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4300 Processors

FRIEND Diagnostic User Guide

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Safety

General

Personal safety cannot be over-emphasized! Always consider safety guidelines and instructions. Pay attention to warning labels! Never *assume* anything about a machine or circuit. No machine is completely safe all the time. The exact condition of a machine may be unknown. Here are some of the reasons why:

- The power receptacle could be incorrectly wired.
- Safety devices or features could be missing or defective.
- The maintenance and/or modification history may be uncertain or unclear.
- A possible design deficiency could exist.
- The machine may have suffered transportation damage.
- The machine might have an unsafe alteration or attachment.
- An EC or sales change may have been improperly installed.
- The machine may have deteriorated due to age or environment extremes.
- A component could be defective, creating a hazard.
- Some component of the machine may have been incorrectly assembled.

Relating to safety, these are some of the ways the condition of the machine can be affected. Before you begin a service call or procedure, exercise good judgement and proceed with caution.

Safety Guidelines

If you are aware of the guidelines for working with electrical and mechanical equipment and practice these guidelines, you can work safely with this equipment.

You need not fear electricity, but you must respect it.

You should 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 this is a potential problem.
2. Remove all power before removing or assembling major components, working in the immediate area of power supplies, performing mechanical inspection of power supplies, or installing changes in machine circuitry.
3. Power supplies, pumps, blowers, motor generators, and other units with voltages which exceed 30V ac or 42.4V dc must not be serviced with power on when the unit is removed from its normal installed position within the machine, unless maintenance documentation clearly states otherwise. (This is done to ensure that proper grounding is maintained.)
4. Unplug the power supply cord whenever possible before working on the machine. The wall box switch when turned off should be locked in the off position or tagged with a DO NOT OPERATE tag (form Z229-0237). Be aware that a non-IBM attachment to an IBM machine may be powered from another source and be controlled by a different disconnect or circuit breaker.
5. When it is absolutely necessary to work on equipment having exposed live electrical circuitry, observe the following precautions:
   a. Another person familiar with power off controls must be in immediate vicinity. (Someone must be there to turn off power if it should become necessary.)
   b. Do not wear any jewelry, chains, metallic frame eyeglasses, or metal cuff links. (In the event of contract, there will be more current flowing because of the greater contract area afforded by the metal.)
   c. Use only insulated pliers, screwdrivers, and appropriate probe tibs/ extenders. (Remember, worn or cracked insulation is unsafe.)
   d. Use only one hand when working on energized equipment. Keep the other hand in your pocket or behind your back. (Remember there must be a complete circuit for electrical shock. This procedure helps eliminate a path that could complete a circuit through you!)
   e. When using test equipment, be certain that controls are set correctly and that insulated probes of proper capacity are used.
   f. Avoid contacting ground potential (metal floor strips, machine frames, etc.), use suitable rubber mats purchased locally if necessary.
6. Follow special safety instructions when working with extremely high voltages. These instructions are outlined in CEMs and the safety portion of maintenance documentation. Use extreme care when checking high voltage.
7. Avoid use of tools and test equipment that have not been approved by IBM. (Electrical hand tools [wire wrap guns, drills, etc.] should be inspected periodically.)
8. Replace worn or broken tools and test equipment.

9. After maintenance, restore all safety devices, such as guards, shields, signs, and ground leads. Replace any safety device that is worn or defective. (These safety devices are there to protect you from a hazard. Don't defeat their purpose by not replacing them at the completion of the service call.)
10. Safety glasses must be worn when:
    - Using a hammer to drive pins, etc.
    - Power hand drilling.
    - Using spring hooks, attaching springs.
    - Soldering, wire cutting, removing steel bands.
    - Parts cleaning, using solvents, chemicals, and cleaners.
    - All other conditions which might be hazardous to your eyes.
11. Never assume that a circuit is de-energized. (Check it first.)
12. Always be alert to potential hazards in your working environment (i.e., damp floors, non-grounded extension cords, power surges, missing safety grounds, etc.)
13. Do not touch live electrical circuits with the surface of the plastic dental mirrors. The surface of the dental mirror is conductive and can result in machine damage and personal injury.
14. Four steps that should be taken in the event of an electrical accident:
    a. USE CAUTION - DON'T BE A VICTIM YOURSELF.
    b. TURN POWER OFF.
    c. HAVE SOMEONE ELSE GET MEDICAL HELP.
    d. ADMINISTER RESCUE BREATHING IF VICTIM IS NOT BREATHING.
15. Do not use solvents, cleaners, or oils that have not been approved by IBM.
16. Lift by standing or pushing up with stronger leg muscles. This takes strain off back muscles. Do not lift any equipment or parts which you feel uncomfortable with.
17. Each customer engineer is responsible to be certain that no action on his/her part renders the product unsafe or exposes hazards to customer personnel.
18. Place removed machine covers in a safe out-of-the-way location while servicing the machine. These covers must be in place on the machine before the machine is returned to the customer.
19. Always place CE tool kit away from walk areas where no one can trip over it (i.e., under desk to table.)
20. Avoid wearing loose clothing that may be caught in machinery. Shirt sleeves must be left buttoned or rolled up above the elbow. Long hair and scarves must be secured.
21. Ties must be tucked in shirt or have a tie clasp (preferably non- conductive) approximately three inches from the end when servicing a machine.
22. Before starting equipment, make sure that fellow CEs and customer personnel are not in a hazardous position.
23. Maintain good housekeeping in the area of the machines while performing and after completing maintenance.
24. Avoid touching moving mechanical parts when lubricating, checking for play, etc.

Electrical Accidents

Prevention is the key to electrical safety. You should always be conscious of electrical safety. Follow the Safety Guidelines and practice good habits such as:

- Making certain that the customer's power receptacle meets IBM equipment requirements.
- Inspect line cords and plugs. Check for loose, damaged or worn parts.
- Before removing a component which can retain a charge from the machine, review the procedure in the maintenance documentation. CAREFULLY discharge the necessary component exactly as directed by the service procedure.
- Do not use an ordinary lamp as an extension trouble light.

Administering First Aid

In implementing rescue procedures in an electrical accident, one must:

- *Use Caution* - If the victim is still in contact with the electrical current source, it may be necessary to use the room EPO (Emergency Power Off) or disconnects switch to remove the electrical current. If the EPO or disconnect switch cannot be located, use a dry stick or another non-conducting object to pull or push the victim away from contact with the electrical equipment.
- *Act Quickly* - If the victim is unconscious, he/she may need rescue breathing and possibly external cardiac compression if the heart is not beating.
- *Call Fire Rescue* (Rescue Squad, Emergency, Ambulance, Hospital, etc.) - Have someone summon medical aid.

Artificial Respiration

Determine if the victim needs rescue breathing.

1. Make certain that the victim's airway is open and that it is not obstructed. Check the mouth for objects that may be blocking the airway such as gum, food, dentures or even the tongue. Position the victim on his back and place one hand beneath the victim's neck and the other hand on his forehead. Then lift the neck with one hand and tilt the head backward with pressure on the forehead from the other hand as shown in Figure 1.

2. Now you must *look, listen, and feel* to determine if the victim is breathing freely. Place your cheek close to the victim's mouth and nose to listen and feel for the exhaling of air.

Figure 1

At the same time, look at the chest and upper abdomen to see if they rise and fall. If the victim is not breathing properly, you should:

a. With the head in a backward tilt as shown in Figure 1, continue to exert pressure on the victim's forehead with your hand while rotating this same hand so that you can pinch the victim's nostrils together with the thumb and index finger (Figure 2).

CAUTION: Use extreme care when administering rescue breathing to a victim that may have breathed in toxic fumes. DO NOT INHALE AIR EXHAUSTED BY THE VICTIM.

Figure 2

b. Open your mouth and take a deep breath. Make a tight seal with your mouth around the victim's mouth and blow into the victim's mouth (Figure 3).

Figure 3

c. Remove your mouth and allow the victim to exhale while watching for the victim's chest to fall (Figure 4).

Figure 4

d. Repeat this cycle once every five seconds until the victim breathes for himself or medical help arrives.

Reporting Accidents

It is a CE's responsibility to report all accidents, potential hazards, and "near miss" accidents to your field manager. Remember, a near miss accident might be the result of a design deficiency and prompt reporting will assure that the situation will be resolved quickly.
It's important to report even a minor shock since the conditions which caused it need only be varied slightly to cause serious injury.

Preface

This manual describes all FRIEND-functions available to diagnose 4300 processors. Information contained herein was formerly published on EC-controlled B-size pages located in Volume 17 of the Maintenance Information Manuals. This manual is shipped with all 4321 and 4331 (all models) processors. In contrast to the B-size edition the information has been rearranged and minor changes and corrections have been incorporated. The FRIEND selection procedure described will apply to all shipments above EC level 364306/4321 and 4331 Model 1 respective 364421/4331 Model 2 and 11.

The commands, messages, etc. in the various chapters are alphabetically arranged.

For the readers convenience 4300-FRIEND is referred to as FRIEND throughout the book.

It is assumed that the user of this book has a thorough knowledge of Channel Command Words, their use, and how to chain them to fulfill a certain task.

This book describes only how with the use of FRIEND

- CCWs can be entered
- CCW chains can be built
- Entered CCW chains can be altered
- Single and Multiple CCW chains can be executed.

In addition Chapter 7 describes the advanced capabilities of FRIEND.

Chapter 9 contains a list of CCW Commands for all 4300 I/O device types. These commands are all accepted by FRIEND.

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Chapter 1. Purpose of FRIEND

1A. General

The FRIEND (Fast Running Interpreter Enabling Natural Diagnosis) is a test tool, which allows the analysis of complex I/O problems in an easy and quick manner.

The FRIEND is a stand-alone, off-line, interpretive diagnostic program and requires 128 K bytes of customer storage and a console display unit (3277/78/79 or 125-DOC or an 4321/4331 console with x'83' op-code), or a 1052 typewriter.

The FRIEND supports all channel command words (CCWs) for most of all /370 files, drums, tapes, card reader/punch units, printers, displays and teleprocessing devices.

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 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 (FRIEND commands) are available for communicating with FRIEND and for controlling the CCW-chain execution.

1B. Overview on Creating a CCW Chain

To create a CCW chain, do the following (as required):

- respond to FRIEND requests, see 3B. and Chapter 4, "Information Requested by FRIEND" on page 4-1.
- Specify CCW commands, see Chapter 9, "Channel Command Words" on page 9-1.
- Optionally specify a predefined CCW chain, see Chapter 7, "Advanced Capabilities of FRIEND" on page 7-1.
- Specify FRIEND commands, see 3C. and Chapter 6, "FRIEND Commands" on page 6-1.
- Respond to FRIEND messages, see Chapter 5, "FRIEND Messages" on page 5-1.

