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E-160-972

ESF LOAD SEQUENCER

DESIGN DEMONSTRATION TEST REPORT

for
Balance of Plant Engineered
Safety Features Actuation System
Contained in
Arizona Nuclear Power Project
Palo Verde Nuclear Generating Station
Units 1, 2, and 3
Purchase Order 10407-13-JM-104

FOR APPROVAL

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Project 2192

GENERAL ATOMIC

February 1981

BECHTEL LOG #13-10407-J104-85-1

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NOTICE

Throughout this document, engineering drawings have drawing numbers that are alphanumeric (e.g., ELE 281-0900) or numeric (e.g., 0281-0900). For simplicity, references to such engineering drawings are generally made by numeric drawing numbers only.

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TABLE

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1. OBJECTIVE

The objective of the design demonstration test is to verify that the design of the ESF load sequencer permits no credible common failure modes to exist in response to credible input perturbations and series of events. The ESF load sequencer is a module in the Balance of Plant (BOP) Engineered Safety Features Actuation System (ESFAS) supplied by General Atomic Company (GA) to the Palo Verde Nuclear Generating Station under Arizona Public Service Company Purchase Order 10407-13-JM-104 and Bechtel Power Corporation Specification 13-JM-104.

The purpose of this test report is to show that the data from the design demonstration test adequately verify that the BOP ESFAS equipment performs as desired. The criteria used to perform this test are the test events specified in the General Atomic test procedure (dwg 0342-0063, Rev. A) attached.

2. TEST DATA AND RESULTS SUMMARY

The design demonstration test was performed on BOP ESFAS equipment for Unit 2 of the Palo Verde Nuclear Generating Station (for a list of the equipment tested, see Table 1). The test procedure was created by GA specifically as a guide for the required design demonstration test; it specifies both the input sequence and the expected equipment response for each test. The data from this test are supplied as appendices to this report. Appendix A is the annotated test procedure with inserts of input sequencer (Encoder Products Co. EPC-7101) programming sheets for each test. Appendix B is a duplicate set of annotated multi-pen recorder runs that verify both the inputs applied to the BOP ESFAS equipment and the output contact response of relays driven by the ESF load sequencer. Each run shows the real operating times (where 5 sec of real operating time is recorded as 1 in.), mode transfer, load shed, and sequencer reset actuations.

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TABLE 1
BOP ESFAS EQUIPMENT TESTED
FOR PALO VERDE NUCLEAR GENERATING STATION UNIT 2

Component Subassembly	A-Train Cabinet Assembly 2-J-SAA-C02A (GA dwg ELE 342-1000)	B-Train Cabinet Assembly 2-J-SAB-C02B (GA dwg ELE 342-2000)
Function	Serial No.	Serial No.
FBEVAS module (GA dwg ELD 342-5000)	6938-0016	6938-0015
CREFAS module (GA dwg ELD 342-5000)	6938-0019	6938-0014
CPIAS module (GA dwg ELD 342-5000)	6938-0011	6938-0008
LOP/LS module (GA dwg ELD 342-5200)	6942-0005	6942-0009
CRVIAS module (GA dwg ELD 342-5300)	6945-0005	6945-0004
DGSS module (GA dwg ELD 342-5100)	6940-0008	6940-0010
ESF load sequencer/ autotest module (GA dwg ELD 342-5400)	6948-0006	6948-0009
Isolator assembly (GA dwg ELD 342-7100)	6936-4	6936-7
Power supply assembly (GA dwg ELE 342-1100)	-04	-05

To test the equipment, two test setups were used.

1. For those inputs not part of the test, the field-initiated contact inputs for both the A-train and the B-train were simulated by using static test switch inputs.

2. For those inputs that were part of the test, the field-initiated contact inputs for both the A-train and the B-train were simulated by using contact expansion relays driven by the external programmable input sequencer.

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Those inputs of interest are the safety injection actuation signal (SIAS), auxiliary feedwater actuation signals (AFAS-1 and AFAS-2), the control room essential filtration actuation signal (CREFAS) manual initiation, the control room ventilation isolation actuation signal (CRVIAS) manual initiation, the fuel building essential ventilation actuation signal (FBEVAS) manual initiation, the diesel generator running signal (DG RUN), two of the four ESF bus undervoltage signals (U/V-1 and U/V-2), and the diesel generator breaker closed signal (DG BKR) as driven by the external programmable input sequencer. In both test setups the logic cabinets (A-train and B-train) were interconnected with their normal cross-logic signals.

For a diagram of the overall test configuration, see Appendix A (specifically, page 1 of the insert following page 5 of GA dwg 0342-0063, "Test Procedure"*).

