

**CONTROL DATA<sup>®</sup>**  
**6400/6500/6600**  
**COMPUTER SYSTEM**

INSTANT SMM

**CONTROL DATA**  
**CORPORATION**

MAINTENANCE  
SYSTEMS ENGINEERING





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## PREFACE

SMM is a maintenance system designed solely for running tests on 6X00 computers and associated peripheral devices. This manual contains deadstart settings, console commands, standard parameters, standard error codes and standard test operation under other operating systems. It does not contain detailed hardware or software descriptions.



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SYSTEM DISPLAY {CPC}  
COMMANDS

## KEYBOARD ENTRIES

XY. {CR}

Sets X display on left screen  
Sets Y display on right screen  
Choices for X,Y=A,B,C,D,E,F,G {see  
Displays}

XN,A. {CR}

Sets field N of display X to display 10  
words of memory from address A.  
X may be C,D or E.  
N may be 0,1,2,3 or 4  
N=4 sets all fields

A,V. {CR}

Stores value V in address A+RA  
or enter: LA,V. {CR} to left justify  
entry

A+V. {CR}

Stores value V in address A+RA and up-  
dates A by 1

A,N,V. {CR} or A+N,V.

Stores value V in byte N of address A+RA.  
N may be 1,2,3,4 or 5 if display E  
is in use.  
N may be 1,2,3 or 4 if display C or D is in  
use.

ENRA,V. {CR}

Replaces RA with value V.

ENP,V. {CR}

Replaces P with value V.

ENYZ,V. {CR}

Enters value V into register YZ. Y may  
be A,B or X; Z may be 0-7.

ENXY,Z,V. {CR}

Enters value V into byte Z of X register Y.  
Y may be 0-7; Z may be 1-5.

ENFL,V. {CR}

Replaces FL with value V.

ENBKP,V. {CR} or BKP,V. {CR}

Sets breakpoint address to value V. If BKP is used the CPU is started after the entry.

TEST. {CR}

Sets up test mode where the P register is continually monitored for breakpoint address.

RUN. {CR}

Sets up RUN mode where the CPU runs until BKP is reached. If BKP is reached, the CPU is exchanged out and the BKP address is restored.

ENEM,V. {CR}

Sets EM to value V.

ENRAX,V. {CR}

Sets RAX to value V.

ENFLX,V. {CR}

Sets FLX to value V.

ENMA,V. {CR}

Sets MA to value V.

EXCH,V. {CR}

Sets exchange address to value V. RA is not added to V.

GO. {CR}

Causes loader operation to continue after stopping on an error condition.

X.GO. {CR}

Causes PPX to start running after it has stopped.



X.MNE. {CR} or X.MNE,CCEE. {CR}

Causes loader to load program MNE. If CCEE is used, the channel and equipment is stored for PP tests or CCEE = RA for CPU tests.

LBC,V. {CR} or LBC,V,CCE. {CR}

Loads binary cards from reader to CM address RA+V until EOF. If the reader is not on channel 12, equipment 4, use the CCE entry. CC=channel, E=equipment 4, 5, 6 or 7.

L8DC,V.{CR} or L8DC,V,CCE. {CR}

Loads 80 column binary cards from reader to CM address RA+V until EOF. Use the CCE entry, if the reader is not on channel 12, equipment 4. E may be 4, 5, 6 or 7.

MTP,V. {CR}

Transfers program at CM address {RA+V+1} to the next available PPU. Upper byte of V must be non-zero.

SMP,V. {CR}

Value V is stored in Dead Start panel word 13 and SMM tape is dead started.

X.HOLD. {CR}

Gives display control to PPX. CAUTION - if PPX is not displaying, system communication will be lost.

DROP. {CR}

Sets PP10 {CPC} to dead start conditions.

X.DROP. {CR}

Sets PPX to idle conditions.

SET,FWA,LWA,V. {CR}

Sets all bytes to value V from location FWA+RA up to and including location LWA+RA.

DCNX. {CR}

Disconnects channel X.

FCNX. {CR}

Sends a release function to device on channel X.

MCHX. {CR}

Master clear the `bbbl` on channel X.

