IBM®

Maintenance Library

MIM	PCM	MDM
INTRO LGND GLOS START MLX PROG LOC PWR CARR INST INSP INDEX	PARTS CATALOG	CARD PLUG CHARTS POWER DIAGRAM VOLTAGE PIN LISTS
VOL.R10	VOL.R20	VOL.R30

ECM	MSM	LRM
INTRO ECI CTL-I MNT-C DBFR CTRL CHL-I DD PORT STOR DC	INTRO SENSE OPER PDA REF MD	LOGIC REFER- ENCE
VOL.R45	VOL.R60	VOL.R70

3880

Storage Control Models 21 and 23
Maintenance Information Manual

3880 MIM		PN 6315669 1 of 6	881143 13 Jan 84	881216 15 Aug 84	A15621 01 Apr 85		
	Seq AA0010						

© Copyright IBM Corp. 1984, 1985

Preface

The drawings and specifications contained herein shall not be reproduced in whole or in part without written permission.

IBM has prepared this maintenance manual for the use of IBM customer engineers in the installation, maintenance, and repair of the specific machines indicated. IBM makes no representation that it is suitable for any other purpose.

Information contained in this manual is subject to change from time to time. Any such change will be reported in subsequent revisions.

It is possible that this material may contain reference to, or information about IBM products (machines and programs), programming, or services that are not announced in your country. Such references or information must not be construed to mean that IBM intends to announce such IBM products, programming, or services in your country.

This manual uses a specific range of words so that the text can be understood by customer engineers in countries where English is not the normal language.

Requests for copies of IBM publications should be made to your IBM representative or to the IBM branch office servicing your locality.

A form for reader's comments is provided at the back of this publication. If the form has been removed comments may be addressed to:

```
International Business Machines Corporation
Department 61C/313
Tucson, Arizona, U.S.A. 85744
```

IBM may use or distribute any of the information you supply in any way it believes appropriate without incurring any obligation whatever. You may, of course, continue to use the information you supply.

Maintenance Manual Ordering Procedure (IBM Internal)

Individual pages of the 3880 Maintenance manual can be ordered from the Tucson 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	Seq AA0010	PN 6315669 2 of 6	881143 13 Jan 84

© Copyright IBM Corp. 1984

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

RELATED PUBLICATIONS

A list of related publications can be found in the Maintenance Support Manual, REF section.

3880 MIM	Seq AA0010	PN 6315669 2 of 6	881143 13 Jan 84	881216 15 Aug 84	A15621 01 Apr 85		

© Copyright IBM Corp. 1984, 1985

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

Parts Catalog Manual (Vol R20)

ECA Number	EC Number

Maintenance Diagrams Manual (Vol R30)

ECA Number	EC Number

Error Code Manual (Vol R45)

ECA Number	EC Number

Maintenance Support Manual (Vol R60)

ECA Number	EC Number

Logic Reference Manual (Vol R70)

ECA Number	EC Number

Maintenance Device Diskettes

ECA Number	EC Number

© Copyright IBM Corp. 1984,1985

EC Level Control

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

Rules for Safety

If (1) you know the safety rules for working with electrical and mechanical equipment and (2) you observe the rules, you can work safely with IBM equipment.

Do not fear electricity, but respect it.

While you are maintaining IBM equipment, (1) observe every safety precaution possible and (2) observe the following safety rules.

Work Environment

- Do not work alone in hazardous conditions or near equipment that has dangerous voltages. Always inform your manager if the conditions or voltages are a possible problem.
- Always look for possible hazards in your work environment. Examples of hazards are: moist floors, nongrounded extension cables, power surges, and missing safety grounds.
- Do not perform any action that makes the product unsafe or that causes hazards for the customer personnel.
- Before you start the equipment, ensure that other CEs, and customer personnel, are not in a hazardous position.
- Do not wear loose clothing that can be trapped in the moving parts of a machine. Ensure that the sleeves of your clothing are fastened or are rolled above the elbow. If your hair is long, or if you wear a neck scarf, fasten it to make it safe.
- Insert your necktie into your clothing or fasten it with a clip (preferably nonconductive) at approximately 8 centimeters (3 inches) from its end.
- Lift the equipment or parts by standing or pushing up with your stronger leg muscles; this action removes the strain from the muscles in your back. Do not lift any equipment or parts that are too heavy for you.
- Put removed machine covers in a safe place while you are servicing the machine. Reinstall the covers before returning the machine to the customer.
- Always keep your CE tool kit away from walk areas so that other persons cannot trip over it. For example, keep the kit under a desk or table.
- Observe good housekeeping practices in the area of the machines while you are performing maintenance and after completing it.
- After maintenance, reinstall all safety devices, such as guards, shields, labels, and ground wires. Exchange safety devices that are worn or defective. (*Remember*: the safety devices protect you from a hazard. You destroy their purpose if you do not reinstall them when you have completed the service call.)

Electrical Safety

- If possible, always unplug the power-supply cable before you work on a machine. When you switch off power at the wall box, lock the switch in the off position or attach a DO NOT OPERATE tag (Z229-0237) to the switch.

  Note: A non-IBM attachment to an IBM machine may be powered from another source and may be controlled by a different switch or circuit breaker.

- Switch off all power before (1) removing or assembling the main units of the equipment, (2) working near to power supplies, (3) inspecting power supplies, or (4) installing changes in machine circuits.
- Unless the maintenance documents specifically instruct you, do not service the following parts with power on *if the part is removed from its installed position in the machine*: power supplies, pumps, blowers, motor generators, and other units with voltages that are more than 30 V ac or 42.4 V dc. (This rule ensures that correct grounding is maintained.)
- If you really need to work on equipment that has exposed live electrical circuits, observe the following precautions:
  - Ensure that another person, who is familiar with the power-off controls, is near you. Another person must be there to switch off the power, if necessary.
  - Do not wear jewelry, chains, metal-frame eyeglasses, or other personal metal objects. (*Remember*: if the metal touches the machine, the flow of current increases because the metal is a conductor.)
  - Use only insulated probe tips or extenders. (*Remember*: worn or cracked insulation is unsafe.)
  - Use only one hand while you are working on live equipment. Keep the other hand in your pocket or behind your back. (*Remember*: there must be a complete circuit for an electrical shock to occur. This precaution prevents *your body* from completing the circuit!)
  - When you use a tester, set its controls correctly and use insulated probes that have the correct electrical specification.
  - Do not touch objects that are grounded, such as metal floor strips, machine frames, or other conductors. Use suitable rubber mats obtained locally, if necessary.
- When you are working with machines having voltages more than 30 V ac or 42.4 V dc, observe the special safety instructions given in customer engineering memorandums (CEMs).
- Never *assume* that power has been removed from a circuit. First, *check* that it has been removed.
- Do not touch live electrical circuits with the surface of a plastic dental mirror. (*Remember*: the surface of the dental mirror is conductive and can cause damage and personal injury.)
- If an electrical accident occurs:
  1. *Use caution; do not be a victim yourself.*
  2. *Switch off the power.*
  3. *Instruct another person to get medical aid.*
  4. *If the victim is not breathing, perform mouth-to-mouth rescue breathing. See "Electrical Accidents - First Aid" (below).*

Mechanical Safety

Do not touch moving mechanical parts when you are (1) lubricating a part, (2) checking for play, or (3) doing other similar work.

Safety Glasses

Wear safety glasses when:

- Using a hammer to drive pins or similar parts
- Using a power drill
- Using a spring hook to attach or remove a spring
- Soldering parts
- Cutting wire or removing steel bands
- Using solvents, chemicals, or cleaners to clean parts
- Working in any other conditions that could injure your eyes

Tools, Testers, and Field-Use Materials

- Do not use tools and testers that have not been approved by IBM. Ensure that electrical hand tools, such as Wire-Wrap[1] tools and power drills, are inspected regularly.
- Exchange worn and broken tools and testers.
- Do not use solvents, cleaners, or oils that have not been approved by IBM.

Summary

Prevention is the main aid to electrical safety. Always think about electrical safety and use *good practice*, for example:

- Ensure that the customer's power receptacle matches the IBM equipment specifications.
- Inspect power cables and plugs; check for loose, damaged, or worn parts.
- Review the procedure in the maintenance documents before you remove a part that can hold an electrical charge from the machine. *Carefully* discharge the necessary parts exactly as instructed by the procedure.
- Do not use a normal light (for example, a table lamp) as an extension trouble light at a machine.

Never *assume* that a machine or a circuit is safe. No machine is *always* completely safe. You may not know the exact condition of a machine because, for example:

- The power receptacles could be wrongly wired.
- Safety devices or features could be missing or defective.
- The maintenance and/or changes history could be wrong or not complete.
- The design could have a problem.
- The machine could have damage, caused when it was shipped.
- The machine could have an unsafe change or attachment.
- An engineering change or a sales change could be wrongly installed.
- The machine could be deteriorated (1) because it is old or (2) because it operates in an extreme environment.
- A part could be defective, therefore causing a hazard.
- A part could be wrongly assembled.

These are some of the ways that the condition of the machine could affect safety. *Before you start a service call or procedure, have good judgment and use caution.*

[1] Trademark of the Gardner-Denver Co.

© Copyright IBM Corp. 1984,1985

Safety SAFE 1

Electrical Accidents - First Aid

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

- *Use Caution:* If the victim is still in contact with the electrical-current source, remove the power; to do this, you may need to operate the room emergency power-off (EPO) switch or the disconnecting switch. If you cannot find the switch, use a dry wooden rod or other nonconductive object to pull or push the victim away from contact with the electrical-current source.
- *Work Quickly*: If the victim is unconscious, he/she may need (1) mouth-to-mouth rescue breathing and possibly (2) external cardiac compression if the heart is not beating.
- *Call for the Rescue Service*, such as the ambulance or the hospital. Instruct another person to call for medical aid.

Determine if the victim needs mouth-to-mouth rescue breathing. If he/she does, perform the following steps.

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

1. Prepare for rescue breathing:
   a. Ensure that the victim's airway is open and that it is not obstructed; check the mouth for objects that may be obstructing the airway, such as chewing gum, food, dentures, or the tongue.
   b. Place the victim on his/her back, put one hand behind the victim's neck, and put the other hand on his/her forehead.
   c. Lift the neck with one hand, and tilt the head backward by pressing on the forehead with the other hand. See Figure 1.

Figure 1.

2. *Look, listen, and feel* to determine if the victim is breathing freely:
   a. Put your cheek near to the victim's mouth and nose.
   b. Listen and feel for the breathing-out of air. At the same time, look at the victim's chest and upper abdomen to see if they move up and down.
3. If the victim is not breathing correctly:
   a. Keep the victim's head tilted backward; (see Figure 1). Continue to press on the forehead with your hand; at the same time, rotate this same hand so that you can pinch together the victim's nostrils with your thumb and finger. See Figure 2.

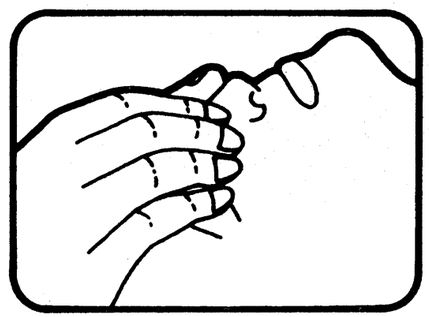


Figure 2.

   b. Open your mouth wide and take a deep breath. Make a tight seal with your mouth around the victim's mouth as shown in Figure 3 and blow into the victim's mouth.

Figure 3.

   c. Remove your mouth to let the victim breathe-out, and check that the victim's chest moves down. See Figure 4.

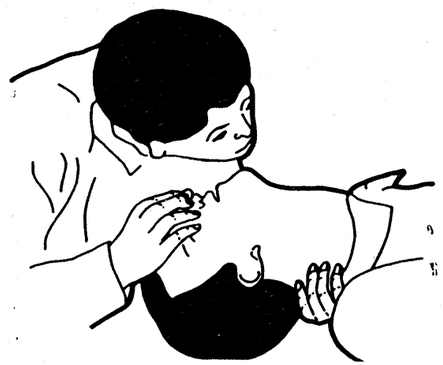


Figure 4.

   d. Repeat steps b and c once every 5 seconds either until the victim breathes for himself/herself or until medical aid comes.

Reporting Accidents

Report, to your *field manager*, all electrical accidents, possible electrical hazards, and accidents that nearly occurred. (*Remember*: an accident that nearly occurs might be caused by a design problem; your immediate reporting ensures that the problem will be solved quickly.)

Report also all small electrical shocks. (*Remember*: a condition that causes a small shock need only differ slightly to cause serious injury.)

3880 MIM	Seq AA0010	PN 6315669 6 of 6	881143 13 Jan 84	881216 15 Aug 84	A15621 01 Apr 85		

© Copyright IBM Corp. 1984,1985

Contents of This Section

3880 Maintenance Library 5
Description of the Maintenance Volumes 5
Contents of the Maintenance Volumes 10

Maintenance Information Manual 25
How To Use The MIM 25
Description By Section 25

3880 Maintenance Plan 28
Prerequisites 28
Methods 28
Maintenance Procedures 28
Start Section of the MIM 28
Maintenance Analysis Procedures 28
Maintenance Programs 28
Subsystem Storage Maintenance 28
Support Material and References 28

Summary Of The 3880 Storage Control Model 21 30
Subsystem Description 30
Processor Attachment 30
Channel Attachment 30
DASD Attachment 30
Channel Features 30
Two Channel Switch-Pair Feature 30
Two Channel Switch-Pair, Additional Feature 30
Remote Switch Feature 30
Modes of Operation 32
Subsystem Storage 32
Addressing 32
3350 Addressing 32

Summary Of The 3880 Storage Control Model 23 34
Subsystem Description 34
Processor Attachment 34
Channel Attachment 34
DASD Attachment 34
Channel Features 34
Two Channel Switch-Pair Feature 34
Two Channel Switch-Pair, Additional Feature 34
Four Channel Switch, Additional Feature 34
Remote Switch Feature 34
Operation 35
Subsystem Storage 35
Addressing 35
3380 Addressing 35

Dual Frame Configuration Model 23 36
Restrictions 36

Storage Director and Subsystem Storage Description—Model 21 37

Storage Director and Subsystem Storage Description—Model 23 38

3880 Storage Control Data Flow 40

3880 Storage Control Functional Areas ..... 42 - 60
Channel Features 45
Two Channel Switch-Pair Feature 45
Two Channel Switch-Pair, Additional Feature 45
Four Channel Switch, Additional Feature 48
Channel Interface 50
Channel Interface Cards 50
Port Adapter 50
Data Buffer 50
Data Buffer Cards 50
Control 52
Control Cards 52
Control Interface 52
Control Interface Cards 52
Port 52
Port Cards 52
Subsystem Storage Control and Data 52
Subsystem Storage Control and Density 52
Subsystem Storage Control and Data Cards for Machines Without Expanded Storage 52
Subsystem Storage Control and Data Cards for Machines With Expanded Storage 52
Subsystem Storage 55
Subsystem Storage Cards for Machines Without Expanded Storage 55
Subsystem Storage Cards for Machines With Expanded Storage 55
Maintenance Connection 55
Maintenance Connection Cards 55
Diskette Drive 60
Operator and Power Switch Panels 60
Power 60

Channel Switching and Device Reservation 62
Two Channel Switch-Pair Feature 62
Two Channel Switch-Pair, Additional Feature 62
Four Channel Switch, Additional Feature 62

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.

See the CARR section for information on the diskette drive.

See the OPER section of the MSM manual for a short description of the cards in the 3880.

© Copyright IBM Corp. 1984, 1985

Description of the Maintenance Volumes

The 3880 maintenance library contains six volumes:

The first three volumes contain:

- Maintenance Information Manual (MIM) (R-10)
- Parts Catalog Manual (PCM) (R-20)
- Maintenance Diagrams Manual (MDM) (R-30)

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

The next three volumes contain:

- Error Code Manual (ECM) (R-45)
- Maintenance Support Manual (MSM) (R-60)
- Logic Reference Manual (LRM) (R-70)

The ECM is provides descriptions of IML codes, symptom codes, and isolation codes. It also describes diagnostic tests and has second level diagrams. The LRM has the oscilloscope points. The MSM gives reference and sense byte information.

© Copyright IBM Corp. 1984, 1985

Contents of the Maintenance Volumes

MIM
Maintenance Information Manual
Vol. R10

Contains: Procedures for the installation, operation, and repair of the machine

User: On-site CE

Entry: Need to install or repair the machine

PCM
Parts Catalog Manual
Vol. R20

Contains: Diagrams and listings of all parts in the machine (except cards and cables). List of where the parts are used. On microfiche only.

User: On-site CE

Entry: Physical part location

MDM
Maintenance Diagrams Manual
Vol. R30

Contains: Cable charts, card charts, power diagrams, and voltage pin lists

User: On-site CE

Entry: Card location, cable location, power unit label, and MD MAP reference

Note: The Maintenance Diagrams Manual (MDM) volume R30, contains the microfiche copy of the Parts Catalog Manual (PCM), volume 20.

ECM
Error Code Manual
Vol. R45

Contains: Symptom codes, diagnostic routines, fault isolation procedures and data and control flow diagrams

User: On-site CE at the direction of the support CE

Entry: Error/Fault symptom codes and diagnostic test descriptions

MSM
Maintenance Support Manual
Vol. R60

Contains: Theory and reference information, sense byte descriptions, problem determination aids, and Trace information

User: Support CE

Entry: Sense data and need for theory information

LRM
Logic Reference Manual
Vol. R70

Contains: Cross references between diagrams and descriptions of logic cards

User: Support CE

Entry: Card physical location and ECM manual

© Copyright IBM Corp. 1984, 1985

3880 Maintenance Library (Cont.) INTRO 10

How To Use The MIM

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

- As a problem-solving aid
- As a memory aid

As a problem-solving aid:

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

As a memory aid:

1. The first page of each volume shows all sections of the maintenance library.
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 used in the documentation.

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	Intro-duction

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.

LGND	Legend

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

GLOS	Glossary

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

START	

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

MLX	Cross-Reference

The Maintenance Library Reference section contains references to and from this MIM to other maintenance library manuals. For example, references from the DASD manuals to the 3880 manuals.

PROG	System Maintenance Programs

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

LOC	Locations

The Locations section contains locations of all assembly parts of the 3880. An index is included to help 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 MD
- 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.

INST	Installation

The Installation section contains installation procedures for the 3880.

INSP	Inspection

The Inspection section contains the procedures to perform a safety inspection.

INDEX	Index

The Index section contains a complete alphabetic list of important items in the documentation.

RCF	Reader's Comment Form

The Reader's Comment Form is for the reader to give comments and recommendations for changing the MIM.

© Copyright IBM Corp. 1984, 1985

Maintenance Information Manual INTRO 25

3880 Maintenance Plan

The objective of the 3880 maintenance plan is to help the CE repair hardware failures quickly. This plan stresses how to repair rather than how the machine works. For each failure, the how to repair method uses resources, fault isolation procedures, and analysis procedures.

Prerequisites

The CE should have completed the 3880 Model 21 or 23 education course and understand the following pages in the MIM:

INTRO 30 through INTRO 60

PWR 1, 17, 18, 22, 27, 72, and 74

START 10

MD 10 through 20 (In the MSM manual)

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 by inspecting sense data, diagnostic results, and visual indications.

The maintenance procedures include the following:

Start section of the MIM

Maintenance analysis procedures (MAPs)

Maintenance programs

Subsystem storage maintenance

Support material and references

Start Section of the MIM

The START section is the starting point for all maintenance actions. This section informs the customer engineer how to proceed.

Maintenance Analysis Procedures

The maintenance analysis procedures (MAPs) consist of the maintenance device programs. These programs give isolation and replacement procedures.

Entry into the MAPs is made from the START section. The MAPs are located on the MD diskettes with each 3880. The MAPs are run by loading MD diskette one into the MD. These MAPs perform maintenance programs that are on the 3880 functional diskette. From the results of the maintenance program, inspection of the 3880 registers, and questions of the customer engineer, the MAPs determine the set of Field Replaceable Units (FRUs) that can cause the failure.

If you enter the MAPs by entering a fault symptom code, the MD can display a list of probable failing FRUs before running any diagnostic tests. If you want to verify a repair action after the probable failing FRUs have been displayed, indicate this action to the MD. The MD will then run the correct diagnostic programs.

Isolation Procedures

The MAPs usually list several possible field replaceable units.

For the methods given below, use MD option 1 and enter a symptom code. This operation is necessary for diagnosing problems that cannot be recreated. By entering **start repair** (MD option 1) with a symptom code, the probable failing FRUs will display.

Use one of the following methods to replace the FRUs:

1. Replace the primary FRUs, run the diagnostic tests, and return the machine to the customer. Return the replaced FRU group to the plant of manufacture along with the symptom code and other important data.

2. If the failure reoccurs, replace all secondary FRUs, run the diagnostic tests, and return the machine to the customer. Return the replaced FRU group to the plant of manufacture along with the symptom code and other important data.

Use your knowledge of the customer and parts availability to determine the best method for each incident.

The FRUs have the failure probability listed with them. The method used is as follows:

9 - The chances are more than 9 out of 10 that this FRU repairs the problem

8 - The chances are more than 8 out of 10 that this FRU repairs the problem

.

.

.

0 The chances are more than 1 out of a 10 that this FRU repairs the problem.

Blank There is less than 1 chance out of a 10 that this FRU repairs the problem.

Note: When using the ECM manual, if no percent of probability is given in the FRU list, this means that the FRUs have an equal probability of repairing the failure.

Replacement Procedures

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

The three primary FRUs are given first on the MD screen. Secondary FRUs are given on a separate MD screen.

Maintenance Programs

The maintenance programs consist of diagnostic microcode and online tests.

Diagnostic Microcode

The diagnostic microcode is the primary tool to recreate a failure and isolate it to a specific functional area. The diagnostic microcode is run using the MD.

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.

© Copyright IBM Corp. 1984,1985

Subsystem Storage Maintenance

Uncorrectable errors in the subsystem storage cause the associated storage director to send sense data about the error (containing up to three symptom codes) to the host and take the failing block of storage offline.

The symptom codes would:

1. Inform the operator of the decrease in storage capacity

2. Identify the failing storage position

Taking the failing storage area offline and informing the operator permits the subsystem to continue working. This procedure also permits the customer engineer to schedule maintenance time.

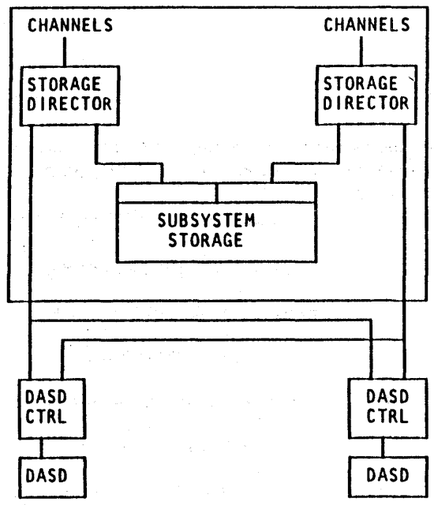
Support Material and References

The support material and references consist mainly of the device's maintenance library.

3880 Maintenance Plan INTRO 28

Summary Of The 3880 Storage Control Model 21

The IBM 3880 Storage Control Model 21 is a high performance paging device that contains two paging storage directors and an 8, 16, 32, 48, or 64 megabyte, high-speed, electronic storage unit named subsystem storage.



3880 Subsystem

Subsystem Description

The 3880 Model 21 is a high performance DASD storage subsystem that supports the paging and swapping functions for MVS and VM. It is specifically designed for these functions and is not intended to be used as a general purpose DASD storage control unit. The 3880 Model 21 supports only 3350 devices.

The subsystem improves system performance by a process named "caching" where blocks of data are either copied from the attached 3350 devices or written by the host system into a random access electronic subsystem storage. This data can then be accessed by the host at electronic speeds rather than at the electromechanical speeds of the DASD. A migration microcode algorithm ensures that a high percent of the blocks referred to are in the subsystem storage.

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

The diskette drive is included in the 3880. (See the CARR (MIM) and OPER (MSM) sections for more information on the diskette drive.)

Processor Attachment

The 3880 Model 21 can be attached to the following systems:

- 303X Series: all models
- 308X Series: all models
- 4341 Series: all models
- 4381 Series: all models

The 3880 Model 21 operates in the following modes:

- System 370
- System 370/XA
- 4300 series in ECPS:VSE (Extended Control Program Support: Virtual Storage Extended)

Channel Attachment

The 3880 Model 21 can only attach to the following channels:

- 1.5 megabyte Block multiplexer channel
- 3.0 megabyte Block multiplexer channel running in data streaming mode

For more information about these channel speeds, see the CHL-I section.

DASD Attachment

The subsystem attaches to one or two controllers. Each controller must be attached to both storage directors in the same subsystem. Only 3350 devices can be attached to the Model 21. Each controller supports two or four devices that must be operated in native mode. Each controller must have the string switch feature installed.

Channel Features

The channel features available for the 3880 are:

- Two Channel Switch-Pair feature
- Two Channel Switch-Pair, Additional feature
- Remote Switch feature

Two Channel Switch-Pair Feature

The Two Channel Switch-Pair feature supplies logically separated switches for both storage directors. It permits each storage director to be shared by two channels. The channels can be attached to the same processor or to different processors. Single devices attached to a storage director can be reserved for the exclusive use of either of the channels.

> **Note:** Although the storage directors can be connected to up to 4 processors, only one processor at a time can use the 3880 Model 21 in paging mode (unless the Model 21 is operating in a multiprocessor environment).

Two Channel Switch-Pair, Additional Feature

The Two Channel Switch-Pair, Additional feature enables four channels to share a storage director and its attached devices.

Remote Switch Feature

The Remote Switch feature removes the channel enable and disable switches from the 3880 operator panel and relocates them to a remote location. This permits an operator to configure the system from a central point.

© Copyright IBM Corp. 1984, 1985

Modes of Operation

The paging subsystem can operate in either paging mode or direct mode.

Paging mode operations move data between the channel and subsystem storage under control of the microcode. In paging mode, the device is not selected and all host accesses are executed to and from the subsystem storage.

The paging subsystem operates in direct mode as a normal DASD. Direct mode is used to write on or read from the disk, give access to the volume table of contents (VTOC), and perform other functions directly with the device. In direct mode, the device is selected and all host accesses are performed to and from the DASD.

Subsystem Storage

The 3880 Model 21 has a two level storage hierarchy. The front storage is a high-performance random access electronic storage area referred to as the subsystem storage. It is dynamically controlled by either one of two independent storage directors. The second level, the back storage, consists of one or two strings of 3350 DASD. Each string consists of two or four 3350 devices. All devices are shared by both storage directors.

Field installable model conversions of 8, 16, 32, 48, or 64 megabytes of subsystem storage are available.

Two ports (one for each storage director) are supplied for the attachment of the subsystem storage to the storage directors. Each port contains two data paths that can concurrently move data to and from the subsystem storage.

An error-correcting-code (ECC) performs correction for all single and double bit failures (inside 16 bytes). The ECC and microcode together performs detection, and at times correction, for all triple bit failures (inside 16 bytes).

The 3880 Model 21 dynamically determines at which level each page should be at and performs data movement inside the hierarchy. The data is moved only when the data is needed in the cache. To the host the subsystem appears to be a single level storage device with the performance attributes of subsystem storage.

The subsystem storage physical identification is found in sense byte 20 of format F, Message 2.

Addressing

Both storage directors must be plugged to take 32 logical device addresses. The address range is plugged on the channel interface (CIF) card. The addresses used by the 3880 Model 21 are as follows.

CONFIGURATION	VALID ADDRESS (hex.)			
1 or 2 Strings	00-1F 20-3F	40-5F 60-7F	80-9F A0-BF	C0-DF E0-FF

Condition code 3 (not operational) is set in the PSW if an attempt is made to address a storage director, controller, or device string that is not attached, powered off, or disabled by the string switch feature.

If an addressed device in a correctly selected string is is not attached or powered off, unit check is presented in the initial status.

Each storage director recognizes four addresses, one direct address and three paging addresses, for each physical device. The direct address is used in direct mode and the paging addresses are used in paging mode. The addresses are defined as follows:

- Bits 0 to 2 - Storage director address
- Bit 3 - Controller (string) address
- Bits 4 to 5 - Direct and paging addresses are as follows:
  - 00 = direct address
  - 01 = paging address 1
  - 10 = paging address 2
  - 11 = paging address 3
- Bits 6 to 7 - Physical device address

3350 Addressing

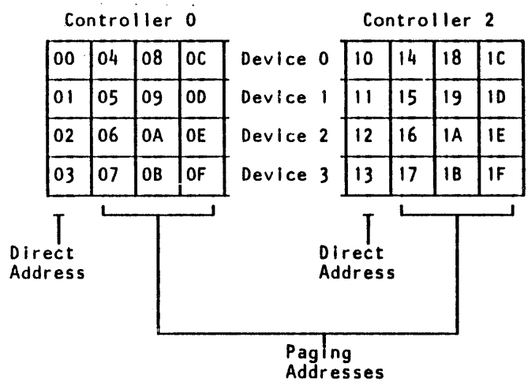
The 3880 Model 21 permits one or two strings with two 3350 devices on each string shared by both storage directors.

The controller address must be set to 0 or 2. The devices must be set to 0 through 3. The paging addressing plan permits the data of one physical DASD to be addressed using any one of four different addresses. For example, the data on device 1 is accessed when the incoming address is:

```
  BITS
012 3 45 67

100 0 00 01 ——— Controller 0, Device 1
                selected in direct mode
100 0 01 01 ——┐ Controller 0, Device 1
100 0 10 01 ——┤ selected in paging mode
100 0 11 01 ——┘ using 3 paging addresses
```

Therefore, if there are four 3350s (eight addresses) attached (two strings) there can be up to 32 addresses associated with each storage director.

For example, control unit addresses 00 - 1F are:



© Copyright IBM Corp. 1984, 1985

Summary Of The 3880 Storage Control Model 23

The IBM 3880 Storage Control Model 23 is a high-performance cache DASD subsystem. It has the following improvements over the Model 13:

- Improved data transfer hardware that permits the data transferred between the DASD and an attaching channel to be concurrently transferred to the cache.
- Support of the Count, Key, and Data Extensions Architecture at the level performed by the 3880 Model 3 with the Speed Match buffer feature.
- Support of the Read Device Characteristics command.
- Support of the Diagnostic Control command.
- Five sizes of subsystem storage: 8, 16, 32, 48, or 64 megabytes.
- Double bit error correction ability for each 16 byte data word stored inside the cache. (The Model 23 can also correct some triple bit errors.)
- Improvements in the availability of the caching function under certain error conditions.
- Attachment of all models of the 3380 DASD as a caching device, except Model A04.

Subsystem Description

Each storage director attaches only 3380s. Each storage director:

- Receives commands and data from the processor through the channels.
- Generates control information from the commands and data.
- Sends control information, commands, and data to the control module in the DASD.
- Receives control information, data, and status information from the control module in the DASD.
- Sends control information, data, and status information to the channels.
- Controls the operation of the channel and the control interfaces.

The subsystem storage, also named cache, is used to hold data sets for quick access by the processor. It has its own power system which can be turned on and off without interrupting storage director operations of the 3880.

Each storage director manages the flow of data between the cache and DASD by:

- Copying data records from DASD to the cache.
- Copying data records between the cache and the processor.
- Determining which data to delete from the cache.
- Searching the directory for requested data records when the records are addressed by the processor.
- Communicating with the other storage director and with the subsystem storage.
- Performing error recovery procedures (ERP's) for subsystem storage operations.

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

The 3880 is controlled by the functional microcode 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 more information on the diskette drive.

Processor Attachment

The 3880 storage control Model 23 can be attached to the following systems:

303X Series: all models

3042 Model 2

308X Series: all models

4341 Series: all models

4381 Series: all models

Channel Attachment

The Model 23 attaches to a 3.0 megabyte per second data streaming channel and does not support the 1.5 megabyte per second non-data streaming channel.

DASD Attachment

The two storage directors support 3380 Models AA4, B04, AD4, BD4, AE4, and BE4. The 3380 Model A04 is not supported. The minimum configuration is a 3880 Model 23 with a single 3380 Model AA4. The maximum single frame 3380 configuration is two strings of the 'A' models with three 'B' models attached to each 'A' model, for a total of 32 device addresses.

3380 Models AD4/BD4 can be intermixed with 3380 Models AE4/BE4 in the same string. 3380 Models AA4/B04 can be attached to the same 3880 Model 23 storage director as the Models AD4/BD4 or AE4/BE4, but must be on a separate string.

If there are two strings of 3380s in the subsystem, both strings must attach to both storage directors.

All models of the 3380 (except the Model A04) have dynamic path selection, which is required for attachment to the two storage directors in the caching subsystem.

Each 3380 Storage Control consists of two controllers and 2, 4, 6, or 8 spindles. Each spindle contains two independent units (actuators). Each 3380 string consists of 4, 8, 12, or 16 independent actuators.

Channel Features

The channel features available for the 3880 are:

- Two Channel Switch-Pair feature
- Two Channel Switch-Pair, Additional feature
- Four Channel Switch, Additional feature (named Eight Channel Switch feature in the customer documentation).
- Remote Switch feature

The Two Channel Switch-Pair feature and the Two Channel Switch-Pair, Additional feature are shown on INTRO 45. The Four Channel Switch, Additional feature is shown on INTRO 39. The Remote Switch feature is not shown.

Two Channel Switch-Pair Feature

The Two Channel Switch-Pair feature supplies logically separated switches for both storage directors. It permits each storage director to be shared by two channels. The channels can be attached to the same processor or to different processors. Each device attached to a storage director can be reserved for the exclusive use of either of the channels.

Two Channel Switch-Pair, Additional Feature

The Two Channel Switch-Pair, Additional feature is similar to the Two Channel Switch-Pair feature except that it enables four channels to share a storage director and its attached devices.

Four Channel Switch, Additional Feature

The Four Channel Switch, Additional feature is similar to the Two Channel Switch-Pair, Additional feature except that it enables eight channels to share a storage director and its attached devices. This feature is named the eight channel switch feature in the customer documentation. On 3880s with subsystem storage, the Four Channel Switch, Additional feature is only fully functional on 3880s installed in a dual frame configuration. (See INTRO 39 for more information.)

Remote Switch Feature

The Remote Switch feature removes the Enable and Disable switches from the 3880 operator panel and relocates them to a remote location. This permits an operator to configure the system from a central point.

© Copyright IBM Corp. 1984, 1985

Operation

Caching mode is the normal operating mode. When the Model 23 is in caching mode, the channel transfers data directly to and from the cache. In most cases, that data is also concurrently transferred to the DASD.

When a caching storage director receives a read command from the channel, it first searches the directory to see if the requested data is in the cache. If a copy of the data is in the cache, the caching storage director transfers it to the channel. If a copy is not in the cache, the caching storage director gets the data requested from the DASD and transfers it to the channel and at the same time writes that data (and the remainder of the track) in the cache. Later requests from the channel for that same data read the data from the high-speed cache.

When data in the cache is updated by the processor, the Model 23 transfers that data to the DASD. This action ensures data integrity. To maximize cache performance the Model 23 also either concurrently transfers the data to the cache or makes the cache copy not valid. When the processor has updated data that was not in the cache, the changed data is written directly to the DASD. The cache is not accessed.

The Model 23 can operate in non-caching mode with the device. When operating in non-caching mode, the channel accesses the DASD without accessing the cache; the channel works directly with the device. Non-caching mode is generally used for maintaining and formatting the DASDs; it is not intended for data management.

Individual devices that contain data which does not permit good caching performance may also be exempted from caching.

Subsystem Storage

The subsystem storage is a random access storage. It has two main areas: cache and directory. Over 99% of the subsystem storage is reserved to the cache, which is used to store data for quick reference by the processor.

The model prefix of the 3880 Model 23 changes with the size of the subsystem storage:

MODEL	D	E	G	H	J
Subsystem Storage Size in Megabytes	8	16	32	48	64

The size of the cache can affect the performance of the subsystem. Obviously, the larger the cache, the more data it can hold. Having more data in the cache increases the chances for the caching storage directors to find the requested data there.

The remainder of the subsystem storage is made up of the directory. The directory contains the locations of the tracks of data that are in the cache.

The subsystem storage physical identification is found in sense byte 20 of Format F, Message 2.

Addressing

Each storage director and device is assigned an I/O address at the time of installation. The address (eight bits) is used to select a specific device. The address has the following format:

BIT	FUNCTION
0-2	Storage director address
3	3380 controller address
4-6	DASD spindle address
7	0 = left actuator; 1 = right actuator

This addressing configuration permits the attachment of two 3380 strings, each with up to 16 actuators.

The storage director addresses are assigned for each channel interface on the storage director. Each of the DASD in the caching subsystem must be addressable from both storage directors in the subsystem and must have the same address from each storage director.

The storage director addresses are set at the time of installation with switches on the 3880 channel interface cards.

The controller address depends on the number of strings attached to the caching subsystem.

If there is one string of 3380s attached, the two controllers in the Model AA4, AD4, or AE4 must have the same bit address, either 0 or 1.

Both controllers can not attach to the same storage director. If there are two strings attached, the controller addresses in one string must be 0's, and in the other string the addresses must be 1's. See the address table below for the address ranges used on the Model 23.

The actuator address range is X'0' to X'F'. For each controller, the actuator addresses start with X'0' and are sequential.

3380 Addressing

The following table lists all the valid device addresses that can be used on both storage directors of the Model 23.

Note: If only one string of 3380s is attached, bit 3 of the storage director address must be the same as the controller address.

CONFIGURATION	VALID ADDRESSES (HEX)			
1 string of 3380s	00-0F 10-1F 20-2F 30-3F	40-4F 50-5F 60-6F 70-7F	80-8F 90-9F A0-AF B0-BF	C0-CF D0-DF E0-EF F0-FF
2 strings of 3380s	00-1F 20-3F	40-5F 60-7F	80-9F A0-BF	C0-DF E0-FF

© Copyright IBM Corp. 1984, 1985

Dual Frame Configuration Model 23

Two 3880 Model 23 Storage Controls can be attached to make a dual frame configuration. This configuration maintains data availability when some of the parts in a single frame are not operational.

A dual frame configuration consists of two complete subsystems. Each subsystem, however, is not completely contained in a single frame. SD2 attaches to port 2 and shares the cache (subsystem storage) in the other 3880.

To connect two 3880s in a dual frame configuration:

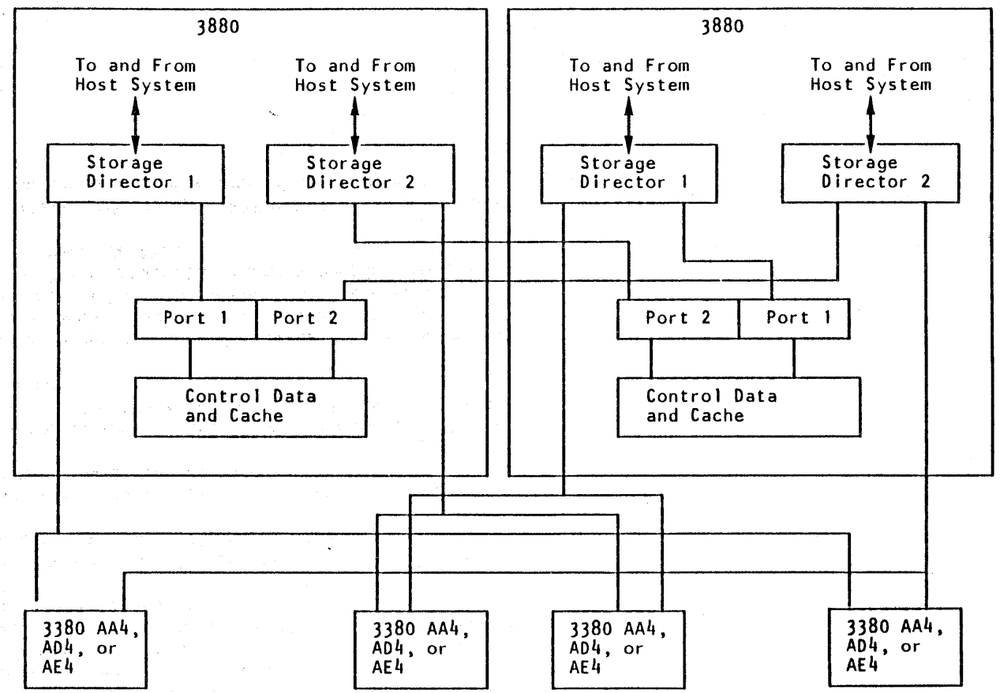
- The two 3880s must be fastened together.
- The SD2 to port cables must be connected to the other 3880.
- The special Unit Emergency cable must be connected to the other 3880.
- The two 3880s must be grounded together.

Restrictions

Dual frame configuration machines must:

- Be the same model number.
- Operate with the same functional microcode (same EC level)

3880 Dual Frame Configuration Internal and Device Connections



© Copyright IBM Corp. 1984, 1985

The IBM 3880 Storage Control Model 21 with subsystem storage connects a channel(s) to subsystem storage and/or a DASD.

The Model 21 contains two storage directors: Storage Director 1 (SD1) and Storage Director 2 (SD2). Both storage directors contain the subsystem controls and data paths needed to transfer data between the channels and subsystem storage, between the devices and subsystem storage, and between the channels and the devices.

Each storage director performs the following:

- Receives and sends commands, status, and data.
- Sends and receives control information to and from the control module in the DASD.
- Controls the operation of the channel interface and the control interfaces.
- Determines which data to place in or remove from the subsystem storage.
- Performs error recovery procedures (ERPs) inside the subsystem storage.
- Manages the subsystem storage directory.
- Communicates with the other storage director.

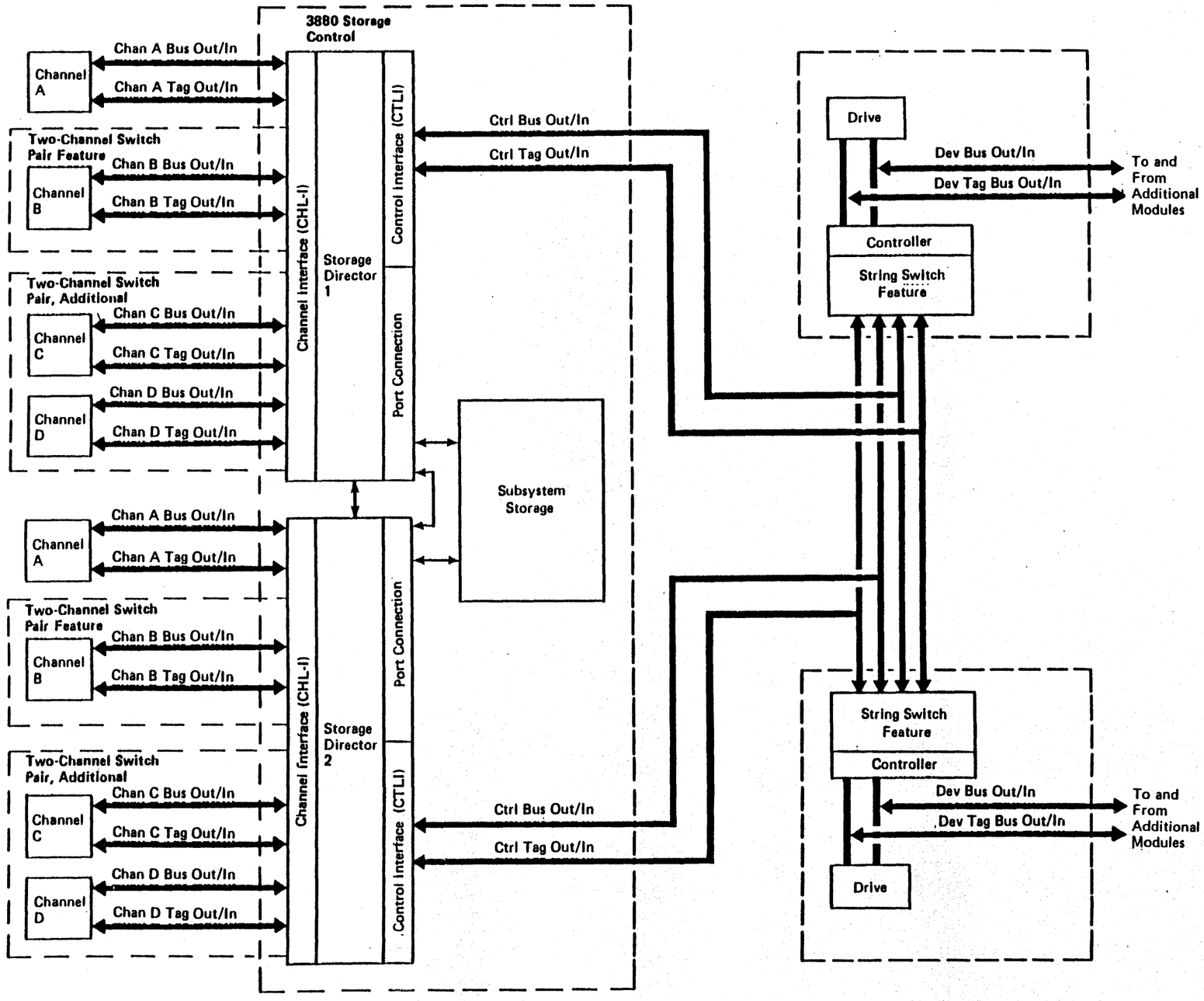
The management of the subsystem storage is performed equally by both storage directors without aid from the attached host processor.

Control Interfaces

There are two control interfaces available for the 3880. For the Model 21, a unidirectional (2-cable) bus in/out and tag in/out is used.

The figure on this page shows the unidirectional control interface of the Model 21 attaching to IBM 3350 devices.

On the left are the channel paths attaching to the storage directors, which in turn attach to the subsystem storage. Shown on the right are the attached devices.



3880 MIM							
	Seq AC0001	PN 6315670 11 of 22	881143 13 Jan 84	881216 15 Aug 84	A15621 01 Apr 85	A06162 15 May 85	

© Copyright IBM Corp. 1984,1985

The IBM 3880 Storage Control Model 23 with subsystem storage connects a channel(s) to subsystem storage and/or a DASD.

The Model 23 contains two storage directors: Storage Director 1 (SD1) and Storage Director 2 (SD2). Both storage directors contain the subsystem controls and data paths needed to move data between the channels and subsystem storage, between the devices and subsystem storage, and between the channels and the devices.

Each storage director performs the following:

- Receives and sends commands, status, and data.
- Sends and receives control information to and from the control module in the DASD.
- Controls the operation of the channel interface and the control interfaces.
- Determines which data to place in or remove from the subsystem storage.
- Performs error recovery procedures (ERPs) inside the subsystem storage.
- Manages the subsystem storage directory.
- Communicates with the other storage director.

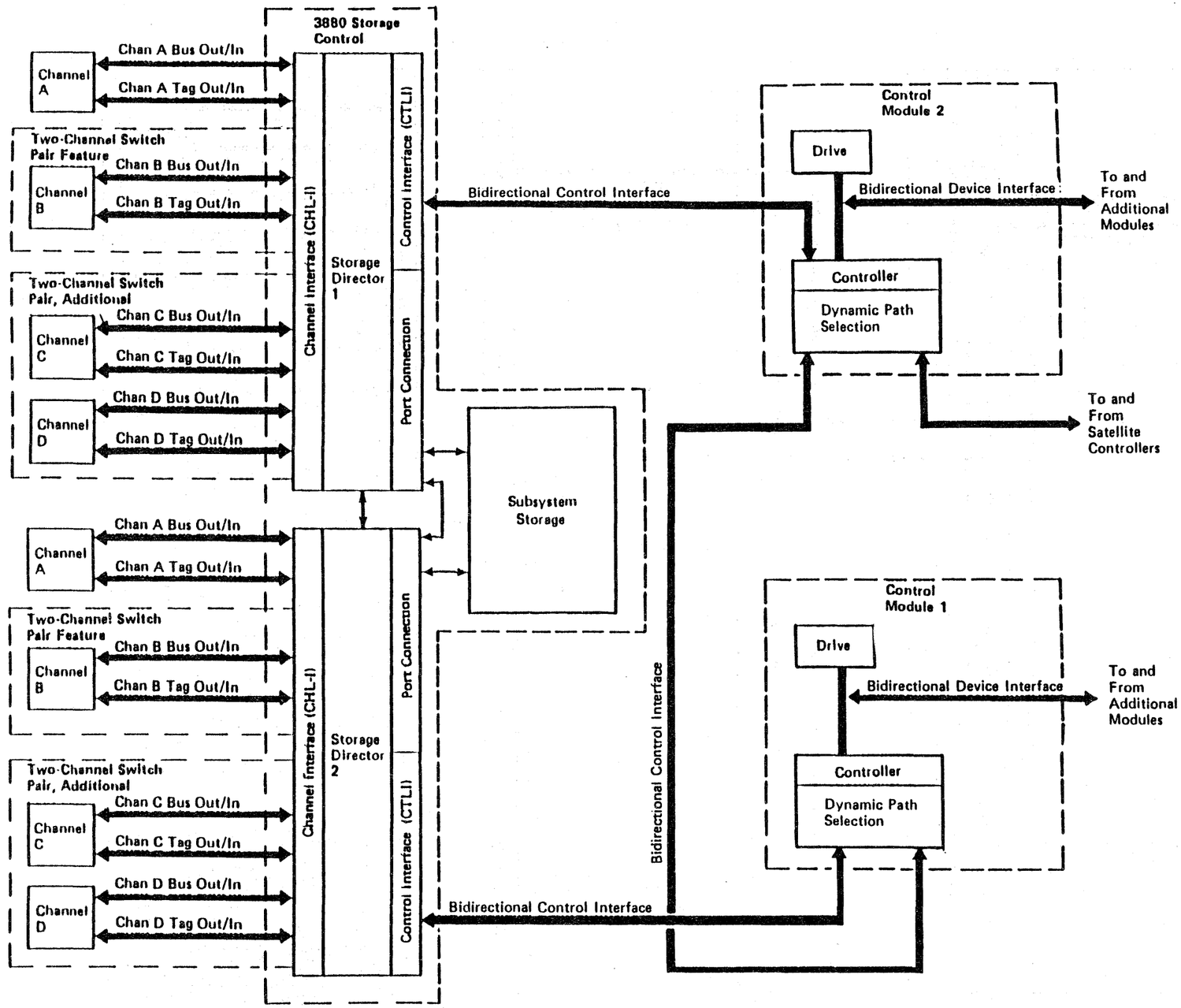
The management of the subsystem storage is performed equally by both storage directors without aid from the attached host processor.

Control Interfaces

There are two control interfaces available for the 3880. For the Model 23, a bidirectional bus/tag cable is used.

The figure on this page shows the bidirectional control interface of the Model 23 attaching to IBM 3380 devices.

On the left are the channel paths attaching to the storage directors, which in turn attach to the subsystem storage. Shown on the right are the attached devices.



3880 MIM	Seq AC0001	PN 6315670 12 of 22	881143 13 Jan 84	881216 15 Aug 84	A15621 01 Apr 85	A06162 15 May 85	

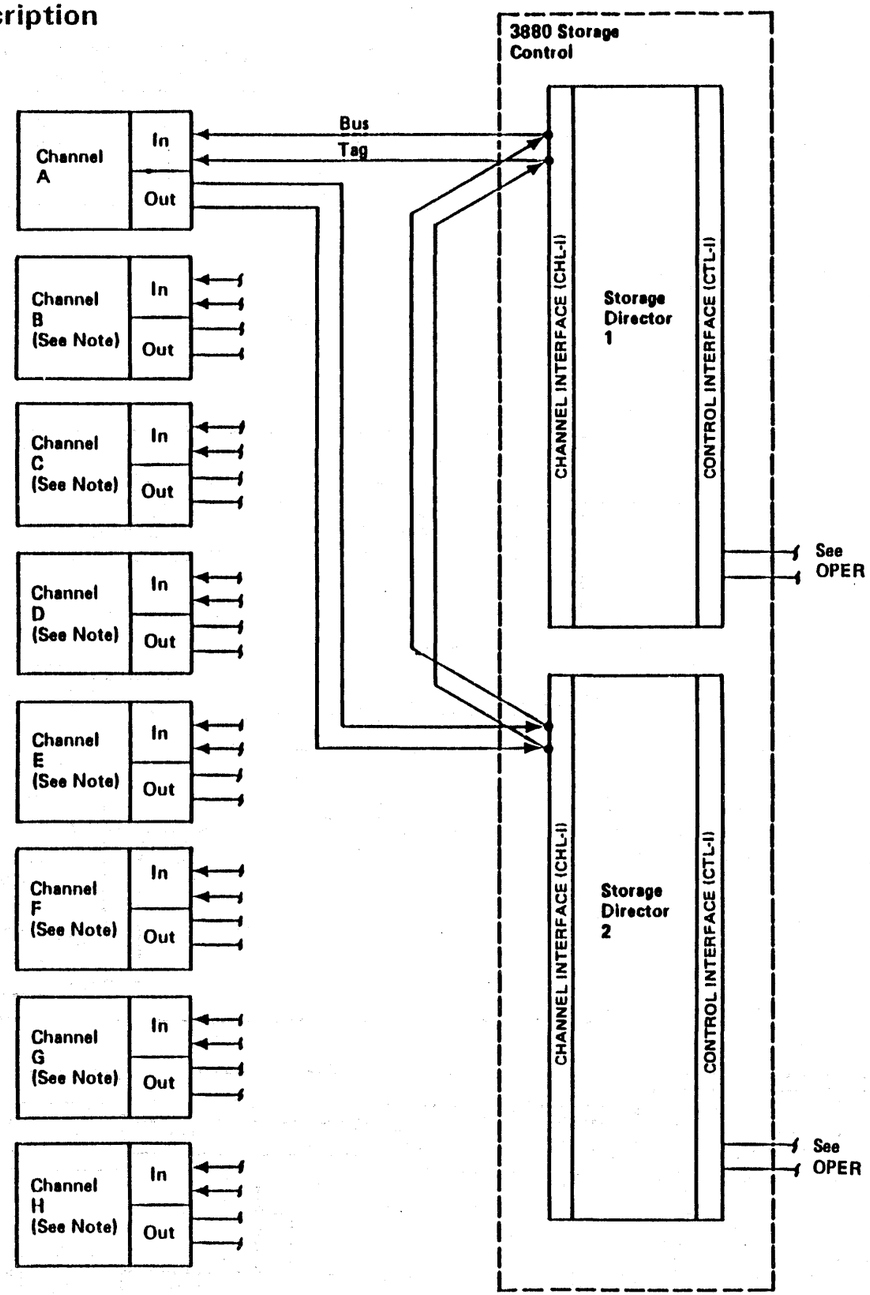
© Copyright IBM Corp. 1984, 1985

Four Channel Switch, Additional Feature

This feature gives each storage director in the Model 23 access to eight channels.

This feature is not supported on the Model 21, and it is of no advantage on the Model 23 unless the Model 23 is installed in a dual frame configuration.

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



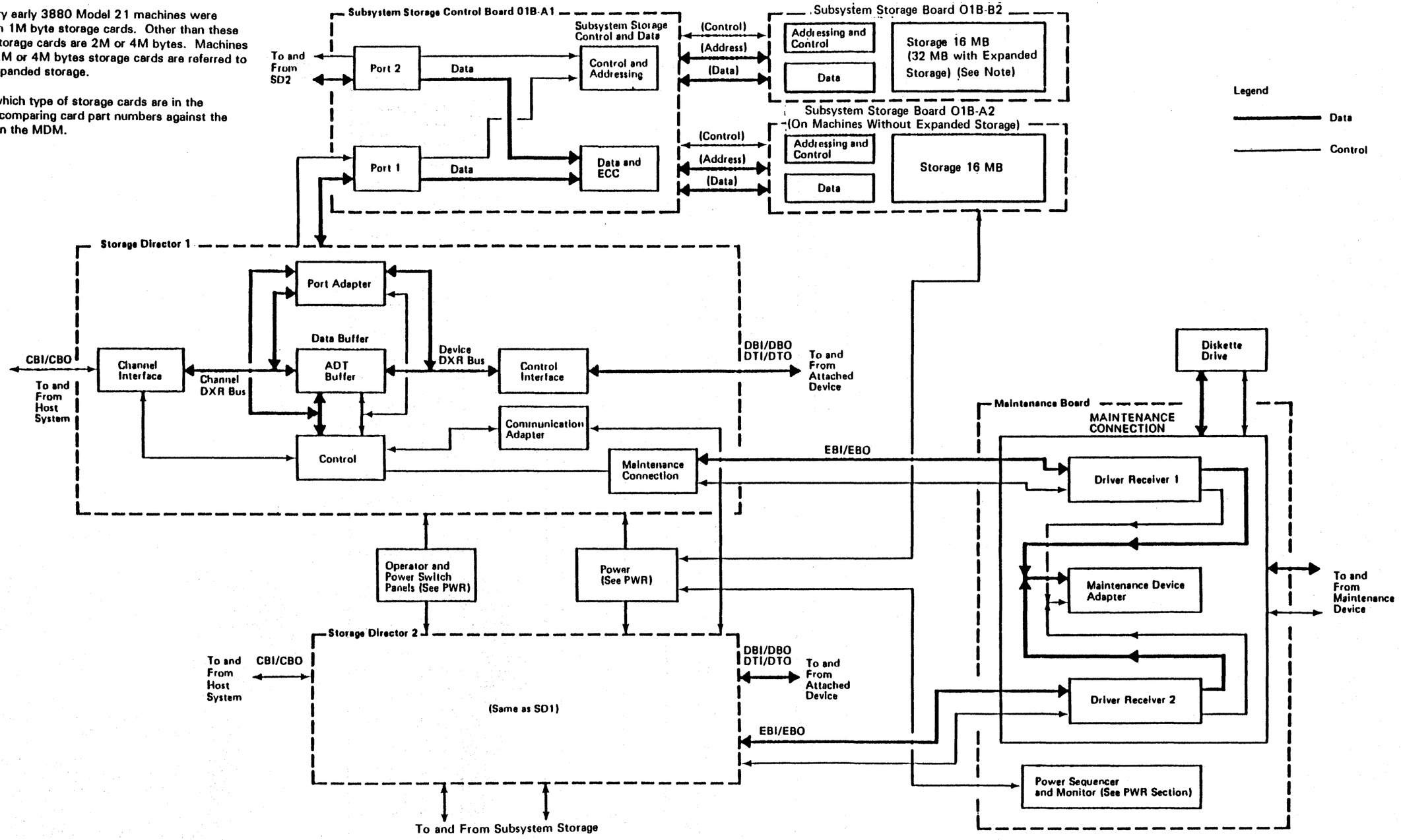
© Copyright IBM Corp. 1984, 1985

3880 Storage Control Data Flow INTRO 40

The figure on this page shows the data flow of storage director 1. The data flow of storage director 2 is the same.

Note: Very early 3880 Model 21 machines were shipped with 1M byte storage cards. Other than these machines, storage cards are 2M or 4M bytes. Machines having the 2M or 4M bytes storage cards are referred to as having expanded storage.

Determine which type of storage cards are in the machine by comparing card part numbers against the plug charts in the MDM.

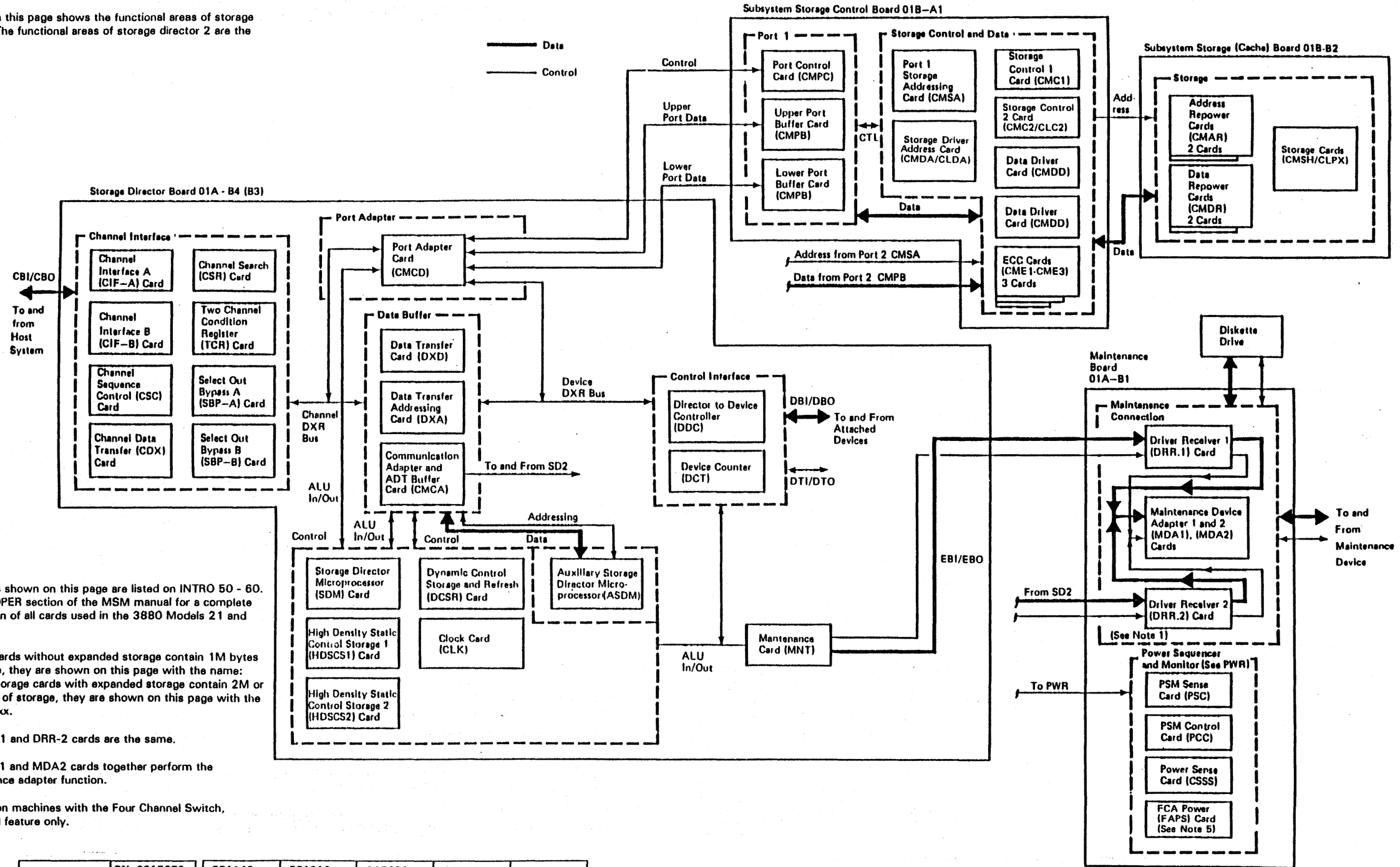


3880 MIM							
	Seg AC0001	PN 6315670 14 of 22	881143 13 Jan 84	881216 15 Aug 84	A15621 01 Apr 86	A06162 15 May 85	

© Copyright IBM Corp. 1984, 1985

3880 Storage Control Functional Areas

The figure on this page shows the functional areas of storage director 1. The functional areas of storage director 2 are the same.



Notes:

1. The cards shown on this page are listed on INTRO 50 - 60. See the OPER section of the MSM manual for a complete description of all cards used in the 3880 Models 21 and 23.
2. Storage cards without expanded storage contain 1M bytes of storage, they are shown on this page with the name: CMxx. Storage cards with expanded storage contain 2M or 4M bytes of storage, they are shown on this page with the name: CLxx.
3. The DRR-1 and DRR-2 cards are the same.
4. The MDA1 and MDA2 cards together perform the maintenance adapter function.
5. Installed on machines with the Four Channel Switch, Additional feature only.

© Copyright IBM Corp. 1984, 1985

Channel Features

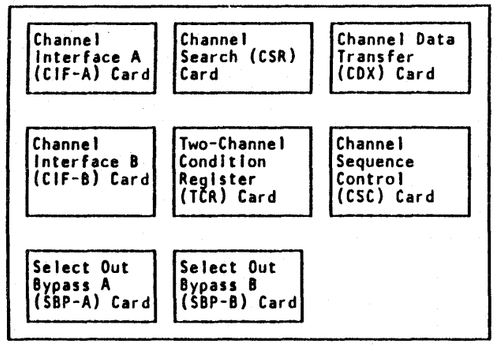
The figures on this page show the Channel Interface (CHL-I) functional area of the 3880 for the Two Channel Switch-Pair feature (the minimum configuration) and the Two Channel Switch-Pair, Additional feature.

Note: The figures on this page are about channels attached to either storage director. Board locations for storage director 1 are shown first and the locations for storage director 2 are shown in parentheses.

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 with the second channel. 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 B3 board for storage director 2, as shown below.

Storage Director Board B4 (B3) with the Standard Two Channel Switch-Pair

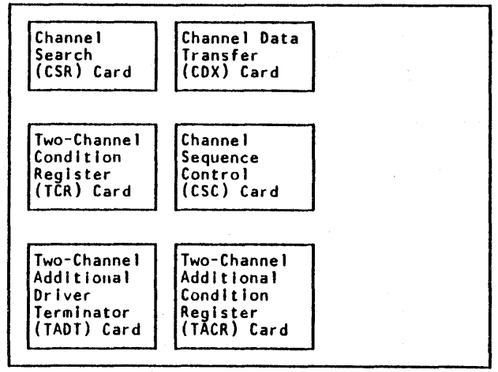


Two Channel Switch-Pair, Additional Feature

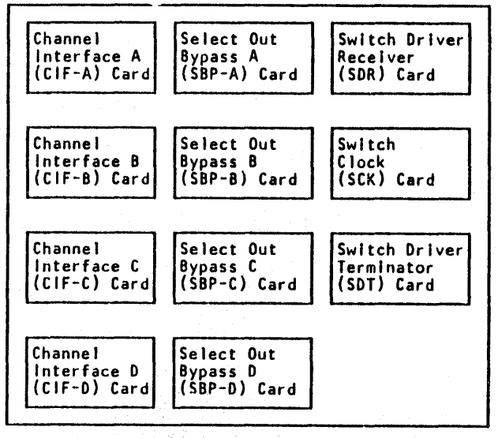
With the Two Channel Switch-Pair, Additional Feature, an additional board is required for each storage director: board 01A-A4 for storage director 1 and board 01A-A3 for storage director 2. The cards necessary for this feature and the boards on which they are located are as shown below.

© Copyright IBM Corp. 1984, 1985

Storage Director Board B4 (B3) with Two Channel Switch-Pair, Additional feature



Two-Channel Switch-Pair, Additional Board A4 (A3)

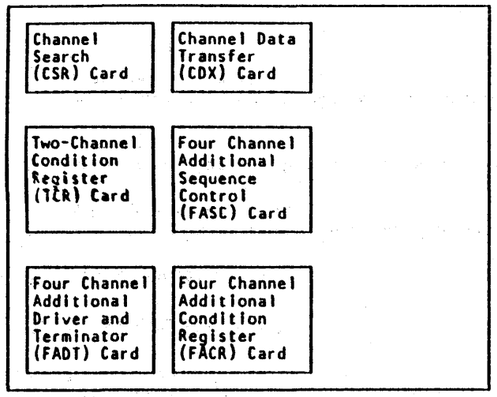


Channel Features (Continued)

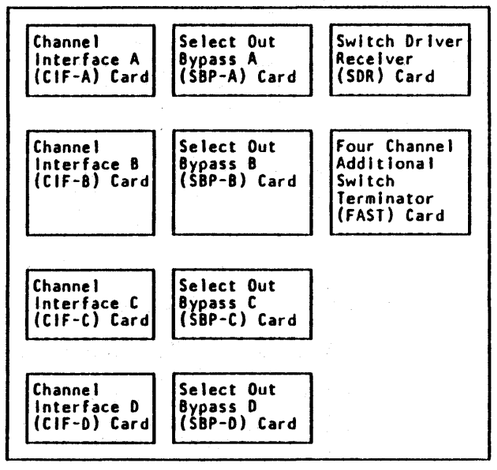
Four Channel Switch, Additional Feature

The figures on this page show the Channel Interface (CHL-I) functional area of the 3880 for the Four Channel Switch, Additional feature.

Storage Director Board B4 (B3)

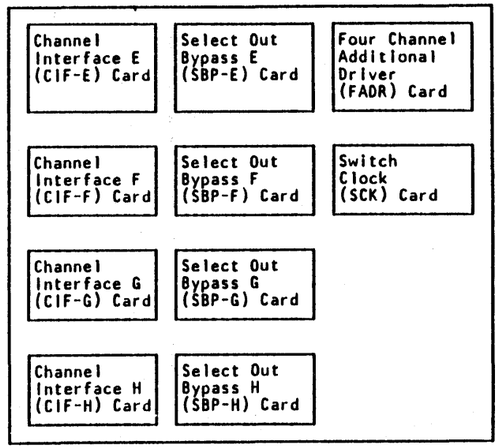


Two-Channel Additional Board A4 (A3)



© Copyright IBM Corp. 1984, 1985

Four Channel Additional Board A2 (A1)



Each 3880 Storage Control contains the following functional areas:

- Channel Interface (2)
- Port Adapter (2)
- Data Buffer (2)
- Control (2)
- Control Interface (2)
- Port (2)
- Subsystem Storage Control and Data
- Subsystem Storage (cache)
- Maintenance Connection
- Diskette Drive
- Operator and power switch panels
- Power

The following pages give a summary of the functional areas. The figure on INTRO 42 shows the 3880 storage control functional areas.

See the OPER section in the MSM manual for a complete description of all the cards used in the 3880.

Functional areas with a (2) mean that there is one functional area for each storage director.

Channel Interface (2)

The channel interface (CHL-I):

- Moves data between the channel and the data buffer and port adapter functional areas.
- Sends control information from the channel to the control functional area
- Detects and informs the control functional area of the status of the channel tag lines.

Channel Interface Cards

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

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

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

The minimum configuration for a Model 21 and 23 is a two channel switch-pair channel configuration. Cards A and B are for the Two Channel Switch-Pair feature.

Cards C and D are added by the Two Channel Switch-Pair, Additional feature.

Cards E, F, G, and H are added by the Four Channel Switch, Additional feature.

© Copyright IBM Corp. 1984,1985

Port Adapter (2)

The port adapter functional area controls data movement between the channel interface, device interface, data buffer, and port functional areas.

Data Buffer (2)

The data buffer:

- Moves data between the channel interface and the control interface and between either of these interfaces and the subsystem storage.
- Moves data concurrently between the channel, the device, and the subsystem storage.

Data Buffer Cards

The data buffer functional area contains the following cards:

- Data transfer data card (DXD)
- Data transfer address card (DXA)
- Communication adapter and ADT buffer card (CMCA)

Control (2)

The control (CTRL) functional area contains a microprocessor that controls all the functional areas in a storage director.

Control Cards

The control functional area contains the following cards:

- Storage director microprocessor
- High density static control storage 1 and 2
- Dynamic control storage and refresh
- Clock
- Auxiliary storage director microprocessor

Control Interface (2)

The control interface (CTL-I):

- Moves data between the data buffer or port adapter 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.

The control interface (CTL-I) sends data to and receives data from a disk device through two separate unidirectional buses for Model 21 or a bidirectional bus for Model 23. Data is sent one byte at a time in a Model 21 and two bytes at a time in Model 23.

Control Interface Cards

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

- Director-to-device controller
- Device counter

Port (2)

The port functional area is the interface between the storage director microprocessor (SDM) and the storage control. This functional area:

- Contains the control cards and data buffers to permit automatic data transfers between the channel or device and subsystem storage
- Generates controls which permit data transfers between the storage and the ADT buffer.
- Acts as an interface between the storage director microprocessor (SDM) and the storage control
- Informs the control functional area of the status of the subsystem storage port and storage control and data functional area.

Port Cards

The port functional area contains the following cards:

- Port control connection (CMPC) card
- Port buffer (CMPB) card

Subsystem Storage Control and Data

The subsystem storage control and data functional area provides:

- Single and double bit error correction
- Triple bit error detection
- Data drivers
- Address drivers
- Storage read and write controls

Subsystem Storage Density

Very early 3880 Model 21 machines were shipped with 1M bytes storage cards. Other than these machines, storage cards are 2M or 4M bytes. Machines having the 2M or 4M bytes storage cards are referred to as having expanded storage.

You may determine which type of storage cards are in the machine by comparing card part numbers against the plug charts in the MDM.

© Copyright IBM Corp. 1984,1985

Subsystem Storage Control and Data Cards for Machines Without Expanded Storage

The subsystem storage control and data functional area contains the following cards:

- Storage address (CMSA) card
- Storage address driver (CMDA) card
- Storage control 1 (CMC1) card
- Storage control 2 (CMC2) card
- Storage data driver 0-35 (CMDD) card
- Storage data driver 36-71 (CMDD) card
- Error correction code ECC1 (CME1) card
- ECC2 (CME2) card
- ECC3 (CME3) card

Subsystem Storage Control and Data Cards for Machines With Expanded Storage

The subsystem storage control and data functional area contains the following cards:

- Storage address (CMSA) card
- Storage address driver (CLDA) card
- Storage control 1 (CMC1) card
- Storage control 2 (CLC2) card
- Storage data driver 0-35 (CMDD) card
- Storage data driver 36-71 (CMDD) card
- Error correction code ECC1 (CME1) card
- ECC2 (CME2) card
- ECC3 (CME3) card

Subsystem Storage

The subsystem storage:

- has 8, 16, 32, 48, or 64 megabytes of subsystem storage
- Repowers address and data lines

Subsystem Storage Cards for Machines Without Expanded Storage

There are three types of cards on the subsystem storage board:

- Address Redrive (CMAR) Card
  - Each CMAR card sends the addresses to two storage cards for every storage request.
  - Each storage board has two CMAR cards.
- Data Redrive (CMDR) Card
  - Each CMDR card drives data to one-half of the cards in a board for each storage request.
  - There are two CMDR cards in each storage board.
- Storage (CMSH) Card
  - Each storage card contains one megabyte of data.
  - Each storage board can have 16 CMSH cards.

Subsystem Storage Cards for Machines With Expanded Storage

There are three types of cards on the subsystem storage board:

- Address Redrive (CLAR) Card
  - Each CLAR card sends the addresses to two storage cards for every storage request.
  - The storage board has two CLAR cards.
- Data Redrive (CMDR) Card
  - Each CMDR card drives data to one-half of the cards in a board for each storage request.
  - There are two CMDR cards in each storage board.
- Storage (CLP2 or CLP4) Card
  - The storage card contains 4 megabytes of data.
  - The storage board may have 8 CLP4 cards.

Maintenance Connection

The maintenance connection (MNT-C):

- Connects the maintenance device to a storage director
- Supplies a connection between the storage directors and the channel interface for sense data in case one storage director fails.

The maintenance connection is shared by the storage directors.

Maintenance Connection Cards

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

© Copyright IBM Corp. 1984,1985

Note: The following functional areas are shared by both storage directors.

Diskette Drive

The diskette drive contains the functional diskette. The functional diskette contains the functional and diagnostic microcode and the device that loads the functional microcode.

See the OPER section of the MSM manual for a description of the diskette drive parts.

Operator and Power Switch Panels

The operator panel contains:

- Subsystem Power On/Off switch for the 3880 Storage Control and each storage director.
- Channel Enable/Disable switches that connect each channel to the storage director. (See the PWR section for details.)
- Unit Emergency Power Enable/Power Off switch gives operator control of subsystem power in case of an emergency. This switch, if turned off, must be manually reset before power can be restored.

The power switch panel contains the:

- Power Select switch that is in either the Remote or Local position
- Device Power Sequencing switch that controls the power up sequencing to the devices attached to the 3880.
- Maintenance Power On switch that switches on 3880 power.
- Subsystem storage power switch that controls the dc power to the subsystem storage and resets the subsystem storage power sense register and the power check indicator.
- Power system switch that controls the storage director power supply during maintenance and resets the Power Check indicator.
- Storage director 1 switch that controls the dc power to storage director 1.
- Storage director 2 switch that controls the dc power to storage director 2.
- Subsystem storage mode switches (1 per port) that prevent the associated storage director from addressing the port.

See the PWR section in this manual for a detailed description of the power switch panel.

Note: When the subsystem storage mode switches have been set to the diagnostic position, the MD 'end of call' routine must be used to allow the subsystem storage to come back online.

Power

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

Power up and power down sequences are controlled by the power sequencer and monitor located on the maintenance board. The subsystem storage has its own power system which can be switched on or off without interrupting the 3880 storage director operations. See the PWR section for details.

© Copyright IBM Corp. 1984, 1985

3880 Storage Control Functional Areas (Cont.) INTRO 60

Channel Switching and Device Reservation

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 circuits 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 allegiance).

The Device Reserve command reserves the device to the channel that sends the command. All devices can be reserved. The Device Release command terminates the reservation of the addressed device from the channel. (Device Reserve and Device Release commands are used in direct mode only in the Model 21.)

A device address reserved to one channel or being used by one channel presents Device Busy status when another channel attempts selection.

Two Channel Switch–Pair Feature

The Two Channel Switch–Pair feature (the minimum configuration) enables two channels, channels A and B, to share a storage director.

The channels can be attached to the same or different processing units. (See INTRO 30, 34, and 45 for more information on channel switch features.)

Two Channel Switch–Pair, Additional Feature

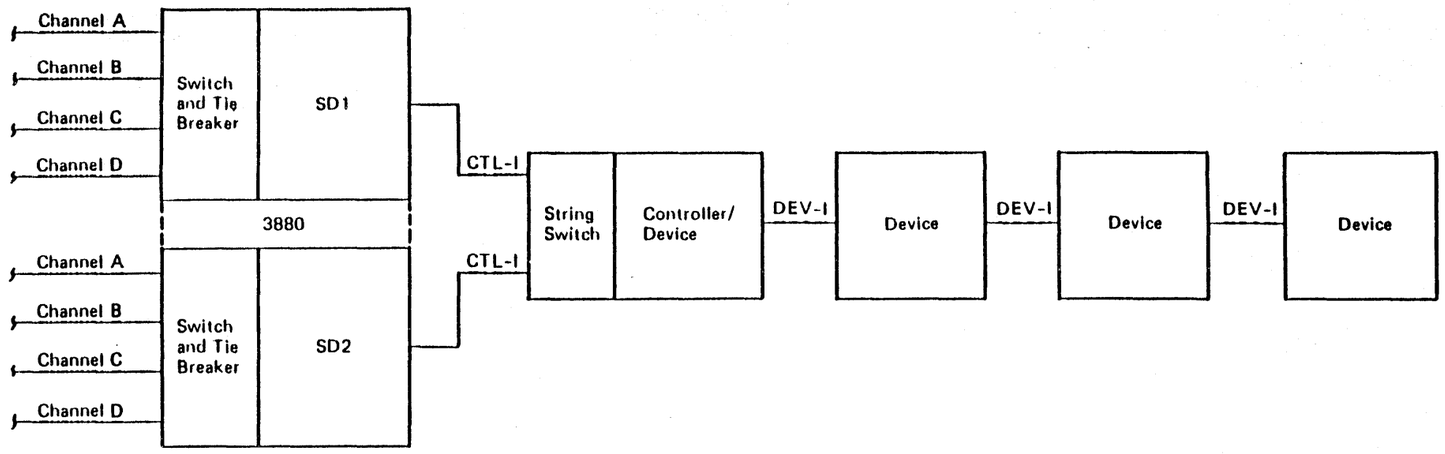
The Two Channel Switch–Pair, Additional feature (TCA) adds channels C and D to both storage directors.

The channels can be attached to the same or different processing units. (See INTRO 30, 34, and 45 for more information on channel switch features.)

Four Channel Switch, Additional Feature

The Four Channel Switch, Additional feature (FCA) adds channels E, F, G, and H to both storage directors. This feature gives a total of eight channels that are shared by both storage directors.

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.

© Copyright IBM Corp. 1984, 1985

Legend

Contents

Error Code and Maintenance Support Manuals **5**
Graphic Symbols and Lines 5

Error Code and Maintenance Support Manuals **10**
Maintenance Support Manual Block and Logic Diagrams Symbols . 10
Remote Communication Manual Card Symbol 10
Logic Reference Page 15
Logic Lines 15
Card Pin Locations 15
Card Description 15

Logic Reference Page **20**

Logic Reference Manual (LRM) **25**
LRM Cross Reference Page 25
Line Number 25
Signal Line Name 25
Card Pin Location 25
Sheet and Line Number 25
Sheet Sequence Number 25

Logic Reference Manual Cross Reference Page **30**

Logic Reference Manual **30**

Maintenance Diagrams Manual **35**
Pin/Net Lists 35

References to Other Sections

See the Logic Reference Manual for crossover connector locations on the gate boards.

© Copyright IBM Corp. 1984,1985

Contents LGND 1

Graphic Symbols and Lines

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

Keys

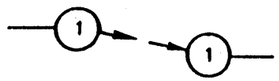
PRIMARY KEY

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

SECONDARY KEY

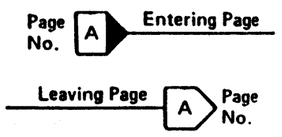
Reverse letter in a black circle. Used in text when keying to a test point symbol in a diagram.

Connectors



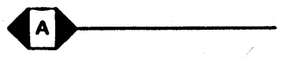
ON-PAGE CONNECTOR

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

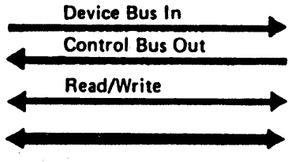
Connection between diagrams on separate pages. Letter keys are used to identify corresponding points.



BIDIRECTIONAL CONNECTOR

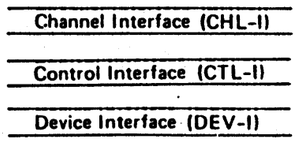
Connection between diagrams on separate pages. Letter keys are used to show flow in both directions.

Bus, Interface, and Control Lines



MINOR BUS LINES (Data Flow)

MAJOR BUS LINE

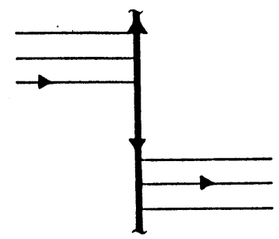


INTERFACE BETWEEN IBM MACHINES

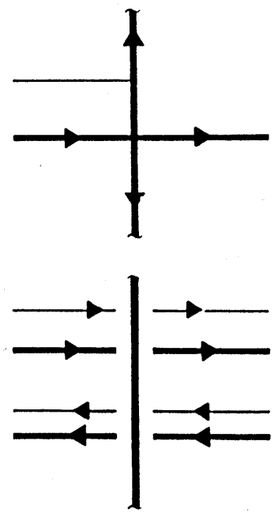
CONTROL LINES

Crossed lines, not connected

Crossed lines, connected

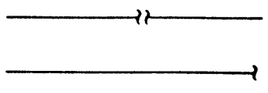


Bus or cable with multiple control lines entering and exiting.



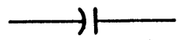
Bus and control lines that connect to a bus.

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

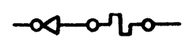


Capacitors

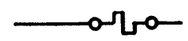
When required for safety or circuit operation, the use of the curved line represents the following:

- 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

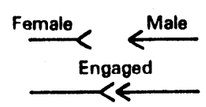


This symbol is used as a circuit breaker (CB) or a circuit protector (CP) that can be turned on or turned off as a switch.



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.

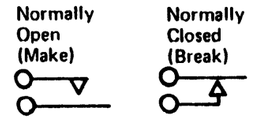
Connectors



MANUAL DISCONNECT

Contacts

RELAY



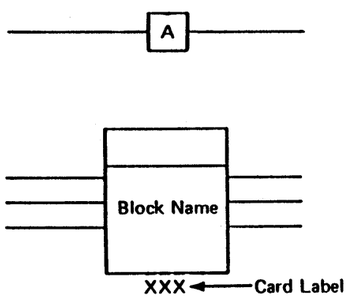
Ground

EARTH

Earth potential or a structure acting as a ground.

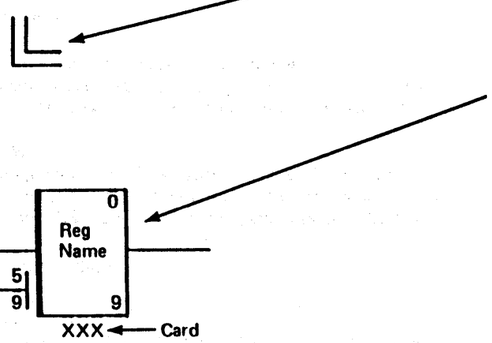
© Copyright IBM Corp. 1984, 1985

Maintenance Support Manual Block and Logic Diagram Symbols

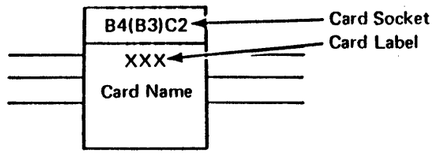


AND Block

Block Diagrams



Remote Communication Manual Card Symbol



Crossover Connector

This symbol represents the cut corner on a top-card crossover connector. See the Block Diagram Manual for the correct position of crossover connectors on gate boards.

Registers

Registers can be horizontal or vertical. Input or output lines that pick up the complete register (all bit positions) are connected directly to the block. Partial register transfer is shown with a numbered parallel line.

© Copyright IBM Corp. 1984, 1985

Logic Reference Page

The text on this page makes reference to the drawing on LGND 20.

The logic reference page is one of a multi-page set in the Logic Reference Manual (LRM). (The first page of the set is the logic reference page.) The logic reference page describes the function of a 3880 card.

The logic flow through the logic reference page is from left to right; signals enter the left side of the page, flow through the logic, and exit on the right. Bidirectional busses, however, are always shown on the right side of the page.

Logic Lines

All I/O signal lines (at the left and right edges of the page) are named 1 or 5; and each has the active polarity indicated by a plus or minus symbol in front of the name. Each is assigned a number 6 on the vertical scale that matches an entry on the cross reference page.

Card Pin Locations

Card pin locations 4 are shown on the logic reference page for all single data and control lines that enter or leave the card. These pin locations and the line names appear on the cross reference page.

All bus lines entering or leaving the card have an asterisk in place of the pin location 3. The cross reference page contains the line names and pin locations of the bus lines.

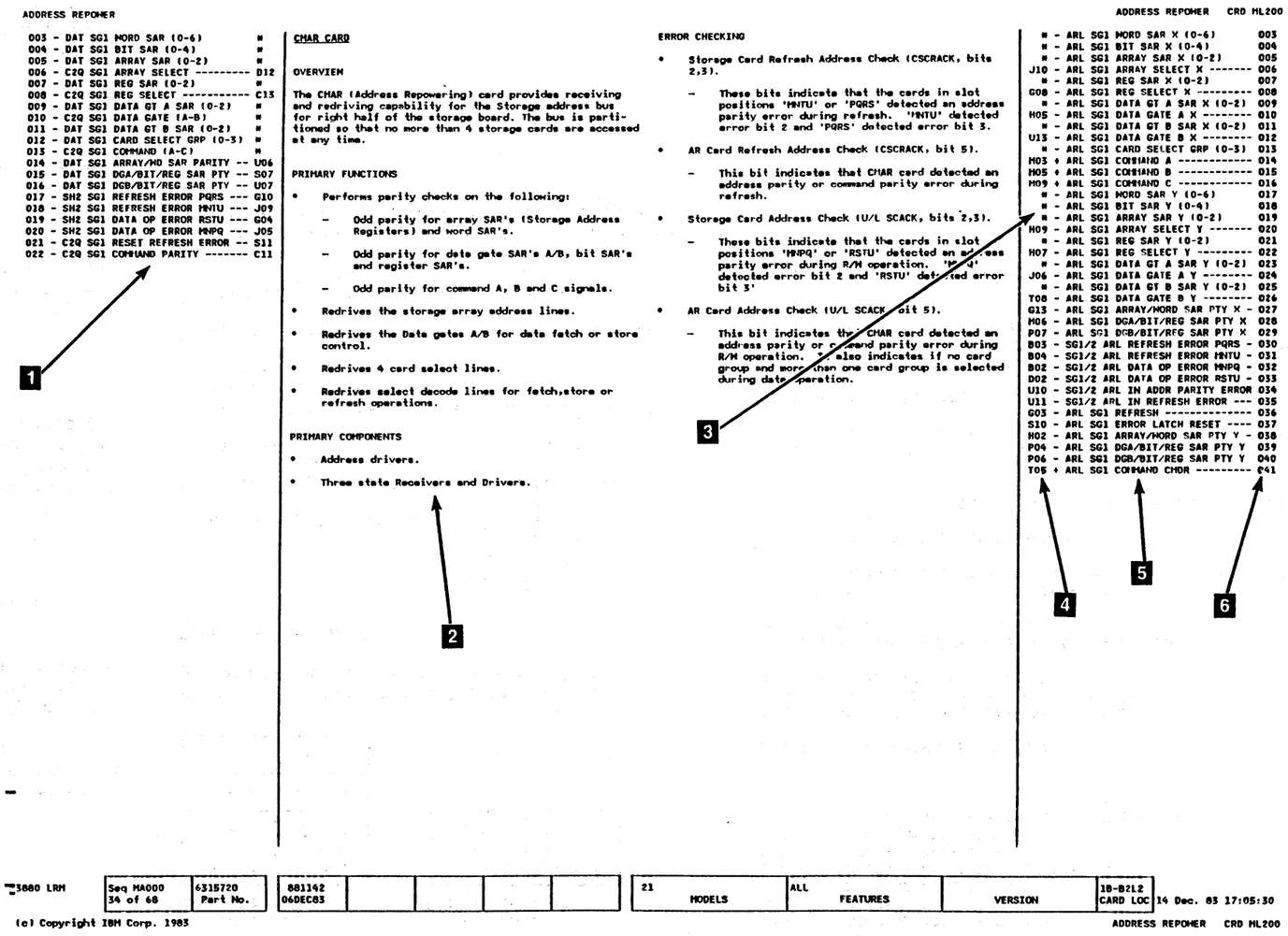
Card Description

The center area of the block diagram 2 contains a description of the card.

