SPS/ACC/GJ/Tech.Note 78-29 23 October 1978

DATA MODULE MANUAL

Further to my Note of 14 July 1978, please find attached a copy showing the current status of the manual. Also attached is a mode-file showing the user files from which this manual was generated.

It is intended to generate the printers copy for this manual on Monday, November 13. So, before this date, please could you:

(a) make any updates you may consider necessary,

(b) check the file list and let me know if there are any files I have missed, or if there are more recent versions than the files I have been using.

Please contact me if there are any complications necessitating a postponement of print-day. Any suggestions for the improvement of this manual are of course welcome.

Thank you.

G. Jennings

Distribution

DATA MODULE PROGRAMMERS

1 ANDREWS. C.
2 CHAPMAN-HATCHETT. A
3 CLAYTON. M.
4 D'AMICO. E.
5 JENNINGS. G.
6 KALBREIER. W.
7 KUHN. H. K.
8 MILLICH. A
9 RICHE. A.
10 SABAN. R.
11 SHAVE. A.
12 SWIFT. A.

DATA MODULE INTEREST LIST

1 ALTABER. J.
2 ANDERSSEN. P.
3 BACONNIER. Y
4 BECK. F.
5 BRUMMER. P.
6 BURNOD. L.
7 COLLINS. M.
8 CROWLEY-MILLING. M.
9 DE RAAD. B.
10 FRAMMERY. V.
11 GAREYTE. C.
12 HATTON. V.
13 JIRDEN. L.
14 MILLS. W.
15 SAGNELL. B.
16 SCANDALE. W.
17 SHERING. G.
18 THOMAS. D.
19 TYRRELL. M.

B. Angerth
G. Dôme
W. Middelkoop

FILE LIST (1)

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@CC DM-MAN-TWO
@SCAN
L-P
(JENNINGS)LSECT1
SECTION PROTECTION CODES

A
(JENNINGS)LCAP1
CAPABILITY BIT ASSIGNMENTS


(JENNINGS)LERR
STANDARD DATA MODULE ERROR CODES


(JENNINGS)NEW-BTV
BEAM TELEVISION CONTROL


(D-M)DM-DOOR
ACCESS DOOR CONTROL


(JENNINGS)NEW-PADR
PUBLIC ADDRESS SYSTEM


(JENNINGS)NEW-GEN-SWI
GP WAVEFORM SWITCHING


(JENNINGS)NEW-CONSOLE-SWI
DISPLAY WAVEFORM SWITCHING


(ANDREWS)NEF-115-CLINT
CLOSED LENS INTERLOCK


(ANDREWS)NEF-116-SUBTIM
SUBLIMATION PUMP TIMING


(ANDREWS)NDM-20-VGPO
VACUUM GAUGE SYSTEM


(ANDREWS)NDM-21-VINT
VACUUM SYSTEM INTERLOCK

```

(ANDREWS)NDM-19-VPRO
VACUUM ROUGHING PUMPS

(ANDREWS)NDM-18-VPSP
VACUUM SPUTTER ION PUMPS

(SHAVE)NEF-162-PAB
RADIATION SITE MONITOR STATUS ACQUISITION

(SHAVE)NDM-43-PAT
RADIATION TUNNEL ALARM MONITOR

(SHAVE)NDM-42-PMG
RADIATION SITE ENVIRONMENT MONITORS

(SHAVE)NEF-161-PRD
RADIATION DISPLAY CONTROLLER

(SHAVE)NDM-49-RAD
RADIATION MONITOR

(JENNINGS)NEW-MPXCAM
CAMAC/MPX INDEPENDANT ACCESS

(BEETHAM)NEW-MTG
MASTER TIMING GENERATOR

(BEETHAM)NEW-TDAM
TIMING CONTROL

(KUHN)EF122
POWER SUPPLIES

(D-M)EF124-PSMON
POWER SUPPLY TIMING

(KUHN)STAB

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104    (KUHN)SMGP3
105    GP3 POWER SUPPLIES
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173     IN-OUT
174
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1.1 LSECT LIST OF SECTION NUMBER ALLOCATION.

SECTN NO.	BIT PATTERN	ALLOCATION
1	[001000	CENTRAL CONTROL
2	[002000	CENTRAL CONTROL
3	[003000	VACUUM
4	[004000	BEAM INSTRUMENTATION
5	[005000	MTS & TIMING
6	[006000	COMPUTER SERVICES
7	[007000	PARAMETERS
8	[010000	RADIATION
9	[011000	POWER SUPPLIES
10	[012000	ALARM SYSTEM
11	[013000	RING MONITORS
12	[014000	PERSONNEL ACCESS
13	[015000	KICKERS
14	[016000	RADIO FREQUENCY
15	[017000	MPX SERVICES
16	[020000	SERVICE COMPUTER
17	[021000	EXPERIMENTAL AREAS
18	[022000	CAMAC SERVICES
19	[023000	DUMPS & COLLIMETERS
20	[024000	GENERAL SERVICES
21	[025000	EXTRACTION
22	[027000	BEAMLINES
23	[027000	PUBLIC ADDRESS. TV
24	[030000	COMPUTER SYSTEM
25	[031000	CONTROL SYSTEM
26	[032000	WATER
27	[033000	OPERATIONS
28	[034000	BEAM TRANSFER. TARGETS
29	[035000	CPS
30	[036000	WEST EXPERIMENTAL AREA
.	...	.....
.	...	.....
41	[051000	WEST EXPERIMENTAL AREA

2.1 LCAP LIST OF CAPABILITY BIT ASSIGNMENTS.

BIT NO.	CAPABILITY AREA
0	OPERATIONS
1	NOT ASSIGNED
2	NOT ASSIGNED
3	NOT ASSIGNED
4	SYSTEM SOFTWARE
5	SPS CAPABILITY
6	ACCESS SYSTEM
7	BEAM MONITORING EQUIPMENT
8	GENERAL SERVICES
9	BEAM TRANSFER
10	RADIATION
11	VACUUM
12	RADIO FREQUENCY
13	MACHINE TIMING AND CORRECTION ELEMENTS
14	MACHINE CYCLE & PRIMARY OPERATIONS
15	EXPERIMENTAL AREAS

3.1 LERR LIST OF STANDARD DATA MODULE ERROR CODES.

EQ.ERR	OCTAL VALUE	DEC VALUE	DESCRIPTION
1	[100	64	SOFTWARE TIME-OUT 1
2	[101	65	SOFTWARE TIME-OUT 2
3	[102	66	INTERLOCK ERROR 1
4	[103	67	INTERLOCK ERROR 2
5	[104	68	DATA ERROR 1
6	[105	69	DATA ERROR 2
7	[106	70	DATA ERROR 3
8	[107	71	STATUS ERROR 1
9	[110	72	STATUS ERROR 2
10	[111	73	STATUS ERROR 3
11	[112	74	SETTING ERROR 1
12	[113	75	SETTING ERROR 2
13	[114	76	SETTING ERROR 3
14	[115	77	INTERRUPT ERROR 1
15	[116	78	INTERRUPT ERROR 2
16	[117	79	HARDWARE ADDRESSING ERROR
17	[120	80	INCORRECT PROPERTY SECTION NO.
18	[121	81	INCORRECT GLOBAL CAPABILITY
19	[122	82	INCORRECT GLOBAL SECTION
20	[123	83	ILLEGAL PROTECTION CODE
21	[124	84	DT CAPABILITY BIT OUT-OF-RANGE
22	[125	85	INCORRECT UNIT SPECIFIC CAPABILITY
23	[126	86	INCORRECT UNIT SPECIFIC SECTION
24	[127	87	INCORRECT UNIT PROTECTION (P-CODE 6)
25	[130	88	HARDWARE FAULT
26	[131	89	EQUIPMENT FAULT
27	[132	90	EQUIPMENT IN USE
30	[133	91	EQUIPMENT NOT READY
29	[134	92	MANUAL CONTROL
30	[135	93	POWER OFF
31	[136	94	SPECIFIED RANGE EXCEEDED
32	[137	95	ANALOGUE MEASUREMANT ERROR
33	[140	96	OVERLOAD
34	[141	97	NO ARRAY HANDLING FACILITIES
35	[142	98	EQUIPMENT NUMBER IN RESERVE

36	[143	99	EQUIPMENT NO. IN RESERVE
37	[144	100	MPXI EQUIPMENT ERROR
38	[145	101	MPXI EQUIPMENT ERROR
39	[146	102	MPXI EQUIPMENT ERROR
40	[147	103	MPXI EQUIPMENT ERROR

4.1 BTV

BEAM TELEVISION CONTROL DATA MODULE.

SET BTV(UNIT,#PROPERTY)=Z; SET Z=BTV(UNIT,#PROPERTY)
PROPERTIES:
  #INC(DEFAULT) #CON #SBT #PWS #STA #SDE #SAC
  #ADR #PSN #PWR #LMP #INL #PAN #TIL #ZOM #FCS
THIS DM CONTROLS:
  1)THE POWER OF THE TV MONITOR.
  2)THE ILLUMINATION & POSITIONING OF THE SCREEN.
HARDWARE USED:
  1)ONE MPX K-MODULE DRIVES ONE BTV.
PROTECTION:
  1)GLOBAL SECTION: [12000 I.E. 10
  2)GLOBAL CAPABILITY: [200 I.E. BIT 7
INITIALISATION:
  USE #INL, THEN USE #PSN UNTIL SOFTWARE POSITION COUNTER
  IS SETUP.
SPECIAL ERRORS:
  1)EQUIPMENT ERROR 1, SOFTWARE TIME OUT 1, SERIAL
    TRANSMISSION INCOMPLETE.
  2)EQUIPMENT ERROR 8, STATUS ERROR 1, NULL POSITION STATUS
    BITS OUT OF RANGE.
  3)EQUIPMENT ERROR 9, STATUS ERROR 2, NULL POSITION OUT
    OF THE BEAM BUT SCREEN POSITION COUNTER=1.
  4)EQUIPMENT ERROR 27, EQUIPMENT IN USE, I.E. ACQU. WHILE
    SCREEN IS STILL MOVING.
DM TYPE NUMBER=2.

4.2 EABTV

EA BEAM TELEVISION CONTROL.

GP61 CONTAINS BOTH BTV & EABTV NAMES, EQUIPMENTS UNDER EABTV
ARE PROTECTED UNDER 'EA'.
PROTECTION:
  1)SECTION: [21000 I.E. 17
  2)CAPABILITY: [100000 I.E. 15

5.1 DOOR

CONTROLS THE ACCESS CARD/DOSIMETER DOOR EQUIPMENT.

