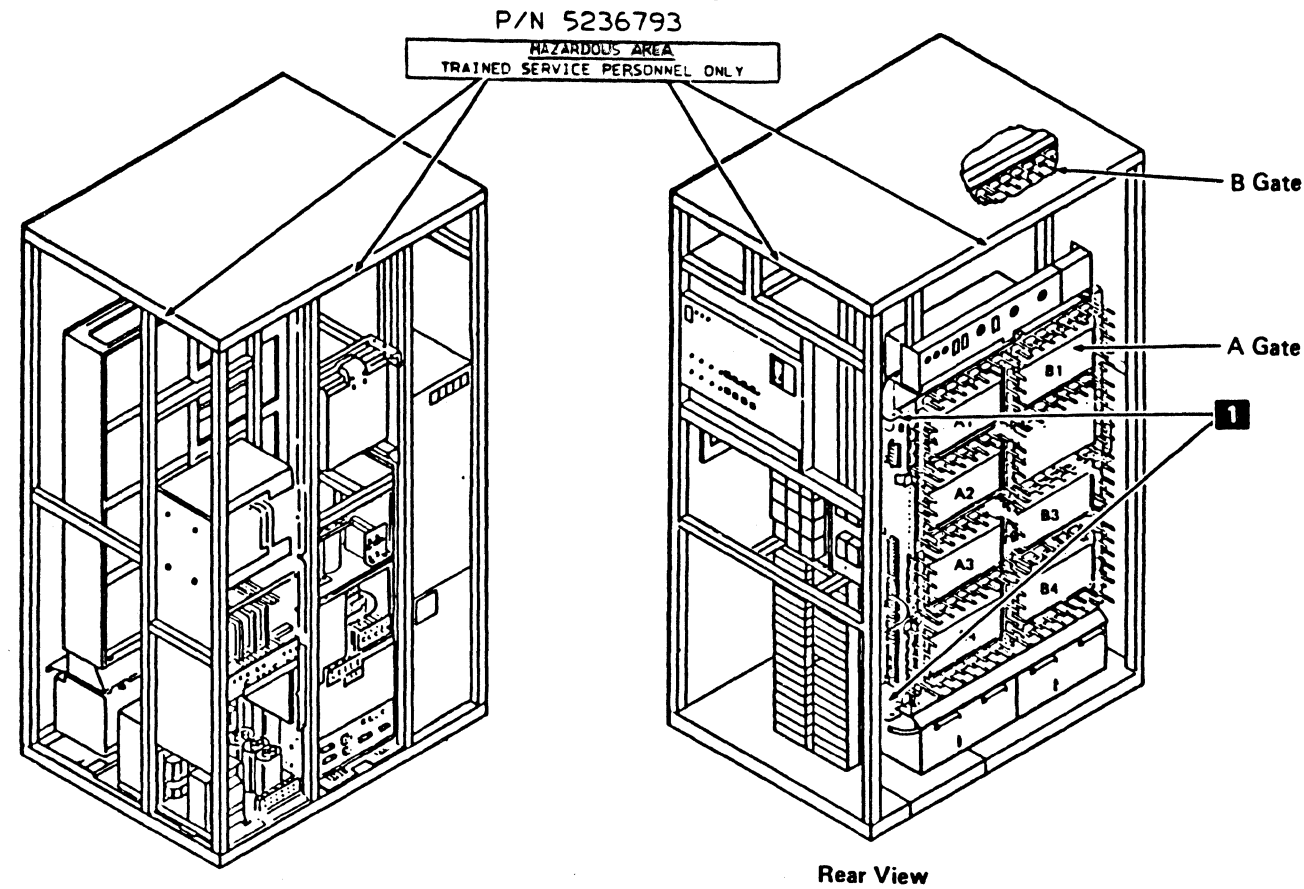
CHECK:

- _____ With your branch office installation planning representative to ensure installation planning specifications have been met (correct power service outlet or connector, line voltage, phase rotation, grounding, cable lengths, service space, environment, etc.).
- _____ Exterior covers are not missing or damaged, and latches operate correctly.

Machine Interior – General – For All 3880 Models

DANGER

Ensure that the machine is powered off and the 3880 control unit ac power cable is disconnected.