3880 MIM	Seq AE0001	PN 6315671 4 of 8	881143 13 Jan 84	881216 15 Aug 84	A15621 01 Apr 85		

© Copyright IBM Corp. 1984, 1985

Example of A Logic Reference Manual Page



3880 MIM	Seq AE0001	PN 6315671 5 of 8	881143 13 Jan 84	881216 15 Aug 84	A15621 01 Apr 85		

© Copyright IBM Corp. 1984,1985

LRM Cross Reference Page

The text on this page makes reference to the drawing on LGND 30.

The LRM cross reference page is one of a multi-page set in the Logic Reference Manual. It contains a list of the following:

- Input/output (I/O) pins for the card shown on the associated logic reference page
- Active levels (polarities) for the I/O pins
- Signal line names
- Other card pins in the signal network

Line Number

Each cross reference page entry starts with a four-character, alphanumeric identifier **1** that indicates the vertical position of a signal line on either side of the logic reference page.

The alphabetic character indicates the side of the diagram the line is located on: L for left or input side, R for right or output side. The three numeric characters indicate the vertical position of the line on the sides of the diagram.

Example: L020 **7** is an input line on the left side of the diagram that is 20 spaces down from the top.

Signal Line Name

The signal line name and its active polarity **2**, **8** are shown on the cross reference page to aid in tracking the line. The same signal line name appears on the logic reference page associated with the cross reference and on any other logic reference page set where the signal line starts or ends.

Card Pin Location

The first level of card pin information **3** identifies the pin location of the signal line on the card represented by the logic reference page. The card position for the pin number matches the card position for this logic reference page. See the card location in the lower right corner **9**.

All other levels of pin information **4**, **6** identify the card and pin that the signal line is connected to. See Fig. 1 for a description of the symbols used in these entries.

Sheet and Line Number

The sheet and line number entries **5** indicate all other pages where the signal line can be found. The first level entry indicates the logic reference page associated with this cross reference page. All other entries indicate other logic reference or cross reference pages.

Sheet Sequence Number

The sheet sequence number **10** identifies the logic/cross reference page set, the cross reference page, and the logic reference page. This number is the same on each logic/cross reference page of the set.

How to Convert Card Location to LRM Page

The first character of the LRM page number represents the gate and board location, as indicated in the following charts.

01A Gate Board Locations

A1 = A	B1 = E
A2 = B	B2 = F
A3 = C	B3 = G
A4 = D	B4 = H

01B Gate Board Locations

A1 = J	B1 = L
A2 = K	B2 = M

The next two characters of the LRM page number represent the card location. The last two characters are (usually) zeros.

Example: For card location

01A B3 F2

1. Use chart for 01A gate
2. B3 translates to G the first letter of the LRM page → G
3. The card location is the second and third letter of the LRM page. → GF2
4. Add two 00s → GF200
5. Therefore, LRM page GF200 represents the card at location 01A-B3F2.

If the card has more information (circuits) than can be shown on one LRM page the second page for this card would be labeled GF210.

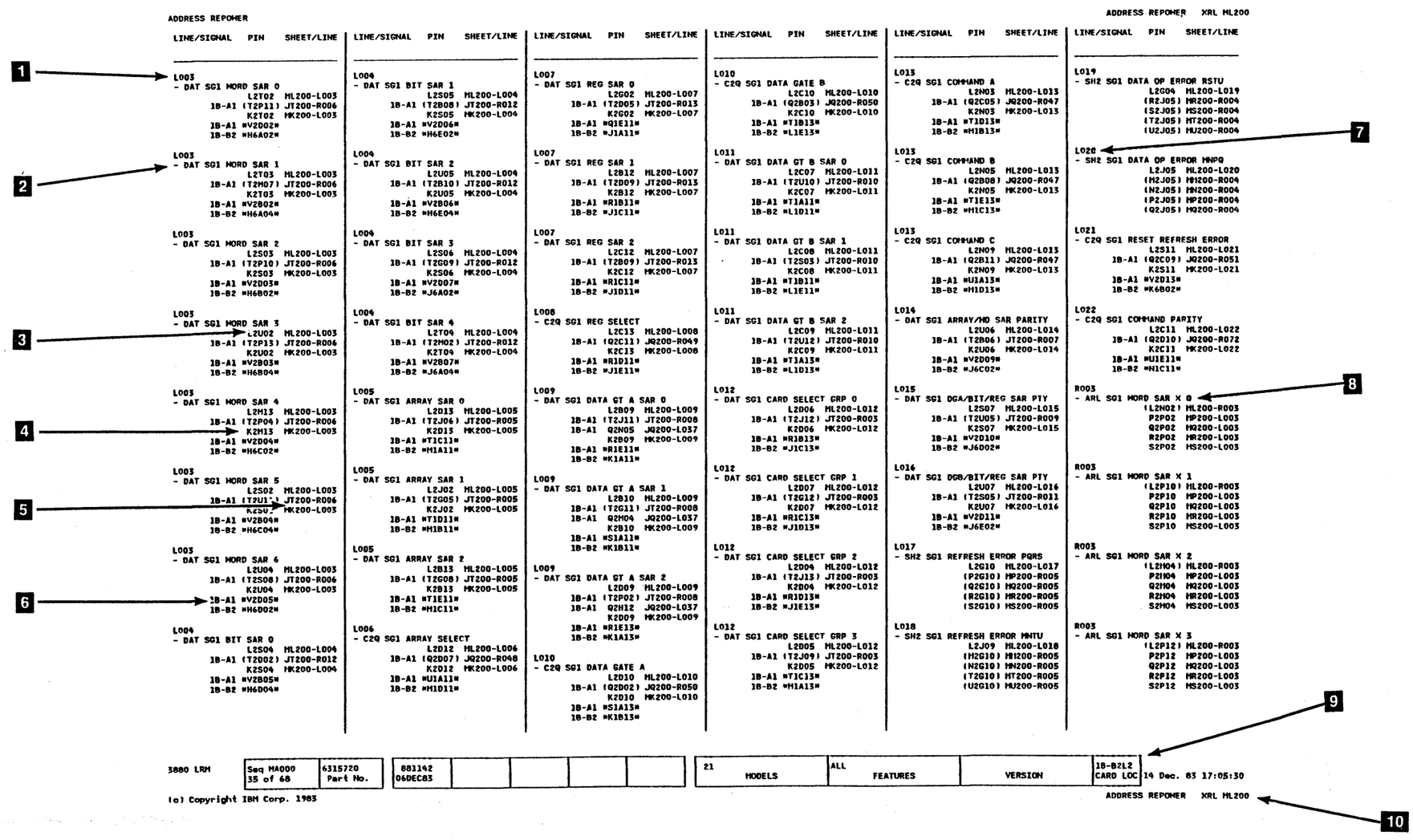

```
                    B O A R D   L O G I C   I N D E X   P A G E   BLI AA000

GLOSSARY OF ABBREVIATIONS USED
ABBR.    EXPLANATION
-------  ------------------------------------------------------------

ASDM     AUXILIARY STORAGE DIRECTOR MICROCONTROLLER
BLI      BOARD LOGIC INDEX
CD       CARD (MICROFICHE)
CRD      CARD REFERENCE DIAGRAM
EW       ELECTRONIC WRAP
FRM      FRAME (MICROFICHE)
HDSCS    HIGH DENSITY STATIC CONTROL STORAGE
IR       INDIRECT REGISTER
PA       PORT ADAPTER (CMCD CARD)
SAR      STORAGE ADDRESS REGISTER
SB1      STORAGE BOARD 1
SD1      STORAGE DIRECTOR 1
SDM      STORAGE DIRECTOR MICROCONTROLLER
XRL      CROSS REFERENCE LIST
2X1      TWO CHANNEL SWITCH
4X1      TWO CHANNEL ADDITIONAL OR FOUR CHANNEL


NOTES USED ON CROSS REFERENCE PAGES

THE LEGEND ON THE CROSS REFERENCE PAGES
SHOW  (   ) AS THE SOURCE(S) OF THE SIGNAL
AND   *   * AS THE CABLE SOCKET PINS

IN ADDITION THE FOLLOWING SPECIAL DESIGNATIONS
WILL ALSO SHOW ON THESE PAGES

        *AANNN*          FOLLOWED BY
   +2-CH *AANNN* INDICATES PREWIRING FOR TWO CHANNEL ADDITIONAL
   ->MDM *AANNN* REFERENCES MDM PAGE

   ->MNT *DEV  * INDICATES A LINE TO THE MAINTENANCE DEVICE


NOTE: THE LINE NAME IN THE MDM MANUAL FOR A GIVEN NET WILL IN
      GENERAL NOT MATCH THE LINE NAME IN THE LRM EXACTLY.

NOTE: MANY OF THE LINE NAMES ARE OF THE FORM
            '+ PPS BBB SIGNAL NAME'
      WHERE 'PP' IS THE LAST TWO CHARACTERS OF THE PNAME OF THE
      SOURCE.  'S' IS THE BOARD POSITION ON THE SOURCE AND 'BBB'
      IS A BOARD WITH WHICH THE LINE IS ASSOCIATED.
```

Fig. 1. Excerpt From Board Logic Index Page

3880 MIM	Seq AE0001	PN 6315671 6 of 8	881143 13 Jan 84	881216 15 Aug 84	A15621 01 Apr 85		

© Copyright IBM Corp. 1984,1985

Logic Reference Manual Cross Reference Page



© Copyright IBM Corp. 1984,1985

Maintenance Diagrams Manual LGND 35

Pin/Net Lists

Pin/Net lists are not supplied for the 3880 Models 21 and 23. To check or repair a net, use the cross reference pages in the Logic Reference Manual (volume R70).

The Maintenance Diagrams Manual (volume R30) contains listings of voltage pins.

© Copyright IBM Corp. 1984,1985

Maintenance Diagrams Manual LGND 35

Glossary

A. Address.

abnormal. Not normal or usual.

Abort. To terminate or cancel prematurely.

abstract. Short description or summary.

ac, AC. Alternating current.

accept, accepting, accepted. To receive or take.

accessing. Moving the read/write head to a data track.

Accessor. The access mechanism that moves the read/write head in DASD.

accomplish, accomplishing, accomplished. To complete.

according to. As stated.

account. A customer installation.

accumulate, accumulating, accumulated. To collect.

acknowledge. Answer.

actively attached. Running, operational.

activity. An action or process.

ACTL. Auxiliary Storage Director Microprocessor Control Register.

actual. Real.

ADDR, addr, adr. Address.

adjacent. Next to.

ADT. Automatic data transfer.

ADTC. Automatic data transfer control.

ADTM. Automatic data transfer multiplexer.

Advantage. Superiority of position or condition.

ALD. Automated logic diagram.

alert. Attention or alarm.

Allegiance. Obligation or loyalty.

allocate, allocating, allocated. To reserve for a specific propose.

allow, allowing, allowed. To let or permit.

alter. Change.

alternative. Another selection.

ALU. Arithmetic and logic unit.

AM. Address mark.

amplifier. A circuit that increases signal voltage or current.

amplifies. Increases the signal voltage or current.

AND. A type of logic circuit that generates an output when all input signals are at the specified polarity.

ANDed, ANDing. Signals that have been or are being used as inputs to an AND circuit.

angular. Forming an angle.

applicable. Suitable.

apply, applying, applied. To put.

appropriate. Correct or suitable.

AR. Address redrive.

arbitrary. Selected at random without reason.

argument. A variable in a programming statement.

arithmetic. Combining numeric quantities as described by rules and definitions.

armature. The relay contact that is controlled by the magnetic field.

arrange, arranging, arranged. To place in correct order.

array. Matrix.

ASDC. Alternate storage director communication.

ASDM. Auxiliary storage director microprocessor.

assignment. Assign.

assist, assisting, assisted. To aid.

assistance. Aid.

auto. Automated.

automated. A process or device that functions without aid from an operator.

aux, AUX. Auxiliary.

availability. Being available.

avoid. Do not use or perform, prevent.

background. Information for understanding.

backwards. Reverse.

BAH. Buffer ALU pointer high.

BAL. Buffer ALU pointer low.

BAP. Buffer ALU pointer.

based. Relying.

basically. Fundamentally.

BC. Byte counter.

BCC. Bottom-card connector.

BCH. Byte counter high.

BC1, BC2. Buffer/channel registers.

bd. Board.

BDM. Block Diagrams Manual.

begin, beginning, begun. To start.

besides. Along with.

BFI. Buffer increment.

bfr, BFR. Buffer.

bias. The 24 Vdc control voltage for the voltage regulators.

BID. Bus in deskew.

bidirectional data bus. A data bus that both sends and receives data on the same signal lines.

BIN. Part of the seek address field, always 0 in the 3880.

binders. Covers for the manuals.

Block. A group.

blocked. Closed off.

blocking. Blocks that hold parts in place during shipment.

blowers. Fans.

BOC. Bus out parity check.

BOD. Bus out deskew.

breaker. Circuit breaker.

brief. Short or quick.

buffer. A circuit to store data temporarily.

buffer, buffering, buffered. To temporarily store.

build, building, built. To assemble, install, or make.

bulk power supply. The main dc-power supply in the 3880.

bussed. Carried on a bus.

butt, butting, butted. To connect back-to-back.

button. Pushbutton.

C. (1) Cable. (2) Capacitor.

CA . Communication Adapter

CAAJCK. Common ADT/ASDM check register.

cabling. Cables.

cache. Storage array.

caching mode. Transfer of data between the subsystem storage and the data channel.

CACTL. Write/read register from SDM.

caked. Solid or hard.

call, calling, called. To name.

callouts. Labels used to identify parts in a figure.

capability. Ability.

Capacity. The ability to hold, receive, store, or accommodate.

CAR. Cylinder address register.

CARD1, CARD2. Write/read registers for SDM.

CARR. Checks, adjustments, removals, and replacements; a section title in the MIM.

caster. A wheel on the bottom corners of the machine that permits easy movement of the machine.

catastrophic failure. A failure that stops all machine operation.

catch. Take hold of.

category. Class.

CAWR1, CAWR2. Read registers for SDM.

© Copyright IBM Corp. 1984, 1985

CB. Circuit breaker.

CBA. Channel buffer adapter.

CBH. Channel buffer pointer high.

CBI. Channel bus in.

CBL. Channel buffer pointer low.

CBO. Channel bus out.

CBP. Channel buffer pointer.

CC. Channel control.

CCA. Connection check alert.

CCB. Command control block.

CCC. Channel control check.

CCH. Channel count high.

CCHH. Cylinder, cylinder, head, head.

CCHHRKDD. Cylinder, cylinder, head, head, record, key, data, data.

CCK. Subsystem storage check.

CCL. Channel count low.

CCOMACK. Common communication adapter check register.

CCOMADI. Common communication adapter diagnostic register.

CCOMADR. Common communication address register.

CCOMCTL. Common communication control register.

CCR. (1) Channel condition register. (2) Channel command retry.

CCS. Cache channel service.

CCTL. Common control register.

CCTLS. Common control shadow register.

CCW. Channel command word.

CC1,2. Channel control 1,2.

CDA. Cache display alter.

CDI. EPC bus in.

CDO. EPC bus out.

CDS. Configuration data set.

CDX. Channel data transfer.

CE. Customer engineer.

CECOM. An OLT subroutine.

certain. Specific.

ch, CH. Channel.

CH A. Channel A.

CH B. Channel B.

chain, chained, chaining. To connect.

chan. Channel.

Chance. Something that happens unpredictably without discernable human intention or observable cause.

char. Character.

characteristics. Distinct qualities.

checker. A circuit that checks machine or program operations.

checklist. A list of steps to perform.

checkout. Check.

chemicals. Cleaning fluids, adhesives, etc.

chip. Module.

chk, CHK. Check.

chl, CHL. Channel.

CHL-I. Channel interface, a section title in the RCM.

chn, CHN. Channel.

choices. Optional selections.

chosen. Selected.

chronological. In the order of time.

CIF. Channel interface card.

CIF-A, -B, -C, -D. Channel interface A, B, C, D.

circuit protector. A circuit breaker.

ck, CK. Check.

CKD. Count, key, and data.

CK1,2,3. Check 1,2,3.

clamping. Holding.

CLAR. Address repower card (expanded storage).

CLC2. Storage control card (expanded storage).

CLDA. Storage driver address card (expanded storage).

clean up. Return to original status.

cleanup. A return to original status.

clearly. Fully.

clk, CLK. Clock.

clocking. To check with time.

CLP2. 2 MB storage card (expanded storage).

CLP4. 4 MB storage card (expanded storage).

cm. Centimeter.

CMAA. Auxiliary storage director microcontroller (auxiliary adapter) card.

CMADEC. Common multiple address decode register.

CMAR. Address repower card (not expanded storage).

CMCA. Communication adapter card.

CMCD. Port adapter card.

CMC1,2. Storage control cards (not expanded storage).

cmd, CMD. Command.

CMDA. Storage driver address card (not expanded storage).

CMDD. Storage driver data card.

CMDR. Data redrive card.

CME1,2,3. Error correction code cards.

CMPB. Port buffer card.

CMPC. Port control connection card.

CMPR. Compare.

CMSA. Storage address card.

CMSH. 1 MB Storage card (not expanded storage).

coded. Encoded.

collapses. Falls.

collet. A locking collar.

com. Common.

comm rejct. Command reject.

compensating. Stabilizing.

compile, compiling, compiled. To collect.

completion. Ending, end.

component. An assembly, unit or part of a machine.

compresses. Holds under pressure.

concatenated. Connected logically.

conclusion. End.

cond. Condition or conditional.

conditional. Having limiting factors.

confined. Limited.

confirm. Verify.

conn. Connector.

consider, considered. To discuss.

consist, consists. To contain.

consult, consulting, consulted. To see or request information.

contamination. Pollution.

contention. Two or more devices requesting service.

contiguous. Next to, touching, sequential.

contingent. Dependent on something else.

continuation. An addition or further part.

controller. Something that controls.

convenience outlet. An ac outlet that is convenient for the CE to use.

convention. Generally accepted rule.

conventional. Acceptable.

© Copyright IBM Corp. 1984,1985

convergent. To circle inward toward a point.

cool, cooling, cooled. To decrease the temperature.

coordinated. Timed.

corporation. Organization.

correctable. Can be improved accurately.

correlated. Associated with.

correspond, corresponding. Equal to or provide a one-to-one ratio.

CP. (1) Circuit protector, a circuit breaker used for other than the main ac power input to the 3880. (2) Control print in the OLTSEP and OLTEP programs.

CPACK1,2. Common port adapter check registers.

CPC. Central power control.

CPU. Central processing unit.

CR. (1) Condition register (2) Rectifier (diode).

CRC. Cyclic redundancy check.

created. Made.

Cross. To go from one place to another place, across.

crossover. Connector between the top of two cards.

CR0. (1) Condition register zero. (2) Channel interface checks register.

CR1,2,3,6. Condition registers.

CS. (1) Control storage (2) Channel status.

CSA. Common subassembly.

CSACK. Common storage adapter check register.

CSADI. Common storage address diagnostic register.

CSARCK. Common storage address refresh check.

CSC. Channel sequence control.

CSCCK. Common storage adapter check register.

CSCRACK. Common storage card refresh address check.

CSR. Channel search.

CST. Subsystem storage status register.

CSTAT1,2,3,4. Common status registers.

CSW. Channel status word.

CS1,2,3. Channel status 1,2,3.

CTI. Channel tags in.

ctl. Control.

CTL-I. Control interface, a section title in the RCM.

CTO. Channel tags out.

ctr. Counter.

CTRL. Control, a section title in the ECM.

CU. Control unit.

cutout. An opening in a panel for a switch, LED, or meter.

CVT. Communication vector table.

CWRBS. Common X'1B' shadow register.

CXC. Channel transfer control.

CXT. Channel transfer control.

cycle, cycling, cycled. To perform in a set sequence.

D. (1) Device. (2) Diagnostic mode.

DASD. Direct access storage device.

DASD Mode. Transfer of data between DASD and the data channel.

dated. Having a date.

DBFR. (1) Data Buffer, a section title in the ECM. (2) Data buffer register.

DBH. Device buffer pointer high.

DBI. (1) Device bus in. (2) Data bus in.

DBL. (1) Device buffer pointer low. (2) Data buffer pointer low.

DBO. (1) Device bus out. (2) Data bus out

DBP. Device buffer pointer.

dc, DC. Direct current.

DCB. Device control block.

DCH. Device count high.

DCK. Data check.

DCL. Device count low.

DCM. Diagnostic code manual.

DCRC. Display cache refresh timer.

DCS. Dynamic control storage.

DCSR. Dynamic control storage and refresh.

DCT. (1) Device counter. (2) Display cache timer.

DD. Diskette Drive, a section title in the RCM.

DDC. Director-to-device-controller.

deactivate, deactivating, deactivated. To make ineffective.

decoder. A circuit that decodes data.

decrement, decrementing, decremented. To decrease.

deenergized. Not energized.

defect. Failure.

defective. Failed, failing, or not correct.

define, defined, defining. To describe or specify.

degated. Not gated.

delimiter. Boundary.

demand, demanding, demanded. To request.

demount, demounting, demounted. To remove a disk from a disk unit.

department. An organization.

depend, depending, depended. To need or rely.

dependent. Needing or relying on.

deposits. Dirt.

derive, deriving, derived. To obtain from.

descriptor. A name that describes something.

deselect. Does not select.

deserializer. A circuit that places serial data into parallel (8-bits wide) form.

design, designing, designed. To make.

desirable. Wanted.

deskew. Straighten.

destination. A place to which something is sent; an end.

detect, detected, detecting. To discover.

dev, DEV. Device.

DEV-I. Device interface.

DIAG. Diagnostic Programs, a section title in the MSM.

diagram. Figure.

dif. Differential.

differential amplifier, differentiator. A circuit that responds to the differance between two signals.

differentiate. Respond to a difference.

DIR. Data in register.

direct mode. Non-caching, non-paging mode.

direct. the shortest way.

direct, directing, directed. To instruct.

director. Storage director, one half of the 3880 that controls the direct storage access devices.

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

directory. The place where addresses are stored for the cache.

disconnect-in. Remove.

discontinue. Disconnect from the customer's system.

discover, discovering, discovered. To find.

discuss, discussed, discussing. Talk about.

displace, displaced, displacing. Move.

displacement. The amount something is moved from the usual place.

dispose, disposition. Parts disposition.

disposition. Parts disposition.

distinguish. To make distinct.

© Copyright IBM Corp. 1984,1985

disturbing. Changing.

divider. Something that divides or separates.

DMO. Direct mode only.

documentation. Manuals or documents.

domain. An area or territory where control is exercised; as in the domain of a Locate Record command.

DOR. Data-out register.

DOS. Disk operating system.

DOS/VS. Disk Operating System/Virtual Storage.

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

dotted OR. An OR circuit made by connecting the output of two or more circuits.

double. Twice the quantity of one.

DP. Data processing.

DPL. DASD pin list.

DPS. Dynamic path selection.

DR. Data redrive.

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,-2. Driver receiver 1,2.

DRS. DASD read service.

DSB. Display sense buffers.

DSCR. Descriptions.

DTG. (1) Device tag gate. (2) Data tag gate

DTI. (1) Device tag in. (2) Data tag in

DTO. (1) Device tag out. (2) Data tag out

due. Caused by.

dump. (1) Raw data. (2) A type of printout.

DWS. DASD write service.

DXA. Data transfer addressing card.

DXC. Data transfer control.

DXD. Data transfer data card.

DXFR. Data transfer.

DXR. Data transfer.

dynamic. Occurring at the time of execution.

dynamic control storage. A type of control storage in the 3880 that 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.

eb. Entry byte.

EBI. External bus in.

EBO. External bus out.

EC. Engineering change.

ECC. (1) Error condition code. (2) Error correction code. (3) Error checking and correcting.

ECD. Error condition diagram.

echoed. Repeated.

ECI. Error Code Index, a section title in the ECM.

ECM. Error Code Manual.

EDI. Expected device interrupt.

edit, edited, editing. To format.

efficiently. Effectively.

EL. Error loop.

EL(I). Error loop (I-indefinite).

EL(n). Error loop (n).

enclosed. Closed in.

encoder. A circuit that encodes data.

encounters. Finds.

energize, energized, energizing. To activate.

ensure. Make certain.

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

environment. The circumstances and conditions that surround an event.

environmental. Associated with the immediate operating surroundings.

environmental recording, editing, and printing. (see EREP).

EOB. End of block.

EOD. End of day.

EOF. (1) End of file. (2) End of field

EOT. End of transfer.

EP. (1) Error processing. (2) Error print.

EPC. External port connector.

equals. Is the same as.

equip. 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.

err. Error.

erroneously. Done by error.

established. Used for some time.

examine. Analyze or inspect.

exceed, exceeded, exceeding. To be more than.

excessive. Too much or more than is needed.

exclusive OR. An OR circuit that generates an output when the inputs are not the same.

execute. To carry out fully; to put completely into effect.

execution. Operation.

execution operation. The operation being performed.

exercise. Run.

exhausted. Emptied.

EXIO. Execute input/output.

exit point. Step from a MAP or flowchart.

exit, exited, exiting. Leave or go from.

Expanded Storage. High density subsystem storage.

explanation. Description.

explicit. Unconditional.

ext. External.

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

extreme. Ultimate.

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.

false. Wrong.

fast. Quick.

fault. Error or failure.

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

FB. Fixed block.

FBD. Functional block diagram.

FBIP. An error code.

FCA. Four-channel switch, additional (Eight-channel switch feature).

FCAS. FCA sense card.

FCCHH. Flag, cylinder, cylinder, head, head.

FE. First error communication (OLTSEP or OLTEP).

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

fetch. Get or read.

© Copyright IBM Corp. 1984,1985

FIFO. First in first out.

file. To put away safely.

finish, finishing, finished. To complete.

fix, fixing, fixed. To repair.

flag. Mark.

floating. An open circuit.

fluff, fluffing, fluffed. To brush until soft.

formation. Form.

FRU. Field-replaceable unit.

FR1,2,3,4. FRU registers.

functional. Performing or able to perform a task or job.

FSC. Fault symptom code.

FWB. Flat wire bus.

FWD. Forward; a key on the MD that steps to the next frame.

gather, gathered, gathering. To collect.

GDI. General diagnostic register.

GECCDI. General error correction code diagnostic register.

GECCK1,2. General error correction code check registers.

GIDSW. General ID switch register.

GMIC. General microcode register.

gnd. Ground.

GRAB. A subroutine in the OLTSEP program.

GSSCIN. General storage size/cables in register.

GSYN1,2. General syndrome registers.

GTB. Gate terminal board.

GTS. General test/set register.

guidance. Instructions.

GWRCK1,2. General write check registers.

H. Host.

H/B. Halt/bypass.

HA. Home address.

halt, halting, halted. To stop.

handle, handling, handled. To touch.

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

HC. Hardcore.

Hd. Head.

HDSCS. High density static control storage.

help. Aid, assistance, remedy, or relief.

helpful. Useful.

hex. Hexadecimal.

hierarchy. A graded or ranked series.

high-order. The left most position of a number or series of data bits.

highly. Very.

HIO. Halt input/output.

hosts. Host processing units.

hub. The end of the shaft that holds the diskette.

Hz. Hertz.

I/O. Input/output.

IAR. Instruction address register.

IC. Isolation code.

ICW. Internal control word.

ID. (1) Identification (2) Identifier.

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

idles. Not doing work.

ILR. Interrupt level register.

IML. Initial microcode load.

IMLT. Initial microcode load with error timeout.

impact, impacting, impacted. To affect.

implementation. Use.

improperly. Not correctly.

inactive. Not doing work.

inbound. To come in from somewhere.

incomplete. Not finished.

incorrect. Not right.

increment, Incremented, incrementing. To increase.

indefinite. Not clear, unknown duration.

indefinitely. Not positive or not specific.

INDEX. A section title in the MIM.

indication. Indicator.

individually. Separately.

individual. Separate.

infinity. Open circuit.

influence. Affect.

initial. First.

initiate, initiating, initiated. To prepare or start.

initiation. Preparation or starting.

inline. A diagnostic.

INST. Installation, a section title in the MIM.

instant. Specific time.

Int Req. Intervention required.

interaction. To act with another.

interchange, interchanging, interchanged. To exchange or swap.

interior. Inside or internal.

interposers. Linkage between parts.

interrogating. Asking, questioning.

intervention. Aid is required.

Intf Dsbld. Interface disabled.

INTRO. Introduction, a section title in the MIM and MSM.

invalid. Not permitted.

inventory. A list of items.

investigate, investigating, investigated. To look at.

invocation. Starting.

invoke. To start or begin.

involve, involved, involving. To take part in.

IPAR. Incident/parts activity report.

IPL. Initial program load.

IR. (1) Internal register. (2) Indirect register.

IRG. Internal register group.

isolate, isolating, isolated. To separate completely.

isopropyl alcohol. A cleaning fluid.

issue, issuing, issued. To send or transmit.

J. Connector.

JCL. Job control language.

JMP. Jumper.

justified. Aligned.

K. Relay.

K/D. Keyboard/display.

keyword. An important word.

khz. Kilohertz.

kilohertz. 1000 hertz.

knowledge. The fact or condition of knowing something.

L. Light-emitting diode.

label, labeling, labeled. To describe with a decal.

LCTL. Lower control register.

ld. Load.

LDCB. Logical device control block.

LDIAG. Linked diagnostic.

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

© Copyright IBM Corp. 1984,1985

LECCCK. ECC check.

LED. Light emitting diode.

LGND. Legend, a section title in the MIM.

limiter. Something that limits.

link, linked, linking. To connect.

listed. Included in a list.

listing. A printout.

loader. A program to put a program or data into storage.

LOC. Location, a section title in the MIM.

locality. Location.

logical. Relating to logic, correct.

logically. Correctly.

LOGREC. Logical record.

longitudinal. The lengthwise dimension.

looped. Done again.

LOPCTL. Operation control register.

LPACK. Port adapter check.

LPBCK. Port buffer check.

LRC. Longitudinal redundancy check.

LRM. Logic Reference Manual.

LSADPCK. Storage adapter check.

LSAR0,1,2. Upper port SSAR registers.

LSCACK. Storage card address check.

LSCCK. Storage control check.

m**.** An MD manual command.

MA. Cache address.

macro. A series of instructions.

maint. Maintenance.

majority. More than half.

malfunction. faulty, to break down, or make a mistake.

management. Conducting or supervising something, control.

MAP. Maintenance analysis procedure.

marginal. Close.

mark-in. A standard interface line.

mask. A pattern of bits used to control data.

MB. (1) Megabyte. (2) Message Byte (3) Cache Buffer

MBR. Magnetic boost regulator.

MCR. Maintenance control register.

MCS. Maintenance control and/or sense.

MD. (1) Maintenance Device, a section title in the MSM (2) The maintenance device used to diagnose 3880 failures.

MDA. Maintenance device adapter.

MDAC. Maintenance Device Adapter Control.

MDAR. Maintenance Device Adapter Register.

MDA1. Maintenance device adapter 1.

MDA2. Maintenance device adapter 2.

MDH. Maintenance device hardware check.

MDM. Maintenance Diagrams Manual.

MDR. Miscellaneous data record or recorder.

media. Cards or tape.

megabyte. One million bytes.

memory. Static or dynamic control storage.

metering. Checking with the CE meter.

mh. Mask byte high.

MI. Manual intervention.

microcontroller. A module that contains a controller.

microdiagnostic. A diagnostic program.

microinstruction. Basic machine instruction; instruction in a microcode.

MIM. Maintenance Information Manual.

miscompare. Not compared.

mismatch. A failure to match.

misshapen. Not correct.

MLX. Maintenance Library Cross-Reference, a section title in the MIM.

MNT. Maintenance.

MNT-C. Maintenance connection, a section title in the ECM.

modifier. Something that changes or defines.

modify, modified, modifying. To change.

mold, molding, molded. To shape.

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

mot, MOT. Motor.

motion. Movement.

mount, mounting, mounted. To install a disk pack on the disk drive.

movable. Can be moved.

MRU. Most recently used.

ms. Millisecond.

MS. Cache sequence.

MSG. Message, a section title in the MIM.

MSM. Maintenance Support Manual.

MSR. Maintenance sense register.

multi-tag. More than one tag line.

multilevel. More than one level.

multiple. Many or more than one.

multitrack. More than one track.

mv. Millivolt.

N/A. Not applicable; is not used.

native. Operating in the original environment.

N/C. Normally closed.

N/O. Normally open.

NCP. No control point.

NEL. No error loop.

NEP. No error print.

net. Network.

NFE. No first error communication.

nmb. Number.

NMI. No manual intervention.

no-operation. An operation during which a dummy operation occurs.

nominal. Unusual or average.

nominally. Usually or on the average.

non-failing. Not failing.

non-formatting. Not formatting.

non-zero. Not zero.

note, noting, noted. To observe.

NP. No print.

NPP. No parallel print.

NRE. No remote FE control.

ns, nsec. Abbreviation for nanosecond.

NSI. No spurious interrupt.

NTL. No test loop.

null. None.

objective. Purpose.

OBR. (1) Outboard record (2) Outboard recorder.

OC. Overcurrent.

occurrence. Event.

odd. Not even.

ODE. Owed device end.

offers. Presents.

offloads. Reads.

OI. Overcurrent.

© Copyright IBM Corp. 1984,1985

OLSTEP. Online test standalone executive program.

OLT. Online Test.

OLTEP. Online test executive program.

OLTS. Online tests.

OLTSEP. Online test standalone executive program.

op. Operator.

OP. Operator.

OPER. Operations, a section in the MSM.

operable. Can be used.

opportune. Suitable or convenient.

opt. Option.

option. Selection.

OR. A type of logic circuit that generates an output when any of the input signals are at the indicated polarity.

ORed, ORing. Signals that have been or are being used as inputs to an OR circuit.

orientation. A predetermined position.

oriented. Placed in an arrangement.

origin. Starting point.

originate, originating, originated. To start or come from.

OS. Operating system.

otherwise. Or, if not.

outboard recorder. A feature of DOS that records important data on the system recorder file when an unrecoverable I/O error occurs.

outbound. To go out from or leave.

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

OV. Overvoltage.

overall. Complete.

overcurrent. Too much current.

overflow, overflowing, overflowed. To exceed a boundary

overlay. Write over.

overrun. To go too fast.

overview. A brief general summary.

overvoltage. Too much voltage.

ovr. Overrun.

P/N. Part number.

PA. (1) Physical address. (2) Port adapter

package. Container.

padded. Filled.

padding. Non-data bytes that fill out a disk record.

paddle. The signal cable connector at a board.

paging mode. Transfer of data between subsystem storage and the data channel.

pair. Group of two items.

PAM. Patch ASDM control store.

parameter. A constant or boundary.

parm. Abbreviation for parameter.

particular. Specific.

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

patch. Temporary correction to a program or microcode.

PB. Port buffer.

PC. Parity check.

PCC. Power control card.

PCH. Pack change.

PCI. Program control interrupt.

PCM. Parts Catalog Manual.

PCR. Pad counter register.

PDA. Problem determination aids.

PDIR. Port data in register.

PDOR. Port data out register.

pending. During, waiting, while, or continuing in a state.

periodically. Occurring at regular intervals.

perm. Permanent.

persists. Continues.

pertain. Belong to.

PF. Program Function, a key on the MD.

PH. Polarity hold, a type of logic circuit.

phototransistor. A transistor that reacts to light.

pinned. reserved.

place, placing, placed. To put.

PLINK. An OLT subroutine title.

polish, polishing, polished. To rub smooth.

polished. Smooth.

polling. Interrogation of a device to determine if it is ready to send or receive data, or to determine its status.

POR. Power on reset.

port. Interface.

portion. Part of a set.

positioned. Placed.

PP(n). Parallel print (n).

PPn. Parallel print n.

PR. Print.

prefix. To place in front.

pre-removal. Before removing.

preamp. Preamplifier, a circuit that increases voltage or current.

preloaded. Loaded before.

premature. Before being ready.

presence. Existing.

present, presenting, presented. To send out.

present. To give, now existing or in progress.

preventing activation of. Inhibits.

previous. Before or earlier.

previous. Earlier.

previously. Preceding.

prior. Before or earlier.

probability. The chance that a given event will occur.

probable. Likely.

proceed. Do, go, or move.

process. To perform operations on data in a sequence of operations.

processor. Controller.

produce, producing, produced. To make.

productive. Can make or generate.

PROG. Program, section title in the MIM.

progress. Advance.

propagate. Cause to continue.

proper. Correct.

properly. Correctly.

protector. A circuit breaker.

provide, providing, provided. To supply.

PS. Power supply.

PSC. (1) PSM sensor card. (2) Paging statistic counter.

PSM. Power sequencer and monitor.

PSW. Program status word.

PS1. Power supply 1.

PS2. Power supply 2.

purple. A blue-red color.

PWR. Power, a section title in the MIM Abbreviation for power.

QSTAR. Quality service technical activity report.

qty. Quantity.

R. (1) Run. (2) Resister

© Copyright IBM Corp. 1984, 1985

R/W. Read/write.

raise, raising, raised. To activate.

RAM. Run ASDM.

RAP. Remote Aid Procedures, a section title in the ECM.

rather. To the contrary, instead

raw. As received, not changed by a process or a program.

RC. Resistor-capacitor.

RCF. Reader's Comment Form.

RCK2. Reset check 2.

rcvd. Received.

rd. Read.

RDB. Read X'1B'register.

RDF. Read X'0F'register.

rdr. Reader.

rdy. Ready.

RE. Remote FE control.

re-enters. Enters again.

re-install. Install again.

re-orientation. Placing again in a predetermined position.

re-try. Try again.

readable. Can be read.

readings. Results.

readout. Display.

recalibrate, recalibrating, recalibrated. 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.

recommendation. Suggestion.

reconnection. Connecting again.

recorder. Cassette recorder.

recoverable. Can be corrected.

recovery. Return to normal position, correction.

recreate. To do again.

rectifier. (1) A circuit that changes an ac voltage to dc voltage. (2) The diode or diodes used in a rectifier circuit.

recycle. Cycle again, repeat.

reduce. Make smaller.

redundancy. That portion of a message that can be lost; repeated.

REF. Reference, a section title in the MSM.

refer, referring referred. To see.

referenced. Included in an information source.

refresh. Make new, recharge, or restore.

refresh cycle. A storage cycle performed at specific intervals to ensure that data is valid in the dynamic control storage matrixes.

reg. (1) Regulator. (2) Register.

regarding. Concerning.

regardless. Despite.

register. A circuit that stores data.

regs. Registers.

reinitialize. To begin or start again.

reissue, reissuing, reissued. To send again.

relate, related, relating. To associate with, to pertain to, to connect.

relationship. Connection.

relevant. With meaning or importance.

reload. Load again.

relocate, relocating, relocated. To place in a new location.

relocation. A new location.

replace, replacing, replaced. To exchange a defective part for new part.

replaceable. Can be replaced.

replicate. Duplicate.

replication. A duplicate.

reply, replying, replied. To respond.

req. Required.

require, requiring, required. To need.

requirements. Things that are needed, conditions, needs, specifications.

reread. Read again.

rerun, rerunning, rerun, reran. To execute a program again.

reselect, reselecting, reselected. To choose again.

reservation. To withhold, or to set aside.

reside. Exist in a location.

resident. Permanently located in storage when the machine is operational.

residual. The remainder.

resolved. Solved.

resource. A source of supply or support, an available means.

rest. Stop or remainder.

restore, restoring, restored. To reset again.

restrict. To limit.

result. The effect of doing something.

result, resulted, resulting. End.

resume, resuming, resumed. To start again or continue.

RESV. Reserve.

ret, RET. Return (OLTSEP, OLTEP).

retain. Keep.

RETAIN. Remote technical assistance network.

retainers. Clips or fasteners.

retest, retesting, retested. To put something to proof again.

retrieval. Recovery.

retrieve, retrieving, retrieved. To collect.

retry, retrying, retried. To attempt again.

reversal. Inversion.

reverses. Inverts.

rewritten. Written again.

rezero. Place at zero again.

ripple. Wave.

ripple voltage or frequency. An AC voltage found on a DC voltage. The frequency of this voltage is the line voltage multiplied by 2, 4, or 6.

risks. Puts in danger.

RMCKD. Read multiple count, key, and data.

RMDA. Reset MD register.

ROS. Read-only storage.

rotate, rotating, rotated. To turn.

rpm. Revolutions per minute.

RSD. Reset storage director.

RT. Redrive/terminator.

rtn. Return.

R0, R1, R2. Record 0, 1, 2.

S. Switch.

sampling. Taking a sample.

SAS. Slot availability services.

satisfy. fulfill, meet, or answer.

save, saved, saving. Preserve, put aside, guard from loss.

SBP. Select out bypass.

SC. (1) Symptom code (2) Storage control.

SCB. Sense control block.

schedule, scheduling, rescheduled. To plan.

scheme. Plan.

SCK. Switch clock.

SCM. Subsystem configuration manager.

© Copyright IBM Corp. 1984, 1985

SCR. Silicon controlled rectifier; a type of diode.

SCS. Static control storage.

SD–SD. Storage director to storage director loop test.

SDI. Storage director identification.

SDIAG. Single diagnostic.

SDM. Storage director microcontroller.

SDR. Switch driver receiver.

SDT. Switch driver terminator.

SD1,2. Storage director 1,2.

sec. Second.

sector. A part of a track on a disk.

secure. Fasten, lock, or tighten.

segment. A part of something.

sel, SEL. Select.

SENSE. Sense, a section title in the MSM.

seq. Sequence.

sequence, sequencing, sequenced. To turn on in a specified order.

sequencer. (1) A circuit that sequentially turns the power supplies on and off. (2) The Power Sequencer and Monitor.

sequencing. The process of sequentially turning the power supplies on and off.

SERDES. Serializer-deserializer.

serializer. A circuit that places parallel data into serial form.

serious. Major.

serpent connector. A type of signal connector.

settings. The position of a series of switches or controls.

setup. Preparation.

SFM. Set file mask.

shade, shading, shaded. To darken.

shaved. Made shorter.

short. Short circuit.

SI. Spurious interrupt.

signifies. Names.

simplify, simplifying, simplified. To make something easier.

simply. Easily.

simultaneously. Occurring at the same time.

sine. Sine wave.

sink. The terminating end of a circuit.

SIO. Start input/output.

SIT. Scatter index table.

skip-defect. A defective area on a disk surface to be bypassed.

SMB. Speed matching buffer.

SMT. Subsystem mode transition.

SP. The space character.

SPACE. The space key on the MD.

SPC. Channel speed control.

spindle. The shaft that a disk spins around on in a DASD.

spurious. Not correct, false.

srch. Search.

SS. Subsystem storage.

SSAR. Subsystem storage address register.

SSW. String switch.

stabilize. Make stable.

standalone. Not controlled by another device or machine.

START. A section title in the MIM.

stat. Status.

state. Condition.

static. Showing little change.

Static control storage. A type of storage matrix that retains stored data as long as power is on.

statistical. Pertaining to data grouping.

stepper. The motor used in the 3880 diskette drive.

strategy. Plan.

streaming. A constantly renewed supply of something, especially data streaming mode in large processors.

string. A series of direct access storage devices.

sub-id. Sub-identification.

subcommand. A command within a command.

subfields. The minor fields of a main field.

subsequent. Next.

success. Reaching an acceptable end.

successful. Acceptable or correct.

suffix. The ending characters of an instruction or an error message that specifically identifies a function, error, or device.

sum, summing, summed. To add.

summarize. To arrange in an abstract or summary.

support. To help or aid.

symbolic. Representative.

symbology. Set of symbols.

symcde. Symptom code.

SYS. System.

SYSGEN. System generation.

T. Transformer.

TACR. Two-channel additional condition registers.

TADT. Two-channel additional driver terminator.

tag, TAG. (1) A line name. (2) A command issued by the microcode and sent to a device.

tailgate. Input/output connectors.

tape, taping, taped. To seal a box with adhesive tape.

TAS. Test and set.

TB. Terminal board.

TCA. Two Channel Switch Pair, Additional.

TCAR. Two-channel additional register.

TCC. Top-card connector.

TCR. Two-channel condition register.

temp. (1) Temporary (2) Temperature.

tens. Sets of ten.

termination. A resistor or plug that terminate a circuit.

terminator. A resistor or plug used to terminate a circuit.

TFR. Toggle, FRU register.

theory. A description of how a machine or program works or operates.

thermals. Temperatures sensing devices.

threshold. Operating limit.

thru. Through.

thumbscrew. A screw that can be turned with the fingers.

TIC. Transfer-in-channel.

tiebreaker. A circuit that decides which of two functions will be the first to operate.

TLn, TL(n). Test loop n.

TM. Terminator.

TO. Time 0 (zero).

top-card. The cables or connectors that attach to the top of a logic card.

towards. In the direction of.

TP. Test point.

TRACE. A section title in the MSM.

trace, tracing, traced. To record a sequence of events as they occur.

transfer, transferring, transferred. Transmit or receive.

transition. A change from one condition to another.

travel. Movement.

tri-lead. A type of connector.

trimming. Limiting.

© Copyright IBM Corp. 1984, 1985

triple. Three times the quantity of one.

TRK0. Track zero.

truncation. The stopping of a calculation process before the normal ending.

try, tried, trying. To attempt.

TTL. Transistor-to-transistor logic.

T0. Time 0 (zero).

U/L. Underwriters laboratories.

UCB. Unit control block.

UCTL. Upper control register.

UCTRH. Byte count high.

UCTRL. Byte count low.

UCW. (1) Unit control word. (2) Unit command word.

UE. Uncorrectable error.

UE. Unit Emergency switch.

UECCCK. ECC check.

uncorr. Uncorrectable (not correctable).

undervoltage (UV). Less than normal voltage.

unexpected. Not anticipated.

unguided. Not directed.

uninstalled. Not installed.

unique. One of a type or nothing is similar to it.

unique. Having no like or equal.

unknown. Not known.

unlike. Not similar to.

unnecessary. Not needed.

unplug. Disconnect.

unreadable. Not possible to interpret data from.

unrecoverable. Not possible to continue.

unshared. Not apportioned.

unspecified. Not detailed.

unsuccessful. Not correctly completed.

unsupported. Not upheld.

unsuppressible. Not suppressible.

unused. Not used.

UOPCTL. Operation control register.

UPACK. Port adapter check.

UPBCK. Port buffer check.

upon. On or when.

USADPCK. Storage adapter check.

usage. The amount of use, acceptable practice.

USAR0,1,2. Upper port SSAR registers.

USCACK. Storage card address check.

USCCK. Storage control check.

utility. A type of program.

UV. Undervoltage.

V. Volts.

VAC. Volts alternating current.

validate, validating, validated. To find to be correct.

variable. Something that can change.

variety. A number of items.

vary, varying, varied. To change.

Vdc, VDC. Volts direct current.

ver, VER. Verify.

verification. Ensuring that something is valid.

version. Model, class, or type.

via. By.

violate. To go against the established rules.

violation. An illegal attempt to read or write in a data file.

virtual machine. An operating program that simulates a machine.

VM. Virtual machine.

vol, VOL. Volume.

VOLID. Volume identifier.

VS. Virtual storage.

VSE. Virtual storage extended.

VTL. Vendor technology logic.

W. Write.

WAITIO. A subroutine identification.

WBM-card. Cache storage card.

whenever. At any time.

whereas. While.

WRB. Write X'1B' register.

WRF. Write X'0F' register.

WRI. Write inhibit.

wrt. Write

XCS. Transfer complete status.

XES. Transfer error status.

YA. Base power reference page.

YC. Subsystem Storage power reference page.

© Copyright IBM Corp. 1984, 1985

Start

Contents of This Section

How to Perform a Task **10**

How to Repair the 3880 ..... **11**
Subsystem Storage Diagnostic Restrictions 11
MD Option Restrictions 11
To Determine the Failure in the 3880 11

Entry From Another Machine **100**

Diskette Drive Problem Suspected **105**

References to Other Sections

See MIM sections referred to on START 10.

See INST 10 for information concerning 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.

© Copyright IBM Corp. 1984,1985

Contents START 1

To Perform CE Safety Inspection Procedure:

Go to INSP

To Install or Discontinue the Machine:

Go to INST

To Install Two 3880s in Dual Frame Configuration:

Go to INST

To Use the MD:

Go to MD in the MSM

To Find Problem Determination Aids:

Go to PDA in the MSM

To Repair the Machine:

Go to START 11

To Check Out Machine:

Use MD option 5

To Run Online Tests:

Go to PROG

To Turn on Force Logging Mode:

Go to PDA in the MSM

To Analyze an Error Message:

Use the maintenance device. If the machine is not available, use MD option 4. If the machine is available go to START 11. Enter the symptom code from the console error message or EREP.

Go to PROG section for error messages from system maintenance programs.

To Analyze an EREP Printout:

Go to the *Environmental Recording Editing and Printing (EREP) Program Manual*, GC28-0772.

To Analyze an Unusual Condition:

To analyze an Unusual Maintenance Condition go to PDA 635 in the MSM.

To analyze an Unusual Operating Condition go to PDA 600 in the MSM.

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 in the MIM

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). Refer to the device MICRO section.

To Exchange Logic Boards:

Go to CARR 205

To Enable or Disable a Channel on Machines With the Remote Switch Feature:

Go to CARR 229

© Copyright IBM Corp. 1984, 1985

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

Each storage director has a unique physical identifier (see INST 71). The physical identifier of the storage director generating an error is found in sense byte 21.

Symptom codes (SCs) located in sense bytes 22 and 23, define the type of error sensed in the DASD subsystem. When available, symptom codes should be used to begin a repair action (MD option 1). This procedure may permit you to perform maintenance concurrent to customer operation. For subsystem storage failures, subsystem storage can be taken offline by a Set Subsystem Mode Command (a customer procedure), permitting you to perform maintenance on subsystem storage and its control logic while the subsystem is operating in direct mode.

Symptom codes can be found in LOGREC (EREP) or in the system console message that was output at the time of the error.

> **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 can be in the channel. If the channel is not the cause, the control unit causing the failure can 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, 3xxx, or Fxxx

  Note: The Fxxx codes indicate an error occurred in subsystem storage.

- Power Check indicator to light on the operator panel

Symptom codes other than 0xxx, 2xxx, 3xxx or Fxxx 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

Subsystem Storage Diagnostic Restrictions

The subsystem storage micro diagnostics can run concurrently with customer programs, but only if the subsystem storage is offline. The 3880 Models 21 and 23 support direct mode (subsystem storage offline) for pack maintenance programs (pack scan, pack formatting, etc.). A Set Subsystem Mode command must be sent from the host (a customer procedure) to take the subsystem storage offline.

MD Option Restrictions

Certain MD options are limited or cannot be used concurrent with channel operations (see MD 50 in the MSM).

To Determine the Failure in the 3880

Use the maintenance device (MD) diskette for the failing 3880.

For a 3880 with Subsystem Storage, the Set Subsystem Mode command is needed to place the Subsystem Storage online or offline (ask the operator to perform this procedure). It can be put online or offline to a single device or the complete Subsystem.

Always enter maintenance using MD option 1 (start repair), with a symptom code when available. This will give a list of probable failing FRU's whether or not the problem can be recreated.

If the MD fails to isolate the failure go to the ECM and use the error as an entry to the ECI. Go to the page indicated by the error code and perform the task listed.

> **Note:** When the Subsystem Storage Mode switches have been set to the Diagnostic position, the MD "End of Call" routine must be run to allow the subsystem storage to come back on line.

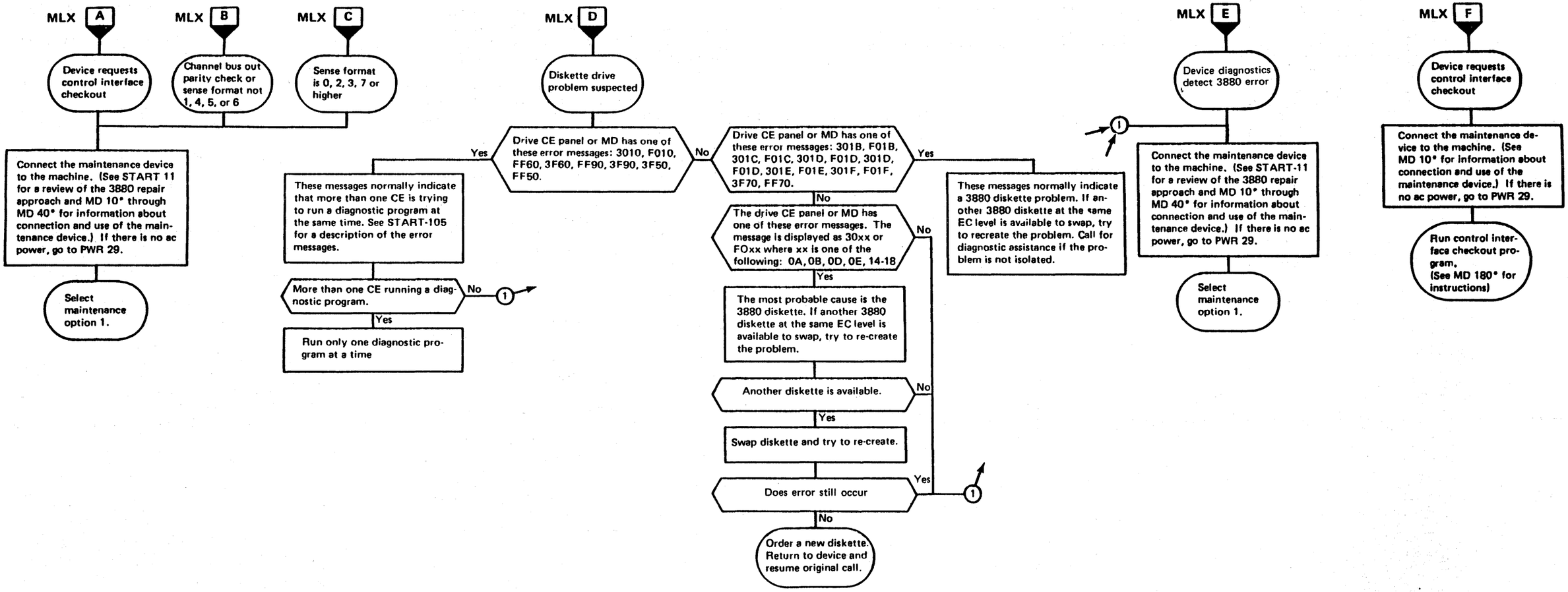
SYMPTOM	DESCRIPTION	ACTION
The 3880 is reporting a symptom code of other than 0xxx, 2xxx, 3xxx, 4xxx, or Fxxx.	The attached device reports a failure, but the CE suspects that the storage director is failing.	Use MD option 1 to determine how to fix the 3880. Enter symptom code when prompted. For the procedure to connect the MD, go to MD 10 in the MSM.
	The attached 3350 or 3380 has a failure that requires analysis.	Go to device MIM, MLX Section, entry 5 for device failure analysis.
The 3880 has a failure and the failing storage director can be taken offline.	A failure exists in the 3880 that allows or requires offline analysis.	Use MD option 1 to determine how to fix the 3880. For the procedure to connect the MD, go to MD 10 in the MSM.
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.	
Subsystem storage error (Fxxx symptom code).	Subsystem storage maintenance may be performed concurrent with customer operations by taking subsystem storage offline to both SDs.	
No power at the 3880 convenience outlet.	Basic power problem. The MD cannot be used.	Go to PWR 29.
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: - operator console messages - EREP - MD maintenance option 8 (see read SD status on MD 40 in the MSM). 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. For the procedure to connect the MD, go to MD 10 in the MSM.
Intermittent errors with symptom indications from different FRUs.	A power problem such as noise, ripple, over-voltage, or over-current may exist.	Go to PWR 32. Check voltages and ripple. Repair as required. Display history records to see if the power sense record contains any indication of intermittent power problems.
The 3880 status pending LED is always on.	More information is needed to determine failure.	Go to PDA 600 in the MSM for Status Pending Hang analysis.
Channel Interface Control Checks.	Problem may be in the 3880 or an attached channel.	Go to PDA 630 in the MSM for analysis of Control Checks.

Figure 1. How to Repair the 3880

© Copyright IBM Corp. 1984, 1985

Entry From Another Machine START 100

* MD information is found in the MSM



© Copyright IBM Corp. 1984,1985

Diskette Drive Problem Suspected

Error Messages 3010 or F010

Error messages 3010 or F010 indicate that drive controllers on both storage directors are attempting 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 while performing an inline program. The trace information is stored in the inline overlay area of control storage. If the inline programs are performed 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 attempting 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.

© Copyright IBM Corp. 1984,1985

Maintenance Library Cross References

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 4

References to Other Sections

MLX 2 makes reference to START 100 for continuation of entries from another MIM.

MLX 4 makes reference to START 11 for error exit 5.

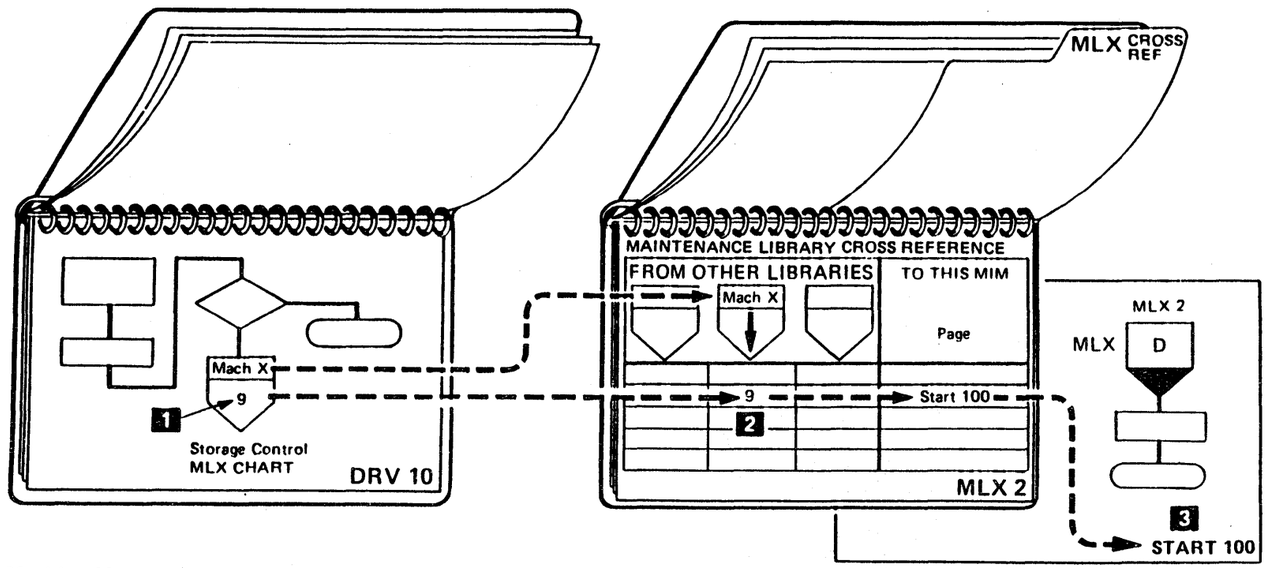
© Copyright IBM Corp. 1984, 1985

How To Use This Page

Notes:

1. Note the exit number **1** on the page of the Maintenance Information Manual (MIM) or maintenance device (MD) display you are leaving.
2. Find that exit number in the proper column of the chart on the maintenance library cross reference page (MLX 2) **2**.
3. Go 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 PAGE
3350	3380	
1	1	START 100, Entry A
5	6	START 100, Entry B
9		START 100, Entry C
10	2	START 100, Entry D
	3	START 100, Entry E
3		START 100, Entry F
4	7	PDA 600
2 or 7		See "Environmental Recording Editing and Printing (EREP) Program", GC28-0772

© Copyright IBM Corp. 1984, 1985

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	3350	3380
Entry to storage control interface analysis procedure. Check out procedure for control interface from storage control.	1	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.	5	6
Entry to storage control for sense format 6 information concerning overruns and/or when sense format 6 sense is obtained.	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.	9	
Entry to storage control if '3XXX' or 'FXXX' is displayed by the MD or in the CE panel lamps while attempting to execute microdiagnostics. An error is found by the storage control, usually while trying to read from a diskette.	10	2
Device requests information on sense format 6, sense bytes 5 and 6.	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.	4	
Device diagnostics found an error in the storage control. MD reference display contains error information.		3
Device request status pending analysis.		7

© Copyright IBM Corp. 1984, 1985

Definition Of Entries From Other Maintenance Libraries MLX 3

Definition of Exits to Other Maintenance Information Manuals

Use this page when coming 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	USE
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 (See Note)
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 (See Note)
3	SC 2080 (Data Overrun). Transfer error sense (XES) register bit 0 is on, indicating that: - Data Bus Out (DBO) registers are not full before receiving +Sync In - Need Data is not active with Take Data - Data Ready is not active with Data Taken	SC 2080 (See Note)
4	SC 2008, 2810, 2820, 28CC, or 292A Request Device Checkout	SC XXXX (See Note)
5	Drive symptoms codes of 1XXX, 4XXX, 5XXX, 6XXX, 7XXX, 8XXX, 9XXX, or 0F00 and byte 0 indicates device failures were reported by the 3880 storage director.	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 3380 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 3380 diagnostic routine C0 finds an error. The CTL-I internal wrap runs without errors. Routine D3 runs without errors.	MD MAP
9	The 3380 diagnostic routine D3 finds an error. The error indicates that the 3380 controller is failing. The other CTL-I tests are not run.	MD MAP

Note: See the Error Code Index (ECI) in the ECM manual.

© Copyright IBM Corp. 1984, 1985

Definition of Exits to Other Maintenance Information Manuals MLX 4

System Maintenance Programs

Contents of This Section

Online Tests **5**
OLT Prerequisites 5

OLTSEP Summary **10**
Load OLTSEP 10
Start OLTSEP 10
Select and Run an OLT 10
Stop a Run 10
Restart The OLT 10
Start Another OLT 10
Cancel The OLT 10

VM/OLTSEP Summary **20**
Load VM/OLTSEP 20
Start OLTSEP 20
Stop a Run 20
Restart the OLT 20
Cancel The OLT 20

OS/VS1 OS/VS2 MVS Summary **25**
Invoking OLTEP 25
Start OLTSEP 25
Select and Run an OLT 25
Stop a Run 25

DOS/OLTEP DOS/VSE OLTEP Summary **25**
Load DOS/OLTEP 30
Start DOS/OLTEP 30
Select and Run an OLT 30
Stop a Run 30

OLT Descriptions **40**
T3880A Channel Interface OLT 1 40
T3880B Channel Interface OLT 2 40
T3880C Trace Dump OLT Model 1, 2, 3, and 11 (SD2) 40
T3880D Trace Dump OLT Model 11 (SD1), Model 13, Model 21, and Model 23 40

3880 OLT Error Messages **50**

© Copyright IBM Corp. 1984, 1985

Contents PROG 1

Online Tests

There are four 3880 online tests (OLTs):

- T3880A - Channel interface OLT 1
- T3880B - Channel interface OLT 2
- T3880C - Trace dump OLT-Models 1, 2, 3, and 11 (SD2)
- T3880D - Trace dump OLT-Model 11 (SD1), Model 13, Model 21, and Model 23

T3880A, T3880B, T3880C, and T3880D 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 or CDS entry via the System Console at OLTs release 13.0 or higher
- Control program
- Attached device
- Error-free block wrap diagnostic, routine 79

Configuration Data Set Card For Each Device

A configuration data set (CDS) card must be prepared for each device attached to a storage director in a 3880. (See *CDS Guide*, D99-CDSGA for instructions.) 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	3880 Models 1, 2, 3, and 11 (SD2 only)
	0A	3880 Model 11 (SD1 only) and Model 21
	0C	3880 Model 13 and 23
22 to 23	20 (or 21)	Class code (21 for fixed block devices)
24 to 25	02	3370
	09	3333/3330 Models 1, 2, or 11, (SD2 only)
	0A	3340/3344
	0B	3350 Model 11 (SD1 only) and Model 21
	0C	3375
	0D	3350 Model 11 (SD2 only)
	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. Cards should be punched for base addresses not paging addresses. (See *CDS Guide*, 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 named device address extent blocks. Note: One or several devices addressed by this storage director can be shared by another system. If so, do not punch the system addresses for these devices in these card columns. The following is the format for columns 44 through 71: 04* 0130** * Two card columns indicating, in hexadecimal, the number of consecutive device addresses defined by this device address extent block. ** Four card columns indicating, 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 to 133. An even number of blank card columns (for example, 0, 2, and 4) can 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 CDS Guide, D99-GDSGA, for the continuation card format.

Control Program

Depending on 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

MVS/OLTEP Multiple Virtual Storage/Online Test Executive Program

© Copyright IBM Corp. 1984, 1985

OLTSEP Summary

The OLTSEP summary assumes that the user understands the detailed OLTSEP procedure in the *OLTSEP Users Guide*, D99-SEPDT. See also appendix B in *S/370 Diagnostic Reference Summary*, SY25-0512, for a bibliography of OLTSEP manuals.

Load OLTSEP

1. Mount the OLTSEP tape, punched cards, or disk pack.
2. Enter the IPL unit address.
3. IPL.

OLTSEP causes the following printout:

```
SEP188D  ENTER  DATE (AND TIME)
'MM/DD/YY,HH/MM/SS'
```

Start OLTSEP

Note: When the level of the OLTSEP being used is release 10.0 or higher or when running under VM, any reply can be entered without the R XX," format.

1. Reply as follows to the enter date message by entering the actual month/day/year, hour/minute/second:

   ENTER:

   ```
   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
   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:

   ENTER:

   ```
   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:

   ENTER:

   ```
   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 DEV/TEST/OPT/message.

ENTER:

```
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, C, or D. 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
Test loop (n)	TL(n)	
No test loop	NTL	X
Error loop	EL	
Error loop (I-indefinite)	EL(I)	
Error loop (n)	EL(n)	
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)	PP(n)	
No parallel print	NP	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: The remote FE control (RE) option runs only when the remote technical assistance network (RETAIN) is active. To activate RETAIN, see step 5 under START OLTSEP.

The options indicated by an X in the default column run when no specific option is specified.

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 as follows:

ENTER:

```
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 as follows:

ENTER:

```
P
```

See *OLTSEP Users Guide*, D99-SEPDT for details concerning the options.

Without Specific Options

Reply as follows to the DEV/TEST/OPT/ MESSAGE.

ENTER:

```
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, C, or D. 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.

Stop A Run

1. Press Interrupt to stop a run.
2. OLTSEP causes the following printout:

   ```
   SEP107I OPTIONS ARE SEP105D ENTER
   DEV/TEST/OPT/
   ```

After stopping a run, perform one of the following:

- Restart the OLT
- Start another OLT
- Cancel the OLT

Restart the OLT

To restart the OLT, reply as follows to the DEV/TEST/OPT/ message.

ENTER:

```
///
```

Start Another OLT

1. Stop the OLT
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 DEV/TEST/OPT/ message.

ENTER:

```
CANCEL
```

See *OLTSEP Users Guide*, D99-SEPDT, for details on how to stop a run.

© Copyright IBM Corp. 1984, 1985

VM/OLTSEP Summary

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*, GC20-1809. See also Appendix B in *Reference Summary*, SY25-0512 for a bibliography of OLTSEP manuals.

The following conditions must be satisfied to permit testing from a virtual machine environment.

1. The integrity of the complete system cannot be degraded to the point where the VM/370 program cannot run.
2. I/O and channel logic communication paths are operative as applied to OLTSEP and OLTS.
3. The virtual machine assigned to the CE is available and functioning.
4. The communication path from and to the CE's terminal is functioning and in an enabled state.
5. The CE user virtual machine identification (userid) and password are known to the CE.
6. The device(s) to be tested must be available for the CE's exclusive use.

   Note: As a user of a virtual machine, it is assumed that the CE has the class G and F commands and CMS allocated for his use.

The typical CE virtual machine configuration specified in the user directory may consist of the following:

```
USER CEMAINT PASSWORD 512K 1M GF
CONSOLE   009     3278
SPOOL     00C     2540   READER
SPOOL     00D     2540   PUNCH
SPOOL     00E     1403   PRINTER A
MDISK     190     3350   000 050 CMS190 R
MDISK     191     3350   010 005 CMS001 W
```

The above configuration is interpreted as follows:

- The first line contains, in left-to-right order, the user identification for the virtual machine, the security password, the normally assigned storage size, the maximum storage size the user can specify, and the privilege classes G and F. The G class is necessary for the CE to examine or change any values in his virtual machine; such as to examine sense bytes or change PSW values. The F class allows the CE to invoke CPEREP to edit and clear error records and to invoke a trace facility to a 3704/3705.
- The remaining lines identify the virtual addresses used with the CE virtual machine.
- Normally, system consoles have an address of 01F. Therefore, assembled diagnostic tape reflects this address. Virtual consoles are configured with an address of 009 in the system directory. To resolve this conflict of different addresses, the DEFINE command is used.

  ```
  define 009 as 01F
  ```

- Timer Real and EC Mode On must be set to on to permit testing from a virtual machine environment.

  Note: To verify this the CE must have previously logged onto his virtual machine.

- To verify that Timer Real and EC Mode are on:

  ENTER:

  ```
  Q SET
  ```

  If Timer Real and EC Mode are not set to on:

  ENTER:

  ```
  SET TIMER REAL
  ```

  ENTER:

  ```
  SET EC MODE ON
  ```

By keying in what are termed "console functions" from the CE virtual machine, simulation of many of the functions that are performed by a real system/370 can be accomplished.

ATTN,REQUEST	Attention interrupt from a system console
ADSTOP	Address stop facility
DISPLAY	Display storage and display register capabilities of a system console
EXTERNAL	External interrupt key on the system console
IPL	Console Load key
NOTREADY	Loss of READY to a virtual device
READY	READY state of a virtual device
REWIND	Function of the Tape Drive Rewind Key
STORE	Function provided by the store key on the system console

Load VM/OLTSEP

1. Mount the OLTSEP tape or disk pack.
2. Log on to the CE virtual machine

   Enter:

   ```
   L CEMAINT
   ```

   VM/370 responds with:

   ENTER PASSWORD

   Enter:

   ```
   CE
   ```

3. Request that the operator attach to the CE virtual machine the IPL device and any device connected to the storage director to be tested.
4. Enter:

   ```
   I XXX
   ```

The Xs contain the address at which the OLTSEP tape or disk pack was attached.

Start OLTSEP

Start is the same as indicated for OLTSEP on PROG 10.

Stop A Run

Press the attention key twice quickly to stop a run. This allows the CE to enter the CP environment to perform a virtual machine function; and, at the same time, temporarily suspends the previous operation.

Restart The OLT

To restart the OLT use the CP EXTERNAL command.

ENTER:

```
EXT
```

Cancel the OLT

OLTSEP can be cancelled while running under VM, however to exit OLTSEP and give control back to the operating system, press the attention key twice quickly to enter the CP environment:

ENTER:

```
LOG
```


© Copyright IBM Corp. 1984, 1985

This OLTEP summary assumes that the user understands the detailed OLTEP procedures in the *Online Test Standalone Executive Program (OLTSEP) Users Guide*, D99-SEPDT. See also Appendix B in *S/370 Diagnostic Reference Summary*, SY25-0512, for a bibliography of OLTEP manuals.

Invoking OLTEP

OLTEP is resident within the operating system.

Start OLTEP

Note: Before starting OLTEP, get the operator to vary offline any device connected to the storage director to be tested.

1. To invoke OLTEP by using job control language (JCL) in the OS job stream, cards must be prepared to execute the program.
2. To invoke OLTEP with the START command, use one of the following. The START command can be used only if an OLTEP procedure is cataloged in SYS1.PROCLIB.)

```
S OLTEP.PN,OPTIONS (VS1)
S OLTEP,OPTIONS (VS2),(MVS)
```

Definitions of the symbols used in the START command are:

S =	START command
OLTEP =	name of OLTEP procedure in SYS1.PROCLIB
.PN =	partition number (VS1 only)
,OPTIONS =	see appropriate OLTEP publication for examples.

3. OLTEP causes the following printout:

   IFD102I OLTS RUNNING

   Starting at this point, and throughout the running of OLTEP, various messages may be generated. See *Online Test Standalone Executive Program (OLTSEP) Users Guide*, D99-SEPTD. See also appendix B in *S/370 Diagnostic Reference Summary*, SY25-0512, for a bibliography of OLTEP manuals.

   Note: When running OLTEP under OS or MVS a two digit reply code must be replied to. The R 01,'/// ' format is not used for OS/OLTEP or MVS/OLTEP.

4. OLTEP causes the following printout:

   IFD105D ENTER DEV/TEST/OPT/
5. If RETAIN is to be used, reply as follows to the preceding printout:

   ENTER:

```
REI
```

6. 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 DEV/TEST/OPT/ message.

ENTER:

```
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, C, or D. 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)	TL(n)	
No test loop	NTL	X
Error loop	EL	
Error loop (I-indefinite)	EL(I)	
Error loop (n)	EL(n)	
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)	PP(n)	
No parallel print	NP	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: The remote FE control (RE) option runs only when the remote technical assistance network (RETAIN) is active. To activate RETAIN, see step 5 under Start OLTEP.

The options indicated by an X in the default column run when no specific option is specified.

See *Online Test Standalone Executive Program (OLTSEP) Users Guide*, D99-SEPDT. 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 DEV/TEST/OPT/ message

ENTER:

```
XXX/T3880Y//
```

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, C, or D. 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 IFD104E TO FORCE COMMUNICATION WITH OLTEP EXECUTIVE, ENTER ANY CHARACTER.
2. To stop OLTEP, reply as follows to the preceding printout:

   ENTER:

   X

   'X' represents any character.
3. OLTEP causes the following printout:

   01 IFD105D ENTER DEV/TEST/OPT/

After stopping a run, do one of the following:

- Restart the OLT
- Restart the OLT with different options
- Start another OLT
- Cancel the OLT

Restart the OLT

To restart the OLT, reply as follows to the DEV/TEST/OPT/ message.

ENTER:

///

Restart the OLT with Different Options

To restart the OLT with different options, reply as follows:

ENTER:

```
//XYZ/
```

XYZ represent the different options.

For other options, see the option list.

Start Another OLT

To start another OLT, reply to the DEV/TEST/OPT/ message with the desired OLT information.

Cancel the OLT

To cancel the current OLT, reply as follows to the DEV/TEST/OPT/ message:

ENTER:

```
CANCEL
```

See *Online Test Standalone Executive Program (OLTSEP) Users Guide*, D99-SEPDT 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.

© Copyright IBM Corp. 1984, 1985

OS/VS1 OS/VS2 MVS OLTEP Summary PROG 25

DOS/OLTEP DOS/VSE OLTEP Summary

The DOS/OLTEP summary assumes that the user understands the detailed DOS/OLTEP procedure in *Systems DOS/VS OLTEP.*, 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*, GC33-5383, for details concerning the entering of the JCL.

1. After the JCL is entered, DOS/OLTEP causes the following printout:

   E102I OLTS RUNNING

   E102I OPTIONS ARE NTL, NEL, EP,

   CP, NPP, PR, FE, NMI, SI, NRE

   01 E105D ENTER DEV/TEST/OPT/

2. If RETAIN is to be used, reply as follows to the preceding printout:

   ENTER:

   ```
   R 01,'REI'
   ```

3. DOS/OLTEP causes the following printout:

   01 '*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 options.

With Specific Options

Reply as follows to the DEV/TEST/OPT/ message:

ENTER:

```
R 01,'XXX/3880Y/MI,RE/'
```

Note: The R 01,'///' format is not necessary for DOS/VSE OLTEP, therefore the CE may reply as follows:

```
XXX/3880Y/MI,RE/
```

The Xs contain the address of the device to be tested. The Y contains the 3880 OLT identifier (ID) A, B, C, or D. 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)	TL(n)	
No test loop	NTL	X
Error loop	EL	
Error loop (I-indefinite)	EL(I)	
Error loop (n)	EL(n)	
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)	PP(N)	
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:

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 *Online Test Standalone Executive Program (OLTSEP) Users Guide*, D99-SEPDT, 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 DEV/TEST/OPT/ message:

ENTER:

```
R 01,'XXX/3880Y//'
```

The Xs contain the address of the device to be tested. The Y contains the 3880 OLT identifier (ID) A, B, C, or D. 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 Interrupt.
2. DOS/OLTEP, causes the following printout:

   01E105D ENTER DEV/TEST/OPT/

3. Reply to the preceding printout as follows:

   ENTER:

   ```
   R 01,'cancel'
   ```

   This cancels DOS/OLTEP.

3880 MIM							
	Seq AM0001	PN 6315675 6 of 19	881143 13 Jan 84	881216 15 Aug 84	A15621 01 Apr 85		

© Copyright IBM Corp. 1984, 1985

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

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 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 X'DA' to the system. When routine 2 detects X'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 - Models 1, 2, 3 and Model 11 (SD2)

T3880C does not run on the IBM 3880 Model 21 or 23.

T3880D Trace Dump OLT - Model 11 (SD1), Model 13, Model 21, and Model 23

The T3880D Trace Dump OLT reads, formats, and prints functional microcode trace data collected in the 3880 storage directors attached to subsystem storage. The Trace Dump is printed both formatted and unformatted. The following information is printed in the order shown:

1. Dynamic Trace Data (formatted)
   a. Module Identifiers (IDs)
   b. Channel and storage director address
   c. Channel commands
   d. Status
2. State Save Data (formatted)
   a. Trace/Save Identifiers (IDs)
   b. External Registers
   c. Internal Registers
   d. Maintenance Connection Trace Data
   e. Variable Information Tables and Control Blocks
   f. Microcode EC and Part Numbers
3. Hexadecimal Dump (unformatted)

Before running this OLT, the trace should have been initiated and then ended. Use maintenance device option 8 for initiating and ending the trace.

If the trace was not initiated, or if the trace did not end correctly, the T3880D Trace Dump OLT receives a Condition Code 1 and a Unit Exception in the channel status word (CSW).

© Copyright IBM Corp. 1984, 1985

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 (X'C4') command successfully read the symptom code.	See the CE action on PROG 55 through 95 for the message preceding this one.
3880A or 3880B	001	*WAIT TIME OUT ERROR=aacd ROUTINE-rr PASS-pp XPTDCC-x... . . . aacd=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=Routine 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 not used.	The ending status was not received within 1 second after the start of an input/output (I/O) operation.	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) 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	One of the following conditions has been detected: - More than 32 unit addresses were specified in a unit address block - More that 128 unit addresses were specified in the CDS entry	

© Copyright IBM Corp. 1984, 1985

3880 OLT Error Messages

SECTION ID	REFERENCE NUMBER	ERROR MESSAGES AND CONSOLE COMMUNICATIONS	DIAGNOSTIC INFORMATION	CE ACTION
3880B	005	WARNING - SYSTEM VOLUMES MUST BE ACCESSIBLE THROUGH SD NOT BEING TESTED THIS SD (aacd) MUST BE ASSIGNED TO OLTEP PARTITION UNIT ADDRESSES ACCESSIBLE BY THIS SYSTEM AND SD XXXX XXXX... ENTER P TO PROCEED, C TO CANCEL See reference number 001 for explanation of storage director address (aacd).	Format 1 (DOS/OLTEP/Unshared CU) 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.	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 OLTSEP with another storage director.
3880B	005	WARNING - SYSTEM VOLUMES MUST BE ACCESSIBLE THROUGH SD NOT BEING TESTED THIS SD (aacd) MUST BE ASSIGNED 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 ENTER P TO PROCEED, C TO CANCEL See reference number 001 for explanation of storage director address (aacd).	Format 2 (OLTSEP/Shared CU) See format 1 above. 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.	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. Note: Sharing systems may use different storage director addresses for these devices.
3880B	006	ENABLE THE SD (aacd) CHANNEL INTERFACE TO BE TESTED ENTER P TO PROCEED, C TO CANCEL See reference number 001 for explanation of storage director address (aacd).		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.

© Copyright IBM Corp. 1984, 1985

3880 OLT Error Messages

SECTION ID	REFERENCE NUMBER	ERROR MESSAGES AND CONSOLE COMMUNICATIONS	DIAGNOSTIC INFORMATION	CE ACTION
3880B	007	*ERROR DURING ROUTINE 75 OR SD NOT READY CONTROL UNIT-aacd ROUTINE-00 XPTD CC-1 XPTD STATUS-2C00 RCVD CC-X... . . . See reference number 001 for explanation of storage director address (aacd).	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.	1. Check subsequent reference number 007 messages for additional details of the error. 2. Ensure that all actions required by reference number 006 messages were completed. 3. Reload routine 75. See MD 180 in the MSM.
3880B	017	RTN-xx BYPASSED. OLTEP CNTRL MODE REQD	Either the OLT is running under an operating system (VM or MVS), 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.	If this routine must be run, bring down the operation system and perform an IPL of OLTSEP through another control unit. Otherwise, no action is required.
3880B	021	*ERROR DURING DISCONNECT-IN TAG TEST CONTROL UNIT-aacd ROUTINE-03 PASS-pp XPTD CC-1 XPTD STATUS-0C00 RCVD CC-x... . . . See reference number 001 for explanation of storage director address, routine number, and pass count.	Expected condition code or initial status was not received in response to a X'CF' command.	Go to the cable swap procedure on CARR 230.
3880B	032	OLT TERMINATED SUCCESSFULLY	The test ended without detecting any errors.	Return to the MD.

© Copyright IBM Corp. 1984, 1985

SECTION ID	REFERENCE NUMBER	ERROR MESSAGES AND CONSOLE COMMUNICATIONS	DIAGNOSTIC INFORMATION	CE ACTION
3880B	024	*ERROR DURING MARK-IN TAG TEST CONTROL UNIT-aacd ROUTINE-01 PASS-pp XPTD CC-0 XPTD STATUS-0C00 RCVD CC-X... . . . See reference number 001 for explanation of storage director address, routine number, and pass count.	Format 1 Expected condition code (initial status of ending status) was not received in response to a X'C2' command.	1. Suspect Mark-In tag line. 2. Perform reference number 001 CE action.
3880B	024	*ERROR DURING MARK-IN TAG TEST CONTROL UNIT-aacd ROUTINE-01 PASS-pp XPTD DATA-DA RCVD DATA-xx . . . See reference number 001 for explanation of storage director address, routine number, and pass count.	Format 2 Storage director retry is transparent to the processor. The storage director diagnostic signals the OLT on every other X'C2' command with X'DA' data when storage director retry was successfully performed.	1. Suspect Mark-In tag line. 2. Perform reference number 001 CE action.
3880B	025	*ERROR DURING CHANNEL UNSHARED UCW TEST CONTROL UNIT-aacd ROUTINE-02 PASS-pp XPTD CC-1 XPTD STATUS-0800 RCVD CC-x... . . . See reference number 001 for explanation of storage director address, routine number, and pass count.	Format 1 Command X'CB' was issued to cause posting of Channel End Status. This test verifies unshared (block multiplex) channel operation.	1. Ignore the message if channel UCW for device under test is plugged for shared (not block multiplex) operation. 2. Check channel UCW's for correct unshared plugging for each device on this storage director if unshared (block multiplex) operation is failing.
3880B	025	*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 See reference number 001 for explanation of storage director address, routine number, and pass count.	Format 2 Command X'DB' was issued while Device End status was still outstanding for the previous X'CB' command.	1. Ignore the message if channel UCW for device under test is plugged for shared (not block multiplex) operation. 2. Check channel UCW's for correct unshared plugging for each device on this storage director if unshared (block multiplex) operation is failing.

© Copyright IBM Corp. 1984, 1985

3880 OLT Error Messages

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 0B 3350	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 enable 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-0 XPTD 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 address storage director. If it is in the Enable position, go to cable swap procedure on CARR 230.

© Copyright IBM Corp. 1984, 1985

3880 OLT Error Messages PROG 75

SECTION ID	REFERENCE NUMBER	ERROR MESSAGES AND CONSOLE COMMUNICATIONS	DIAGNOSTIC INFORMATION	CE ACTION
3880A	074	SD BUFFERED LOG DATA-00001000800000600000000000000000	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-0XPTD 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.	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 XPTD CC-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.	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-XXXX RTN-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.	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.

© Copyright IBM Corp. 1984, 1985

3880 OLT Error Messages PROG 75

3880 OLT Error Messages PROG 80

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 channel 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 channel 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, D	081	EXIO DID NOT START, JOB TERMINATED	EXIO command failed during OLTSEP or OLTEP. Received a non-zero return code from the EXIO macro.	1. See the printer output for additional information. 2. Check for the following possible failures. a. The trace program in the storage director did not end correctly. b. The attached storage control is not a 3880; it may be a 3830. c. Channel interface is disabled. 3. Go to the cable swap procedure on CARR 230.
3880C, D	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.	1. See the printer output for additional information. 2. Check for the following possible failures. a. The trace program in the storage director did not end correctly. b. The attached storage control is not a 3880; it may be a 3830. c. The channel interface is disabled. 3. Go to the cable swap procedure on CARR 230.

© Copyright IBM Corp. 1984, 1985

SECTION ID	REFERENCE NUMBER	ERROR MESSAGES AND CONSOLE COMMUNICATIONS	DIAGNOSTIC INFORMATION	CE ACTION
3880C, D	083	COND CODE 1 RCVD, POSSIBLE NO TRACE DATA	Received a Condition Code 1.	1. See the printer output for additional information. 2. Check for the following possible failures. a. The trace program in the storage director did not end correctly. b. The attached storage control is not a 3880; it may be a 3830. c. Channel interface is disabled. 3. Go to the cable swap procedure on CARR 230.
3880C, D	084	COND CODE 2 RCVD, RETRIES EXHAUSTED	Received a Condition Code 2.	1. See the printer output for additional information. 2. Check for the following possible failures. a. The trace program in the storage director did not end correctly. b. The attached storage control is not a 3880; it may be a 3830. c. Channel interface is disabled. 3. Go to the cable swap procedure on CARR 230.
3880C, D	085	COND CODE 3 RCVD	Received a Condition Code 3.	1. See the printer output for additional information. 2. Check for the following possible failures. a. The trace program in the storage director did not end correctly. b. The attached storage control is not a 3880; it may be a 3830. c. Channel interface is disabled. 3. Go to the cable swap procedure on CARR 230.
3880A, B	000	T3880A, B CANNOT RUN ON UNIT-XXXX. UNSUPPORTED CU OR DEVICE TYPE.		Validate CDS entries for unit/device addresses specified. Refer to PROG 5 regarding CDS card format.
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).
3880C, D	086	T3880C,D INCORRECT OLT DASD/SD CONFIGURATION. CDS ENTRY MAY BE IN ERROR, OLT TERMINATED.	T3880C executing against 3880 Model 11(SD1), Model 13, Model 21 or Model 23. T3880D executing against 3880 Model 1, 2, 3 or Model 11 (SD2). CDS entry for device under test may be invalid.	1. Use correct OLT for configuration. 2. Examine and correct CDS entries.

© Copyright IBM Corp. 1984, 1985

3880 OLT Error Messages

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).	1. Restart OLTEP or OLTSEP. 2. 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. 3. A return code of 04 means: a. The OLT and the OLT error print are not at compatible levels. b. The error print module has been removed from the OLT library. c. 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.

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	

The following list indicates possible causes of termination codes:

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	Device under test, including channel and/or storage director hardware and software
U	User Error

© Copyright IBM Corp. 1984, 1985

3880 OLT Error Messages PROG 95

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 opertional) usually indicates a catastrophic failure not cleared by a previously issued Halt I/O command. Therefore, further testing is usually invalid.	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. 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 90.
3880A	None	INTERVENTION REQUIRED, REPLY ANY CHAR TO RETRY	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 90.

© Copyright IBM Corp. 1984, 1985

3880 OLT Error Messages

SECTION ID	REFERENCE NUMBER	ERROR MESSAGES AND CONSOLE COMMUNICATIONS	DIAGNOSTIC INFORMATION	CE ACTION
OLTSEP	SEP1251 SEP1371 SEP1371 SEP139D	UNREADABLE LABEL ON xxxx CSW xxxxxxxxxxxxxxxx SNS xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx xxxxxxxx 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 T3880A.
OS OLTEP	IFD1251 IFD1251 IFD1251 IFD139D	UNREADABLE LABEL ON xxxxxxxx CSW xxxxxxxxxxxxxxxx SNS xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx xxxxxxxx REPLY B TO BYPASS, R TO RETRY, P TO PROCEED		
OLTSEP	SEP1381	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 T3880A, this message will be presented.	Enable the storage director channel interface switch and reply P.
OS OLTEP	IFD1381 IFD139D	DEVICE xxxx NOT OPERATIONAL CC=3 REPLY B TO BYPASS, R TO RETRY, P TO PROCEED (MAY DESTROY DATA)		

© Copyright IBM Corp. 1984, 1985

3880 OLT Error Messages

3880 OLT Error Messages PROG 105

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:	Go to the cable swap procedure on CARR 230.
EXAMPLE		*T3880A-10 RTN 001 DEV/LN0160 ECA 0 REFERENCE NUMBER 00005 ERROR ON DIAGNOSTIC LOAD CHAIN CCW01 53 00B683 40 00 0001 CAW 0000B880 *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 First Line Name of test An * on CCW02 Failing CCW An * on RCVD CSW Failing status	See reference number in this section and proceed, using diagnostic information and CE action.

© Copyright IBM Corp. 1984, 1985

3880 OLT Error Messages PROG 105

Locations

Contents of This Section

Front and Rear Views 10

Power Stack Label 15

Regulator +5 Volt 20

Regulator Cards 23

DC Bulk Power Supply 25

Three Phase AC Bulk Supply 30

Maintenance Power Supply-60 Hz 35

Maintenance Power Supply-50 Hz 40

Primary Power Box-50 Hz (Except Japan) 41

Primary Power Box-60 Hz and 50 Hz Japan 43

AC Distribution/Control Board Power 45

+5, -5, and +8.5 VDC Cache Power 50

SD Auxiliary Power 55

Central Power Control Board 60

Device Interface Power Board 65

Power Switch Panel 71

Gate Boards 75

Circuit Card Connector Assignments 80

Logic Board Pin Identification (20 Card Board) 84

Logic Board Pin Identification (22 Card Board) 85

Crossovers 90

MD and Cable Connectors, Convenience Outlet, Frame and Gate Parts 95

Channel Interface and Control Interface Cable Connectors . 100

Tailgate Cable Connector Pin Identification 101

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.

© Copyright IBM Corp. 1984, 1985

For machines with relocated tailgate see LOC 11.

The front and rear storage control figure shows the location of specific parts. Each reference also indicates where more information can be found.

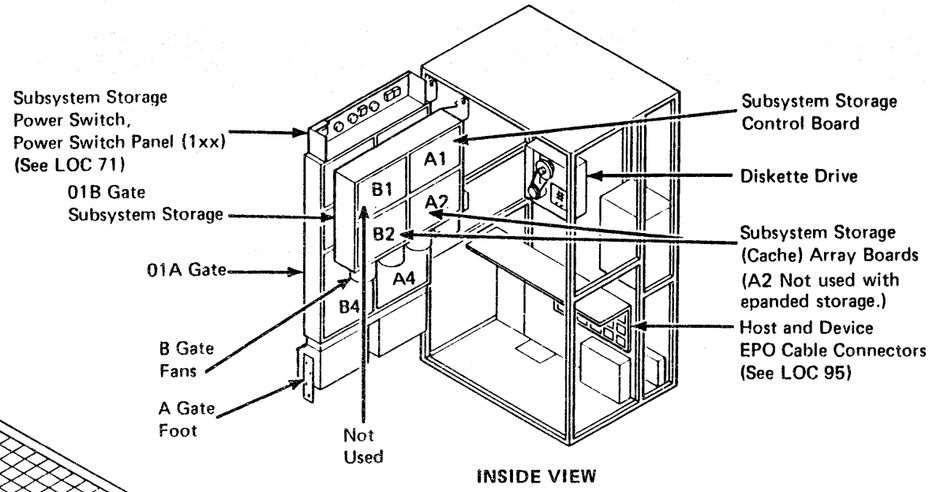
The following is the numbering arrangement for specific areas in the storage control where xx is the unit in that area.

PS-1

- 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

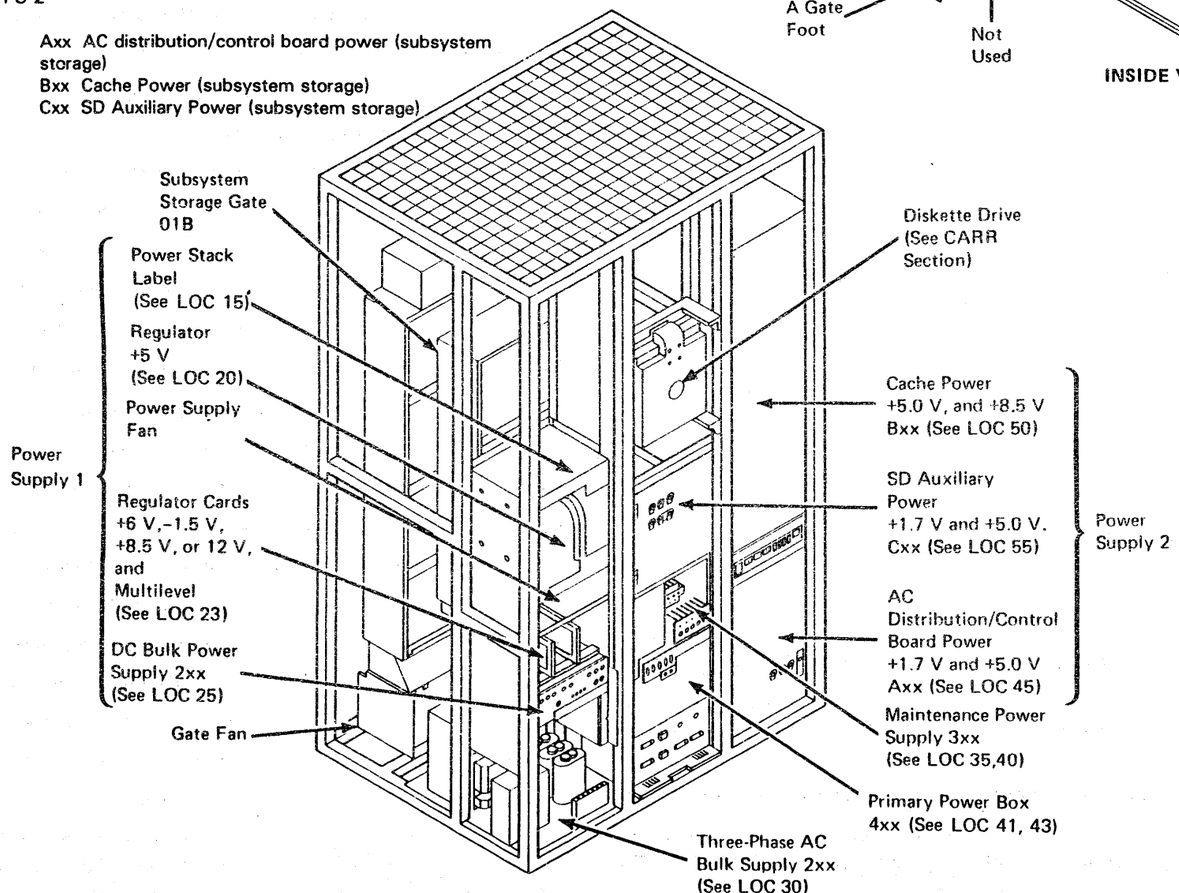
PS-2

- Axx AC distribution/control board power (subsystem storage)
- Bxx Cache Power (subsystem storage)
- Cxx SD Auxiliary Power (subsystem storage)

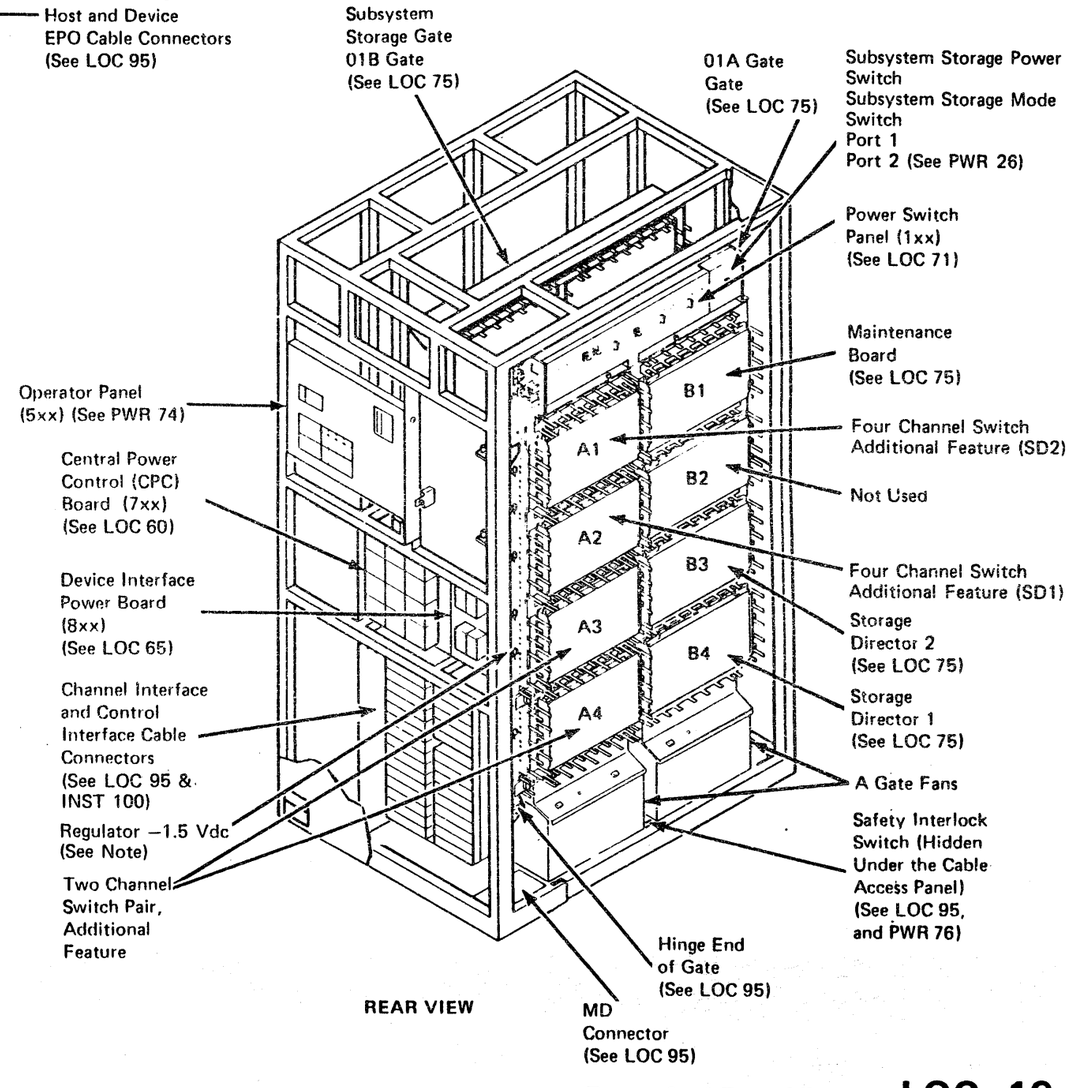


INSIDE VIEW

Note: 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 on the A gate between GTB-3 and GTB-4 (see LOC 95).



FRONT VIEW



REAR VIEW

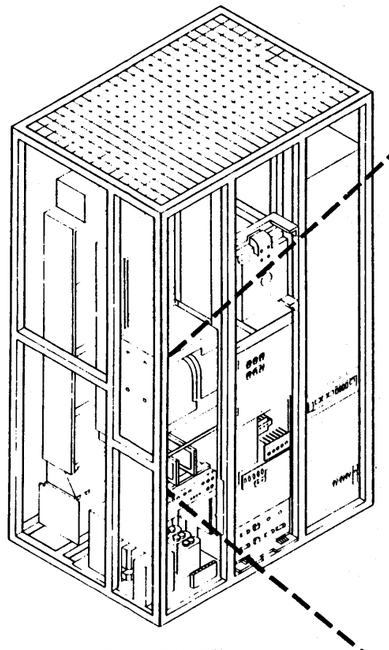
3880 MIM		PN 6315676	881143	881216	A15621		
	Seq AQ0001	2 of 25	13 Jan 84	15 Aug 84	01 Apr 85		

© Copyright IBM Corp. 1984, 1985

Power Stack Label

The figure shows the following parts on the power stack label.

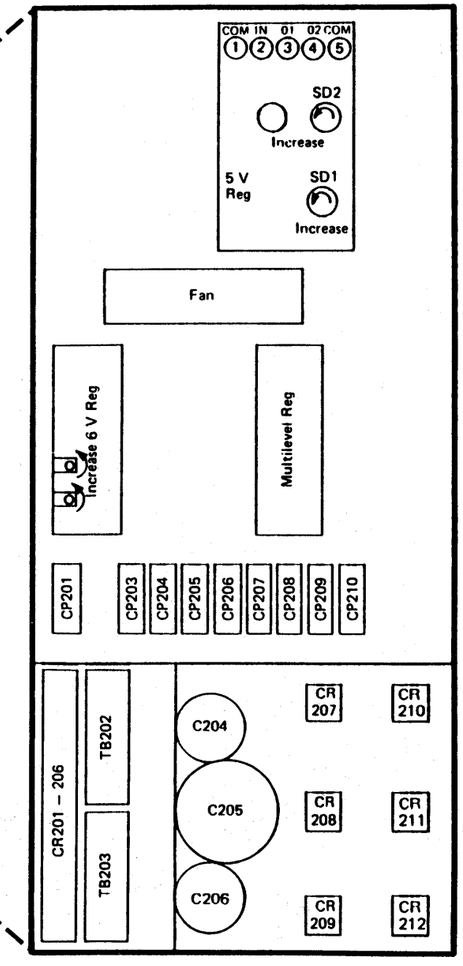
- 5 V regulator
- 6 V, and multilevel regulator cards
- C204 through C207 capacitors
- CP201, CP203 through CP210 circuit protectors
- CR201 through CR212 rectifiers
- TB202 and TB203 terminal boards
- Fan



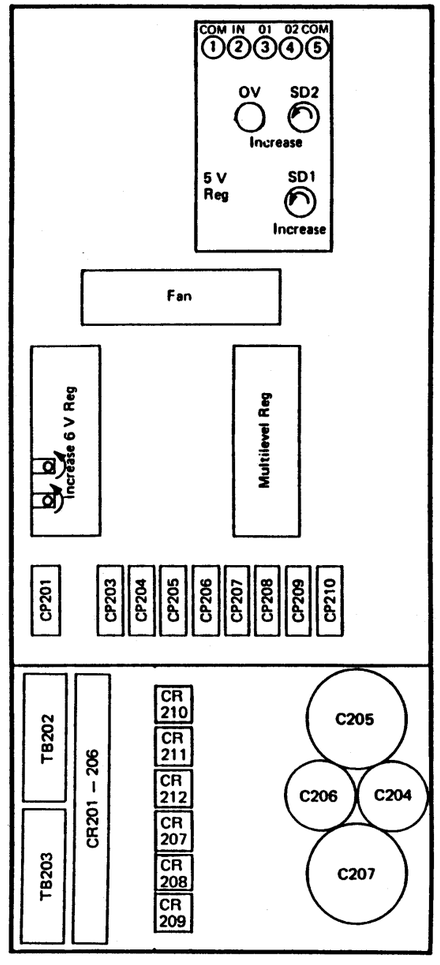
FRONT VIEW

Two or Four Channels (TCA)

One, Two or Four Channels



Four Channel Switch, Additional (FCA)

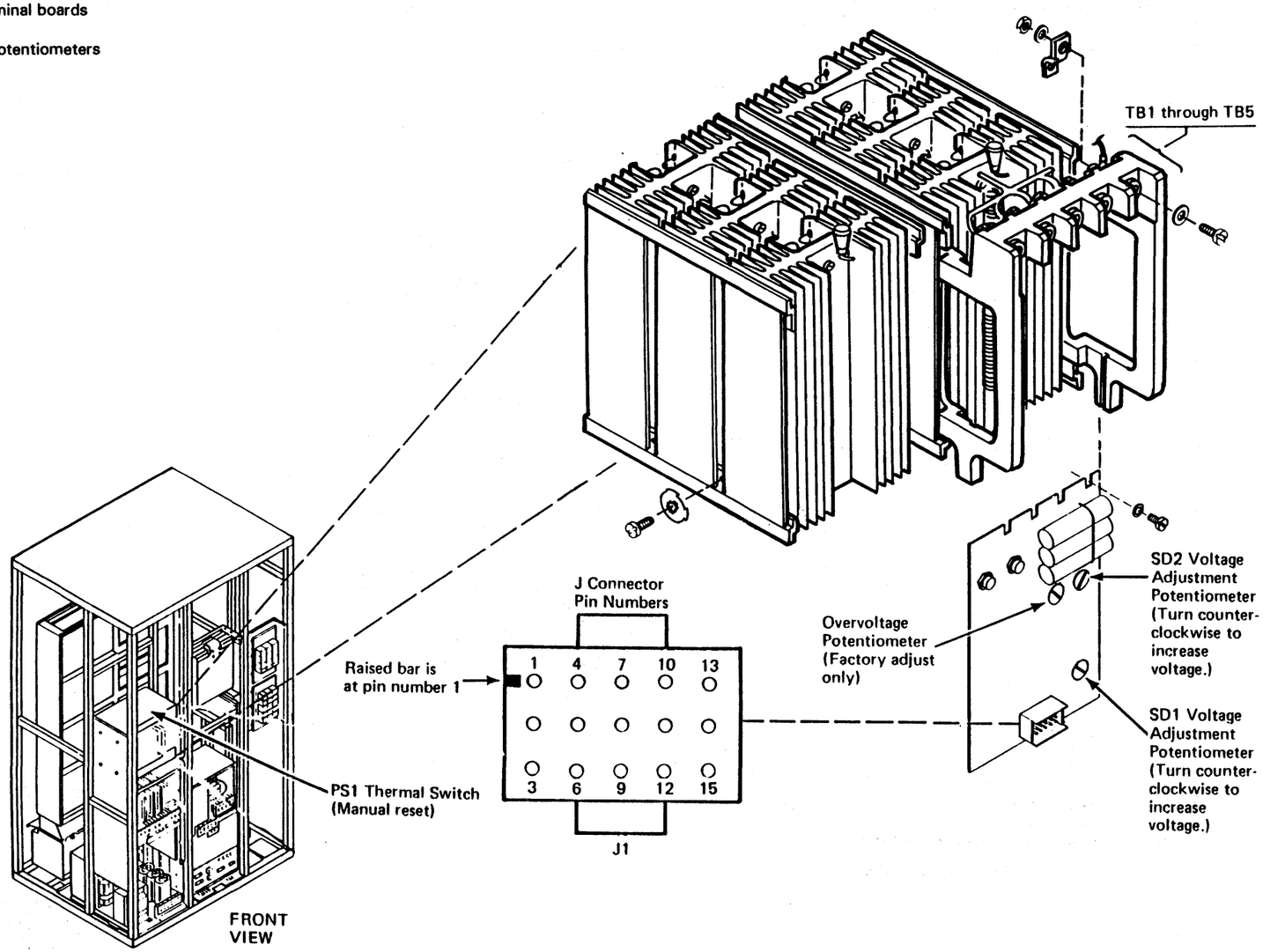


© Copyright IBM Corp. 1984, 1985

The +5 V regulator contains the following parts:

- +5 V regulators
- J1 connector
- PS1 thermal switch
- TB1 through TB5 terminal boards
- Voltage adjustment potentiometers

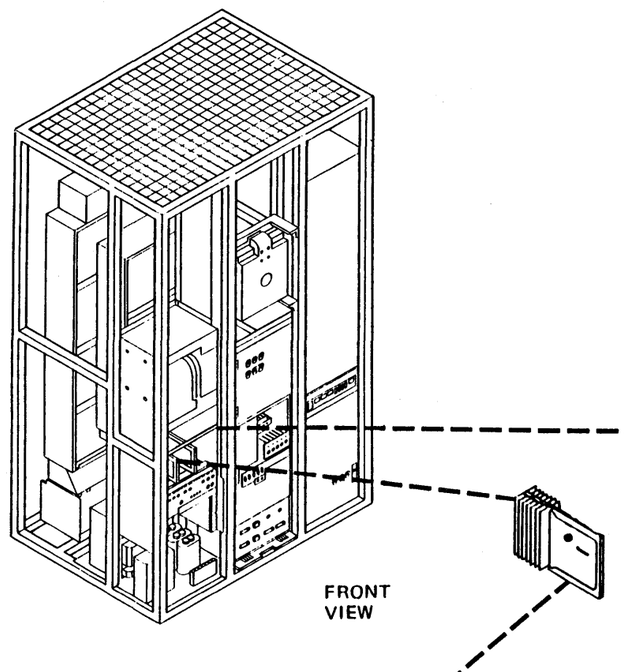
+5 V Regulator



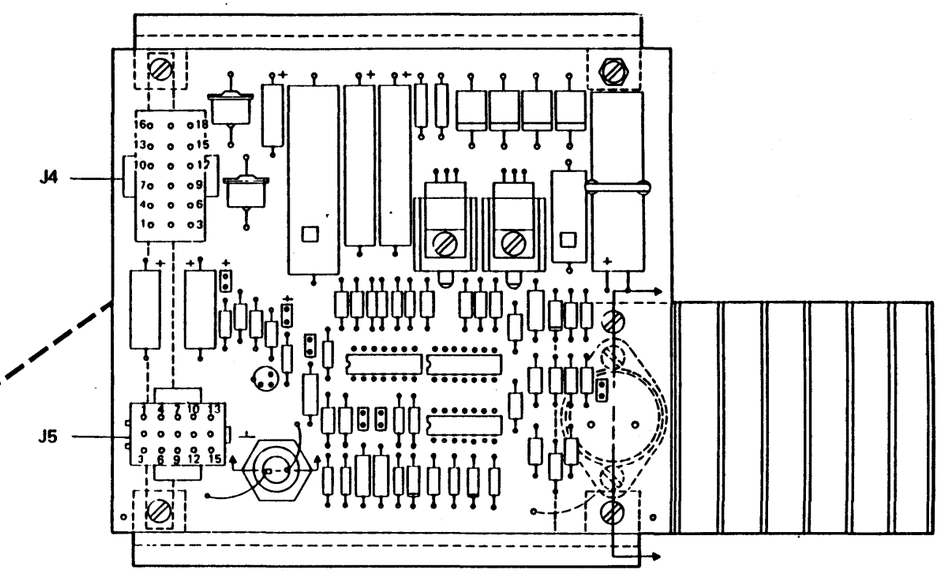
© Copyright IBM Corp. 1984, 1985

The figure shows the following regulator cards and their parts:

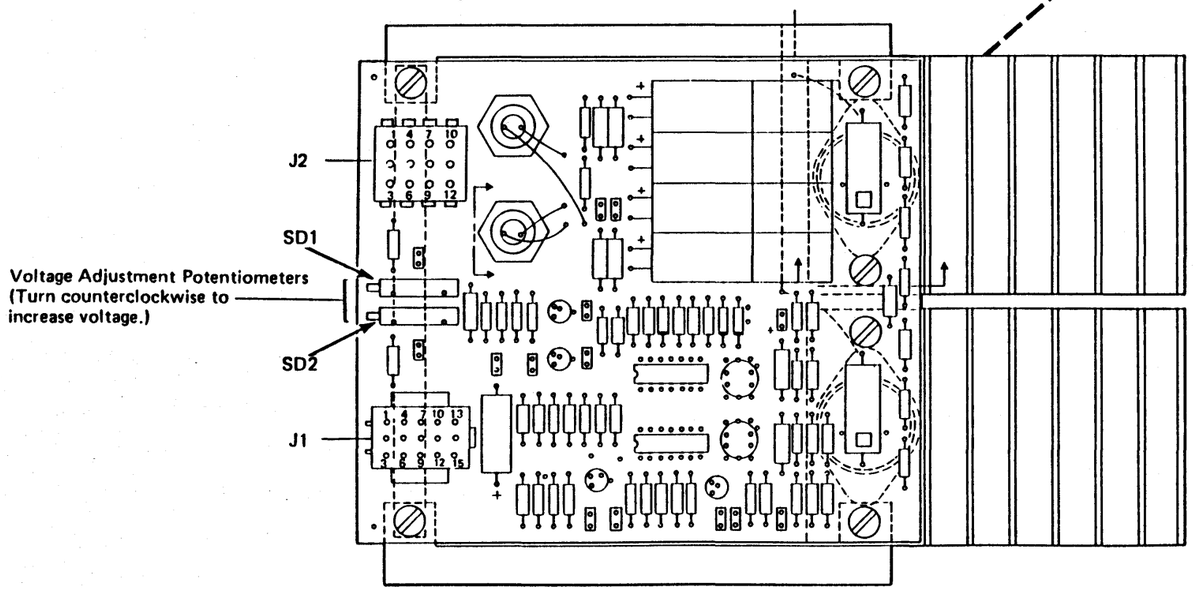
- -1.5 V, +8.5 V or +12 V, and multilevel regulator card
- +6 V regulator card
- J1, J2, J4, and J5 connectors
- Voltage adjustment potentiometers



MULTILEVEL REGULATOR CARD
-1.5 Vdc (see note 1), +8.5 Vdc or +12 Vdc, and
+3.0 Vdc (see note 2)



+6 V Regulator Card



Notes:

1. When CP207 is not installed, the -1.5 Vdc regulator is installed on the A gate between GTB-3 and GTB-4.
2. +3.0 Vdc not used on this model.

3880 MIM		PN 6315676	881143	881216	A15621		
	Seq AQ0001	5 of 25	13 Jan 84	15 Aug 84	01 Apr 85		

© Copyright IBM Corp. 1984, 1985

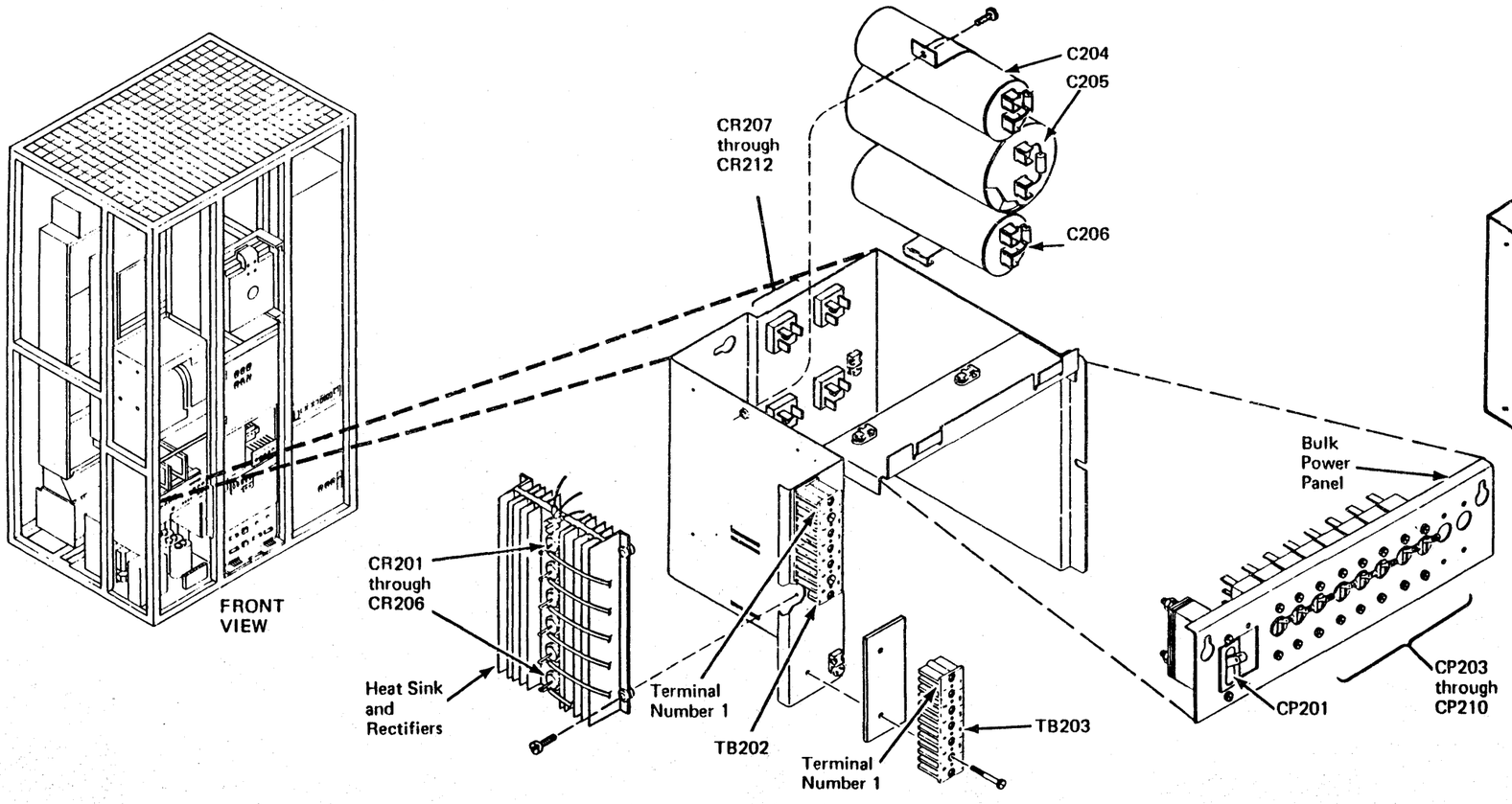
Power Supply 1, (2xx)

The DC bulk power supply contains the following parts:

- C204 and C207 capacitors
- CP201, and CP203 through CP210 circuit protectors
- CR201 through CR212 rectifiers
- Heat sink and rectifiers
- TB202 and TB203 terminal boards

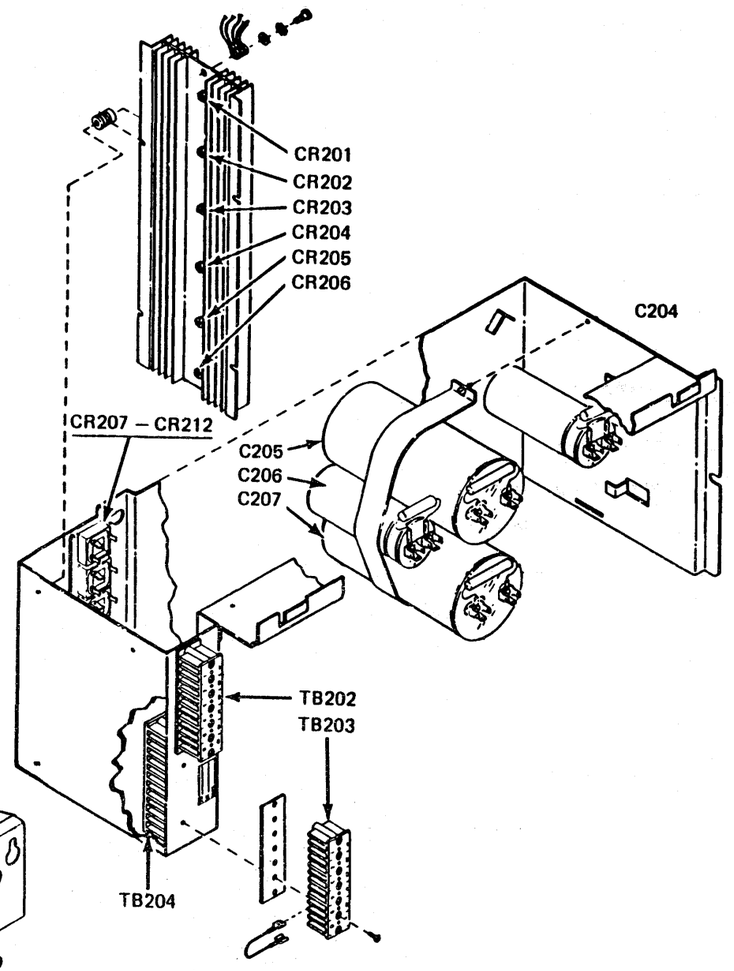
Two Channel or Two Channel Switch Pair, Additional (TCA)

One, two, or four channels



Four Channel Switch, Additional (FCA)

Eight Channels (FCA)



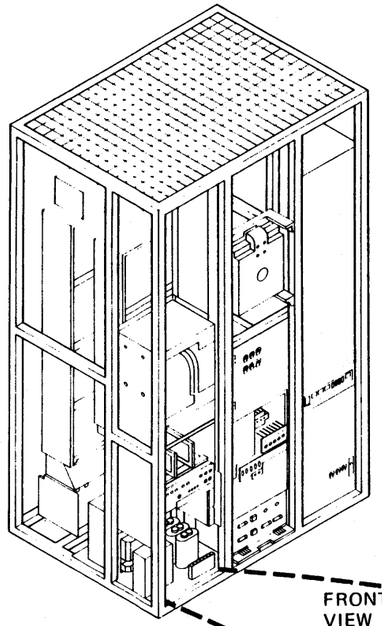
3880 MIM							
	Seq AQ0001	PN 6315676 6 of 25	881143 13 Jan 84	881216 15 Aug 84	A15621 01 Apr 85		

© Copyright IBM Corp. 1984, 1985

Three Phase AC Bulk Supply

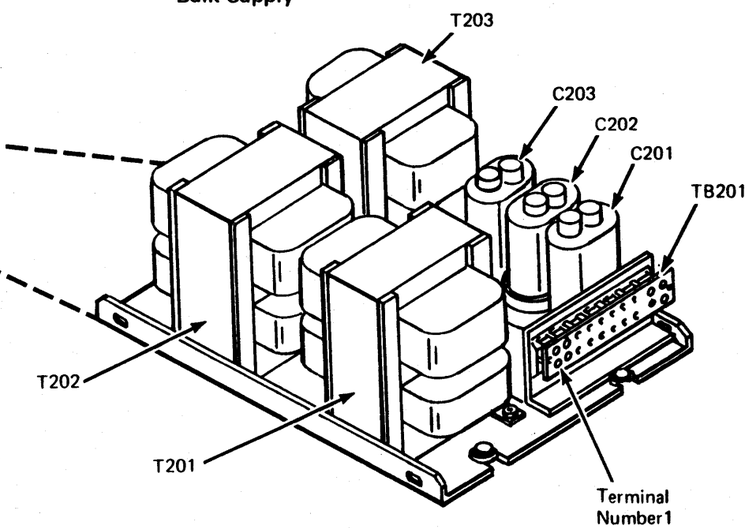
The three-phase AC bulk supply contains the following parts:

- C201 through C203 capacitors
- T201 through T203 transformers
- TB201 terminal board



FRONT VIEW

Three-Phase AC Bulk Supply



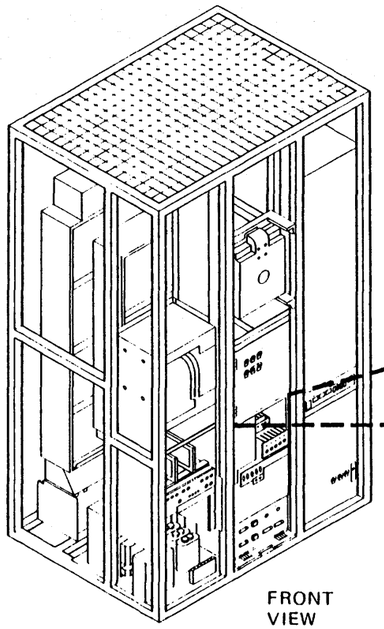
3880 MIM	Seq AQ0001	PN 6315676 7 of 25	881143 13 Jan 84	881216 15 Aug 84	A15621 01 Apr 85		

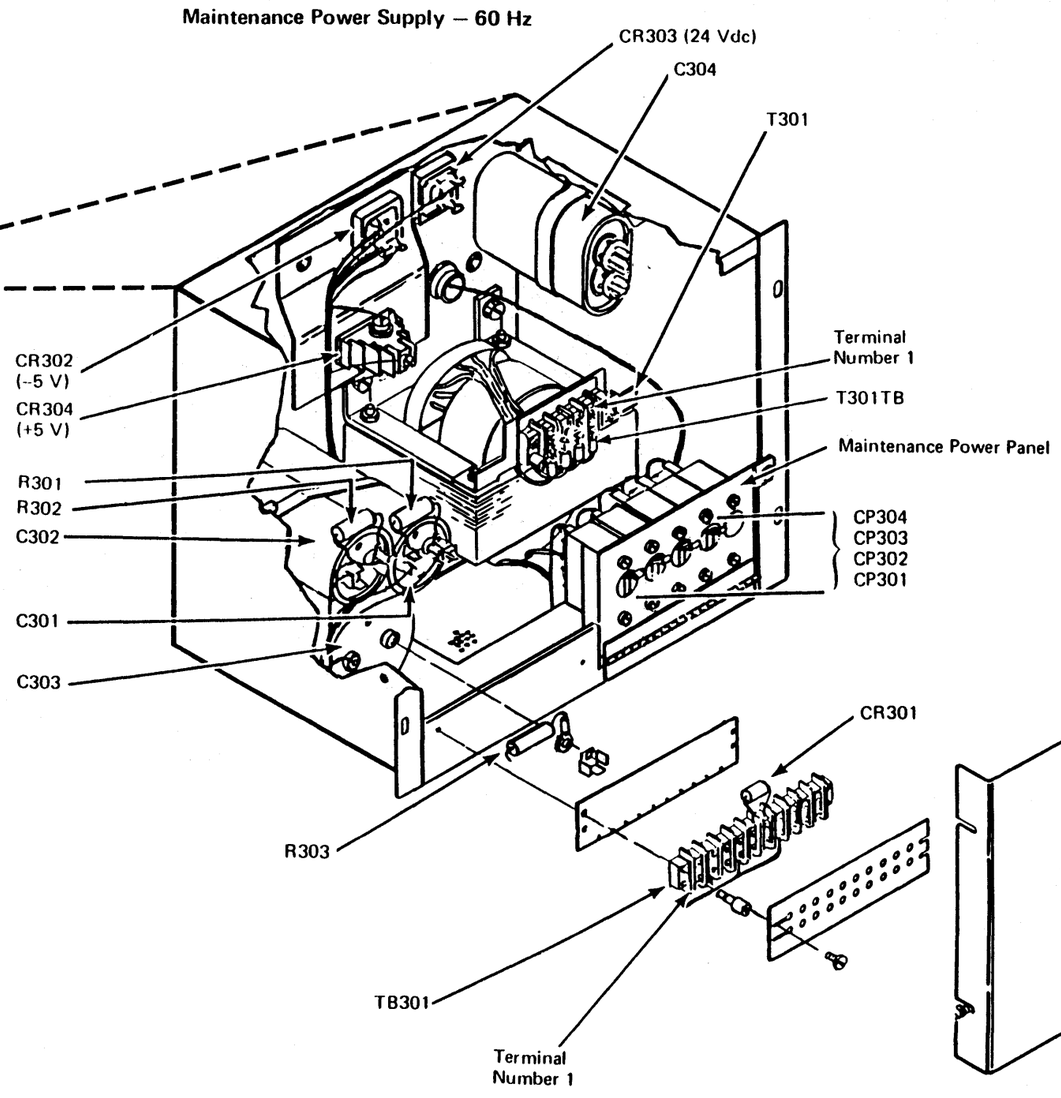
© Copyright IBM Corp. 1984, 1985

Power Supply 1, (3xx)

The maintenance power supply – 60 Hz 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





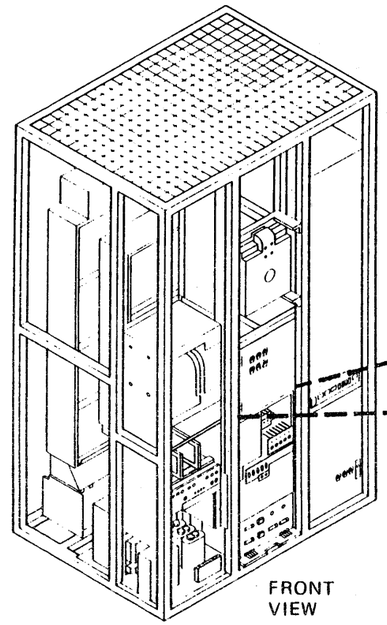
3880 MIM	Seq AQ0001	PN 6315676 8 of 25	881143 13 Jan 84	881216 15 Aug 84	A15621 01 Apr 85		

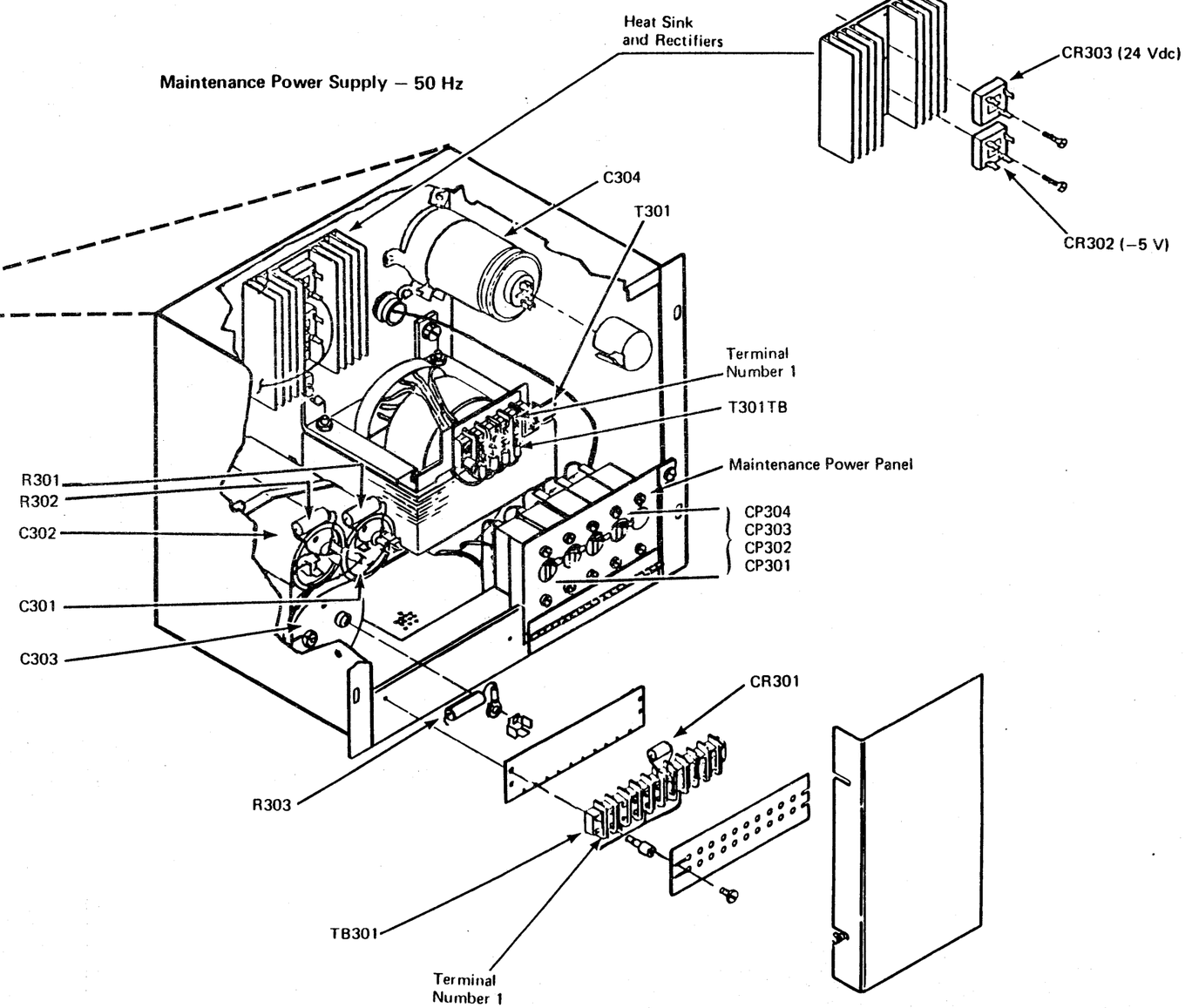
© Copyright IBM Corp. 1984, 1985

Power Supply 1, (3xx)

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





© Copyright IBM Corp. 1984, 1985

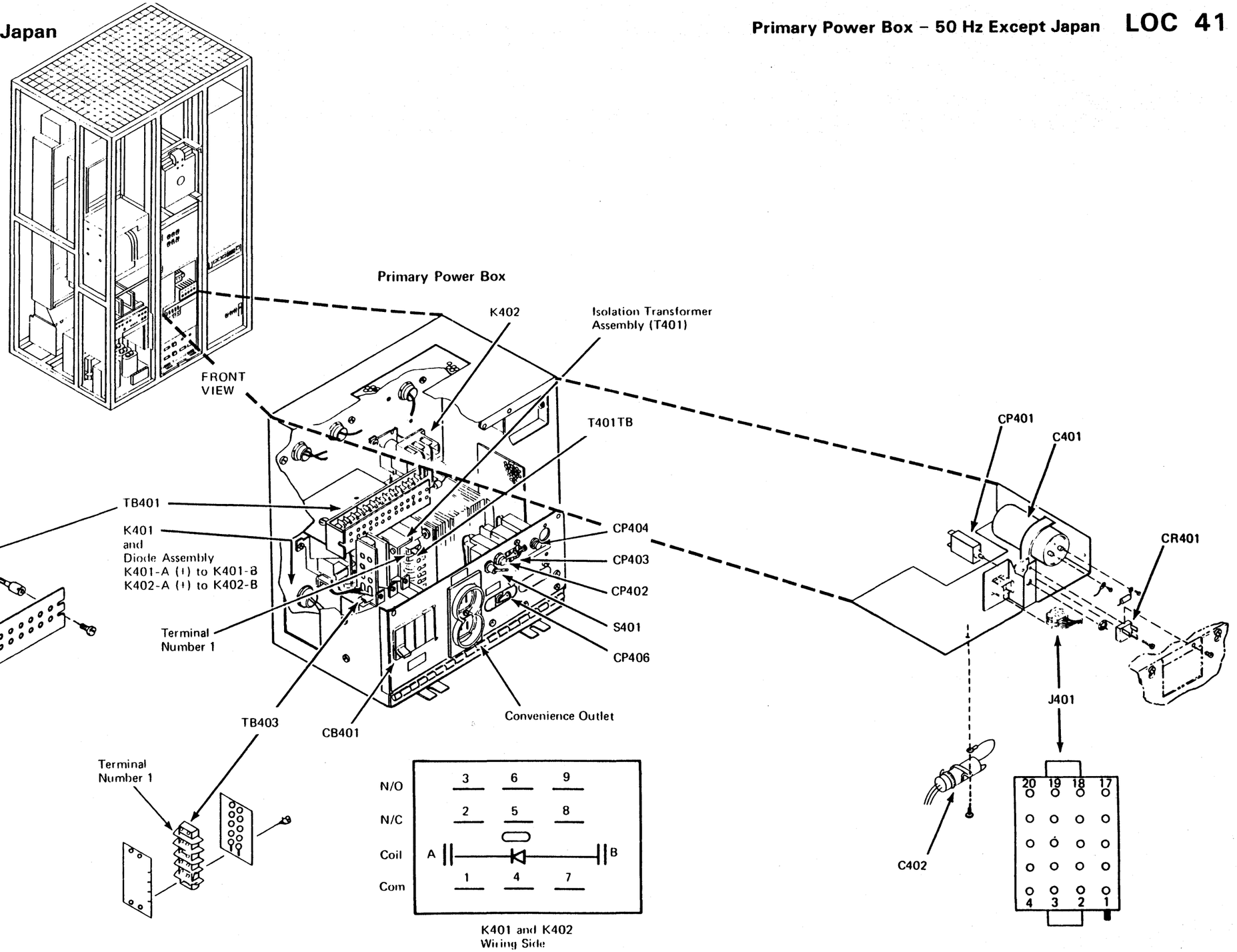
Primary Power Box – 50 HZ Except Japan

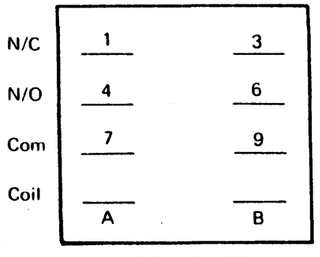
Power Supply 1, (4xx)

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

The figure also shows the wiring sides of relays K401, K402, and K404.





K404 Wiring Side

K401 and K402 Wiring Side

3880 MIM							
	Seq AQ0001	PN 6315676 10 of 25	881143 13 Jan 84	881216 15 Aug 84	A15621 01 Apr 85		

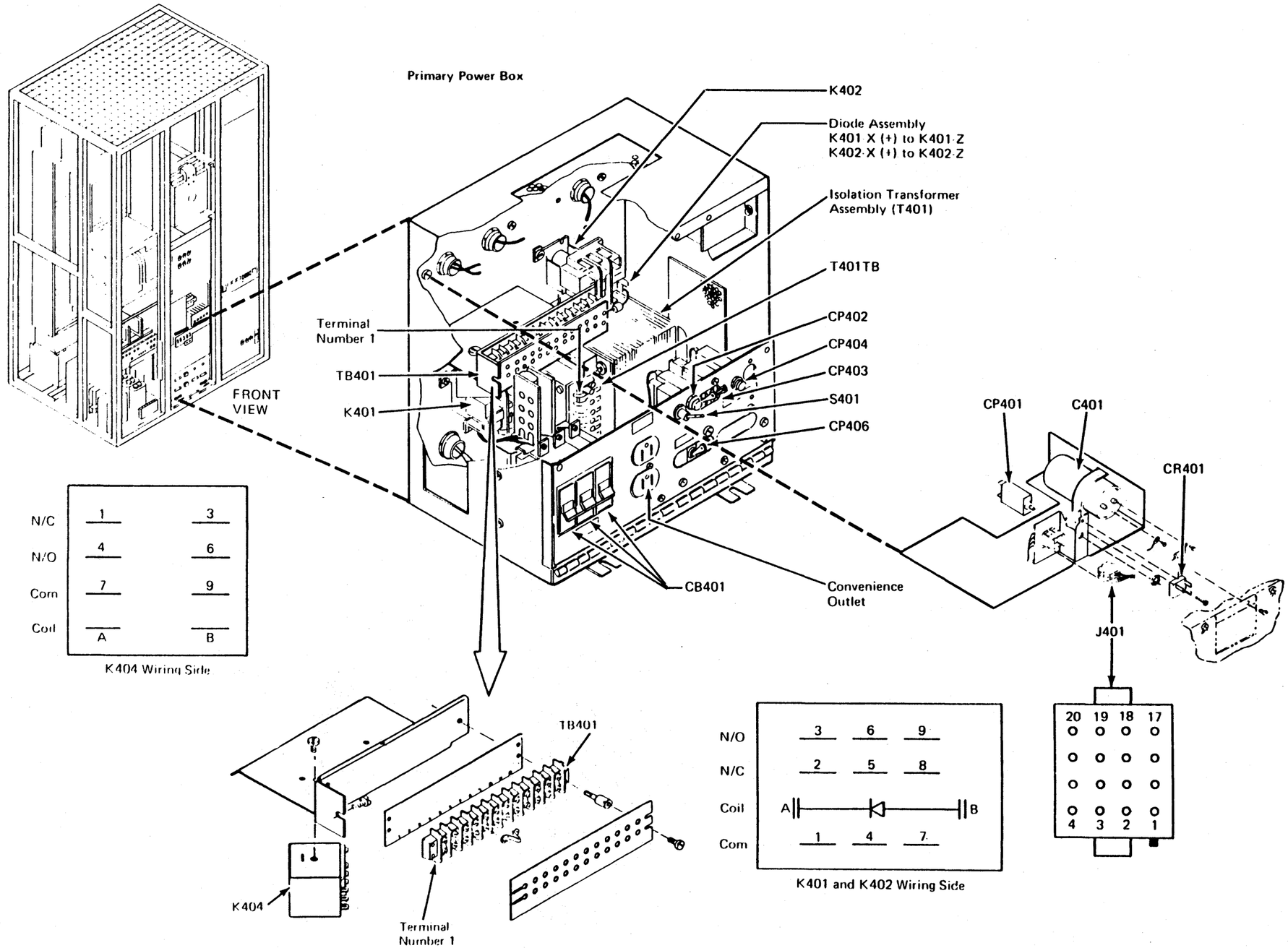
© Copyright IBM Corp. 1984, 1985

Power Supply 1, (4xx)

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

The figure also shows the wiring sides of relays K401, K402, and K404.



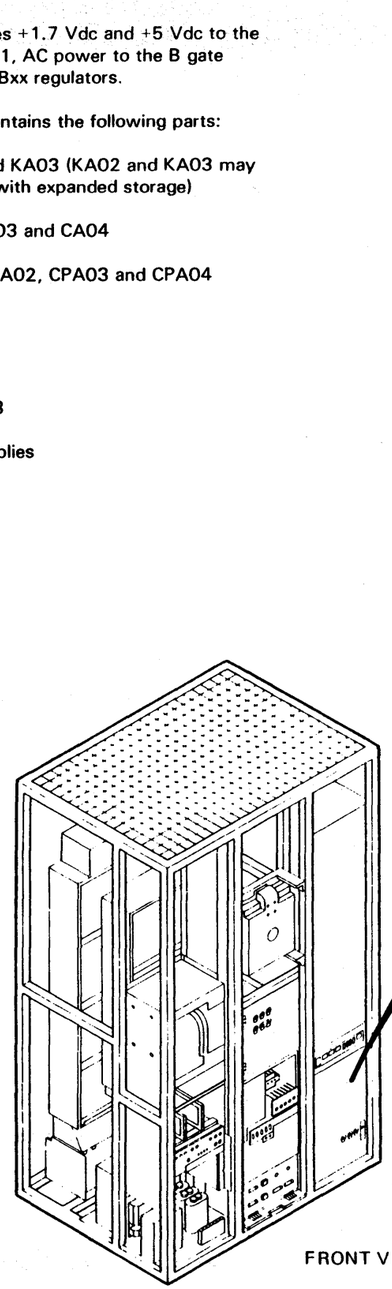
© Copyright IBM Corp. 1984, 1985

Power Supply 2, AC Power Distribution / Control (Axx)

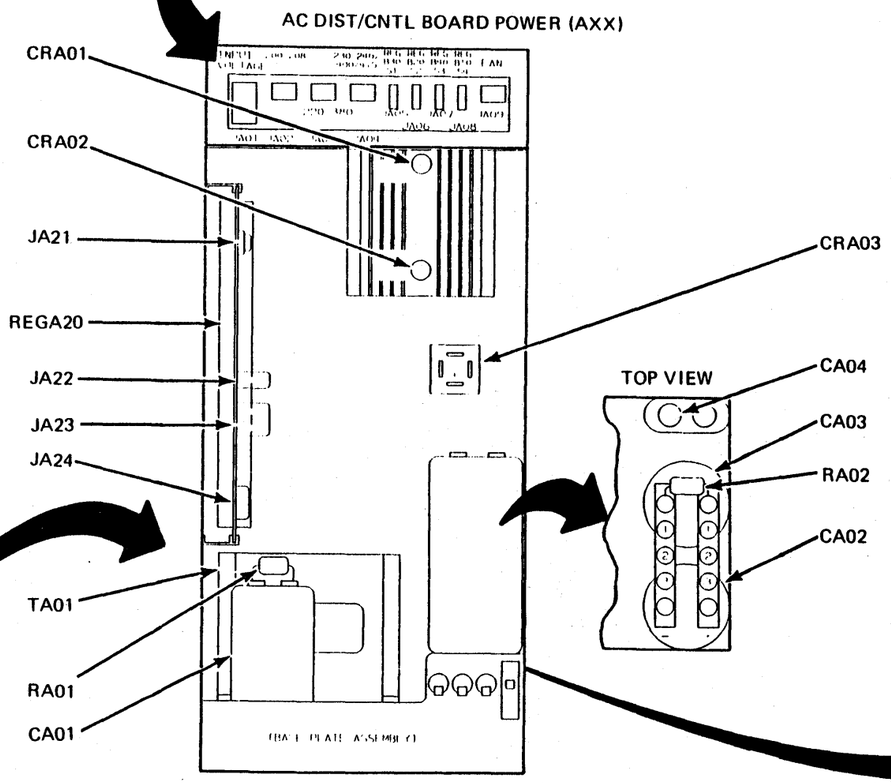
Area Axx power assembly supplies +1.7 Vdc and +5 Vdc to the subsystem storage board, 01B-A1, AC power to the B gate fans, and the bulk voltage to the Bxx regulators.

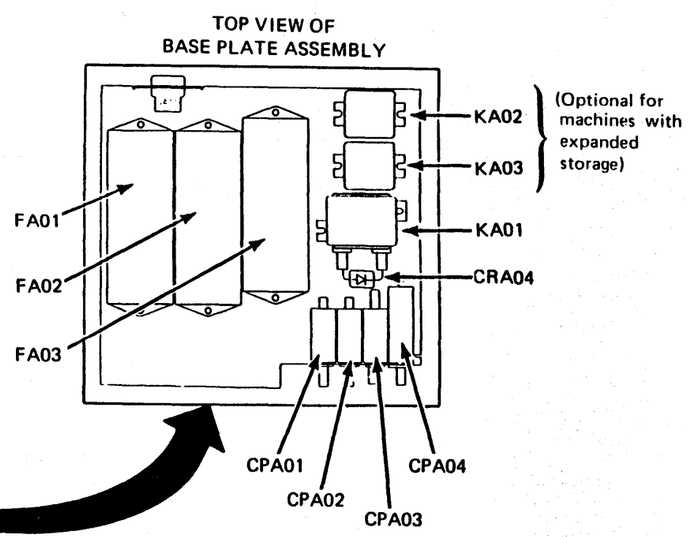
The AC power distribution box contains the following parts:

- Contactors KA01, KA02, and KA03 (KA02 and KA03 may not be present on machines with expanded storage)
- Capacitors CA01, CA02, CA03 and CA04
- Circuit Protectors CPA01, CPA02, CPA03 and CPA04
- Regulator A20
- Transformer TA01
- Filters FA01, FA02 and FA03
- Heat sink and rectifier assemblies



FRONT VIEW





3880 MIM		PN 6315676	881143	881216	A15621		
	Seg AQ0001	12 of 25	13 Jan 84	15 Aug 84	01 Apr 85		

© Copyright IBM Corp. 1984, 1985

Power Supply 2, (Bxx)

Machines Without Expanded Storage

PS2 area Bxx power assembly contains up to four regulators named Reg-B10, Reg-B20, Reg-B30, and Reg-B40. Each regulator supplies power for up to 8M bytes of subsystem storage installed in the B Gate (Boards 01B-B2 and 01B-A2). Each regulator supplies +5, -5, and +8.5 Vdc. The following regulators are needed:

Storage Size	Supply Installed
8M bytes	Reg-B30
16M bytes	Reg-B20
32M bytes	Reg-B40 and REG-B10

Machines With Expanded Storage

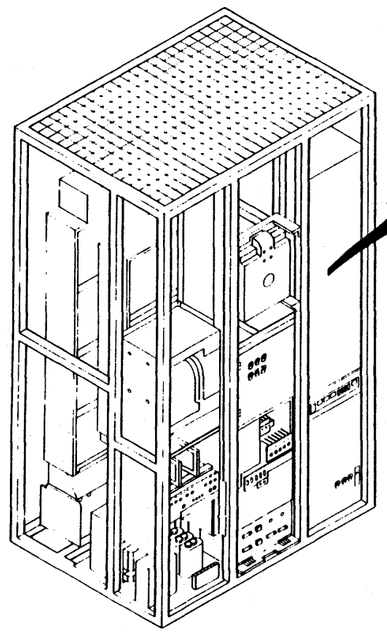
PS2 area Bxx power assembly contains up to two regulators named Reg-B20 and Reg-B30. Reg-B30 supplies power for 8M or 16M bytes of subsystem storage. Reg-B20 supplies power for 32M, 48M, or 64M bytes of subsystem storage. Each regulator supplies +5, -5, and +8.5 Vdc. The following regulators are needed:

Storage Size	Supply Installed
8M bytes	Reg-B30
16M bytes	Reg-B30
32M bytes	Reg-B20
48M bytes	Reg-B20
64M bytes	Reg-B20

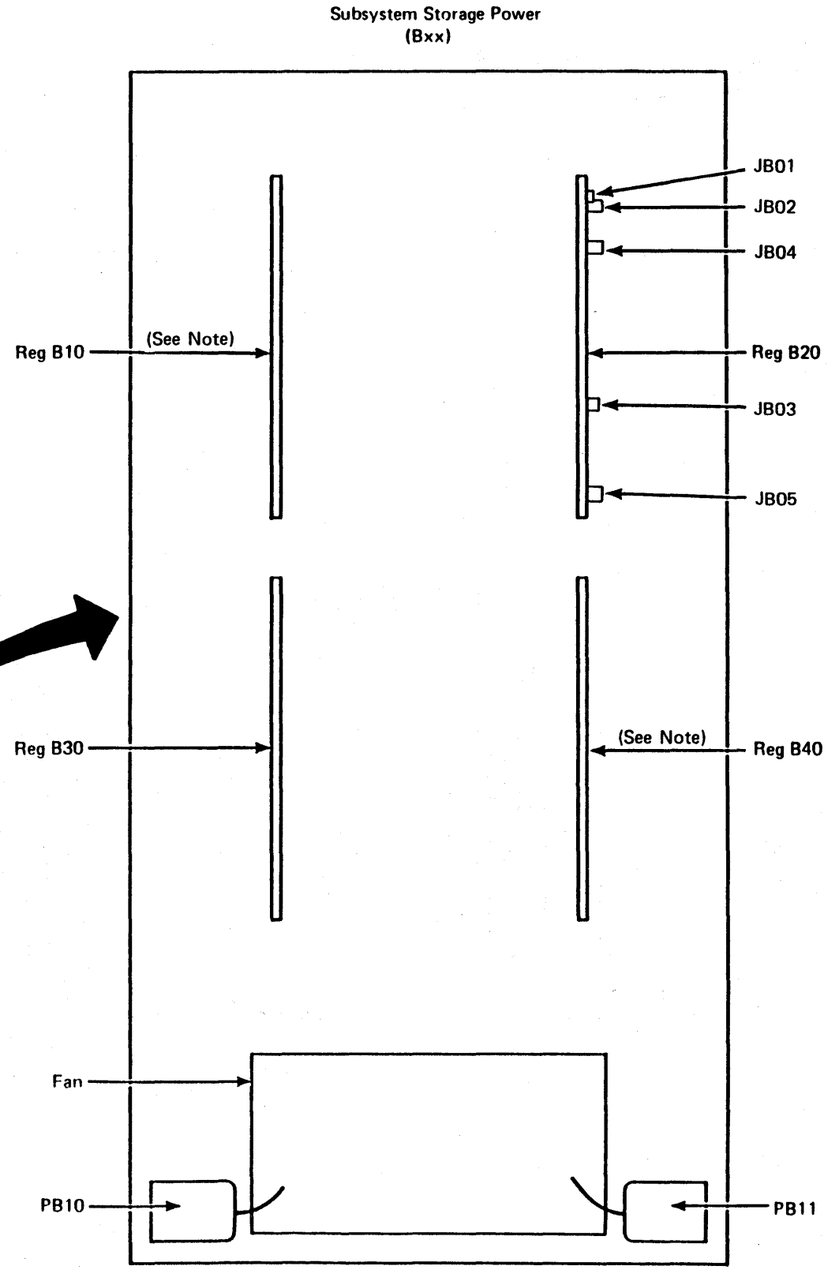
PS2 area Bxx contains the following parts:

- Regulators B10, B20, B30, and B40 (see note)
- Fan assembly
- Connectors PB10 and PB11

Note: Reg B10 and Reg B40 are not used with Expanded Storage. Machines with Expanded Storage may have 2 or 4 MB storage cards. By comparing storage card part numbers to the plug charts in the MDM (R 30), storage type and size can be determined.



FRONT VIEW



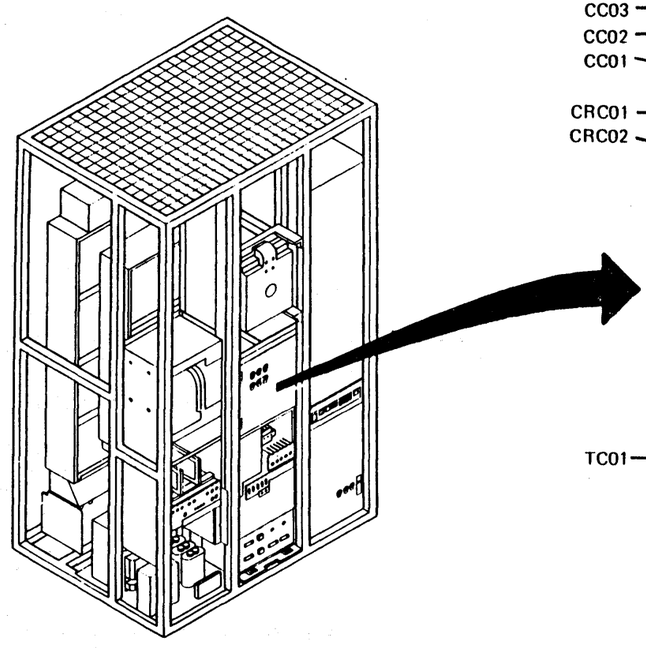
© Copyright IBM Corp. 1984, 1985

Power Supply 2, SD Auxiliary Power (Cxx)

PS2 area Cxx power assembly supplies additional +5 Vdc and +1.7 Vdc to three cards (L2, M2, and N2) in 01A-B3 and 01A-B4. The dc voltage levels are supplied by two dual level series regulators. The input power for each regulator comes from a common ferro transformer.

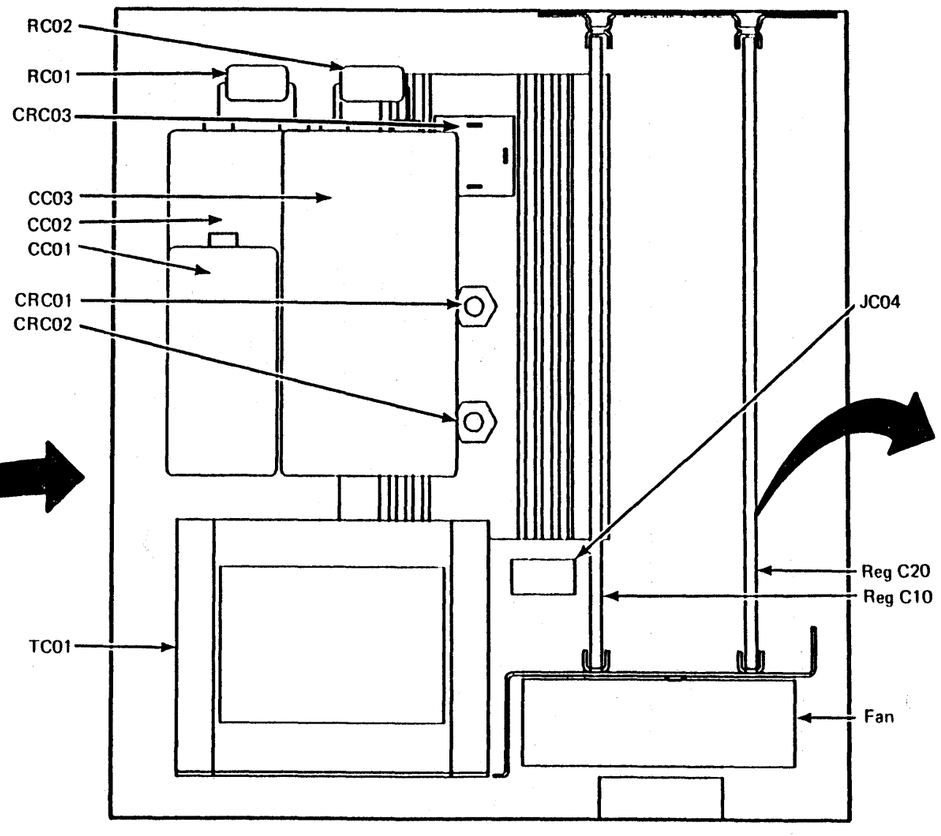
The SD Auxiliary Power contains the following parts:

- Capacitors CC01, CC02 and CC03
- Transformer TC01
- Regulators C10 and C20
- Connectors JC01, JC02, JC03 and JC04
- Rectifiers CRC01, CRC02, and CRC03

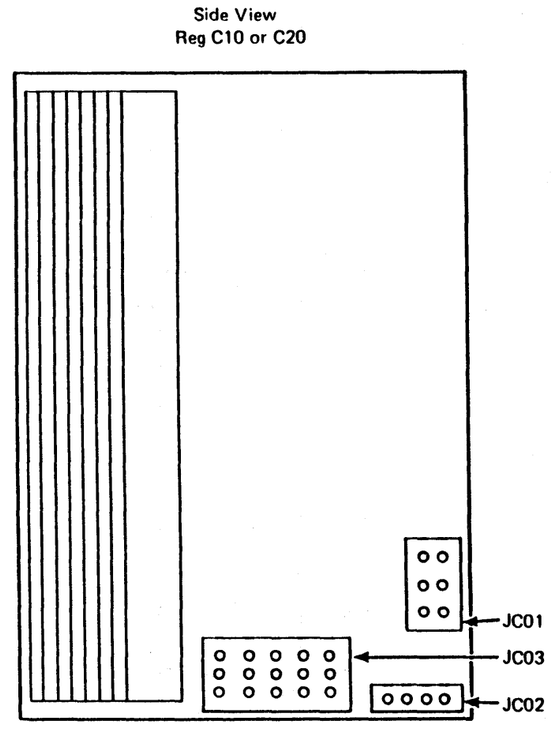


FRONT VIEW

SD Aux Power (Cxx)



TBC01



3880 MIM	Seq AQ0001	PN 6315676 14 of 25	881143 13 Jan 84	881216 15 Aug 84	A15621 01 Apr 85		

© Copyright IBM Corp. 1984, 1985

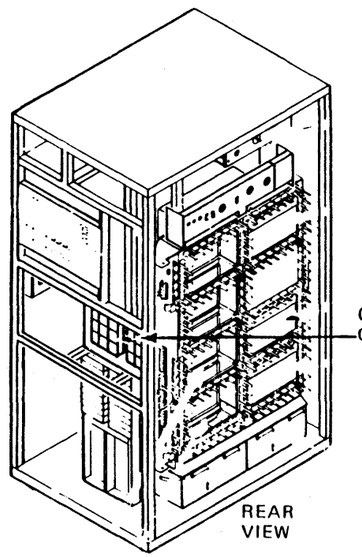
Central Power Control Board

Power Supply 1, (7xx)

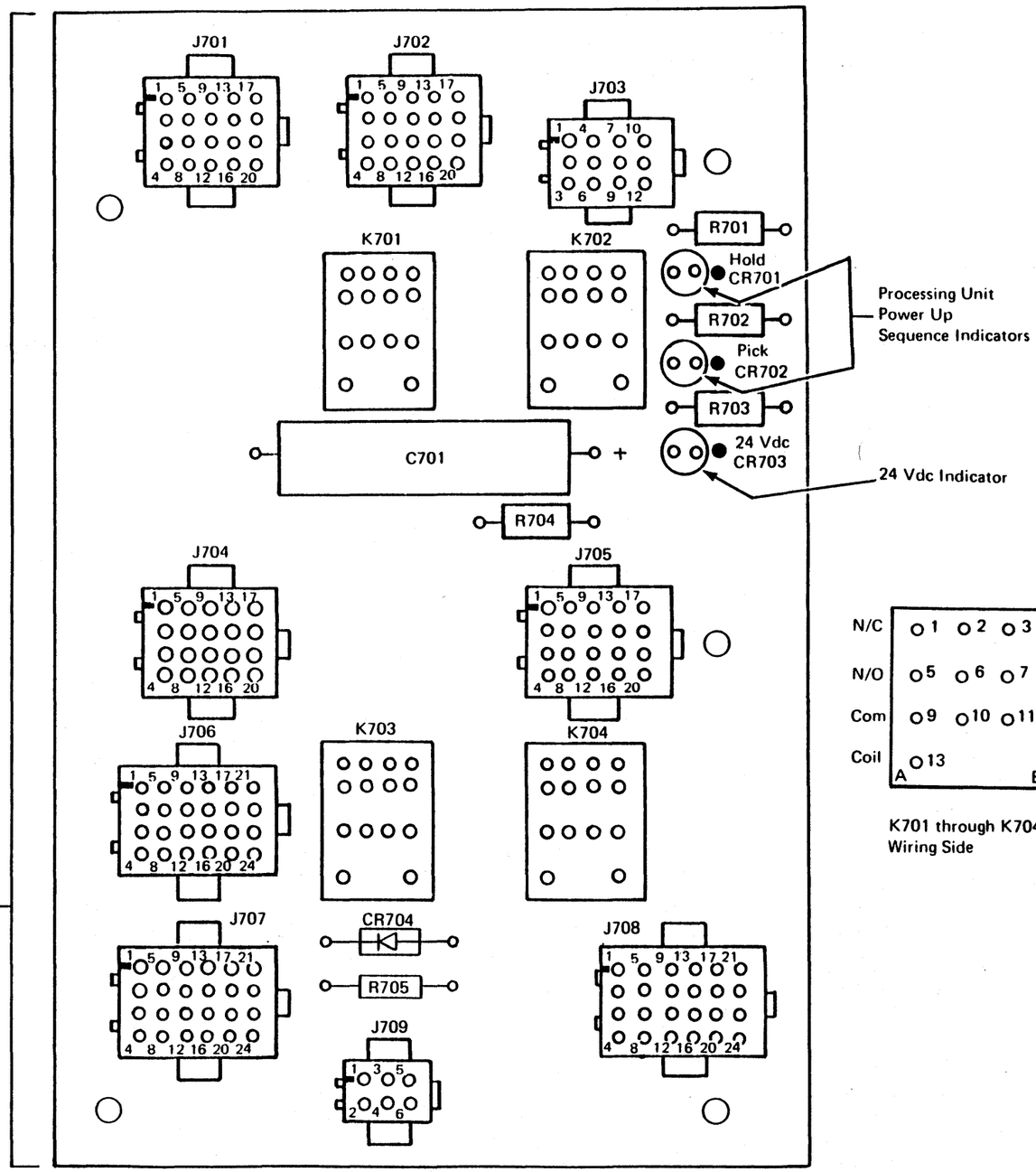
The figure shows the following parts of the central power control (CPC) board:

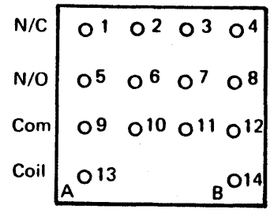
- C701 capacitor
- J701 through J709 connectors
- Hold, pick, and +24 Vdc processing unit power up sequence indicators
- CR701 through CR705 rectifiers
- K701 through K704 relays
- R701 through R705 resistors

The figure also shows the wiring side of relays K701 through K704.



Central Power Control Board





K701 through K704
Wiring Side

© Copyright IBM Corp. 1984, 1985

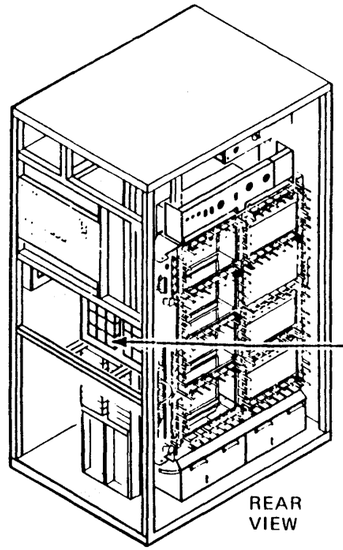
Device Interface Power Board

Power Supply 1, (8xx)

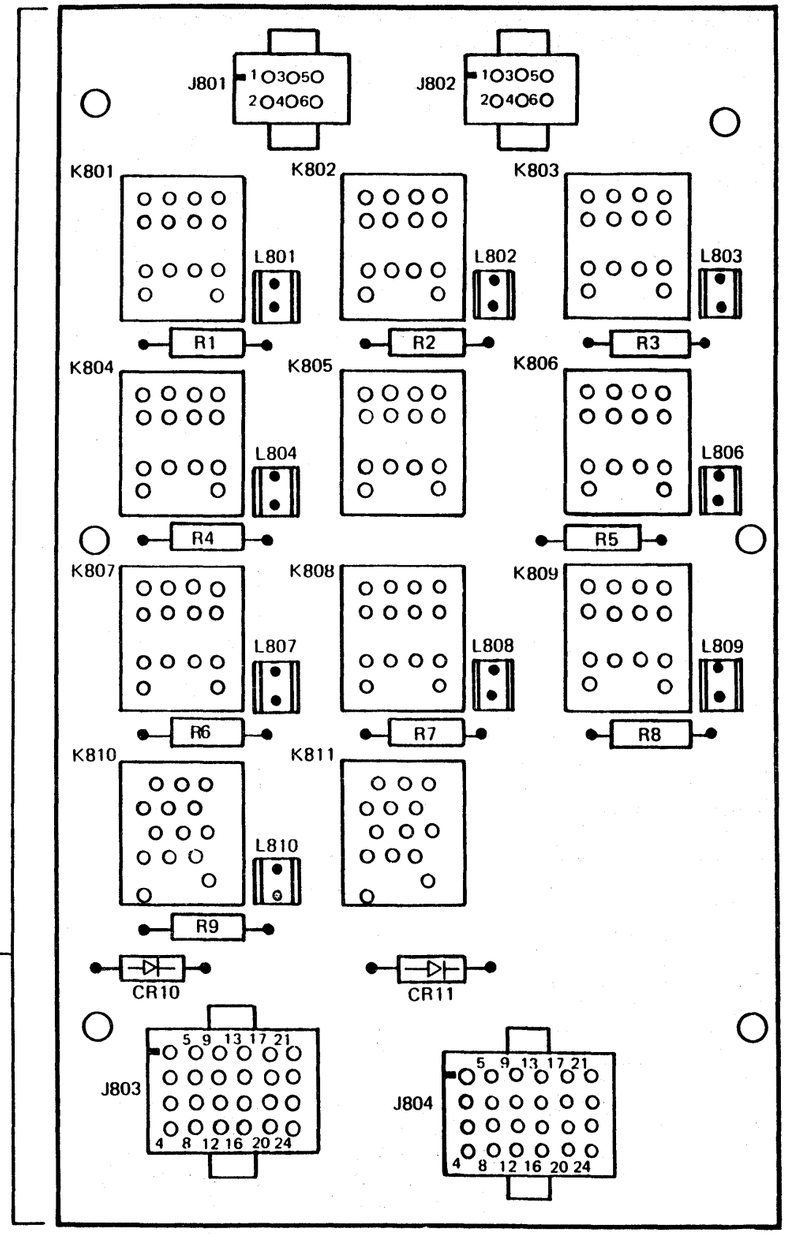
The following parts of the device interface power board are shown in the figure.

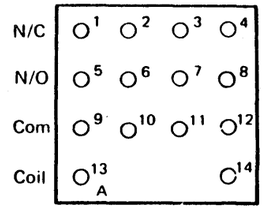
- J801 through J804 connectors
- K801 through K811 relays
- L801 through L804 and L806 through L810 relay indicators
- R1 through R9 resistors

Also shown is the wiring side of relays K801 through K811

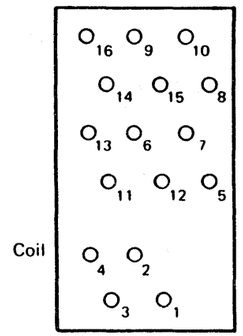


Device Interface
Power Board
(New Type)





K801 through K809
Wiring Side



K810 and K811
Wiring Side
(See Note)

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).*

© Copyright IBM Corp. 1984, 1985

Power Switch Panel – Rear View

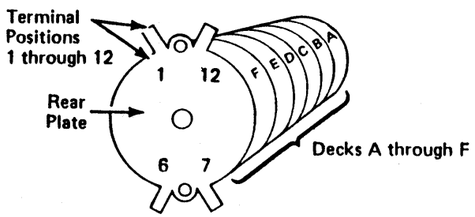
Power Supply 1, (1xx)

The back side of the power switch panel is accessible from the rear of the 01A gate. The following parts are shown in the figure:

- EC101, connector
- J101 through J104, connectors
- S101, Storage Director 1 switch
- S102, Storage Director 2 switch
- S103, DC Power switch
- S104, Maintenance Power switch
- S105, Device Power Sequencing switch
- S106, Power Select switch
- S110, Subsystem Storage Power switch
- S111, Port 1 Mode Switch
- S112, Port 2 Mode Switch
- Power Status indicators

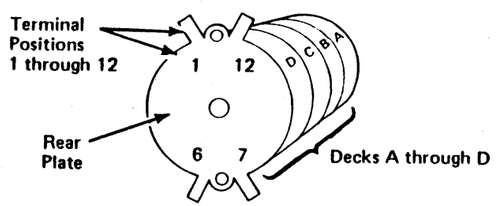
See PWR-26 for a front view and description.

Switches 101 and 102

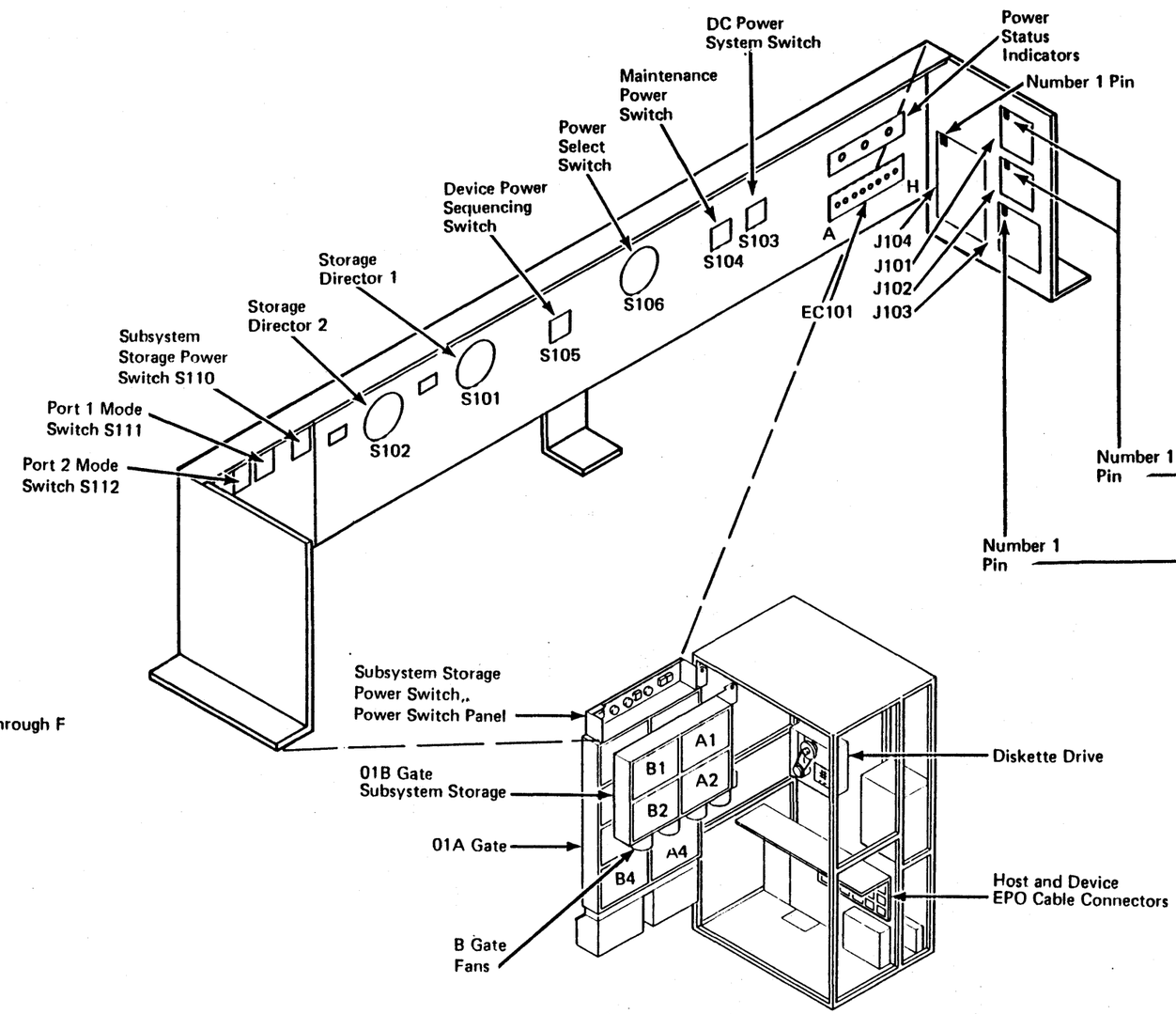


REAR VIEW

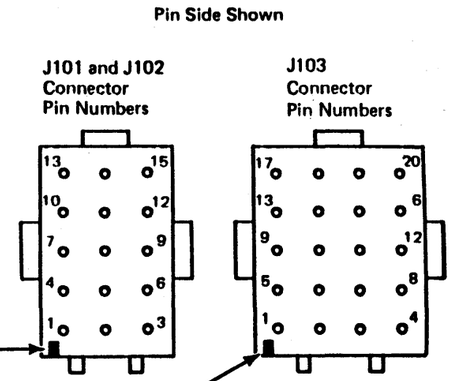
Switch 106

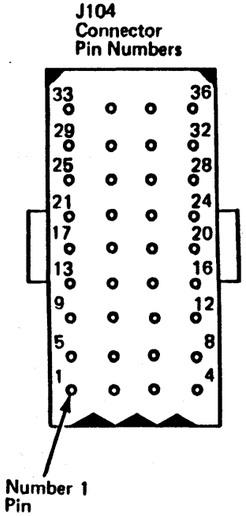


REAR VIEW



Pin Side Shown





3880 MIM							
	Seq AQ0001	PN 6315676 17 of 25	881143 13 Jan 84	881216 15 Aug 84	A15621 01 Apr 85		

© Copyright IBM Corp. 1984, 1985

Gate Boards

There are two gates in the 3880 Models with subsystem storage: 01A and 01B. The 01A gate contains the following boards.

- 01A-A1 Four Channel Switch, Additional for Storage Director 2
- 01A-A2 Four Channel Switch, Additional for Storage Director 1
- 01A-A3 Two Channel Switch Pair, Additional for Storage Director 2
- 01A-A4 Two Channel Switch Pair, Additional for Storage Director 1
- 01A-B1 Maintenance Board
- 01A-B2 Not used
- 01A-B3 Storage Director 2
- 01A-B4 Storage Director 1

The 01B gate contains the following boards:

01B-A1 = Subsystem Storage Control

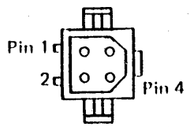
01B-A2 = Subsystem Storage Array (16-32M bytes on machines without Expanded Storage only)

01B-B1 = Not Used

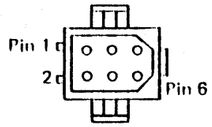
01B-B2 = Subsystem Storage Array (0-16M bytes on machines without Expanded Storage or 8-64M bytes on machines with Expanded Storage)

Note: Refer to INTRO 10 in the ECM to convert card location (Cyxxx) to LRM page.

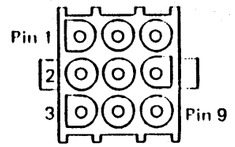
J CONNECTOR PIN LOCATIONS



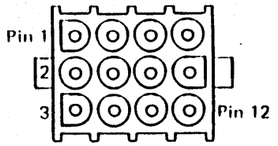
4 Position Connector



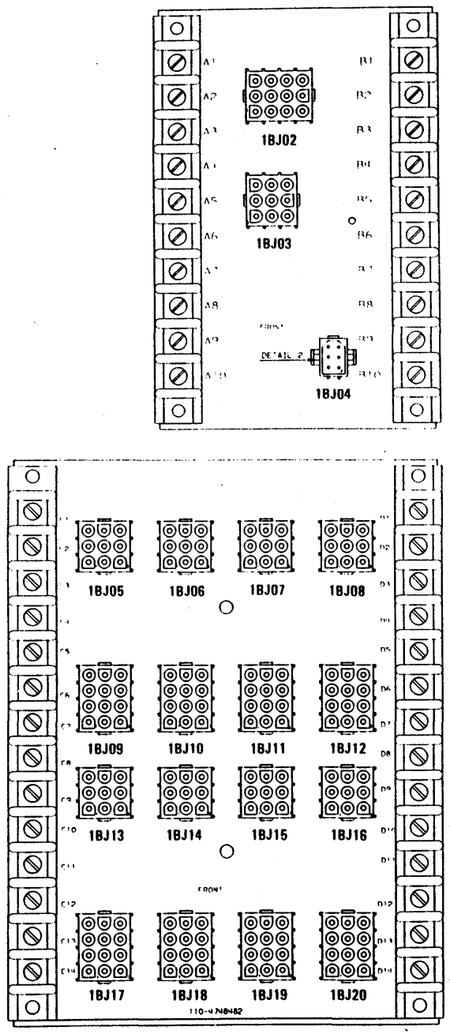
6 Position Connector



9 Position Connector

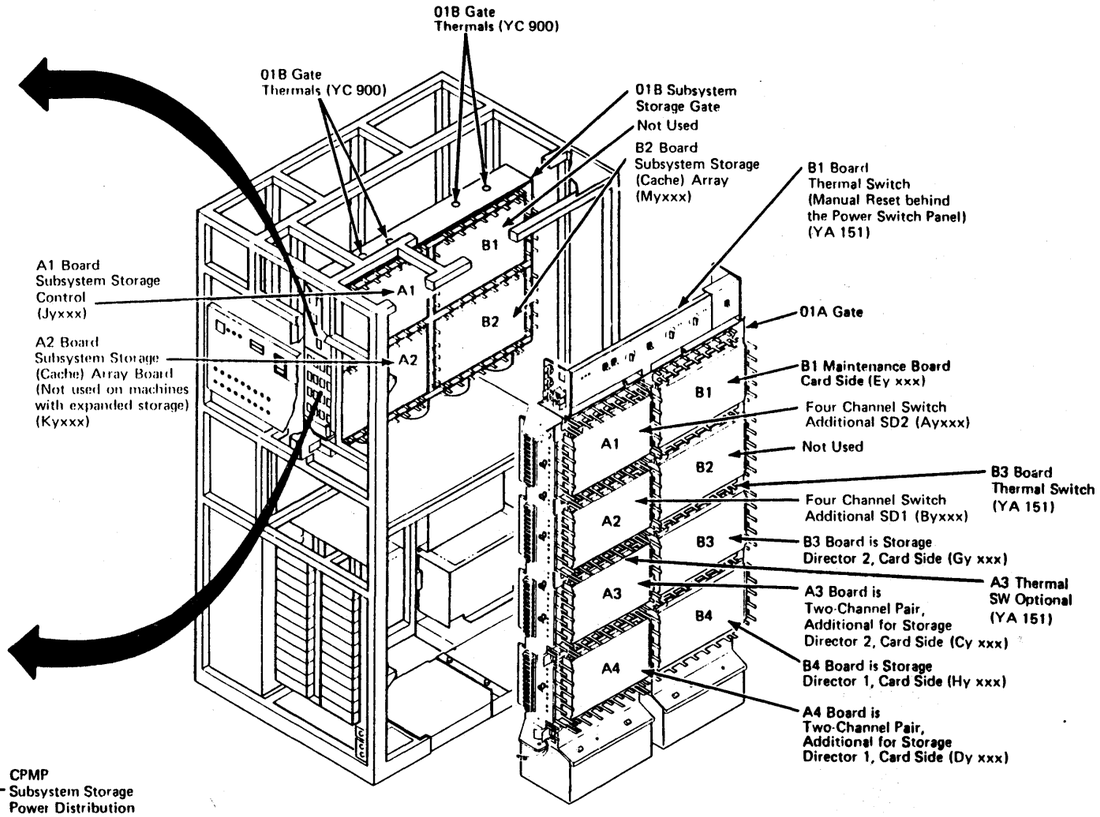


12 Position Connector



CPCP Subsystem Storage Control Power Distribution (YC 550)

CPMP Subsystem Storage Power Distribution (YC 650)



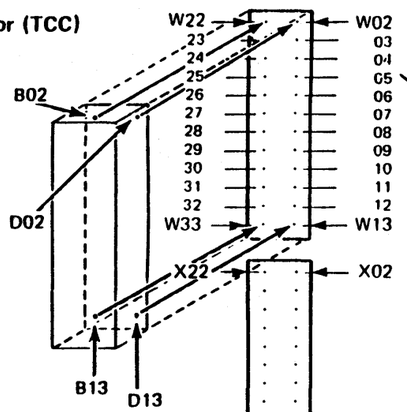
© Copyright IBM Corp. 1984, 1985

Circuit Card Connector Assignments

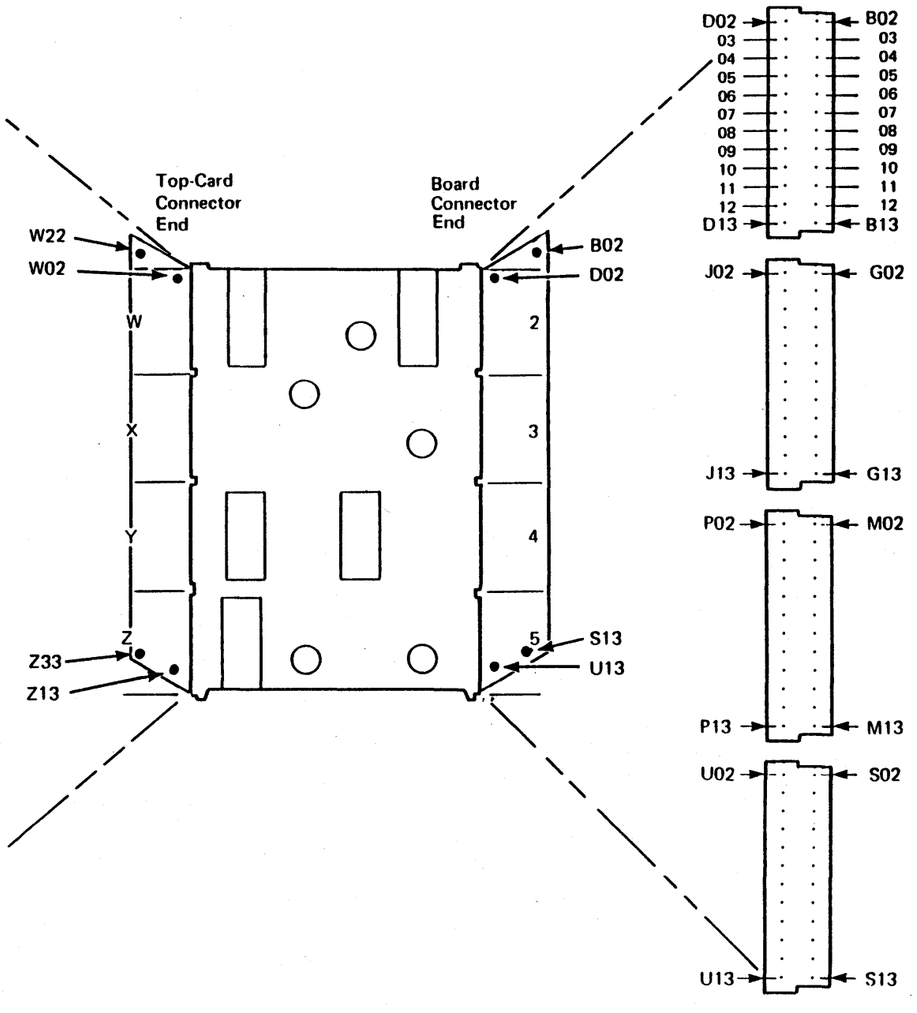
The figure shows the location for a top-card connector end and a board connector end on a circuit card and their ground pins. A circuit card can be one-wide, two-wide, or four-wide.

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



Circuit Card

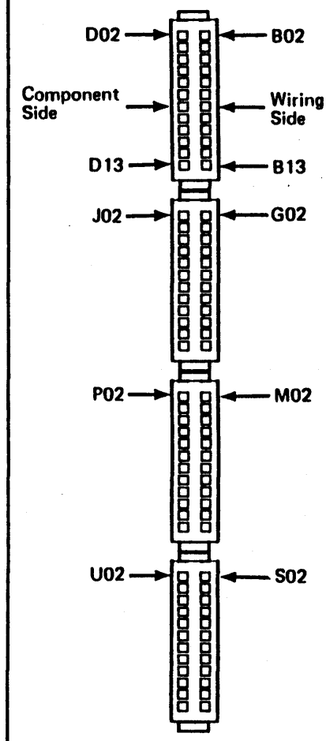


Ground Pins

W23	W04
W27	W08
W31	W12
X23	X04
X27	X08
X31	X12
Y23	Y04
Y27	Y08
Y31	Y12
Z23	Z04
Z27	Z08
Z31	Z12

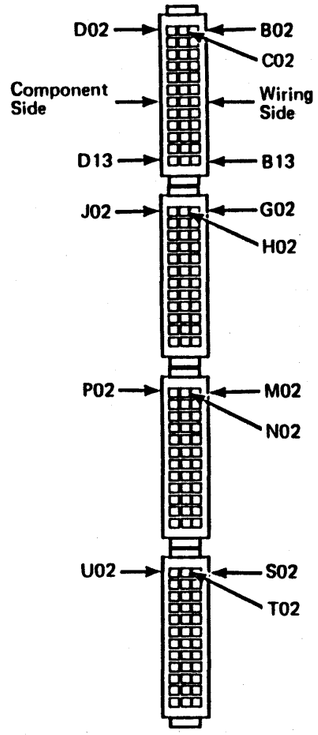
Card Contact Assignments

(Viewed from bottom of card)

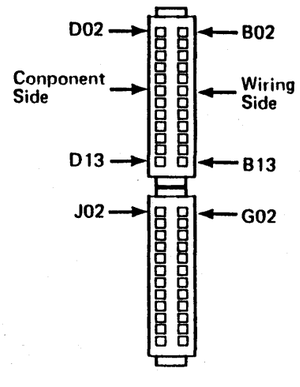


Four-Wide Card

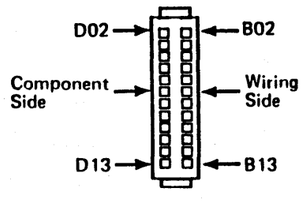
(Viewed from bottom of card)
1.5 Density Card



Four-Wide Card



Two-Wide Card



One-Wide Card

Ground Pins

D08
J08
P08
U08

3880 MIM						
	Seq AQ0001	PN 6315676 19 of 25	881143 13 Jan 84	881216 15 Aug 84	A15621 01 Apr 85	

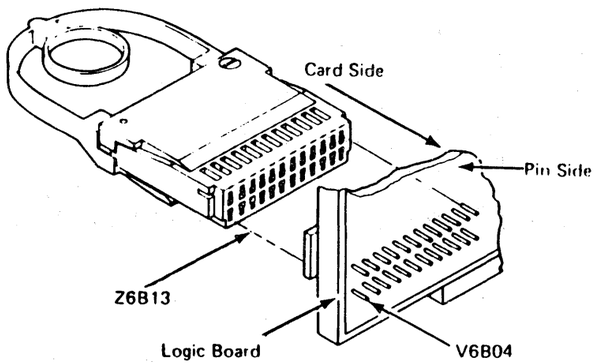
© Copyright IBM Corp. 1984, 1985

Logic Board Pin Identification

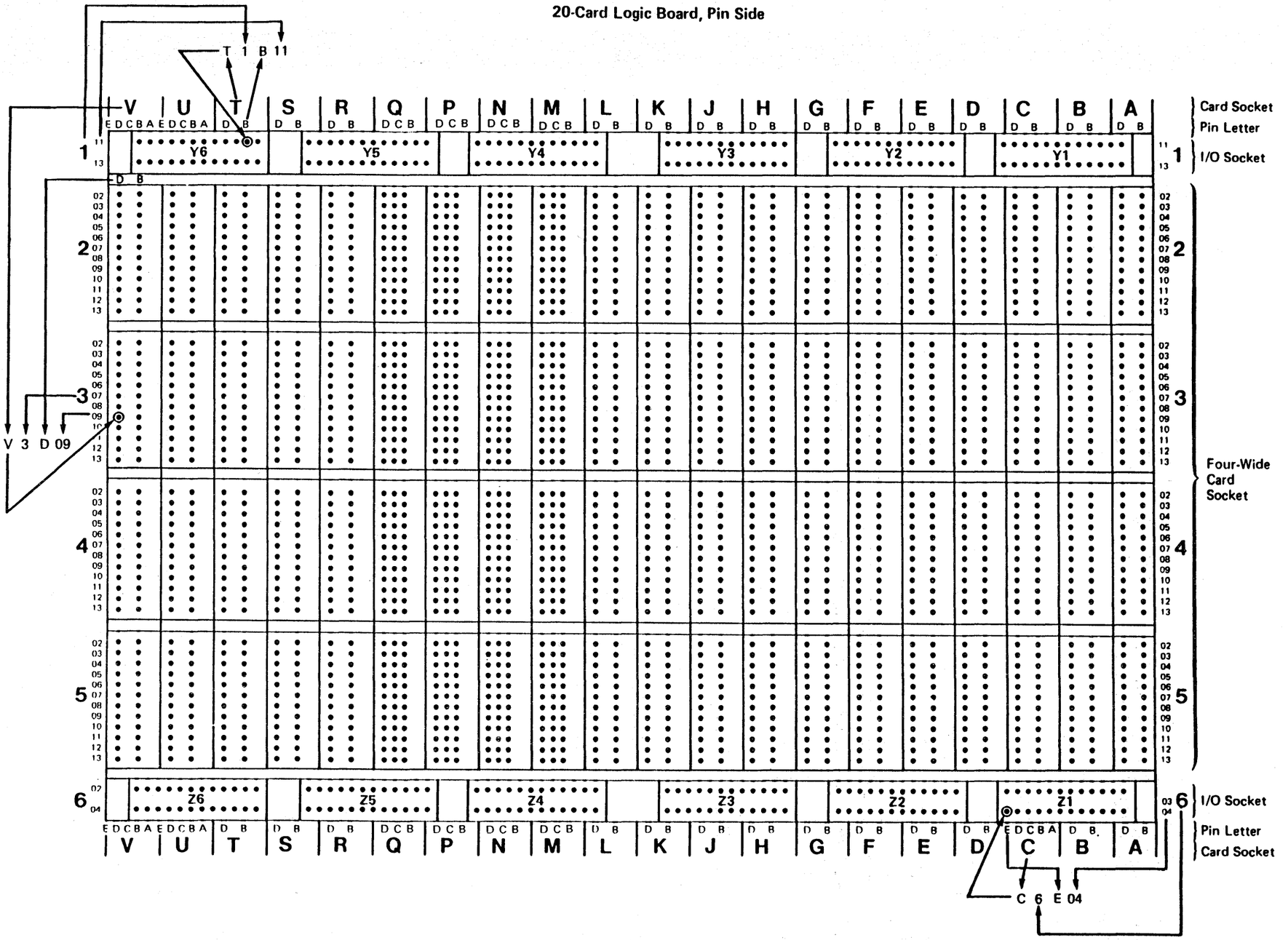
The figure shows examples of pins located on I/O sockets, rows 1 and 6, a four wide card socket, and 1.5 density sockets located in positions: M2, N2, P2, and Q2.

An example of a cable connector is also shown.

Cable Connector



20-Card Logic Board, Pin Side



3880 MIM							
	Seq AQ0001	PN 6315676 20 of 25	881143 13 Jan 84	881216 15 Aug 84	A15621 01 Apr 85		

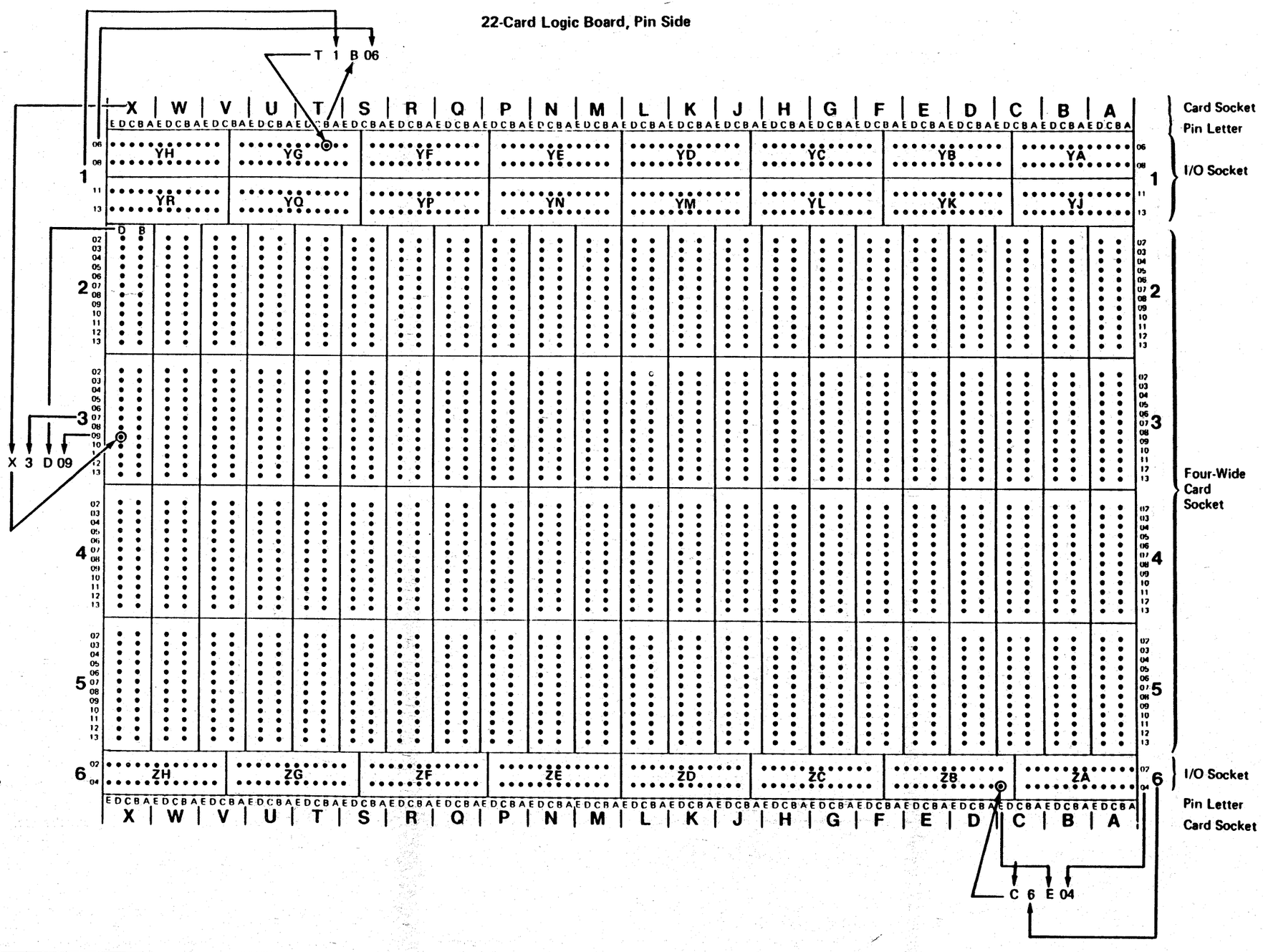
© Copyright IBM Corp. 1984, 1985

Logic Board Pin Identification

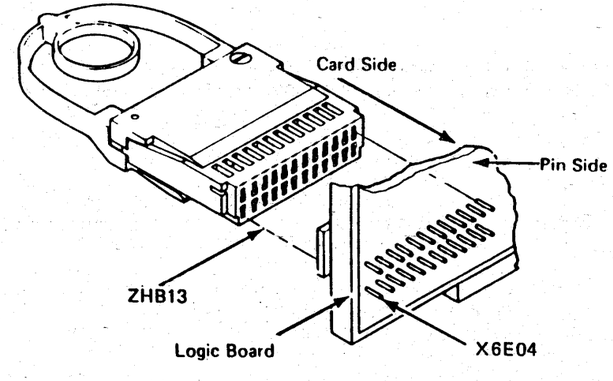
The figure shows examples of pins located on I/O sockets, rows 1 and 6, and on a four wide card socket.

An example of a cable connector is also shown.

22-Card Logic Board, Pin Side



Cable Connector



3880 MIM		PN 6315676	881143	881216	A15621		
	Seq AQ0001	21 of 25	13 Jan 84	15 Aug 84	01 Apr 85		

© Copyright IBM Corp. 1984, 1985

Crossovers

The Maintenance Diagram Manual (MDM) contains a complete set of diagrams showing the boards and top-card connectors for the 3880.

In the example shown, the storage director board is used. The crossovers can be recognized by the heavy lines and the crossover name inside the box.

The crossover name is a combination of the following:

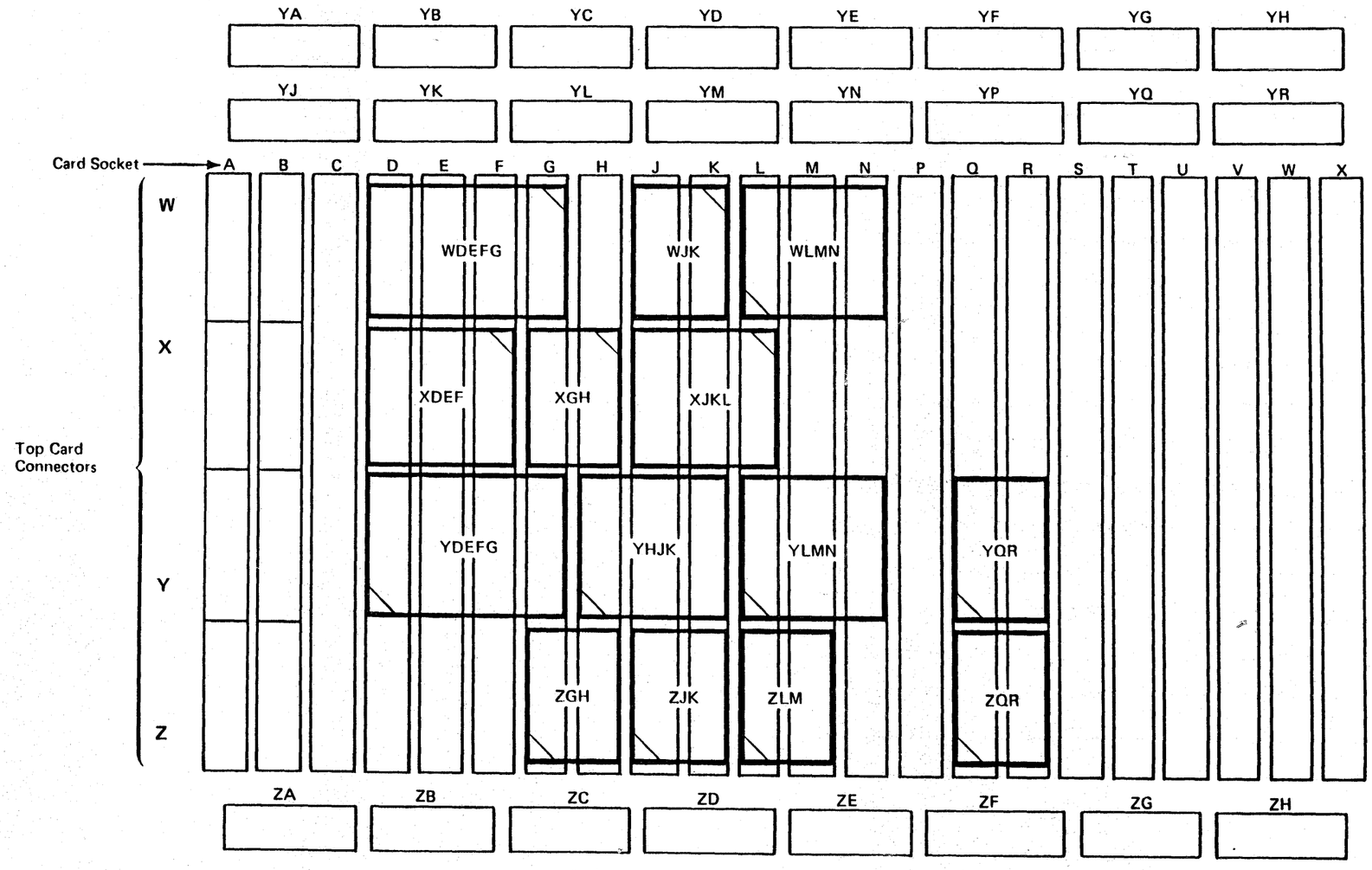
1. Top-card connector identification W, X, Y, or Z
2. The card sockets on the gate board, A through X

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.

. . . . . .

. . . . . .

. . . . . .



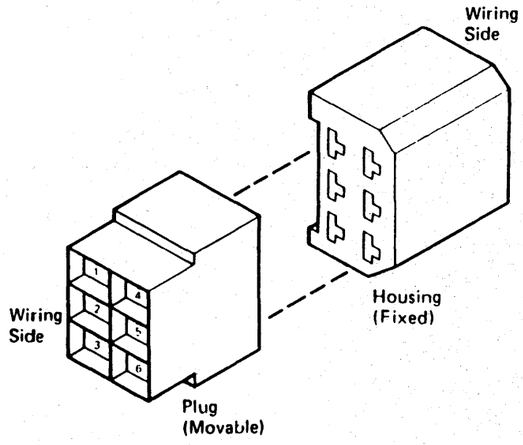
© Copyright IBM Corp. 1984, 1985

Connectors, Convenience Outlet, Frame, and Gate Parts

The figure shows the following parts:

- B1 board and B3 board thermal switches
- D1 through D8 device cable connectors
- 01A-gate
- 01A-GTB1, GTB2, GTB3, and GTB4 gate terminal boards
- 01B-gate
- 01B-CPCP and CPMP gate terminal boards
- H1 through H8 host cable connectors
- Channel interface cable connectors
- Control interface cable connectors
- Convenience outlet
- Device, host, and remote cable connectors
- Maintenance device (MD) connector
- R1-R4 remote enable/disable switch connectors
- Safety interlock switch

Device, Host, and Remote Cable Connector



Channel Interface and Control Interface Cable Connectors

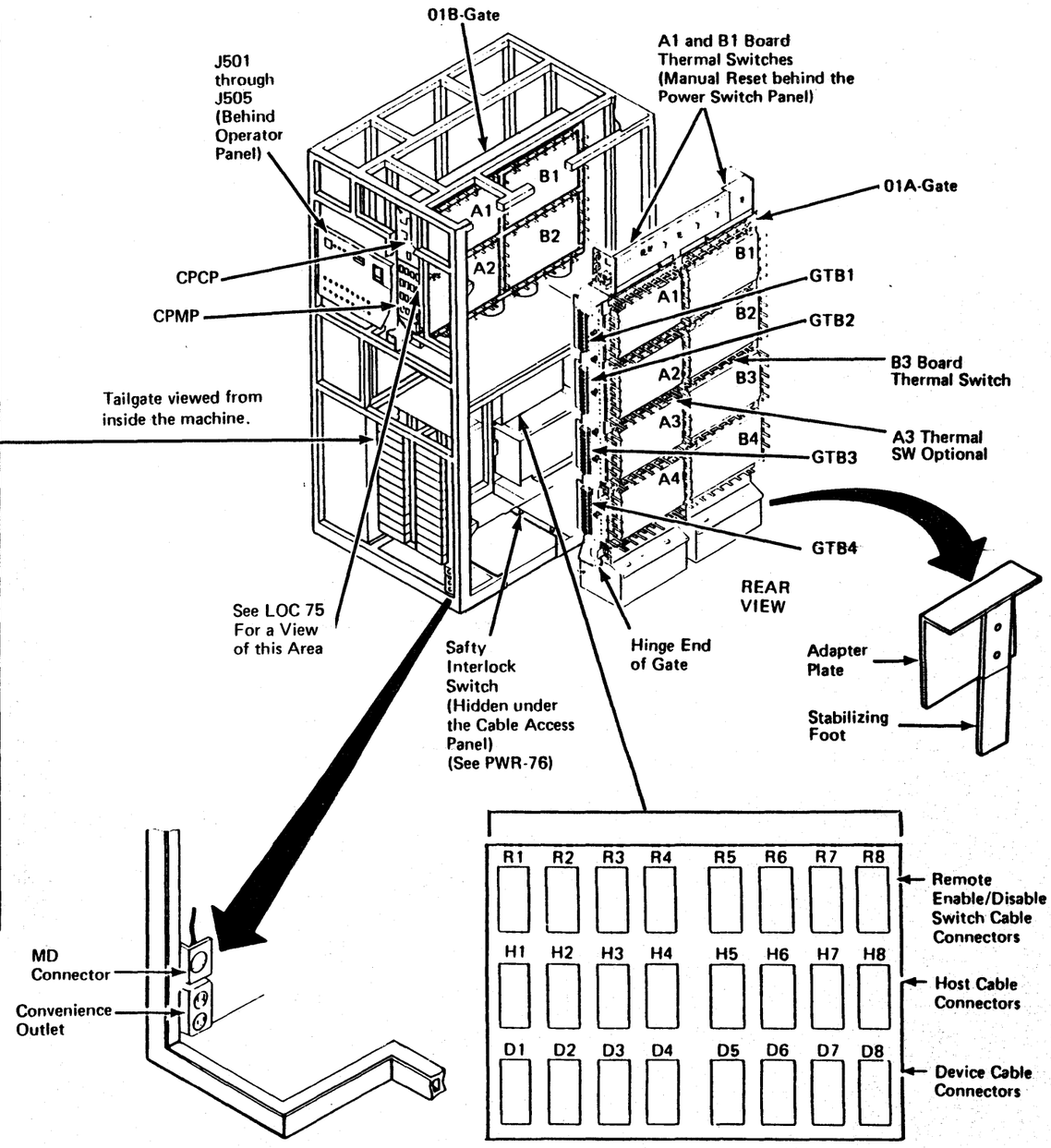
	STORAGE DIRECTOR 1	STORAGE DIRECTOR 2	
CTL-I	BUS	BUS	CTL-I
	TAG	TAG	
CHL-I CHANNEL A	BUS IN	BUS IN	CHL-I CHANNEL A
	TAG IN	TAG IN	
	BUS OUT	BUS OUT	
	TAG OUT	TAG OUT	
CHL-I CHANNEL B	BUS IN	BUS IN	CHL-I CHANNEL B
	TAG IN	TAG IN	
	BUS OUT	BUS OUT	
	TAG OUT	TAG OUT	
CHL-I CHANNEL C	BUS IN	BUS IN	CHL-I 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	

MODEL 21
(Tailgate viewed from inside the machine)

	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	

MODEL 23
(Tailgate viewed from inside the machine)

Storage Control



© Copyright IBM Corp. 1984, 1985

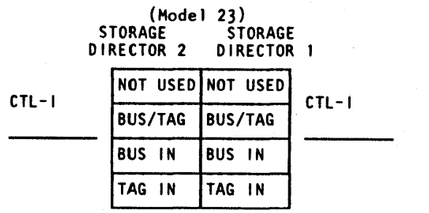
Channel Interface and Control Interface Cable Connectors Description

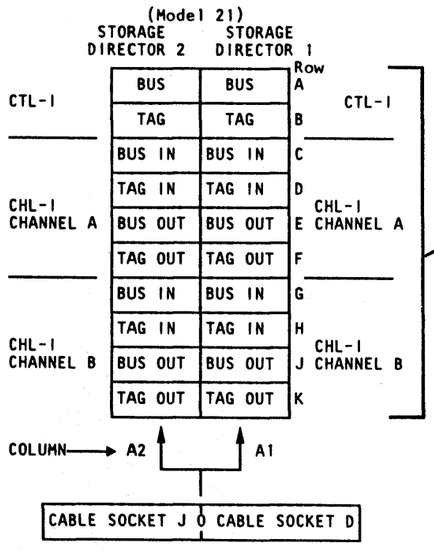
The figure shows how to locate a cable connector for the channel and control interfaces using the following identifiers.

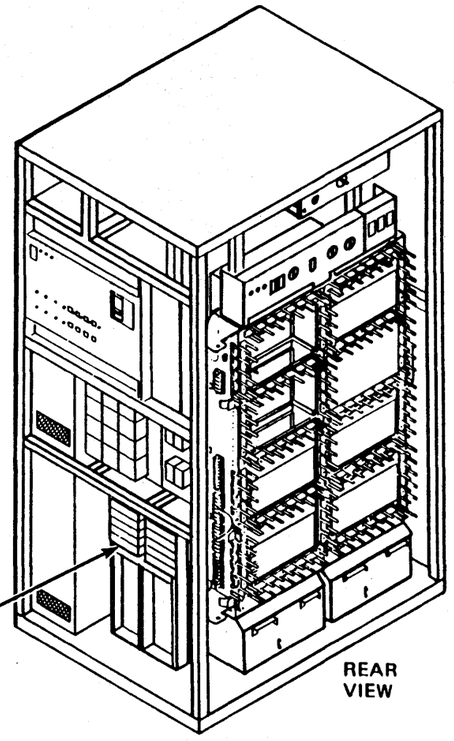
- Frame
- Tailgate
- Column
- Row
- Sockets

See the example **1** to locate 01T-A1KD.

Channel Interface and Control Interface Cable Connectors







3880 Without Relocated Tailgate

1 EXAMPLE

Frame	Tailgate	Column	Row	Socket
01	T	A1	K	D

Tailgate viewed from outside the machine.

© Copyright IBM Corp. 1984, 1985

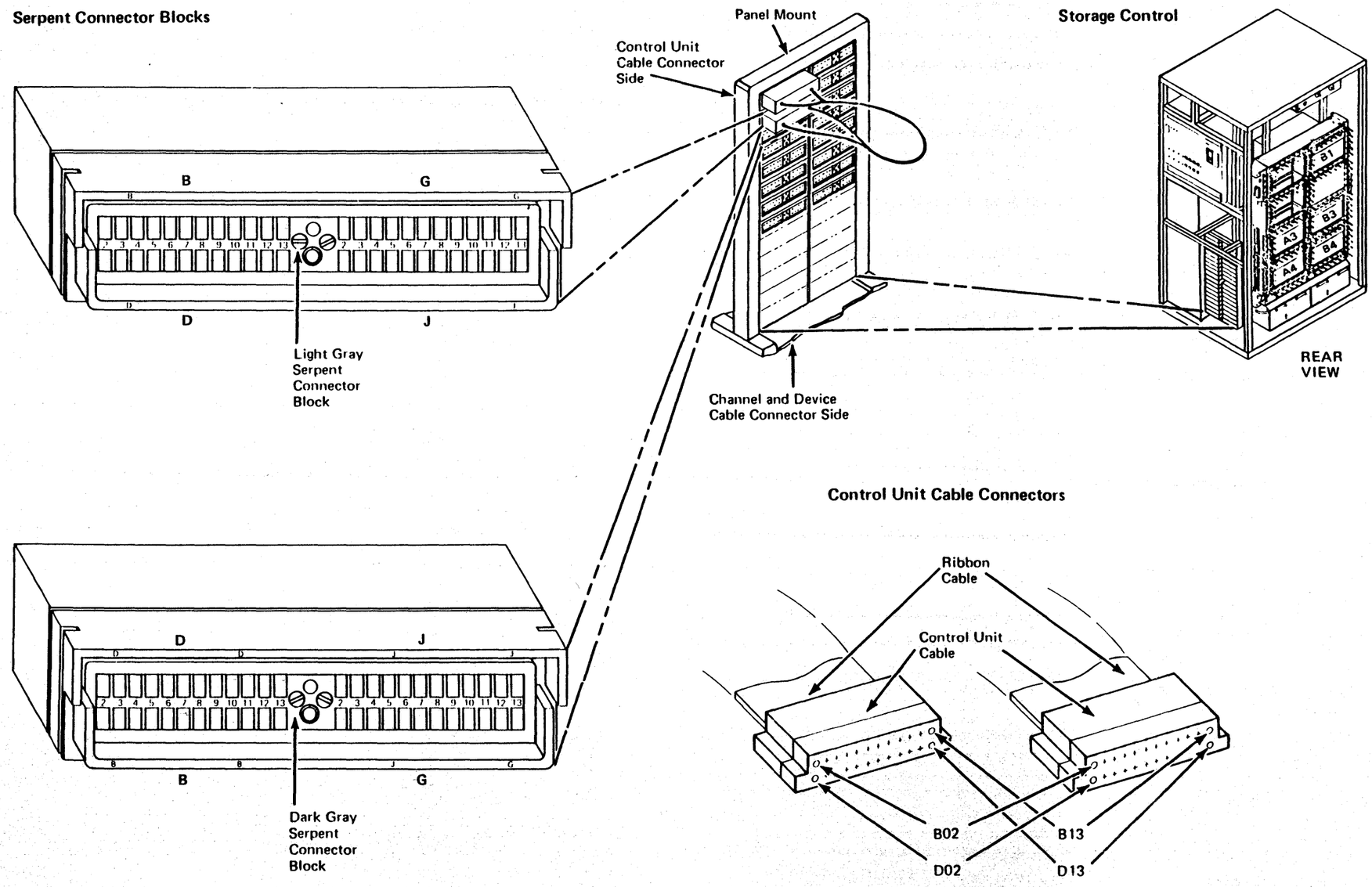
Tailgate Cable Connector Pin Identification

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.



© Copyright IBM Corp. 1984, 1985

Power

Contents of This Section

Introduction ... 17
Primary Power ... 17
Logic Power (PS1) ... 17
Maintenance Power ... 17
Subsystem Storage Power (PS2) ... 17
Power Off Procedure to Remove or Replace Logic Cards ... 17
Resetting the Subsystem Power Check Indicator (Operator Panel) ... 17
Scoping Information ... 17
Card Contact Assignment ... 17
Card Replacement Power On Procedures ... 18
Introduction To Parts Numbering System ... 20

Power Control Summary ... 22
Circuit Objective ... 22
Circuit Theory ... 22

Power Control Summary-Diagram ... 23

Power-On Sequence ... 24
Power Switch Panel ... 26
Power Select Switch or Local/Remote Switch (S106) ... 27
Device Power Sequencing Switch ... 27
Maintenance Power Switch ... 27
Power On Status Indicators ... 27
DC Power Switches ... 27

AC Distribution and +24 Vdc Summary ... 28

No Power at the Convenience Outlet ... 29
Voltage Checks ... 32
Repair Action and Checkout Procedure ... 32
Service Notes ... 32
Intermittent Logic Errors ... 32
Overload Isolation ... 32
Voltage Checks ... 32
Regulator Replacement ... 33

Power Sequencer and Monitor Initialization ... 37

Power Sense Conditions ... 39
Functional Description ... 39
Power Symptom Code Table ... 40
Power Sense Conditions ... 41

Logic Power Turn-On, Thermal Sense, and Power Failure Reset ... 42

Circuit Protector Sense Circuit ... 44
Service Aids ... 44

Regulator Turn-On and Sense Circuits ... 46
Circuit Theory ... 46

Maintenance Power Panel ... 48
CP301, Diskette Drive and Maintenance Board, +5 Vdc ... 48
CP302, Diskette Drive, -5 Vdc ... 48
CP303, Diskette Drive, +24 Vdc ... 48
CP304, Maintenance Board and Regulator Bias, +24 Vdc ... 48
CP305 ... 48

Maintenance Power Distribution ... 49

Bulk Power Distribution ... 52
B4/B3 Boards ... 52

Bulk Power Distribution ... 53
B4/B3 Boards With Four Channel Switch, Additional Feature ... 53

Bulk Power Panel ... 56
CP201, +5 Vdc Regulator ... 56
CP203, Storage Director 1, +6 Vdc Regulator ... 56
CP205, Storage Director 1, -5 Vdc ... 56
CP206, Multilevel Regulator ... 56
CP207, Multilevel Regulator ... 56
CP208, Storage Director 2, +6 Vdc Regulator ... 56
CP210, Storage Director 2, -5 Vdc ... 56

-1.5 Vdc and -5 Vdc Distribution and Sense ... 57

+5 Vdc Distribution and Sense ... 61

+6 Vdc Distribution and Sense ... 63

DC Distribution-Subsystem Storage ... 66

+12 Vdc Distribution and Sense ... 68

Primary Power Panel ... 72
CB401, Primary ac Circuit Breaker ... 72
SW401, Diskette Drive ac ... 72
CP401, Power Control +24 Vdc ... 72
CP402, Input for 24 Vac Transformer ... 72
CP403, CE Convenience Outlet ... 72
CP404, Maintenance Power ac Input ... 72
CP406, Storage Director Power Supply ac Input ... 72

Subsystem Storage Power Supplies ... 73
CPA01 Through CPA04 (PS2 Area Axx) ... 73
CPC01 Through CPC05 (PS2 Area Cxx) ... 73

Operator Panel ... 74
Unit Emergency Switch ... 74
Subsystem Power Switch and Indicators ... 74
Subsystem Configuration Indicators and Switches ... 74

Power Sequence Distribution-Host System ... 76
Circuit Objectives ... 76
Sequencing Prerequisites ... 76

Power-On Sequence For Attached Device Strings ... 81

End of MD Guided Maintenance ... 91
Power Analysis (With Symptoms) ... 91
Power Analysis (Without Symptoms) ... 91

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.

© Copyright IBM Corp. 1984, 1985

Contents PWR 1

This page intentionally left blank

© Copyright IBM Corp. 1984, 1985

Introduction

The 3880 power circuits and assemblies are divided into four major groups:

- Primary Power
- Logic Power (PS1)
- Maintenance Power
- Subsystem Storage Power (PS2)

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, 01A-gate blowers, maintenance power supply, and logic power supplies.

Logic Power (PS1)

The logic power supply includes:

- Three-phase bulk supply
- DC bulk supply
- Regulators and cards

The logic power supply (PS1) distributes power to 01A-B3 (SD2) and 01A-B4 (SD1) boards (except L2, M2, and N2 cards which have their power supplied by PS2 Area Cxx).

Power to each of the two storage directors can be separately controlled by switches on the power switch panel.

The logic power supply output voltages are: +5 Vdc, +1.5 Vdc, -5 Vdc, +6 Vdc, and +8.5 Vdc or +12 Vdc.

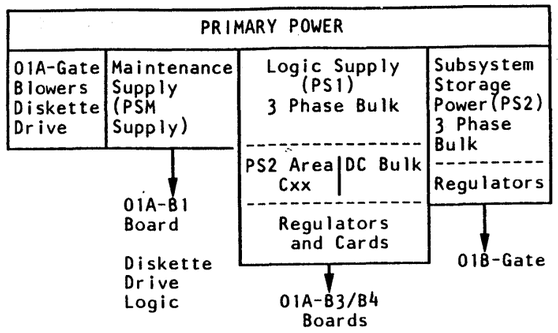
Maintenance Power

The maintenance power supply (PSM) is used to power the maintenance board (01A-B1) and the diskette drive logic. The maintenance power supply outputs are: +5 Vdc, +24 Vdc, and -5 Vdc.

Subsystem Storage Power (PS2)

The subsystem storage power supplies power for the storage arrays (+8.5 Vdc, +5 Vdc and -5 Vdc) and the storage control board (+5 Vdc and +1.7 Vdc) on the 01B gate. It also supplies additional power (+5 Vdc and +1.7 Vdc) to SD1 and SD2 (L2, M2, and N2 cards). AC power is also supplied for the 01B gate fans and the subsystem storage power supply fans.

The +5 Vdc and the +1.7 Vdc to SD1 and SD2 locations (L2, M2, and N2) are powered up along with the other SD power.



Power Off Procedure to Remove or Exchange Logic Cards

CAUTION
The Power Check indicator (operator panel) must be off (see 'Resetting The Subsystem Power Check Indicator' on this page).

. . . . . .

. . . . . .

01A-B1 Board (Maintenance Board)

CAUTION
This action also removes power from both storage directors and subsystem storage. Ensure that both storage directors can be taken offline.

. . . . . .

. . . . . .

1. Press the Device Power Sequencing switch (power switch panel) to the disabled 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.

01A-A3, A4, B3, B4 Boards (Storage Directors 1 and 2)

Warning: To prevent damage to the power supply, always use the DC Power System switch (power switch panel) when removing dc power from both storage directors at the same time.

. . . . . .

. . . . . .

. . . . . .

1. Press the Device Power Sequencing switch (power switch panel) to the disabled position.
2. Turn the Power Select switch (power switch panel) to the Local position.
3. Press the DC Power System switch (power switch panel) to the Off position.

01A-A3, A4, B3, B4 Board (STORAGE DIRECTOR 1 or STORAGE DIRECTOR 2 ONLY)

1. Press the Device Power Sequencing switch (power switch panel) to the disabled position.
2. Turn the Power Select switch (power switch panel) to the Local position.
3. Turn the Storage Director Power SD1 or SD2 switch (power switch panel) to the Off position.

01B-A1, A2, B2 Boards (Subsystem Storage)

1. Turn the Power Select switch (power switch panel) to the Local position.
2. Press the Subsystem Storage Power switch (power switch panel) to the Off position.

Resetting the Subsystem Power Check Indicator (Operator Panel)

Note: The following procedure assumes both storage directors and subsystem storage are offline. On the 3880 models with Subsystem Storage the Power Check Indicator may be set by either a PS1 power failure or a PS2 power failure.

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 Subsystem Storage Power switch (power switch panel) to the On position.

Scoping Information

Warning: Use an oscilloscope (X 10 probe) to measure the DIF/VTL levels. Do not use a volt-ohmmeter.

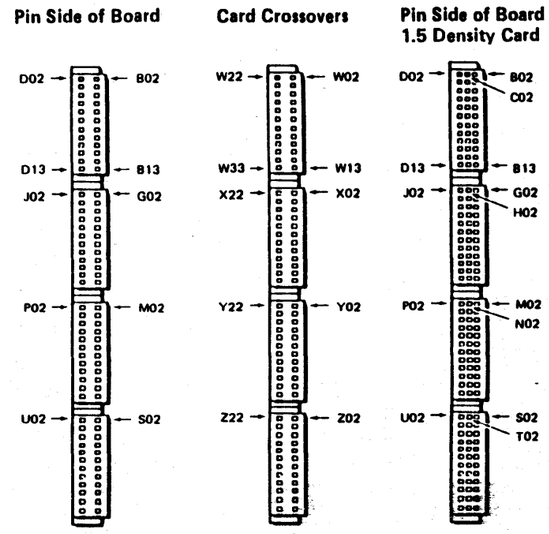
. . . . . .

. . . . . .

Use the INDEX and OPER sections in the Maintenance Support Manual (MSM) to aid 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 symbols used in the MIM circuit diagrams. Use the GLOS section in the MIM for a definition of technical terms and for descriptions of abbreviations.

Card Contact Assignment



© Copyright IBM Corp. 1984, 1985

Card Replacement Power on Procedures

01A-B1 Board (Maintenance Board)

Note: This procedure also powers on the storage director boards.

1. Turn the Power Select switch (power switch panel) to the Remote position.
2. Press the Subsystem Power switch (operator panel) to the On position.
3. Press the Device Power Sequencing switch (power switch panel) to the Enable position.

01A-A3, A4, B3, B4 Boards (Storage Directors 1 and 2)

1. Press the DC Power System switch (power switch panel) to the On position.
2. Turn the Power Select switch (power switch panel) to the Remote position.
3. Press the Device Power Sequencing switch (power switch panel) to the Enable position.

01A-A3, A4, B3, B4 Boards (Storage Director 1 or Storage Director 2 Only)

1. Turn the Storage Director Power SD1 or SD2 switch (power switch panel) to the Normal position.
2. Turn the Power Select switch (power switch panel) to the Remote position.
3. Press the Device Power Sequencing switch (power switch panel) to the Enable position.

01B-A1, A2, B2 Boards (Subsystem Storage)

1. Press the Subsystem Storage Power switch (power switch panel) to the On position.
2. Turn the Power Select switch (power switch panel) to the Remote position.
3. Press the Device Power Sequencing switch (power switch panel) to the Enable position.

© Copyright IBM Corp. 1984, 1985

Introduction To Part Numbering System

Part Numbering System

The following part numbering system shows specific storage control power areas where xx is the unit number within that area.

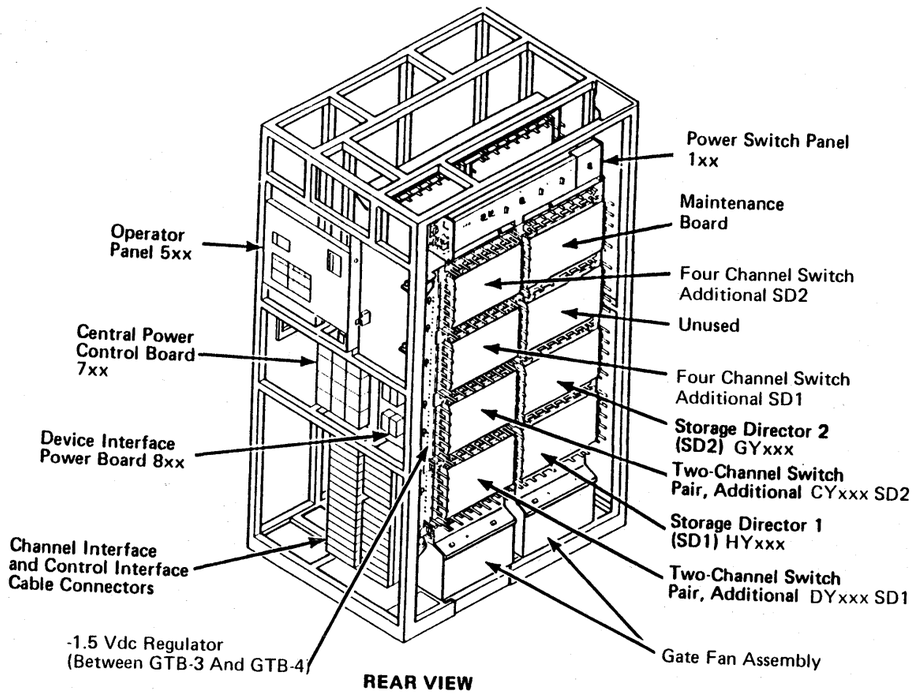
PS1

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

PS2

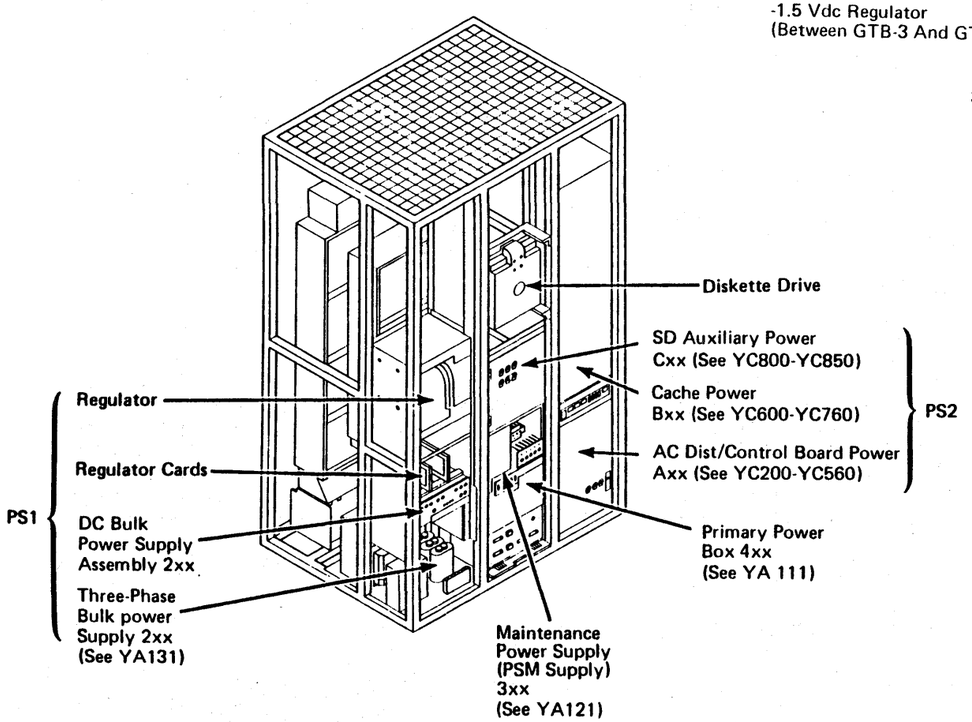
Axx AC Distribution/Control Board power (Subsystem Storage)
Bxx Cache Power
Cxx SD Auxiliary Power (Subsystem storage)

Note: This figure is for reference only. See the LOC section for detailed locations.



REAR VIEW

3880 Without Relocated Tailgate



FRONT VIEW

3880 MIM	Seq AS0001	PN 6315677 5 of 44	881143 13 Jan 84	881216 15 Aug 84	A15621 01 Apr 85		

© Copyright IBM Corp. 1984, 1985

Circuit Objective

This page makes reference to PWR 23 and PWR 24.

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 main circuit breaker, CB401 **1**.

DANGER
Circuit breaker CB401 must be turned off when maintenance is performed on the primary power circuits or hardware.

. . . . . .

. . . . . .

Circuit protector CP402 **2** protects the primary winding of isolation transformer T401 (60Hz), which supplies power for the convenience outlet **9** and the +24 Vdc control voltage power supply **6**.

The +24 Vdc control voltage 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 Power Select switch **14** **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 Power Select 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 (see PWR 26).

Power control at the operator panel is independent of the Power Select switch position (remote or local) see PWR 17.

Unit Emergency

The Unit Emergency switch **10** **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 Disable position, relay K404 **17** is deactivated, removing power from the outlet **9**. This switch is a safety measure to ensure power removal from any device connected to the convenience outlet and all power supplies except the +24 Vdc power supply.

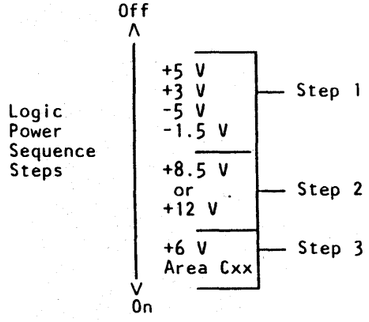
If the machines are in a dual frame configuration, setting one Unit Emergency switch off removes power from both of the subsystems.

Primary Power Indicators

The Power On indicator **18** on the operator panel comes on when power on is started from any source. Primary power control makes ac power available to the remaining 3880 circuits by picking relay K401 **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 supplies 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 power supply PS1 **3** and SD1 and SD2 auxiliary power (PS2 area Cxx), by picking relay K402 **11**. PS1 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.

After PS1 logic power has been sequenced on, the storage director auxiliary power (PS2 area Cxx) will power up. If a failure occurs in either SD1 auxiliary power or SD2 auxiliary power, the storage director associated with the failure will remain powered up, however, it will be unusable because the Power On Reset (POR) to that storage director is now active. If a failure occurs in both SD1 and SD2 auxiliary power, both storage directors will sequence down.

Switches 101 and 102 **4**, which are SD1 and SD2 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, and causes a power on reset (POR) to the correct board, and inhibits the power failure sensors with a service mask signal to prevent wrong error conditions. See PWR 39 for additional information concerning 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.

Subsystem Storage Physical Description

A power sequence and monitor card (PSM), power distribution, sense and control cables, and PS2, made up of three power assemblies, (PS2 areas Axx, Bxx, and Cxx) are added to the base power system. These additional power assemblies make up the Subsystem Storage Power System.

PS2 Area Axx power assembly is the ac power distribution section and also supplies +1.7 Vdc and +5 Vdc power to the subsystem storage control board (01B-A1).

For Machines Without Expanded Storage

PS2 area Bxx power assembly contains up to four regulators (Reg B10, Reg B20, Reg B30, and Reg B40). Each regulator supplies power for up to 8M bytes of subsystem storage installed in the B gate (01B-B2 and 01B-A2 boards). For a subsystem storage with 8M bytes of storage, one regulator is installed. For a subsystem storage with 16M bytes of storage, two regulators are installed. For a subsystem storage with 32M bytes of storage, four regulators are installed. The sequential order of installing the four regulators is Reg B30 for 8M bytes, Reg B20 for 16M bytes, Reg B40 and Reg B10 for 32M bytes of storage.

For Machines With Expanded Storage

PS2 Area Bxx power assembly contains two regulators are installed. For a subsystem storage with 8M bytes or 16M bytes of storage, Reg B30 is installed. For a subsystem storage with 32M, 48M, or 64M bytes of storage, Reg B20 is installed.

PS2 area Cxx supplies power to the L2, M2, and N2 cards in the storage directors. PS2 area Cxx supplies additional +1.7 Vdc and +5 Vdc to each storage director and powers up and down with the PS1 power.

The subsystem storage power system has three power contactors: KA01, KA02, and KA03. They are controlled by the subsystem storage PSM card. KA02 and KA03 are picked when the 3880 maintenance power supply powers up and remain picked (except for some PS2 area Bxx failures) until the 3880 maintenance power supply powers off. A power failure in Reg B30 or Reg B20 causes KA03 to drop but ac power is supplied to Reg B40 and Reg B10 through KA02. A power failure in Reg B40 or Reg B10 causes KA02 to drop but ac power is supplied to Reg B30 and Reg B20 through KA03. Contactor KA01 controls power to PS2 Area Axx, KA02, and KA03. Power failures can be isolated by using the MD.

> **Note:** On machines with expanded storage, KA02 and KA03 may not be present. A failure on Reg B20 or Reg B30 will cause KA01 to drop.

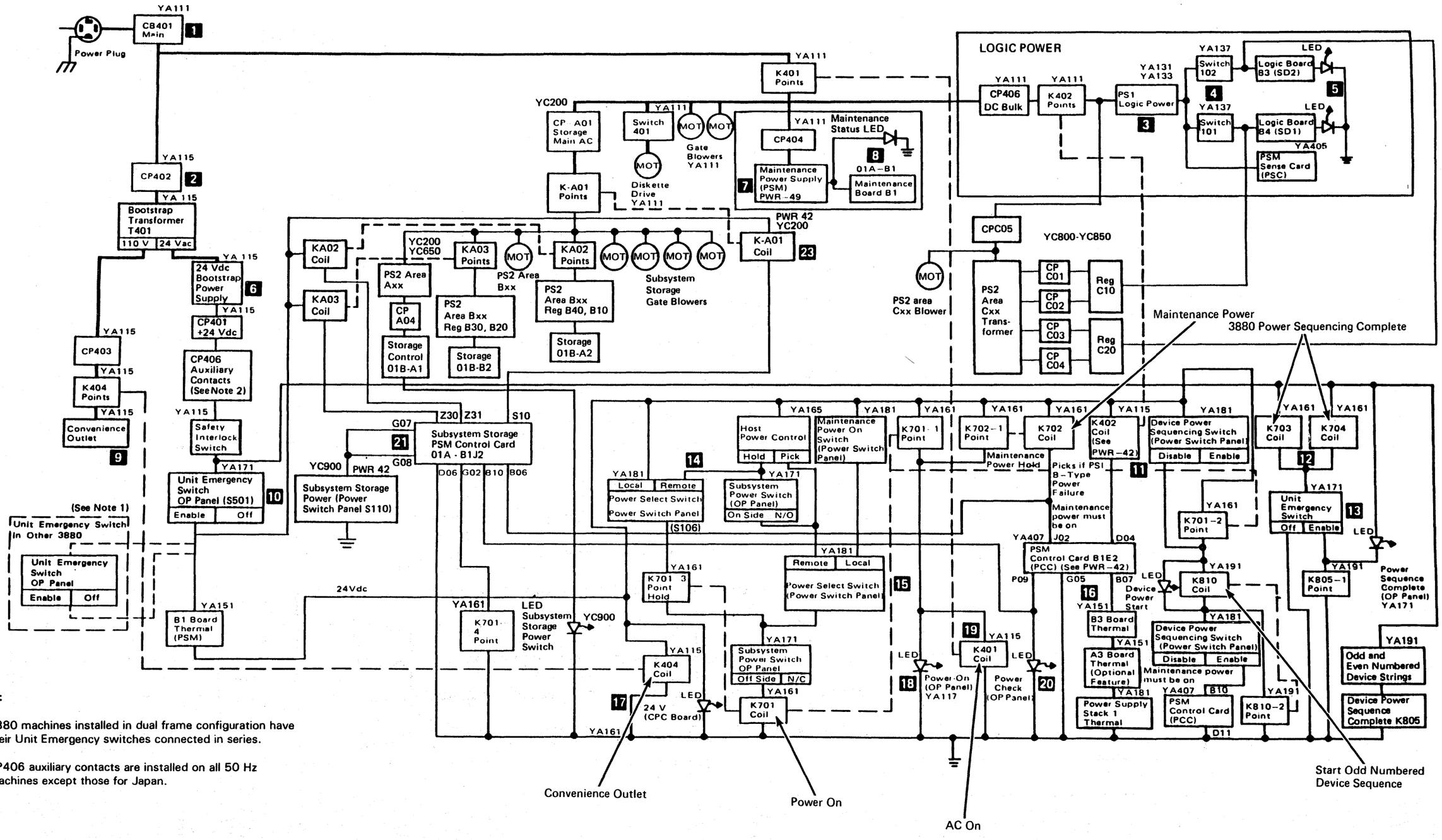
PS2 area Cxx receives ac power from K402 which is part of PS1. K402 is controlled by the PS1 PSM card.

The power on position of the subsystem power switch is active only in the remote mode, while the power off position is active in both the local and remote modes. The subsystem storage power can be turned on with the 3880 (remote mode only) by turning the subsystem power switch to the power on position.

The subsystem storage and 3880 power can also be turned on remotely by a host processor through the power control interface (remote mode only).

In local mode, power is turned on by powering up maintenance power. PS2 area Axx and area Bxx power can be turned on or off in local mode by using the Subsystem Storage power switch if maintenance power is on.

© Copyright IBM Corp. 1984, 1985



Notes:

1. 3880 machines installed in dual frame configuration have their Unit Emergency switches connected in series.
2. CP406 auxiliary contacts are installed on all 50 Hz machines except those for Japan.

3880 MIM							
	Seq AS0001	PN 6315677 7 of 44	881143 13 Jan 84	881216 15 Aug 84	A15621 01 Apr 85		

© Copyright IBM Corp. 1984, 1985

Notes:

1. If in remote mode, a power-on select can come from the system or operator panel switches. If in local mode, a power-on select can come only from the power switch panel.
2. KA02 and KA03 may not be present on machines with expanded storage.

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	YA 161	1
3	Unit Emergency Switch	YA171	
4	Pick Relay K404	YA115	1, 2
5	Power To Convenience Outlet	YA115	4
6	Power On Select (See Note 1)	YA181	Local or Remote
7	Pick Relay K701	YA161	6
8	Pick Relay K401	YA 115	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, -1.5 Vdc	YA133	11
13	+8.5 Vdc or +12 Vdc	YA105	12
14	+6 Vdc	YA105	13
15	SD Auxiliary Power (+1.7, +5)	YC820	
16	Storage Director Power LED	See PWR-27	
17	Pick Relay KA02, KA03 (See note 2)	YC200	
18	Pick Relay KA01	YC200	
19	+5 Vdc, +1.7, Control Board	YC400 YC500	
20	+8.5 Vdc ± 5 Vdc, Storage BD	YC600, YC620 YC700, YC720	

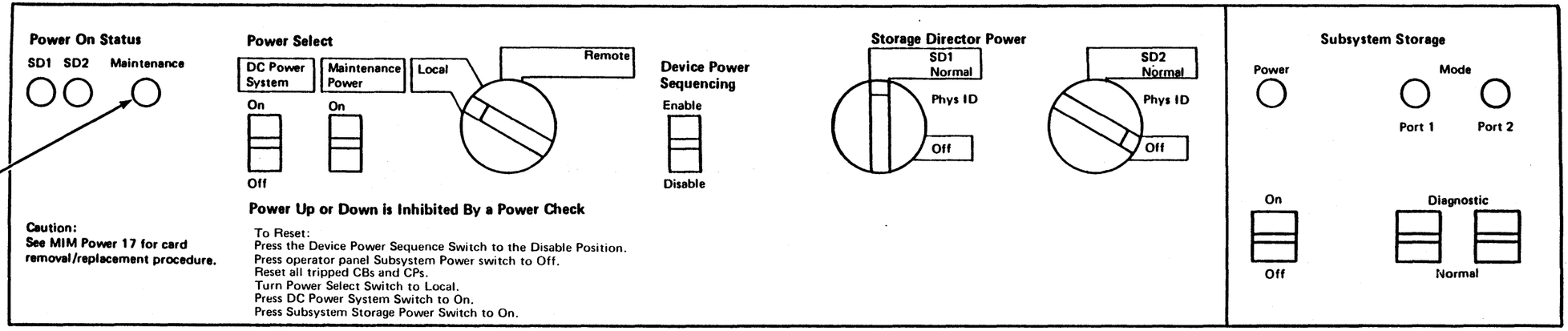
© Copyright IBM Corp. 1984, 1985

This page intentionally left blank

© Copyright IBM Corp. 1984, 1985

Note: The Power On Status Maintenance indicator is the same as the PSM indicator on an old style panel. The circuits for these switches are located on Logic pages YA137 and YA181.

Power Switch Panel and Subsystem Storage Power



© Copyright IBM Corp. 1984, 1985

Power Switch Panel (Continued)

Introduction

The 3880 power is divided into four functional areas:

- Primary Power
- Logic Power (PS 1)
- Maintenance Power
- Subsystem Power (PS 2)

The power switch panel controls these areas for maintenance purposes.

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 or 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.

Device Power Sequencing Switch

The Device Power Sequencing switch 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 Vdc power to the maintenance board (01A-B1) is on. The +5 Vdc is needed to generate the power symptom codes.

Subsystem Storage Power Indicator

This indicator is on when all voltages are present for the subsystem storage array.

DC Power Switches

DC Power System Switch

The Power System switch (S103), with the Power Select switch (S106) in the Local position, controls DC power to all the boards on the 01A gate except the B1 and B2. This switch is used when it is necessary to remove dc power from both storage directors at the same time. DC power to all boards (except B1 on the 01A gate and the 01B gate) is turned off by pressing this switch to the Power Off (down) position. Power is turned on again by pressing this switch to the Power On (up) position. The 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, press the Power System switch and the Subsystem Storage Power switch to the on position to reset the power-check register and then turn power on or off as needed.

Subsystem Storage Power

The Subsystem Storage Power switch turns power on and off to the subsystem storage array and the subsystem storage control board (01B gate). The switch is active when the Power Select switch is in Local and maintenance power is on. When power is turned on in Local mode, the subsystem storage logic in the PSM is reset. Turning DC power on also resets the Power-Sense register of subsystem storage PS2.

Storage Director 1 Switch

Warning: To prevent damage to the power supply, always use the DC Power System switch when removing dc power from both storage directors at the same time.

. . . . . .

. . . . . .

The Storage Director Power SD1 switch 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 PS1 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

Warning: To prevent damage to the power supply, always use the DC Power System switch when removing dc power from both storage directors at the same time.

. . . . . .

. . . . . .

. . . . . .

The Storage Director Power SD2 switch 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 PS1 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.

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.

Subsystem Storage Mode Switches

The Port switches logically prevent the associated storage director from having access to the subsystem storage located in this frame.

Example: When Port 2 Mode switch is in the Diagnostic position it will prevent the customer from having access to the subsystem storage from the storage director connected to port 2 in this frame.

> **Note:** When the Subsystem Storage Mode switches have been set to the Diagnostic positions, the MD "End of Call" routine must be used to allow the Subsystem Storage to come back on line.

In a Dual Frame configuration the Port 2 switch prevents storage director 2 in the other frame from having access to subsystem storage in this frame.

© Copyright IBM Corp. 1984, 1985

AC Distribution and +24 VDC Supply

DANGER
Lethal voltages are present in the power servicing area. Safety is most important. Assume all circuits are live until measured. Capacitors are possible exploding devices. Wear safety glasses when working in the power area.

Always install all safety covers before powering on the machine.

. . . . . .

. . . . . .

. . . . . .

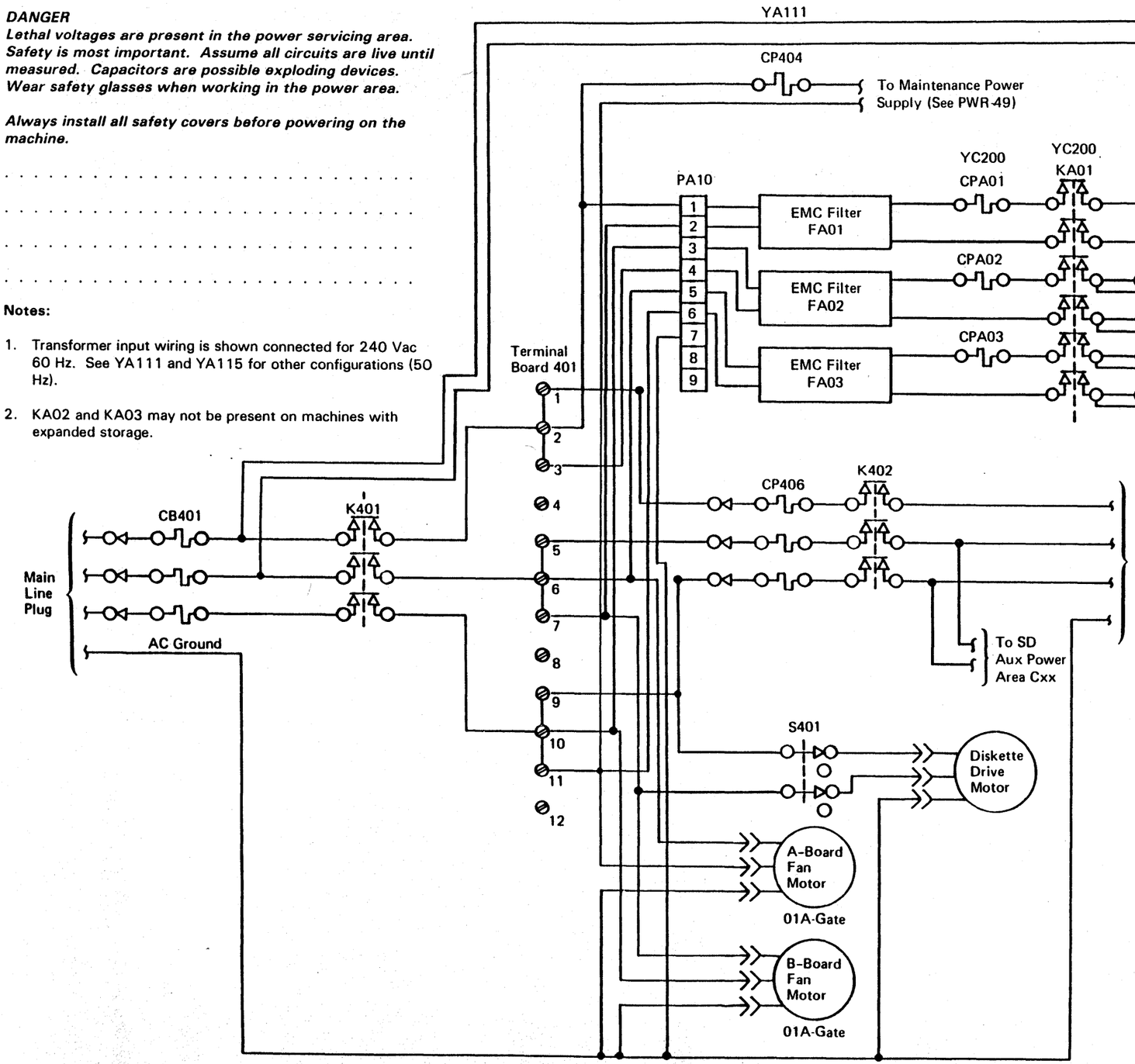
. . . . . .

Notes:

1. Transformer input wiring is shown connected for 240 Vac 60 Hz. See YA111 and YA115 for other configurations (50 Hz).
2. KA02 and KA03 may not be present on machines with expanded storage.

AC Distribution and +24 VDC Supply

This diagram is logically correct, but not point-to-point. See the MDM power diagrams for point-to-point wiring. (Use YAxxx and YCxxx reference to find the correct page.)



3880 MIM	Seq AS0001	PN 6315677 12 of 44	881143 13 Jan 84	881216 15 Aug 84	A15621 01 Apr 85	

Copyright IBM Corp. 1984, 1985

No Power at the Convenience Outlet

DANGER
Lethal voltages are present in the power servicing area. Safety is most important. Assume all circuits are 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: 3880 machines installed in a dual frame configuration have their Unit Emergency switches connected in series.

001
Is the Unit Emergency switch in the Power Off position?

Y: 002
Is the +24V LED on (CPC board)?

Y: 003
Trip and reset main CB401.

Is CB401, CP301, CP401, CP402, CP403, or CP406 tripped?

Y: 004
Measure the dc voltage across C401 (see LOC 55 and YA115).

Is it between +19.2 Vdc and +30.9 Vdc?

Y: 005
Measure the line voltage at the input to T401 (see LOC 55 and YA115).

Is line voltage present?

Y: 006
There is an open circuit to T401. See PWR 28, YA115, and YA111. CB401 or CP402 could be bad, or phase A or phase B power could be missing.

N: 007
Measure the 24 Vac input to CR401 (see LOC 55 and YA115).

Is it between 13.5 Vac and 22 Vac?

Y: 008
Replace T401. Verify that ac power at the convenience outlet is correct.

N: 009
Exchange CR401 and C401.

N: 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 01A-B1 board thermal could be bad.

A 1 B 1 C 1

N: 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: 012
If there was an earlier machine problem, continue with the MD diagnostics. If not, return the machine to the customer.

N: 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?

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?

N: 017
Is this 3880 60 Hz or 50 Hz for Japan?

Y: 018
There is an open circuit between the convenience outlet and CB401. This circuit includes TB403, CP403, and K404 points and connecting wires. See YA111, YA115, and LOC 50.

N: 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.

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.

© Copyright IBM Corp. 1984, 1985

Repair Action and Checkout Procedure

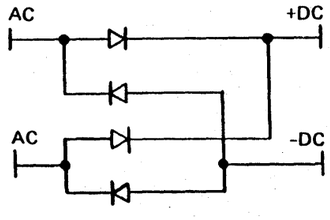
Complete the following checklist to ensure the machine problem has been corrected. If a check cannot be completed, start the MD again.

Note: It is not always necessary to check each step. Use your judgment in skipping all unnecessary steps.

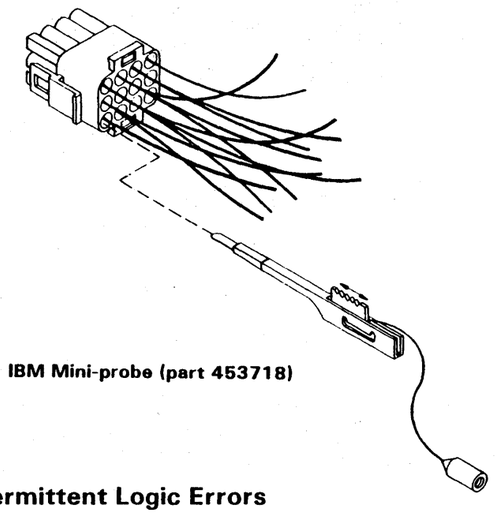
1. Set the Power Select switch to the Remote position on the power switch panel, then set the Device Power Sequencing switch to the Disable position. Power off from the operator panel. Are all power lamps on the operator panel off? (Ignore the Power On Status indicators.) If not, start the MD again.
2. Reset the machine to normal operating conditions. (Remove all diagnostic jumpers and reinstall 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. Reinstall all covers.

Service Notes

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 reading falls to near zero, then returns toward infinity.
   e. Reverse the leads and repeat the check. Because of the capacitor charge caused by the first check, the reading should fall below 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 Mini-probe (part 453718).



IBM Mini-probe (part 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. Reinstall parts and adjust the regulators as needed.
2. Check that screws and connectors on the power supplies and the gate TBs are tight.
3. Reinstall the cards at 01A-B1C2 and 01A-B1E2 if wrong voltage levels are not detected by the power sequencer and monitor sense circuits.

   If four channel switch, additional feature is installed, reinstall 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 indicates an overload (overcurrent) condition, press the DC Power System switch (Power Switch Panel) to the off position and reconnect the FWB at the gate TB. 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. Power on 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. Assume all circuits are 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 voltage and the ac ripple of each voltage before going on to the next voltage. Only three voltages can be directly adjusted (+5 Vdc and +6 Vdc) for the logic boards. If adjustments are necessary, measure with a digital voltmeter. The adjustment potentiometers for +5 Vdc and +6 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 over-voltage potentiometer on each card is adjusted at the plant and should not be changed.

The +24 Vdc control voltage 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 control voltage 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 correct 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 correct 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 permissible 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.

© Copyright IBM Corp. 1984, 1985

Regulator Replacement

Before exchanging 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 exchanged and CB401 is reset.

+5 Vdc Regulator

Unplug the pluggable cable and disconnect and label all wires from the terminal board.

Exchange 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 over-voltage 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 over-voltage or under-voltage 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 attempt to power on the system again.

Complete the regulator replacement by adjusting both SD1 and SD2 for +5 Vdc.

+6 Vdc Regulator

Slide the regulator out part of the way and unplug the cables. Remove the regulator and exchange it with a new one.

Power on the machine and adjust voltages for correct values. Sensing circuits detect over-voltage or under-voltage 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 attempt to power on the system again.

Multilevel Regulator

Slide the regulator out part of the way and unplug the cables. Remove the regulator and exchange 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.

Notes:

1. Adjust the SD1/SD2 +5 Vdc regulator for +5.07 V measured between gate TB4-1 and -4 for SD1 and measured between Gate TB3-1 and -4 for SD2.

2. The dc voltage and the peak ac ripple voltage must not be more than the maximum acceptable dc voltage.

3. The 01B-A2 Board is present only when 32M bytes of storage are installed on a machine not having expanded storage. Machines with Expanded Storage may have 2 or 4 MB storage cards. By comparing storage card part numbers to the plug charts in the MDM (R 30), storage type and size can be determined.

See PWR 32 for voltage check problems.

Voltage Checks Subsystem Storage

PS2 (Areas Axx, Bxx, Cxx) has regulator cards that are not adjustable. If the voltages measured are not in tolerance, then the regulator card for the affected supply must be exchanged. **Voltage Checks**

POWER SUPPLY	TEST POINT SEE NOTE 3	ACCEPTABLE RANGE **	MAXIMUM AC RIPPLE	REFERENCE PAGE MIM	REFERENCE PAGE MDM
+24 Vdc Control Voltage	CPC Board J704-1 J704-2 Gnd	+19.2 Vdc to +30.9 Vdc (See Note 2)	800 mV	PWR 76	YA161
+5 Vdc Maintenance	01A-B1 E2D03 E2D08 Gnd	+4.5 Vdc to +5.5 Vdc (See Note 2)	300 mV	PWR 49	YA407
-5 Vdc Maintenance	01A-B1 E4D10 E2D08 Gnd	-4.5 Vdc to -5.5 Vdc (See Note 2)	300 mV	PWR 49	YA407
+24 Vdc Maintenance	01A-B1 E3D07 E2D08 Gnd	+21.2 Vdc to +26.8 Vdc (See Note 2)	600 mV	PWR 49	YA407
+12 Vdc SD1/SD2 B4/B3 Boards	01A-B4/B3 U4B11 K4D08 Gnd	+11.4 Vdc to +12.6 Vdc (See Note 2)		PWR 68	YA151
+6 Vdc SD1/SD2*	01A-B4/B3 X2D12 K4D08 Gnd	+5.76 Vdc to +6.24 Vdc (See Note 2)		PWR 64	YA151
+5 Vdc SD1/SD2*	01A-B4/B3 V5D03 K4D08 Gnd	+4.85 Vdc to +5.15 Vdc (See Notes 1 and 2 for adjusting voltages)		PWR 62	YA151
-1.5 Vdc SD1/SD2	01A-B4/B3 X3B13 K4D08 Gnd	-1.35 Vdc to -1.65 Vdc (See Note 2)		PWR 58	YA151
-5 Vdc SD1/SD2*	01A-B4/B3 U2B06 K4D08 Gnd	-4.55 Vdc to -5.45 Vdc (See Note 2)		PWR 58	YA151

* Adjustable regulator
** Under-voltage sensing is below the lower limit of the acceptable range.

Voltage Checks (Continued)

POWER SUPPLY	TEST POINT	ACCEPTABLE RANGE **	MAXIMUM AC RIPPLE	REFERENCE PAGE MIM	REFERENCE PAGE MDM
+6 Vdc SD1/SD2*	01A-A4/A3/A2/A1 R2D12 K4D08 Gnd	+5.76 Vdc to +6.24 Vdc (See Note 2)		PWR 64	YA151
+5 Vdc SD1/SD2*	01A-A4/A3/A2/A1 R4D03 K4D08 Gnd	+4.85 Vdc to +5.15 Vdc (See Notes 1 and 2 for adjusting voltages)		PWR 62	YA151
-1.5 Vdc SD1/SD2	01A-A4/A3/A2/A1 R3B13 K4D08 Gnd	-1.35 Vdc to -1.65 Vdc (See Note 2)		PWR 58	YA151
+5 Vdc Control Board	01B-A1 C2D03 C2D08 Gnd	+4.5 Vdc to +5.5 Vdc (See Note 2)	±150 mV	PWR 66	YC560
+1.7 Vdc Control Board	01B-A1 C2G06 C2D08 Gnd	+1.615 Vdc to +1.785 V (See Note 2)	±30 mV	PWR 66	YC560
+5 Vdc Subsystem Storage	01B-A2/B2 M2B13 C2B13 C2D08 Gnd	+4.55 Vdc to +5.45 Vdc (See Notes 2 and 3)	±40 mV	PWR 66	YC760 YC660
-5 Vdc Subsystem Storage	01B-A2/B2 M2B06 C2B06 E2P08 Gnd	-4.55 Vdc to -5.45 Vdc (See Notes 2 and 3)	±35 mV	PWR 66	YC760 YC660
+8.5 Vdc Subsystem Storage	01B-A2/B2 M2B11 C2B11 C2D08 Gnd	+7.735 Vdc to +9.265 Vdc (See Notes 2 and 3)	±80 mV	PWR 66	YC760 YC660
+1.7 Vdc SD1/SD2	01A-B3/B4 L2G06 L2D08 Gnd	+1.615 Vdc to +1.785 Vdc (See Note 2)	±30 mV	PWR 66	YC850
+5 Vdc SD1/SD2	01A-B3/B4 L2D03 L2D08 Gnd	+4.75 Vdc to +5.25 Vdc (See Note 2)	±50 mV	PWR 66	YC850

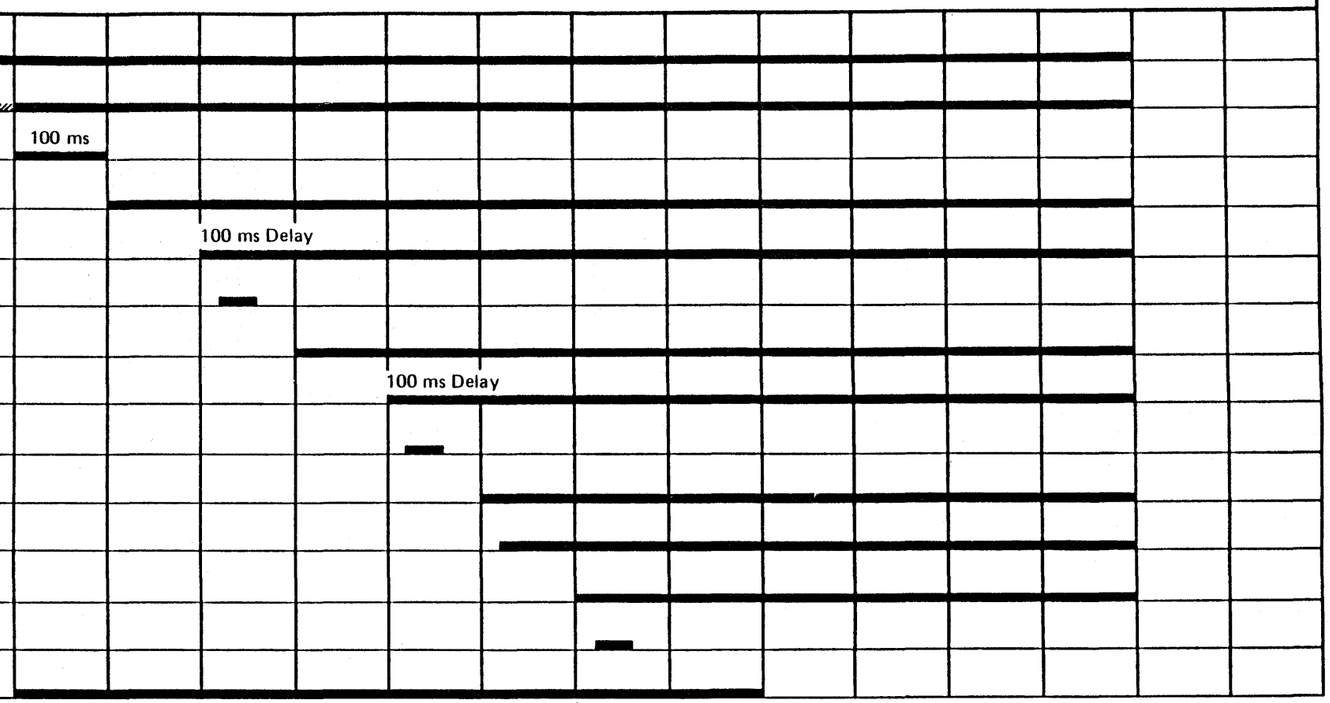
© Copyright IBM Corp. 1984, 1985

Power Sequencer and Monitor Initialization

PS1

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	+ 5V Maintenance Supply	YA121	+
3	Power Sequencer and Monitor Reset		
4	Pick K402, Turn On +3 V, +5 V −1.5 V, −5 V Bulk Supply	YA111, YA115 YA133	
5.	Turn Off Sequence Mask 1	YA407	
6	Test Sequence 1		
7	Turn on +8.25 V or +12 V Series Regulators	YA133	+
8	Turn Off Sequence Mask 2	YA407	
9	Test Sequence 2		
10	Turn on +6 V Regulator	YA 133	+
11	Turn on Auxiliary SD Power +1.7, +5 Vdc	YC960	
12	Turn Off Sequence Mask 3	YA407	
13	Test Sequence 3		
14	Power On Reset (POR) to Storage Director Boards	YA407	

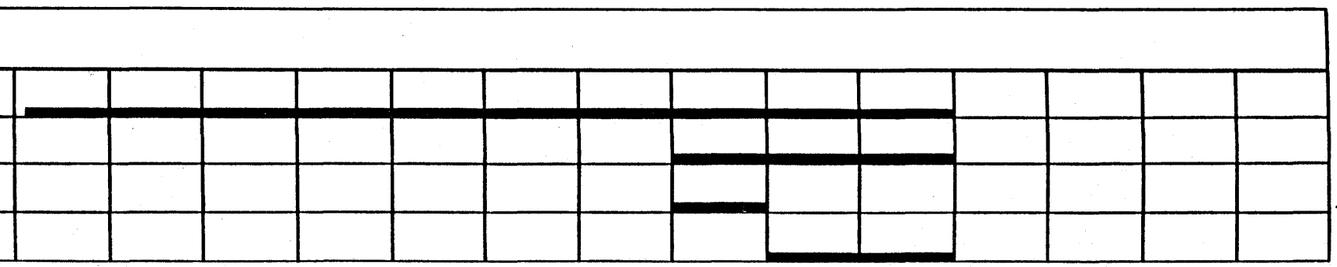


Notes: 1. KA02 and KA03 may not be present on machines with expanded storage.

2. Description of failure conditions are located on PWR 39.

PS2

Chart Line No.	Signal Name	Logic Page Number
1	Pick K-A02, K-A03 (See note 1)	YC200
2	Pick K-A01	YC200
3	Sequence Mask	
4	Power On Reset	YC960



© Copyright IBM Corp. 1984, 1985

Power Sense Conditions

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 storage director is given 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.

The subsystem storage PSM board tests distinct sense points in subsystem storage and the SD auxiliary supply. It also checks the status of CPs and thermals unique to PS2. All faults (except CP faults) are latched and displayed in a sense register. CP faults are displayed in the sense register but are not latched by the PSM card since they act as self-latching devices.

Any fault detected by the subsystem storage PSM card or any 3880 Action B fault causes subsystem storage power to be sequenced down.

Power Sense Registers

Note: Refer to PWR 41 Power Sense Conditions for power symptom code tables.

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 starts, 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.) The subsystem storage PSM (CSSS) card uses one sequence mask.

Service Masks

Service masks are used to prevent setting false indications while one of the storage directors is powered off.

The 1 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 2 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. The subsystem storage PSM card does not use service masks.

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. A through H identify the failures that cause action A through action H.

Power Sense Conditions and the MD

Note: Refer to PWR 40 and PWR 41 Power Sense Conditions for power symptom code tables.

The sense registers are read and analyzed by the MD during maintenance analysis procedures (MAPs). The results are used to direct the CE in maintenance activity.

The MD can also be used in 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. Start isolation on the page given in the table (suspect any FRU shown). Then use the End of Guided Maintenance procedures on PWR 91.

MD Sense Registers Display

Note: Refer to PWR 40 and PWR 41 Power Sense Conditions for power symptom code tables.

The MD must be connected to the 3880, powered-on, and loaded with a maintenance diskette. Then, the following procedure can be used to display the contents of the power sense registers.

1. Press 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.
4. Select the desired Read Power option from the list:

   a. Read Base Power Sense
   b. Read Subsystem Storage Power Sense
   c. Exit Routine

The following figure is an example of the MD display of option A.