```
SET DOOR(UNIT,#PROPERTY)=Z; SET Z=DOOR(UNIT,#PROPERTY)
PROPERTIES:
  #CON #SBT #PWS #STA #ST1 #ST2 #AD1 #AD2 #AD3 #AD4
  #RD1 #RD2 #KCT #STK #IDN #IN1 #IN2 #DOS #CD1 #CD2
  #RIN #OVF #SUS #SH1 #SH2 #SH3 #SH4 #SH5
THIS DM CONTROLS:
  1)THE ACCESS CARD/KEY SYSTEM OF THE DOOR.
  2)THE RADIATION DOSIMETERS OF THE DOOR.
HARDWARE USED:
  1)3 MPX MD1-MODULES FOR THE ACCESS KEYS.
  2)1 MPX D-MODULE FOR THE DOSIMETERS.
PROTECTION:
  1)GLOBAL SECTION: [14000 I.E. 12
  2)GLOBAL CAPABILITY: [100  I.E. BIT 6
SPECIAL ERRORS:
  1)EQUIPMENT ERROR 1, SOFTWARE TIME-OUT 1
    FOR DOSIMETER SECOND READ.
  2)EQUIPMENT ERROR 16, HARDWARE ADDRESSING ERROR,
    MPX ADDRESS OF ZERO.
DM TYPE NUMBER=4
```

6.1 PADR PUBLIC ADDRESS CONTROLLER.

```
SET PADR(#PROPERTY)=Z: SET Z=PADR(#PROPERTY)
PROPERTIES:
   #CON, #PWS, #SBT, #STA, #MES, #ZON
   #AD1, #AD2, #AD3, #AD4, #AD5, #AD6
THIS EF CONTROLS THE PUBLIC ADDRESS SYSTEM. IT OPERATES
FROM THE MAIN CONTROL ROOM. IT ALLOWS SELECTION OF ONE OF
63 MESSAGES TO BE BROADCASTED TO ONE OF 80 SPS GEOGRAPHICAL
ZONES.
HARDWARE USED:
  1)SIX MPX C-MODULES.
PROTECTION:
  1)GLOBAL SECTION: [27000 I.E. 23
  2)GLOBAL CAPABILITY: [40 I.E. BIT 5
SPECIAL ERRORS:
  1)EQUIPMENT ERROR 16, HARDWARE ADDRESSING ERROR. MPX
    ADDRESS=0.
  2)EQUIPMENT ERROR 27, EQUIPMENT IN USE. SELECTIVE STATUS
    OF A C-MODULE=0.
  3)EQUIPMENT ERROR 1, SOFTWARE TIME-OUT FOR EQUIPMENT
                       ACCEPTING DATA.
EF TYPE NUMBER=101 DEC.
```

7.1 WSW VIDEO/WAVEFORM SWITCH CONTROL DATA MODULE.

SET WSW(UNIT,#PROPERTY)=Z: SET Z=WSW(UNIT,#PROPERTY)
PROPERTIES:
#SWI(DEFAULT) #CRA #MOD #TYP #ADR
#SBT #PWS #STA
THIS DM CONTROLS:
1)THE SWITCHING OF THE WAVEFORM SIGNALS IN THE BA'S.
2)THE SWITCHING OF THE VIDEO SIGNALS IN THE BA'S.
HARDWARE USED:
1)ONE MPX C-MODULE DRIVES ONE SWITCH CRATE. THE SWITCH CRATE CAN HOLD UP TO 21 SWITCH MODULES.
INITIALISATION:
THE DM HAS NO #CON PROPERTY, BUT TO GAIN SOFTWARE ACCESS TO THE DM, THE SWITCH CRATE VALUE HAS TO BE NONE ZERO. THIS IS CONTROLLED BY THE #CRA PROPERTY. THE VALUE OF #CRA IS ALSO USED AS A POINTER TO THE MPX ADDRESSES WHICH ARE STORED AT THE END OF THE DT.
PROTECTION:
1)GLOBAL SECTION: [27000 I.E. 23 DEC.
2)GLOBAL CAPABILITY: [40 I.E. BIT 5.A
FOR ALL COMPUTERS MENTIONED EXCEPT "RF WHICH HAS:
GLOBAL SECTION: [16 I.E. 14 DEC.
SPECIAL ERRORS:
1)THE GLOBL NAME WSW IS USED TO BACKUP THE DT. THIS INCLUDES THE C-MODULE ADD'S. FOLLOWING THE STANDARD DT. A CHECK IS MADE SO THAT THIS PART OF THE DT IS NOT ACCESSED WITH A NORMAL DM STATEMENT. IF IT IS, "ILLEGAL EQUIPMENT NO." IS RETURNED.
2)EQUIPMENT ERROR 1, SOFTWARE TIME-OUT 1, THE C-MODULE HANDSHAKE=0 WHILE TRYING TO CHANGE A SWITCH STATE. THE HANDSHAKE IS NORMALLY 1 & IS SET TO 0 WHEN DATA IS SENT TO THE C-MOD.. THE SWITCH INTERFACE RE-SETS IT TO 1 WHEN IT ACCEPTS THE DATA.
3)EQUIPMENT ERROR 2, SOFTWARE TIME-OUT 2, HANDSHAKE=0 WHILE TRYING TO RE-SET THE SECOND HALF OF A TYPE 2/3 SWITCH.
4)EQUIPMENT ERROR 11, SETTING ERROR 1, ERROR IN CALCULATING CRATE/MODULE NUMBER.
5)EQUIPMENT ERROR 16, HARDWARE ADDRESSING ERROR, MPX ADDRESS=0.
6)EQUIPMENT ERROR 25, HARDWARE FAULT, CAMPX ERROR RETURN WHEN RE-SETTING SECOND HALF OF A TYPE 2/3 SWITCH.
DM TYPE NUMBER=1.

8.1 SWITCH VIDEO/WAVEFORM SWITCH CONTROL DATA MODULE.

SET SWITCH(UNIT,#PROPERTY)=Z: SET Z=SWITCH(UNIT,#PROPERTY)
PROPERTIES:
#SWI(DEFAULT) #CRA #MOD #TYP #ADR
#SBT #PWS #STA
THIS DM CONTROLS:
1)THE SWITCHING OF THE WAVEFORM SIGNALS IN BC.
2)THE SWITCHING OF THE VIDEO SIGNALS IN BC.
3)THE NAME 'SWITCH' IS THE GENERIC NAME & IS NORMALLY USED FOR DT BACKUP ONLY. NAMES 'WSW' 'VSW' & 'EASW' ARE USED FOR CONTROL.
HARDWARE USED:
1)ONE MPX C-MODULE DRIVES ONE SWITCH CRATE. THE SWITCH CRATE CAN HOLD UP TO 21 SWITCH MODULES.
INITIALISATION:
THE DM HAS NO #CON PROPERTY, BUT TO GAIN SOFTWARE ACCESS TO THE DM, THE SWITCH CRATE VALUE HAS TO BE NONE ZERO. THIS IS CONTROLLED BY THE #CRA PROPERTY. THE VALUE OF #CRA IS ALSO USED AS A POINTER TO THE MPX ADDRESSES WHICH ARE STORED AT THE END OF THE DT.
PROTECTION:
1)GLOBAL SECTION: [1000 I.E. 1
2)GLOBAL CAPABILITY [40 I.E. BIT 5
SPECIAL ERRORS:
1)THE GLOBL NAME SWITCH IS USED TO BACKUP THE DT. THIS INCLUDES THE C-MODULE ADD'S. FOLLOWING THE STANDARD DT. A CHECK IS MADE SO THAT THIS PART OF THE DT IS NOT ACCESSED WITH A NORMAL DM STATEMENT. IF IT IS, "ILLEGAL EQUIPMENT NO." IS RETURNED.
2)EQUIPMENT ERROR 1, SOFTWARE TIME-OUT 1, THE C-MODULE HANDSHAKE=0 WHILE TRYING TO CHANGE A SWITCH STATE. THE HANDSHAKE IS NORMALLY 1 & IS SET TO 0 WHEN DATA IS SENT TO THE C-MOD.. THE SWITCH INTERFACE RE-SETS IT TO 1 WHEN IT ACCEPTS THE DATA.
3)EQUIPMENT ERROR 2, SOFTWARE TIME-OUT 2, HANDSHAKE=0 WHILE TRYING TO RE-SET THE SECOND HALF OF A TYPE 2/3 SWITCH.
4)EQUIPMENT ERROR 11, SETTING ERROR 1, ERROR IN CALCULATING CRATE/MODULE NUMBER.
5)EQUIPMENT ERROR 16, HARDWARE ADDRESSING ERROR, MPX ADDRESS=0.
6)EQUIPMENT ERROR 25, HARDWARE FAULT, CAMPX ERROR RETURN WHEN RE-SETTING SECOND HALF OF A TYPE 2/3 SWITCH.
DM TYPE NO.=0

8.2 WSW WAVEFORM SIGNAL SWITCH CONTROL NAME.

8.3 VSW VIDEO SIGNAL SWITCH CONTROL NAME.

8.4 EASW CONTROL OF THE SWITCHES ASSOCIATED WITH GROUP EA.

9.1 CLINT CORRECTION LENS INTERLOCK EQUIPMENT FUNCTION.

SET CLINT(#PROPERTY)=Z: SET Z=CLINT(#PROPERTY)
PROPERTIES:
#ADR, #STH, #ANA, #RS1, #RS2, #RS3, #RS4
THIS EF CONTROLS THE INTERLOCKS ON THE COOLING OF THE
CORRECTION LENSES. #STH RETURNS THE HARDWARE INTERLOCK STATUS.
#RS1-2 RESETS THE INTERLOCKS. #RS3 ALLOWS SELECTION OF A
SECOND TEMPERATURE FOR A PERIOD OF 500MS. USING #ANA.
#ANA READS THE TEMPERATURE IN VOLTS. 1V=100 DEGREES C.
HARDWARE USED:
1)ONE MPX BI-MODULE.
PROTECTION:
1)GLOBAL SECTION: [3000 I.E. 3
2)GLOBAL CAPABILITY: [4000 I.E BIT 11
SPECIAL ERRORS:
1)EQUIPMENT ERROR 16, HARDWARE ADDRESSING ERROR. MPX
ADDRESS=0.
2)EQUIPMENT ERROR 32, ANALOGUE MEASUREMENT ERROR.
EITHER THE VOLTAGE IS NEGATIVE OR IT IS>5 VOLTS.
EF TYPE NUMBER=115 DEC.

10.1 SUBTIM SUBLIMATION PUMP TIMING INTERVAL EQUIPMENT FUNCTION

SE SUBTIM(#PROPERTY)=Z ; SE Z=SUBTIM(#PROPERTY)
PROPERTIES :
#ADR #CON #PWS #STT #STK #TM0 #TM1 #TM2 #OFF #BSY #RST
THIS EF CONTROLS THE TIMING INTERVALS FOR SUBLIMATION PUMP OPERATION
#STT RETURNS DATA TABLE STATUS WORD
#STK RETURNS TIMING UNIT STATUS : 1=LOCAL , 0=REMOTE , DEFAULT
#TM0 SETS AND READS A VALUE REPRESENTING THE REQUIRED
TIMING INTERVALS AND HAS THE FORMAT XXYY , WHERE
YY = SUBLIMATION ON-TIME , RANGE 0-99 SECONDS
XX = INTERVAL BETWEEN ON-TIMES (I.E. OFF-TIME)
RANGE 0-99 MINUTES
A TIME OTHER THAN ZERO SWITCHES PUMP ON
A TIME OF ZERO SWITCHES PUMP OFF
#TM1 READS ACTUAL RUNNING TIME , I.E. WHERE IN TIMING CYCLE
ONE IS . IT HAS THE SAME FORMAT AS #TM0
#TM2 RETURNS TIME VALUE LAST LOADED BY COMPUTER - WORD
THREE IN DATA TABLE
#OFF STOPS TIMING CYCLE AND SWITCHES OFF PUMP - LOADS TIMER
WITH THE VALUE 0000 , Z=0
#BSY READS BUSY BIT - INDICATES THAT AN ORDER TO LOAD HAS
BEEN GIVEN BUT NOT TERMINATED
#RST RESETS BUSY BIT IN STATUS WORD AND COUNTER IN
TIMER - USED TO RECOVER FROM ERROR INDICATED BY #BSY

HARDWARE USED :
1) ONE MPX MD MODULE
PROTECTION :
1) GLOBAL SECTION : [3000 I.E. 3
2) GLOBAL CAPABILTY : [4000 I.E. BIT 11
SPECIAL ERRORS :
1) EQUIPMENT ERROR 16 : HARDWARE ADDRESSING ERROR
MPX ADDRESS=0
2) EQUIPMENT ERROR 11 : SETTING ERROR - WRONG VALUE FOR
#OFF PROPERTY
3) EQUIPMENT ERROR 25 : HARDWARE ERROR - LAST COMMAND NOT
TERMINATED - BUSY BIT SET

11.1 VGPO VACUUM GAUGE SYSTEM