The external programmable input sequencer controls the timed inputs (10 functions) to the system under test. These timed inputs are expanded and isolated through 17 contact expansion relays as follows:

1. The 17 contacts, one from each relay, simulate the actuation input signals that the BOP ESFAS equipment needs. Ten of these signals are for the A-train cabinet assembly and seven are for the B-train cabinet assembly (only the A train received undervoltage and DG BKR closure inputs).

2. Other contacts simulate the input reference transfers for each event recorder. Recorders one and three each received nine reference inputs (missing was U/V-2 which was not used as an input to the recorders but was used as an input to the equipment under test). Recorders two and four each received all 10 input reference signals. These reference signals are used to time-

*GA dwg 0342-0063 is hereafter referred to as the "reference test procedure."

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correlate the monitored sequencer output actuation signals for each recorder. Recorders one and two were connected to the A-train outputs, and recorders three and four to the B-train outputs.

For a diagram of the recorder channel assignments, see Appendix A (specifically, page 2 of the insert following page 5 of the reference test procedure). The interconnections between the EPC-7101 programmable input sequencer, the contact expansion relays, the event recorder, and the BOP ESFAS logic train cabinet input interface are shown in Appendix A (specifically, pages 3-6 of the insert following page 5 of the reference test procedure). The interconnections between the sequencer actuation outputs and the event recorders are shown by coupling the data on outputs (see Appendix A, Table 2) to the recorder channel assignments referenced above. Output channel assignments and cabinet connections are specified in Appendix A (see the three-page insert following page 7 of the reference test procedure).

Mode transfer and entry-and-exit conditions for the ESF load sequencer are diagrammed in Fig. 2 of the reference test procedure. The ESF load sequencer output actuation timing expected for each of the four operational design modes is shown in Figs. 3 through 6 of the reference test procedure.

A list of the credible input perturbations and the series of events postulated for the load sequencer are on pages 13 through 15 of the reference test procedure. The list constitutes the scenario by which the design demonstration tests were conducted.

Three basic groups (or classes) of tests were performed on the BOP ESFAS equipment:

1. Loss of offsite power (LOP)(forced shutdown).
2. Single initiating signal.
3. Multiple initiating signals.

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The tests consisted of the following three steps:

1. Putting both logic trains in the automatic (auto) testing mode.

2. Submitting a specified series of input condition states to the logic trains. The series of input condition states were either (a) the ESF bus available state (a state that depends on bus undervoltage and/or DG BKR closure status) or (b) the state of the various ESFAS input control signals specified, such as SIAS, AFAS-1, AFAS-2, or CRVIAS.

3. Observing that the ESF load sequencer responded as predicted by observing the tracings on the event recorders.

The test input conditions and expected responses that constitute the actual test procedure are specified on pages 16 through 43 of the reference test procedure. The program coding forms follow each test specification sheet; these forms were used to program the EPC-7101 test input sequencer to generate the desired input signal transfer times. To verify that the equipment was operating properly, each event recorder run (see Appendix B) was compared to the expected ESF load sequencer actuation specified.

During tests 8A and 8B an error was noted. In these tests an initiating signal, SIAS or AFAS-1, was followed by an ESF bus undervoltage signal. The undervoltage signal occurred before the completion of sequencing which was then followed by closure of the diesel generator breaker and clearing of the undervoltage signals. The error occurred at the end of the test on the simultaneous reset of either (1) SIAS and DG BKR or (2) AFAS-1 and DG BKR. The load sequencer detected a false error during its return to the auto test mode. This detection of a false error was cleared by manually restarting the auto test from the load sequencer module front panel. The test operator determined that the false error resulted from an electronic circuit timing race. The internal circuitry for the DG BKR input is slightly slower than is the internal circuitry for AFAS-1 or for SIAS on the reset transition. The auto test feature, therefore, detected the apparent error (i.e., the existence of input signals) during the first steps of the

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automatic testing procedure. This detection of an error when none existed occurred in about 30% of the trials. To correct this problem, the time in the polling cycle at which the load sequencer examines the field input signals was reprogrammed. In essence the revised program forces a delay (about 250 msec) between the time when all system inputs return to normal state and the time when automatic testing polling cycle begins.

All BOP ESFAS units were reprogrammed and verified to be free of this problem.

During test 15A the EPC-7101 test instrument failed. It was returned to the vendor for repair on February 1, 1980. The repaired unit was returned on February 15, 1980, at which time the tests were resumed and completed.