**CHECK:** Front View

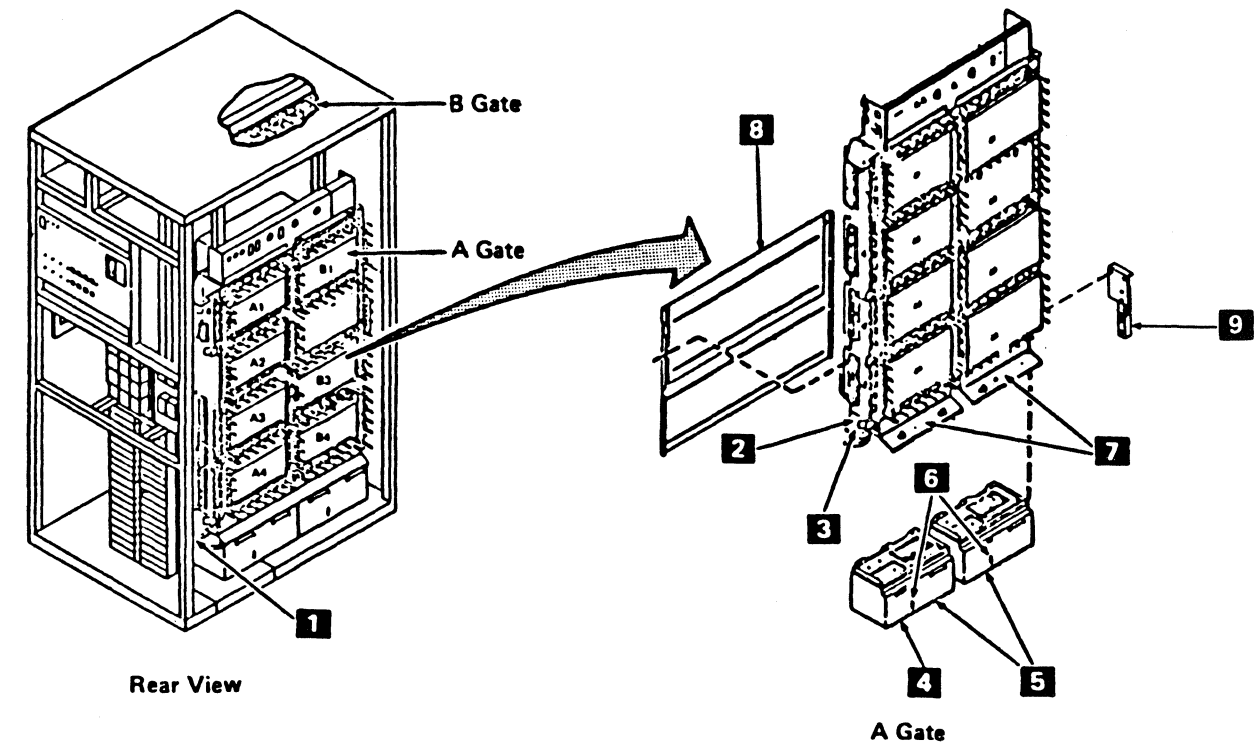
Note: References to B gate apply to Models 11 and 13 only.

- Correct safety label illustrated above is installed as you perform the following.
- Hinge pins on the A and B gates **1** are secured with retaining rings.
- Obvious mechanical problems (broken shock mounts, gate hinges, etc.).
- Open A and B gates. (Before opening B gate, ensure fan assembly is attached to gate.)**
- A and B gate latch assemblies are functional.
- Any obvious non-IBM alterations. If yes, complete R009 Non-IBM Alteration/Attachment Survey form.
- Condition of inside machine (any metal filings, contamination or contaminants, indications of water or other liquids, indications of fire or smoke damage, etc.).
- Exposed cables and the connectors for worn, frayed, cracked, or pinched condition.
- Cover hinges are loose or broken.

Close A and B gates.

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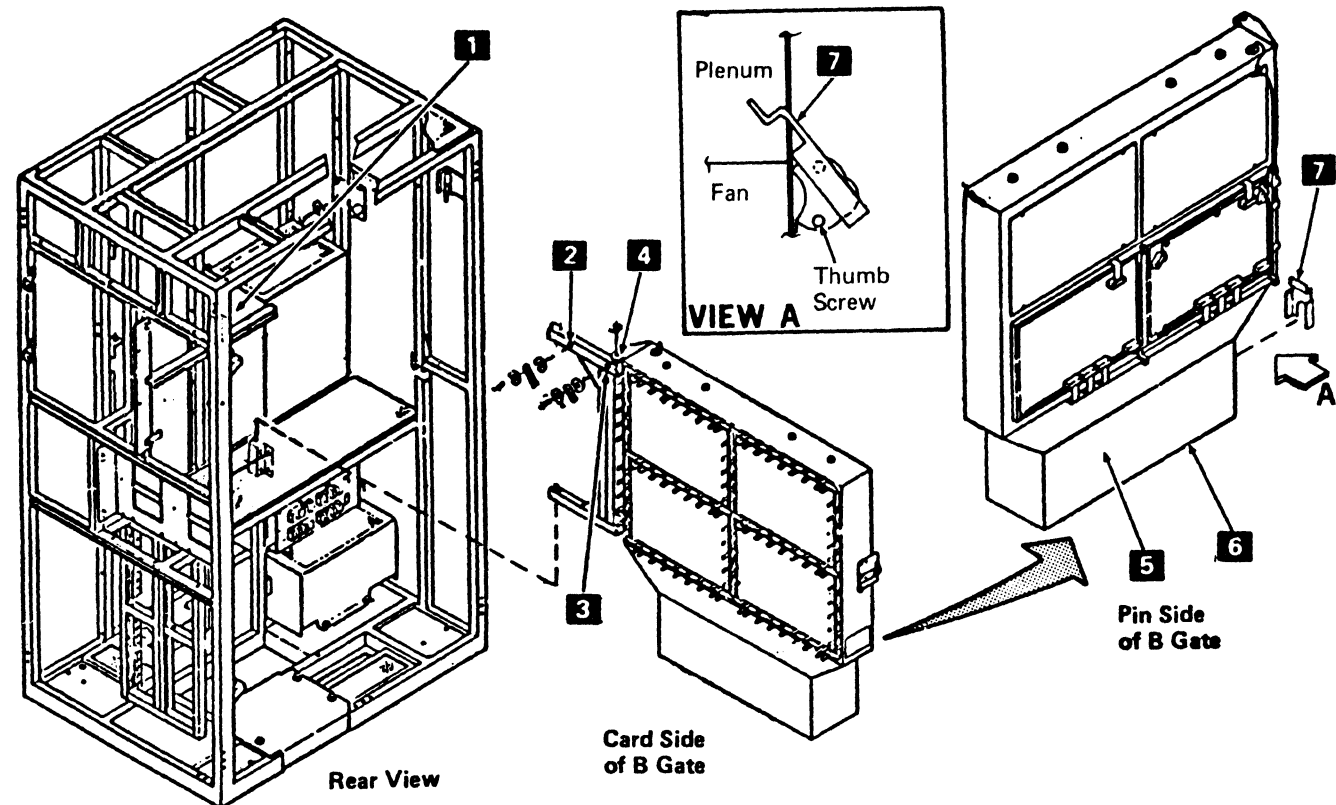
**CHECK:**