```
BASE POWER SENSE:

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 under-voltage 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.

© Copyright IBM Corp. 1984, 1985

Power Symptom Code Table

See PWR 41 for subsystem storage power sense.

DISPLAY CODE (MD)		SENSE CONDITIONS	SEQUENCE MASK	SERVICE MASK	ACTION See Note 2 and 3	REFERENCE PAGE
REGISTER ADDRESS	REGISTER DATA BIT	UNLESS NOTED, SENSORS ARE ON THE POWER SENSE CARD (PSM) 01A-B1C2				
1	8	K402 CMD	1			PWR 42
	4	PSM CP Chain			B	PWR 44
	2	Thermals			B	PWR 42
	1	+24.0 V Bias				PWR 49
2	8	+6.0 V Regulator turn-on signal is missing	3			PWR 46
	4	Not used				
	2	Not used				
	1	Stack CP Chain	0			PWR 44
3	8	+6.0 V OV	3			PWR 63
	4	+5.0 V OV	1			PWR 61
	2	Not used	2			PWR 65
	1	+8.5 V or +12 V OV	2			PWR 66,68
4	8	Not used				
	4	+6.0 V OC	3			PWR 63
	2	+5.0 V OC	1			PWR 61
	1	Not used	2			PWR 65
5	8	+8.5 V or +12 V OC	2			PWR 66,68
	4	Not used				
	2	+10.7 V Regulator Bulk UV	1			PWR 52,61
	1	+12 V Regulator Bulk UV	1			PWR 68
6	8	Not used	1	1	B	PWR 59
	4	Not used	1	2	B	PWR 59
	2	-5.0 V UV Storage Director 1 (See Note 1)	1	1	B	PWR 57
	1	-5.0 V UV Storage Director 2 (See Note 1)	1	2	B	PWR 57
7	8	+5.0 V UV Storage Director 1	1	1	B	PWR 61
	4	+5.0 V UV Storage Director 2	1	2	B	PWR 61
	2	+5.0 V UV 01A-A4 Board	1	1	B	PWR 61
	1	+5.0 V UV 01A-A3 Board	1	2	B	PWR 61
8	8	+6.0 V UV Storage Director 1 (See Note 1)	3	1	A	PWR 63
	4	+6.0 V UV Storage Director 2 (See Note 1)	3	2	A	PWR 63
	2	-1.5 V UV Storage Director 1	1	1	A	PWR 57
	1	-1.5 V UV Storage Director 2	1	2	A	PWR 57
9	8	Not used	2	1	A	PWR 65
	4	Not used	2	2	A	PWR 65
	2	+8.5 V or +12 V UV Storage Director 1 (See Note 1)	2	1	A	PWR 66,68
	1	+8.5 V or +12 V UV Storage Director 2 (See Note 1)	2	2	A	PWR 66,68
A	8	-1.5 V UV 01A-A4 Board	1	1	A	PWR 57
	4	-1.5 V UV 01A-A3 Board	1	2	A	PWR 57
	2	+6.0 V UV 01A-A4 Board	3	1	A	PWR 63
	1	+6.0 V UV 01A-A3 Board	3	2	A	PWR 63
B	8	-5 V UV Maintenance Power (See Note 1)			A	PWR 49
	4	Not used				
	2	+5 V UV 01A-A2 Board (See note 4)	1	1	B	PWR 61
	1	+5 V UV 01A-A1 Board (See note 4)	1	2	B	PWR 61
C	8	-1.5 V UV 01A-A2 Board (See note 4)	1	1	A	PWR 57
	4	-1.5 V UV 01A-A1 Board (See note 4)	1	2	A	PWR-57
	2	+6 V UV 01A-A2 Board (See note 4)	3	1	A	PWR-63
	1	+6 V UV 01A-A1 Board (See note 4)	3	2	A	PWR-63
D-F		Not used				

Notes:

1. Sensors are located on the power control card at 01A-B1E2.
2. Action =
   - A - Power on Reset to board
   - B - Power off the logic supply
3. To display registers, see PWR 39 (MD Sense Register Display). The MD will display the procedure used to display the contents of these registers.
4. The sensors are located on the power control card 01A-B1H2.
5. When the 3880 is installed in a dual frame configuration, sense information for subsystem storage power must be taken from the 3880 frame (either SD) that contains the failing subsystem storage.