Example for a Typical Chain Input

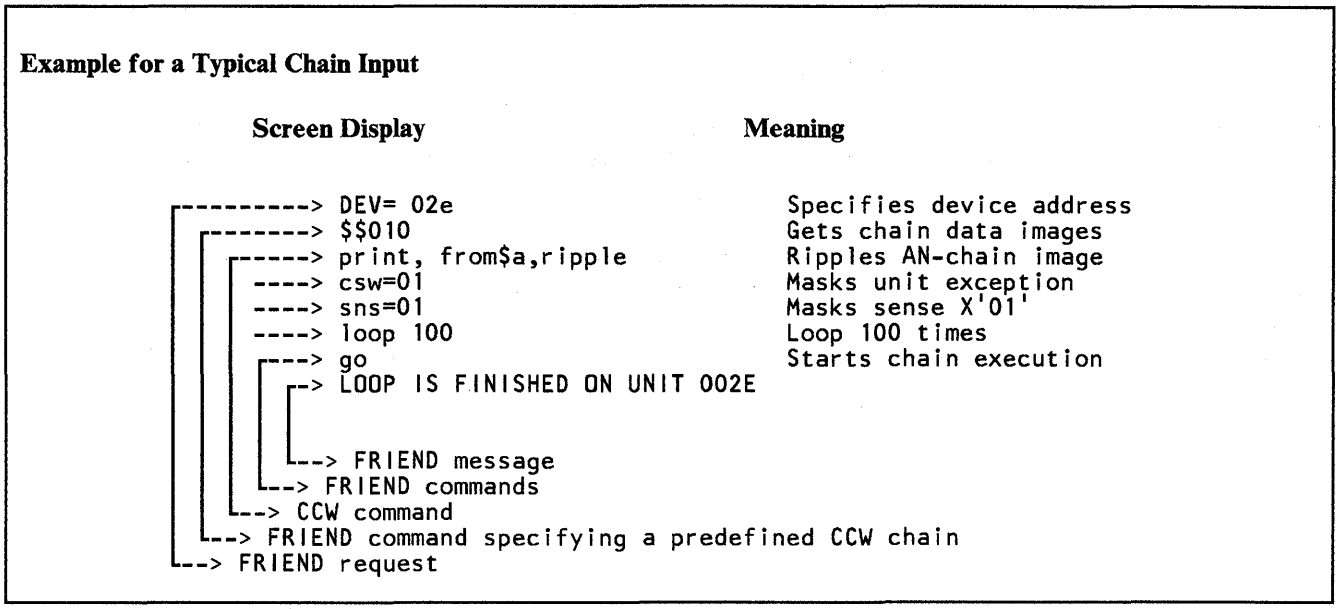


Figure 1-1. Typical Chain Input

Chapter 2. FRIEND Functions That Go Beyond Original 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 (3277/78/79 or /370 125 DOC)
  - 20 lines of 80 bytes each for a 3277/78/79
  - Status line
  - 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 ($$...)
- 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/Os:	5424/5425 (MFCU)
- Diskettes:	3540
- Displays:	3277, 3278, 3279, 125 DOC (3278 printer)
- Local SNA Devices:	3274, Loop Adapter (LA)

  - Communications Adapter (CA) including SDLC
- 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 FRIEND commands.
- Support of program controlled interrupt (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).

Chapter 3. How to Use FRIEND

3A. How to Load FRIEND from Diskette

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.

To load the FRIEND proceed as follows:

1. Do a system IML with the control diskette
2. Select MODE SELECTION and do a system CLEAR RESET (C)
3. Insert diagnostic diskette and press MOD SEL key. Enter selection for FRIEND (F), press ENTER. Wait for message
   FRIEND LOAD COMPLETE
4. Execute steps indicated on the screen:
   a. Insert control diskette
   b. Select MODE SELECTION (customer MAN OPS)
   c. Do a program RESTART (R). There will be no response on the screen at this point.
   d. Press ENTER
      FRIEND screen is now displayed.
5. Enter now your replies to the FRIEND requests and give your command input.

For details see:
Chapter 4, "Information Requested by FRIEND" on page 4-1
Chapter 5, "FRIEND Messages" on page 5-1
Chapter 6, "FRIEND Commands" on page 6-1
Chapter 9, "Channel Command Words" on page 9-1

This screen picture appears when FRIEND is ready:

```
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
*****************************************
```

3B. List of FRIEND-Requests

The following is a list of the FRIEND requests. For details about these requests, see Chapter 4, "Information Requested by FRIEND" on page 4-1.

ADR=
ATT=
BBCCHH=
BL OFFS=
BLCK CNT=
CMD=
CYL=
DATA=
DEV=
DEV ADDR=
DEV TYPE=
DL=
FLG=
HARD COPY(Y/N)=
HD=
IDAWS IN HEX=
KEY=
KL=
LNG=
LOG END=
LOG START=
MASK=
MASK BYTE=
MLCCCBBCCHHRDDS=
MODE (BC/EC)=
MODE CMD=
MODEL=
NUMBER OF TIMES=
OP BYTE=
PHY START=
RCD NO=
REPL CNT=
SCT=
SD=
SEC PRINTER ADDR=
SECOND SD=
THIRD SE=
TRK=
WCC=

3C. List of FRIEND Commands

The following is a list of the FRIEND commands. For details about these commands, see Chapter 6, "FRIEND Commands" on page 6-1.

$$?
$$nnn,*
$*=hh
? or ??
ACTIVATE
ADD
ALARM
ALTER KEY
ALTER nnn
BMPX
BTS
BUILD
CCW
CHANGE KEYBOARD
CHANGE nnn
CLEAR
CLEAR$c
COMPARE
CONFIG
CONNECT
COPY
COUNTER
CREATE
CSW=xxxx
DATA DUMP
DECREASE
DEVICE=
DISCONNECT
DISPLAY
DUMP $
DUMP KEY
DUMP
DUMP T
EX CLRIO
EX HDV
EX HIO
EX SENSE
EX STIDC
EX TCH
EX TIO
FLAG
GO
HALT
HELP
I
INCREASE
INT
KEY CAW
KEY CCW
KEY DATA
KEY IDA
LIST
LOOP
NO ALARM
NO BMPX
NO COMPARE
NO DATA DUMP
NO DECREASE
NO EX SENSE
NO HALT
NO INCREASE
NO INT
NO TEST I/O
NO TIME DELAY
NO WAIT
POINTER CCW
POINTER DATA
POINTER IDA
PRINT LOG
PRINT SENSE
PSW
QUIT
REMOVE
REP
RESET
RETURN
SCOPE
SENSE
SET FB
SIZE
START READER
STATUS
STOP
SUBST
TEST I/O
TIME DELAY
TRACE
WAIT

3D. How to Specify a Single CCW Chain

Proceed as follows:

1. Specify the device address of the unit you want to exercise when FRIEND asks for it (DEV=_____).
2. When PROCEED is displayed in the status field, enter a CCW command in English language. (followed by pressing the ENTER key).
3. Enter any additional information requested by FRIEND. For details about these requests see Chapter 4, "Information Requested by FRIEND" on page 4-1.
4. After your entire CCW chain has been entered, type 'GO' and press ENTER.
5. The device should now perform the operation you requested.
6. If you want to enter another CCW chain, press REQUEST key.
7. When the status field indicates PROCEED, type RESET or I to reset the previous CCW chain.
8. Go to instruction step 1. and specify the new CCW chain.

3E. Examples of Single CCW Chains

Example 1: Seek Cylinder

This example instructs FRIEND to first seek cylinder 5, head 5 and then cylinder 198, head 9 on device address 260.

```
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 key first on 1052)
```

Figure 3-1. Seek Cylinder

Example 2: Read one Block (FB Device 3310/3370)

This example instructs FRIEND to read one block of data from a Fixed Block device (3310).

```
DEV= 240
I/O= 433100-331000
CHAR= 3008210102000000000200000016000001EC400000000010C201
      6001300..
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
```

Figure 3-2. Read One Block (FB Device 3310/3370)

The next example instructs FRIEND to print (in ripple fashion) the AN-chain image using a 1403 or 3203 Model 5 printer.
See Chapter 7, "Advanced Capabilities of FRIEND" on page 7-1 for information on predefined chain $$010.

Example 3: Ripple Print on a 1402 or 3203 Mod 5 Printer

```
DEV= 2e
$$010                        (Gets chain data images)
print, from$a,ripple         (Ripples AN-chain image)
csw=01                       (Masks unit exception)
sns=01                       (Masks sense X'01')
loop 100                     (Do 100 times)
go
LOOP IS FINISHED ON UNIT 002E
```

Figure 3-3. Ripple Print 1403 or 3203 Mod 5 Printer

Example 4: Ripple Print on a 3203 Model 1 or 2 Printer

```
DEV= e
I/O= 312500-320202
advance to eos
write
DATA= cEND OF SHEET          (use SHIFT key if no lowercase
imm skip1                     characters are on the print chain
space 1                       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
```