Note: Fan **4** is only installed on machines with four or eight channels.

- Two green and yellow ground leads are connected to A gate frame **7** with star washers.
- Note:** Some machines with serial number 1XXXX (narrow gate) have one green and yellow ground lead connected to A gate frame **7** with a star washer, and one green and yellow ground lead routed near the A gate lower hinge pin from **2** to machine frame **1** with a star washer at both ends.
- Braided ground wire is connected from logic gate **3** to machine frame **1** with a star washer at both ends.
- Green and yellow ground lead is connected from A gate frame **7** to fan motor housing **6** with a star washer at both ends. (ECA 046 on page 15 of this guide.)
- Remove filter(s) **5**.**
- Resistance from fan motor housing(s) to A gate frame **7** is less than 0.1 ohm. This check is to verify the continuity of green and yellow ground lead connected from fan motor housing to A gate frame **7** with a star washer at both ends.
- Reinstall filter(s) **5**.**
- Open A gate.**
- Gate cover **8** is installed.
- Stabilizing foot **9** for binding condition (Models 11 and 13 only).
- Close A gate.**

Machine Interior – General – For 3880 Models 11 and 13

DANGER
Ensure that the machine is powered off and the 3880 control unit ac power cable is disconnected.



CHECK:

Open A gate.

Green and yellow ground cable is connected from machine frame **1** to upper section of hinge **2** with a star washer at both ends.

Green and yellow ground cable is connected from upper section of hinge **3** to B gate frame **4** with a star washer at both ends.

Open B gate.

Plenum lock **7** is installed over plenum latch.

Green and yellow ground lead is connected from middle of B gate fan housing **5** to B gate frame **4** with a star washer at both ends.

Remove filter **6.**

Resistance from fan motor housing to B gate frame **4** is less than 0.1 ohm. This check is to verify the continuity of green and yellow ground lead connected from fan motor housing to B gate frame **4** with a star washer at both ends.

