NDRO DESCRIPTION

GENERAL

Bootstrap Switch Positions

- 0 Load Failure Program
- 1 Magnetic Tape Bootstrap (1240/1540)
- 2 Paper Tape Bootstrap (1232/1532)

Manual Auto Rec Sw

- Manual - For Selected Bootstrap Ref when Depressing Start
- Auto Rec - Causes Selected Bootstrap Ref on Class II Illegal Instruction Interrupt

Memory Allocations (NDRO) octal

0-144	Paper Tape - Mag Tape Bootstrap	
145-177	Class I Interrupt Analysis	
200-345	Processor Test	Load Failure Program
346-615	IOC Test	
616-657	Memory Test	
660-751	Interface Test	
777	Auto Recovery Jump	

May Enter Any NDRO Program By Selecting Bootstrap Bit in ASR and S7

CLASS I INTERRUPT ANALYSIS

Hardware Entered for All Class I Interrupts if Class I Lockout is Cleared

If ICW4 = 0 (CM ADDR 154)
Program will 4-STOP P=161
If ICW4 ≠ 0 and Bit 2^0 ISC = 0 (Memory Resume Condition)
Test Alternate Recovery Location
If Non Zero Exit to ALTR
If Zero Exit to ICW4 - 1
If ICW4 ≠ 0 and Bit 2^0 ISC ≠ 0 (Non Memory Problem)
Exit to ICW4-1

Bootstrap Program Options (Mag Tape/Paper Tape)

Program Modifications Avail By Making Entries at 6-STOP

- A3 Channel Number
- A4 Program Entrance Addr if Different From Loading
- S1 Program Load Addr Modification
- S6 Bootstrap Working Area

Select STOP-7 For Stop After Good Checksum Load
STOP-4 Indicates Checksum Error or Improper 176 on Paper Tape

After A Good Load

- S0 = 0
- A0 = 0
- S1 = Load Addr Modification
- S3 = Entrance Addr of Prog. P Relative to S3
- S2 = Final Addr Input

MEMORY TEST

This program will test and clear a 16K memory.
PARAMETER ENTRIES
Start Address MTEST+1 P=617
Select Bootstrap bit in ASR and S7
Select return address in B3
Select base address of memory to be tested in S1

- S1 = 0 for BANK 0
- S1 = 40000 for BANK 1
- S1 = 100000 for BANK 2

Select STOP 5 for error stop
Select STOP 6 to stop after one run
At error 5-STOP

- B4 = Error Count
- B5 = Error Address

INTERFACE TEST

This program tests the O Buss, I Buss, CP-IOC, IOC-DRO. This is a looping test.
PARAMETER ENTRIES
Start Address SSA+1 P=661
Select Bootstrap bit in ASR and S7
Select STOP 5 for error stop
Select STOP 6 for terminating test
Select memory to be tested in S1
Error 5-STOPS indicate:

- B5 = 101 - O Buss failure
- B5 = 102 - I Buss failure
- B5 = 103 - CP-IOC failure
- B5 = 104 - IOC-DRO failure

MANUAL PROGRAM LOADING PROCEDURES FROM IOC

Store the appropriate loading program in memory, Set CAR to starting address Ø, select SEQ MODE, MON CHAIN, and RUN modes.

TO MANUALLY STORE LOAD INSTRUCTIONS FROM IOC:
Clear IOC; select SEQ MODE; SEL2; CAR to start address Ø, set first IOC word in DIRL and DIRU, SEL2 select MON CHAIN, REQ STORE and depress IOC START.

TO STORE ADDITIONAL WORDS
Select REQ STORE, set next word in DIRL and DIRU and depress IOC START.

LOAD PROGRAMS:

Paper Tape						
Addr.	0	10	1	(CH) 00	000001	Input ½ wd addr 1
	I	(Final)			(Initial)	Buffer area.
Mag Tape						
Addr.	0	12	0	(CH) 01	000002	Read EF.
	1	10	3	(CH) 00	000003	Input full words.
	2			000000	003511	Mag tape EF word.
	3	(Final)			(Initial)	Buffer Area. Adjust
					(Initial)	for two Buffer words.

FOR PAPER TAPE LOAD:
Position tape at start addr 9 frames past 176 Code.
Select READ and START READ.

FOR MAG TAPE LOAD:
Rewind tape and SELECT mag tape transport.

Load Failure Analysis

Before selecting Load Failure Programs, change the bootstrap working memory S6 and the program loading memory S1 to another memory module at the bootstrap 6-STOP. If a successful bootstrap load results, the initially selected memory or interface was bad.

Processor Test

Select bootstrap position 0, manual switch, program breakpoint, and STOP-7.
Select STOP-6 if this option was used for the bootstrap attempt.
Select STOP-7.
Execute program START.
If STOP-6 was selected, make the normal bootstrap parameter entries at the stop, release the manual switch and RESTART.

Program Options

7-STOP - Processor is OK. Continue with IOC Test.
4-STOP or Hang Up condition indicates a non-IOC failure and the CP Diagnostic should be loaded manually with the IOC.

IOC TEST

Select STOP 5 for error STOP.
Select STOP 7.
Position program tape in reader or select mag tape unit.
Execute program START.

Options

A 7-STOP will indicate a good load.
Error 5-STOP will indicate the following conditions:

P = 373	No Communication with IOC
P = 374	CP-IOC Interrupt Code Resume
P = 375	LIM Does Not Work
P = 401	HSIM Does Not Work
P = 402	CP-IOC Interrupt Code Resume
P = 404	CP-IOC Resume on HSTC
P = 420	No RTC
P = 425	CP-IOC Interface (Data) Error
P = 432	CP-IOC Interface (Data) Error
P = 463	IOC Memory Interface (Data) Error
P = 464	Illegal IOC Instruction (Data) Error
P = 467	CP-IOC Resume on IO Instruction
P = 474	IOC-Memory Resume Error (Wrong Bank)
P = 475	IOC-Memory Resume Error (Right Bank)
P = 543	Class I During Bootstrap
P = 571	First Frame (PT) Not 0176
P = 601	Timeout During Bootstrap
P = 614	Checksum Error (Control Words Wrong)
P = 615	Checksum Error (Control Words Right)
P = 616	Spurious Class III Interrupt