ACNX. {CR}

Activates channel X.

X.STOP. {CR}

Causes PPX to stop on its next pass through its display loop.

X.DIS. {CR}

Gives display control to PPX. If PPX is not using the display at least once every 500 msec., display control is returned to CPC.

T1. {CR}

Loads a test list of 1-8 programs. Normally set to load DF1, DT2, MTT, LPT, CP1, CR1, DS1, and EXC.

T1, MN1, MN2, MN3, MN4, MN5, MN6, MN7, MN8. {CR}

Alters the T1 entry to load the tests specified by MNX. From 1-8 tests may be called, providing there is available PPU's.

AUTO. {CR}

Initiates the SMM system for multi-programming use.

## SPECIAL FIRST CHARACTER ENTRIES

- + Advances all memory displays by 40<sub>g</sub> locations.
- Decrements all memory displays by 40<sub>g</sub> locations.
- \* Toggles CPU controls from CPU0 to CPU1 - 6500's only.
- {CR} Sets repeat entry flag.
- {Backspace} Stops CPU currently running and selected.
- {Space} Starts CPU currently selected.

## SYSTEM DISPLAYS

- A Both input and output exchange packages are displayed when CPU is stopped. Only input package is displayed when CPU is running.
- B Displays input exchange package.
- C 4 fields of 10 CM words each are displayed. Words are displayed in 4 groups of 15 bit bytes. Instruction code conversions appear opposite octals.
- D Same format as 'C' display without code conversion.
- E 4 fields of 10 CM words each in 5 groups of 12 bit bytes are displayed. Display code conversions appear opposite octals.
- F Fake display {used to speed up CPU tests}.
- G AUTO mode PPU system display.



DEAD START SETTINGS

TO LOAD 80 COLUMN BINARY CARDS

<u>Address</u>	<u>Contents</u>	<u>Description</u>
0001	75CC	Deactivate channel CC.
0002	77CC	Connect card reader E.
0003	E000	
0004	77CC	Select binary mode.
0005	0001	
0006	77CC	Select bbb1 to read.
0007	1500	
0010	2000	Load word count.
0011	77b0	
0012	74CC	Activate channel CC.
0013	71CC	Input to address 0.
0014	0000	

TAPE DEADSTART ON CHANNEL 4,5,6 or 7

A deadstart card must be obtained by assembling and punching program {PTL} on the SMM program library. PTL assumes card reader on channel 12, tape on channel 7, equipment 5, unit 0. PTL must be modified if this is not the case.

<u>Address</u>	<u>Contents</u>	<u>Description</u>
0001	75CC	Disconnect channel CC.
0002	77CC	Connect equipment E.
0003	E000	
0004	77CC	Set binary mode.
0005	0001	
0006	77CC	Read
0007	1400	
0010	74CC	Activate CC.
0011	71CC	Input to 7bbb.
0012	7bbb	
0013	SSSS	SMM parameters.
0014	MMMM	SMM/MACE parameters.

E may be 4, 5, 6, or 7.

## LOAD BINARY CARDS

<u>Address</u>	<u>Contents</u>	<u>Description</u>
0001	75CC	Disconnect channel CC.
0002	77CC	Connect reader E.
0003	E000	
0004	77CC	Set bb81 to read.
0005	1400	
0006	74CC	Activate channel CC.
0007	71CC	Input to address 7666.
0010	7666	
0011	XXXX	
0012	XXXX	
0013	XXXX	
0014	XXXX	

Card 1 of the deck must be removed and replaced with a special loader card. The deck must terminate by a card with a b789 punch in column 1. The special loader card may be obtained by assembly of a program called DSCL on the SMM program library tape. Use a COMPASS {I=COMPILE,B=PUNCHB} card after the program library call card.