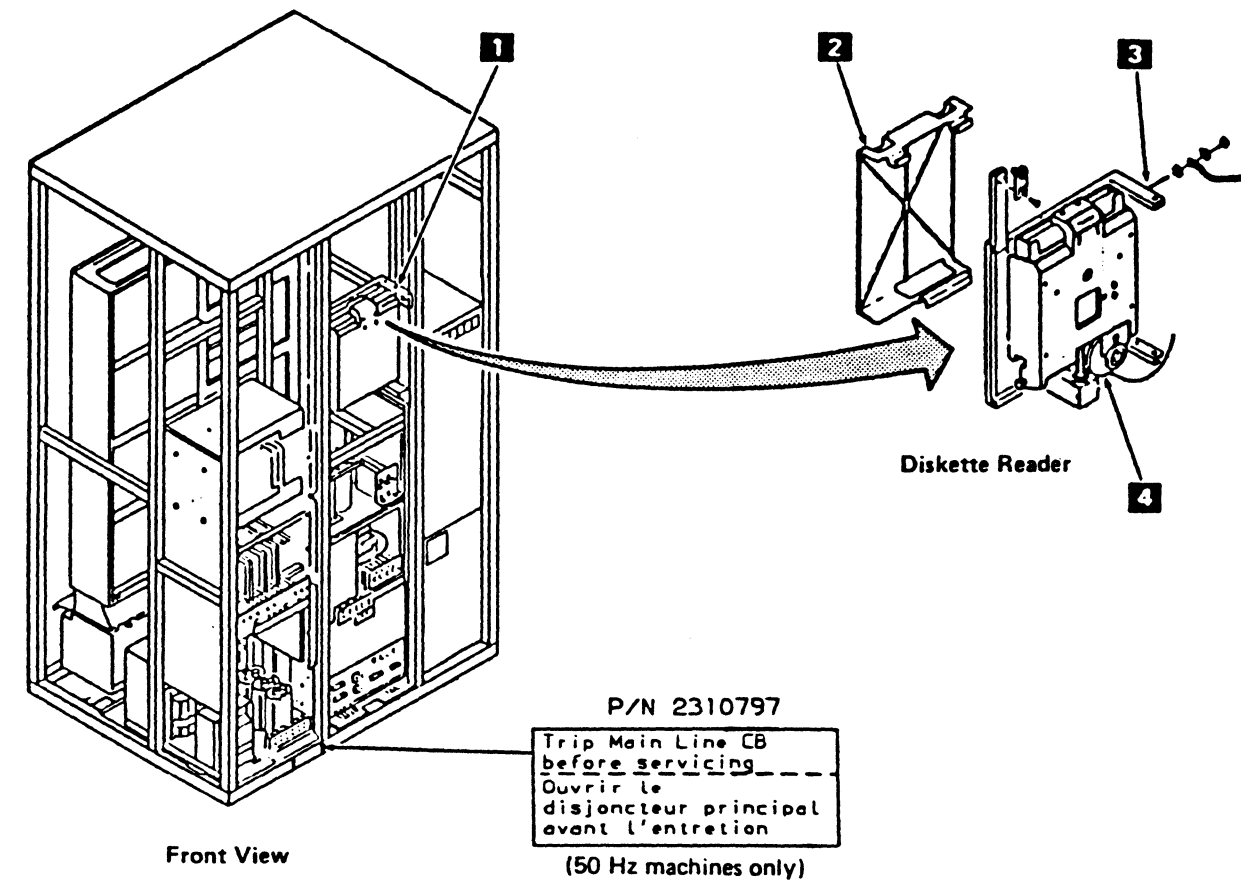
Reinstall filter **6.**

Close B gate.

Close A gate.

Machine Interior – General – For All 3880 Models

DANGER
Ensure that the machine is powered off and the 3880 control unit ac power cable is disconnected.



CHECK:

Correct safety label illustrated above is installed as you perform the following (50 Hz machines only).

Green and yellow ground lead is connected from drive motor **4** to frame ground **1** with a star washer at both ends.

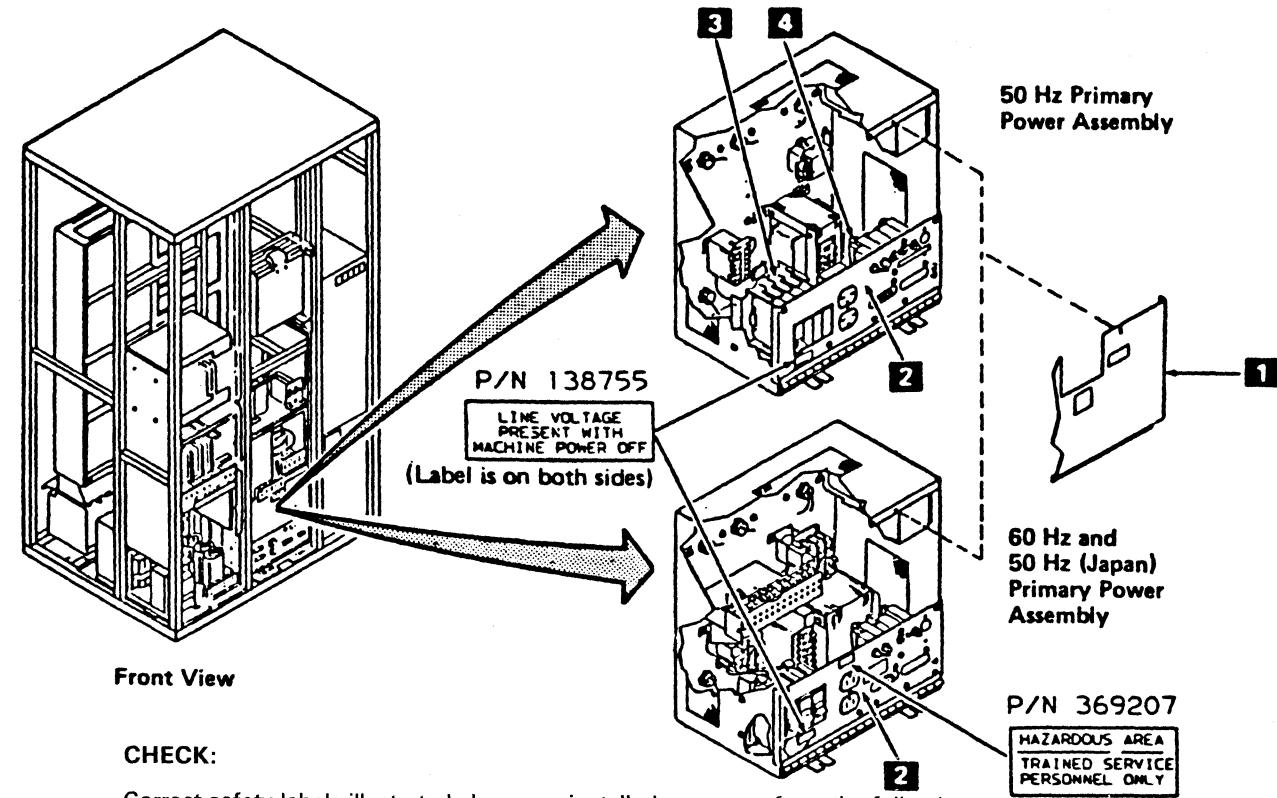
Braided ground wire is connected from diskette reader mounting frame **3** to frame ground **1** with a star washer at both ends.

Safety shield **2** is installed.

