

**General Systems
Division**

**System/3
Seminar**

**Boca Raton
Field Support**

IBM

PREFACE

The information contained in this seminar book applies to System/3 (CPU, Features, I/O Devices, and Software); it is FOR INTERNAL USE ONLY.

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The purpose of this seminar manual is to provide the Customer Engineer with a source of condensed reference material on certain features of the System/3 product line. The original concept of this seminar was to provide current technical information on the System/3 Model 4 and Model 8. It was expanded to include other features and topics of the System/3 line that have not been previously covered by other seminars. It is to be used as a reference aid in conjunction with other seminar books, TMD's, FETOM's, etc. to service System/3.

The manual is designed as a loose-leaf binder so that updates, local procedures, Service Aids, etc. may be added.

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5404

Introduction

System/3 Model 4 is a disk oriented, cardless system designed for on-line CRT work station applications. It can control up to five locally-attached work stations (terminals) and an operator's message console.

Communication with remote terminals and other systems is possible via an optional BSCA (Binary Synchronous Communications Adapter).

5404 Processing Unit

The processing unit contains 64K of main storage and an operator's console (keyboard). The CPU is similar to the System/3 Model 6 in that both use the same instruction set, registers, and general data flow. Both have similar operator's consoles and many of the I/O devices are the same or similar.

Some differences between the 5404 and 5406 are as follows:

- o The 5404 uses FET memory (64K only).
- o 5447 is a machine type not an I/O frame.
- o The disk attachment is housed in the 5447, not in the 5404.
- o CCP (Communication Control Program) available.
- o The 5404 contains attachment logic for five work stations and an operator's message display station (3277). Three of the six port circuits are standard with all 5404's; however, the tubes are an option.
- o 5213 Printer only available as Model 3.

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5213 Printer, Model 3

Prints 132 characters per line at a rate of 115 characters per second. Bi-directional printing is a standard feature. Same printer as on System/3 Model 6. Only available printer for 5404.

5447 Disk Storage and Control

5447 is available in two models. Model A1 has one drive with one removable and one fixed disk (same as 5444). Model A2 has two drives; drive 1 has one removable and one fixed, while drive 2 has two fixed disks. Each disk on the 5447 holds a maximum of 2,457,600 bytes. To permit program compatibility, drive 2 disks are identified as fixed and removable disk, although neither is removable. The 5447 supplies the system table top. (The 5447 is similar to 5406 I/O frame with 5444's.)

3277 Display Station

Every Model 4 is equipped with three ports as a standard feature. The first port is always an IBM 3277 Display Station Model 1. This unit is placed on the table top provided with the 5447 and serves as the operator's message display unit. Originally the 5404 was designed as a CCP (Communication Control Program) system only; however, requests were made to get 5404 without display unit. Thus, the 3277 Display Unit was made an option, but the attachment which is part of the memory board is still on all systems.

The two remaining work stations (or optional 3 more) can be any combination of the following units:

- o 3277 Display Station Model 1 or 2
(Keyboard can be attached to each 3277)
- o 3284 Printer Model 1 or 2
- o 3286 Printer Model 1 or 2
- o 3288 Printer Model 1

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Introduction

The System/3 Model 8 is a disk oriented cardless work station with local and remote teleprocessing capabilities. The system is especially applicable to (a) on-line work station using 3270's, (b) cardless batch processing using a magnetic media machine as input, (c) and linked to a larger central processing system operating in a remote job entry environment. The work station concept is enhanced through optional features like the ICA (Integrated Communications Adapter), the BSCA (Binary Synchronous Communications Adapter), and the 3741 Data Station with Native Attach.

The CPU itself is System/3 architecture, having the same basic instruction set, cycle and access time as the System/3 Model 10.

The technology employed is MST-1 and SLD. Storage is FET (Field Effect Transistors) and has a cycle time of 480 nanoseconds.

Devices and Features

Printers

5203 Model 1 - 100 LPM - 96, 120, 132 Prt. Pos.
 5203 Model 2 - 200 LPM - 96, 120, 132 Prt. Pos.
 5203 Model 3 - 300 LPM - 96, 120, 132 Prt. Pos.
 1403* - 600-1000 LPM - 132 Prt. Pos.
 Printer attachment same as Model 10.

* RPQ

Disk I/O

5444 Model A1	2.45 megabytes capacity
5444 Model A2	4.90 megabytes capacity
5444 Models A2 & A3	7.35 megabytes capacity
5444 Two Model A2's	9.80 megabytes capacity
5448 Model A1	9.80 megabytes capacity

All 5444/5448 devices employ the high speed access method. The 5444 disk drive and attachment are the same as Model 10. The 5448 disk drive and attachment are modified 5444 disk drives and attachment. A minimum of one 5444 A1 is required.

Printer Keyboard

The system may have a 5471 Printer Keyboard attached. If the 5471 is not attached, the system must have a 3741 Data Entry Device natively attached.

Storage - FET (Field Effect Transistor)

FET storage with non-destructive read-out and without error checking and correction. An error in main storage will cause a processor check.

Storage is available in the following sizes: 16K, 32K, 48K and 64K.

Power Supplies

Conventional series regulator type.

Minimum Configuration

5408 - 16K

5203 - any model

5444 - one model A1

5471 Printer Keyboard or 3741 natively attached.

Optional Features

ICA - Under manual switch control, allows connection of up to three separate communications interface.

- o Local 1 - 8000 BPS EIA Local modemless attachment permits local attachment of one 3271 Model 1 or 2 control unit, or one 3275 Model 1 or 2 display unit.
- o Local 2 - 2400 BPS EIA Local modemless attachment permits local attachment of one binary synchronous IBM terminal, such as a 3741.
- o Remote - Medium Speed BSCA, switched or leased line, data set clocking.

BSCA - Same as System/3 Models 6, 10, 15. Mutually exclusive with SIOC feature.

SIOC - Same as System/3 Models 6, 10, 15. Mutually exclusive with BSCA feature.

Dual programming - same function as System/3 Model 10.

3741 Native Attachment - Key-entry Station used to record data onto a magnetic diskette.

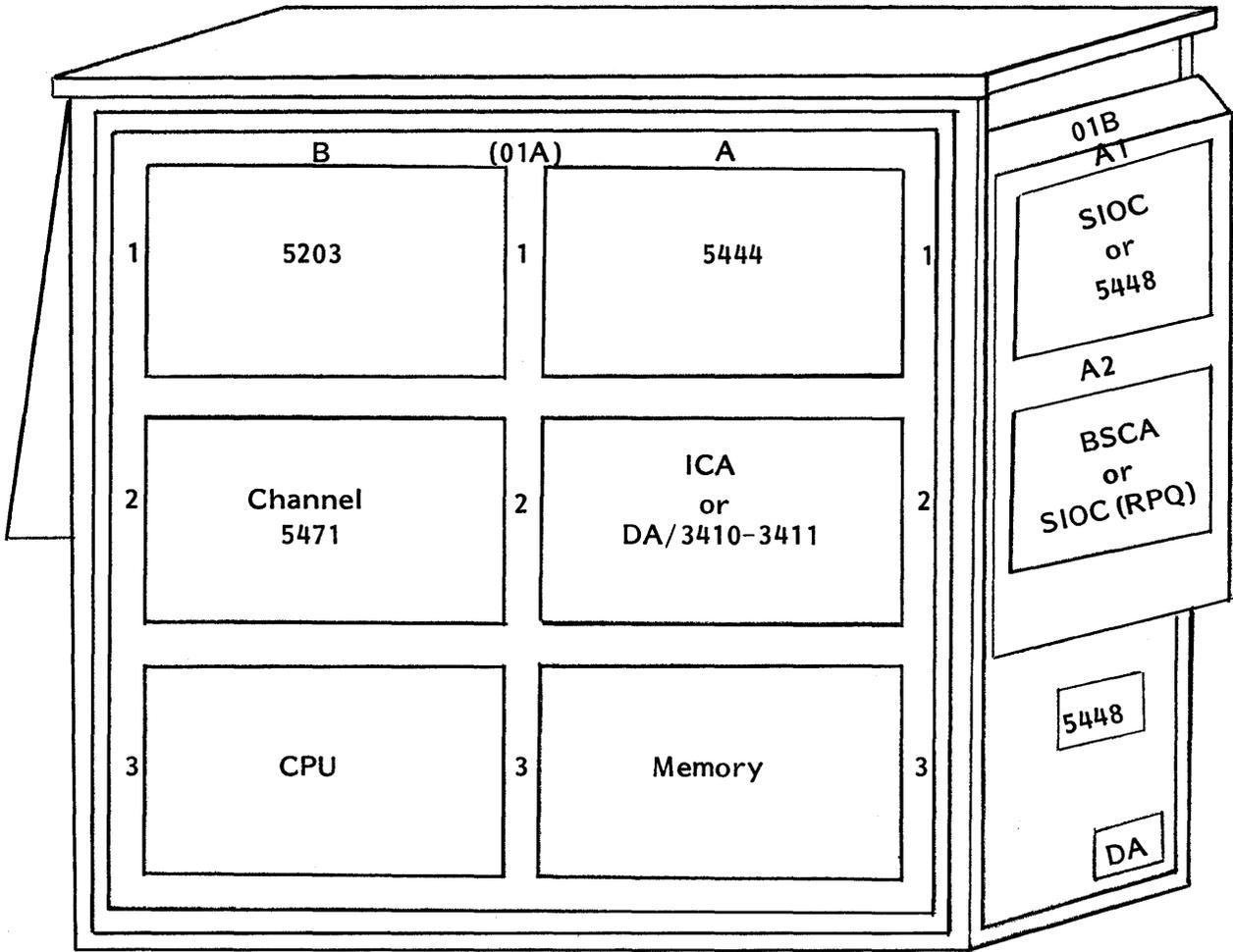
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Local Display Adapter - provides direct attachment of terminals.
Mutually exclusive with ICA.

3410/3411 - provides magnetic tape input/output. Mutually exclusive
with ICA.

5448 - Additional on-line disk storage.

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FET STORAGE

MOSFET (Metal Oxide Semi-conductor Field Effect Transistor)

MAIN STORAGE

The basic 5408 Main Storage provides the customer with 16K bytes of data storage and is located on board A-A3. Storage can be incremented up to 64K in 16K increments. FET circuitry is used in the Main Storage. Each FET array card contains 8K x 9 bits of storage. The basic 5404 Main Storage provides the customer with 64K bytes of data storage and is located on Board A-A3.

A Read Op is not destructive; therefore, it is not followed by a Write Op. A write cycle is required only when it is desired to change data in a particular storage location. A Write Op is always preceded by a Read Op.

INTERFACE

The interface consists of 16 SAR bits, 8 data bits, plus 1 parity bit (to storage), 3 control signals, 'reset', 'read call/write call', and 'storage new', and 8 data bits plus 1 parity bit (from storage to the CPU).

The control card, A-A3T2, provides array card selection, CSX and CSY decoding, data gating and termination of all input signals.

ERROR CHECKING

Main Storage and the control card do not perform any error checking or correction (5404/5408). The CPU performs parity checking during Storage Read or Write cycles.

READ CALL

The control card is initialized by the CPU signal, 'reset'. The Read Storage cycle is started by the CPU signal, 'Read Call/Write Call' signals. SAR Hi bits 0, 1, and 2 are decoded to activate one of eight 'card select' signals. SAR Hi bit 3 is decoded to activate one of two 'CSY' signals. SAR Hi bits 4 and 5 are decoded to activate one of four 'CSX' signals. The remaining SAR bits are decoded on each of the ARRAY cards. The read data is stored into the SDR 250 ns after a card select signal becomes active.

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WRITE CYCLE

The Write Storage cycle is started by the control card when it receives the signals 'Read Call/Write Call' and 'Store New' from the CPU. The operation of the 'Card Select', 'CSY' and 'CSX' signals is the same as in a Read cycle. CPU data is stored into the SDR 100 ns after a card select signal becomes active. A 'Write Pulse' is generated 50 ns later to store the SDR data into the addressed storage location.

FB1 Diagnostic

Introduction

FB1 replaces FF6 Disk Editor used on the System/3 Models 6 and 10. The new Editor can be used to configure and customize as well as program maintenance for the CE diagnostic pack. The input device for the 5408 can be 3741 diskette, 5471 keyboard, tape cassette or customer console switches. Block 20 of the Diagnostic User's Guide contains operating instructions for FB1.

Operation

After FB1 is loaded, instructions for the CE are printed along with an option menu.

Options are selected using the customer console switches (3-4).

Program prompts and F3 halts enable CE communication with the program using console switch 4.

Sense Switch 4 = 1 - indicates yes.

Sense Switch 4 = 0 - indicates no.

Prompts and answers are printed for the CE's records.

Functions

Pack configuration:

Diagnostic pack is shipped with all diagnostics and configured for a minimum system.

The first function you will use is configuration using the console switches as input.

Through switch options the following configuration functions may be performed:

1. Complete configuration
2. CPU storage size and CPU options
3. Configure U.D.T. only
4. Add to or modify an existing U.D.T. entry
5. Configure 48 or 120 chain image

Miscellaneous Functions

List, reproduce, delete are some miscellaneous functions. All operate the same as FF6, however, selection can be through console switches or 5471 keyboard.

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Note: A list of all programs should be taken before and after any changes are made to the pack.

Dup Pack Functions

A complete pack may be duplicated from any disk to any other disk through selecting options 12 to 43. This function would be used for backing-up the CE pack before any changes are made to the diagnostic programs.

Input Selection

1. Option - BB - use 3741 diskette as input (Model 8 only)
2. Option - CC - use 5424 MFCU as input (Model 10 only)
3. Option - DD - use 5471 keyboard as input
4. Option - EE - use tape cassette as input

Customizing Pack

1. Option - FF - used to remove all unused programs.
2. After initial installation, the CE pack must be customized.

Note: UDT configuration must be correct and tested before pack is customized.

Diskette/Tape Cassette

1. All diagnostic EC's are shipped on diskettes or tape cassettes.
2. Diagnostic programs for sales changes are shipped on diskettes or tape cassette.
3. Diskette/cassette operation is located in the Users Guide Block 20.

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APLD

Introduction

1. Used when disk is down to load disk diagnostics.
2. Plugs into a jack on the CE Panel.
3. Block 7 in The Diagnostic Users Guide contains operating instructions.

Cassette

1. Tape contains
 - a. Tape Loader
 - b. DCP
 - c. Disk diagnostics only

Operation

1. Fill storage with 'FE'.
2. Manually enter bootstrap - starting at address '005D'.
3. Turn on CE override switch on 5203.
4. Program halts in block 7 will direct you for proper operating procedure.
5. Block 7 also contains a flow chart showing - halts and CE action.

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AAPLD Diskette (5406, 5408, 5410)

Introduction

A special AAPLD (Alternate Alternate Program Load Device) is available from Mechanicsburg which provides DCP and 5444 Diagnostic on a 3741 diskette. This special diskette is used in conjunction with a direct attached 3741 on a System/3 Model 6, 8, or 10.

Providing that the CPU and 3741 attachment are functioning, the AAPLD will provide a fast, convenient way of getting DCP and 5444 Diagnostics into storage so that problems with the 5444 can be diagnosed. This is a free lance tool and has no MAP support.

Parts

P/N 5132740	B/M (2 diskettes, operating instructions, listing FB4)
P/N 5132739	Operating instructions
P/N 5132738	Diskette
P/N 5132737	Listing FB4

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PRELIMINARY AAPLD INSTRUCTIONS

1.0 DESCRIPTION

- 1.1 The AAPLD (Alternate Alternate Program Load Device) uses a special diskette in conjunction with a direct attached 3741 in a System/3 Model 6, 8 or 10. Providing that the CPU and the 3741 attachment are functioning, the AAPLD will provide a fast, convenient way of getting DCP and the 5444 Diagnostics into storage so that problems with the 5444 can be diagnosed. No map support is provided, so if there is a channel or CPU problem that disables the 3741, the tape cassette (APLD) must be used instead.
- 1.2 The programs written on the diskette are a special 3741 loader, DCP and all 5444 Diagnostics.
- 1.3 The DCP is configured as follows:

CPU	D, 2000
UDT	F1, E0, A0-2

For use on a Model 6, the CPU and UDT records must be modified. For use on a Model 10 without high speed files, the UDT card must be changed. See Section 5.

2.0 INSTRUCTIONS FOR USE

- 2.1 Manually insert the following 29 byte bootstrap in storage starting at Address 0100:

<u>ADDRESS</u>	<u>DATA</u>
0100	C2 02 0100
0104	B1 41 1B
0107	B1 42 1C
010A	F3 43 08
010D	B1 44 19
0110	F3 41 00
0113	E1 42 13
0116	C0 87 000E
011A	40 00
011C	7F

- 2.2 Insert the AAPLD diskette in the 3741.
- 2.3 Depress 'FUNCT SEL' lower and 'RET TO INDEX'. This step is not necessary if you are already at the index.
- 2.4 Depress and hold 'NUM SHIFT' while entering '41'.

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- 2.5 Depress 'FUNCT SEL' upper and then depress 'OUTPUT FROM 3741'. Wait while the diskette advances to and displays the 1st record of the special loader. Since this loader is hex data, most characters displayed are unrecognizable.
- 2.6 Make the printer ready, if necessary.
- 2.7 Set CPU SAR to 0100. Then depress 'START' on the CPU. The loader and DCP will be loaded and the normal DCP printout and HA Halt will occur.
- 2.8 Reset the HA Halt and Program A01 will load and a second HA Halt will occur. From this point on, the system looks similar to a card system except that the cards are written on the diskette. To rerun a program, system reset and depress start. Resetting the HE Halt at program termination will cause the next program to be loaded.
- 2.9 When the last record on the diskette has been read, an H5 Halt will occur indicating there is no more data. (BCD 1345 on Model 6)
- 2.10 The bootstrap will remain at Address 0100 so that loading of DCP can be repeated at any time by returning to Step 2.2.

3.0 DISKETTE ORGANIZATION

- 3.1 The front of the AAPLD diskette contains the special loader and DCP. After DCP, the following disk diagnostics are written in the following order and locations:

<u>PROGRAM ID</u>	<u>LOCATION (TRACK & SECTOR)</u>
A01	04015
A03	08008
A05	12002
A06	15013
A07	18022
A08	22002
A09	25012
A0A	28011
A0B	31021
A0C	35003
A0D	38011
A0E	40019
B01	43011
B03	46010
B04	47015
B0B	52001

4.0 SELECTING PROGRAMS OUT OF SEQUENCE

- 4.1 Once DCP is loaded, any program on the diskette may be selected as follows:
- A. If the 3741 is in Read Mode, reset it by holding both shift keys depressed at the same time and then depressing Reset.
 - B. Now depress 'FUNCT SEL' lower and then 'SEARCH ADDRESS'.
 - C. Key in the track and sector location of the program (see Section 3) in positions 1-5.
 - D. Depress 'REC ADV'.
 - E. The header record for the desired program should be displayed. If it is not, you should be able to 'REC ADV' or 'REC BKSP' to find it in case some minor changes have been made to the diskette.
 - F. With the header record for the desired program displayed, depress 'NUMERIC SHIFT' and enter '41'. Then depress 'FUNCT SEL' upper and 'OUTPUT FROM 3741'.
 - G. The desired program is now ready to be read when the HE Halt is reset.

5.0 MODIFYING CPU & UDT RECORDS

- 5.1 When running on a Model 6, it will be necessary to modify the CPU and UDT records. This is easily done as follows:
- A. Depress 'FUNCT SEL' lower and then 'UPDATE'.
 - B. Depress 'FUNCT SEL' lower and then 'SEARCH CONTENT'.
 - C. Key in 'CPU' in position 1-3.
 - D. Depress 'REC ADV'.
 - E. When the CPU record is found, it will be displayed.
 - F. Change the record to: CPU B,2000
 - G. Depress 'REC ADV'.
 - H. The UDT record will soon be displayed. Change it to: UDT F1, E8, A0.

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- I. Depress 'REC ADV'.
 - J. Verify that both records have the correct information in them by depressing 'REC BKSP' to display their contents.
 - K. Depress 'FUNCT SEL' lower and then 'RETURN TO INDEX'.
 - L. Diskette is now configured.
- 5.2 When running on a Model 10 without high speed files, it is necessary to change only the UDT card. See Section 5.1 for the procedure. However, in Step C, Key in 'UDT' and then skip to Step G. In Step H, change UDT record to: UDT F1, E0, A0.

6.0 PRECAUTIONS AND COMMENTS

- 6.1 Always be sure you have the AAPLD diskette in the 3741 before trying to run the bootstrap at Address 0100. Failure to do this can destroy the bootstrap at Address 0100.
- 6.2 If the 3741 appears to be hung up and not taking commands properly from the keys, try resetting it by depressing and holding both shift keys and then depressing 'RESET'. If all else fails, open the diskette cover and reclose it. NOTE: If reading in programs, it will be necessary to manually reselect the desired program (Section 4) and get the 3741 back into Read Mode.
- 6.3 Once Program B03 (IPL Test) has been loaded, it must be executed! If you try to terminate it early, it may disturb the low order 256 bytes of storage and cause a 'PROC CHECK' when trying to load the next program. It is then necessary to re-enter the bootstrap and reload DCP.

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3741 DIRECT ATTACHMENT

3741 Introduction

The 3741 Data Station is a single-operator, key-entry station used to record data onto a magnetic disk (diskette).

System/3 Models 6, 8, 10 (disk 12 and 15) use the 3741 data station natively attached to the I/O channel as an on-line magnetic diskette reader-writer. Data transfer is serial by byte, one byte at a time (EBCDIC) with a maximum 128 bytes transferred to or from the 3741. All data is parity checked on the channel and at the 3741 attachment interface.

The IBM 3741 can be used in the following ways:

1. As an off-line data entry device.
2. As an on-line input/output device attached directly to the CPU.
3. As a terminal device in a communications environment.

There are four models of the 3741:

Model 1 is a single data-entry station with a 240 character CRT display. Its record size is from 1 to 128 characters.

Model 2 has the functional characteristics as Model 1, but also includes a BSCA (binary synchronous communications adapter).

Model 3 executes programs written in the ACL (Application Control Language), and can optionally create object programs from source programs. When not under ACL program control, Model 3 can operate with the same characteristics of the Model 1.

Model 4 is the same as the Model 3, plus BSCA capabilities of the Model 2.

One optional feature of the IBM 3741 is a second disk drive and keyboard that allows merging, copying, and pooling of records when the 3741 is off-line. When directly attached to System/3, the two diskettes are not separately addressable. Rather, they are used to simplify on-line operation when handling large quantities of data. When reading data into System/3, for example, control can automatically be switched between the first and second diskettes to provide a continuous input of data.

Rated speeds for all models are listed below, but no effort is made to limit transfer to these rates.

Read	1500 Records per minute
Write	1000 Records per minute

Physical attachment is via a 50 twisted pair shielded cable available in two lengths, 20 ft. and 40 ft. The cable is connected through two 48 pin connectors. The 3741 end of the cable plugs into two SLT paddle cards. This cable comes with the 3741 as part of the ship group via a specify code.

Cabling from the system connectors to the board is via four flat ribbon cables. These cables provide all interface signal lines between the attachment and the 3741.

The attachment is available in two versions, IPL and Non-IPL. The IPL version consists of 11 cards (7 logic and 4 convert cards). The non-IPL version has 10 cards (6 logic and 4 convert cards). Both attachments are basically a modified SIOC attachment; each version has its own unique board part number. The version used and its location in the system vary between models as described below:

Model 15 IPL version only (IPL capability can be activated on the B & C models only.) on Gate B Board A4 Channel bank 3 is a prerequisite.

Model 12 (A) cardless - IPL version on Gate A board A3, (B) with card I/O - IPL version on Gate B, board A4. Channel bank 3 is a prerequisite.

Model 10 - Non-IPL version only on gate B, board A4. Channel bank 3 is a prerequisite.

Model 8 - Non-IPL version only on gate A, board A3. Located on channel bank 1 the attachment shares the board with memory. This board is prewired, and the 3741 feature is added by inserting the cards into the board. (NOTE: Card locations on this board are different from the standard board used on all other models.)

Model 6 - Non-IPL version only. Gate B, board A1, exclusive with SIOC.

Board P/N w/o IPL - 5554836

Board P/N with IPL - 5554842

On the Mod 8 3741 DA CKT is located in the memory board.

ATTACHMENT ASSIGNMENTS

Device Address

- (A) The System/3 device address for 3741 is '4', M Bit = 0.
- (B) The 3741 address for System/3 is also '4' (address bit 5 active). However, the system only uses this address to identify that the 3741 is ready and not busy. Only address Bit 5 is sensed for this purpose. Consequently any address from the 3741 with address bit 5 active will make the device appear active to the system. If it is necessary to determine which device is really attached, this can be done by sensing the I/O transfer lines. Four of these lines contain the device address (in this case '4') which is hard wired in the connector.

The cycle steal priority used is 16 (priority clock 0, bit line 3).

Assignment code is DBO Bits 2 and 3 at clock 8.

LSR's - one LSR, the DSAR (Data Station Address Register) has been assigned to the attachment. It is selected by raising LSR select line 4 and 5 on all models of System/3.

Interrupt level 5 (DBI bit 5 during interrupt poll). This interrupt is used on the Model 15 to signal not only 'op-end', but also that the 3741 has come ready or has some other status which requires attention.

Cable Outlet

The following cable outlet hole in the system will be used by the 3741:

Model 15-OIC-B1

Model 12-OIC-B1

Model 10-OIC-F1 (shares hole with SIOC).

Model 8-Same place as the data recorder on the Model 6.

Model 6-In place of the SIOC

Power

Power for the 3741 is supplied by the existing power supplies in the 3741. No power is supplied to the 3741 by the System/3.

Power for the attachment is supplied by System/3. No special supplies or power increments are required to be added to the system.

The 3741 attachment requires +6 volts and -4 volts. Tolerances and variations are the same as for other MST logics within the system. (No emergency power off capability exists between the system and the 3741.)

On-Line Selection

The 3741 is placed on-line by insuring it is powered on and by performing a designated function select on the 3741 keyboard. Off-line selection is also accomplished at the 3741 keyboard. (Off-line is the normal power up state of the 3741.)

The 3741 keyboard is locked out, except for the function select options, while on line. If the operator selects 'off-line' while the system is using the 3741, the program will detect this and halt.

Indicators

There are no indicators for the 3741. Device identification is via the halt code.

Functional Description

As mentioned earlier, the 3741 attachment is a modified SIOC attachment. Not all functions available in this attachment (adapter) are used by the 3741.

The major changes made to the SIOC to form the 3741 adapter are:

- End of transmission can cause an interrupt without the attachment being in the read or write state.
- End of transmission will generate one pulse per transition. This pulse is approximately 3 microseconds long and coincides with the leading edge of the EOT input signal. The duration of the EOT input signal is immaterial, but must be longer than 6 microseconds.
- The cycle steal timing has been changed.
- The interrupt level is now 5 (used on Mod 15 only).
- The device address is different.
- The capability to directly test the ready/not busy status of the box has been included.

- No EPO capability exists.
- The indicator light has been removed.
- An IPL capability has been added on attachments with board P/N 5554842 (Model 12/15 only).
- Other minor changes to adapt to the 3741 I/O adapter method of operation.

The System/3 3741 adapter serves as a buffer storage and control unit between the attached I/O device and the CPU I/O channel. Data transfer between the adapter and the 3741 occurs on a request and acknowledgment (asynchronous) basis and between the adapter and the CPU storage by means of 'cycle steal' through the I/O channel. A single byte of data (8 bits plus parity) is transferred on each cycle. Depending on the nature of the attached I/O device, data can be 'READ' from the device and placed into core storage or data can be 'WRITTEN' into the device from storage. The read or the write mode of the attachment is program selectable. The 3741 must be placed in the corresponding mode.

In addition to data transfer, sixteen program selectable control lines (I/O select lines) are provided between the adapter and the 3741 box for the purpose of controlling various I/O device functions. Eleven program testable status lines (I/O transfer lines) are also included to permit program testing of various 3741 conditions.

MAINTENANCE AND DIAGNOSTICS

Maintenance

Maintenance of the 3741 attachment is performed in the following manner:

- The customer takes the 3741 off-line to determine if it operates properly. If it does not, the 3741 is failing and the 3741 has to be serviced.
- If the System/3 Model 8 attachment is failing, diagnostic programs, map charts, and CE aids are used to isolate the problem.

A 'WRAP' test capability has been incorporated into the attachment design. This is accomplished by a shorting connector which is shipped with each system. This connector is used to 'wrap' the VTL level interface signals at the tailgate connectors. The wrap connector can also be used to wrap the interface cable back to the 3741 to assist in diagnosing.

No preventive maintenance is required on the 3741 attachment.

Diagnostics available for the 3741 direct attach are as follows:

- 401 Diagnostic function test no diagnostic connector.
- 402 Attachment function test with diagnostic connector.
- 403 Test 3741 functions of a data byte transfer - with diagnostic connector.
- 404 3741 function test.
- 40F System Test Exerciser.
- ERAP

Refer to block 40 of Diagnostic Users Guide for complete details.

Procedures For Loading and Running Diagnostics from 3741 with Channel Terminate Feature

Diagnostic Control Program (Block 10)

To configure diskette DCP:

- Insert diskette #1 (P/N 1607738) in 3741
- Press LWR 'funct sel' and 'search content'
- Type an asterisk * in col. 1.
- Press 'Record Advance'
- When record is found, 'Rec BKSP' to desired record (CPU, UDT, 11 CHAN, IMAGE, MISC). Define system as described for cards. 'Rec Adv' enters data displayed on screen.

Diagnostic Programs available on diskette are as follows:

1 for 1 - The data previously contained on one 96 column card appears on one diskette record using standard EBCDIC.

PROCEDURES FOR LOADING DCP

First insert the diskette, put 3741 on-line, and output mode, type "41", press upper "Function Select", and "Output from 3741" (dup key). This procedure will prepare the 3741 to start reading when the "Program Load Key" on the CPU is pressed.

After DCP is loaded, continue hitting "Record Advance" until the desired program is displayed on the screen. Then put the 3741 on line and in output mode (Type "41", upper "Function Select" and "Output from 3741", dup key).

In order to use diskettes instead of cards for the diagnostic programs, the diagnostics have been grouped on the diskettes in the order the maps call out to run then. This is convenient to use and faster than with cards.

The following shows the method of grouping.

- Diskette 1 P/N 1607738
Map Entry Diskette
Contents: ODO-FFB-FFF-FD6-143
FCO,DD6,D44, FC2, DD9, C17-FA0, FA6, FA7.

- Diskette 2 P/N 1607739
Stand Alone Diskette
Contents: LDR-FCO, LDS-FA0,EoA

- Diskette 3 P/N 1607740
3340 Micro Diagnostic Diskette
Contents: C16-FA1-FA2-FA3-FA4-FA5.

- Diskette 4 P/N 1607741
3340 Diagnostic Diskette
Contents: C11, C12, C14, C15, C17-FA0
C18, C19, C1A, C1B, C1F.

ALTERNATE LOAD DEVICES

	Cassette	5424	2560	1442	3741
5404	X				
5408	X				X
5410	X	X		X	
5412		X		X	X
5415A	X	X	X	X	
5415 B&C		X	X	X	X

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5-8

5448

5448 DRIVE

The 5448 Disk Storage Drive (Model A1) provides 9.8 MB of additional online storage for system 3 Model 8/10. The 5448 is a stand-alone box that contains two disk drives and a 24 volt power supply which supplies both the +24 volt and the +6 volt power for the drives. All other voltages and control signals are supplied by the host system. The two disk drives are modified 5444 (same as lower drive on 5447). The basic differences between a 5448 drive and a standard 5444 are as follows:

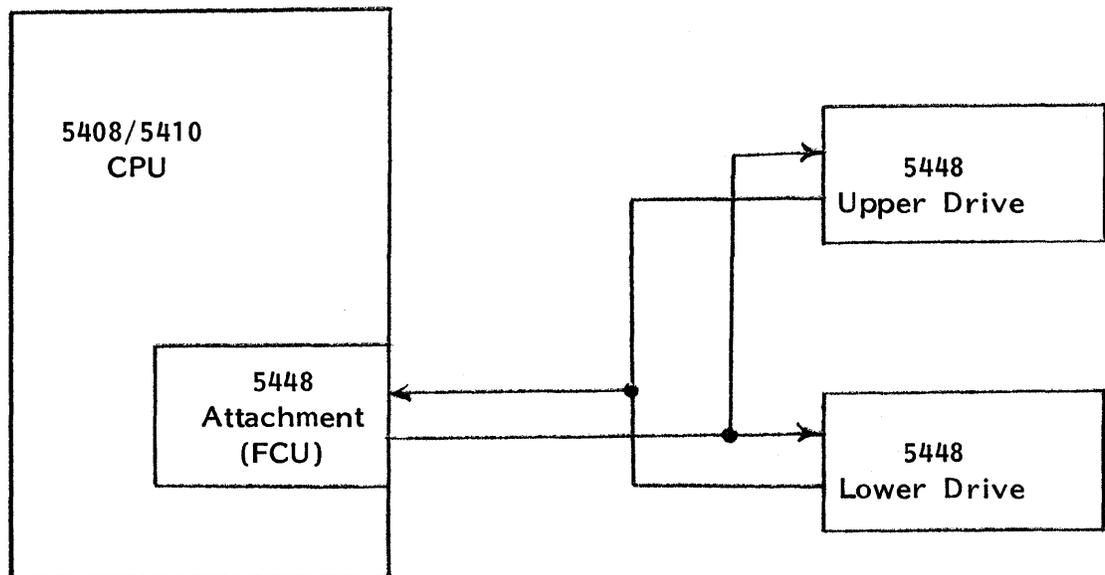
- o Two disk drives each with two fixed disks attached to a common spindle (no removable disk).
- o High speed access only.
- o Only one model available (9.8 MB).
- o No cleaning brushes (ready in 10 seconds).
- o No indicator lights (depends on host system to relay status to the operator).
- o Drives have no disk or drawer interlocks (Drives not accessible to the customer).

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5448 ATTACHMENT

The 5448 FCU (File Control Unit) is a 5444 Board with wiring modifications plus three reworked cards (P2, Q2, S2). These cards have been modified due to 5448 not being IPL'able; however, there are still non used IPL and cartridge lines in the circuit which, if not at proper level, could cause a failure. These lines are still shown in ALD's to assist in problem determination. Since most cards in 5448 FCU are identical to 5444 FCU, card swapping can be used for problem determination.

The FCU is the interface between the 5448 and the CPU, which provides a way for the 5448 to use the facilities of the CPU to communicate with main storage. The 5448 File Attachment is located within the CPU (01B-A1 Board in 5408, 01B-B1 in 5410). This means that the 5448 Attachment is mutually exclusive with SIOC (Serial Input/Output Channel) on the Model 8 and the 5445 Disk Drive on the Model 10.



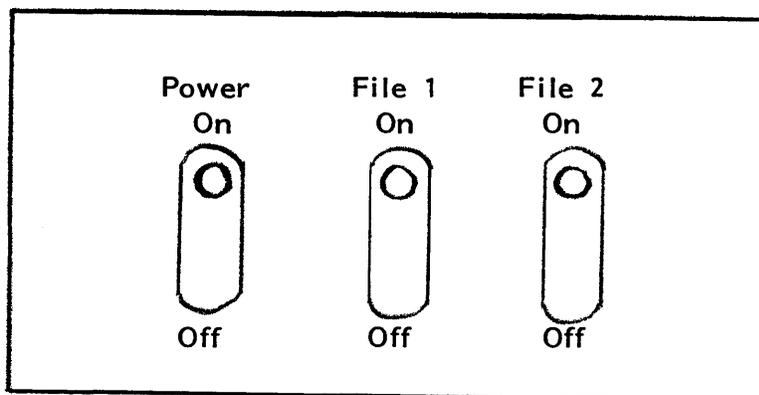
Each disk drive has a separate interface, which may be selected by the host system. The customer programs consider each 5448 spindle as a 5445. The 'Q' codes for the 5448 are C0 for spindle 0 and D0 for spindle 1. The address conversion is done by the SCP (System Control Program). Each of these simulated 5445's are equal to one quarter the capacity of a 5445 (approximately 5 MB).

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5448 CABLES & POWER

The 5448 attaches to the system via 2 cables. The signal cable is a shielded 50 connector twisted pair cable with 4 coaxial lines attached to the cable. The other cable is AC/DC power lines. These cables connect from front of 5448 thru 5203 to front of 5410 (route of 3410/3411) or back door of 5408 (route of SIOC).

The AC power, supplied by host system, is distributed to the disk drives and the 24 volt supply. There are three power switches on the 5448.



Power Control Switches

- o IPO (Immediate Power Off) - Removes all AC power from the 5448.
- o Start/Stop File 1. Off position removes the control voltages and the AC voltages from the upper drawer. Turning on switch, a POR (Power on Reset) occurs and control voltages and AC voltages are restored to drawers
- o Start/Stop File 2. Off position removes the control voltages and the AC voltages from the lower drawer. Turning on switch, a POR occurs and control voltages and AC voltages are restored to drawer.

The host system provides the -4 volts and -30 volts to the 5448. The +6 volts is supplied by a regulator in the 5448. When -4 and -30 voltages are present and stable, the system must send a signal, "5448 power complete", to the 5448. The "5448 power complete" signal allows K1 relay to pick which places 24 volts on the disk drives completing the power up sequence. In emergency power down situations, K3 (AC power) is dropped, which removes 24 volts from the drives. This is done to remove 24 volts before +6 volts and -4 volts to protect data present on the disk drives. If 24 volts is present after the +6 volts and -4 volts are removed, write current will be present and data would be written over.

Power on Sequence

- o Insure Start/Stop File 1, File 2 and IPO switches are on.
- o Switch on host system power.
- o AC applied to 5448
- o +6 volt ready
- o 5448 power complete signal
- o +24 volts applied to drives

Power Off Sequence

Just the reverse of Power On Sequence.