© Copyright IBM Corp. 1984, 1985

Power Sense Conditions

Additional Power Symptom Code Table for Models with Subsystem Storage

DISPLAY CODE (MD)		SENSE CONDITIONS		
REGISTER ADDRESS	REGISTER DATA BIT	UNLESS NOTED, SENSORS ARE ON PSM CARD 01A-B1J2	ACTION	NOTES
0	8	Non Simultaneous SD Faults		1
	4	Invalid Power Configuration	H	
	2	Configuration Bit 1		3
	1	Configuration Bit 0		3
1	8	Not Used		
	4	+1.7, +5 CP Trip Reg C20	D	5
	2	Thermal SD P/S Area Cxx	E	
	1	+1.7, +5 CP Trip Reg C10	C	5
2	8	+1.7 OV Sense Reg C20	D	
	4	+1.7 OV Sense SD2	D	
	2	+1.7 OV Sense Reg C10	C	
	1	+1.7 OV Sense SD1	C	
3	8	Reg C20 +5 OI Sense at SD2	D	
	4	Reg C20 +5 OV Sense at Cxx	D	
	2	Reg C10 +5 OI Sense at SD1	C	
	1	Reg C10 +5 OV Sense at Cxx	C	
4	8	Reg C20 +5 OV Sense at SD2	D	
	4	Reg C20 +1.7 OI	D	
	2	+5 OV Sense SD1	C	
	1	Reg C10 +1.7 OI	C	
5	8	+1.7 UV Sense at SD2	D	
	4	+5 UV Sense at SD2	D	
	2	+1.7 UV Sense at SD1	C	
	1	+5 UV Sense at SD1	C	
6	8	Non Simultaneous Subsystem Storage Faults		2
	4	Thermal B Gate	H	
	2	Thermal Area Bxx	H	
	1	+5 CP Cntl Board Area Axx	H	5
7	8	Fan Fault B Gate	H	
	4	Fan Fault Area Bxx	H	
	2	+1.7 OV Sensed at Reg A20	H	
	1	+1.7 OV Sensed at 01B-A1	H	
8	8	+1.7 UV Sensed at 01B-A1	H	
	4	+5 UV Sensed at 01B-A1	H	
	2	Cable Check in Area Axx or in B gate A1 board	H	
	1	Reg A20 1.7 UV Sensed at A20	H	
9	8	Reg B10 OI Sensed at Reg	G	4
	4	Reg B40 OI Sensed at Reg	G	4
	2	Reg B20 OI Sensed at Reg	F	4
	1	Reg B30 OI Sensed at Reg	F	4
A	8	Reg B10 OV Sensed at Reg	G	4
	4	Reg B40 OV Sensed at Reg	G	4
	2	Reg B20 OV Sensed at Reg	F	4
	1	Reg B30 OV Sensed at Reg	F	4

DISPLAY CODE (MD)		SENSE CONDITIONS		
REGISTER ADDRESS	REGISTER DATA BIT	UNLESS NOTED, SENSORS ARE ON PSM CARD 01A-B1J2	ACTION	NOTES
B	8	+5 OV A2B Reg B10 Sensed at Bd	G	4
	4	+5 OV A2A Reg B40 Sensed at Bd	G	4
	2	+5 OV B2B Reg B20 Sensed at Bd	F	4
	1	+5 OV B2A Reg B30 Sensed at Bd	F	4
C	8	+5 UV A2B Reg B10 Sensed at Bd	G	4
	4	+5 UV A2A Reg B40 Sensed at Bd	G	4
	2	+5 UV B2B Reg B20 Sensed at Bd	F	4
	1	+5 UV B2A Reg B30 Sensed at Bd	F	4
D	8	+8.5 UV A2B Reg B10 Sensed at Bd	G	4
	4	+8.5 UV A2A Reg B40 Sensed at Bd	G	4
	2	+8.5 UV B2B Reg B20 Sensed at Bd	F	4
	1	+8.5 UV B2A Reg B30 Sensed at Bd	F	4
E	8	-5 UV A2B Reg B10 Sensed at Bd	G	4
	4	-5 UV A2A Reg B40 Sensed at Bd	G	4
	2	-5 UV B2B Reg B20 Sensed at Bd	F	4
	1	-5 UV B2A Reg B30 Sensed at Bd	F	4
F	8	NOT USED		
	4			
	2			
	1			

To display Registers, see PWR 39 (MD Sense Register Display). The MD will display the procedure used to display the contents of these registers.

ACTION	DESCRIPTION
C	PS2 area Cxx, SD1 regulator turned off. If an 'Action D' also exists, it becomes an 'Action E'.
D	PS2 area Cxx, SD2 regulator turned off. If an 'Action C' also exists, it becomes an 'Action E'.
E	Turn off both storage directors.
F	Drops KA03 which drops power to regulators B30 and B20. If an 'Action G' exists or the machine does not have expanded storage and 16M bytes or less of storage, or the machine has expanded storage it becomes an 'Action H'.
G	Drops KA02 which drops power to regulators B40 and B10. If an 'Action F' exists, it becomes an 'Action H'. 'Action G' should occur only on machines without expanded storage and having 16M bytes or more of subsystem storage.
H	Drops KA01 which drops power to PS2 area Axx and area Bxx.

Notes:

1. If more than 900 milliseconds elapse from the time an 'Action C' or an 'Action D' becomes an 'Action E', this bit is turned on.

2. If more than 900 milliseconds elapse from the time an 'Action F' or an 'Action G' becomes an 'Action H' or more than 900 milliseconds elapse from the time an 'Action F' or an 'Action G' is present and a 'Action H' occurs, this bit is turned on.

3. These bits indicate the number of regulators installed in PS2 area Bxx:

   - xx00 = One regulator (Reg B30).
   - xx01 = Two regulators (Reg B30 and Reg B20).
   - xx10 = Three regulators (Reg B30, Reg B20, and Reg B40).
   - xx11 = Four regulators (Reg B30, Reg B20, Reg B40, and Reg B10).

4. **Machines Without Expanded Storage**

   The two subsystem storage array boards are divided into two power boundaries so that each half of the board can be supplied with dc voltages from different sources. The power boundaries are A2A and A2B for the 01B-A2 board, and B2A and B2B for the 01B-B2 board. The A2A and B2A power boundaries include cards A thru K. The A2B and B2B power boundaries include cards L thru V. When 8M bytes of subsystem storage are installed, Reg B30 supplies dc power to both halves of the 01B-B2 board (B2A and B2B). When 16M bytes (or more) of subsystem storage are installed, Reg B30 supplies dc power to the B2A half of the 01B-B2 board and Reg B20 supplies power to the B2B half of the 01B-B2 board. board. When 32M bytes of subsystem storage are installed, Reg B40 supplies dc power to the A2A half of the 01B-A2 board, and Reg B10 supplies dc power to the A2B half of the 01B-A2 board.

   Machines With Expanded Storage

   On machines with Expanded Storage only the 01B-B2 board is used. For machines with 8M bytes or 16M bytes of subsystem storage, Reg B30 supplies dc power to both halves of the 01B-B2 board. When 32M, 48M, or 64M bytes of subsystem storage are installed , Reg B30 supplies dc power to the B2A half of the 01B-B2 board and Reg B20 supplies dc power to the B2B half of the 01B-B2 board.

5. A CP sense line active does not cause any fault conditions. If another fault occurs and a CP sense line is active at the time of the fault, the CP bit will become active. The CP bits are included for information only.

© Copyright IBM Corp. 1984, 1985

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 and the subsystem storage Power 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 relays K402 and KA01 can be activated. The path for ground is through the normally open relay point K701-4.

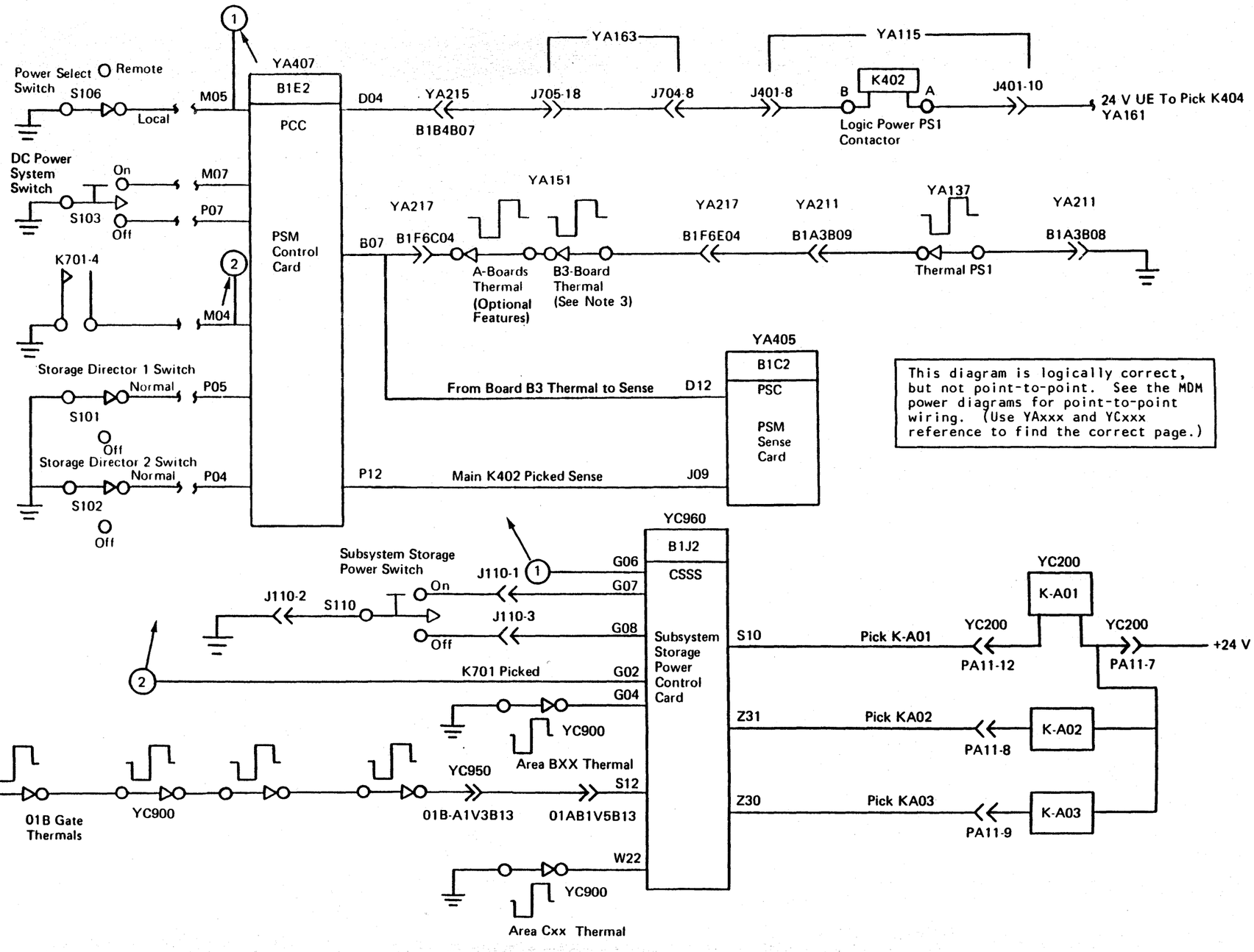
If both storage director switches 1 and 2 are off, relay K402 is de-activated and cannot be activated.

Maintenance power supply must be on to supply voltages to the maintenance board and supply a pick to K402 through card 01A-B1E2.

The subsystem storage Power switch turns power on and off only to the subsystem storage. This permits maintenance to be performed without disturbing 3880 operations.

Notes:

1. The storage gate thermals are located above each storage board on the 01B gate. When one of the thermals opens, only the power to the subsystem storage is turned off.
2. This maintenance analysis page is used for maintenance device reference only. See PWR 27 for additional descriptions of the switches shown on this page.
3. For the 01A-B1 board thermal, see PWR 76, PWR 82, or PWR 84.
4. KA02 and KA03 may not be present on machines with expanded storage.



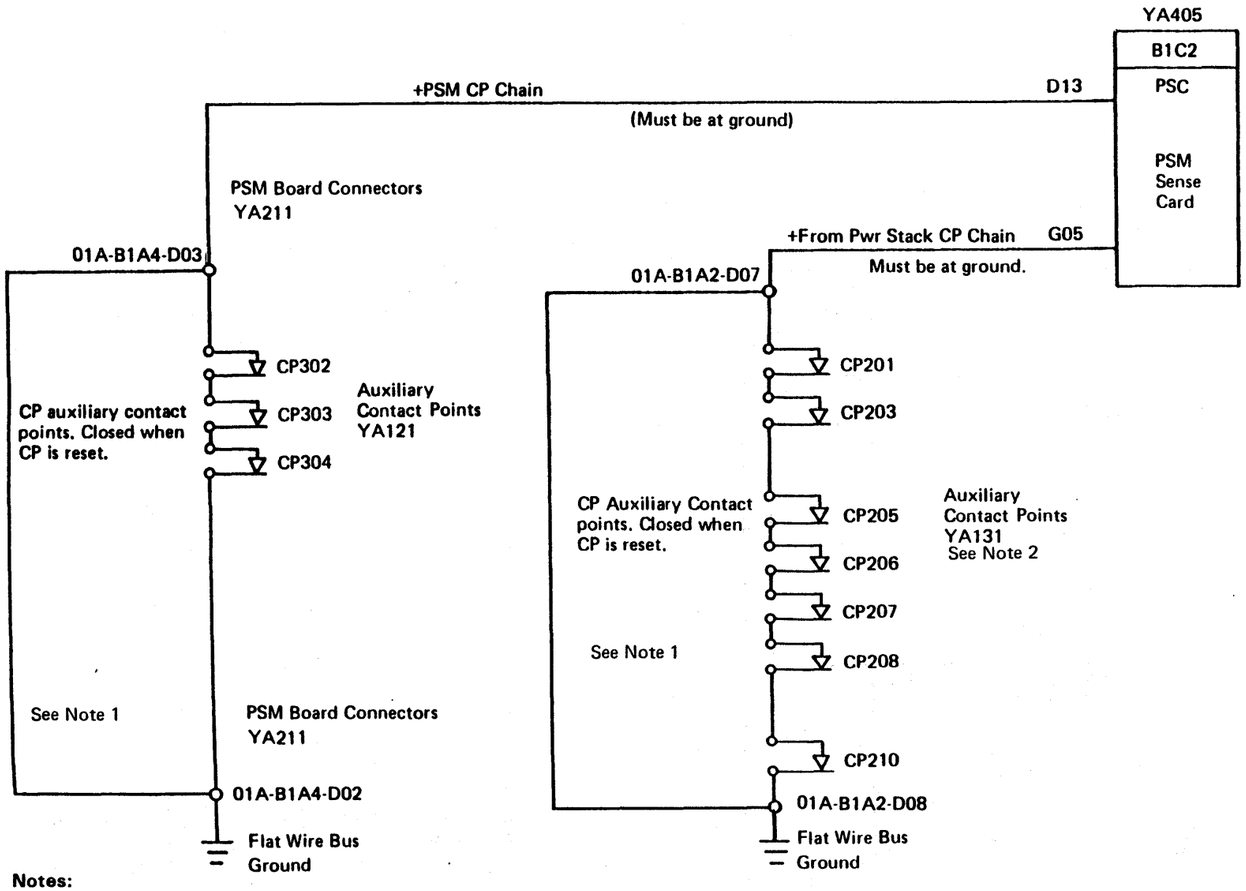
3880 MIM							
	Seq AS0001	PN 6315677 20 of 44	881143 13 Jan 84	881216 15 Aug 84	A15621 01 Apr 85		

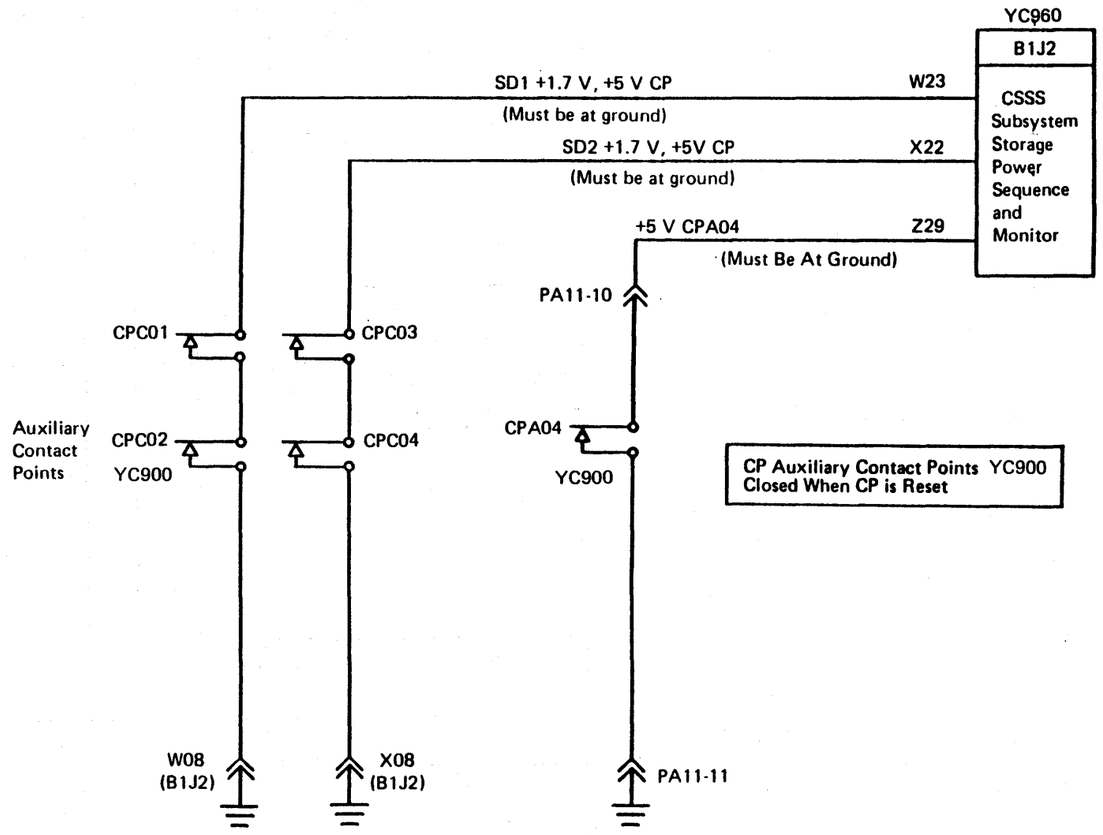
© Copyright IBM Corp. 1984, 1985

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 aids the CE in checking the condition.





This diagram is logically correct, but not point-to-point. See the MDM power diagrams for point-to-point wiring. (Use YAxxx and YCxxx reference to find the correct page.)

Notes:

1. The wires that short the circuit protector auxiliary contacts are installed to prevent 3880 failures that are caused by intermittent opening of the auxiliary contacts. These wires can be imbedded into the board or connected from 01A-B1A4D02 to 01A-B1A4D03 and 01A-B1A2D08 to 01A-B1A2D07.

2. Circuit protector CP207 is removed when the -1.5 Vdc regulator box is installed on the A gate between GTB-3 and GTB-4.

© Copyright IBM Corp. 1984, 1985

Note: This maintenance analysis procedure page is used with the MD only.

Circuit Theory

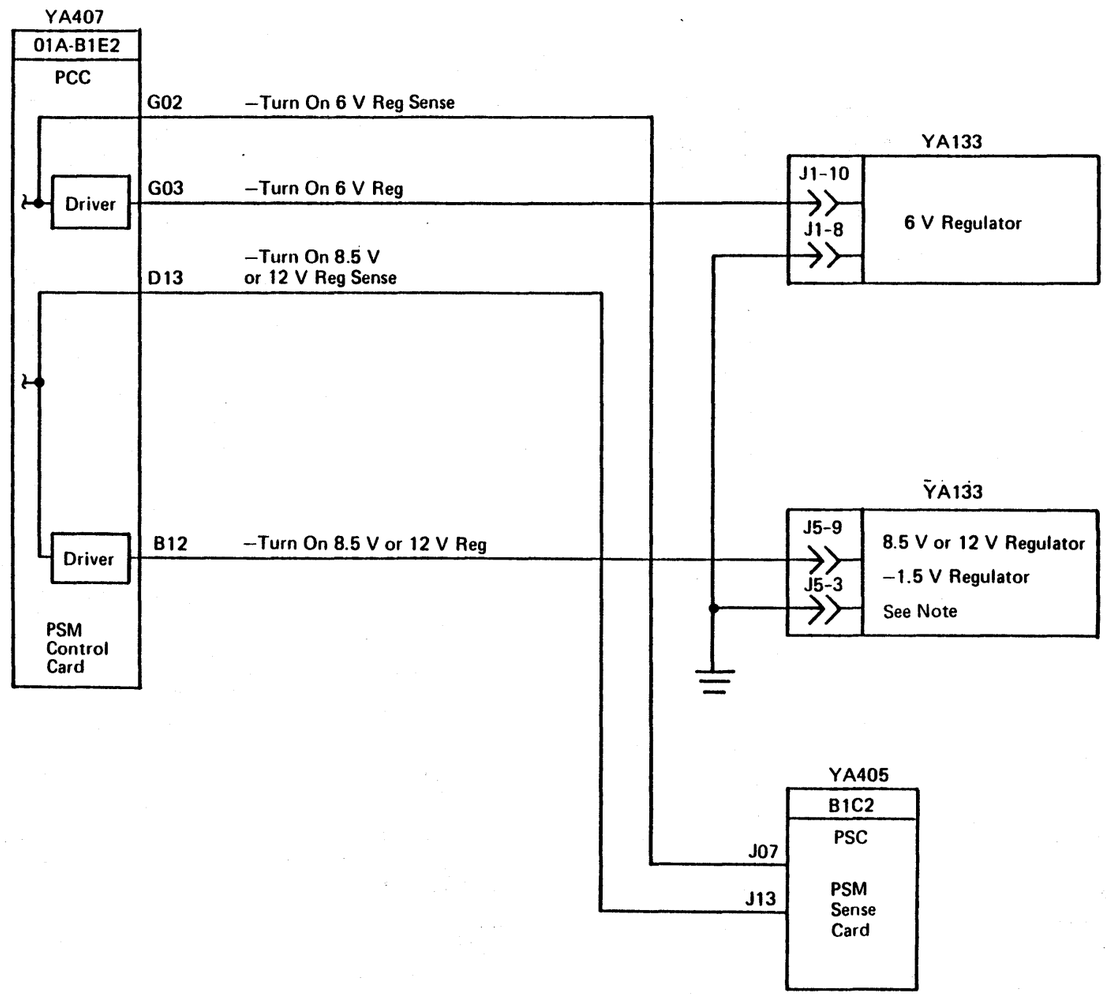
Circuits on the PSM control card (01A-B1E2) turn on the series regulator. The PSM sense card (01A-B1C2) senses the turn-on level.

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 can 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 6 Vdc regulator can be turned on by grounding J1-10. The multilevel regulator can be turned on by grounding J5-9.

Note: When CP207 is removed, the -1.5 Vdc is installed on the A gate between GTB-3 and GTB-4.

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.)

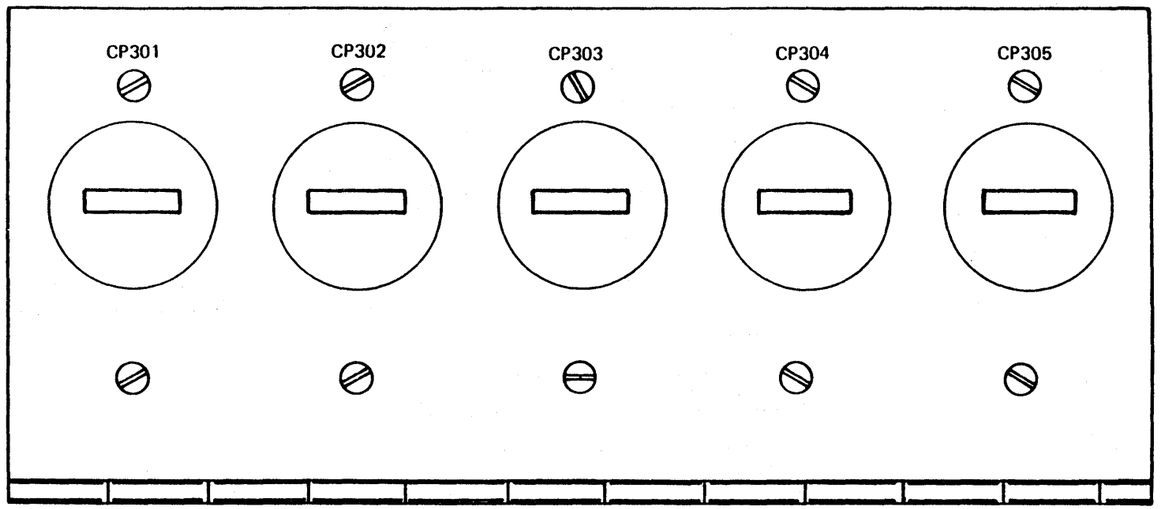


© Copyright IBM Corp. 1984, 1985

Maintenance Power Panel

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

CP304 distributes +24 Vdc to the maintenance board. This voltage is also the bias voltage for all voltage regulators in the 3880 (see YA121).

CP305

Not used.

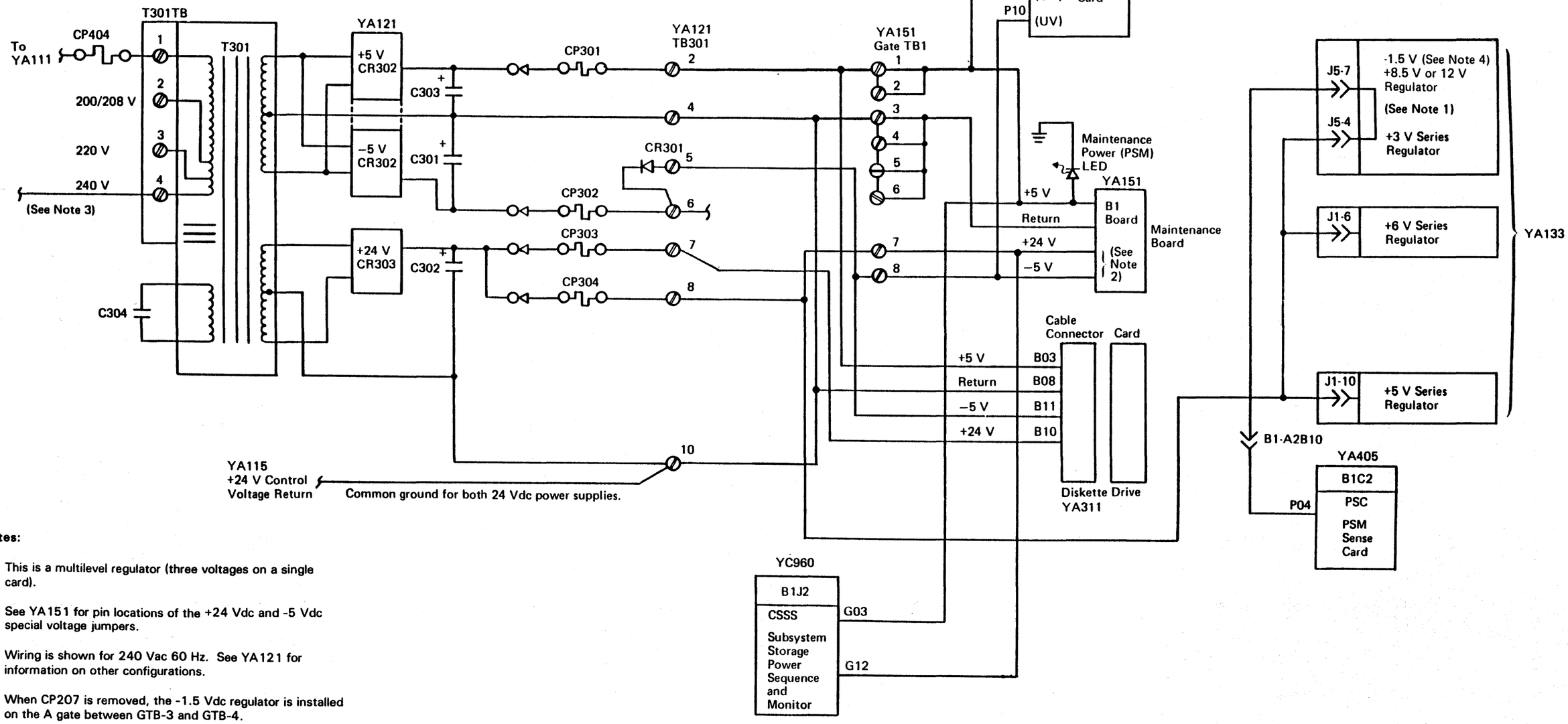
© Copyright IBM Corp. 1984, 1985

Maintenance Power Distribution

DANGER
Lethal voltages are present in the power servicing area. Safety is most important. Assume all circuits are live until measured. Capacitors are possible exploding devices. Wear safety glasses when working in the power area.

Always install 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 and YCxxx reference to find the correct page.)



Notes:

1. This is a multilevel regulator (three voltages on a single card).
2. See YA151 for pin locations of the +24 Vdc and -5 Vdc special voltage jumpers.
3. Wiring is shown for 240 Vac 60 Hz. See YA121 for information on other configurations.
4. When CP207 is removed, the -1.5 Vdc regulator is installed on the A gate between GTB-3 and GTB-4.

See LOC 35 (60 Hz) or LOC 40 (50 Hz) for the location of the maintenance power supply.

3880 MIM							
	Seq AS0001	PN 6315677 24 of 44	881143 13 Jan 84	881216 15 Aug 84	A15621 01 Apr 85		

© Copyright IBM Corp. 1984, 1985

B4/B3 Boards

DANGER
Lethal voltages are present in the power servicing area. Safety is most important. Assume all circuits are live until measured. Capacitors are possible exploding devices. Wear safety glasses when working in the power area.

Always install all safety covers before powering on the machine.

. . . . . .

. . . . . .

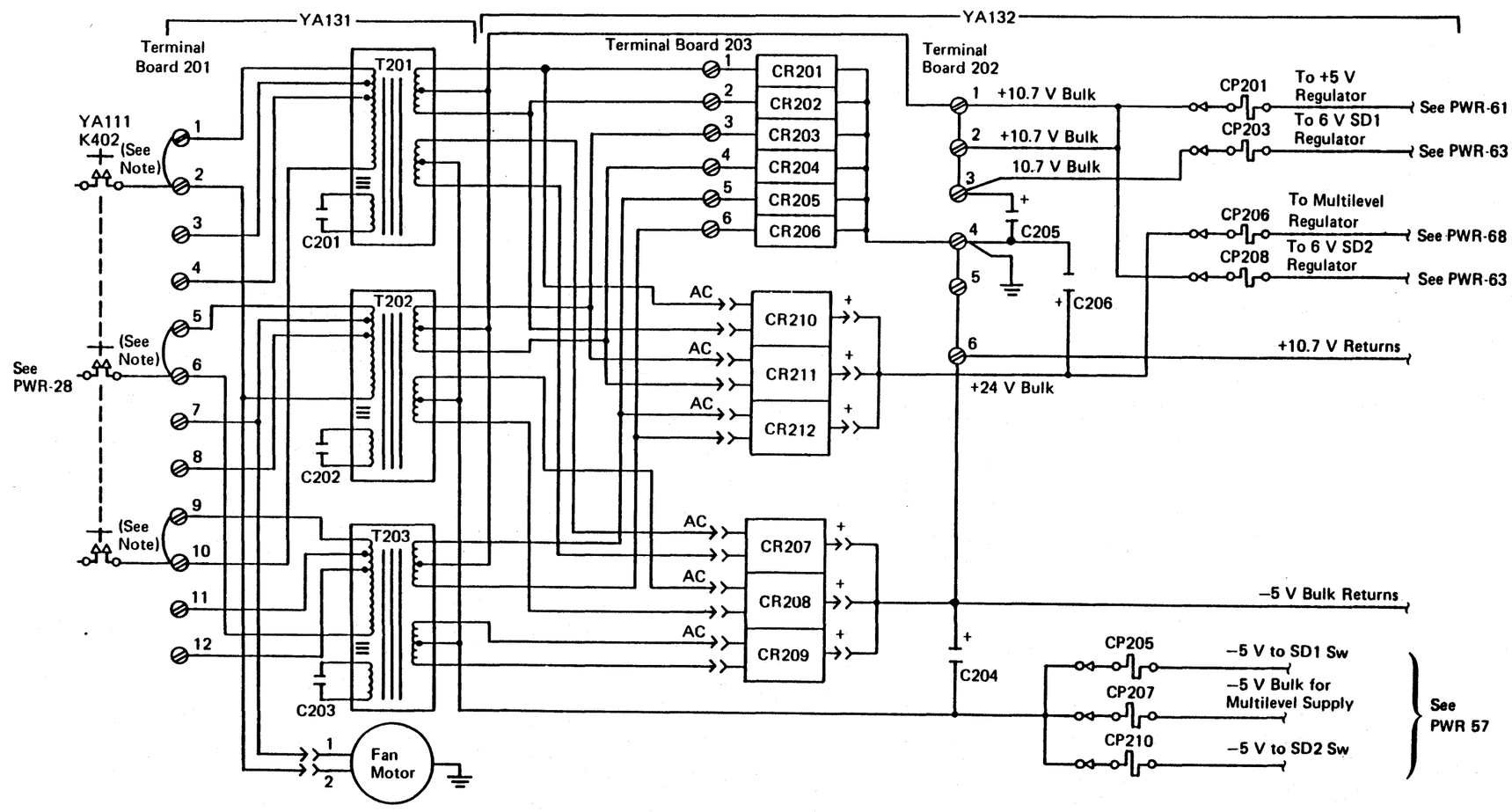
. . . . . .

. . . . . .

Notes:

1. See PWR 53 for machines with the Four-Channel Switch, Additional Feature.

2. Jumpers are shown connected for 240 Vac. See YA 131 for jumper information.



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	Seq AS0001	PN 6315677 25 of 44	881143 13 Jan 84	881216 15 Aug 84	A15621 01 Apr 85	

© Copyright IBM Corp. 1984, 1985

B4/B3 Boards With Four-Channel Switch, Additional Feature

DANGER
Lethal voltages are present in the power servicing area. Safety is most important. Assume all circuits are live until measured. Capacitors are possible exploding devices. Wear safety glasses when working in the power area.

Always install all safety covers before powering on the machine.

. . . . . .

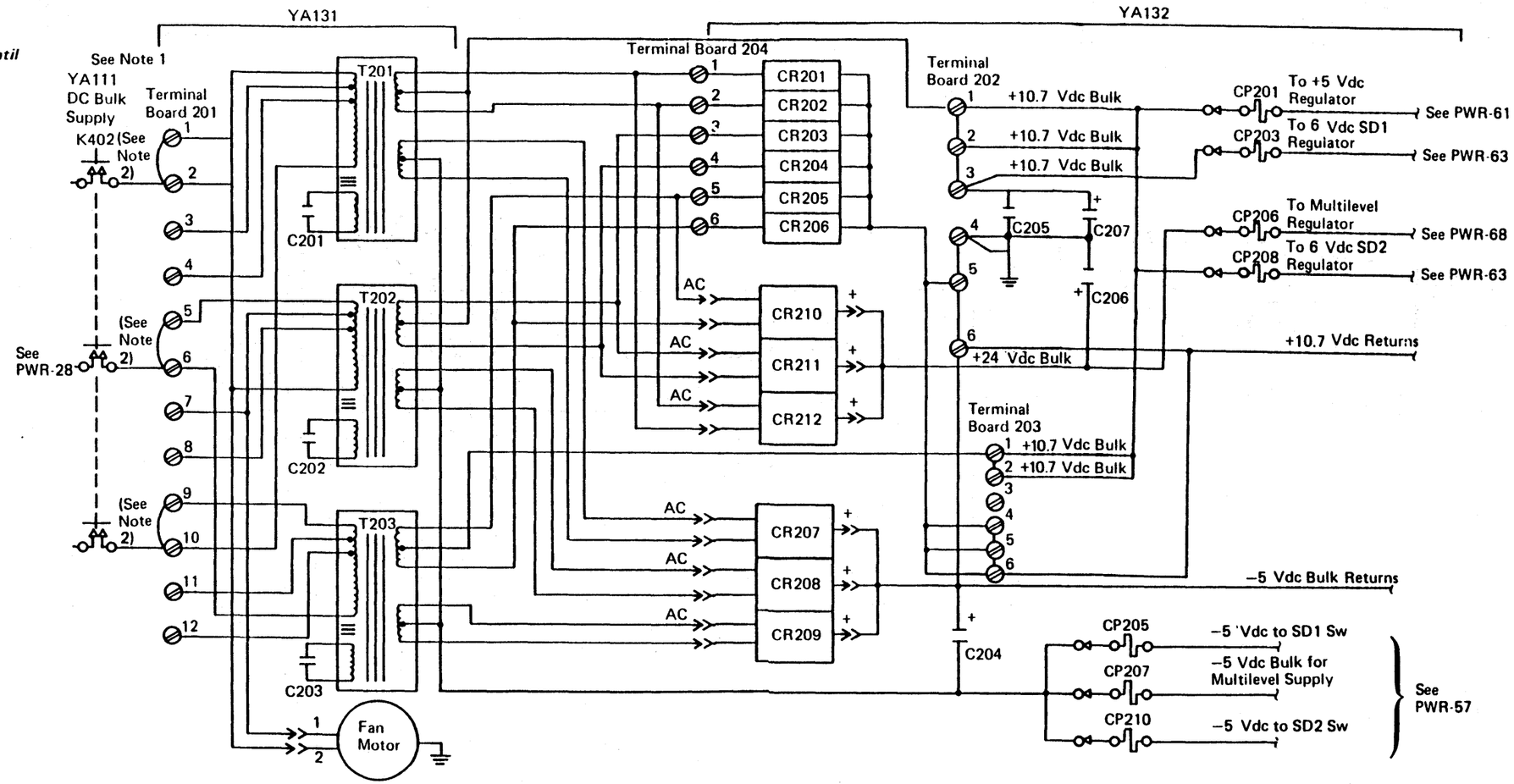
. . . . . .

. . . . . .

. . . . . .

Notes:

1. See PWR 52 for machines without the Four-Channel Switch, Additional Feature.
2. Jumpers are shown connected for 240 Vac. See YA 131 for jumper information.



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.)

© Copyright IBM Corp. 1984, 1985

Bulk Power Panel

The bulk power panel circuit protectors control the distribution of dc power to the voltage regulators in the 3880. Circuit protectors, CP203 and CP205, control the regulators for storage director 1 and circuit protectors, CP208 and 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
- CP205, -5 Vdc to storage director 1
- CP206, +10.7 Vdc or +24 Vdc input to the multilevel regulator
- CP207, -5 Vdc input to the multilevel regulator
- CP208, +10.7 Vdc input to +6 Vdc regulator
- CP210, -5 Vdc to storage director 2

CP201, 5 Vdc Regulator

CP201 distributes +10.7 Vdc bulk power to the 5 Vdc regulator. This regulator supplies +5 Vdc to both storage directors (MDM YA132).

CP203, Storage Director 1, 6 Vdc Regulator

CP203 distributes +10.7 Vdc bulk power to the 6 Vdc regulator for storage director 1 (MDM YA132).

CP205, Storage Director 1, -5 Vdc

CP205 distributes -5 Vdc bulk power to storage director 1 (MDM YA132).

CP206, Multilevel Regulator

CP206 distributes +10.7 Vdc or +24 Vdc bulk power to the Multilevel regulator. This regulator supplies -1.5 Vdc and +8.5 Vdc or +12 Vdc to both storage directors in the 3880 (MDM YA132).

CP207, Multilevel Regulator

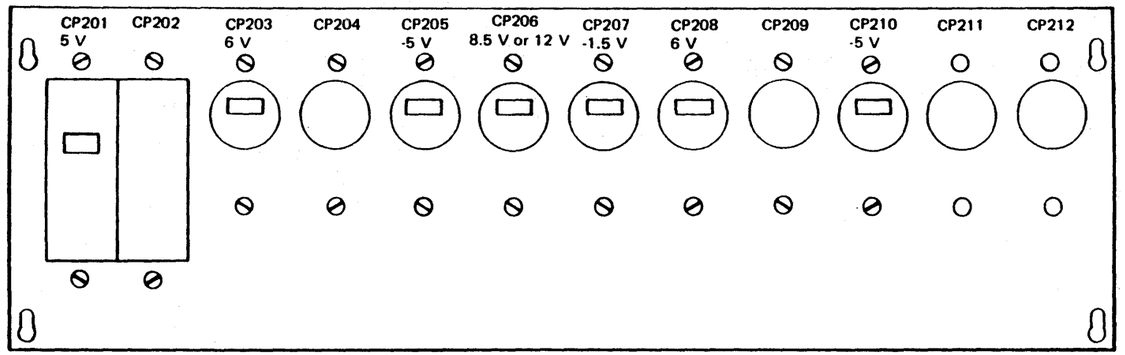
CP207 distributes -5 Vdc bulk power to the multilevel regulator. This regulator supplies -1.5 Vdc and +8.5 Vdc to both storage directors in the 3880 (MDM YA131).

CP208, Storage Director 2, 6 Vdc Regulator

CP208 distributes +10.7 Vdc bulk power to the 6 Vdc regulator for storage director 2 (MDM YA132).

CP210, Storage Director 2, -5 Vdc

CP210 distributes -5 Vdc bulk power to storage director 2 (MDM YA132).

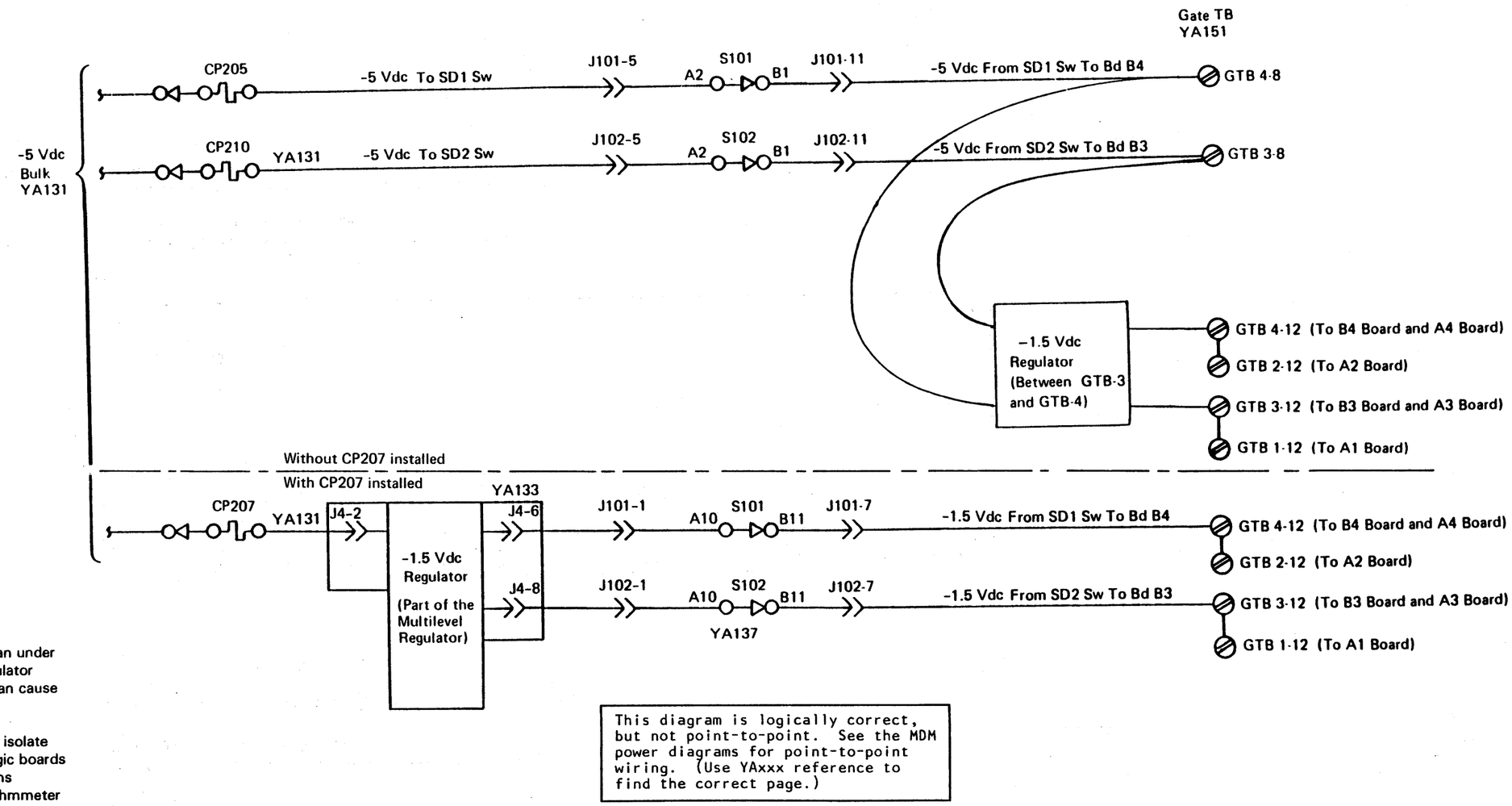


Notes:

1. When CP207 is removed, the -1.5 Vdc regulator is installed on the A gate between GTB-3 and GTB-4.
2. Circuit protectors CP204 and CP209 are not present on this model.

© Copyright IBM Corp. 1984, 1985

-1.5 Vdc and -5 Vdc Distribution and Sense PWR 57



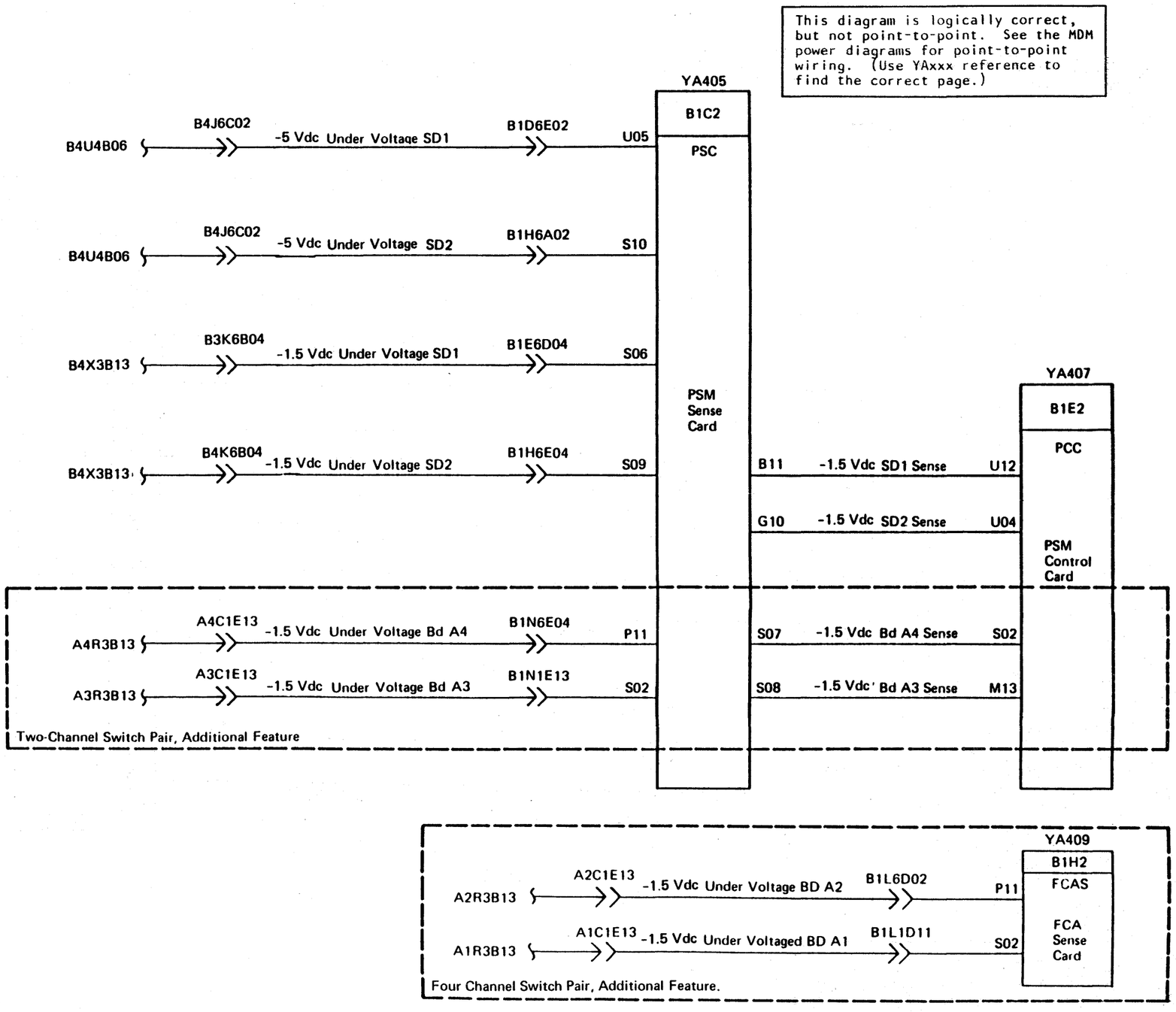
This diagram is logically correct, but not point-to-point. See the MDM power diagrams for point-to-point wiring. (Use YAxxx reference to find the correct page.)

Service Note

An open or short circuit in the sensing logic can cause an under voltage 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 ohmmeter readings. (Parallel paths through electronic circuits can be misleading, causing ohmmeter readings that are inaccurate.)

© Copyright IBM Corp. 1984, 1985



Service Note

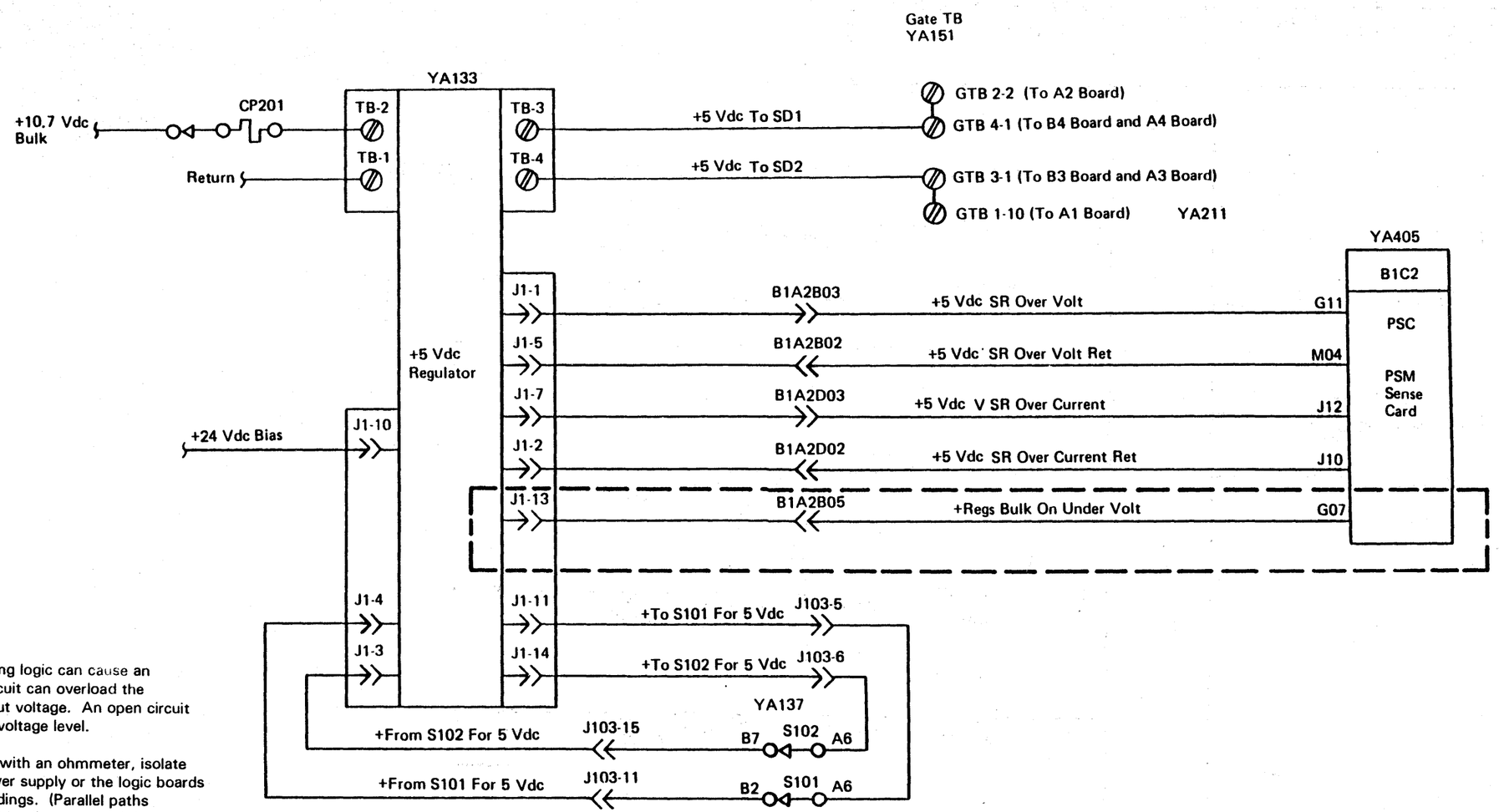
An open or short circuit in the sensing logic can cause an under voltage symptom. A short circuit can overload the regulator causing a drop in the output voltage. An open circuit can cause a failure to sense a good voltage level.

When performing continuity checks with an ohmmeter, isolate the line being checked from the power supply or the logic boards to prevent inaccurate ohmmeter readings. (Parallel paths through electronic circuits can be misleading, causing ohmmeter readings that are inaccurate.)

© Copyright IBM Corp. 1984, 1985

+5 Vdc Distribution and Sense

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.)

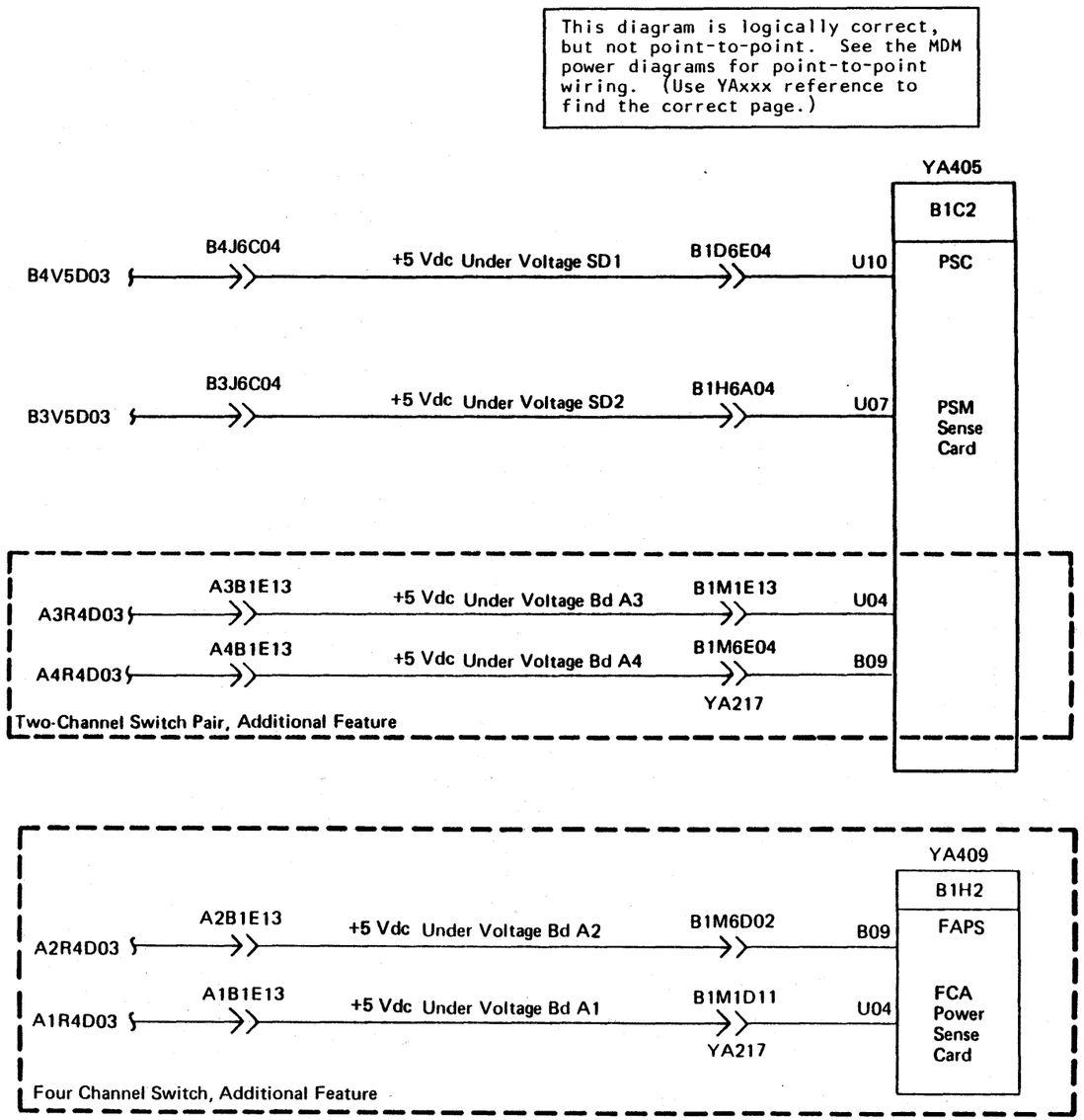


Service Note

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 ohmmeter readings. (Parallel paths through electronic circuits can be misleading, causing ohmmeter readings that are inaccurate.)

© Copyright IBM Corp. 1984, 1985



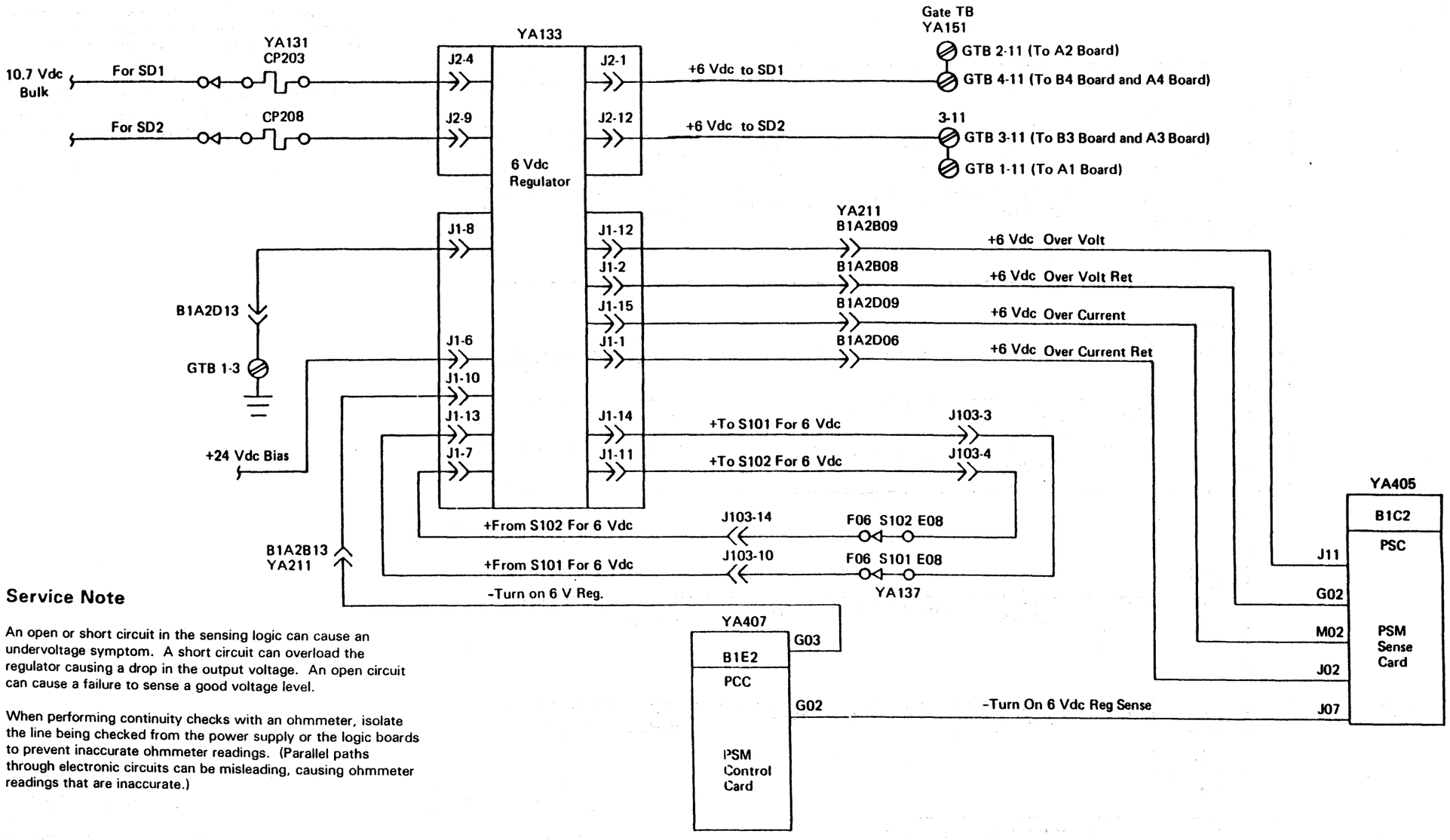
Service Note

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 ohmmeter readings. (Parallel paths through electronic circuits can be misleading, causing ohmmeter readings that are inaccurate.)

© Copyright IBM Corp. 1984, 1985

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.)



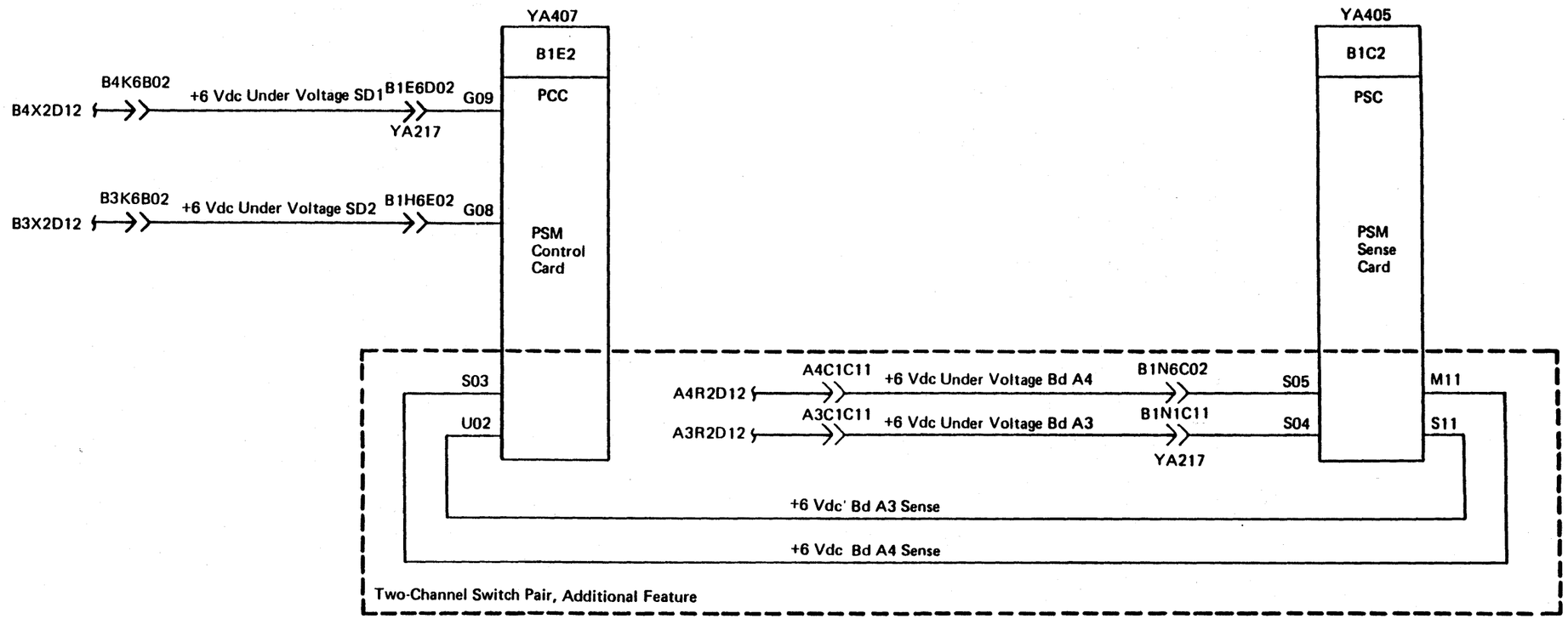
Service Note

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 ohmmeter readings. (Parallel paths through electronic circuits can be misleading, causing ohmmeter readings that are inaccurate.)

© Copyright IBM Corp. 1984, 1985

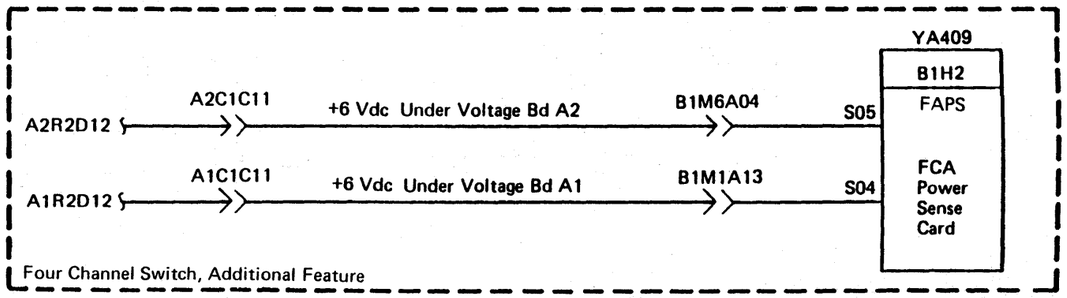
This diagram is logically correct, but not point-to-point. See the MDM power diagrams for point-to-point wiring. (Use YAxxx reference to find the correct page.)



Service Note

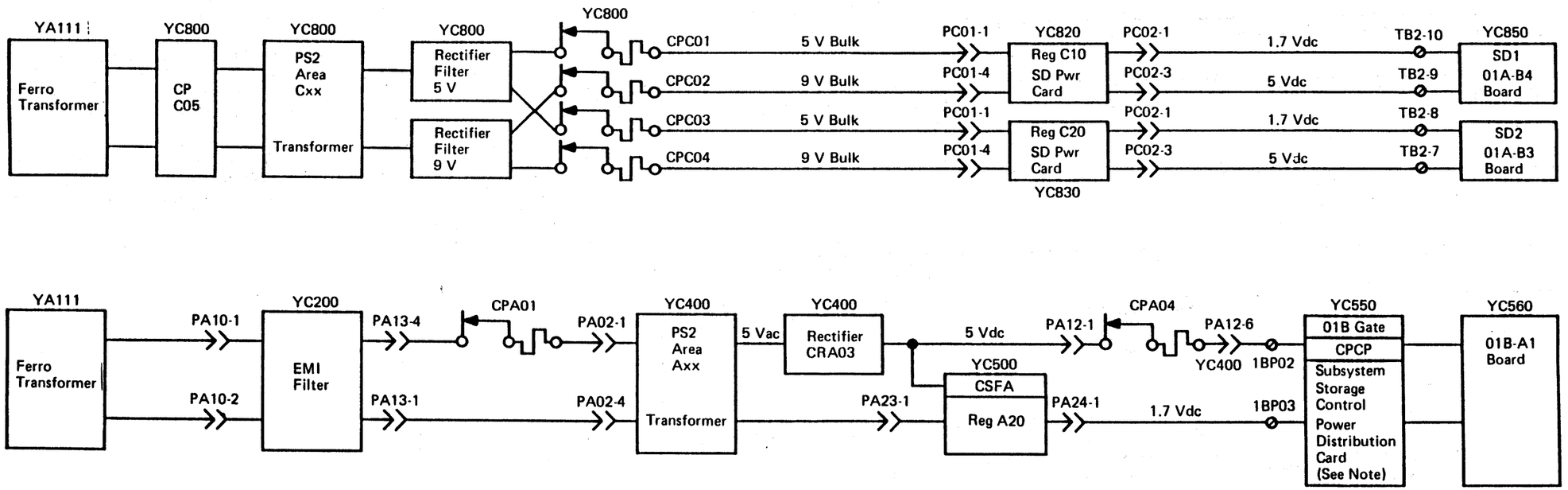
An open or short circuit in the sensing logic can cause an undervoltage symptom. A short circuit can overload the regulator causing a drop in the output voltage. An open circuit can cause a failure to sense a good voltage level.

When performing continuity checks with an ohmmeter, isolate the line being checked from the power supply or the logic boards to prevent inaccurate ohmmeter readings. (Parallel paths through electronic circuits can be misleading, causing ohmmeter readings that are inaccurate.)



© Copyright IBM Corp. 1984, 1985

DC Distribution-Subsystem Storage

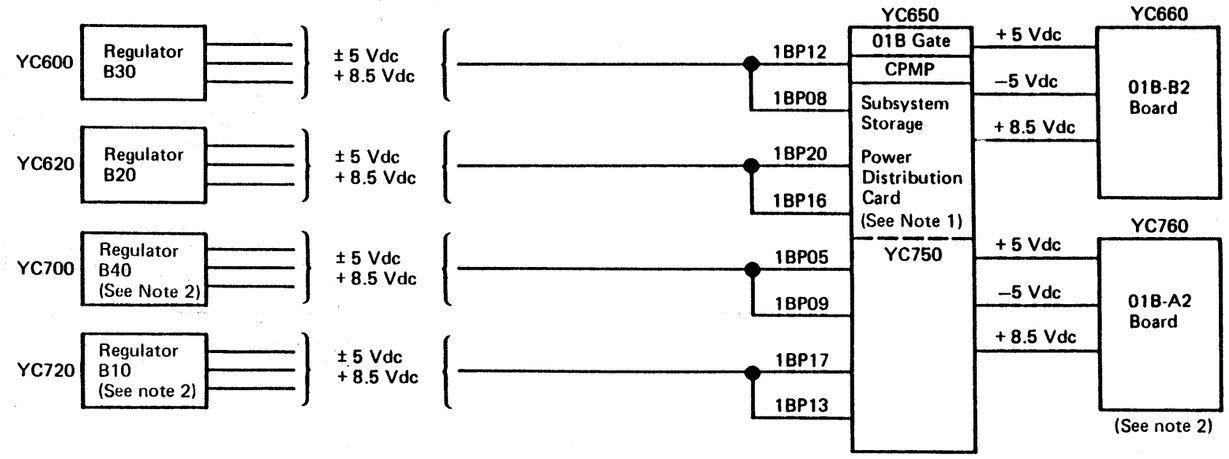


Notes:

1. The power distribution cards are located on the hinge end of Gate 01B (see LOC 75)

2. Present on machines without expanded storage and 32M bytes of subsystem storage.

This diagram is logically correct, but not point-to-point. See the MDM power diagrams for point-to-point wiring. (Use YCxxx reference to find the correct page.)

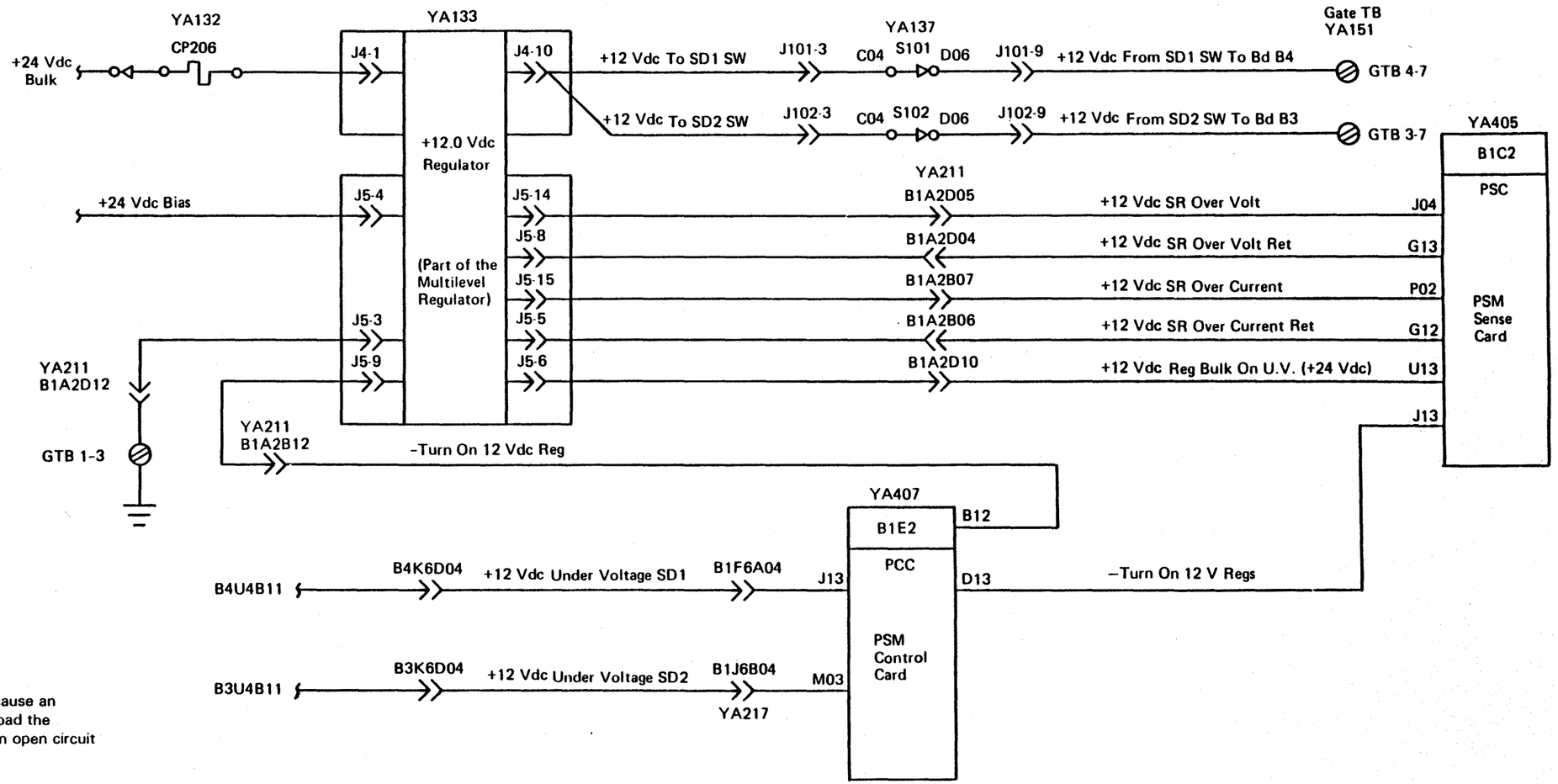


3880 MIM	Seq AS0001	PN 6315677 34 of 44	881143 13 Jan 84	881216 15 Aug 84	A15621 01 Apr 85		

© Copyright IBM Corp. 1984, 1985

+12 Vdc Distribution and Sense

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.)



Service Note

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 ohmmeter readings. (Parallel paths through electronic circuits can be misleading, causing ohmmeter readings that are inaccurate.)

© Copyright IBM Corp. 1984, 1985

Primary Power Panel

See LOC 41 (50 Hz) or LOC 43 (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 (CP's), and the diskette drive switch. On this panel are:

- CB401, primary ac circuit breaker
- CE convenience outlet
- SW401, diskette drive ac power switch
- CP401, control power
- 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 and PS2 area Cxx subsystem storage supply

CB401, Primary AC Circuit Breaker

CP401 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, Power Control +24 Vdc

CP401 distributes +24 Vdc to the power control circuits and the cover interlock switch (see YA115).

CP402, Input for 24 Vac Transformer

CP402 distributes input ac power to the 24 volt bootstrap transformer (see YA115).

CP403, CE Convenience Outlet

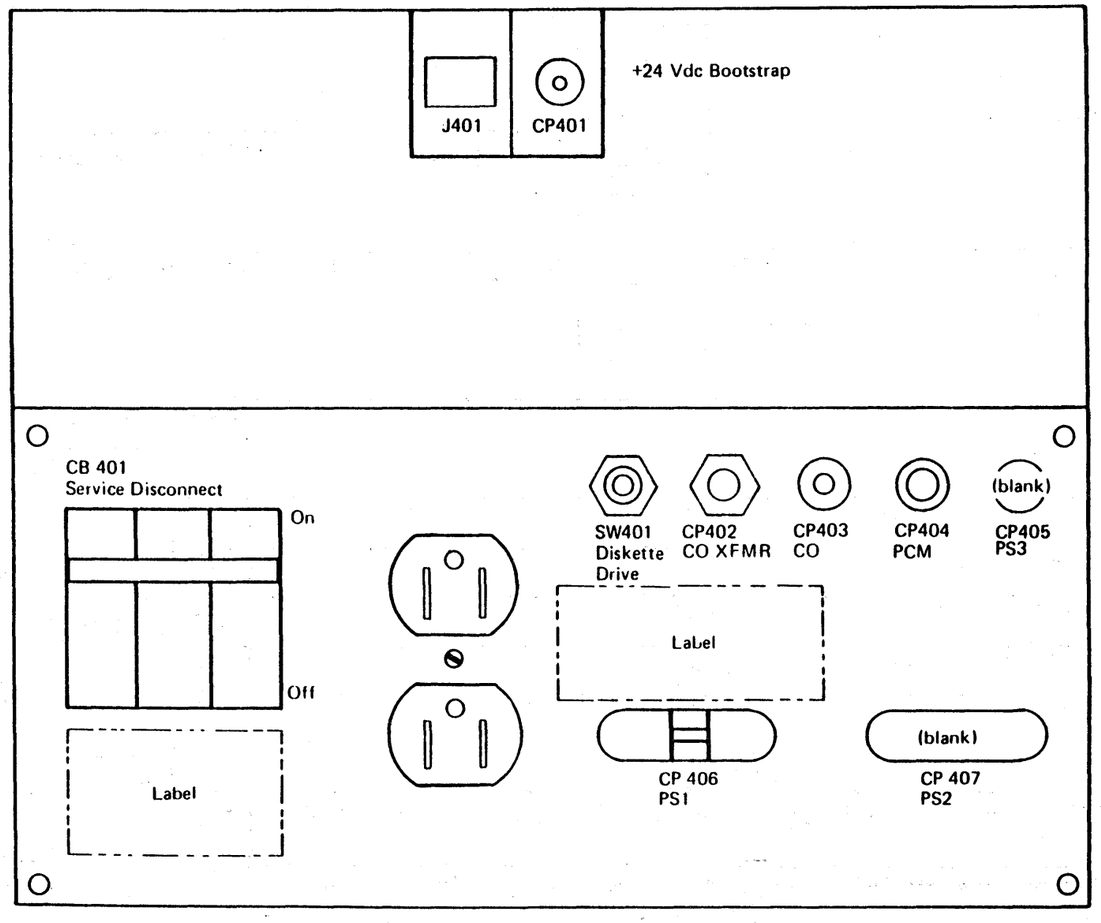
CP403 distributes ac power to the CE convenience outlet (see YA115).

CP404, Maintenance Power AC Input

CP404 distributes ac power to the maintenance power supply (PSM power supply). See YA111.

CP406, Storage Director Power Supply AC Input

CP406 distributes ac power to the storage director power supply PS1 and to the subsystem storage power supply PS2 area Cxx. See YA111.



© Copyright IBM Corp. 1984, 1985

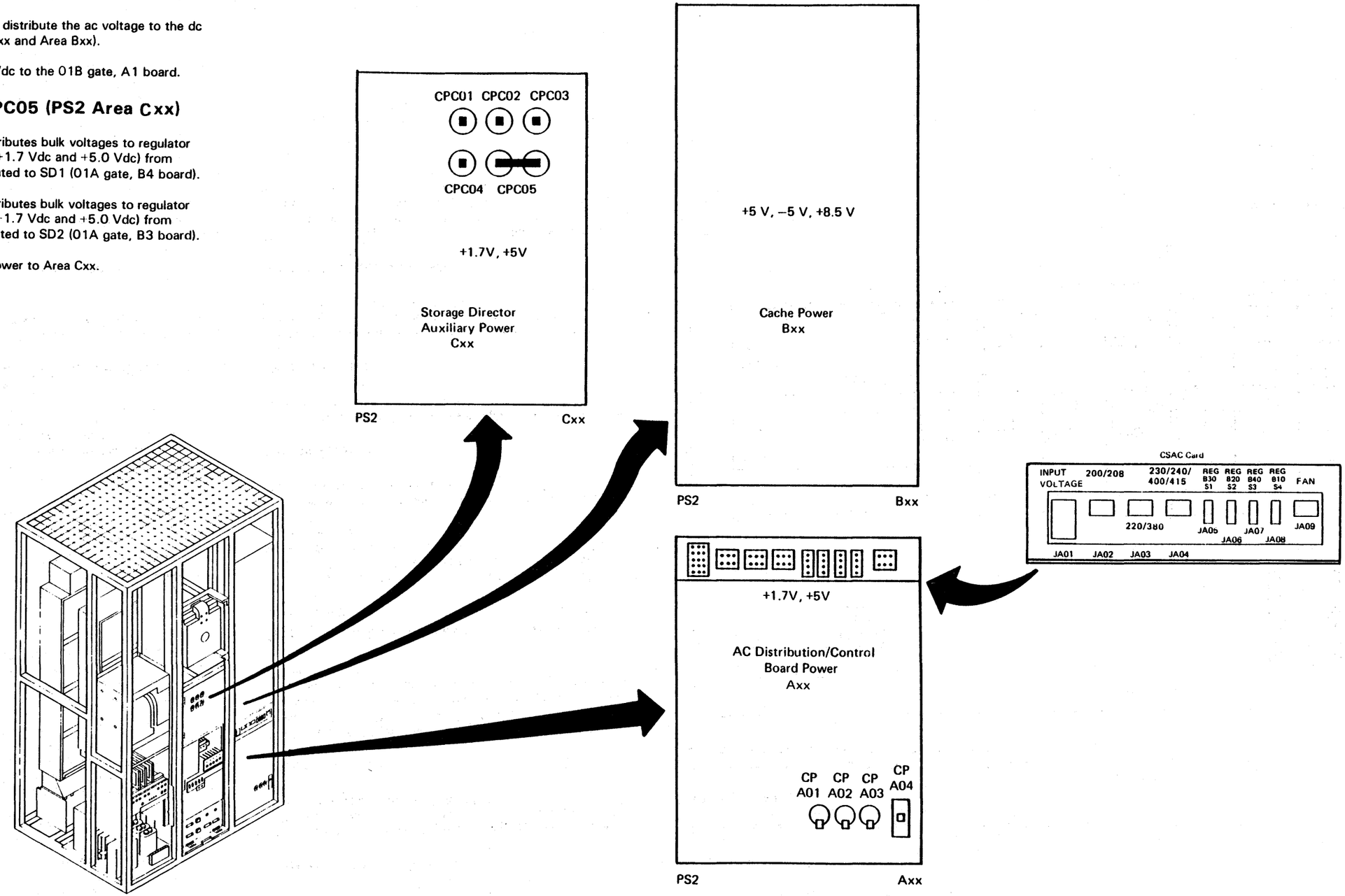
Subsystem Storage Power Supplies

CPA01 Through CPA04 (PS2 Area Axx)

- CPA01 through CPA03 distribute the ac voltage to the dc power supplies (Area Axx and Area Bxx).
- CPA04 distributes +5 Vdc to the 01B gate, A1 board.

CPC01 Through CPC05 (PS2 Area Cxx)

- CPC01 and CPC02 distributes bulk voltages to regulator C10. Auxiliary power (+1.7 Vdc and +5.0 Vdc) from regulator C10 is distributed to SD1 (01A gate, B4 board).
- CPC03 and CPC04 distributes bulk voltages to regulator C20. Auxiliary power (+1.7 Vdc and +5.0 Vdc) from regulator C20 is distributed to SD2 (01A gate, B3 board).
- CPC05 distributes ac power to Area Cxx.



3880 MIM							
	Seq AS0001	PN 6315677 37 of 44	881143 13 Jan 84	881216 15 Aug 84	A15621 01 Apr 85		

© Copyright IBM Corp. 1984, 1985

Operator Panel

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.

. . . . . .

. . . . . .

. . . . . .

Note: When two 3880 machines are installed in a dual frame configuration, if either of the Unit Emergency switches are in the power off position, power is removed from both 3880s.

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 Complete Indicator

The Power Sequence (seq) 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 part 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.

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 a channel to accept status information (in contingent allegiance), 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).

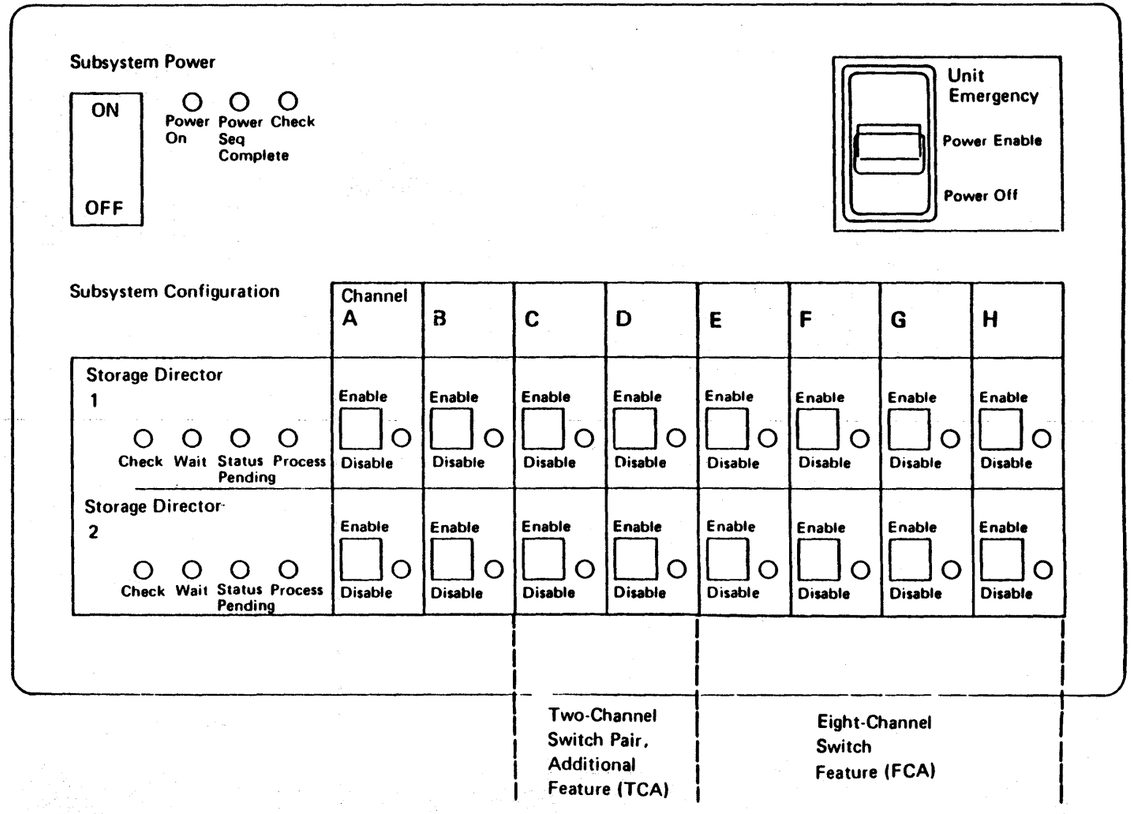
Disable Indicators

The amber Disable indicator for each channel switch lights to indicate that the channel is disabled (see YA171 or YA173).

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.



© Copyright IBM Corp. 1984, 1985

Power Sequence Distribution-Host System

Circuit Objectives

This circuit gives support to power on/off 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.

