



# Maintenance Information

<b>MI</b> MAPs START EXIT 00-02  VOL 01	<b>MI</b> MAPs 04-0E 2X-4X  VOL 02	<b>MI</b> MAPs 80-84  VOL 03	<b>MI</b> MAPs 88 89  VOL 04	<b>MI</b> MAPs AX  VOL 05	<b>MI</b> MAPs AX  VOL 06	<b>MI</b> MAPs CX DX EX F1-F5  VOL 07	<b>MI</b> MAPs F7 00-69  VOL 08	<b>MI</b> MAPs F7 6A-B5  VOL 09	<b>MI</b> MAPs F7 B6-FF  VOL 10	<b>MI</b> MAPs F8 FC FD FE INDEX  VOL 11
<b>MI</b> STM LOC REM ADJ DIAGN 53 FD CONFIG  VOL 13	<b>MI</b> STM FEAT CA 5424  VOL 14	<b>MI</b> STM FEAT LA OP GUIDE PDG DIAGN CONFIG  VOL 15	<b>MI</b> POWER INTROD. PRINCIP. DETAILS REP INFO REF INFO  VOL 16	<b>MI</b> GSI INTRO MAINT DIAGN TOOLS FRIEND  VOL 17	<b>MI</b> INSTALL. MANUAL PARTS CAT. OP GUIDE PACK. INSTR.  VOL 18					



## IBM 4331 Processor General System Information

Preface

This manual provides general information to the IBM 4331 Processor. The manual contains the following major items.

- Section 1 contains an overview of the system documentation, a high level description of the system and the support subsystem.
- Section 2 describes the maintenance concept of the system, and how to use the MAPs.
- Section 3 contains information about error logging.
- Section 4 describes tools.
- Abbreviation List (page 9970).

Each section has its own table of contents.

The reader is assumed to have a good basic understanding of IBM system concepts.

The manual is not intended as a self-study course but as a recall document. It may also be used as an introduction to the system by people interested in the philosophy and concepts of the system but not in detailed maintenance or how-it-works information.

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Title: MI GSI, FRIEND  
Machine Type: 4331-2  
Power Design Level: 4/5  
B/M Number: 5683367

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# Safety

## Personal Safety

Personal safety cannot be over-emphasized. To ensure your safety and that of co-workers, always observe the safety precautions given during your safety training and adhere to the following:

## General Safety Practices

Observe the general safety practices and the procedure for performing artificial respiration that are outlined in CE Safety Practices card, Order No. S229-1264 (shown here).

## Machine Warning Labels

Pay attention to the warning labels placed in hazardous areas of the machines.

## Danger

Before switching on power, ensure that no person is exposed to risk and that all equipment covers for hazardous areas are closed.

# SAFETY NOTICES

## CE SAFETY PRACTICES

All Customer Engineers are expected to take every safety precaution possible and observe the following safety practices while maintaining IBM equipment.

1. You should not work alone under hazardous conditions or around equipment with dangerous voltage. Always advise your manager if you **MUST** work alone.
2. Remove all power AC and DC when removing or assembling major components, working in immediate area of power supplies, performing mechanical inspection of power supplies and installing changes in machine circuitry.
3. Wall box power switch when turned off should be locked or tagged in off position. "Do not Operate" tags, form 229-1266, affixed when applicable. Pull power supply cord whenever possible.
4. When it is absolutely necessary to work on equipment having exposed operating mechanical parts or exposed live electrical circuitry anywhere in the machine, the following precautions must be followed.
  - a. Another person familiar with power off controls must be in immediate vicinity.
  - b. Rings, wrist watches, chains, bracelets, metal cuff links, shall not be worn.
  - c. Only insulated pliers and screwdrivers shall be used.
  - d. Keep one hand in pocket.
  - e. When using test instruments be certain controls are set correctly and proper capacity, insulated probes are used.
  - f. Avoid contacting ground potential (metal floor strips, machine frames, etc.—use suitable rubber mats purchased locally if necessary).
5. Safety Glasses must be worn when:
  - a. Using a hammer to drive pins, riveting, staking, etc.
  - b. Power hand drilling, reaming, grinding, etc.
  - c. Using spring hooks, attaching springs.
  - d. Soldering, wire cutting, removing steel bands.
  - e. Parts cleaning, using solvents, sprays, cleaners, chemicals, etc.
  - f. All other conditions that may be hazardous to your eyes.**REMEMBER, THEY ARE YOUR EYES.**
6. Special safety instructions such as handling Cathode Ray Tubes and extreme high voltages, must be followed as outlined in CEM's and Safety Section of the Maintenance Manuals.
7. Do not use solvents, chemicals, greases or oils that have not been approved by IBM.
8. Avoid using tools or test equipment that have not been approved by IBM.
9. Replace worn or broken tools and test equipment.
10. The maximum load to be lifted is that which in the opinion of you and management does not jeopardize your own health or well-being or that of other employees.
11. All safety devices such as guards, shields, signs, ground wires, etc., shall be restored after maintenance.
12. Each Customer Engineer is responsible to be certain that no action on his part renders product unsafe or exposes hazards to customer personnel.
13. Place removed machine covers in a safe out-of-the-way place where no one can trip over them.
14. All machine covers must be in place before machine is returned to customer.
15. Always place CE tool kit away from walk areas where no one can trip over it (i.e., under desk or table).
16. Avoid touching mechanical moving parts (i.e., when lubricating, checking for play, etc.).
17. When using stroboscope — do not touch **ANYTHING** — it may be moving.

18. Avoid wearing loose clothing that may be caught in machinery. Shirt sleeves must be left buttoned or rolled above the elbow.
19. Ties must be tucked in shirt or have a tie clasp (preferably non-conductive) approximately 3 inches from end. Tie chains are not recommended.
20. Before starting equipment, make certain fellow CE's and customer personnel are not in a hazardous position.
21. Maintain good housekeeping in area of machines while performing and after completing maintenance.

## ARTIFICIAL RESPIRATION

### General Considerations

1. **Start Immediately, Seconds Count**  
Do not move victim unless absolutely necessary to remove from danger. Do not wait or look for help or stop to loosen clothing, warm the victim or apply stimulants.
2. **Check Mouth for Obstructions**  
Remove foreign objects — Pull tongue forward.
3. **Loosen Clothing — Keep Warm**  
Take care of these items after victim is breathing by himself or when help is available.
4. **Remain in Position**  
After victim revives, be ready to resume respiration if necessary.
5. **Call a Doctor**  
Have someone summon medical aid.
6. **Don't Give Up**  
Continue without interruption until victim is breathing without help or is certainly dead.

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

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



Thumb and finger positions



Final mouth to mouth position

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General System Information, Section 1: Introduction

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Documentation Organization

The documentation for the system consists of two categories:

System Library

- (available to customers)
- Processor Summary and I/O Configuration
  - I/O Device Summary
  - Data Communications Device Summary
  - Functional Characteristics and System Configurator
  - Channel Characteristics / Channel Load Sum Worksheet
  - Principles of Operation
  - Processor IM - PP / Templates
  - I/O Equipement IM - PP / Templates
  - Data Communication IM - PP / Templates
  - Compatibility Features
  - TP Configurator
  - Operators Guide

Maintenance Information (MI)

(For use by IBM and customer service personnel. Prerequisite is that the user is familiar with IBM system concepts and has attended an IBM course or equivalent).

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(WT only)

# Description of the System

The system consists of the IBM 4331 Model 2 Processor, the IBM 3278 Model 2A Display Console (Operator's Console), and a number of I/O devices. For details of the system configuration refer to "IBM 4300 Processors Summary and Input/Output and Data Communications Configurator" in the systems library.

## Operator Console

The operator console consists of the following units:

- The display unit.
  - The keyboard.
  - The operator control panel (OCP), with keys and indicator lights to control and check the basic functions.
- For details of the OCP refer to "Keys, Switches and Indicator Lights" in this section.

## Processor 4331 (Model 2)

The processor includes:

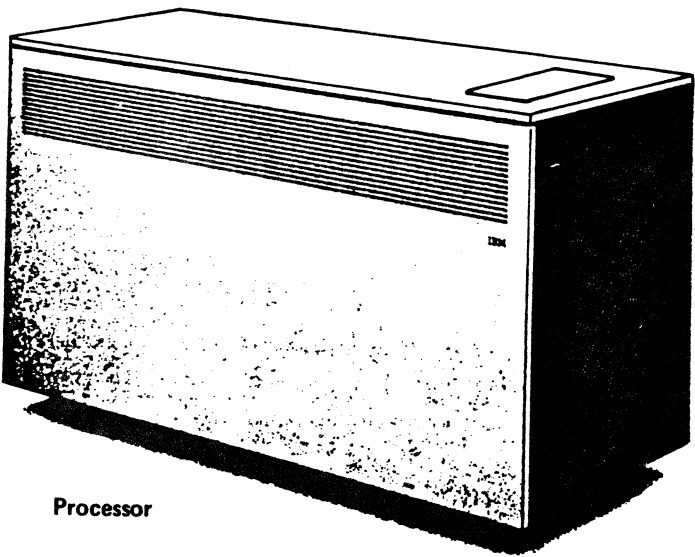
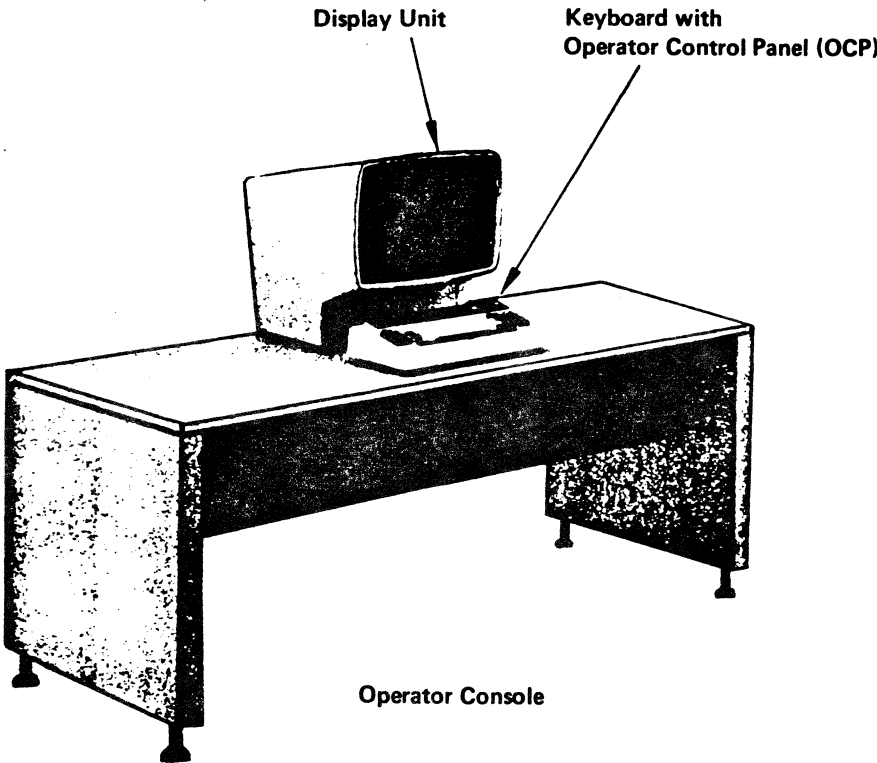
- The processing unit (PU).
  - The basic storage module (BSM).
  - Two integrated channels (IC-Bus 0 and 1) with ports for three adapters each.
- Adapters available for IC-Bus 0 are: MPX/CA, SCA2, FTA2, FTA3, and HSC.
- Adapters available for IC-Bus 1 are: FTA1, SCA 1, and BBA01.

## Processing Unit (PU)

The data flow in the PU is four bytes wide. The PU executes the entire system /370 instruction set, which includes:

- Control instructions
- Fixed point arithmetic instructions
- Floating point arithmetic instructions
- Decimal arithmetic instructions
- Logical instructions
- I/O instructions

In addition, a number of new control instructions are provided to support DOS/VSE (DOS Virtual Storage Extended).



Because all instructions and operand addresses are treated as virtual addresses, the PU uses a DLAT (Directory Look Aside Table) for fast address translation (Virtual Addresses to Real Addresses). The execution time for the instructions depends upon their complexity.

## Basic Storage Module (BSM)

The BSM is the main storage of the processor. It may be considered as having two sections:

- The storage section
- The control section

Data transfers from or to the storage take place on a full word basis (4 bytes) via the fullword BSM register.

The BSM can perform the following operations:

- Fetch 64 bytes
- Store 1...64 bytes
- Store zeros in an address range of 1K bytes

To improve reliability of the storage, the storage is equipped with single bit error corrections logic. The storage size can be 1MB, 2MB, 3MB or 4MB.

## Integrated Channel (IC)

The logic consists of four data buffers for each adapter. Each of these four buffers has a capacity of 64 bytes. A maximum of 32 buffers may be installed. The buffers are controlled via two control arrays, one is used for bus control, the other is used for storage control. The bus control array contains two fullwords per adapter, storage control array contains four words per adapter. The arrays allow for the collection of 64 bytes and subsequent transfer to main storage automatically when an adapter buffer has been filled (and vice versa).

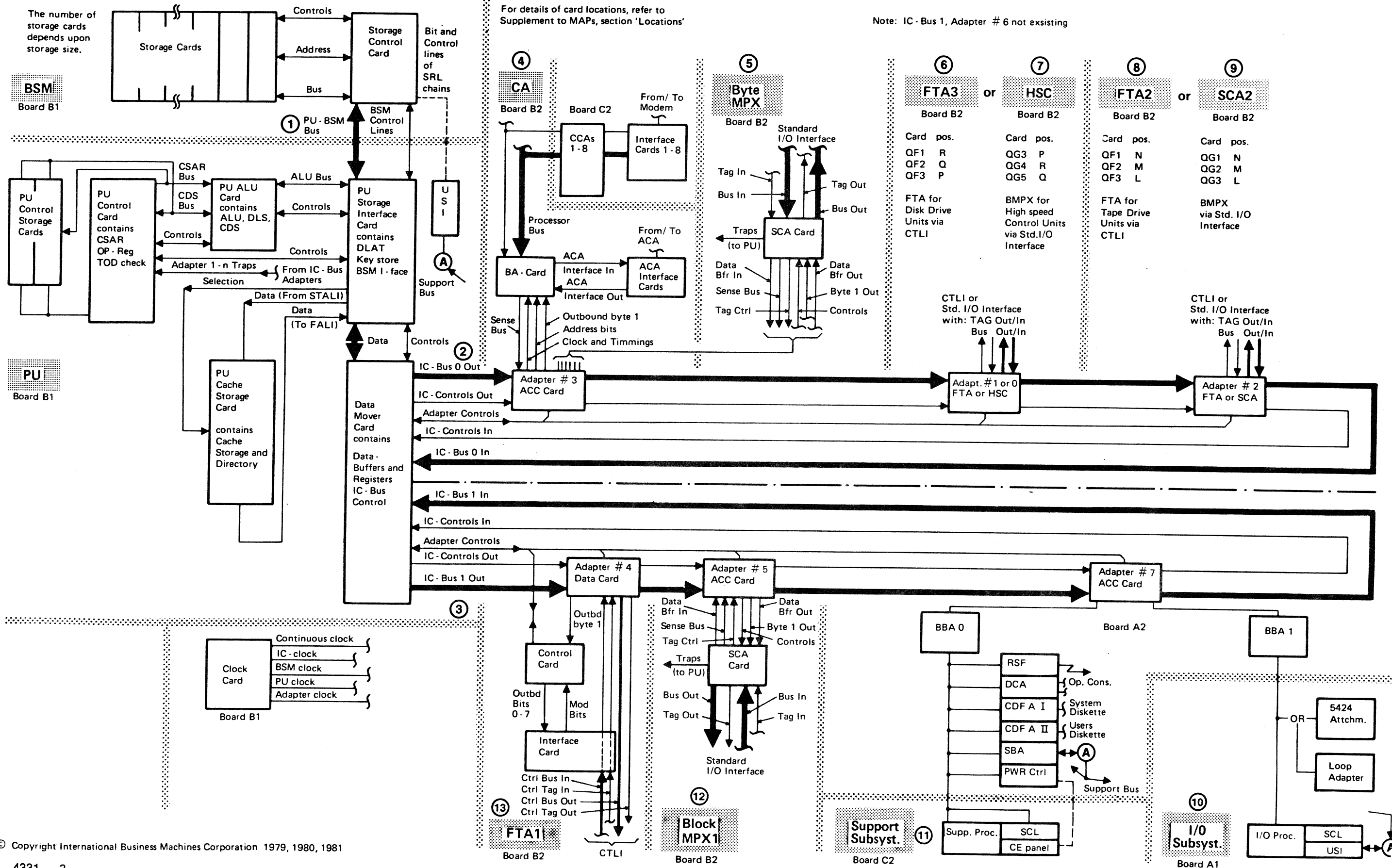
Up to three adapters may be connected to each IC-Bus. These adapters are the link between the different I/O Interfaces and the IC-Buses.

I/O interfaces are:

- Standard I/O Interface (used by the Byte and Block Multiplexer channels).
- Controller Interface (used for the attachment of disk drive units and tape drive units).
- Internal Processor Buses (used to attach the Support Subsystem, which includes the operator's console, and the I/O subsystem to the IC-Bus).

## System Data Flow (FRU oriented)

The number of storage cards depends upon storage size.



System Data Flow Description

① PU-BSM Bus

This is a four-byte-wide bidirectional bus. It connects the PU to the BSM. Control lines, which are needed to control data transfers via this bus (fetch and store operations) interconnect the BSM control logic in the PU and the run control logic in the BSM.

②③ Integrated Channel Bus (IC-Bus 0 and 1)

The following description applies to IC-Bus 0 and 1 which are identical.

Each IC-Bus is a two-byte-wide, single-loop ring bus. It connects the integrated channel (IC) with the IC-Bus adapters and is used for data transfer between the basic storage module (BSM) and the I/O devices. All adapters are connected to the IC-Bus in the same way, and most of them transfer data in cycle-steal mode. In addition to the data bus, there is a number of control lines connected to the adapters.

The IC-Bus consists of different line groups, such as:

- Ring Lines  
These are the two-byte-wide IC-Bus Out lines and IC-Bus In lines with the transfer control lines. These lines run from the PU to the first adapter, through all adapters, and from the last adapter back to the PU.
- Star Lines  
These are adapter specific (unique) lines, such as request and check lines. Each adapter has its own group of lines.
- Stub Lines  
These are the control lines, such as the clock pulses and the strobe lines, which connect all adapters in parallel.

The following adapters may be connected to the IC bus:

④ Communications Adapter (CA)

The communications adapter provides for the connection of up to 8 communication lines. The CA includes the necessary control for each line.

Binary-synchronous control (BSC), start/stop (S/S) control and SDLC (Synchronous Data Link Control) are supported.

Up to two autocall adapters (ACA) can be installed. An ACA can be used with any CA line.

⑤⑦ Channels (Byte MPX, Block MPX, and HSC)

The byte multiplexer and block multiplexer channels and also the high speed channel provide conventional Bus and Tag cables (Standard I/O Interface), to which I/O devices with their control units may be connected.

⑥⑧ File/Tape Adapters (FTA)

The File Tape Adapters allow the direct attachment of disk drive units and tape drive units. A maximum of two FTAs can be installed on the 4331 Processor, Model 2. Tape/disk drives are connected to an FTA through the Control Interface (CTLI).

FTA 1 and FTA 3 can attach disk drive units IBM 3310, 3340, 3344 and 3370.

FTA 2 can attach tape drive units IBM 8809.

For more detailed information about attachable tape/disk drives refer to 'IBM 4300 Processors Summary and Input/Output & Data Communications Configurator', GA 33-1523.

⑩ I/O Subsystem

The I/O Subsystem consists of a processor that is identical to the processor of the Support Subsystem. It has its own storage and bus system, and is connected to the IC-Bus through a bus switching unit (BSU), which in turn is made of an ACC card and a BBA card.

One out of two different I/O adapters can be attached to the I/O Subsystem:

1. 5424 Adapter  
The 5424 adapter allows to attach one IBM 5424 Multi Function Card Unit.

For more detailed information about the 5424 Adapter Feature refer to Vol.14, STM FEAT 5424.

2. Loop Adapter  
The Loop Adapter permits the attachment of up to four multiuse communication loops which can be directly attached or data-link attached.

For more detailed information about the Loop Adapter Feature refer to Vol.15, STM FEAT LA.

⑪ Support Subsystem

The support subsystem consists of a processor with its own bus, and attachments for the operator's console, power control, console disk drive, support bus and a teleprocessing remote link. This subsystem is connected to the IC-Bus via a bus switching unit (BSU), which in turn consists of an ACC card and one or two BBA cards.

# Concepts of the Support Subsystem

The support subsystem contains the hardware and provides the control logic for the following functions:

- 1. System initialization
- 2. Monitoring of the system hardware
- 3. Maintenance (See Section 2: "Maintenance Concepts")

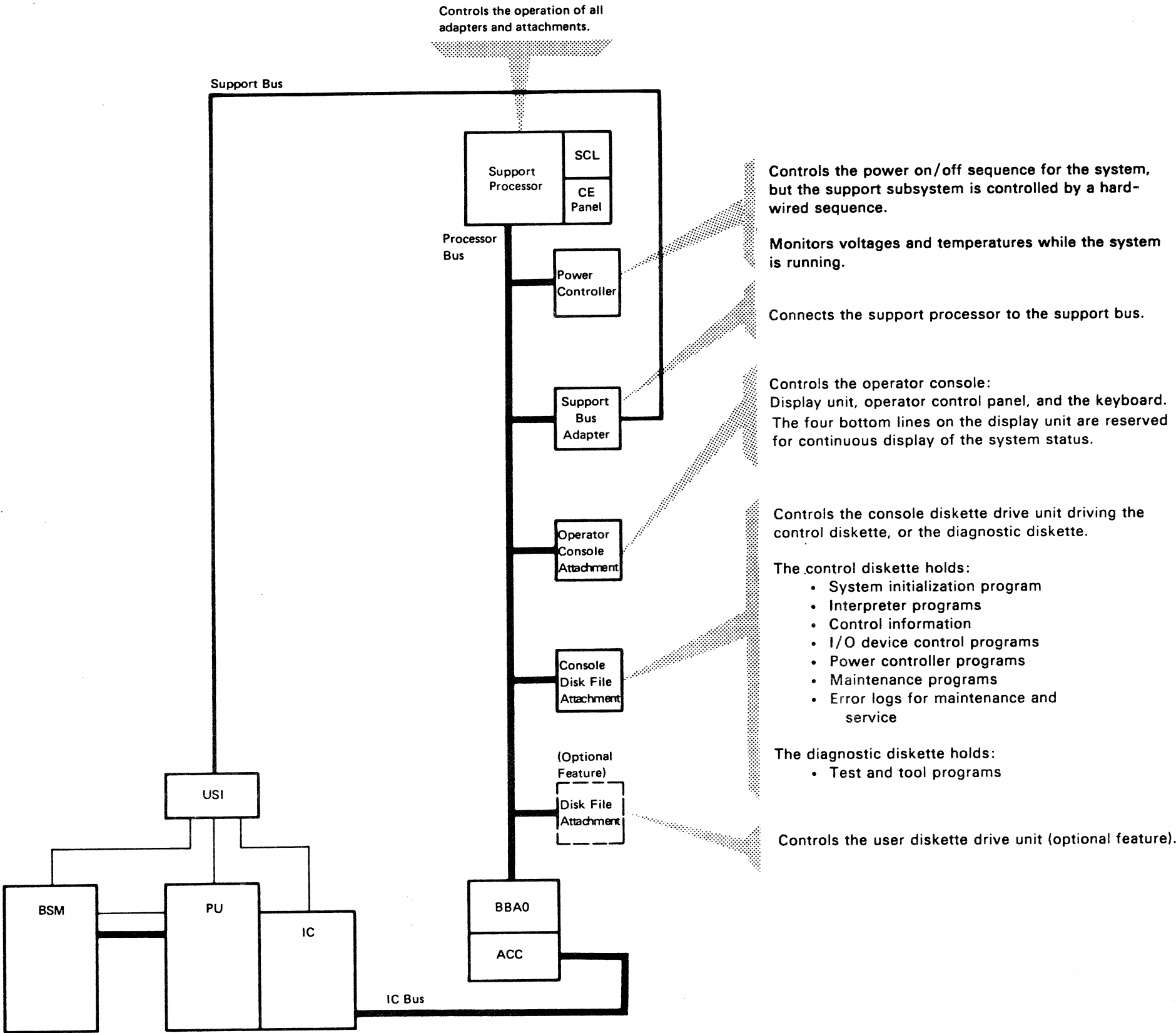
At system initialization, the support subsystem loads the control information from the control diskette into the PU, the I/O processor, and the processor of the support subsystem.

## System Initialization Procedure

Place the required control diskette in the system diskette drive unit and switch power on. This raises the power-on-reset for the support processor (SP) and starts the system oscillator and SP clock. A bootstrap program is initiated automatically to control the following functions:

- 1. Tests the support processor, including the control store, using the basic assurance test.
- 2. Tests the path to the control diskette.
- 3. Verifies correct reading of the first record of the control diskette.

The basic assurance test takes about three seconds to run, indicated by LED 7 on the CE panel, see page 1400. If a failure occurs the LED is not turned off at the end of the test. Other errors detected during the (IML) program can be displayed on the CE panel. (For details refer to 'Supplement to MAPs', Section 4: "Support Processor Display".)



# Concepts of the Support Subsystem (continued)

## Monitoring

The support subsystem monitors the system by continually and sequentially checking all system components for errors that may occur during normal system operation, and by checking all voltage levels and currents in the power supply.

If an error is detected, the support subsystem uses all of the information that is available about the failing component and analyzes it. The result is logged on the control diskette and, at the same time, a reference code is displayed on the screen.

Each component has a separate area assigned to it on the control diskette for error logging. Each component's area has two parts:

One is a record of the most recently logged item on the component, and provides some information about it.

The second part is the reference code that was displayed on the screen. A counter for each error type records the number of times each error occurred. Use these records as a starting point when intermittent errors are affecting the normal operation of the system. First work through the MAP called out by the reference code that occurs most frequently.

