SIMULATED INSTRUCTIONS FOR COMPASS PROGRAMS

*[handwritten in left margin: JUMP SEEK]*

There are a number of instructions that are illegal for a program that is not in monitor state to use. OS-3 has attached special meaning to some of these so that a user can communicate with the monitor to do I/O, check for various faults, or get information about the status of his job.

The following is a brief description of these instructions, their puposes, their COMPASS mnemonic^S and the format^S of the assembled instruction^S. *[handwritten: SP ?]*

READ WRITE CNTL XREQ .   effective addresses on these
instructions are computed as
follows:

6	1	2	15
f	I	b	m

$M = m+B$ b *[handwritten: SMALL b]*

[handwritten: ANOTHER SPACE]
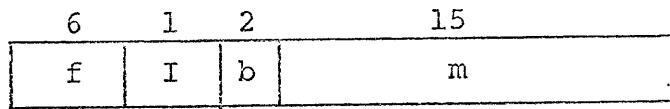
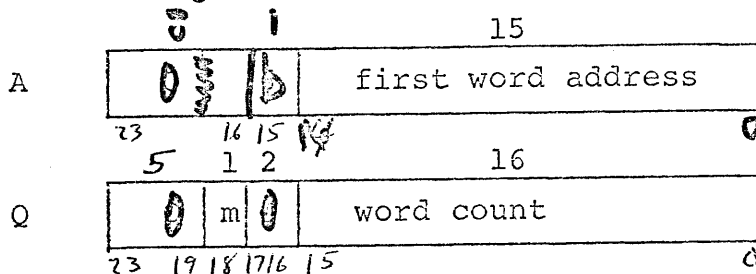if I = 1 fetch bits 17-0 from location M and repeat
if I = 0 M specifies the LUN to use (0 ≤ LUN ≤ 100)

READ   read a record on LUN
    f=74

WRITE   write a record on LUN
    f=76

0		b	15
0		b	first word address

A   *[bit labels: 23   16 15 14   0]*

5	1	2	16
0	m	0	word count

Q   *[bit labels: 23 19 18 17 16 15   0]*

b = 0 start in same bank
      as the ⟨⟩ instruction
b = 1 start in other bank

m = 0 BCD mode
m = 1 binary mode

LUN must be defined. After a READ or WRITE operating the status of the LUN (see CNTL). After read $Q_2 := (Q_1$ AND $17777 B)$ - (number of words in the record)

$wc = Q_1 - Q_2$

CNTL

     f=72.0

Issue CONTROL function in lower 15 bits of Q to LUN. After the operation the status of the unit is returned in A, all other registers are unchanged. For all functions except status LUN must be defined or the user is put into control mode.

CONTROL CODES

SYMBOLIC NAME	OCTAL CODE	
STATUS	0	copy status of L to A
CLEAR	1	clear status of L (file mark & binary bits)
WFM	2	write file mark
RELEASE	3	release file or output unit
REWIND	4	rewind to load point
SFPFM	5	search forward past file mark
SBPFM	6	search backward past file mark
BKSPACE	7	backspace one record
FWDSPACE	10	space forward one record

Status of device in A

9		15
STATUS		TYPE
23	15 14	0
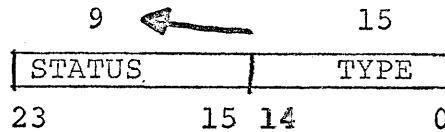
STATUS

BIT	MASK	CONDITION
23	40000000	READ ONLY (FILE PROTECT)
22	20000000	LOAD POINT (BEGINNING OF FILE)
21	10000000	END OF DATA
20	04000000	FM just processed
19	02000000	NOT USED
18	01000000	BINARY RECORD just Read
17	00400000	ABNORMAL/UNAVAILABLE
16	00200000	ADDRESS ERROR
15	00100000	SAVED FILE

TYPE

```
0  = UNIT NOT EQUIPPED
1  = FILE
2  = LINE PRINTER
3  = CARD PUNCH
4  = CARD READER
5  = MAGNETIC TAPE
6  = TELETYPE
7  = PLOTTER
8  = NULL (ABSORBS ALL
         OUTPUT)
9  = TV (DISPLAY CONSOLE)
10 = RANDOM ACCESS FILE
11 = TASK (REMOTE BATCH
         JOB)
```

XREQ

    $f = 71.0$

Executive request – used to equip LUNs, save, delete, file protect, and remove file protect on files, and call library programs. ~~(strikethrough text)~~

AQ   Name of file or library program, in BCD character codes. Is left unchanged except in case of EQUIP and UNEQUIP.