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5445 DISK MAP

<u>LOCATION</u>	<u>CONTENT</u>
Cyl 0 Track 1	Cyl 0 5444 Format (sectors 99 thru 5C)
Track 2	Cyl 0 Head 0 5445 (20 sectors) (4 sectors reserved)
Track 3	Cyl 0 5444 Format (sectors 00 thru 5C)
Track 4	Cyl 0 Head 1 5445 Format (20 sectors) (4 sectors reserved)

Cyl 1-3 ALTERNATE TRACKS & LOG

Cyl 4 Track 1	Cyl 1 Head 0 (20 sectors)	Cyl 1 Head 1 (4 sectors)
Track 2	Cyl 1 Head 1 (16 sectors)	Cyl 1 Head 2 (8 sectors)
Track 3	Cyl 1 Head 2 (12 sectors)	Cyl 1 Head 3 (12 sectors)
Track 4	Cyl 1 Head 3 (4 sectors)	Cyl 1 Head 4 (16 sectors)
Cyl 5 Track 1	Cyl 1 Head 4 (4 sectors)	Cyl 1 Head 5 (20 sectors)
Track 2	Cyl 1 Head 6 (20 sectors)	

NOTE: Six 5445 tracks are mapped on five 5448 tracks. Mapping is continuous thru the data area.

Cyl 203 Track 1	Cyl 48 Head 10 (12 sectors)	Cyl 48 Head 11 (12 sectors)
Track 2	Cyl 48 Head 4 (8 sectors)	Cyl 48 Head 12 (16 sectors)
Track 3	Cyl 48 Head 12 (4 sectors)	Cyl 48 Head 13 (20 sectors)
Track 4	Cyl 48 Head 14 (20 sectors)	(4 sectors reserved)

To convert from 5445 C/H/R to 5448 C/S:

$$\frac{400 C^* + 20 H^{**} + R^* - 16}{96} = \text{CYLINDER}^* \text{ Remainder} = \text{Sector}^*$$

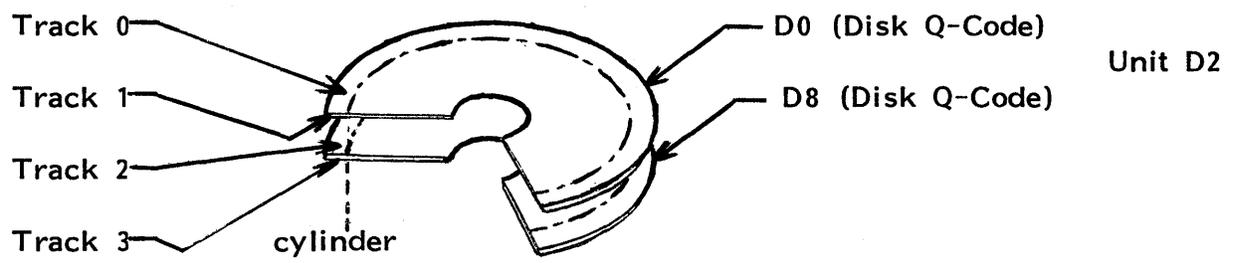
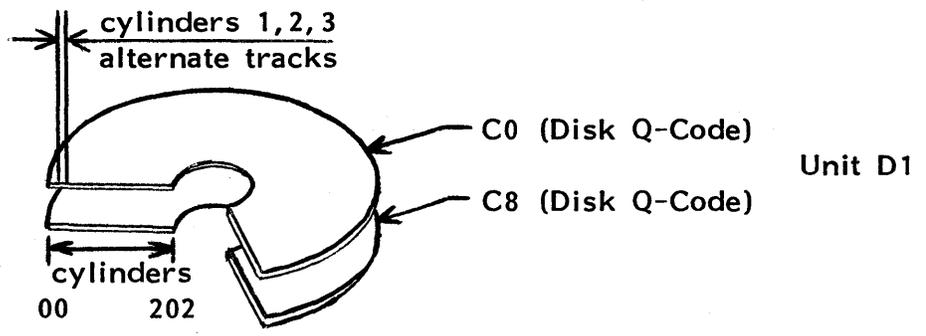
To convert from 5448 C/S to 5445 C/H/R:

$$\frac{96 C^* + S^* + 16}{400} = \text{CYLINDER}^* \frac{\text{REMAINDER}}{20} = \text{HEAD}^{**} \quad \text{Remainder} = \text{Record}^*$$

*A Decimal non-zero number

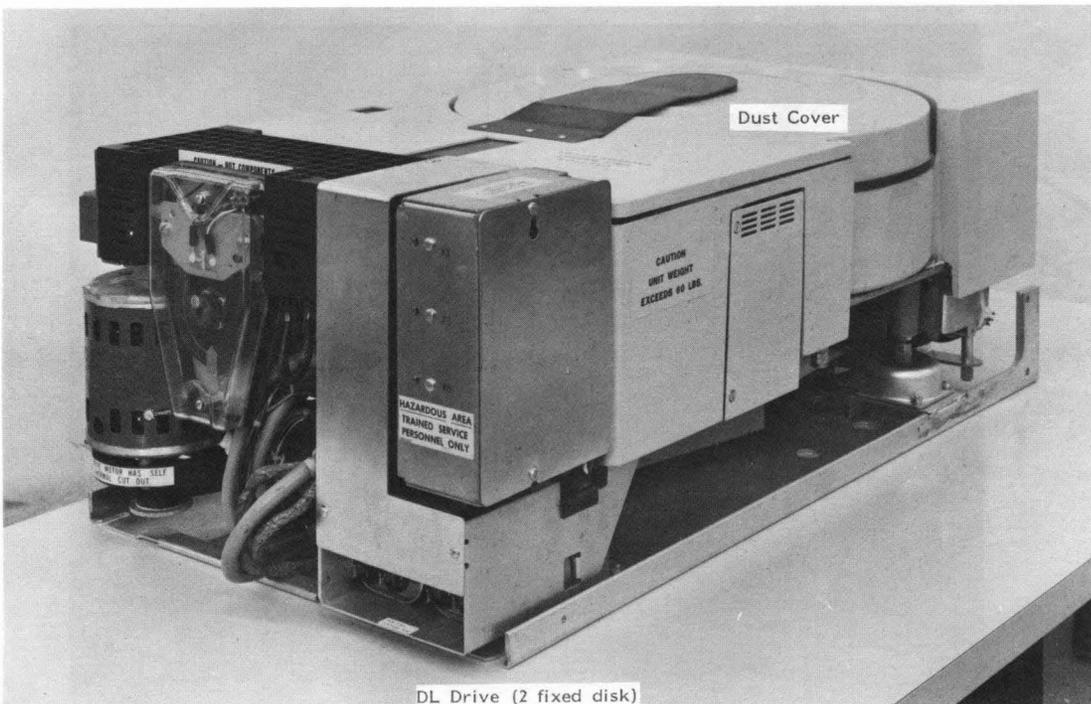
**A Decimal number from 0 thru 19

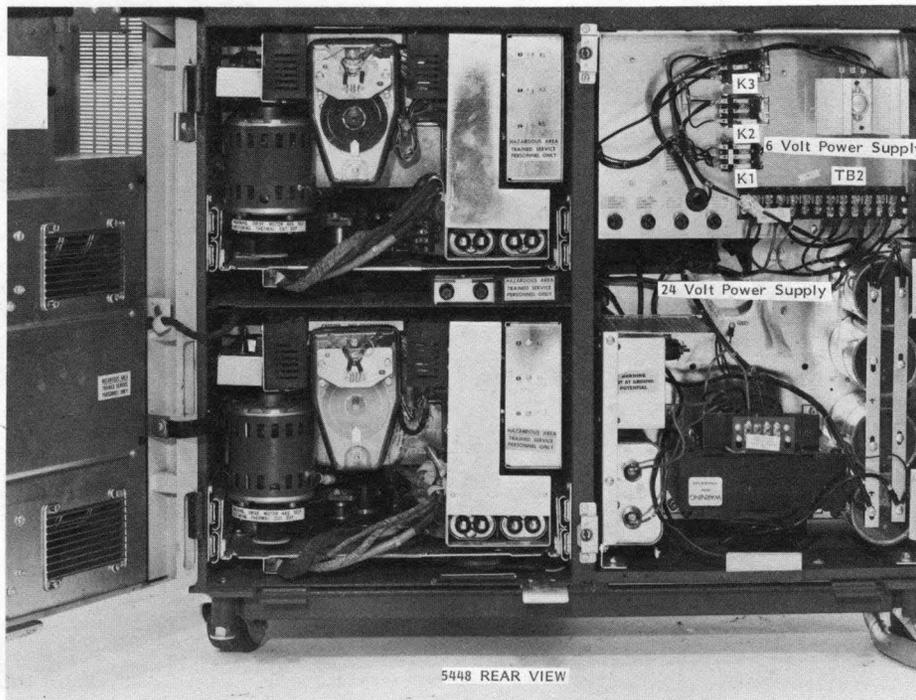
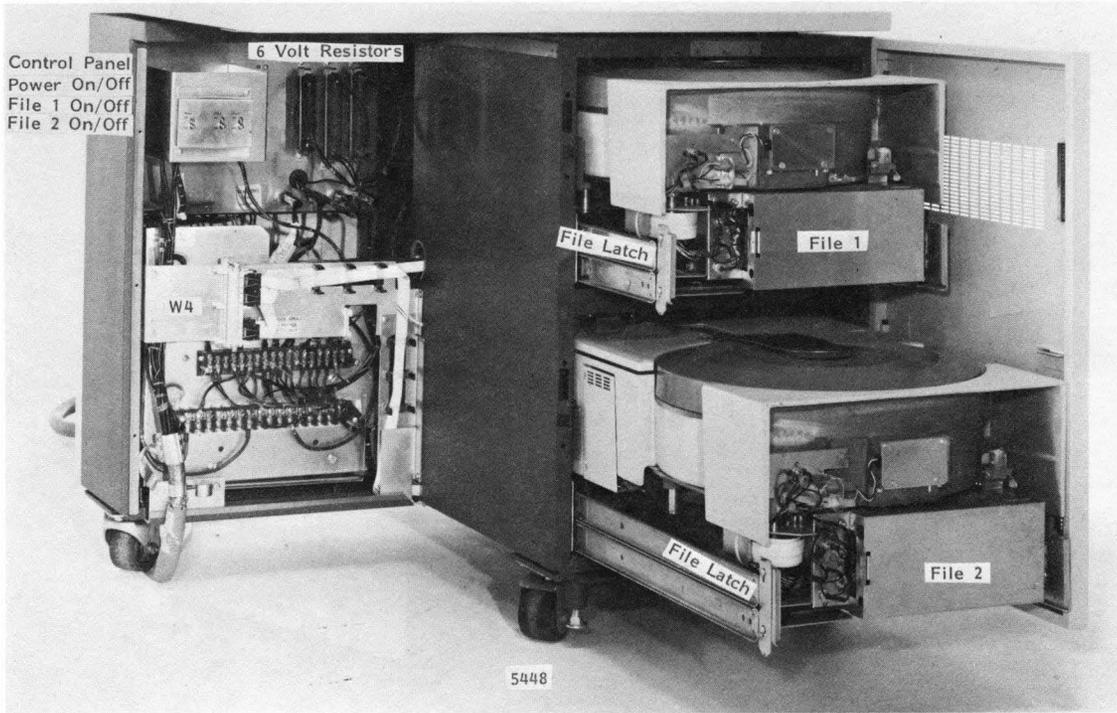
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	<u>PHYSICAL</u> 5448	<u>LOGICAL</u> 5445
BYTES PER SECTOR	256	256
SECTORS PER TRACK	24	20
BYTES PER TRACK	6144	5120
TRACKS PER CYLINDER	4	20
SECTORS PER CYLINDER	96	400
BYTES PER CYLINDER	24576	102240
CYLINDERS PER UNIT	200	47 3/4
MAXIMUM NUMBER OF FILES PER UNIT	50	50
MAXIMUM NUMBER OF TRACKS PER UNIT	800	955
NUMBER OF UNITS	2	2

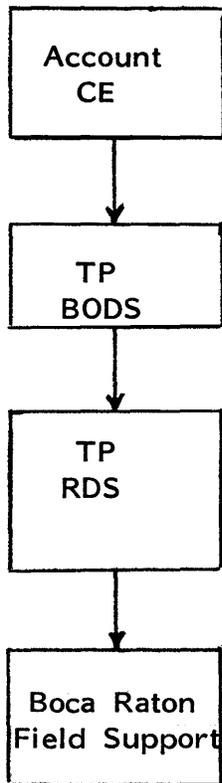
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TP SUPPORT STRUCTURE



CE should run in-house diagnostics (801/881 - 806/886), run 809 to Raleigh TPTC, run 809/80A or 871/872 with attaching BSC device. If all available diagnostics run or on-line test fail, call TP BODS.

He has trap available to record and analyze line traffic. He may not be System/3 trained, but is trained on network problem determination.

He has data scope available to record and analyze line traffic. He can have TP BODS transmit trap recording to his data scope for remote analyzation. Like the TP BODS, he may not be System/3 trained, but has had in-depth training on network problem determination.

Final level of support in resolving System/3 TP network problems.

1200 BPS INTEGRATED MODEM FEATURE (MINI-12)

INTRODUCTION

Purpose

The 1200 BPS Integrated Modem Feature will provide 1200 BPS communication capability between System/3 and the telephone interface line connection.

General Description

The 1200 BPS Integrated Modem is being implemented in two versions.

The first version is a leased line configuration. This will provide a 1200 BPS, point-to-point non-switched or multipoint communication link. Both 2-wire and 4-wire options are available.

The second version is a switched network configuration. This will provide a 1200 BPS, auto-answer, point-to-point switched network communication link.

Both versions will interface to the BSCA-1 and/or BSCA-2 via the standard EIA data set interface (RS-232/CCITT V24). Available on 5408, 5410, 5412, 5415.

HARDWARE DESCRIPTION

Physical Requirements

The 1200 BPS Integrated Modem is housed in the BSCA-1 and/or the BSCA-2 boards on the System/3. Two new versions will be added to the BSCA boards. Note: Not available on BSCA-2 on 5408.

Leased line version -- This point-to-point non-switched version will utilize the basic transmit, receive and wrap cards. The wrap card is a 1 wide 2 high card plugged into location 01BA2D4 (BSCA-1) and/or 01BA3D4 (BSCA-2). The receive card is a 2 wide 2 high card plugged into location 01BA2E4 (BSCA-1) and/or 01BA3E4 (BSCA-2). The transmit card is a 2 wide 2 high card plugged into location 01BA2F4 (BSCA-1) or 01BA3F4 (BSCA-2).

Switched network version -- This auto-answer point-to-point switched network version will use the same basic cards used by the leased line version plus the two auto-answer cards. One auto-answer card is a 2 wide 2 high card that plugs into location 01BA2G4 (BSCA-1) and/or 01BA3G4 (BSCA-2). The other auto-answer card is 1 wide 2 high card plugged into 01BA2H4 (BSCA-1) and/or 01BA3H4 (BSCA-2).

BSCA Requirements

Both versions of 1200 BPS Integrated Modem require BSCA features medium speed in internal clock at 1200 BPS. The leased line version requires BSCA network selection feature point-to-point non-switched. The switched network version requires BSCA network selection feature point-to-point switched.

Cable Requirements

Both versions of the 1200 BPS Integrated Modem (switched network and leased line) will use the same cable from the BSCA board to the enter/exit tailgate on both BSCA's.

Leased line version will utilize an x-length cable of 2 twisted pairs terminated with a 4 prong telephone plug on the line end. The other end will have a 14 pin amp connector to mate with the internal cable at the enter/exit tailgate. This cable is used by both BSCA's.

Switched network auto-answer will use an x-length cable consisting of 8 conductors with ring terminals on the line end for connection to CBS Automatic Data Coupler. The other end will have a 14 pin amp connector to mate with the internal cable at the enter/exit tailgate. This cable is used by both BSCA's. Both external cables are x-length, maximum of 30 feet.

Power Requirements

The standard medium speed -12 Volt power supply is replaced by a larger + or -12 Volt power supply. This will supply the + and -12 volts required by the 1200 BPS Integrated Modem Feature.

Remote Data Terminal Equipment Requirements

BSC devices on the 1200 BPS Integrated Modem Feature teleprocessing line must also have a Mini-12 attachment of the same configuration.

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PROGRAMMING CONSIDERATIONS

All existing programming support for BSCA-1 and BSCA-2 on System/3 Models 8, 10, 12 and 15 can be used with the 1200 BPS Integrated Modem Feature.

Switches

When the 1200 BPS Integrated Modem Feature is installed on BSCA-2, a local test switch is installed for BSCA-2 to put its 1200 BPS Modem Feature in wrap mode when used.

Diagnostics

The additional maintainability requirements for this BSCA feature involves only the dedicated diagnostic program support. A loop test capability will be provided by the modem wrap feature which can be utilized by BSCA diagnostics and MAPS. A console switch (local test) will be used to place the Mini-12 BPS Integrated Modem feature in loop test mode.

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ICA (INTEGRATED COMMUNICATION ADAPTER)

Purpose

1. The ICA will provide three different communication adapters in one attachment, one remote and two local. The local attachment will allow the 3741-2 and/or the 3271/3275 to attach directly to the System/3. The remote communication adapter will allow, via data sets and telephone lines, a data link to any device presently supported on the System/3 BSCA.
2. ICA is available on System/3 Model 8 or 12 as a feature and on the Model 4 as an RPQ.

General Description

The ICA feature is a type of communications adapter, similar to BSCA on System/3. There is a switch on the console that selects one of the data links: (1) Remote, medium speed, (2) Local 1, and (3) Local 2. Any combination of the data links can be installed on the medium speed ICA feature, but only one may be active at a time.

Remote

This feature provides one medium speed binary synchronous line interface to an external modem.

1. Attached modem must provide clocking
2. Switched or leased line
3. Medium speed - 600 BPS to 7200 BPS
4. Half duplex only
5. EBCDIC or ASCII code

Local 1

Data transfer rate is 8000 BPS. This feature permits local attachment, without the use of a modem or communications line, a BSC device; for example, 3271 or 3275.

Local 2

Data transfer rate is 2400 BPS. This feature permits local attachment, without the use of a modem or communications line, a BSC device; for example, 3741.

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HARDWARE DESCRIPTION

Physical Requirements

ICA occupies board location 01A-A2 (5408), 01B-A3 (5412). ICA is on channel Bank 1 (5408) and channel Bank 3 (5412) and uses the interrupt features. If more than one data link interface is required, a switch on the console will be used to select the different interfaces.

Cable Requirements

ICA can use up to 3 I/O cables, one standard System/3 medium speed data set cable and 2 Local modemless attachment cables.

Attaching Device Requirements

Devices attaching to one of the local attachments must have a BSCA feature with a point-to-point non-switched network and a standard EIA data set interface.

MAINTENANCE AND DIAGNOSTICS

The proper operation of ICA can be verified by running the BSCA wrap diagnostic to the end of the signal cable and back. This can be performed to verify each of the three medium speed interfaces.

Diagnostics

The same diagnostics used for the BSCA-2 on System/3 will be used for ICA since the M bit of the Q code is always a 1 for ICA. Check UDT configuration chart (User Guide block 19) and use sense switch 1A where needed.

WORLD TRADE CONSIDERATIONS

The ICA feature operates at fixed bit rates; therefore, the rate select feature is not allowed.

All display panels for ICA for the different language groups are covered.

IBM INTERNAL USE ONLY

LCA (LOCAL COMMUNICATION ADAPTER)

Purpose:

The LCA will provide a direct connect binary synchronous communications adapter on the System/3 Model 6, 10, and 15. This feature will allow 3741 to attach directly to System/3 Model 6, 10, and 15 disk systems, without the use of modems. A direct connection to 3271/3275 will provide limited function local CRT's on System/3 Model 10 and 15.

General Description:

The LCA feature is a simplified, reduced function BSCA similar to the existing BSCA-1. A single data rate, EBCDIC transmission code and local modemless connection describes the LCA feature.

LCA Functional Characteristics:

1. Basic BSCA-1
2. Point-to-point non-switched network
3. EBCDIC transmission code
4. Local EIA modemless attachment at 2400 bits/second

No other BSCA features apply to LCA.

HARDWARE DESCRIPTION

Physical Requirements:

The LCA feature is mutually exclusive with BSCA-1 on System/3 Model 6, 10, and 15. LCA on System/3 is compatible with BSCA-2. All channel bank, power group, etc., prerequisites for BSCA-1 apply to the LCA feature.

Indicator panel molding has LCA in place of BSCA-1 on machines with the LCA feature installed. The 5406 BSCA attention indicator located on the operator console is replaced with panel with LCA attention. LCA labels cover BSCA on the 5406 CE panel.

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Cable Requirements:

The same interface cable utilized by BSCA-1 Local Modemless Attachment on System/3 is being used for this direct connect feature.

Attaching Device Requirements:

An attaching device will have a BSCA feature with a point-to-point non-switched network, EBCDIC transmission code and an EIA data set interface.

PROGRAMMING CONSIDERATIONS

3741 Attached

Programming support for 3741 attached to disk systems is with the existing RPG II Telecommunications feature.

3271/3275 Attached

For these devices the existing SCP ML/MP and CCP support applies to System/3.

WORLD TRADE CONSIDERATIONS

The LCA feature runs at a fixed bit rate (2400 bps); therefore, the World Trade Rate Select feature is not allowed.

All display panels with LCA in place is BSCA for the different language groups are covered.

IBM INTERNAL USE ONLY

BSCA DIAGNOSTICS

BSCA BASIC AND ICA DIAGNOSTIC TESTS

The BSCA diagnostic program is made up of 6 sections but only 5 of these sections are required for any one BSCA. BSCA and ICA have separate but similar diagnostics.

Each group of diagnostics must be run separately with the BSCA display selection SW in the appropriate position. Sections 801 through 806 are for BSCA. Sections 881 through 886 are for ICA. Sections 803/883 and 804/884 are the same except 803/883 is for an EBCDIC BSCA and 804/884 is for an ASCII BSCA. In diagnostics user's guide, block 19, describes each section and routine in more detail. (The following steps are related to the BSCA entry chart, starting on page 007.)

External Test Switch

Med Speed or ICA The switch on the end of the data set cable or local modemless cable (See note 3).

High Speed or Med Speed Local/test switch on the CE panel (See note 4).

Step 1 - Section 801 or 881

Section 801/881 is run with the EXT test SW in the off or operate position. (EXT SW indicator should be off.) All sense switches used by the BSCA should be off for normal running (SSW's are defined in block 19 of the diagnostic user's guide). Routine 06 and 07 are special routines which are run only if the configuration is a switched network. The BSCA UDT must have bit '7' on before these 2 routines are run.

Step 2 - Section 801 or 881

The printout from routine 05 should be checked for correct BAUD rate. If the World Trade Corporation feature rate select SW is installed, switch it to the other position and go to routine 05 to check this BAUD rate. Section 801 is now rerun. This time, after a system reset, sense switch 16 is turned on the EXT test SW is put in the 'test' or 'on' position (EXT test SW indicate should be on). If a World Trade Corp. switched network using CDSTL (Connect-Data Set-To-Line) and the 'Rate Select Switch' feature are installed, sense switches 16 and 10 should be set on. With sense switched 16 on, the special routine 07 is not run.

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Step 3 - Section 802 or 882

Section 802/882 is run with the EXT test SW still in the 'test or on' position except if a high speed modem is installed which does not have 'local loop' test capability. If the high speed modem does have 'local loop' capability or if 1200 BPS integrated modem feature is installed (see note 4), the EXT test SW should be on and the sense switch 11 must be on.

In summary:

- o Medium Speed or ICA - EXT test SW in test and SSW 16 on.
- o High Speed or med. speed with 'local loop' - EXT test SW in test and SSW 11 on (BSCA UDT bit 's' on the high speed, bit 1 and 8 on for 1200 EPS integrated modem).
- o High Speed with no 'local loop' - skip step 3 and go to step 4.

Routine 04 is a special routine which will be run only if sense switch 20 is on. This routine will continuously transmit SYN characters until a system reset is given. If sense switch 21 is on, test mode will be set on. This routine will be especially useful for CE remote assist. NOTE: If this routine is used and sense switch 21 is not on, the EXT test SW must be in 'operate' or 'off' as in step 4 below.

NOTE 1:

BSCA/ICA display select switch is used only to display either BSCA or ICA. The SW does not cause a program to switch from one BSCA to the other.

NOTE 2:

Local modemless feature may be installed on medium speed BSCA. This feature eliminates the need for a modem but normally the attaching BSCA is within 40 ft. of the host CPU. The modemless cable can be identified by opening the cable entry door at the rear of the CPU to find the attaching BSCA cable connected directly to the host CPU modemless cable.

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NOTE 3:

ICA (Integrated Communication Adapter) is installed on the 5408 and 5412. The ICA uses the BSCA-2 diagnostic programs (PID 88X). ICA is the same as BSCA-2 with the following modification:

- o Same device address, interrupt priority and cycle steal priority.
- o Basic ICA - the following do not apply to ICA: High Speed, Autocall, Internal Clock, New SYNC, Full Duplex (4-wire), Multipoint Tributary and Mini-12.
- o Options:
EBCDIC or USASCII
Transparency
- o Synchronous Line, Medium Speed (remote) Data Set Clocking only.
Switched, Non-Switched or Multipoint Control Station.
- o 8000 BPS Local Interface (Local 1) EIA Local modemless attachment wired for 8000 BPS.
- o 2400 BPS Local interface (Local 2) EIA Local modemless attachment wired for 2400 BPS.

NOTE: The interface switch is only installed when 2 or more data link interfaces are installed.

NOTE 4:

The Local/Test SW on the CE panel is installed whenever:

- o High speed feature is installed, or
- o 1200 BPS integrated modem feature (med speed) is installed on BSCA only.

1200 BPS integrated modem feature (sometimes known as mini-12) is an under-the-covers modem that supports:

- o Duplex (4-wire) or half duplex (2-wire)
- o Point-to-point non-switched or switched auto answer.
- o Operation over telephone company communications facilities from either or both BSCA-1 and/or ICA.

To identify this feature, look for:

- o Cards in D4, E4, F4 (Basic and PT-PT NON-SW) of the respective BSCA board B-A2.
- o Refer to logic pages A6009 and A6011 to identify modem configuration.

If auto answer version of the 1200 BPS integrated modem feature is installed, refer to step 8 for preliminary check out.

Step 4 - Section 802 or 882

Section 802/882 is now run with the EXT test SW in 'operate' or 'off'. This time after a system reset, the EXT test SW must be in 'operate' or 'off' position and if sense switch 11 or 16 was on in step 3, it must be turned off now.

Routine 05 is a routine used to test the auto call unit if that switched network feature is installed. The BSCA UDT bit '3' must be on to run this routine. The BSCA will 'dial' the number put in core. The CE should use the number of a nearby phone so he can hear it ring. This routine is bypassed when the EXT test SW is in test and SSW 16 is on.

Step 5 - Section 803, 804 or 883, 884

If EBCDIC code is installed, section 803/883 should be used. If ASCII, section 804/884 should be used. BSCA UDT bit '6' on indicated the ASCII code is being used. Bit '6' off indicated EBCDIC. NOTE: If the wrong section is loaded, it will not be run and the 'BE' halt will occur.

Routine 03 checks the various differences between the receive initial instructions for switched, multipoint, and point-to-point networks. BSCA UDT bit '7' and '0' off for point-to-point network.

Section 803/883 and 804/884 can be run with the EXT test SW in either position.

Step 6 - Section 805 or 885

Routine 02 is run only if both transparency feature and internal clock features are installed. BSCA UDI bit '4' must be on for transparency and UDT bit '1' must be on for internal clock. Section 805/885 can be run with the EXT test SW in either position.

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Step 7 - Section 806 or 886

Routine 04 is similar to routine 04 in section 802/882 for continuous transmit. This routine will allow the CE to choose the data to be transmitted by using a data card if you have a card system. Sense switch 20 must be on to run this routine. Section 806/886 can be run with EXT test SW in either position. However, if routine 04 is run, sense switch 21 must be on if the EXT test SW is in 'test' or 'on'.

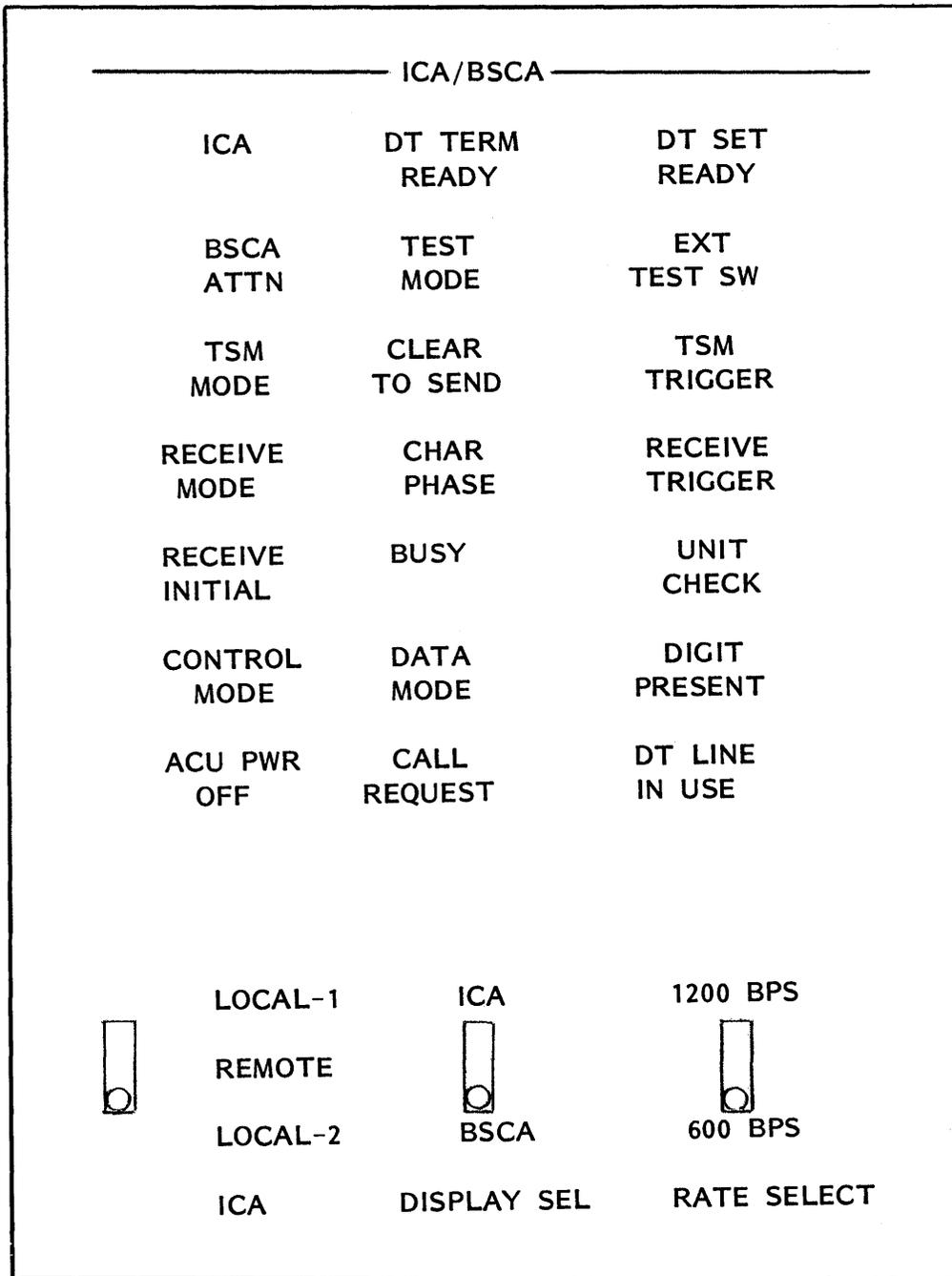
Step 8 - Auto Answer 1200 BPS Integrated Modem (BSCA Only)

Read note 4. The following preliminary check of the auto answer feature should be preceded prior to on-line communications.

- o Insure that all the CBS data coupler switches and indicators are off and the hand set is cradled.
- o Enable your BSCA to answer a call. Load diagnostic 80A and reset halt HA to bring up halt E2. (REF: User's Guide Block 19).
- o Dial the modem number from a nearby voice phone. Listen for a 2100 HZ 3 second auto answer tone. At the end of this tone, insure data set ready comes on.
- o This insures that the auto answer circuitry is working properly.
- o If step 3 fails, replace auto answer cards (B-A2G4 and B-A2H5).

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DISPLAY AND CONTROL PANEL FOR ICA AND BSCA



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Operator's Console

The following indicators are located on the CPU Operator's Console and indicate the operational status of the adapter.

BSCA Attn:	This light is on when the I/O Attention is caused by one of the not ready or check conditions.
Unit Check: *	This light is on when any Status Bit from Byte 2 is on.
DT Term Ready:	This light indicates that the BSCA is enabled and that the Data Terminal Ready line to the modem is on. With two WTC modems, this indicator shows the status of the signal, "Connect Data Set to Line".
DT Set Ready:	This light indicates that the Data Set Ready line from the modem is on and the modem is ready for use.
Clear to Send:	This light indicates that the Clear to Send line from the modem is on and that the adapter may now transmit.
Receive Trigger:	This light indicates the status of the Receive Trigger. The light is on when the trigger is at a binary "0" state (equivalent to a "Space" on the Communication Line).
TSM Trigger:	This light indicates the status of the Transmit Trigger. The light is on when the trigger is at a binary "0" state (equivalent to a "Space" on the Communication Line).
Receive Mode:	This light indicates that the BSCA has been instructed to perform a receive operation.
TSM Mode:	This light indicates that the BSCA has been instructed to perform a transmit operation.

*When an SNS Transition of SNS Stop Register instruction is executed, it is possible for a LSR, S Register or DBI Register Parity Check to occur resulting in a Unit Check condition. Under this condition, the Byte 2 Status Bits may be all zero.

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Receive Initial:	This light is turned on by a Receive Initial instruction. It is turned off at the end of the Receive Initial operation.
Busy:	This light indicates that the BSCA is executing a Receive Initial, Transmit and Receive, Auto Call, Receive, or Loop Test instruction.
Char Phase:	This light indicates that the adapter has established character sync with the transmitting station by receiving two successive SYN characters. The light is turned off at the end of the receive operation.
Data Mode:	This light is turned on by the decode of an SOH or STX during a transmit or receive operation. It is turned off at the end of the transmit or receive operation.
Control Mode: (Station Select Feature)	This light is turned on when an EOT sequence is detected in a Transmit, Receive, or Receive Initial monitor operation. It is turned off by decode of an SOH or STX.
Digit Present: (Auto Call Feature)	This light is turned on by the BSCA when a new dial digit is present on ACU interface.
ACU Pwr Off: (Auto Call Feature)	This light indicates that the Auto Call Unit has power off.
Call Request: (Auto Call Feature)	This light indicates that the BSCA has received an Auto Call instruction and is performing an Auto Call operation.
DT Line in Use: (Auto Call Feature)	This light indicates that the Data Line Occupied line from the ACU is on.
Test Mode:	This light indicates that the program has placed the adapter in a test mode of operation.
EXT Test SW:	This light indicates that the switch at the modem end of the Medium Speed modem cable is in the TEST position. For High Speed modems this indicator will be active when the Local Test Switch is in the on position.

These indicators are testable by the CPU Lamp Test Key.

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CPU Type	Adapter Type	Cable P/N	From	To Bd Socket	Cable Termination
5404	BSCA 1				
	- High Speed	2590807	Data Set	A-A3A3,A4	Burndy Md 12 MXP
	- Med Speed	1636476	Data Set	A-A3A3	EIA RS232
	- Auto Call	1636477	Auto Call Unit	A-A3A5	EIA RS232
	LCA	Note 1	Note 2	A-A3A3	Note 3
	ICA (RPQ)				
- Remote	Note 1	Data Set	A-A3A2,A3	EIA RS232	
- Local 1	Note 1	Note 2	A-A3A2,A4	Note 3	
- Local 2	Note 1	Note 2	A-A3A2,A5	Note 3	
5406	BSCA 1				
	- High Speed	5133612	Data Set	B-A2A3,A4	Burndy Md 12 MXP
	- Med Speed	5133611	Data Set	B-A2A3	EIA RS232; Note 5
	- Auto Call	5133613	Auto Call Unit	B-A2A5	EIA RS232; Note 6
LCA	Note 1	Note 2	B-A2A3	Note 3	
5408	BSCA 1				
	- High Speed	5133612	Data Set	B-A2A3,A4	Burndy Md 12 MXP
	- Med Speed	5133611	Data Set	B-A2A3	EIA RS232; Note 5
	- Auto Call	5133613	Auto Call Unit	B-A2A5	EIA RS232; Note 6
	ICA				
	- Remote	2590800	Data Set	A-A2A2,A3	EIA RS232
- Local 1	Note 1	Note 2	A-A2A2,A4	Note 3	
- Local 2	Note 1	Note 2	A-A2A2,A5	Note 3	

CPU Type	Adapter Type	Cable P/N	From	To Bd Socket	Cable Termination
5408 (cont.)	Integrated 1200 BPS Modem (Mini-12) - Leased Line - Switched Line	 2775810 2775811	 Leased Line Coupler		 4 Prong Plug 8 Wires
5410	BSCA 1 - High Speed - Med Speed - Auto Call BSCA 2 - Med Speed - Auto Call LCA Integrated 1200 BPS Modem (Mini-12) - Leased Line - Switched Line - Note 4	 2590807 2590800 2590802 2590800 2590802 Note 1 2775810 2775811	 Data Set Data Set Auto Call Unit Data Set Auto Call Unit Note 2	 B-A2A3, A4 B-A2A3 B-A2A5 B-A3A3 B-A3A5 B-A2A3	 Burndy Md 12 MXP EIA RS232; Note 5 EIA RS232; Note 6 EIA RS232; Note 5 EIA RS232; Note 6 Note 3 4 Prong Plug 8 Wires

CPU Type	Adapter Type	Cable P/N	From	To Bd Socket	Cable Termination
5415 (cont.)	LCA	Note 1	Note 2	B-A2A3	Note 3
	Integrated 1200 BPS Modem (Mini-12)				
	- Leased Line	2775810	Leased Line		4 Prong Plug
	- Switched Line - Note 4	2775811	Coupler		8 Wires

NOTES:

1. Cable supplied by attaching BSC device.
2. Attaching BSC device.
3. System/3 internal cable terminates at tailgate with EIA RS232 connector.
4. Integrated 1200 BPS Modem (Mini-12) can be installed on BSCA 1 and/or BSCA 2.
5. P/N 5133611 and P/N 2590800 are functionally the same.
6. P/N 5133613 and P/N 2590802 are functionally.