## Manual Controls

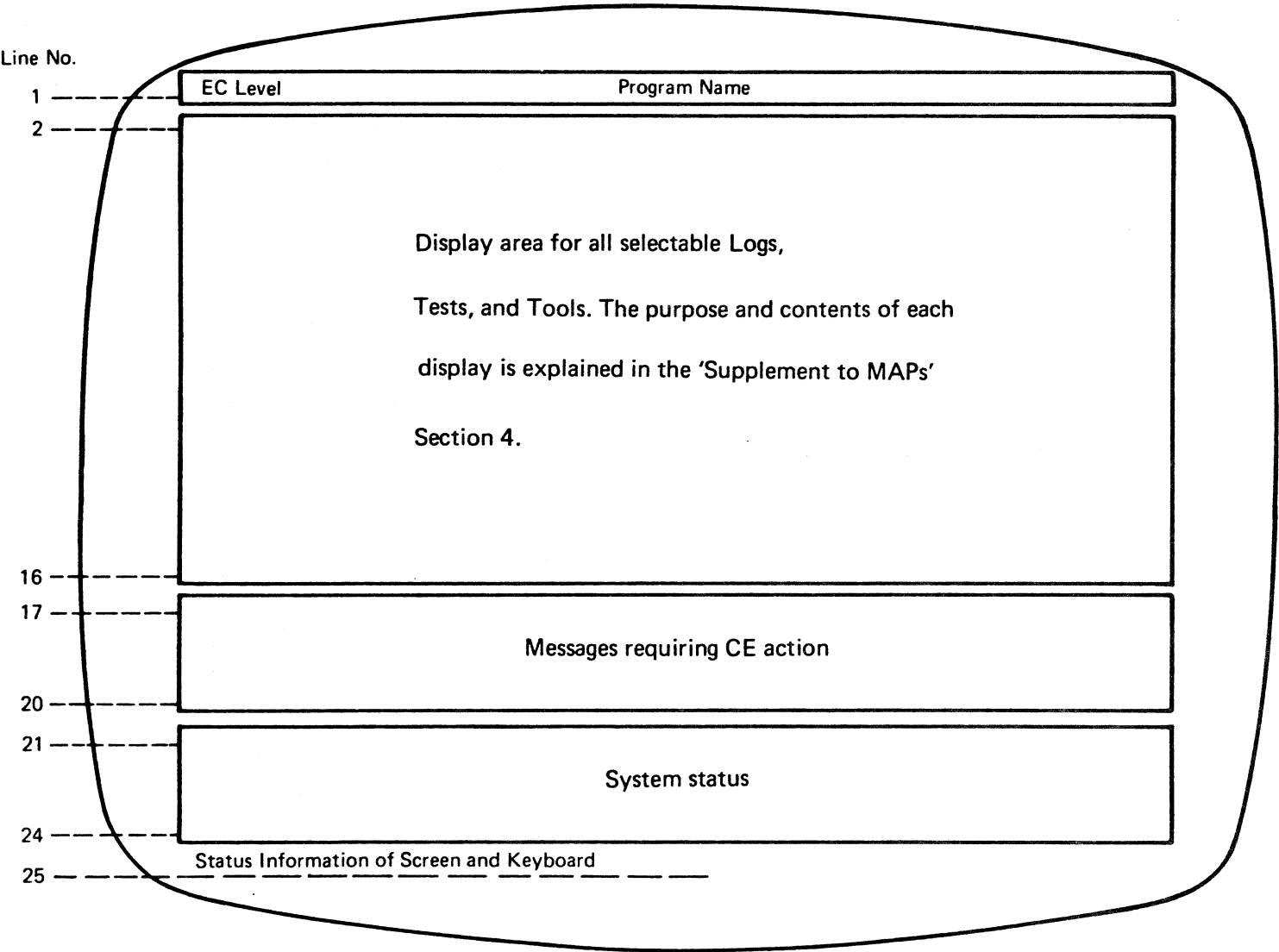
Manual operations are provided for the operator and for the CE. A brief explanation of the manual controls is given in 'POWER ON POWER OFF Control' in this section.

## Verification

The MSSS is verified by tests which are automatically executed during IML. To verify correct FRU installation or EC installation, perform IML. Errors occurring during IML before the display is operational can be displayed on the CE panel. For details, see Supplement to MAPs, Section 4: 'Support Processor Display'. In general, errors are indicated on the display console in the form of a reference code referring to the MAP chart applicable to the error.

# Basic Display Format

The following display format is used during execution of diagnostic programs:



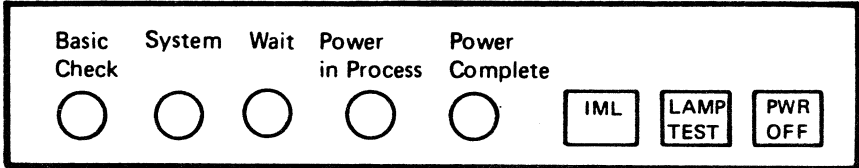
For details of line 25 refer to 'IBM 4331 Processor Operating Procedures and Problem Determination Guide'.



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Keys, Switches and Indicator Lights

Operator Control Panel (OCP)



Indicator lights and keys to check and control basic machine functions.

Indicator Lights

- Basic Check:

Indicates a malfunction in the power section that requires CE activity. It is always on, as long as the CE Mode switch is on.
- System:

Indicates that instructions are being processed.
- Wait:

Indicates that the 'wait' bit in the current PSW is set. This means that the processor is idling. The wait bit is set by the operating system.
- Power in Process:

Indicates a power-on or power-off sequence in process.
- Power Complete:

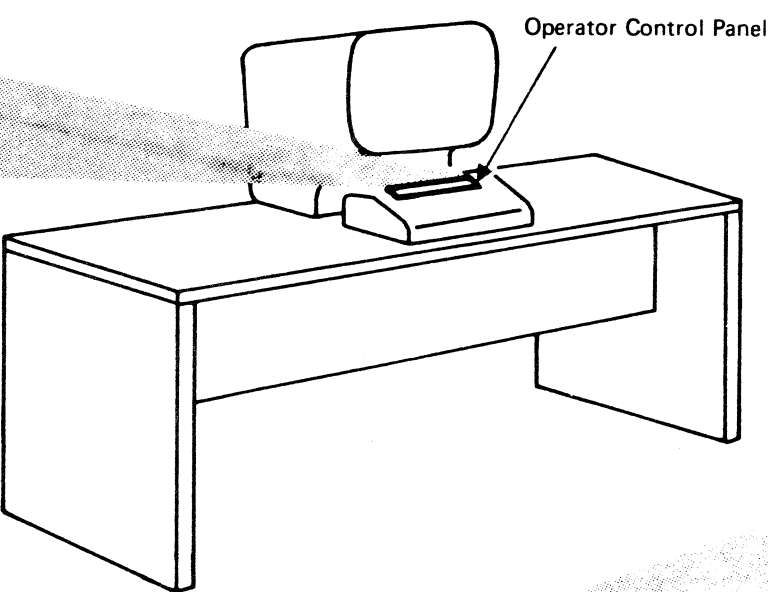
Indicates that the power-on sequence is completed.
- Keys
- IML:

Pressing this key while power is on, starts an IML sequence.
- Lamp Test:

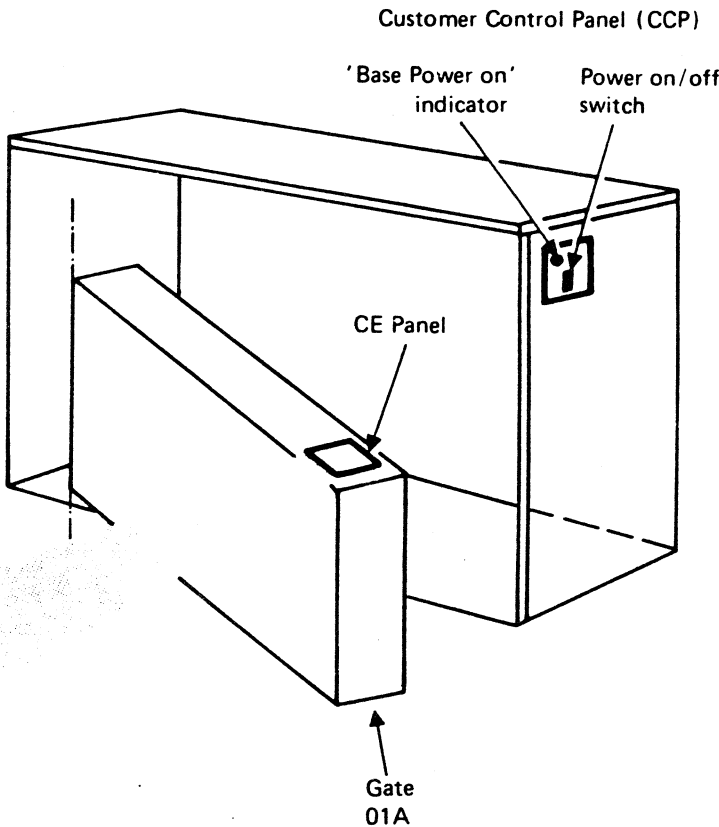
As long as this key is pressed the indicator lights on the OCP must be on and, in addition, the indicator lights on the 5424 MFCU (if attached) will also be on. The LEDs on the CE-panel are not checked by Lamp Test.
- Power off:

Pressing this key starts a power-off sequence.

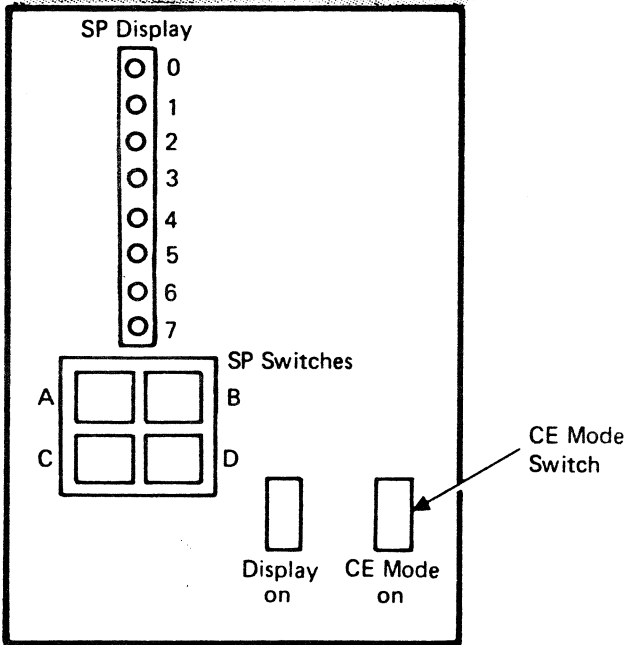
Operator Console



Processor



CE Panel



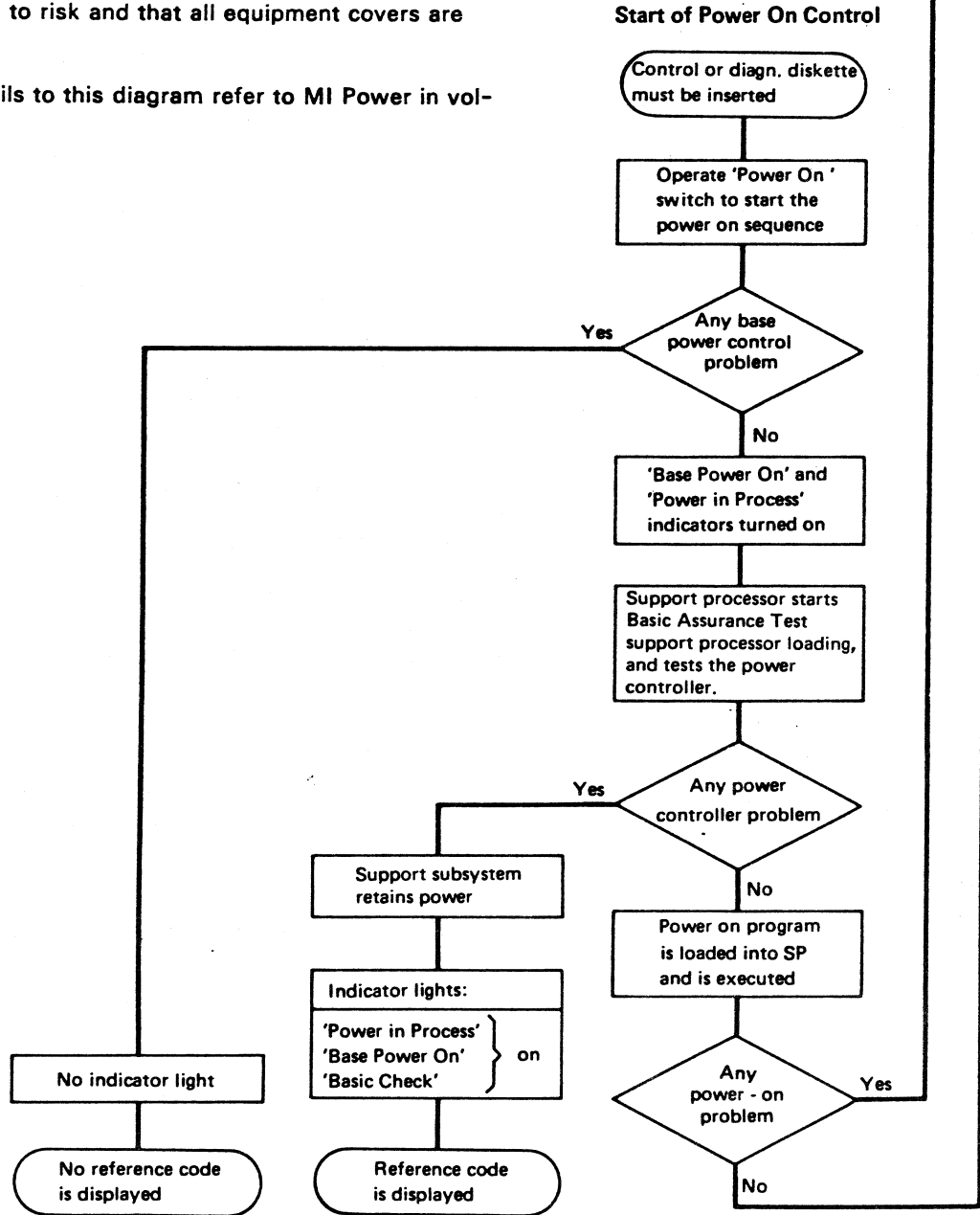
For details refer to STM, Section 4: 'Support Processor Display'.

Power On, Power Off Control

This chart shows how power is turned on and how it is monitored. The chart also shows power removal and symptoms in case of power failure.

**DANGER**  
Before switching on power, ensure that no person is exposed to risk and that all equipment covers are closed.

For details to this diagram refer to MI Power in volume 16.

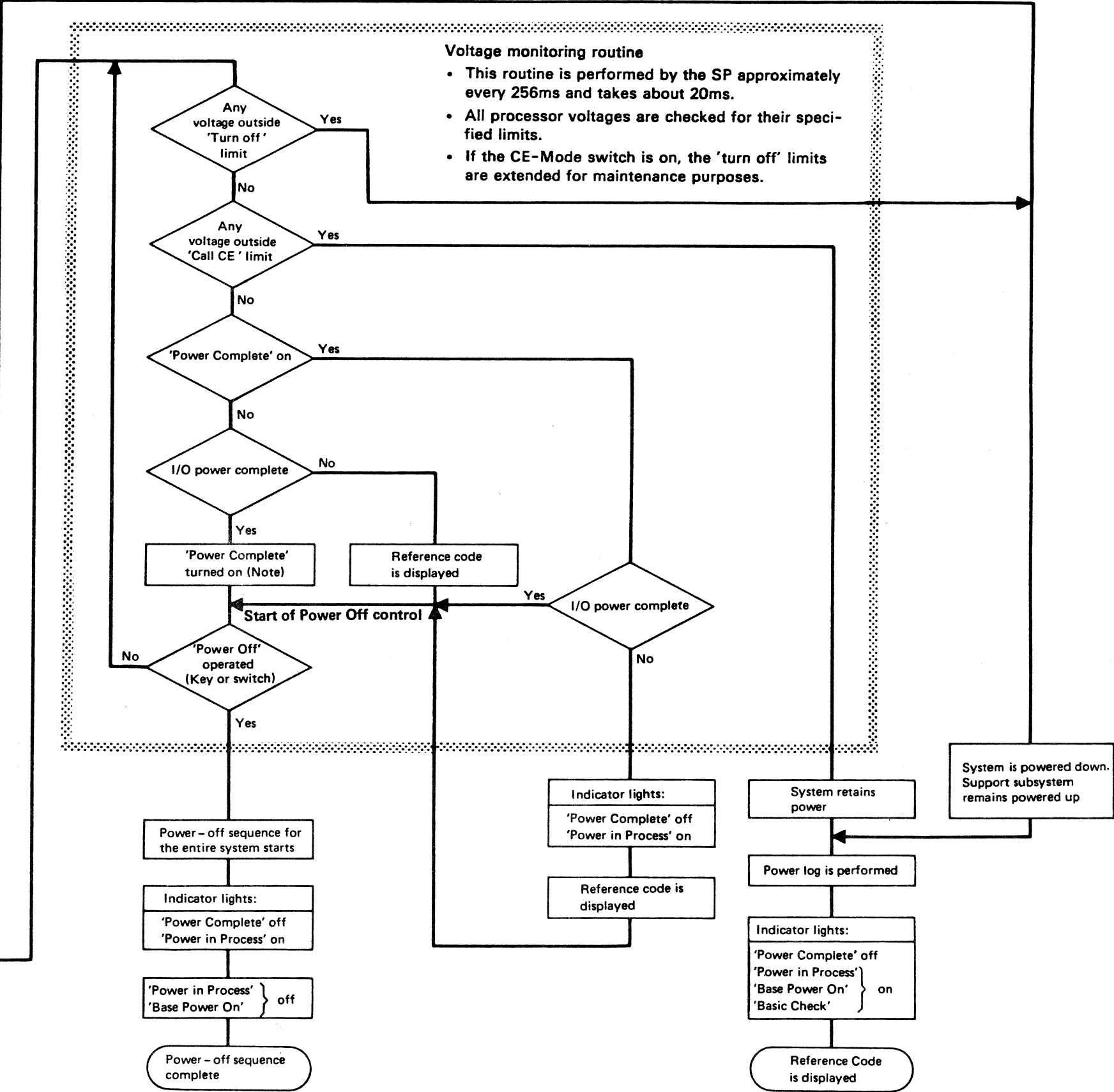


Note PROGRAM LOAD is displayed.  
To get the 'Maintenance/Service Program Selection' picture, hold ALT key pressed while pressing DIAG key.

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GSI



# Program Execution and Interruptions

The execution of machine language programs is controlled by program status words (PSWs) which are prepared by the control program (Operating System). There are old, current, and new PSWs. With program load, the new PSW's (one for each type of interruption) are loaded. After loading is complete, a 'current' PSW points with its instruction address field to the first instruction to be executed. During execution of the program the instruction address in the current PSW is continuously updated, so that it points always to the next instruction to be executed.

There may be different reasons to interrupt the execution of a program:

Machine check interrupt  
Supervisor-call interrupt  
Program check interrupt  
External interrupt  
I/O interrupt  
Restart

With any of these interruptions the current PSW is replaced by the applicable new PSW. The former current PSW becomes an old PSW and is set into a pre-determined storage location. The cause of the interruption is identified by an interruption code which is stored during the interruption. The new PSW becomes the current PSW and this PSW controls further processing. This further processing consists in the 'handling' of the interruption. Upon completion of this interrupt-handling the previously stored PSW may be restored as the current PSW which allows the PU to continue processing of the interrupted program. This PSW hierarchy allows the PU to execute different programs.

## Operation Modes

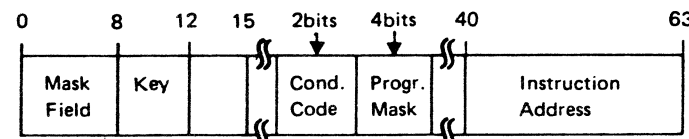
The PU may run in two operation modes which is indicated in the PSW, bit 12:

- BC mode (basic control)
- EC mode (extended control)

which is indicated in the PSW, bit 12. The PSW format for both operating modes is different.

## PSW Format

The picture shows a simplified format which is valid for either mode.



- The mask field in BC mode contains the channel mask; in EC mode the system mask.
- The key-field contains the storage key. This key is compared with the key in the key storage. Upon compare equal BSM store operations are allowed. Upon compare equal or an all zero key BSM fetch operations are allowed.
- The 4 bits following the key field define:
  - EC/BC mode
  - Machine check
  - Wait state
  - Problem state
- The condition code field indicates four different conditions (00,01,10,11) used for branching. The setting of this condition code depends on the type of instruction.
- The program mask field contains:
  - Fixed point overflow mask
  - Decimal overflow mask
  - Exponent underflow mask
  - Significance mask
- The last three bytes of either PSW contain the instruction address, which points always to the next instruction to be executed.

## Other Control Words

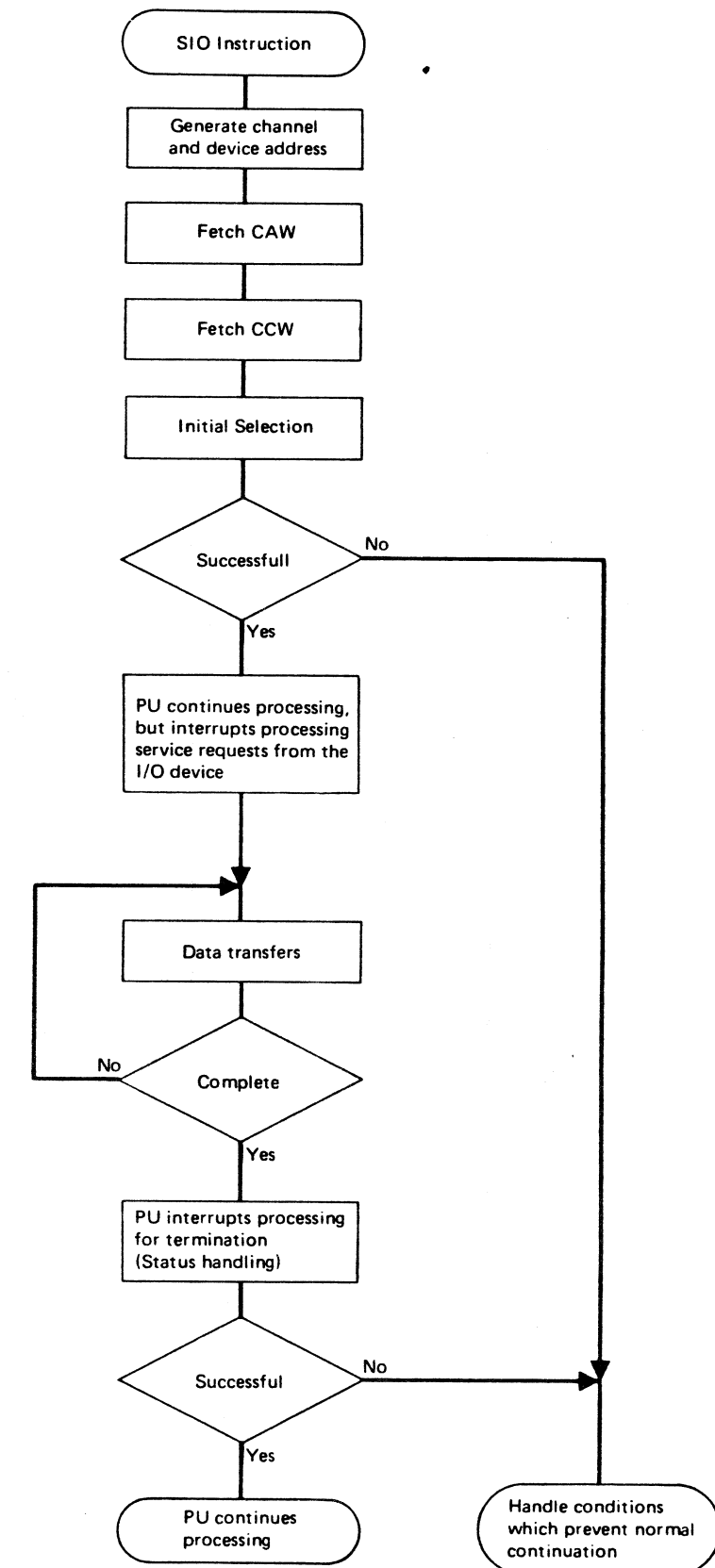
In addition to the PSW, there are some more control words used in connection with I/O operations:

- Channel Address Word (CAW) which points to a command which is to be executed by the addressed I/O device.
- Channel Command Word (CCW) which contains the command and the data address for the I/O operation to be executed by the addressed I/O device. Several such CCW's make up an I/O program.
- Channel Status Word (CSW) which contains status information on the execution of an I/O operation.

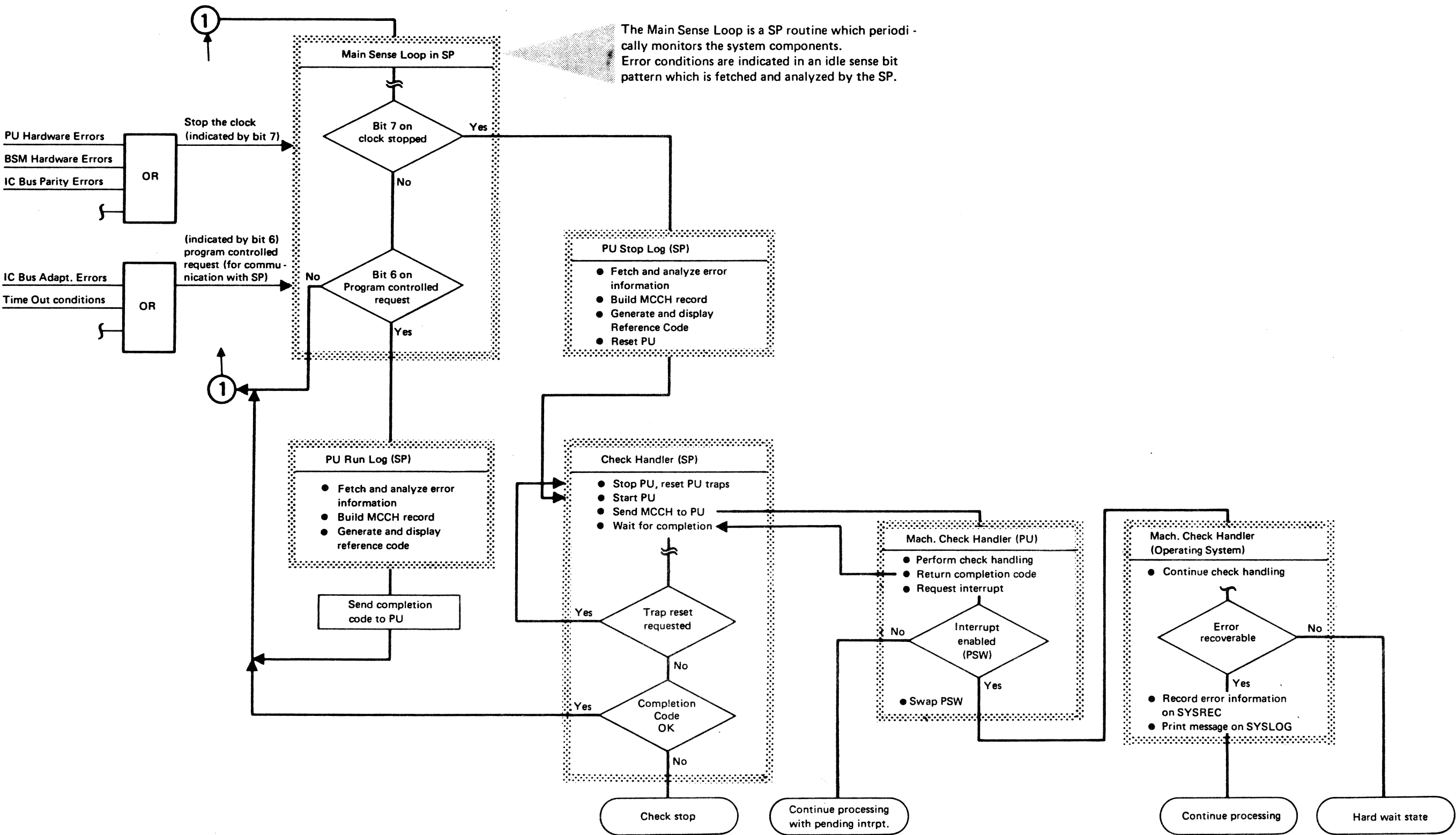
Refer to the System Reference Summary for more information on:

Instruction Formats and Types  
PSW Formats  
CAW, CCW, CSW Formats  
Condition code setting

## Principles of an I/O Operation



# PU to SP Communication in Case of Errors



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General System Information, Section 2: Maintenance Concept

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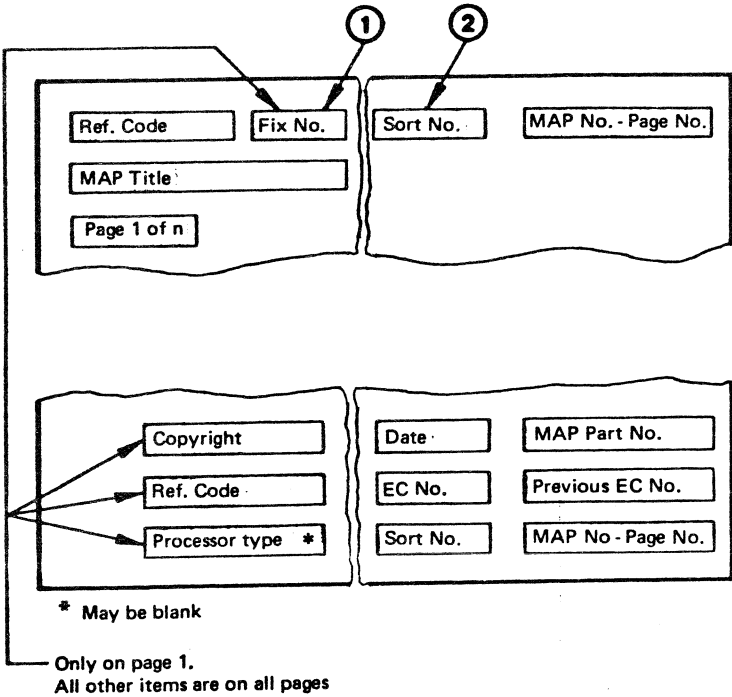
Unit Type Table

BASIC GROUP	DETAILED GROUPS	REMARKS
0X = No reference code on screen	00 = Introduction, Start MAP, Exit MAP, Call for Support MAP  01 = Procedures in STM 02 = Power problems 04 = IML problems 06 = Operator console failures 08 = Support subsystem 0C = Miscellaneous 0E = Operating system (DOS, EREP)	
2X = IC-bus 4331-1	None	4331-1 only
3X = IC-bus 4331-2	None	4331-2 only
4X = PU-BSM	49 = PU-BSM 4331-1 4B = PU-BSM 4331-2	4331-1 only 4331-2 only
8X = Channels	80 = BMPX 1 81 = BMPX 2 82 = HSC 84 = MPX 88 = CA channel checks 89 = CA unit checks	4331-2 only
AX = I/O Sub-system	A0 = Processor bus and adapter interfaces A1 = Processor A2 = I/O BBA (1) A3 = SCL adapter A8 = Loop adapter AA = 5424 adapter	

BASIC GROUP	DETAILED GROUPS	REMARKS
CX = Disk/Tape adapters	C0 = CTLI and interface adapters C1 = FTA1-CTLI C2 = FTA2-CTLI C3 = FTA3-CTLI C4 = FTA1 C5 = FTA2 C6 = FTA3 C8 = ) reserved C9 = ) CA = )	4331-2 only  4331-2 only
DX = Disk/Tape ILTs	D0 = ILT monitor D8 = 8809 D9 = 3330 DA = 3340 DB = 3344 DD = 3310 DE = 3370	
EX = System related problems	E0 = IML problems / power on reset E1 = Timer damage E4 = PU programmed clock stop E6 = Customer manual operations E8 = Ambient recording EA = Internal program checks (excluding SPIL)	
FX = Support Subsystem	F0 = Processor bus and adapter interfaces F1 = Support Processor F2 = SP BBA (0) F3 = SBA/SCL adapter F4 = Transmit/receive F5 = SPIL program checks F7 = Power system F8 = Remote support F9 = DCA I/O counter overflow FC = Log-in and idle programs FD = Diskette drive adapter FE = Utilities	

MAP Page Layout

Common Parts



1 Fix Number

- Shows the number of fixes of the MAP. The CE has to update this number, whenever he inserts a fix.
- The fix number of a MAP updated by an engineering change shows the latest fix.