Machine Interior – AC Primary Power for All 3880 Models

DANGER

Ensure that the machine is powered off and the 3880 control unit ac power cable is disconnected.



Front View

CHECK:

Correct safety labels illustrated above are installed as you perform the following.

Remove ac primary power assembly cover **1**.

Pivot lower cover **2** down.

Exposed wires and the connectors for worn, frayed, cracked, or pinched condition.

All green and yellow ground leads are connected to ac compartment frame with star washers.

Capacitors for leakage or expansion.

Safety shields are installed over TBs and capacitors.

If this is a 50 Hz machine, safety shield is installed over CB401 **3**. (ECA 025 on page 14 of this guide.)

If this is a 50 Hz machine, jumper is installed at CP406 **4** auxiliary contact points. (ECA 039 on page 15 of this guide.)

AC power cable not frayed or otherwise damaged.

Note: The power plug must be a male 15-amp type B Russell and Stoll 3730 or equivalent.

AC power cable strain relief hardware is secure.

Resistance from ac power cable ground pin to machine frame and to ac compartment frame is less than 0.1 ohm.

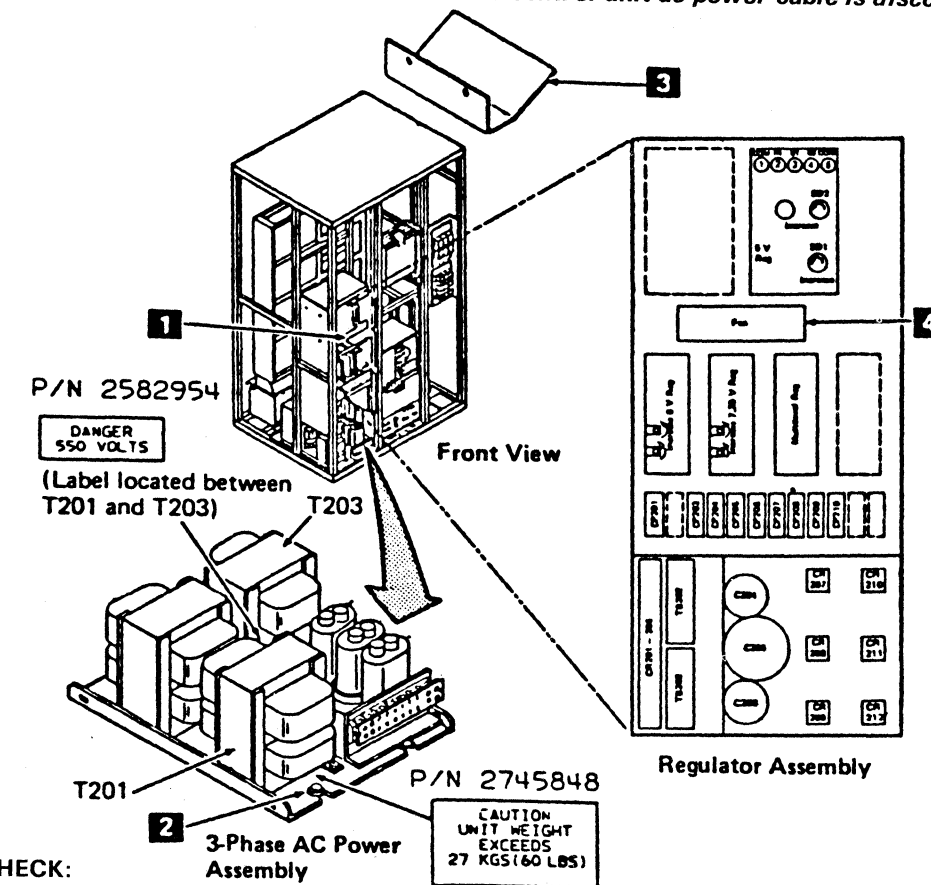
Pivot lower cover **2** up.

Reinstall ac primary power assembly cover **1**.

Machine Interior – AC/DC Power Distribution – For All 3880 Models

DANGER

Ensure that the machine is powered off and the 3880 control unit ac power cable is disconnected.



Front View

Regulator Assembly

CHECK:

Correct safety labels illustrated above are installed as you perform the following.

Open regulator cover **1**.

Note: The following instructions apply to both of the illustrated assemblies.

Exposed wires and the connectors for worn, frayed, cracked, or pinched condition.

Capacitors for leakage or expansion.

Safety shields are installed over capacitors and TBs.

Safety shield **3** is installed over fan **4**. (Shield **3** is not installed on machines with eight channels.)

Fan guard is installed on bottom of fan motor **4**.

Resistance from fan motor housing to 3-phase ac power assembly baseplate **2** is less than 0.1 ohm. This check is to verify continuity of green and yellow ground lead connected from fan housing **4** to 3-phase ac power assembly baseplate **2** with a star washer at both ends.

Close regulator cover.

Green and yellow ground leads are connected to 3-phase ac power assembly baseplate with star washers.