TAPE DEADSTART ON CHANNEL 12 OR 13

<u>Address</u>	<u>Contents</u>	<u>Description</u>
0001	75CC	Deactivate channel CC.
0002	77CC	Connect tape.
0003	E00U	Equipment E Unit U
0004	77CC	Rewind tape
0005	0010	
0006	77CC	Set 6681 to read
0007	1400	
0010	74CC	Activate channel
0011	71CC	Input to address 6606
0012	6606	
0013	SSSS	SMM Parameters
0014	MMMM	SMM/MACE parameters

SMM Parameters

SSSS = 0000	Load MACE
= 0010	Load SMM from tape
= XXXZ	Disc load {Z=device 1-4, XXX=track}*see MMMM for word 14=CCUE, see below for Z
= 4XXZ	Load SMM and suppress CM features
= XX20	Load ENS Mode I or II {XX}
= 0040	Load dump routine
MMMM = 0000	Request storage device
= 0YXX	Load MACE on device XX, if Y=4, use CPU1.
= 10XX	Recovery on device XX.
*      = CCUE	Chan, unit, equipment of disc for SMM. If bit 11 is set, SMM will write the en- tire SMM tape on disc device Z starting with XXX of word 13 on channel CC, equipment E, unit U. If bit 11 is clear, SMM will load on disc device Z starting from XXX on channel CC, equipment E, unit U.
	Z = device code {1-4}
	1 - load on 808
	2 - load on 6603
	3 - load on 813/814
	4 - load on 853/854

PS COMMANDS

## KEYBOARD ENTRIES

02YYW20XX {CR}

Sets display field YY to display  $100_8$  words of PP memory from address XX. YY may be 0, 4, 10 or 14.

0221W0222 {CR}

Activates the breakpoint option in PS. Locations 76 and 77 must be set equal to the breakpoint address before this command is executed.

0221WXXXX {CR}

Start executing the test at address XXXX.

YYYY+XXXX {CR}

Stores XXXX at address YYYY and adds 1 to YYYY. If the {+} sign is not present, YYYY will not be incremented by 1.

## SPECIAL FIRST CHARACTER ENTRIES

- D Returns display control to CPC.
- S Stops test and displays PP memory on right screen.
- R Restart test over.
- {blank} Clears {+} key used for incrementing P address.
- {space} Starts test running again.



EXC COMMANDS

## KEYBOARD ENTRIES FOR EXC

TL, MN1, MN2, MN3, MN4. {CR}

Load from 2 to 4 tests specified by MNX.

CP1. {CR} {6500's only}

Sets up EXC for running CPU1 instead of CPU0.

Note: This entry must be made before the TL entry if CPU1 is to be used.

EX, Z. {CR}

Sets exchange rate Z in EXC. Z may be 0-7777.

D

Releases display to CPC {system display}.

Note: When running EXC with overlay programs {DF8, DF4, DR5, LP1, etc.} one of the following procedures should be used: Do not initially load EXC.

1. If only 1 overlay program is to be run, load it into PP1 only and then load and run EXC.
2. If CM size allows a setting of RA=100000, enter ENRA,100000.{CR} and then load and run EXC. This will allow any number of overlay programs to run.
3. Load all overlay programs sequentially from PP1. Set RA to X0000, where X = the last PP loaded. Then load and run EXC.

CENTRAL MEMORY TABLES

## TABLES

<u>CM Address</u>	<u>Contents</u>
0	Zero
1	CPU type and number of banks of memory.
2	Field length and RA.
10	PPU-1 Input register.
11	PPU-1 Output register.
12-17	PPU-1 Message buffer
20-27	PPU-2 Communication area
30-37	PPU-3 Communication area
40-47	PPU-4 Communication area
50-57	PPU-5 Communication area
60-67	PPU-6 Communication area
70-77	PPU-7 Communication area
100-107	PPU-8 {CPC} Communication area
110-117	PPU-9 Communication area
120-127	PPU-10 Communication area
130-137	PPU-11 Communication area
140-147	PPU-12 Communication area
150-157	PPU-13 Communication area
160-167	PPU-14 Communication area
170-177	PPU-15 Communication area
200-207	PPU-16 Communication area
210-217	PPU-17 Communication area
220-227	PPU-18 Communication area
230-237	PPU-19 Communication area
240	CPC display communication flag
241	0000 00CC E00U 1524 0000

↑ display code MT  
 ↑ tape unit number  
 ↑ tape equipment number  
 ↑ tape channel number

  

300-337	Channel reservation table--a non-zero value in the upper byte indicates that channel is being used. Location 300=Ch. 0, 301=Ch. 1, etc.
400-577	CPU0 exchange area
600-777	CPU1 exchange area
1000-100000	PPU1-7 and PPU9 program overlay table. 1000-7777=PP1, 11000-20000=PP2, 21000-30000=PP3, etc.