Figure 3-4. Ripple Print 3203 Model 1 or 2 Printer

3F. Restrictions

FRIEND will insert TIC *-8 and/or SET FILE MASK CCWs 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 R0)
  KL= 0
  DL= 100
```

Figure 3-5. Invalid Chain

The sequence of the above chain is invalid because the WRITE R0 is not directly preceded by a SEARCH CCW. The user should specify SET FILE MASK before the SEARCH HA.

Chapter 4. Information Requested by FRIEND

4A. Hex '5B' Character Assignment

Several FRIEND commands use a hex '5B' character which is normally generated by pressing the $-sign key. Some language groups do not have the $-sign key. The table below shows, for the various language groups, the key that generates the hex '5B' character.

LANGUAGE GROUP	HEX '5B' CHARACTER
English (US) Austrian/German French Italian Portuguese Belgian/Spanish speaking Canadian (French) International	$
Danish/Norwegian Danish/Norwegian (Alternate) Finish/Swedish Finish/Swedish (Alternate)	Å
Austrian/German (Alternate)	Ü
Spanish	Pts
Spanish (Alternate)	Pt
English (UK)	£
Brazilian/Portuguese	Ç
Japanese (English)	¥

4B. FRIEND Requests

Listed below are the FRIEND requests and your replies to them. Enter decimal data with no separation; that is, 123456 (not 123,456 or 123 456). Enter hexadecimal data with a preceding X; for example X60.

In case of input errors FRIEND will either repeat the request or will ask for the whole command.

If a program loop occurs, enter the character I to initialize FRIEND.

ADR=

Enter either the 327x buffer address. as four hexadecimal characters, or the one byte long address (in hex) for local SNA commands.

ATT=

Enter the 327x attribute character as two hexadecimal digits.
The default is X'60'.

BBCCHH=

Enter the 2321 seek argument as 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

BL. OFFS.=

Enter the block offset value for the LOCATE FB command as in decimal or up to 8 hexadecimal digits preceded by a 'X'.
Default = X'00000000'

BLCK. CNT=

Enter the block count for the LOCATE FB-command as a decimal value or up to four hexadecimal digits preceded by a 'X'.
Default = X'0001'

CMD=

Enter either the 327x 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 key == no command
'*'	end of data stream (no code generated)

or the one byte long command (in hex) for a local SNA device.

CYL=

Enter the cylinder number in decimal for a SEEK command. If 'X' is used as the first character, the following data is taken as hexadecimal value.
Default is cylinder zero.

DATA=

Enter the data for the data field in one 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. 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. If no data is entered a CCW with data length one is created.

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 of DATA= Entry

DATA= 100Xff	Generates 100 bytes of X'FF'
DATA= 1000Xf00f	Generates 1000 groups of X'F00F'.
DATA= 80c1	Generates 80 bytes of X'F1' = EBCDIC 1s.

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

DATA= (EOB=enter) Indicates all data entered

DEV=DEVICE ADDRESS= (appears first time only)
DEV= (all other times)

Specify 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, FRIEND will take the last entered device address or will enter the command input mode if no device address was specified before. FRIEND will request the device address if a CCW is entered but no device address was specified before.

DEV. ADDR=

Specify 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 1052/327x/125D/P/M/R/S=

Specify the type of the new console.

1052 1052 type console
327x 3277/78/79 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 type consoles.
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 on 4321/31.
Sp 4321/31 system console with X'83' op-code enabled.

DL=

Enter the data length to be used in decimal. 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.

HARD COPY (Y/N)=

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

HD=

Enter 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=

Enter the flag byte in hexadecimal for a write HA command.

IDAWs IN HEX=

Specify 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'1A000', where the FRIEND program is located. If data is requested for the CCW, FRIEND will automatically move these data to the specified real storage area(s).

KEY=

Specify the key for the data field. Enter the data as shown for DATA= .

KL=

Enter the key length to be used. in decimal. Range is 0 to 255. If 'X' is used as the first character, the following data is taken as hexadecimal value.
The default value is zero.

LNG=

Enter the length in decimal for a local SNA command.

LOG. END=

Enter the logical end value for the DEFINE EXTENT FB-command in decimal or up to 8 hexadecimal digits preceded by a 'X'. Default is the value read by the READ DEVICE CHARACTERISTICS command.

LOG.START=

Enter the logical start value for the DEFINE EXTENT FB-command in decimal or up to 8 hexadecimal digits preceded by a 'X'.
Default = 0

MASK=

Specify 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.

Examples: MASK= C0
MASK= 18

MASK BYTE=

Enter 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 DEVICE CHARACTERISTICS command (logical end).

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.

MODE (BC/EC)=

Enter 'BC' for basic control mode or 'EC' for 'extended control mode.
Default = 'EC'.

MODE CMD=

Enter two hexadecimal characters for the set mode command. For 9-track tapes use MODE SET ...., ... = 800, 1600 or 6250.
Default = X'93'.

Example: MODE CMD= 93 (800 BPI, odd parity, data convertor on, translator off)

MODEL=

This message is only displayed if the processor model is not supported.
For the 4300 processors the value stored by the processor is automatically taken. The correct model chooses the proper time calculation for the WAIT and TIME DELAY commands.

NUMBER OF TIMES=

Specify 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.

OP. BYTE=

Enter the operation byte for the LOCATE fixed block command as up to two hexadecimal digits.
Default = X'06'

PHY.START=

Specify the physical start for the DEFINE EXTENT fixed block command. Enter a decimal value or up to 8 hexadecimal digits preceded by a 'X'.
Default = 0

RCD NO.=

Specify the record number to be used in the file identifier field. Enter a decimal (0 to 255) or a hexadecimal value (X'00' to X'FF').

REPL. CNT=

Specify the replication count for the LOCATE fixed block command. Enter a decimal value (0 to 255) or a hexadecimal value (X'00' to X'FF').
Default = X'00'

SCT=

Enter the sector number (1 to 26) in decimal for a diskette SEEK command.

SD=

Specify 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.

SEC. PRINTER ADDRESS=

Specify the device address of the secondary output printer on which a hard copy of all operator messages are to be printed, for example: 02E.
You can enter an optional second operand after the printer address; for example: 02E, LOG. LOG causes the call of the PRINT LOG function.
If FRIEND runs under remote control enter REM as second operand, for example: 02E, REM.
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. If you want to modify the secondary printer address later, use the CHANGE KEYBOARD command.

SECOND SD=

Enter the second 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.

THIRD SD=

Enter the third 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.

TRK=

Enter the track number (0-74) in decimal for a diskette SEEK command.

WCC=

Specify the 327x write control character in hexadecimal (two digits).
The default is X'C3'.

Chapter 5. FRIEND Messages

5A. General

```
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 displayed by FRIEND. They are only displayed once, immediately after FRIEND is loaded. The date printed is this of the last FRIEND assembly, followed by the program version and level (for example 08.05).

If a CRT device is used as operator console FRIEND will display status information in line 20 as shown below:

<....> | nn-ccuu-ffff | C=xxxxxx,kf | D=xxxxxx,kf | I=xxxxxx,kf | mmmm | ccc
<.....> shows the status as follows

COMMAND	Enter any FRIEND command
REPLACE	Enter replace CCW command specified by REP command
RESPOND	enter requested information
RUNNING	FRIEND is executing CCW chain(s) In case of CPU-wait state and stop address '0DEAD0' FRIEND is waiting for an I/O interrupt from a test device. On a CRT operator console one may enter FRIEND commands during this mode without stopping the execution.
TRACING	FRIEND is tracing the execution of CCW chain(s). See also above description of RUNNING.
SCOPING	FRIEND is looping on a SIO or TIO command
TIOLOOP	FRIEND is repeating the execution of a TIO command.
PRNTLOG	PRINT LOG function is active to copy 4300 console to a line printer.
WORKING	FRIEND commands are executed - no action required

| nn-ccuu-ffff | C=xxxxxx,kf | D=xxxxxx,kf | I=xxxxxx,kf | mmmm | ccc

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'= 'F' if fetch protection C= CCW area / D= data area / I= IDA area 'mmmm'= BMPX if Block multiplexor mode or SEL if Selector mode 'ccc' = CRD if card/tape input.

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

5B. Status and Operator Messages

$x aaaaaa llll

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

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.

CHAR= xxxxx....

FRIEND prints the data received for a READ DEVICE CHARACTERISTICS command if it is a Fixed Block mode (FB) device.

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, 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

These messages 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 displayed to further clarify the error condition.

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 FRIEND.

FRIEND STANDARD OPTION SET:

After this message all standard options of 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.

ENTER CCW LIST IN ENGLISH

This message prints out initially and after 'DEV= ' has been requested after the user has entered RESET.

EXT-INTRPT BROKE CHAIN

This message will indicate that the interrupt feature was active and that the second external interrupt stopped FRIEND. The TIO mode and the card/tape input mode are reset.
In case this option is not required, use the NO INT command.

HALT

This message is displayed after 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.

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.

ID = xxxxxxxxxxxxxxxx

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

I/O= cccctt-ddddtt

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').

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.

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).

nn-ccuu-ffff | C=xxxxxx,kf | D=xxxxxx,kf | I=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'= 'F' if fetch protection C= CCW area / D= data area / I= IDA area mmmm = BMPX if block multiplexor mode or SEL if selector mode.

SET FILE MASK INSERTED

This message prints out to inform the user that 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 CCW if WRITE HA and WRITE RECORD ZERO CCW commands are used. This automatic insertion is only done if the user forgot to specify SET FILE MASK. See also "3F. Restrictions" on page 3-6.

START

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

STORAGE SIZE= xxxxxx

This message will specify the storage size of the system in hexadecimal.

TIC *-8 INSERTED

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

UNIT=xxxx - COUNT=nnnnnnn

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

5C. Error Messages

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

This error message indicates a 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.

DEVICE QUEUE FULL, LAST CMD IGNORED

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

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

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

****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 DUMP TRACE commands. The automatic execution of a sense command may be inhibited by the NO EX SENSE command.

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

This printout will occur if 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.

I/O-INTRPT, PSW = xx xx xxxx xx xxxxxx/.... E

The I/O interrupts are caused if abnormal input/output interrupts detected by FRIEND (usually from other devices becoming ready). The PSW printed out is the old PSW for the interrupt.
In addition to the PSW, the CSW and SENSE data are displayed.
'E' at the end of the message indicates an 'EC' mode interrupt. In this case the '....' digits contain the interruption code.

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 IDAWs are ignored and the request for IDAWs is repeated.

INVALID MODEL, USE 21-41 OR 115-168 OR 25-75

This message will indicate that you specified the wrong processor model.

KEYWORD MISMATCH ON INPUT-xxx...xxx

FRIEND is reading the CCW commands from card or tape. The record read must also contain the information that 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.

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

If a machine check interrupt occurs, the log-out area is saved so it can be displayed by the DUMP command.
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.

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

This printout occurs if an abnormal program interrupt is detected. 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.
If PGM interrupts start to be displayed, perform a PSW/PROGRAM restart. If this does not help, reload the FRIEND. For the DUMP, DISPLAY, or ALTER commands, this check may happen if the specified address is out of storage or the page is disconnected in VSE mode.

PRINTER NOT READY

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

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

This printout occurs if an abnormal supervisor call (SVC) interrrupt is detected.
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.

SYMBOL TABLE FULL, LAST CMD IGNORED

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

-SYNTAX ERROR-

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

-SYNTAX ERROR- ON INPUT

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.

UNDEFINED SYMBOL(S)

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.

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

This error message will result if FRIEND receives an I/O interrupt and unit check is on in the CSW. 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 - NO DEV-END OR CU-END I/O INTRPT**

This error message will be printed out if 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, 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.

Chapter 6. FRIEND Commands

6A. Chain (UCB) Control Commands

All FRIEND commands and their alternate forms are listed below.

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

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 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'.

$$? Display all $$nnn Chains
The first 79 source characters of all predefined chains are displayed.

$$nnn,* Invoke predefined CCW Chain
nnn = Number of predefined chain. This command allows to invoke a predefined CCW chain. If the optional parameter '*' is specified, the selected CCW chain is displayed.:

$*=.. Specify two hexadecimal digits
This command may be used to assign two hexadecimal digits for the characters '$' and '*'. If the character '$' or '*' is used in hexadecimal input fields, they are replaced by the digit assigned. The default value is 'FF'.