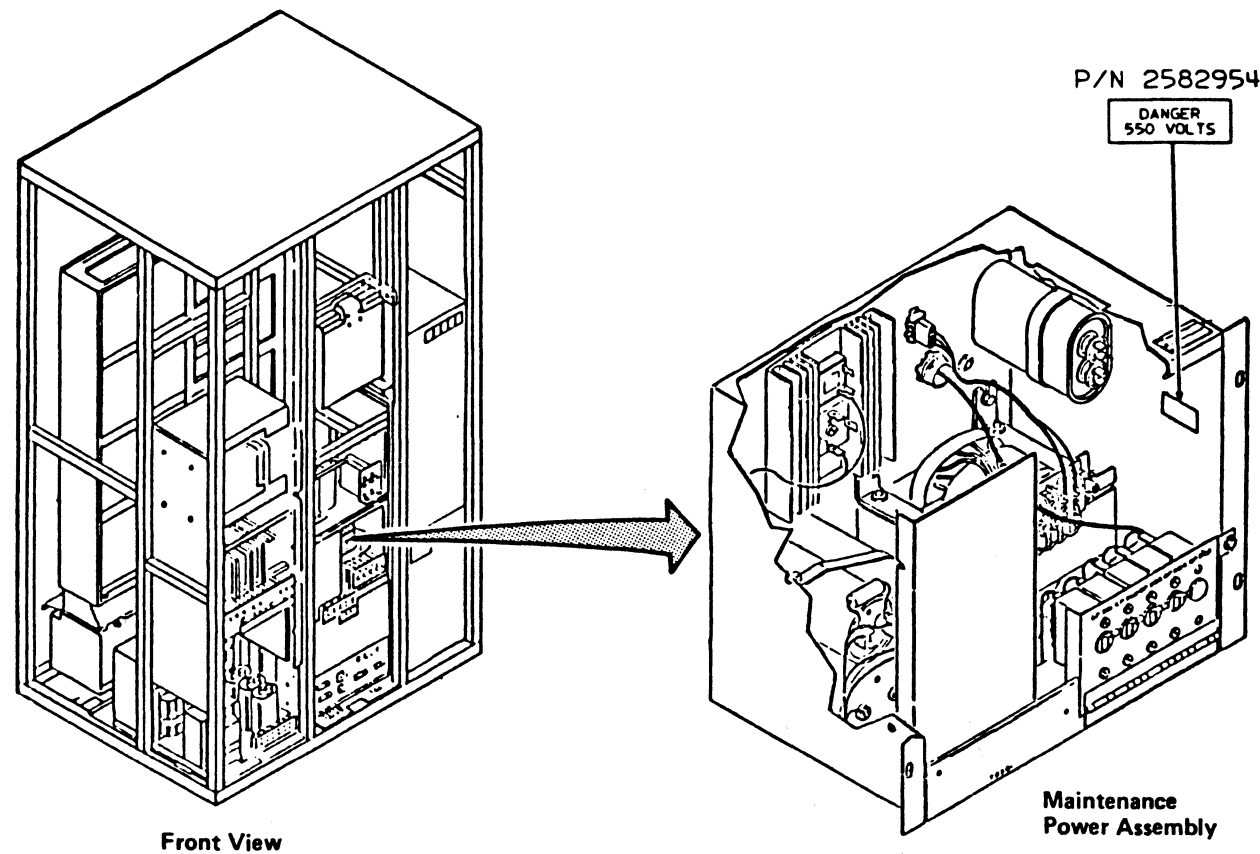
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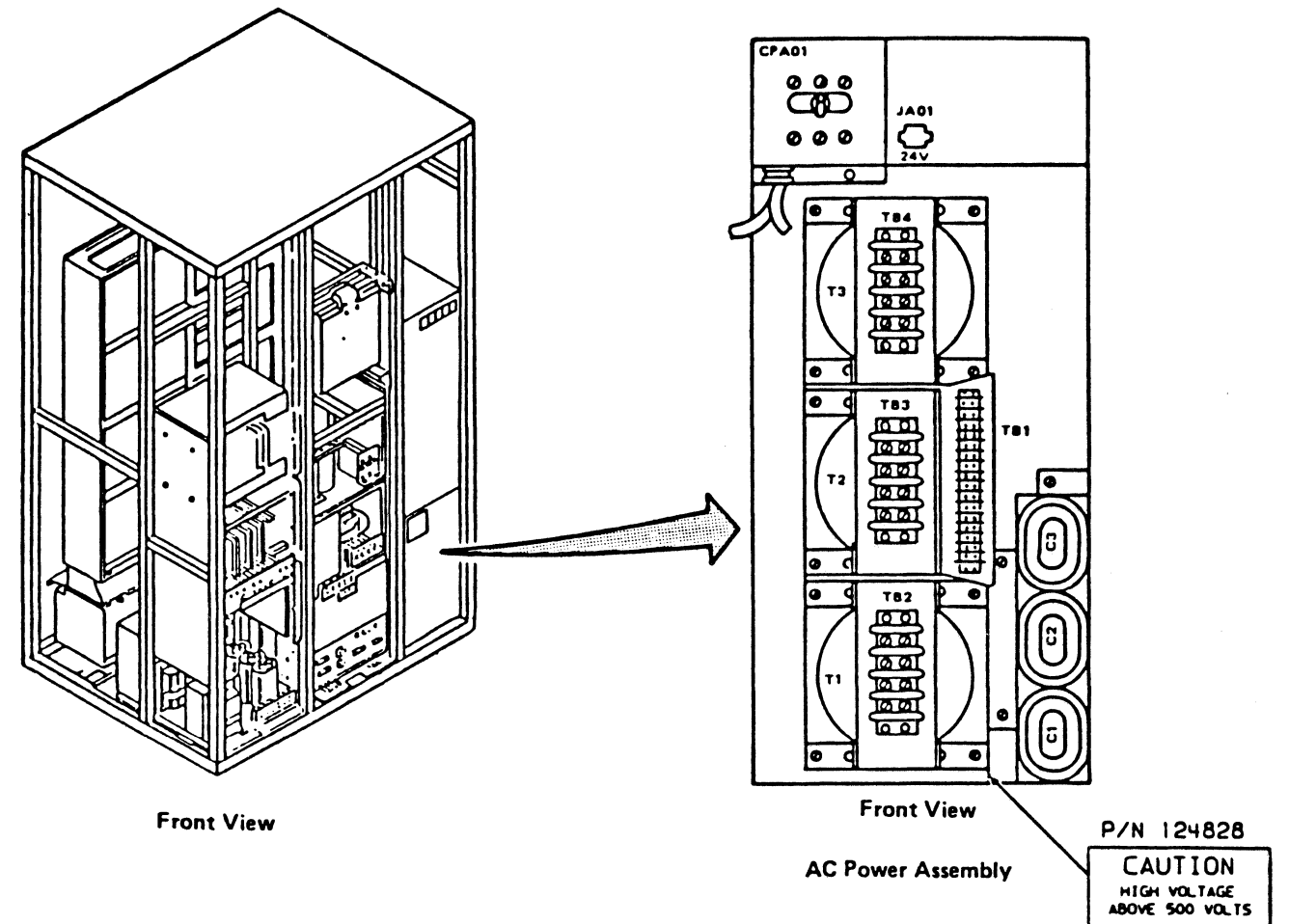
Machine Interior – Maintenance Power – For All 3880 Models