```
SET VGPO(UNIT,#PROPERTY)=Z; SET Z=VGPO(UNIT,#PROPERTY)
PROPERTIES:
  SECTION MATCH
  #CON, #PWS, #PNB, #ST1, #ADR, #PDT, #CAL
  UNPROTECTED
  #ERB, #STA, #STX, #PLG, #RD1, #RD2, #TS1, #TS2
```

12.1 VINT VACUUM INTERLOCK CONTROL

```
SET VINT(UNIT,#PROPERTY)=Z; SET Z=VINT(UNIT,#PROPERTY)
PROPERTIES:
 CAPABILITY MATCH
 #ERB, #ENB, #MOD, #REL, #RST, #ARM
 SECTION MATCH
 #CON, #SBT, #PWS, #ST1, #ST2, #AD1, #AD2
 NO MATCH
 #SVC, #STA
```

13.1 VPRO VACUUM ROUGHING PUMPS AND VALVES

THIS DMS CONTROLS AND GIVES STATUS INFORMATION ON
THE VACUUM ROUGHING PUMPS, ROUGHING VALVES AND
SECTOR VALVES.

```
SET VPRO(UNIT,#PROPERTY)=Z; SE Z=VPRO(UNIT,#PROPERTY)
PROPERTIES:
CAPABILITY MATCH
  #ERB  SET OR READ ERROR BIT
  #VV5  OPEN OR CLOSE VALVE 5, READ SUMMARY STATUS
  #VV6  OPEN OR CLOSE VALVE 6
  #VV7  OPEN OR CLOSE VALVE 7
  #PMP  SWITCH ON OR OFF PUMP, READ SUMMARY STATUS
SECTION MATCH
  #CON  SET OR READ SOFTWARE CONNECT
  #SBT  SET OR READ SERVICE BIT
  #PWS  SET OR READ PASSWORD SWITCH
  #ST1  SET OR READ DATA TABLE ACTUAL STATUS WORD
  #ST2  SET OR READ DATA TABLE DESIRED STATUS WORD
  #ADR  SET OR READ MPX ADDRESS WORD
  #TYP  SET OR READ STATION TYPE BITS DEMANDED STATUS WORD
NO PROTECTION
  #SDE  READ DATA TABLE DESIRED STATUS WORD
  #SAC  READ DATA TABLE ACTUAL STATUS WORD
  #STA  READ ACTUAL STATUS WORD VIA MPX

HARDWARE USED
  1) ONE MPX BR MODULE
PROTECTION
  1) GLOBAL SECTION : [3000 I.E. 3
  2) GLOBAL CAPABILITY : [4000 I.E. BIT 11
SPECIAL ERRORS
  1) EQUIPMENT ERROR 5  - DATA ERROR
                          TYPE HAS NO SUCH VALVE
  2) EQUIPMENT ERROR 6  - DATA ERROR
                          INCORRECT COMMAND
  3) EQUIPMENT ERROR 11 - SETTING ERROR
                          SAFE BIT NOT SET
  4) EQUIPMENT ERROR 28 - EQUIPMENT NOT READY
                          SEVICE BIT=0
  5) EQUIPMENT ERROR 29 - MANUAL CONTROL
                          ONLY STATUS READING POSSIBLE.
```

SUPPORTED BY

14.1 VPSP VACUUM SPUTTER ION PUMPS

THIS DMS CONTROLS AND GIVES STATUS AND PRESSURE
ACQUISITION FOR VACUUM SPUTTER ION PUMP POWER SUPPLIES

SET VPSP(UNIT,#PROPERTY)=Z; SE Z=VPSP(UNIT,#PROPERTY)
PROPERTIES:
CAPABILITY PROTECTED
  #SWI SWITCHES ON(Z=1) OR OFF(Z=0) POWER SUPPLY
  #VLT CHANGES HIGH VOLTAGE OUTPUT ON 400L/S POWER SUPPLIES
SECTION PROTECTED
  #CON SET OR READ SOFTWARE CONNECT
  #SBT SET OR READ SERVICE BIT
  #PWS SET OR READ PASSWORD SWITCH
  #SIZ SET OR READ POWER SUPPLY TYPE: 0=25L/S. 1=400L/S
  #ST1 SET OR READ DATA TABLE STATUS WORD
  #ADR SET OR READ MPX ADDRESS WORD
  #PDT SET OR READ DATA TABLE PRESSURE WORD
  #CAL SET OR READ CALIBRATION GROUP
NO PROTECTION
  #ERB SET OR READ ERROR BIT
  #STA READ POWER SUPPLY STATUS VIA MPX
  #PLG READ LOG OF PRESSURE VIA MPX
  #RD1 READ LOG OF PRESSURE VIA MPX
  #RD2 READ LOG OF PRESSURE FROM DATA-TABLE
  #TS1 READ DIGITAL WORD OF MPX MODULE
  #TS2 READ ANALOG VALUE WITH ADC 5V RANGE
  #TS3 READ ANALOG VALUE WITH ADC 10V RANGE

HARDWARE USED
  1) ONE MPX BI MODULE
PROTECTION
  1) GLOBAL SECTION : [3000 I.E. 3
  2) GLOBAL CAPABILITY : [4000 I.E. BIT 11
SPECIAL ERRORS
  1) EQUIPMENT ERROR 5 - DATA ERROR
                          CALIBRATION GROUP VALUE(0-3)
                          OUT OF RANGE.
  2) EQUIPMENT ERROR 6 - DATA ERROR
                          COMMAND VALUE (0-1) OUT OF RANGE.
  3) EQUIPMENT ERROR 28 - EQUIPMENT NOT READY
                          SERVICE BIT=0.
  4) EQUIPMENT ERROR 29 - MANUAL CONTROL

ONLY STATUS AND PRESSURE
READING POSSIBLE.

5) EQUIPMENT ERROR 32 - ANALOG MEASUREMENT ERROR
OVERFLOW

15.1 PAB RADIATION SITE MONITOR STATUS ACQUISITION.