? or ?? Repeat Last Input (327x)
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.

nn-ACTIVATE,* Activate CCW Chain nn
n-ACTVT
n-ACTV
n-ACT
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).

ADD Add CCW to Chain
DD
This command will instruct FRIEND to add the following CCWs to the last CCW chain entered. 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 CCWs may be added by using the nn-ADD command for each additional CCW.

ALARM Alarm for Operator Console
L
This command instructs FRIEND to issue an audible alarm after a message is displayed for which an operator action is required.

ALTER KEY n..n,addr,k,f Alter Storage Key for n..n Bytes
ALTER KEY n..n,$A,k,f
ALTER KEY $A,k,f
LTR K ...
ALT K ...
LTK ....
This command will instruct FRIEND to alter the storage keys of the specified storage area to the key specified by 'k' and will set fetch protection on if a 'f' is specified as last operand.

ALTER n..n,addr,hhhhhh.. Alter n-Bytes in Hexadecimal
ALTER n..n,$A,hhhhh...
ALTER $A,hhhhh...
LTR ....
ALT ....
LT ....
This command will instruct FRIEND to alter up to 80 bytes in main storage at the specified address 'addr' or symbolic I/O area '$A'. The data 'hhhh' is 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.

B Begin (see GO command)

BMPX Enable Block Multiplexer Mode
370
Standard if EC-mode specified. This command instructs FRIEND to set bit zero of control register zero, which indicates the block multiplexer mode.

BTS Branch to SIO (TIO/SIO Loop at X'300')
This command instructs 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 the interrupt feature is active, otherwise by program RESTART.

BUILD n..n,$A Build/Create Symbolic I/O Area
BLD n..n,$A
CREATE n..n,$A
CRT n..n,$A
This command will instruct FRIEND to reserve a n..n byte long symbolic data field $A (any alpha value). The data can be specified after message DATA=. 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). 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 CCWs 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.

CCW (PF1), or CCW=xxx (PF2) List CCWs (xxx = opt. dev addr)
LIST
LST
This command will instruct 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 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).