3. CONCLUSION

The ESF load sequencer in the BOP ESFAS equipment performed successfully. Specifically, no common failure modes exist in its operation, as determined by the tests conducted and reported in this report. Therefore, under the criteria specified in Section 1, the objective of demonstrating the validity of the ESF load sequencer design was met.

APPENDIX A
ANNOTATED TEST PROCEDURE AND
INPUT SEQUENCER PROGRAMMING SHEETS

APPLICATION	
NEXT ASSY	USED ON

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
/ A	Revised per customer comments.	2/1/80	R.C. Weddle 2/1/80

REV. STATUS	REV.	/	A
OF SHEETS	SHEET	1	

RELEASE 12-20-79

DRAWN

CHECKED R.C. Weddle 12/20/79

DESIGN

ENGINEER R.C. Weddle 12/20/79

DESIGN ACTIVITY

APPD.

OC. SCHEM. NO.

DRAWING LEVEL 1

GENERAL ATOMIC COMPANY
SAN DIEGO, CALIFORNIA

TITLE TEST PROCEDURE
PVNGS ESF LOAD SEQUENCER
DESIGN DEMONSTRATION J104-85-1

SIZE	CODE IDENT. NO.	DWG. NO.
A	32334	0342-0063

SCALE REV. / SHEET 1 OF 43

DWG NO. 0342-0063

A

FORM GA1024A-1

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1. TEST OBJECTIVE

The sequencer design demonstration test is intended to verify that no credible common failure modes exist in the sequencer design in response to credible input perturbations and series of events.

The test will consist of individual functional performance tests of the loss of offsite power detection and ESF load sequencer portions of the Balance of Plant Engineered Safety Features Actuation System (BOP ESFAS). Field input contact initiations will be simulated to represent credible series of events that may occur in the power plant. System output actuations will be monitored to verify system responses.

2. GENERAL TEST ARRANGEMENT (Figure 1)

Interconnect the train A and train B BOP ESFAS cabinets to duplicate plant installation. Connect the inputs presented in Table 1 to a field input sequencer for both train A and train B. Connect a contact for each output relay presented in Table 2 to the output data recorders for both train A and train B. Also connect to the output data recorders duplicate signals from the field input sequencer for each train A and train B input. Connect all inputs to the BOP ESFAS not presented in Table 1 to their not initiated state via test box TE0027.

NOTE

After testing is completed, remove any test box connections added to simulate a closed contact input.

3. TEST PERFORMANCE

3.1. General

A. Prior to each individual test, verify that all inputs are in the not initiated state, all modules are reset, all outputs are in the not actuated state, and the ESF sequencer/auto test module is in the auto test (auto test function on) mode.

B. Redundant initiating signals (inputs (A) through (G)) are initiated to both the train A cabinet and the train B cabinet by the field input sequencer simultaneously. The undervoltage and diesel generator breaker closed signal (inputs (H) and (I)) are initiated only to the train A cabinet by the field input sequencer.