```
  SET PAB(#PROPERTY)=Z; SET Z=PAB(#PROPERTY)
PROPERTIES:
  #CON #GRP #PWS #SBT #STA #ADR #SAC #RST #SSL
  #STH #TST
THIS EF READS A 16 BIT STATUS WORD ASSOCIATED WITH
THE SITE MONITORS. WHEN THE STATUS IS READ THE VALUE IS
RETURNED AS THE VALUE. STORED IN THE DT & THE SELECTIVE
STATUS BIT RESET. THE DT STATUS VALUE CAN BE ACCESSED
INDEPENDENTLY. WHEN A CHANGE OCCURS IN THE STATUS WORD
A SELECTIVE STATUS BIT IS ACTIVATED. THIS STATUS BIT IS
SCANNED BY FASP & WHEN ACTIVE CAUSES A NODAL PROGRAM TO RUN.
A DIGITAL CONTROL COMMAND CAN BE USED TO RESET THE
SELECTIVE STATUS BIT.
HARDWARE USED:
  1)ONE MPX BI MODULE PER EQUIPMENT GROUP.
PROTECTION:
  1)GLOBAL SECTION: [10000 I.E. 8
  2)GLOBAL CAPABILITY: 2000 I.E. BIT 10
SPECIAL ERRORS:
  1)EQUIPMENT ERROR 16, HARDWARE ADDRESSING ERROR.
    MPX ADDRESS OF ZERO.
EF TYPE NUMBER=162.
```

16.1 PAT RADIATION TUNNEL ALARM MONITOR CONTROLLER.

SET PAT(UNIT,#PROPERTY)=Z: SET Z=PAT(UNIT,#PROPERTY)
PROPERTIES:
#REA(DEFAULT) #CON #SBT #PWS #STA #AD1 #AD2 #AD3
#RST #RRE #SSL #SS1 #SAC #ANA #FUN #PSN #TST
THIS DM CONTROLS:
THE STATUS & READING OF THE PAT RADIATION MONITORS.
SELECTIVE STATUS BITS ASSOCIATED WITH THE MONITORS ARE
SCANNED BY FASP & WHEN ACTIVE A NODAL PROGRAM IN THAT
COMPUTER IS CALLED. THIS PROGRAM ACCESSES THE DM & DECIDES
WHAT ACTION TO TAKE:
1)SEND AN ALARM TO THE ALARM COMPUTER.
2)ALERT THE RADIATION PERSONNEL USING EQUIPMENT FUNCTION
PAB.
THE DM IS ALSO USED TO READ DIRECTLY THE STATUS OF ANY
PAT MONITOR.
HARDWARE USED:
1)ONE MPX BI-MODULE IS USED BY 4 EQUIPMENTS. EACH
EQUIPMENT USES 4 BITS OF THE 16 BIT I/P WORD. THE
SELECTIVE STATUS BIT CAN BE READ. A SINGLE PULSE COMMAND
IS USED TO RESET THE SELECTIVE STATUS BIT.
2)ONE MPX E-MODULE IS USED BY 16 EQUIPMENTS.
3)THOSE DM CONTAINING SPECIAL PROPERTIES USE ONE MPX
MD1-MODULE FOR 16 EQUIPMENTS. THE 16 BIT I/P & O/P WORDS
ARE USED AS WELL AS THE SELECTIVE STATUS BIT.
PROTECTION:
1)GLOBAL SECTION: [10000 I.E. 8
2)GLOBAL CAPABILITY [2000 I.E. BIT 10
SPECIAL ERRORS:
1)EQUIPMENT ERROR 11, SETTING ERROR 1, MPX FUNCTION FOR
ANALOGUE ACQUISITION=0, #FUN.
2)EQUIPMENT ERROR 16, HARDWARE ADDRESSING ERROR, MPX
ADDRESS OF ZERO.
3)EQUIPMENT ERROR 32, ANALOGUE MEASUREMENT ERROR,
ANALOGUE OVERFLOW OR VALUE IS NEGATIVE.
DM TYPE NO.=43

17.1 PMG THE DM CONTROLS THE SITE ENVIRONMENTAL MONITORS.

SET PMG(UNIT,#PROPERTY)=Z: SET Z=PMG(UNIT,#PROPERTY)
PROPERTIES:
#REA(DEFAULT) #CON #SBT #PWS #STA #ADR #RST #PSC
#LIM #RRE #RIN #TM1 #TM2 #CNT #ACC #NAC #SSL
THE EQUIPMENT IS DEFINED AS A RADIATION SITE MONITOR.
SELECTIVE STATUS BITS ARE TRIGGERED FOR: END OF COUNT,
PRE-SET COUNT EXCEEDED OR COUNT OVERFLOW. THESE IN TURN TRIGGER
A NODAL PROGRAM VIA FASP. THE NODAL PROGRAM ACCESSES THE DM TO
FIND WHICH EQUIPMENT NEEDS ATTENTION. IT READS THE HARDWARE
& PLACES THE DATA IN THE DT. A LOGGING PROGRAM ACCESSES THE
DATA FOR FUTURE ANALYSIS.
HARDWARE USED:
1)ONE MPX D MODULE SERVES 8 EQUIPMENTS, 8 SCALERS.
PROTECTION:
1)GLOBAL SETION: [10000 I.E. 8
2)GLOBAL CAPABILITY [2000 I.E. BIT 10
INITIALISATION:
1)THE READ REFERENCE MUST BE SET, #RRE
2)THE PHASING OF THE READ, #REA MAY BE WRONG TO START.
3)ONCE THE DT HAS BEEN SET-UP BOTH 1 & 2 SHOULD BE CORRECT.
SPECIAL ERRORS:
1)EQUIPMENT ERROR 1, SOFTWARE TIME-OUT 1, EXTENDED STATUS
OF THE D MODULE=1, NO DATA PRESENT FROM EQUIPMENT.
2)EQUIPMENT ERROR 5, DATA ERROR 1, BITS 10 & 11 SET IN
DATA WORD IN PHASE ERROR ROUTINE.
3)EQUIPMENT ERROR 6, DATA ERROR 2, OVERFLOW B SET BUT
NO OVERFLOW DETECTED.
4)EQUIPMENT ERROR 7, DATA ERROR 3, PRESET COUNT C SET
BUT NOT DETECTED.
5)EQUIPMENT ERROR 8, STATUS ERROR 1, OTHER THAN 1 STATUS
BIT SET IN THE STATUS WORD.
6)EQUIPMENT ERROR 9, STATUS ERROR 2, NO STATUS BIT SET
IN THE DATA.
7)EQUIPMENT ERROR 10, STATUS ERROR 3, 10 READS MADE IN
THE PHASE ERROR ROUTINE.
DM TYPE NUMBER=42.

18.1 PRD RADIATION DISPLAY CONTROLLER.

```
SET PRD(#PROPERTY)=Z: SET Z=PRD(#PROPERTY)
PROPERTIES:
  #CON #PWS #SBT #STA #ADR #WRT #ST1
THIS EF CONTROLS THE O/P (#WRT) TO THE RADIATION ALARM SCREEN
SITUATED IN THE RADIATION ROOM IN BA3. IT ALSO ALLOWS THE
HANDSHAKE OF THIS WRITE COMMAND TO BE READ (#ST1).
HARDWARE USED:
  1)ONE MPX C-MODULE.
PROTECTION:
 1)GLOBAL SECTION: [10000 I.E. 8
 2)GLOBAL CAPABILITY: [2000 I.E. BIT 10
SPECIAL ERRORS:
  EQUIPMENT ERROR 16. HARDWARE ADDRESSING ERROR. MPX
  ADDRESS=0.
EF TYPE NUMBER=161 DEC.
```

19.1 RAD RADIATION DIGITAL DATA LOGGER CONTROLLER.

SET RAD(UNIT,#PROPERTY)=Z: SET Z=RAD(UNIT,#PROPERTY)
PROPERTIES:
#DOR(DEFAULT) #CON #SBT #PWS #STA #ADR #PCT #CNT
#RST #SSL #AL0 #AL1 #LV0 #LV1 #TIP #TIM #CAL #QF
#STE #STM #STZ #SYS #SAL
THIS DM CONTROLS:
THE READING OF THE RADIATION MONITORS AND STATUS SIGNALS
WHICH ARE CONNECTED TO A MICROPROCESSOR-CONTROLLED
DIGITAL DATA LOGGER (DDL).
A SELECTIVE STATUS BIT ASSOCIATED WITH THE STATUS IS
SCANNED BY FASP & WHEN ACTIVE, A NODAL PROGRAM IN THAT
COMPUTER IS CALLED. THIS PROGRAM ACCESSES THE DM & DECIDES
WHAT ACTION TO TAKE:
1) SEND AN ALARM TO THE ALARM COMPUTER.
2) ALERT THE RADIATION PERSONNEL USING EQUIPMENT FUNCTION
PRD.
HARDWARE USED:
ONE MPX MD-MODULE IS USED BY EACH DATA LOGGER WHICH
CONTROLS UP TO 16 MONITORS.
THE DM USES THE OUTPUT WORD TO SEND A COMMAND TO THE
MICROPROCESSOR AND READS THE REPLY VIA THE INPUT WORD.
PROTECTION:
1) GLOBAL SECTION: [10000 I.E. 8
2) GLOBAL CAPABILITY [2000 I.E. BIT 10
SPECIAL ERRORS:
1) EQUIPMENT ERROR 1.
SOFTWARE TIME-OUT. DDL DID NOT RESPOND WITHIN
THE REQUIRED 16 MSEC.
2) EQUIPMENT ERROR 5.
DATA ERROR 1. DDL ERROR BIT WAS SET IN THE WORD
WORD READ FROM THE DDL.
3) EQUIPMENT ERROR 6.
DATA ERROR 2. PHASE ERROR IN READ. DURING A READ
OF A DOUBLE DATA WORD (OVERFLOW OF FIRST WORD)
EITHER THE FIRST WORD HAD BIT 15 = 1
OR THE SECOND WORD HAD BIT 15 = 0. THE INVERSE
SHOULD HAVE BEEN TRUE.
4) EQUIPMENT ERROR 8.
STATUS ERROR 1. DDL NOT RESET. THE DDL DID NOT RETURN
THE CORRECT RESPONSE TO A RESET COMMAND.
5) EQUIPMENT ERROR 9.
STATUS ERROR 2. DDL NOT RESET. RESET INHIBITED.
#CLR MUST BE DONE TO RE-ENABLE THE #RST. THIS IS
PROBABLY DUE TO A FAULT IN SAVING DATA AFTER THE

LAST #RST. CHECK DATA BEFORE NEXT #RST.

6) EQUIPMENT ERROR 16.
LAST #RST. CHECK DATA BEFORE NEXT #RST.

6) EQUIPMENT ERROR 16.
HARDWARE ADDRESSING ERROR. MPX ADDRESS WAS SET TO ZERO.

7) EQUIPMENT ERROR 28.
EQUIPMENT NOT READY. A DEAC WAS ALREADY PRESENT BEFORE WRITING A COMMAND TO THE DDL. A #REA MUST BE DONE BEFORE ANY FURTHER COMMAND IS ACCEPTED.

DM TYPE NO.=49

20.1 MPXCAM GENERAL MPX/CAMAC DM TO ACCESS MPX/CAMAC MODULES.

```
SET MPXCAM(UNIT,#PROPERTY)=Z; SET Z=MPXCAM(UNIT,#PROPERTY)
PROPERTIES:
  #ADR #PWS #STA #TYP #MCC #MCN #MSN #MPN #MSA #MFN #A00-#A15
  #SCL #S00-#S15 #HS0-#HS7 #P00-#P15 #DR0-#DR7 #DW0-#DW7
THIS DM CONTROLS:
  1)MPX:
    A)THE EQUIPMENT IS DEFINED AS AN MPX MODULE.
    B)THE PROPERTY #TYP DEFINES THE EQUIPMENT AS MPX-VALUE=0
      OR CAMAC-VALUE=1.
    C)FOR MPX THE DETAILS OF THE ADDRESS CAN BE READ OR SET.
    D)ALL POSSIBLE FUNCTIONS CAN BE CONTROLLED. NOT ALL
      OF WHICH WILL BE VALID FOR EVERY MPX MODULE.
  2)CAMAC:
    NOTHING WRITTEN TO-DATE.
HARDWARE USED:
  1)ONE MPX-MODULE PER EQUIPMENT.
PROTECTION:
  1)GLOBAL SECTION: [1000 I.E. NAME MPXFSP
    GLOBAL SECTION: [17000 I.E. NAME MPXTST
    GLOBAL SECTION: [22000 I.I. NAME CAMTST
  2)GLOBAL CAPABILITY 0
SPECIAL ERRORS:
  1)EQUIPMENT ERROR 16. HARDWARE ADDRESSING ERROR. MPX
    ADDRESS OF ZERO.
  2)EQUIPMENT ERROR 32. ANALOGUE MEASUREMENT ERROR.
    ANALOGUE OVERFLOW OR VALUE IS NEGATIVE.
DM TYPE NO.=5
```

21.1 MTG MASTER TIMING GENERATOR

```
SET MTG(#PROPERTY)=Z:  SET Z=MTG(#PROPERTY)
MTG(ARRAY-NAME,"R/W",1,#ARRAY-PROPERTY)
UNRESTRICTED PROPERTIES:
    #STA,  #STT,  #ST0-7,  #ENB,  #MDE,  #AD1-6
    #DU1,  #DU2,  "AR1,  #AR2
PROPERTIES PROTECTED BY SECTION MATCH
    #CON,  #PWS,  #SBT
PROTECTION:
    1) GLOBAL SECTION:  [24000  I.E. 20
    2) GLOBAL CAPABILITY [400   I.E.  BIT 8
#AR1 AND #AR2 ARE PROPERTIES WITH ARRAY HANDLING.