Example:

```
ccw=30
01*UNIT=0030, UCB=0F9000, FL=8009
1-01A000  01 01D000 6010 03E8 RANDOM
2-01A008  27 01D0E8 6000 0001
3-01A010  02 01D0E9 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 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).

CHANGE KEYBOARD Change Keyboard or Printer Address/Type **CHKNGKBRD**
CK
This command instructs 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: 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.

CHANGE n..n,addr,cccccc.. Change n-Bytes in Character Format
CHANGE n..n,$A,ccccc...
CHANGE $A,ccccc...
CHNG ....
This command will instruct FRIEND to alter up to 80 bytes in main storage at the specified address 'addr' or symbolic I/O area '$A'. The data 'cccc' is moved to the storage (lower case characters are accepted). 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 displayed.

CLEAR Clear all Active UCBs

CLR
This command instructs 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.

CLEAR$x Clear References to Symbolic Areas
CLR$x
CLR$
This command instructs FRIEND to clear the reference to a symbolic data area (x) or all references (if x is blank).

COMPARE $x,$y,n..n Compare n-Bytes ('n..n' is optional)
COMPARE addr1,addr2,n..n
CMPARE ....
CMPR ....
CMP ....
This command can be used to instruct 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. FRIEND will perform the compare at each completion of the CCW chain.

CONFIG xxx,yyy Configuration Test of System I/Os
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. 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'=Block 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.

During execution of this command FRIEND switches to selector mode (NOBMPX).

CONNECT n..n, addr Connect Storage Block (VSE mode)
CONN n..n, $a
CNN $a
This command will instruct FRIEND to connect a storage block of length 'n.. n', (full 2k blocks are used).

nn-COPY Copy CCW Chain nn
n-CPY
n-CP
This command will duplicate the references to the channel program and conditions entered for UCB nn.

COPY xxx
CPY
CP
Use this command to copy the last entered CCW chain for device with address xxx. The CCW chain is not actually

duplicated, instead, the same physical CCW chain is used. This permits the same CCW chain to be run on several devices (of the same type) at the same time.

COUNTER (PF12) Display Counters
CNTR
Use this command to display the LOOP values (thresholds) and the SIO counters for all active CCW chains/UCBs.

CREATE (See the BUILD Command)

CSW=xxxx Generate CSW Status Mask
Use this command 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 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.

DATA DUMP n..n,addr,* Data Dump on Secondary Printer
DATA DUMP n..n,$a,*
DATA DUMP $a,*
DTDMP ....
This command instructs FRIEND to dump after each CCW-chain execution the specified data area on the secondary printer n..n= length of data area (not requested 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 specified, the operator console is used for the display. If the optional parameter '*' is specified, the dump will appear also on the operator console.

DECREASE n,addr,incr,thr,ini,* Decrease Counter(s)
DECREASE n,addr,incr,thr,ini,n2,addr2,incr2,thr2,ini2,*
DECREMENT ....
DCR ....
This command instructs 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)

DEVICE=xxx Create Unit Control Block (UCB) for Device xxx
DVC=xxx
DEV=xxx
DV=xxx
This command will instruct FRIEND to initialize a new unit control block (UCB) to execute the next CCW chain entered with the unit address of xxx (leading zeroes 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: 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.

DISCONNECT n..n, addr Disconnect Storage Block (VSE mode)
DISC n..n, $a
DSC $a
This command will instruct FRIEND to disconnect a storage block of length 'n..n' (full 2k blocks are used). Reconnect the block(s) before using the DUMP/ALTER commands.

DISPLAY n..n,addr,xxx Display n-Bytes (xxx==opt.prt addr)
DISPLAY n..n,$a,xxx
DISPLAY $a,xxx
DSPL ....
This command will instruct FRIEND to display the contents of storage in character 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.

DUMP $ Dump Symbolic Data Area Names
DMP$
This command will instruct 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 Dump Storage Keys for n..n Bytes
DUMP KEY n..n,$a
DUMP KEY $a
DMPK ....
This command will instruct FRIEND to dump the storage keys of the specified storage area.

DUMP n..n,addr,xxx Dump n-Bytes (xxx==opt.prt addr)
DUMP n..n,$a,xxx
DUMP $a,xxx
DMP ....
This command will instruct FRIEND to dump the hexadecimal contents of storage. The customer storage is displayed in lines of maximum 32 bytes along with the address of the first byte. 'DUMPT n..n,address' will cause the dump of n..n bytes, starting at 'address'. The length of the area to be displayed can be either specified in decimal or hexadecimal. A hexadecimal value has to be preceded by character 'X'. Optionally a line printer address xxx may be specified for output. '$a' may be any symbolic I/O area specified by a previous BUILD/CREATE command or by FROM or INTO CCW command modifiers. If the length is not specified the one stored for the symbolic field is taken. Symbolic address may be '$A' or with offset '$A+a' (a = offset 1..F).

DUMP T (PF 6) Dump Trace Area
DMPT
This command will dump the last entries of the TRACE area (max. 36 entries).

EXEQ Execute (See GO command)
XQ

EX CLRIO,xxx Execute Clear I/O to Device xxx
XC
After executing the specified I/O command the condition code is displayed.

EX HDV,xxx Execute Halt Device to Device xxx
XHD
After executing the specified I/O command the condition code is displayed.

EX HIO,xxx Execute Halt I/O to Device xxx
XH
After executing the specified I/O command the condition code is displayed.

EX STIDC,xxx Execute Store Channel ID Command (Dev. xxx)
XS
After executing the specified I/O command the condition code is displayed.

EX TCH,xxx Execute Test Channel Command for Dev. xxx
XTC
After executing the specified I/O command the condition code is displayed.

EX TIO,xxx(PF7) Execute Test I/O to Device xxx
XT
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.

FLAG nn,xx Modify Flag Byte in CCW nn (first == 1)
FLGn,xxxx
This command will instruct 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.

GO Go (Start CCW Chains)
G
ENTER key = START
B
EXQ
XQ
Use this command to start running all active CCW chains beginning with chain one. After all active CCW chains have started running the CRT console will accept commands (for example STOP, ACTIVATE, COUNTER, EXHIO etc.) without halting the execution. FRIEND may be stopped by an I/O interrupt from the operation console. (REQU. or TEST REQ. or ENTER key without data.)
If chain execution should start with any other than chain one, use the nn-GO version of the GO command where 'nn' is the chain number.

HALT Halt After Error
HLT
H
This command instructs FRIEND to halt after any detected I/O error or false PSW swap. No device will be restarted, but additional errors may be indicated.

HELP Display Help Message
HLP
FRIEND will display operating hints.

I Initialize FRIEND (in any input-field)
Reset (lower case). Same as RESET but accepted in all input fields (for example, in data request).

INCREASE n,addr,incr,thr,ini,* Increase Counter(s)
INCREASE n,addr,incr,thr,ini,n2,addr2,incr2,thr2,ini2,*
INCREMENT .... INCR ....
This command instructs 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 exactly 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 = optional increment value (in decimal or hex). The default is 0.
thr = optional value (decimal or hex) of the counter at which the counter is initialized. The default = 0.
ini = optional value (decimal or hex) to which the counter is initialized at the beginning and when the threshold is reached. The default is 0.
* = stop processing if threshold of the only or second counter is reached.

INT Interrupt (standard option) 2x External Interrupt
NT
This command instructs FRIEND to discontinue 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 FRIEND is reset. (See TEST I/O command).

KEY CAW=k Set CAW Key
KCAW=k
KCW=k
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 Set Storage Key for CCW Area
KCCW=k,f
This command is used to specify the key for the 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 Set Storage Key for Data Area
KDATA=k,f
KDT=k,f
This command is used to specify the key for the FRIEND data area for the next chains to be entered. 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 Set Storage Key for IDA Area (IDAW)
KIDA=k,f
KD=k,f
This command is used to specify the key for the 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.

LIST (See the CCW Command)

LOOP / LOOP n..n,p Loop on CCW Chain
LP / LPn,p
This command instructs 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, 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.

NO ALARM No Alarm (standard option)
NLRM
This command instructs FRIEND to reset the audible alarm for operator console.

NO BMPX Disable Block Multiplex Mode
NBMPX
360
Standard if BC-mode specified. This command instructs FRIEND to reset bit zero of control register zero.

NO COMPARE Reset Compare
NCMPR
NCMP
This command will reset the Compare indication for the last entered chain, or for the chain specified in the nn-NOCOMPARE format.

NO DATA DUMP Reset Data Dump
NDTDMP
This command will reset the Data Dump.

NO DECREASE Reset Decrease Function
NDCR
Use this command to reset the decrease function.

NO HALT No Halt (standard option)
NHLT
NH
This command instructs FRIEND to continue after an I/O error print out.

NO INCREASE Reset Increase Function
NINCR
Use this command to reset the increase function.

NO INT No Interrupt
NNT
This command instructs FRIEND to handle the external interruptions normally.

NO TEST I/O Reset Test I/O Mode
NTST
This command resets the execution of the TIO command.

NO TIME DELAY (Standard option)
NTMDL
NTD
This command instructs 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 FRIEND is used in the virtual machine (VM) environment, in order to save processor time.

NO WAIT Reset Wait
NWT
This command will reset the WAIT indication for the last entered chain, or for the chain specified in the nn-NOWAIT format.

POINTER CCW=x....x Set CCW Pointer
PNTRCCW=...
PTRCCW=...
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 DATA=x....x Set Data Pointer
PNTRDT=...
PTRDT=...
Specify the data area address for the next CCW.

POINTER IDA=x....x Set IDAW Pointer
PNTRD=...
PTRD=...
Specify the address for the next IDAW used (should be on word boundary).

PRINT LOG,xxx Print Screen Image (Log Display)
PRNTLG ...
This command invokes the PRINTLOG function to copy screen images on any line printer if no console printer is available.
The displayed data on the operator console is printed out on the secondary printer or the printer specified by the optional address (xxx) entered with the PRINT LOG command.
To print the sreen image press the COPY key, call another display press the COPY key, and so on.

Termination:

Press MOD SEL key and do IML, or if you want to continue to use FRIEND call MODE SELECTION and perform a:

- PROGRAM RESET (P)
- RESTART (R)

FRIEND commands can now be entered.

PRINT SENSE Print Sense Byte Area
RNTSNS
PRTSNS
This command instructs FRIEND to display the 32 bytes long standard sense area. The TIO mode of FRIEND is reset.

Program (PSW) Restart
(via 4321/31 Mode Selection Menu)
In execution mode use this 4331 function to request a CLEAR function without counter reset.

QUIT Quit FRIEND Request for Console Input
QT
Q
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. The characters QT have a special meaning if card/tape is used as input device (test case number)

REMOVE=xxx Remove Device xxx (Deactivate Device)
RMV=xxx
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.

REP nn Replace CCW (First CCW of Chain == 1)
RPn
This command will instruct 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.

RESET Initialize FRIEND
RST
RQT
F
This command instructs FRIEND to reinitialize 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.

RETURN Return to Operator Console Control
RTRN
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).

SCOPE Scope
SCP
This command instructs 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 program 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.

SENSE=xxxx SENSE Mask (sense bytes 1+2 mask)
NS=c..x
This command instructs 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 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.

SET FB Set FB Device Type (3310/3370)
STFB
May be used for devices not storing the correct FB ID after a Sense I/O.

SIZE Display Storage Size
SZ
The storage size is displayed in hexadecimal.

START READER,xxx,*,nnnn,B Start Reader for CCW Command Input
STRTRDR,xxx
STRDR,xxx
S,xxx
This command instructs 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. FRIEND will skip all test cases up to the one specified.

STATUS Display FRIEND Status
STTS
This command instructs FRIEND to print all program indicators, normally displayed on the 327x console line 20.

nn-STOP Stop Execution of Chain nn
n-STOP
This command is used to deactivate a certain CCW-chain. 'nn' is the UCB number displayed by the LIST= function. The chain may be made active again by use of ACTIVATE command.

SUBST xxx,yyy Substitute I/O Devices (xxx for YYY)
SBST ...
SB ...
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.

TEST I/O TIO to Last Specified Device
TEST
TST
T
FRIEND will repeatedly execute the TIO instruction and type out the results of the instruction, for example: 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 generating two external interrupts (for example: press the INTR (interrupt) key at the operator console twice), if interrupt feature is active, or by commands NO TEST I/O, PRINT SENSE, or RESET.

TIME DELAY n..n Time Delay for n..n Seconds
TMDL n..n
This command tells FRIEND to set the time out counter for the execution of all chains to decimal n..n seconds. An error message is indicated if FRIEND does not receive a device end for a CCW chain within the specified time period. This command should be used if FRIEND operator console or sec. printer should be used as test devices too.

TRACE,xxx (PF5) Trace all SIOs and I/O Interrupts
TRC
This command instructs 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.

WAIT n..n,n Wait N-Milliseconds
WT n..n
This command instructs FRIEND to wait for the completion of one chain before starting the next one. n..n is an optional operand. If n..n is not specified, 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.

6B. CCW Chain Execution Control

Before a SIO is issued, 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 1 or 3 after a Start I/O instruction FRIEND analyses the CSW and issues the specified UCB control commands in the following sequence:

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

    a. Data compare
    b. Data dump
    c. Data ripple or random
    d. Increment or decrement storage field
    e. Compare loop count

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

    a. Issue SENSE command in case of unit check in CSW
    b. In case of all sense bytes masked and no other error in CSW, handle it as normal interrupt
    c. Display error message
    d. Data dump
    e. Data ripple or random
    f. Increment or decrement storage field
    g. Compare loop count

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

    a. In case of all CSW status error bits masked handle it as immediate interrupt
    b. Issue SENSE command in case of unit check in CSW
    c. In case of all sense bytes masked and no other error in CSW, handle it as immediate interrupt
    d. Display error message
    e. Increment or decrement storage field
    f. Retry Start I/O (SIO counter is not incremented) The SIO is not retried if the loop count is one

4. Condition Code three after Start I/O

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

5. 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).

6. Test I/O Loop (last entered device address at storage location X'424')

   a. Print out condition code
   b. Increment or decrement storage field
   c. Compare Loop Count

6C. How to Modify Existing CCW Chains

During the 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. To modify an existing CCW chain (UCB) the UCB/chain number has to be used as a command prefix. Use the CCW= or LIST= commands to obtain the number of the chain (UCB) if it is not known.
The following commands can be used to alter a CCW chain. Enter the one or two digit chain/UCB number, a dash and then the command (see the examples after the command table).

nn-ACTIVATE	activate UCB/chain
nn-ADD	add one command after specified chain (up to four CCWs may be added by subsequent nn-ADD commands)
nn-CCW	lists CCW's of UCB/chain nn
nn-COMPARE ...	specify/modify COMPARE values
nn-COPY	copy CCW-chain 'nn' for current UCB
nn-COUNTER	list counters of UCB/chain nn
nn-CSW=xxxx	specify/modify CSW bits to be ignored
nn-DATA DUMP ..	specify/modify DATA DUMP values
nn-DECREASE ..	specify/modify DECREASE values
nn-DEVICE=	change device address for a chain without device type determination.
nn-FLAG nn,xx	modify flag byte in specified CCW for a chain
nn-GO	start running with chain nn
nn-INCREASE ..	specify/modify INCREASE values
nn-KEY CAW=	specify/modify CAW key
nn-LIST	list CCWs of UCB/chain nn
nn-LOOP	specify/modify LOOP count
nn-NO COMPARE	deactivate COMPARE for a chain
nn-NO DATA DUMP	deactivate DATA DUMP for a chain
nn-NO DECREASE	deactivate DECREASE for a chain
nn-NO INCREASE	deactivate INCREASE for a chain
nn-NO WAIT	deactivate WAIT for a chain
nn-REP nn	replace one CCW in a chain (new CCW to be entered as next command)

nn-SENSE=nnnn	specify/modify SENSE bits to be ignored
nn-SETFB	set FB type for device (required before nn-REP and nn-ADD for 3310/3370)
nn-STOP	stop/deactivate UCB/chain
nn-TRACE	start tracing with chain nn
nn-WAIT nnnn	specify/modify WAIT for a chain

For a detailed description of the above commands, see "8A. Chain (UCB) Control Commands".

Example 1

The following command will modify the loop count for chain 12

12-loop 5000

Example 2

The following command will copy the UCB of CCW-chain number 2 to the current UCB (using the same CCWs and data).

2-copy

Chapter 7. Advanced Capabilities of FRIEND

7A. Predefined CCW Chains

See also "$$nnn,*" on page 27.

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

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. See "4A. Hex '5B' Character Assignment" on page 11.

To display the commands used by a predefined chain, an asterisk (*) has to be used following the number; for example $$110,*.

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)

$$004 Load UCS Buffer for 1403 (PCS-AN chain)
(specify DEV= ... and $$010 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
See example on next page.

$$020 Diskette (3540 type) to printer
(specify DEV= ... for diskette, printer address is always X'02E')

$$101 3287/3230/3268 Ripple Print 1 (specify DEV=... before)

$$102 3287/3230/3268 Ripple Print 2 (specify DEV=... before)

$$110 327x display/read (specify DEV=... before)
Two SIOs are used with increments on the screen buffer addresses and the read data is compared.

$$111 327x display/read (specify DEV=... before)
Same as 110, but with a single SIO. This chain is only supported by the 4321/31 display printer adapter.

$$119 327x display with increment (specify DEV=... before)

$$2xx Predefined Chains for the Loop Adapter
If one of the $$ chains 200 to 209 is selected you must first specify DEV= of the subchannel of the device to be tested.

$$200 Connect SNA Terminal

$$201 Disconnect SNA Terminal

$$202 LA SNA Chain - Write Text to a 8775
System services control point to logical unit (SSCP-LU) session.
Logical unit number = 02.

$$203 Display SNA Responses for $$202
1. Activate physical unit response (ACT-PU RSP)
2. Activate logical unit response (ACT-LU RSP)

3. Data response (DATA RSP)

Response Format:

```
                    BYTE
                          0 -  1  Data count field starting with byte 0
                          2 -  3  Not used
                          4 -  9  Transmission header
                         10 - 12  Request/response header
If byte 10 bit 5 = 0     13 - End SNA request/response or data
If byte 10 bit 5 = 1     13 - 16  SNA sense code
                         17 - End SNA request/response or data
```

$$204 Display SNA Responses for $$205 - $$209

1. Activate physical unit response
2. Activate logical unit response
3. Notify request (3274 only)
4. Bind response
5. Start data traffic (SDT) response
6. Data response

The response format is the same as described in $$203

$$205 LA SNA Chain - Write Text to 8775 / 3276 - 3278.
Specify logical unit number (LU) $*=...
(For example: 8775=02, 3276 port 0=02, port 3=05 etc.)

$$206 LA SNA Chain - Write Text to 3274-3278
Specify logical unit number (LU) $*=...
(For example: port 0=02, port 4=06, port 6=08 etc.)

$$207 LA SNA Chain - Write Text to 3287 - 11 and 12 / 3645
Specify logical unit number (LU) $*=01

$$208 LA SNA Chain - Write Text to 3276 - 3287
Specify logical unit number (LU) $*=...
(For example: port 0=02, port 5=07 etc.)

$$209 LA SNA Chain - Write Text to 3274 - 3287
Specify logical unit number (LU) $*=...
(For example: port 0=02, port 7=09 etc.)

$$400 Tape (e.g. 8809) write and read back
(specify DEV= ... before). Data read is printed on printer with address '02E'.

$$5xx For all $$5xx chains enter DEV=... before and make sure that the device is ready and supports fixed block (FB) commands. If FB is not supported use the SETFB command before.

$$500 3310 - CE track initialization
(specify DEV=... before)

$$501 3310 - Read FB with increment
(specify DEV=... before)

$$502 3310 - Dump CE-cylinder to secondary printer

$$510 3370 - CE track initialization
(specify DEV=... before)

$$511 3370 - Read FB with increment
(specify DEV=... before)

$$512 3370 - Dump CE-cylinder to secondary printer

$$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 $*=..

Example for Load UCS-Buffer on a 3205 Mod 5 Printer