2 Sort Number

- The sort number is used to insert additional MAPs in the correct sequence.

The other items are self explanatory.

Reference Code Directory

The reference code directory in front of each basic group of the MAP package is used to find the appropriate MAP for troubleshooting.

Example:

REFERENCE CODE DIRECTORY		
Refer. Code	Title	Go to MAP
00000001	Start MAP	0000
00000101	Exit MAP	0001
01nnnnnn	.....	01nn
02nnnnnn	.....	02nn
0Ennnnnn	.....	0Enn

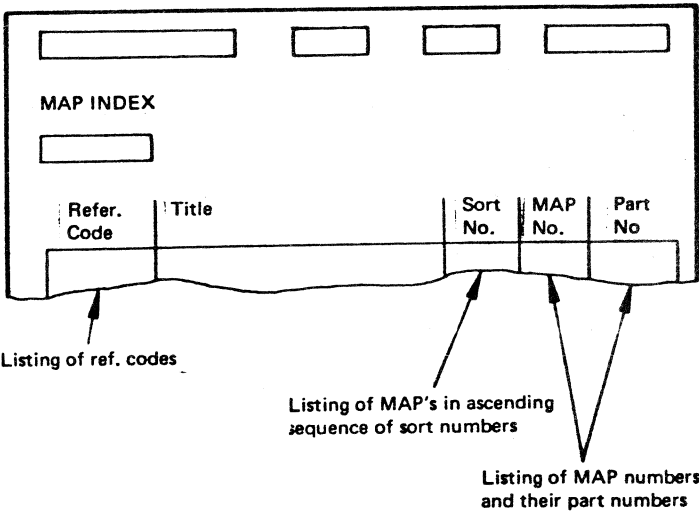
Labels for the table:

- Basic Group (points to the first two rows)
- Detailed Group (points to the third row)
- Error description (points to the title column)
- Direct to the MAP associated with the respective Ref. code (points to the 'Go to MAP' column)
- Unit Type (for details refer to Unit Type Table, page 2100). (points to the last row)

MAP Index

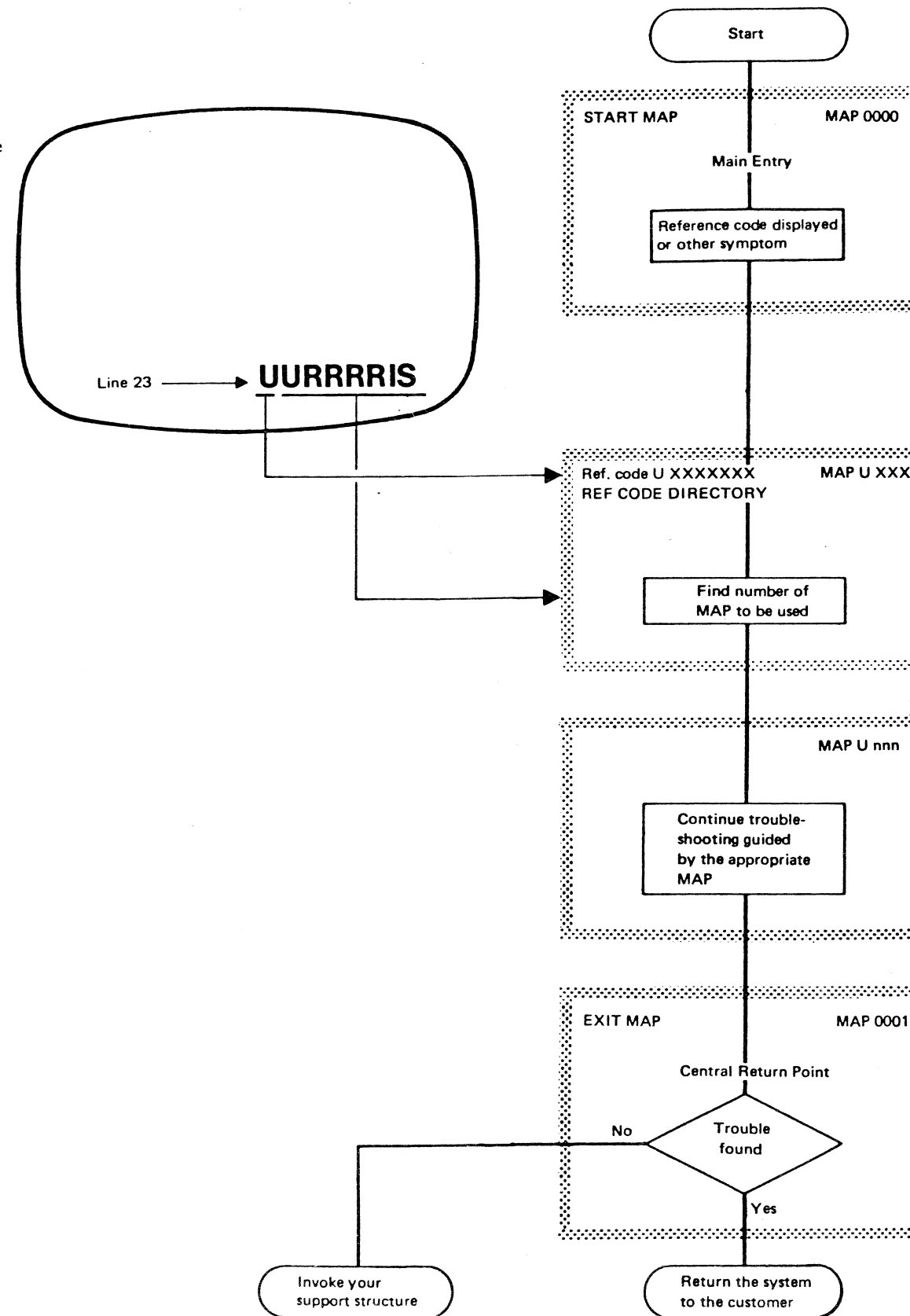
The MAP index is a table of contents of the entire MAP package. It is subdivided into two groups:

The first group is a listing of all system MAPs, the second group is a listing of all power MAPs.



# How to Use the MAPs

- Start troubleshooting always using the START MAP.
- Terminate troubleshooting always using the EXIT MAP.



## The Start MAP contains:

- The main guidance and distribution to all other MAPs.
- The 'main entry' with information for troubleshooting.
- The start point for troubleshooting.

Whenever a signal has to be probed, use the General Logic Probe (GLP), described in Section 4 of this manual.

## The Exit MAP contains:

- The 'central return point' after all CE activities.
- Procedures for final verification of all maintenance activities.
- Instructions to invoke support for a solution, if the MAPs fail.

Preventive Maintenance

The only preventive maintenance on the central electronic complex of the system has to be done on the air filters.

These filters are located in the front and back cover and should be maintained at least once a year. To do a proper maintenance the filters must be removed since dust and other particles which reduce air throughput collect on the inner side, see Figure B. Clean or replace the filters.

In a very contaminated enviroment cleaning or replacement may be necessary more often.

After you have cleaned or replaced the filters make an entry in the inspection table, see Figure A.

Inspection Table

INSPECTION DATE	REPLACED	CLEANED
Air filter part no. 8483722		

Figure A

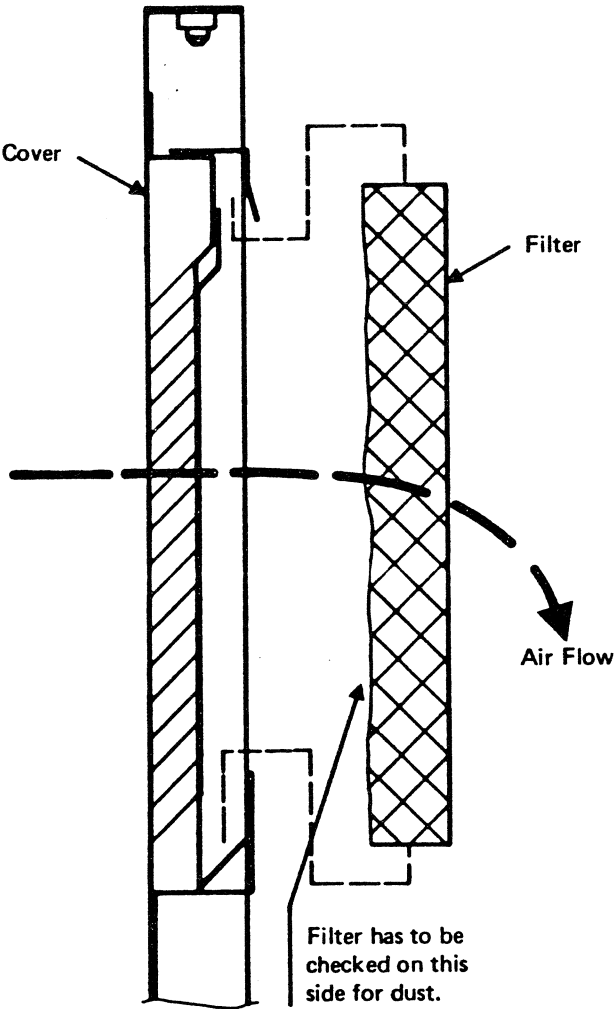


Figure B

# General System Information, Section 3: Diagnostic Information

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Log

Principle

- Errors detected in the CPC (Central Processing Complex), and CA unit checks are logged on the control diskette. The control diskette contains two log areas:  
‘Reference code log area’ and ‘detailed log area’. All logs are stored in the ‘reference code log area’. A number of logs contain additional error information which is stored in the ‘detailed log area’. Reference code logs and detailed logs can be displayed by the M/S Program Selection.
- Machine/ and channel-checks generated from CPC error data, and unit checks (except CA unit checks) are recorded by the operating system and can be fetched by EREP.

Logging of Errors in the Central Processing Complex

The CPC includes the PU, BSM, IC, IC bus, adapters, attachments, and all buses located within the processor.

Any error detected within the CPC is reported to the support processor. The support processor executes the corresponding log analysis program. As a result the following information is stored on the control diskette:

- Last detailed log per unit (last log raw data)
- Pointer to last detailed log
- Reference codes of all logged errors
- Total count per reference code entry
- Date of last error per unit
- Date of last erase per unit

Any date is displayed in the following format:  
MM DD HH MM  
(month/day/hour/minutes)

Reference Code Log Area

This area contains all reference code logs collected since the last erase date, representing a system log overview.

Up to 148 different log types can be stored in this area. If the same log type occurs several times (same reference code), no new entry is made, but only the fields for ADD INFO, COUNT, DATE, and TIME of the first entry are updated. The counter per log type may be 1 to 255.

If there is space left for only 10 entries or less in this log area, a warning REF CODE LOG AREA FULL is displayed on line 23. If the entire area is filled, the last position is always overloaded.

The reference code log area also contains the area for the ‘Log Distribution Statistic’.

Reference Code LoG Display

The reference code log display consists of two parts:

Log distribution statistic,  
Reference code log.

Log Distribution Statistic

Keeps tracks of the logging history. A reference code pre-analysis is performed to offer the correct reference code for entering the MAP.

(CA unit check logs do not update the log distribution statistic.)

Detailed Log Area

Each log type has its individual log area:

Header	last log raw data	compressed log area.
--------	-------------------	----------------------

Header layout (common for all logs):

Name of log type e.g. PU, FTA etc.  
Date of last log erase } contains zeros  
Date of first log } if TOD was  
Date of last log } not available  
Total count of logs for this log type  
Last reference code.

Last log raw data: error data from the failing unit during the last log-in

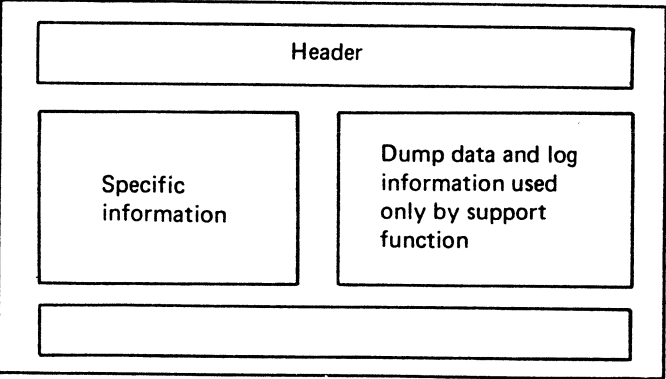
Compressed log area: collected data for the total number of logs for this log type.

Dump Type Logs

The following detailed logs are dump type logs:

BMPX= Block multiplexer channel  
MPX = Multiplexer channel  
IOC = I/O Controller  
BBA0 = BBA0  
BBA1 = BBA1  
PUPR = PU Program check  
SPIL = SP Interpreter check

Dump type log display



General System Information, Section 4: Tools

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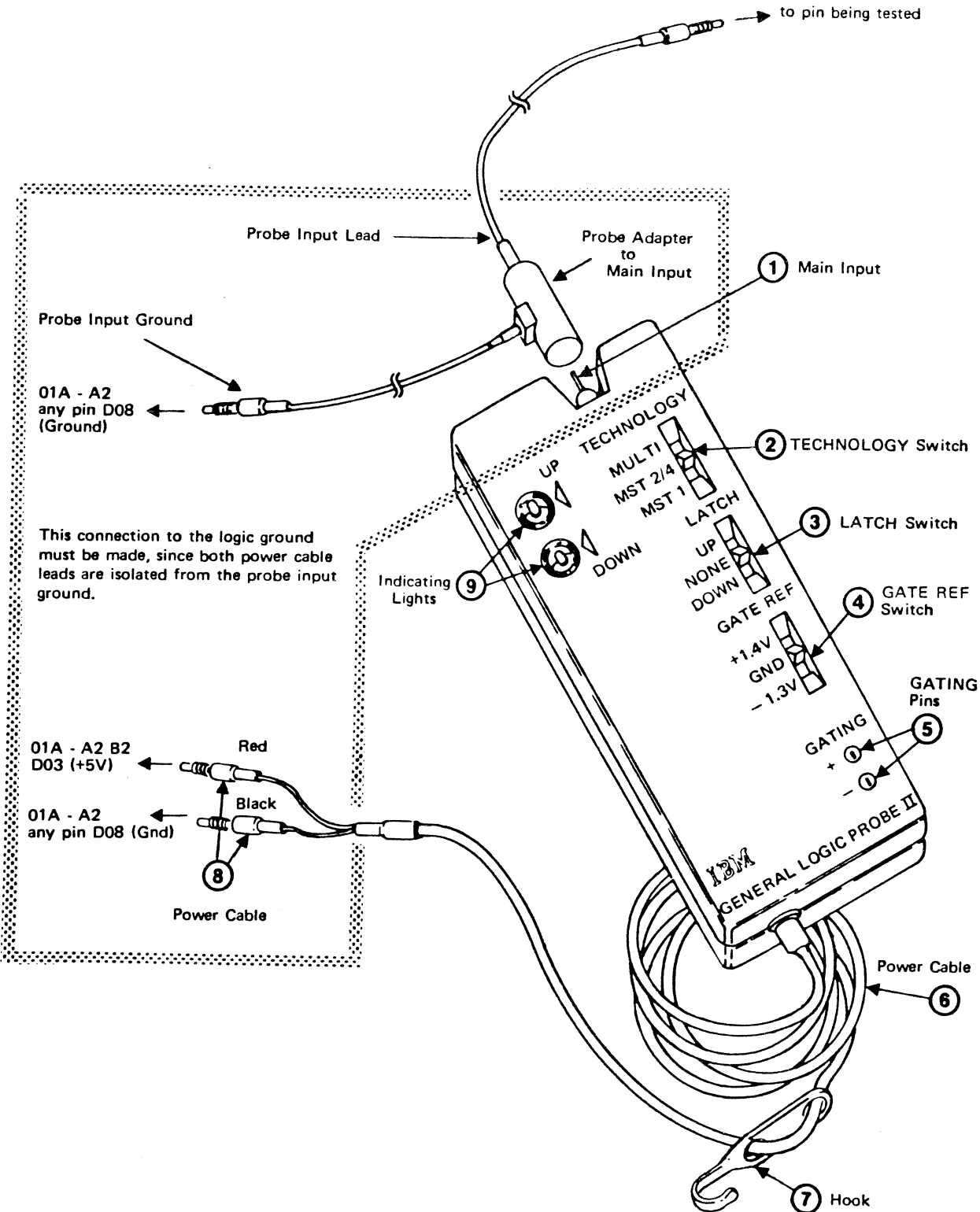
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General Logic Probe II	4005

# General Logic Probe II (GLPII)

The GLPII is a tool used to detect logic signals. Its operation and maintenance are described in detail in the 'General Logic Probe II Manual', SY27-0127. The GLPII can be used to check signals of two technologies in the system (Dutches and VTL), which are compatible; therefore the following guide applies to both technologies. It does not replace or override the instructions in the GLPII manual.

## Preliminary Setup with Checking for Correct Operation

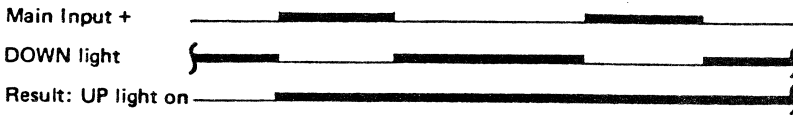
1. Connect cables as shown.
2. Set TECHNOLOGY switch 2 to MULTI.
3. Connect probe input lead to 01A-C2 F2 U02 (+osc. out):
4. Both indicating lights 9 have to be on.
5. Connect probe input lead to 01A-B2J03, or D03, or U03 (+5V). Up indicator should be on. If the down indicator is on, it usually indicates a failure of the probe input around lead.



## Latch Function

1. Perform preliminary setup with checking for correct operation.
2. Set TECHNOLOGY switch 2 to MULTI.
3. Set LATCH switch 3 to NONE.
4. Connect probe input lead to pin being tested.
5. If there is a valid static logic condition present, one of the indicator lights 9 is turned on:
  - If the UP light is on, set the LATCH switch to DOWN,
  - If the DOWN light is on, set the LATCH switch to UP.
 the light, which is off will be turned on, and both lights stay on.

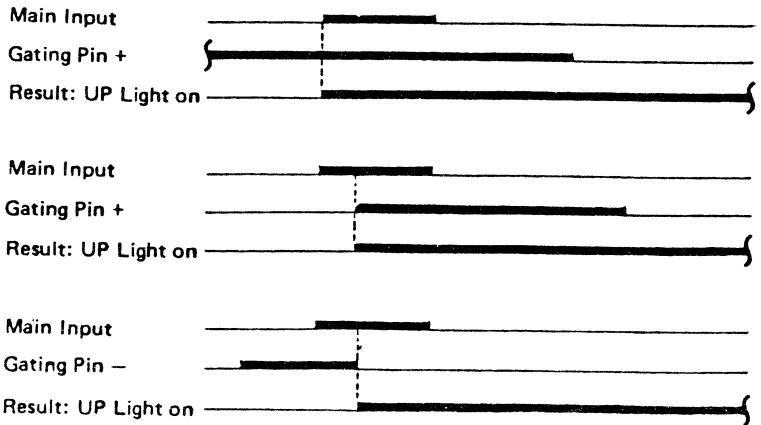
Example: The DOWN light was turned on in step 5, therefore the LATCH switch has been set to UP.



## Latch Function with Gating

1. Perform preliminary setup with checking for correct operation.
2. Set TECHNOLOGY switch 2 to MULTI.
3. Set LATCH switch 3 to the expected level.
4. Set GATE REF switch 4 to +1.4 V.
5. Connect the board pin used for gating to the appropriate GATING pin 5.
6. Connect probe input lead to the pin being tested.
7. If there is no signal on the gate, the probe operates in the normal way. If, however, a signal is on the gate at the same time, a signal is present on the main input, the appropriate indicator light 9 is turned on.

### Examples:





# Abbreviation List

Abbr.	Abbreviation	Cap.	Capacitor	DAD	Device Adapter
AC	Alternating Current	CAW	Channel Address Word	DASD	Direct Access Storage Device
ACA	Auto Call Adapter	CB	Circuit Breaker	DAT	Dynamic Address Translation
ACC	Adapter Common Card	CBG	Check Bit Generator	Data Mover	Hardware-part of the integrated channel
ACO	Auto Call Originator	CC	Chain Command	DBR	Data Buffer Register
ACT	Action	CC	Condition Code	DC	Direct Current
ACU	Auto Call Unit	CCA	Common Communications Adapter	DCA	Display (Device) Cluster Adapter
ADC	Adapter Card	CCP	Customer Control Panel	DCD	Data Carrier Detect
Addr.	Address	CCW	Channel Command Word	DCI	Director-Controller Interface
ADI	Address In	CD	Chain Data	DDA	Direct Disk Attachment
adj.	adjust, adjustment	Cd	Card	DE	Device End
ADO	Address Out	CDF	Console Disk File	Dec.	Decoder, Decimal
Adpt.	Adapter	CDFA	Console Disk File Attachment	Del.	Delay
AFL	Automatic Field Length	CDR	Characteristic Difference Register (floating point)	Descr.	Description
ALD	Automated Logic Diagram	CDS	Central Data Switch	Diagn.	Diagnostics
Aligner	allows selection of individual bytes in a full word	CE	Customer Engineer	DIB	Data In Buffer
ALU	Arithmetic and Logic Unit	CE	Channel End	Dim.	Dimension
AMD	Air Moving Device	CET	Central European Time	Dir.	Directory, Direction
ANR	Alphanumeric Replacement	Char.	Character	Displ.	Display
AR	Attention Routine	CHK CTRL	Check Control	Disc.	Disconnect
AR	Amplifier	CKD	Count, Key, Data	Div.	Division, Divide
AS	Analog Sense	Ckt.	Circuitry, Circuit	DLAT	Directory Look-Aside Table
ASC	Adapter Specific Card	Clk.	Clock	DLS	Data Local Storage
ASCP	Automatic System Checkout Program	Cmd.	Command	DM	Data Mover
ASR	Adapter Status Register	CMO	Command Out	DOB	Data Out Buffer
Atchmt.	Attachment	Comp.	Comparator, Compare	DOS	Disk Operating System
		CNCL	Cancel	DOS/VS	Disk Operating System/Virtual Storage
		CNSL	Console	DOS/VSE	... Extended
BA	Bus Adapter	Cnt.	Count(er)	DR	Driver
BAC	Buffer Address and Control	CNTLD	Controlled	DS	Digital Sense
BACR	Buffer Address Compare Register	COB	Card on board	DSR	Data Set Reading
BAT	Basic Assurance Test	COER	Correctable Error Request	DTE	Data Terminal Equipment
BBA	Bus to Bus Adapter	Con.	Connector	DTM	Data Transfer Mechanism
BC	Basic Control Mode	Cont.	Contact		
Bd	Board	COS	Call originate status	EC	Engineering Change
Bfr.	Buffer	CP	Circuit Protector	EC	Extended Control Mode
BIB	Bus In Buffer	CPC	Central Processing Complex	ECC	Error Correction Code
BIR	Bus In Register	CRC	Cyclic Redundancy Check	EIA	External Interface Adapter
Bksp.	Backspace	CRT	Cathode Ray Tube	EI.	electrical, electronic
BMPX	Block-Multiplexer Channel	CS	Cycle Steal	EM	EMC Monitor
BOB	Bus OUT Buffer	CS	Control Storage	EMC	Electromagnetic Compatibility
BOR	Bus-Out Register	CSAR	Control Storage Address Register	Emu.	Emulator
BPC	Base Power Control	CSB	Control Storage Buffer	ENBL	Enable
BSC	Binary-Synchronous Control	CSCB	Cycle Steal Control Buffer	EPO	Emergency Power Off
BSM	Basic-Storage Module	CSCW	Cycle Steal Control Word	EREP	Environmental recording, editing, and printing
BSR	Basic-Status Register	CSW	Channel Status Word	ERR	Error
BSU	Bus Switching Unit	Ctrl.	Control	ESD	Electrostatic Discharge
Bwd.	Backward	CTS	Clear to send	ESDM	Electrostatic Discharge Monitor
		CU	Control Unit	EXT	Extension
				Ext.	External
				Extr.	Extract(ion)
C-Reg.	Control Register	DAA	Data Access Arrangement (non IBM equipment)		
CA	Communications Adapter	DAC	Digital Analog Converter		
CAC	Common Adapter Code				

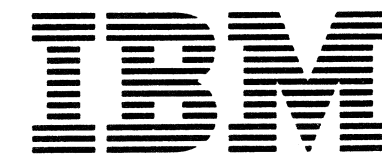
Abbreviation List (continued)