STANDARD ERROR MESSAGES.
USES CAMAC UNIVERSAL I/O REGISTER.
NO SPECIAL PRECAUTIONS FOLLOWING RELOAD.

REF: THE MASTER TIMING GENERATOR - G. BEETHAM
```

22.1 TDAM TIMING DATA MODULE

SET TDAM(UNIT-NO.,#PROPERTY)=Z; SET Z=TDAM(UNIT-NO.,#PROPERTY)
PROPERTIES:
#ENB. #CON. #EVN. #DL1: #D2: #EVC: #ADR: #MDE; #RST
#INC; #TD1: #TD2: #TEC: #STA: #RES; #REL
NO PROTECTION ON ANY OF THE ABOVE PROPERTIES EXCEPT STANDARD
CONNECT PROCEDURE MUST BE USED.
STANDARD ERROR MESSAGES.
REF: THE GENERAL TIMING DATA MODULE -G. BEETHAM
LAB II-CO/CC/INT. NOTE/GB/75-12

23.1 IMB EF-122, SMB POWER SUPPLIES SYSTEM CURRENT

23.2 IQF EF-122, SQF POWER SUPPLY CURRENT

23.3 IQD EF-122, SQD POWER SUPPLY CURRENT

EQUIPMENT FUNCTION #122 DEALS WITH THE CURRENTS
IN THE 3 SYSTEMS SMB, SQF, SQD
VIA 3 15 BIT+SIGN ADC'S, ONE PER SYSTEM.
IT IS LOADED INTO G P 3 ONLY.
CALLED BY 3 NAMES : IMB , IQF , IQD
CAN ALSO BE ENTERED VIA SMB(8/9/10,#...) AT EE1221
1 PARAMETER (=PROPERTY) PER CALL
NO PASSWORD, CAPABILITY REQUIRED

24.1 PSMON EF-124, PS-COMPUTER TIMING SURVEILLANCE

CHECKS THE TIMING, CAMAC AND COMPUTER FUNCTIONING
DEALS WITH THE GENERAL REFERENCE RESET
IN THE SPS-MODULE #3024 IN RA-1321, BA30
FOR THE MAIN POWER SUPPLY SYSTEM
VIA A MODIFIED QUAD LEVEL DRIVER CAMAC#2299
CALLED VIA "PSMON(#PROPERTY)"
1 PARAMETER (=PROPERTY) PER CALL, NO PASSWORDS

25.1 STAB DATA-MODULE #23, STAB, PS-COMPUTER ONLY

LAST UPDATE : 10 MAY 1978

STAB(EQ.NO,PROP) DEALS WITH THE 2 COMPENSATORS IN BE.
THE COMPENSATORS ARE SUBDIVIDED INTO 11 "EQUIPMENTS"
PLUS A 12TH ONE WHICH IS INVISIBLE TO USER AND USED
MAINLY FOR SUPPLEMENTAL DATA HOLD.

COMPENSATOR #1 RESPONDS TO EQUIPMENT NUMBERS 1...11.
COMPENSATOR #2 RESPONDS TO EQUIPMENT NUMBERS 21..31.

THE TECHNICAL RESPONSIBILITY LIES WITH BAYARD/SWIFT,
THE SOFTWARE RESPONSIBILITY WITH H.K.KUHN.

26.1 SMB D-M #16, MAIN POWER SUPPLIES, GP3 VERSION

THE GP3 VERSION OF D-M 16 HAS A TOTAL OF 11 "EQUIPMENTS"
OF WHICH ARE 4 REAL MAIN POWER SUPPLIES.
THE 11 ENTRIES HAVE THE FOLLOWING SIGNIFICANCE :
SMB(1/2,...) = SMB 03/SMB 11
SMB(3,...) = SQF
SMB(4,...) = SQD
SMB(5,...) = CENTRAL CONTROLS FOR ALL SMBS
SMB(6,...) = CIRCUIT BREAKER STATII SMB01-07,13
SMB(7,...) = CIRCUIT BREAKER STATII SMB08-12,QF,QD,14
SMB(8/9/10,...) EXIT TO EF122, WHERE THEY BECOME
IMB, IQF, IQD RESPECTIVELY.
SMB(11,...) ACCESSES THE BYPASS INTERLOCKS

SOME OF THESE EQUIPMENTS CAN BE CALLED WITH OTHER NAMES.

26.2 SQF SQF(1,...) EQUALS SMB(3,...)

26.3 SQD SQD(1,...) EQUALS SMB(4,...)

26.4 CCSMB CCSMB(1,...) EQUALS SMB(5,...)

26.5 SMCB SMCB(1/2,...) EQUALS SMB(6/7,...)

27.1 ATX CONTROL OF RF TRANSMITTERS

```
SE ATX(N,#PRP)=Z; SE Z=ATX(N,#PRP)
PROPERTIES:
  #CON #SBT #PWS #SDE #AD1-7 #SAC #ST1-6
  #STX #SPD #WCW #PFN #PRW #RST #PL1-2 #SL1-2
  #RFS #SK1-3
THIS DM CONTROLS:
  1) SWITCHING OF PREDRIVER AND SIEMENS LEVELS 1&2
  2) MONITORING OF FAULTS IN TRANSMITTERS
  3) FAULT RESETTING
  4) MONITORIING OF WARNING IN TRANSMITTERS
DM NUMBER=31
```

28.1 BLINT : DETECTION OF TRIPPED BEAM LOSS DETECTORS ON THE
EXTRACTION CHANNELS. RESETTING AND TEST
FACILITIES. SETTING OF THE TRIP THRESHOLD.

PROPERTIES:
#ADR #T01 - 15
#STA #RDY
#RST #ENB

SPECIAL ERRORS:
NONE

EF NUMBER = 157 (DECIMAL)

CONDITIONAL ASSEMBLY MARKS USED:
"NEXTR, "WEXTR

FUNCTION NAME IS 'BLINT'

EXTERNAL ROUTINES CALLED:
NFIX
ECDTA PROBR
CAMPX RESEF TRESE

LOADING PRECAUTIONS: NONE.

29.1 CPS : FOR THE ACQUISTION OF THE CPS EXTRACTION DATA

VIA THE LONG-RANGE MPX FROM INJ.

SET VALUE=CPS(#PROPERTY)

PROPERTIES:

#AD1- 5 #SF1 - 5
#IEX #BEX #IPP #RFV #RFM

SPECIAL ERRORS:

OVERLOAD BIT ONE
END OF CONVERSION BIT ONE
STATUS BIT ZERO

EF NUMBER = 156 (DECIMAL)

```
30.1   KICK     : FOR THE POWER SUPPLIES OF THE FAST KICKERS

                      ALL ON/OFF CONTROLS, STATUS ACQUISITION, DAC SETTING,
                      LIMIT CHECKING & ADC ACQUISITION WITH DIALOGUE.

                SET KICK(N,#PROPERTY)=VALUE:SET VALUE=KICK(N,#PROPERTY)

                PROPERTIES:
                            #CON,#MNS,#HVL,#VLT,#PLS,#RST
                            #RDY,#STA,#ST1,#MP1,#MP2
                            #AD1,#AD2,#CL1,#CL2,#MIN,#MAX

                SPECIAL ERRORS:
                             EQUIPMENT NOT READY - ATTEMPT TO SET DAC WITH
                                                   HV OFF
                                                 - ATTEMPT TO TURN ON HV
                                                   BEFORE SETTING DAC TO ZERO.
                             MAINS POWER OFF
                             UNDER LOCAL CONTROL


                                                "GP4,"GP5,"INJ,"NEXTR,"WEXTR.

                GLOBAL NAME IS 'KICK' & APPEARS IN ALL ABOVE COMPUTERS.
                CONDITIONAL  NAMES:
                               GP4 - BDVLT
                               GP5 - QHVLT,QVVLT
                             NEXTR - FSEVLT
                               INJ - INJVLT
                             WEXTR - FEVLT,FSEVLT
                              DMS NUMBER=39
```

31.1 MK?STOP : DETECTION & CLEARING OF EMERGENCY KICKER INTERLOCKS

FOR THE BEAM DUMP, INFLECTOR & FAST EXTRACTION KICKER SYSTEMS.

SET VALUE=MK?STOP(#PROPERTY): SET MK?STOP(#PROPERTY)=VALUE

PROPERTIES:

#ADR
#RDY #STA
#RST #OFF

SPECIAL ERRORS:

NONE

EF NUMBER = 155 (DECIMAL)
GENERIC NAME: MKSTP

```
32.1  PFN     : FOR THE PULSE FORMING NETWORKS OF THE FAST KICKERS

                ALL ON/OFF CONTROLS & STATUS ACQUISITION.

              SET PFN(N,#PROPERTY)=VALUE:SET VALUE=PFN(N,#PROPERTY)

              PROPERTIES:
                        #CON #MNS #HTR #SWI #TRG
                        #SBY #WRM #RDY #WRN #WAT #RST
                        #RSC #STA #ST1 #ST2 #ST3 #ST4
                        #MP1 #MP2 #MP3 #AD1 #AD2 #AD3.

              SPECIAL ERRORS:
                           EQUIPMENT NOT READY - ATTEMPT TO TURN ON HV
                                                 SWITCH BEFORE HEATERS READY
                           MAINS POWER OFF
                           UNDER LOCAL CONTROL

              DMS NUMBER = 40 (DECIMAL)

              CONDITIONAL ASSEMBLY MARKS USED:
                                          "GP4,"GP5,"INJ,"NEXTR,"WEXTR.