PPU SERVICE ROUTINES

PSP  
KEYBOARD ENTRIES

MXXX {CR}

Changes display M to begin at address XXXX. M may be A, B, C or D.

EXXX {CR}

Changes A display to XXXX, B display to XXXX+100, etc.

X

Increments X display by 100. X may be A, B, C or D.

E

Increments the entire right screen fields by 400.

F

Removes or restores display.

G

Execute program starting at contents of 45.

S

Stop running program.

⌘

Set or clear sequence storing.

CM {CR}

Clear PPU memory locations 0-37 and 3000-7777.

PPX {CR}

Transfer PSP to PPX.



PMX,Y {CR}

Read 200 words from PPX at address Y,  
and display on A and B fields.

RBCE,Y,X {CR}

Read X binary cards from card reader  
channel C, equipment E, to address Y.

PBCE,Y,X {CR}

Punch X binary cards from Y on card  
punch channel C, equipment E.

CCXY,WZ {CR}

Copy cards until double EOF from card  
reader channel X, equipment Y to card  
punch channel W, equipment Z.

WCX,Y,W {CR}

Write W central memory words from PP  
address X to CM address Y.

RCX,Y,W {CR}

Read central memory {same as WC}.

WPX,N,P {CR}

Store N number of words of pattern P  
starting at address X.

To loop on a program and retain display,  
jump to address 0236 at the end of your  
program.

To execute program once and retain display,  
jump back to address 0232 at the end of  
your program.

PST  
KEYBOARD ENTRIES

S	Stops execution of program.
G	Restarts program that has been stopped.
+	Increments store address by one.
-	Decrements store address by one.
CC	Returns display to CPC.
ON	Forces memory display during program execution.
OFF	Turns off memory display.
DCNX	Disconnects channel X.
MCX	Master clears channel X.
CRXXYY	Sets card reader to channel XX and equipment YY.
CPXXYY	Sets channel XX and equipment YY for the card punch.
LPXXYY	Sets channel XX and equipment YY for the line printer.

If a program is started by entering address 21 with the starting address, the program will remain running when display control is given back to CPC by a 'CC' entry.

## PSX

PSX is a 3000 peripheral service routine designed to allow the C.E. to make alpha keyboard entries to accomplish various I/O tasks. Runs under either SMM stand-alone or AUTO mode.

### KEYBOARD ENTRIES

Entry	Function
RQCXX.	Sets up PSX to use channel XX. This must be the first I/O entry word.
RLCXX.	Releases channel XX to SMM for use by another PPU.
FCHX.	Functions the channel/bb8] with function X.
CONX.	Connects equipment on requested channel. X=connect code. {A}=bb8] status.
FNCX.	Functions equipment with function X. {A}=bb8] status.
OUTX.	Outputs X number of words from location 7000. X may be 1-1000. {A}=equipment status.
INPX.	Inputs X number of words to location 6000. 1500 read mode is used. X may be 1-1000. {A} = equipment status.
INRX.	Inputs X number of words to location 6000. 1400 read mode is used. X may be 1-1000. {A} = equipment status.
EST.	Takes equipment status and displays on left screen E=XXXX. {A}= equipment status.
CST.	Takes bb8] status and displays on left screen C=XXXX. {A}=bb8] status.
IO.	Transfers input buffer to output buffer area.
PXXXX.	Sets P address of PPU to XXXX.
MFXX.	Sets right screen memory display field F to XX times 100. F may be A, B, C or D.
ENT>F>L>X.	Sets X in PP memory from location F to location L.
XXXX.	Sets XXXX in PP memory at current P address.
D	Release display to SMM {CPC}.