```
With this example the chain image PCS A1 is loaded:
```

Dev=02E $$010 $$005 LP1 go

```
With the following example you may select one special
  image out of four:
```

Dev=02E $$010 LDUCS,FROM$x LP1 go

```
The character x can be either A, H, 1, or 2,
see predefined chain $$010.
```

Figure 7-1. Multiple CCW Chain

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 the following:

1. Start as you would execute a single CCW chain. Perform steps 1 to 4 as described under Chapter 3, "How to Use FRIEND" on page 3-4.
2. After typing 'GO', this chain will be executing.
3. Press keyboard REQUEST or CRT TST REQ and ENTER key.
4. When PROCEED is displayed in the status field, (line 20) enter DEV=xxx, where xxx is the hexadecimal device address on which the next CCW chain to be entered will 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 3 to 6 to enter another CCW chain.

Example for a Multiple CCW Chain

```
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, then 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.
```

Figure 7-2. Multiple CCW Chain

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. Refer to "6A. Chain (UCB) Control Commands" on page 6-1 for the complete set of available commands.

See also INTO and FROM CCW control commands and the BUILD/CREATE commands.

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. FRIEND will use data chaining to get the data field of these commands.

How 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, 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, FRIEND will not ask for the data length or the data field. The Symbolic Table generated by FRIEND contains the corresponding data address and the implied length of the data area.

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

Optionally, an offset of 1 to 15 bytes may be used when referring a symbolic I/O area by specifying + 1 .... F. A symbolic I/O area character (name) may be redefined after use of the CLEAR$ command.

Example 1: Write Disk Record Zero and One from Same Area

```
DEV= 160                    << Unit address for first CCW chain
I/O= ......-......             FRIEND type out.
ENTER CCW LIST IN ENGLISH
seek
CYL= 5
HD = 1
set file mask
 MASK= c0
srch eq ha                     FRIEND will use CCHH from SEEK
tic *-8
write r0,from$a                $A actually points to data field
 KEY=                          ENTER (EOB) will cause no key to
                               be generated.
 DATA= 500xf00f                data field is 1000 bytes long
wr ckd,from $a                 data portion will be data chained
 RCD NO.= 1
 KEY=                          FRIEND will not ask for DATA=
go                             start execution
```

Figure 9. Write Disk Record Zero and One from Same Area

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........
  .
  .
  .
                                         hit REQUEST key
1-no data dump                           halt data dump
1-compare $a,$b                          specify data compare
go
                                         hit REQUEST key
counter                                  print loop counter
01-UNIT=0033, LOOP= 0000000/0001585 -A
02-UNIT=0034, LOOP= 0000000/0001586 -A
go                                       restart operation
```

Figure 7-4. CREATE/BUILD Command Usage (CA Wrapped Lines)

7D. CCW Chain Sequence Control and Delay Between Chains

See also WAIT n..n command.

The WAIT command causes 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.

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

Figure 7-5. Tape to Printer 80/80 List

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 FRIEND to delay 500 ms
                            after device end before starting
                            the next write CCW.
go
```

Figure 7-6. Wait with Time Delay for Single Chain

7E. 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. 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.

Example 1: Write and Read Disk Record Zero (Symbolic Areas)

```
DEV= 161                    << specify device to be used
I/O= ......-......
ENTER CCW LIST IN ENGLISH      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 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
```

Figure 7-7. Write and Read Disk Record Zero (Symbolic Areas)

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

Compare command specifying actual absolute addresses and length. 'A...A' and 'B...B' represent absolute 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 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                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
 1-01A000  01  01D000  6000  03E8
 2-01A008  27  01D3E8  6000  0001
 3-01A010  02  01D3E9  6000  03E8 cmd chain bit is turned off if
                                         'GO' is entered.
compare 1d000,1d3e9,1000                 absolute data addresses
go
```

Figure 7-8. Write and Read Tape Record (Absolute Area Addresses)

7F. 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= 01A008, 1 |D= 01D3E8, 1 |I= ...
  -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
1-stop                          stop first CCW chain
dev=180                         new Unit Control Block
rew                             rewind tape command
lp1
go
LOOP IS FINISHED ON UNIT 0180
rep1                            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
```

Figure 7-9. Record Counter for Tape

Example 2: Modify a 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$x
list=0                          get UCB address (e.g. C3000)
01-UNIT= 0000, UCB= 0C3000, FL=0019
01A000 E4 01D000 6000 0007
increase 2,C3000,1,Xff,0        modify device address X'000'-X'0FF'
data dump$x,*                   dump result of sense I/O on console
go
```

Figure 7-10. Modify a Device Address

7G. 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 FRIEND to perform the following function at each conclusion of the CCW chain. FRIEND will search for all CCWs 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 CCWs will be bypassed. Some bits are used in byte 5 of the CCW by 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) or with WRITE SPECIAL CKD CCWs.

Example 1: Write Random Data on Disk

```
DEV= 161                        << specify device to be used
I/O= ......-......
ENTER CCW LIST IN ENGLISH          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
```

Figure 7-11. Write Random Data on Disk

Example 2: Ripple Data on Printer

```
reset                                          REQUEST first
DEV= e                                       << Specify device to be used.
I/O= ......-......
ENTER CCW LIST IN ENGLISH                    / FRIEND display
space1,ripple                                  Print with one space after,
                                               press SHIFT key to enter 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
```

Figure 7-12. Ripple Data on Printer

7H. Card/Tape CCW Command Input

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

The START RDR command is used to instruct 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 FRIEND requesting information. Input parameters and operands must be separated by a slash (/). The maximum length of a field between two slashes should not exceed 240 characters (the rest is ignored). Slashes cannot 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 '*', 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, for example:

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 for a START READER Command

```
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=1000XF00F/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=/
        BLCK. CNT=32/BL. OFFS.=/RFB/DL=16384/
        INCR3,8805,32,126016,0/TRACE/
```

Figure 7-13. START READER Command

7J. 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/altered by the DUMP KEY/ ALTER KEY commands. The special areas for CCWs, 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.

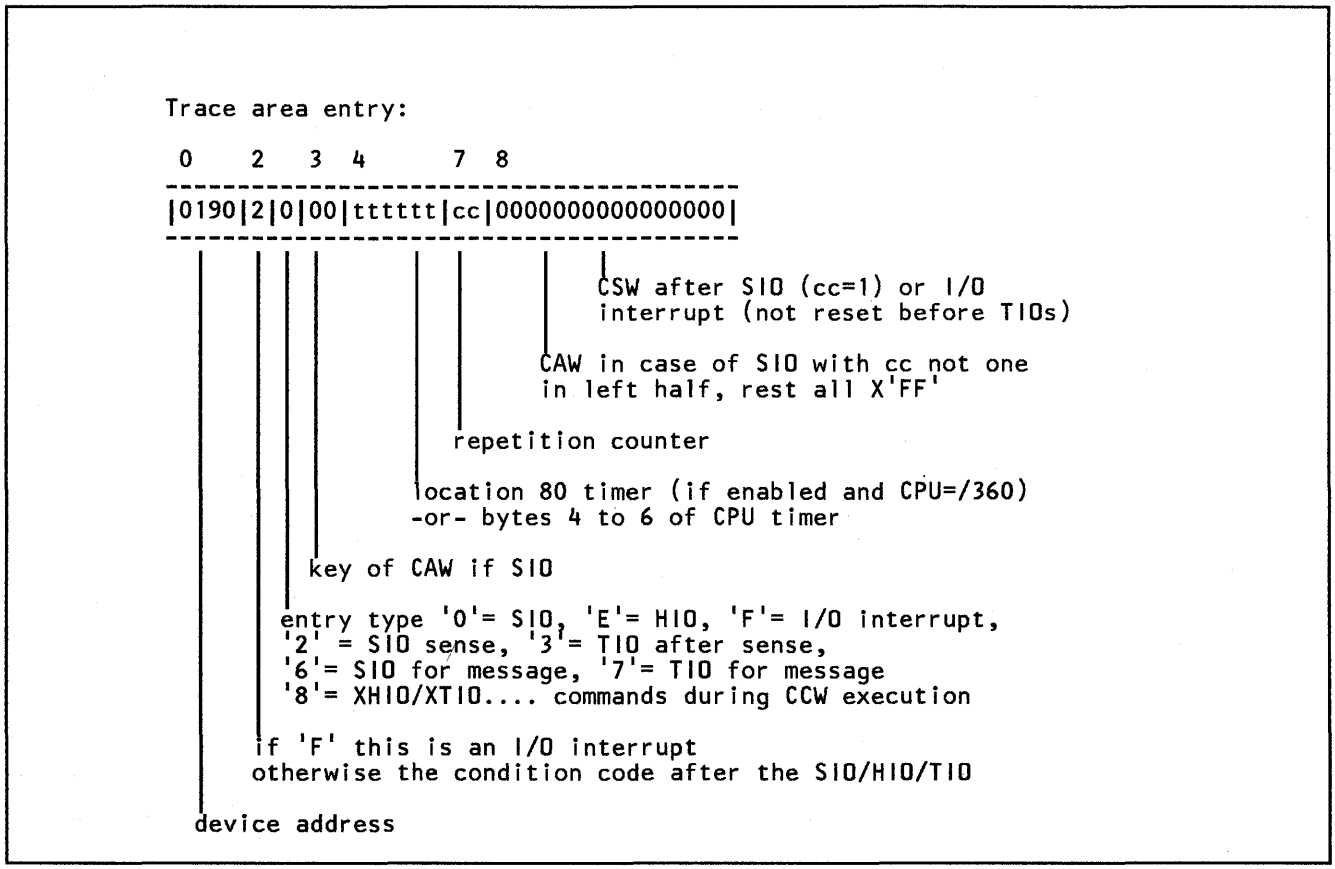
7K. Trace Function

See also TRACE command.