DISPLAY ADAPTER

The System/3 Display Adapter is an attachment designed to allow online access to a remote user. It is used to either provide information on a display screen, punched card output, hard copy printout or to alter data at the user's request from a remote console/keyboard.

The attachment will support 6 terminals on a 5404, 12 terminals on 5408 or 5412, and up to 30 terminals on a 5415. The terminals that can be attached include 3277 (both Model 1 and 2), 3284, 3286, 3288, and 129 RPQ. Each terminal is connected to the attachment by a single coaxial cable up to 2000 feet in length.

The Display Adapter is mutually exclusive with ICA or BSCA 2. (It uses BSCA 2 device address, interrupt level and cycle steal priority.) It emulates a 3271 BSCA with EBCDIC point-to-point non-switched support. Minimum system size is 32K.

Data transfer between the attachment and CPU is by means of cycle steal via the I/O channel. Transfer is serially by byte. Data transfer between the attachment and the terminal is serially by bit with 13 bits per word.

Instructions to the Display Adapter come in two forms: BSCA/3271 emulation instructions (device address 88 or 8A) or attachment instructions (device address 4X or 5X). The attachment, when addressed, will acknowledge TIO, LIO, SNS, and SIO instructions.

The Display Adapter uses cycle steal priority level 10 with cycle steal lines DBO 0 and DBO 7. Device address for attachment initialization is channel address 4 with an M bit of 1 or channel address 5 with an M bit of 1. Device address for 3271/BSCA emulation is 88 or 8A.

Interrupts are handled on interrupt level 2, using one CPU LSR (LSR lines 3 and 6) as a main storage address register for data location.

The attachment is divided into the following functional elements:

- Microprogram: Located in read/write control storage, it consists of a series of micro instructions arranged in routines to service requests.
- Microcontroller: Hardware microcontroller provides sequential execution of micro instructions read from control storage.

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- Adapter Base: Contains the logic that provides a control interface between the microcontroller and the various data and address registers residing within the attachment.
- Line Adapter: A line adapter is selected by the microprogram based on the unit address. A selected line adapter gates the serial SERDES input and output to and from the coaxial cable that connects the unit via line driver/receiver circuits. There are three line adapters per feature card.
- FET Storage: The FET storage cards used in DA contain 2K of nine bit storage. Two cards are used for Model 1 support and three cards are used for Model 2's. This is a total of 6K of nine bit bytes and acts as control storage and high density buffers.

The following steps must be taken by the host program to initialize the Display Adapter attachment, using attachment instructions, before any BSCA/3271 emulation instructions can be accepted after a power on.

- 16 attachment LIO's to the op decode must be issued to provide the op decode (32 positions) with the proper information.
- 16 attachment LIO's to the HDB's (High Density Buffers) must be issued to insure proper parity in the 32 low order HDB's (LIO's and SNS commands are directed to the low order HDB's when the attachment is disabled).
- Enable the attachment with an SIO.
- 16 attachment LIO's (any data) to the HDB's must again be issued to insure parity in the next 32 HDB's. (LIO's and SNS commands to the HDB after the attachment is enabled are directed to the high order HDB.)
- The entire control storage must be initialized with LIO's to load the microprogram. (It should then be sensed to insure that it was loaded properly.)
- Enable the microcontroller with an SIO.

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The attachment will now accept BSCA/3271 emulation type instructions. The configuration emulated is local, point-to-point, EBCDIC, non-switched. There are no modems, no data sets and no bi-sync line discipline.

Diagnostics include 891 (attachment test), 893 (microcode loader), 894 (function test), FC 7 (functional microcode) and FC 8 (program to update Display Adapter microcode). (One thing to remember when using FC 8 is that on the PID pack, there is a non-functional data set labeled \$@MCRI. FC 8 assumes \$\$MCRI data set labels, so when updating PID pack, the name \$@MCRI must be furnished. On system pack, the name is \$\$MCRI.) FC 8 will print prompting messages and questions prior to copying the microcode.

Diagnostic tools include:

Indicator card (P/N 5558107) which is one of two one-wide cards each containing nine light emitting diodes (LED's). This allows one byte of information to be displayed by each card.

The indicator card which plugs at Z5 is used in conjunction with the 'Display Select' and 'HDB/TSN SEL' switches (on CE selector box) to display HDB registers. (See DA TMD)

The indicator card at location Z6 is a permanently wired display except for bit 0 which is selected by the 'HDB/TSN SEL' switch to display various bit or latch conditions. (See DA TMD)

The part number of the CE selector box is 5558132 and it plugs into Z3 and Z4.

The part number of the display/sync logic card which plugs into position P2 is 8239421. The part number of the CE panel overlay is 4234248. (The overlay and card are available as B/M 4234322.)

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8-4

ENVIRONMENTAL

Introduction

From the time of the System/3's inception in 1969 until now in the mid-seventies, the product line has not only increased numerically, but also in its importance to the user's throughput.

What was initially regarded as a general purpose computer for a small customer, has now increased in size and complexity so that System/3 models now rival midrange 370's in applications. From a self-contained system that resided in one piece in the customer's environment, it has grown to become a central unit cabled to I/O up to 2000 feet away.

This change in size, complexity, and usage found in the customer's applications demands an up-to-date approach to the solution of his problems. One of these problems now coming to the fore is ESD.

ESD problems are among the most difficult of problems to identify and fix. Without the proper tools and diagnostic approach, these problems could be insurmountable. For this reason, an understanding of ESD Service Aids and the tools available to your Installation Planning Representative is very beneficial.

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GENERAL INFORMATION

This section will introduce you to the special tools available to the IPR (Installation Planning Representative). Use and application of IP tools and test equipment will be described.

There are many areas of physical planning that require the use of specialized tools or test equipment. These devices will be described and their use discussed. However, proficiency in their use and application can only be developed by "hands-on" experience.

Special Tools and Test

- Clamp-on Ammeter
- Weston AC Voltmeter (or equivalent)
- Null Balanced Earth Tester
- Phase Sequence Checker
- Esterline-Angus Recording Voltmeter
- Environmental Monitoring Device (EMD)
- Sling Psychrometer
- Thermohumidigraph
- Electrostatic Locator
- Spark Gap
- Megohmmeter
- Electrostatic Discharge Simulator (Zapper)
- Probe Convertor Attachment (Mini-Zapper)
- Single Discharge Control Unit
- Scope Loop with 453 Scope
- R.F. Field Intensity Meter
- Line Interrogation Device
- Tektronix C-31-P Trace Recording Camera
- Stoddart Probe
- Radar Crystal Detector
- Ground Monitor (OPD Tool)

Most Physical Planning special tools can be grouped into several general categories, depending on their application:

- o Power and Grounding Measurements
 - 1. Clamp-on Ammeter
 - 2. Weston AC Voltmeter (or equivalent)
 - 3. Null Balance Earth Tester
 - 4. Phase Sequence Checker
 - 5. Esterline-Angus Recording Voltmeter
- o Customer Environment (Site) Evaluation
 - 1. EMD
 - 2. Sling Psychrometer
 - 3. Thermohumidigraph

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POWER AND GROUNDING MEASUREMENT TOOLS

1. Clamp-on Ammeter PN 453554

The Clamp-on Ammeter can be used to indicate the amount of AC amperage on a phase conductor or on a green-wire ground. The balance of AC phase-wires can be readily determined. The loading of a power panel feeder can also be measured.

The Clamp-on Ammeter is capable of measuring AC Voltage with the test leads supplied.

An interesting feature of the meter is the ability to lock the scale with the reading obtained when the meter scale is not visible.

2. Weston AC Voltmeter PN 460880

The Weston AC Voltmeter is an instrument with a mirrored scale to be used when an accurate ac voltage reading is necessary. It should be utilized whenever a voltage is suspected of being close to a high or low limit of tolerance. The Esterline-Angus Recording Voltmeter (described later) can be calibrated using the Weston AC Voltmeter.

The CE Meter, the voltage scale of the Clamp-on Ammeter and the Recording Voltmeter are not to be relied upon for accurate AC voltage measurements.

3. Null Balanced Earth Tester PN 453537 Accessory Kit PN 453538

The Biddle Null Balanced Earth Tester is an instrument with good low range accuracy to measure resistances from .01 ohms to 10K ohms. This instrument is used to make relative ground measurements within the room including green wire ground, water pipe, conduit and raised floor understructure resistances. The accessory kit includes steel rods which can be employed to make soil conductivity tests. Cranking the handle on the side of the instrument generates about 90 volts of low frequency AC. Null balance is obtained by adding resistance into the internal bridge using the knobs and setting the multiplier range in the center of the panel. The actual resistance is read from the setting of the knobs and multiplier used to achieve a null.

4. PSC (Phase Sequence Checker) PN 453203

The IBM PSC is a device for determining whether an input power receptacle is wired in the proper phase sequence for IBM equipment. It was designed for use on Russell & Stoll 30, 60, and 100 Ampere (or is required as an indicating device.) It is estimated that some forty percent of the input power receptacles in customer locations are initially phased improperly for IBM equipment. Not all IBM equipment is phase sensitive; however, a forty percent exposure to lost man hours does exist if the specific machine is sensitive to the power phase sequence.

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Before plugging the equipment into the receptacle a Phase Checker is a safe and easily used test unit for determining if the input-power receptacle is wired in the phase sequence that will be compatible with IBM equipment.

5. Esterline-Angus Recording Voltmeter PN 453571

The Esterline-Angus Recording Voltmeter is used to monitor and evaluate primary ac power variations. This instrument records the full reading of a 6 hertz disturbance and is capable of registering down to a half hertz disturbance at reduced amplitude. The recording voltmeter has proven valuable to the field by demonstrating how attached loads affect the computer feeder line regulation.

SITE EVALUATION TOOLS

1. EMD (Environmental Monitoring Device) PN 453208

The EMD was developed to provide an easy means of determining the atmospheric severity of a site. It is an analytical tool used during routine installations to assist in the decision of matching the machine to the installation environment.

The EMD consists of two cartridges and a pumping unit. The EMD cartridges, which are mailable, are connected to the pumping unit for collecting atmospheric samples. One cartridge contains four chemically treated filters, which selectively react with and permanently trap several pollutants. The first filter collects particles, the second collects chlorine, the third collects reactive sulphur, and the last filter reacts with and retains sulphur dioxide. Those filters, when returned to the central laboratory at Raleigh, can easily and rapidly be analyzed by a special process.

2. Sling Psychrometer PN 453543

The Sling is used to obtain readings of temperature and relative humidity. This is a simple instrument to use, but its accuracy depends on proper use and care.

It consists of two accurate thermometers mounted in a frame attached to a swivel. The swivel attaches to a handle. The two thermometers can be swung in a circular fashion by means of the handle and swivel joint. One of the thermometers has a woven cloth similar to a "sock" fitted over the mercury-filled bulb portion. This thermometer is the "wet-bulb" thermometer. The action of slinging the two thermometers through the air simultaneously causes the dry-bulb thermometer to register the temperature of the ambient air while the wet-bulb thermometer reading becomes lower. The action of moving the wet bulb through the air speeds up the evaporation process of water from the wet bulb. Since evaporation is a cooling process, the wet bulb thermometer temperature drop is dependent on the ability of the air to accept moisture. When the wet-bulb and dry-bulb

temperatures are applied to a psychrometric chart, the relative humidity can be accurately determined.

3. Thermohumidigraph PN 453539

The Bristol Thermohumidigraph Model 4069TH is a temperature and relative humidity recorder which can record over a 7-day period on a circular chart. The unit is portable and is powered by a spring wound mechanism to drive the chart. Use of this device provides hard copy of temperature and relative humidity which can be useful in solving a customer's environmental problems.

Some factors that have an influence on the environment and may be assessed with the use of test instrumentation are:

- Temperature and humidity.
- Type of raised floor and surface material.
- Grounding
- Electrical Power
- Furniture and Carts
- Radiation

The following tools and test equipment are generally used to resolve problems of unusual nature.

- Electrostatic Locator
- Spark Gap
- Earth Tester (listed earlier)
- Megohmmeter
- Electrostatic Discharge Simulator (Zapper)
- Probe Converter Attachment (Mini-Zapper)
- Single Discharge Control Unit
- Scope Loop
- R.F. Field Intensity Meter
- Sling Psychrometer (listed earlier)
- Thermohumidigraph (listed earlier)
- Line Interrogation Device
- Event Pen (s)
- Event Recorder Control Unit

While tools and test equipment are grouped as above for explanatory purposes, their use is not restricted to those specific categories. As a matter of fact, it is best to know the proper combinations of these tools for use in a given situation. Some tools will be utilized more frequently in a routine manner such as the Clamp-on ammeter and the phase sequence checker. Accurate voltage measurements should be made with a calibrated instrument such as the Weston AC Voltmeter or digital voltmeter.

ENVIRONMENTAL NOISE ANALYSIS

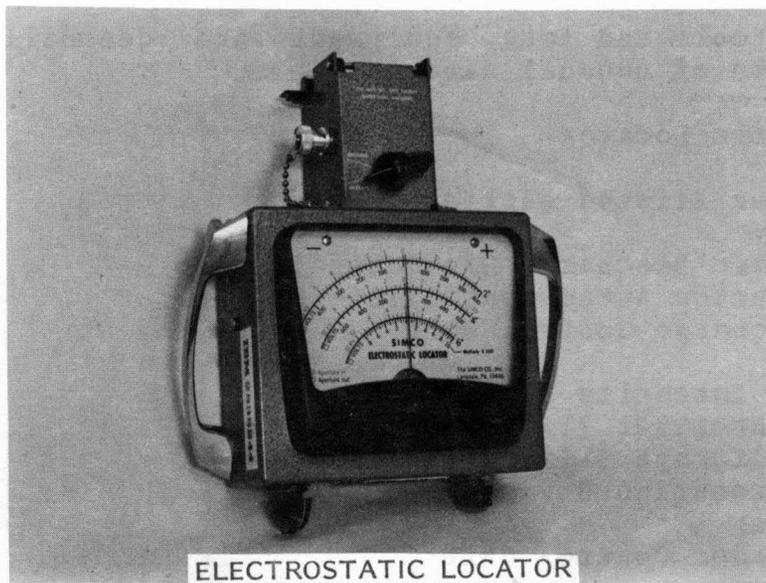
With the advanced technology, faster circuits, and lower signal levels, IBM recognizes environment as a vital consideration in system design, installation, and operation. As a result, Customer Engineering has developed a more sophisticated knowledge

of EMC (Electro-Magnetic Compatibility) noise analysis and instrumentation used to diagnose and define the problems in the field. This noise can cause systems failures and can be defined by the following three general areas:

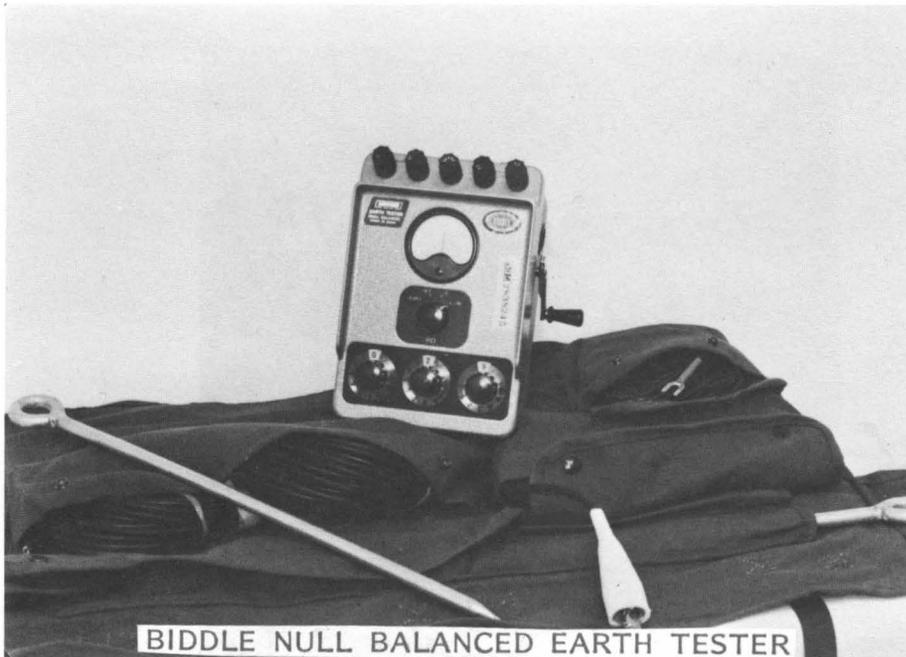
1. Static: High voltage buildup on furniture or people and then discharged to ground on or near the system.
2. Input Power and Grounding: Power Line transients on the power feeder and high resistance or noisy grounds.
3. Radiation: Radar electromagnetic interference and high frequency broad band radiation coupling into our systems.

Static

Personnel, furniture, raised floors and relative humidity are major factors that contribute to static buildup. The tools used in defining and solving static problems are: Electrostatic Locator, Spark Gap, Earth Tester, Megohmmeter, Thermohumidigraph and Electrostatic Discharge Simulator (zapper) and Static Loop (see General CEM 256 and 268).

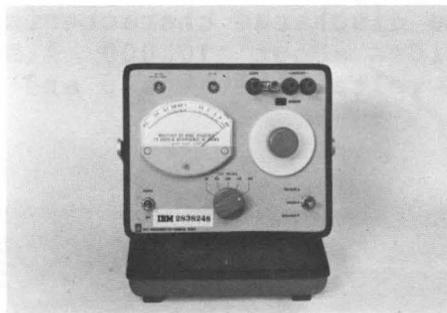


The Electrostatic Locator is used to measure the electrostatic charge on any object. A special scale has been calibrated to provide direct reading in kilovolts. This kilovolt scale is valid when the static locator is held about one inch from the object being measured. You can measure how much charge is built up on a console chair or a cart by reading the value directly from the kilovolt scale. In a similar manner you can demonstrate how much charge people can build up or carry from one object to another. This static buildup is more easily understood when it is detected by the electrostatic locator. Actually it is the buildup and sudden discharge that creates static noise. The spark gap can be connected between the chair or cart and ground to further demonstrate the static charge buildup by observing the arc that will jump the gap to discharge the object.

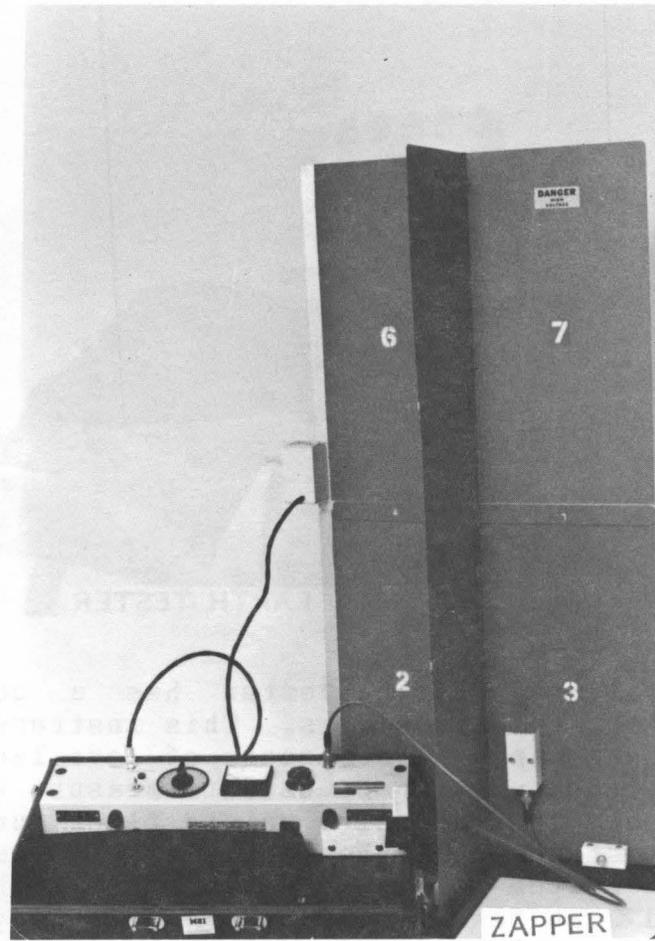


BIDDLE NULL BALANCED EARTH TESTER

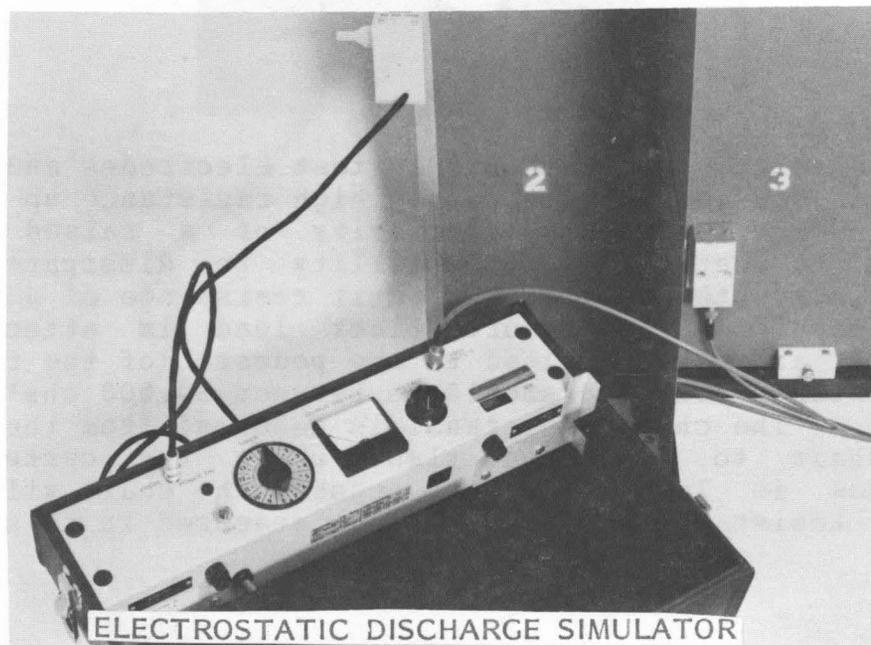
The Biddle Null Balanced Earth Tester has a good low-range accuracy from .01 ohm to 10,000 ohms. This instrument is used to make comparative resistance measurements of available grounding points within the room, it can be used to measure the resistance of green wire, water pipe, conduit, raised floor understructure, etc., (In most instances all the metal in the room will measure less than one ohm. By the reference measurement technique, a high resistance ground can be detected.) The accessory kit includes test leads and stakes which can be used to measure actual earth resistivity.



The Megohmmeter used with Biddle test electrodes and the special coax leads can accurately measure high resistance up to 100,000 megohms. The surface conductivity of a raised floor can be measured to determine its ability to dissipate a static charge. Also the actual in-circuit resistance of a raised floor can be measured. The short black lead is attached to the electrode and the red lead to the pedestal of the raised floor. The resistance measured should be between 50,000 ohm's and 2,000 megohm's. The chair resistance is measured from the metal frame of the chair to a ground plane under the caster. If the resistance is less than 100 megohms the chair will not hold a charge. Resistance on carts is also measured in this manner.



The Electrostatic Discharge Simulator, sometimes called a zapper, simulates the average discharge characteristics of furniture. A three minute run provides about 10,000 discharges. A control adjusts the discharge voltage between 0 and 2500 volts.



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An attachment has been developed known as the Mini-Zapper (P/N 5187150). This Probe Converter Attachment is built into the same simulator case and uses the 2500 volt DC supply of the type 1 simulator. An internal RC circuit is charged rather than the vane assembly of the type 1 simulator. Radiation from one of four probes provides a means of determining individual wire or circuit noise sensitivity. The probes provide the user with the ability to introduce noise into a single board via a board radiator, into a section of logic board via a strip radiator or a disk radiator.

Also available is the Single Discharge Control Unit which changes the discharge rate from 60 Hertz to a manual rate controlled by the operator.

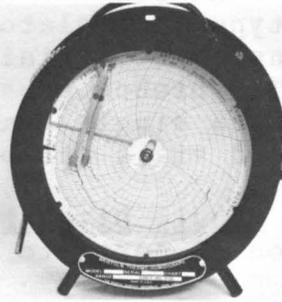
Additionally, anytime that EMI (Electromagnetic Interference) is suspected, the Scope Loop should be employed. The scope loop is a 5' piece of insulated wire coiled into 3 loops with the ends connected together. The loop is then connected to an oscilloscope which gives an indication of radiated noise in a facility. For complete detail of construction and operation of the scope loop, refer to General CEM #268 "Procedure for evaluating electromagnetic interference in a computer room". The scope loop should be the first means employed to make an evaluation of an environment suspected of having RFI or EMC problems.



The accuracy of the Sling Psychrometer depends on its proper use and care. This instrument is used to check the calibration of the customers temperature and relative humidity recorder. Experience indicates that when the recorder is in error it frequently reads 10 to 25 percent high but never low. The portable Bristol temperature and relative humidity recorder runs 7 days and records on an 8 in. chart. It can be taken into a customer's computer room and left there for as many weeks as required to provide a long term hard copy record of the environment. Many times machine errors are related to a change in the temperature or relative humidity in the computer room.

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Low relative humidity 10-20% allows static to build up on surfaces. Relative humidity between 40-60% allows a discharge path of water molecules and static does not build up as readily.



BRISTOL'S THERMO-HUMIDIGRAPH

Static generation is a primary concern within a computer room. Removal of the major static source could well prove to be the simplest solution to an intermittent static related problem. The service aid in General CEM #256 entitled "Static Environment Evaluation" suggests a measurement procedure for the Branch Office Installation Planning Representative to effectively define static sources within the room. Logical judgement can now be used to determine the most appropriate action to improve the environment.

Input Power and Grounding

Input power and improper grounding maybe a factor of system failures. The following are the major factors that contribute to improper input power and grounding. Power line disturbances, ground loops, RF noise, high resistance grounds and current on the green wire. The tools used for input power and ground analysis are the Earth Tester and probe, Clamp-on Ammeter, Stoddart Probe, Esterline-Angus rapid response voltmeter, Line Interrogation Device, and Tektronix C-21-P Trace recording camera.

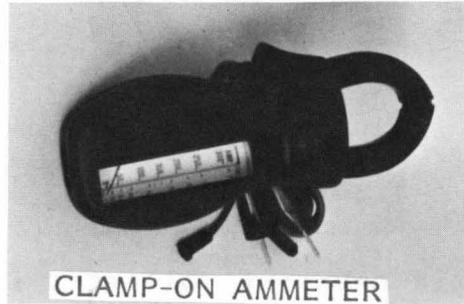


PHASE SEQUENCE CHECKER

IBM's grounding practice should be adhered to, ie; the grounding conductor should be continuous from the power receptacle to the grounding point. Conduit must not be used as the grounding conductor. No connection should be made to the neutral. This is a non-current carrying ground, not a neutral. Grounding conductors should not be attached to nor run parallel to conduit carrying power to other large loads such as compressors, etc. Noise can be coupled to an otherwise quiet ground.

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The Earth Tester previously discussed is one tool used to evaluate the good green wire ground.

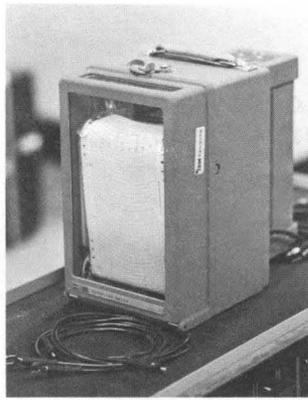


The Clamp-on Ammeter is a simple instrument which has solved many problems in the field. It can be used for checking the green wire for 60 cycle neutral current and determining phase balance by measuring current flow in each of the 3 phases.



The Stoddart Probe is released as a Region Office tool. It is used to measure high frequency current flow. The probe has a one and a quarter inch window and a frequency range up to 140 megahertz. A 50 ohm terminator is required for the 453 scope. The presence of high frequency current can be detected on the green wire or frame ground on the system. Excessive high frequency noise can cause system failure or perhaps increase the system sensitivity to static discharge. Radiation problems frequently couple high frequency noise to phase or ground wires. The Stoddart Probe provides a means of detecting this. Electrostatic discharge (a burst of high frequency current flow) can also be detected by the Stoddart Probe. To determine which of several ground sources has lowest RF impedance path use the system or zapper as a radio frequency source.

IBM INTERNAL USE ONLY



ESTERLINE-ANGUS

The Esterline-Angus rapid response voltmeter is used to evaluate power line variations. This meter records the full reading of a 6 cycle disturbance and is even capable of indicating a half cycle disturbance, not of full amplitude however. Even with its response limitations this has proven very valuable to the field by demonstrating how other loads affect the computer feeder line.



LID (Line Interrogation Device) will detect power excursions in either the negative or positive direction anywhere on the voltage sine wave. This is accomplished by comparing one sine wave to the preceding sine wave. The sensitivity knobs are adjusted to trigger on a particular voltage level or amplitude of disturbance. Any detection will turn on an indicating lamp and sound an audible alarm. The audible alarm is required to permit correlation of system error indications with power line disturbance. The LID can be used to trigger an oscilloscope with a scope camera to provide a hard copy record. The LID can sense a two microsecond disturbance. This means that typical power line disturbances such as capacitor switching and contact bounce from desk top adding machines can easily be detected.

It must be recognized that the LID does not in any manner indicate steady state RMS voltage either 115 or 230 volts. An Esterline Angus recording voltmeter should be used in conjunction with the LID for a complete problem analysis. In some cases a malfunction may be related to low voltage rather than the 10 percent transient that the LID has detected.

The LID can also be used in conjunction with the Recording Voltmeter via an ERCU (Event Recorder Control Unit). Event pens can be added to the Esterline-Angus recording voltmeter to provide hard copy indication of events occurring at certain times. The ERCU provides power and current to operate the event pens. The LID provides an output when transients are detected which can be interconnected to the event pens via the ERCU.



TEKTRONIC C-13-P CAMERA

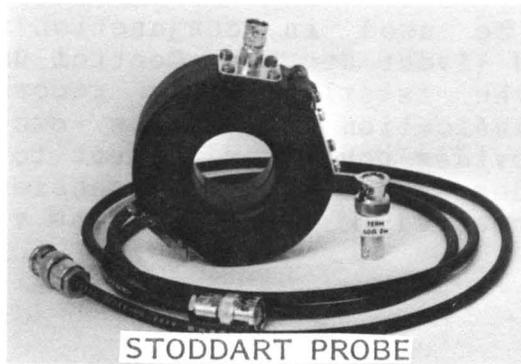
The Tektronix C-31-P trace recording camera can record any trace detected by a 453 or 454 scope. The camera mounts directly to a 453 or 454 'scope and can be used with the LID to photograph power line disturbances and power line transients when it becomes necessary to prove to a customer and/or power company that the power line is at fault. Also by using the oscilloscope in chop mode one can photograph concurrently the power disturbance and its effect on a DC voltage level. This 'scope camera technique can also be used with the Stoddart Probe to capture a microsecond disturbance.

In summary the instrumentation discussed can evaluate the nature of electrical disturbance on the input power and grounding to our systems. The occurrence of ground shift, load changes, capacitor switching, high resistance grounds and high frequency noise caused by many sources can be detected.

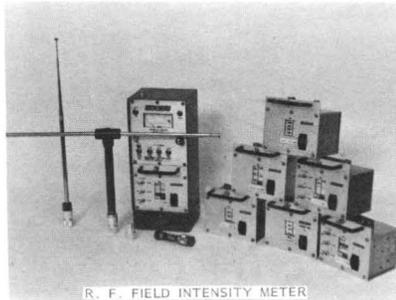
Radiation

The third category of system failure as related to environmental noise analysis is radiation or electro-magnetic interference. Some of the causes of radiation problems are radar, microwave repeaters, RF heaters and electrostatic arc welders and arc furnaces. The tools used for radiation analysis are the Radar Crystal Detector, the Stoddart Probe and the 'scope camera.

The Radar Crystal Detector package consists of appropriate antenna attenuators, crystal detectors and 453 'scope. A calibration chart converts 'scope readings into values of radar field intensity.



The Stoddart Probe can be useful in detecting RF radiated energy coupled to power or ground lines. EMI problems have been solved in the field through the use of this tool. For visual hard copy of the failure a 'scope camera can be utilized.



Additional Tools

An R.F. Field Intensity Meter for IPR's is available from Boca Raton Field Support to measure narrow-band and broad band radiation that may be present in a facility. This instrument is capable of quantitative analysis of RFI (Radio Frequency Interference). The meter is capable of monitoring the spectrum from .5 MHZ to over 900 MHZ.

Ground Monitor Part #9900453 (OPD Tool)

This device is used to detect whether or not proper ground and AC polarity are available from 115 Volt power outlets. This tool is described in Tools and Test Equipment CEM #174.

SOURCES OF INFORMATION

As you have seen, there are many test instruments available to you, each having a specific purpose. The accuracy in determining the results of a particular test procedure comes only with the experience of the operator in the use of that device. Therefore, it is recommended that some practice testing be done, prior to actual use of the testing instrument in the customers account, to develop confidence in its use and application.

IBM INTERNAL USE ONLY

To help you evaluate accuracy of a particular environment some aids are available in the General CEMs. These are:

CEM #66 EMC/NOISE/POWER Support Structure.

#255 Environmental Noise Analysis.

#256 Static Environment Evaluation.

#268 Procedure for Evaluating Electromagnetic Interference in Computer Room.

#269, 270, 171 - Environmental Analysis and Instrumentation, EMC/ NOISE POWER - Evaluation.

#276 - LID Operation Limits

Also available for certain unusual situations are:

Hard Hat Part #5442867

Hard Hat Liners Part #5442868

(General TSL #89)

C.E. Coveralls

Small - #453660

Medium - #453661

Large - #453662

(General TSL #85)

Supplies for the Esterline-Angus recording voltmeter are now available by part number.

Chart Paper (Roll) #453573

Accessory Kit #453574

Red Ink (Bottle) #453586

*Also check Tools and Test TSL #128 for a safety hazard on the Esterline-Angus Recorder.

The group of instruments just presented are described in Tools and Test Equipment TSL #28. Prices may be obtained from your Regional Designated Specialist.

These tools are used in the customer account within the Branch. The "Recommended Location" to place the tools at either Region or Branch is based upon (1) cost of tool, (2) frequency of use, (3) portability of the tools, and (4) the delicacy or precision of the instrument.