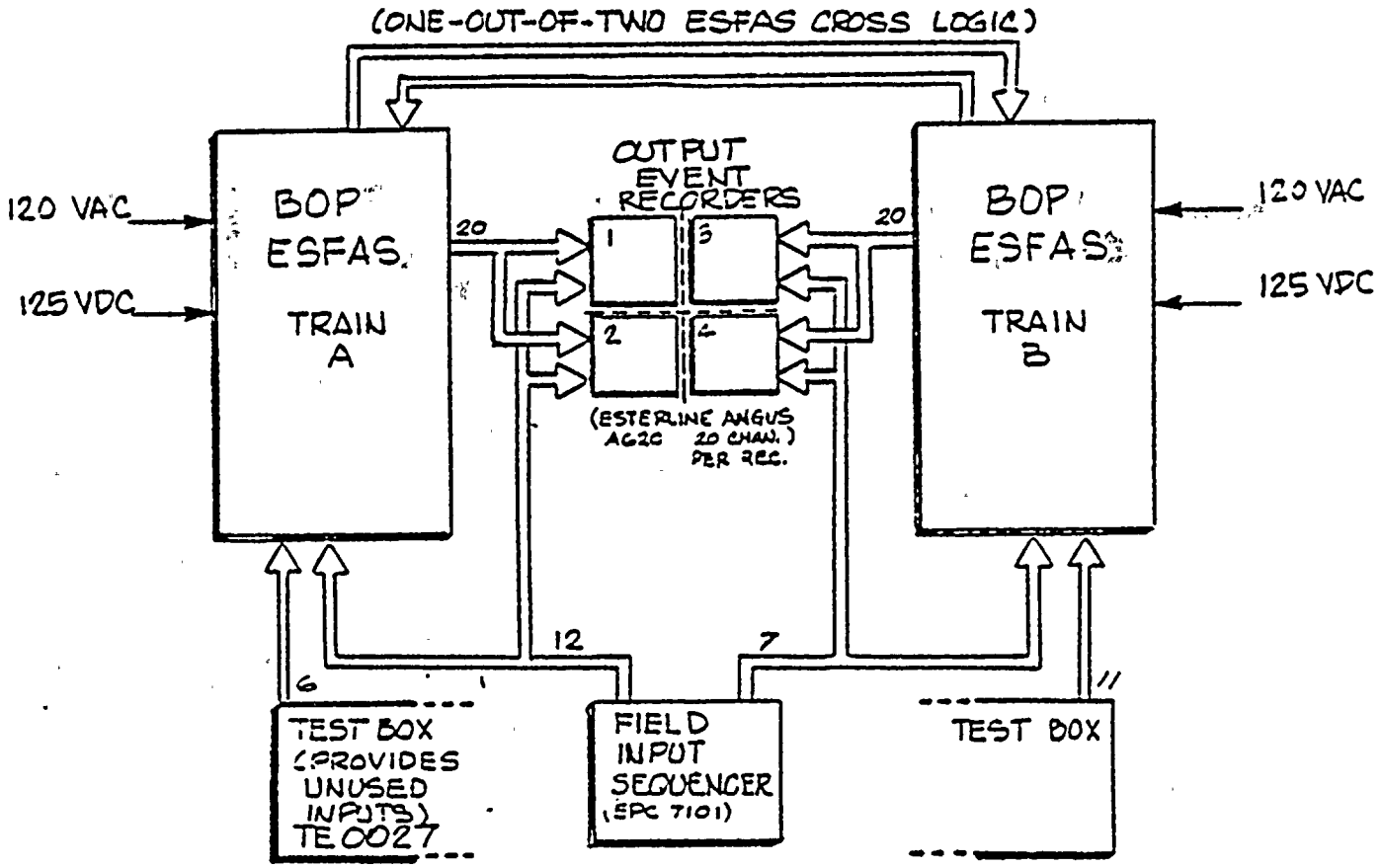

FIGURE 1.

GENERAL TEST ARRANGEMENT

J104-85-1

ECN 10-12-79

GENERAL ATOMIC COMPANY SAN DIEGO, CALIFORNIA	SIZE A	CODE IDENT. NO. 32334	~~DWG. NO.~~ PVNGS ESF LOAD SEQUENCER DESIGN DEMO. TEST CONFIGURATION
	SCALE ——	REV. /	SHEET 3 OF 43