B1   Code for action desired. After operation, contains an error code (0 means no error).

effective address (M): logical unit number (0 to 99) or memory page number (0 to 37_8), or not used.

CODE in B1	Request	Action and error conditions
0	DELETE	Delete file name (in AQ) from file directory. File must be equipped as the specified logical unit.
		ERROR
		1 unit is not equipped
		2 file is protected
		3 unit is not a saved file
		4 name in AQ does not agree with name of file
		5 not enough scratch file space for file
1	SAVE	Save specified logical unit under name in AQ (put name in file directory).
		ERROR
		1 unit is not equipped
		2 there already exists a file with the name given in AQ
		3 unit is already a saved file
		4 unit is not a file
		5 not enough saved file space for file
		6 name is illegal (such as FILE, PUN, etc.)

2	UNEQUIP	Unequip the specified logical unit. If LUN is a tape the density code of the tape is returned in A, otherwise AQ is not changed.

ERROR

    1   unit is not equipped
    2   unit is a file or RAF which is protected and not saved

3	EQUIP	If $A \neq 0$, equip specified unit as the saved file whose name is in AQ, or as the hardware unit whose name is in AQ. See list below. If $A = \pm 0$, equip specified unit as equivalent to the unit number specified in Q(0 to 100). If no error occurs, A contains the status of the unit after equipping it.

HARDWARE NAMES (in AQ):

FILE	create an empty scratch file
LP	line printer
~~PR~~	~~same as LP~~
PUN	card punch
PLOT	plotter
RAF	create an empty random access file
TASK	remote batch job
NULL	null (device absorbs and discards all outputs to it)
MT	(in A) magnetic tape
	(Q) = reel number
	= density
	0 = 200 BPI
	1 = 550 BPI
	2 = 800 BPI

ERROR

    1   unit is already equipped
    2   there is no saved file with the name given in AQ
    3   unit number (in Q) is not equipped
    4   saved file with name in AQ is busy (it is not protected and some other user has it equipped.)
    5   ~~not enough tape drives available~~
    6   illegal tape number or density ~~not enough hardware available~~

4	RFP	Remove file protection from specified unit. If it is saved, its name must be given in AQ. If it is not saved, AQ is ignored.

ERROR

    1   unit is not equipped

		2 file is busy (some other user is equipped to it, too).
		3 name in AQ does not agree with the name of the file
		4 file is public or semi-public and it belongs to some other user.

5   FP

Protect the file which is equipped to the specified unit. AQ is ignored.

ERROR

1   unit is not equipped
2   unit is not a file

6   Unused

7   ZEROPAGE

Effective address (0 to 37_8) specified a page in memory, which is set to all zero. A page is 2048 words, and they are numbered from the low end of memory upward. Thus, page 0 extends from address 000000 to 003777, page 13 extends from 054000 to 057777, etc. AQ is ignored.

8   LIBCALL

Call the library program whose name is in AQ. This involves copying the program into the pages of memory which it is to occupy, and transferring control to it. If the library program needs a parameter string, this must have been defined previously by storing ASCII characters, using the ACI instruction. The effective address is ignored.

ERROR

If there is no library program by the name given in AQ, nothing is done and the computer executes the next instruction after the XREQ.

RF77	bits	
	23	ABORT THE USER
	22	RESTRICTED MODE
	.	
	.	
	.	
	2	MODE 37 TTY
	1	DATE
	0	DELETE LOADING

move

CTI 77.75

Console Teletype input--read a character from a Teletype - This instruction is also used to read parameter strings on overlay calls. This instruction is illegal if LUN 100 is not a Teletype and there are no characters in the Teletype input string. See ACI.