IBM INTERNAL USE ONLY

BRANCH OFFICE

<u>TOOL NAME</u>	<u>IBM PART NUMBER</u>	<u>TSL NUMBER</u>
Thermo-Humidigraph	453539	Tools 28
Sling Psychrometer	453543	" 28
Electrostatic Locator	453541	" 28
Clamp-on Ammeter	453554	" 28
(See TSL for list of Supplies and P/N)		
Electromagnetic Compatibility Simulator (Zapper)	453204	" 28
Recording Voltmeter	453571	" 28
(See TSL for list of Supplies and P/N)		
Phase Sequence Checker	453203	" 59
Weston AC Voltmeter	460880	
AC Ground/Neutral Tester	9900453	

REGION OFFICE (RDS BRANCH)

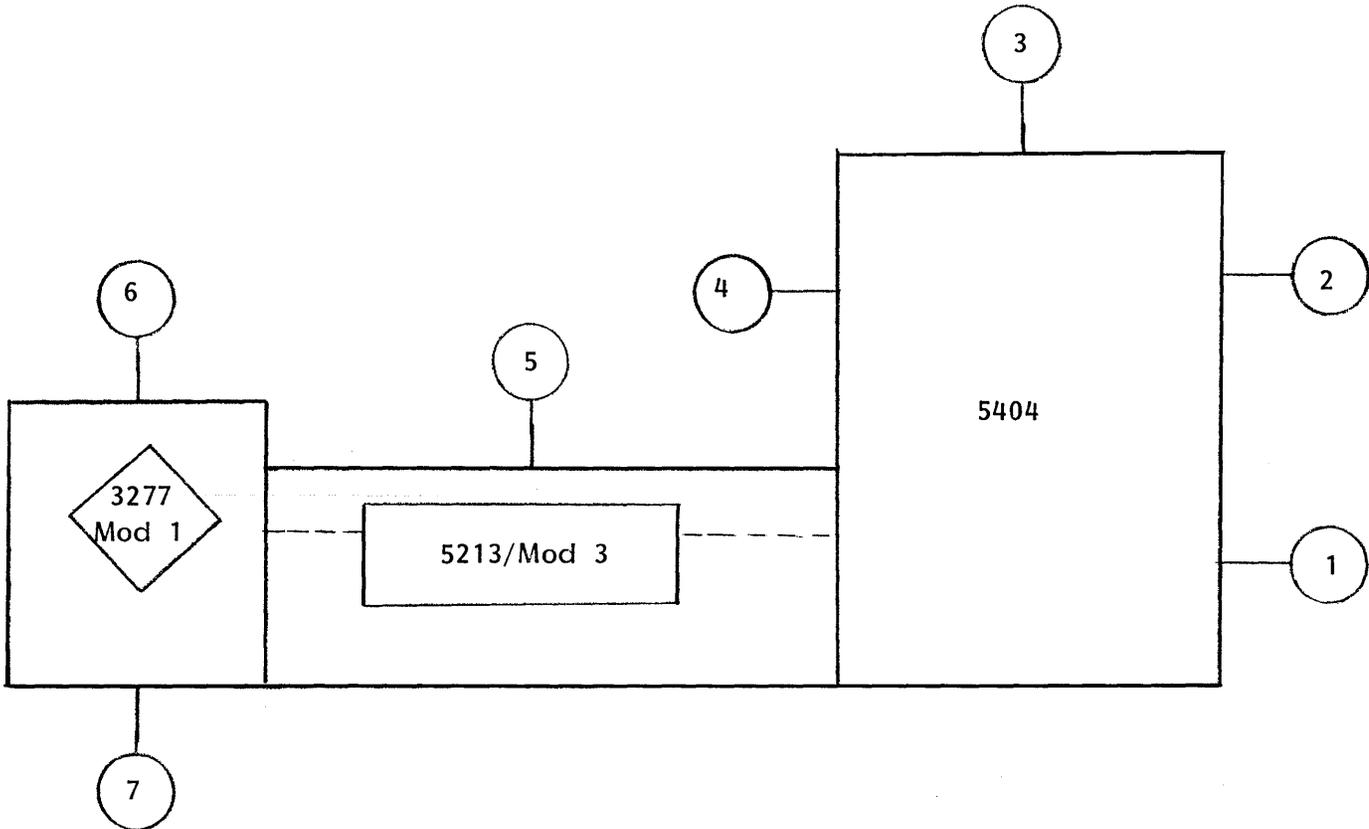
Environmental Monitoring Device (EMD) Cart P/N	453208 1748250	
Line Interrogation Device 60 HZ	453599	" 42
Textronic C-31-P	453650	" 47
Trace Recording Camera Camera Carrying Case	453651	" 47
R.F. Current Probe	453671	" 49
Analog Event	453613	" 73
Esterline-Angus Recorder* See TSL #28 for List of Supplies & P/N		" 73
Megohmmeter	453540	" 28
Test Electrodes Kit (megohmmeter)	453542	" 28
Earth Tester	453537	" 28
Accessory Kit (Earth Tester)	453538	" 28
Event Recorder	453224	" 72
Control Unit		
Event Pen Kit	453657	

DIVISION (BOCA RATON CE FIELD SUPPORT)

R.F. Field Intensity Meter

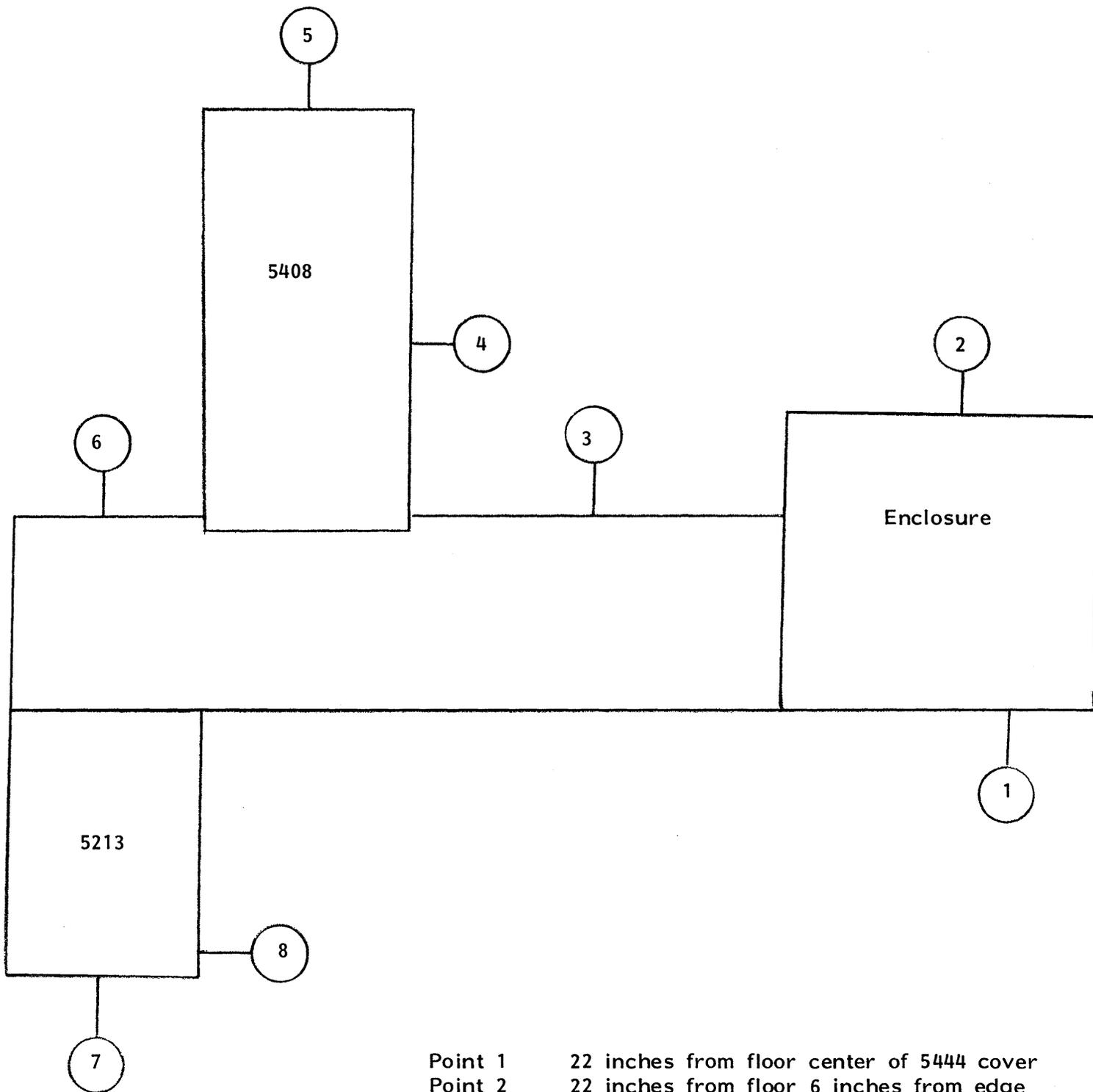
IBM INTERNAL USE ONLY

ESD (5404)



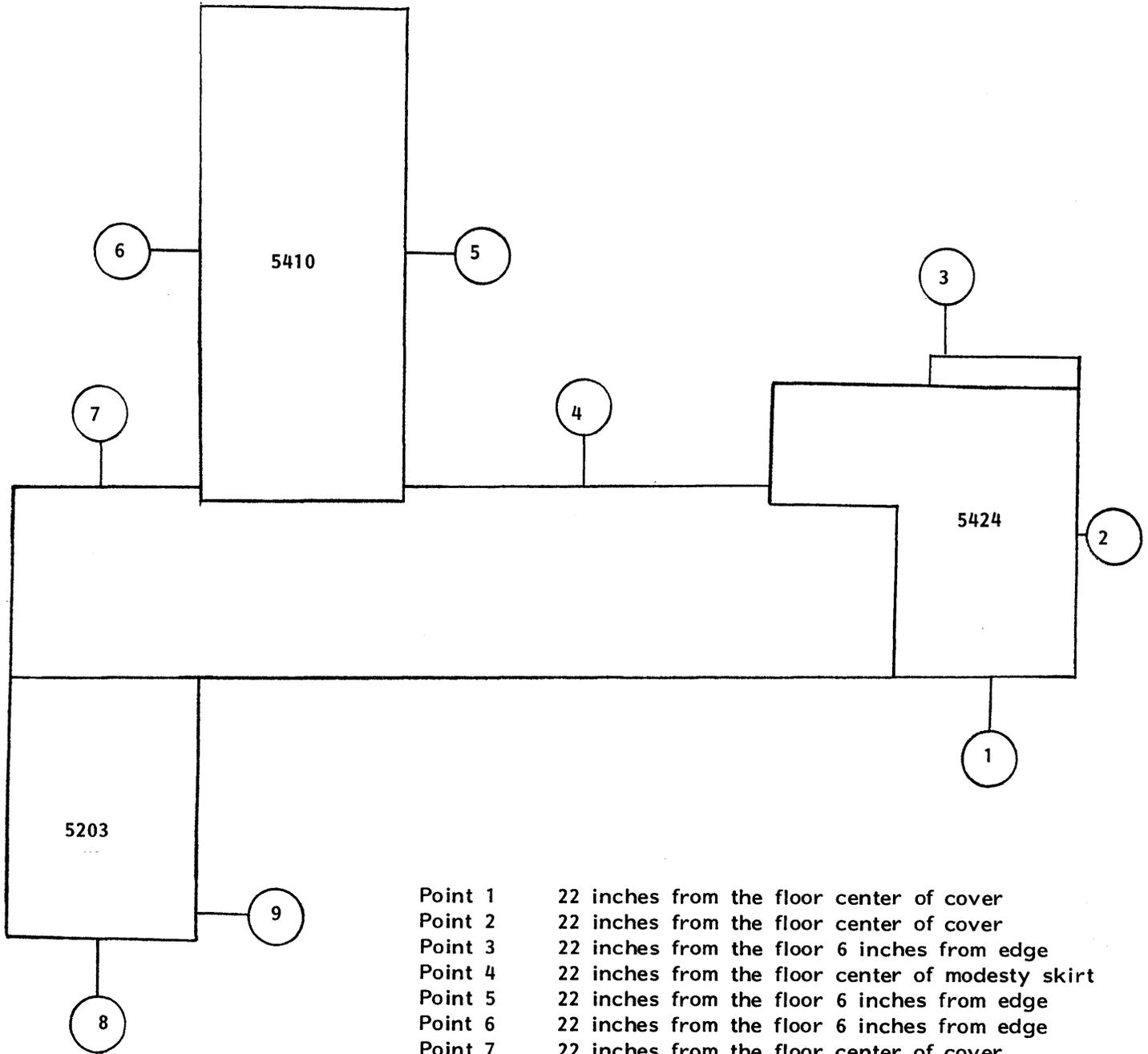
- Point 1 22 inches from floor center of cover
- Point 2 22 inches from floor center of cover
- Point 3 22 inches from floor center of cover
- Point 4 Center of cover on modesty skirt
- Point 6 Center of attachment board
- Point 7 Center of top file

IBM INTERNAL USE ONLY



- Point 1 22 inches from floor center of 5444 cover
- Point 2 22 inches from floor 6 inches from edge
- Point 3 22 inches from floor center of modesty skirt
- Point 4 22 inches from floor 6 inches from edge
- Point 5 22 inches from floor center of cover
- Point 6 22 inches from floor center of cover
- Point 7 22 inches from floor center of cover
- Point 8 22 inches from floor 6 inches from corner

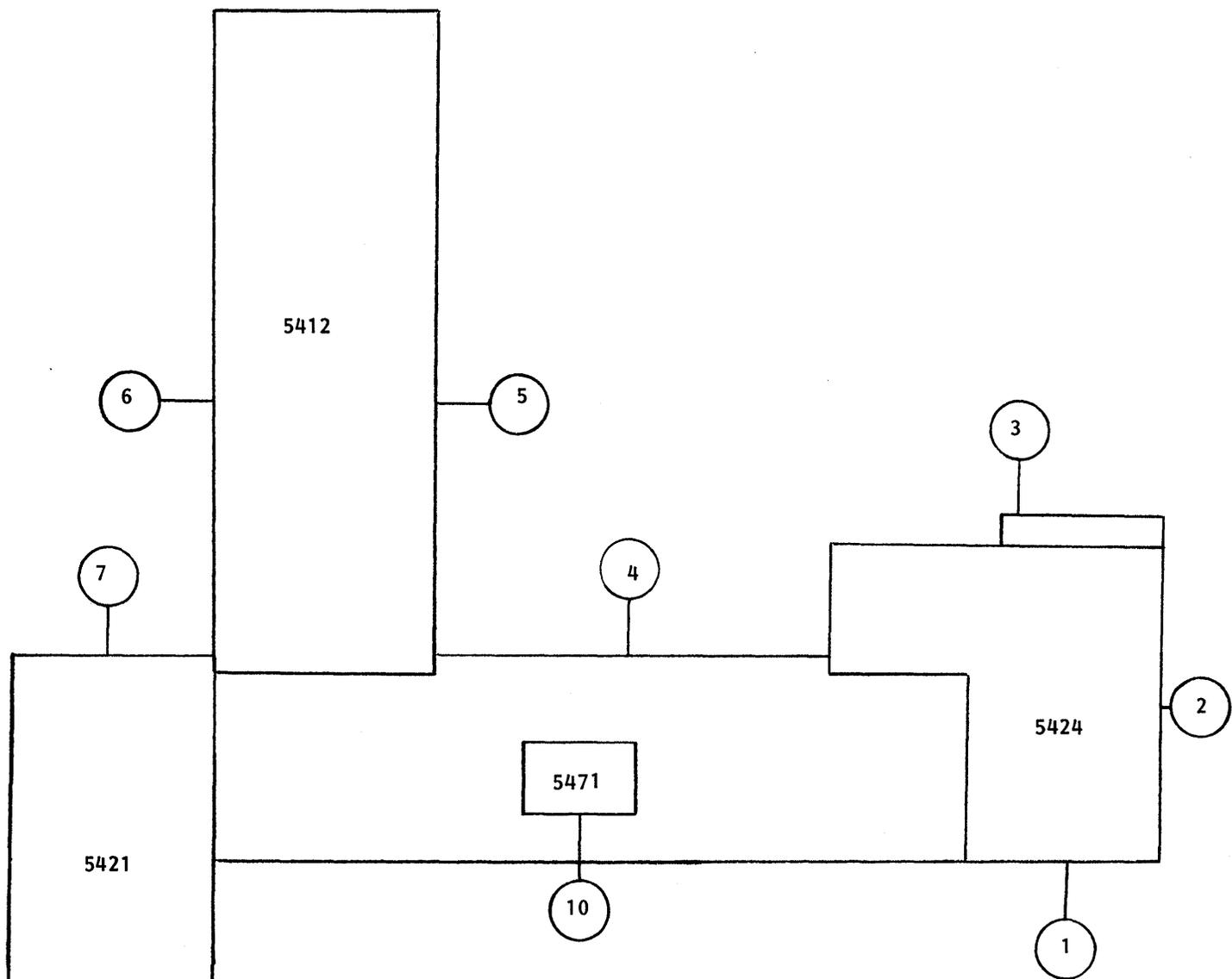
ESD (5410)



- Point 1 22 inches from the floor center of cover
- Point 2 22 inches from the floor center of cover
- Point 3 22 inches from the floor 6 inches from edge
- Point 4 22 inches from the floor center of modesty skirt
- Point 5 22 inches from the floor 6 inches from edge
- Point 6 22 inches from the floor 6 inches from edge
- Point 7 22 inches from the floor center of cover
- Point 8 22 inches from the floor center of cover
- Point 9 22 inches from the floor 6 inches from corner

IBM INTERNAL USE ONLY

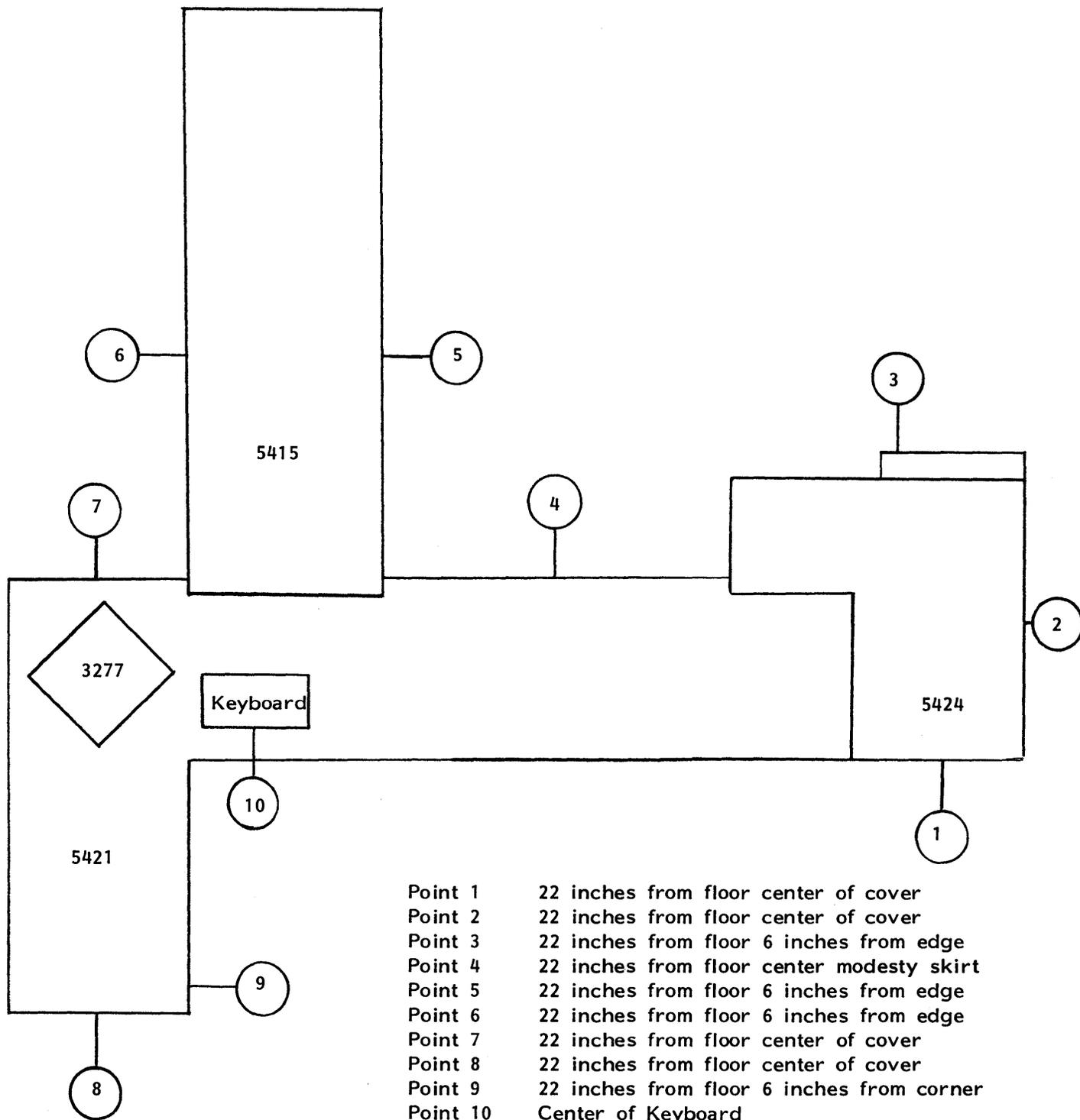
ESD (5412)



- Point 1 22 inches from the floor center of cover
- Point 2 22 inches from the floor center of cover
- Point 3 22 inches from the floor 6 inches from edge
- Point 4 22 inches from the floor center of modesty skirt
- Point 5 22 inches from the floor 6 inches from edge
- Point 6 22 inches from the floor 6 inches from edge
- Point 7 22 inches from the floor center of cover
- Point 8 22 inches from the floor center of cover
- Point 9 22 inches from the floor 6 inches from corner
- Point 10 Center of Selectric

IBM INTERNAL USE ONLY

ESD (5415)



- Point 1 22 inches from floor center of cover
- Point 2 22 inches from floor center of cover
- Point 3 22 inches from floor 6 inches from edge
- Point 4 22 inches from floor center modesty skirt
- Point 5 22 inches from floor 6 inches from edge
- Point 6 22 inches from floor 6 inches from edge
- Point 7 22 inches from floor center of cover
- Point 8 22 inches from floor center of cover
- Point 9 22 inches from floor 6 inches from corner
- Point 10 Center of Keyboard

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IBM INTERNAL USE ONLY

9-22

Use of Non-IBM Supply Items and Disk Packs in IBM Equipment

It is a fundamental IBM principle that every customer must receive the best possible IBM service to ensure the best possible performance by each IBM machine or unit. Since this principle applies under all circumstances, it includes among others, situations where some other manufacturer's ribbons, cards, tape or disk packs are used in IBM machines.

No machine trouble is to be attributed to the use of such items, either IBM's or another supplier's, until we have determined beyond any reasonable doubt that such is the case.

Rechecking Machine Adjustments

If there is a good reason to believe that machine problems may be the result of imperfections in supply items or disk packs being used, the machine adjustments should be rechecked by CE. This includes readjusting the feed or transport within allowable tolerances, realigning guides, checking and resetting related clearances or projections, and making variations in individual adjustments within specifications in an effort to obtain satisfactory performance.

Off-Specification Adjustments

If the Customer Engineer's efforts do not result in satisfactory operation of the IBM machine, off-specification adjustments should be tried in a further effort to overcome the problem and allow the customer's work to continue. Since the customer may not achieve optimum performance of the IBM equipment under these conditions, Branch Management is to inform the customer of the rechecking, the off-specification adjustments, and the results of CE efforts. The customer should also be advised that no further adjustments will be made except to IBM specifications.

IBM has always readily provided specifications for supplies and accessories which would give the best performance when used with its equipment. Therefore, if any supply items or disk pack creates undue difficulty, the customer should be encouraged to contact the supplier for a solution.

IBM INTERNAL USE ONLY

One CE responsibility is to keep IBM informed of any changes to the machines or systems in his or her territory. Discovery sheets (see sample sheet) are the most accurate way of obtaining the data needed to provide Engineering with the necessary information to determine the effect of that alteration or device on machine or system serviceability.

The Branch Office then forwards this data to Boca Raton where a survey package is developed. Boca Raton will determine whether the survey package will be of verification or initial survey level. If this alteration/attachment has been initially surveyed before, a verification survey takes place to insure that this particular non-IBM device corresponds to the original machine surveyed in respect to tie-ins, voltages, physical location, etc. If this alteration/attachment has not been previously surveyed, then vendor interface documentation and/or a physical engineering inspection is required by Boca Raton in order to verify that the maintenance package has not been invalidated.

The customer will be notified of the survey results through the branch letter and the Multiple Suppliers System Bulletin (see samples).

IBM INTERNAL USE ONLY

This is a sample non-IBM Alteration or Attachment discovery sheet. Your Field Manager will give you the actual one you need along with the instructions and coding key. This sample is for your information only.

FIELD #1 - TRANSACTION CODE

<u>Circle One</u>	<u>Required Fields</u>
82	1, 3, 4, 5, 6, 10, 14, 15 and 7, 11, 13 as applicable
83	1, 3, 4, 8, 9, 10 and 12, 13 as applicable
84	1, 3, 4, 5, 6, 7 <u>GSD only:</u> 8 and 10 as applicable
85	1, 2 and changed fields 1, 2, 9 quantity equal zero
86	1, 3

FIELD #2 Record Number _____

FIELD #3 Type _____ Serial _____

FIELD #4 Manufacturer's Name Code M/CD _____

Manufacturer's Name (Code 99 Only) _____

Marketing Name Code MKTCD _____

FIELD #5 Alteration Change ALT _____

FIELD #6 Alteration Date ALT/DT _____

FIELD #7 Alteration Description DESC _____

FIELD #8 Device Function Code D/F/CD _____

FIELD #9 Quantity of Attachments now on IBM Machine QTY _____

FIELD #10 Serviced by Company Code SVC BY _____

FIELD #11 IBM Equivalent Type ETYPE _____

FIELD #12 IBM Equivalent Model EMOD _____

FIELD #13 Manufacturer's Type/Model MTYP/MMOD _____

FIELD #14 IBM Memory Size IMEM _____

FIELD #15 Non-IBM Memory Size OMEM _____

SAMPLE LETTER TO BE SENT TO CUSTOMER

IBM has inspected the following IBM machine which was altered to accommodate the addition of a non-IBM alteration/attachment.

<u>Date of Inspection</u>	<u>Altered IBM Machine Type & Serial</u>	<u>Non-IBM Alteration/Attachment</u>
---------------------------	--	--------------------------------------

As a result of our inspection and subsequent evaluation of the effect of the alteration on the maintainability of the above IBM machine, IBM will attempt to maintain the unaltered portion of the machine in accordance with the Maintenance Plan described in the IBM Multiple Supplier System Bulletin, a copy of which is attached.

- * During our evaluation, however, we did note the following service problems that concern us.

The above problems may at some time impair the IBM Customer Engineer's ability to readily isolate malfunctions, thereby extending machine downtime. Accordingly, any additional time and material expended by IBM because of the aforementioned items, will be billed in accordance with our standard practices regarding alterations and attachments as described in the Multiple Supplier System Bulletin.

IBM assumes no responsibility for the diagnosis or maintenance of any alterations or attachments to the IBM machine or for the compatibility of future changes to such machine as may be provided by IBM.

Should you have questions concerning the inspection results or our Multiple Supplier System Bulletin, please contact your Marketing Representative.

- * To be included only if maintenance limitations have been identified in the ITPS wire from FE HQ specifying the results of the IBM inspection.

GS Branch Manager

Attachment: Multiple Supplier System Bulletin

bcc: CE Branch Manager

IBM INTERNAL USE ONLY

SUBJECT:**MULTIPLE SUPPLIER SYSTEM BULLETIN***International Business Machines Corporation / Armonk, New York 10504*

Multiple Supplier System Bulletin

The purpose of this Bulletin is to define IBM's relationship with our customers and their other suppliers regarding systems comprised of IBM equipment and that of other suppliers, or when an alteration is made to an IBM machine.

In Multiple Supplier Systems, IBM responsibility is limited to equipment marketed by IBM and to compatibility with tariffed communication services provided by regulated common carriers and recommended by IBM for configuration of IBM Teleprocessing systems.

Our experience with Multiple Supplier Systems has indicated that the variations and complexity of alterations to IBM machines have increased our cost of providing maintenance service. These increased costs include diagnostic and repair time identified at the time of service calls and installation time which results from alterations and attachments, the cost of restoring altered rental machines being returned to IBM and the time and expense of inspection of altered machines to determine the practicality and safety of maintenance. Charges to recover these additional costs are set forth in this Bulletin.

Upon request, we will meet with our customers and the other suppliers to achieve a common understanding of each party's responsibility.

Definitions

A Multiple Supplier System is one which involves an alteration in an IBM machine or attachment of other suppliers' equipment to an IBM machine or system. An alteration is defined as any change to an IBM machine which deviates from IBM's physical, mechanical or electrical machine design (including microcode) whether or not additional devices or parts are required. An attachment is defined as the mechanical, electrical or electronic interconnection of non-IBM equipment marketed by others to an IBM machine or system.

Maintenance Services

General

IBM provides maintenance service for equipment manufactured by, or for, IBM and marketed by IBM. It is impractical to train our Customer Engineers on a wide range of non-IBM equipment. In certain cases, upon request, IBM may procure maintenance for specified supporting equipment such as motor generators, cooling systems or back-up power supplies.

When an alteration in or attachment to an IBM machine or system (a) interferes with the normal and satisfactory operation or maintenance of a machine in a manner which renders its maintenance and repair impractical for IBM's personnel having had the standard training and instruction provided for such personnel, or (b) creates a safety hazard, the Customer will be required in the case of a rental machine, upon written notice, to modify the alteration or attachment to achieve a practical maintenance condition, to remove the alteration or attachment and restore the machine or system to its normal and satisfactory operating condition or to purchase the machine and obtain maintenance from another source. In the case of a purchased machine, the Customer will be required, upon written notice, to modify the alteration or attachment to achieve a practical maintenance condition or to remove the alteration or attachment and return the machine to a practical maintenance condition as a requisite for continuation of IBM warranty and maintenance service.

Inspection

Upon learning of an installed alteration, IBM will determine if maintenance or warranty service of the unaltered

(over)

SUBJECT:**MULTIPLE SUPPLIER SYSTEM BULLETIN**

portion of the machine or system is practical and that no safety hazard has been created. If an inspection is required to make this determination, the customer will be notified and an inspection date will be scheduled. The inspection of an alteration is a requirement for our continuing service. Reconfiguration of an alteration may necessitate reinspection and reassessment of the maintenance status of the machine.

The initial inspection of a particular alteration may require an engineering analysis by IBM laboratory engineering personnel. Other suppliers may request initial inspections of alterations to IBM machines at their manufacturing facilities prior to installation at a customer location. Otherwise, the initial inspection will be performed at the customer location. When the same alteration is made to another machine, an inspection will be performed at the customer site by local IBM Field Engineering personnel to verify that the installation was accomplished in substantially the same manner as those previously inspected.

The customer is to make available to IBM, for such inspections, a description of all alterations. The description is to include maintenance documentation and an identification of all modifications and displacements of IBM parts, wiring, and microcode. In addition, all parts and wiring comprising the alteration shall be made clearly distinguishable to IBM personnel by color coding and other appropriate means.

Maintenance Plan

When maintenance of the unaltered portion of a machine or system has been determined upon inspection by IBM to be practical and no safety hazard has been created, IBM and customer responsibilities will be:

- a) In servicing and maintaining the unaltered portion of a machine, our personnel will use the diagnostics, maintenance procedures, and other maintenance documentation normally supplied by IBM for the machine.
- b) If in the course of a service call, IBM's diagnostic efforts indicate that the failure is located in the unaltered portion of the machine, we will proceed to perform maintenance and repair.

If in attempting to service and maintain the unaltered portion of a machine, IBM is precluded from completing normal diagnostic efforts and maintenance procedures as a result of interference by an alteration or attachment or if IBM determines that the failure may be located in the alteration or attachment, IBM will notify the Customer that he has the option either to cause the alteration or attachment to be disconnected or removed before IBM will be obligated to proceed further, or to call upon the service organization responsible for maintaining the alteration or attachment to proceed with diagnosis, maintenance and repair of the alteration or attachment. If the cause of the failure cannot be determined by such service organization, IBM may require that the alteration or attachment be disconnected or removed in order for IBM to complete maintenance and repair of the unaltered portion of the machine.

- c) Alteration in or attachment to equipment or changes in programming other than as provided by IBM may affect the compatibility of IBM engineering changes, programs, features and model conversions. Customers may find it necessary to re-establish a compatible interface to an alteration or attachment as a consequence of IBM modifications to equipment or programming or to avoid any adverse effect of such modifications on the performance of the alteration or attachment. When an alteration or attachment interferes with installation of engineering changes, model changes, programs or features provided by IBM, or with their maintenance or removal, IBM may require that the alteration or attachment be removed as a condition of our completing installation, maintenance or removal.
- d) In the event that an alteration or attachment impacts any maintenance dependency of one IBM machine upon any other IBM machine, IBM's warranty and maintenance service may be adversely affected. In such situations, IBM shall attempt to complete maintenance and repair in as timely and effective a manner as possible.
- e) On occasion, IBM replaces a rental machine due to maintenance considerations. The customer is advised and provided the scheduled date of replacement. If such a machine contains an alteration, the customer will be responsible for removing the alteration from the machine prior to replacement and for its reinstallation.

Restoration

The customer is responsible for the storage of any IBM parts removed as a result of alteration to an IBM rental machine and for the reinstallation of the parts when the alteration is removed.

Prior to discontinuance of a rental machine or upon removal of an alteration from a rental machine, the customer will be responsible for restoring the machine to its normal condition. When restoration is performed by other than IBM personnel, an inspection will be scheduled following removal of an alteration to determine that proper restoration has been completed, (e.g. all parts, wiring and microcode which were modified or displaced by the alteration have been



SUBJECT:

MULTIPLE SUPPLIER SYSTEM BULLETIN

reinstalled so that the machine is in normal condition). This inspection will be completed prior to discontinuance of rental machines.

Upon customer removal of an alteration, purchased machines must be restored to a practical maintenance condition if IBM warranty or maintenance service is to continue.

Charges

Time and expenses incurred by IBM for diagnosis or repair of the unaltered portion of a machine attributable to an alteration or attachment; or for other IBM Field Engineering activities such as the installation, maintenance or removal of engineering or model changes, programs or features with which the alteration or attachment interferes will be charged to the customer at IBM's time and material rates and terms then in effect.

Time and expenses incurred by IBM in inspection or reinspection of altered machines or inspection of restored machines will be charged to customers at IBM's rates and terms then in effect for participation of local Field Engineering personnel and at applicable hourly rates and travel and living expenses for assistance from IBM laboratory engineering personnel when required. Billable time for an inspection performed by IBM laboratory engineering personnel will be that time at the inspection site recorded to the nearest hour.

In addition to the charges described above, IBM may establish additional charges for maintenance service under existing Agreements. Such charges could result if the cost of maintaining the unaltered portion of such machines is significantly increased above the cost of maintaining similar machines which have not been altered. These charges would recover additional costs such as those due to an increase in "no trouble found" and intermittent failure incidents, greater diagnostic complexities and increased parts requirements.

Liability

IBM does not assume liability for personal injury or property damage, including damage to IBM equipment, caused by an alteration or attachment or service thereon. IBM does not assume liability for any damage occurring to an alteration or attachment attributable to IBM's use of its standard maintenance and installation procedures.

Other Services

For systems in which IBM equipment is a significant part of the customer's installation, IBM may provide maintenance coordination services on a fixed price contract basis. This service is designed to meet complex system requirements such as common carrier and sensor-based installation coordination, problem determination for modems and instrumentation, and common carrier and instrumentation stand-by assistance, and service coordination.

Patents

IBM's standard indemnification will apply to equipment manufactured and marketed by IBM. IBM does not assume responsibility for the infringement of patents which relate to the combination of non-IBM equipment with IBM equipment and programming. In those situations where IBM markets non-IBM equipment, IBM's indemnity to the customer is limited to that which can be passed on as the result of the manufacturer's indemnity. This Bulletin does not imply the granting of a license under any IBM patent.

General

IBM's maintenance of IBM equipment in Multiple Supplier Systems does not constitute endorsement of any alteration or attachment.

Any questions concerning the provisions of this Bulletin should be directed to your IBM representative.

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IBM INTERNAL USE ONLY

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MES

MES shipments from Boca Raton are discretely packaged by Bill of Material. To insure that all parts required to install a feature or features shipped on an MES are received, a complete understanding of this packaging is required.

An MES may contain one or more feature B/M's. A feature B/M can contain one or more sub B/M's. A sub B/M is made up of parts and may also contain additional B/M's, commonly called "J" bills. See Figure 1.

"J" bills are packaged assemblies of parts such as logics, power supplies, or assemblies and may be packaged separately but will have the "J" bill number written on the package.

Each feature B/M is assigned a bin number which is located in the upper right-hand corner of the computerized B/M listing. See Figure 2. All parts included in this B/M have been assigned on the identification ticket attached to the part, and a job number. The last two digits of the job number are the same as the bin number.

Each part included in the B/M will have the same job number and will be packaged separately. The main B/M may not be packaged separately but may be found loose in the main box of parts.

In some cases, when the B/M contains a small amount of parts, they may be packaged in a large grey envelope with the B/M number or bin number written on the package.

To effectively inventory the MES from the computerized Bill of Material list, an understanding of the codes used in the PL and CH columns is required. See Figure 2.

- RS - Reference material shipped
- D - Detail part shipped, such as screw or fuse
- A - Assembly shipped, such as MST or power supplies
- PD - Bulk item shipped, such as wire or tubing
- XJ - Packaged group of parts, such as logics or panel assembly
- RR - Reference material not shipped
- JA - An as-required assembly shipped, such as a table top
- ID - Parts shipped to field (substitute). See reference number column for substitute part number
- MD - Parts to be removed
- MA - Assemblies to be removed
- RM - Reference material to be removed

IBM INTERNAL USE ONLY

Service Aid 12 can be used as a guide to sequence the different B/M's that need to be installed.

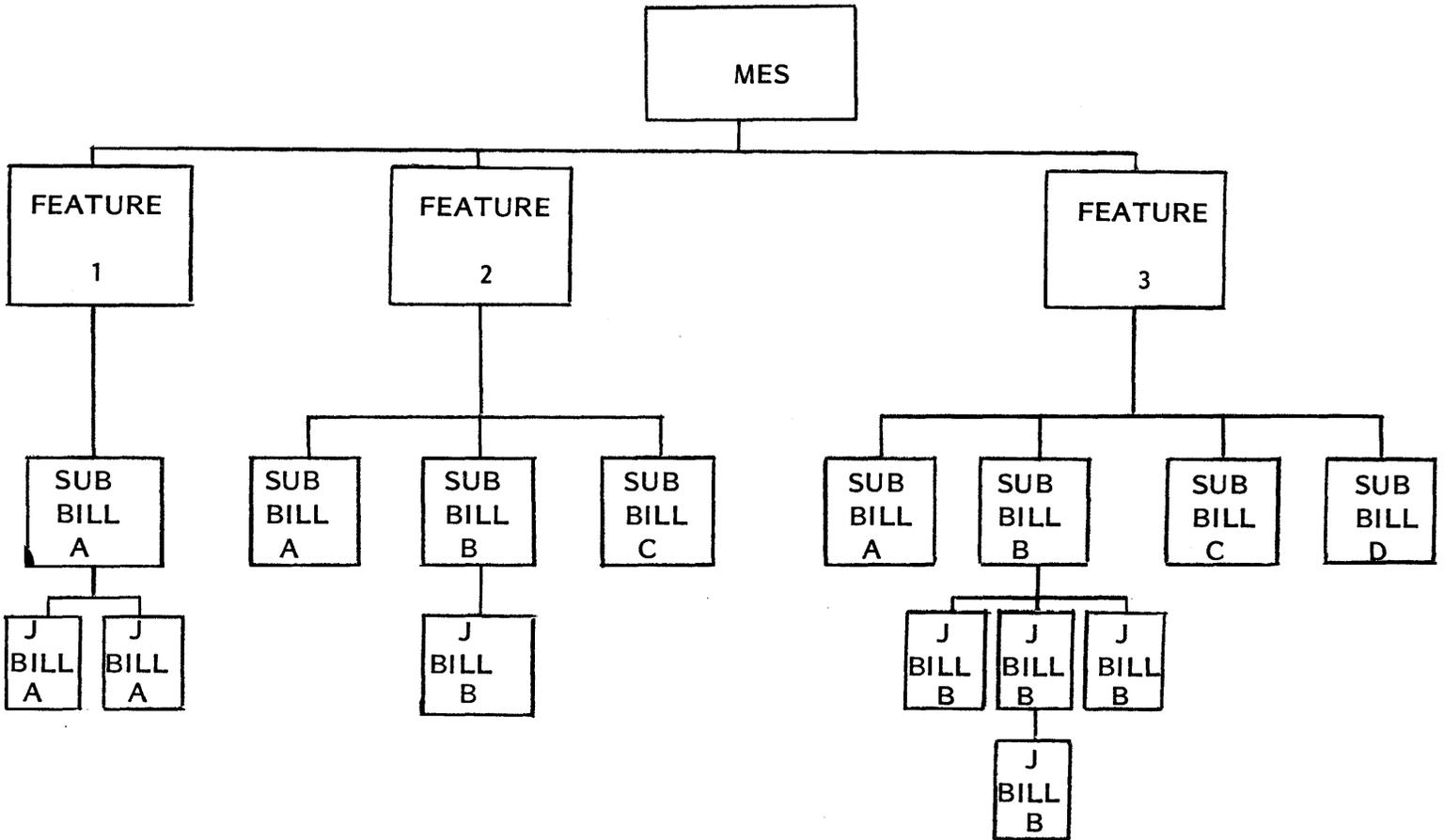
Service Aid 13 gives a big picture view of the Channel Bank Cabling, which should help understanding.