FORM GA1024A-2

Notations in this column indicate where changes have been made

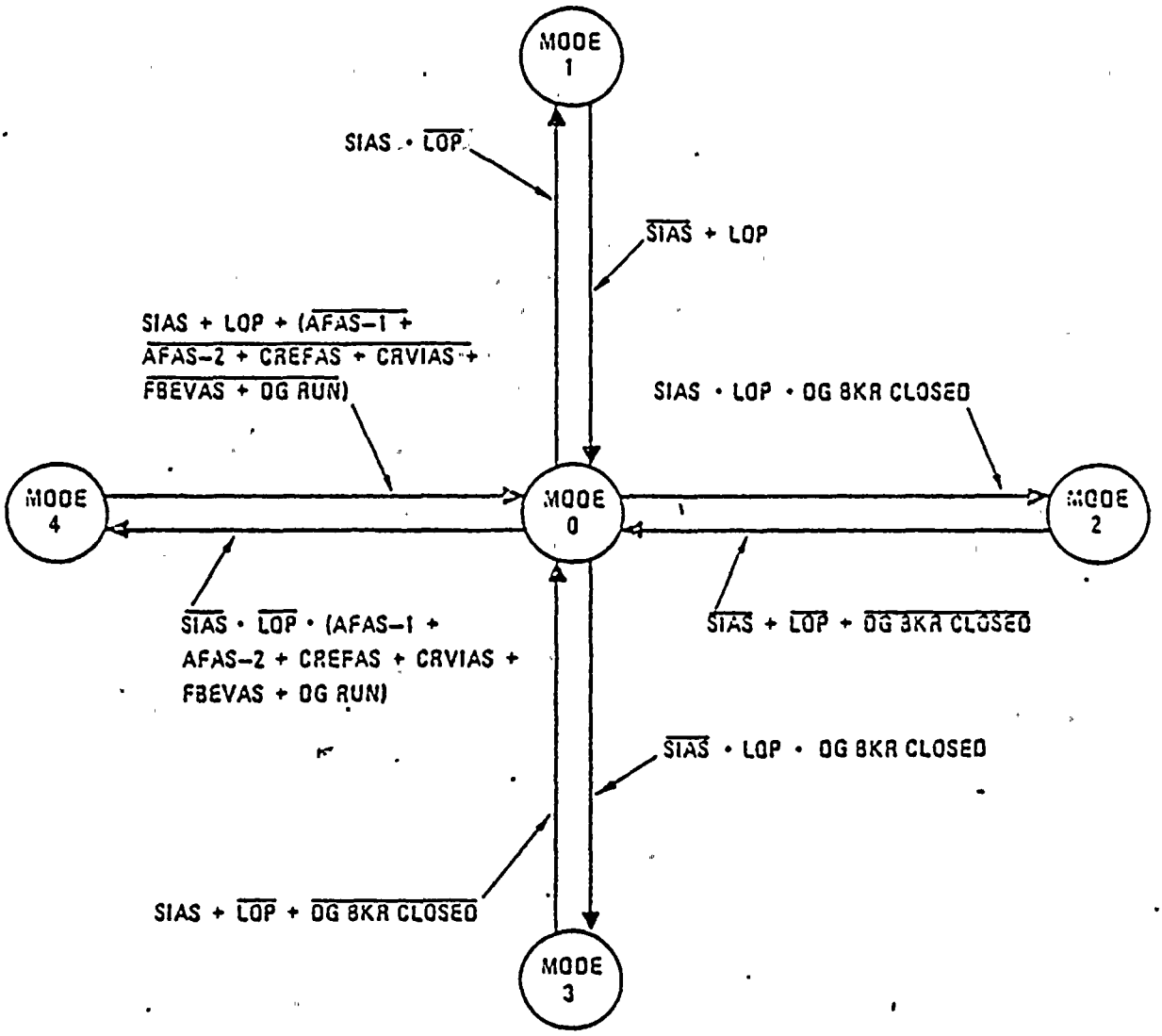

Fig. 2. State diagram showing Load Sequencer/Auto Test modes and transitions between modes

Notations in this column indicate where changes have been made

TABLE 1
INPUTS

Letter	Description	Initiated State
(A)	Safety injection actuation signal (SIAS) TB44-07, 08	Contact opening
(B)	Auxiliary feedwater actuation signal-1 (AFAS-1) TB44-9, 10	Contact opening
(C)	Auxiliary feedwater actuation signal-2 (AFAS-2) TB44-11, 12	Contact opening
(D)	Control room essential filtration actuation signal (CREFAS) manual initiation TB42-03, 04	Contact closure
(E)	Control room ventilation isolation actuation signal (CRVIAS) manual initiation TB42-07, 08	Contact closure
(F)	Fuel building essential ventilation actuation signal (FBEVAS) manual initiation TB42-01, 02	Contact closure
(G)	Diesel generator running signal TB45-03, 04	Contact closure
(H)	4 ESF bus undervoltage signals (any two out of four) U/V-1: TB43-07, 08 U/V-2: TB43-09, 10 U/V-3: TB43-11, 12 U/V-4: TB44-01, 02	Contact closures
(I)	Diesel generator breaker closed signal TB45-01, 02	Contact closure