The TRACE command may be used to create a trace table in storage of all SIO/HIO/TIO 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).

Example: 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.



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 CPUs 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 DUMPT command e.g. dump X300,d20e0 . The DUMPT command will automatically display the last one to 36 trace entries.

7L. 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.

Chapter 8. Special Storage Areas

8A. Assignment of Storage Areas

X'0300' Special TIO/SIO loop area.

X'0400' 4 bytes long 'data area address' (standard X'1D000'). 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'1A000', must start on double-word boundary).

X'0408' 4 bytes long 'IDA area address' (standard X'19F00', 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'6FFF').

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' == 3277/78/79 type console
X'10' == extended control (EC) mode

X'044F' SP console control byte X'01' == SP console.

The addresses used for CCW chains, data areas and IDA areas may be altered by using the POINTER commands.

8B. Unit Control Block (UCB)

For each CCW chain created, 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 hex	Offset dec	Length	Contents
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 count. mess., set by LOOP n,M comm.
2E	46	02	number of SIOs done for counter message

Chapter 9. Channel Command Words

On the following pages all CCW command codes accepted by 4300 FRIEND are listed. The commands are grouped by task and listed in alphabetical sequence. Besides the command name at least one mnemonic and the hex value of the code is given.
In general, all vowels, blanks, periods, and asterisks are ignored in FRIEND input except in requested data. All commands can be entered in either uppercase or lowercase characters.

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

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. CCW Commands (Task Oriented)

General CCW Commands

CMD HH *S* Command Code in Hexadecimal
Enter any hexadecimal command code. If the last hex-digit is odd, data is requested (outbound commands).

HEX HHHHHHHHHHHHHHHH Complete CCW in Hexadecimal
HX HHHHHHHHHHHHHHHH
X 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 FRIEND (not if SKIP bit on in CCW flag). Blanks may be inserted to separate fields. It is not possible to specify any flag or modifier command.

NOP (X'03') *S* No-operation
NP

READ (X'02') *S* **Read**
RD
R

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)

SENSE I/O (X'E4') *S* Sense Input/Output Device - 7 Bytes
SENSE DEVICE
SNSDVC
SNSN

TIC *-n..n -or- -n..n (X'08') **Transfer in Channel**
TIC *+n..n -or- +n..n
TC
'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 characters are taken as hexadecimal displacement.

WRITE (X'01') *S* Write
WRT
WR
W

Disk CCW Commands

DIAGNOSTIC LOAD (X'53') Diagnostic Load
DGLD
DGL
DL

DIAGNOSTIC WRITE (X'73') Diagnostic Write
DGWRT
DW

ERASE (X'11') *S* Erase Record
RS

INIT BUF (X'E3') Initialize Buffer (2314) - 30 hex digits
NTBF

M/T + CCW command
MT + CCW command
Multi Track (M/T) - next cmd. Read/Seek. The multi track bit is set for the specified CCW.

READ BUF (X'E2') Read Buffer (2314)
RDBF
RBF

READ BUFFERED LOG (X'A4') Read Buffered Log (33XX)
RDBFDLG
RDBL
RBL

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 DATA (X'06') *S* Read Data
RDD
RDT

READ DIAGNOSTIC STATUS (X'42') Read Diagnostic Status
RDDGSTS
RDDGST
RDDGS
RDDS

READ HA (X'1A') Read Home Address
RDH
RH

READ IPL (X'02') *S* Read IPL (Initial Program Load)
RDPL
RD

READ KEY DATA (X'0E') *S* Read Key and Data
RDKDT
RDKD
RKDT
RKD
Key and data length is requested.

READ R0 (X'16') *S* Read Record Zero
RDR0
RDR
RR0
RR

READ SECTOR (X'22') Read Sector
RDSTR
RDSC
RDS
RS

RECALIBRATE (X'13') *S* Recalibrate
RCL

RELEASE (X'94') Device Release (String Switch)
RLS
RL
Length 24 bytes

RESERVE (X'B4') Device Reserve (String Switch)
RSV
Length 24 bytes

RESERVE UN (X'14') Device Reserve Unconditional (String Sw.)
RSVN
Length 24 bytes

RESET BUF (X'C3') *S* Reset Buffer (2314)
RSTBF

RESTORE (X'17') *S* Restore
RSTR

SEARCH HA EQ (X'39') Search Home Address Equal
SQH
SHQ
SH

SEARCH ID EQ (X'31') Search Identifier Equal
SQID
SDQ
SQD
SD

SEARCH ID HI (X'51') Search Identifier High
SDH
SHD

SEARCH ID HI EQ (X'71') Search Identifier Equal or High
SDQH
SQHD
SHQD

SEARCH KD EQ (X'2D') *S* Search Key and Data Equal
SQDT
SKDT
SDT

SEARCH KD EQ HI (X'6D') *S* Search Key and Data Equal/High
SQHDT
SHQDT
SKDQH

SEARCH KD HI (X'4D') *S* Search Key and Data High
SHDT
SKDH

SEARCH KEY EQ (X'29') *S* Search Key Equal
SQK
SKQ
SK

SEARCH KEY EQ HI (X'69') *S* Search Key Equal/High
SQHK
SHQK
SKQH

SEARCH KEY HI (X'49') *S* Search Key High
SHK
SKH

SEEK (X'07') Seek
SK

SEEK CYL (X'0B') Seek Cylinder
SKCL
SKCC

SEEK HEAD (X'1B') Seek Head
SKHD
SKHH

SET FILE MASK (X'1F') Set File Mask
STM
SFM
MK

SET SECTOR (X'23') Set Sector
SS

SPACE COUNT (X'0F') *S* Space Count
SPCNT

WRITE BUF (X'E1') Write Buffer (2314) -Load Buffer-
WRBF
WBF

WRITE COUNT KEY DATA (X'1D') Write Count, Key and Data
WCKD

WRITE DATA (X'05') Write Data
WD

WRITE HA (X'19') Write Home Address
WH

WRITE H40 (X'19') Write 3340 Home Address
WH40
WWH

WRITE H50 (X'19') Write 3350 Home Address
WH50
WMH

WRITE KEY DATA (X'0D') Write Key and Data
WKD

WRITE R0 (X'15') Write Record Zero
WRR0
WRR

WRITE SPECIAL COUNT K DT (X'01') Write Special Count, Key and Data
WSPCKD

Fixed Block CCW 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 characteristics record 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') Define Extent (FB) - 16 bytes -
DFNX
DX
Requested parameters are:

MASK BYTE	Two hex digits
PHY.START	Decimal value or up to 8 hex digits preceded by 'X'
LOG.START	Decimal value or up to 8 hex digits preceded by 'X'
LOG. END	Decimal value or up to 8 hex digits preceded by 'X'

If nothing is entered defaults are:
First three parameters all X'00'. LOG. END is the value read by the READ DEVICE CHARACTERISTICS command (reduced by 1).

DIAGNOSTIC CONTROL (X'F3') Diagnostic Control (FB)
DGC
DC

DIAGNOSTIC SENSE (X'C4') *S* Diagnostic Sense (FB)
DSNS
DGS
DS

LOCATE (X'43') Locate (FB) - 8 bytes -
LC
L

Requested parameters are:

OP. BYTE	Two hex digits
REPL. CNT	Decimal value or up to 2 hex digits preceded by 'X'
BLCK. CNT	Decimal value or up to 4 hex digits preceded by 'X'
BL. OFFS.	Decimal value or up to 8 hex 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'

READ BUFFERED LOG (X'A4') *S* Read and Reset Buffered Log (FB)
RDBL
RBL
This command reads and resets the buffered log (FB) of 24 bytes.

READ DEVICE CHAR (X'64') Read Device Characteristics (FB)
RDDVCC
RDDVC
Length of record read is set to 32.

READ FB (X'42') *S* Read Fixed Block (FB)
RFB
RF

READ IPL (X'02) *S* Read IPL
RDPL

RELEASE (X'94') *S* Device Release (String Switch)
RL

RESERVE (X'B4') *S* Device Reserve (String Switch)
RSV

SENSE EXTENDED (X'84') *S* Sense Extended (FB) - 256 bytes
SNSX
SX

WRITE FB (X'41') Write Fixed Block (FB)
WFB
WF

Tape CCW Commands

BACKSPACE (X'27') *S* Backspace Record (BSR)
BKSP
BSR
BK

BSF (X'2F') *S* Backspace File (BSF)

ERG (X'17') *S* Erase Record Gap
RG

FSF (X'3F') *S* Forward Space File (FSF)

FSR (X'37') *S* Forward Space Record (FSR)

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 is set to 800

MODE SET 1600 (X'C3') Mode Set (Tape) 9 Track/1600 BPI
MDST 1
Mode is set to 1600

MODE SET 6250 (X'D3') Mode Set (Tape) 9 Track/6250 BPI
MDST 6
Mode is set to 6250

READ (X'02') *S* Read
RD
R

READ BACKWARDS (X'0C')*S* Read Backwards
RBCK
RBK
RB

REWIND (X'07') *S* Rewind -REW-
RW

UNLOAD (X'0F') *S* Rewind Unload -RUN-
RUN
RN

WRITE (X'01') *S* Write
WRT
WR
W

WTM (X'1F') *S* Write Tape Mark
M

Specific 8809 Tape Unit CCW Commands

DSR (X'97') *S* Data Security Erase

LWR (X'8B') *S* Loop Write to Read

RDBL (X'A4') Read and Reset Buffered Log
RBL

SHS (X'E3') *S* Set High Speed

SHSLG (X'93') *S* Set High Speed and Long Gap

SHSNG (X'33') *S* Set High Speed and Normal Gap

SLG (X'13') *S* Set Long Gap

SLS (X'83') *S* Set Low Speed

SLSLG (X'53') *S* Set Low Speed and Long Gap

SLSNG (X'63') *S* Set Low Speed and Normal Gap

SNG (X'23') *S* Set Normal Gap

Card Reader/Punch CCW Commands (incl.5424/5425)

CONTROL P n (X'n3') *S* Control Primary n (542x)
CNTPn
CNPn
'n' may be digit 1, 2, 3, or 4

CONTROL P n F (X'n7') *S* Control Primary n and Feed (542x)
CNTPnF
CNPnF
'n' may be digit 1, 2, 3, or 4

CONTROL S n (X's3') *S* Control Secondary n (542x)
CNTSn
CNSn
'n' may be digit 1, 2, 3, or 4 command 's' will be 9, A, B, or C

CONTROL S n F (X's7') *S* Control Secondary n and Feed (542x)
CNTSnF
CNSnF
'n' may be digit 1, 2, 3, or 4 command 's' will be 9, A, B, or C

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 CARD (X'02') *S* Read Card
RCRD
RCD

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

RESET ERP (X'0B') *S* Reset ERP (542x)
RSTRP

SET ERP (X'0F') *S* Set ERP (542x)
STRP

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

WRITE PU F P (X'01') *S* Write Punch and Feed Primary (542x)
WRPFP
WPFP

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

Line Printer CCW Commands

ADVANCE TO EOS (X'5B') Advance to End of Sheet (3203-01/02)
DVNCTOS

ALLOW DC (X'7B') Allow Data Check
LLWDC

BLOCK DC (X'73') Block Data Check
BLCKDC

FOLD (X'43') Fold (3211 + 3203-4)
FLD

GATE LOAD (X'EB') Gate Load (1403)
GTLD

IMM + CCW command Space/Skip Immediate
MM
Use this command combination with SPACE/SKIP commands.