If parts are missing on an MES, the MES department in Rochester, MN should be contacted:

First Shift	507-286-5382
	8-456-5382
Off Hours	507-286-4011
	8-456-4011

RCQ Code should be used for reporting MES defects by IR; also explain all codes fully in description section (include B/M and/or part number where applicable).

STRUCTURE OF AN MES



* "J" Bills may call out further "J" Bills.

IBM INTERNAL USE ONLY

March 19, 1974

Production Level

Bin # AF1D

Page 1

Title

\$Field Install Chan 3
Sig. Cables 5555162
W/O BSCA-2 with MLTA
The following Class I
FIED items must be
packaged with the
B/M separately

P/N 0664454 Instructio

Basic Name & Descr.	PL	CH	Part No.	UM	Qty.	Ref.#	Mfg 1 2 3	Oper	Dept	Mfg 4 5	File	Open	EC	Ins-Ext
FFB/M Instr 821718	R	S	0664454		1					R *				
Tubing Plastic	P	D	0073430	11	2				92E	P				
Strap Cable	L	D	0811427	01	20				92E	L				
Backplate	A	D	0815215	01	1				92E	A				
Plate Asm	A	A	0815224	01	1				92E	A				
Screw	A	D	2588874	01	2				92E	A				
Trough Vertical	A	D	2590010	01	2				92E	A				
Trough Horizontal	A	D	2590011	01	1				92E	A				
Cable Grp 01A-01B	A	J	5554871	01	1				92E	A				

Prod. Change Level 821718

FIGURE 2

IBM INTERNAL USE ONLY

11-4

SUPPORT STRUCTURE

With the transfer of the 5408 to Class II, 5415 B & C to Class II, 5415 A to Class III on 7/1/77, the System/3 CPU family today has products in each of the three service classes. This is an opportune time to review the function of the System/3 FSC (Field Support Center) and the GSD technical support structure as it applies to the individual classes and the many variations of service class I/O attached to the System/3. This section will identify the interface guidelines between the Field, the Field Support Center, and the Product Service Planning Representative when assistance is required.

On a Class I product, any CE can call the FSC (Field Support Center). The only requirement, other than proper security, is that all on-site documentation and RETAIN will have already been exhausted. Field Support will then give Data Bank Search, technical direction and guidance on the problem. (On Class II or III, the CE will use the SSI (System Service Index) or equivalent (such as SIMS), instead of the FSC.)

If the problem is not resolved, the CE will call the BODS (Branch Office Designated Support person). If BODS and/or RDS are unknown to the CE, his or her Field Manager can provide the names of the personnel currently with those levels of support. After the BODS has arrived on site and exhausted all resources, the BODS may elect to call FSC on the WATS line for Class I products or toll call Boca Raton for Class II products, and talk to a Product SPR for indepth analysis and Engineering interface, if necessary. (Class III products do not use Boca Raton Field Support for technical assistance, but instead utilize interoffice support.)

If a Class I or II machine is still down after the Branch Office has exhausted its resources, including all on site and Branch Office documentation, to the best ability of the CE and the BODS, the branch should get an RDS (Region Designated Support) on site. After the RDS arrives, he or she may call FSC (Class I), or toll call Boca Raton (Class II) and go into indepth analysis with the Product SPR, and Engineering, if necessary.

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If the problem still cannot be resolved remotely and Branch Office requests on-site assistance, an SPR and/or Engineer will go on site to assist in problem resolution.

In summary, what Field Support asks of the Field is that, before each step is taken, all prior resources should be exhausted.

MIXED CLASSES

During problem determination, all assist calls involving mixed classes of product support between the host system and the I/O units will assume the CPU class for the entire system.

If problem determination places the trouble in the I/O unit, then its class and support structure will be followed; otherwise, the CPU support will be utilized.

SUMMARY

CLASS I

- A. Early Product Life
- B. Direct Plant Support (FSC)
- C. Support Structure
 - 1. CE calls FSC for Data Bank Search and technical direction
 - 2. BODS on site
 - 3. BODS on site calls FSC for indepth and/or Engineering interface
 - 4. RDS on site
 - 5. RDS on site calls FSC for indepth and/or Engineering interface
 - 6. SPR and/or Engineering on site

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CLASS II

- A. Mid Product Life
- B. Region Designated Support (RDS)
- C. Support Structure
 - 1. FSC closed - no WATS
 - 2. CE uses SSI or equivalent
 - 3. BODS on site
 - 4. BODS on site toll calls Product SPR
 - 5. RDS on site
 - 6. RDS on site toll calls Product SPR for indepth and/or Engineering interface
 - 7. SPR and/or Engineering on site

CLASS III

- A. Late Product Life
- B. Branch Office Self-Sufficiency (BODS)
- C. Support Structure - Branch Office Responsibility

PRIOR TO ASSISTANCE CALL, CE SHOULD USE LOCAL RESOURCES

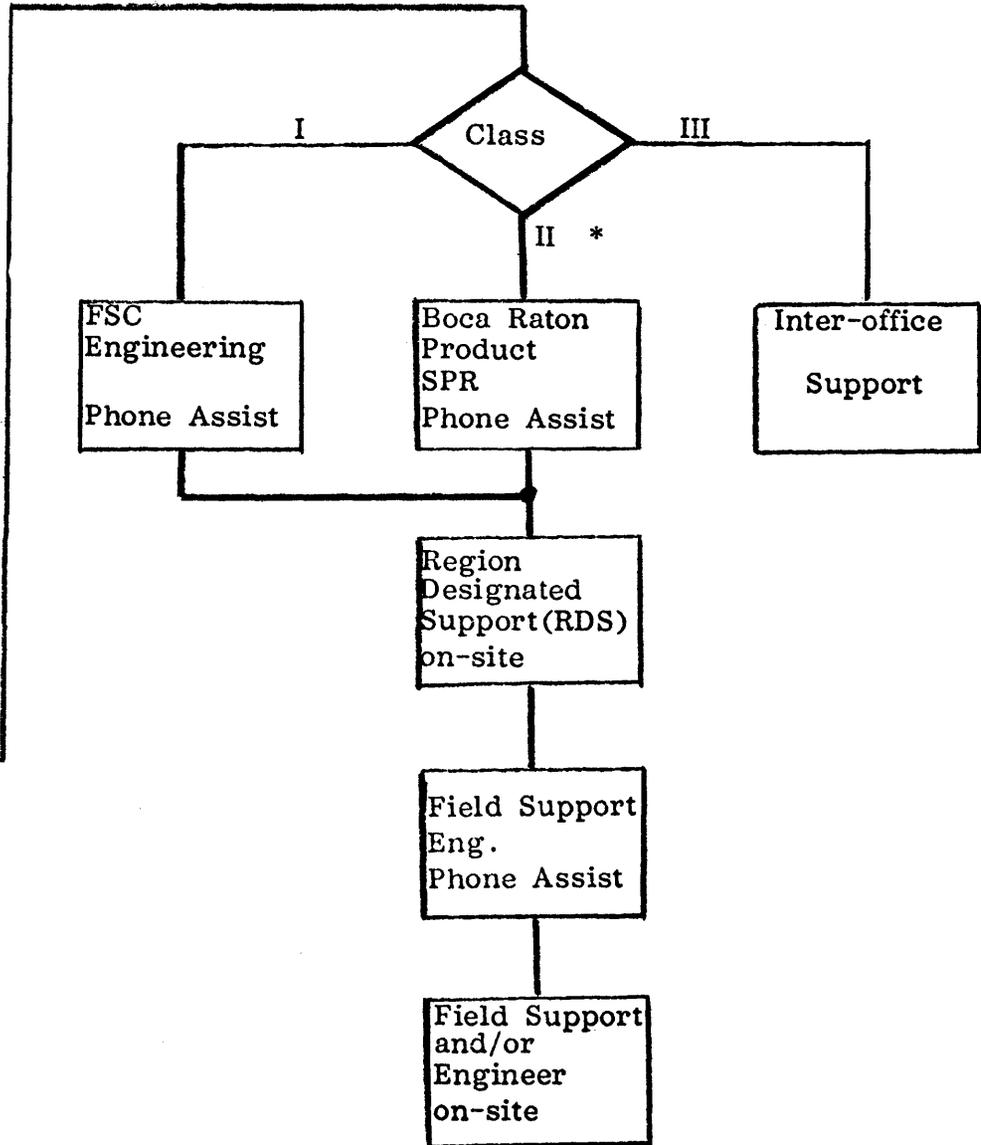
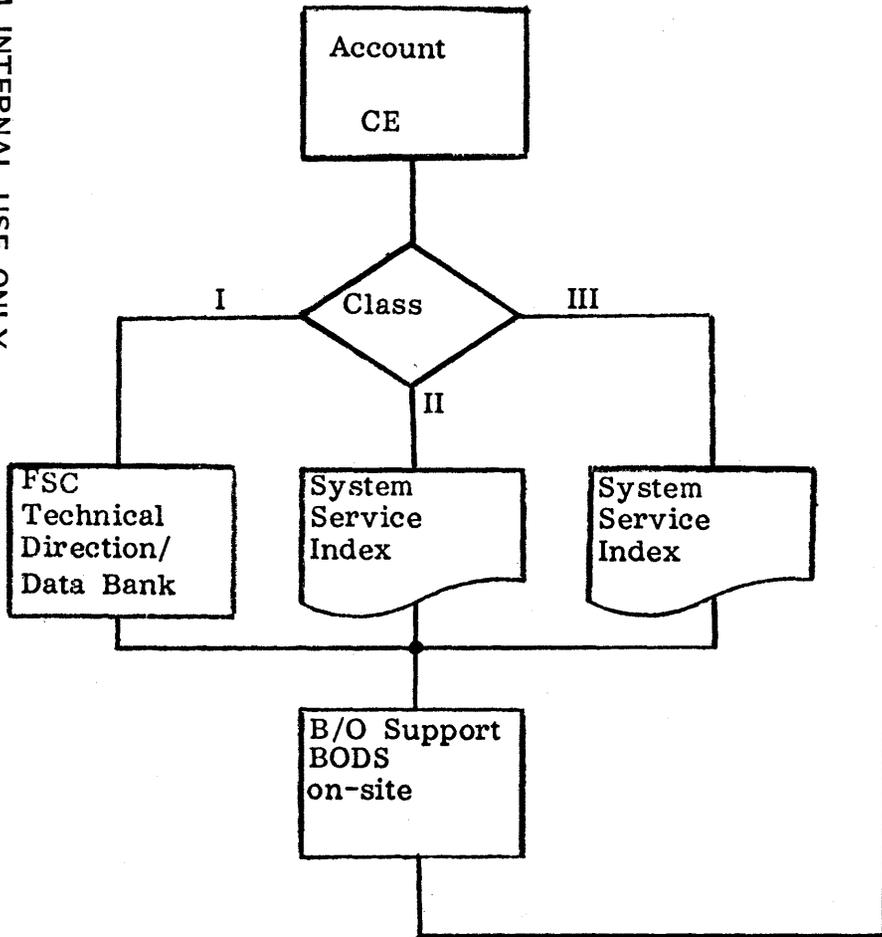
- A. MAPS
- B. MLM's
- C. RETAIN's
- D. ETC.

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RESPONSIBLE PLANTS
FOR
SYSTEM/3 AND I/O UNITS

<u>TYPE</u>	<u>CLASS</u>	<u>PLANT OF MFG/FIELD SUPPORT</u>	<u>PLANT OF MES/MLC CONTROL</u>
1017, 18	III	Raleigh	Raleigh
1255	III	Endicott	Endicott
1403-2,5	III	Endicott	Endicott
1403 N1	III	Endicott	Endicott
1419	III	Endicott	Endicott
1442	III	Rochester	Rochester
2501	III	Rochester	Rochester
2560	III	Rochester	Rochester
327X	II	Kingston	Kingston
328X	II	Kingston	Kingston
3340	II	San Jose	San Jose
3344	I	San Jose	San Jose
3410, 3411	III	San Jose	San Jose
374X	II	Rochester	Rochester
5203	III	Endicott	Endicott
5404	I	Boca Raton	Rochester
5406	III	Boca Raton	Rochester
5408	I	Boca Raton	Rochester
5410	III	Boca Raton	Rochester
5412	I	Boca Raton	Rochester
5415A	II	Boca Raton	Rochester
5415B,C,D	I	Boca Raton	Rochester
5421	III	Boca Raton	Rochester
5422	III	Rochester	Rochester
5424	III	Rochester	Rochester
5444	III	Rochester	Rochester
5445	III	San Jose	San Jose
5447	I	Boca Raton	Rochester
5448	I	Rochester	Rochester
5471	III	Boca Raton	Rochester

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S/3 SOFTWARE

System Programming

The purpose of this section is to acquaint hardware CEs with the very basic programming structure of the System/3 Model 15. Emphasis will be placed on those areas that can provide diagnostic information to both hardware and software CEs in an effort to reduce problem determination time.

Three architectural characteristics of the System/3 Model 15 have created areas that can require the joint effort of software and hardware CEs for quick and efficient problem determination:

1. Multi-programming environment
2. Hardware driven interrupts
3. Microcode IOS (Interface to Software)

The programming approach to this architecture has resulted in some confusion on Process Check problem determination. Hardware malfunctions can create Process Check conditions with software failure symptoms. We will examine each of these areas and the respective symptoms that could be confusing from a problem determination standpoint.

MAIN STORAGE ORGANIZATION

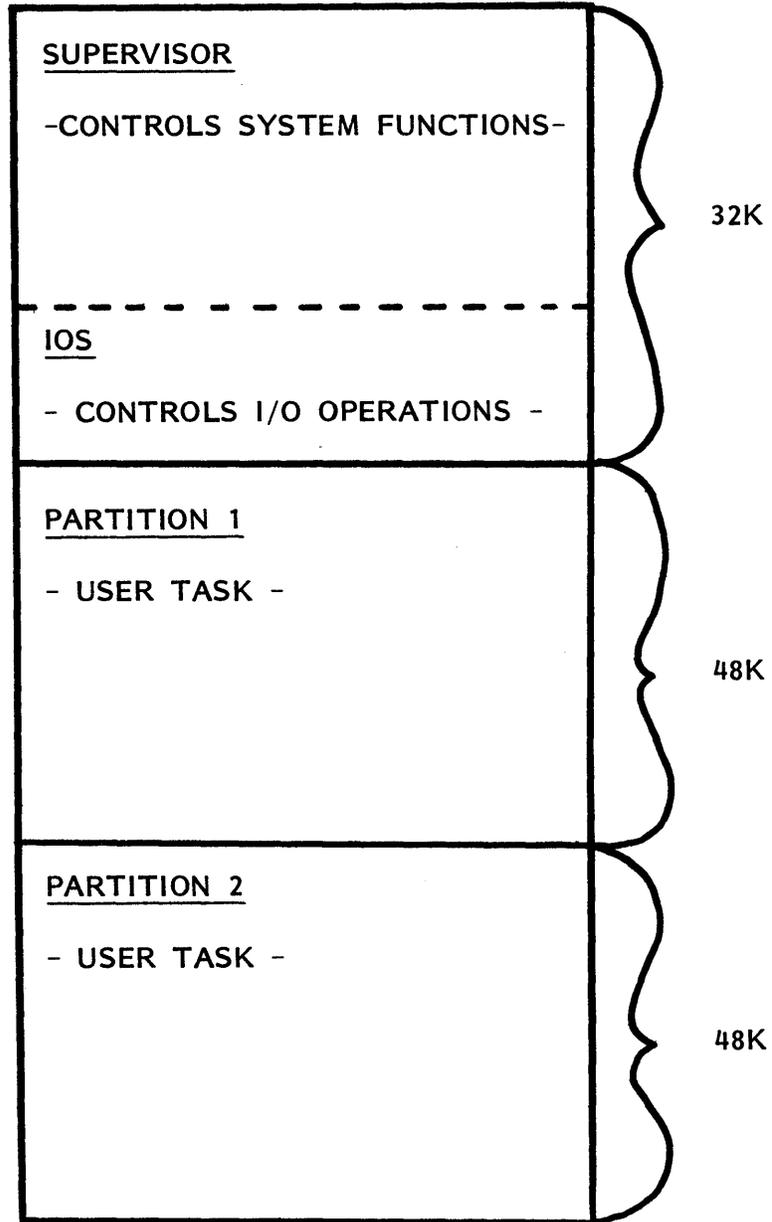


FIGURE 1

Multi-Programming

With the advent of multiple task System/3 Model 15, a more efficient method of handling Process Check conditions became necessary. As many as sixteen user tasks may be executing at any given time on a Model 15 using CCP.

The Process Check handler function was developed to intercept 'Process Check' conditions and interrogate the type of failure. A decision is then made as to whether a single partition user task under CCP, or the entire system should be halted. The Process Check handler operates in interrupt Level 7 of the system. If diagnosis of the error indicated that a single user task or partition cannot be stopped to eliminate the error, an internal branch to a X'00' OP Code is made. This action results in an invalid OP Process Check (red light) and the interrupt Level 7 indicator on the console. This symptom indicates only that a Process Check occurred and system integrity could not be maintained. Information regarding the actual type of Process Check and real system address associated with it are logged at address X'100'.

Figure 2 shows the content of the Process Check Address Register and Program Status Register which are located at address X'100'. This information is provided to stress the fact that console indications are not always valid for software process checks and that a PSR should be involved for proper diagnosis.

PROGRAM CHECK INFORMATION

Displ	Label	Lng in bytes	Description
X/0100'	PCSTAT	0	Program check information start
X'0100'	PCADRG	2	Program check address register
X'0102'	PCSTRG	2	Program check status register
			Byte 1
			X'80' = reserved
			X'40' = reserved
			X'20' = Interrupt level ID (4 bit)
			X'10' = Interrupt level ID (2 bit)
			X'08' = Interrupt level ID (1 bit)
			X'04' = Any interrupt level
			X'03' = Greater than 192K
			X'02' = Greater than 64K
			X'01' = Greater than 128K
			Byte 2
			X'80' = Storage violation
			X'40' = Invalid Q-byte
			X'20' = Invalid Op code
			X'10' = Invalid address
			X'08' = Privileged operation
			X'07' = reserved
X'0104'	PCIAI	2	Interrupt level IAR
X'0106'	PCPMR	2	Interrupt level PMR
X'0108'	PCPSR	2	PSR
X'010A'	PCXR2	2	XR2
X'010C'	PCXR1	2	XR1
X'010E'	PCTCB	2	Address of associated TCB (if known)

FIGURE 2

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Hardware Interrupts

Unexpected hardware interrupts on the System/3 Model 15 can also cause system symptoms that appear to be software failures. At system generation time a table is built for every device on the system. Each table contains numerous elements which can represent a function for the device to perform at execution time, when a function is requested of the device, the element is plugged with the address of the requesting task and the address of the active IOB (Input/Output Block). The requesting task may be a user program or the system itself. The IOB contains a description of the function to be performed. When the SIO is given to the device, the IOB is put in the wait state. When the OP END interrupt is received from the device, the active IOB is posted complete if the operation was successful.

In the case of the unexpected interrupt, no information has been plugged into the table element. Upon receiving the interrupt, the interrupt handler determines the device type and goes to the appropriate table to get the task and IOB information. System programming will check for a valid IOB address and, if none is present, will force a processor check. The PSR can determine the device that caused the unexpected interrupt.

The programming system trace program is the best tool available for diagnostic aid when this type of failure is suspected. An OP END interrupt will be logged from the device without a corresponding SIO.

Microcode and IOS Interface

As I/O devices have become faster and more sophisticated, microcode has come into widespread use as a communication interface between system programming and I/O devices. The major impact from a microcode failure is the inability of IOS to communicate with the device. For the purpose of this discussion, we will limit our discussion to the 3340 microcode and corresponding disk IOS (\$@DE33).

When device errors occur, IOS can retry the operation and assuming successful completion, continue on. When an adapter check occurs, IOS can force a reload of the microcode (soft-IPL) and continue on. If the error persists after three retries, IOS will cause a branch to a X'00' OP Code and force a process check. This will result in a red light indication and the interrupt Level 7 light on the console.

Disk IOS contains an area called the 3340 IOS queue that can provide important information to the hardware CE on both device and adapter problems. A PSR will be needed to locate the appropriate queue and extract the information from the memory dump. Figure 2 shows a physical layout of the 3340 IOS queue with appropriate description of content. Sense information, which should be of prime concern to the hardware CE is located at displacements A,B,C,D and 36.

Sense bytes 0 and 1 are updated on every instruction to the device. Sense bytes 2 and 3 are only updated on an adapter check. The 24 bytes of sense information at displacement 24 are updated by a diagnostic sense instruction which is performed for all temporary and permanent errors.

The information contained in the IOS queue can be used with halts and messages as well as process checks. Figure 3 contains a list of halts and messages issued by 3340 IOS. A brief description of each halt is given as well as the most probable cause (hardware (H) and software (S)).

3340 Disk IOS Queues

There is one 78-byte queue for each 3340 disk drive on the system. A pointer in SYSCOM points to the first queue. The queues are chained together.

Displ	Label	Lng in bytes	Description
0	DIODO2	0	Start of 3340 queues
0	QX1	78	Queue for D1
4E	QX2	78	Queue for D2
9C	QX3	78	Queue for D3
EA	QX4	78	Queue for D4

*****Format of each 78-byte queue*****

0	QFIRST	2	Address of first element in IOQE table for this drive
2	QLAST	2	Address of last element in IOQE table for this drive
4		4	reserved
8	QCHR	2	Last cylinder head accessed for seek operation
A	QSNS2	1	Sense byte 2
B	QSNS3	1	Sense byte 3
C	QSMS0	1	Sense byte 0
D	QSNS1	1	Sense byte 1
E	NXTQUE	2	Address of next 3340 IOS queue
10	LASTSK	1	Logical cylinder number of last seek
11	PHYSCS	2	Physical C/H
13	SAVEOP	2	SAVE AREA FOR Q/R during verify
15	QSTATS	1	Status of drive
16	INT45	2	Interrupt status
18	ADHA	2	Address of home address save area (HAFLD1)
1A	ADRO	2	Address of record 0 save area (ROFLD1)
26	HAFLD	5	Home address save area
28	ROFLD	9	Record 0 save area
34	DFCA45	2	Address of record 0 count field (COUNTx)
36	DGSNS	24	Diagnostic sense save area (DGSNSx)

FIGURE 2

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Disk Errors

<u>Stic-Lite</u>	<u>Error Description</u>	<u>Responsibility*</u>
HE	Permanent Disk Error	(H,S)
Blank 0	Attempt to IPL from a non-system pack; D1 is in read only mode; adapter check on 3340 attempting to run CEFS	U
Blank 1	Permanent disk error; an attempt to load a system program that is not on the IPL pack	H,S

Message

0A--	Wrong data module size	U
	Write inhibited	U
	Intervention (not ready)	U
0C--	Equipment check	H
	Permanent Error during error logging	U
	(Not properly initialized)	U
	(Hardware failure)	H
0F	Seek Check	H
0H	Command reject	S,H
0J	Invalid track format	H,S
0L	Data check	(H,S)
0N	No record found/end of pack	S,H
0U	Data overrun/command overrun	H

Responsibility*

*H = Hardware

S = Software

U = User

Where H and S appear together, the code specified first is most probable.
When they appear in parenthesis, neither takes precedence.

FIGURE 3

HOW IS THE CCP RELATED TO DISK SYSTEM MANAGEMENT

The communications control program operates under control of disk system management. Your telecommunications application programs are under control of the communications control program (Figure 2). Your programs issue requests for services. The requests are received by the communications control program. Some of these services are performed by the CCP itself, such as communications I/O. Other service requests are passed on by the CCP to disk system management.

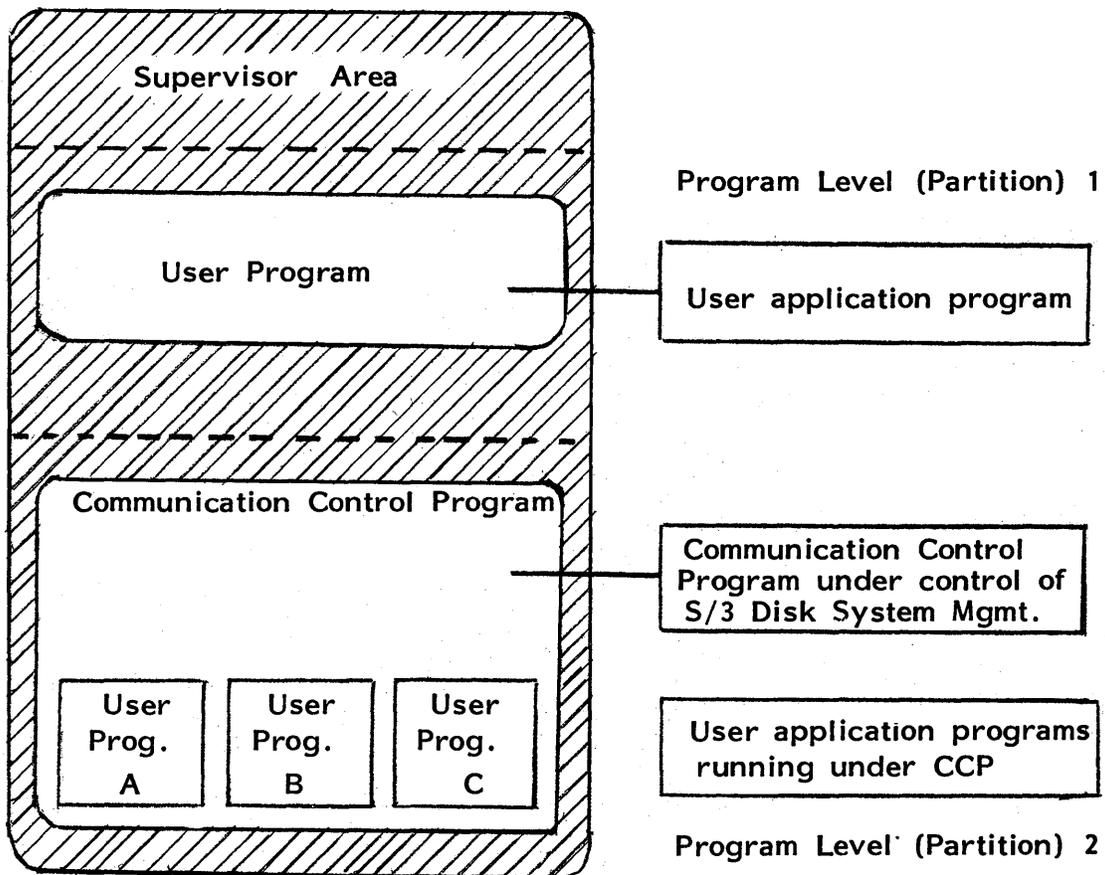


Figure 2. Communications Control Program (CCP)
The maximum partition size in a Model 15 system that does not use CCP is 48K. The CCP partition can be greater than 48K, but any program in the CCP partition is limited to 32K bytes.

OCL - OPERATION CONTROL LANGUAGE

OCL is primarily used to load and execute programs. It may also be used to control system resources and initialize the system; such as a "reader" statement in changing the sysin device or a "date" statement to set the system date. The applicable model System/3 OCL reference manual contains an explanation of each OCL statement and its placement in the OCL stream. The reference manual also explains how to use all of the system services programs (\$MAINT, \$COPY, \$INIT, etc.) and the functions they perform and gives examples of the OCL and control statements necessary to perform their various functions. Additionally, the customer should be thoroughly familiar with the use of OCL.

System services programs that might be used to gather APAR or problem determination information:

- \$MAINT - Copy the user's program to cards - any function involving the use of libraries.
- \$COPY - Copy data files to card or diskette.
- \$LABEL - Take a VTOC to determine where files are located on a pack.

SYSGEN

System generation builds a supervisor and provides the supporting data management modules and program products for a specific customer environment.

The system generation reference manuals for the respective system types explain all of the parameters and procedures used to perform a sysgen.

Additionally, if your customer will be a CCP user, the CCP Systems Reference Manual for the appropriate system type, in the chapter entitled "Generation Stage" lists some prerequisites and assumptions for doing a CCP generation that will have to be considered during SCP generation. Generally, these are the considerations:

- System must have the Overlay Linkage Editor - all systems.
- System must have the Macro Processor - all except Mod 4
- System must have MLMP or MLTA program support - all except Mod 4
- Must know number of user tasks to run under CCP - Mod 15
- \$DBSC (Mod 15 - Line B prompt) generation statement
- \$DMLP (Mod 15 - MLMPS prompt) generation statement
- TIMER prompt if interval polling will be supported by CCP - Mod 15

Before you begin a sysgen, have the customer back-up his system. Find out if the customer has other than a standard chain on his line printer. If so, you will have to submit an image statement as the initial step of the generation process. The procedure for doing this can be found in the applicable system operators guide.

It is the customer's responsibility to know what options he wants at sysgen time. If you find yourself in a bind, ask the customer for the listing of his last sysgen and use it as a guideline. Also, ask him if any of the options should change from his previous sysgen. The CPU usage meter should be in CE mode when doing an SCP generation; however, for the installation of program products it should not be.

SERVICE AID PROGRAMS AND THEIR USES

The purpose for and how to use these service aid programs can be found in the applicable handbook. The text that follows is a general guideline. (Warning - Whenever working with customer data, it is advisable to have it backed-up!)

- CEFE - Used by all systems for core and disk dumps. Additionally, for Model 10 or Model 12 can be used for tape and 5445/3340 main data area dumps. MUST IPL after use.
- \$DUMP - (Disk and Tape Dump Program) - Used by Models 12 and 15 for disk and tape dumps. Loads as a user task.
- \$BUILD - (Alternate Track Rebuild Program) - This is a customer program. The procedures for using it can be found in the applicable OCL manual. By substituting the word "Patch" for the word "Rebuild", data can be replaced on disk (including cylinder 0).
- \$\$DISK - (Disk Rebuild Program) - Used by Models 12 and 15 to verify and replace any disk data. Loads as a user task.
- \$TRACE - (Interrupt Trace Program) - Used to trace any and all interrupts on the Model 15. Trace table can be written to disk. Will record SIO and OPEND interrupts for I/O devices.
- BSCA Trace - Records BSCA I/O operations on all system types. Shows the SIO Q and R bytes, sense bytes, and the bytes addressed by CAR, TAR and SAR. (BSCAR = Bi-sync Current Address Register, BSTAR = Bi-sync Transition Address Register, BSSAR = Bi-sync Stop Address Register).
- \$\$FTRC - (RIB/IOB Trace) - Records branches to the supervisor for I/O functions and prints the contents of the IOB.

APAR-AUTHORIZED PROGRAM ANALYSIS REPORT

This is the document used to notify the Central Programming Service Group that a possible defect has been diagnosed in an IBM program or a component that is the responsibility of the group. It is generally completed by the PSCE but can be prepared by the SE or the customer.

Problem Resolution Via The APAR

1. PSR verifies unreported defect in IBM programming; fills out APAR and contacts Field Support to get a pre-screening number; mails APAR and supporting documentation to development group location.
2. APAR coordinator logs in APAR; sends to responsible development group; advises submitter that APAR has been received; enters APAR into RETAIN 370. (APAR has an 'active' status)
3. Developer answers APAR and sends resolution to APAR coordinator.
4. APAR coordinator advises submitter of resolution and enters resolution on R370. (APAR has 'closed' status)
5. SPR creates a PIN from APAR text and developer's conclusion, advising the field of the problem via R370; requests a PTF, if necessary, and advises the field of the request.
6. Developer builds the PTF.
7. PTF coordinator sends the PTF to the submitter and to PID for distribution to the field.
8. SPR announces the availability of the PTF to the field via R370; enters 'patch' type PTF text on R370.

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INSTRUCTIONS

- A. The APAR form must be used to report program problems found in IBM programs having service classification "A" or "B".

Note: Customers may ignore all instructions in italics.

1. Before submitting as APAR, the maintenance information documents should be consulted. These include PSM's Early Warning System, RETAIN, SECOM, and the material released with the program from PID.
 2. Field Engineering Area Support must be consulted, subject to locally accepted procedures, prior to the actual submission of an APAR for problems associated with programs having service classification "A".
 3. Each problem identified must be reported on a separate APAR form.
 4. Send APAR and the supporting documentation to the location responsible for that program as given in PS General Information Booklet Form G229-2228.
 5. For programs having Service Classification "B" consult the documentation associated with the program to find the address of the responsible APAR Processing Center.
 6. Keep them together by affixing the envelope containing the APAR to the package containing the supporting documentation.
 7. When the APAR is received by the responsible location, it will be numbered and an acknowledgement returned indicating the assigned APAR number. Any additional information or correspondence on the APAR should reference the number.
- B. The following FE and DP documents contain GENERAL APAR INFORMATION:

1. Branch Office Manual
2. Sales Manual
3. Programming Systems Memoranda

The PSM General No. 4 must be consulted for information necessary to submit an APAR on programs with service classification of "A".

If necessary, contact your local marketing representative for information necessary to submit an APAR on programs having service classification "B".

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INSTRUCTIONS

C. Severity Code

APAR's for programs having service classification "B" will not include the severity code section.

The severity assigned to the APAR must reflect the impact of the problem against the total programming system or installation. See PSM General No. 4 for definition of severity codes. Class "A" program severity code one APAR's should not be submitted without prior contact through FE Area and FE Technical Operations.

D. All the following sections of the form should be completed before the APAR will be processed:

1. Customer Name - A
2. Customer Number - B
3. Date - J
4. Operating Environment - L
5. Program ID and Change Level - N
6. Abstract - T
7. Symptom - R
8. Failure Keyword - S
9. FE Area and Branch Office - E
10. Severity Codes - K

E. All problems associated with SCP's or programs with service classification "A" must be described and submitted in a manner which allows testing and repair to be made on an unmodified IBM program.

F. Care should be taken by the APAR submitter to insure that the customer is aware of the support material being submitted. Use of data or programs which contain sensitive customer information should be avoided by substituting sample data which produces the same error symptoms.

G. APAR's are not to be used for comments, suggestions, or improvements. The Product and Support Requirements Request, form ZZ29-1702, should be used and submitted through DPD Systems Engineering or Marketing.

PREASSIGNED APAR SERIAL NO. 78716

(A) CUSTOMER NAME: ABC Company
 (B) CUSTOMER NO.: 1 2 3 4 5 - 0 0
 (J) APAR SUBMITTED: MO. 4 DAY 15 YR. 77
 APAR IDENTITY: _____
 (K) SEVERITY CODE: 1 2 3 4
 ASSIGNED BY APAR CONTRC: _____

(C) CUSTOMER MAILING ADDRESS: 1234 Freemont Road
 Anywhere, Ohio 12345
 (L) OPERATING ENVIRONMENT: CCP
 (M) CPU: 5415 STORAGE SIZE: G SYS. RES.: F1 SYS. IN: 5424 SYS. OUT: 1403

IBM REPRESENTATIVE--NAME AND ADDRESS
 (D) NAME: Joe Doe EMPLOYEE SERIAL: 654321
 (N) Comp't ID Number: 5 7 0 4 - S C I C P 0 5 0 0 5 0
 MAILING ADDRESS: 9876 Springfield Road
 Anywhere, Ohio 12345

(E) FE AREA: 2 4 BRANCH OFF. NO.: 1 0 9 WORLD TRADE COUNTRY NO.: _____ NAME: _____
 (G) ITPS CODE: COLS IBM-BRANCH OFF. PHONE: 614-225-7354, 8-657-7354
 (P) MATERIAL SUBMITTED WITH APAR:
 X STORAGE DUMP CONTROL CARDS/JCL
 STORAGE MAP CONSOLE LOG X
 TAPE DUMP CONSOLE CONDITIONS
 DASD DUMP/Q SYSTEM LOG
 SOURCE DECK/TAPE SYSTEM OUTPUT
 OBJECT DECK/TAPE TEST DATA
 PROGRAM LISTING DIAGNOSTIC OUTPUT
 OTHER: Assignment Set History PTF LIST X
 Trace-CCP, BSCA USERS ROUTINE
 TP CONF. LIST

(R) SYMPTOM: M S / M S G FAILURE KEYWORD: 4 1 1 - 0 8 (U) RE-IPL REQ. _____ REGRESSION X
 (Y) PRE-SCREENING: 1030229

(T) ABSTRACT: E X E C C P M S G 4 1 1 - 0 8 U S I N G S Y M B O L I C
 C N A M E T O S E N D T E R M I N A L M S G

(V) Error description text--Note variations between expected and actual output--differences from previous successful runs--suspected problem area--verify EC level as adequate for program (PSM)--special configuration, teleprocessing, I/O switching, multi-systems, etc. Identify any bypass, circumvention, or relief given.

Sending Msg to terminal using symbolic name

Example: M0DAT01, sign on control, causes error msg "CCP U-I 411
 output error-08 on '00'"

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DISTRIBUTION: 1,2APAR PROCESSING
 4..... ORIGINATOR
 3APAR PROCESSING/OR AS DIRECTED IN PSM GEN=4
 PAGE _____ OF _____

(W) Submitters Name (print) and Signature
 Don Douglas Thompson

ORIGINATOR IS
 FE DP CUST OTHER
 GSD

PTF APPLICATION

1. The "module replacement" PTF uses the Library Maintenance Program (\$MAINT) to replace complete modules in the Object (O) and Routine (R) Libraries. Object library module PTFs will not necessitate a new sysgen, link, or recompilation of user programs. Routine library module PTFs will.
2. The "Patch" PTF uses the PTF programs \$SGPTF, \$SGPVR, \$SGPTR to alter or "patch" hexadecimal code within a module. \$SGPTF patches Object library modules and is the most commonly used. \$SGPVR and \$SGPTR patch link-edited subroutines and routines from the Routine Library, respectively. \$SGPTR patches will necessitate sysgens, or links, or recompilations.
3. The "modify" PTF uses \$MAINT to modify source library macros for CCP. These PTFs will require a new CCP sysgen or link-edit. A "modify" PTF must not be applied twice. Special instructions on the PTF cover letter, the RETAIN 370 pin that announces the PTF and the RETAIN 370 PTF cross reference list will advise of the necessity of sysgens, re-links, or recompilations.