FA	Functional Adapter	IPS	Integrated Power System	OC	Overcurrent
FA	File Adapter	INTR	Interrupt, Interruption	OCP	Operator Console Panel
FALI	Fetch Aligner	Irpt.	Interrupt, Interruption	Ofi.	Overflow
FBA	FB-512 (All fixed block references)	I-Step	Instruction step (mode)	Op.	Operand, Operation, Operator
FBF	FB-512 (All fixed block references)	ITC	Individual Table of Contents	Oper.Ctrl.	Operation Control
FBM	Field Bill of Material				The operation control consists of
FCS	First Customer Shipment	K	Contactar		two components, the hardware
FFBM	Feature Field Bill of Material	KB	Keyboard		component and the microcode component.
FFI	Field Feature Index	LA	Loop Adapter		These two components (mainly the
Fig.	Figure	LB	Latch Byte		micro-code component) are needed to
FL	Field Length	LC	Length Count		control the execution of the various
FL	Flip Latch	LCA	Local Channel Adapter		operations.
FP	Floating Point	LCL	Line Channel Logout	Op.-Reg.	Operation Register
FSC	Field Support Center	LE	Leading Edge	OPI	Operational In
FTA	File/Tape Adapter	LED	Light Emitting Diode	OS	Operating System
FW	Fullword	LF	Line Filter	Osc.	Oscillator
Fwd.	Forward	LM	Latch Module	OTOCH	Original time out, count high
		Loc.	Location	OV	Overvoltage
		LRC	Longitudinal Redundancy Check		
Gen.	general	LS	Local Storage	P/N	Part Number
Gnd.	Ground	LSAR	Local Storage Address Register	PBC	Page Boundary Crossing
Grd.	Ground	Lt	Latch	PC	Parts Catalogue
GPR	General Purpose Register			PC	Parity Check
GSI	General System Information			PC	Power Controller or Power Complex
		M-Reg.	Modify Register	PCC	Power Control Compartment
		MA	Maintenance Adapter	Pch.	Punch
HEX	Hexadecimal	MACR	Microinstr. Address Compare Register	PCI	Program Controlled Interruption
HO	Hold Out	Man.	Manual	PCR	Program Controlled Request
HW	Halfword	Man.Ops.	Manual Operations	PCS	Power Controller Sense
		MAP	Maintenance Analysis Procedure	PCUR	Program Controlled Unit Request
		Max.	Maximum	PER	Program Event recording
I/O Disk.	Input/Output Diskette	MC	Machine Check	perm.	permanent
IAR	Instruction Address Register	MCCH	Mchine Check Handler	PG	Parity Generation, Parity Generator
IC	Integrated Channel	MCIC	Machine Check IRPT Code	Pgm.	Program
ICA	See CA	Mech.	mechanical	PLA	Programmable Logic Array
Id.	Identifier	MFCU	Multifunction Card Unit	PM	Preventive Maintenance
IFC	Interface Card	MFI	Machine Feature Index	PP	Peak to Peak
IFL	Initial Field Length	MI	Maintenance Information	Prim.	Primary
ILC	Instruction Length Count	MI-OPC	Machine Instruction OP-Code Register	Prod.	Product
ILI	Incorrect Length Indication	MIBU	Machine Instruction Buffer	Prtr.	Printer
ILT	In Line Test(s)	Min.	Minimum, Minute	PS	Power Supply
IML	Initial Microcode Load	Mod.	Model	PS	Pico Store
IMPL	See IML	MPX	Multiplexer Channel	PST-CE	Product Support Trained Customer Engineer
Ins.	Insert(ion)	MS	Main Storage	PS 0	Pico Store Left
Inst.	Install(ation)	ms	Millisecond	PS 1	Pico Store Right
Instr.	Instruction	MSD	Main Storage Directory	PSAR	Pico Storage Address Register
Int.	Interval, Internal	MSSS	Maintenance/Service Sub-System	PSW	Program Status Word
INT	Integrator	MSVP	Maintenance/Service Processor	PT-CE	Product Trained Customer Engineer
IOAR	Input/Output Address Register	MVS	Multiple Virtual Storage	Pt.	Point
IOC	I/O Controller (Proc. of I/O Subsystem)			Ptr.	Pointer
IPL	Initial Program Load	N	Inverter	Pty.	Parity
IPO	Instant Power Off	Nom.	Nominal	PU	Processing Unit
		NPRO	Non Process Runout	PUSIC	PU Support Interface Control
		NSAT	Non-Sequential Address Table	PV	Parity Valid
				Pwr.	Power

# Abbreviation List (continued)

RAM	Random Access Memory	Stg.	Storage
Rd.	Read	STI	Status In
Rec.	Record	STM	Supplement to MAP's
Reg.	Register	SU	Shift Unit
Ref.	Reference	SVI	Service In
Rem.	Remote, removal	SVO	Service Out
Rep.	Repair	SVS	Single Virtual Storage
Requ.	Request	SX	Selector Channel
Res.	Reset	SYNC	Synchronous
Res.	Resistor		
RLK	Remote Link	TA	Tape Adapter
RLP	Remote Loop	TB	Terminal Block
RMS	Root Mean Square	TD	Time Delay
ROM	Read Only Memory	TE	Trailing Edge
ROS	Read Only Storage	Term.	Terminator
RQI	Request In	TH	Thermal
RSP(L)	Recommended Spare Parts (List)	THSW	Thermal Switch
RTS	Request to Send	TIR	Tag In Register
		TO	Time Out
S-Reg.	Sense Register	TOC	Table of Contents
SAT	Sequential Address Table	TOD	Time of Day
SB	Support Bus	TOR	Tag Out Register
SB	Sense Byte	TP	Teleprocessing
SBA	Support Bus Adapter	TP	Testpoint
SC	Sense Card	Tr.	Transformer
SCA	Standard Channel Adapter	TRD	Trap Request Demand
SC-Reg.	Shift Control Register	Trap	Forced Microprogram Branch
SCL	Support Control Logic		
SCR	Silicon Controlled Rectifier	UCS	Universal Character Set
SDLC	Synchronous Data Link Control	UCW	Unit Control Word
Sec.	Second(ary), Section	UMC	Usemeter and Control
Sel.	Select(ion)	USI	Unit Support Interface
Sep.	Separator, separate	UV	Undervoltage
Sequ.	Sequence		
SF	Support File	Var.	Variable
SI	Support Interface	VD	Voltage Divider
Sig.	Signal	VF	Voltage Failure
SL	System Library	VFO	Variable Frequency Oscillator
SLI	Select In	VIRT	Virtual
SLO	Select Out	VRC	Vertical Redundancy Check
SM	Sense Module	VS	Virtual Storage
SP	Support Processor	VTOC	Volume Table of Contents
SPI	Standard Power Interface		
SPIL	Support Processor Interpreter Language	Wr.	Write
SPO	Suppress Out		
SPR	Support Processor Request	Xfer	Transfer
SRL	Shift Register Latch	Xlator	Translator
SRL	(System Reference Library) see SL		
SS	Single Shot		
SSD	Support Subsystem Diskette		
STALI	Store Aligner		
Std.	Standard		

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## Maintenance Information

### IBM 4300 Friend

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FFFFFFFF	RRRRRRRR	IIIIIIII	EEEEEEEE	NN	NN	DDDDDDDD
FFFFFFFF	RRRRRRRR	IIIIIIII	EEEEEEEE	NNN	NN	DDDDDDDDDD
FF	RR	RR	II	EE	NNNN	NN DD DD
FF	RR	RR	II	EE	NN NN NN	DD DD
FFFFF	RRRRRRRR	II	EEEE	NN	NN NN	DD DD
FFFFF	RRRRRRRR	II	EEEE	NN	NN NN	DD DD
FF	RR	RR	II	EE	NN NNNN	DD DD
FF	RR	RR	II	EE	NN NNN	DD DD
FF	RR	RR	IIIIIIII	EEEEEEEE	NN NNN	DDDDDDDDDD
FF	RR	RR	IIIIIIII	EEEEEEEE	NN NN	DDDDDDDD

4300-FRIEND

Program Version 09

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# 1. PURPOSE OF 4300-FRIEND

4300-FRIEND is a test tool, which allows the analysis of complex I/O problems in an easy and quick manner.

4300-FRIEND supports all channel command words (CCW's) for most of all /370 files, drums, tapes, card reader/punch units and teleprocessing devices.

4300-FRIEND is a stand-alone, off-line, interpretive diagnostic program and requires 64 K bytes of customer storage and a console display unit (3277/78 or 125-D0C or an 433x console with x'83' op-code), or a 1052 typewriter.

It allows the user to construct S/370 channel programs in English language along with formatted data pattern.

Each channel command is entered in English from the console keyboard, card or tape. Channel programs for up to 99 devices can be entered and executed simultaneously. The user will not have to learn a strict set of command spellings, as several forms and alternatives are provided.

If 4300-FRIEND needs any additional information about the command such as seek arguments, record numbers, data length, or data, the program will request this information to be entered.

Several interpreter commands are available for communicating with 4300-FRIEND and for controlling the CCW-chain execution.

Often used CCW chains (4300-FRIEND commands) may be punched into cards or written on tape, from which they can be read and executed for a fast system I/O verification.



## 2. DIFFERENCES BETWEEN 4300-FRIEND AND /360 FRIEND

- Support of /370 and VSE mode inclusive 'Indirect Data Addressing'
- Storage fetch and store protection support.
- Program load from 4300 diagnostic diskette.
- Support of CRT type operator consoles (3277/78 or /370 125 DDC)
  - 20 lines of 80 bytes each for a 3277/78
  - Usage of program function keys
  - 12 lines of 56 bytes each for a 125D
- Support of secondary output station (printer) in case of 327x or 125D operator keyboards (command CHANGE KEYBOARD).
- Improved multiple chain control commands.
- I/O instructions and I/O interrupt trace.
- Additional FRIEND control commands.
  - Trace of all I/O events
  - System configuration test (CONFIG)
  - Predefined CCW chains (\$\$...) etc.
  - New commands are indicated by a 'new' in the command description.
- Support of new I/O devices.
  - Disks: 3330, 3340, 3350, 3310, 3370
  - Printers: 3203-1/2, 3203-4/5, 3211, 5203, 3262, 3289
  - Card I/O's: 5424/5425 (MFCU)
  - Diskettes: 3540
  - Displays: 3277, 3278, 125 DDC (3278 printer)
  - Local SNA Devices: 3274, Loop Adapter (LA)
  - Communication Adapter (CA)
- Values for CYL=, HD=, KL=, DL= etc. may be entered in decimal or hexadecimal.
- New syntax for separation of commands and flags/modifiers (comma). This will avoid misinterpretation of 4300-FRIEND commands.
- Support of PCI and immediate command interrupts.
- Enter 'Wait State' after all CCW-chains have been started. ('NO TIME DELAY' function.)
- Press 'REQUEST' or 'ENTER' key at operator console after program load (IPL).

### 3. INFORMATION REQUESTED BY 4300-FRIEND

In case of input errors 4300-FRIEND will either repeat the request or will ask for the whole command. If a program loop occurs try to enter character 'i' or to perform a 'program (PSW) restart'.

Request Code	Explanation
MODEL=	4300-FRIEND is asking for the processor model on which it is running. Enter a two or three digit number, for example 25, 30, 40, 50, 65 for /360 CPU's, 115, 125, 135, 138, 145, 148, 155, 158, 168 for /370 CPU's, and 31, 41 for the 4300 processors (4331 = 31, 4341 = 41). For the 4300 processors no number has to be entered if the value stored by the processor is taken. The specification of the processor type is important for the time calculation for the 4300-FRIEND commands 'WAIT' and 'TIME DELAY'.
MODE (BC/EC)=	4300-FRIEND is asking for the control mode. Enter 'BC' for 'Basic Control mode' or 'EC' for 'Extended Control mode'. If no data is entered, 'EC' is assumed.
DEV=DEVICE ADDRESS= DEV=	(first time only) (all other times) 4300-FRIEND is asking for the hexadecimal address of the device to be used to execute a CCW chain -- leading zeroes are not required --. For details see the DEVICE= command. If no data is entered, 4300-FRIEND will take the last entered device address or will enter the command input mode if no device address was specified before. 4300-FRIEND will request the device address if a CCW is entered but no device address was specified before.
DEV. ADDR=	4300-FRIEND is asking for the device address of the new operator console or the address of the secondary output station (printer) (after CHANGE KEYBOARD) If the secondary output station address is set to zero, the secondary printer function is inoperative.
DEV. TYPE 1052/3277/.. ...125D/P/M/R/S	4300-FRIEND is asking for the type of the new console. 1052 == 1052 type console 3277 == 3277 type console 3278 == 3278 type console 125D == /370 125 display unit

Prt == Secondary output printer, which must accept a x'09' print command. The PRT function is not used for a 1052 and SP console.  
Msg == Message Printer, on which all output messages should be printed in case the console should not be used. Address X'FF' will stop all output messages to be printed/displayed. Address X'00' will reset this function (messages are displayed on the operator console).  
Rem == Usage of Special Remote Console 327x display.  
Sp == 433x system console with X'83' op-code enabled.

HARD COPY (Y/N)= 4300-FRIEND is asking if the messages should be printed on the hard copy printer (if type = 125D). If a 'hard copy' console printer is attached and you want a copy of all console messages, type 'Y' or hit the 'ENTER' key (default).

SEC. PRINTER ADDRESS= 4300-FRIEND is asking for device address of the secondary output printer on which a hard copy of all operator messages will be printed. Optionally, a second operand may be entered after the printer address. LOG will cause the call of the PRINT LOG function for the 433x processor. 'REM' will indicate the special 327x support for remote console (small display).  
If no data is entered or an address of zero, the secondary printer output routine is not used. All lower case characters are converted to upper case.  
In case you want to modify the secondary printer address later, you may use the CHANGE KEYBOARD command.

IDAWs IN HEX= 4300-FRIEND is requesting the 'real storage addresses' for the 'IDA' address list (IDAWs). Enter as many addresses as required separated by commas (leading zeroes are not required).  
The addresses should not be in the storage range x'0000' to about x'A000', where the 4300-FRIEND program is located.  
If data is requested for the CCW, 4300-FRIEND will automatically move these data to the specified 'real storage area(s)'.

CYL= 4300-FRIEND is requesting the cylinder number in decimal for a 'seek' command.  
If 'X' is entered as the first character, the following data is taken as hexadecimal value -- default is cylinder zero --.

3. INFORMATION REQUESTED BY 4300-FRIEND (continued)

HD= 4300-FRIEND is requesting the head number in decimal. If 'X' is entered as the first character, the following data is taken as hexadecimal value. -- Default is head zero. --

FLG= 4300-FRIEND is requesting the flag byte in hexadecimal for a write HA command.

BBCCHH= 4300-FRIEND is requesting the 2321 seek argument. Enter exactly 12 hexadecimal characters (6 bytes) for the cell, subcell, strip, head position, and head number.

Byte	Function	Range (hexadecimal)
0	---	00
1	Cell	00-09
2	Subcell	00-13
3	Strip	00-09
4	Head position	00-04
5	Head number	00-13

RCD NO.= 4300-FRIEND is requesting the record number to be used. Enter the decimal record number to be used in the file identifier field. Range is 0 to 255. If 'X' is entered as the first character, the following data is taken as hexadecimal value.

KL= 4300-FRIEND is requesting the key length to be used. Enter the decimal key length. Range is 0 to 255. If 'X' is entered as the first character, the following data is taken as hexadecimal value. The default value is zero.

DL= 4300-FRIEND is requesting the data length to be used. Enter the decimal data field length. Range is 0 to 65535. In addition a parameter may be entered. See the LOOP command. If 'X' is entered as the first character, the following data is taken as hexadecimal value. The default value is one.

DATA= 4300-FRIEND is requesting the data for the data field. Enter the data in either of the following formats:

N..NXHHH...HHH or N..NCAAA...AAA

'NN..NN' is an optional decimal duplication factor.

'X' is an indicator for data in 'hexadecimal' format following this character.

'C' is an indicator for data in EBCDIC format following this character.

'HHH...HHH' is hexadecimal data. Two characters determine one byte of data.

'DDD...DDD' is EBCDIC data. 4300-FRIEND will not convert any lower case character in upper case.

Maximum number of characters allowed is 242. The maximum length of the total data field is 65535.

In the case of the CREATE/BUILD command, you may specify both hexadecimal and decimal data for one symbolic data area. The DATA= request is repeated until no data is entered as response.

Example:

DATA= 100xff Generates 100 bytes of x'FF'

DATA= 1000xf00f Generates 2000 bytes of x'F00FF00FF.....0FF00F'.

DATA= 80c1 Generates 80 bytes of x'F1' = EBCDIC 1s.

DATA= 12cABC Generates 36 bytes of x'818283' lower case - or x'C1C2C3' upper case, dependent on the use of the 'shift' key.

DATA= (EOB=enter) 4300-FRIEND will assume no data field == length zero (in CCW set to one).

KEY=

4300-FRIEND is requesting the key for the data field. Enter the data as shown for 'DATA = '.

MASK=

4300-FRIEND is asking for the file mask to be used for the 'Set File Mask' CCW. Enter two hexadecimal characters for the one byte to be used as file mask.

Example: MASK= c0  
MASK= 18  
MASK= (EOB or Enter) x'CO' assumed.

MODE CMD=

4300-FRIEND is asking for the 'Mode Set' CCW command code to be used. Enter two hexadecimal characters for the 1-byte-long set mode command. For 9-track tapes use 'MODE SET 800' 1600/6250.

Example:  
MODE CMD= 93 (800 BPI, odd parity, conv. on, xlator off)

MODE CMD= (EOB or Enter) x'93' assumed.

NUMBER OF TIMES=

4300-FRIEND is asking for the number of times the user wants to execute the last entered CCW chain or for the chain specified in the nn-LOOP command. Enter a decimal number for the desired limit. Range is 1 to 32767.

In addition, a parameter may be entered. See the LOOP command.

MLCCCBBCCHHRDDS=

This is the request for the buffer control information for the buffer control record. This is the data record transferred to the 2314 on an initiate buffer command. Enter 30 hexadecimal characters for the 15-byte-long record.

3. INFORMATION REQUESTED BY 4300-FRIEND (continued)

M = Mode byte (81 or 01,81 needs write buffer)  
L = Length byte (fixed at 60)  
CCC = Command 1 (07,13,00)  
          Command 2 (31,29,A9,69,E9)  
          Command 3 (05,35,0D,3D,06,0E,1A,16)  
BBCCHH = Seek argument (hexadecimal)  
R = Record number (hex)  
DD = Data length (hex)  
S = Search key length (hex)  
Example:  
  INIT BUF  
  MLCCCBBCCHHRDDS= 816d073135000000c3000101005000  
  WRITE BUF  
  DATA= 40xf00f  
SD= 4300-FRIEND is asking for the defect skip displacement in decimal for the 3340/3350 home address.  
      If 'X' is entered as first character, the following data is taken as hexadecimal value.  
SECOND SD= 4300-FRIEND is asking for the second defect skip displacement in decimal for the 3350 home address.  
            If 'X' is entered as first character, the following data is taken as hexadecimal value.  
THIRD SD= 4300-FRIEND is asking for the third defect skip displacement in decimal for the 3350 home address.  
            If 'X' is entered as first character, the following data is taken as hexadecimal value.  
WCC= 4300-FRIEND is asking for the 3277 write control character in hexadecimal (two digits).  
      The default is x'C3'.  
CMD= 4300-FRIEND is asking for the 3277 command.  
      'SB' == Set Buffer Address (x'11') + address  
      'Sf' == Start Field (x'1D') + attribute char.  
      'IC' == Insert Cursor (x'13')  
      'Pt' == Program Tabulator (x'05')  
      'Ra' == Repeat to Address (x'3C') + address and 'fill' character.(DATA=)  
      'Eu' == Erase Unprotected (x'12') + address  
      'EM' == End of Message (x'19') - for printer  
      'FF' == Forms Feed (x'0C') for printer  
      'Nl' == New Line (x'15') - for printer  
      ' ' == 'enter' == no command  
      >> '\*' == end of data stream (no code generated)  
ADR= 4300-FRIEND is asking for the 3277 buffer address.  
      Enter four hexadecimal characters.  
ATT= 4300-FRIEND is asking for the 3277 attribute character. Enter two hexadecimal digits.  
      The default (enter) is x'60'.

MASK BYTE= 4300-FRIEND is asking for the 'mask byte' for the 'Define Extent' FB command. Enter two hexadecimal digits.  
            If no data is entered, the default for the first 12 bytes of the data area is x'00', the last four bytes will be set to the value read by the 'Read Dev. Char.' command (logical end).  
PHY.START= 4300-FRIEND is asking for the 'physical start' for the 'Define Extent' FB command.  
            Enter a decimal value or up to 8 hexadecimal digits preceded by a 'x'.  
            Default = 0  
LOG.START= 4300-FRIEND is asking for the 'logical start' for the 'Define Extent' FB command.  
            Enter a decimal value or up to 8 hexadecimal digits preceded by a 'x'.  
            Default = 0  
LOG. END= 4300-FRIEND is asking for the 'logical end' for the 'Define Extent' FB command.  
            Enter a decimal value or up to 8 hexadecimal digits preceded by a 'x'.  
            Default is the value read by the 'Read Device Characteristics' command.  
OP. BYTE= 4300-FRIEND is asking for the 'operation byte' for the 'Locate' FB command. Enter up to two hexadecimal digits.  
            Default = X'06'  
REPL. CNT= 4300-FRIEND is asking for the 'replication count' for the 'Locate' FB command.  
            Enter a decimal value or up to two hexadecimal digits preceded by a 'x'.  
            Default = x'00'  
BLCK. CNT= 4300-FRIEND is asking for the 'block count' for the 'Locate' FB command.  
            Enter a decimal value or up to four hexadecimal digits preceded by a 'x'.  
            Default = x'0001'  
BL. OFFS.= 4300-FRIEND is asking for the 'block offset' for the 'Locate' FB command.  
            Enter a decimal value or up to 8 hexadecimal digits preceded by a 'x'.  
            Default = x'00000000'  
TRK= 4300-Friend is asking for the track number in decimal for a diskette 'Seek' command (0-74).  
SCT= 4300-Friend is asking for the sector number in decimal for a diskette 'Seek' command (1-26).

4. 4300-FRIEND MESSAGES

If a message is starting with '\*' and the console is an CRT device, the 4300-FRIEND program will wait for some seconds before displaying the message in order to allow the use of the 'REQUEST' key to stop execution.

If a CRT device is used as operator console 4300-FRIEND will display status information in line 20.

11 <....> |nn-ccuu-ffff|C=xxxxxx,kf|D=xxxxxx,kf|I=xxxxxx,kf|mmmm|ccc

- 11 = program version <....> shows the status as follows
- COMMAND = enter any 4300-FRIEND command
- REPLACE = enter 'replace' CCW command specified by REP command
- RESPOND = enter requested information
- RUNNING = 4300-FRIEND is executing CCW chain(s)
  - In case of CPU-wait state and stop address 'ODEADO'
  - 4300-FRIEND is waiting for an I/O interrupt from a test device.
  - On a CRT operator console one may enter 4300-FRIEND commands during this mode without stopping the execution.
- TRACING = 4300-FRIEND is tracing the execution of CCW chain(s).
  - See also above description of RUNNING.
- SCOPING = 4300-FRIEND is looping on a SIO or TIO command
- TIOLOOP = 4300-FRIEND is repeating the execution of a TIO command.
- PRNTLOG = PRINT LOG function is running to copy 433x console to a line printer.
- WORKING = 4300-FRIEND commands are executed - no action required

The current UCB will be displayed together with area pointers.  
'nn'=chain number, 'ccuu'=unit address, 'ffff'=flag bytes  
'xx.xx'= area address, 'k'=area key, 'f'=fetch protection if 'F'  
C= CCW area / D= data area / I= IDA area  
'mmmm'= Block multiplexor mode (BMPX) or Selector mode (SEL)  
'ccc' = card/tape input if CRD

4300 - F R I E N D - 04/05/79 - 08.05 -EMH  
\*WARNING\* WRITE COMMANDS MAY DESTROY DATA  
ON A CUSTOMER DISK PACK OR ON CE-TRACKS  
-----

The above statements are the introductory messages printed out by 4300-FRIEND. These are only printed once, immediately after 4300-FRIEND is loaded.  
The date printed is this of the last 4300-FRIEND assembly, followed by the program version and level (e.g. 01.01).

STORAGE SIZE= xxxxxx  
  
This message will specify the storage size of the system in hexadecimal.

ID = xxxxxxxxxxxxxxxx  
  
This message will display the ID of the system /370 or the ID of the 4300 processor.

EC-MODE SET, NO RESET POSSIBLE  
  
This message indicates that the 'Extended Control Mode' was set and no return to 'Basic Control Mode' is possible except by re-IPL of 4300-FRIEND (/370 and 4300).

4300-FRIEND STANDARD OPTION SET:  
  
After this message all standard option of 4300-FRIEND set during program initialization are displayed. If you want to set other options use the 'BMPX' 'NO BMPX' 'TIME DELAY nn' 'HALT' 'ALARM' or 'NO INT' commands.

I/O= cccctt-ddddtt  
  
4300-FRIEND prints bytes two to seven of the 'sense I/O' command for the new device specified. This message will not appear if the 'Sense I/O' command is not supported by the device. (first byte is not x'FF')

CHAR= xxx  
  
4300-FRIEND prints the data received for a 'Read Device Characteristic' command if it is a 'Fixed Block Mode' (FB) device.

ENTER CCW LIST IN ENGLISH  
  
This message prints out initially and after 'DEV= ' has been requested after the user has entered 'RESET'.

SET FILE MASK INSERTED  
  
This message prints out to inform the user that 4300-FRIEND inserted a 'Set File Mask' CCW. The command was entered preceding the last CCW entered. The CCW chain being generated will require a set file mask IF 'Write HA' and 'Write Record Zero' CCW commands are used. This automatic insertion is only done if the user forgot to specify a 'Set File Mask'.

TIC \*-8 INSERTED  
  
This message prints out to inform the user that 4300-FRIEND inserted a 'TIC \*-8' CCW. The TIC command was inserted preceding the last command entered.

## 4. 4300-FRIEND MESSAGES (continued)

The CCW chain being generated will require a 'TIC' CCW if a 'Search' CCW was used. If the user forgets to specify the 'TIC', 4300-FRIEND will insert one.

LOOP IS FINISHED ON UNIT xxxx

This message is displayed if the CCW chain of unit 'xxxx' has been executed the number of times specified by the 'LOOP' command. The execution of all active CCW chains is discontinued after waiting for outstanding I/O interrupts. If busy devices do not present their interrupt in the time specified by the 'TIME DELAY' command, a Halt I/O is issued.

START

This message is displayed after the execution of CCW-chains was started by ENTER key operation without input. ('GO')

HALT

This message is displayed after 4300-FRIEND detected a condition which requires a program halt (e.g. loop finished or attention interrupt from operator console). Specify GO to continue if required.

UNIT xxxx STOPPED

This message is displayed after the loop counter for unit xxxx was reached and the parameter '\*' was used in the loop command.

COND CODE= 0 ON UNIT xxxx

This message will be displayed after a XTIO, XCLRIO, XHIO, XHDV, XTCH, or XSTIDC command to show the condition code for device xxxx.

This message will also be displayed to indicate the status of the 'TEST I/O'. Condition code '0' indicates that the device, whose address is 'xxxx', is ready and available. Condition code '2' indicates that the channel or subchannel is busy for which the device is attached. Condition code '3' indicates that the address is not recognized by a channel or any device on the channel.

Press request and type NOTEST to enter commands. If 'SCOPE' is active, 4300-FRIEND will require a PSW (program) restart to exit from the scope loop.

COND CODE= 1 ON UNIT xxxx

CSW YY YY ... YY YY

SNS zzzzzzzzzz.zzzzzzzz

This message will be displayed after a XTIO, XCLRIO, XHIO, XHDV, XTCH, or XSTIDC command to show the condition code for device xxxx.