G	Start program {which is in test mode} and make one pass starting from location 5000.
SPACE	Start program {which is in test mode} from location 5000 and run until S key is depressed.
S	Stop program running in test mode.
T	Set test mode.
{CR}	Set repeat entry flag.
Blank {55}	Clear test mode flag and reset P address to 5000.

#### OPERATION

If test mode is not set all I/O entries are executed as they are entered.

bb&l status {C}, {E} equipment status and the current {P} address are displayed at all times.

If test mode is set all I/O entries are stored in the current P address area {5000-5777} and not executed until a G or a space is entered. P is automatically updated for each entry made. Octal entries {XXXX.} may be mixed with I/O entries or they may be the only entries used.

Locations 20-b7 and locations 5000-5777 are reserved for operator use.

Locations 6000-6777 are reserved for the input buffer. If no input operation is to be performed this area may be used to store a program.

Locations 7000-7777 are reserved for the output buffer. If no output operation is to be performed this area may be used to store a program.

#### EXAMPLE

One wishes to read cards from card reader on channel 12, equipment 4 and punch the card on card punch channel 12, equipment 5 and output the card on line printer channel 11, equipment 6. Enter the following:

Entry	Description
T	Set test mode.
RQC12.	Sets up PSX to use channel 12.
CON4000.	Connects card reader.
FNC1.	Sends function 1 to card reader.
INP120.	Inputs 1 card.
I0.	Transfers input buffer to output buffer.
CON5000.	Connects card punch.
FNC1.	Sends function 1 to card punch.
OUT120.	Outputs 1 card.
RLC12.	Releases channel 12 to SMM.
RQC11.	Sets up PSX to use channel 11.
CON6000.	Connects line printer.
OUT104.	Outputs 1 line {1 card}.
RLC11.	Releases channel 11 to SMM.
SPACE	Starts program running until S key is depressed.

To use MODE I connect and function, set location 1500=0020. To wait not busy before sending a function to the equipment, set location 1663=XXXX. Where XXXX = the wait count in seconds.

Any channel error encountered while doing an I/O operation will be displayed in the standard PSIO format.

If a channel error exists, during a run in test mode, you may start the program over by a °G° or space or continue on by releasing the display to CPC and typing X.G0. Where X=PPU that PSX is running in.

The SCOPE/MACE version of PSX operates in the same fashion as the SMM version with the following exceptions:

Only the display may be assigned to the control point. °D° entry will release the display to the system. Any channel error will abort PSX. If peripherals are to be used, they must first be turned off, also the entry °RQCX.° must be used before the program and °RLCX.° must be the last entry.

PSX may be called in by job cards or DIS. No central memory is used.





CPU TESTS

## CTL

CTL is divided into two test phases, a quick look and a command test.

### PART ONE {CTLQL}

Exchange package can be changed in the normal manner.

#### KEYBOARD ENTRIES

SSE or CSE	Set or clear error stop
SSS or CSS	Set or clear section stop
SST or CST	Set or clear test stop
SSC or CSC	Set or clear conditional stop
SRS or CRS	Repeat section
SRT or CRT	Repeat test
SRC or CRC	Repeat conditions
T	Set or release TEST MODE {eliminates the display}
BC	Bypass CTLQL and begin CTLCM
SPACE	Resume test
CPUD/CPU1	Select CPUD/CPU1 {6500's}
D0,XXXX	Change display field 0
D1,XXXX	Change display field 1
D2,XXXX	Change display field 2

### PART TWO {CTLCM}

Uses same entries as Part 1 except for:

SRU or CRU	Repeat unit or sequence
SSU or CSU	Set or clear unit stop

#### KEYBOARD ENTRIES FOR RUN MODES

RUN	Stops only on selected stops
BKP,X.	Normal breakpoint at X.
BKPC,X	Exchanges from the output package to the next breakpoint address X.
TST,X	Runs to X and restarts with input exchange package.
EXCH,X	Changes input exchange address to X {only 1260 and 1300 can be used}

## RAN

Random instruction CPU test, with a ten word instruction loop.