DANGER
Ensure that the machine is powered off and the 3880 control unit ac power cable is disconnected.



Machine Interior – AC Power – For 3880 Models 11 and 13

DANGER
Ensure that the machine is powered off and the 3880 control unit ac power cable is disconnected.



CHECK:

- _____ Correct safety label illustrated above is installed as you perform the following.
- _____ Exposed wires and the connectors for worn, frayed, cracked, or pinched condition.
- _____ Capacitors for leakage or expansion.
- _____ Safety shields installed over capacitors and TBs.
- _____ Green and yellow ground leads are connected to power supply compartment with star washers.

CHECK:

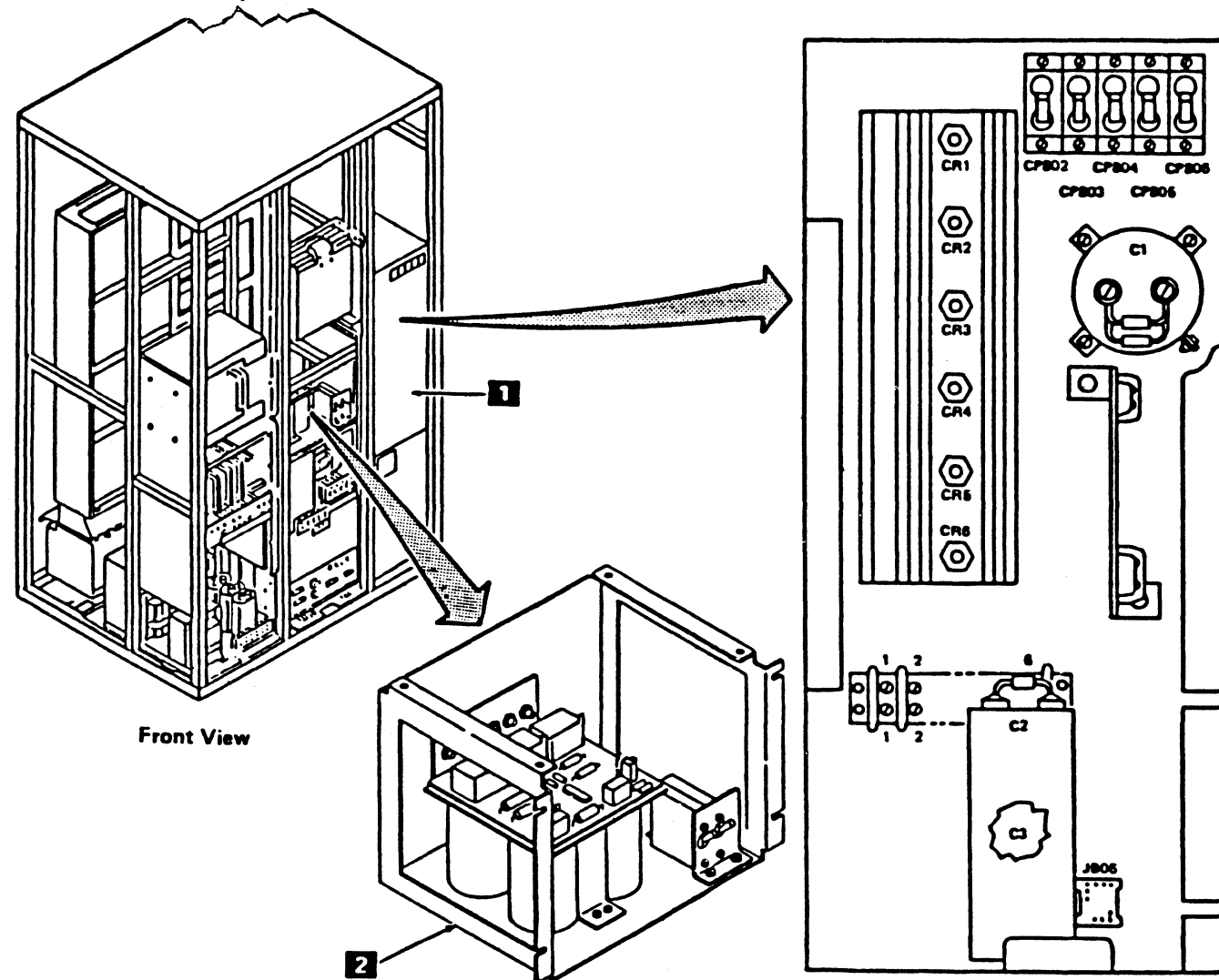
- _____ Correct safety label illustrated above is installed as you perform the following.
- _____ Exposed wires and the connectors for worn, frayed, cracked, or pinched condition.
- _____ All green and yellow ground leads are connected to ac compartment frame with star washers.
- _____ Capacitors for leakage or expansion.
- _____ Safety shields are installed over TBs and capacitors.