This message will also be displayed to indicate the status of the 'TEST I/O'. Condition code '1' indicates that the channel status word (CSW) was stored. The CSW and sense bytes are typed out to further clarify the error condition.

EXT-INTRPT BROKE CHAIN

This message will indicate that the 'INT' feature was active and that the second 'EXTERNAL' interrupt stopped 4300-FRIEND. The TIO mode and the Card/Tape Input mode are reset.

HALT ON ERROR

This message will indicate that the 'HALT' on error feature was 'ON' and an error occurred during the execution of the CCW chain. It will also indicate a unit check or a permanent CU-busy condition at the device used for the 'START READER' command.

-SYNTAX ERROR-

4300-FRIEND was unable to determine the meaning of the input statement. The statement or the information was incorrectly spelled, invalid characters, wrong number of characters entered (hex), undefined CCW, data field length over 65535, missing delimiter (comma), unknown verb etc.

4300-FRIEND requires that the entire CCW command is reentered. On a CRT type console enter '?' and correct erroneous command/reply.

-SYNTAX ERROR- ON INPUT

4300-FRIEND has detected an error in the information entered for a 'DATA=', 'KEY=', or 'BBCCHH=' request.

The 'BBCCHH=' requires exactly 12 hexadecimal characters.

Possible data field errors:

- Missing 'X' or 'C' to indicate data type
- No data after the type code 'X'/'C'

Reenter the requested information.

On a CRT type console enter '?' and correct erroneous input.

- ENTER 'DEV=' OR 'ADD' BEFORE CCW-

A CCW command was entered without a correct UCB (device) assignment.

- UNDEFINED SYMBOL(S)

4300-FRIEND has detected the use of a symbol that was not previously defined. The user cannot 'COMPARE' or 'DUMP' from a symbolic I/O area unless it has already been defined by a 'CREATE', 'INTO', or 'FROM' statement.

- DEVICE QUEUE FULL, LAST CMD IGNORED

4300-FRIEND will allow only 99 devices to be entered into the device queue. Type 'RESET' to clear the device queue and start again.

- SYMBOL TABLE FULL, LAST CMD IGNORED

4300-FRIEND will allow only 40 symbolic characters to be used. Type 'CLEAR\$' to clear the symbol table.

- KEYWORD MISMATCH ON INPUT-xxx...xxx

4. 4300-FRIEND MESSAGES (continued)

4300-FRIEND is reading the CCW commands from card or tape. The record read must also contain the information that 4300-FRIEND would normally request. The requested information must be the correct sequence and an exact duplicate of the request typeout. The missing keyword is displayed after this message.

The user has to enter 'START RDR,xxx' again after typing 'RESET'.

\*\*ERROR ON SENSE\*\*

This error message indicates an unusual error situation during execution of a sense command after an unit check occurred. This could be an unit check or channel check. For exact analysis use the TRACE and DUMPT commands. The automatic execution of a sense command may be inhibited by the NO EX SENSE command.

\*\*CC=2 ON SENSE\*\*

This error message indicates an permanent busy condition during execution of a sense command after an unit check occurred. The automatic execution of a sense command may be installed by the NO EX SENSE command.

\*UNIT=0160 - I/O INTRPT,UNIT CHECK  
CSW 00 00D4E0 0E 00 0000  
SNS 100020C800 0000000000 0000000000 .....  
LOOP 00662

This error message will result if 4300-FRIEND receives an I/O interrupt and unit check is on in the CSW. 4300-FRIEND will print out the device address that gave the unit check, actual CSW, and the sense bytes in hexadecimal received from the device.

If the message 'ERROR ON SENSE' is displayed in front of the sense data, the SIO-sense ended with an invalid status (for example unit check).

\*UNIT=xxxx - INCORRECT CSW

CSW yy ... yy  
LOOP nnnnn

This error message will result if any unusual status is detected. This includes attention, unit exception, and any channel status in the CSW.

\*UNIT=xxxx - CC=1 AFTER SIO

CSW yy ... yy  
SNS zz ... zz

LOOP nnnnn

This error message will result if the start I/O instruction is not accepted (condition code = 1).

The CSW device status is not 'control unit busy' or 'device busy' or not a single 'channel end' or 'device end'/'channel end' (immediate commands).

The user should check that the device is ready and on-line.

The LOOP counter 'nnnnn' is not incremented and indicates the number of successfully initiated I/O operations.

\*UNIT=xxxx - CC=3 AFTER SIO

LOOP nnnnn

This error message will result if the start I/O instruction is not accepted (condition code = 3).  
The LOOP counter 'nnnnn' is not incremented.

\*UNIT=xxxx - DATA COMPARE ERROR

BYTE NO.=aaaa \$X=bb \$Y=cc

. . . . . One for each byte that failed to compare.  
. . . . .

LOOP nnnnn

This error message will result if the user has specified that the data is to be compared at each completion of the CCW chain and the two areas compared were not equal.

'xxxx' is the hexadecimal device address.

'nnnn' is the loop number that failed.

'aaaa' is the relative byte number of the two areas compared (first byte = 1).

'X' represents the first area and will be a symbolic character if symbolic I/O areas were used (otherwise = 1).

'Y' represents the second area (= 2, if no symbolic area).

'bb' represents the hexadecimal byte in the first area.

'cc' represents the hexadecimal byte in the second area.

\*UNIT=xxxx - NO DEV-END OR CU-END I/O INTRPT

This error message will be printed out if 4300-FRIEND does not receive a 'device end' or 'control unit end' (CUE) within 5 to 10 seconds after starting a CCW chain or receiving a control unit busy. The amount of time delayed will vary depending upon the number of devices running.

The time may be changed with the 'TIME DELAY' command.

If a time out occurs, 4300-FRIEND will issue a 'HALT I/O' instruction to attempt to reset the device and then will wait another time period for a device interrupt from the HALT I/O.

zzz-INTRPT, PSW = xx xx xxxx xx xxxxxx/.... E

This printout will occur if 4300-FRIEND detects an abnormal interrupt. The 'PSW' printed out is the old PSW for the interrupt.

'E' at the end of the message indicates an 'EC' mode interrupt. In this case the '....' digits contain the interruption code.

'zzz' can be: EXT external  
SVC supervisor call  
PGM program  
MCK machine check  
I/O input/output

If 'PGM' interrupts start typing out, perform a 'PSW/PROGRAM' re-start. If this does not help, reload the 4300-FRIEND.

In case of DUMP/DISPLAY/ALTER commands, this check may happen if the specified address is out of storage or the page is disconnected in VSE mode.

The 'I/O' interrupts are usually from other devices becoming ready. In addition to the PSW, the CSW and SENSE data are displayed.

If 'MCK' interrupt occurs, the log-out area is preserved so it can be displayed by the 'dump' command.



4. 4300-FRIEND MESSAGES (continued)

• IDAW POINTS TO PROGRAM AREA

This error message will be printed out if one of the specified IDA addresses points inside the FRIEND program. All entered IDAW's are ignored and the request for IDAW's is repeated.

• INVALID MODEL, USE 31-41 OR 115-168 OR 25-75

This message will indicate that you specified the wrong model. In case of /370 or 4300 processors you may just hit the 'ENTER' key without specifying any model number.

aaaaaa K=k,F=f,R=r,C=c

This message displays the storage protection keys of the area with address 'aa..aa' which points to the first byte of a 2K large storage block.  
K=storage key in hexadecimal, F=fetch protection on if 1  
R=reference bit on if 1, C=change bit on if 1

nn\*UNIT=ccuu, UCB=aaaaaa, FL=cccc

This message indicates the UCB entry if CCW= or LIST= was specified. 'nn'=chain number, 'ccuu'=unit address, 'aaaaaa'=address of 34-byte-long UCB entry, 'cccc'=active UCB flags (see UCB description).

UNIT=xxxx - COUNT=nnnnnnn

This message will indicate a DATA DUMP print out.  
'xxxx'=unit address, 'nn..nn'=SIO counter.

\$x aaaaaa 1111

This message will appear after the DUMP\$ command.  
'x'=symbolic I/O area name, 'aaaaaa' address of area in hex, '1111' length of area in hex.

nn\*UNIT=ccuu, LOOP=nnnnnnn/cccccc - l

This message will appear after the COUNTER command, or when the limit for the LOOPnn,M command is reached.  
'nn'=chain number, 'ccuu'=unit address, 'nn..nn'= LOOP threshold  
'cc..cc'= SIO counter, 'l' = Active/Stopped line indication

nn-ccuu-ffff|C=xxxxxx,kf|D=xxxxxx,kf|l=xxxxxx,kf|mmm

This message will appear after the STATUS command.

The current UCB will be displayed together with area pointers.  
'nn'=chain number, 'ccuu'=unit address, 'ffff'=flag bytes  
'xx..xx'= area address, 'k'=area key, 'f'=fetch protection if 'F'  
C= CCW area / D= data area / l= IDA area  
mmm = block multiplexor mode if BMPX or selector mode if SEL

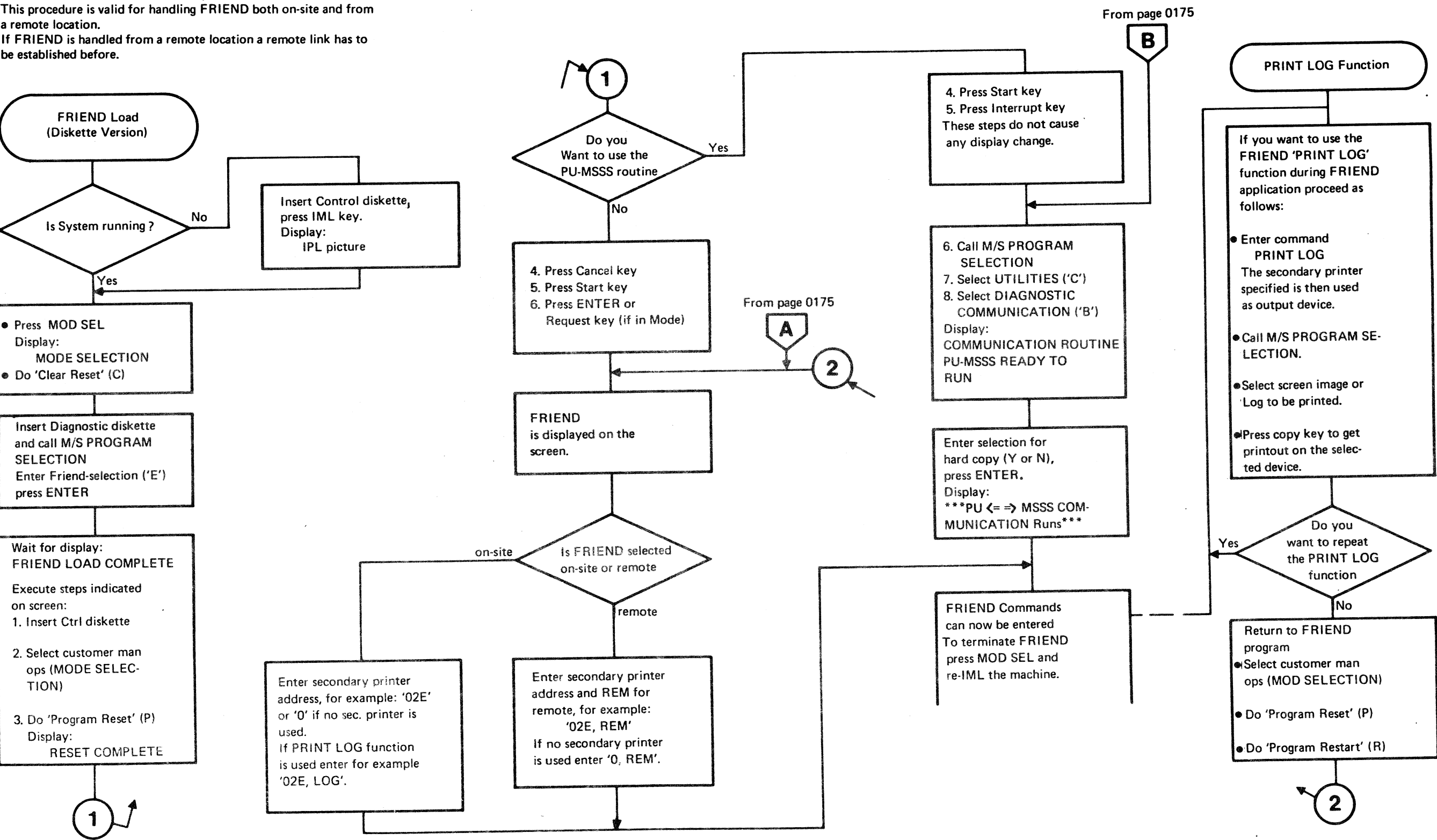
PRINTER NOT READY

The specified secondary printer is either not available or not ready. Start the printer or correct the device address.



5. HOW TO USE 4300-FRIEND  
5A. Load 4300-FRIEND Diskette Version

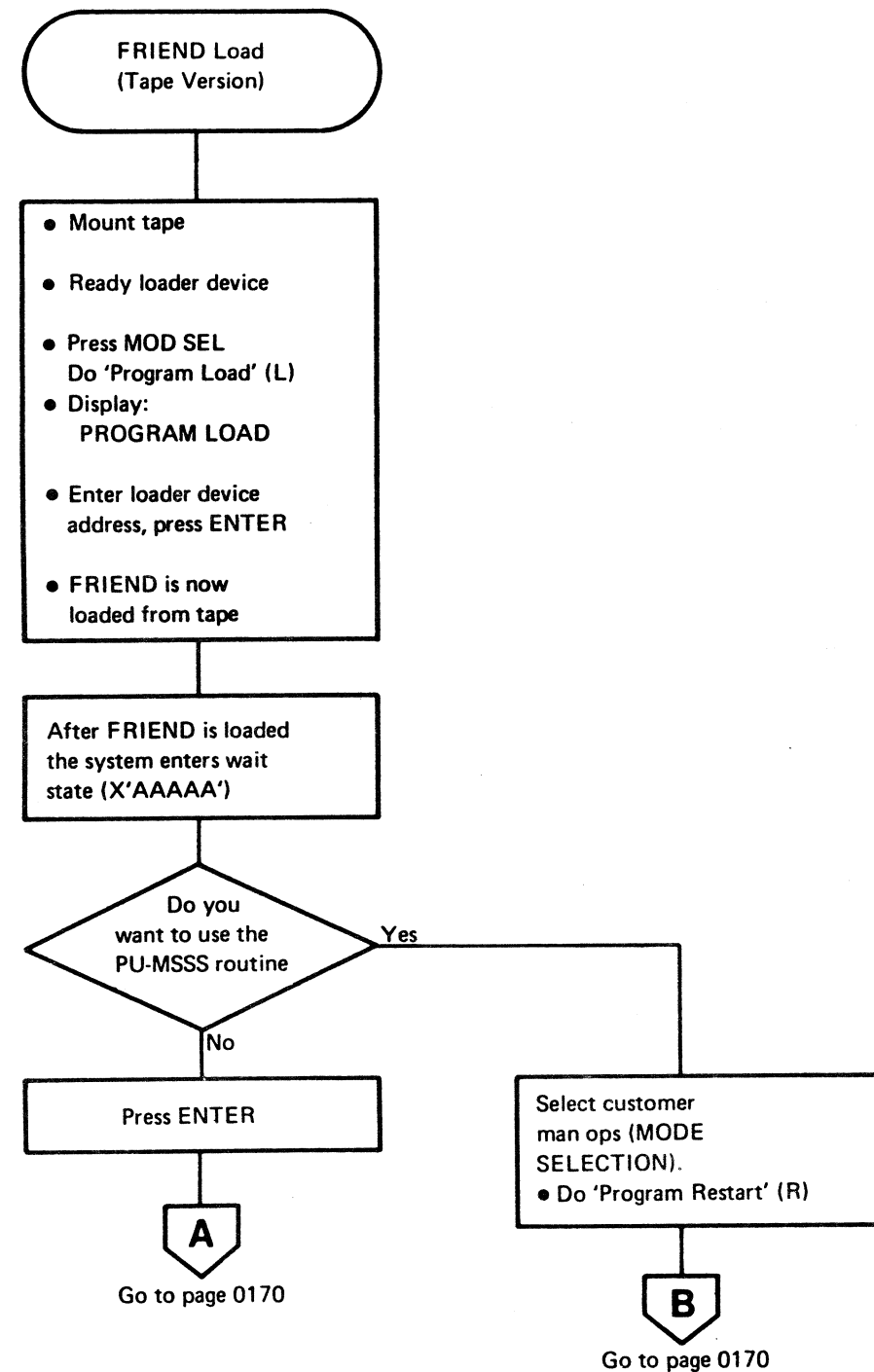
This procedure is valid for handling FRIEND both on-site and from a remote location.  
If FRIEND is handled from a remote location a remote link has to be established before.



## 5. HOW TO USE 4300-FRIEND (continued)

### 5B. Load 4300-FRIEND Tape Version

(Normally not available in the field)



# How to Use 4300-FRIEND (continued)

## 5C. Restrictions

4300-FRIEND will insert 'TIC \*-8' or 'SET FILE MASK' CCW's if they are left out. This may sometimes create an invalid CCW chain.

Example of an invalid chain

```
seek
  CYL= 5
  HD= 1
srch eq ha
wr r0
TIC *-8 INSERTED      (placed after the 'SEARCH HA')
SET FILE MASK INSERTED (placed before the 'WRITE RO')
KL= 0
DL= 100
```

The above chain is an 'invalid sequence' as the 'Write RO' is not directly preceded by a 'Search' CCW. The user should specify his own 'Set File Mask' before the 'Search HA'.

## 5D. Single CCW Chain

1. Specify the device address of the unit you want to exercise when 4300-FRIEND asks for it (DEV=\_\_\_).
2. When the proceed light (or indicator) turns on, enter a CCW command in English language. (followed by pressing the 'ENTER' key)
3. Enter any additional information requested by 4300-FRIEND.
4. After your entire CCW chain has been entered, type 'GO'.
5. The device should now functioning.
6. When you want to enter another CCW chain, press 'REQUEST' key.
7. When the PROCEED indicator turns on, type 'RESET' or 'I'.
8. Go to instruction 1. for the next CCW chain.

## 5E. Examples

```
4 3 0 0 - F R I E N D - 11/06/76 - .01.01 -EMH
*WARNING* WRITE COMMANDS MAY DESTROY DATA
ON A CUSTOMER DISK PACK OR ON CE-TRACKS
-----
HARD COPY Y/N= n          << n == no console printer attached
SEC. PRINTER ADDRESS= e   << e == device address of printer
STORAGE SIZE= 03FFFF      for hard copy of messages
MODEL= 31                 << 31 for 4331 processor (default = CPU-ID)
ID = 0230095543310000
MODE (EC/BC)= ec          << ec == extended control mode (default)
EC-MODE SET, NO RESET POSSIBLE
4300-FRIEND STANDARD OPTIONS SET:
  BMPX,NO TIME DELAY,NO HALT,NO ALARM,INT
*****
DEV= DEVICE ADDRESS= 260   << 260 (231x or 33xx type)
I/O= .....-.....
ENTER CCW LIST IN ENGLISH
seek
  CYL=5                    (leading zeroes are not required)
  HD =5
sk                          (an abbreviation for 'seek')
  CYL=198
  HD =9
go                          (causes CCW chain to be executed)
LOOP IS FINISHED ON UNIT 0260
reset                       (press 'request' button first on 1052)

*** FB DEVICE *** 3310/3370 (Read one block)
```

5. HOW TO USE 4300-FRIEND (continued)

```

DEV= 240
I/O= 433100-331000
CHAR= 300821010200000000020000001600001EC400000000010C20160001300..
set fb          < only if above two lines are not displayed
ENTER CCW CHAIN IN ENGLISH
def ext
  MASK BYTE= C4          < two hexadecimal characters
  PHY.START=             < blank
  LOG.START=             < blank
  LOG. END = 31          < decimal 31
locate
  OP. BYTE = 06
  REPL. CNT=
  BLCK. CNT= 32
  BL. OFFS.=
read fb
  DL= 16384
lp1              < execute chain once
go
LOOP IS FINISHED ON UNIT 0240

```

\*\*\* 3203 - MODEL 1 OR 2 \*\*\*

```

DEV= e
I/O= 312500-320202
advance to eos
write
  DATA= cEND OF SHEET      (use 'UPPER CASE' key if no lower
imm skip1                  case characters are on the print
space 1                    chain and 'dualing' is not active)
  DATA= cTHIS IS CHANNEL 1
space2
  DATA= cONE SPACE BEFORE
space 3
  DATA= cTWO SPACES BEFORE
skip 12
  DATA= cTHREE SPACES BEFORE
print
  DATA= cTHIS IS CHANNEL 12
loop 10                    (execute chain 10 times)
go
LOOP IS FINISHED ON UNIT 000E

```

6. ADVANCED CAPABILITIES OF 4300-FRIEND

Note: To enter a dollar sign (hex 5B) on a machine with a keyboard other than US English, use the key which causes hex '5B' to be entered.

6A. Multiple CCW Chains in Overlap

4300-FRIEND allows the user to enter several different CCW chains for the same or different devices. This capability is provided to let the user generate a simple system test to check for interactions between different I/O devices.  
For overlapping different CCW chains do:

- 1. Start as you would execute a single CCW chain.
- 2. After typing 'GO', this chain will be executing.
- 3. Press keyboard 'REQUEST' or CRT 'TST REQ' / 'ENTER' key.
- 4. When PROCEED indicator turns on, enter 'dev=xxx', where xxx is the hexadecimal device address on which the following CCW chain entered is to be executed. This device address may be the same as this of the previously started device. Do not type 'RESET'.
- 5. Enter the CCW chain to be overlapped.
- 6. Type 'GO'.
- 7. Repeat step number 3 for the next CCW chain.

Example:

```
DEV= 160                << Unit address for first CCW chain.
I/O= .....-.....
ENTER CCW LIST IN ENGLISH
seek
  CYL= 0
  HD = 1
seek
  CYL= 100
  HD = 2
go                      Start executing first CCW chain,
dev=161                 press 'REQUEST', enter 'dev=' and
I/O= .....-.....      device address for next chain.
seek
  CYL= 100
  HD = 3
seek
  CYL= 200
  HD = 4
go                      Start executing both chains in
                        overlap.
```

If you like to modify the CCW chain or its associated Unit Control Block (UCB) you may use the multiple chain commands. Type CCW= or LST= to obtain the UCB/chain number. With the nn-REPnn command you may replace a single CCW. A CCW may be added to the chain with the nn-ADD command. See the Chapter 'Multiple Chain (UCB) Commands' for the complete set of available commands.

6B. Symbolic I/O Areas

See also 'INTO' and 'FROM' CCW Control Commands and the 'BUILD/CREATE' commands.  
4300-FRIEND allows the user to reference the data address in a CCW to another CCW. This capability is provided so that the data read may be used as write data or vice versa. Also a large write or read area can be used repeatedly to conserve use of storage space.  
For files, the symbolic I/O area only applies to the data area of any COUNT-KEY-DATA or KEY-DATA command. 4300-FRIEND will use data chaining to get the data field of these commands.  
To use symbolic I/O areas:

- 1. If you like to intermix data in character format and hexadecimal format, the CREATE/BUILD command should be used. With this command a symbolic output area is constructed, which may be used by subsequent write type CCW commands.
- 2. Type the normal 'READ CKD', 'RD', 'WRITE', or 'PRINT' ... command,
- 3. followed by a 'comma' and 'INTO \$X' if the I/O command is an input type, or 'FROM \$X' if the I/O command is an output type. 'X' can be any keyboard character, but the use of characters A through Z is recommended for ease of cross referencing.
- 4. If this is the first use of the symbolic character, 4300-FRIEND will ask for the normal additional information. If the symbolic character has been used before and no 'RESET' command has been given in between, 4300-FRIEND will not ask for the data length or the data field. The Symbolic Table generated by 4300-FRIEND contains the corresponding data address and the implied length of the data area.

All keyboard characters except blank may be used as symbolic data area names.  
Characters entered in lower case are converted to upper case ones. The assigned symbolic data area characters (names) may be listed by using the DUMP\$ command. The length of a symbolic data area is restricted to 65535.

Example 1: Write disk record zero and one from same area

```
DEV= 160                << Unit address for first CCW chain
I/O= .....-.....      4300-FRIEND type out.
ENTER CCW LIST IN ENGLISH
seek
  CYL= 5
  HD = 1
set file mask
```

6. ADVANCED CAPABILITIES OF 4300-FRIEND (continued)

MASK= c0	
srch eq ha	
tic *-8	
write r0,from\$a	4300-FRIEND will use 'CCHH' from SEEK
KEY=	
DATA= 500xf00f	\$A actually points to data field
wr ckd,from \$a	'ENTER' (EOB) will cause no key to be generated.
RCD NO.= 1	data field is 1000 bytes long
KEY=	data portion will be data chained
go	4300-FRIEND will not ask for 'DATA=' start execution

Example 2: CREATE/BUILD command usage (CA wrapped lines)

DEV= 33	
enable	
read,into \$a	
DL= 50	
data dump\$a	dump received data
dev= 34	
crt50,\$b	create area \$b with length 50
DATA= x02	start of text character
DATA= 4cABCDEFGH1234	48 data bytes (4x12)
DATA= x03	End of text character
DATA=	'enter' only - to end requests
nbl	
wr,from\$b	
go	
UNIT= 0033 - COUNT= 0000001	dump of received data
008801 02C1C2C3C4C5.....	
.	
.	
.	
1-no data dump	hit 'request' key
1-compare \$a,\$a	halt data dump
go	specify data compare
counter	hit 'request' key
01-UNIT=0033, LOOP= 0000000/0001585 -A	print loop counter
02-UNIT=0034, LOOP= 0000000/0001586 -A	
go	restart operation

6C. CCW CHAIN SEQUENCE CONTROL AND DELAY BETWEEN CHAINS

See also 'WAIT n..n' command.

The 'WAIT' command causes 4300-FRIEND to wait until a CCW chain has been completed (Device End Interrupt) before the next CCW chain is started. This capability is provided for use with symbolic I/O areas when you are writing data that was read by a previous CCW chain. This will insure that all the data is read before the write CCW is executed.

The 'WAIT' command can be also used for a single CCW chain.

To use 'WAIT':

1. 'WAIT' (optional n..n milliseconds) can be specified anytime during the entry of the CCW chain.
2. After 'WAIT' has been typed for the last CCW chain entered, type 'GO' to execute the chains.

Example 1: Tape to Printer 80/80 list

DEV= 281	<< tape unit address
I/O= .....-.....	
ENTER CCW LIST IN ENGLISH	
read,into\$a	
DL= 80	
wait	<< instruct 4300-FRIEND to wait until read CCW is finished.
DEV= e	<< printer address
I/O= .....-.....	
print,from\$a	
csw=01	<< tells 4300-FRIEND to mask out unit exception (chan. 12) and chan. 9
sns=01	<< instruct 4300-FRIEND to wait on printing, before reading again
wt	
go	

Example 2: WAIT with time delay for single chain

reset	press 'REQUEST' first
DEV= 185	
I/O= .....-.....	
ENTER CCW LIST IN ENGLISH	
write	
DATA= 100xf00f	
wait 500	causes 4300-FRIEND to delay 500 ms after device end before starting the next write CCW.

6. ADVANCED CAPABILITIES OF 4300-FRIEND (continued)

6D. DATA COMPARE

See also 'COMPARE \$X,\$Y' command.

Type 'COMPARE....' anytime during the entry of a CCW chain. If symbolic I/O areas are used, they must have already been defined. 4300-FRIEND will perform the compare at each completion of the CCW chain.

COMPARE \$X,\$Y,n..n (n..n is the optional compare length)

Compare command specifying symbolic I/O areas. 'X' and 'Y' can be any previously defined I/O areas. If the length is not specified, the length of the first operand 'X' will be used for the amount of data to be compared.