              GLOBAL NAME IS 'PFN' & APPEARS IN ALL ABOVE COMPUTERS.
              CONDITIONAL NAMES:
                            GP4 - BDPFN
                            GP5 - QHPFN,QVPFN
                          NEXTR - FSEPFN
                            INJ - INJPFN
                          WEXTR - FEPFN,FSEPFN

              EXTERNAL ROUTINES CALLED:
                                   NFIX
                                   DCDTA PROBR
                                   CAMPX RESEF TRESE

              LOADING PRECAUTIONS: NONE
```

33.1 SERVO MOTOR CONTROL DATA MODULE

SE SERVO(UNIT,#PROPERTY)=Z; SE Z=SERVO(UNIT,#PROPERTY)
ALTERNATIVE NAME: TARGET
CONTROLS SERVO MOTORS OF TARGETS, BEAM DUMPS, COLLIMATORS, ZS, MST, AND MSE
HARDWARE USED: ONE MPX-DM MODULE CONTROLES ONE SRVO MOTOR
PROPERTIES WITH SECTION MATCH PROTECTION:
#CON, #ADR, #TOL, #FSC, #MIN, #MAX, #PWS, #SBT
PROPERTIES WITH CAPABILITY MATCH PROTECTION:
#PSN, #SWI
PROPERTIES WITH NO PROTECTION:
#BSY, #RDY, #LST, #STA, #SAC, #TST
FOR FURTHER INFORMATION SEE DATA MODULE MANUAL IN SPS-MCR

34.1 ZS H.T. CONTROL EQUIPMENT FUNCTION

SE ZS(#PROPERTY)=Z: SE Z=ZS(#PROPERTY)

PROPERTIES WITH SECTION MATCH PROTECTION:
#SW0,#SW1,#MDE,#BD0-:-BD3,#BDM,#TIM,
#A00-:-#A12,#CON,#PWS,#SBT

PROPERTIES WITH CAPABILITY PROTECTION: #ION

PROPERTIES WITH NO PROTECTION:
#RY0,#RY1,#RDY,#KV,#CUR,#CA0-:-#CA3,
#WB0-:-#WB3,#SAC,#STA

THIS EF CONTROLS:
1) THE H.T.-GENERATOR(SAMES)
2) THE ACQUISITION OF THE ANODE CURRENT PER ZS-TANK
3) THE H.T. OF THE ION COLLECTOR P.S.
4) THE NUMBER OF SPARKS AND THE PERMITTED SPARKING
   RATE PER ZS-TANK

ALARM:
AN INTERLOCK SIGNAL IS TRIGGERED IF THE SPARKING RATE
IS ABOVE THE PRESET VALUE

HARDWARE USED:
NEXTR,WEXTR : CONTROL OF 4 ZS-TANKS BY 7 BR-, 1 MP-, 5 MD-
              MPX-MODULES
GP4   : CONTROL OF 1 EL-STAT. DEFLECTOR ZDPV BY
              3 BR-, 0 MP-, 2 MD-MPX MODULES

35.1 ESA EXTRACTION ALARM & INTERLOCK DATA MODULE

===

SE ESA(N.VALUE,#PROPERTY)=Z
SE Z=ESA(N.VALUE,#PROPERTY)

PROPERTIES WITH SECTION MATCH PROTECTION:
#ADR,#AD0,#CON,#PWS,#SBT

PROPERTIES WITH CAPABILITY PROTECTION: #RST

PROPERTIES WITHOUT PROTECTION:
#SSL,#SA0,#SA1,#STA

THIS DM CONTROLS:
1) THE STATUS OF THE EXTRACTION MOTORISATION (N.VAL = 1)
2) THE STATUS OF THE ZS (N.VAL = 2)
3) THE STATUS OF THE MST (N.VAL = 3)
4) THE STATUS OF THE MSE (N.VAL = 4)

HARDWARE USED:
WEXTR,NEXTR : 4 MP- + 1 A (SEL. STATUS BIT) MPX-MOD.
GP4 : 2 MP- + 1 A (SEL. STATUS BIT) MPX-MOD.

35.2 MST STATUS CONTROL EQUIPMENT FUNCTION

===

SE MST(#PROPERTY)=Z
SE Z=MST(#PROPERTY)

PROPERTIES WITH SECTION MATCH PROTECTION:
#FS0,#FS1, #AD0-:-#AD4, #CON,#SBT,#PWS

PROPERTIES WITH NO PROTECTION:
#TC0-:-#TC7, #WF0-:-#WF3, #TP0-:-#TP7, #TW0-:-#TW3
#TIN,#TOU, #WV0-:-#WV4, #SAC,#STA

THIS EF CONTROLS:
1) ANALOGUE ACQUISITIONS (8) OF TEMPERATURES FOR
8 SEPTUM MAGNETS (2 PER TANK)
2) ANALOGUE ACQUISITIONS (6) OF COOLING WATER
TEMPERATURES

3) STATUS & CMD OF 4 VALVES FOR THE COOLING WATER
   CIRCUITS (1 PER MST TANK)
4) ACQUISITION OF MICROSWITCH STATUS FOR 4 VALVES
   AND 4 PLUG-INS
5) ANALOGUE ACQUISTION OF WATER FLOW

HARDWARE USED :
NEXTR.WEXTR : 1 E -MPX MODULE FOR 1)
              1 E -MPX MODULE FOR 2)
              1 A -MPX MODULE FOR 3)
              1 BR-MPX MODULE FOR 4)
              1 E -MPX MODULE FOR 5)

35.3 MSE STATUS CONTROL EQUIPMENT FUNCTION

===

SE MSE(#PROPERTY)=Z
SE Z=MSE(#PROPERTY)

PROPERTIES WITH SECTION MATCH PROTECTION:
#FS0-:-#FS2. #AD0-:-#AD4. #CON.#SBT.#PWS

PROPERTIES WITH NO PROTECTION:
#TC0-:-#TC9. #WF0-:-#WF4. #TP0-:-#TP9. #PIN.#POU
#TIN.#TOU. #WV0-:-#WV5. #SAC.#STA. #TW0-:-#TW4

THIS EF CONTROLS:
1) ANALOGUE ACQUISITIONS (10) OF TEMPERATURES FOR
   10 SEPTUM MAGNETS (2 PER TANK)
2) ANALOGUE ACQUISITIONS (7) OF COOLING WATER
   TEMPERATURES
3) STATUS & CMD OF 5 VALVES FOR THE COOLING WATER
    CIRCUITS (1 PER MSE TANK)
4) ACQUISITION OF MICROSWITCH STATUS FOR 5 VALVES
   AND 5 PLUG-INS
5) ANALOGUE ACQUISTION OF WATER FLOW

HARDWARE USED :
NEXTR.WEXTR : 1 E -MPX MODULE FOR 1)
              1 E -MPX MODULE FOR 2)
              1 A -MPX MODULE FOR 3)
              1 BR-MPX MODULE FOR 4)

1 E -MPX MODULE FOR 5)

35.4 EPO EXTRACTION POSITION EQUIPMENT FUNCTION

```
===
SE EPO(#PROPERTY)=Z
SE Z=EPO(#PROPERTY)

PROPERTIES WITH SECTION MATCH PROTECTION
#FS0-:-#FS7, #AD0,#AD1,#STA,#CON,#PWS,#SBT

PROPERTIES WITH CAPABILITY MATCH: #SW1

PROPERTIES WITHOUT PROTECTION:
#SAC,#RDY,#PSN, #PS0-:-#PS2, #WP0-:-#WP7

THIS EF CONTROLS:
1) - P.S. STATUS OF MOTORS FOR GIRDERS, ANODES,CATHODES
   - CMD ON/OFF OF THE P.S.
2) - ANALOGUE ACQUISITION (8) OF ANODE POSITIONS

HARDWARE USED:
NEXTR,WEXTR : 1 BR-MPX MODULE FOR 1)
              1 E -MPX MODULE FOR 2)
```

36.1 TICK : FOR THE TIMING GENERATORS OF THE FAST KICKERS

ALL SETTING AND READBACK CONTROLS
N.B. CERTAIN PROPERTIES - THOSE REQUIRING CAPABILITY
MATCH - ACT OR MAY ACT ON SEVERAL TIMING MODULES AT ONCE.
THIS IS ACHIEVED BY A CODE IN COL. 9 OF THE DATA TABLE.
WHICH ASSOCIATES MODULES IN THE SAME GENERATOR.

SET TICK(N,#PROPERTY)=VALUE;SET VALUE=TICK(N,#PROPERTY)

PROPERTIES:

#CON #ADR #LL1 #UL1 #LL2 #UL2 #COD #SEP
#DL1 #DL2 #EVC #ARM
#MIN #MAX #STA #MPX
#TRD #CYC #PPL #DPS #ENB #RST

SPECIAL ERRORS: NONE

DMS NUMBER = 41 (DECIMAL)

CONDITIONAL ASSEMBLY MARKS USED:
"GP4,"GP5,"INJ,"NEXTR,"WEXTR.

GLOBAL NAME IS 'TICK' & APPEARS IN ALL ABOVE COMPUTERS.
CONDITIONAL NAMES:
GP4 - BDTIM
GP5 - QHTIM.QVTIM
NEXTR - FSETIM
WEXTR - FETIM.FSETIM

EXTERNAL ROUTINES CALLED:
NFIX
DCDTA PROBR
CAMPX RESEF TRESE

LOADING PRECAUTIONS: NONE

37.1 COD CLOSED ORBIT DIPOLES CONTROL

TYPE 7
SET COD(UNIT,#PROPERTY)=Z: SET Z=COD(UNIT,#PROPERTY)
PROPERTIES:
#CUR(DEFAULT) #ANM #CAN #CDE #CDI #VLT #VL1
#LIM #SWI #CON #STA #PRO #ADR #SAL
#CU1 #CU9 #MAX #MXC #CAL #CL1 #VMX #VMN
#TFS #TZO #CL4 #ENB #MDE
THIS DMS SETS AND ACQUIRES THE CURRENT
SENT TO THE CLOSED ORBIT DIPOLES.
THE AQUISITION IS DONE BY THE STANDARD MPX 10 BITS ADC
AT EACH TIMING T3 (=MASTER TIMING RESET PULSE)
OR AT REQUEST.
WHEN THE DMS IS CALLED TO SET THE CURRENT, TWO CASES
MAY HAPPEN : 1) THE CALL OCCURS BEFORE T1 OR AFTER T2
2)THE CALL OCCURS BETWEEN T1 AND T2.
IN THE FIRST CASE THE DIGITAL BUFFER OF THE POWER SUPPLY IS LOADED
WITH THE MAXIMUM VALUE, WHICH IS ENABLED BY THE NEXT
PULSE (I.E. T1). THE SAME PULSE STARTS THE RT-PROGRAM WHICH
LOADS THE DIGITAL BUFFER WITH THE DESIRED CURRENT SETTING
WHICH WILL BE ENABLED BY THE PULSE T2. IN
THE SECOND CASE THE SAME PROCEDURE WILL OCCUR
IN THE NEXT MACHINE CYCLE.
BESIDES CANNED NODAL MESSAGE, THE FOLLOWING EQUIPEMENT ERRORS MAY OCCUR: **
2 INTERRUPT ERROR:
3 EQUIPEMENT IS OFF
4 INTERRUPT DISABLED (INITIALISATION MISSING)
6 OVER CURRENT (>3.5A)
7 CURRENT OUT OF VALUE (>1A IN CO MODE)

% #CUR=COMMAND OF I
% #ANM=ANAL MEAS OF I VIA CAMPX
% #CAN=ANAL ACQ OF I IN DT1
% #CDE=CURRENT DEMANDED (0=OK)
% #CDI=DIG VALUE OF I
% #VLT=ANAL ACQ OF VOLTAGE
% #VL1=CHECK VOLT BETWEEN LIMITS
% #LIM=CHECK CURRENT BETWEEN LIMITS
% #SWI=SWITCH ON OR OFF
% #CON=CONNECT OR DISCON
% #STA=MD STATUS WORD
% #PRO=PROTECT
% #CUR=IDENTICAL TO DEFAULT PROPERTY (I)
% #ADR=MD MPX ADDRESS