Generally, to apply PTFs:

1. Mount the PID pack on R1.
2. Remove the PID header card from the PTF. If present, this will be the first card on the deck and will have "PID1HDR" in the first seven columns.
3. Having IPL'd from F1, load the PTF deck into the reader and make the reader ready.
4. Start the system and the PTF will be applied.
5. These procedures will have to be modified for cardless systems.

In addition to the above formal PTF programs, \$SGFIX may be used to patch O-library modules, including user programs, until a formal PTF is available. It may also be used to apply diagnostic traps for problem determination.

Determining What PTFs are Applied to a System

Cyl 0, Sector 47 (decimal) of a 5444 or 3340 simulation area is the PTF logging sector.

For models 12 and 15, \$SGLOG, the PTF Logging Program can be run. It will list the names of all modules that have a PTF applied and the log number of the PTF.

For the other System/3 Models, CEFE can be used to dump the PTF logging sector. Instructions for using CEFE and \$SGLOG are in the appropriate handbooks.

```
// Load $SGLOG, R1
// Run
// PTFLIST UNIT-R1
// PTFLIST UNIT-F1
// END
```

This procedure may be used on the Models 12 and 15 to determine what PTFs are on the disk pack on R1 or F1. Only one "// PTFLIST" statement need be supplied. More can be supplied.

To use CEFE to dump the PTF logging sectors for Models 4, 6, 8 and 10:

1. Make sure the system is at EJ. Verify this with the customer.
2. Press console stop.
3. Set the address/data switches to CEFE
4. Press System Reset; Press start; 50 will be displayed in the console stick lights.
5. Set rightmost address/data switch to 2; press start; a halt code of 55 will be displayed in the stick lights.
6. Set the address data switches to 00DC for R1, 00DD for F1; press start; a halt code of E5 is displayed.
7. Set the address/data switches to the same value as in step 6 and press start. The PTF logging sector will be printed.
8. The switches may be set to 00DE and 00DF to dump the PTF logging sector for R2 and F2, respectively.
9. The system will have to be IPL'd before the customer can use it again.

Additionally, to determine what PTFs have been applied to source macros used for CCP, the following procedure may be used to print macro \$E000 from the CCP PID pack.

```
// Load $MAINT, F1
```

```
// Run
```

```
// Copy From-xx,To-Print,Library-S,RETAIN-P,Name-$E000
```

```
// End
```

(where xx is the drive that contains the CCP PID Pack R1, F1, R2, F2.)

Near the bottom of the listing of macro \$E000 will be a list of all the CCP source module PTFs.

Device Counter Logout Program

The primary purpose of the Device Counter Logout program is to report information about errors that were recorded during execution of a binary synchronous communications (BSC) program that contained the programming support to update these counters. You should run the Device Counter Logout program immediately after every such BSC program.

The Device Counter Logout program prints the counters for adapter 1 (and adapter 2 if available on the system). The contents of the terminal statistics table, MLTERFIL, which is a permanent file on F1 and contains counters for multipoint control stations only, is printed following the counters. If MLTERFIL does not contain any entries for an adapter, the following message is printed in place of the contents of MLTERFIL:

TERMINAL STATISTICS TABLE (MLTERFIL) EMPTY

If MLTERFIL does not exist, the following message is printed:

TERMINAL STATISTICS TABLE (MLTERFIL) NOT FOUND

Adapter 2 information is printed on a separate page.

The contents of the counters will be displayed on the device assigned as the system LOG.

Operating Procedure

1. Place the following OCL cards in the card reader:

```
// LOG      { 1403  
             { 3284  
             { CONSOLE
```

```
// LOAD $BSDL, F1 (Use R1 if your system pack is mounted there.)
```

```
// RUN
```

2. Start the card reader.
3. Ready the system LOG device.
4. Start the partition. The device counters will be printed in the following format:

IBM INTERNAL USE ONLY

BSCA LOG mm/dd/yy

ADAPTER 1

```

*****
COUNTER DESCRIPTION      TOTAL  LAST JOB
*****

```

```

TEXT BLOCKS SENT          nnnn   nnnn
TEXT BLOCKS RECEIVED     nnnn   nnnn
NAKS RECEIVED            nnnn   nnnn
DATA CHECKS              nnnn   nnnn
FORWARD ABORTS          nnnn   nnnn
ABORTS                   nnnn   nnnn
ADAPTER CHECKS ON TRANSMIT nnnn   nnnn
ADAPTER CHECKS ON RECEIVE nnnn   nnnn
INVALID REPLIES         nnnn   nnnn
ENQS RECEIVED           nnnn   nnnn
LOST DATA COUNT        nnnn   nnnn
DISCONNECT TIMEOUTS     nnnn   nnnn
TIMEOUTS DURING RECEIVE DATA nnnn   nnnn

```

```

*****
TERMINAL ADDRESS      UNSUCCESSFUL I/O OPERATIONS  SUCCESSFUL I/O OPERATIONS
*****

```

```

Address 1          nnnn   nnnn
Address 2          nnnn   nnnn
Address 3          nnnn   nnnn
Address 4          nnnn   nnnn
Address 5          nnnn   nnnn
Address 6          nnnn   nnnn
Address 7          nnnn   nnnn
Address 8          nnnn   nnnn
Address 9          nnnn   nnnn
Address 10         nnnn   nnnn

```

ADAPTER 2

```

*****
COUNTER DESCRIPTION      TOTAL  LAST JOB
*****

```

```

TEXT BLOCKS SENT          nnnn   nnnn
TEXT BLOCKS RECEIVED     nnnn   nnnn
NAKS RECEIVED            nnnn   nnnn
DATA CHECKS              nnnn   nnnn
FORWARD ABORTS          nnnn   nnnn
ABORTS                   nnnn   nnnn
ADAPTER CHECKS ON TRANSMIT nnnn   nnnn
ADAPTER CHECKS ON RECEIVE nnnn   nnnn
INVALID REPLIES         nnnn   nnnn
ENQS RECEIVED           nnnn   nnnn
LOST DATA COUNT        nnnn   nnnn
DISCONNECT TIMEOUTS     nnnn   nnnn
TIMEOUTS DURING RECEIVE DATA nnnn   nnnn

```

```

*****
TERMINAL ADDRESS      UNSUCCESSFUL I/O OPERATIONS  SUCCESSFUL I/O OPERATIONS
*****

```

```

Address 1          nnnn   nnnn

```

The entries have the following meaning:

BSCA LOG Heading to identify the printout.

mm/dd/yy Date stored in the system communication area.

ADAPTER Identifies adapter being used.

TEXT BLOCKS SENT Number of blocks of data transmitted successfully from this terminal to a remote terminal.

TEXT BLOCKS RECEIVED Number of blocks of data received successfully by this terminal from a remote terminal.

NAKS RECEIVED Number of negative responses received by this terminal in response to data transmitted by this terminal.

DATA CHECKS Number of text blocks received with invalid error check bits.

FORWARD ABORTS Number of times a remote terminal has terminated transmission abnormally while transmitting data.

ABORTS Number of times a remote terminal has terminated transmission abnormally while receiving data.

ADAPTER CHECKS ON TRANSMIT Number of times the following errors occurred while the terminal was transmitting data:
1. Parity check within the adapter.
2. Cycle steal overrun.
3. Local store register or control register check.

ADAPTER CHECKS ON RECEIVE Number of times the following errors occurred while the terminal was receiving data:
1. Parity check within the adapter.
2. Cycle steal overrun.
3. Local store register or control register check.

INVALID REPLIES Number of abnormal responses (including no responses) from the remote terminal.

ENQ'S RECEIVED Number of requests for retransmission of this terminal's last acknowledgement after the acknowledgement has already been sent.

LOST DATA COUNT Number of text blocks received which do not fit into the receive area.

DISCONNECT TIMEOUTS Number of times the data set has dropped ready status after that status was set on.

TIMEOUTS DURING RECEIVE DATA Number of times this terminal expected to receive text but did not receive anything for 3.25 seconds.

GLOSSARY

Abend

Abnormal termination of a task - may or may not be associated with an error message.

Alteration

An alteration is any change to the logic (code) of an IBM Program - Class A, B or C Program Product or System Control Programming. An alteration may be as small as one bit or as large as a module or more.

APAR

The standard document used to notify the Central Programming Group that a possible defect has been diagnosed in a program with Central Programming Service.

Assembler

A program to convert a single mnemonic instruction into a single machine instruction. The mnemonic language is a programmer's "short-hand" that allows human memory association with the actual machine operation.

Background Job

A job that is processed in a partition or region other than the one associated with the input/output unit that was used to define this job.

Back Level

See 'Current Level'.

Basic Record

An entry on R/370 for a System/3 programming system that contains documentation order numbers, pointers to the PTF cross reference lists PINS, program service numbers, pointers to service aids, etc.

Batch Processing

The execution of a sequence of programs such that each is completed before the next program of the sequence is started.

BCD

Binary Coded Decimal. The six bit code (plus parity bit) used to represent data in most CPUs prior to System 360, as well as many I/O devices.

GLOSSARY

Beta Test

This has been replaced by Development and System Test. These tests are done to ensure that the program meets the committed specifications and that the customer can install and use it. Following the successful completion of System Test, the supporting documentation is published and all of the program material is sent to PID for distribution to customers.

Bypass

Used interchangeably with Circumvention.

Byte

One logical unit of information as used internally in System/360. It consists of eight bits, each carrying a weight of 0 or 1, and has a possibility of 256 combinations that represent various numbers, characters, and special symbols when translated by the EBCDIC Table. The eight bits may also be used in pure binary form for numeric data or in a packed decimal form that permits efficient use of core storage and other storage media.

CCP (Communications Control Program)

CCP is a feature of System/3 DSM (Disk System Management) that operates in conjunction with MLMP and/or MLTA IOCS to control a communications based operating system.

Central Programming Services

Refers to the various SDD, GSD or DP Support groups that have the responsibility for providing answers to APARs and supplying corrections as required.

Checkpoint

A predetermined point within a job step at which the system records on external storage all information necessary to restart from that point.

Circumvention

The process of getting a customer around a programming systems problem by varying the input. This normally consists of a change in the source or control statements involved with the problem program, eg; a variation in the type or order of the input statements to a compiler, a change to a job control card, a change to a Sort/Merge control statement, etc.

GLOSSARY

COBOL

Common Business Oriented Language - A compiler based on the English language. The structure of the language has been described and specified by a committee consisting of representatives of the users and manufacturers of Data Processing Systems. The advantages of COBOL are that it is easy to learn and to write, and that COBOL programs are self-documenting in that the compiler listing is easily read and the logic of the program is easy to comprehend. COBOL compilers are available for most general purpose computers in use today.

Compiler

A program that converts a programmer's directive and descriptive statements into machine language instructions. The statements may be English format (COBOL) or mathematic notation with descriptive words and symbols (FORTRAN). The compiler takes the meaning of a statement, associating this meaning with the I/O devices and data as also described within the program, and generates the necessary instructions to be executed by a system to accomplish the programmer's intention.

Component

Used to indicate a program that is a complete, uniquely functioning part of a programming system. An example would be any compiler, Sort/Merge, etc. program that is supported by an operating system. Components are generally dependent upon a particular programming system for access and I/O support and are not universal. For instance, System/3 Model 15 RPG II will not execute in a Model 10 environment.

CPU

Central Processing Unit - Refers, in common usage, to that unit generally called a "Computer". It can be in one "box" in a small system or it may be made up of a number of "boxes" in a large system. Regardless of how it is packaged, it consists of Main Storage (Core, in most systems), Auxiliary Storage (Core and various other devices), and Arithmetic and Logical Unit, Input/Output Interface (or channels), a unit to sequence and control the internal operations, and a provision for external operator control of the entire system. The CPU does not (except in the smallest systems) contain the necessary control units to operate the variety of I/O device types that may be attached.

GLOSSARY

Current Level

A program release is called the current level from the announced day of availability until a specific number of days after the availability of the next release. The overlap provides a buffer period for the user to update at his convenience. The overlap period is generally three months (System/32-System/7); but there are exceptions (System/3 - four months). Back level (CSP) or non-current level (SCP) refers to any release after its overlap period has expired. The terms 'level', 'release', 'version', are used somewhat interchangeably, in the context of Current, Non-current or Back Level/Release/Version, in various IBM literature. (See note at end of Section I, IBM Programming, Service Class "C".)

Data Servicer

Any IBM system user who provides data processing services on a fee basis (whether such services are the primary, or merely an adjunctive function of the organization).

Defect

A defect in an IBM program is any deviation from the published specifications for the program. It can be a source code error, an error in the documentation, a logical error or failure to follow interfaces and conventions regarding use by or with other programs.

Dial-up

A term that refers to the use of a dial or push-button telephone to initiate a station-to-station connection with a computer from a terminal.

DSM (Disk Systems Management)

Those control programs and routines that supervise the operations of an IBM System/3. DSM is sometimes used interchangeably with SCP (System Control Program).

EWS

Early Warning System - The portion of the RETAIN Data File reformatted and printed on microfiche and available for general distribution. See PSM General #6.

FE Service Number

Used on the IR or PSAR to identify the program worked on. It is a seven digit non-alpha (to satisfy optical scanning requirements) number consisting of a three digit base and a four digit component. A cross-reference between FE Service Number and PID Program IDs is included in Programming Systems General Information Handbook, Form No. ZZ25-0511.

GLOSSARY

Foreground Job

A job that is processed in a partition or region associated with the input/output unit from which the job was defined, thus preventing the input/output unit from being used to define another job until processing of the current job has been completed.

FORTRAN

A compiler based on mathematical notation. The language was originally conceived and developed by an IBM employee. It has achieved universal acceptance among mathematical and scientific users of IBM Data Processing Systems. The programmer learns a "shorthand" notation for mathematical expressions and symbolic terms for control of the system devices that permit complex arithmetic problems to be written and solved quickly and easily.

Hardware

The Processing System, including all of the local or remote attachments and all of the necessary interconnections.

IOB (Input/Output Block)

The interface between the I/O device and System/3 control programming. Shows current I/O operation and points to data buffer.

Instruction

The single step direction to the hardware, stored temporarily in the CPU memory, that causes it to perform an explicit function. Instructions cause data manipulation, arithmetic functions, logical alteration, input/output operation, CPU mode changes (for instance, 360 to 1401 compatibility), and various special hardware functions.

Interim Support

A program normally written by DP to do a function, or support hardware, prior to and while waiting for the formal programming package to do that job.

IVP

Installation Verification Program.

Job

A unit of work for the system from the standpoint of installation accounting and control. A job consists of one or more job steps.

GLOSSARY

Leased Line

A permanent communication connection between a terminal and the terminal control unit. No dialing is required to establish the connection.

Local Fix

A locally developed change to the logic of a program in an attempt to cause it to perform in accordance to the design specifications of the program. Local fixes to program defects are considered emergency temporary corrections made by IBM support personnel. They are not considered alterations and are supported by IBM until a formal PTF or support release is available from IBM.

A local fix should be attempted only after a Severity Code 1 APAR is submitted and it has been determined that a circumvention is not feasible.

Localize

The goal of the diagnostic activity performed during "Problem Determination" that enables the CE or PS Rep to make an educated guess as to what hardware units or programs are failing.

LSU

Language Sorts and Utilities - Another term for Program Products.

Macro

An assembler language function that vastly increases the power and utility of the assembler. It provides the insertion of repetitious groups of instructions with the ability to modify the groups depending on Macro Internal instructions that are controlled by parameters specified by the programmer when he writes the Macro operation code into his source program.

GLOSSARY

Module

Term describing a group of programmed instructions that are accessed and executed as an entity to perform some function within the overall scope of the total program. A program may consist of one or many modules, depending upon size and flexibility of the main program. The modular structure permits many programmers to write the actual coding of a program, only requiring that each programmer observe a "common interface", or rules, that describe how the main program will pass data to and from modules and how the main program will "call" or access the module to be executed and how the module will indicate that it is finished, passing control back to the main program. The modules are stored in executable form for ready access by the CPU, generally in a DASD (Direct Access Storage Device) with low access time such as a Type 2311 or 2314.

Non-Defect

Term used to describe those situations of Program Support that are caused by something other than a defect in a program that has Central Programming Services. A non-defect problem is usually an operator error, user error, a hardware failure, an alteration, etc.

Non-Disclosure Agreement

An agreement signed by a customer prior to disclosure by IBM of any information that is of an IBM Confidential nature. The agreement states that the customer will hold in trust any IBM Confidential information until such time as that information becomes public knowledge.

Operator Error

An error made at the system operation level, for instance, incorrect manual entry of data via the control console or incorrect response to a system message. The majority of 'Operator Error' conditions are caught by the inherent self-checking in job-to-job transition and control programs.

Partition

In systems with Multiprogramming, an area of main storage set aside for a job.

PIN (Program Information Network)

An entry on RETAIN that describes a problem and/or resolution to a System/3 programming problem.

GLOSSARY

Pinpoint

The detailed diagnosis and instruction by instruction analysis of a failing program that leads to the isolation of a new defect, determination of user error, or the recognition of a known defect.

PLM

Program Logic Manual - The flowcharts and narrative explaining the logic of a program, usually broken down to a description of the entire component, a description of the modules that make up the component, and then the details of the modules. The PLM is part of the System Reference Library but is usually not given to the customer, being primarily a reference for support and troubleshooting activities as performed by PS Reps.

PSHRPQ

See RPQ.

PSRR

Products and Support Requirements Request (Form #120-1702).

PTF (Program Temporary Fix)

A temporary correction, provided by the Central Support Group, for a program defect. A PTF is normally provided in response to a Severity One or Two APAR.

Publications Release Letters (PRL)

This letter distributed weekly to Branch Offices announces any new publications available at the stationery stores. This includes PLMs, SRLs and TNLs.

Reconfiguration

The ability to alter the hardware or software configuration of a system. This term could apply to either dynamic or static alteration.

Remote Debug

The ability to diagnose a problem and effect a fix or bypass without being physically on-site. Primarily in dynamic state.

GLOSSARY

Remote Terminal

A terminal which is connected to the computing system via communication lines.

RETAIN (Remote Technical and Information Network)

IBMs communication network for disseminating information, including System/3 PINs containing APAR information, PTF cross reference lists and basic records. Also, RETAIN/370, R/370.

RPG

Report Program Generator - Originally conceived and developed by IBM as a means of providing easy transition for the Unit Record Equipment user to perform his work on small IBM Data Processing Systems, using techniques and terminology that were familiar. The RPG as we know it today, has grown far beyond the early "Unit Record Compatibility" concept and is an easy-to-learn and use compiler. It is effective for jobs that must be programmed and executed almost as soon as the need for the resulting output data is realized.

RPQ

A customer request for price quotation on alterations or additions to the functional capabilities of a machine. The RPQ may be used in conjunction with a Programming RPQ (PRPQ) or a Programming Support for Hardware RPQ (PSHRPQ) to solve unique data processing problems.

Severity Code

A number 1 through 4 recorded on SCP or Service Classification "A" APARs. The number is the PS Rep's assessment of the impact the program defect has on the customer. Severity Code 1 represents the highest amount of impact and 4 the lowest.

IBM INTERNAL USE ONLY

GLOSSARY

SRL

System Reference Library - The user manuals and guides, published by DP, kept as system reference by customers, are collectively known as SRLs. The library covers Installation Planning Manuals, Programmer's Guides, I/O Component Description, Program Specifications, Operator's Guides, etc.

Standalone System

A system that is not interconnected (through TP, channel, etc.) to another system.

SYSGEN

System Generation - The term used to describe the activity required of the customer to convert a total Programming System, as received from IBM, into a tailored system that consists only of the components that are to be used by the customer on his particular hardware configuration. The basic steps involve copying the original system for backup, assembling a supervisor that supports the hardware configuration and contains various user options, the selective copying of components to be used into the proper libraries and the inclusion of user programs in the libraries.

Tailored

When speaking of 'SYSGEN', 'Configuration' and 'Reconfiguration', we refer to a control program 'Tailored' to the hardware system. A 'Tailored' control program (supervisor) is one that has been 'configured' (generated, assembled, etc.) to provide the facilities to support the I/O attached and system usage mode required by the customer, no more or less. This is usually done at 'SYSGEN', assuming that the proper Programming System was selected to satisfy all of the user requirements. The 'Tailoring' of a software system may also include the addition of user programs and alterations to meet unusual conditions.

Terminal

Any device or collection of components that is capable of sending and/or receiving information over a communication channel.

GLOSSARY

TNL

Technical News Letters - The update information provided for SRLs, consisting of replacement pages. TNLs usually provide minor revisions or corrections that do not justify a reprinting of the entire SRL.

User

Broad term referring to the person/persons charged with the practical application of the capabilities of a Data Processing System. It usually refers to the system programmer and is often substituted for "customer". The term is only useful when used in context referring to a situation that leaves no doubt as to who is being called the "User".

User Error

When properly used, this term covers errors made above the operations level. The programmer is generally the "User" in the context of "User Error" since he has the responsibility for implementation and is the user, literally, of the capabilities of the system. "User Error" tends to be improperly applied to situations where the term "Operator Error" would be more appropriate.

HALT/SUBHALT LOG OPTIONS REASON AND RECOVERY



GG'4EX 3

System generation errors.

Reason: End-of-extent was reached while building output file on F1.

Recovery 3: Immediate cancel.

1. Examine the last logged FILE statement and prepare a new FILE statement increasing the space requirements. You will use this statement in step 7.
2. Press MFCU STOP.
3. Remove cards in the primary hopper.
4. Press NPRO. One card is fed into stacker 1.
5. Remove cards from stacker 1.
6. Remove all cards preceding the // CALL \$SGEN, R1 card.
7. Place the FILE statement prepared in step 1 immediately after the // CALL \$SGEN,R1 card.
8. Place the // CALL \$SGEN,R1 card and cards that follow it in front of the cards removed from the primary hopper.
9. Place these cards back into the primary hopper.
10. Press MFCU START and continue with system generation from this point.

GG'4GT 3

Reason: A permanent disk I/O error has occurred while reading from F1.

Recovery 3: Immediate cancel.

1. Press MFCU STOP.
2. Raise cards in primary hopper and press NPRO. One card is fed into stacker 1.
3. Remove cards from stacker 1 and place them in front of the cards in the primary hopper of the MFCU.
4. Press MFCU START. This restarts system generation.

GG'4PT 3

Reason: A permanent disk I/O error occurred while writing on F1.

Recovery 3: Immediate cancel.

1. Press MFCU STOP.
2. Raise cards in primary hopper and press NPRO. One card is fed into stacker 1.
3. Remove cards from stacker 1. Remove cards preceding the // CALL \$SGEN,R1 statement and set them aside. Place the // CALL \$SGEN, R1 statement and the cards that follow it in the primary hopper of the MFCU.
4. Press MFCU START. Continue with system generation.

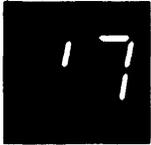
<u>HALT/SUBHALT</u>	<u>LOG</u>	<u>OPTIONS</u>	<u>REASON AND RECOVERY</u>
		03	<p>Reason: Inquiry program is ready to be executed.</p> <p>Recovery 0: Continue. The inquiry program is executed.</p> <p>3: Immediate cancel. The inquiry program is not executed.</p>
	GP'6NE	3	<p>Reason: A problem has been encountered that invalidates the system generation cartridge that contains the program products. Contact IBM for programming support.</p> <p>Recovery 3: Immediate cancel.</p>
	GF'7AD	3	<p>Field Engineering Maintenance program errors.</p> <p>Reason: First three characters of PTF ID are not the same as the first three characters on the PTF statement.</p> <p>Recovery 3: Immediate cancel.</p>
	GF'7B1	3	<p>Reason: An invalid unit was specified in the UNIT 1 field of the HEADER statement or the unit specified is not online.</p> <p>Recovery 3: Immediate cancel.</p>
	GF'7B2	3	<p>Reason: An invalid unit was specified in the UNIT 2 field of the HEADER statement or the unit specified is not online.</p> <p>Recovery 3: Immediate cancel.</p>
	GF'7BD	3	<p>Reason: Displacement for patch is greater than the total module length.</p> <p>Recovery 3: Immediate cancel.</p>
	GF'7CS	3	<p>Reason: Invalid program temporary fix deck. The cumulative check sum in the CKSUM field of the control statement does not match the calculated check sum.</p> <p>Recovery 3: Immediate cancel.</p>

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<u>HALT/SUBHALT</u>	<u>LOG</u>	<u>OPTIONS</u>	<u>REASON AND RECOVERY</u>
	GF'7DC	3	Reason: Invalid patch characters on the DATA statement for the Program Temporary Fix program. Valid characters are 0-9 and A-F. Recovery 3: Immediate cancel.
(continued)	GF'7DS	3	Reason: Format or punctuation error in the DATA statement for the Program Temporary Fix program. Recovery 3: Immediate cancel.
	GF'7ES	3	Reason: The last control statement was not an END statement. Recovery 3: Immediate cancel.
	GF'7HS	3	Reason: Format or punctuation error in the HEADER statement for the Program Temporary Fix program. Recovery 3: Immediate cancel.
	GF'7HN	3	Reason: HEADER statement not first statement of Program Temporary Fix statements. Recovery 3: Immediate cancel.
	GF'7ID	3	Reason: The module referred to by the PTF ID field on the HEADER statement can not be found on the unit specified by the UNIT 2 field. Recovery 3: Immediate cancel.
	GF'7LD	3	Reason: An invalid RLD byte was found in the module being patched. Recovery 3: Immediate cancel.
	GF'7LV	03	Reason: The level of the module to which the program temporary fix is to be applied is not the same level as specified in the level field of the PTF statement. Recovery 0: Continue. The program temporary fix is applied. 3: Immediate cancel.
	GF'7ME	3	Reason: Insufficient room in the module being patched for the additional RLD's required by the addition of the patch. Recovery 3: Immediate cancel.
	GF'7ND	3	Reason: No DATA statements followed the PTF statements. Recovery 3: Immediate cancel.
	GF'7NE	3	Reason: No END statement found at end of PTF. Recovery 3: Immediate cancel.

(continued on next page)

HALT/SUBHALT LOG OPTIONS REASON AND RECOVERY



GF'7NM

3

Reason: Module name on PTF statement was not found.

Recovery 3: Immediate cancel.

GF'7NP

3

Reason: No PTF statement was found following the HEADER statement.

Recovery 3: Immediate cancel.

(continued)

GF'7NS

3

Reason: Insufficient space on the unit specified by the UNIT 1 field of the HEADER statement. Six tracks are needed for temporary work space.

Recovery 3: Immediate cancel.

GF'7PS

3

Reason: Format or punctuation error in the PTF statement.

Recovery 3: Immediate cancel.

GF'7TM

3

Reason: Too many PTF statements after one HEADER statement. The maximum is 11.

Recovery 3: Immediate cancel.

GF'7WP

3

Reason: Pack applying PTF to is not an active program pack or an active system pack.

Recovery 3: Immediate cancel.

GF'7WS

3

Reason: The check byte of the module to which the program temporary fix is to be applied is not the same as the check byte field of the DATA statement.

Recovery 3: Immediate cancel.



3

Reason: Auto Report. Terminal errors have been found in the Auto Report source program.

Note: This halt will be bypassed if NOHALT was specified for program level 1.

Recovery 3: Immediate cancel.



Reason: An error has been detected by the MULTI-LEAVING Remote Job Entry Work Station (MRJE/WS) program. The subhalt or logged error code indicates the reason for the halt.

Note: If recovery option 2 indicates that a failing task is deactivated, the other tasks of the MRJE/WS remain active when option 2 is selected.

HALT/SUBHALT LOG OPTIONS REASON AND RECOVERY



EL67NL 03

Reason: Library does not exist on specified pack.
 Probable user error.

Reason: Error detected by system control program.
Recovery 0: The request is ignored and the module is punched.
3: Immediate cancel.

EO67NL 03

Reason: Error detected by Overlay Linkage Editor.
Recovery 0: The request is ignored and the module is punched.
3: Immediate cancel.

LM67NL 03

Reason: Error detected by Library Maintenance Program.
Recovery 0: Continue. The request is ignored and the next control statement is read.
3: Immediate cancel.



EL68DF 03

Reason: No room in library or directory.
 Probable user error.

Reason: System control program detected that no more directory space is available for the entry.
Recovery 0: The request is ignored and the module is punched.
3: Immediate cancel.

EL68LF 03

Reason: System control program detected that not enough space exists in the library to contain the new entry.
Recovery 0: The request is ignored and the module is punched.
3: Immediate cancel.

EO68DF 03

Reason: Overlay Linkage Editor detected that no more directory space is available for the entry.
Recovery 0: The request is ignored and the module is punched.
3: Immediate cancel.

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HALT/SUBHALT LOG OPTIONS REASON AND RECOVERY



(continued)

EO68LF 03 Reason: Overlay Linkage Editor detected that no more library space is available for the entry.

Recovery 0: The request is ignored and the module is punched.

3: Immediate cancel.

LM68DF 03 Reason: Library Maintenance Program detected that no more directory space is available for the entries being copied.

Recovery 0: Continue. Request is ignored. Next control statement is read.

3: Immediate cancel.

Note: If a module was being replaced, it might have been deleted, but the new module will not have been copied into the library.

LM68LF 03 Reason: No room exists in the library to copy the specified entry or entries, or there is not enough room to write the modified entry back into the library.

Recovery 0: Continue. Request is ignored. Next control statement is read.

3: Immediate cancel.

Note: If a module was being replaced, it might have been deleted, but the new module will not have been copied into the library.



3 Reason: Unrecoverable disk error while using a disk library.

Note: For the LM69HE log, when the logging device is on, the unit in error is displayed by the OX halt. The pack is referenced on the last library statement used. The pack is defective and the library used by the executing program must be recreated.

- If the error is on the TO pack, the TO pack is defective and the library must be recreated from the master. Run the alternate track assignment program to check for a defective track.
- If the error is on the FROM pack, run the alternate track assignment program to check for a defective track. If no alternate is assigned, rerun the program. If the alternate track assignment program indicates errors during transfer of data, recreate the library.
- If the error is on the WORK pack, consider that the WORK and TO packs are defective. Assign an alternate track to the WORK pack, if necessary, and rerun the program.

XX69HE Recovery 3: Immediate cancel.

Note: XX can be EL, EO, or LM.

HANDBOOKS

IBM System/3 Models 4, 6, 8, 10 and 12
System Data Areas and Diagnostic Aids SY21-0045

IBM System/3 Model 15
System Data Areas and Diagnostic Aids SY21-0032
(For Model 15D - SY21-0052)

IBM Field Engineering Programming System General
Information ZZ25-0511
(Contains information for preparing APARs, APAR mailing addresses,
component IDs and service numbers for System/3)

IBM INTERNAL USE ONLY

13-39

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IBM INTERNAL USE ONLY
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RETAIN/370

RETAIN/370 provides remote support to a variety of functions. The principal means of support is a data bank which contains information about software and hardware problems relating to IBM products, and associated activity concerning their resolution. Information is added to this data bank, from your feedback, continually so that it reflects the current status of problems and fixes.

As a Branch Office user of RETAIN/370, you will have available to you the following data bank facilities:

- BOIF = Branch Office Info - This file contains information concerning Branch Office addresses, phone numbers, region and time zone.
- CALC = Calculator - This file, as its name implies, enables the user to use RETAIN/370 as a desk calculator in either decimal or hexadecimal mode.
- DATE = Data/Time Facility - This file will take a month, day, and year entry and give the day of the week it falls on, a display of that entire month, and the time of the request. It is based on a perpetual calendar.
- TUTOR = Teaching Facility - This file will instruct the user in the basic functions of the terminal itself.
- DEFAULT=Default Update - This is a facility designed to allow you to create a chain of selections for use with the Search and/or PASS facility which will then be automatic when you use either of those facilities. Where you commonly use a particular selection, using default will save time and effort. (However, it is of little importance to the average user and can create inaccessability of information if used incorrectly. It really should not be utilized.)
- SRCH = Search Facility - This facility's primary function is to provide access to maintenance information stored in the Data Bank through the use of a sequence of words called parameters (search argument). These words can be almost any common maintenance terms, including numbers (5408, 1403, etc.). The facility will scan records for the parameters that you entered and display all records found on the screen, along with the number of records found. These records may then be individually selected for display.

IBM INTERNAL USE ONLY

For search purposes, data bank structure is as follows:

- Information stored by: Library, File and Record
- Maximum of 10 Libraries
- Each Library supports up to 32 files
- Each File may contain up to 8000 records
- Each record may contain up to 256 pages of text

The Library listing is:

V0 = Hardware files, including Symptom Fix, Tech Hardware, and search assist (help).

V1 = Software File - APARs, PIN, General Program Info

V2 = Inaccessible

V3 - V8 = Software files

INCD = Incident Facility - This file contains incidents pertaining to hardware, OS, DOS, Small System Software and Diagnostic Programs. (Some of these are available to the field. All are available to the affected support center.)

PASS = Program Assisted Symptom Search - This facility provides field access for software problems. By using PASS, that portion of the Data Bank is searched which contains APARs at various stages of resolution. The Search allows you to select the type of software product you are interested in, which part of the APARs in the Data Bank you wish to search and to display those APARs which contain the symptom words you entered in that part.

APAR review makes available to you the following types of information:

Abstract: Component Identity, APAR numbers, reported release, symptoms of failure and fix release.

Text: Detailed problem description, PIN items.

Status: PTF information, severity codes, closing codes and dates, duplicate APAR information, local fixes or bypasses, and release information.

IBM INTERNAL USE ONLY

Resolution Mailing List & Customer Information: Submitter of the APAR, customer, and PSRs requesting a copy of the resolution.

COMPID= Component ID - This facility, if you enter a seven or nine character specific component ID, will display for that component:

Which PIN file in Search Library V1 the component should reside in; which PASS Library the component should reside in; which Tech Ops Attention list the component should reside in.

A four character component ID, followed by a space and ALL, will display the same information for all components with that four character base.

DLL = Data Link Library - This library contains fixes, additional to those in the PASS libraries, including pre-released PTFs. There are other options also, but they are not relevant so are not discussed here.

WHO = Get Signed on ID - This function will display the name of the user who is signed on the terminal.

TEST = Terminal Test - This function will test the terminals ability to function as a display. The tests are as follows:

Full screen - All characters
Full screen - H
Full screen - O
Full screen - I
Alternate blank and I
Ripple pattern
Erase screen
Fill screen with echo message
Full screen of A, then B, etc
Start Line Test

TRANSFER = Transfer User - This function will allow the user to transfer sign on of the terminal to another user without a sign-off and sign-on.

PEND = Pending Log - This is the function that allows messages to be sent, via the RETAIN/370 system, from one location to another. A pend ID selection (and only those assigned to your location, and available, will display a list of memo titles. They may then be selected by number to display the memo.

IBM INTERNAL USE ONLY

5404 RETAINS

TIP 5404 001 -AI-LOGIC YB101
LOGIC PAGE YB101 IN 5404 ALD VOL 11 MISSING
END OF ABSTRACT
LOGIC PAGE YB101, P/N1639807, EC571784 IS MISSING FROM THE
5404 VOLUME 11 ALD BINDER. THIS PROBLEM IS BEING CORRECTED
BY BOCA RATON. IF REFERENCE IS NEEDED TO THIS PAGE TO MAKE
208/230 AC VOLTAGE CHANGE, AND YOU HAVE A 5408 IN YOUR AREA,
THE YB101 PAGES ARE THE SAME.
76/07/13, BOCA RATON

TIP 5404 002 -CK-5213 SYNC CHECK
AAA 5213 PRINTERS EXPERIENCING SYNC CHECKS ON INSTALLATION
END OF ABSTRACT
SOME 5213 PRINTERS BEING SHIPPED TO THE FIELD WITH SYSTEM/3
PRODUCTS MAY HAVE INCORRECT PRINTHEAD TO PLATEN CLEARANCE,
CAUSING SYNC CHECKS WHEN THE FORMS THICKNESS KNOB IS SET TO 3.
CHECK THIS ADJUSTMENT PRIOR TO ADJUSTING THE PRINT EMITTERS.
REFERENCE 5213 THEORY-MAINTENANCE MANUAL, PRINTHEAD TO PLATEN
CLEARANCE SECTION, FOR CORRECT ADJUSTMENT PROCEDURE.
76/07/14, BOCA RATON

TIP 5404 003 -AI-LOGIC ERROR
AAA LOGIC PAGE JR610 NOTE 1 IS INCORRECT. CORRECT JUMPER
IS REFERENCED ON TIE DOWN PAGE A6001.
76/07/14, BOCA RATON

TIP 5404 004 -AI-UPENDING KIT
AAA ZZZ THE UPENDING KIT BILL NO. IS B/M7374676. THIS NO. IS
IN THE UNPACKING/PACKING INSTRUCTIONS. ALSO THE SPECIFY CODE
FROM THE SALES MANUAL PAGE IS NO. 9840 LOCATED IN 5447 SECTION
UNDER SPECIFY.
76/07/20, BOCA RATON

TIP 5404 005 -AI-INSTALL ASSIST
AAA ZZZ TO ASSIST YOU IN ADDING THE DISPLAY ADAPTER MICRO-
PROGRAM TO THE CUSTOMERS PACK(S) REFER TO CHAPTER 10 STEP
10.3 OF THE INSTALLATION INSTRUCTIONS FOR THE PROCEDURE.
76/07/21, BOCA RATON

IBM INTERNAL USE ONLY

TIP 5404 006 -AI-5213 PRINT SLOW

AAA 5406 BEING REPLACED BY 5404 AND CUSTOMER RETAINS THE 5213 FROM 5406. 5213 BUILT PRIOR TO JULY 1972 MAY NOT HAVE FACTORY EC 138845.