$0 \rightarrow A_{23-8}$

ASCII character $\rightarrow A_{7-0}$

CTO 77.76

Console Teletype output--write a character on a Teletype. This instruction is illegal if LUN 100 is not a Teletype.

$A_{11-0} \rightarrow$ Teletype output buffer.

Teletype input string is discarded.

No registers are changed.

ACI 77.54

ASCII code to input string - put the ASCII character in A_{7-0} on the end of the Teletype input string. This instruction is used to put out parameter strings for overlays or library calls.

$A_{7-0} \rightarrow$ Teletype input string.

No registers are changed.

INTERRUPT CONTROL

There are four instructions with which a user can test internal fault conditions and/or interrupt if a fault occurs. There instructions have the following format:

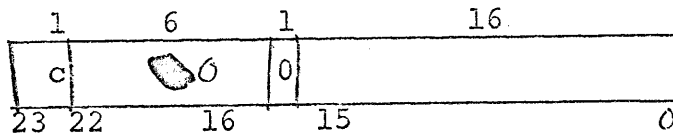| 6	3	3	12
f	g	ch	X
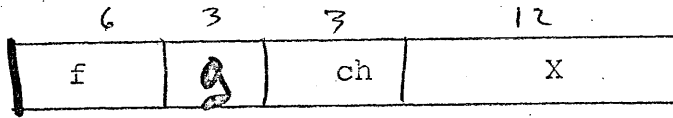
f = 77

g is a sub operation code

ch = channel (should be zero)

X = 12 bit mask used to select certain conditions

An INTERRUPT stores into word m and jumps to m + 1

1	6	1	16
c	6	0	

23 22   16   15   0

address of instruction to be executed next.

C = 1 RIS

   0 ROS

m	Condition
2	BCD FAULT
4	DIVIDE FAULT
6	ARITHMETIC OVERFLOW
10_8	EXPONENT FAULT
12_8	MANUAL INTERRUPT

INTERNAL STATUS

BIT	MASK	CONDITION
11	4000	BCD FAULT
10	2000	DIVIDE FAULT
9	1000	ARITHMETIC OVERFLOW
8	0400	EXPONENT FAULT

| 9 | 1000 | EXPONENTIAL AND BCD FAULT |
| 10 | 2000 | DIVIDE AND ARITHMETIC OVERFLOW |

~~FAULT~~

~~SCIM AND SSIM SETS OR CLEARS INTERRUPT MASK REGISTER.~~

CINS
F.9
77.30

Copy internal status - internal status→ (A_{11-0}); interrupt mask →(A_{23-12}).
(X = 0)

INS
77.3

Internal sense - if any internal status line selected by X is a 1, ~~skip~~ take next instruction, otherwise ↑small skip.
(X ≠ 0)

SCIM
77.53

Selectively clear interrupt mask - clear all bits in the interrupt mask that ~~are~~ correspond ~~in X~~ to 1 bits IN X.

SSIM
77.52

Selectively set interrupt mask - set all bits in the interrupt mask ~~that~~ correspond to the 1 bits in X.

RIS
55.0

Relocate with instruction state register - fetch operands from same memory bank as the instruction.

ROS
55.4

Relocate with operand state register. Fetch operands from other memory bank.

JUMP

SBJP
77.62

Set boundary jump - normal termination of a user program. After executing this instruction a user will be put in control mode. If a user is on a TV, if index 2 is zero the screen will be cleared, otherwise it will not be changed.

SLS

      77.70

Select stop - abnormal termination of a user program. After executing this instruction a user will be put in control mode and an error message will be printed. If the user types GO the instruction after the SLS will be executed.

UCS

      77.77

UNCONDITIONAL STOP - see SLS

COMPASS programmers should be aware that communication between some system routines and the monitor is carried on through RF77 and therefore a user should not set or clear bits in RF77.

RF 77

etc