```
%  #SAL=READ STATUS ERROR (ERVAL)
%  #CU1=READ BIN. VAL. OF I (WITHOUT CAL.)
%  #CU9=SET A CURRENT WITHOUT TIMING AND CHECK
%  #MAX= I MAX IN BEAM GYM
%  #MXC= I MAX IN C.O
%  #CAL= I CALIBRATION FOR COMMAND
%  #CL1= I ANAL. CAL.
%  #VMX=MAX VOLTAGE
%  #VMN=MIN VOLTAGE
%  #TFS=FULL SCALE TOLERANCE FOR I
%  #TZO=TOLERANCE FOR I-O
%  #CL4=CAL. FOR I=4 AMP
%  #ENB=1=ENABLE JIR10;0=DISABLE
%  #MDE=C.O OR BEAM GYM MODE
% PTY SWITCH ON OR OFF IS ONLY POSSIBLE IF EQUIPT IS CONNECTED
% PTYS #CUR,#ANM,#CAN,#CDI CHECK IF EQUIPT IS "ON",THEN THEY
% AUTOMATICALLY CHECK THE EQUIPT IS CONNECTED
```

38.1 DETP BEAM POSITION MONITORS ACQUISITION & CONTROL

TYPE 6
SET DETP(UNIT,#PROPERTY)=Z: SET Z=DETP(UNIT,#PROPERTY)
PROPERTIES:
#10(DEFAULT) #20 #30 #21 #32 #31
#D1 #S1 #D2 #S2 #D3 #S3
#STA #ENB #CON #PRO #SWI #CL1 #CL2 #GA1 #GA2
#AD1 #AD2 #AD3 #NAQ #ADR #ST1
THIS DMS CONTROLS:
1) THE GLOBAL AMPLIFIER GAIN (20,30,40,50,60 DB)
2) THE INDIVIDUAL DIFFERENCE 10 DB GAIN
3) CALIBRATION SWITCH
1: NORMAL MEASUREMENT
2: SAME SIGNAL ON BOTH DIFFERENCE & SUM CHANNELS
3: DIFFERENCE CHANNEL SET TO ZERO
IT ACQUIRES EITHER THE DIFFERENCE SIGNAL OR THE SUM SIGNAL OR
THE BEAM POSITION IN UNITS OF THOUSANDTHS OF THE VACUUM
CHAMBER DIMENSION
IF THE SUM CHANNEL IS LESS THAN THE OFFSET DIFFERENCE CHANNEL
DIVIDED BY 16. THE POSITION IS GIVEN THE ERROR VALUE OF 30000.
THE DIFFERENCE BETWEEN BEAM POSITIONS AT TWO DIFFERENT TIMINGS
MAY ALSO BY ACQUIRED DIRECTLY PROVIDED THAT THE DMS CALL
DOES NOT OCCUR BETWEEN THESE TWO TIMINGS
ERRORS MAY BE FURTHER INVESTIGATED BY EXAMINING THE
BITS 3 TO 5 INCLUDED OF THE STATUS WORD
THEIR MEANING IS AS FOLLOWS:
2 ATTEMPT TO CALIBRATE WHILE THE CALIBRATION SWITCH IS SET
TO POSITION 1 (= NORMAL MEASUREMENT)
3 ERROR DETECTED BY THE SYSTEM ROUTINE CAMPX
4 DIFFERENCE ACQUISITION REQUESTED AT THE WRONG TIMING
5 ILLEGAL ACQUISITION
6 ILLEGAL REQUESTED GAIN
7 ATTEMPT TO DIVIDE BY ZERO DURING COMPUTATION OF
THE BEAM POSITION.

% ********** W R I T E **********

% SOFT CONNECTION -----#CON-----
% LAM ENABLE/DISABLE -----#LAM-----
% SINGLE GAIN MPX ADDRESS -----#AD1-----
% DIFF. & SUM 30 DB GEN. GAIN MPX ADD. -----#AD2-----
% DIFF. 60 DB GENERAL GAIN MPX ADD. -----#AD3-----
% CORRECTING FACTOR K -----#CL1-----
% ZERO OFFSET DIFF. CALIBRATION -----#CL2-----

```
%  NUMBER OF ACQUISITIONS                    -----#NAQ-----
%  POINTER TO DMA TABLE                      -----#ADR-----
%  OPERATION MODE SWITCHING                  -----#SWI-----
%  1=MEASUREMENT/2=EQUAL CHANNEL CALIBRATION/3=ZERO OFFSET CALIBRATION
%  GENERAL GAIN SETTING (NO OF DB/10)        -----#GA1-----
%  SINGLE GAIN SETTING ("1"=ON/"0"=OFF)      -----#GA2-----
%  **********   R E A D   **********
%  SOFT CONNECTION                           -----#CON-----
%  LAM ENABLE/DISABLE                        -----#LAM-----
%  STATUS                                    -----#STA-----
%  FIXED STATUS                              -----#ST1-----
%  SINGLE GAIN MPX ADDRESS                   -----#AD1-----
%  DIFF. & SUM 30 DB GEN. GAIN MPX ADD       -----#AD2-----
%  DIFF. 60 DB GENERAL GAIN MPX ADD.         -----#AD3-----
%  CORRECTING FACTOR K                       -----#CL1-----
%  ZERO OFFSET DIFF. CALIBRATION             -----#CL2-----
%  NUMBER OF ACQUISITIONS                    -----#NAQ-----
%  POINTER TO DMA TABLE                      -----#ADR-----
%  OPERATION MODE SWITCHING                  -----#SWI-----
%  GENERAL GAIN                              -----#GA1-----
%  SINGLE GAIN                               -----#GA2-----
```

39.1 DETL BEAM LOSS CONTROL & ACQUISITION

TYPE 15
SET DETL(UNIT,#PROPERTY)=Z:SET Z=DETL(UNIT,#PROPERTY)
PROPERTIES:
#21(DEFAULT) #32 #43 #31 #41 #21 #10 #20
#30 #40 #DOS #STA #ENB #CON #SWI
#CAL #AD1 #NAQ #ADR #AD2 #RST
THIS DMS CONTROLS THE CAPACITANCE SWITCH
AND ACQUIRES THE SIGNAL GENERATED BY THE IONISATION CHAMBERS
AND SAMPLED BY A 10 BITS ADC -
VALUES ARE GIVEN IN VOLTS -
STANDARD NODAL ERRORS MAY BE FURTHER INVESTIGATED
BY EXAMINING BITS 3 TO 5 INCLUDED OF THE STATUS WORD
THE CODES ARE AS FOLLOW:
3 ERROR DETECTED BY THE SYSTEM ROUTINE CAMPX
4 DIFFERENCE ACQUISITION REQUESTED AT THE WRONG
TIME IN THE CYCLE

% ********** W R I T E **********

% SOFT CONNECTION -----#CON-----
% LAM ENABLE/DISABLE -----#LAM-----
% MPX ADDRESS FOR CAPACITANCE SWITCHING -----#AD1-----
% MPX ADDRESS TO ACCESS RESET STATUS -----#AD2-----
% CALIBRATION FACTOR -----#CAL-----
% NUMBER OF ACQUISITIONS -----#NAQ-----
% POINTER TO DMA TABLE -----#ADR-----
% CAPACITANCE SWITCHING -----#SWI-----
% ********** R E A D **********
% SOFT CONNECTION -----#CON-----
% LAM ENABLE/DISABLE -----#LAM-----
% STATUS -----#STA-----
% MPX ADDRESS FOR CAPACITANCE SWITCHING -----#AD1-----
% MPX ADDRESS TO ACCESS RESET STATUS -----#AD2-----
% CALIBRATION FACTOR -----#CAL-----
% NUMBER OF ACQUISITIONS -----#NAQ-----
% POINTER TO DMA TABLE -----#ADR-----
% CAPACITANCE SWITCH -----#SWI-----
% RESET STATUS -----#RST-----
% CUMULATIVE DOSE -----#DOS-----

40.1 DETN SECONDARY EMISSION MONITORS ACQUISITION

TYPE 9
SET DETN (UNIT,#PROPERTY)=Z; SET Z=DETN(UNIT,#PROPERTY)
PROPERTIES:
#21(DEFAULT) #32 #43 #31 #42 #41
#10 #20 #30 #40 #STA #ENB #CON
#POL #RSL #CAL #RGE #IDX #CST
#NAQ #ADR #CRA #EES
THIS DMS ACQUIRES EITHER THE VALUE OF THE CHARGE INTEGRATOR
(SAMPLED BY A 10 BITS ADC)
TAKEN AT A PRE-FIXED TIMING OR THE DIFFERENCE
BETWEEN TWO CHARGE INTEGRATORS VALUES TAKEN AT TWO
DIFFERENT TIMINGS PROVIDED THAT THE DMS CALL
DOES NOT OCCUR BETWEEN THESE TWO TIMINGS.
SUCH VALUES ARE GIVEN IN VOLTS
ERRORS COMING OUT WITH THE NODAL MESSAGE "VALUE OUT OF RANGE"
MAY BE FURTHER INVESTIGATED BY A CALL TO THE DMS
USING THE PROPERTY #EES. THE MEANING OF THE RESULTING
NUMBER IS AS FOLLOWS:
1 ILLEGAL ACQUISITION
2 BAD SEM-SYSTEM
3 BAD CHANNEL INDEX
4 CALIBRATION OR RANGE OR RESOLUTION TABLE FULL.

% ********** W R I T E **********

% SOFT CONNECTION ----- #CON -----
% CALIBRATION ----- #CAL -----
% RANGE ----- #RGE -----
% NUMBER OF ACQUISITIONS ----- #NAQ -----
% CHANNEL INDEX ----- #IDX -----
% CONSTANT(EFFICIENCY*ELECTRON CHARGE) ----- #CST -----
% SEM-SYSTEM INDEX -----#CRA-----
% LAM ENABLE/DISABLE -----#ENB-----
% SEM DETECTOR ORIENTATION ----- #POL -----
% RESOLUTION ----- #RSL -----
% ********** R E A D **********

% RANGE ----- #RGE -----
% STATUS ----- #STA -----
% SOFT CONNECTION ----- #CON -----
% CALIBRATION ----- #CAL -----
% CHANNEL INDEX ----- #IDX -----
% CONSTANT (EFFICIENCY*ELECTRON CHARGE) -----#CST-----