COMPARE A...A,B...B,n..n

Compare command specifying actual absolute addresses and length. 'A...A' and 'B...B' represent absolut hexadecimal addresses of the areas you want to be compared. 'n..n' is the number of bytes to be compared in decimal or hexadecimal (a hexadecimal value has to be preceded by a 'x'). The 'CCW' command can be used to list the CCW chain to obtain the absolute addresses.

Example 1: Write and read disk record zero (symbolic areas)

DEV= 161	<< specify device to be used
I/O= .....-.....	
ENTER CCW LIST IN ENGLISH	4300-FRIEND display
seek	
CYL= xa0	hexadecimal cylinder x'A0' = 160
HD= 7	decimal head 7
wrha	HA is written from SEEK argument
SET FILE MASK INSERTED	user forgot to specify, so it was inserted by 4300-FRIEND
wrr0,from\$r	
KEY=	
DATA= 1800xf00f	data area is 3600 bytes long
rdr0,into\$s	
KL=	'ENTER' will give a KL= 0
DL= 3600	
compare \$r,\$s	the length of \$r is used
go	

Example 2: Write and read tape record (absolute area addresses)

reset	press 'REQUEST' first
DEV= 180	<< specify device to be used
I/O= .....-.....	
ENTER CCW LIST IN ENGLISH	4300-FRIEND display
write	write a tape record
DATA= 1000xff	
bksp	backspace record on tape
read	read data previously written
DL= 1000	
ccw	display CCW chain
1-00A000 01 00D000 6000 03E8	
2-00A008 27 00D3E8 6000 0001	
3-00A010 02 00D3E9 6000 03E8	cmd chain bit is turned off if 'G0' is entered.
compare d000,d3e9,1000	absolute data addresses
go	

6. ADVANCED CAPABILITIES OF 4300-FRIEND (continued)

6E. INCREMENT/DECREMENT COUNTER

See also 'INCREASE' and 'DECREASE' commands.

The Increase/Decrease commands may be used for modification of a one to four bytes long field in memory. The field is either incremented or decremented by the specified value after each execution of the CCW chain belonging to the same Unit Control Block (UCB). This function may be used to modify seek arguments in a data field belonging to a CCW chain or to maintain a hexadecimal record counter.

Example 1: Record Counter for tape

```
DEV= 180
write,from $a
DATA= 100c1234567890
-see data pointer address in CRT status line 20
or enter STATUS command
.... C= 00A008, 1 ID= 00D3E8, 1 II= ...
-subtract four from data pointer (D=) to use last four bytes
of write data field as counter
increase 4,d3e4,1,0,1
loop 1000                write 1000 records
go
LOOP IS FINISHED ON UNIT 0180
l-stop                  stop first CCW chain
dev=180                 new Unit Control Block
rew                     rewind tape command
lp1
go
LOOP IS FINISHED ON UNIT 0180
repl                    replace 'rew' command
read,into $b
DL= 1000
inrease 4,d3e4,1,0,1    update 'old' $a area
compare $a,$b           compare record to expected one
loop 1000
go
```

Example 2: Modify device address

With the following chain you may test a certain range of device addresses for availability. (see also CONFIG command)

```
DEV= 0
sense device,into$x
list=1                  get UCB address (e.g. D0000)
01-UNIT= 0000, UCB= 0D0000, FL=0019
00A000 E4 00D000 6000 0007
increase 2,d0000,1,xff,0 modify device address x'000'-x'OFF'
data dump$x,*           dump result of sense I/O on console
go
```

6F. DATA RIPPLE/RANDOM

See also 'RIPPLE' and 'RANDOM' CCW command modifiers.

'Ripple' and 'Random' are CCW Control Commands, which can be entered with the CCW command. This command will cause 4300-FRIEND to perform the following function at each conclusion of the CCW chain. 4300-FRIEND will search for all CCW's to be rippled or randomized in the CCW chain and either ripple (rotate the data pattern one byte to the left) or generate a random data pattern. Random data is generated 4 bytes at a time and data is rippled in blocks of 256 bytes. Search, Write HA, and the count field of 'Write Count/Key/Data' CCW's will be bypassed. Some bits are used in byte 5 of the CCW by 4300-FRIEND to indicate 'Random' or 'Ripple' and presence of a count field.

Restrictions:

Do not use 'Ripple' or 'Random' together with 'Indirect Data Addressing' ('IDA') and also not for 'Write special CKD' CCW's.

Example 1: Write random data on disk

```
DEV= 161                << specify device to be used
I/O= .....-.....
ENTER CCW LIST IN ENGLISH 4300-FRIEND display
seek
CYL= 5
HD = 1
set mask                 set file mask
MASK= c0                 file mask in hexadecimal
wr ha
wr r0,random
KEY=
DATA= 3600xff            data used for first record and
                           establishes data length
rdha                     verify home address
rdr0                     verify record zero written
KL= 0
DL= 3600
go
```



6. ADVANCED CAPABILITIES OF 4300-FRIEND (continued)

Example 2: Ripple data on printer

```
reset                                'REQUEST' first
DEV= e                               << Specify device to be used.
I/O= .....-.....
ENTER CCW LIST IN ENGLISH           / 4300-FRIEND display
space1,ripple                        Print with one space after,
                                     press 'UPPER SHIFT' for charac-
                                     ters in 'DATA=' field.
DATA= 4cABCDEFGHIJKLMNOPQRSTUVWXYZ1234567 4x33=132 bytes data
csw=0100                             Mask out 'UNIT EXCEPTION' in CSW.
loop                                 Execute chain 500 times.
NUMBER OF TIMES= 500
go
```

6G. Predefined CCW Chains

See also '\$\$xxx' command.

With the '\$\$xxx' command predefined CCW chains and data strings may be used which are provided by 4300-FRIEND. The available chains may be displayed by the '\$\$?' command.

The predefined chains may require a RESET command before or the device address (DEV=cuu). In some cases the device address is fixed and has to be modified by the n-DEV=cuu or SUBcuu,nnn command.

The predefined chains are:

- 000 Set 4300 FRIEND data pointer to address X'30000'
- 001 Card to Printer (02C/02E)
- 002 Set Tape to 1600 BPI (181) and Copy Tape to Tape (180/181)
- 004 Load UCS Buffer for 1403 (PCS-AN chain)  
(specify DEV= ... and \$\$0101 before)
- 005 Load UCS Buffer for 3203/3211 (PCS-AN chain)  
(specify DEV= and \$\$010 before).
- 010 Define four UCS Images for symbolic data areas  
\$A = AN-chain \$H = HN-chain \$1 = PCS-AN chain  
\$2 = PCS-HN chain
- 020 Diskette (3540 type) to printer  
(specify DEV= ... for diskette, printer address is always x'02E')
- 101 3287 Ripple Print 1 (specify DEV=... before)
- 102 3287 Ripple Print 2 (specify DEV=... before)
- 110 327x display/read (specify DEV=... before)  
Two SIO's are used with increments on the screen buffer addresses and the read data is compared.
- 111 3278 display/read (specify DEV=... before)  
Same as 110, but with a single SIO.
- 119 327x display with increment (specify DEV=... before)
- 400 Tape (e.g. 8809) write and read back  
(specify DEV= ... before). Data read is printed on printer with address '02E'.
- 500 3310 - CE tack initialization (specify DEV=... before)
- 501 3310 - Read FB with increment (specify Dev=... before)
- 510 3370 - CE tack initialization (specify Dev=... before)
- 511 3370 - Read FB with increment (specify Dev=... before)
- 520/) Special CE chains for 3370 check
- 521/) - separate instructions required
- 900 CA BSC Write on 8 lines (30...37)
- 901 CA SDLC XID and TEST commands for one line  
Specify device address DEV=... and station address \$\*=..
- 902 CA BSC - select 327x  
Specify device address DEV=... and sel/terminal address \$\*=..
- 903 CA S/S - select 3767 or 2740  
Specify device address DEV=... and terminal address \$\*=..

# 6. ADVANCED CAPABILITIES OF 4300-FRIEND (continued)

## 6H. CARD/TAPE CCW COMMAND INPUT

See also 'START RDR,xxx,\*,nnnn' command.

The 'START RDR' command is used to instruct 4300-FRIEND to read in the CCW chain(s) to be executed from either a card reader or a tape drive. The records read must be 80 bytes long and sequential. The input records must contain an exact duplicate of what would have been displayed on the console. Include keywords which would have been typed out by 4300-FRIEND requesting information.

Input parameters and operands must be separated by a slash (/).

The maximum length of an field between two slashes should not

exceed 240 characters (the rest is ignored).

Slashes can not be used in one of the data fields of 'EBCDIC' data.

The data field for EBCDIC data must be immediately terminated by a slash or the blanks between actual end of data and the slash will be used as part of the data field.

The entire 80 bytes of the record (card) may be used and a parameter can be split between records.

If the second parameter is '\*', 4300-FRIEND will display the input record before any commands are processed. (on a CRT only 79 bytes are displayed)

The input records may be grouped into test cases, each one starting with a QUIT command and a four digit long test case number in columns three to six of the first record. E.g.

QT9001 this is testcase 9001 /

The test case may be terminated by a RETURN command. These test cases can be loaded by the START READER,xxx,nnnn command, where 'nnnn' is the number of the required test case.

In case of variable hexadecimal digits (e.g. SDLC station address) the characters '\$' and '\*' may be used in the hexadecimal data fields. These characters are replaced by those specified in the '\$\*=..' command before.

The card-type input mode can be left by the RETURN command or by commands GO, TRACE, SCOPE, or RESET provided in the input record.

If syntax errors are detected in the input parameters, the card tape input mode is left too.

In case of a program loop because of permanent I/O errors on the input device a 'program restart' or hitting the 'external interrupt key' twice will return the control to the operator console.

Examples:

```
DEV= q                      ( device address is not required
                             if specified in the input record )
start rdr,c,*                ( input device = 00C )
DEV=160 /SEEK/CYL=5/HD=7/SRCH HA/TIC *-8/
I/O= .....-.....
      SEEK/CYL=198/HD=9/SRCH HA/TIC *-8/NOP/GO/
```

( press request, if 'RESET' is not entered, the following CCW chain will be overlapped)

```
st rdr,00c,*
DEV=282/WRITE/DATA=1000XFOOF/BSR/RD/DL=2000/RETURN/
I/O= .....-.....
  1-stop                      ( deactivate first chain )
  go                          ( start execution of last chain )
```

( press request )

```
s,c,*
DEV=200/DX/MASK BYTE=C6/PHY.START=/LOG.START=/
I/O= .....-.....
      LOG. END=31/LC/OP. BYTE =06/REPL. CNT=/
```

6. ADVANCED CAPABILITIES OF 4300-FRIEND (continued)

BLCK. CNT=32/BL. OFFS.=/RFB/DL=16384/  
INCR3,8805,32,126016,0/TRACE/

6I. STORAGE PROTECTION KEY MODIFICATION

'KEY CAW'/'KEY CCW'/'KEY DATA'/'KEY IDA'/'DUMP KEY'/'ALTER KEY'

The above commands are available to display or modify the storage keys of the different storage areas used for CCW chain execution. Initially and after the RESET command all areas are store protected with key one (1). The current assignments are displayed on CRT line 20 or after the STATUS command. The storage keys of any area may be dumped/alterd by the DUMP KEY/ALTER KEY commands. The special areas for CCW's, data and IDAW may be altered by the KEY CCW=/KEY DATA=/KEY IDA= commands. The key used for the CAW may be displayed for each CCW chain by the CCW=/LIST= commands in the third flag digit and may be altered by the nn-KEY CAW= command.

6J. TRACE FUNCTION

See also 'TRACE' command.

The 'TRACE' command may be used to create a trace table in storage of all SIO issued for and all interrupts received from the test devices during the execution of the CCW-chains. The TRACE command may be used instead of the 'GO' command. In case TRACE,\* is specified, all SIO/TIO/HIO are traced including these for the operator console and the secondary printer. By specifying a device address with the TRACE command the trace may be restricted to one device. The trace table start address is stored at location x'040C' and the current trace table pointer at address x'0414'. Use the DUMP function after the trace loop is finished (or the execution is stopped).

e.g. dump12,40c  
00040C 000D2000000D3F70 000D28F0

The trace function will use a certain main storage area to store the trace information in 16 byte long records.

Trace area entry:

0	2	3	4	7	8
-----					
0190 2 0 00 tttttt cc 0000000000000000					
-----					
					CSW after SIO (cc=1) or I/O interrupt (not reset before TIO's)
					CAW in case of SIO with cc not one in left half, rest all x'FF'
					repetition counter
					location 80 timer (if enabled and CPU=/360) -or- bytes 4 to 6 of CPU timer
					key of CAW if SIO
					entry type '0'= SIO, 'E'= HIO, 'F'= I/O interrupt, '2' = SIO sense, '3'= TIO after sense, '6'= SIO for message, '7'= TIO for message '8'= XHIO/XTIO.... commands during CCW execution
					if 'F' this is an I/O interrupt otherwise the condition code after the SIO/HIO/TIO
					device address

The CPU timer value stored in the trace entry represents byte 3 to 5 of the doubleword long binary counter. The last digit of the stored value is decremented every 16 microseconds. On /360 CPU's the location timer is used, where the last digit of the stored value is decremented every 1/300 of a second.

The one byte long repetition counter is incremented if identical trace entries (except the time value) are stored in sequence, where the first entry is stored and all other are ignored.

An entry of 16 bytes containing all x'FF' indicates the end of the current trace area. If the trace reaches the last trace area entry the trace will use the first entry and all following again. Display the last trace entries or the complete trace table with the DUMP command e.g. dump x300,d20e0 . The DUMPT command will automatically display the last one to 36 trace entries.

Because the same storage area is used for predefined chains, these chains (command \$\$nnn) are destroyed after a trace run in addition to the HELP command text.

ADVANCED CAPABILITY of 4300 FRIEND (continued)

6K.ASSIGNMENT OF PROGRAM FUNCTION KEYS (Operator Console)

The following program function keys are assigned for the 327x console:

To be used in any input field:

- PF 3 = Quit (cancel command input)
- PF 4 = Swap screen mode for remote support  
from large to small display or vice versa
- PF 10 = Display last command (?)
- PF 11 = Display last but one command (??)

To be used in command input (not allowed if 'RESPOND' is displayed in status field):

- PF 1 = Display last channel program (CCW)
- PF 2 = Display all channel programs (CCW =)
- PF 5 = Start active CCW-chain and trace (TRACE)
- PF 6 = Display last trace entries (DUMPT)
- PF 7 = Execute TIO command to last entered device (XTIO)
- PF 9 = Repeat execution of last entered command
- PF 12 = Display counters of all active channel programs (COUNTER)

CCW *	CCW = *	QUIT *
SWAP REM	TRACE *	DUMPT *
XTIO *		REPEAT *
?	??	CNTR *

\*: To be used in command input only.

7. SPECIAL STORAGE AREAS

- X'0300' Special TIO/SIO loop area.
- X'0400' 4 bytes long 'data area address' (standard x'D000'). This address should point behind all other FRIEND areas, because FRIEND will use the data space up to the end of the storage.
- X'0404' 4 bytes long 'CCW area address' (standard x'A000', must start on double word boundary).
- X'0408' 4 bytes long 'IDA area address' (standard x'9F00', must start on word boundary).
- X'040C' 4 bytes long trace area start address (standard x'4FFF' before storage end).
- X'0410' 4 bytes long trace area end address (standard x'2FFF' before storage end).
- X'0414' 4 bytes long current trace entry pointer.
- X'0418' 4 bytes long address of first unit control block (UCB) (storage end - x'GFFF').
- X'041C' 2 bytes long internal program version/level (xxyy).
- X'041E' 2 bytes long 'secondary output station' (printer) address.
- X'0420' 2 bytes long 'keyboard' device address.
- X'0422' 2 bytes long 'printer' device address (for internal use).
- X'0424' 2 bytes long 'current test device' unit address used for TIO.
- X'0426' 2 bytes long 'last test device used' unit address used for HIO after 2x external interrupt (INT Command).
- X'044C' Control Indicator Byte (INDBYTE)
  - X'81' == 125 DOC console
  - X'01' == 3277 type console
  - X'10' == extended control (EC) mode
- X'044F' SP console control byte x'01' == SP console.

To change the area where 4300-FRIEND will locate the data area, the CCW area or the IDA area, include the following patch (REP) card preceding the END (last) card, or alter the storage areas after 4300-FRIEND is loaded by use of the 'ALTER' command. Note that CCWs should start on double word boundary and IDAWs on word boundary and that these areas should not overlap. The data area should be assigned to the last part of the storage.

Patch card format:

Column 1234 7 17  
&REP 000400 XXXX,XXXX where XXXXXXXX is the address of  
2 the new data area.  
9

ALTER command example:

DEV=DEVICE ADDRESS= q any device address  
I/O= .....-.....  
alter 8,400,xxxxxxxx xxxxxxxx == addr. of new data area  
0003f8 ..... xxxxxxxx 4300-FRIEND displays altered memory  
reset Reset 4300-FRIEND, to make change(s)  
active.  
DEV=

7. SPECIAL STORAGE AREAS (continued)

7A. Unit Control Block (UCB)

For each CCW chain created, 4300-FRIEND uses a special control block called UCB. The address of each UCB may be displayed by using the CCW= or LIST= commands. The length of one UCB entry is 48 bytes.

offset len			contents
hex dec	gth		
-----			
00	00	02	device address
02	02	02	chain execution flags
		8000	wait
		4000	compare
		2000	increase/decrease
		1000	ripple/random/zero (plus indicator in CCW byte 5)
		0800	data dump
		0400	data dump on operator console
		0200	continue if loop finished
		0100	FB device
		00x0	CAW key
		0008	UCB is used
		0004	device or control unit busy
		0002	chain being executed
		0001	device is ready (active)
04	04	04	CCW pointer = address of first CCW
08	08	02	CSW mask bytes set by CSW= command
0A	10	02	sense bytes mask set by SENSE= command
0C	12	04	time delay set by WAIT command
10	16	04	time out counter for missing device end (TIME DELAY)
14	20	04	operand one address of COMPARE
18	24	04	operand two address of COMPARE
1C	28	02	length of compare fields
1E	30	02	length for the DATA DUMP function
20	32	04	address for the DATA DUMP function
24	36	04	address of the INCREASE/DECREASE table
28	40	02	loop count to do, set by LOOP command (threshold)
2A	42	02	number of SIOs done
2C	44	02	loop count to do for counter message, set by LOOP n, M command
2E	46	02	number of SIOs done for counter message

8. COMMAND LANGUAGE

All 4300-FRIEND commands and their alternate forms are listed below.

In general all vowels, blanks, periods, and asterisks are ignored in 4300-FRIEND input except in data. A comma may be used to separate a parameter from the command.

A '\_' after the command name means that no other character except comma has to follow. Otherwise the command is misinterpreted or a 'SYNTAX ERROR' occurs.

In case of syntax errors or if you would like to repeat the previous input, which was more than three characters long, a question mark '?' may be entered on CRT or DOC operator consoles. By entering '?' or by depressing the PF 10 key 4300-FRIEND displays the last entered 30 characters in the CRT input field. Entering '??' or depression of the PF 11 key causes the last but one input to be displayed. Correct the last command/reply if necessary and hit the 'Enter' key.

If storage addresses have to be specified for a command, they have to be specified in hexadecimal with or without leading zeroes. Other numeric data (for example, data/field length) may be specified either in decimal or hexadecimal, where the hexadecimal values must be preceded by the character 'x'.

8A. Normal Chain (UCB) Control Commands

GO

G

B

EXQ

XQ

'ENTER' key == START

Go (Start CCW chains)

This command instructs 4300-FRIEND to start execution of all active CCW chains. After 4300-FRIEND has started the execution of all active CCW chains the CRT console will accept commands (for example STOP/ACTIVATE COUNTER/EXHIO) without halting the execution. 4300-FRIEND may be stopped by an I/O interrupt from the operation console. (REQU. or TEST REQ. or ENTER key without data.)

TRACE,xxx (PF5) (new)

TRC

Trace all SIOs and I/O interrupts

This command instructs 4300-FRIEND to start execution of all active CCW chains and to build up a trace area which contains information about all SIOs and I/O interrupts of all test devices. If an asterisk (\*) is specified for 'xxx' the SIOs and TIOs for the operator console and the secondary printer are traced too. If the optional device address 'xxx' is specified, only trace entries for this device are stored in the trace area. The last trace area entries may be dumped by using the DUMPT command.

LOOP / LOOP n..n,p

LP / LPn,p

Loop on CCW chain

This command instructs 4300-FRIEND to ask how many times it has to perform the current CCW chain 'NUMBER OF TIMES='. The loop number may be specified directly after the keyword in decimal (n..n). The maximum number is 65535. The SIO counter will be reset to zero. 'LOOP' can be specified for each CCW chain. If parameter 'p' is specified as '\*', the CCW chain is 'stopped' when the specified loop count is reached. The stopped chains may be activated again by the 'ACT,\*' command. If the parameter '\*' is not specified and the CCW chain has been executed the specified number of times, 4300-FRIEND will stop the execution of all active CCW chains and will print out:  
'LOOP IS FINISHED ON UNIT xxxx' and will request a new command. Type in 'GO' to repeat the CCW-chain(s). The current loop values (thresholds) may be displayed by the COUNTER command. If parameter 'p' is specified as 'M', the loop counter is displayed after n..n SIOs have been executed. For the 1052/SP console this is done by default every 100 SIOs.

CCW (PF1) - or CCW=xxx (PF2)

LIST

LST

List CCW's (xxx = optional device addr)

This command will instruct 4300-FRIEND to display the channel program being generated together with up to 16 data bytes in hexadecimal. If a device address is specified, all CCW blocks for this specific device are listed. A device address of '0' or 'CCW=' alone will cause 4300-FRIEND to display all CCW blocks of all devices. If 'GO' has not been entered, the command chain bit will be on in the last CCW. If 'CCW' is entered immediately after an I/O error message, the displayed chain will be the one that detected the error. The actual failing command will be flagged by \*\* (CCW address in CSW minus 8).

8. COMMAND LANGUAGE (continued)

8A. Normal Chain (UCB) Control Commands

Example:

```
ccw=30
01*UNIT=0030, UCB=0F9000, FL=8009
 1-00A000 01 00D000 6010 03E8 RANDOM
 2-00A008 27 00D0E8 6000 0001
 3-00A010 02 00D0E9 6020 03E8 ZERO
. . . . .
. . . . .CCW count
. . . . .random/ripple/zero
. . . . .modifiers
. . . . .CCW tags
. . . . .data address
. . . . .CCW command
. . . . .storage address of CCW
. . . . .CCW number (for REP/FLAG commands)
```

'UCB' means Unit Control Block address of 4300-FRIEND for this CCW chain.  
'FL' means UCB flag bytes in the UCB.

Use the nn-CCW command for one UCB (for example, 2-CCW to display UCB/chain two).

<u>STATUS</u> STTS	(new)	<u>Display FRIEND Status</u> This command instructs 4300-FRIEND to print all program indicators, normally displayed on the 327x console line 20.
? (??)	(new)	<u>Repeat last input (327x)</u> 4300-FRIEND will repeat the last command or data entered on a 327x console (up to 30 bytes) if more than three characters long. If two question marks are used (??) the last but one data input is displayed. The data may be modified and entered again.
<u>HELP</u> HLP	(new)	<u>Display Help Message</u> 4300-FRIEND will display operating hints.
<u>COUNTER</u> (PF12) CNTR	(new)	<u>Display Counters</u> This command instructs 4300-FRIEND to print the LOOP values (thresholds) and the SIO counters for all active CCW chains/UCBs.

<u>SIZE</u> SZ	(new)	<u>Display Storage Size</u> The storage size is displayed in hexadecimal.
<u>RESET</u> RST RQT F		<u>Initialize 4300-FRIEND</u> This command instructs 4300-FRIEND to re-initialize itself. The device queue, CCW area, data area, and IDA areas will be zeroed out. All references to symbolic data areas (\$A...\$Z) are reset. A new device address will be requested.
<u>I</u> reset (lower case)		<u>Initialize 4300-FRIEND (in any input-field)</u> Same as 'RESET' but accepted in all input fields (for example, in data request).
<u>QUIT</u> QT Q	(new)	<u>Quit 4300-FRIEND request for console input</u> By entering character 'Q' in lower or upper case one may leave any request for input (e.g. DATA=). The whole last command is ignored and a new command is requested. The REPLACE function is reset.
<u>CLEAR</u> CLR	(new)	<u>Clear all active UCBs</u> This command instructs 4300-FRIEND to clear all CCW execution flags in all active UCBs and to reset the execution counters. This command may be used after an error stop in order to reinitialize the CCW execution sequence.
<u>CLEAR\$X</u> CLR\$X CLR\$	(new)	<u>Clear references to symbolic areas</u> This command instructs 4300-FRIEND to clear the reference to a symbolic data area (x) or all references (if x is blank)
<u>SCOPE</u> SCP		<u>Scope</u> This command instructs 4300-FRIEND to do a scope loop on the Start I/O or Test I/O instruction. 'SCOPE' can only be used in single CCW chain mode. If 'SCOPE' is specified after a TEST I/O a 'PSW RESTART' has to be performed to exit SCOPE mode. Console REQUEST can be used to exit the START I/O scope loop. No messages (for example, for I/O interrupts) are displayed/printed during the scope loop.



8. COMMAND LANGUAGE (continued)

<u>TIME DELAY</u> <u>n..n</u> TMDL <u>n..n</u>	<u>Time Delay for n..n seconds</u> This command tells 4300-FRIEND to set the time out counter for the execution of all chains to decimal n..n seconds. An error message is indicated if 4300-FRIEND does not receive a device end for a CCW chain within the specified time period. This command should be used if 4300-FRIEND operator console or sec. printer should be used as test devices too.
<u>NO TIME DELAY</u> (new) NTMDL NTD	<u>No Time Delay = use PSW wait (standard)</u> This command instructs 4300-FRIEND to go into WAIT state after all active UCB devices are started until an I/O interrupt occurs. Devices which do not return a device end interrupt are not restarted. This mode is recommended if 4300-FRIEND is used in the 'Virtual Machine' (VM) environment, in order to save Processor time.
<u>WAIT</u> <u>n..n.n</u> WT <u>n..n</u>	<u>Wait N-milliseconds</u> This command instructs 4300-FRIEND to wait n..n is an optional operand. If n..n is not specified, 4300-FRIEND will start the next CCW immediately upon the receipt of the device end interrupt. Otherwise it will wait for n..n milliseconds before starting the next CCW chain. The second parameter is optional and specifies 1/10 of milliseconds.
<u>NO WAIT</u> (new) NWT	<u>Reset WAIT</u> This command will reset the WAIT indication for the last entered chain, or for the chain specified in the 'nn-NOWAIT' format.
<u>ADD</u> DD	<u>Add CCW to chain</u> This command will instruct 4300-FRIEND to add the following CCW's to the last CCW chain entered. 4300-FRIEND will turn on the Command Chain bit in the preceding CCW. For a CCW chain which has been completed before, up to four additional CCW's may be added by using the nn-ADD command for each additional CCW.

RPn	This command will instruct 4300-FRIEND to replace the number n..n CCW in the last CCW chain entered with the next CCW that is entered. Use the nn-REP command to modify a specific CCW chain. During command (CCW) input REP alone will cause the last entered CCW to be replaced by the next one.
<u>FLAG</u> <u>nn,xx</u> (new) FLGn,xxxx	<u>Modify flag byte in CCW nn (first == 1)</u> This command will instruct 4300-FRIEND to modify the flag byte in the specified CCW to the hexadecimal value 'xx'. If no value is specified the flag is set to zero. If 'nn' is not specified, the last entered CCW is used.
<u>DEVICE=xxx</u>  DVC=xxx DEV=xxx DV=xxx	<u>Create Unit Control Block (UCB) for device xxx</u> This command will instruct 4300-FRIEND to initialize a new unit control block (UCB) to execute the next CCW chain entered with the unit address of xxx (leading zeros are not required). If the device address is '*', the address of the operator console is taken. The last entered UCB entry will be completed by turning the command chaining bit off in the last CCW. Note: 4300-FRIEND will analyse the device type at this time. A Halt I/O and Start I/O's with the following commands are executed (if the device es ready): For FB device type determination: Sense I/O (x'E4') 2321 determination (if Sense I/O not accepted): Seek Cylinder (x'0B') - length 4 x'FF.FF' Seek (x'07') x'000010000000' After previous checks: Sense (x'04') - if any error occurred before to clean status.  If the specified device does not handle the above commands, you may specify an asterisk (*) as second operand. For FB devices COMMAND SET FB has to be used before entering CCW's.