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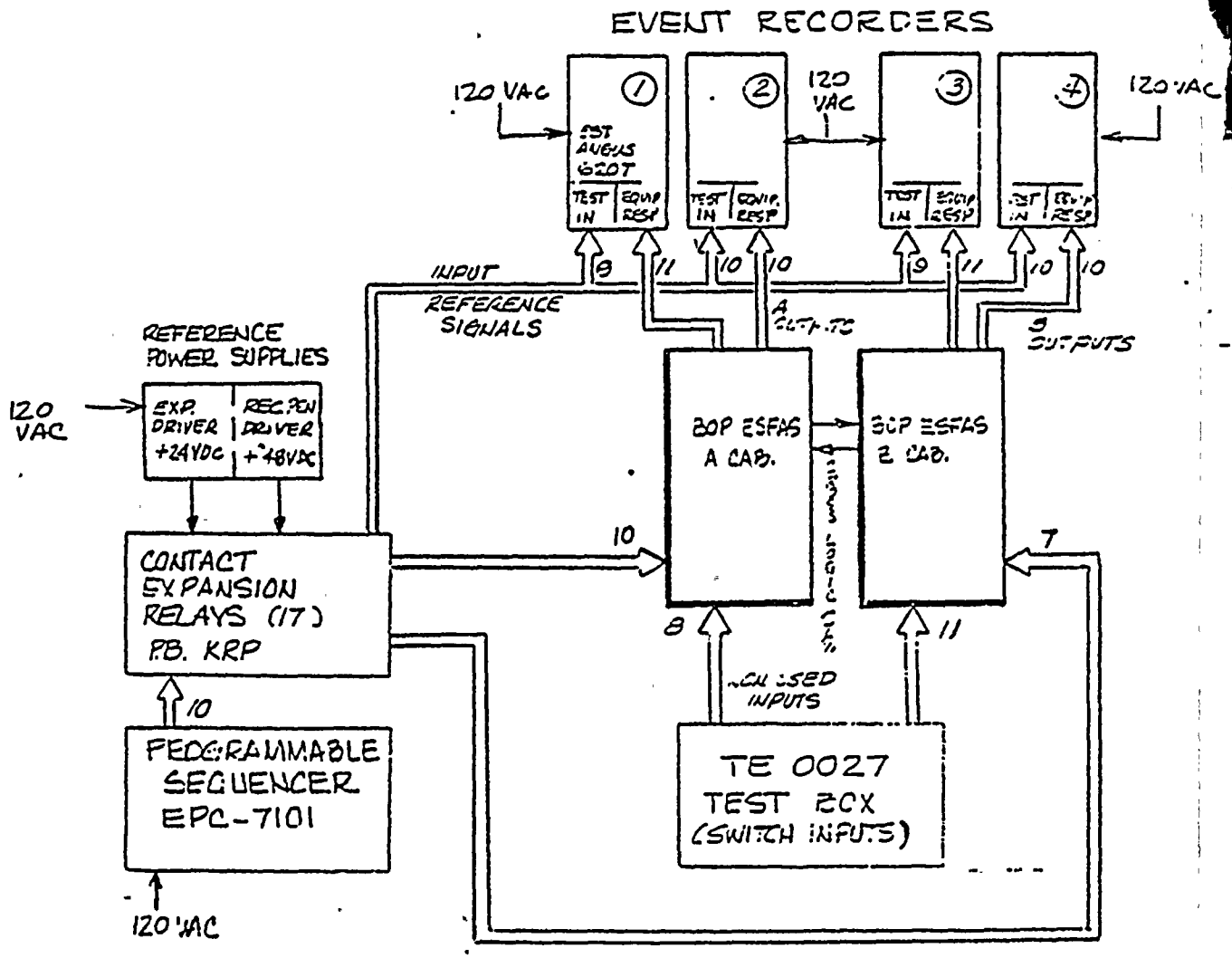
CALCULATIONS FOR NRC PROOF OF DESIGN TESTS - PVNGS BOP ESFAS			
EQUIP. NO. 342-XXXX	PROJ. NO. 2192	CALC. NO.	PAGE 1 of
PREPARED BY E.C. WEDDLE	DATE 12/28/79	REF. DOCUMENTS:	
REVIEWED BY	DATE		
APPROVED BY	DATE		

OVERALL TEST CONFIGURATION



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PROOF OF DESIGN TEST:

CALCULATIONS FOR RECORDER CHANNEL ASSIGNMENTS PVNGS BOP ESFAS			
EQUIP. NO.	PROJ. NO.	CALC. NO.	PAGE OF
PREPARED BY	DATE	REF. DOCUMENTS: 342-0063	
REVIEWED BY	DATE		
APPROVED BY	DATE		

RECORDER 1,3

INPUTS	CHANNEL 1		SIAS
		2	AFAS-1
		3	AFAS-2
		4	CREFAS MAN INIT
		5	CRVIAS " "
		6	FBEVAS " "
		7	DG RUN
		** 8	U/V-1
		** 9	DG BKR CLOSURE
OUTPUTS		10	LOAD SHED 1 (K202)
		11	LOAD SHED 2 (K204)
		12	DG START (K12A)
		13	LOP 1 (K205)
		14	LOP 2 (K205)
		15	HPSI (K125)
		16	LPSI (K126)
		17	CREAHU (K127)
		18	DG EXAFU (K128)
		19	FB EXAFU (K221)
		20	AF (K222)

RECORDER 2,4

INPUTS	CHANNEL 1		SIAS
		2	AFAS-1
		3	AFAS-2
		4	CREFAS MAN INIT
		5	CRVIAS " "
		6	FBEVAS " "
		7	DG RUN
		** 8	U/V-1
		** 9	U/V-2
		** 10	DG BKR CLOSURE
OUTPUTS		11	CS (K223)
		12	ECW (K225)
		13	ESP (K226)
		14	ESS CHL (K227)
		15	BATT CH (K232)
		16	480 LC (K233)
		17	NORM CHL (K236)
		18	CHG PMP P* (K231)
		19	CEDM MOTR* (K234)
		20	CONT NORM* (K235)

(INTERNAL B.I.D.)