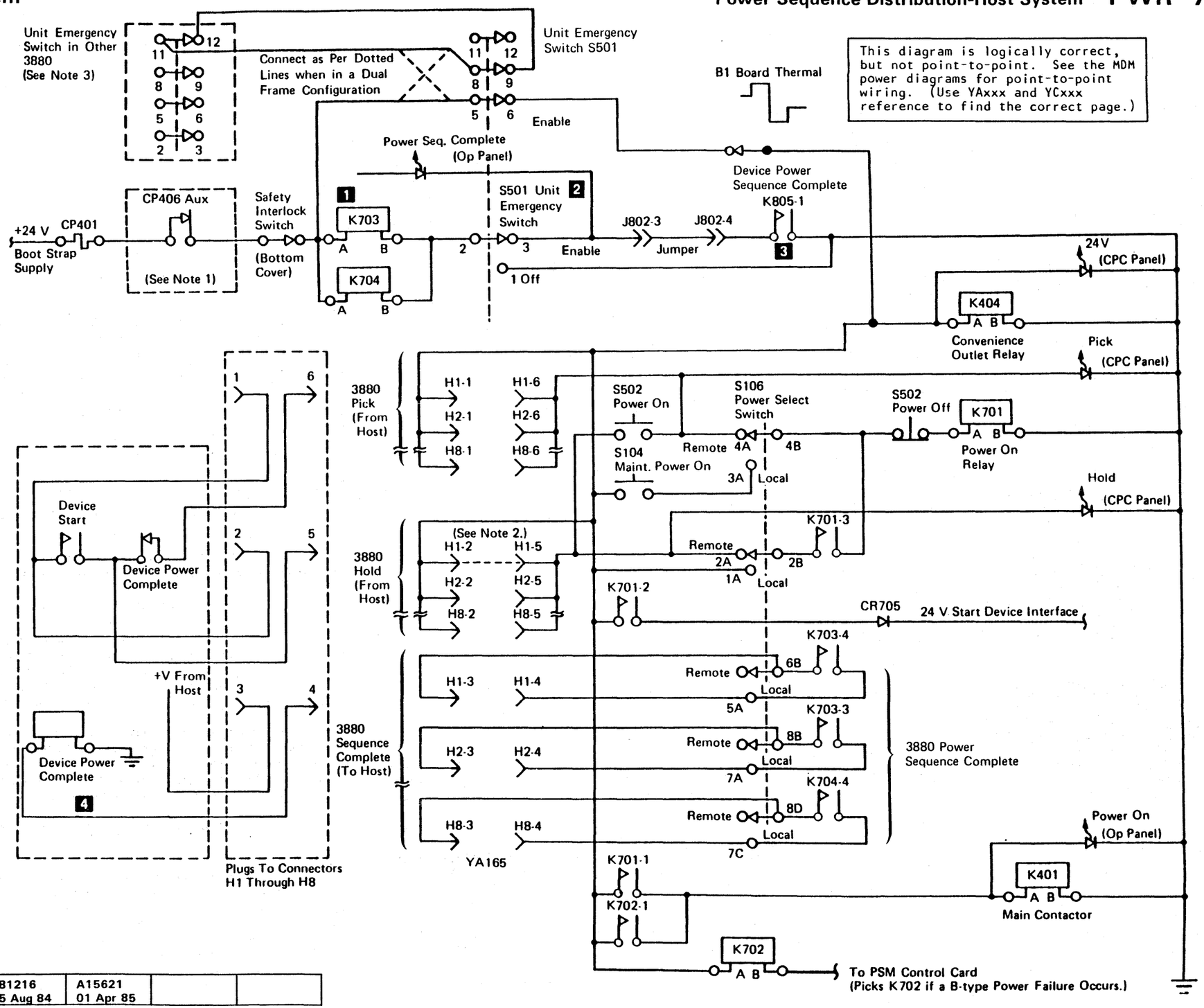
Relay K805 must be picked first to supply a ground return **3** so that relays K703 and K704 can be picked. Relay K805 is picked when all attached device strings return their power sequence complete levels to the storage director (see PWR 82).

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		
Axx	on YC400	to	YC560
Bxx	on YC600	to	YC760
Cxx	on YC800	to	YC850

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 the H connector to power-on with the Power Select switch in the Remote position and no host selection.
3. 3880 machines installed in a dual frame configuration have their Unit Emergency switches connected in series.



3880 MIM							
	Seq AS0001	PN 6315677 39 of 44	881143 13 Jan 84	881216 15 Aug 84	A15621 01 Apr 85		

© Copyright IBM Corp. 1984, 1985

Sequencing Attached Device Strings

The Model 21 can have a maximum of 2 device strings, with two 3350s per string. The Model 23 can have a maximum of two device strings, with four 3380s per string, making a total of 32 addresses (4 addresses per device). If there are fewer than eight device strings, dummy plugs must be used so all sequencing relays can be activated.

Note: If the Device Power Sequencing switch is in the Disable position, the Power Sequence Complete indicator turns on when +24 Vdc is supplied 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 (odd-numbered) device strings is started by activating relay K810. 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 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	
	N/O AT START	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, visually showing if the device string is powered on.

When relay K810 is picked, device strings 1, 3, 5, and 7 are started. The corresponding hold 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 picks when all of the odd-numbered device strings are powered on.

Even-Numbered Device Strings

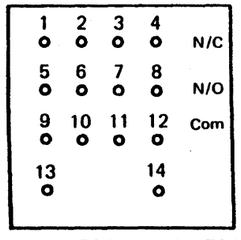
Relay K811 starts device strings 2, 4, 6, and 8. The comparable hold relays K803, K804, K808, and K809 are picked when the device strings are powered on or a dummy plug is in the cable connector. Also, the correct LED is lighted on the device interface board as each of the hold relays is picked.

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.

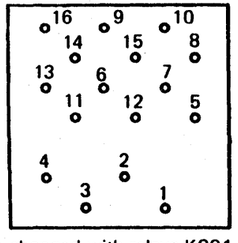
Relay Terminal Locations

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 can be changed with relays K801 through K809.

Note: Common relays can be swapped to verify failing relays.

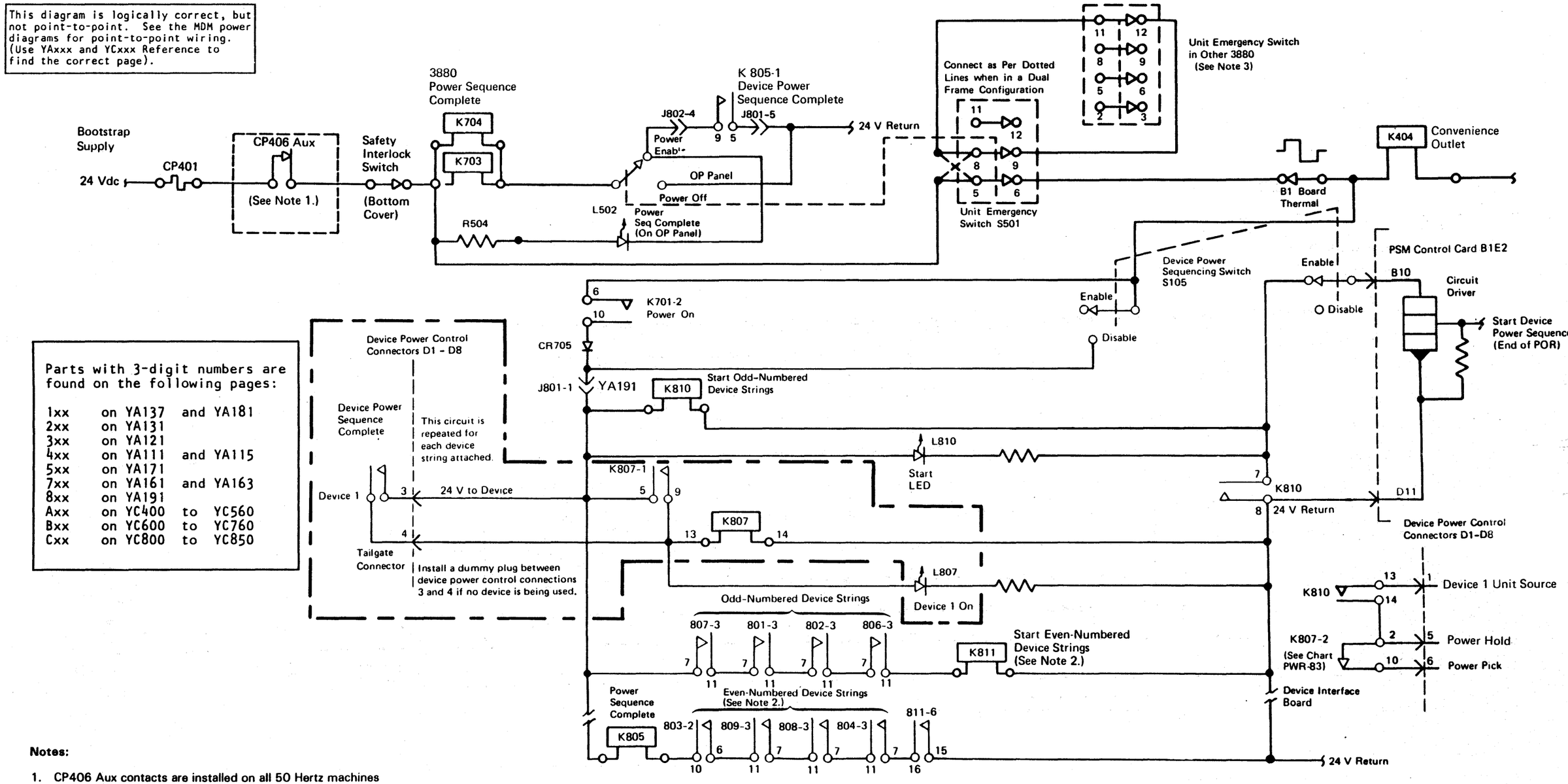
Start Power Device Sequence Driver

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.

© Copyright IBM Corp. 1984, 1985

This diagram is logically correct, but not point-to-point. See the MDM power diagrams for point-to-point wiring. (Use YAxxx and YCxxx Reference to find the correct page).



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	
Axx	on YC400	to YC560
Bxx	on YC600	to YC760
Cxx	on YC800	to YC850

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 being picked.
3. 3880 machines installed in dual frame configuration have their Unit Emergency switches connected in series.

Service Notes

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.

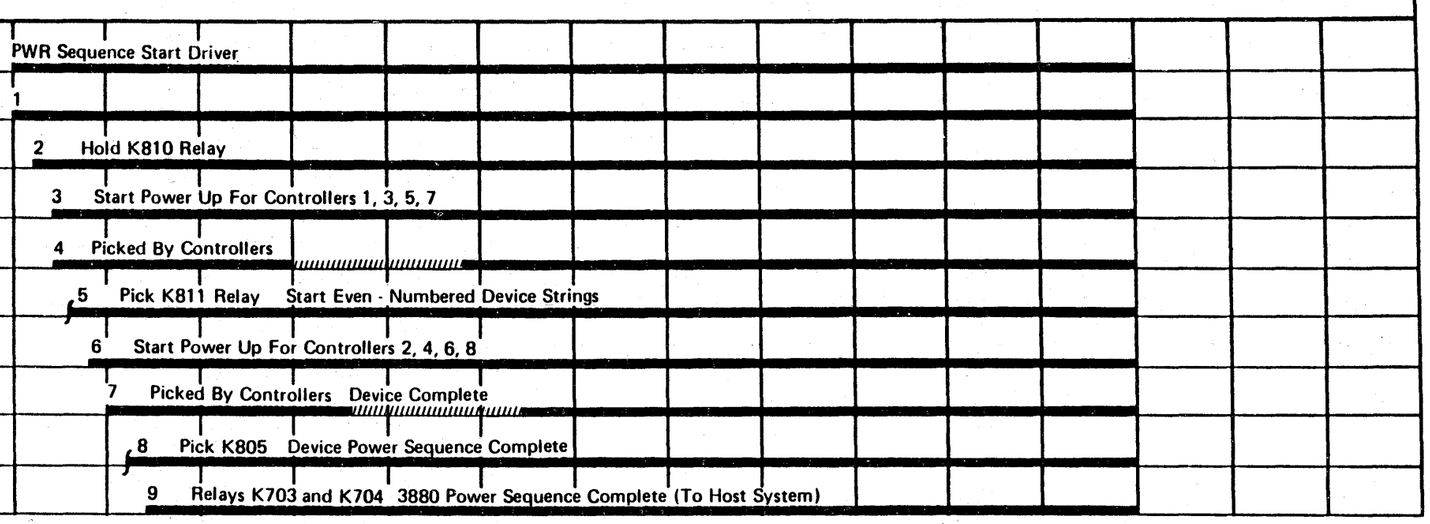
The status (activated or de-activated) of the relays on the device interface board can be easily determined during diagnosis. With 3880 power on, observe a relay as you remove and reinstall it. You can feel and hear the relay as it releases and picks.

© Copyright IBM Corp. 1984, 1985

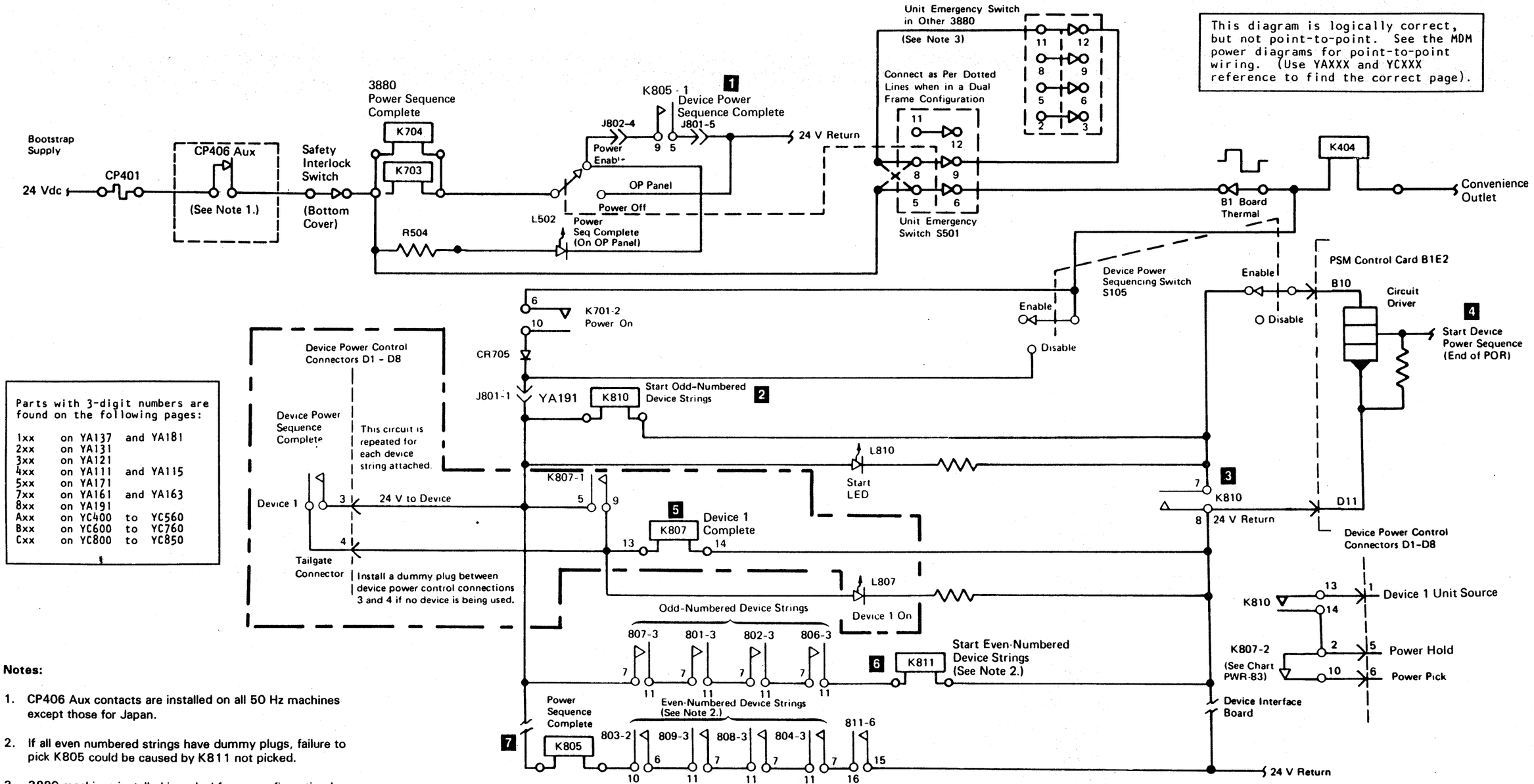
Note: Circuit diagram is on PWR 84.

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
2	Pick K810 relay	YA191	+	2
3	Relay K810–7, 8	YA191	+	3
4	Relay K810–13/14, 5/6, 9/10, and 15/16 (See PWR-84)	YA191	+	
5	Relays K807, K801, K802, and K806	YA191		5
6	Relays K801, K802, K806, K807 #3 N/O	YA191		6
7	Relay K811–11/12, 7/8, 13/14, and 5/6 (See PWR-84)	YA191		
8	Relays K804, K808, K809, and K803	YA191		
9	Relays K803, K804, K808, and K809 #2 or 3 N/O +K811 15/16	YA191		7
10	Relay K805–1 picks sequence complete relay and turns on the indicator	YA191		1



© Copyright IBM Corp. 1984, 1985



Notes:

1. CP406 Aux contacts are installed on all 50 Hz 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.
3. 3880 machines installed in a dual frame configuration have their Unit Emergency switches connected in series.

Service Notes

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.

3880 MIM							
	Seq AS0001	PN 6315677 43 of 44	881143 13 Jan 84	881216 15 Aug 84	A15621 01 Apr 85		

© Copyright IBM Corp. 1984, 1985

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 completed. If it has, restore the machine to normal operating condition and return it to the customer; if not, go to the next step.

Power Analysis (With Symptoms)

If the power sense registers are now 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 40 (PWR 41 for Subsystem Storage), 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 unit 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 aids in isolating problems are:

- For under-voltage indications, check the level of the voltage pulses as the machine attempts to power up (use PWR 17 for power up and down procedures).
- Over-current and under-voltage indications together mean there is a short in the voltage distribution.

  Alternately remove power from storage director 1 and storage director 2, to help isolate the circuit with the over-current. Separate the distribution to isolate the circuits.

  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.
- Over-current or over-voltage indications alone do not turn on the power check LED (operator panel) and do not drop machine power.
- An over-voltage 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. **Turn Off Machine Power**

   Exchange the cards at 01A-B1C2, 01A-B1E2, and/or 01A-B1J2. Also exchange the B1H2 card if the four channel, additional feature is installed. Verify that the power problem has been corrected; if it has not been corrected, go to the next step.

2. **Turn Off Machine Power If Still On**

   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 exchange 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. **Turn Off Machine Power If Still On**

   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. Assume all circuits are live until measured. Capacitors are possible exploding devices. Wear safety glasses when working in the power area.

   Always install 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 help.

© Copyright IBM Corp. 1984, 1985

Check, Adjust, Remove, Replace

Contents of This Section

01A Gate Foot Adjustment **10**

Removal of Power Supply 2 Area Axx **20**

Diskette Drive **110**
Introduction 110
Maintenance procedure 110
Tools 110
Safety 110

Diskette Cover 120
Pressure Pad Actuators 120

Drive Motor 130
Belt Tracking 130
Idler Assembly 130
Belt Path 130
Diskette Drive Casting 130

Head And Pressure Pad **150**

File Control Circuit 180
IML Control and Data Lines 195
File Control Card 197
File Control Card Pin Assignment 200

Logic Board Maintenance **205**

Control Interface Wrap Cable Installation **210**
CTL-I Wrap Test Description 210

Internal Electronic Wrap Test (All Models) **215**

Internal Electronic Wrap Block Tool Connection **216**

Remote Switch Feature **229**

Channel Interface Cable Swap **230**

Channel Interface Cable Swap, TCA **370**

Intraboard Cable Diagram, TCA FCA **480**

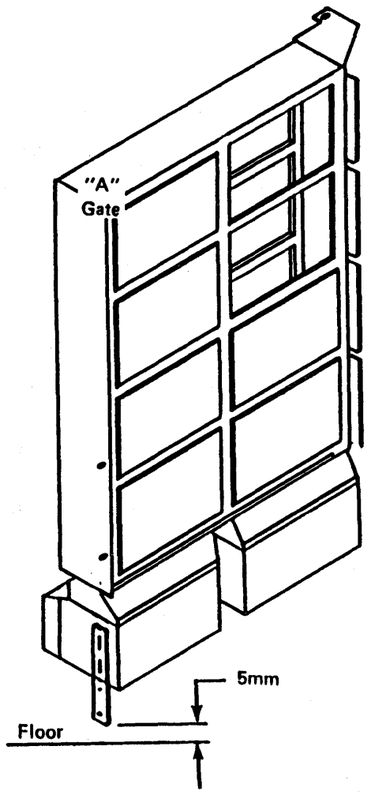
Cable Locator Chart TCA FCA **482**

Channel Interface Isolation Aids, TCA FCA **490**

© Copyright IBM Corp. 1984, 1985

Foot Adjustment

Adjust the foot for 5 mm (0.2 in.) between the surface of the floor and the base of the foot with the 01A gate open.



© Copyright IBM Corp. 1984, 1985

01A Gate Foot Adjustment CARR 10

Preparation for Removing Power Supply 2 (PS2)

Warning: Before starting this procedure, check the 01A gate foot adjustment (see CARR 10).

In order to remove PS2 Area Axx, hoist assembly (part 4479280) must be used.

__ 1. Have the system operator vary both 3880 storage directors off line to all attached systems.

__ 2. Set all of the Enable/Disable switches (located on the operator panel) to the disable position. The amber indicator will be lighted when the channel is disabled.

__ 3. Set the Subsystem Power switch (located on the operator panel) to the off position.

__ 4. Turn off CB401.

DANGER
Hazardous voltage. Switch off the wall circuit breaker. Disconnect the 3880 main power cord before starting this part of the installation.

. . . . . .

. . . . . .

. . . . . .

__ 5. Remove the front and right side machine covers.

Removal, PS2 Area Axx

Note: See LOC 10 for location of Areas Axx, Bxx, and Cxx.

__ 1. Before PS2 Area Axx can be removed, PS2 Area Bxx must be removed (see procedure this page).

CAUTION
PS2 Area Axx has a weight of 36.5 kg (81 lbs.). Use the hoist to remove it.

. . . . . .

. . . . . .

__ 2. Disconnect PS2 Area Axx by removing the cables and connectors, (record their locations for reinstallation).

__ 3. Extend the legs of the hoist, part 4479280, by removing the safety pins, extending the legs, and reinstalling the pins.

__ 4. Position the hoist over PS2 Area Axx.

Note: The hoist winch uses a friction clutch. To lower the cable, turn the winch crank counterclockwise.

__ 5. Attach the lifting cable to the lifting plate (part 8576750) by inserting the bolt in the hoist cable through the holes in the lifting plate and tightening the nut 1.

__ 6. Leaving enough slack in the cable, slide the lifting plate under the turned over ears on top of the power supply. Locate the plate so that the extended portion on the sides of the plate fit between the turned over ears on top of the power supply 2.

__ 7. Remove the screws 4 holding Axx in place.

__ 8. Lift the power supply out and lower it onto the trolley 3.

__ 9. Disconnect the lifting cable from the power supply.

Removal, PS2 Area Bxx

Note: See LOC 10 for location of Areas Axx, Bxx, and Cxx.

__ 1. Disconnect the cables and connectors, (record their locations for reinstallation).

__ 2. Remove the 4 screws holding Bxx in place.

__ 3. Lift the power supply out and set it to the side.

Removal, PS2 Area CXX

Note: See LOC 10 for location of Areas Axx, Bxx, and Cxx.

CAUTION
PS2 Area Cxx has a weight of 24 kg (53 lbs.). Use the hoist to remove it.

. . . . . .

. . . . . .

__ 1. Unplug the power cord from the box.

__ 2. Unplug the cables inside the box (record their locations for reinstallation), and push them through the opening in the back panel.

__ 3. Remove the four screws holding CXX in place.

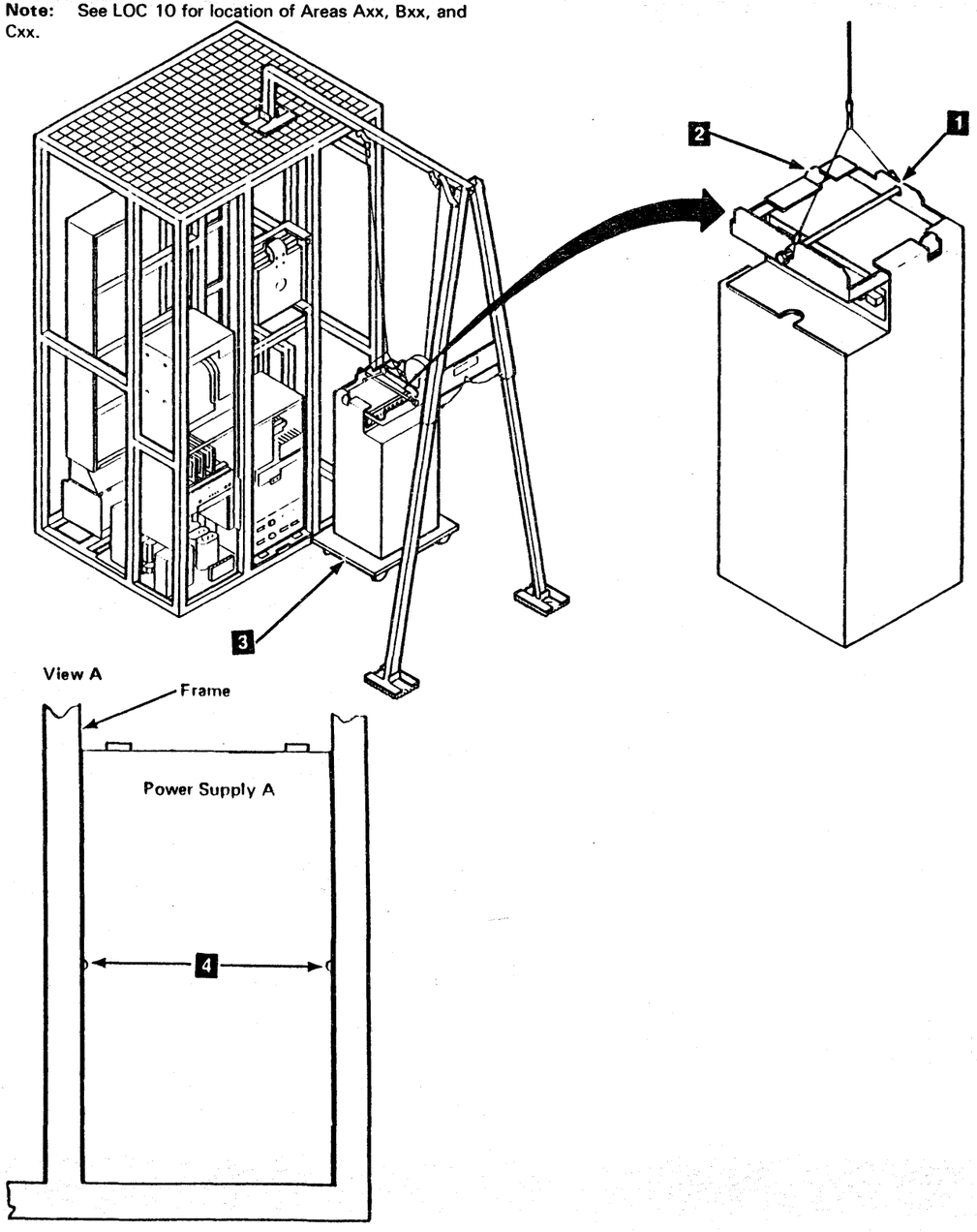
__ 4. Lift the power supply out and set it to the side.

© Copyright IBM Corp. 1984, 1985

Reinstallation

To reinstall the power supplies reverse the above procedures.

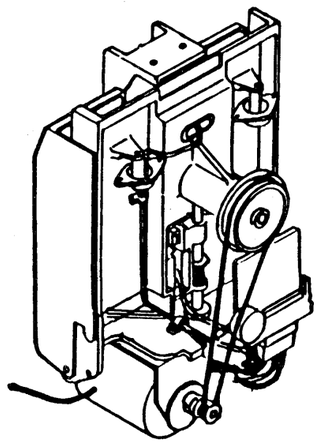
Note: See LOC 10 for location of Areas Axx, Bxx, and Cxx.



Introduction

The diskette drive reads data from the magnetic surface of a diskette in the following applications:

- Loading the initial control program
- Diagnostic microcode storage



REAR VIEW

Maintenance Procedure

The diskette drive needs no scheduled maintenance. The success of this maintenance method depends on correct care of the diskettes and head carriage assemblies.

Offline Servicing

Maintenance of the diskette drive includes:

- Diagnosis
- Offline repair, checkout, and adjustment
- Online verification

Tools

CE Alignment Tool

The CE alignment tool (part 2200698) is used for:

- Adjustment of the phototransistor assembly by mechanical alignment

Head Cleaning Tools

- Brush (part 2200106)
- Isopropyl alcohol (part 2200200)
- Cloth (part 2108930)

Safety

Personal Safety

Because the diskette drive obtains its ac and dc power from the 3880, voltage is present on the terminals and connectors when the drive motor is activated.

Motor housing temperatures can be too hot to touch safely.

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.

CAUTION
The diskette drive contains plastic materials that can be damaged by a various 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.

© Copyright IBM Corp. 1984, 1985

Diskette Drive CARR 110

Diskette Cover

Removal

Warning: Do not let the pressure pad arm **1** hit against the head.

. . . . . .

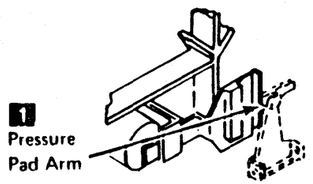
1. Remove the two cover screws **2** while holding the cover.
2. Remove the cover carefully to prevent damage to the wires.
3. Remove the wires from the light-emitting diode (LED) actuator (the yellow wire goes to the LED terminal marked Y).
4. Remove the wires from the clips on the cover.

Replacement

Warning: Before reinstalling the cover screws, position the actuator bail under the pressure pad arm.

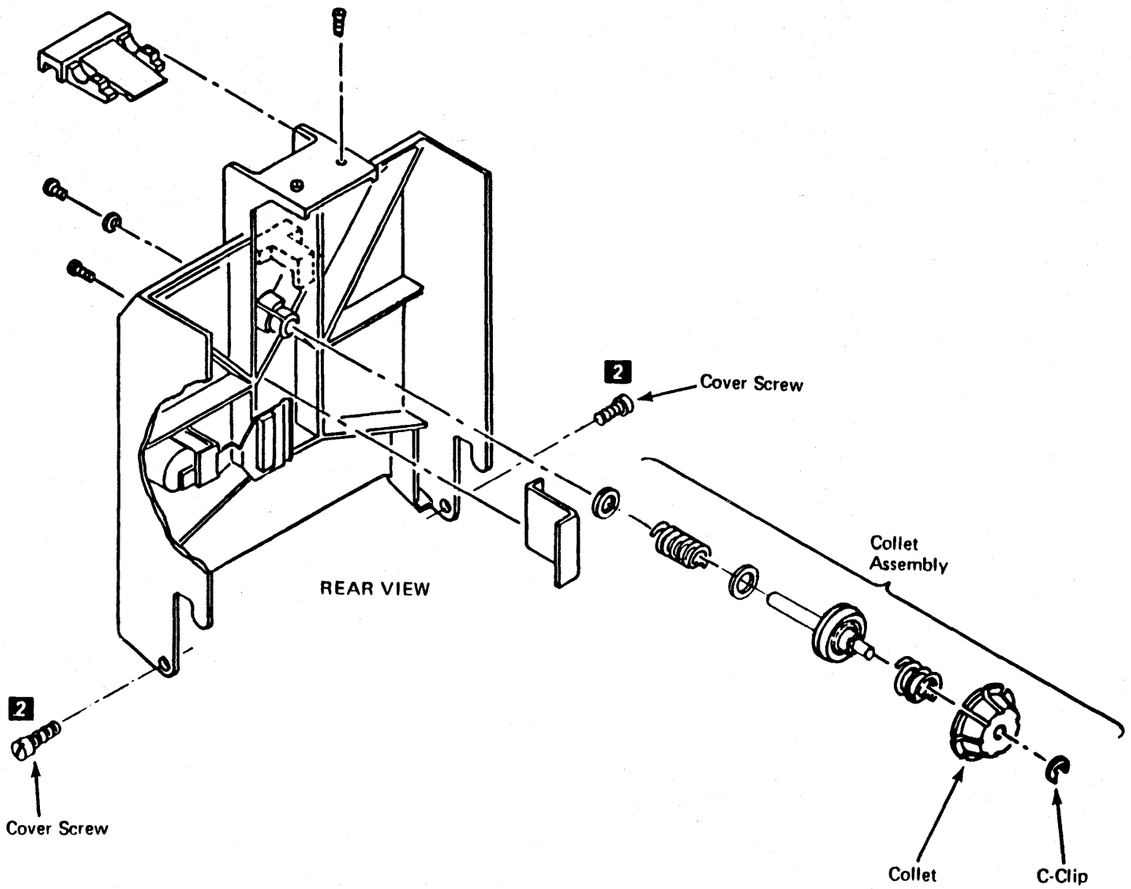
. . . . . .

. . . . . .



To reinstall the drive cover, reverse the removal procedure.

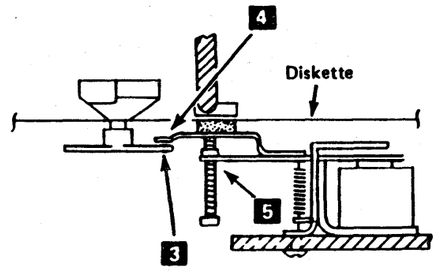
Diskette Drive Cover



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 adjustment 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.

© Copyright IBM Corp. 1984, 1985

Diskette Drive (Continued)

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.

   DANGER
   The motor case temperature can be more than safe handling limits.

   . . . . . .

   . . . . . .
3. 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.)

   DANGER
   For 60Hz motors–to prevent personal injury, position the two large holes in the motor frame to the top and bottom of the bracket 2.

   . . . . . .

   . . . . . .

   . . . . . .
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.

. . . . . .

. . . . . .

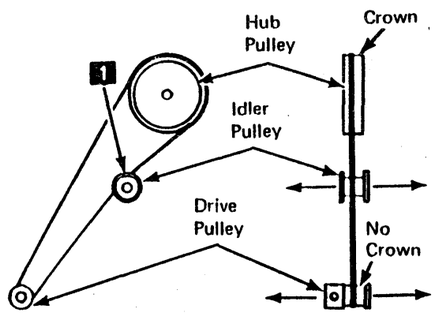
To adjust the belt tracking, loosen the idler assembly screw 9 and slide the idler until the belt tracks in the center of the pulley. Since the drive pulley does not have a crown, the belt does not have to be exactly centered on the drive pulley.

Idler Assembly

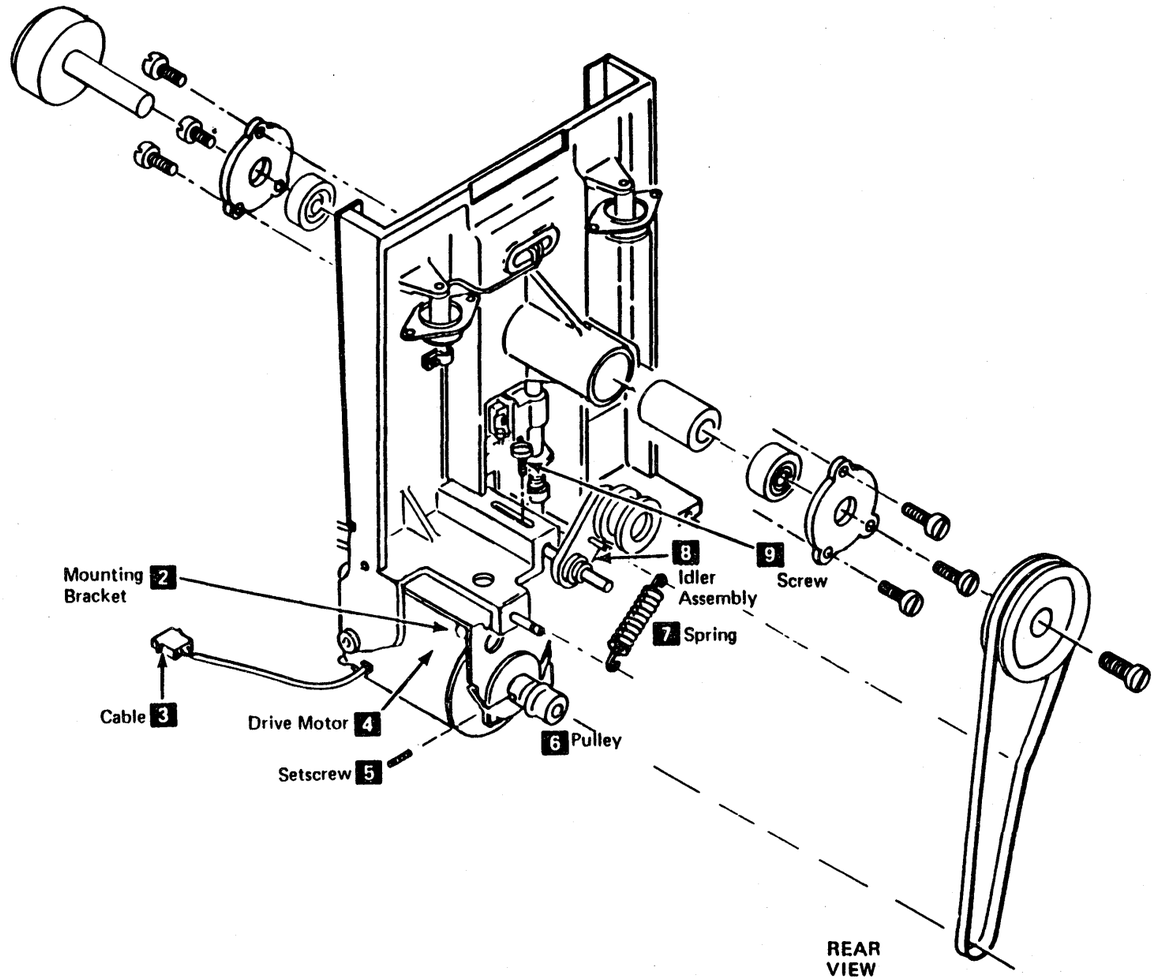
Removal

1. Remove the belt and spring 7.
2. Remove the screw 9 and the idler assembly 8
3. To reinstall the idler assembly, reverse the procedure and check the belt tracking.

Belt Path



Diskette Drive Casting



© Copyright IBM Corp. 1984, 1985

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 foreign particles. If the pad is not clean, use a dry brush (part 2200106) to remove the foreign particles.

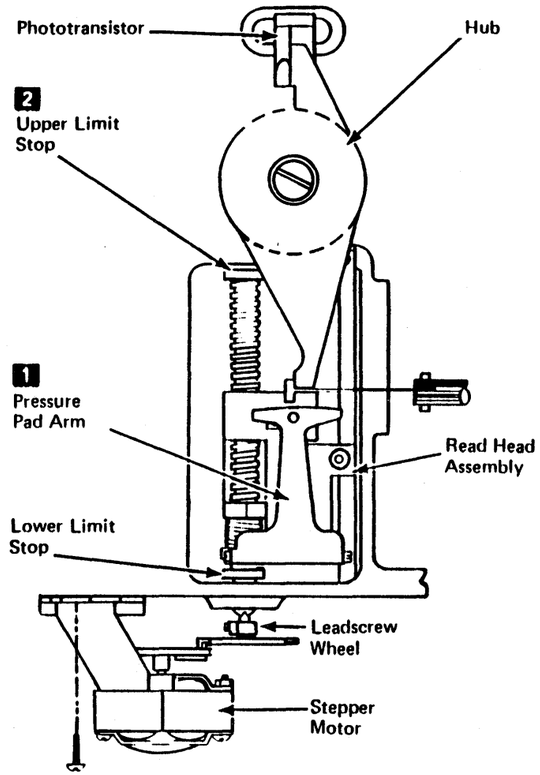
   Warning: Ensure the cloth moistened with isopropyl alcohol does not touch the pressure pad while cleaning the read head surface.

   . . . . . .

   . . . . . .

   . . . . . .

3. Holding the pressure pad arm **1** out, clean the head surface with a clean cloth (part 2108930) soaked with isopropyl alcohol (part 2200200).



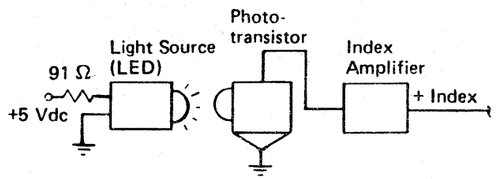
© Copyright IBM Corp. 1984, 1985

File Control Circuit

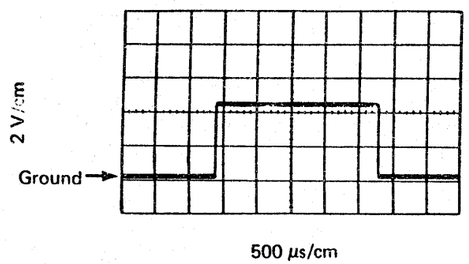
Phototransistor

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 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 the 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 and 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.



Use a scope to 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 (B14) or CARR 200 for +index (diskette) card pin (G13).

Removal

The 3880 need not be powered down to perform this procedure.

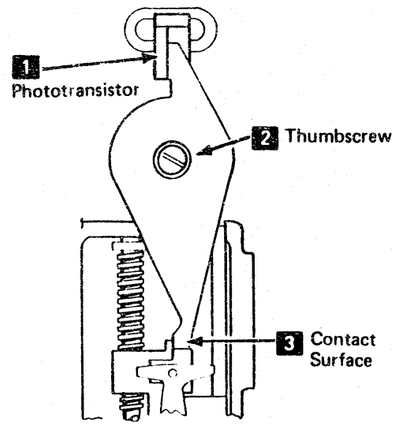
1. Move the head carriage assembly to track 0.
2. Turn off switch SW401 on the primary power panel.
3. Remove the diskette drive cover.
4. Remove the mounting screw 8.
5. Remove the leads.

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 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 (part 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.

Warning: Before reinstalling the cover screws, position the actuator bail under the pressure pad arm 4.

. . . . . .

. . . . . .

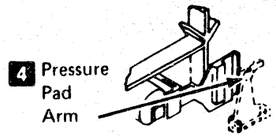
Replacement

Warning: Before reinstalling the cover screws, position the actuator bail under the pressure pad arm.

. . . . . .

. . . . . .

To reinstall the cover, reverse the removal procedure.



9. Replace the cover.
10. Do the Phototransistor Service Check (see CARR 180).

Light-Emitting Diode (LED)

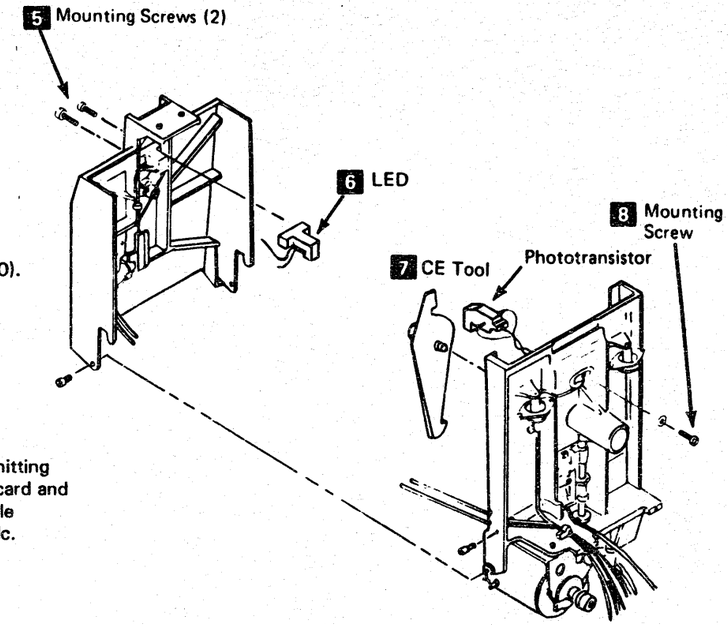
The 3880 need not be powered down to perform this procedure.

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.

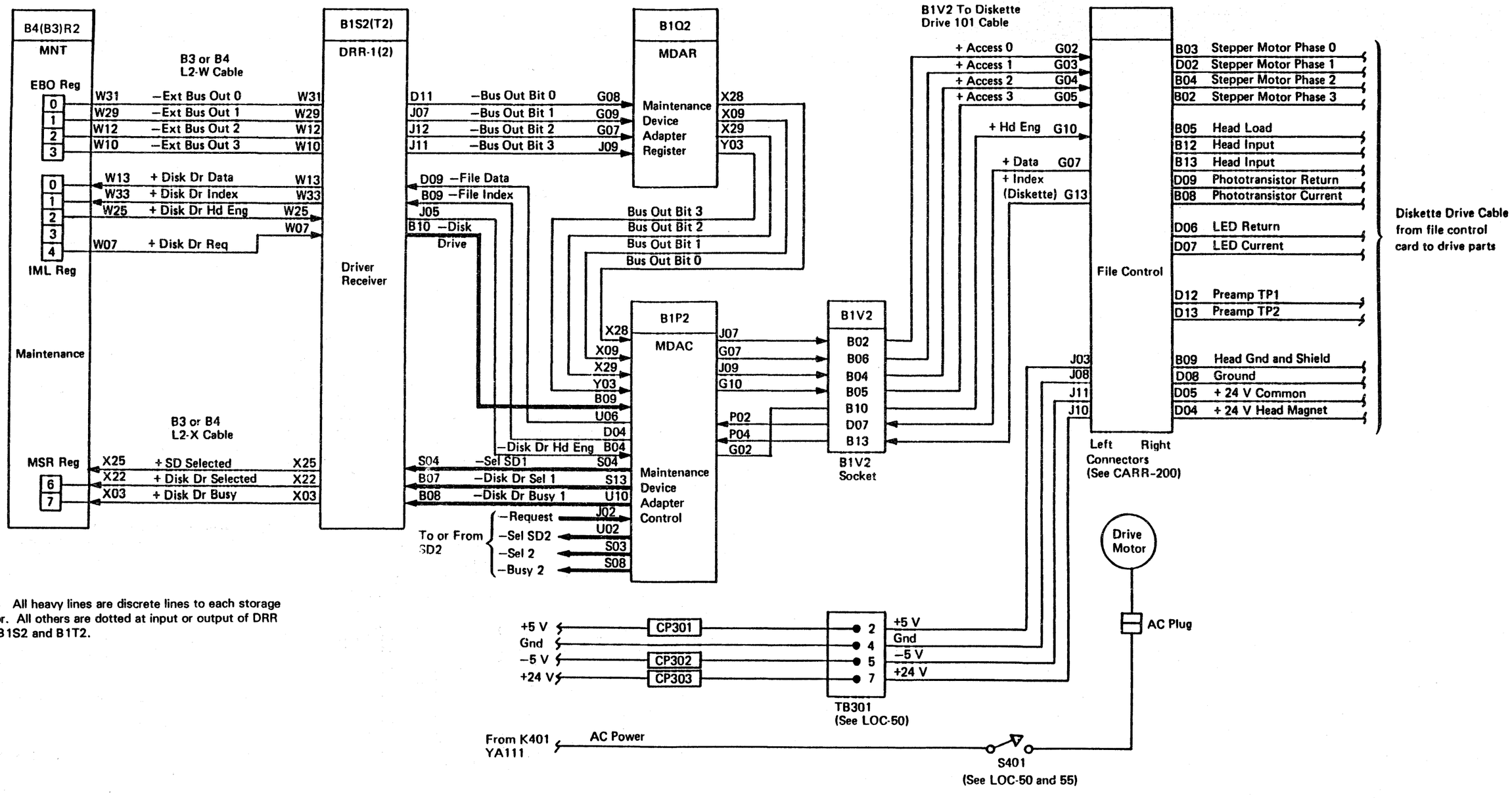
Removal

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).



© Copyright IBM Corp. 1984, 1985

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.

© Copyright IBM Corp. 1984, 1985

File Control Card

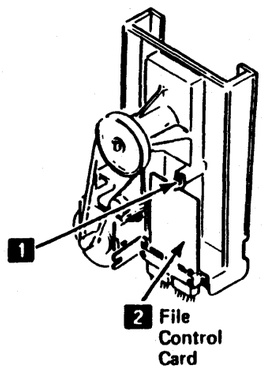
The file control card pin assignments can be found on CARR 200. The 3880 need not be powered off to perform the following procedures.

Removal

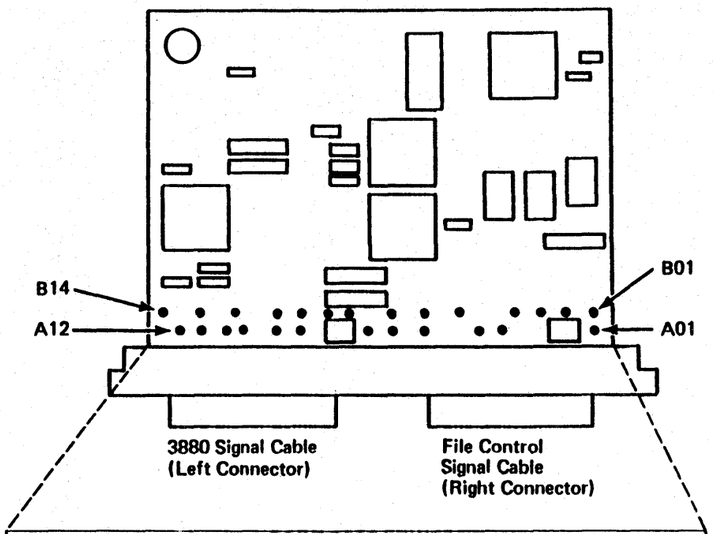
1. Turn off the switch SW401 on the primary power panel.
2. Remove the diskette from the diskette drive.
3. Remove the 3880 signal cable connector from the file control card.
4. Loosen the screw and turn the bracket (if present) 90 degrees. Tighten the screw 1.
5. Remove the file control card 2.

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



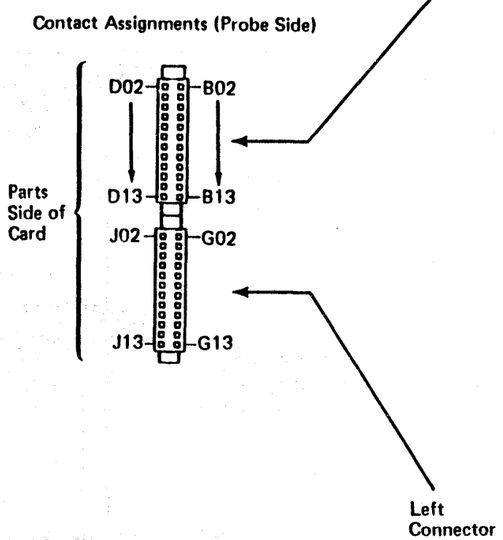
CARD TEST POINTS

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
		-5 Vdc	A12
Phototransistor Current	B05	Ground	A03

© Copyright IBM Corp. 1984, 1985

File Control Card Pin Assignment

See CARR 197 for the assignment of test points and CARR 195 for a diagram of IML control and data lines.



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.

© Copyright IBM Corp. 1984, 1985

Logic boards should be ordered by part number and EC level. 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.

Notes:

1. Cable part 4797570 connects TB1-7 to the following pins:

   01A-B1B1C11
   01A-B1C1C11

2. Cable part 4797570 connects TB1-8 to the following pins:

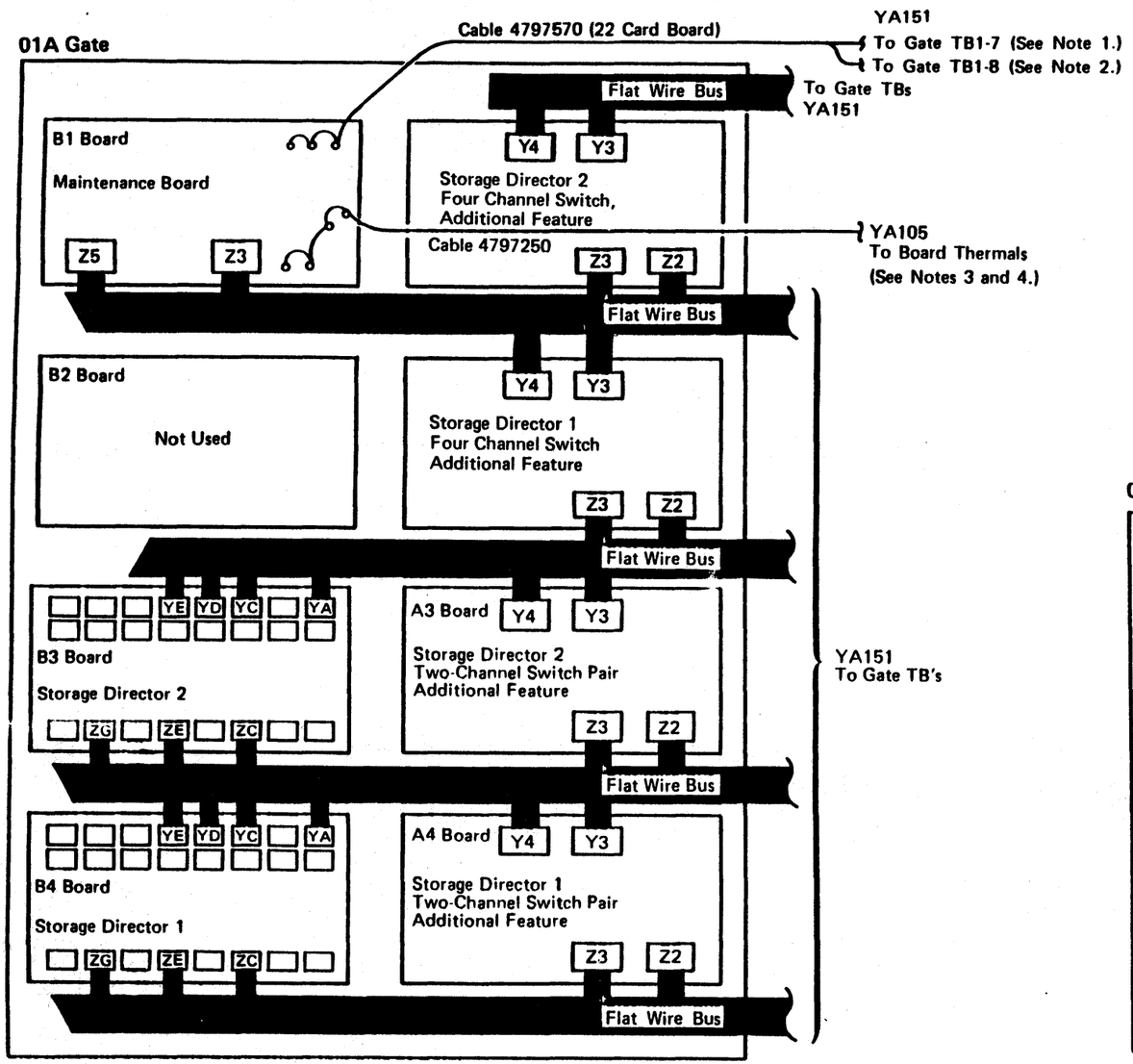
   01A-B1C1E11

3. Cable part 4797250 connects the 01A-B1 board thermal to the following pins:

   01A-B1A4B02
   01A-B1B4B10

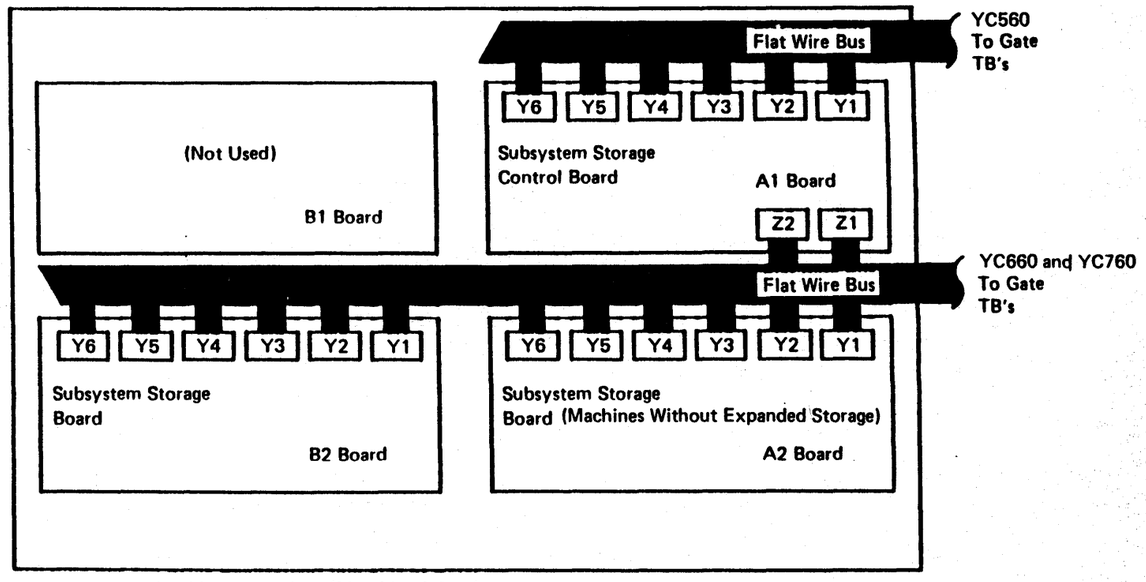
4. Cable part 4797250 connects the 01A-B3 board thermal to the following pins:

   01A-B1F6C04
   01A-B1F6E04



Flat Wire Bus and Cable Connections (Pin Side of Gate)

01B Gate



Flat Wire Bus and Cable Connections (Pin Side of Gate)

© Copyright IBM Corp. 1984, 1985

This page intentionally left blank

© Copyright IBM Corp. 1984, 1985

CARR 207

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. Remove the CTL-I bus and tag cables and install 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.
2. All channel switches (operator panel) for the storage director to be tested must be in the Disable position.

Installation, Model 21

Warning: Before removing cables, check that the machine and cable connectors are correctly labeled because bus and tag connectors can be swapped by mistake.

. . . . . .

. . . . . .

. . . . . .

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 cause wrong test results. See the Installation Manual Physical Planning (IMPP) for more information.

Perform the following steps only when running in maintenance mode and instructed by the MD to do so.

1. Disconnect the CTL-I bus and tag cables from the storage director to be tested or disconnect the bus and tag cables from the device tailgate.
2. Run CTL-I wrap test.
3. Install the wrap cable (part 2346604) in the storage director tailgate, between the bus and tag connectors in the tailgate (see figure); or in the bus and tag out connectors in the device tailgate. Turn the controller logic power off. Power must be off and the CTL-I wrap test must be run with the wrap cable installed in the device tailgate.
4. Run CTL-I wrap test.

To return the machine to normal operation, reverse the procedure.

Installation Model 23

Warning: Before removing cables, check that the machine and cable connectors are correctly labeled because bus and tag connectors can be swapped by mistake.

. . . . . .

. . . . . .

. . . . . .

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 cause wrong test results See the Installation Manual Physical Planning (IMPP) for more information.

Perform the following steps only when running in maintenance mode and instructed by the MD to do so.

1. Disconnect the CTL-I bus and tag cables from the storage director to be tested or disconnect the bus and tag cables from the device tailgate. Turn the controller logic power off before installing the wrap tool in the device tailgate. Leave the logic power off.
2. Install the wrap tool (part 4299863) in the tailgate connector socket with the arrow from 1 pointing to the tailgate.
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.
5. Turn on power and run CTL-I tests.

To return the machine to normal operation, use the following procedure.

- Turn off the controller power if the wrap tool is installed in the device.
- 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.

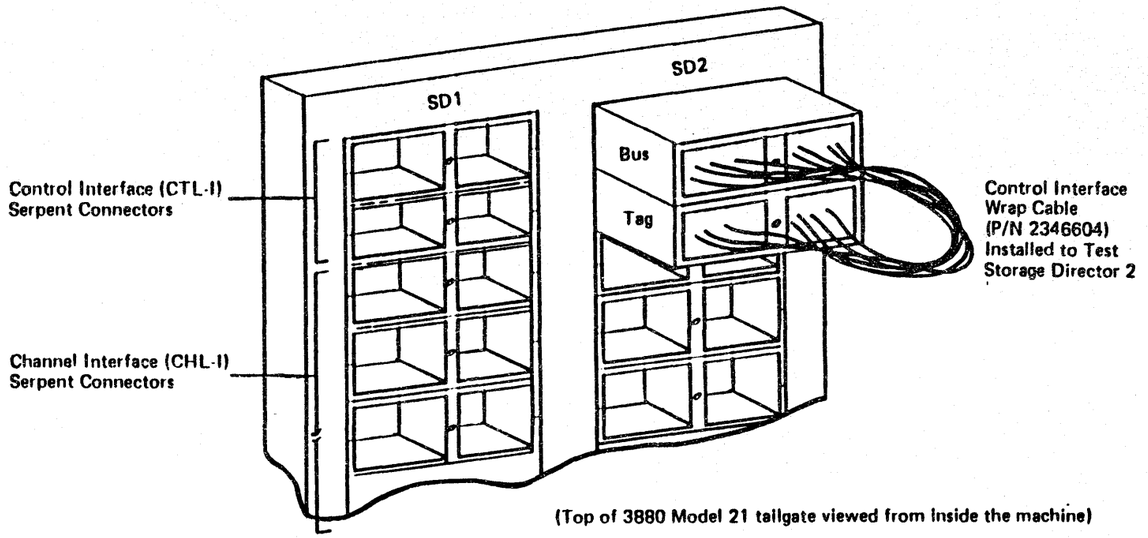


Figure 1. Control Interface Connectors (Model 21)

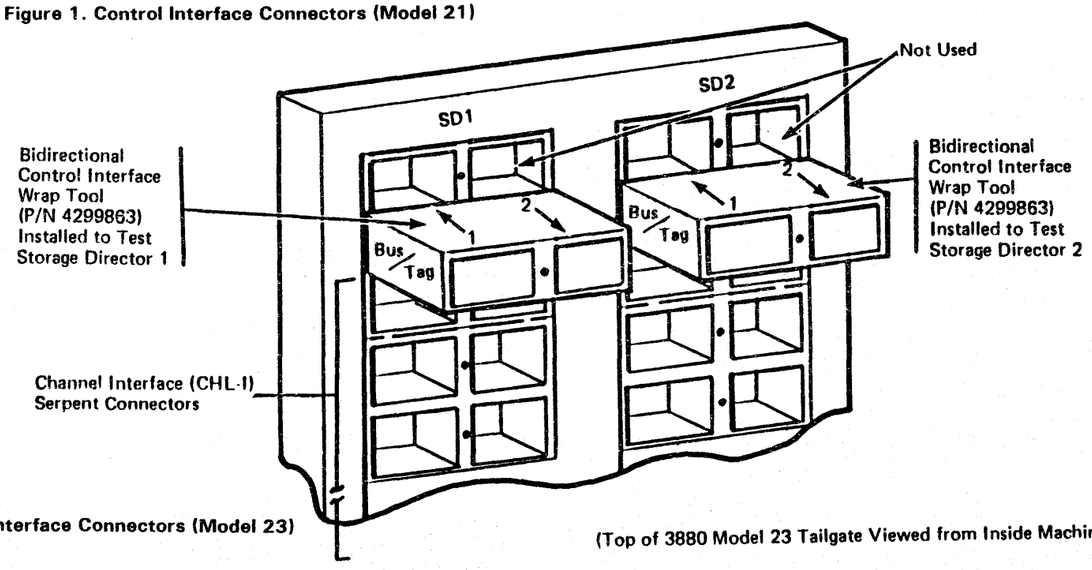


Figure 2. Control Interface Connectors (Model 23)

© Copyright IBM Corp. 1984, 1985

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 Error Code Manual (ECM).

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
- Channel interface cables
- Terminators

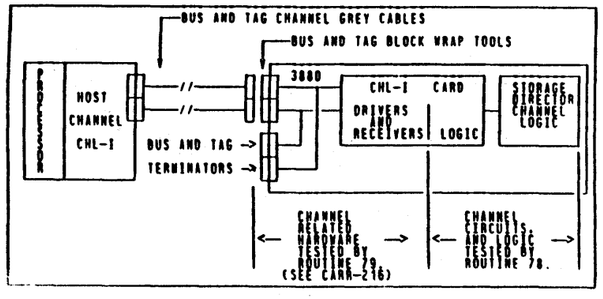


Figure 1. Circuits tested by routines 78 and 79

Channel Wrap Diagnostic (Routine 78)

Routine 78 is performed each time an initial microcode load (IML) is performed on the 3880. The results of the diagnostic test are stored in control storage for use 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 disabled status.

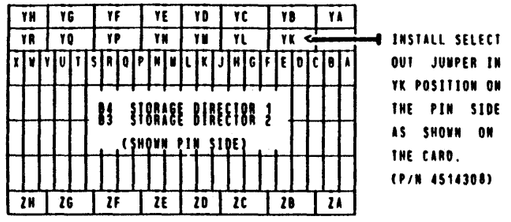
When the MD is used to diagnose channel failures, it performs an IML and reads the results of the diagnostic tests for each channel from control storage. Then, depending on the number of failing channels, the MD either isolates to a failing pair of channels or presents a list of FRUs.

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:

. . . . . .

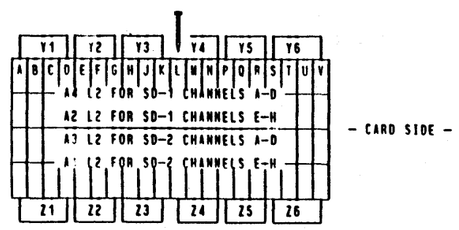
. . . . . .

. . . . . .



1- or 2-channel 3880

Install the select-out bypass jumper (part 2679478 or part 4515064) in the L2 position on each channel board installed for the failing storage director.



4- or 8-channel 3880

Channel Block Wrap Diagnostic (Routine 79)

Routine 79 is run only when invoked by the maintenance device and requires the following manual intervention:

1. The bus and tag block wrap tools must be placed 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.

	SD-1	SD-2	
	CTL-I BUS	CTL-I BUS	A
	CTL-I TAG	CTL-I TAG	B
BUS WRAP TOOL (P/N 4299876) ⇒	CH A BUS IN	CH A BUS IN	C
TAG WRAP TOOL (P/N 4299873) ⇒	CH A TAG IN	CH A TAG IN	D
STANDARD BUS TERMINATOR →	CH A BUS OUT	CH A BUS OUT	E
STANDARD TAG TERMINATOR →	CH A TAG OUT	CH A TAG OUT	F
	CH B BUS IN	CH B BUS IN	G
	CH B TAG IN	CH B TAG IN	H
	A1	A2	

Figure 2. Example of the block wrap tools installed in channel A on a 1-, 2-,or 4-channel 3880

© Copyright IBM Corp. 1984, 1985

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. Routine 78 must run without errors 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.

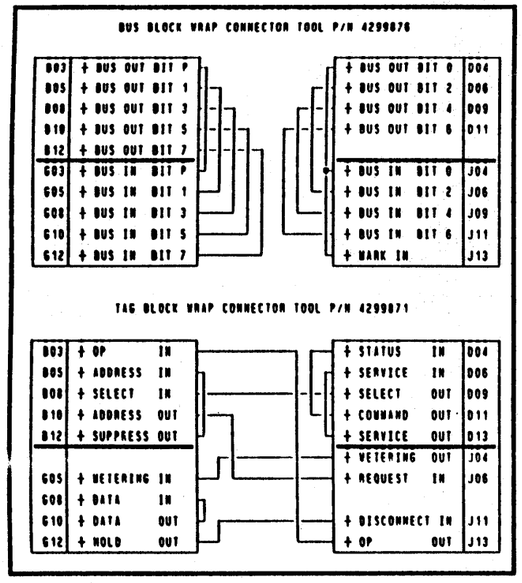


Figure 1. Circuit Diagrams for Bus and Tag Block Wrap Tools.

Channel Cable Checkout Using Routine 79

Routine 79 is also used to check the channel bus and tag cables. This test is performed by installing the bus and tag block wrap tools at various locations in the channel path (see Fig. 2). Routine 79 must run without errors before going to the next location in the subsystem channel path (see Figure 2).

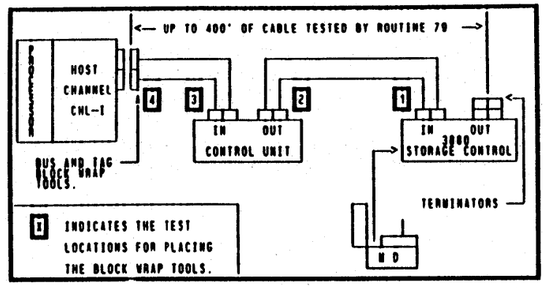


Figure 2. Possible Combination of Channel Bus and Tag Codes Tested by Routine 79.

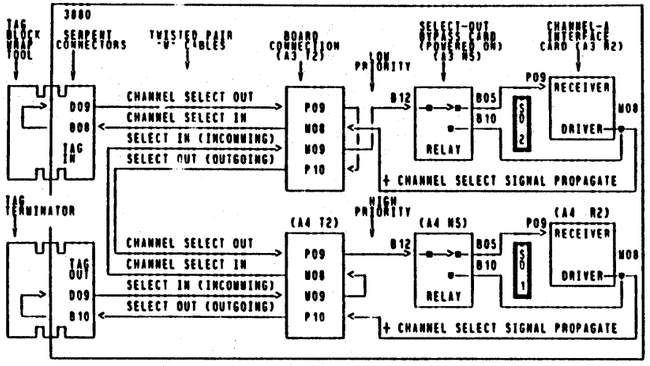
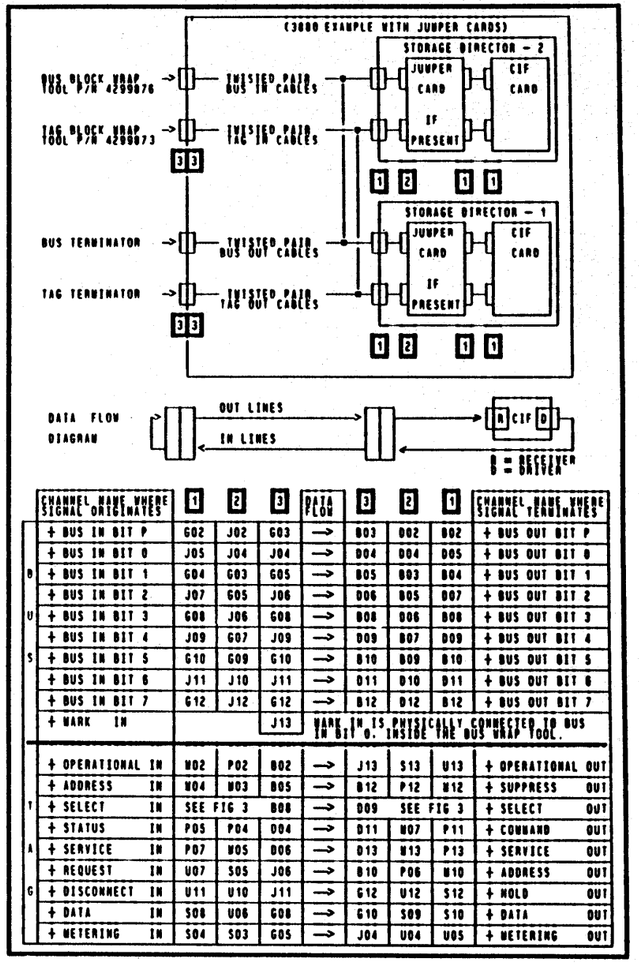


Figure 3. Example of Block Wrap, Routine 79, Channel A, Storage Director 2.



CHANNEL NAME WHERE SIGNAL ORIGINATES	1	2	3	DATA FLOW	3	2	1	CHANNEL NAME WHERE SIGNAL TERMINATES
+ BUS IN BIT P	G02	J02	G03	→	B03	B02	B02	+ BUS OUT BIT P
+ BUS IN BIT 0	J05	J04	J04	→	D04	D04	D05	+ BUS OUT BIT 0
+ BUS IN BIT 1	G04	G03	G05	→	B05	B03	B04	+ BUS OUT BIT 1
+ BUS IN BIT 2	J07	G05	J06	→	D06	B05	B07	+ BUS OUT BIT 2
+ BUS IN BIT 3	G08	J06	G08	→	B08	D06	B08	+ BUS OUT BIT 3
+ BUS IN BIT 4	J09	G07	J09	→	D09	B07	D09	+ BUS OUT BIT 4
+ BUS IN BIT 5	G10	G09	G10	→	B10	B09	B10	+ BUS OUT BIT 5
+ BUS IN BIT 6	J11	J10	J11	→	D11	B10	B11	+ BUS OUT BIT 6
+ BUS IN BIT 7	G12	J12	G12	→	B12	B12	B12	+ BUS OUT BIT 7
+ MARK IN			J13		MARK IN IS PHYSICALLY CONNECTED TO BUS IN BIT 0. INSIDE THE BUS WRAP TOOL.			
+ OPERATIONAL IN	H02	P02	B02	→	J13	S13	U13	+ OPERATIONAL OUT
+ ADDRESS IN	H04	H03	B05	→	B12	P12	H12	+ SUPPRESS OUT
+ SELECT IN	SEE FIG 3		B08	→	D09	SEE FIG 3		+ SELECT OUT
+ STATUS IN	P05	P04	D04	→	D11	H07	P11	+ COMMAND OUT
+ SERVICE IN	P07	H05	D06	→	D13	H13	P13	+ SERVICE OUT
+ REQUEST IN	U07	S05	J06	→	B10	P06	H10	+ ADDRESS OUT
+ DISCONNECT IN	U11	U10	J11	→	G12	U12	S12	+ HOLD OUT
+ DATA IN	S08	U06	G08	→	G10	S09	S10	+ DATA OUT
+ METERING IN	S04	S03	G05	→	J04	U04	U05	+ METERING OUT

Figure 4. Example of Block Wrap Configuration for a 3880.

© Copyright IBM Corp. 1984, 1985

This page intentionally left blank

© Copyright IBM Corp. 1984, 1985

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

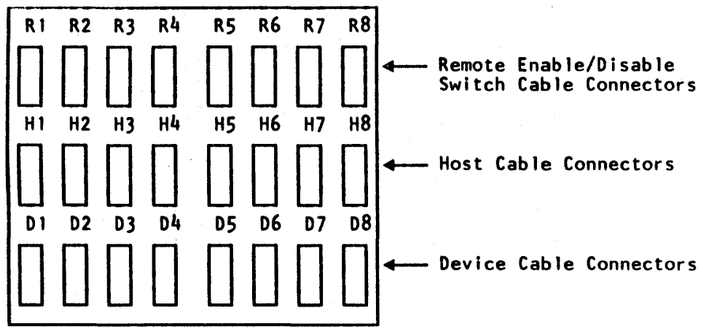


Figure 1. Remote Enable/Disable Switch Connector Positions

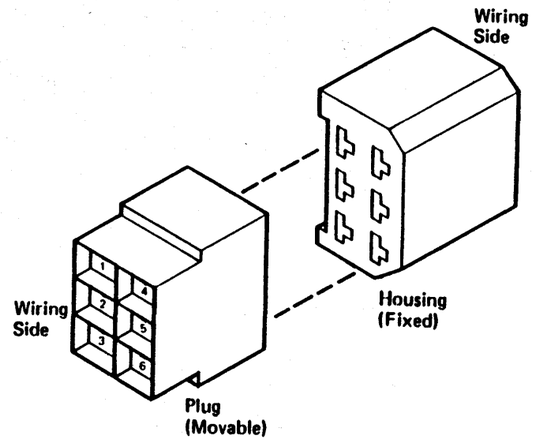


Figure 2. Remote Cable Connector Pin Identifier

© Copyright IBM Corp. 1984, 1985

Channel Interface Cable Swap

1

If the two-channel switch pair, additional feature is installed, go to CARR 370. If the four-channel switch, additional feature is installed go to CARR 490.

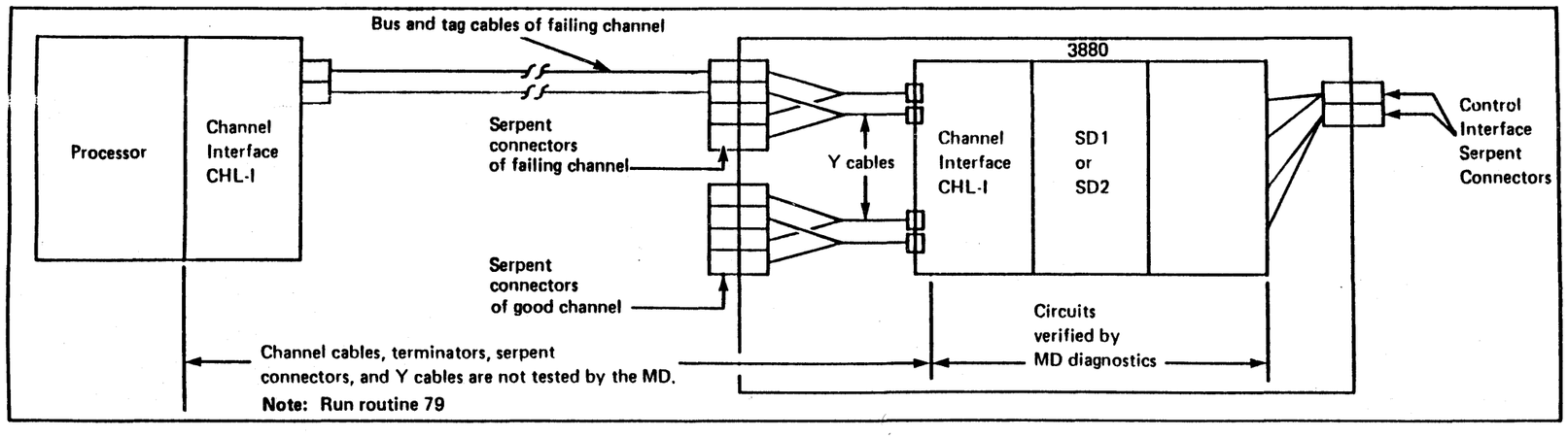
The channel interface cable swap procedure is used to determine if the cause of a channel type failure is in the 3880 or in another part of the system.

The channel interface cables should be swapped only if all MD diagnostics run without errors, and a failure can be repeatedly duplicated by running 3880 OLT T0200A (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 (routine 79) 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 the figure below. 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).

Figure 1. Channel Circuits and Y-Cables



Channel Circuits and Y-Cables

Procedure

Swap Cables

1. Use the following procedure to swap the cables attached to the failing channel:

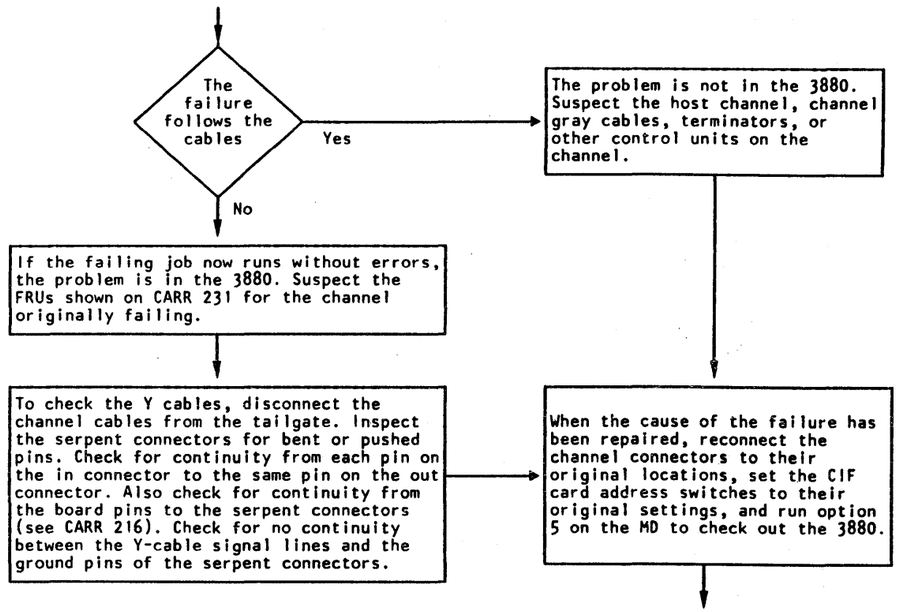
   - Swap the channel interface bus in and tag in cables with the bus in and tag in cables of a good channel in the same storage director.
   - Swap the channel interface bus out and tag out cables with the bus out and tag out cables of the same channel as in step a.

     Note: If terminators are used on any out connectors, swap them as if they were cables.

   - 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.

2. Run the failing OLT, utility or job



© Copyright IBM Corp. 1984, 1985

If the two-channel switch pair, additional feature is installed, go to CARR 370. If the four-channel switch, additional feature is installed, go to CARR 490.

Suspected FRUs are not tested by the MD. The FRUs for the failing channel are:

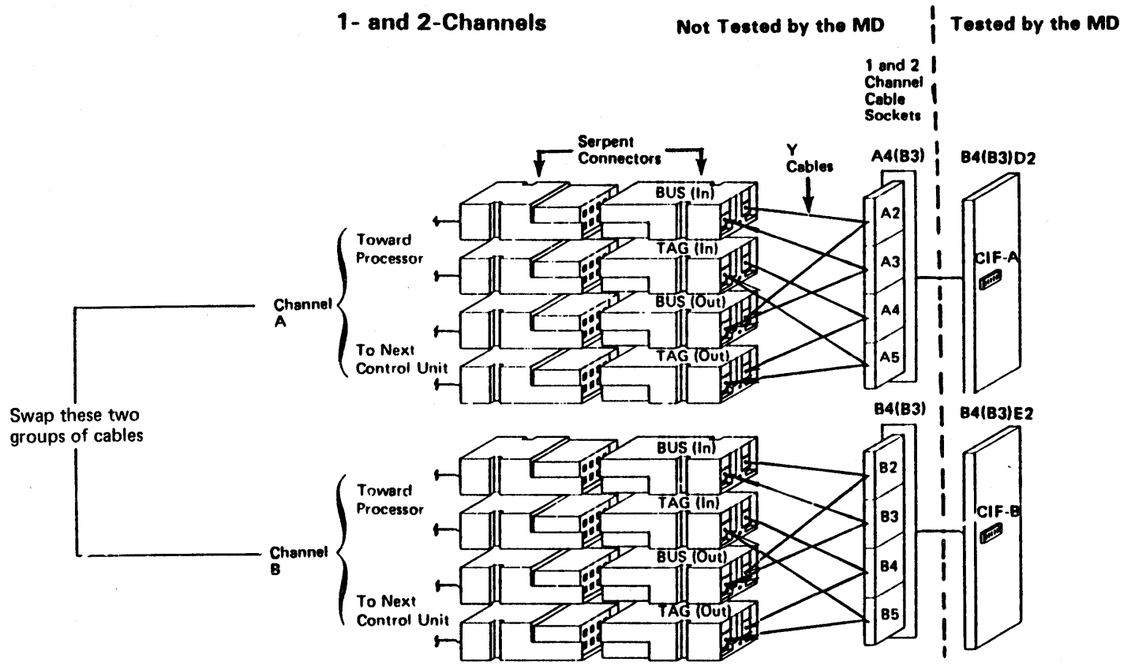
- The Y-cable assemblies
- The serpent connectors

	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	
	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	

Figure 1. Channel and Device Connectors (Model 21)

	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	

Figure 2. Channel and Device Connectors (Model 23)



© Copyright IBM Corp. 1984, 1985

Channel Interface Cable Swap (TCA)

The channel interface cable swap procedure is used to determine if the cause of a channel type failure is in 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 (routine 79) 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 the figure below. 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

Swap Cables

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 in the same storage director.

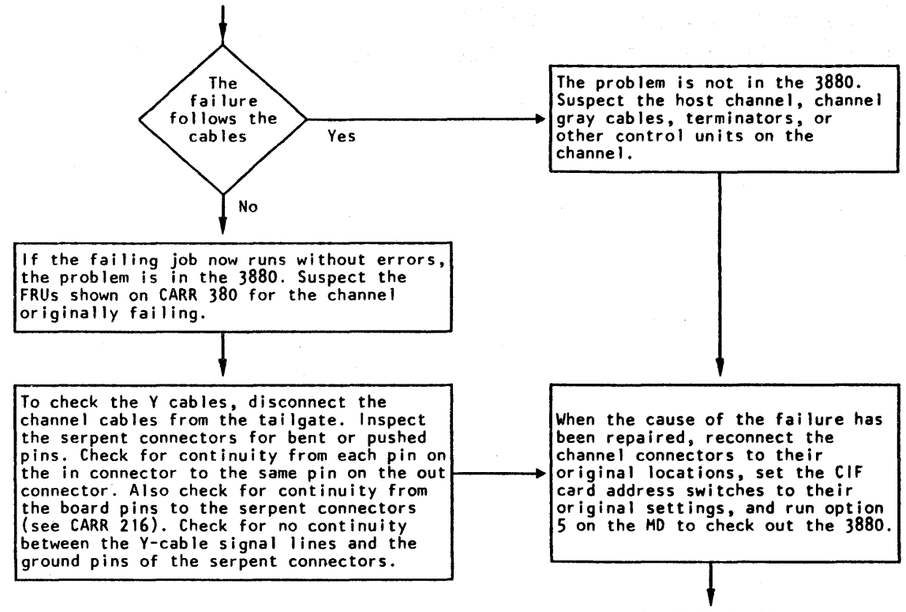
   b. Swap the channel interface bus out and tag out cables with the bus out and tag out cables of the same channel as in step a.

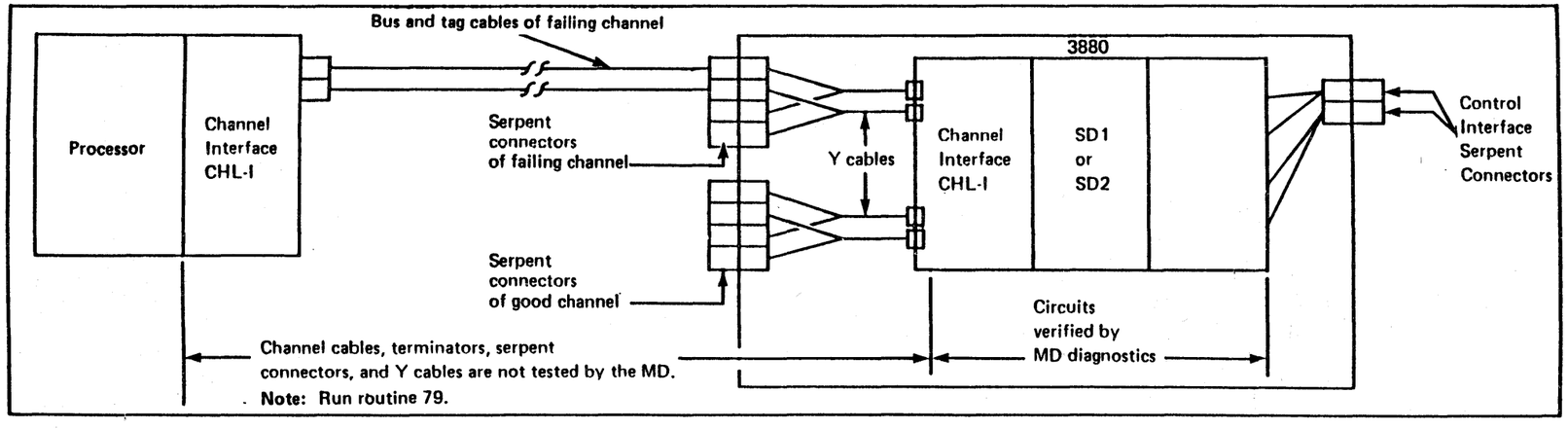
      Note: If terminators are used on any out connectors, swap them as if they were cables.

   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.

2. Run the failing OLT, utility or job





Channel Circuits and Y-Cables

© Copyright IBM Corp. 1984, 1985

Channel Interface Cable Swap (TCA) (Continued)

Swap two groups of channel cables (bus and tag) at the tailgate, and swap the address switch settings of the associated CIF cards (Do not swap the cards).

Suspected FRUs are not tested by the MD. The FRUs for the failing channel are:

- The Y-cable assemblies
- The serpent connectors

	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	
	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	

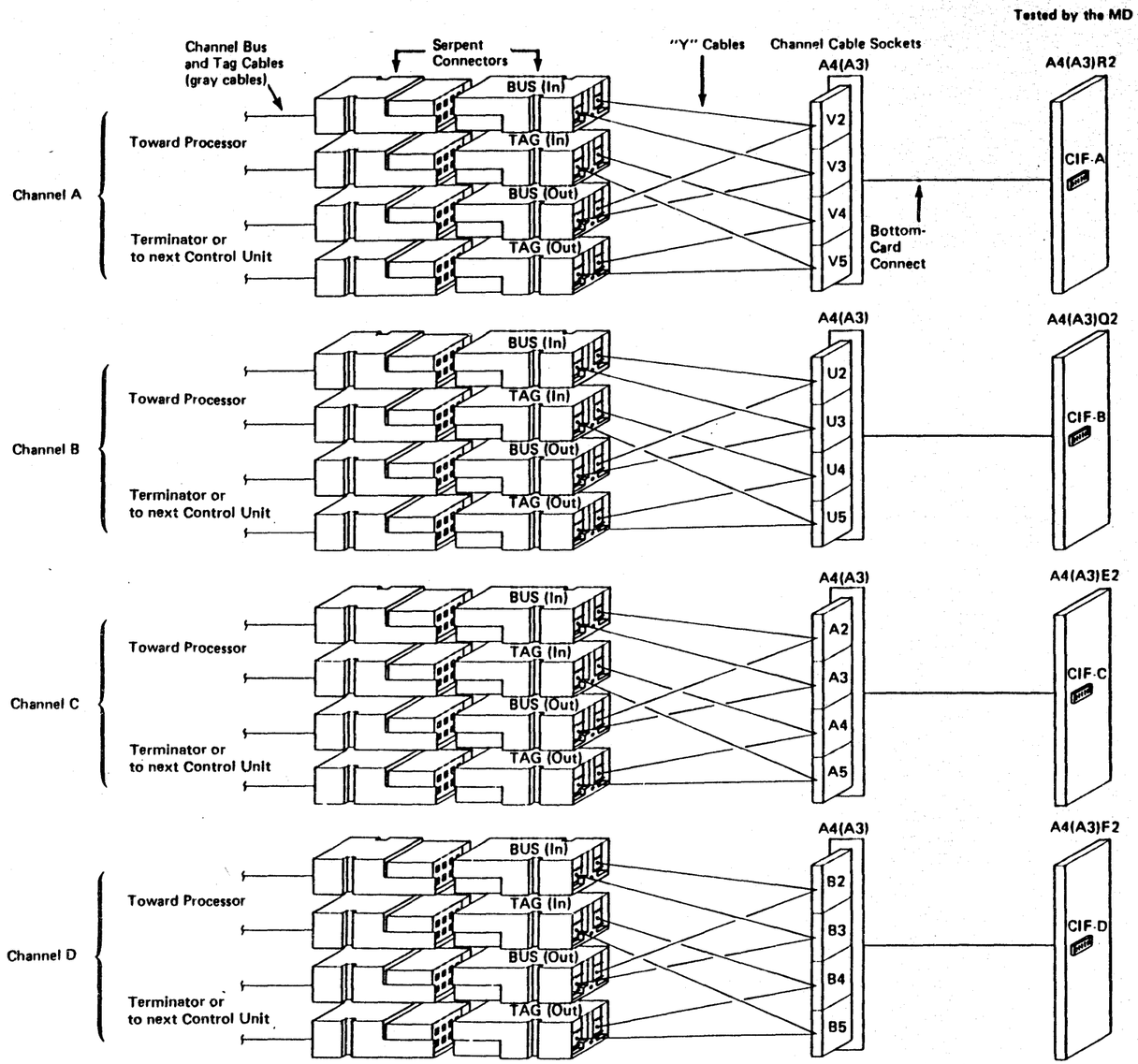
Tailgate viewed from inside the machine

Figure 1. Channel and Device Connectors (Model 21).