8. COMMAND LANGUAGE (continued)

----- POINTER DATA=x....x (new) PNTRDT=... PTRDT=...	<u>Set data pointer</u> Specify the data area address for the next CCW.
----- POINTER CCW=x....x (new) PNTRCCW=... PTRCCW=...	<u>Set CCW pointer</u> Specify the address where the next CCW should be located (should be on double word boundary). If a command (CCW) was already entered for the current chain, a TIC command to the new area is automatically added.
----- POINTER IDA=x....x (new) PNTRD=... PTRD=...	<u>Set IDAW Pointer</u> Specify the address for the next IDAW used. (should be on word boundary)
----- COPY xxx CPY ... CP ...	<u>Copy previous CCW-chain of device 'xxx'</u> This command will duplicate the references to the last channel program and conditions entered for device xxx. The channel program is not actually duplicated, the same physical CCW chain is used. This permits the same channel program to be run on several devices at the same time. The devices must be the same type.
----- DEVICE=xxx  DVC=xxx DEV=xxx DV=xxx	<u>Create Unit Control Block (UCB) for device xxx</u> This command will instruct 4300-FRIEND to initialize a new unit control block (UCB) to execute the next CCW chain entered with the unit address of xxx (leading zeros are not required). If the device address is '*', the address of the operator console is taken. The last entered UCB entry will be completed by turning the command chaining bit off in the last CCW. Note: 4300-FRIEND will analyse the device type at this time. The following commands are executed (if the device is ready): For FB device type determination: Sense I/O (x'E4') 2321 determination (if Sense I/O not accepted): Seek Cylinder (x'0B') - length 4 x'FF.FF' Seek (x'07') x'000010000000' After previous checks: Sense (x'04') - if any error occurred before to clean status.

If the specified device does not handle the above commands, you may specify a dummy device address (e.g. 0). The real device address may be specified later by the nn-DEVICE= command.	
----- REMOVE=xxx RMV=xxx	<u>Remove device xxx (deactivate device)</u> This command is used to remove all CCW chains for a specific device from the device queue. If a user is executing several different devices in overlap mode, the complete CCW chain(s) of a device can be removed with this command. If you want to remove a single CCW chain you have to use the STOP command.
----- nn-STOP (new) n-STOP	<u>Stop execution of chain nn</u> This command is used to deactivate a certain CCW-chain. 'nn' is the UCB number displayed by the LIST= function.
----- nn-ACTIVATE,* (new) n-ACTVT n-ACTV n-ACT	<u>Activate CCW chain nn</u> This command is used to reactivate a certain CCW-chain. 'nn' is the UCB number displayed by the LIST= function. In case the optional parameter '*' is specified, all stopped CCW chains are activated (see LOOP command).
----- KEY CAW=k (new) KCAW=k KCW=k	<u>Set CAW key</u> This command is used to specify the CAW key for execution of the CCW chain. 'k' may be any hexadecimal digit '0-F'. The standard key used is one (1).
----- KEY CCW=k,f (new)	<u>Set storage key for CCW area</u>
----- nn-COPY (new) n-CPY n-CP	<u>Copy CCW chain nn</u> This command will duplicate the references to the channel program and conditions entered for UCB nn.
----- SUBST xxx,yyy SBST ... SB ...	<u>Substitute I/O devices (xxx for yyy)</u> This command will search all channel programs for device address yyy and change their device address to xxx. If you want to change the device address in a specific CCW-chain, you may use the 'nn-DEV=xxx' chain control command.

8. COMMAND LANGUAGE (continued)

<u>CSW=xxxx</u>	<u>CSW=xxxx (CSW status mask)</u> This command instructs 4300-FRIEND to generate a CSW device and channel status mask. The two byte long hexadecimal xxxx field indicates those bits that the user wants to be ignored by 4300-FRIEND. 'CSW=' can be entered anytime during generation of a CCW chain and may be specified for each CCW chain entered. The device end bit cannot be turned off.
<u>SENSE=xxxx</u> <u>SNS=x..x</u>	<u>SENSE mask (sense bytes 1+2 mask)</u> This command instructs 4300-FRIEND to generate a sense byte status mask. The two byte long hexadecimal xxxx field indicates those bits that the user wants to be ignored by 4300-FRIEND in the first two bytes of the sense information. 'SNS=' can be entered anytime during generation of a CCW chain and may be specified for each CCW chain entered.
<u>INCREASE n,addr,incr,thr,ini,*</u> Increase counter(s) <u>INCREASE n,addr,incr,thr,ini,n2,addr2,incr2,thr2,ini2,*</u> <u>INCREMENT ....</u> (new) <u>INCR ....</u>	This command instructs 4300-FRIEND to increment a counter after each completion of a channel program. Optionally a second counter may be specified, which will be updated if the threshold of the first counter is reached. The use of this command is exclusive to the DECREASE command. n = length of the counter (field) 1 to 4. addr = hexadecimal address of the counter incr = increment in decimal or hexadec. (optional, default = 0) thr = optional threshold = value of the counter at which the counter is initialised. (dec. or hex) (optional, default = 0) ini = value on which the counter should be initialised at the begin and when the threshold is reached. (decimal or hex) (optional, default = 0) * = stop execution if threshold of the only or second counter is reached.

<u>NO INCREASE</u> (new) <u>NINCR</u>	<u>Reset Increase function</u>
<u>DECREASE n,addr,incr,thr,ini,*</u> Decrease counter(s) <u>DECREASE n,addr,incr,thr,ini,n2,addr2,incr2,thr2,ini2,*</u> <u>DECREMENT ....</u> (new) <u>DCR ....</u>	This command instructs 4300-FRIEND to decrement a counter after each completion of a channel program. Optionally a second counter may be specified, which will be updated if the threshold of the first counter is reached. The use of this command is exclusive to the INCREASE command. The parameters are the same as for the INCREASE command. ( decr == incr )
<u>NO DECREASE</u> (new) <u>NDCR</u>	<u>Reset Decrease function</u>
<u>COMPARE \$x,\$y,n..n</u> <u>COMPARE addr1,addr2,n..n</u> <u>CMPCMPARE ....</u> <u>CMPCR ....</u> <u>CMPP ....</u>	Compare n-bytes ('n..n' is optional) This command can be used to instruct 4300-FRIEND to compare two data areas. Only two areas can be compared for one CCW chain. The two areas compared can be different in any CCW chain(s). The length of the area to be compared can be either specified in decimal or hexadecimal. A hexadecimal value has to be preceded by character 'x'. The maximum length is 65535. 'COMPARE' can be entered anytime during generation of a CCW chain and may be specified for each CCW chain entered. If symbolic I/O areas are used, they must have been defined before. If no length (n..n) is specified, the one of the first symbolic I/O area is used. 4300-FRIEND will perform the compare at each completion of the CCW chain.
<u>NO COMPARE</u> <u>NCMPR</u> <u>NCMP</u>	<u>Reset Compare</u> This command will reset the Compare indication for the last entered chain, or for the chain specified in the 'nn-NOCOMPARE' format.

8. COMMAND LANGUAGE (continued)

DATA DUMP n..n,addr,* (new)	Data Dump on secondary printer
DATA DUMP n..n,\$a,*	This command instructs 4300-FRIEND to dump
DATA DUMP \$a,*	after each CCW-chain execution the spe-
DTDMP ....	cified data area on the secondary printer
	n..n = length of data area (not requ.
	for symbolic address (e.g. \$A
	or \$A+a ( a = offset 1..F )
	addr = address of first byte to be
	dumped (can be symbolic)
	If the secondary printer is not speci-
	fied, the operator console is used for
	the display.
	If the optional parameter '*' is speci-
	fied, the dump will appear also on the
	operator console.
NO DATA DUMP (new)	Reset Data Dump
NDTDMP	This command will reset the Data Dump.
DUMP I (PF6) (new)	Dump trace area
DMPT	This command will dump the last entries
	of the TRACE area (max. 36 entries).
DUMP S (new)	Dump Symbolic Data Area Names
DMP\$	This command will instruct 4300-FRIEND to
	dump the names of all assigned symbolic
	data areas along with their storage
	address and length in hexadecimal.
DUMP KEY n..n,addr (new)	Dump storage keys for n..n bytes
DUMP KEY n..n,\$a	This command will instruct 4300-FRIEND to
DUMP KEY \$a	dump the storage keys of the specified
DMPK ....	storage area.
DUMP n..n,addr,xxx	Dump n-bytes (xxx==opt.prt addr)
DUMP n..n,\$a,xxx	This command will instruct 4300-FRIEND to
DUMP \$a,xxx	dump the hexadecimal contents of sto-
DMP ....	rage. The customer storage is displayed
	in lines of maximum 32 bytes along with
	the address of the first byte.
	'DUMP n..n,address' will cause the dump
	of n..n bytes, starting at 'address'.
	The length of the area to be displayed
	can be either specified in decimal or
	hexadecimal. A hexadecimal value has to
	be preceded by character 'x'.
	Optionally a line printer address xxx
	may be specified for output.

'\$a' may be any symbolic I/O area speci-  
fied by a previous 'BUILD'/'CREATE' com-  
mand or by 'FROM' or 'INTO' CCW command  
modifiers. If the length is not speci-  
fied the one stored for the symbolic  
field is taken.

Symbolic address may be '\$A' or with  
offset '\$A+a' ( a = offset 1..F )

DISPLAY n..n,addr,xxx (new)	Display n-bytes (xxx==opt.prt addr)
DISPLAY n..n,\$a,xxx	This command will instruct 4300-FRIEND to
DISPLAY \$a,xxx	display the contents of storage in cha-
DSPL ....	racter format if printable.
	The customer storage is displayed in
	lines of maximum 64 bytes along with
	the address of the first byte.
	'DSPL n..n,addr' will cause the display
	of n..n bytes, starting at 'addr'.
	The length of the area to be displayed
	can be either specified in decimal or
	hexadecimal. A hexadecimal value has to
	be preceded by character 'x'.
	Optionally a line printer address xxx
	may be specified for output.
ALTER KEY n..n,addr,k,f (new)	Alter storage key for n..n bytes
ALTER KEY n..n,\$A,k,f	This command will instruct 4300-FRIEND to
ALTER KEY \$A,k,f	alter the storage keys of the specified
LTR K ...	storage area to the key specified by 'k'
ALT K ...	and will set fetch protection on if a 'f'
LTK ....	is specified as last operand.
ALTER n..n,addr,hhhhhh.. (new)	Alter n-bytes in hexadecimal
ALTER n..n,\$A,hhhhhh...	This command will instruct 4300-FRIEND to
ALTER \$A,hhhhhh...	alter up to 80 bytes in main storage
LTR ....	at the specified address 'addr' or symbo-
ALT ....	lic I/O area '\$A'. The data 'hhhh' is
LT ....	moved to the storage.
	The length of the area to be altered
	can be either specified in decimal or
	hexadecimal. A hexadecimal value has to
	be preceded by character 'x'.
	After the storage alter operation the
	changed memory location is dumped
	including the preceding and following
	eight bytes.
	Note that for altering one byte, one has
	to specify two hexadecimal digits.

8. COMMAND LANGUAGE (continued)

CHANGE n..n,addr,cccccc.. (new)	Change n-bytes in character format
CHANGE n..n,\$A,cccccc...	This command will instruct 4300-FRIEND to alter up to 80 bytes in main storage at the specified address 'addr' or symbolic I/O area '\$A'. The data 'cccc' is moved to the storage (lower case characters are accepted).
CHANGE \$A,cccccc...	The length of the area to be altered can be either specified in decimal or hexadecimal. A hexadecimal value has to be preceded by character 'x'.
CHNG ....	After the storage alter operation the changed memory location is displayed.
DISCONNECT n..n, addr (new)	Disconnect storage block (VSE mode)
DISC n..n, \$a	This command will instruct 4300-FRIEND to disconnect a storage block of length 'n..n'. (full 2k blocks are used)
DSC \$a	Re-Connect the block(s) before using the DUMP/ALTER commands.
CONNECT n..n, addr (new)	Connect storage block (VSE mode)
CONN n..n, \$a	This command will instruct 4300-FRIEND to connect a storage block of length 'n..n'. (full 2k blocks are used).
CNN \$a	
BUILD n..n,\$A (new)	Build/Create symbolic I/O area
BLD n..n,\$A	This command will instruct 4300-FRIEND to reserve a n..n byte long symbolic data field \$A (any alpha value). The data can be specified after message 'DATA= '.
CREATE n..n,\$A	You may specify as many data streams in character or hexadecimal form as required to build the total number of bytes specified by (n..n).
CRT n..n,\$A	4300-FRIEND repeats the 'DATA=' request until no data is entered or the length count is exhausted.
	The length of the area to be created can be either specified in decimal or hexadecimal. A hexadecimal value has to be preceded by character 'x'.
	If the specified length is zero (0) a data area with length one is created and no data is requested (pointer).
	The created data area is available for the use in all following CCW's until the 'RESET' command is entered.

An asterisk (\*) may be entered as a third optional parameter. This will create a pointer to the current CCW area.

PRINT LOG,xxx (new)	Print log/screen image
PRNTLG ....	This command instructs 4300-FRIEND to print the data displayed on the 433x console on the secondary printer, or the printer specified by the optional xxx address.
	A whole screen image is printed when the COPY key is pressed.
	This is a special 433x system command which will use the x'83' op-code.
	After this function a system reset (P) and reset (R) must be performed.
CONFIG xxx,yyy (new)	Configuration Test of system I/O's
CNFG	This command allows to test a certain range of devices with addresses 'xxx' to 'yyy'. If no device address is entered all device addresses from x'000' to x'FFF' are tested.
	4300-FRIEND will issue a TIO command, a SIO sense and SIO sense I/O command to each device. The resulting condition codes, first four sense bytes and sense I/O information bytes one to seven will be displayed. In addition TCH and STIDC commands will be issued for the first device and all following channel addresses ending with x'00'.
	The first byte of the channel ID means x'00'= Selector Channel, x'10'= Byte MPX channel, x'20'= Burst MPX channel.
	Devices/Channels which are storing condition code three after TIO/TCH will not be displayed.
	All outstanding I/O interrupts will be cleared before the CONFIG command. If an I/O interrupt is encountered after one device is tested, a message will be displayed.

# 8. COMMAND LANGUAGE (continued)

TIO T TEST TST	Test I/O to last specified device 4300-FRIEND will repeatedly execute the TIO instruction and type out the results of the instruction i.e. condition code, CSW and sense bytes. If a loop count is specified for the last entered UCB, the TIO loop may be restricted. The TIO command is issued to the last entered device address only. Use the 'EX TIO' command if you want to execute the TIO only once. By typing 'SCOPE' instead of 'GO' the display of the result is skipped. Reset of the 'TIO' mode is possible by hitting the 'external interrupt key' twice (if 'INT' feature is active) or by commands 'NO TEST I/O', 'PRINT SENSE', or 'RESET'.
NO TEST I/O(new) NTST	Reset Test I/O mode This command resets the execution of the TIO command.
EX TIO,xxx(PF7) (new) XT	Execute Test I/O to device xxx After executing the specified I/O command the condition code is displayed. If the device address xxx is not specified, the last entered one is used.
EX CLRIO,xxx (new) XC	Execute Clear I/O to device xxx After executing the specified I/O command the condition code is displayed.
EX HIO,xxx (new) XH	Execute Halt I/O to device xxx After executing the specified I/O command the condition code is displayed.
EX HDV,xxx (new) XHD	Execute Halt Device to device xxx After executing the specified I/O command the condition code is displayed.
EX TCH,xxx (new) XTC	Execute Test Channel Cmd for dev. xxx After executing the specified I/O command the condition code is displayed.
EX STIDC,xxx (new) XS	Execute Store Channel ID Cmd (dev. xxx) After executing the specified I/O command the condition code is displayed.

PRINT SENSE(new) RNTSNS PRTSNS	Print sense byte area This command instructs 4300-FRIEND to display the 32 bytes long standard sense area. The 'TIO' mode of 4300-FRIEND is reset.
BMPX (new) 370	Enable block multiplex mode Standard if EC-mode specified. This command instructs 4300-FRIEND to set bit zero of control register zero, which indicates the block multiplex mode.
NO BMPX (new) NBMPX 360	Disable block multiplex mode Standard if BC-mode specified. This command instructs 4300-FRIEND to reset bit zero of control register zero.
HALT HLT H	Halt after error This command instructs 4300-FRIEND to halt after any detected I/O error or false PSW swap. No device will be restarted, but additional errors may be indicated.
NO HALT (new) NHLT NH	No Halt (standard) This command instructs 4300-FRIEND to continue after an I/O error print out.
ALARM (new) L	Alarm for operator console This command instructs 4300-FRIEND to issue an audible alarm after a message is displayed for which an operator action is required.
NO ALARM (new) NLRM	No Alarm (standard) This command instructs 4300-FRIEND to reset the audible alarm for operator console.
EX SENSE (new) NXSNS	Execute Sense Command (standard) This command instructs 4300-FRIEND to execute an SIO with a sense command after a Unit Check.
NO EX SENSE(new) NXSNS	No Execute Sense Command This command instructs 4300-FRIEND to skip the execution of the SIO with a Sense command in case of an Unit Check.

8. COMMAND LANGUAGE (continued)

REMOVE=xxx RMV=xxx		<u>Remove device xxx (deactivate device)</u> This command is used to remove all CCW chains for a specific device from the device queue. If a user is executing several different devices in overlap mode, the complete CCW chain(s) of a device can be removed with this command. If you want to remove a single CCW chain you have to use the STOP command.
nn-STOP n-STOP	(new)	<u>Stop execution of chain nn</u> This command is used to deactivate a certain CCW-chain. 'nn' is the UCB number displayed by the LIST= function.
nn-ACTIVATE,* n-ACTVT n-ACTV n-ACT	(new)	<u>Activate CCW chain nn</u> This command is used to reactivate a certain CCW-chain. 'nn' is the UCB number displayed by the LIST= function. In case the optional parameter '*' is specified, all stopped CCW chains are activated (see LOOP command).
KEY CAW=k KCAW=k KCW=k	(new)	<u>Set CAW key</u> This command is used to specify the CAW key for execution of the CCW chain. 'k' may be any hexadecimal digit '0-F'. The standard key used is one (1).
KEY CCW=k,f KCCW=k,f	(new)	<u>Set storage key for CCW area</u> This command is used to specify the key for the 4300-FRIEND CCW area for all chains. The standard key is one (1) without fetch protection. If 'f' is specified as last operand, the CCW area is fetch protected.
KEY DATA=k,f KDATA=k,f KDT=k,f	(new)	<u>Set storage key for data area</u> This command is used to specify the key for the 4300-FRIEND data area for the next chains to be entered. 4300-FRIEND will increment the data area pointer to the next 2k storage boundary and will set the specified key up to the end of the storage. The standard key is one (1) without fetch protection. If 'f' is specified as last operand, the data area is fetch protected.
KEY IDA=k,f KIDA=k,f KD=k,f	(new)	<u>Set storage key for IDA area (IDAW)</u> This command is used to specify the key for the 4300-FRIEND IDA area for all chains. The standard key is one (1) without fetch protection. If 'f' is specified as last operand, the IDA area is fetch protected.



8. COMMAND LANGUAGE (continued)

<u>INT</u> NT	(new)	<u>Interrupt (standard) 2x extern. interr.</u> This command instructs 4300-FRIEND to dis-continue the execution of CCW chain(s) after the external interruption button has been hit twice. A Halt I/O instruction will be issued after about 5 seconds to still active I/O devices. The 'TIO' mode of 4300-FRIEND is reset.
<u>NO INT</u> NNT	(new)	<u>No Interrupt</u> This command instructs 4300-FRIEND to handle the external interruptions normally.
<u>BTS</u>	(new)	<u>Branch to SIO (TIO/SIO loop at x'300')</u> This command instructs 4300-FRIEND to execute the last CCW chain entered with a small TIO/SIO loop at address x'300'. The loop can be finished by hitting the external interrupt button twice if 'INT' is active, otherwise by 'program restart'
<u>\$\$nnn,*</u>	(new)	<u>Get predefined chain 'nnn' out of memory</u> The chain source may be displayed by a '*' as last parameter.
<u>\$\$?</u>	(new)	<u>Display all \$\$nnn chains</u> The first 79 source characters of all pedefined chains are displayed.
<u>START READER,xxx,* ,nnnn,B</u> STRTRDR,xxx STRDR,xxx S,xxx		<u>Start reader for CCW command input</u> This command instructs 4300-FRIEND to read the CCW chain(s) to be executed from either a card reader or a tape drive with address 'xxx'. If the second parameter is '*' all records read are displayed. As an optional third parameter a four digit long test case number may be specified. This number must be located in columns 3 to 6 of the first record of a test case. If a tape is used and the required test case has been passed, a fourth parameter 'B' for backward read may be used. 4300-FRIEND will skip all test cases up to the one specified.

<u>SET FB</u> STFB	(new)	<u>Set FB Device Type (3310/3370)</u> May be used for devices not storing the correct FB ID after sense i/o.
<u>RETURN</u> RTRN	(new)	<u>Return to operator console control</u> This command may be used to return from card/tape input to operator console input (Otherwise the GO or TRACE command has to be used).
<u>\$*=..</u>	(new)	<u>Specify two hexadecimal digits</u> This command may be used to assign two hexadecimal digits for the characters '\$' and '*'. If the character '\$' or '*' is used in hexadecimal input fields, they are replaced by the digit assigned. The default value is 'FF'.
<u>CHANGE KEYBOARD</u> CHKNGKBRD CK	(new)	<u>Change keyboard or printer address/type</u> This command instructs 4300-FRIEND to request a new keyboard address for command input, or the address of the secondary output station (printer) for CRT hard copy (type PRT). Note: 4300-FRIEND will ask for the device type of the new console / secondary output station. Secondary output station printing will produce a hard copy of all messages for the 327x, or 125D type console. If a secondary output station is specified, make sure that it can handle the print CCW x'09'. Reset the secondary output by specification of address = 0 and type = PRT.
<u>Program (PSW) Restart</u>	(new)	<u>In execution mode this system function is requesting a command.</u> = CLEAR function without counter reset.



# 8. COMMAND LANGUAGE (continued)

## 8B. MULTIPLE CHAIN (UCB) CONTROL COMMANDS

During creation of a CCW chain all entered commands are related to the current unit control block (UCB). The number of the current UCB is displayed on CRT line 20 or after the STATUS command.  
In order to allow the modification of existing CCW chains (UCB's) the UCB or chain number has to be used as a command prefix.  
The chain/UCB number may be obtained by using the 'CCW=' or 'LIST=' commands.  
The following commands may be used in connection with a one to two digit chain or UCB number in front of the command separated by a dash.

- nn-LIST / nn-CCW = list CCW's of UCB/chain nn
- nn-COUNTER = list counters of UCB/chain nn
- nn-LOOP = specify/modify LOOP count
- nn-KEY CAW= = specify/modify CAW key
- nn-STOP = stop/deactivate UCB/chain
- nn-ACTIVATE = activate UCB/chain
- nn-WAIT nnnn = specify/modify WAIT for a chain
- nn-NO WAIT = deactivate WAIT for a chain
- nn-CSW=xxxx = specify/modify CSW bits to be ignored
- nn-SENSE=nnnn = specify/modify SENSE bits to be ignored
- nn-DATA DUMP .. = specify/modify DATA DUMP values
- nn-NO DATA DUMP = deactivate DATA DUMP for a chain

- nn-INCREASE .. = specify/modify INCREASE values
- nn-NO INCREASE = deactivate INCREASE for a chain
- nn-DECREASE .. = specify/modify DECREASE values
- nn-NO DECREASE = deactivate DECREASE for a chain
- nn-COMPARE ... = specify/modify COMPARE values
- nn-NO COMPARE = deactivate COMPARE for a chain
- nn-DEVICE= = change device address for a chain without device type determination.
- nn-REP nn = replace one CCW in a chain
- nn-FLAG nn,xx = modify flag byte in specified CCW for a chain
- nn-ADD = add one command after specified chain (up to four CCW's may be added by subsequent nn-ADD commands)
- nn-COPY = copy CCW-chain 'nn' for current UCB
- nn-SETFB = set FB type for device (required before nn-REP and nn-ADD for 3310/3370)

For a detailed description of the commands refer to the chapter COMMAND LANGUAGE.

e.g. the following command will modify the loop count for chain 12

12-loop 5000

e.g. the following command will copy the UCB of CCW-chainnumber 2 to the current UCB (using the same CCW's and data).

## 8. COMMAND LANGUAGE (continued)

### 8C. CHAIN EXECUTION CONTROL

Before a SIO is issued, 4300-FRIEND will check the CCW-chain and zeroes all input areas indicated by the ZERO flag in the CCW.

In case of an I/O interrupt or condition code one or three after a start I/O instruction 4300-FRIEND will analyse the CSW and issues the specified UCB control commands in the following sequence.

A. Successful completion of a CCW chain. (either no error detected or error was masked out by CSW=/SENSE= commands)

1. Data compare
2. Data dump
3. Data ripple or random
4. Increment or decrement storage field
5. Compare loop count

B. Unsuccessful execution of a CCW chain (error in CSW after I/O interrupt and CSW status not masked)

1. Issue 'sense' command in case of unit check in CSW
2. In case of all sense bytes masked and no other error in CSW, handle it as normal interrupt
3. Display error message
4. Data dump
5. Data ripple or random
6. Increment or decrement storage field
7. Compare loop count

C. Condition Code one (CSW stored) after Start I/O with unexpected CSW status

1. In case of all CSW status error bits masked handle it as immediate interrupt
2. Issue 'sense' command in case of unit check in CSW
3. In case of all sense bytes masked and no other error in CSW, handle it as immediate interrupt
4. Display error message
5. Increment or decrement storage field.
6. Retry Start I/O (SIO counter is not incremented)  
The SIO is not retried if the loop count is one

D. Condition Code three after Start I/O

1. Display error message
2. Increment or decrement storage field.
3. Retry Start I/O (SIO counter is not incremented)  
The SIO is not retried if the loop count is one

E. Condition Code two (busy) after Start I/O

- If WAIT specified: Wait until device end is signalled by device or stop execution if interrupt not received after about five seconds.
- If WAIT was not specified: start next device (if specified)

F. Test I/O Loop (last entered device address at storage location x'420')

1. Print out condition code
2. Increment or decrement storage field
3. Compare Loop Count

9. CHANNEL COMMAND WORDS

Explanation of Signs and Codes in the CCW Listing

The hexadecimal Command Code is printed at the left side of the command name. Under the command name the importance of each single character of the name is classified as follows :

- | means that this character has to be typed
- \_ means that this character may be necessary
- 'BLANK' means that this character can be left out

In general, all vowels, blanks, periods, and asterisks are ignored in 4300-FRIEND input except in requested data. All commands can be typed in either upper or lower case characters.

The character 'Q' can be either entered as 'q' or as '='.

A '\_' after the command name means that no other character except comma has to follow. Otherwise the command is misinterpreted or a 'SYNTAX ERROR' occurs.

Following the CCW command, the CCW flag or modifier control commands may be specified separated by a comma.

Some CCWs will be automatically created with the SILI bit set. These CCWs are indicated in the following listing by a \*S\* behind the command. If you do not want the SILI flag bit set, use the CCW flag command 'NOSILI' after the channel command.