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Machine Interior – DC Power – For 3880 Models 11 and 13

DANGER

Ensure that the machine is powered off and the 3880 control unit ac power cable is disconnected.



CHECK:

Remove dc power assembly cover **1**. **DC Power Assemblies**

Exposed wires and the connectors for worn, frayed, cracked, or pinched condition.

Capacitors for leakage or expansion.

Reinstall dc power assembly cover **1**.

Safety shields are installed over TBs and capacitors

Exposed wires and the connectors in power assembly **2** for worn, cracked, or pinched condition.

Capacitors in power assembly **2** for leakage or expansion.

Safety shields are installed over TBs and capacitors.

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Safety ECs

DANGER

Ensure that the machine is powered off and the 3880 control unit ac power cable is disconnected.

CHECK:

Latest safety ECs are installed using the following chart. See product microfiche to verify that all existing ECAs and checkpoints have been included.

Machines Affected	ECA	EC	Description	Checkpoint
Below S/N 10178	013	453986	Install safety shield.	See INSP 7, 2 .
Below S/N 10445	014	453994	Install logic gate cover (narrow gate).	See INSP 6, 8 .
Above S/N 10445	015	454029	Install logic gate cover (wide gate).	See INSP 6, 8 .
50 Hz Model 1	025	454032	Install safety shield on CB401.	See INSP 9, 3 .
50 Hz without REA 13-34659, with B/M 4518496	026	462803	Install warning label P/N 2310797.	See INSP 7.
50 Hz Model 1	028	454033	Replace power cable assembly P/N 4797623.	Power cable to TB201 has a green and yellow ground lead connected to 3-phase ac power assembly base plate. See INSP 8, 2 .
Model 1, below S/N 11700	029	460701	Check for loose A gate hinge pins.	See INSP 6, 1 .
Below S/N 10161	030	462802	Insulate terminals on ac power plug.	Check terminals in ac power plug for insulation.
Without fan under A4 logic board location	031	462790	Tape unused fan power plug.	Located below A4 logic board location. See INSP 6.
Below S/N 10161	034	462810	Add green and yellow ground lead from maintenance power assembly to ac primary power assembly.	Visible from rear of maintenance power assembly and ac primary power assembly. See INSP 8 and INSP 9.

Machines Affected	ECA	EC	Description	Checkpoint
With fan installed under A4 logic board location	038	450176	Check fan under A4 logic board for extra ground lead.	Remove filter and check for green and yellow ground lead connected from motor housing to power connector located on side of fan housing. Reinstall filter. See INSP 6, 4 .
50 Hz	039	462801	Add jumpers to CP406 auxiliary contact points.	Wires installed on CP406 at N/O and common points. See INSP 8, 4 .
Without EC 462852	046	462820	Add ground lead connected from A gate frame to fan motor housing.	See INSP 6, 6 and 7 .
S/N 14105 through S/N 15099	057	458435	Install bolts through A gate hinges if there are less than three welds attaching hinge to frame.	See INSP 6, 1 .
S/N 10000-19999 20000-26700 30000-30650 40000-41600 80000-80230 90000-90060 X0000-X0280 Y0000-Y0210 Z0000-Z0210	059	458472	Check for burned wires on TB202 and TB203.	See INSP 8 for TB locations.
Models 11 and 13	503	328957	Install a lock over plenum latch.	Ensure plenum latch is securing fan assembly in place. See INSP 7, 7 .

This concludes the safety inspection procedures to be conducted with the machine powered off. The last remaining step is to ensure that the machine can be powered on and off correctly.

Power On and Off

CHECK:

Using the Electrical Safety for IBM Customer Engineers handbook as a guide, perform the Power Receptacle and Primary Power check procedures to verify that the source power is correct for the machine attachment.

Ensure that all covers are replaced, and connect the 3880 control unit ac power cable.

_____ Machine should power on and off correctly.

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