END OF ABSTRACT

AFTER INSTALLATION, THE 5213 MAY RUN AT SLOW SPEED WITH NO CHECK INDICATIONS. CHECK THE 5213 FOR EC138845 BEING INSTALLED WITH THE MACHINE POWER ON, PROBE 01A-A2B5-D03. IF THIS POINT IS APPROX. -4V THE EC IS NOT PRESENT ON THE 5213.

TO INSTALL, LOCATE WHERE THE PRINTER CABLE GOES INTO SOCKET POSITION ON MODESTY IN 5447 LOCATION W2A1. LOCATE THE B03 PIN ON THE PADDLE CARD. INSERT JUMPER P/N347120 AND SOLDER BETWEEN PIN B03 AND THE COMMON BUSS. THIS MAKES THE LINE GOING TO THE CPU CALLED FEATURE INTERLOCK ACTIVE. REPLUG CABLE W2A1. THIS CHECK WILL BE INCLUDED IN THE NEXT EC UPDATE TO THE INSTALLATION INSTRUCTIONS.

UPDATE HISTORY TO SHOW EC138845 AND ORDER LOGIC PAGES FOR THE 5213.

PAGE ZZ106 P/N2632649

ZZ103 P/N2632646

WP020 P/N2640762

TIP 5404 009 -DD-ERROR ON YB 100

NOTE 3 ON YB 100 P/N1636079 EC571869 IS INCORRECT

END OF ABSTRACT

NOTE 3 ON LOGIC PAGE YB100 HAS CE ADD JUMPER P/N208989 FROM CB1-R1 TO CB1-C1. IT SHOULD READ CB1-L1 TO CB1-C1. THIS PAGE WILL BE CORRECTED IN EC571962.

76/10/21, BOCA RATON

TIP 5404 010 -AI-S/3 TP NETWORK

AAA ON SYSTEMS THAT HAVE MULTIPOINT CONTROL STATIONS USING 3875 MODEMS, CHECK THAT TRIBUTARY MODEMS HAVE AUTO-RESYNC TIMER PLUGGED CORRECTLY.

END OF ABSTRACT

IF NOT PLUGGED CORRECTLY, RETRIES ON VARIOUS ERROR CONDITIONS WILL BE UNSUCCESSFUL AND CCP PLACES THE TERMINAL IN ERROR RECOVER (DROPS IT LINE). REFER TO TIP 3875 FOR STRAPPING OPTIONS.

76/10/28, BOCA RATON

IBM INTERNAL USE ONLY

TD22926 TIP 5404 012 -CK-DA PROC CHECKS

AAA KEYBOARD PARITY ERRORS AND I/O LSR PROCESS CHECKS MAY BE CORRECTED BY PERFORMING THE FOLLOWING.

END OF ABSTRACT

1. REMOVE SLIP ON CONNECTOR FROM 01A-B3H2 D06 AND PLACE ON ANY D08 PIN.
2. INSTALL TWO (2) FERRITE CORES (P/N853288) AROUND THE DISPLAY ADAPTER COAX CABLES JUST BEFORE THE CABLES ENTER THE TAILGATE PORT PLATE.

A CHECK OF ALL ESD HARDWARE, FINGERSTOCK, STRIKER PLATES, KNIFE BLADES, COVER STRAPS, ETC. SHOULD BE MADE. THIS SHOULD ELIMINATE ESD CAUSED PROBLEMS.

AN EC WILL BE RELEASED TO DOCUMENT THESE CHANGES.

76/12/22, BOCA RATON

IBM INTERNAL USE ONLY

5408 RETAINS

TIP 5408 001 -AI-SYS/3 FILE SWAP

AAA 5408 SYSTEMS BEING ORDERED WITHOUT 5444 FILES.

SEE TEXT.

END OF ABSTRACT

SOME 5408 SYSTEMS, THAT ARE DISPLACING OTHER SYSTEM/3 DISK SYSTEMS, ARE BEING ORDERED WITHOUT A 5444 FILE. CUSTOMER ENGINEERING WILL BE REQUIRED TO RELOCATE THE 5444 FILE FROM THE EXISTING SYSTEM INTO THE 5408 FILE ENCLOSURE. INSTALLATION INSTRUCTIONS WILL BE UPDATED, IN THE INTERIM USE CHAPTER 3 AND APPENDIX III FOR ASSISTANCE. THE FOLLOWING SHOULD HELP TO ELIMINATE RELOCATION PROBLEMS -

1. CAUTION, THE FILE WEIGHS IN EXCESS OF 60 POUNDS. TWO CUSTOMER ENGINEERS SHOULD BE USED TO PHYSICALLY CHANGE A FILE FROM ONE ENCLOSURE TO ANOTHER. IF NECESSARY A 5444 SHIPPING CONTAINER P/N7360660 CAN BE ORDERED FROM THE ROCHESTER MLC DEPARTMENT 624 TO ASSIST WITH 5444 RELOCATION.
2. THE 5444 MUST BE A MODEL A (HIGH SPEED ACCESS) TO BE RELOCATED INTO THE 5408.
3. ALL RELOCATION TIME, INCLUDING TESTING, MUST BE WRITTEN AGAINST SERVICE CODE 21 NOT BILLABLE. FOR REPAIRS USE SERVICE CODE 01 OR 02. SEE YOUR SERVICE CODE FOLDER, DO NOT USE SERVICE CODE 22 AND/OR 20.

75/04/29, BOCA RATON

TIP 5408 003 -AI-PTR METER POWER

AAA 5203 PRINTER MUST HAVE METER POWER PACK TO FUNCTION CORRECTLY ON 5408

END OF ABSTRACT

SOME 5408 SYSTEMS WILL BE DISPLACING 5410 SYSTEMS AND OCCASIONALLY A 5203 PRINTER WILL BE RELOCATED ON TO THE 5408 SYSTEM. THERE ARE 5203 PRINTERS, WITH EC360335, THAT HAVE A USE METER TERMINAL BLOCK AND NOT A USE METER POWER PACK. ALL METERS ON 5408 SYSTEMS REQUIRE POWER PACK. ENDICOTT B/M4254963 MUST BE ORDERED TO INSTALL A POWER PACK IN THE 5203. SEE 5203 SERVICE AID NUMBER 8.

75/07/09, BOCA RATON

IBM INTERNAL USE ONLY

TIP 5408 005 -AI-SYSTEM LOOPS

5408 HANGS IN I-R BACKUP AFTER CUSTOMER RUNS OUT OF PAPER OR CHANGES PAPER ON THE 5203.

END OF ABSTRACT

IF YOU HAVE A LOOPING PROBLEM CHECK TO MAKE SURE THAT YOU HAVE A 500MFD CAPACITOR BETWEEN TB2-4 AND TB2-6 ON THE PEB IN THE 5203. CHECK THE POLARITY OF THE INSTALLED CAPACITOR TB2-6 (PLUS) TB2-4 (MINUS) ALSO MAKE SURE A CAPACITOR 39MFD IS INSTALLED ON THE TB2-1 (PLUS) AND TB2-3 (NEG). THE 500MFD IS P/N4035628 AND THE 39MFD IS P/N4254517. IF YOU STILL HAVE A PROBLEM REPLACE 500MFD CAPACITOR WITH A 1000MFD.

75/07/18, BOCA RATON

TIP 5408 008 -AI-ORDER PROBLEM

FEATURE CODE 9221 MUST BE ORDERED FOR 5203 PRINTER INSTALLED ON 5408

END OF ABSTRACT

WHENEVER A 5408 IS ORDERED, 5203 PRINTER PREREQUISITE FEATURE CODE 9221 MUST ALWAYS BE ORDERED. THIS WILL INSURE THE 5203, SHIPPED FOR INSTALLATION, WILL HAVE THE METER POWER BACK AND DC DISTRIBUTION POWER CABLE FACOTRY INSTALLED. IF THE MODEL 8 IS DISPLACING A SYSTEM/3 MODEL 10 AND THE EXISTING 5203 IS TO BE RELOCATED ONTO THE 5408, THIS FEATURE CODE CAUSES B/M4254915 TO BE SHIPPED. ENDICOTT B/M4254915 SHIPS THE DC POWER CABLE P/N1639656 AND WILL ALSO SHIP METER POWER PACKS IF REQUIRED. PLEASE INSURE THIS FEATURE CODE HAS BEEN ORDERED TO PREVENT INSTALLATION DIFFICULTY AND DELAY.

75/08/19, BOCA RATON

TIP 5408 023 -AI-CABLE DRAWINGS

AAA INSTALL 5421 ON 5408 (RPQ)

END OF ABSTRACT

B/M2444326, INSTALL 1403 ON 5408 REFERS TO CABLE DRAWINGS P/N2444303. B/M2445950 REFERS TO CABLE DRAWINGS P/N2444304. THESE DRAWINGS ARE SHIPPED IN RPQ ALD VOLUME 4, NOT WITH THE B/M INSTRUCTIONS. DRAWINGS P/N2444309, P/N2444308, P/N2444328 AND P/N2454751 ARE ALSO IN THIS VOLUME. EC894060 WILL CORRECT THE REFERENCE TO THESE DRAWINGS.

IBM INTERNAL USE ONLY

TIP 5408 036 -AI-NON-IBM PRINTERS

AAA SYSTEMS WITH AN NON-IBM PRINTER ATTACHED MAY SHOW A SHORT BETWEEN FRAME GRD AND LOGIC GRD DURING CPU GROUND CHECKS AS PER SYSTEM/3 INSTALL INSTRUCTIONS OR MAP CHARTS.
END OF ABSTRACT

SOME NON-IBM PRINTER MANUFACTURES TIE LOGIC GROUND TO FRAME GROUND. WHEN INSTALLING OR TROUBLE SHOOTING A SYSTEM WITH AN NON-IBM PRINTER, IF A SHORT IS EXPECTED TO BE CAUSING A PROBLEM THE NON-IBM ATTACHMENT OR PRINTER MAY HAVE TO BE ISOLATED FROM THE CPU.

THE CE SHOULD ADVISE THE CUSTOMER THAT THE NON-IBM SUPPLIER SHOULD BE NOTIFIED AND ASKED TO UNHOOK THE ATTACHMENT TO ALLOW TROUBLE SHOOTING TO CONTINUE.

76/10/26, BOCA RATON

TIP 5408 038 -AI-CABLE ASM 5471

AAA ZZZ WHEN DISCONTINUING A 5408 WITH A 5471, CABLE ASSEMBLY P/N2590388 SHOULD BE REMOVED FROM THE CPU END AND RETURNED ATTACHED TO THE BEZEL ASSEMBLY. DO NOT LEAVE IT INTACT IN THE CPU.

END OF ABSTRACT

76/11/17, BOCA RATON

TIP 5408 039-DD-MAP ERROR

AAA ZZZ CPU MAP CHART PAGE 204, BLOCK F1, STEP 2, STATES 'METER E10 TO E13 AND E10 TO E12 ON THE MEMORY P/S. LOOK FOR 10-13 VAC'. THIS INPUT RANGE SHOULD BE 13-18 VAC.

END OF ABSTRACT

76/11/30, BOCA RATON

IBM INTERNAL USE ONLY

5404 SERVICE AID

5213 Intermittent Sync Check

The following procedure should be used to eliminate intermittent SYNC checks on 5213 Model 3 printers.

1. Turn power off.
2. Loosen the coupling which joins the leadscrew and stepper motor. Remove the stepper motor from the casting and lay in base.
3. Check for binds in the leadscrew by pushing the printhead from one margin switch to the other. The printhead should be very free and move with little or no resistance. The following steps should be used to eliminate any binding conditions.
 - a. Check for contamination on the carrier support shaft and leadscrew.
 - b. If binds still exist, rotate the carrier support shaft in one quarter turn increments. This shaft can be rotated by loosening the set screw on the left support frame.
4. Mount the stepper motor on the frame.
5. Loosen the transducer clampscrews and adjust each transducer eccentric to the center of its travel.
6. Perform the print carrier and print emitter adjustment per step 2.20 of the 5213 TMD.
7. Adjust the emitter air gaps to .001 to the highest point on the emitter wheel.
8. Turn power on and run diagnostic E8A and loop on Routine 2. Scope the following points in the 5213 attachment and check for a minimum output of 3 volts.

Print Right Emitter	01A-A2-C2D07
Print Left Emitter	01A-A2-C3D07
Stepper Forward Emitter	01A-A2-B2B08
Stepper Reverse Emitter	01A-A2-B2B12

If 3 volts is not obtained, readjust appropriate emitter.

9. Adjust stepper motor speed using diag E87. Adjust forward and reverse emitters so they fall into the 11.50 to 11.70 MS Range.

10. Adjust print emitters using Diag E89. Adjustment on the 5213/3 Printer is correct when the X is lined up under the left hand X and adjusted via the eccentric to fall in the middle of the 3X tolerance.
11. Recheck the output of the emitters using the procedure in Step 8.

IBM INTERNAL USE ONLY

PURPOSE: To provide guidance in defining and solving random system failures caused by adverse environments, such as static discharge, improper grounding, input power and radiation.

Suggested Problem Analysis

A suspected noise-sensitive system must be thoroughly checked to insure the absence of hardware oriented failures, particularly where critical circuit timings are concerned. Insure that the timings in the critical path under consideration are within specified tolerance. Lack of optimum adjustments may be a contributory failure factor in a marginal environment. Check all noise analysis service aids or ECA's and upgrade system accordingly.

The environment should be considered when the trouble shows up as random unexplainable machine failures which do not respond to hardware efforts, primarily in one or more of the following:

1. Read Only Storage Checks
2. Main Memory Checks
3. Storage Protect Checks
4. Local Storage Checks
5. Power Checks
6. Failure symptoms not logical. (Indicators set which should not be on under normal operation)
7. Random failures on several devices. (Sync checks, ROS hits, select locks etc.)

Contact your Branch Office Installation Planning Representative to assist you in analyzing your customer's computer room environment. He is a specialist in this type of analysis. The following should be considered:

Cause of Random System Errors

1. Static Discharge

Major factors that contribute to static charge build up are:

- a. Static generation and dissipation characteristics of the furniture within a computer room.
- b. Static characteristics of the raised floor in the computer room. (Type of tile, resiliency pads, proper grounding)
- c. Relative humidity below recommended criteria of 50% \pm 5%.

Static Discharge ("Arc") may occur from:

- a. Furniture to CPU and/or I/O units
- b. Personnel to CPU and/or I/O units
- c. Furniture to any grounded metal
- d. Personnel to any grounded metal

255 continued

2. Improper Grounding

- a. 115 volt neutral current on green wire ground.
- b. High resistance ground. (Requires use of Earth Tester)
- c. Excess RF noise. (Requires use of Stoddart Probe)
- d. Ground loops

3. Input Power (Not meeting IBM specifications)

- a. Power line disturbances. (Low frequency) Requires use of Esterline Angus recording voltmeter.

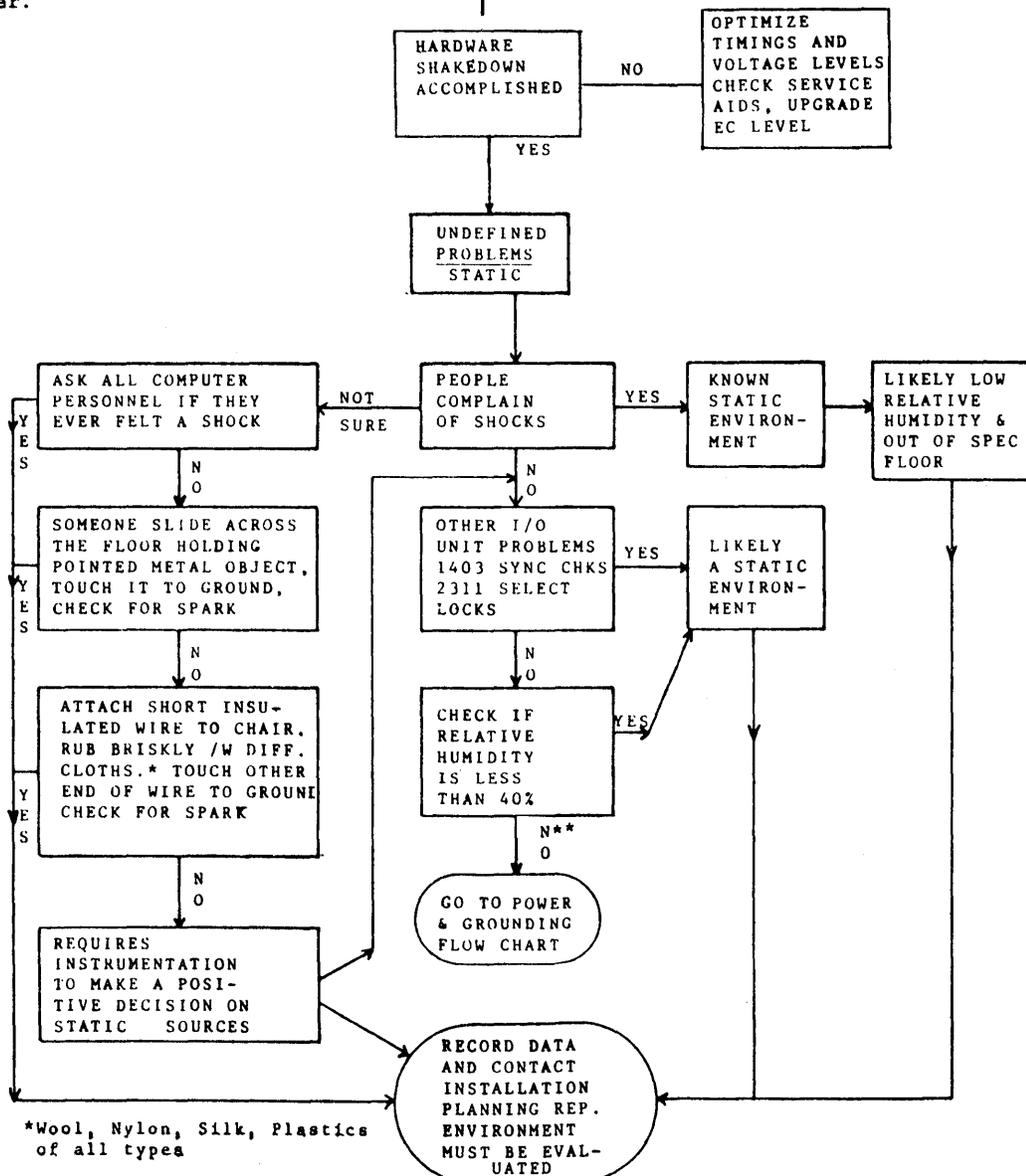
255 continued

- b. Power line transients. (High frequency) Requires use of Line Interrogation Device (LID)

4. Radiation

- a. Radar
- b. RF heaters
- c. Electrostatic devices

The following flow chart details a recommended environmental analysis procedure:

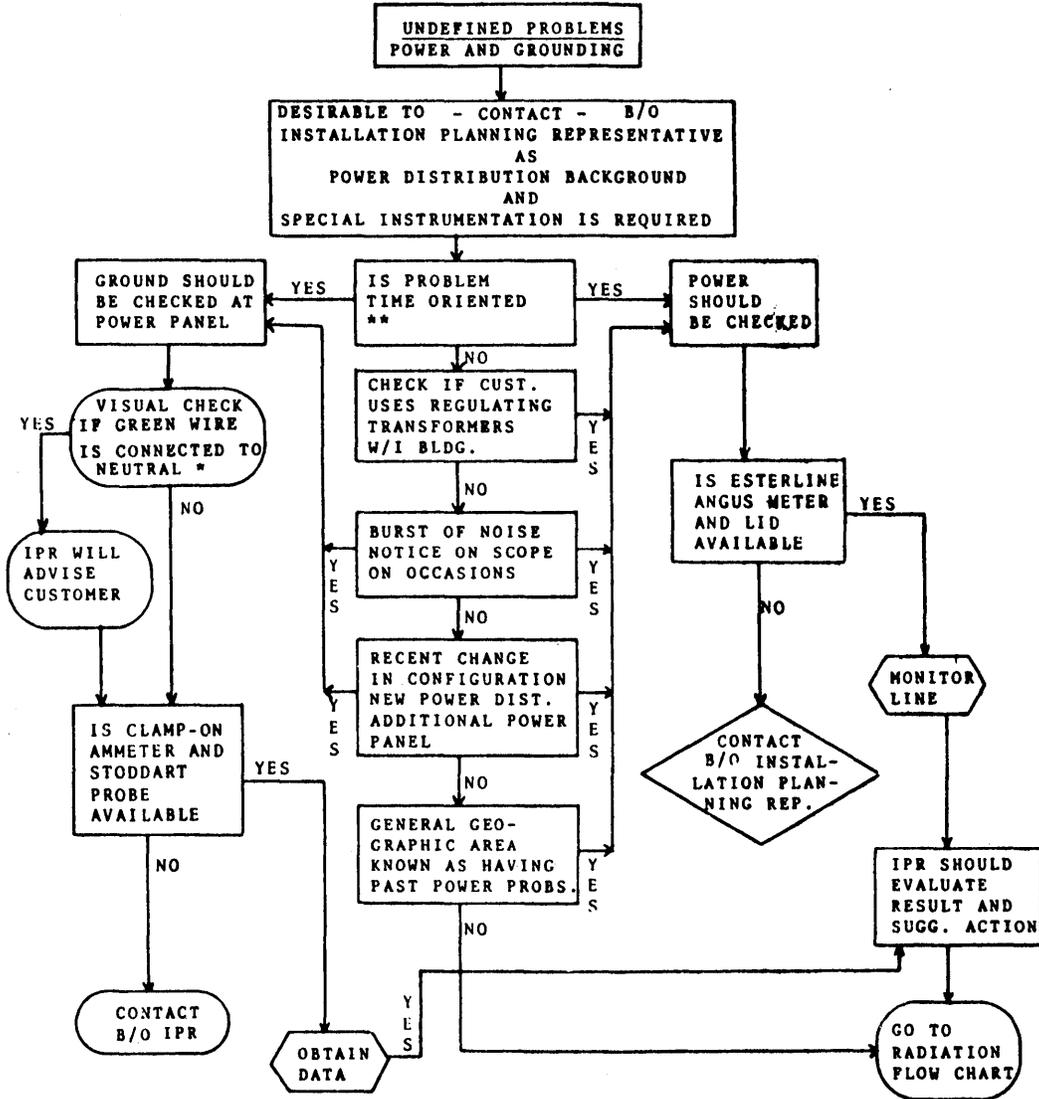


*Wool, Nylon, Silk, Plastics of all types

** Probably OK; however, on very rare occasions, static problems have been known to occur where room relative humidity was in excess of 50%. Ask IPR for assistance if you feel static is a factor.

NOTE: To properly judge static charge build-up a static-locator tool must be used. Ask the Installation Planning Representative for assistance.

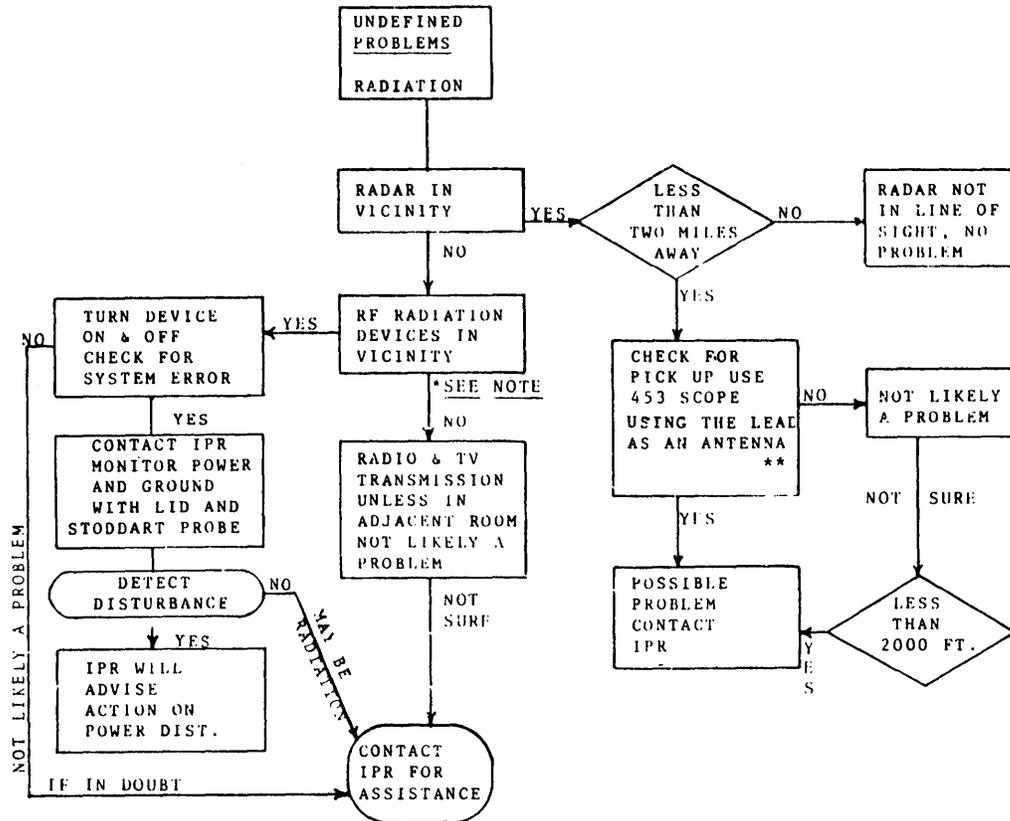
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* By definition, a "neutral" conductor (white insulation) normally carries 115V AC return currents to transformer center top. By definition, a "green wire" (green or green with yellow tracer insulation) must not normally carry current, but must be capable of supporting phase fault detection and interrupting currents.

** Power distribution load changes or capacitor switching may be occurring.

255 continued



*NOTE: RF DEVICES - ARC AND RESISTANCE WELDERS
 RF HEATERS - ELECTROSTATIC PAINT SPRAYERS
 CONTACTORS - COMMUTATOR TYPE MOTORS ETC.

** Repetition rate normally every 6 to 10 seconds
 (function of antenna rotation)

The electrostatic simulator should be used to check a system's general noise susceptibility. Contact your B/O Installation Planning Representative for assistance.

Remember, the IPR has the responsibility to interface to the customer to modify the environment with local management approval on post installation problems.

Environmental Instrumentation

The following instruments are available through your B/O IPR. Some of the instrumentation is under Area Control.

STATIC

Sling Psychrometer	Checks humidity
Thermo Humidigraph	Graphs temperature and humidity.
Earth Tester	Checks all ground including floor under structure
Megohmmeter	High resistance measurement of floor surface and furnitures
Static Locator	Measures static voltage charged up on objects
"Spark Gap"	Demonstrates static discharge
Electrostatic Discharge Simulator	Checks unit static sensitivity

GROUNDING

Earth Tester	Tests continuity Poor contact resistance
Clamp-on Ammeter	Checks for low frequency ground current

INPUT POWER

Esterline-Angus Recording Voltmeter	Graphs low frequency power line disturbances
Line Interrogation Device	Detects hi-frequency power line transients
Clamp-on Ammeter	Checks phase balance

RADIATION

Radar Crystal Detector	Measures radar field intensities
LID and Stoddart Probe	Measures RF noise coupled from radiation on to ground or power lines

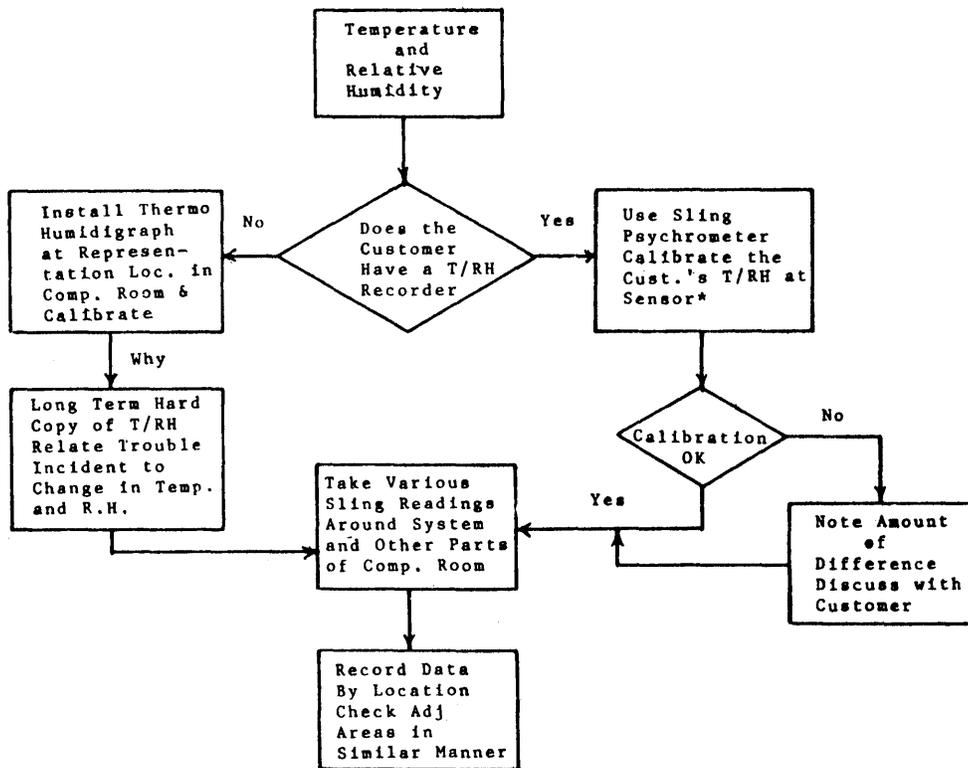
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256 STATIC ENVIRONMENT EVALUATION
SERVICE AID

Purpose: Static generation is a primary concern within a computer room. Removal of the major static source could well prove to be the simplest solution to an intermittent problem.

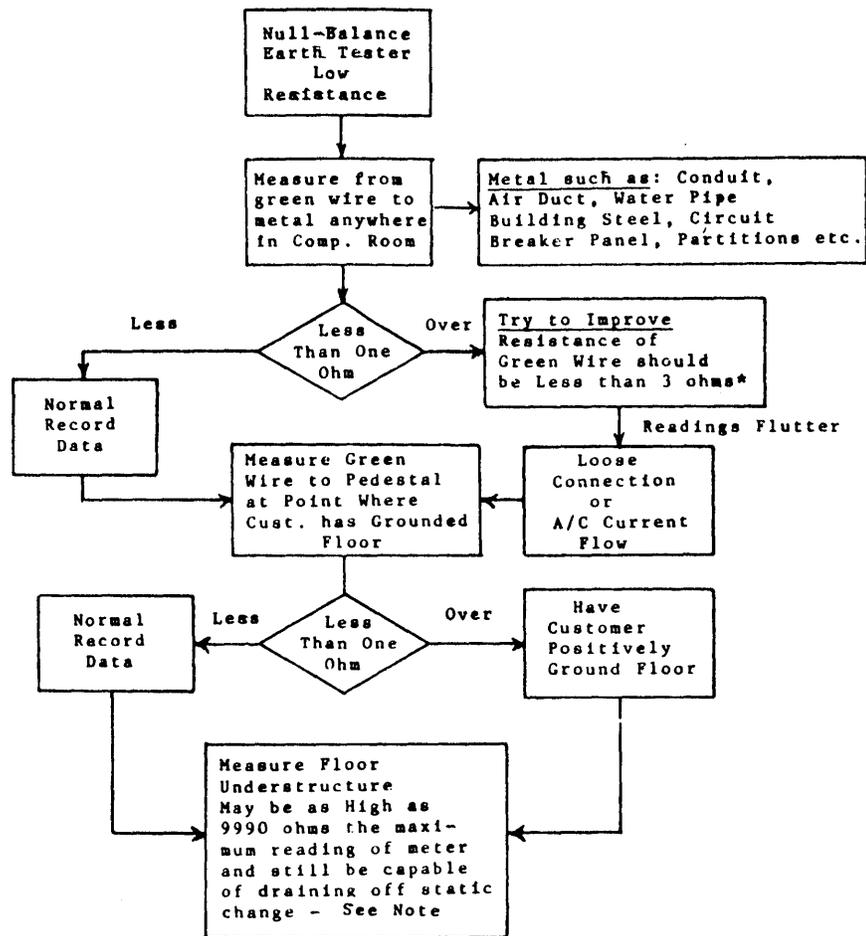
This service aid suggests a measurement procedure for the Branch Office Installation Planning Representative to effectively define static sources within the room. Therefore, by the utilization of this Service Aid, logical decisions can be made to determine the most appropriate action to improve the environment.

Remember, static problems have been known to occur even when the humidity is over 50%. Humidity is only one parameter. The flow charts in this service aid will describe how to measure some of the other factors.



*Before wetting the sling's wet bulb, check both thermometers for identical recordings. Record any difference and apply this for conversion.

NOTE: How much effect relative humidity has on static generation can be judged if the humidity varies 10% to 20% within the computer room. Make resistive measurements and conduct static demonstration at both RH conditions and compare results.



NOTE: Static charge will drain off an object as fast as it is generated if its path to ground is less than 10^9 ohms.

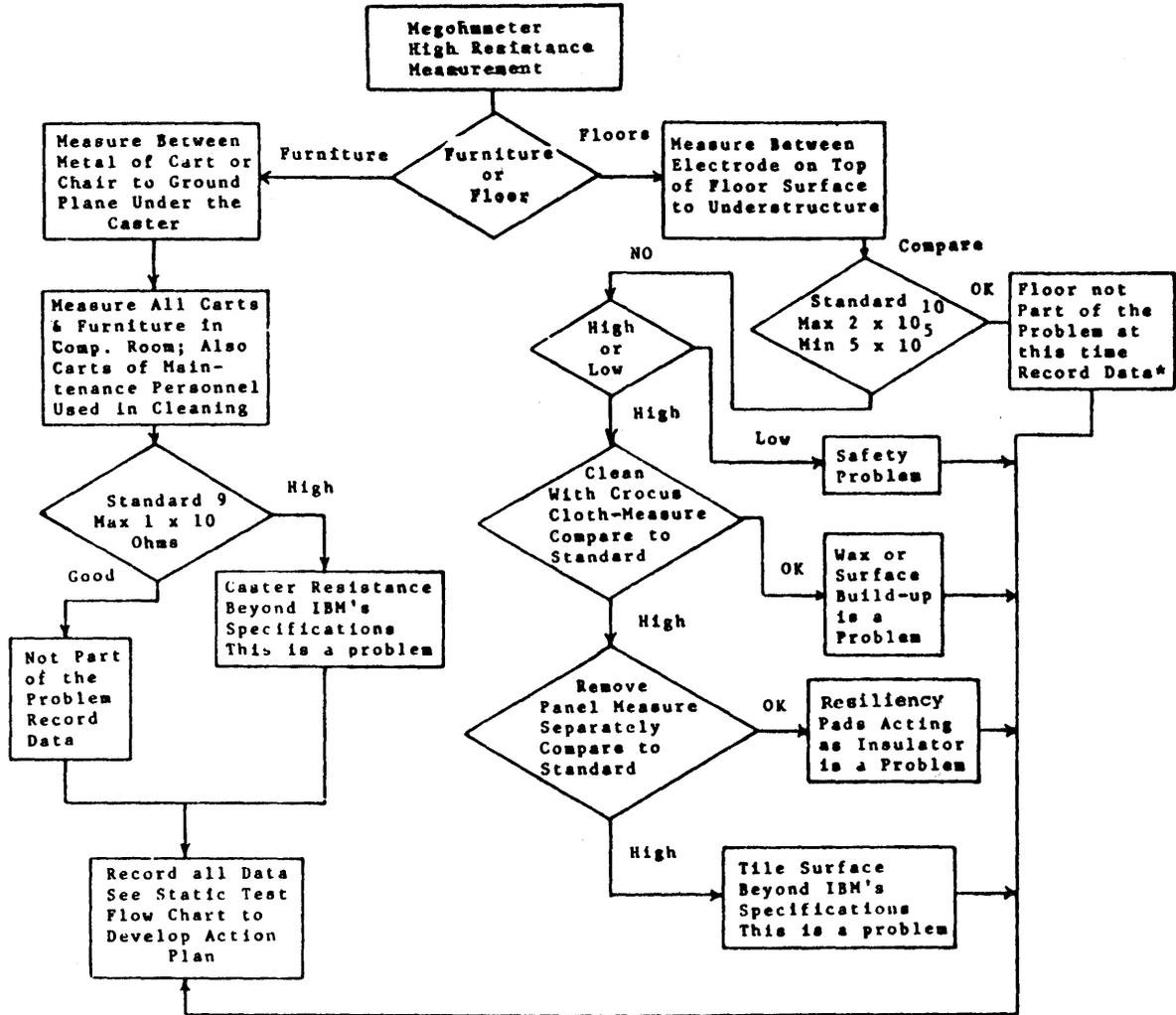
Reference in IP Manual relative to RF filters and for safety to trip circuit breaker on fault condition.