LOAD FCB (X'63') *S* Load Forms Control Buffer
LDFCB

LOAD UCS (X'FB') *S* Load UCS Buffer without Folding
LD UCS
LDCS
(for 1403 a GATE LOAD command must be executed before)

LOAD UCS F (X'F3') *S* Load UCS Buffer and Fold (except 3211)
LDCSF

PRINT (X'09') *S* Print with one Space after
PRNT
PRT

RAISE COVER (X'6B') Raise Cover (3211)
RSCVR

READ FCB (X'12') *S* Read FCB (3211)
RFCB

READ PLB (X'02') *S* Read PLB (3211)
RPLB

READ UCSB (X'0A') *S* Read UCSB (3211)
RCSB

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

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

UNFOLD (X'23') Unfold (3211 + 3203-4)
NFLD

WRITE (X'01') *S* Write without Space
WRT
WR
W
Warning: This operation may destroy the printer ribbon

CCW Commands for CRT and Printer using 3270 Command Set

ERASE ALL U (X'0F') *S* Erase All Unprotected
RSLL

ERASE/WRITE (X'05') *S* Erase/Write
RSWRT
RSW

RSWRTALT (X'0D') **Erase/Write Alternate**
RSWL

ERASE/WRITE CRT (X'05') *S* Erase/Write 327x Data Stream
RSWRTCRT
RSW3270
Instead of DATA= 327x specific requests are typed. To end them, enter '*' after CMD= is typed.
See command table following (no IDA allowed).

RSWLCRT (X'0D') Erase/Write Alternate 327x Data Stream
RSWL3270

READ BUFFER (X'02') *S* Read Buffer
RBFFR
RBFF

READ MODIFIED (X'06') *S* Read Modified
RDMD
RMD

SELECT (X'0B') *S* Select
SLCT

SRB (X'IB') *S* **Select Read Buffer**

SRBFP (X'3B') *S* **Select Read Buffer from Positon**
SRBP

SRM (X'0B') *S* **Select Read Modified**

SRMFP (X'2B') *S* **Select Read Modified from Position**
SRMP

SWRT (X'4B') *S* **Select Write**
SW

WRITE (X'01') *S* Write
WRT
WR
W

WRITE CRT (X'01') *S* Write 327x Data Stream
WRTCRT
W3270
Instead of DATA= 327x specific requests are typed. To end them, enter '*' after CMD= is typed.
See command table following (no IDA allowed)

WRITE SF (X'11') *S* Write Structured Field
WSF

Command Table

In case of commands WRITE CRT and ERASE WRITE CRT, FRIEND is asking for a 327x command (buffer control order).
Enter one of the following:

'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
'Nl'	New Line (X'15') - for printer
' '	'ENTER' == no command
'*'	end of data stream (no code generated)

CCW Commands for Local SNA Devices (Including Loop Adapter)

CONTROL L (X'05') *S* Control Local SNA
CL

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 + length

READ (X'02') *S* Read
RD
R

READ START 0 (X'32') *S* Read Start 0
RDS0
RS0

READ START 1 (X'52') *S* Read Start 1
RDS1
RS1

RESTART RESET (X'93') *S* Restart Reset
RSTRT
RSTL

SENSE ID (X'E4') *S* Sense ID (4 bytes)
SNSD

WRITE BREAK (X'09') *S* Write Break (last write in chain)
WB

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 plus data length

WRITE L (X'01') *S* Write Local SNA
WRTL
WL

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

WRITE START 0 (X'31') *S* Write Start 0
WS0

WRITE START 1 (X'51') *S* Write Start 1
WS1

Teleprocessing CCW Commands (270x, 370x and CA)

ADPREP (X'1A') *S* Address Prepare
ADP

AUTOPOLL (X'09') *S* Autopoll
TPLL

BREAK (X'0D') *S* Break
BRK

CONTROL SCB (X'0B') *S* Control SCB (SDLC) - 16 bytes length
CNTRLS
CS
Address aligned on fullword boundary.

OFS= Enter buffer offset in decimal - Default = 2
ADR= Enter SDLC station address
FLG= Enter control flag byte in hex
X'80' = inactive station (0=active)
X'40' = datapoll station (0=contact)
X'20' = send rnr poll (0=rr)
X'10' = reply rnr to poll (0=rr)
NSC= Enter ns current
NSA= Enter ns acknowledged
NRA= Enter nr of next frame to be received
IDT= Enter four bytes identification field in hex

DIAL (X'29') *S* Dial (Switched Line with Autocall)
DL

DISABLE (X'2F') *S* Disable Line
DSBL

DTD (X'42') *S* Dynamic Trace Dump (CA of 433x)

2048 bytes length - address aligned on fullword boundary.

ENABLE (X'27') *S* Enable Line
NBL

INHIBIT (X'0A') *S* Inhibit
NH

POLL (X'09') *S* Poll
PLL
TPLL

POLL SCB (X'09') *S* Poll SCB (SDLC Autopoll)
PLLS
End command by answer 'n' after Y-N=

POLL SDLC (X'0F') *S* Poll SDLC
PLLSD

PREPARE (X'06') *S* Prepare
PP

READ (X'02') *S* Read
RD
R

READ PIU (X'06') *S* Read PIU (SDLC)
RD

SADn *S* SAD 'n' (270x)
SDn
'n' may be 0, 1, 2, or 3

SENSE SCB (X'14') *S* Sense SCB (SDLC) - 24 bytes length
SNSS
address aligned on fullword boundary.

SET LINE MODE (X'2B') *S* Set Line Mode (CA of 3115/3125)
STLNMD

SET MODE (X'23') *S* Set Mode (270x + CA)
STMD
Length for BSC CA = 1
X'40' EIB mode
Length for SDLC CA up to 8 bytes. The meaning of each byte is:

byte 1 X'80' change datapoll ind (see also byte 2)
byte 1 X'40' change contactpoll ind (see also byte 3)
byte 2 datapoll index (if 1=X'80')
byte 3 contactpoll index (if 1=X'40')
byte 4 contactpoll frequency
byte 5 service seaking pause
byte 6 primary: idle detect timeout
byte 6 secondary: nonprod. rec. timeout
byte 7 X'80' secondary station (see also byte 8)
byte 8 secondary station address (if 7=X'80')

WRAP (X'05') Wrap
WRP
WP

WRITE (X'01') *S* Write
WRT
WR
W

WRITE PIU (X'05') *S* Write PIU (SDLC)
WRTP
WP

OFS= Specify offset in decimal
- Default is value from last CONTROL SCB command or 2
- If zero (0) command is data spanning version (no offset)

DATA= Enter data C.. or X..
- Terminate by no data entry

LNG= Enter length for length field
- Default= offset + data length(s)

Typewriter CCW Commands (1052)

CONTROL ALARM (X'0B') *S* Control Alarm
CNLRM

READ INQUIRY (X'0A') *S* Read Inquiry (1052 Read)
RDNQ

TYPE (X'09') *S* Type with Carriage Return
TP

WRITE (X'01') *S* Write (Inhibit with Carrier Return)
WRT
WR
W

Diskette CCW Commands

DEFINE OP (X'2F') *S* Define Operations
DFNP
DFP

Byte 0	CCW count for number of writes between seeks.
Byte 1	X'80' allow read cmd X'40' allow write cmd X'20' suppress UC on delete
Byte 2 and 3	zero

FEED (X'17') Feed
FD

READ DATA (X'06') *S* Read Data
RDD
RDT
This command reads one record = 1...128 bytes

READ IPL (X'02') *S* Read IPL
RD

SEEK SECTOR (X'07') Seek Sector
SKSC
SKS
TRK = track number 0...74 SCT =sector number 1...26

WRITE CONTROL (X'21') *S* Write Control
WRTC
WC
C'D' = X'C4' - logical delete C'F' = X'C6' - surface defect

WRITE DATA (X'05') *S* Write Data
WRTD
WD
This command reads one record = 1...128 bytes

9B. 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 some CCW flags are automatically set by FRIEND, for example the SILI flag. After the CCW has been specified the flags may be changed by the FLAG command.

DC (X'80') Data Chaining
CD
Causes use of address portion of next CCW (command chaining is not turned on)

IDA (X'04') Indirect Data Addressing (IDA)
D
** NOTE: This parameter must be the last one entered behind a CCW. IDA areas for IDAW are requested by FRIEND. No command modifier is allowed.

NOSILI reset (X'20') Reset Suppress Incorrect Length Indicator
NSL
Inhibit set of SILI bit in CCW by FRIEND.

SKIP (X'10') Skip Transfer
SKP
Suppress transfer of information to main storage.

PCI (X'08') Program Controlled Interrupt
PC
Causes a channel controlled interruption. FRIEND will ignore all interrupts with PCI on in the CSW until Device End is posted in the CSW.

SILI (X'20') Suppress Incorrect Length Indicator
SL
Causes suppression of possible incorrect length indication in CSW.

9C. CCW Command Modifiers

CCW command modifiers are added to the CCW to allow special FRIEND actions. These modifiers may be combined if meaningful.

NOTE: Do not use these modifiers together with indirect data addressing.

CRT or 3270 327x Device (after WRITE and ERASE WRITE)
Special 327x data stream is requested.

FROM From (Area)
FRM
Specify symbolic data area to be used.

INTO Into (Area)
NT
Specify symbolic data area to be used.

LENGTH
LNGTH
LN
Data Length FRIEND requests 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 FRIEND this length may be modified by using this keyword.

NEW Reset CCW Indicators.
NW
This modifier will reset the disk indicators for:

- TIC required
- Seek argument not required
- Set File Mask required

RANDOM Random
RNDM
RN
This modifier will generate random data at the completion of a chain (bypasses 'home address' and 'count fields')

RIPPLE Ripple Data
RPPL
RP
This modifier will move the data area one byte to the left for all write CCWs at the completion of the chain.

ZERO
ZR
Clear Input Area of CCW before execution of Start I/O.

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Diagnostic User Guide

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