** NOTE: U/V-1, U/V-2, DG BKR CLOSURE ARE APPLIED AS INPUTS TO THE A CABINET ONLY.

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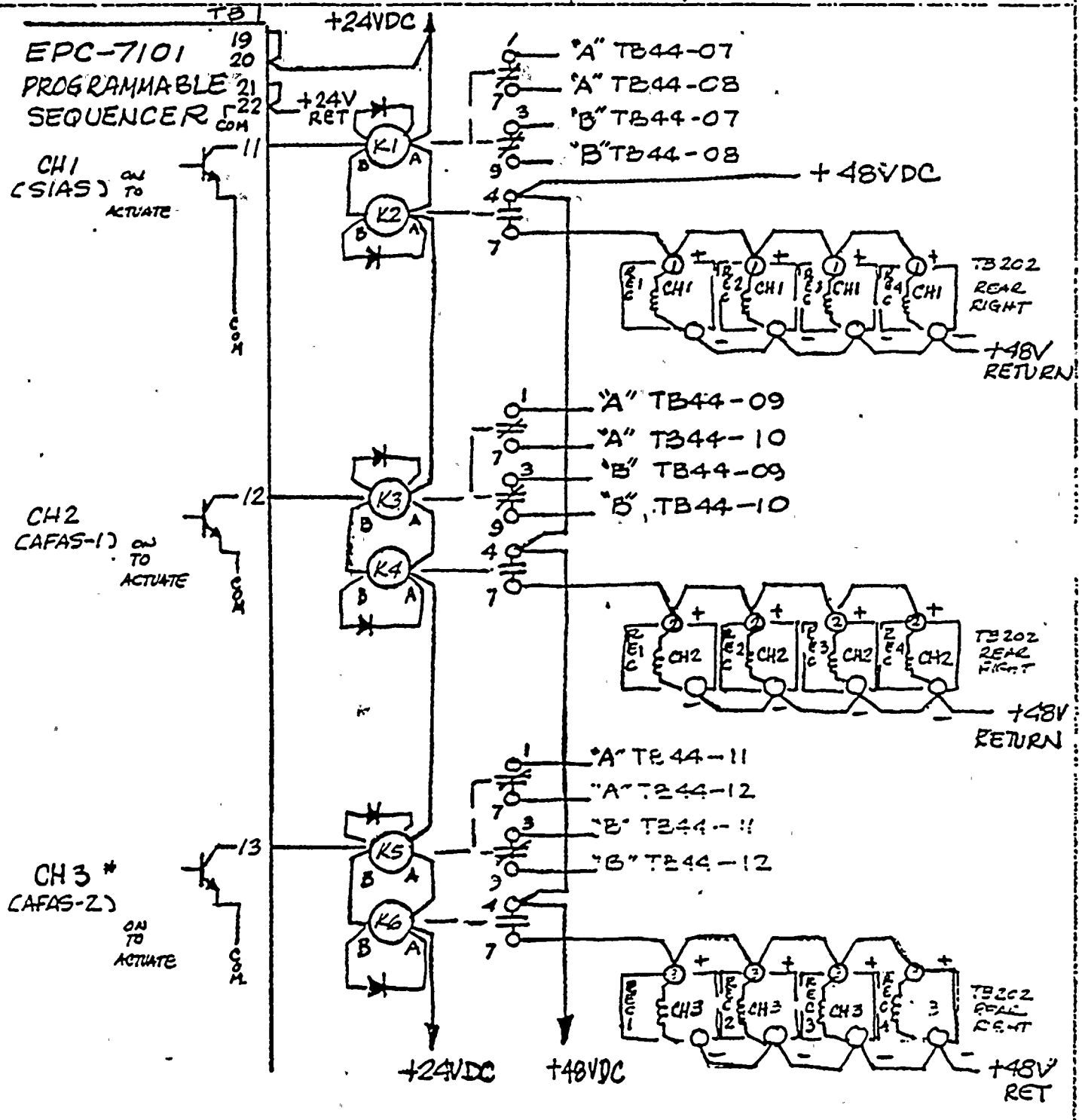
CALCULATION FOR NRC PROOF OF DESIGN TESTS: PVNGS BOP ESFAS			
JOB NO. 342-XXXV	PROJ. NO. 2192	CALC. NO.	PAGE 1
PREPARED BY R.C. WEDDLE	DATE 12/28/79	REF. DOCUMENTS: INPUT SEQUENCER/EXPANDER RELAY — CABINET INTERFACE	
REVIEWED BY	DATE		
APPROVED BY	DATE		