Apply ohms law $R = \frac{E}{I}$

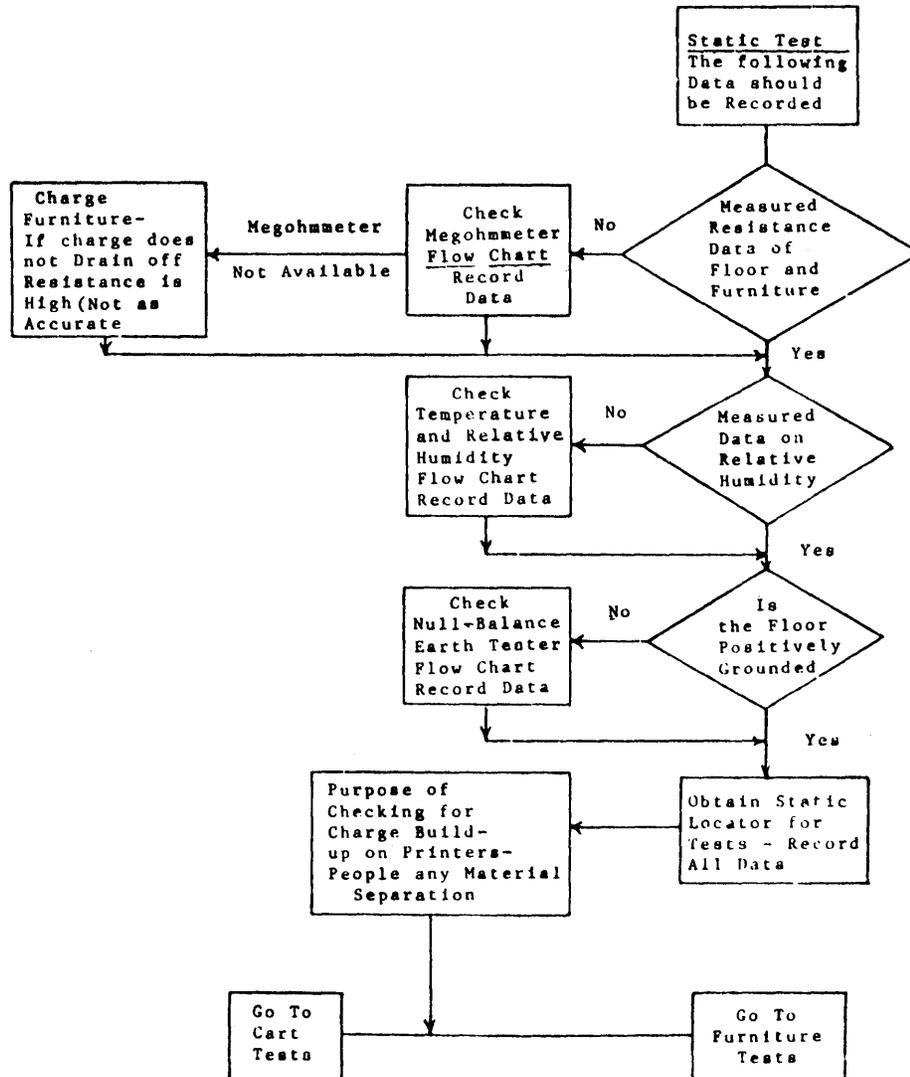
For 60 amp service $\frac{230 \text{ Volts}}{60 \text{ Amp}} = 3.8 \text{ ohms to trip breaker}$

For 100 amp service $\frac{230 \text{ volts}}{100} = 2.3 \text{ ohms to trip breaker}$

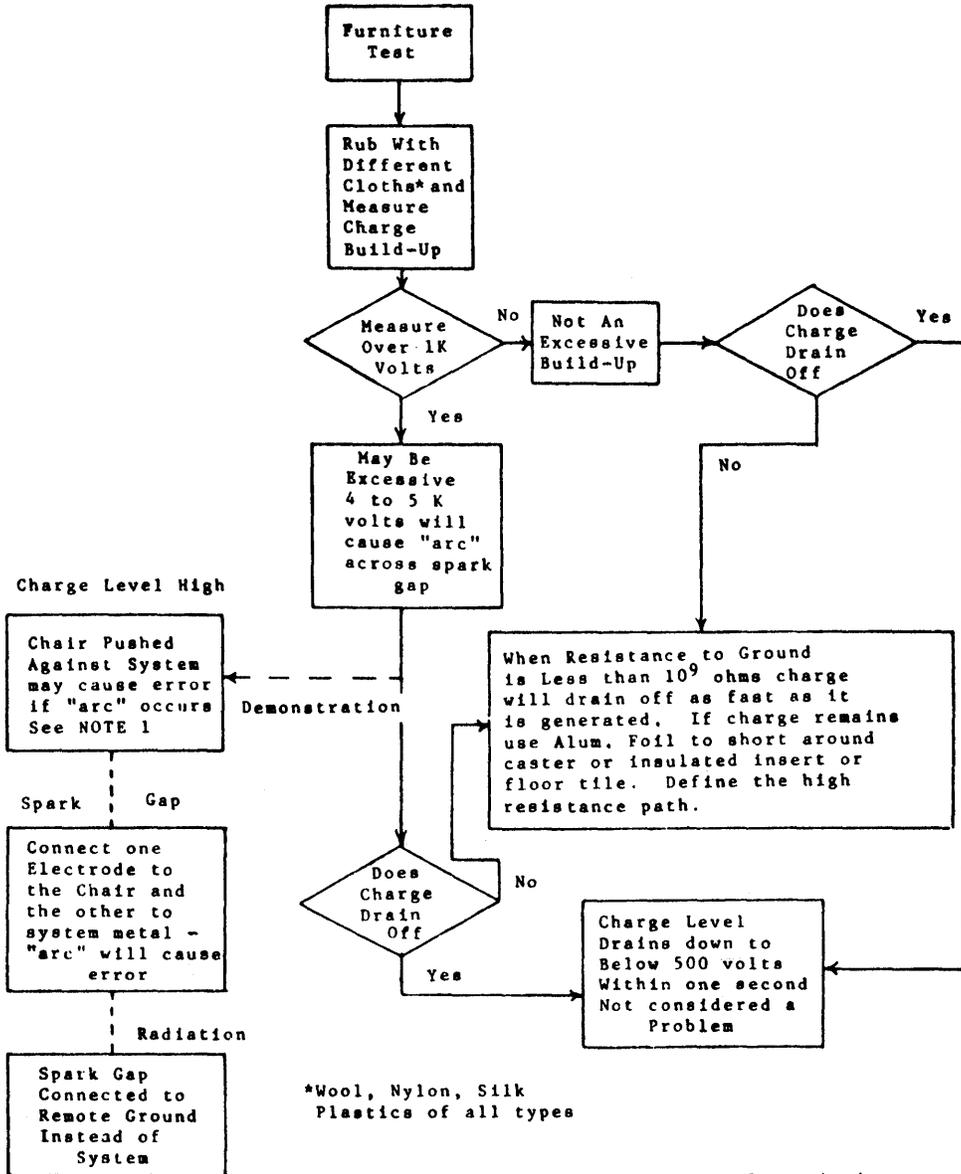
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- * Floor resistance is related to other parameters which can materially affect our measurement, such as:
1. The relative humidity within the computer room
 2. Recent maintenance action on the tile surface (wax, mopped)

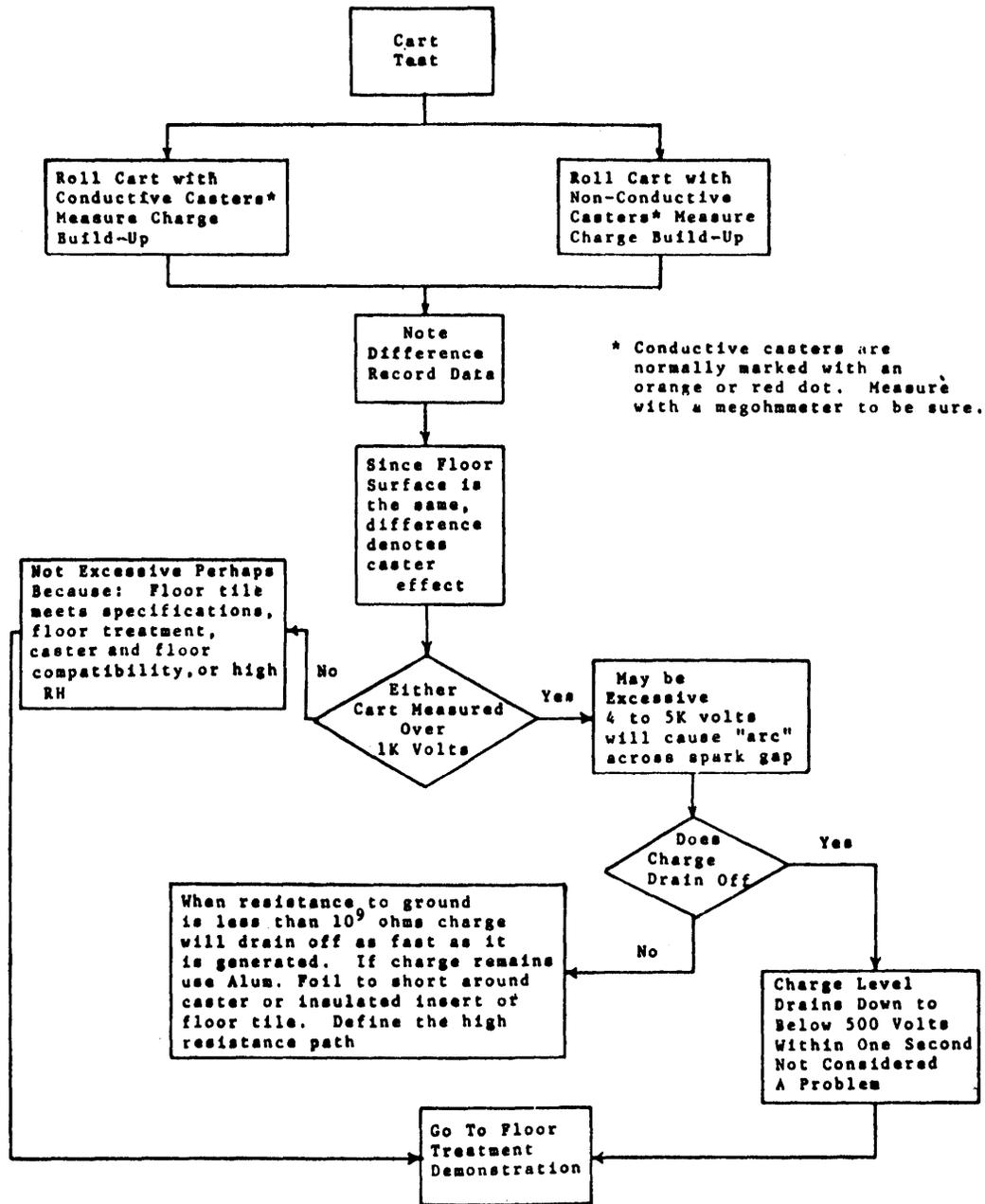


NOTE: If error occurs while on site, try to reproduce failure situation using static locator to determine the amount of charge that may have built-up during the time of system failure.



NOTE 1: System may not fail because of a coincidence factor - amount of voltage charge, time of discharge, and timing relationship of the critical circuit. A marginal value charge may not cause a failure in 10 tries, but static still could be a problem.

256 continued



General

256 continued

Floor Treatment Demonstration

Treat several panels with an anti-stat concentrate. Take the same cart, roll on the untreated floor until the charge is built up, continue to roll the cart onto the treated floor. Does the charge dissipate? Now reverse the procedure. Roll cart on treated floor. Does the charge build up? Then continue to roll onto the untreated floor to determine if charge again builds up. This demonstrates the effectiveness of the treated floor. When the floor is an adverse factor, corrective action should be considered.

Review Hints

1. What is the major static source?
 - a. Can you prevent static generation?
 - b. Can you prevent static "arc"?
2. Are casters part of the problem?
3. What factors will change or did change with variation of the relative humidity?
4. What can you demonstrate?
5. Is this a three shift operation? Is the problem related to a particular shift?
6. Is the problem temperature related?

How Susceptible is the System to Static Discharge

The Electrostatic Discharge Simulator, sometimes called a "Zapper" simulates the average discharge characteristics of furniture. This tool can determine the static susceptibility of the system and evaluate noise abatement changes.

CAUTION: Proper training is absolutely required on the use of this tool. Check with your Area Installation Planning Engineer who controls this tool.

"ZAP" Considerations

1. Establish system ESD level.
2. "ZAP" other units of a system such as 2821, 1403 and 2540 so that a reference judgement can be obtained.
3. By observation of operation and traffic flow, ZAP parts of the system that have a possibility of experiencing a static "arc". Attempt to duplicate the problem.
4. Use "ZAP" technique to check the adjustment of retry on 360/50 system.

NOTE: Excessive RF noise on the green wire, as measured by the Stoddart Probe, can be a cause of increased sensitivity of a system to static discharge.

Problem Analysis Considerations

1. Were the ESD Zap levels considered average? If they were well below average, can the system be upgraded? How much RF noise is on the ground? Are noise abatement ECs available? Check ECA in CEM.
2. Was the problem or part of the problem duplicated by either the ESD simulator or by static demonstration? If this is true, static is likely to be a factor.

The environmental type of problem may be masking a hardware problem. Once the environment is controlled, the hardware problem can be more effectively analyzed.

Static Environment Conclusions:

1. Review all data to determine which parameters are combining to cause static generation and lack of dissipation.
2. Determine what customer action would be least expensive and still effective. As an example: Remove the console chair for a test period of two weeks.
3. Demonstrate to the customer the static relationship of the things you wish to change.

Consult with DP and FE management before interfacing with the customer with your recommendations. Normally, all relative data and facts should be presented to the customer in a straight forward manner.

When assistance is required, contact your Area Installation Planning Engineer.

171/06-01-7C

268 PROCEDURE FOR EVALUATING ELECTRO-
MAGNETIC INTERFERENCE IN A COMPUTER
ROOM

Electromagnetic interference is known by many names: EMI - Transients - noise - zaps and electrostatic discharge. Regardless of what it is called, when it occurs it can cause random errors in CPUs, control units or I/O equipment. The most common source of this interference is electrostatic discharge. This phenomenon occurs in our customer's computer room when the electrostatic charge that has been built up on his chairs or carts is dissipated to ground via a spark. For example, when the console operator stands up he causes a static charge to build up on his chair, (this charge could be of the magnitude of 10,000 to 15,000 volts) if he accidentally causes the chair to contact the console table leg (zap!) electrostatic discharge. Another example could be when a machine operator pushes a cart into some ground such as the ramp guard rail, once again (zap!) an electrostatic discharge and possible computer failure. Remember that static electricity is produced by the action (motion required) of contact or separation of dissimilar materials.

If an electrostatic charge is discharged via an arc, its rapid discharge can cause peak currents, of several tens of amperes for greater than ten nanoseconds, to flow. These currents and their associated electromagnetic fields can trigger computer circuitry, causing malfunctions, if the discharge occurs at or near a CPU, control unit, or I/O frame.

This transient normally causes malfunctions in the high speed low voltage circuits first, such as ROS, TROS, delay lines, etc.

This article describes a method to observe the simultaneous occurrence of a machine malfunction and a noise transient. The procedure is:

I. Tools Required

- a. 453 scope with a 10 to 1 scope probe
- b. static loop-the following describes how to construct a static loop

1. use a 5 ft. piece of insulated No. 12 wire (stranded preferred vs. solid)

NOTE: AWG 14 can be used where AWG 12 is not available.

2. remove 1" of insulation from each end of wire - form the wire into a coil of 3 concentric loops with the bared ends brought together - twist bare ends of wire together - this results in a closed 3 coil loop of wire, the diameter of the coil will be approximately 6".

II. Placement of the Scope and the Static Loop

The best results can be obtained by placing the scope on top of the CPU so the screen can be viewed from some remote spot in the computer room. This allows you to watch the traffic pattern of personnel and carts that could create an electrostatic discharge, while at the same time observing the single sweep light or scope trace that would indicate a transient is being produced in the computer room. Attach the bared end of the static loop to the scope probe. Place the probe so that the static loop hangs over the front

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of the CPU. Do not let the loop touch any metal. Try to keep the loop at least 2" in front of the console. Masking tape can be used to secure the probe to the top cover of the CPU.

III. Scope set-up procedure

1. Attach scope probe (with static loop) to Ch No. 1
2. Set "A & B time/Div. and Delay Time" (grey knob) to .5 millisecc scale. Turn (red knob) CW and detent.
3. Set "Mode/Trigger" knob (grey knob) to CH1, (red knob) to "Channel 1 only".
4. Set "A Triggering" as follows:
 - a. Source - "Internal"
 - b. "Coupling" - "AC"
 - c. "Slope" - "Plus"
 - d. Set "Level Control" (grey knob) "0" position - Turn "HF Stabilizer" (red knob) all the way CW.
5. Set "A Sweep Mode" to auto trig.
6. Set Horizontal Display/Magnifier (grey knob) to "A". (Red knob) "Magnifier" to "Off".
7. Set the "Volts/Div. CH1" (grey knob) to "50 MV". (with a 10 to 1 probe this is an actual setting of 500 millivolts). Turn (red knob), fully CW; set the three way switch below it to the "AC" position.
8. Adjust the CH1 vertical "Position" (grey knob) so as to vertically center the sweep.
9. In order to be able to view the trace from a distance, you will want a slow but discernible trace. To obtain this, reset the "A Sweep Mode" switch from "Auto Trig" to "Single Sweep".
 - a. Turn the "Scale Illumination" knob all the way CCW.
 - b. Turn the "Focus" knob all the way CCW.
 - c. Keep "Intensity" setting as low as possible.

Your scope is now adjusted to indicate the ambient room noise. As a matter of fact, when the single sweep "fired" the ambient room noise level caused it to sweep. The ambient noise in the room is composed of noise from the lights, air-conditioner, the computer system, etc. When these noises occur simultaneously, they algebraically add together (calibrate the scope slightly above the room ambient noise level, it will require a transient to trigger the scope).

The Volts/Div. CH1 and the "A Triggering Level" control knob (now at "0") were purposely set low so as to force you to go through this ambient noise evaluation procedure.

You are now ready to evaluate the ambient room noise. At the present settings, the single sweep circuit will be very active and require practically continuous resetting of the "Reset" green button-light. Gradually turn the "A Triggering Level" knob clockwise (+ slope) until the reset light stays on. If the knob turns all the way clockwise and the scope continues to frequently sweep, turn the "Level" control knob back to "0" and move the Volts/Div. CH1 switch up to the next level (in this case it would be to .1 volts). Then proceed as previously, i.e., each time the "Level" control knob reaches full CW position, reset it to "0" and raise the Volts/Div. CH1 knob one increment. Soon a level will be reached where the scope might only sweep once an hour. It is now at its critical point. It is at this time that the next sweep might be the one coincident with a machine error. When this coincidence of action happens, then an evaluation can be made as to the cause of the transient noise.

If you can definitely pinpoint the cause to the movement of a cart or chair, then the "cause" should be repeatable and you should be able to duplicate the failure of the computer.

189/02-19-71

268 VOLTAGE MEASUREMENT WITH METER AND SCOPE

Reference: General CEM 34 Three Phase Power Configuration

Purpose: To avoid confusion when checking power with an AC voltmeter and with an oscilloscope.

The following table can be used to calculate the relationship between the two measurements:

Converting A-C Voltages

To Convert From	To	Use the Equations
RMS	Peak	$E_{pk} = 1.414 \text{ RMS}$
RMS	Peak to Peak	$E_{pk-pk} = 2.828 \text{ RMS}$
Peak	RMS	$\text{RMS} = .707 \text{ Epk}$
Peak to Peak	RMS	$\text{RMS} = .3535 \text{ Epk-pk}$

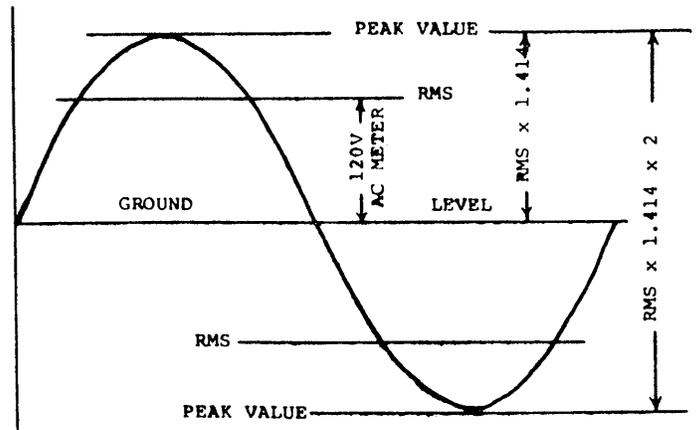
AC meters normally represent RMS or effective voltage. The scope is ground reference, so when the probe is checking one phase, it displays a peak to peak voltage with the center line at ground level.

Sample Calculation

Grounded Y cust. power

$$\begin{aligned} \text{RMS} \times 1.414 &= \text{peak to ground} \\ 120 \times 1.414 &= 170\text{V} \end{aligned}$$

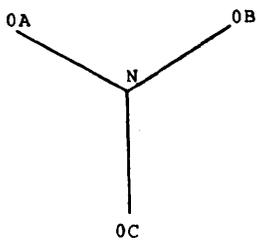
$$\begin{aligned} \text{RMS} \times 1.414 \times 2 &= \text{peak to peak} \\ 120 \times 2.828 &= 339\text{V} \end{aligned}$$



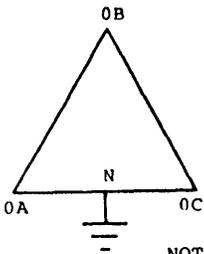
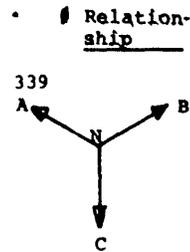
General

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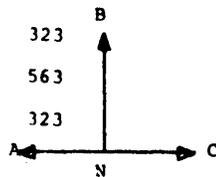
Customer Power



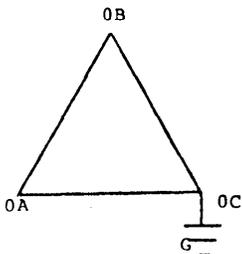
Measurement Points	Meter RMS	Scope P-P
0-0	208	
0-N	120	



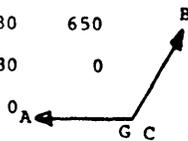
0-0	230
0A-N	115
0B-N	199
0C-N	115



NOTE: Scope display between 0A & 0C will be 180° out of phase with each other and 90° out of phase with Phase B, rather than the normal 120° phase relationship.



0-0	230	650
0A-G	230	650
0B-G	230	0
0C-G	N	0



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191/03-19-71

System fails from an ESD effect of 500 MV rather than 900 MV if the noise bursts occur in coincidence.

Excessive internal RF noise can be generated by a component malfunction or from missing or loose ground straps. External generated RF noise enters the system from the outside environment by radiation through the air or conduction on signal, power or ground nets.

The following flowchart will provide guidance to the Installation Planning Representative in evaluating the RF parameters of the ground network.

FLOW CHART IS ON PAGE 49

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POST-INSTALLATION GREEN WIRE GROUND ANALYSIS

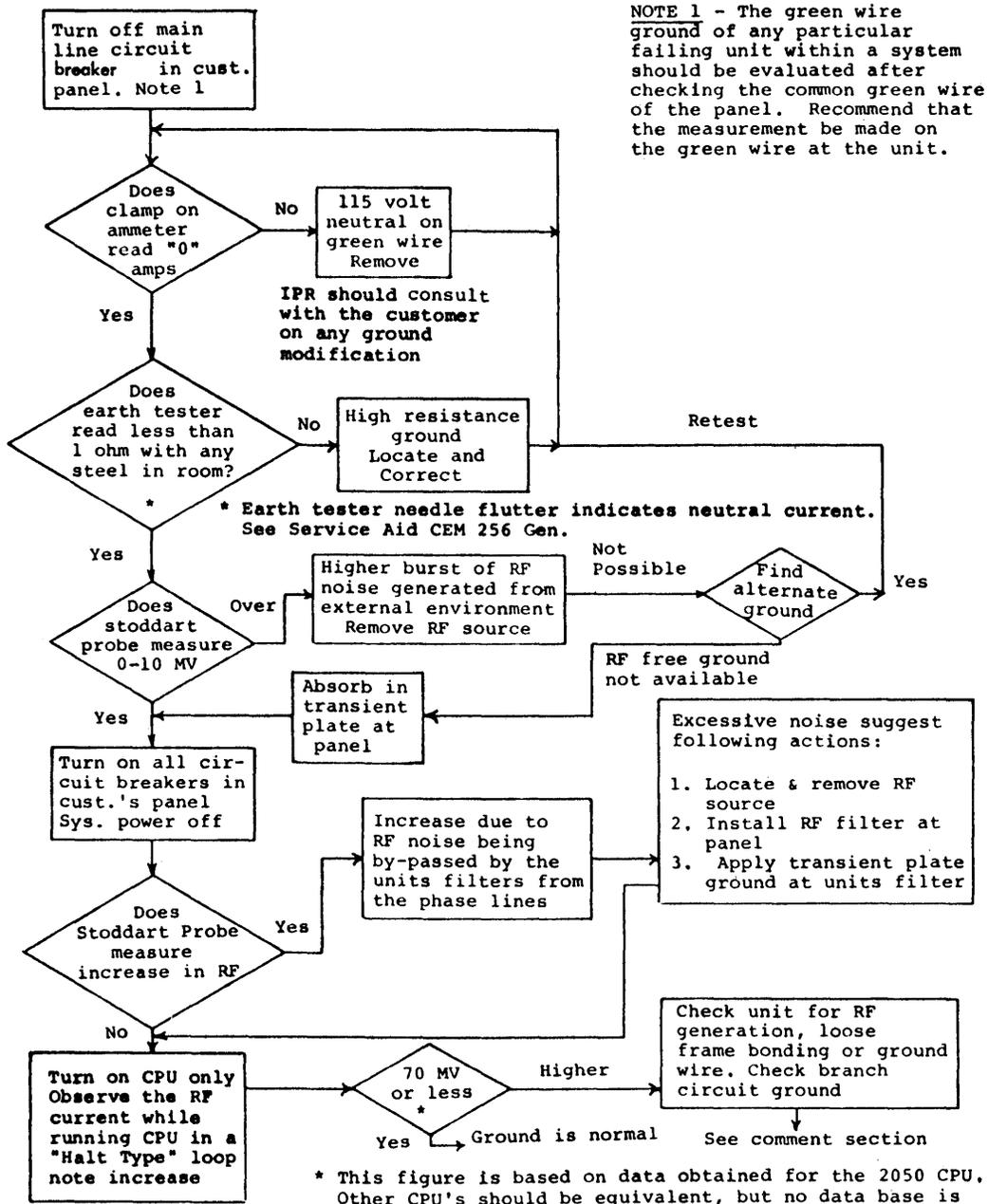
The noise susceptibility of a system can vary with the amount of internal RF noise that is present within our units.

An RF noise pulse, such as an electrostatic discharge (ESD) may be added algebraically to this existing RF level.

As an example, an ESD ground shift RF effect of 900 MV will cause a system failure.

RF noise in system	500 MV
ESD effect	500 MV
TOTAL	1000 MV

Procedure to Measure Common Green Wire at the Customer's Panel



Comment Section

1. Loose Bonds and Ground Wires



Even though not detectable through a DC resistance test, RF current, when involved with a loose connection as shown above, causes a sparking type action and can be considered as a "little RF generator". Proper unit bonding and tight green wire ground connections thus become important to eliminate RF noise within the system.

2. RF Coupling

RF can have many diverse coupling paths internally to the unit frame or externally to the ground.

General

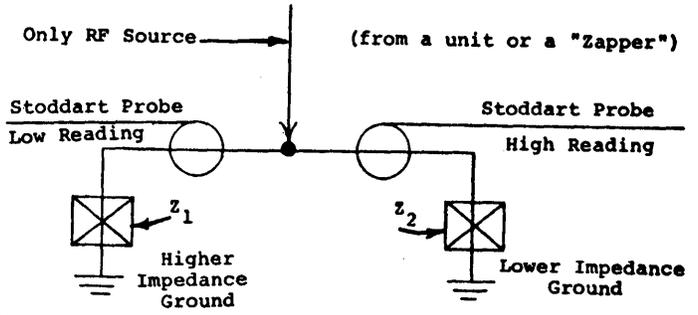
270 continued

Discontinuities of frame members can cause standing waves to develop which may couple noise into cables. External inter-unit cables provide capacitive coupling paths of RF to the ground plane of the base floor. When zapping a system one must recognize that many variable RF coupling paths are involved. System noise susceptibility can sometimes be upgraded by controlling the coupling path and directing the RF in a particular direction.

As an example, ECA 297 on the 2040 unit provides a 1052 table pedestal plate to dissipate electrostatic discharge into the raised floor, rather than to have coupling into the system circuits.

3. Check for Lowest Impedance Path

If experimentally controlled, you can judge the lowest impedance path provided you have parallel paths to ground, as indicated in the following example:



If $Z_1 = 4Z_2$, then 4 times as much RF will flow through Z_2 ground leg.

4. Transient Plate Ground

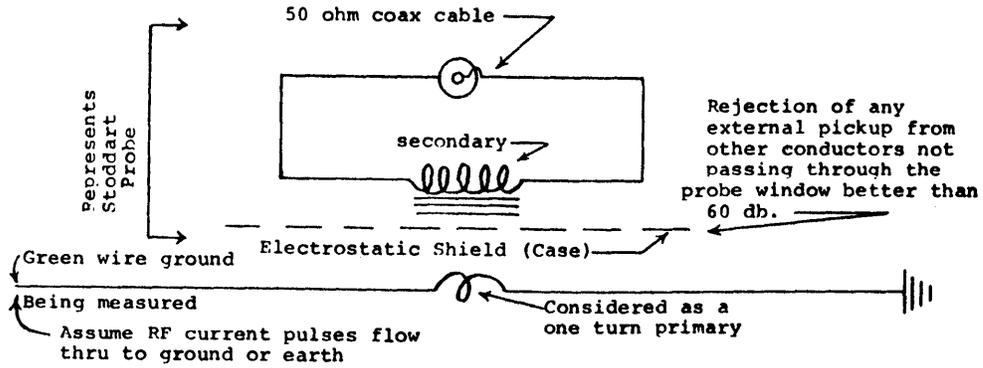
Stoddart Probe measurements indicate that the transient plate ground is 4 to 8 times more effective in conducting or "draining off" RF current than a 100 foot or over isolated green wire ground from a single point, as indicated in the previous illustration. This ratio is a function of the frequency of RF and quality of the transient plate installation.

Depending on the circumstance, a transient plate ground can be effectively used to drain off a local electrostatic discharge effect, and raise the ESD level of susceptibility of a system.

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271 STODDART PROBE

The operating circuit of the Stoddart Probe is equivalent to a radio frequency transformer.



This is a current measuring instrument, but when connected through a 50 ohm impedance terminator of a receiver (453 scope), this current is displayed as a voltage.

To convert back to a current ohms law ($I = \frac{E}{Z}$) is applied.

Z is variable dependent on the frequency of the current. This transfer impedance (Z) has a relatively constant 5 ohms value in the MHz frequency range. At 100 KHZ frequency, the transfer impedance is one ohm, and at 60 cycle it is .0012 ohms. This is another way of indicating that this probe is primarily a high frequency instrument. See the following example:

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Sufficient current is passed through a wire being measured to cause a 100 MV deflection on a 453 scope. Current then is calculated.

Frequency

$$4 \text{ MHZ} \quad I = \frac{E}{Z} = \frac{100 \text{ MV}}{5} = 20 \text{ milliamp}$$

$$60 \text{ HZ} \quad I = \frac{E}{Z} = \frac{100 \text{ MV}}{.0012} = 83.3 \text{ amperes}$$

60 HZ current should be measured with a clamp-on ammeter; not the Stoddart Probe.

Use the Stoddart Probe to:

1. Measure RF current in:
 - a. A single wire (green wire ground)
 - b. Multi conductor cable
 - c. Grounding and bonding straps
 - d. External surface of conduit or shielded cable
2. Check wave form of inverter converter cables
3. Detect standing waves of frame members

For other specific uses, see Service Aids under General CEM Index, Environmental Analysis and Instrumentation, EMC/Noise Power Evaluation.

191/03-19-71

274 P/S MAINTENANCE ANALYSIS PROCEDURE (MAP) General

Purpose: To provide a procedure that will enable isolation and replacement of a defective component within the Converter/Inverter (C/I) units, P/N 5703200 and P/N 5712000.

Certain sections of this MAP will require the use of a pair of indicators in place of the inverter fuses. It is recommended that these indicators be assembled immediately so that they will be available when needed. Two types can be used and are as follows:

- 1) Indicator light - consists of a clear 6W 120V bulb and socket such as the GE 6S6. Alligator clips should be soldered to the socket leads. If blown fuses are available, the socket leads may be soldered to the end caps of the fuses instead of the clips. When using these indicators, any amount of brilliance, even a dull filament glow, indicates trouble. Check bulbs for open filaments before each use to prevent erroneous branching within the MAP.
- 2) Resistor indicator - a 50K ohm 2W resistor is soldered as above. These indicators are used in conjunction with the CE VOM and will indicate higher than normal leakage currents or partial shorts that may not be detected using the indicator lights. Use of the resistors will require a reading across both at most decision blocks referencing the indicators. Normal component leakage current will develop approximately 1.5V across these resistors. Although a maximum allowable reading has not been established, it is felt that an additional 5V drop should be suspect.

CARE MUST BE TAKEN TO INSURE ADEQUATE INSULATION OF SOCKETS AND LEADS TO PREVENT SHOCK HAZARDS AND ELECTRICAL SHORTING.

SAFETY PRECAUTIONS

1. VOLTAGES IN EXCESS OF 300V ARE PRESENT IN THE C/I UNIT. Observe all IBM safety practices while working on this unit. Remove all jewelry and wear IBM approved safety glasses.
2. DO NOT FLOAT THE SCOPE. All scoping procedures will be done with the scope grounded to the C/I chassis.
3. ALL POWER MUST BE REMOVED WHEN INSTALLING OR REMOVING ANY WIRING. If extension jumpers are required due to short system cabling, tape all connections with electrical tape before powering up.
4. WAIT A MINIMUM OF 30 SECONDS FOLLOWING A POWER OFF BEFORE STARTING ANY ACTION REQUIRING CONTACT WITH ANY COMPONENT IN THE C/I UNIT. This will provide adequate time for the filter capacitors to discharge.
5. The C/I requires two voltage inputs, 28V and 208-230V (WTC requirements may differ). While using this MAP, some sections require the removal or application of one or both inputs. The following definitions will apply.
 - a) NORMAL POWER ON or OFF - 208-230V three phase is applied or removed by any means available to the using system. The 28V input is still present on the C/I.
 - b) COMPLETE POWER ON or OFF - Both inputs are applied or removed. Use system CB for a complete power off.

CAUTION - ALWAYS initiate a normal power off before tripping system CB.

LINE INTERROGATION DEVICE OPERATING LIMITS

Establish the triggering limitations of the Line Interrogation Device (LID) Part #453599 and the inherent delay within the circuitry of LID to capture a picture of a disturbance using the 453 scope camera Part #453650.

1. The sensitivity knobs are adjusted to trigger on a particular voltage level or amplitude of disturbance.

A disturbance, to be sensed by LID, must be at least two usec in duration, and beyond the amplitude setting of the sensitivity knobs. Six additional usec delay is required before the 453 oscilloscope can be triggered by the LID circuitry.

As an example, assume LID is triggered by a .9 usec square pulse disturbance. The scope camera would capture only one usec of the trailing edge of this disturbance. A 7 usec pulse would trigger LID, but the disturbance would not be captured on film.

If the rise time of the disturbance is slower than the fast rise time of the square pulse, more than 2 usec may be required to trigger LID.

2. Each half cycle of the power sine wave is compared to the preceding half cycle by the LID's detection circuitry. If the disturbance has a slow rise time, i.e., "greater than one-half cycle to reach sense amplitude", LID will not trigger. The Esterline Angus Recording Voltmeter, Part # 453571 would indicate, in this situation, that a disturbance existed.
3. The LID's internal battery must be charged (indicate white) for proper operation. The power drain of the four indicating lamps exceeds the trickle-charge to the battery and will discharge the battery within three hours. If operated only on battery (without A/C power input) and with the four indicating lamps on, the battery will discharge within one hour.

Be sure the battery is fully charged by following the charging procedures outlined in the operational manual. Removal of the indicating lamps will provide an added precaution that charge is maintained.

4. An external 12 volt battery can be used to provide an isolated power source for LID. With four indicating lamps on, the current drain will be approximately 112 milli-amperes. Current drain from circuitry alone is approximately 34 milli-amperes.

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278 ELECTROMAGNETIC COMPATIBILITY (EMC) DESIGN AND ELECTRICAL NOISE ABATEMENT ECS LISTING

Purpose:

The Customer Engineer must become aware and appreciate the importance of EMC design. He must not remove the covers, groundstraps, shields, etc., and leave them off. He must be able to recognize if existing products have noise abatement B/M's installed.

Where an environmental problem is suspected, check with the Area Technical Specialist for the latest servicing techniques.

For a guide reference, the following listing, by product, indicates the EMC design and/or EC's available for ESD noise abatement. However, this

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Incident Reporting

The IR (Incident Report) is the primary service document that a Customer Engineer is responsible for originating. It is used to identify and report all maintenance activity performed on a machine or system. Its importance cannot be stressed too highly in today's service environment. Every effort should be made to fill out the IR promptly, accurately and legibly. Accuracy includes the use of the correct service code, unit and cause code and descriptive narrative.

The IR provides input data for most of the reports used by GSD at the branch office level. These reports provide information for workload and manpower planning, product performance analysis, territory maintenance analysis and for billing purposes.

Many IBM groups, department and divisions beyond the branch office need IR data to perform their functions effectively. The major users are:

- Product Pricing Groups
- GSD Plant Service Planning Representatives
- GSD Regional and Headquarters management
- Advanced Maintenance Development
- Development and Product Engineering
- Reliability and Serviceability Engineering
- Product Test Laboratory
- Manufacturing and Quality Control
- Marketing and Financial Analysis
- Field and General Accounting

IR Data - GSD Field Support Uses:

1. Weekly/Monthly Serial IR Data Listing
This is a prime tool used by Field Support for getting early indications of potential problems. This listing is a complete list of all IR's for the week/month in serial number order. It contains complete IR data including the comments. This report is also available sorted by major/minor/cause codes, or sorted by CEH time in descending order.
2. HSIR File (Hardware Selected IR File)
This file is updated weekly. It takes approximately 8 working days from the time the CE sends in an IR until it is available at our terminals. Data can be pulled by machine type and serial number, by major/minor unit, or by part number. When there is a hint of a problem, this file is used to provide the very latest data available to define the magnitude of the problem (last 8 weeks data is available). The HSIR File is also very helpful to the SPR for determining the value of suggestions.

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