	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

Figure 2. Channel and Device Connectors (Model 23)



© Copyright IBM Corp. 1984, 1985

Intraboard Cable Locator

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 find the cable number in the figure below.
4. Reseat, repair, or exchange each cable indicated for that code.

Figure 1. Two-Channel Switch Pair, Additional Feature

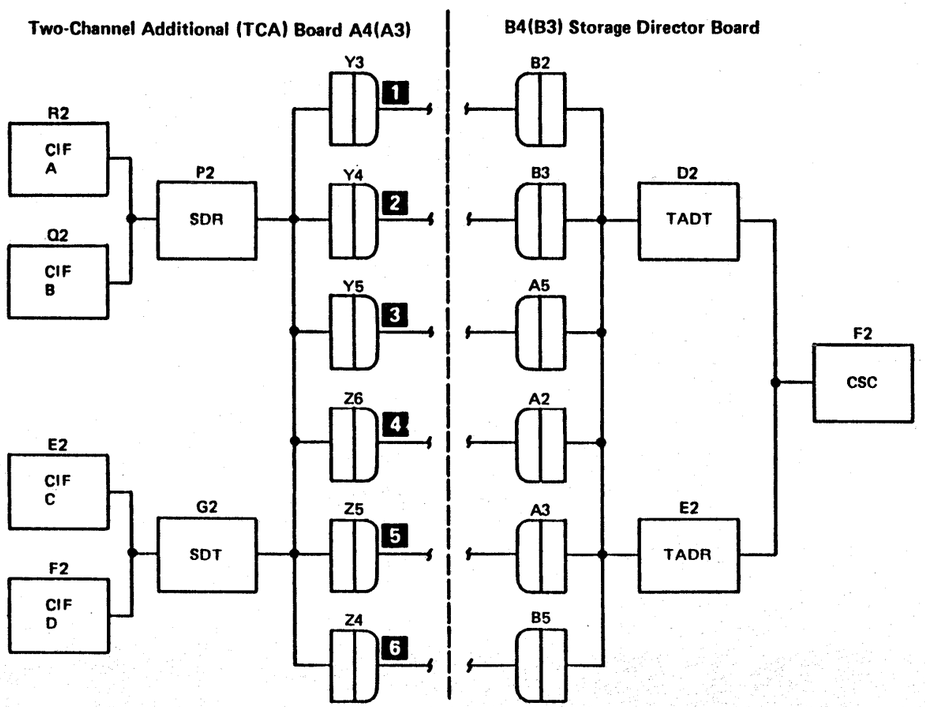
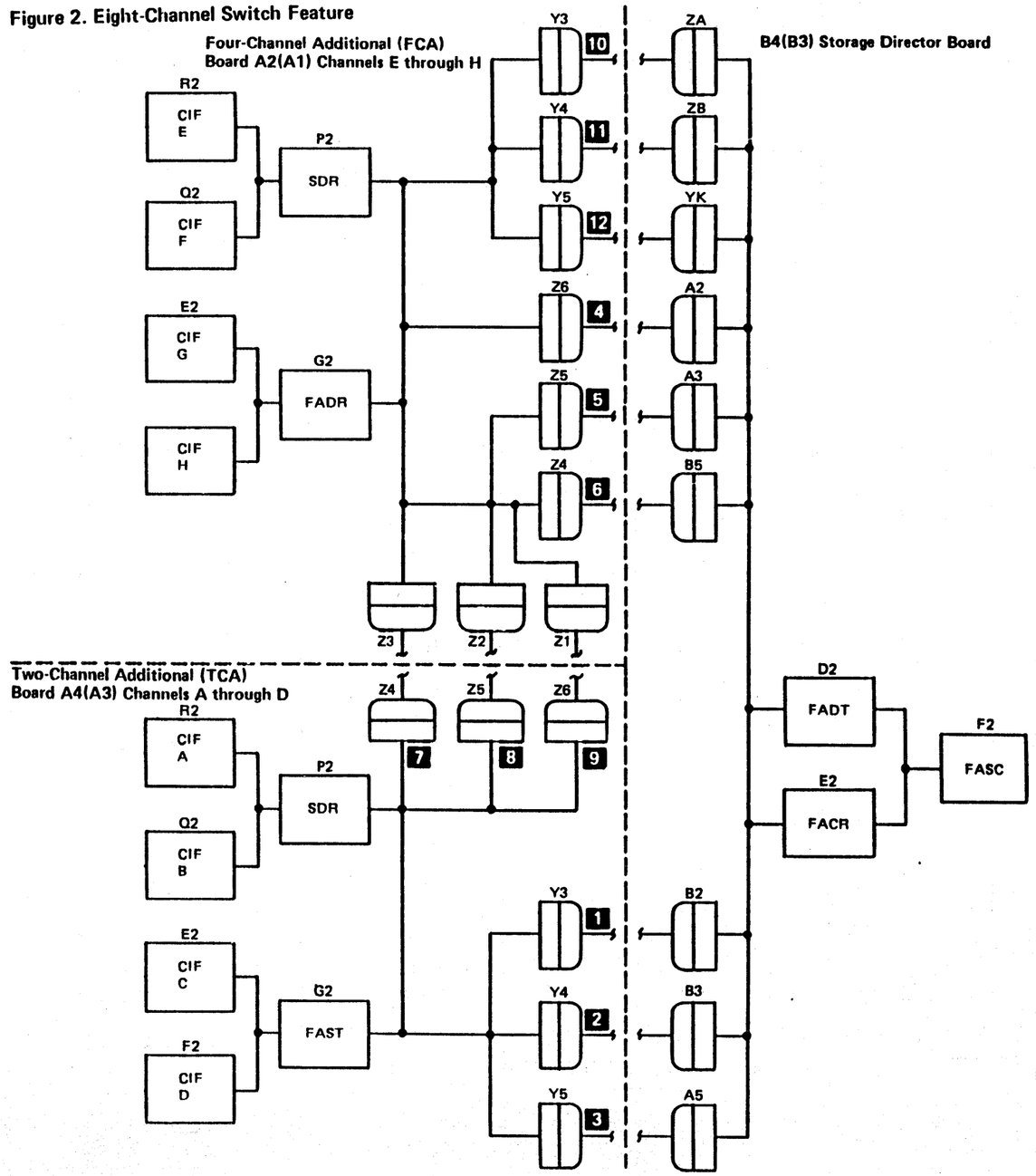


Figure 2. Eight-Channel Switch Feature



© Copyright IBM Corp. 1984, 1985

Intraboard Cable Locator (Continued)

This page, CARR 482, and CARR 483 are used to locate the cables and connectors in the 3880 that are not shown on CARR 480.

Note: A # next to a code (for example #7300) indicates more possible cables are included in the cable charts on CARR 482 and CARR 483.

Code	Four-Channel Switch, Additional 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						•	•					
	1	2	3	4	5	6	7	8	9	10	11	12
	CABLE NUMBERS											

Code	Four-Channel Switch, Additional 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					•			•				
#3F0X				•			•					
#FF01					•			•				
#FF03					•			•				
#FF04		•	•	•	•	•	•	•	•		•	•
#FF06				•		•	•		•			
#FF07		•	•	•	•	•	•	•	•		•	•
#FF09					•		•	•				
#FF0A					•		•	•				
	1	2	3	4	5	6	7	8	9	10	11	12
	CABLE NUMBERS											

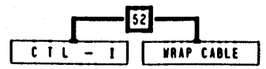
Code	Four-Channel Switch, Additional Feature Cables											
	Two-Channel Switch Pair, Additional Feature Cables											
	1	2	3	4	5	6	7	8	9	10	11	12
#0F00-0				•		•	•		•			
#0F00-2			•	•	•		•	•	•			
#0F00-5				•					•	•		
Note: For any 78XX code, see the corresponding 73XX listed below.												
#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				•	•	•	•	•	•	•	•	•
	1	2	3	4	5	6	7	8	9	10	11	12
	CABLE NUMBERS											

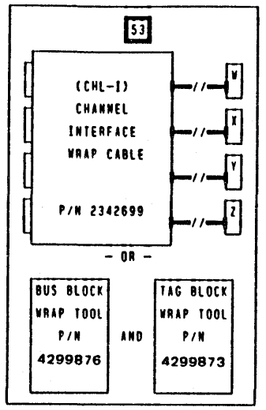
3880 MIM						
	Seq AU0001	PN 6315678 24 of 28	881143 13 Jan 84	881216 15 Aug 84	A15621 01 Apr 85	

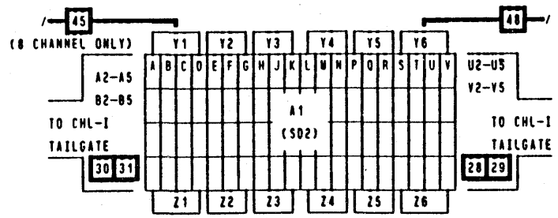
© Copyright IBM Corp. 1984, 1985

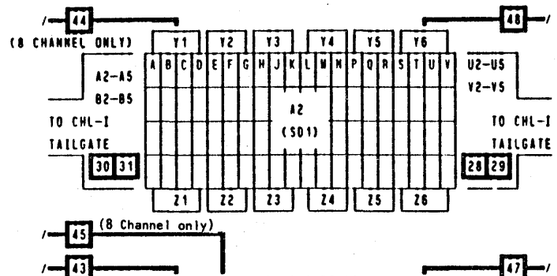
CABLE	FROM	TO
20	B4(B3) A2-A5	CHL-A TAILGATE
21	B4(B3) B2-B5	CHL-B TAILGATE
22	B4(B3)X2 W-Z	CTL-I TAILGATE
23	B4(B3)X2 W.X	CTL-I TAILGATE
24	A4(A3) Y2-Y5	CHL-A TAILGATE
25	A4(A3) U2-U5	CHL-B TAILGATE
26	A4(A3) A2-A5	CHL-C TAILGATE
27	A4(A3) B2-B5	CHL-D TAILGATE
28	A2(A1) Y2-Y5	CHL-E TAILGATE
29	A2(A1) 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

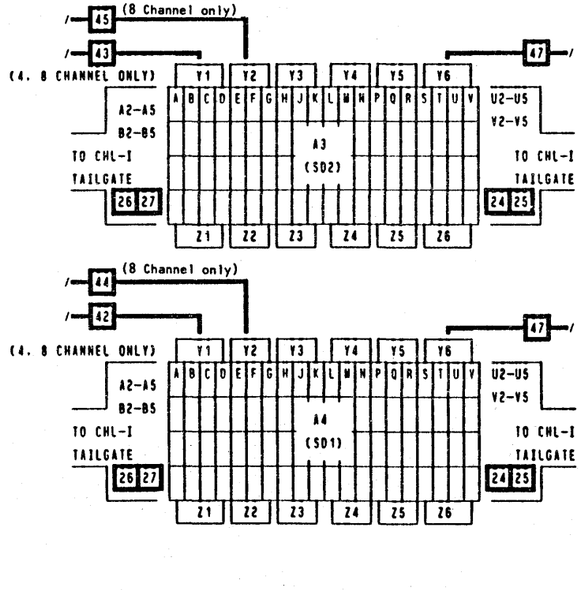
CABLE	FROM	TO
37	B3 Q2 X TCCC	B1 T2 X TCCC
38	B1 Y2 CABLE	IGAR DISKETTE
39	B1 Y4 CABLE	MD CONNECTOR
40	B1 Z2 CABLE	B4 ZD CABLE
41	B1 Z3 CABLE	B3 ZD CABLE
42	B1 Z4 CABLE	A4 Y1 CABLE
43	B1 Y4 CABLE	A3 Y1 CABLE
44	A4 Y2 CABLE	A2 Y1 CABLE
45	A3 Y2 CABLE	A1 Y1 CABLE
46	B4(B3) ZG CBL	OPERATOR PANEL
47	A4(A3) 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)	
54	B1V3	Subsys Stor P5
55	B1V5	01B-A1V3

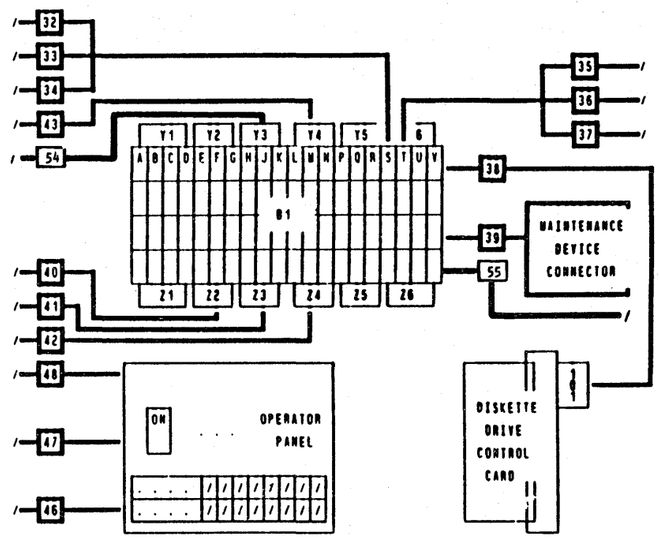


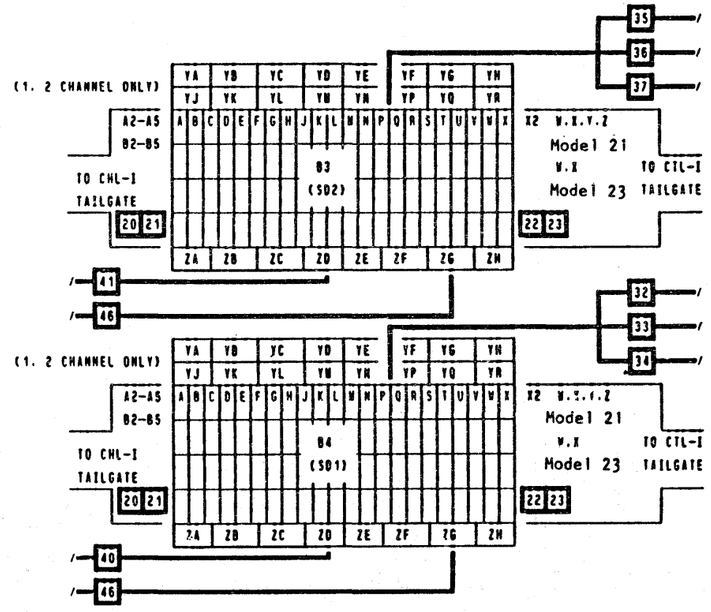












Note: For detailed cable plugging information for the 3880, see the cable plug charts in the *Maintenance Diagram Manual (MDM)*, Volume R30

GREY CABLES

		SD-1	SD-2	
TO DEVICE INTERFACE	49	CTL-I BUS	CTL-I BUS	A
	49	CTL-I TAG	CTL-I TAG	B
TO HOST CHANNEL	50	CH A BUS IN	CH E BUS IN	C
	50	CH A TAG IN	CH E TAG IN	D
51 SERPENT CONNECTORS AND TERMINATORS		CH A BUS OUT	CH E BUS OUT	E
		CH A TAG OUT	CH E TAG OUT	F
		CH B BUS IN	CH F BUS IN	G
		CH B TAG IN	CH F TAG IN	H
		CH B BUS OUT	CH F BUS OUT	J
		CH B TAG OUT	CH F TAG OUT	K
		CH C BUS IN	CH G BUS IN	L
		CH C TAG IN	CH G TAG IN	M
		CH C BUS OUT	CH G BUS OUT	N
		CH C TAG OUT	CH G TAG OUT	P
		CH D BUS IN	CH H BUS IN	Q
		CH D TAG IN	CH H TAG IN	R
		CH D BUS OUT	CH H BUS OUT	S
		CH D TAG OUT	CH H TAG OUT	T
		A1	A2	

EXAMPLE OF TAILGATE SERPENT CONNECTORS FOR EIGHT CHANNEL SWITCH FEATURE.

3880 MIM	Seq AU0001	PN 6315678 25 of 28	881143 13 Jan 84	881216 15 Aug 84	A15621 01 Apr 85	

© Copyright IBM Corp. 1984, 1985

Cable Locator Chart (Continued)

This page and CARR 482 are used to locate the cables and connectors in the 3880 that are not shown on CARR 480, or CARR 481.

Procedure

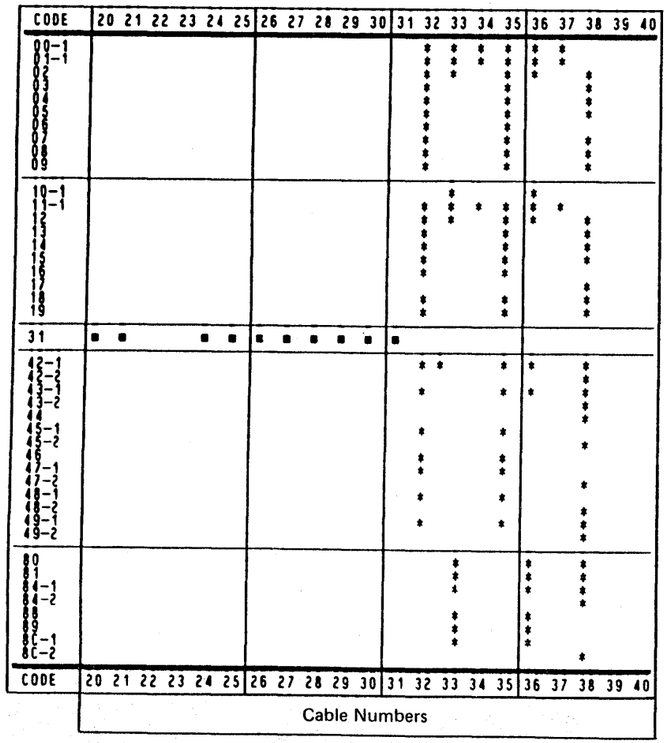
1. Use the chart on this page to find the initial microcode load (IML) code, or isolation code in the left column of the charts.
2. Follow the row to the right; one of the three types of marks below, indicates the cables that are a part of the FRU group for that code:

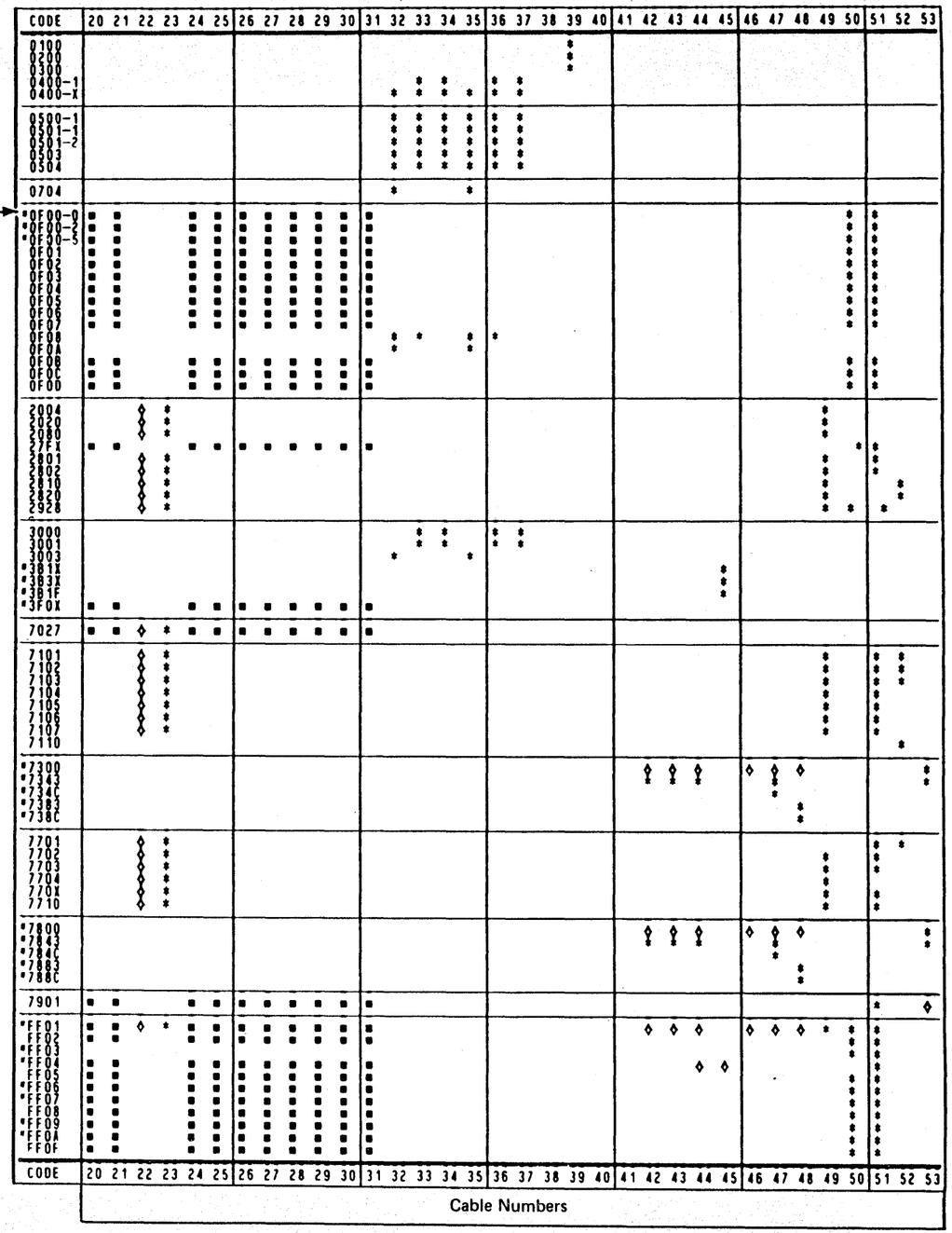
   * asterisk - should be suspected with any combination of features

   diamond - should only be suspected if this cable is installed

   square - should only be suspected if this channel is failing
3. Use the cable number (20 through 53) at the top of the column to find the cable number on CARR 482.
4. Reseat, repair, or exchange 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.





© Copyright IBM Corp. 1984, 1985

Channel Isolation

Some errors detected in the 3880 need 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 steps remove this problem.

1. The 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 on the failing storage director.
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 MD to continue error isolation.

Restoring The 3880 To The Customer After Channel Isolation

Warning: Failure to follow these steps in the order given, can cause customer jobs to fail.

1. Remove select-out bypass jumpers installed during this procedure.
2. Return to the MD for guidance.

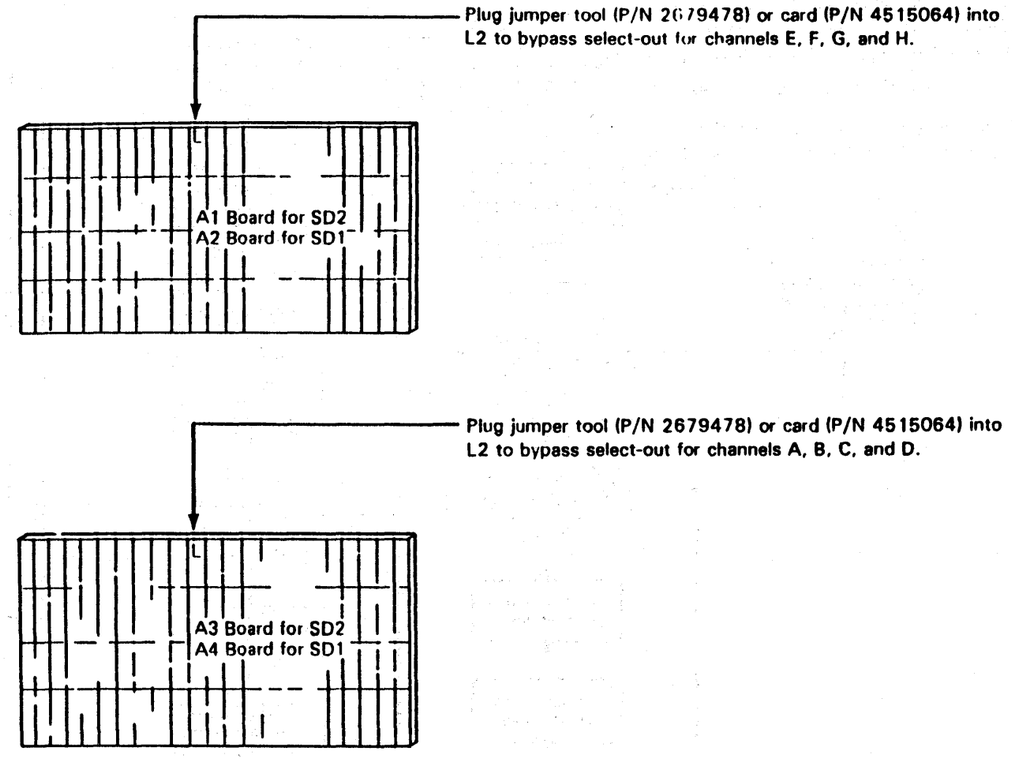
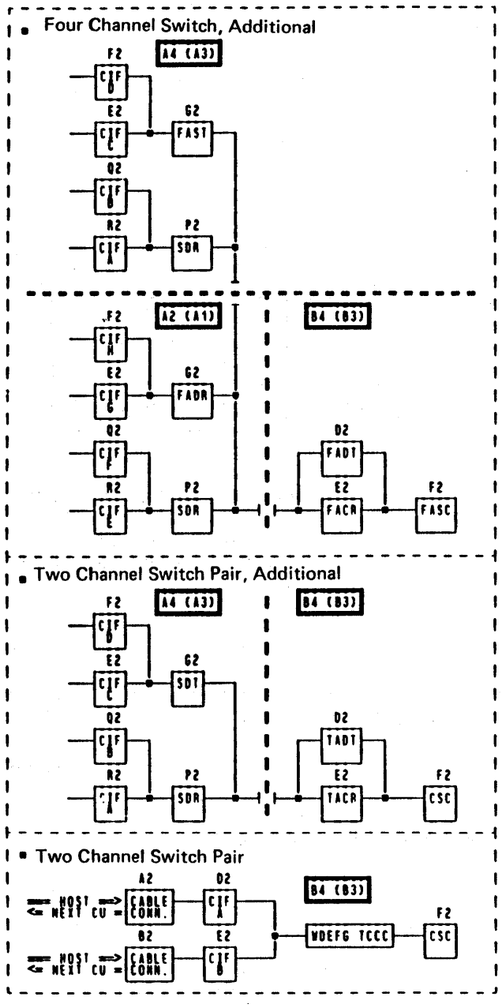


Figure 1.

© Copyright IBM Corp. 1984, 1985

Channel Block Diagrams

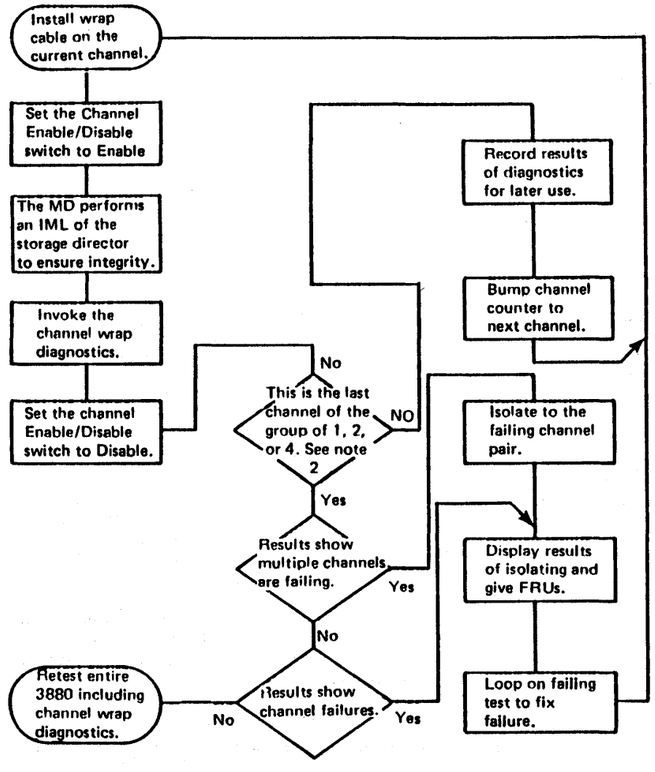
Errors caused by channel switch hardware, need isolation to determine which channel interface paths are failing. The following figure shows the electrical dot ORs, and physical locations of the different channel configurations for the 3880. The isolation procedure physically and electrically removes channel paths from the 3880 to break the dot ORs isolating FRUs.



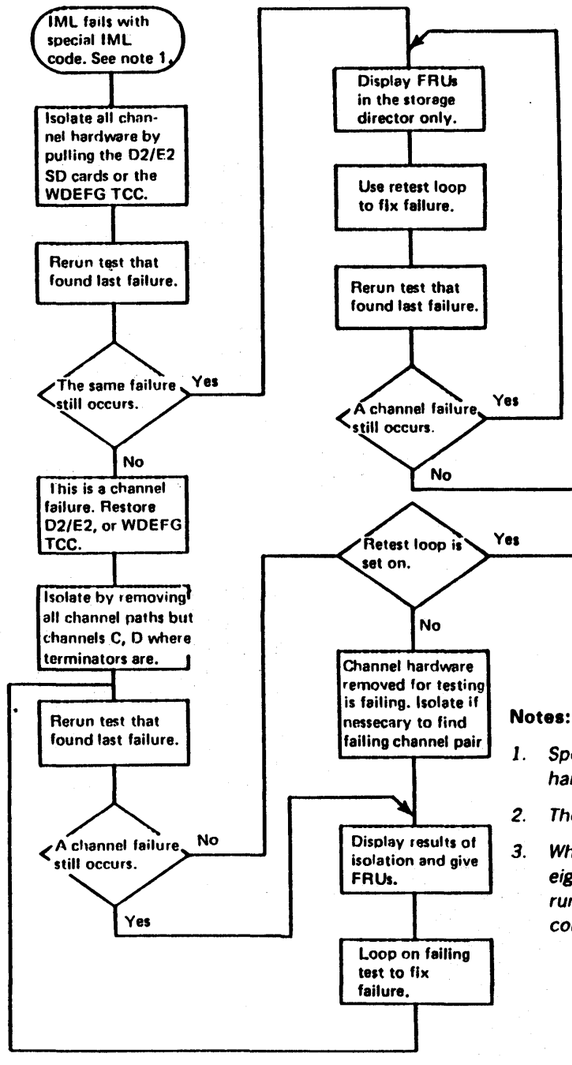
Isolation Methods

1. During the running of channel wrap diagnostics, the following is the procedure the MD uses in options 1 and 5 when running the channel wrap diagnostics on the 3880. This isolation method 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
   - Eight Channels have been tested on a 3880 with the four channel switch, additional feature



After detection of some storage director failures, the following is the procedure the MD 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 performed 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.*

© Copyright IBM Corp. 1984, 1985

Installation Procedures

Contents of This Section

Before Installation **10**
Machine Type 10
Introduction 10
Preparation 10
Storage Director Identification 10
Subsystem Storage Identification 10
Programming 10
Special Tools/Test Equipment 10

Unpack and Locate **20**

Priority Setting **30**

Primary Power **40**
Unit Emergency Switch Release Procedure 40
Transformer Taps 40
Switches and Circuit Protectors 40

Safety Checks **50**
Machine Ground Check 50
Branch Circuit CB Turned Off Check 50
Primary Power On 50
Introduction to MD 50
MD Process 50
Attaching the MD 50

DC Power Checks **60**

Switch Setting **70**
Channel Speed Control Switches 70
Storage Director Address Switch Setting 70
Storage Director Physical ID Switches 70
3880 Diskette Load Control Switches 80
Subsystem Storage Physical ID and Size Switches 80

Subsystem Machine Checkout, Electronic Wrap **90**
Connecting the CTL-I Wrap Cable, Model 21 90
Connecting the CHL-I Tailgate Block Wrap Tool 90

Cable Installation **100**
Channel Enable/Disable Without Switches 100

System Test **110**

After Installation **130**

Relocation/Removal Procedures **140**

Dual Frame Installation Configuration Procedure **150**

Dual Frame Removal Procedure **160**

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 T3880A.

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.

See PWR 33 for subsystem storage power test points.

© Copyright IBM Corp. 1984, 1985

Before Installation

Machine Type

3880 Model 21 and 23 G23

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 can work together, if desired. This results in a slightly shorter elapsed time, but increases the total CE hours.

Do each step in sequence, and place a mark beside each step number as it is completed.

Note: The 3880 Model 21 can attach to 3350 disk storage devices only. The 3880 Model 23 can attach to 3380 disk storage devices only.

Preparation

Before starting the installation process, determine 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 one of the machine history form. Other information must be obtained from the customer or from the Account Records. The Storage Director and Subsystem Storage ID's are assigned by the CE.

Complete the following table information and use it for reference when needed.

3880 CONFIGURATION			
Model		21__	23✓
Dual Frame Configuration		Yes__	No__
Two-Channel Switch-Pair		Yes✓	No__
Two-Channel Switch-Pair, Additional		Yes__	No__
Four-Channel Switch, Additional		Yes__	No__
Remote Switch Attachment		Yes__	No__
Remote Switch Attachment, Additional		Yes__	No__
Remote Switch Attachment Four-Channel Switch, Additional		Yes__	No__
SYSTEM INFORMATION			
		STORAGE DIRECTOR 1	STORAGE DIRECTOR 2
Number of Channels Attached			
DASD Address Range			
Storage Director Physical ID *		04	05
Subsystem Storage Physical ID **		0	
Subsystem Storage Size		32 M	
Disk Storage Types		3350	3380
Priority	Channel A		2450
	Channel B		120
	Channel C		
	Channel D		
	Channel E		
	Channel F		
	Channel G		
	Channel H		
NOTE: For more information, see Storage Director Identification.			

* For more information, see Storage Director Identification on this page.

**For more information, see Subsystem Storage Identification on this page.

© Copyright IBM Corp. 1984, 1985

Storage Director Identification

Each storage director should have a physical identifier assigned to ensure positive identification of the storage director that failed if a failure 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. The smaller of the two numbers must be an even number, and it must be assigned to SD1. For example: 02 and 03, 30 and 31 are valid pairs; 05 and 06, 23 and 24 are not valid pairs because they start 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 2, 3, and F, and in sense byte 6 for format 6. It is printed in the heading of the EREP detail report (format 0, 2, 3, F) and summary report (format 6). In EREP reports it appears as the storage director 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.

Subsystem Storage Identification

Each subsystem storage must have an identifier assigned to it. Each 2-character hex identifier is assigned by the CE and must be used only once in each customer location. The subsystem storage identification is in addition to the storage directors identification.

The subsystem storage physical identifier is included in sense byte 20 for sense format F, messages 2 and 5.

Programming

None.

Special Tools/Test Equipment

Needed for installation:

Digital Voltmeter	part 8496278 or equivalent
Maintenance Device	
Metric Tool Set	part 1749235
CTL-I Wrap Cable (E/ME/A Only)	part 2346604

To continue installation go to INST 20.

Note: The 3880-23 fulfills the PTT RFI specifications when installed on raised floors which include a bonded and grounded conductive layer (metal plates or metal foil).

This equipment can violate National Law on Radio Interference if not installed and used in accordance with these instructions. In cases where the interface cables cannot be routed under the raised floor as described above, the user, at his own expense, is required to take the following measures to comply with national law.

A metal plate (minimum size 2 m by 2 m and approximately 2 mm thick) is to be placed under the machine in direct contact with the floor of the building structure. The machine frame is to be bonded near each interface connector gate to this plate by metalic bands (minimum width of 50 mm and approximately 0.5 mm thick or more). The bands must run straight to the plate and be in contact with the frame and the plate for the full width of the band.

In addition, all interface cables are to be shielded with Zipper Tubing and the Zipper Tubing shields clamped directly to the metal plate (connection through wires is not suitable).

Installation Procedures INST 20

Unpack and Locate

1. Inspect the machine for shipping damage. If any damage is found, report it to the IBM branch office immediately, using existing procedures.

2. If the machine was installed before, and was not covered by an IBM maintenance plan (check with your Branch Office), go to INSP 10 and complete the Safety Inspection Procedure before continuing with the next step.

3. Make an inventory of the parts in the shipping group (see parts list in the shipping group box).

4. Remove all tape and packing material used to fasten internal parts during shipment.

5. If this is a dual frame configuration, leave this page and go to INST spc 150.

6. Place the unit in its permanent location.

   The removable panel **2** can be removed to aid in placing the cables into the cable hole **1** in the base of the 3880. (The bolts holding the panel have 10 mm heads.)

7. Install four wheel locks **3** on the 3880 casters.

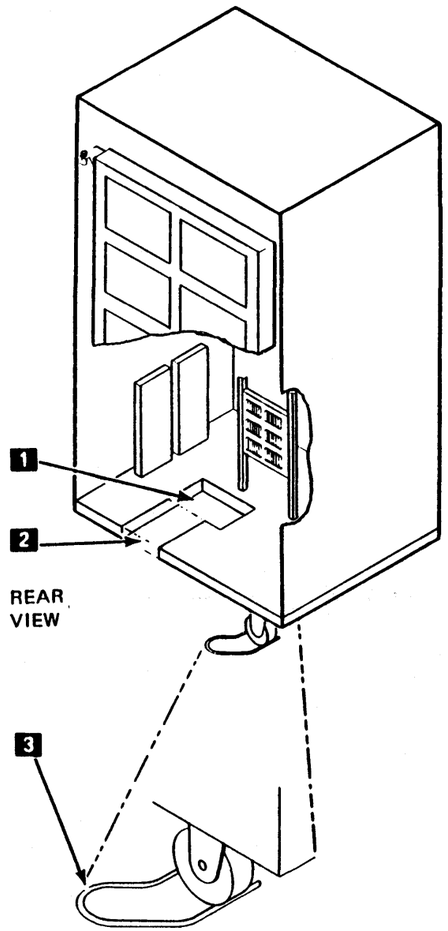
   CAUTION
   Do not connect the 3880 power cord until the 'Safety Checks' are performed on INST 50).

8. Reinstall the removable panel, if removed earlier.

   Note: Do not install the channel or control interface cables until the wrap tests are run.

   The panel has an electrical interlock that prevents powering up unless the panel is in place.

9. Go to INST 30.



© Copyright IBM Corp. 1984, 1985

This page intentionally left blank

© Copyright IBM Corp. 1984, 1985

Installation Procedures

Priority Setting

1. The 3880 is factory wired for high priority in both storage directors for all channels. Wire color can be either violet 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.

Note: For logic board pin locations, see LOC 84 and LOC 85.

Priority Jumper Locations For (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	V4B08 to R4B12
	F	A2	A1	U4D09 to N4B12	N4B10 to Q4B08	U4D10 to Q4B08	U4B08 to U4B09	U4B09 to N4B12	N4B10 to Q4B08	U4B08 to Q4B08	U4B08 to Q4B12
	G	A2	A1	A4D09 to H5B12	H5B10 to E4B08	A4D10 to E4B08	A4B08 to A4B09	A4B09 to H5B12	H5B10 to E4B08	A4B08 to E4B08	A4B08 to E4B12
	H	A2	A1	B4D09 to H4B12	H4B10 to F4B08	B4D10 to F4B08	B4B08 to B4B09	B4B09 to H4B12	H4B10 to F4B08	B4B08 to F4B08	B4B08 to F4B12

© Copyright IBM Corp. 1984, 1985

Installation Procedures

NOTE: Dual Frame installation must begin on page INST 20.

Primary Power

Unit Emergency Switch Release Procedure

Note: Perform this procedure ONLY if instructed 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, use the following steps to release the latch after it has been tripped:

1. Loosen the screw 9 that holds the lockout spring 8 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.

Transformer Taps

1. Determine the voltage at the customer outlet. If it agrees with the voltage tag 3 on the 3880, go to step 1 of Switches and Circuit Protectors.
2. If the customer voltage does not agree with the voltage tags, wire the transformers as shown on the power logic pages. See the Power Logic Page table for the correct pages to be used in this installation (see figure 1).
3. Change the voltage tag to show the correct voltage.

Switches and Circuit Protectors

1. Check that the 3880 circuit protectors at the following locations are in the ON position:
   a. Those at 2 (four places).
   b. Those on the ac power distribution 3.
   c. Those at 5 (Area Axx).

   Also, check that the mainline circuit breaker 401 4 is in the Off position.
2. Set the following switches to the indicated positions (see figure 2). (All switches are located on the power switch panel 7 except as noted.)

POWER SUPPLY	TERMINAL BOARD	LOGIC PAGE NO.
Primary Power Box	13 TB403 10 TB401	YA111* YA111*
Primary Power Box Controls	11 T401 TB	YA115
Power Sequencer and Monitor	14 T301 TB	YA121
DC Bulk Supply	15 TB201	YA131
Area AXX	5 PA02	YC300
Subsystem Storage (Area CXX)	1 TBC01	YC800

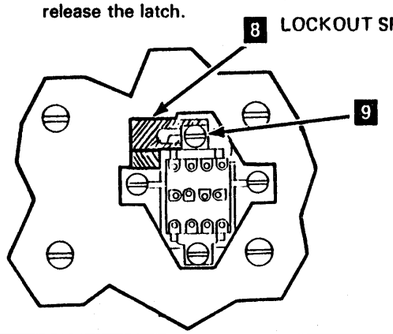
*Not applicable on 50 Hz (Japan) and 60 Hz machines.

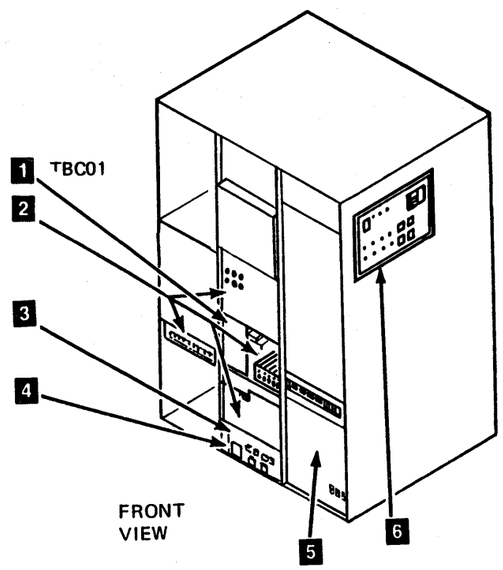
Figure 1. Power Logic Pages

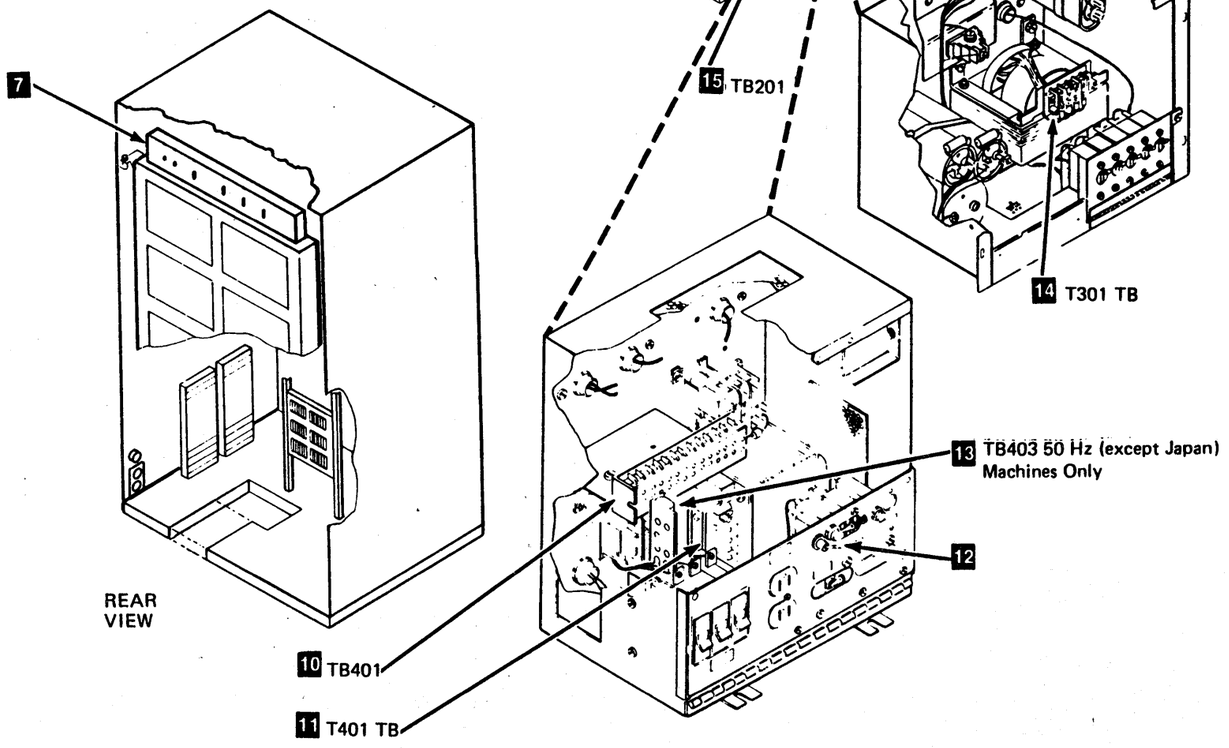
SWITCH NAME	POSITION SETTING
Power Select	Local
Device Power Sequencing	Disable
Storage Director 1	Normal
Storage Director 2	Normal
Unit Emergency (operator panel) 6	Enable
SW401 (CB panel) 12	On

Figure 2. Switch Settings

Note: If the Unit Emergency switch cannot be set to the Enable position, see the procedure on this page to release the latch.







© Copyright IBM Corp. 1984, 1985

Safety Checks

Machine Ground Wire Check

1. Use the CE meter 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 more than 1.0 ohm, determine the cause and correct it before continuing with the installation.

Branch Circuit CB Turned Off Check

1. Have the customer locate and turn off the branch circuit CB.
2. ***DANGER***
   Until step 4 is completed, the outlet case should only be touched with test probes.
3. Check the voltage from the outlet case to the building ground for less than 1.0 Vac. (Start with the meter scale that is correct for normal line voltage checks.)
4. Check the voltage from the ground pin to the building ground for less than 1.0 Vac. The outlet is now safe to touch.
5. ***DANGER***
   Do not touch internal parts (pins and sockets) of the outlet until step 6 is completed.
6. Check the resistance from the ground pin to the outlet case.

   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.

   Note: This note pertains to the following step. All voltage values are to be less than 1.0 Vac.

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).

Branch Circuit CB Turned On Check

DANGER
Do not touch the outlet before meeting the following conditions of steps 1 and 2.

1. Have the customer turn on the CB that supplies voltage to the receptacle.
2. Measure the voltages from the outlet case to the building ground, the outlet case 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 case can be touched. Do not touch the internal parts (pins and sockets) of the outlet.
3. Measure the voltages from the ground pin and the neutral pin (if present) to all phases, and measure the voltages from phase to phase.
4. Have the customer turn the branch circuit CB off before connecting the 3880 power cord into the customer outlet.

Primary Power On

1. Reinstall the removable panel if it has been removed.
2. Connect the 3880 power cable to the ac outlet. Have the customer set the branch circuit CB on. Turn the 3880 mainline circuit breaker, CB401, 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.**

Introduction to MD

The installation steps to be performed next use the maintenance device (MD) and the three diskettes that are sent with the 3880. The diskettes contain:

1. Base Machine Maps
2. Subsystem Storage Maps
3. Power Maps

The following paragraphs give an introduction to the MD and its use with the 3880 after diskette 1 has been inserted into the MD and IPL'ed.

MD Process

The first frames displayed on the MD keyboard/display (K/D) are easily understood, the CE should respond 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 any of the tests, the MD gives instructions for repair, then permits all of the diagnostic programs to be repeated.

If an error occurs and you must run the diagnostics over to verify the repair, the MD will not complete the machine checkout. You must start again with MD option 5.

Attaching The MD

1. Place the MD 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.

   Insert MD diskette 1 into the diskette reader, and follow the instructions inside the MD cover. The diskettes are included in the shipping group.

   Note: Ensure that the latest level MD diskettes are used. Failure to do so can give wrong test results.

4. Press the IPL RESET pushbutton.
5. Press the ENTER key and follow the instructions on the keyboard/display until the following message is displayed.

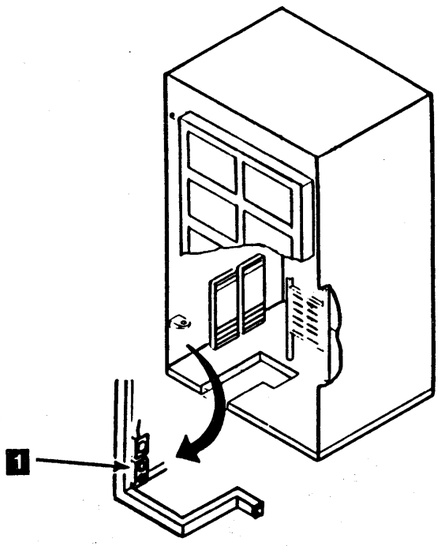
```
ENTER NUMBER
FROM THE FOLLOWING
LIST TO SELECT A
MAINTENANCE ACTION
```

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	5 - Machine checkout
1 - Start repair	6 - Set/read switches
2 - Continue repair	7 - Feature change
3 - Display history	8 - Diagnostic aids
4 - Symptom analysis	9 - SD-SD error analysis

At this point, the initializing process is complete and the MD is ready to be used with the installation procedure.



© Copyright IBM Corp. 1984, 1985

DC Power Checks

Warning: Ensure that the latest level diskette is used in all following procedures. Failure to do so can give wrong test results.

. . . . . .

. . . . . .

. . . . . .

1. Visually inspect all cards and cable connectors that may have become loose during shipment. Reseat any that are loose.

2. Insert the 3880 microcode diskette into the 3880 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.

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. Except for emergency conditions DC power should be dropped only with the Subsystem Power switch on the operator panel.

. . . . . .

. . . . . .

4. If this is a dual frame configuration, a check must be made to see if the Unit Emergency switch (UE) is working correctly. When the UE switch on either 3880 is turned to the off position, the power on both 3880s should drop. If a failure occurs with either UE switch when it is used to drop power, the problem must be corrected before continuing with installation.

5. 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.
   - Cool air is forced up through the power supply 1, 9, 10 and the logic gates 7 and 8.

If any of these conditions 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 can be connected to any ac outlet (other than on the 3880) of the correct voltage if the power supply diagnosis makes it necessary to turn the mainline CB (CB401) on and off repeatedly.

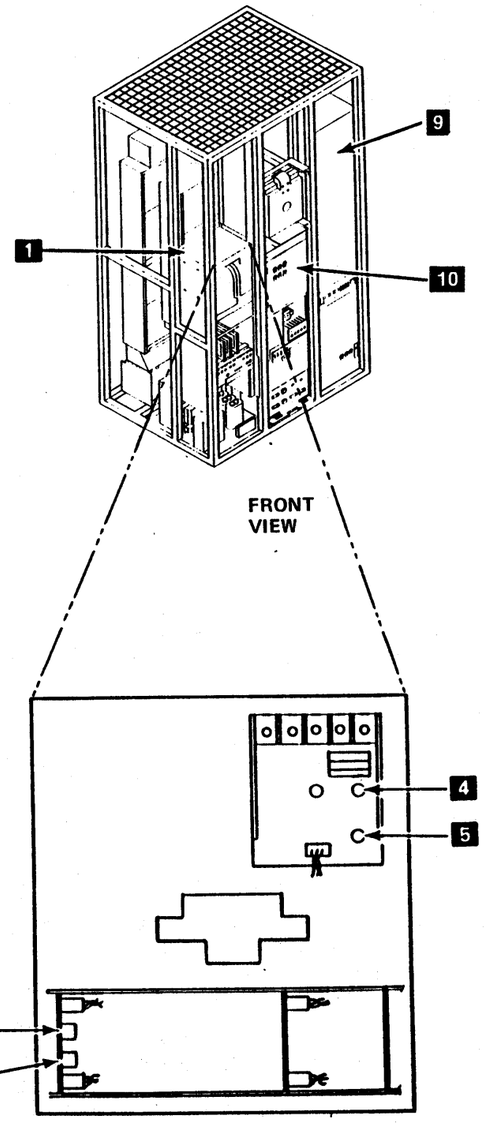
6. Measure the dc voltages at the gate terminal boards 6 with a digital voltmeter. Adjust or repair *only if* a voltage is not between the limits shown. If adjustment is necessary, see PWR 33 for correct test points.

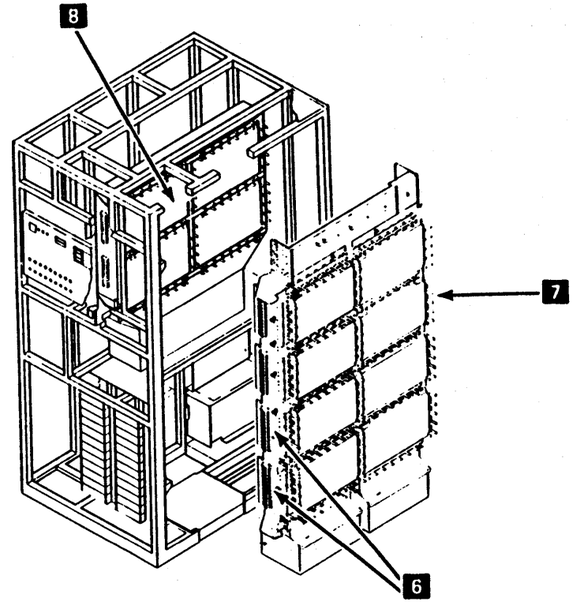
Note: Open the logic gate and place the meter on the floor so that it can be seen while making adjustments at the regulator panel.

All test points are located on gate terminal boards 3 and 4 6 located on the hinge edge of the 01A logic gate. The ground reference point for all voltages is Gate Terminal Board 3-3 (GTB3-3) 6.

VOLTAGE	TEST POINT	ACCEPTABLE LIMITS	IF OUTSIDE LIMITS
+5.00 A	GTB3-1	4.85-5.15	Adjust at (4)
+5.00 B	GTB4-1	4.85-5.15	Adjust at (5)
+6.00 A	GTB3-11	5.76-6.24	Adjust at (3)
+6.00 B	GTB4-11	5.76-6.24	Adjust at (2)

The other power supplies are not adjustable. They are checked by the power sequence monitor.





© Copyright IBM Corp. 1984, 1985

Switch Settings

Warning: When removing or reinstalling crossovers, keep them square with the cards. Tilting them can break the logic card shrouds.

. . . . . .

. . . . . .

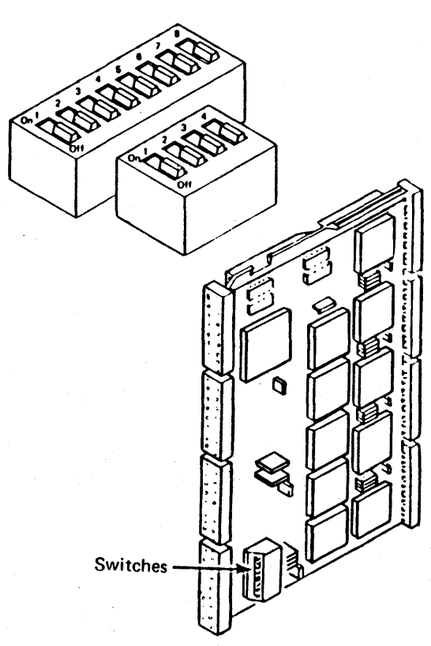
. . . . . .

Channel Speed Control Switches

The switches are located at the edge of the card, in the Z position (TCC), and can be operated with a scriber point without removing the card (see Figure 1).

Note: These switches may be 4 or 8 position (4 or 8 channel machines).

Early Production



Later Production

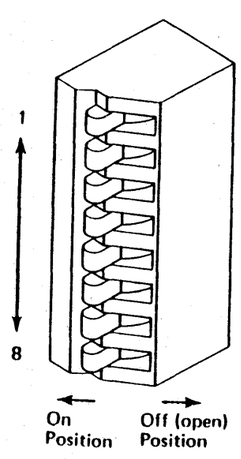


Figure 1. CSC Card 01A-B3/B4 F2 (FASC card for FCA)

1. Power off the 3880.
2. Remove the covers from boards B3 and B4.
3. The switches on the channel sequence cards must be set to indicate to the 3880 whether each attached channel is to operate in a data streaming mode. (The Data Streaming feature must be installed on the processing unit and must be activated if these switches are set on.)

   Note: All channel speed control switches are set to the Off position at the factory.

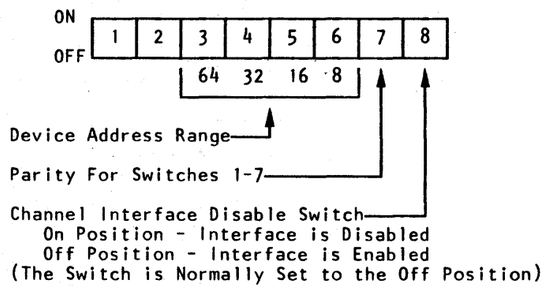
   There is one switch for each channel. For each channel that is to operate in data streaming mode, set the corresponding switch to the On position. Set all other switches to the Off position.

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

Figure 2. Storage Director Address Switch Setting

The address of the storage director is set by using switches on the channel interface (CIF) card. The switch settings contain the address of the storage director and reflects the address range, or the quantity, of the storage devices that can be attached (8, 16, 32, or 64).

The purpose of each switch is shown in the following diagram.



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.

Note: For address switch settings see the charts on the following page.

For multi-channel 3880s, switches 4, 5 and 6 must be set the same on all CIF cards in each storage director. If they are not the same, the 3880 cannot enter the wait state after an IML.

On machines with the Four Channel Switch, Additional feature, 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. Remove the board covers and crossovers as necessary.

See Figure 3.

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

Figure 3. CIF Card Locations

Notes:

1. When addressing two 3880s in a dual frame configuration, be aware that a 3880 subsystem is made up of SD 1 of frame 1 and SD 2 of frame 2.
2. The 32 address chart on the following page, is the only one that can be used with the Model 21.

(Storage director address switch settings continued on next page)

© Copyright IBM Corp. 1984, 1985

Storage Director Address Switch Setting (Continued)

Warning: When removing or reinstalling crossovers, keep them square with the cards. Tilting them can fracture the logic card shrouds.

1. Ensure that device controller addresses are set as shown in the following tables for the address ranges assigned.

* Those 8-address ranges marked with an asterisk must not be used for 3380 devices.

SD1=240
SD2=120

8 ADDRESSES		
RANGE	SWITCHES 12345678	3380 CONTROLLER ADDRESSES
00-07	00000100	0
08-0F	00001110	*
10-17	00010110	1
18-1F	00011100	*
20-27	00100110	0
28-2F	00101100	*
30-37	00110100	1
38-3F	00111110	*
40-47	01000110	0
48-4F	01001100	*
50-57	01010100	1
58-5F	01011110	*
60-67	01100100	0
68-6F	01101110	*
70-77	01110110	1
78-7F	01111100	*
80-87	10000110	0
88-8F	10001100	*
90-97	10010100	1
98-9F	10011110	*
A0-A7	10100100	0
A8-AF	10101110	*
B0-B7	10110110	1
B8-BF	10111100	*
C0-C7	11000100	0
C8-CF	11001110	*
D0-D7	11010110	1
D8-DF	11011100	*
E0-E7	11100110	0
E8-EF	11101100	*
F0-F7	11110100	1
F8-FF	11111110	*

16 ADDRESSES		
RANGE	SWITCHES 12345678	3380 CONTROLLER ADDRESSES
00-0F	00001000	0
10-1F	00011010	1
20-2F	00101010	0
30-3F	00111000	1
40-4F	01001010	0
50-5F	01011000	1
60-6F	01101000	0
70-7F	01111010	1
80-8F	10001010	0
90-9F	10011000	1
A0-AF	10101000	0
B0-BF	10111010	1
C0-CF	11001000	0
D0-DF	11011010	1
E0-EF	11101010	0
F0-FF	11111000	1

32 ADDRESSES			
RANGE	SWITCHES 12345678	3350 CONTROLLER ADDRESSES	3380 CONTROLLER ADDRESSES
00-1F	00010000	0,2#	0,1
20-3F	00110010	0,2#	0,1
40-5F	01010010	0,2#	0,1
60-7F	01110000	0,2#	0,1
80-9F	10010010	0,2#	0,1
A0-BF	10110000	0,2#	0,1
C0-DF	11010000	0,2#	0,1
E0-FF	11110010	0,2#	0,1

#Controller(s) must be plugged for address 0 or 2.
Attached devices addresses must be plugged for 0 and 1 or 0, 1, 2, and 3.

© Copyright IBM Corp. 1984, 1985

Storage Director Physical ID Switches

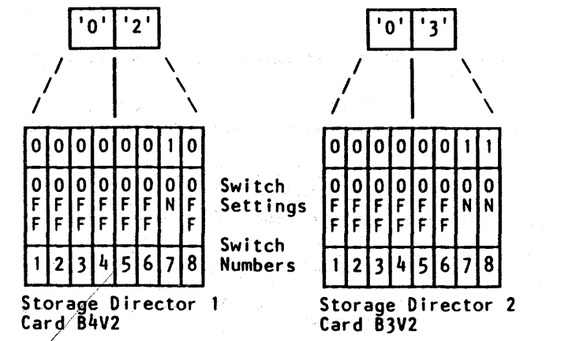
See the table on INST 10 for the two storage directors physical ID numbers assigned to this 3880.

1. Convert the hex numbers to their binary equivalents.

04 SD1 [| | | | | 1 | | |]

05 SD2 [| | | | | 1 | 1 |]

2. Set the switches on the device counter (DCT) cards to represent the binary code developed in step 1. See the following example.



3. Reinstall all cards and crossovers removed while setting the switches. See the Crossover Location charts in MDM Volume 30.

4. Reinstall the storage director board covers that were removed earlier.

Switch Settings (Continued)

Subsystem Storage Physical ID and Size Switches

See the table on INST 10 for the subsystem storage ID number and size assigned to this subsystem storage.

__ 1. Remove the CMC1 card (01B-A1P2)

__ 2. Set the switches for the assigned ID number.

Note: Subsystem storage ID must be different for each subsystem storage within a customer installation. This ID is contained in sense byte 20 of Format F, Messages 2 and 5.

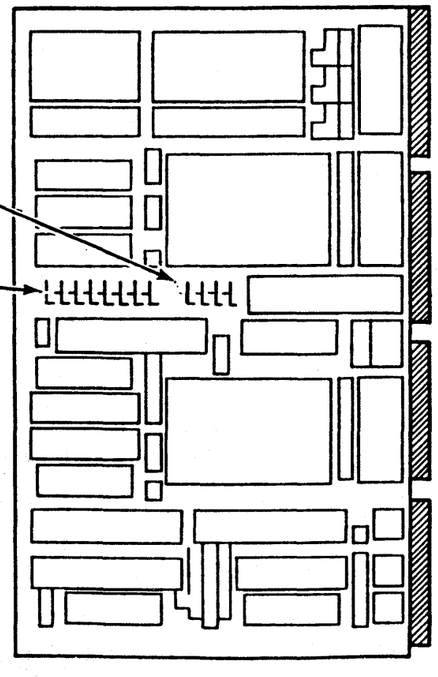
__ 3. Set the switches for the subsystem storage size.

__ 4. Reinstall covers that were removed.

Storage Size (MB)	Switch Position 1 2 3 4
8	0 0 0 1
16	0 0 1 0
32	0 1 0 0
48	0 1 1 0
64	1 0 0 0

Switch Position	1	2	3	4	5	6	7	8
Subsystem Storage ID	8	4	2	1	8	4	2	1

Figure 1. CMC1 Card Switches



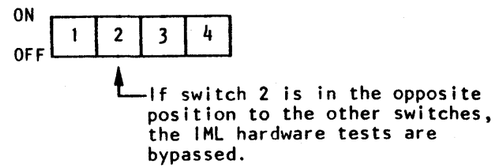
© Copyright IBM Corp. 1984, 1985

3880 Diskette Load Control Switches

The 3880 functional microcode diskette contains both functional and diagnostic microcodes for the 3880 and for the attached devices. It must be in place in the diskette reader when the 3880 is operating.

The diskette load control is located on the maintenance (MNT) card at 01A-B3/B4 R2 in each storage director.

These control switches select the functional code that is loaded into the 3880 control store from the diskette. A label on the 3880 diskette describes the setting of these switches for the configuration on any 3880.



The specific part of the 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.

Note: All load control switches are set to the On position at the factory. Remove cards only if removal is necessary to set switches to the Off position.

For the 3880 Models 21 and 23, the switches on the maintenance card must be on.

Subsystem Machine Checkout, Electronic Wrap

__ 1. Plug the MD signal cable into the MD connector on the 3880 near the MD power outlet.

__ 2. Turn on 3880 power.

__ 3. Select MD option 6 on the MD keyboard/display.

__ 4. Read and display the settings of the diskette load control switches, the storage director's address switches, the storage director physical ID switches, the subsystem storage physical ID switches, and the subsystem storage size switches to ensure they are correct.

If a machine failure prevents displaying any of the switch settings, go to step 4 and perform the 3880 checkout procedure. Switch settings can be checked again after the failure has been corrected.

__ 5. Select MD 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/Disable switches removed from operator panel), see Channel Enable/Disable Without Switches on INST 100.

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 need additional special tests, the following are typical. All tests made available by the MD must be run on **both** storage directors.

- Storage Refresh test
- CTL-I Wrap test
- CHL-I Tailgate wrap test (see note)
- Operator Panel Lamp test
- Subsystem storage

Note: 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 is a test of the internal 3880 cables.

If an error occurs during any of the tests, the MD gives instructions for repair, then permits all of the diagnostic programs to be repeated.

If an error occurs and you rerun the diagnostic to verify the repair, the MD will not complete the machine checkout. You must start again with MD option 5.

If no error is found, the MD displays:

```
DO YOU WANT TO
RUN OLTS?
.
.
```

All 3880 stand-alone 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 100 to attach device and channel cables.

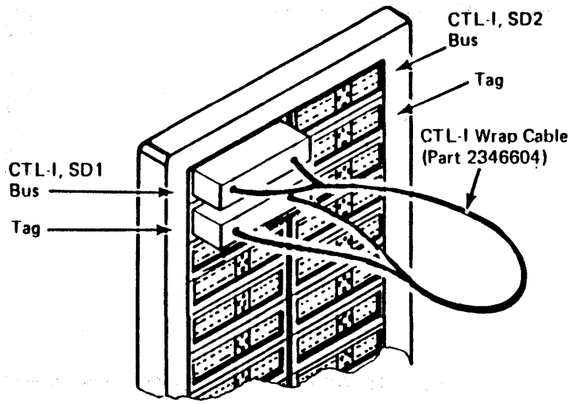


Figure 1. CTL-I Wrap Connection Shown for SD1, on 3880 Model 21

Connecting The CTL-I Wrap Cable, Model 21

The control interface (CTL-I) wrap cable (part 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 tool is disconnected.

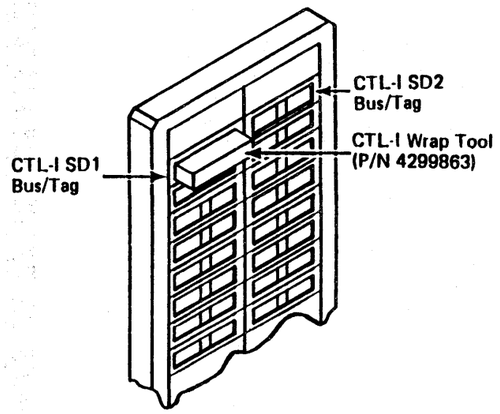


Figure 2. CTL-I Wrap Connection Shown for SD1, on 3880 Model 23

Connecting the CTL-I Wrap Tool, Model 23

The control interface wrap tool (part 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 tool is disconnected.

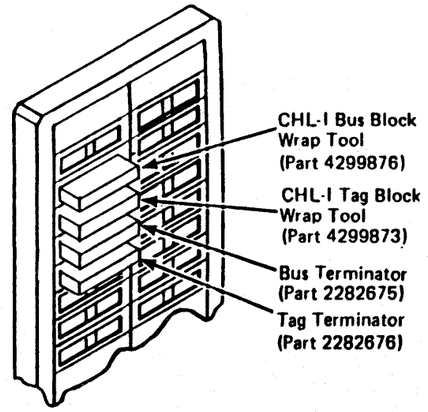


Figure 3. CHL-I Tailgate Wrap Connection Shown for SD1, Channel A

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 (part 4299876 and part 4299873).

__ 1. Connect the block wrap tool, as shown in Figure 3. See INST 100 for connector locations.

Ensure blocks are installed, as instructed by the MD display.

__ 2. Insert channel bus and tag terminators (part 2282675 and part 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 problem can be in the board tailgate cables, the tailgate connectors, the terminators, or the wrap tool itself.

© Copyright IBM Corp. 1984, 1985

Cable Installation

__ 1. Turn the power off at the operator panel.

__ 2. Check all tailgate connectors for bent pins.

__ 3. Plug the bus and tag terminators (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.

__ 4. Connect the channel interface cables. If you are installing a Model 23, go to INST 105. If you are installing a Model 21, continue with step 5.

__ 5. 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 140 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, part 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. Connectors D1 through D4 are for controllers connected to storage director 1; D5 through D8 are for controllers connected to storage director 2.

> **Note:** All device power cable connectors not used must have a dummy plug, part 4797247, inserted (this plug connects pins 3 and 4). The 3880 is shipped with eight plugs in place.

__ 8. If the remote switch feature is installed, connect the remote switch cables from the host console to the remote switch cable connectors **1** in the 3880.

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 storage director desired (see Figure 3).

To disable: Insert a jumper wire between the disable pin and the ground pin for the correct channel and storage director (see Figure 3).

	STORAGE DIRECTOR 1	STORAGE DIRECTOR 2	
CTL-I	BUS	BUS	CTL-I
	TAG	TAG	
	BUS IN	BUS IN	
	TAG IN	TAG IN	
CHL-I CHANNEL A	BUS OUT	BUS OUT	CHL-I CHANNEL A
	TAG OUT	TAG OUT	
	BUS IN	BUS IN	
	TAG IN	TAG IN	
CHL-I CHANNEL B	BUS OUT	BUS OUT	CHL-I CHANNEL B
	TAG OUT	TAG OUT	
	BUS IN	BUS IN	
	TAG IN	TAG IN	
CHL-I CHANNEL C	BUS OUT	BUS OUT	CHL-I CHANNEL C
	TAG OUT	TAG OUT	
	BUS IN	BUS IN	
	TAG IN	TAG IN	
CHL-I CHANNEL D	BUS OUT	BUS OUT	CHL-I CHANNEL D
	TAG OUT	TAG OUT	

MODEL 21
Tailgate viewed from inside the machine.

Figure 1. Connector Locations For 2- or 4-Channels (TCA)

	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	
CHL-I CHANNEL A	BUS OUT	BUS OUT	CHL-I CHANNEL E
	TAG OUT	TAG OUT	
	BUS IN	BUS IN	
	TAG IN	TAG IN	
CHL-I CHANNEL B	BUS OUT	BUS OUT	CHL-I CHANNEL F
	TAG OUT	TAG OUT	
	BUS IN	BUS IN	
	TAG IN	TAG IN	
CHL-I CHANNEL C	BUS OUT	BUS OUT	CHL-I CHANNEL G
	TAG OUT	TAG OUT	
	BUS IN	BUS IN	
	TAG IN	TAG IN	
CHL-I CHANNEL D	BUS OUT	BUS OUT	CHL-I CHANNEL H
	TAG OUT	TAG OUT	

MODEL 23
Tailgate viewed from inside the machine.

Figure 2. Connector Locations For Four Channel Switch, Additional

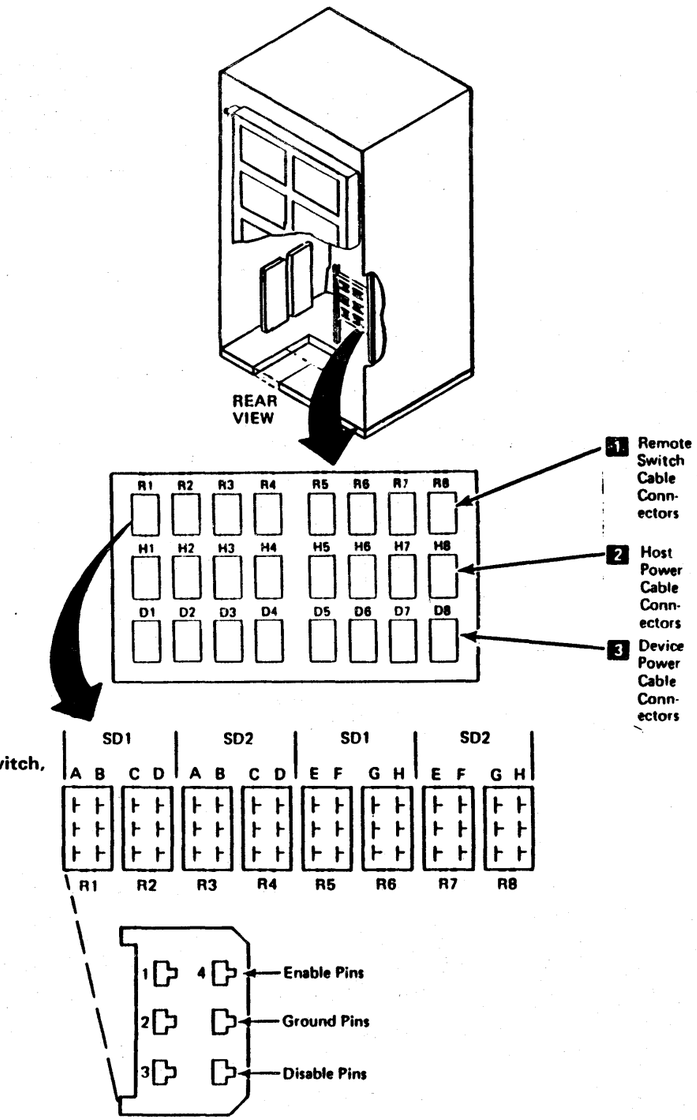


Figure 3. Remote, Host, and Device Cable Connectors

© Copyright IBM Corp. 1984, 1985

3380 CTL-I Cable Installation

If the cable clamp **1** (see Figure 1) is installed in the cable hole in the 3880, perform this procedure. If there is no cable clamp **1**, return to step 5 on INST 100.

Locate the 3380 CTL-I tag and bus cables (two cables for a 3880 Model 23). Compare the 3880 end of the 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 cables in the 3880 tailgate.

Select one of the following tools to remove the insulation from the 3380 CTL-I tag and bus cable.

- A knife, Part 452561 (this is the preferred tool)
- A pen knife or a pocket knife
- A pair of diagonal cutters (CE tool kit)

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 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 a knife (part 452561), a pen knife, or a pocket knife to make a cut in the insulation at the top of the loop in the 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 done 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 made on the 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 cables.
7. Install the cables in the 3880 tailgate.
8. Clamp the cables to the 3880 frame at **1** (see Figure 1), using the clamp, spacers, washers, and screws supplied. Tighten the screws enough to hold the cables tightly, but do not crush the wires in the cable.
9. Return to step 5 on INST 100.

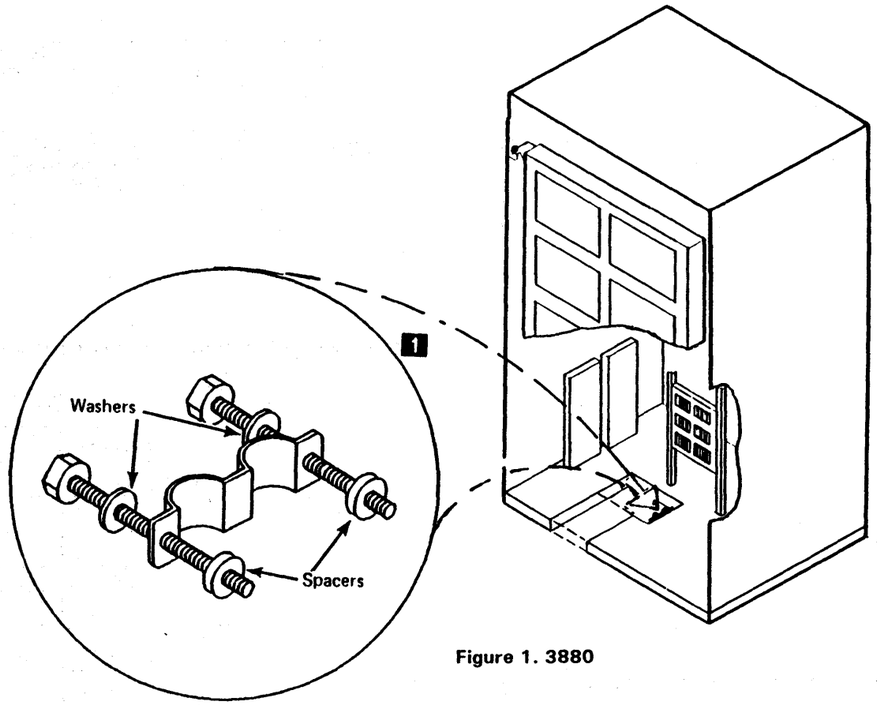


Figure 1. 3880

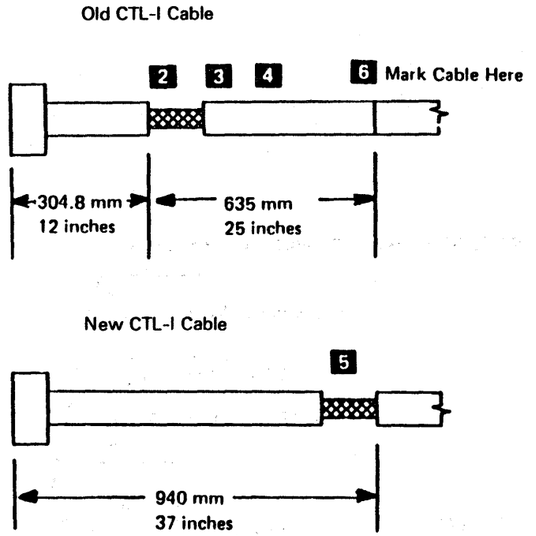


Figure 2. 3380 CTL-I cable

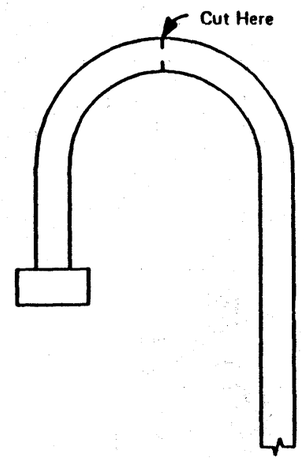


Figure 3. Cable Loop

© Copyright IBM Corp. 1984, 1985

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) in the CPU or channel is set for unshared 3880 addresses. System performance can be seriously degraded if 3880 addresses are set to share UCWs. Verify that the host CPU or channel has the necessary unshared UCWs. See the CPU or channel maintenance manuals.
3. Verify that the customer has performed a new system generation (SYSGEN) for the addresses used.
4. Ensure that a configuration data set card has been prepared for each storage director and each attached device (see PROG 5 in this manual for more information).

Test Procedure

__ 1. Set power control switches on all the subsystem storage units to the Power On or Enable position.

__ 2. 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
Subsystem Storage Diagnostic Mode	
Port 1	Diagnostic
Port 2	Diagnostic

__ 3. Turn on the power to the 3880 at the operator panel.

__ 4. Perform the following steps to ensure that the power control cables are installed correctly and that all power control circuits are operating correctly.

- 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

__ 5. Return to the MD and run OLTs as instructed.

Note: Device diagnostics are on the 3880 functional microcode diskette and are immediately available for use.

If no error is found, the MD displays:

```
NO FAILURE DETECTED
BY DIAGNOSTIC
PROGRAMS
.
```

__ 6. Press the ENTER key; the MD displays:

```
DO YOU WANT TO END
THIS CALL
.
.
```

__ 7. Respond no to the MD question. The MD returns to the option list.

__ 8. Select option 9 shown on the MD display and run the SD-SD error analysis.

__ 9. Select option 0 shown on the MD display and follow the MD instructions for end-of-call.

__ 10. Remove the diskette from the MD and place it in the storage pocket inside the rear cover of the 3880.

© Copyright IBM Corp. 1984, 1985

After Installation

Record Updating

__ 1. Write all the correct switch settings and other storage control information on the labels on the inside of the rear cover 2.

__ 2. Locate the sheet of ID hex labels 3 (part 2342978) in the 3880 shipping group. Select the characters to represent the physical identifier numbers assigned to the storage directors and subsystem storage. 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.

__ 3. Locate the label holders (part 4797298) in the 3880 shipping group and attach them to the operator panel as shown 5, and on the label holder reference drawing (part 2342864, 3880 shipping group).

__ 4. Select the characters from the ID hex label sheet (part 2342978) to represent the starting address for each channel on both storage directors and attach them to the correct label holders.

__ 5. Complete all installation records and report that the installation is complete to your Customer Service Co-ordinator.

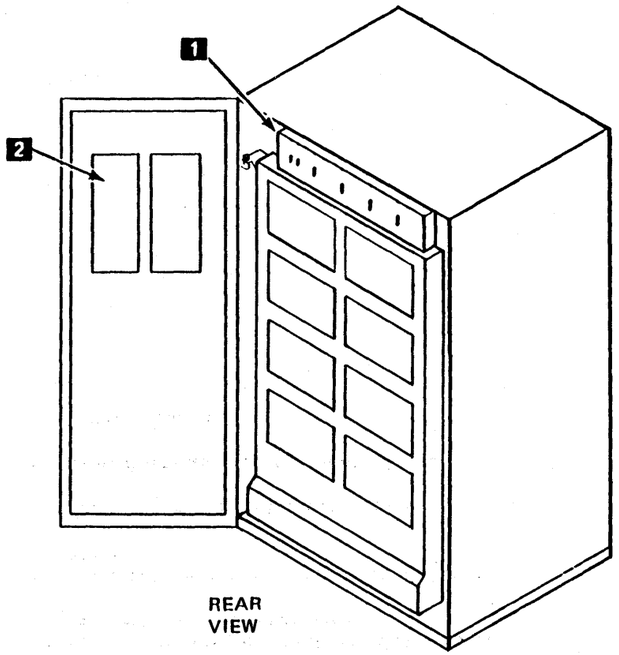
__ 6. Keep these installation procedures in the Maintenance Information Manual for future reference.

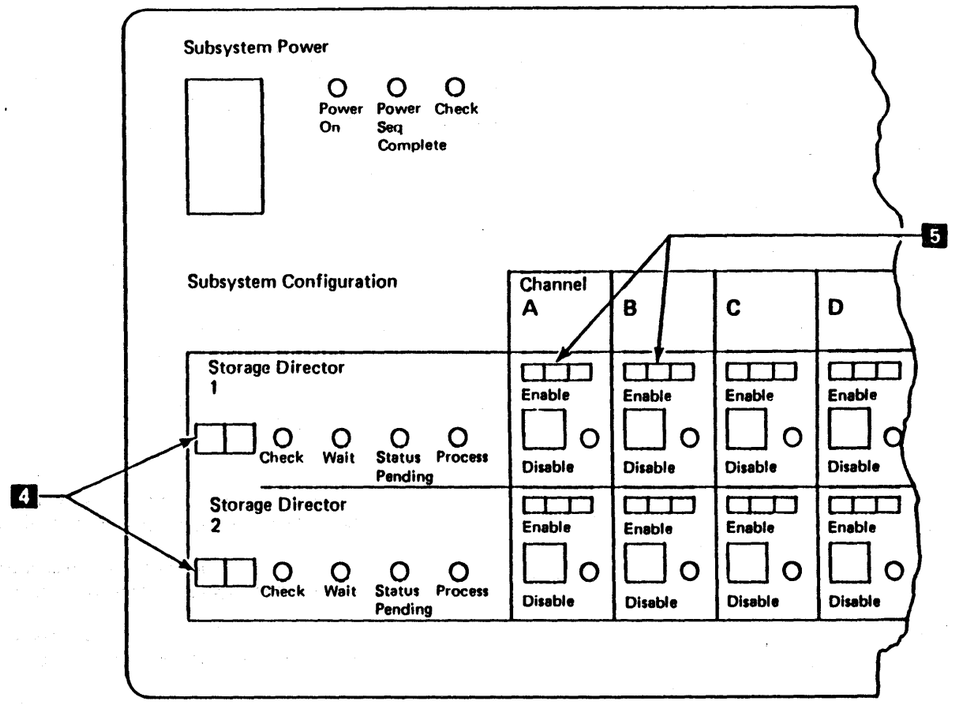
__ 7. Update the Account Records to include this installation.

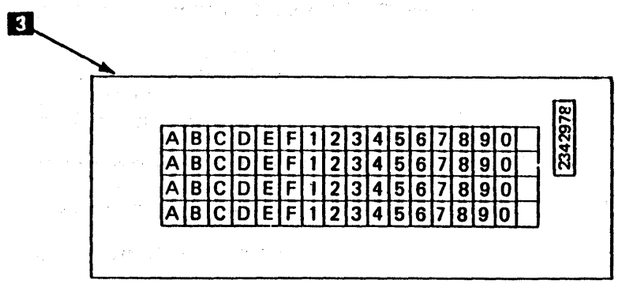
__ 8. If this is the first model and type of the 3880 in this location, order one set of hard-copy documentation. Use the FE Document Request Form that is shipped with the microfiche.

Disposition of Shipping Material

Dispose of the material locally.







© Copyright IBM Corp. 1984, 1985

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 putting the system back in 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, call the IBM Sales Office to ensure that the packing materials and instructions have been ordered. To permit immediate shipment of the 3880 after it has been removed from the system, the packing materials should be immediately available.

The CE should 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 knows that the 3880 is 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.

__ 4. **Warning:** Before performing steps 5, 6, and 7, stop the channel(s).

__ 5. Disconnect the power control cables (to both the host system and devices) from the cable connectors in the 3880.

__ 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 dummy plugs (part 2282264) at the host in place of the power control cables. This makes it possible to start the system again. Dummy plugs (part 4797247) should also be inserted in all positions of the device power cable connectors of the 3880 before relocation.

__ 8. Disconnect the CTL-I bus and tag cables from the 3880 tailgate.

__ 9. 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 reinstalled 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
Port Switch	Diag

2. Connect the MD power cable to the 3880 and press the Maintenance Power On switch to the Power On position.
3. Insert the MD diskette and connect the signal cable to the 3880.
4. Select option 5 on the MD keyboard/display.
5. Run all wrap tests as instructed by the MD display. For instructions on how to connect wrap cables, see INST 90.
6. Repair any failures found 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.

Interface Termination

See Cable Removal, step 6.

Disassemble

Note: If this is a dual frame configuration, go to INST spc 160.

__ 1. Pull the power cable up and out of the cable hole in the floor.

__ 2. Remove the removable panel located beside the cable hole in the base of the 3880.

__ 3. Roll the 3880 away from the cable hole in the floor.

__ 4. Reinstall the removable panel.

__ 5. 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 (part 7357959) that must be done inside the machine and close the covers.
2. Instruct the customer to complete the external packing and prepare the machine for shipment as described on 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	PART NUMBER	QTY
Caster Lock	280336	4
CHL-I Block Wrap Tool Bus	4299876	1
CHL-I Block Wrap Tool Tag	4299873	1 1
CTL-I Terminator Mod 21	2282675	4
CTL-I Wrap Cable Mod 21	2346604	1
CTL-I Terminator Mod 23	2759398	2
CTL-I Wrap Cable Mod 23	4299863	1
3880 Diskette		1
MD Diskettes Diskette 1 Diskette 2 Diskette 3	 4747856 4747857 4747858	 1 1 1
Select Out Jumper Card 2-channel 3880 4-channel 3880 8-channel 3880	 4514308 2679478 2679478	 1 1 2
Maintenance Library Manuals		6

Record Updating

1. Complete all necessary removal records and report that the removal is complete to the branch office.
2. Update the Account Records to include this removal.

© Copyright IBM Corp. 1984, 1985

Dual Frame Configuration (Model 23 Only)

Two 3880s cannot be installed in a dual frame configuration unless the following restrictions are met.

- Be the same Model
- Operate with the same functional microcode (same EC level)

Locate

1. Perform the following on both 3880s:

   Remove the end cover and all mounting hardware opposite the operator panel.

   Note: For leased machines, discard locally the covers and mounting hardware.

   For customer owned machines, save the covers and mounting hardware. These parts belong to the customer.