9A. General CCWs

CMD HH	*S*	Command Code in hexadecimal
	=====	Enter any hexadecimal command code. If the last hex-digit is odd, data is requested.
-----		
HEX HHHHHHHHHHHHHHHH		Complete CCW in hexadecimal
	=====	
HX HHHHHHHHHHHHHHHH		Enter a complete CCW in hexadecimal. 16 hexadecimal characters are packed into an 8 byte CCW and inserted into the CCW chain. The data address in the CCW will be changed to point to the next available data area location of 4300-FRIEND (not if SKIP bit on in CCW flag).
X HHHHHHHHHHHHHHHH		Blanks may be inserted to separate fields. It is not possible to specify any flag or modifier command.

WRITE	(x'01')	*S*	Write
			=====
WRT			
WR			
W			
-----			
READ	(x'02')	*S*	Read
			=====
RD			
R			
-----			
NOP	(x'03')	*S*	No-operation
			=====
NP			
-----			
SENSE	(x'04')	*S*	Sense (length always 32 bytes)
			=====
SNS			Standard sense bits are (byte zero):
			x'80' = command reject
			x'40' = intervention required
			x'20' = bus out check
			x'10' = equipment check
			x'08' = data check
			x'04' = (overrun)
			x'02' = (track cond. check/lost data)
			x'01' = (seek check/channel 9/time out)
-----			
TIC *-n..n	-or-	-n..n	Transfer in channel
			=====
TIC *+n..n	-or-	+n..n	'n..n' is the decimal number of bytes for the channel to transfer to (displacement) the '*' and '+' or '-' are optional. If only 'TIC' is entered, '*-8' is assumed. If 'X' is the first character of n..n, the following charaters are taken as hexadecimal displacement.
TC		(x'08')	
-----			
SENSE INPUT/OUTPUT (x'E4')	*S*		Sense Input/Output (Device) - 7 bytes
' '   ' '   ' '			=====
SNSN			
SENSE DEVICE			
SNSDVC			

9. CHANNEL COMMAND WORDS (continued)

9B. Disk CCWs

M/T + CCW command 	Multi Track (M/T) - next cmd. Read/Seek =====
MT + CCW command	The 'multi track' bit is set for the specified CCW.
-----	
READ DATA (x'06') 	*S* Read Data =====
RDD RDT	
-----	
READ KEY DATA (x'0E') 	*S* Read Key and Data =====
RDKDT RDKD RKDT RKD	Key and data length is requested.
-----	
READ COUNT (x'12') 	Read Count =====
RCNT RC	
-----	
READ COUNT KEY DATA (x'1E') 	*S* Read Count, Key and Data =====
RCNTKDT RDCKD RCKD	Key and data length is requested, count length is set to eight.
-----	
READ IPL (x'02') 	*S* Read IPL ( Initial Program Load ) =====
RDPL RD	
-----	
READ HA (x'1A') 	Read Home Address =====
RDH RH	
-----	
READ RO (x'16') 	*S* Read Record Zero =====
RDRO RDR RRO RR	

READ DIAGNOSTIC STATUS 	Read Diagnostic Status =====
RDDGSTS RDDGST (x'44') RDDGS RDDS	
-----	
SEEK (x'07') 	Seek =====
SK	
-----	
SEEK CYL (x'0B') 	Seek Cylinder =====
SKCL SKCC	
-----	
SEEK HEAD (x'1B') 	Seek Head =====
SKHD SKHH	
-----	
SEARCH HA EQ (x'39') 	Search Home Address Equal =====
SRCHQH SRCHHQ SRCHH SCHQH SCHHQ SCHH SQH SHQ SH	
-----	
SEARCH ID EQ (x'31') 	Search Identifier Equal =====
SRCHQLD SRCHDQ SRCHD SRCHQD SCHQLD SCHDQ SCHD SCHQD SQLD SDQ SD SQD	
-----	
SEARCH ID HI (x'51') 	Search Identifier High =====
SRCHHGHD SRCHHD SRCHDH	

9. CHANNEL COMMAND WORDS (continued)

SCHHGHD  
SCHHD  
SCHDH  
SHGHD  
SHD  
SDH

SEARCH ID HI EQ (x'71') Search Identifier Equal or High

SRCHDQH  
SRCHQHD  
SRCHHQD  
SCHDQH  
SCHQHD  
SCHHQD  
SDQH  
SQHD  
SHQD

SEARCH KEY EQ (x'29') \*S\* Search Key Equal

SRCHQLK  
SRCHK  
SRCHQK  
SRCHKQ  
SCHQLK  
SCHK  
SCHQK  
SCHKQ  
SQLK  
SQK  
SKQ

SEARCH KEY HI (x'49') \*S\* Search Key High

SRCHHGHK  
SRCHHK  
SRCHKH  
SCHHGHK  
SCHHK  
SCHKH  
SHGHK  
SHK  
SKH

SEARCH KEY EQ HI (x'69') \*S\* Search Key Equal/High

SRCHQHK  
SRCHHQK  
SRCHKQH  
SCHQHK  
SCHHQK  
SCHKQH  
SQHK  
SHQK  
SKQH

SEARCH KD EQ (x'2D') \*S\* Search Key and Data Equal

SRCHDT  
SRCHQDT  
SRCHKDQ  
SCHDT  
SCHQDT  
SCHKDT  
SDT  
SQDT  
SKDT

SEARCH KD HI (x'4D') \*S\* Search Key and Data High

SRCHHDT  
SRCHKDH  
SCHHDT  
SCHKDH  
SHDT  
SKDH

SEARCH KD EQ HI (x'6D') \*S\* Search Key and Data Equal/High

SRCHQHDT  
SRCH4QDT  
SRCHKDQH  
SCHQHDT  
SCHHQDT  
SCHKDQH  
SQHDT  
SHQDT  
SKDQH

WRITE DATA (x'05') Write Data

WRTD  
WRDT  
WRD  
WDT  
WD

9. CHANNEL COMMAND WORDS (continued)

9b. Disk CCW s (continued)

WRITE KEY DATA (x'0D')	Write Key and Data
WRTKD	
WRKDT	
WRKD	
WKDT	
WKD	
WRITE COUNT KEY DATA (x'1D')	Write Count, Key and Data
WRTCKD	
WRCKD	
WCKD	
WRITE SPECIAL COUNT K DT	Write Special Count, Key and Data
WRTSPCKD	
WRSPCKD (x'01')	
WSPCKD	
WRITE HA (x'19')	Write Home Address
WRTH	
WRH	
WH	
WRITE H40 (WH) (x'19')	Write 3340 Home Address
WRH40	
WH40	
WRTWH	
WRWH	
WWH	
WRITE H50 (MH) (x'19')	Write 3350 Home Address
WRH50	
WH50	
WRTMH	
WRMH	
WMH	
WRITE RO (x'15')	Write Record Zero
WRTR_	

RECALIBRATE (x'13')	*S* Recalibrate
RCL	
RESTORE (x'17')	*S* Restore
RSTR	
SET FILE MASK (x'1F')	Set File Mask
STFLMK	
FLMK	
STMK	
STM	
SFM	
MK	
SPACE COUNT (x'0F')	*S* Space Count
SPCNT	
ERASE (x'11')	*S* Erase Record
RS_	
SET SECTOR (x'23')	Set Sector
STSTR	
SSTR	
STSC	
STS	
SS	
READ SECTOR (x'22')	Read Sector
RDSTR	
RDSC	
RDS	
RSC	
RELEASE (x'94')	Device Release (string switch)
RLS	length 24 bytes
RL	
RESERVE (x'B4')	Device Reserve (string switch)
RSV	length 24 bytes
RESERVE UN (x'14')	Device Reserve Unconditional (string sw.)
RSVN	length 24 bytes

9. CHANNEL COMMAND WORDS (continued)

----- READ BUFFERED LOG (x'A4')                 RDBFDLG RDBFLG RDBL RBFDLG RBFLG RBL ----- DIAGNOSTIC LOAD (x'53')                 DGLD DGL DLD DL ----- DIAGNOSTIC WRITE (x'73')                 DGWRT DGWR DGW DWR DW ----- INIT BUF (x'E3')           NTBF ----- RESET BUF (x'C3') *S*           RSTBF ----- READ BUF (x'E2')           RDBF_ RBF_ ----- WRITE BUF (x'E1')           WRTBF WRBF WBF	Read Buffered Log (33XX) =====
--	-----------------------------------

9C. Fixed Block Commands (FB) 3310/3370

Fixed block (FB) devices are identified during device address specification time (DEV=...). If the device handles FB (depends on SENSE I/O bytes 4/5 which must be x'3310'/'3370'), the 'DEVICE CHARACTERISTIC' is read and saved for later use.  
If the device does not store the correct FB ID after the sense I/O command, the SET FB (STFB) command may be used after 'DEV='.

DEFINE EXTENT (x'63)           DFNXT DFNX DX ----- LOCATE (x'43')           LCT LC L_ ----- READ FB (x'42')           RDFB RDF_ RFB_ RF_ -----	Define Extent (FB) - 16 bytes - =====
	Requested parameters are: MASK BYTE= (two hexadec. digits) PHY.START= (decimal value or up to 8 hexadec. digits preceded by 'x' LOG.START= (decimal value or up to 8 hexadec. digits preceded by 'x' LOG. END = (decimal value or up to 8 hexadec. digits preceded by 'x' If nothing is entered defaults are: First three parameters all x'00'. 'LOG. END ' is taken from the value save during initial 'READ DEVICE CHARACTERISTICS' command (reduced by 1).
	Locate (FB) - 8 bytes - =====
	Requested parameters are: OP. BYTE = (two hexadec. digits) REPL. CNT= (decimal value or up to 2 hexadec. digits preceded by 'x' BLCK. CNT= (decimal value or up to 4 hexadec. digits preceded by 'x' BL. OFFS.= (decimal value or up to 8 hexadec. digits preceded by 'x' If nothing is entered the defaults are: OP. BYTE = x'06' REPL. CNT= x'00' BLCK. CNT= x'0001' BL. OFFS.= x'00000000'
	*S* Read Fixed Block (FB) =====

9. CHANNEL COMMAND WORDS (continued)

-----  
WRITE FB (x'41') Write Fixed Block (FB)  
| | |  
=====

WRFB  
WRF\_  
WFB\_  
WF\_  
-----

READ IPL (x'02) \*S\* Read IPL  
| | |  
=====

RDPL  
-----

SENSE EXTENDED (x'84') \*S\* Sense Extended (FB) - 256 bytes  
| | | | | | | |  
=====

SNSXT  
SNSX  
SX\_  
-----

READ BUFFERED LOG (x'A4') \*S\* Read and Reset Buffered Log (FB) - 24 b.  
| | | | | | | |  
=====

RDBFLG  
RDBL  
RBFLG  
RBL  
-----

READ DEVICE CHAR (x'64') Read Device Characteristics (FB) - 32 b.  
| | | | | | | |  
=====

RDDVCCH  
RDDVCC  
RDDVC  
length is set to 32.  
-----

RELEASE (x'94') \*S\* Device Release (String Switch)  
| | |  
=====

RLS  
RL  
-----

RESERVE (x'B4') \*S\* Device Reserve (String Switch)  
| | |  
=====

RSV  
-----

DIAGNOSTIC SENSE (x'C4') \*S\* Diagnostic Sense (FB)  
| | | | | | | |  
=====

DGNSTCS\_  
DGSNS  
DGSN  
DGS\_  
DSNS  
DSN  
DS\_  
-----

-----  
DIAGNOSTIC CONTROL (x'F3') Diagnostic Control (FB)  
| | | | | | | |  
=====

DGNSTCC\_  
DGCNTRL\_  
DGCNT  
DGC\_  
DCNTL  
DCNT  
DC\_  
-----



9. CHANNEL COMMAND WORDS (continued)

9D. TAPE CCW'S

WRITE	(x'01')	*S* Write
		=====
WRT		
WR		
W		
W		
-----		
READ	(x'02')	*S* Read
		=====
RD		
R		
R		
-----		
MODE SET		Mode Set (tape) - enter command code
		=====
MDST		default taken is x'93' = 7 track/800 BPI
-----		
MODE SET 800	(x'CB')	Mode Set (tape) 9 track / 800 BPI
		=====
MDST 8		mode set 800
-----		
MODE SET 1600	(x'C3')	Mode Set (tape) 9 track / 1600 BPI
		=====
MDST 1		mode set 1600
-----		
MODE SET 6250	(x'D3')	Mode Set (tape) 9 track / 6250 BPI
		=====
MDST 6		mode set 6250
-----		
READ BACKWARDS	(x'0C')	*S* Read Backwards
		=====
RDBCK		
RDBK		
RDB		
RBCK		
RBK		
RB		
RB		
-----		
WTM	(x'1F')	*S* Write Tape Mark
		=====
M		
M		

FSR	(x'37')	*S* Forward Space Record -FSR-
		=====
-----		
BACKSPACE	(x'27')	*S* Backspace Record -BSR-
*   ' ' *		=====
BKSP		
BK		
BSR		
-----		
FSF	(x'3F')	*S* Forward Space File -FSF-
		=====
-----		
BSF	(x'2F')	*S* Backspace File -BSF-
		=====
-----		
REWIND	(x'07')	*S* Rewind -REW-
' '		=====
RWD		
RW		
-----		
UNLOAD	(x'0F')	*S* Rewind Unload -RUN-
		=====
RUN		
RN		
NLD		
-----		
ERG	(x'17')	*S* Erase Record Gap
		=====
RG		

9. CHANNEL COMMAND WORDS (continued)

9E. Card Reader/Punch CCW's (incl.5424/5425)

READ CARD (x'02') \*S\* Read Card  
| ' | ' |  
=====

RDCD  
RCRD  
RCD

PUNCH (x'01') \*S\* Punch  
| ' | |  
=====

PNH 2540 punch, feed, select stacker

PUNCH BINARY (x'21') \*S\* Punch Binary  
| | | | | |  
=====

PNCHBNR 2540 punch binary, feed, select stacker

PUNCH 42 (x'C1') \*S\* Punch on 1442  
| | | | |  
=====

PNCH42 1442 punch, eject, select stacker 2

PUNCH 42 BINARY (x'E1') \*S\* Punch 1442 Binary  
| | | | | | | |  
=====

PNCH42BNR 1442 punch binary, eject, select stacker

READ F P (x'02') \*S\* Read and Feed Primary (542x)  
| ' | | |  
=====

RDFP

READ F S (x'82') \*S\* Read and Feed Secondary (542x)  
| ' | | |  
=====

RDFS

READ IPL F P (x'22') \*S\* Read IPL Mode and Feed Primary (542x)  
| ' | | | |  
=====

RDPLFP

READ IPL F S (x'A2') \*S\* Read IPL Mode and Feed Secondary (5425)  
| ' | | | |  
=====

RDPLFS

WRITE PU F P (x'01') \*S\* Write Punch and Feed Primary (542x)  
| ' | | | |  
=====

WRPFP  
WFPF

WRITE PU F S (x'81') \*S\* Write Punch and Feed Secondary (542x)  
| ' | | | |  
=====

WPFS

WRITE PU P (x'05') \*S\* Write Punch Primary (542x)  
| ' | | | |  
=====

WPP

WRITE PU S (x'85') \*S\* Write Punch Secondary (542x)  
| ' | | | |  
=====

WPS

WRITE PR F P (x'41') \*S\* Write Print and Feed Primary (542x)  
| ' | | | | |  
=====

WPRFP

WRITE PR F S (x'C1') \*S\* Write Print and Feed Secondary (542x)  
| ' | | | | |  
=====

WPRFS

WRITE PR P (x'45') \*S\* Write Print Primary (542x)  
| ' | | | |  
=====

WPRP

WRITE PR S (x'C5') \*S\* Write Print Secondary (542x)  
| ' | | | |  
=====

WPRS

SET ERP (x'0F') \*S\* Set ERP (542x)  
| | | |  
=====

STRP

RESET ERP (x'0B') \*S\* Reset ERP (542x)  
| | | | |  
=====

RSTRP

CONTROL P n (x'n3') \*S\* Control Primary n (542x)  
| | | ' | | |  
=====

CNTPn 'n' may be digit 1, 2, 3, or 4  
CNPn

CONTROL P n F (x'n7') \*S\* Control Primary n and Feed (542x)  
| | | ' | | | |  
=====

CNTPnF 'n' may be digit 1, 2, 3, or 4  
CNPnF

CONTROL S n (x's3') \*S\* Control Secondary n (542x)  
| | | ' | | |  
=====

CNTSn 'n' may be digit 1, 2, 3, or 4  
CNSn command 's' will be 9, A, B, or C

CONTROL S n F (x's7') \*S\* Control Secondary n and Feed (542x)  
| | | ' | | | |  
=====

CNTSnF 'n' may be digit 1, 2, 3, or 4  
CNSnF command 's' will be 9, A, B, or C

# 9. CHANNEL COMMAND WORDS (continued)

## 9F. Printer CCW's

IMM + CCW command	Space/Skip immediate
	=====
MM	use in combination with SPACE/SKIP cmds.
-----	
WRITE (x'01')	*S* Write without Space
'	=====
WRT_	-- may destroy printer ribbons --
WR_	
W_	
-----	
PRINT (x'09')	*S* Print with one Space after
	=====
PRNT	
PRT	
-----	
SPACE n (x'cc')	*S* Print with 'n' Space(s) after
	=====
SPCn	'n' may be 1, 2, or 3
	command is 09, 11, or 19
	immediate 0B, 13, or 1B
-----	
SKIP n	*S* Skip to Channel 'n'
	=====
SKPn	'n' may be a number between 1 and 12
-----	
SKIP 0 (x'83')	Skip to Channel zero immediate (3211)
	=====
SKP0	
-----	
ADVANCE TO EOS (x'5B')	Advance to End of Sheet (3203-01/02)
	=====
DVNCTOS	
-----	
GATE LOAD (x'EB')	Gate Load (1403)
	=====
GTLD	
-----	
LOAD UCS (x'FB')	*S* Load UCS Buffer without Folding
	=====
LD UCS	(for 1403 a 'GATE LOAD' command must be
LDCS	executed before)
-----	
LOAD UCS F (x'F3')	*S* Load UCS Buffer and Fold (except 3211)
	=====
LDCSF	

BLOCK DC (x'73')	Block Data Check
	=====
BLCKDC	
-----	
ALLOW DC (x'7B')	Allow Data Check
	=====
LLWDC	
-----	
LOAD FCB (x'63')	*S* Load Forms Control Buffer
	=====
LDFCB	
-----	
FOLD (x'43')	Fold (3211 + 3203-4)
	=====
FLD	
-----	
UNFOLD (x'23')	Unfold (3211 + 3203-4)
	=====
NFLD	
-----	
READ PLB (x'02')	*S* Read PLB (3211)
'	=====
RDPLB	
RPLB	
-----	
READ UCSB (x'0A')	*S* Read UCSB (3211)
'	=====
RCSB	
-----	
READ FCB (x'12')	*S* Read FCB (3211)
'	=====
RFCB	
-----	
RAISE COVER (x'6B')	Raise Cover (3211)
'	=====
RSCVR	
-----	

## 9. CHANNEL COMMAND WORDS (continued)

**9G. CRT and Hard Copy Printer CCW's (3277/3278-3287)**

```

WRITE      (x'01')          *S* Write
| | | |                      =====
WRT_
WR_
W_
-----
WRITE CRT   (x'01')          *S* Write 3277 Data Stream
| | | | |                      =====
WRTCRT                                Instead of 'DATA=' 3277 specific requests
WR3277      CRT==3277         are typed. To end them, enter '*' after
W3277                               'CMD=' is typed.
                                      See command table below. (no IDA !!)
-----
ERASE/WRITE (x'05')          *S* Erase/Write
| | | | |                      =====
RSWRT
RSW
-----
ERASE/WRITE CRT (x'05')      *S* Erase/Write 3277 Data Stream
| | | | | |                      =====
RSWRTCRT                                Instead of 'DATA=' 3277 specific requests
RSW3277     CRT==3277         are typed. To end them, enter '*' after
                                      'CMD=' is typed.
                                      See command table below. (no IDA !!)
-----
READ BUFFER (x'02')          *S* Read Buffer
| | | | |                      =====
RBFFR
RBFF
-----
READ MODIFIED (x'06')        *S* Read Modified
| | | | |                      =====
RDMD
RMD
-----
SELECT      (x'0B')          *S* Select
| | | |                      =====
SLCT
-----
ERASE ALL U   (x'0F')        *S* Erase All Unprotected
| | | |                      =====
RSLI

```

In case of commands 'Write CRT' and 'Erase Write CRT' 4300-FRIEND is asking for the 3277 command (buffer control order).

```
'SB' == Set Buffer Address (x'11') + address
'Sf' == Start Field (x'1D') + attribute character
'IC' == Insert Cursor (x'13')
'Pt' == Program Tabulator (x'05')
'Ra' == Repeat to Address (x'3C') + address and 'fill'
      character.(DATA=)
'Eu' == Erase Unprotected (x'12') + address
'EM' == End of Message (x'19') - for printer
'FF' == Forms Feed (x'0C') - for printer
'NI' == New Line (x'15') - for printer
',' == 'enter' == no command
>> '*' == end of data stream (no code generated)
```

9. CHANNEL COMMAND WORDS (continued)

9H. Local SNA-PU Type 2 Commands (Including Loop Adapter

WRITE L (x'01')

WRTL  
WL

\*S\* Write Local SNA

=====

ADR= one byte hexadecimal address  
CMD= one byte hexadecimal command  
DATA= enter data C.. or X..  
- terminate by no data entry  
LNG= enter length for length field  
- default= 4 + data length(s)

WRITE BREAK (x'09')

WRTBRK  
WB

\*S\* Write Break (last write in chain)

=====

ADR= one byte hexadecimal address  
CMD= one byte hexadecimal command  
DATA= enter data C.. or X..  
- terminate by no data entry  
LNG= enter length for length field  
- default = 4 data length(s)

WRITE START 0 (x'31')

WRTSTRT0  
WRTSO  
WSO

\*S\* Write Start 0

=====

WRITE START 1 (x'51')

WRTSTRT1  
WRTS1  
WS1

\*S\* Write Start 1

=====

CONTROL L (x'05')

CNTRL  
CL

\*S\* Control Local SNA

=====

ADR= one byte hexadecimal address  
CMD= one byte hexadecimal command  
DATA= enter data C.. or X..  
- terminate bt no data entry  
LNG= enter length for length field  
- default = 4 + length(s)

READ (x'02')

RD  
R

\*S\* Read

=====

READ START 0 (x'32')

RDSTRT0  
RDSO  
RSO

\*S\* Read Start 0

=====

READ START 1 (x'52')

RDSTRT1  
RDS1  
RS1

\*S\* Read Start 1

=====

RESTART RESET (x'93')

RSTRTRST  
RSTRT  
RSTL

\*S\* Restart Reset

=====

SENSE ID (x'E4')

SNSD

\*S\* Sense ID (4 bytes)

=====



9. CHANNEL COMMAND WORDS (continued)

DIAL     DL	(x'29')	*S* Dial (switched line with autocall) =====
SADn     SDn		*S* SAD 'n' (270x) ===== 'n' may be 0, 1, 2, or 3
SET MODE         STMD	(x'23')	*S* Set Mode (270x + CA) =====
		-- length for BSC CA = 1 x'40' EIB mode -- length for SDLC CA up to 8 1- x'80' change datapoll ind -> 2 1- x'40' change contactpoll ind -> 3 2- datapoll index (if 1=x'80') 3- contactpoll index (if 1=x'40') 4- contactpoll frequency 5- service seaking pause 6- primary: idle detect timeout 6- secondary: nonprod. rec. timeout 7- x'80' secondary station -> 8 8- secondary station address (if 7=x'80')
SET LINE MODE             STLNMD	(x'2B')	*S* Set Line Mode (CA of 3115/3125) =====
ENABLE     NBL	(x'27')	*S* Enable Line =====
DISABLE         DSBL	(x'2F')	*S* Disable Line =====
WRAP  '   WRTP WRP WP_	(x'05')	Wrap =====
DTD	(x'42')	*S* Dynamic Trace Dump (CA of 433x). =====
		2048 bytes length - address alligned on fullword boundary.

9J. TYPEWRITER CCW s (1052)

WRITE  '   WRT_ WR_ W_	(x'01')	*S* Write (Inhibit with carrier return) =====
TYPE     TP	(x'09')	*S* Type with carriage return =====
READ INQUIRY         RDNQR RDNQ	(x'0A')	*S* Read Inquiry (1052 read) =====
CONTROL ALARM    '  '     CNALRM CNLRM	(x'0B')	*S* Control Alarm =====





10. CCW FLAGS

All CCW flags can be combined separated by comma. They may be entered after a CCW command, a CCW modifier, or another CCW flag.  
Note that same CCW flags are automatically set by 4300-FRIEND especially SILI.  
After the CCW has been specified the flags may be changed by the FLAG command.

<u>DC</u> CD	<u>x'80'</u>	<u>Data Chaining</u> Causes use of address portion of next CCW (command chaining is not turned on)
<u>SILI</u> SL	<u>x'20'</u>	<u>Suppress Incorrect Length Indicator</u> Causes suppression of possible incorrect length indication in CSW.
<u>NOSILI</u> NSL	<u>reset x'20' (new)</u>	<u>Reset Suppress Incorrect Length Indicator</u> Inhibit set of SILI bit in CCW by FRIEND.
<u>SKIP</u> SKP	<u>x'10'</u>	<u>Skip transfer</u> Suppress transfer of information to main storage.
<u>PCI</u> PC	<u>x'08'</u>	<u>Program Controlled Interrupt</u> Causes a channel controlled interruption. 4300-FRIEND will ignore all interrupts with PCI on in the CSW until Device End is posted in the CSW.
<u>IDA</u> D	<u>x'04' (new)</u>	<u>Indirect Data Addressing (IDA)</u> ** NOTE: This parameter must be the last one entered behind a CCW. 'IDA' areas for 'IDAW' are requested by 4300-FRIEND. No command modifier is allowed.

11. CCW COMMAND MODIFIERS

CCW Command modifiers are added to the CCW to allow special 4300-FRIEND actions. These modifiers may be combined if meaningful.  
\*\*NOTE: Don't use these modifiers together with 'IDA'.

<u>LENGTH</u> LN		<u>Data Length</u> 4300-FRIEND will request key length and data field length for the file count instead of using the amount of data entered from 'KEY=' and 'DATA='. For commands which have a fixed data length assigned by 4300-FRIEND this length may be modified by using this keyword.
<u>FROM</u> FRM		<u>From (Area)</u> Specify symbolic data area to be used.
<u>INTO</u> NT		<u>Into (Area)</u> Specify symbolic data area to be used.
<u>RIPPLE</u> RPPL RP		<u>Ripple data</u> This modifier will move the data area one byte to the left for all write CCW'S at the completion of the chain.
<u>RANDOM</u> RNDM RN		<u>Random</u> This modifier will generate random data at the completion of a chain (bypasses 'home address' and 'count fields')
<u>ZERO</u> ZR	<u>(new)</u>	<u>Clear input area</u> of CCW before execution of Start I/O.
<u>CRT</u> <u>or</u> <u>3277</u>	<u>(new)</u>	<u>3277 device (after WRITE and ERASE WRITE)</u> Special 3277 data stream is requested.
<u>NEW</u> NW	<u>(new)</u>	<u>Reset CCW indicators.</u> This modifier will reset the disk indicators for: • TIC required • Seek argument not required • Set File Mask required

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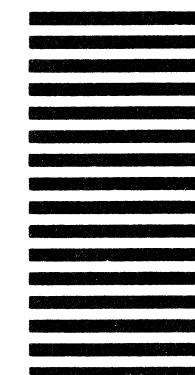
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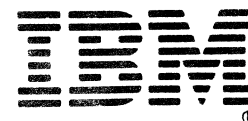
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