Field length	1200
Error halt	567
Address of failing register	263
Failing fast loop	403
Slow loop starts at	615
Slow loop answers	1000
Fast loop answers	1020
Register results	1040
Pass counter	266
Error counter	265
Compare Difference	260
Fast loop result	261
Slow loop result	262
Fast loop pass counter	232

To Loop After Error Occurs:

```
267,1. {CR}
ENB1,0. {CR}
ENP,173. {CR}
SPACE
```

To continue after error

```
267,0. {CR}
ENP,224. {CR}
SPACE
```

FST

*C DISPLAY*

Uses same instructions and operands as RAN, but has optimized generating and error checking routines.

Field length	500
Error halt	213
Failing fast loop	250
Slowloop starts at	371
Slow loop results	300
Fast loop results	320
Compare Difference	270
Slow loop result	271
Fast loop result	272
Address of slow loop result	273
Address of fast loop result	274
Error count	275
Pass count	276
Repeat flag	277

To Loop After Error:

ENP,214. {CR}  
SPACE

To continue after error

ENP,214. {CR}  
277,0. {CR}  
SPACE

The number of times the fast loop is run, can be changed from 40, by changing:

Loc. 51 = 7170X XXXXX 46000 36623  
where XXXXX is the new count.

An option exists which allows fast generation of random numbers. To use, enter pass count of error in location 276 {right justified}, and ENP,226. Start FST and it will generate the instructions for that pass and then loop on those instructions. To continue with further pass counts, clear location 277.

ALS

This is a random instruction program whose primary purpose is to check the stack and the scoreboard. The main program is contained in addresses 03-15. It consists of return jumps to various subroutines.

03	RJ to random number generator
04	Instruction sequence scanner
05	Set up register for fast loop
06	Execute fast loop
07	Store results
10	Set up register for slow loop
11	Execute slow loop
12	Store answers
13	Check answers
14	Loop repeat checker
15	Pass counter
224	Error stop
403-407	Instruction sequence
414	Pass counter
415	Error counter

1000-1017 Initial register contents  
 1020-1037 Answer difference  
 1040-1057 Fast loop answers  
 1060-1077 Slow loop answers

To Loop on Error:

ENP,225.{CR}  
 SPACE

To Restart after Error:

ENP,227. {CR}  
 SPACE

CT3

Random instruction test with simulation.  
 Under SMM the error option must be set to a 1  
 or 2. {Address 5}

PARAMETERS

<u>Address</u>	<u>Significance</u>
2=00-00	Use program supplied number to generate random numbers.
=XX-XX	Use XX-XX as the number to generate random numbers.
3=00-00	Use central simulator {SMM}.
=00-01	Use PP simulator {MACE,SCOPE}.
4=00-00	Use 5 as the length of the random loop.
=00-XX	Use 00-XX as the length of the random loop {1-??}.
5=00-00	Dump errors in dayfile.
=00-01	Stop on error.
=00-02	Loop on failure.
6=00-00	Run once through the loop and check for failures.
=00-01	Run a double pass through loop {to check bb00 stack} before answers are checked.
7=00-00	Do not use this option.
=00-XX	CT3 will generate instructions for pass XX and then loop on them.

10=00-00	Do not optimize.
=00-01	Optimize result registers in the random loop.
11=00-00	Execute random loop 1 before generating new operands.
=00-XX	Test random loop XX times {1-??}.
12=00-00	Use all instructions in random loop.
=00-01	Use only instructions in locations 13-4b.
=00-02	Do not use instructions in 13-4b.
13-4b	Contains fm code of the instructions to be used or not used {b bits only}.
600	Failing loop
7b0	Register difference
7b1	Simulated register difference
7b2	Machine result register
7b3	Address of simulator result
7b4	Address of machine result
7b5	Error counter
7b6	Pass counter
1000-1017	Simulated results
1020-1037	Machine results
1040-1057	Operands used by random loop
1060-1077	PP simulator results
2304-2345	Write buffer area
234b	Error stop

To Loop on Error {if loop on error not set}:

```
ENP,2347. {CR}
SPACE
```

Go generate a third set of answers using the PP simulator:

```
ENP,2352. {CR}
RCP.
```

To continue after error:

```
ENP,2350. {CR}
RCP. or SPACE
```