Fastening the Machines Together

__ 1. Locate the three dual frame clamps and ground strap **6** in each 3880. (Only five of six clamps will be used. Leave the extra clamp on one of the 3880 frames in its shipping position.)

__ 2. Install five clamps inside the frame **1** so that there is no interference with the covers.

__ 3. Take the dual frame ground strap **5** from one 3880 and connect it to the same point on the other machine. Keep the extra ground strap.

Connecting the Dual Frame Cables

__ 1. Locate the two wire cable (part 4479298) that is connected to the Unit Emergency (UE) switch **2** terminals 8 and 9. Route the cables from each 3880 to the other 3880, **3** and **4**. Connect the black wire to terminal 11 and the yellow wire to terminal 12, in each 3880 **7**.

__ 2. Reverse the wires on the UE switch **7**, terminals 5 and 8, in both 3880s. One wire of the dual frame UE cable (part 4479298) should now be connected to terminal 5.

__ 3. Disconnect the following cables in each 3880:

   01B-A1B2

   01B-A1B3

   01B-A1B4

   01B-A1B5

   Release the cable retainers and route the cables to the other 3880 as shown **8**, **9**.

__ 4. Reconnect the cables, in both 3880s, from the opposite 3880 into:

   01B-A1B2

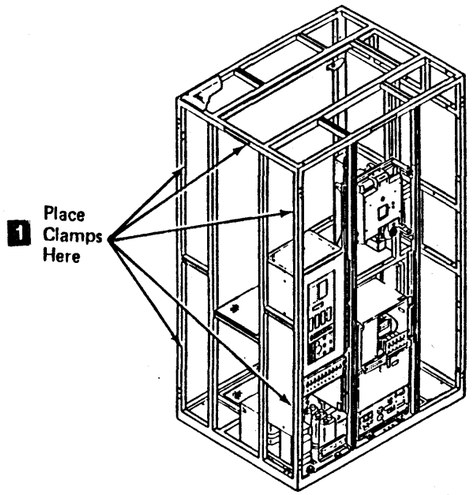
   01B-A1B3

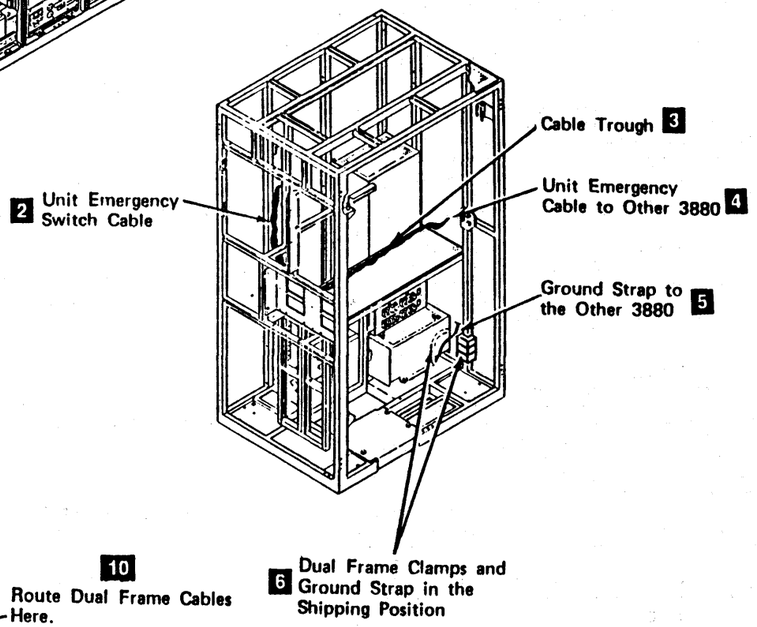
   01B-A1B4

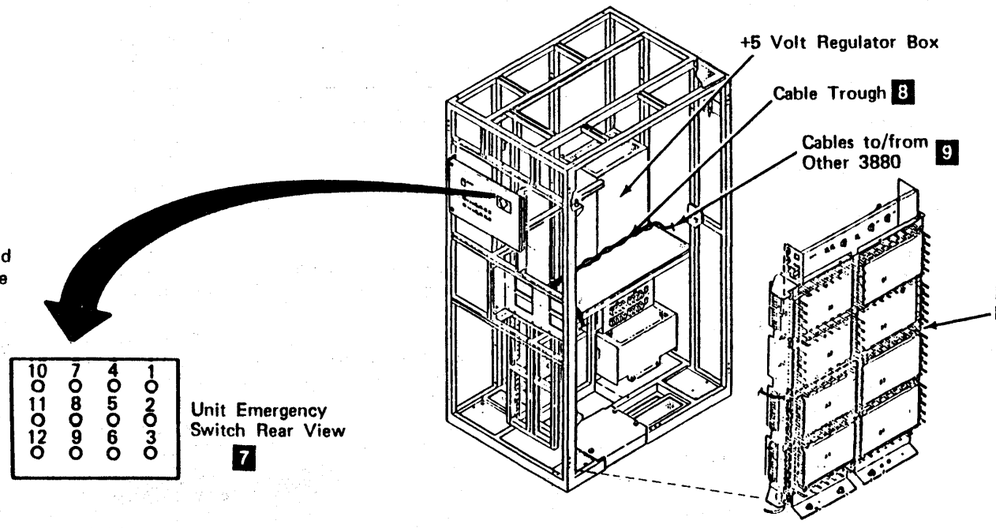
   01B-A1B5

__ 5. Route dual frame cables **10**. Fold any excess cable into the cable trough **8**. Reinstall all cable retainers.

__ 6. Return to INST 20, step 6.







10	7	4	1
11	8	5	2
12	9	6	3

Unit Emergency Switch Rear View 7

© Copyright IBM Corp. 1984, 1985

Dual Frame Removal Procedures

Note: For World Trade countries, refer to WT General CEM 257, General Internal Packaging Instructions for Replant Machines.

If the covers that were removed for the dual frame configuration were not saved locally, they can be obtained by RPQ. (Have your customer call the IBM Marketing Representative). Each RPQ supplies one cover and the mounting hardware. It is not necessary to obtain an RPQ for machines that are being returned to the factory.

The RPQs are:

1. RPQ 8B1000 - No charge for IBM owned machines
2. RPQ 8B1001 - There is a charge for customer owned machines

Removal of the Dual Frame Cables

__ 1. Reverse the wires on the Unit Emergency (UE) switch 7, terminals 5 and 8, in both 3880s. One wire of the dual frame UE cable (part 4479298) should now be connected to terminal 8.

__ 2. Disconnect the wires going to the UE switch 2 terminals 11 and 12 in both 3880s. Pull this cable 4 (part 4479298) back into the other 3880 and tape the cable below the UE switch.

__ 3. Disconnect the following cables in each 3880:

01B-A1B2

01B-A1B3

01B-A1B4

01B-A1B5

__ 4. Release the cable retainers and pull the cables back into the other 3880.

__ 5. Reconnect the cables in each 3880 to the following locations:

01B-A1B2

01B-A1B3

01B-A1B4

01B-A1B5

__ 6. Fold the excess cable into the cable trough behind the +5 volt regulator box 3.

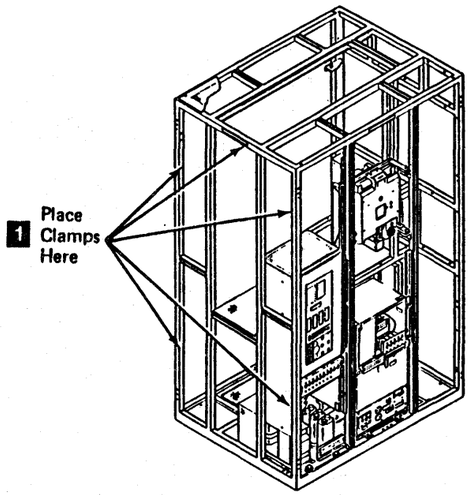
__ 7. Reinstall all cable retainers that were removed earlier.

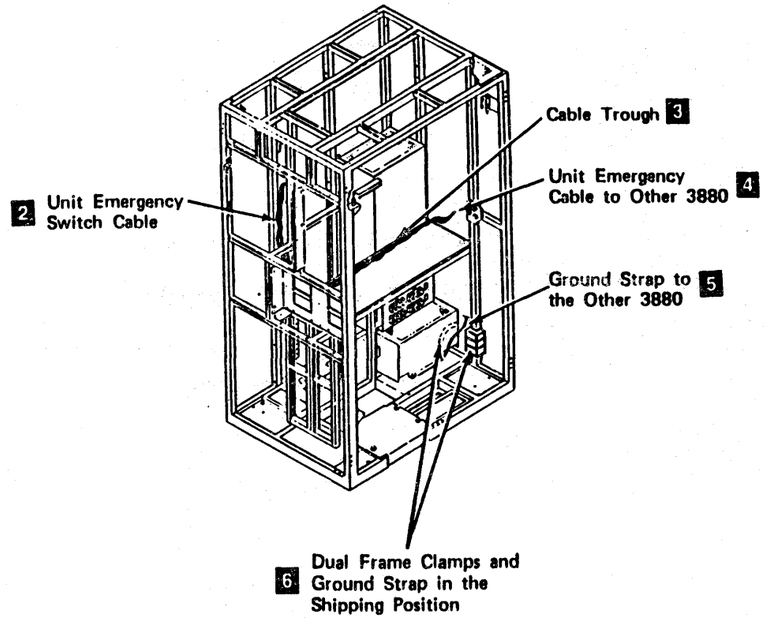
__ 8. Remove the ground strap from one of the 3880s 5.

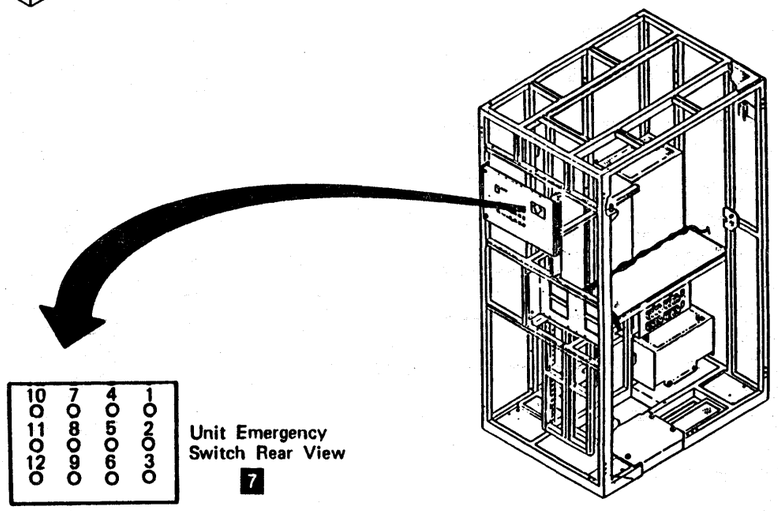
__ 9. Remove five clamps from the frame 1. Return the clamps and ground straps to their shipping positions 6.

__ 10. Reinstall the cover, hinges, and striker plates.

__ 11. Return to step 1 under DISASSEMBLE on INST 140.







3880 MIM							
	Seq AW0001	PN 6315680 19 of 19	881143 13 Jan 84	881216 15 Aug 84	A15621 01 Apr 85		

© Copyright IBM Corp. 1984, 1985

Safety Inspection Procedure

Contents of This Section

Safety Inspection 10
Requirements Before Starting 10
Guidelines 10
Reference Items 10
Exterior Checks 20
Machine Stability Checks 30
Power Distribution Capacitor Checks 40
Power Distribution Terminal Board Checks 60
Internal Checks 70
Grounding 80
Summary of Warning Labels 90
Power Sequencing 95

© Copyright IBM Corp. 1984, 1985

Contents INSP 1

Safety Inspection Procedure INSP 10

Safety Inspection

The purpose of the safety inspection procedure is to verify the safe condition of the 3880 Storage Control. If the inspection indicates the safety of the machine is not acceptable, it must be made acceptable before IBM service can be performed.

A safety inspection is needed:

- When an IBM machine is considered for an IBM service agreement.
- When IBM per-call service is requested and the machine is not being serviced by IBM.
- As part of an alteration and attachments review on any IBM machine on lease, rental, service agreement, or per-call service.
- On any machines that are relocated.

If any of the above four conditions are met, perform the following safety inspection procedure.

Requirements Before Starting

Warning: Assume that a safety hazard is present. The machine must be powered off before performing this inspection. Disconnect all power connections to the machine.

Read the complete Safety Inspection Procedure before performing any steps.

You must have completed the *Electrical Safety Training Course For IBM Customer Engineers* (self study course 77170 or current level).

Guidelines

The purpose of this Inspection Procedure is to aid you in identifying possible unsafe conditions on the machine you are inspecting. Any machine that has not been on an IBM Maintenance Agreement must be inspected for safety hazards. Each machine, at the time of manufacture, had needed safety items installed to protect the owner/operators and service personnel from injury. This checklist addresses those items. Use good judgement in identifying possible safety conditions not covered by this procedure.

If any unsafe conditions are found, determine if you can safely continue this procedure before correcting the problem.

Consider these examples of conditions and the hazards they present:

- **Electrical:** A frame that is not grounded can cause a serious or fatal electrical shock.
- **Explosives:** Bulging capacitors can cause severe injury if they explode.
- **Mechanical:** Missing belt covers can be the cause of injuries.

Reference Items

1. The latest machine history should be with the machine. If the latest history is not available, continue with this procedure and arrange to obtain a copy for future reference.
2. The *IBM Safety Handbook*, S229-8124 should be available.
3. The *IBM Input/Output Equipment Installation Manual Physical Planning*, GC22-7064 should be available.
4. A complete set of the Maintenance Library should be available:
   - MIM Volume 10
   - PCM Volume 20 (microfiche or hardcopy)
   - MDM Volume 30
   - ECM Volume 45
   - MSM Volume 60
   - LRM Volume 70
5. The latest ECA listing for this machine type and model should be available.

© Copyright IBM Corp. 1984, 1985

External Checks

The remainder of this procedure makes it necessary that the power be completely removed from the machine.

Warning: Proceed only if the machine power is off and the line cord is disconnected.

__ 1. Ensure that all outside covers are installed and not damaged.

__ 2. Check that all latches and hinges are mechanically sound and operating correctly.

__ 3. Ensure that the power cord is not frayed or damaged.

__ 4. Check that the correct approved power plug is installed (U.S. only).

> **Note:** See the *IBM Input/Output Equipment Installation Planning Manual - Physical Planning* for the correct power plug.

__ 5. Check that the strain relief on the power cord, located on the rear of the primary power box, is securely fastened.

__ 6. Check the transformer taps to see that they correspond to the power label.

© Copyright IBM Corp. 1984, 1985

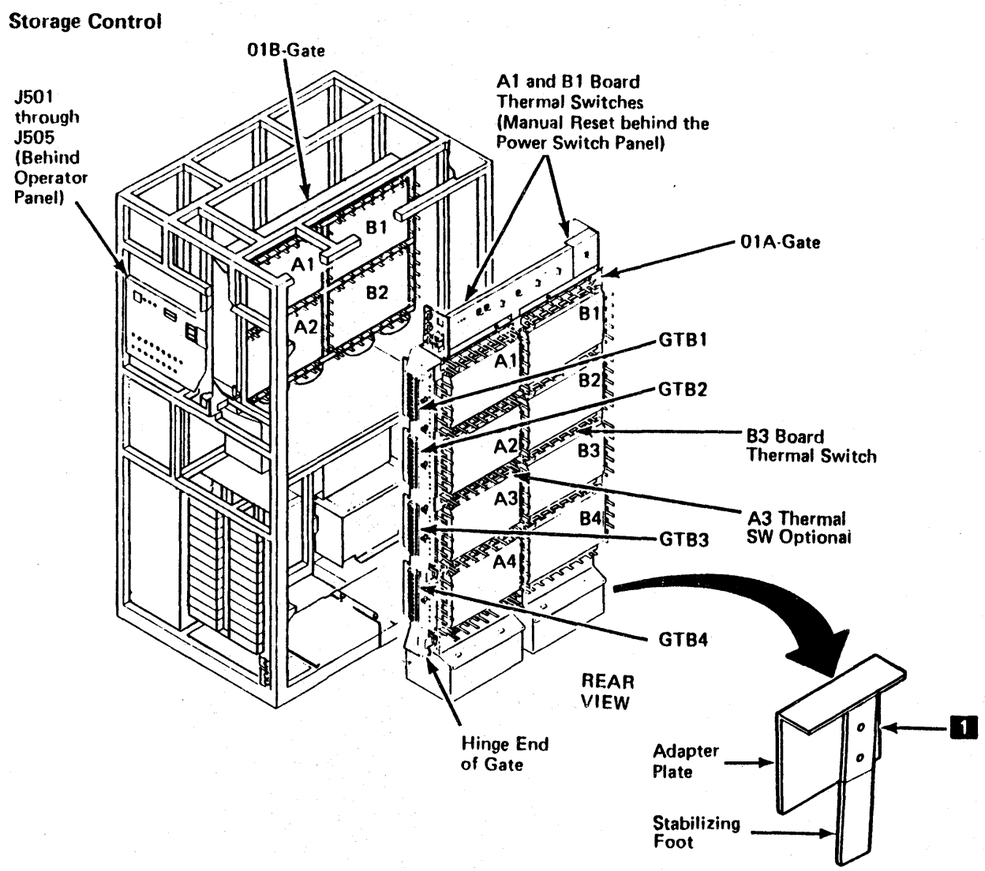
Safety Inspection Procedure INSP 20

Machine Stability Checks

__ 1. Check the machine for loose, broken, or binding castors.

__ 2. Check the foot on the bottom of the A-gate for correct operation 1.

Note: The foot should not interfere with the A-gate opening and closing. The foot should lock in the down position when the A-gate is open and any weight is put on it (see CARR 10).



© Copyright IBM Corp. 1984, 1985

Power Distribution Capacitor Checks

__ 1. Inspect the following electrolytic capacitors for any swelling or physical damage. Also check that the capacitors which need bleeder resistors have them.

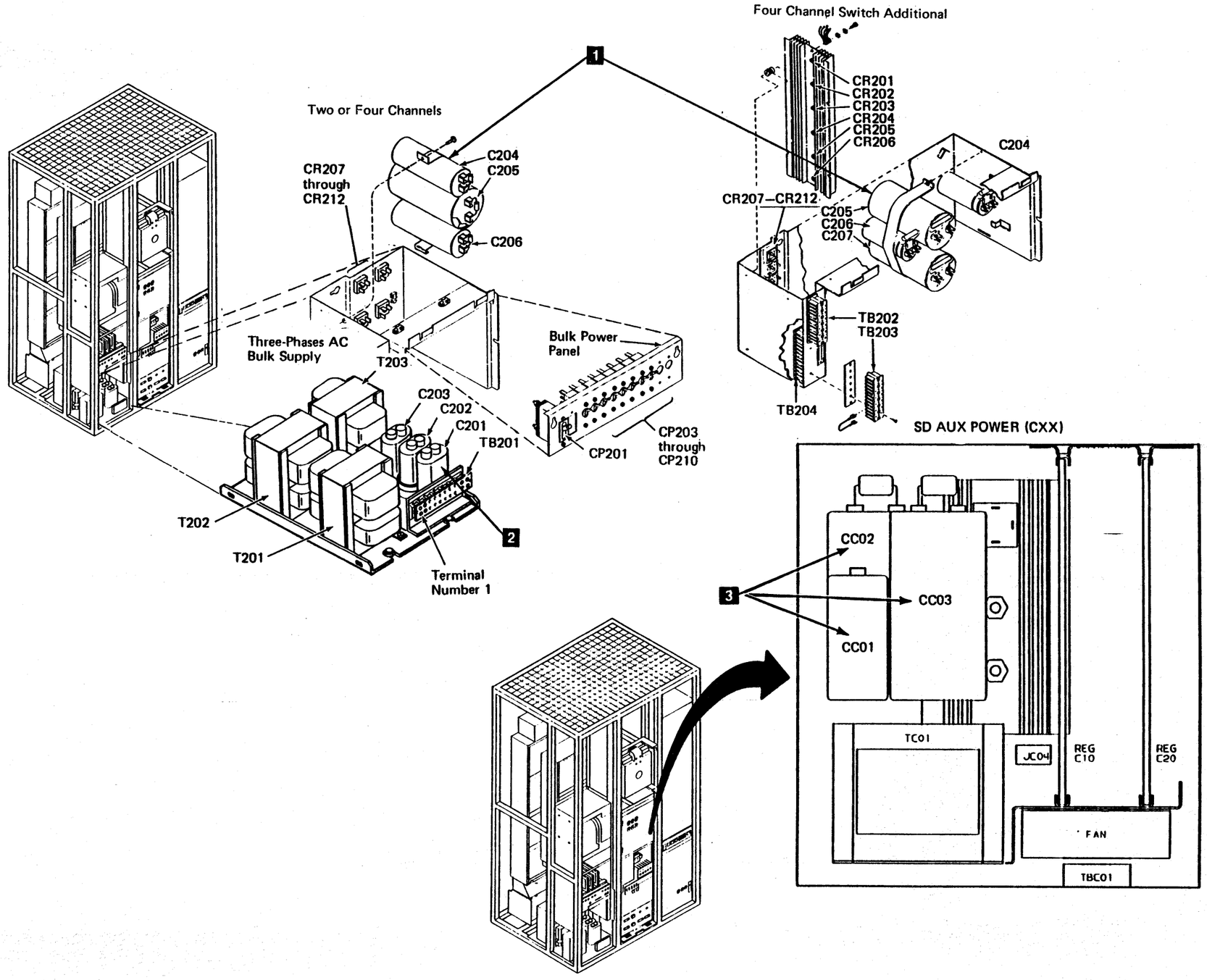
__ a. C204 through C207 in the DC bulk power supply 1. C204 through C207 must have bleeder resistors.

__ b. C201 through C203 in the three-phase AC bulk supply 2

__ c. Capacitors in power supply 2, area Cxx 3

__ 2. Verify that C201 through C203 in the three-phase AC bulk supply 2 have covers over the exposed slip-on terminals.

(Continued on next page)



3880 MIM	Seq AX0001	PN 6315682 5 of 11	881143 13 Jan 84	881216 15 Aug 84	A15621 01 Apr 85		

© Copyright IBM Corp. 1984, 1985

Power Distribution Capacitor Checks (Continued)

__ 1. Inspect the following electrolytic capacitors for any swelling or physical damage. Also check that the capacitors which need bleeder resistors have them.

   __ a. C301 through C304 in the maintenance power supply 2. C301, C302, and C303 must have bleeder resistors.

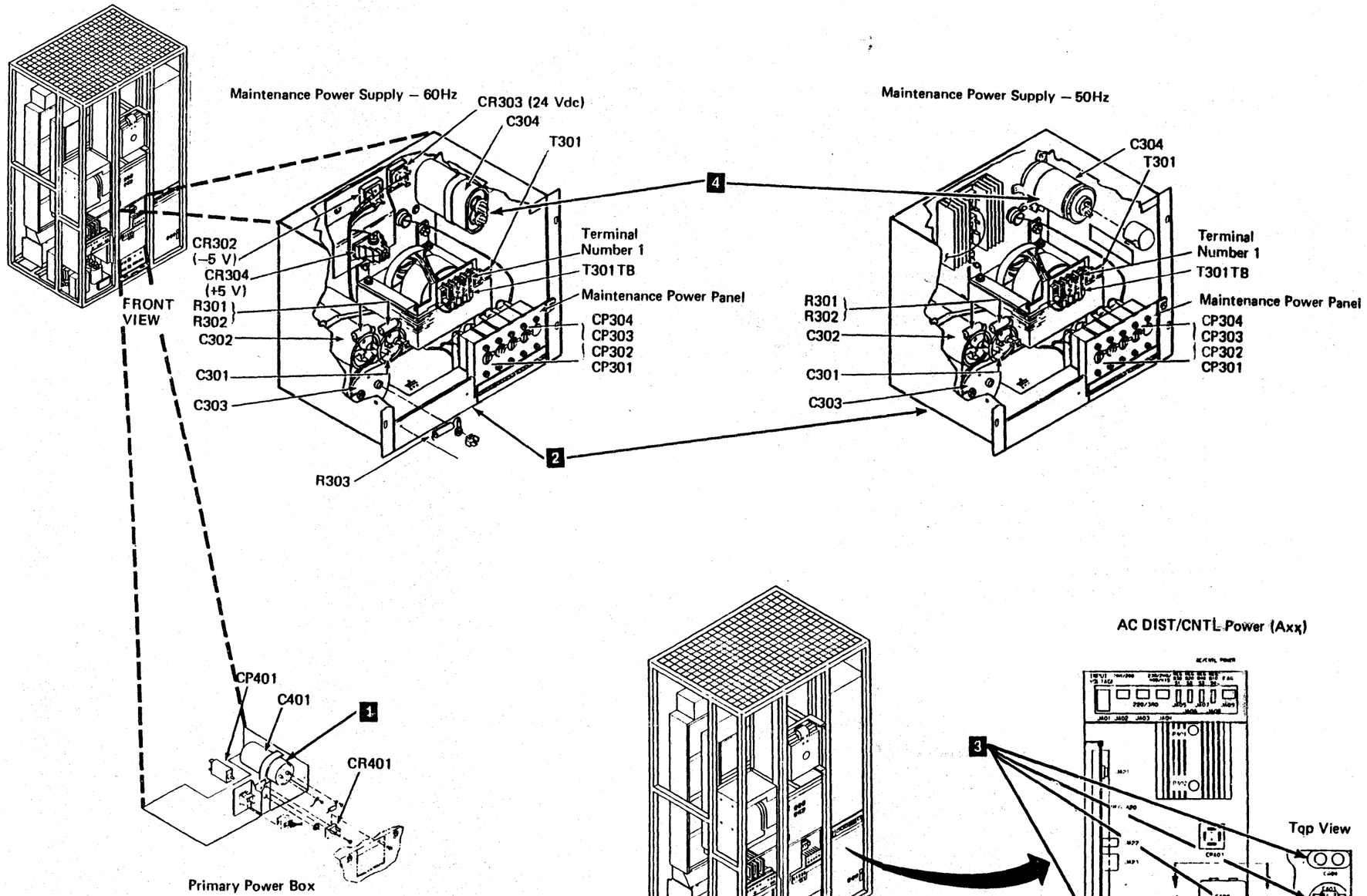
   __ b. C401 in the primary power box 1. C401 must have a bleeder resistor.

   __ c. CA01, CA02, CA03, and CA04 in PS2 area Axx must have bleeder resistors 3.

__ 2. Verify that the following capacitors have covers over the exposed slip-on terminals.

   a. C304 in the maintenance power supply 4.

   b. CA04 in PS2 area Axx 3.



© Copyright IBM Corp. 1984, 1985

Power Distribution Terminal Board Checks

__ 1. Verify that the following terminal boards have their shields in place:

   a. TB201 in the three-phase AC bulk supply 4

   b. TB301 in the maintenance power supply 8

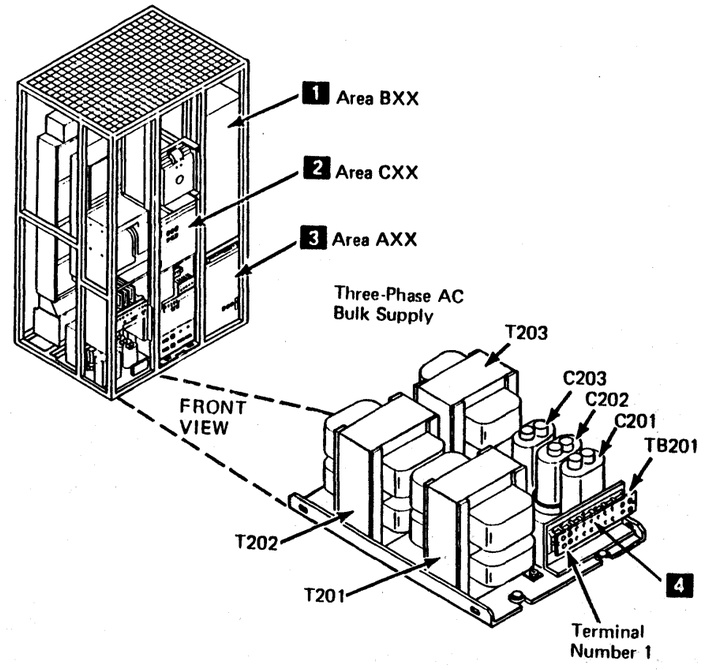
   c. T301TB in the maintenance power supply 6

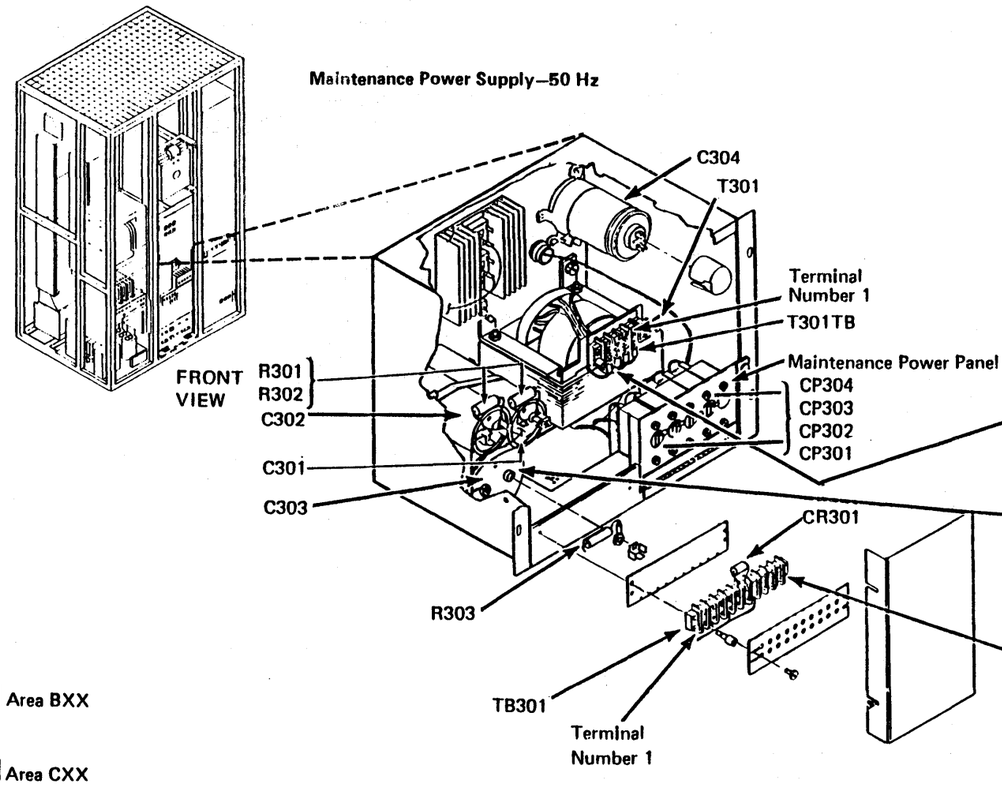
   d. TB401 and TB403 in the primary power box 5

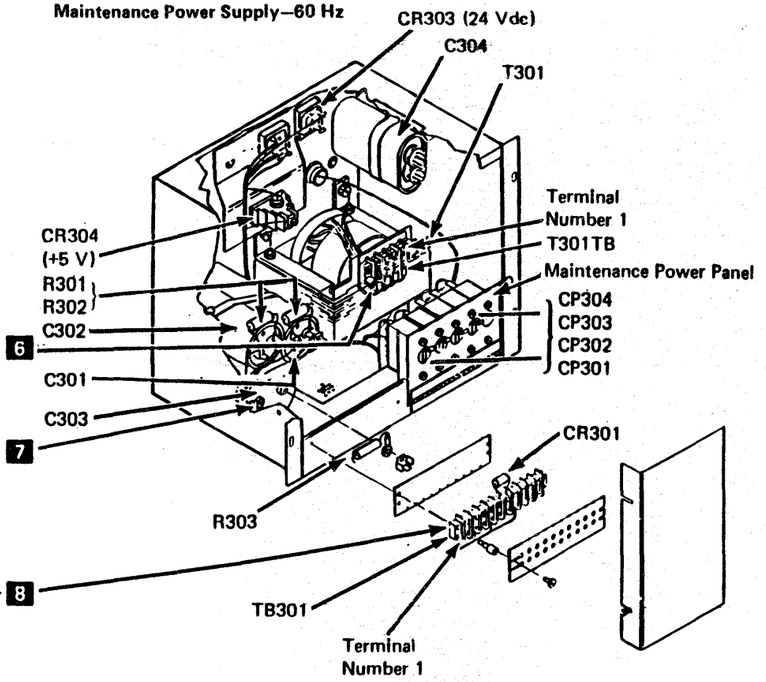
__ 2. Verify that the plastic shield, fastened in front of C301-C303 in the maintenance power supply 7, is in place.

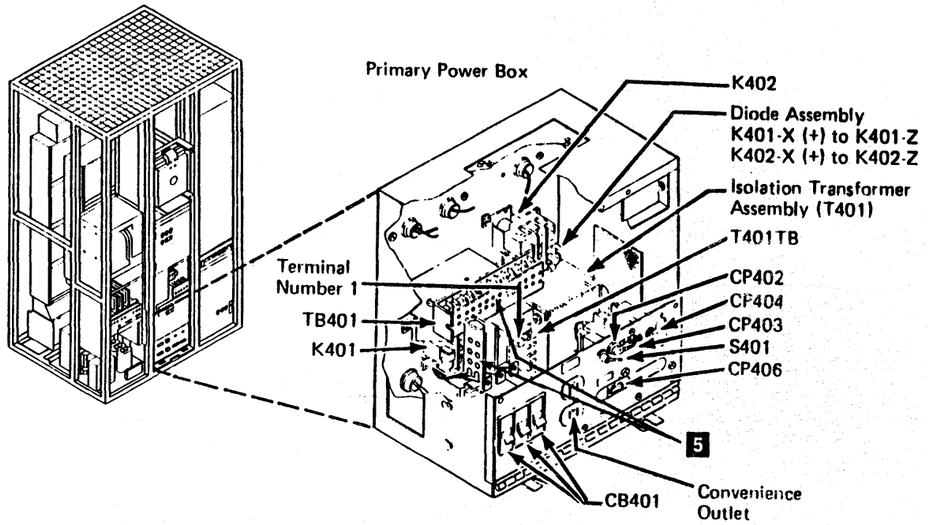
__ 3. Check the cables in the power sections for worn insulation and loose or missing strain reliefs.

__ 4. Verify that PS2 area Axx 3, Bxx 1 and Cxx 2 have metal covers fastened on their front sides.









3880 MIM		PN 6315682	881143	881216	A15621		
	Seq AX0001	7 of 11	13 Jan 84	15 Aug 84	01 Apr 85		

© Copyright IBM Corp. 1984, 1985

Internal Checks

__ 1. Check the machine for non-IBM alterations. Were any found?

YES --

NO --

If YES complete *R009 Non-IBM Alterations/Attachments Survey.*

__ 2. Verify that the following yellow labels are in place and are readable.

Note: Labels may be in local language.

a. Four labels 1; one located on each side of the machine on top of each frame member.

HAZARDOUS AREA

TRAINED SERVICE PERSONNEL ONLY

b. In the three phase ac bulk supply 3.

CAUTION UNIT WEIGHT
EXCEEDS 27 KG (60 LB)

c. In the three phase ac bulk supply 2.

DANGER
550 VOLTS

d. On the front of the primary power box 4.

HAZARDOUS AREA

TRAINED SERVICE PERSONNEL ONLY

e. On the front of the primary power box 5.

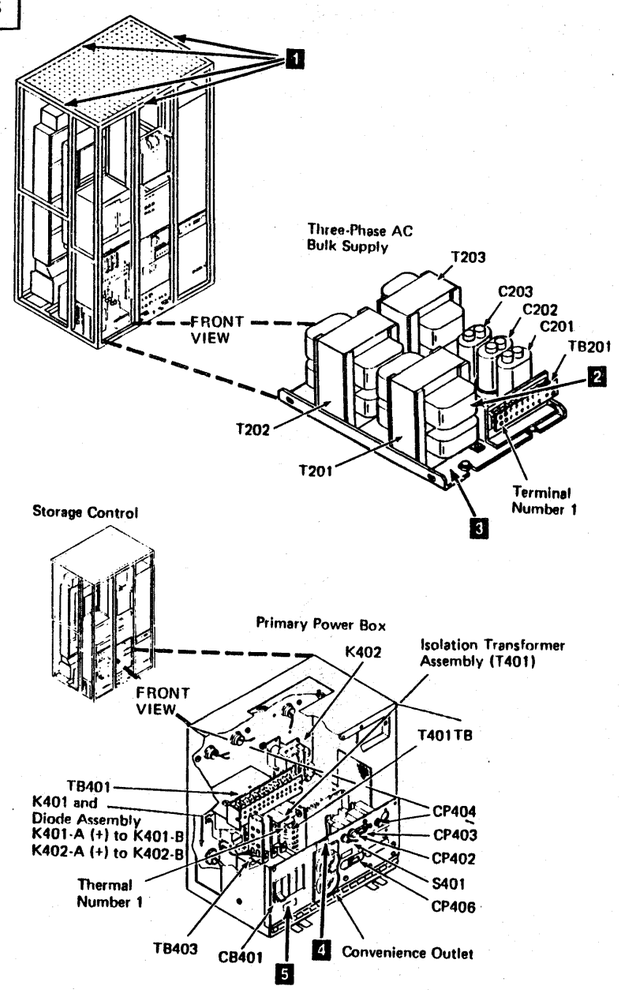
LINE VOLTAGE
PRESENT WITH
MACHINE POWER OFF

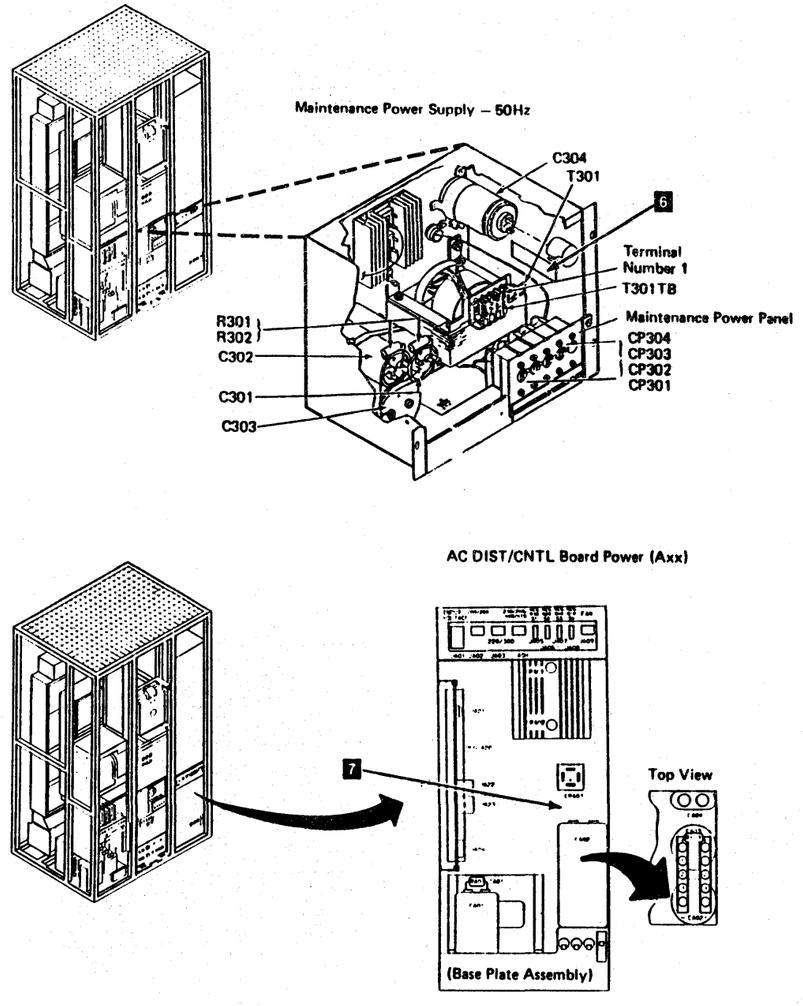
f. In the maintenance power supply, in front of C304 6.

DANGER
550 VOLTS

g. In PS2 area Axx, in front of C1-C3 7.

CAUTION
HIGH VOLTAGE
ABOVE 500 VOLTS





Seq AX0001	PN 6315682 8 of 11	881143 13 Jan 84	881216 15 Aug 84	A15621 01 Apr 85		

© Copyright IBM Corp. 1984, 1985

Safety Inspection Procedure

Grounding

__ 1. See the *Electrical Safety For IBM Customer Engineers* handbook, for the procedure to measure power receptacle and equipment ground. Also, verify that the machine is grounded correctly.

__ 2. Verify that the green and yellow wire or ground straps are in place for the following assemblies:

__ a. AC Bulk Supply (green and yellow wire is attached to the bottom of the power supply box 1).

1) A green and yellow wire in the cable from TB201 2 to connector PC204 attached to the back of Area Cxx.

2) A green and yellow wire in the cable from TB201 2 to the primary power box (4xx).

3) A green and yellow wire in the cable from TB201 2 to the fan located below the +5 Vdc regulator in PS1.

__ b. PS1 Area Axx

1) A green and yellow wire in the cable going from the rear center of the Primary Power box to PA10 connector located on the lower rear of Area Axx.

__ c. A green and yellow wire going from the diskette drive motor to the machine frame.

__ d. A green and yellow wire from the A-gate fans to the fan mounting on the machine frame.

__ e. A ground strap from the machine frame to the A-gate.

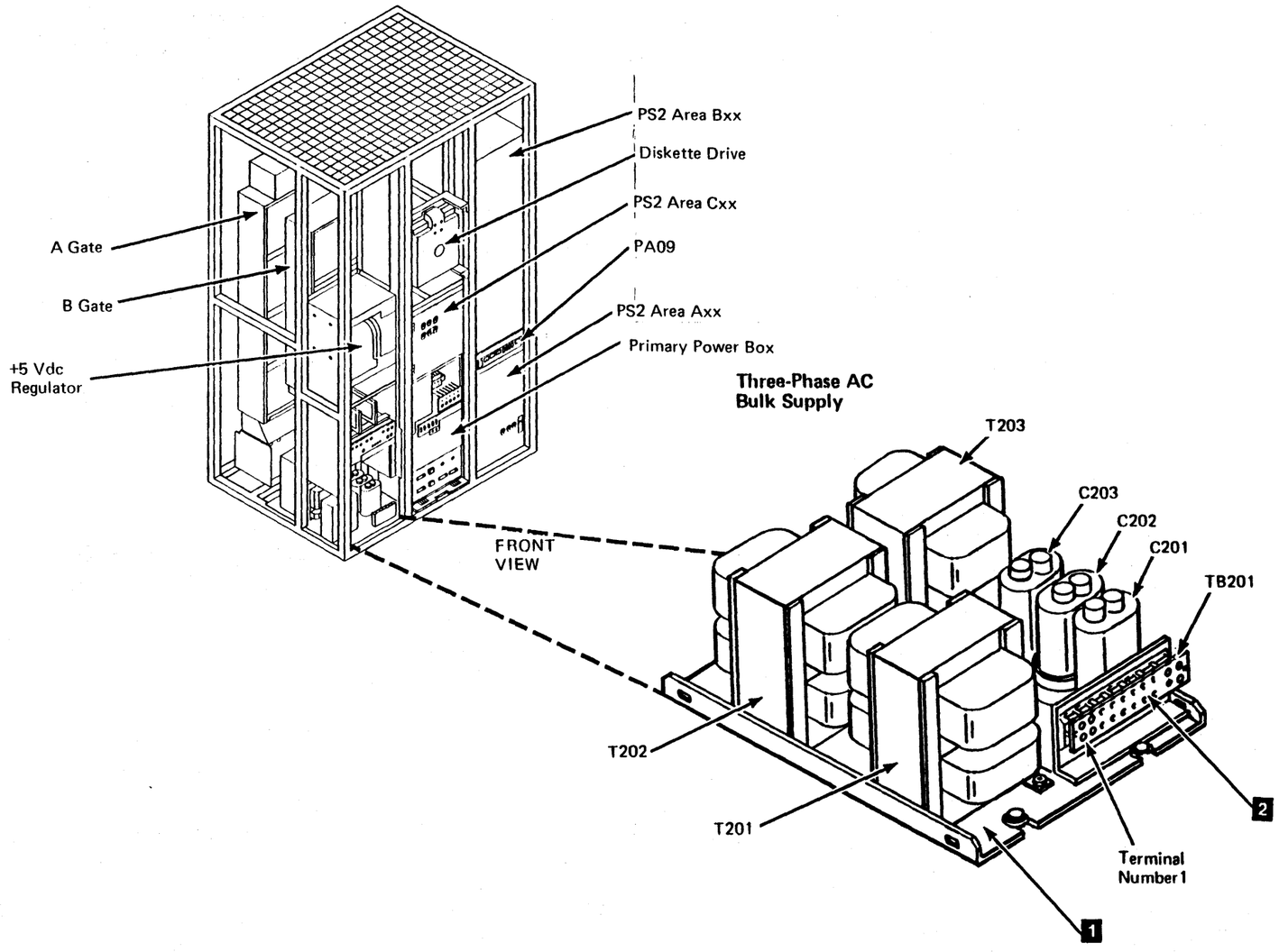
__ f. Two ground straps connecting the B-gate to the machine frame.

__ g. Four green and yellow wires connecting the four B-gate fan housings to the B-gate frame (located on the bottom of the B-gate).

__ h. A green and yellow wire in the cable from the fan in Area Bxx to PA09 connector in Area Axx.

__ i. A green and yellow wire in the cable from PA09 connector in Area Axx to the 1BP21 connector on the bottom of the B gate.

This completes the safety inspection in the power off environment.



© Copyright IBM Corp. 1984, 1985

Listed below are the part numbers of warning labels in various language groups.

LABEL	PART NUMBER	QUANTITY
USA-ENGLISH		
WARNING label group (supplied with all orders)	no number	
•HAZARD (large)	5236793	4
•HAZARD (small)	369207	1
•DANGER 550 V	2582954	2
•THIS MACHINE IS WIRED FOR	345762	1
•LINE VOLTAGE PRESENT	138755	2
BRAZILIAN-PORTUGESE		
WARNING label group	4518874	
•HAZARD	6815183	5
•DANGER 550V	5718488	2
•THIS MACHINE IS WIRED FOR	6815196	1
•LINE VOLTAGE PRESENT	6815188	2
CHINESE		
WARNING label group	4518882	
•HAZARD (large)	no number	1
•HAZARD (small)	no number	1
•DANGER 550V	no number	1
•THIS MACHINE IS WIRED FOR	no number	1
•LINE VOLTAGE PRESENT	no number	1
CANADIAN-FRENCH		
WARNING label group	4518877	
•HAZARD (large)	4948492	4
•HAZARD (small)	4948490	1
•DANGER 550V	no number	2
•THIS MACHINE IS WIRED FOR	6815189	1
•LINE VOLTAGE PRESENT	6825808	2
FRENCH		
WARNING label group	4518873	
•HAZARD (large)	8326722	5
•DANGER 550V	1731444	2
•THIS MACHINE IS WIRED FOR	6815192	1
•LINE VOLTAGE PRESENT	6812828	2
FRENCH-DUTCH		
WARNING label group	4518879	
•HAZARD	8329450	5
•DANGER 550V	4420468	2
•THIS MACHINE IS WIRED FOR	8329449	1
•LINE VOLTAGE PRESENT	8329452	2
FINNISH		
WARNING label group	4518878	
•HAZARD	5562398	5
•DANGER 550V	6825833	2
•THIS MACHINE IS WIRED FOR	6825864	1
•LINE VOLTAGE PRESENT	6825818	2

LABEL	PART NUMBER	QUANTITY
GERMAN		
WARNING label group	4518871	
•HAZARD (large)	4056733	4
•HAZARD (small)	6815193	1
•DANGER 550V	5718485	2
•THIS MACHINE IS WIRED FOR	6815195	1
•LINE VOLTAGE PRESENT	6815194	2
ITALIAN		
WARNING label group	4518872	
•HAZARD	6815181	5
•HAZARD (small)	no number	1
•DANGER 550V	6815831	2
•THIS MACHINE IS WIRED FOR	6815191	1
•LINE VOLTAGE PRESENT	6825820	2
JAPANESE		
WARNING label group	4518876	
•HAZARD	8326797	5
•DANGER 550V	6825839	2
•THIS MACHINE IS WIRED FOR	6825867	2
•LINE VOLTAGE PRESENT	6825840	2
KOREAN		
WARNING label group	4518883	
•HAZARD (large)	2679448	4
•HAZARD (small)	2679447	1
•DANGER 550V	2679446	2
•THIS MACHINE IS WIRED FOR	2679449	1
•LINE VOLTAGE PRESENT	2679450	2
NORWEGIAN		
WARNING label group	4518881	
•HAZARD	4423212	5
•DANGER 550V	no number	2
•THIS MACHINE IS WIRED FOR	no number	1
•LINE VOLTAGE PRESENT	4418722	2
SPANISH		
WARNING label group	4518875	
•HAZARD	6815180	5
•HAZARD (small)	no number	1
•DANGER 550V	6825830	2
•THIS MACHINE IS WIRED FOR	6815190	1
•LINE VOLTAGE PRESENT	6815185	2
SWEDISH		
WARNING label group	4518880	
•HAZARD	8551904	5
•DANGER 550V	8551902	2
•THIS MACHINE IS WIRED FOR	8551907	1
•LINE VOLTAGE PRESENT	8551903	2

© Copyright IBM Corp. 1984, 1985

Power Sequencing

__ 1. To verify customer power is correct, see the *Safety Handbook For IBM Customer Engineers*, and perform the power receptacle and primary power checkouts.

__ 2. Verify that the machine will power up and down correctly using the SUBSYSTEM POWER On/Off switch.

__ 3. Test the ability to drop power to the subsystem storage and each storage director.

THIS CONCLUDES THE SAFETY INSPECTION. KEEP THIS COMPLETED CHECKLIST WITH THIS MACHINE.

DATE	PROBLEMS FOUND	DATE CORRECTED

© Copyright IBM Corp. 1984, 1985

Safety Inspection Procedure INSP 95

Index

Special Characters
+5 V
  regulator location ..... LOC 20, MIM
  dc power location ..... LOC 50, MIM
+8.5 Vdc power location ..... LOC 50, MIM
-5 Vdc power location ..... LOC 50, MIM

A
ac bulk supply location ..... LOC 30, MIM
ac power distribution/control location ..... LOC 45, MIM
address in ..... OPER 305, MSM
address out ..... OPER 300, MSM
address redrive (CMAR) cards ..... OPER 105, MSM
addressing, Model 21 ..... INTRO 32, MIM
addressing, Model 23 ..... INTRO 35, MIM
address switch settings ..... INST 70, MIM
adjustments
  diskette drive ..... CARR 120, MIM
  gate foot ..... CARR 10, MIM
aids
  diagnostic ..... MD 40, MSM
  problem determination ..... PDA 10, MSM
alternate controller selected ..... SENSE 25, MSM
analysis procedures ..... INTRO 28, MIM
analyzer, logic ..... PDA 740, MSM
areas, functional ..... INTRO 42, MIM
attachments
  channel, Model 21 ..... INTRO 30, MIM
  channel, Model 23 ..... INTRO 34, MIM
  DASD, Model 21 ..... INTRO 30, MIM
  DASD, Model 23 ..... INTRO 34, MIM
  processor, Model 21 ..... INTRO 30, MIM
  processor, Model 23 ..... INTRO 34, MIM
auxiliary microprocessor adapter (CMAA) card ..... OPER 25,55, MSM
auxiliary power location ..... LOC 55, MIM

B
bibliography ..... REF 5, MSM
block diagrams, channel ..... CARR 491 TCA, MIM
block tool connection, channel wrap ..... CARR 216, MIM
board maintenance ..... CARR 205, MIM
bulk power panel ..... PWR 56, MIM
bulk power supply location, dc ..... LOC 25, MIM
bus in ..... OPER 305,365, MSM
bus out ..... OPER 300,360 MSM

C
cable connector locations ..... LOC 100, MIM
cables
  CE safety practices ..... SAFE 1, MIM
  checkout ..... CARR 216, MIM
  installation ..... INST 100, MIM
  locator chart ..... CARR 482 TCA, MIM
  locator, intraboard ..... CARR 480 TCA, MIM
  swap, channel interface ..... CARR 230,370 MIM
cache power locations ..... LOC 50, MIM
capacitor checks ..... INSP 40, MIM
card contact assignment ..... PWR 17, MIM
card descriptions
  channel interface ..... OPER 35, MSM
  subsystem storage area ..... OPER 105, MSM
card diagrams
  control area ..... OPER 60, MSM
  subsystem storage area ..... OPER 110, MSM
card pin assignment ..... CARR 200, MIM
card to card data flow
  data buffer ..... OPER 75, MSM
  port ..... OPER 90, MSM
  port adapter ..... OPER 90, MSM
  storage control ..... OPER 95, MSM
  storage ..... OPER 95, MSM
  control interface ..... OPER 115, MSM
CDX (channel data transfer) card ..... OPER 35, MSM
central power control board location ..... LOC 60, MIM
channel bus out parity check ..... SENSE 15, MSM
channel
  attachment Model 21 ..... INTRO 30, MIM
  attachment Model 23 ..... INTRO 34, MIM
  block diagrams ..... CARR 491 TCA, MIM
  cable checkout ..... CARR 216, MIM
  check 1 ..... SENSE 125, MSM
  enable/disable ..... CARR 229, MIM
  features ..... INTRO 30-48, MIM
  locations ..... LOC 15, MIM
  monitor ..... PDA 710, MSM
  switches ..... PWR 74, MIM
  switching ..... INTRO 62, MIM
  wrap block tool connection ..... CARR 216, MIM
  wrap test, electronic ..... CARR 215, MIM
channel data transfer (CDX) card ..... OPER 15,35, MSM
channel initiated sequence ..... OPER 310, MSM
channel interface (CIF)
  cards ..... OPER 35, MSM
  card diagram ..... OPER 40, MSM
  card to card data flow ..... OPER 50, MSM
  cable swap ..... CARR 230,370, MIM
  isolation aids ..... CARR 490 TCA, MIM
  description ..... OPER 300,305, MSM
  description ..... INTRO 50, MIM
channel search (CSR) card ..... OPER 15,35, MSM
channel sequence control (CSC) card ..... OPER 15,35, MSM
checkout procedure, power ..... PWR 32, MIM
checkout, channel cable ..... CARR 216, MIM
checks
  1, channel ..... OPER 65, MSM
  2, channel ..... MD 130, MSM
  adjust, remove, replace ..... CARR 1, MIM
  control ..... SENSE 5, MSM
  channel bus out parity ..... SENSE 15, MSM
  error reporting ..... MD 50, MSM
  equipment ..... SENSE 5, MSM
  safety ..... INST 50, MIM
  voltage ..... PWR 32, MIM
CIF (channel interface) cards ..... OPER 35, MSM
circuit card connector assignments location ..... LOC 80, MIM
circuit maintenance ..... CARR 200, MIM
CLK (clock) card ..... OPER 15,55, MSM
clock (CLK) card ..... OPER 15,55, MSM
clock start and stop ..... OPER 65, MSM
clock stopped check 1 ..... SENSE 110, MSM
CMAA (auxiliary microprocessor adapter) card ..... OPER 25,55, MSM
CMAR (address redrive) cards ..... OPER 105, MSM
CMCA (communication adapter) card ..... OPER 15,75, MSM
CMCD (port adapter) card ..... OPER 25, MSM
CMDA (storage driver address) card ..... OPER 95, MSM
CMDD (storage driver data) card ..... OPER 95, MSM
CMDR (data redrive) cards ..... OPER 105, MSM
CME1 (error correction code 1) card ..... OPER 95, MSM
CME2 (error correction code 2) card ..... OPER 95, MSM
CME3 (error correction code 3) card ..... OPER 95, MSM
CMPB (port buffer) cards ..... OPER 90, MSM
CMPC (port control) card ..... OPER 90, MSM
CMSA (storage address) card ..... OPER 95, MSM
CMSH (storage) cards ..... OPER 105, MSM
codes, error ..... see error codes index (ECI) section, ECM
command
  out ..... OPER 300, MSM
  reject ..... SENSE 15, MSM
  retry ..... OPER 260, MSM
communication adapter (CMCA) card ..... OPER 15,75, MSM
communication buffer ..... OPER 330, MSM
communication registers ..... OPER 330, MSM
connectors location ..... LOC 95, MIM
control area
  card descriptions ..... OPER 55, MSM
  card diagram ..... OPER 60, MSM
  description ..... OPER 65, MSM
control cards ..... INTRO 52, MIM
control checks ..... SENSE 5, MSM
control commands, paging mode ..... OPER 205, MSM
control interface (CTL–I) ..... OPER 115,360-380, MSM
control interface wrap cable installation ..... CARR 210, MIM
convenience outlet location ..... LOC 95, 96, MIM
correctable errors ..... SENSE 25, MSM
crossovers location ..... LOC 90, MIM
CSC (channel sequence control) card ..... OPER 35, MSM
CSR (channel search) card ..... OPER 15,35, MSM
CTL-I (control interface) ..... OPER 115,360-380, MSM

D
DASD attachment Model 21 ..... INTRO 30, MIM
DASD attachment Model 23 ..... INTRO 34, MIM
data buffer ..... OPER 50-75, MSM
data check ..... SENSE 15, MSM
data flow ..... INTRO 40, MSM
data in ..... OPER 305, MSM
data out ..... OPER 300, MSM
data redrive (CMDR) cards ..... OPER 105, MSM
data transfer address (DXA) card ..... OPER 75, MSM
data transfer data (DXD) card ..... OPER 75, MSM
dc bulk power supply location ..... LOC 25, MIM
dc power switches ..... PWR 27, MIM
DCT (device counter) card ..... OPER 25,115, MSM
DDC (director-to-device controller) card ..... OPER 15, MSM
device connectors ..... CARR 380 TCA, MIM
device counter (DCT) card ..... OPER 25,115, MSM
device interface power board location ..... LOC 65, MIM
device power sequencing switch ..... PWR 27, MIM
Device Release command ..... OPER 235, MSM
device reservation ..... INTRO 62, MIM
Device Reserve command ..... OPER 235, MSM
device sequence driver ..... PWR 81, MIM
device tag sequence ..... OPER 370-380, MSM
diagnostic microcode ..... INTRO 28, MIM
diagnostic restrictions ..... START 11, MIM
Diagnostic Sense/Read command ..... OPER 235, MSM
diagnostic, channel wrap ..... CARR 215, MIM
diagnostic, channel block wrap ..... CARR 215, MIM
diagnostics aids ..... MD 40, MSM
direct mode commands ..... OPER 210, MSM
  control commands ..... OPER 230, MSM
  search commands ..... OPER 240, MSM
  sense commands ..... OPER 235, MSM
  write commands ..... OPER 225, MSM
director-to-device controller (DDC) card ..... OPER 15,35,115, MSM
Discard Block command ..... OPER 205, MSM
diskette drive ..... INTRO 60, MIM
  components ..... OPER 345, MSM
theory ..... CARR 110, MIM
driver receiver (DRR) card ..... OPER 125, MSM
DRR (driver receiver) card ..... OPER 125, MSM
DSCR (dynamic storage control and refresh) card ..... OPER 25,55, MSM
dual frame installation ..... INST 150, MIM

© Copyright IBM Corp. 1984, 1985

dual frame removal ..... INST 160, MIM
DXA (data transfer address) card ..... OPER 15,75, MSM
DXD (data transfer data) card ..... OPER 15,75, MSM
dynamic storage control and refresh (DSCR) card ..... OPER 25,55, MSM
dynamic trace tables ..... PDA 105, MSM

E
electronic wrap ..... INST 90, MIM
  test ..... CARR 215, MIM
  block tool connection ..... CARR 216, MIM
emergency switch, unit ..... PWR 74, MIM
end of cylinder ..... SENSE 20, MSM
end of file ..... OPER 265, MSM
entries from other maintenance libraries ..... MLX 2, MIM
entry from another machine ..... START 100, MIM
environmental data present ..... SENSE 25, MSM
equipment check ..... SENSE 15, MSM
Erase command ..... OPER 225, MSM
error alert ..... OPER 335,365, MSM
error analysis ..... MD 40, MSM
error correction code 1 (CME1) card ..... OPER 95, MSM
error correction code 2 (CME2) card ..... OPER 95, MSM
error correction code 3 (CME3) card ..... OPER 95, MSM
errors, check 1 ..... MD 50, MSM
errors ..... OPER 65, MSM
  usage, overrun, and error ..... SENSE 5,170-185, MSM
  subsystem storage ..... SENSE 190-245, MSM
error codes ..... see error codes index (ECI) section, ECM
expanded storage ..... see subsystem storage density, MSM
exits from other maintenance libraries ..... MLX 2, MIM
exterior machine checks ..... INSP 20, MIM
external registers ..... OPER 70, MSM
  description ..... REF 65, MSM
  summary ..... REF 10, MSM

F
failure determination ..... START 11, MIM
features, channel ..... INTRO 30-48, MIM
file control card ..... OPER 345, MSM
file protected ..... SENSE 22, MSM
foot adjustment ..... CARR 10, MIM
format F, messages ..... SENSE 195-250, MSM
format F, subsystem storage errors ..... SENSE 190-250, MSM
format identifier ..... SENSE 35, MSM
format 0, program or system checks, Model 21 ..... SENSE 45, MSM
format 0, program or system checks, Model 23 ..... SENSE 50, MSM
format 2, storage director equipment checks ..... SENSE 55, MSM
format 3, storage director control checks ..... SENSE 110-165, MSM
format 6, usage statistics and overrun errors ..... SENSE 170-185, MSM
formats, 0-F, introduction ..... SENSE 5, MSM
formatting ..... OPER 270, MSM
frame location ..... LOC 95,96, MIM
functional areas ..... INTRO 42, MIM

G
gate boards location ..... LOC 75, MIM
gate foot adjustment ..... CARR 10, MIM
gate parts location ..... LOC 95,96, MIM
grounding ..... INSP 80, MIM

H
HDSCS (high density static control storage) cards ..... OPER 25,55, MSM
high density static control storage (HDSCS) cards ..... OPER 25,55, MSM
hold out ..... OPER 300, MSM

I
identification, storage director ..... INST 10, MIM
identification, subsystem storage ..... INST 10, MIM
identifier, format ..... SENSE 35, MSM
identifier, message ..... SENSE 35, MSM
IML storage director ..... MD 150, MSM
inbound lines ..... OPER 365, MSM
indicators
  power ..... PWR 74, MIM
  power check ..... PWR 17, MIM
  power on status ..... PWR 27, MIM
  primary power ..... PWR 22, MIM
indirect registers ..... REF 40, MSM
  description ..... REF 80, MSM
  summary ..... REF 40, MSM
initial microcode load ..... OPER 325, MSM
initial microcode load reset ..... OPER 320, MSM
initial selection sequence ..... OPER 310,315, MSM
inspection, safety ..... INSP 10, MIM
installation, cable ..... INST 100, MIM
internal checks ..... INSP 70, MIM
internal registers ..... OPER 70, MSM
interrupt bytes description ..... PDA 125, MSM
interrupts ..... OPER 260, MSM
interval timer ..... OPER 65, MSM
intervention required ..... SENSE 15, MSM
intraboard cable locator ..... CARR 480 TCA, MIM
isolation aids, channel interface ..... CARR 490 TCA, MIM
isolation procedures ..... INTRO 28, MIM

L
libraries, entries and exits ..... MLX 2, MIM
library, 3880 maintenance ..... INTRO 5, MIM
light emitting diode ..... OPER 345, MSM
limit amplifier ..... OPER 355, MSM
local/remote switch ..... PWR 27, MIM
logic analyzer ..... PDA 740, MSM
logic board pin identification location ..... LOC 84,85, MIM
logic power ..... PWR 17, MIM
lower port registers ..... REF 100, MSM

M
machine reset ..... OPER 320, MSM
machine stability checks ..... INSP 30, MIM
maintenance (MNT) card ..... OPER 25,125, MSM
maintenance analysis procedures ..... INTRO 28, MIM
maintenance area data flow ..... OPER 125, MSM
maintenance card start and stop ..... OPER 65, MSM
maintenance connection ..... INTRO 54, MIM
maintenance connection (MNT-C) functional area ..... OPER 120-130, MSM
maintenance connection tables ..... PDA 120, MSM
maintenance device adapter control (MDAC) card ..... OPER 125, MSM
maintenance device adapter registers (MDAR) card ..... OPER 125, MSM
maintenance diagram manual (MDM) syntax description . see the Legend (LGND) section, MIM
Maintenance Information Manual (MIM) description ..... INTRO 25, MIM
maintenance libraries entries and exits ..... MLX 2, MIM
maintenance library, 3880 ..... INTRO 5, MIM
maintenance methods ..... INTRO 28, MIM
maintenance mode, MD ..... MD 40, MSM
maintenance operations ..... OPER 340, MSM
maintenance plan, 3880 ..... INTRO 28, MIM
maintenance power ..... PWR 17, MIM
maintenance power switch ..... PWR 27, MIM
maintenance power supply – 60 Hz location ..... LOC 35, MIM
maintenance power supply – 50 Hz location ..... LOC 40, MIM
maintenance
  board ..... CARR 205, MIM
  circuit ..... CARR 200, MIM
  prerequisites ..... INTRO 28, MIM
  procedures ..... INTRO 28, MIM
  programs ..... INTRO 28, MIM
  subsystem storage ..... INTRO 28, MIM
  unguided ..... MD 20, MSM
masks, sequence and service ..... PWR 39, MIM
MD (maintenance device)
  concurrent operations ..... MD 50, MSM
  error displays ..... MD 30, MSM
  how to use ..... MD 20, MSM
  introduction ..... MD 10, MSM
  maintenance mode ..... MD 40, MSM
  operations ..... MD 130, MSM
  option restrictions ..... START 11, MIM
  options ..... MD 130, MSM
  programs run from ..... MD 190, MSM
  SD-SD error analysis ..... MD 40, MSM
  storage director reset with ..... MD 160, MSM
  support mode ..... MD 50, MSM
MDAC (maintenance device adapter control) card ..... OPER 125, MSM
MDAR (maintenance device adapter registers) card ..... OPER 125, MSM
MDM (maintenance diagram manual) syntax description . see the Legend (LGND) section, MIM
message codes
  description, format F ..... SENSE 190, MSM
  format 2 ..... SENSE 105, MSM
  format 3 ..... SENSE 165, MSM
  format 6 ..... SENSE 185, MSM
  format F ..... SENSE 195, MSM
message identifier ..... SENSE 35, MSM
message to operator ..... SENSE 20, MSM
microcontroller ..... OPER 375, MSM
microcode, diagnostic ..... INTRO 28, MIM
MIM description ..... INTRO 25, MIM
MNT (maintenance) card ..... OPER 25,125, MSM
modes of operation, Model 21 ..... INTRO 32, MIM
monitor, channel ..... PDA 710, MSM
motor and drive ..... OPER 345, MSM
MSM section description ..... INTRO 10, MSM
multiple track operation ..... OPER 265, MSM

N
no record found ..... SENSE 22, MSM
No-Operation command, paging mode ..... OPER 205, MSM
No-Operation command, direct mode ..... OPER 230, MSM

O
offline servicing, diskette drive ..... CARR 110, MIM
OLT (online test) ..... see the OPER section, MIM
  descriptions ..... PRG 40, MIM
  prerequisites ..... PRG 5, MIM
OLTEP ..... PRG 25, MIM
OLTSEP ..... PRG 10, MIM
online tests ..... See OLT
OPER section description ..... OPER 5, MSM
operating modes, Model 21 ..... INTRO 32, MIM
operating sequence ..... OPER 350, MSM
operation incomplete ..... SENSE 22, MSM
operational in ..... OPER 305, MSM
operational out ..... OPER 300, MSM
operations, MD ..... MD 130, MSM
operator and power switch panels ..... INTRO 60, MIM
operator panel ..... PWR 74, MIM
options, MD ..... MD 130, MSM
orientation ..... OPER 265, MSM
outbound lines ..... OPER 360, MSM
overflow record ..... OPER 270, MSM
overrun errors ..... SENSE 5, MSM
overview, Model 21 ..... INTRO 30, MIM
overview, Model 23 ..... INTRO 34, MIM
paging mode commands
  control ..... OPER 205, MSM

© Copyright IBM Corp. 1984, 1985

Index INDEX 2

read data ... OPER 200, MSM
search ... OPER 210, MSM
sense ... OPER 210, MSM
write data ... OPER 200, MSM

P

panel, operator ... PWR 74, MIM
panels ... INTRO 60, MIM
permanent errors ... SENSE 20, MSM
phototransistor ... OPER 345, MSM
pin assignment ... CARR 200, MIM
pin identification ... LOC 101, MIM
port adapter (CMCD) card ... OPER 25, MSM
port adapter ... INTRO 50, MIM
port and port adapter card to card data flow ... OPER 90, MSM
port buffer (CMPB) cards ... OPER 90, MSM
port cards ... INTRO 52, MIM
port control (CMPC) card ... OPER 90, MSM
port ... INTRO 52, MIM
power
- analysis ... PWR 91, MIM
- check indicator ... PWR 17, MIM
- distribution capacitor checks ... INSP 40, MIM
- distribution terminal board checks ... INSP 60, MIM
- distribution/control location ... LOC 45, MIM
- introduction ... PWR 17, MIM
- panel, primary ... PWR 72, MIM
- select switch ... PWR 27, MIM
- sense conditions ... PWR 41, MIM
- sense registers ... PWR 39, MIM

sequencer and monitor ... PWR 22,37, MIM
sequencing ... INSP 95, MIM
sequencing switch, device ... PWR 27, MIM
- stack label location ... LOC 15, MIM

power off procedure ... PWR 17, MIM
power on reset ... OPER 65,320, MSM
power on status indicators ... PWR 27, MIM
power supplies, locations ... LOC 25-65, MIM
power switch panel ... PWR 71, MIM
power switch panels ... INTRO 60, MIM
power switches ... PWR 27, MIM
power symptom code table ... PWR 40, MIM
power-on sequence ... PWR 24, MIM
prerequisites, maintenance ... INTRO 28, MIM
primary power box – 50 Hz except Japan location ... LOC 41, MIM
primary power box – 60 Hz and 50 Hz Japan location ... LOC 43, MIM
primary power
- control ... PWR 22, MIM
- indicators ... PWR 22, MIM
- panel ... PWR 72, MIM

probability code ... MD 20, MSM
problem determination aids ... PDA 10, MSM
procedures
- isolation ... INTRO 28, MIM
- maintenance ... INTRO 28, MIM
- maintenance analysis ... INTRO 28, MIM
- relocation/removal ... INST 140, MIM
- replacement ... INTRO 28, MIM

processor attachment ... INTRO 30, MIM
program or system checks, Model 21 ... SENSE 45, MSM
program or system checks, Model 23 ... SENSE 50, MSM
program status word storage ... OPER 65, MSM
program status word swap ... OPER 65, MSM
programming ... INST 10, MIM
programs run from MD ... MD 190, MSM
programs, maintenance ... INTRO 28, MIM

R

raw read data ... OPER 355, MSM
read amplifier ... OPER 355, MSM
Read and Reset Buffered Log command ... OPER 235, MSM
read circuit principles ... OPER 355, MSM
Read Count command ... OPER 215, MSM
Read Count-Key-Data command ... OPER 215, MSM
Read Data command, paging mode ... OPER 200,215, MSM
read hit ... OPER 200, MSM
Read Home Address command ... OPER 215, MSM
Read Initial Program Load command ... OPER 220, MSM
Read Key-Data command ... OPER 215, MSM
read miss ... OPER 200, MSM
Read Multiple Count-Key-Data command ... OPER 220, MSM
Read R0 command ... OPER 215, MSM
Read Sector command ... OPER 220, MSM
Recalibrate command ... OPER 230, MSM
recycle ... OPER 360, MSM
references and support material ... INTRO 28, MIM
refresh ... OPER 95, MSM
registers
- external ... REF 10, MSM
- indirect ... REF 40, MSM
- shadow ... OPER 70, MSM
- upper/lower port ... REF 60,100, MSM

regulator cards location ... LOC 23, MIM
regulator, +5 v location ... LOC 20, MIM
relay terminal locations ... PWR 81, MIM
relocation/removal procedures ... INST 140, MIM
Remote Switch features ... INTRO 30,34, MIM
removal/relocation procedures ... INST 130, MIM
repair actions ... PWR 32, MIM
repairing the 3880 ... START 11, MIM
replacement procedures ... INTRO 28, MIM
request in ... OPER 305, MSM
reset command ... OPER 320, MSM
reset storage director ... MD 160, MSM
resets ... OPER 320, MSM
Restore command ... OPER 230, MSM

S

safety checks ... INST 50, MIM
safety inspection ... INSP 10, MIM
safety ... CARR 110, MIM
SBP (select out bypass) cards ... OPER 35, MSM
SCK (switch clock) card ... OPER 35, MSM
scoping information ... PWR 17, MIM
SDM (storage director microprocessor) card ... OPER 25,55, MSM
SDR (switch driver receiver) card ... OPER 35, MSM
SDT (switch driver terminator) card ... OPER 35, MSM
Search Home Address Equal command ... OPER 240, MSM
Search ID Equal command ... OPER 210, MSM
Search ID Equal command ... OPER 240, MSM
Search ID Equal or High command ... OPER 240, MSM
Search ID High command ... OPER 240, MSM
Search Key Equal command ... OPER 240, MSM
Search Key High command ... OPER 240, MSM
section description, MSM ... INTRO 10, MSM
Seek and Seek Cylinder commands ... OPER 230, MSM
Seek Head command ... OPER 230, MSM
Seek, Seek head, and Seek cylinder commands ... OPER 205, MSM
select hold ... OPER 360, MSM
select in ... OPER 305, MSM
select out bypass A through D (SBP) cards ... OPER 35, MSM
select out ... OPER 300, MSM
selective reset ... OPER 320, MSM
sense byte 0 ... SENSE 15, MSM
sense byte 1 ... SENSE 20, MSM
sense byte 2 ... SENSE 25, MSM
sense byte 3-5 ... SENSE 30, MSM
sense byte 6 ... SENSE 32, MSM
sense byte 7 ... SENSE 35, MSM
sense bytes summary ... SENSE 10, MSM
Sense command ... OPER 210, MSM
Sense command ... OPER 235, MSM
Sense I/D command ... OPER 210,235, MSM
sense registers ... PWR 39, MIM
Sense Subsystem Status command ... OPER 235, MSM
Sense Subsystem counts command ... OPER 235, MSM
sense, introduction ... SENSE 5, MSM
sequence chart ... OPER 375, MSM
sequence driver ... PWR 81, MIM
sequence masks ... PWR 39, MIM
sequencing attached device strings ... PWR 81, MIM
sequencing prerequisites ... PWR 76, MIM
service in ... OPER 305, MSM
service out ... OPER 300, MSM
servicing, diskette drive offline ... CARR 110, MIM
Set File Mask command ... OPER 230, MSM
Set Paging Parameters command ... OPER 205, MSM
Set Sector command ... OPER 205,230, MSM
Set Subsystem Mode command ... OPER 230, MSM
settings of switches ... INST 40, MIM
shadow registers ... OPER 70, MSM
Space Count command ... OPER 230, MSM
special reset ... OPER 320, MSM
stability checks, machine ... INSP 30, MIM
Start section description ... START 11, MIM
state save-tables ... PDA 110,300, MSM
status in ... OPER 305, MSM
status indicators ... PWR 27, MIM
status information ... OPER 260, MSM
status pending in the storage director ... OPER 260, MSM
status pending in the device ... OPER 260, MSM
stepper motor assembly ... OPER 345, MSM
storage (CMSH) cards ... OPER 105, MSM
storage address (CMSA) card ... OPER 95, MSM
storage addressing ... OPER 95, MSM
storage control cards ... OPER 95, MSM
storage control and storage card to card data flow ... OPER 95, MSM
storage control and data ... INTRO 52, MIM
storage control and data cards ... INTRO 52, MIM
storage control ... OPER 95, MSM
storage data flow ... OPER 95, MSM
storage director
- channel check 1 ... SENSE 125, MSM
- clock stopped check 1 ... SENSE 110-120, MSM
- communication ... OPER 330, MSM
- data flow, card to card ... OPER 15, MSM
- data flow diagrams ... OPER 20, MSM
- equipment checks ... SENSE 55, MSM
- IML ... MD 150, MSM
- initiated sequence ... OPER 315, MSM
- microprocessor (SDM) card ... OPER 25,55, MSM
- reset ... MD 160, MSM

storage driver address (CMDA) card ... OPER 95, MSM
storage driver data (CMDD) card ... OPER 95, MSM
storage operation ... OPER 95, MSM
storage, subsystem, Model 21 ... INTRO 32, MIM
storage, subsystem, Model 23 ... INTRO 34, MIM
subsystem description ... see the INTRO section, MIM
subsystem storage
- control ... OPER 95, MSM
- density ... INTRO 52, MIM
- diagnostic restrictions ... START 11, MIM
- errors ... SENSE 190-250, MSM
- identification ... INST 10, MIM

© Copyright IBM Corp. 1984, 1985

maintenance ..... INTRO 28, MIM
power ..... PWR 17, MIM
subsystem storage control area card diagram ..... OPER 100, MSM
subsystem storage area card descriptions ..... OPER 105, MSM
subsystem storage area card diagram ..... OPER 110, MSM
support material and references ..... INTRO 28, MIM
support mode, MD ..... MD 50, MSM
suppress out ..... OPER 300, MSM
swap cables ..... CARR 230, MIM
switch clock (SCK) card ..... OPER 15,35, MSM
switch driver receiver (SDR) card ..... OPER 15,35, MSM
switch driver terminator (SDT) card ..... OPER 15,35, MSM
switch feature, remote ..... CARR 229, MIM
switch panels ..... INTRO 60, MIM
switch settings ..... INST 40, MIM
switch, maintenance power ..... PWR 27, MIM
switch, unit emergency ..... PWR 74, MIM
switches and circuit protectors ..... INST 60, MIM
switches, power ..... PWR 74, MIM
switches, subsystem power ..... PWR 27, MIM
symbols ..... see the Legend (LGND) section, MIM
symptom code table ..... PWR 40, MIM
sync and save tables ..... PDA 200, MSM
sync out ..... OPER 360, MSM
syntax description, maintenance diagram manual (MDM) . see the Legend (LGND) section, MIM
system reset ..... OPER 320, MSM
system test ..... INST 110, MIM

T

TACR (two-channel additional condition register) card ..... OPER 35, MSM
TADT (two-channel additional driver terminator) card ..... OPER 35, MSM
tag bus ..... OPER 360, MSM
tag gate ..... OPER 360, MSM
tailgate cable connector pin identification ..... LOC 101, MIM
tailgate cable connectors location ..... LOC 101, MIM
TCR (two-channel condition register) card ..... OPER 35, MSM
terminal board checks ..... INSP 60, MIM
test equipment/tools need for the 3880 ..... INST 10, MIM
Test I/O command ..... OPER 210,235, MSM
test, electronic channel wrap ..... CARR 215, MIM
test, online ..... see the OPER section, MIM
test, system ..... INST 110, MIM
tests, online ..... PRG 5, MIM
three phase ac bulk supply location ..... LOC 30, MIM
tools/test equipment needed for the 3880 ..... INST 10, MIM
tools ..... CARR 110, MIM
trace program introduction ..... PDA 100, MSM
trace program ..... MD 60, MSM
two-channel additional condition register card ..... OPER 15, MSM
two-channel additional driver terminator card ..... OPER 15, MSM
two-channel additional condition register (TACR) card ..... OPER 35, MSM
two-channel additional driver terminator (TADT) card ..... OPER 35, MSM
two-channel condition register (TCR) card ..... OPER 25, MSM
two-channel condition register (TCR) card ..... OPER 35, MSM
Two-Channel Switch Pair feature ..... INTRO 30,34,45,62, MIM
Two-Channel Switch Pair, Additional feature ..... INTRO 30,34,45,62, MIM

U

Unconditional Reserve command ..... OPER 235, MSM
unguided maintenance ..... MD 20, MSM
unit check ..... OPER 255, MSM
unit emergency switch ..... PWR 22,74, MIM
unit emergency switch ..... INST 60, MIM
unit exception ..... OPER 255, MSM
upper/lower port registers ..... REF 60,100, MSM
usage statistics and overrun errors ..... SENSE 170-185, MSM

V

VM/OLTSEP ..... PRG 20, MIM
voltage checks ..... PWR 32, MIM

W

wrap cable installation ..... CARR 210, MIM
wrap test description ..... CARR 210,215, MIM
wrap, electronic ..... INST 90, MIM
write commands, direct mode ..... OPER 225, MSM
Write Count-Key-Data command ..... OPER 225, MSM
Write Data command, paging mode ..... OPER 200, MSM
Write Data command ..... OPER 225, MSM
write hit ..... OPER 200, MSM
Write Home Address command ..... OPER 225, MSM
write inhibited ..... SENSE 22, MSM
Write Key-Data command ..... OPER 225, MSM
write miss ..... OPER 200, MSM
Write Record Zero command ..... OPER 225, MSM
Write Special Count-Key-Data command ..... OPER 225, MSM

Numerals

3350 addressing ..... INTRO 32, MIM
3380 addressing ..... INTRO 35, MIM
3880 maintenance library ..... INTRO 5, MIM
3880 maintenance plan ..... INTRO 28, MIM
50 Hz maintenance power supply – location ..... LOC 40, MIM
50 Hz primary power box – location ..... LOC 41, MIM
60 Hz maintenance power supply – location ..... LOC 35, MIM
60 Hz primary power box – location ..... LOC 43, MIM

© Copyright IBM Corp. 1984, 1985

Index INDEX 4

Reader's Comment Form

You may use this form to communicate your comments about this publication, its organization, or subject matter, with the understanding that IBM may use or distribute whatever information you supply in any way it believes appropriate without incurring any obligation to you.

Your comments will be sent to the author's department for whatever review and action, if any, is deemed appropriate. Comments may be written in your own language; use of English is not required.

Note: *Copies of IBM publications are not stocked at the location to which this form is addressed. Please direct any requests for copies of publications, or for assistance in using your IBM system, to your IBM representative or to the IBM branch office serving your locality.*

Mach Type/Mod	Serial Number	Storage Control/CPU	Page ID	Page EC No.
Symptom/Error Code			If no error or symptom code, check here ☐	

Describe the trouble as it was reported to you, or as it appeared to you (machine problem).

Describe problem you encountered with documentation.

Do you want an acknowledgement?	For plant use only
Fill in your name and Branch Office Number:	Date received _____
Name _____	Sender acknowledged _____
B/O No. _____	Research completed _____
Occupation _____	Incorporated by EC _____

Thank you for your cooperation. No postage stamp necessary if mailed in the U.S.A. (Elsewhere, an IBM office or representative will be happy to forward your comments.)

Note: Staples can cause problems with automated mail sorting equipment. Please use pressure sensitive or other gummed tape to seal this form.

3880 MIM | Seq AZ0002 | PN 6315756 1 of 6 | 881143 13 Jan 84 | A15621 01 Apr 85

© Copyright IBM Corp. 1983

Reader's Comment Form

You may use this form to communicate your comments about this publication, its organization, or subject matter, with the understanding that IBM may use or distribute whatever information you supply in any way it believes appropriate without incurring any obligation to you.

Your comments will be sent to the author's department for whatever review and action, if any, is deemed appropriate. Comments may be written in your own language; use of English is not required.

Note: *Copies of IBM publications are not stocked at the location to which this form is addressed. Please direct any requests for copies of publications, or for assistance in using your IBM system, to your IBM representative or to the IBM branch office serving your locality.*

Mach Type/Mod	Serial Number	Storage Control/CPU	Page ID	Page EC No
Symptom/Error Code			If no error or symptom code, check here ☐	

Describe the trouble as it was reported to you, or as it appeared to you (machine problem).

Describe problem you encountered with documentation.

Do you want an acknowledgement?	For plant use only
Fill in your name and Branch Office Number:	Date received _____
Name _____	Sender acknowledged _____
B/O No. _____	Research completed _____
Occupation _____	Incorporated by EC _____

Thank you for your cooperation. No postage stamp necessary if mailed in the U.S.A. (Elsewhere, an IBM office or representative will be happy to forward your comments.)

Note: Staples can cause problems with automated mail sorting equipment. Please use pressure sensitive or other gummed tape to seal this form.

Reader Comment Form RCF 1

Reader's Comment Form

Fold and tape | Please Do Not Staple | Fold and tape

Attention: Information Development
Department 61C

NO POSTAGE
NECESSARY IF
MAILED IN THE
UNITED STATES

BUSINESS REPLY MAIL

FIRST CLASS PERMIT NO. 40 ARMONK, NEW YORK

POSTAGE WILL BE PAID BY ADDRESSEE

International Business Machines Corporation
General Products Division
P. O. Box 27155
Tucson, Arizona 85726

Fold and tape | Please Do Not Staple | Fold and tape

IBM®

3880 MIM	Seq AZ0002	PN 6315756 2 of 6	881143 13 Jan 84	A15621 01 Apr 85		

© Copyright IBM Corp. 1983

Reader's Comment Form

Fold and tape | Please Do Not Staple | Fold and tape

Attention: Information Development
Department 61C

NO POSTAGE
NECESSARY IF
MAILED IN THE
UNITED STATES

BUSINESS REPLY MAIL

FIRST CLASS PERMIT NO. 40 ARMONK, NEW YORK

POSTAGE WILL BE PAID BY ADDRESSEE

International Business Machines Corporation
General Products Division
P. O. Box 27155
Tucson, Arizona 85726

Fold and tape | Please Do Not Staple | Fold and tape

IBM®

Reader's Comment Form

You may use this form to communicate your comments about this publication, its organization, or subject matter, with the understanding that IBM may use or distribute whatever information you supply in any way it believes appropriate without incurring any obligation to you.

Your comments will be sent to the author's department for whatever review and action, if any, is deemed appropriate. Comments may be written in your own language; use of English is not required.

Note: *Copies of IBM publications are not stocked at the location to which this form is addressed. Please direct any requests for copies of publications, or for assistance in using your IBM system, to your IBM representative or to the IBM branch office serving your locality.*

Mach Type/Mod	Serial Number	Storage Control/CPU	Page ID	Page EC No.
Symptom/Error Code			If no error or symptom code, check here ☐	

Describe the trouble as it was reported to you, or as it appeared to you (machine problem).

Describe problem you encountered with documentation.

Do you want an acknowledgement?	For plant use only
Fill in your name and Branch Office Number:	Date received _____
Name _____	Sender acknowledged _____
B/O No. _____	Research completed _____
Occupation _____	Incorporated by EC _____

Thank you for your cooperation. No postage stamp necessary if mailed in the U.S.A. (Elsewhere, an IBM office or representative will be happy to forward your comments.)

Note: Staples can cause problems with automated mail sorting equipment. Please use pressure sensitive or other gummed tape to seal this form.

3880 MIM

Seq AZ0002	PN 6315756 3 of 6	881143 13 Jan 84	A15621 01 Apr 85		

© Copyright IBM Corp. 1983

Reader Comment Form

Reader's Comment Form

You may use this form to communicate your comments about this publication, its organization, or subject matter, with the understanding that IBM may use or distribute whatever information you supply in any way it believes appropriate without incurring any obligation to you.

Your comments will be sent to the author's department for whatever review and action, if any, is deemed appropriate. Comments may be written in your own language; use of English is not required.

Note: *Copies of IBM publications are not stocked at the location to which this form is addressed. Please direct any requests for copies of publications, or for assistance in using your IBM system, to your IBM representative or to the IBM branch office serving your locality.*

Mach Type/Mod	Serial Number	Storage Control/CPU	Page ID	Page EC No.
Symptom/Error Code			If no error or symptom code, check here ☐	

Describe the trouble as it was reported to you, or as it appeared to you (machine problem).

Describe problem you encountered with documentation.

Do you want an acknowledgement?	For plant use only
Fill in your name and Branch Office Number:	Date received _____
Name _____	Sender acknowledged _____
B/O No. _____	Research completed _____
Occupation _____	Incorporated by EC _____

Thank you for your cooperation. No postage stamp necessary if mailed in the U.S.A. (Elsewhere, an IBM office or representative will be happy to forward your comments.)

Note: Staples can cause problems with automated mail sorting equipment. Please use pressure sensitive or other gummed tape to seal this form.

Reader's Comment Form

Fold and tape | Please Do Not Staple | Fold and tape

Attention: Information Development
Department 61C

NO POSTAGE
NECESSARY IF
MAILED IN THE
UNITED STATES

BUSINESS REPLY MAIL

FIRST CLASS PERMIT NO. 40 ARMONK, NEW YORK

POSTAGE WILL BE PAID BY ADDRESSEE

International Business Machines Corporation
General Products Division
P. O. Box 27155
Tucson, Arizona 85726

Fold and tape | Please Do Not Staple | Fold and tape

IBM®

3880 MIM		PN 6315756 4 of 6	881143 13 Jan 84	A15621 01 Apr 85			
	Seg AZ0002						

© Copyright IBM Corp. 1983

Reader's Comment Form

Fold and tape | Please Do Not Staple | Fold and tape

Attention: Information Development
Department 61C

NO POSTAGE
NECESSARY IF
MAILED IN THE
UNITED STATES

BUSINESS REPLY MAIL

FIRST CLASS PERMIT NO. 40 ARMONK, NEW YORK

POSTAGE WILL BE PAID BY ADDRESSEE

International Business Machines Corporation
General Products Division
P. O. Box 27155
Tucson, Arizona 85726

Fold and tape | Please Do Not Staple | Fold and tape

IBM®

This page is intentionally left blank

© Copyright IBM Corp. 1983

Back Cover BACK 2

3880 MIM	Seq AZ0002	PN 6315756 6 of 6	881143 13 Jan 84	A15621 01 Apr 85			

© Copyright IBM Corp. 1983