```
%  NUMBER OF ACQUISITIONS                ----- #NAQ -----
%  POINTER TO DMA TABLE                  ----- #ADR -----
%  CRATE NUMBER                          ----- #CRA -----
%  LAM ENABLE/DISABLE                    ----- #ENB -----
%  EXTENDED ERROR STATUS                      -----#EES-----
%  SEM DETECTOR ORIENTATION                   ----- #POL -----
%  RESOLUTION                            ----- #RSL -----
```

41.1 GEF FUNCTION GENERATORS CONTROL

```
TYPE 14
SET GEF(UNIT,#PROPERTY)=Z ;
SET Z=GEF(UNIT,#PROPERTY)
CALL GEF(A,"R",UNIT,#PROPERTY)
FOR PROPERTIES #NC,#NA (A IS THE NAME OF THE USER'S ARRAY)
CALL GEF(A,"W",UNIT,#PROPERTY)
FOR PROPERTIES #NC,#NA,#NCC
(A IS THE NAME OF THE USER'S VECTOR TABLE)
PROPERTIES:
#VC(DEFAULT) #VA #AQN #TST #VAC #VCC #NA #NC #NCC
#ENB #STA #ADR #MX1 #MX2 #POL #EXS
#EES #PRO #CON #MSK #THS #SWI #RDY
THIS DMS SCHEDULES THE LOADING OR THE READING
OF THE HARDWARE MEMORY WHICH IS PART OF THE
FUNCTION GENERATOR - THE ACTUAL LOADING OR READING
IS EXECUTED BY A REAL-TIME PROGRAM SYNCHRONISED
WITH THE MACHINE CYCLE.
THE MAIN TASK OF THE DMS IS TO CHECK THE
CORRECTENESS OF THE VECTOR TABLE PROVIDED BY THE USER
AND TO CONVERT IT IN THE FORMAT REQUIRED
BY THE HARDWARE. THE CONVERTED TABLE IS STORED
ON THE DRUM WHERE IT WILL BE PICKED UP BY
THE REAL-TIME PROGRAM.
THE STANDARD NODAL ERROR MESSAGES MAY BE FURTHER
INVESTIGATED BY A CALL TO THE DMS GEF USING
THE PROPERTY # EES. THE MEANING OF THE RESULTING
NUMBER IS AS FOLLOWS.
AFTER THE NODAL MESSAGE: "UNAUTHORISED ACTION"
  1   THE REAL-TIME PROGRAM HAS BEEN ALREADY
      SCHEDULED FOR THIS EQUIPEMENT
  2   THE DMS HAS BEEN ALREADY CALLED
      BY ANOTHER NODAL PROGRAM - (THE DMS
      IS NOT RE-ENTRANT)
AFTER THE NODAL MESSAGE: "VALUE OUT OF RANGE"
  1   VECTOR AMPLITUDE TOO LARGE
  2   SLOPE BEFORE REPORT TOO LARGE
  3   SLOPE AFTER REPORT TOO LARGE (>65368)
  4   BIAS CHANGE LARGER THAN 1/32 TH OF THE MAX AMPLITUDE
  5   FIRST AMPLITUDE IS NOT EQUAL TO BIAS
  6   TIME DURATION OF THE VECTOR IS LARGER THAN 1023
      TIME UNITS (1 TIME UNIT=2 MSEC)
  7   THE AMPLITUDE OF THE LAST VECTOR IS NOT
      EQUAL TO THE AMPLITUDE OF THE FIRST VECTOR
  8   NO VECTOR WITH ZERO DURATION
```

```
 9   THE TOTAL FUNCTION DURATION IS TOO LARGE
10   THE RESIDENT WAITING QUEUE FOR ACTION
     (SCANNED BY THE REAL-TIME PROGRAM)
     IS FULL
11   ILLEGAL INTERRUPT NUMBER (#MSK)
12   BAD AVT TABLE (#VC & #NC  READ MODE)
     AVT IS THE VECTOR TABLE STORED ON THE DRUM


%  **********   W R I T E   **********

%  SOFT CONNECTION                                      -----#CON-----
%  POLARITY                                             -----#POL-----
%  MPX ADDRESS                                          -----#ADR-----
%  MAXIMUM AMPLITUDE                                    -----#MX1-----
%  MAXIMUM SLOPE                                        -----#MX2-----
%  JIR10 MASK                                 -----#MSK-----
%  POWER SUPPLY SWITCH ON/OFF                 -----#SWI-----
%  LAM ENABLE/DISABLE                                   -----#ENB-----
%  CONVERT,WRITE & COMPARE                              -----#VCC-----
%  CONVERT,WRITE & COMPARE (CALL FORMAT)                -----#NCC-----
%  CONVERT & TRANSFER AVT INTO THE HARDWARE             -----#VC-----
%  CONVERT & TRANSFER AVT INTO THE HARDWARE (CALL)      -----#NC-----
%  WRITE AVT INTO THE HARDWARE (BOTH FORMATS)             -----#NA & #VA-----
%  IMMEDIATE WRITE & COMPARE (BOTH FORMATS)         -----#VAC-----
%  OLD/NEW FORMAT FLAG                               -----#NEW-----
%  **********   R E A D   **********
%  SOFT CONNECTION                                      -----#CON-----
%  POLARITY                                             -----#POL-----
%  RT-LOADER EXECUTION STATUS                 -----#EXS-----
%  EXTENDED ERROR STATUS                                -----#EES-----
%  MPX ADDRESS                                          -----#ADR-----
%  MAXIMUM AMPLITUDE                                    -----#MX1-----
%  MAXIMUM SLOPE                                        -----#MX2-----
%  JIR10 MASK                                 -----#MSK-----
%  THRESHOLD                                  -----#THS-----
%  STATUS                                               -----#STA-----
%  LAM ENABLE/DISABLE                                   -----#ENB-----
%  POWER SUPPLY SWITCH ON/OFF                 -----#SWI-----
%  FUNCTION GENERATOR READY STATUS                      -----#RDY-----
%  READ AVT INTO USER'S TABLE WITHOUT CONVERSION        -----#VA-----
%  READ AVT INTO USER'S TABLE WITHOUT CONVERSION          -----#NA-----
%  READ AVT INTO USER'S TABLE & COUVERT                 -----#VC-----
%  READ AVT INTO USER'S TABLE & CONVERT -----#NC-----
%  READ HARDWARE INTO TVT                                 -----#AQN-----
%  READ HARDWARE INTO TVT & COMPARE WITH AVT              -----#TST-----
```

```
      %  OLD/NEW FORMAT FLAG                -----#NEW-----
```

42.1 STEP STEP MOTOR CONTROL & ACQUISITION

TYPE 12
SET STEP(UNIT,#PROPERTY)=Z: SE Z=STEP(UNIT,#PROPERTY)
PROPERTIES:
#PSN(DEFAULT) #RDY #BSY #STA #PSD #PWS #CON
#TOL #ADR #CAL #MIN #MAX #LST #RST
#CST #EES #IN #OUT
THIS DMS CONTROLS THE MOVEMENT OF THE STEP MOTORS
AND ACQUIRES THEIR POSITION (UNIT IS NUM)
THE STANDARD NODAL ERROR MESSAGES MAY BE FURTHER
INVESTIGATED BY A CALL TO THE DMS USING
THE PROPERTY #EES. THE MEANING OF THE RESULTING
NUMBER IS AS FOLLOWS:
AFTER THE NODAL MESSAGE "HARDWARE ERROR"
1 ERROR RETURNED BY THE SYSTEM ROUTINE CAMPX
2 MOTOR NOT READY
3 MOTOR BUSY
AFTER THE NODAL MESSAGE "VALUE OUT OF RANGE"
1 REQUESTED POSITION OUT OF RANGE
2 BAD CALIBRATION INDEX OR CALIBRATION TABLE FULL
3 ILLEGAL MIN OR MAX VALUE

% ********** W R I T E **********

% SOFT CONNECTION ----#CON---
% PASSWORD SWITCH -----#PWS-----
% TOLERANCE -----#TOL-----
% MPX ADDRESS -----#ADR-----
% MINIMUM -----#MIN-----
% MAXIMUM -----#MAX-----
% CALIBRATION FACTOR -----#CAL-----
% REFERENCE POSITION -----#CST-----
% RESET -----#RST-----
% ********** R E A D **********

% PASSWORD SWITCH -----#PWS-----
% TOLERANCE -----#TOL-----
% MPX ADDRESS -----#ADR-----
% MINIMUM -----#MIN-----
% MAXIMUM -----#MAX-----
% CALIBRATION FACTOR -----#CAL-----
% REFERENCE POSITION -----#CST-----
% LAST DEMANDED POSITION -----#LST-----
% STATUS -----#STA-----

```
%  EXTENDED ERROR STATUS                          -----#EES-----
%  MOTOR READY STATUS                             -----#RDY-----
%  MOTOR BUSY STATUS                              -----#BSY-----
%  IN-STATUS                          -----#IN-----
%  OUT-STATUS                         -----#OUT-----
%  READ & UPDATE POSITION                         -----#PSN & #PSD-----
```

43.1 INOUT IN/OUT MOVEMENTS CONTROL & ACQUISITION

TYPE 13
SET INOUT (UNIT,#PROPERTY)=Z ; SE Z=INOUT(UNIT,#PROPERTY)
PROPERTIES:
#OUT(DEFAULT) #IN #PSN #MNS #SEC #STA #CON
#PWS #ADR #IDX
THIS DMS CONTROLS THE IN/OUT MOVEMENTS OF SEM DETECTORS
AND OF SOME OTHER EQUIPMENTS (I.E. BEAM STOPPERS,
SPLITTER,ETC.) - IT IS USED TO ACQUIRE THE POSITION
AND STATUS FOR EQUIPMENTS SUCH AS FANS OR HELIUM INTERLOCKS ETC.
THE STANDARD NODAL ERROR MESSAGES HAVE THE FOLLOWING
MEANING:
HARDWARE ERROR - EITHER POWER OFF OR ERROR RETURNED
BY THE SYSTEM ROUTINE CAMPX
VALUE OUT OF RANGE - SYSTEM INDEX LARGER THEN 3

% ********** W R I T E **********

% SOFT CONNECTION -----#CON-----
% PASSWORD SWITCH -----#PWS-----
% INDEX -----#IDX-----
% MPX ADDRESS -----#ADR-----
% COMMAND IN-THE-BEAM -----#IN-----
% COMMAND OUT-OF-THE-BEAM -----#OUT-----
% ********** R E A D **********

% SOFT CONNECTION -----#CON-----
% PASSWORD SWITCH -----#PWS-----
% MPX ADDRESS -----#ADR-----
% INDEX -----#IDX-----
% STATUS -----#STA-----
% SECURITY STATUS -----#SEC-----
% MEANS STATUS -----#MNS-----
% POSITION -----#PSN-----