* FROM TEST 15B TO COMPLETION · CH3 WAS DRIVEN FROM EPC-7101 TB2 PIN 13

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GENERAL ATOMIC COMPANY

CALCULATIONS FOR NRC PROOF OF DESIGN TESTS: PVNGS BOP ESFAS

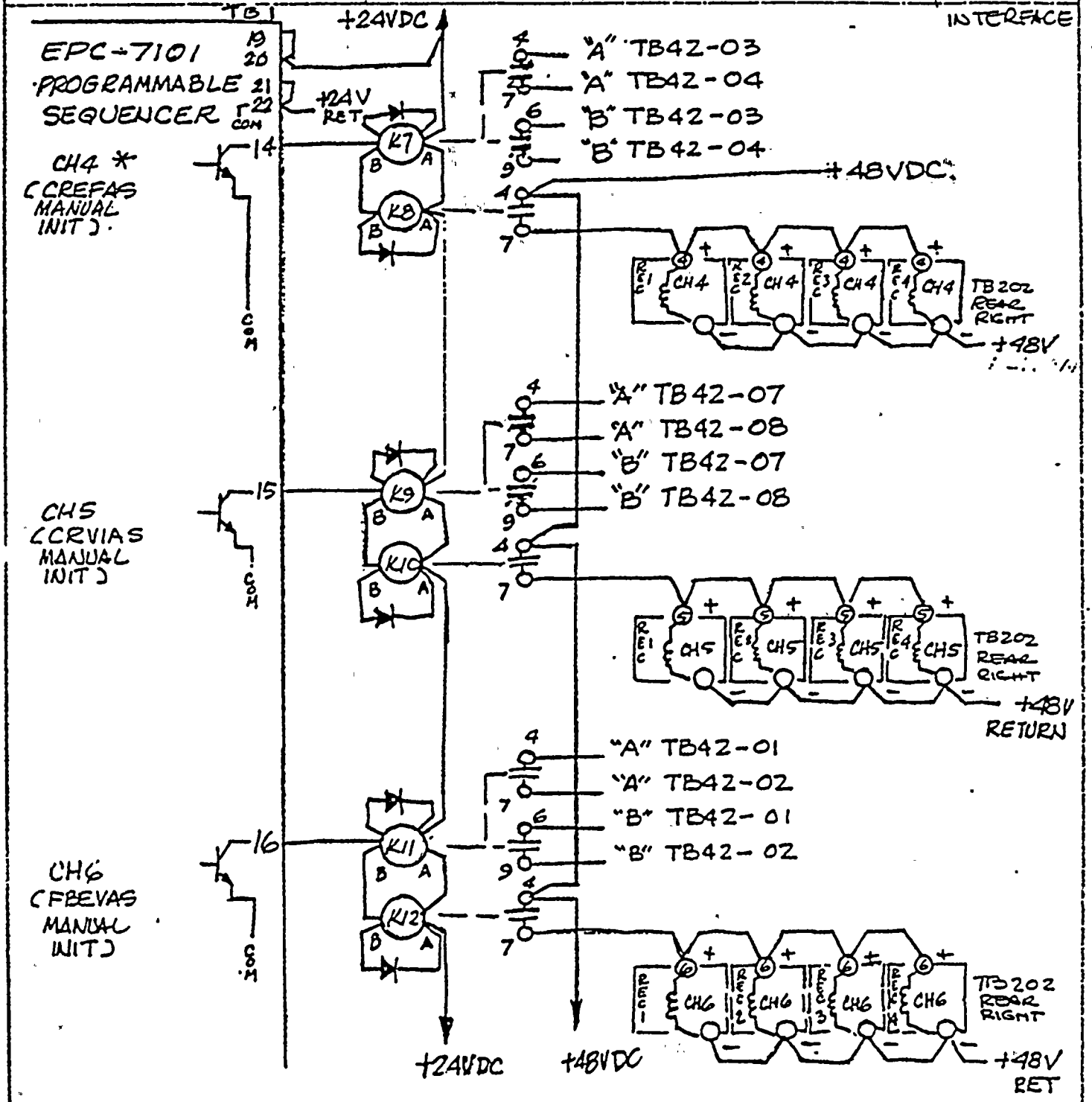
EQUIP. NO. 342-XXXX | PROJ. NO. 2192 | CALC. NO. | PAGE OF

PREPARED BY R.C. WEDDLE | DATE 12/28/79 | REF. DOCUMENTS:

REVIEWED BY | DATE

APPROVED BY | DATE

INPUT SEQUENCER / EXPANDER RELAY-CABINET INTERFACE



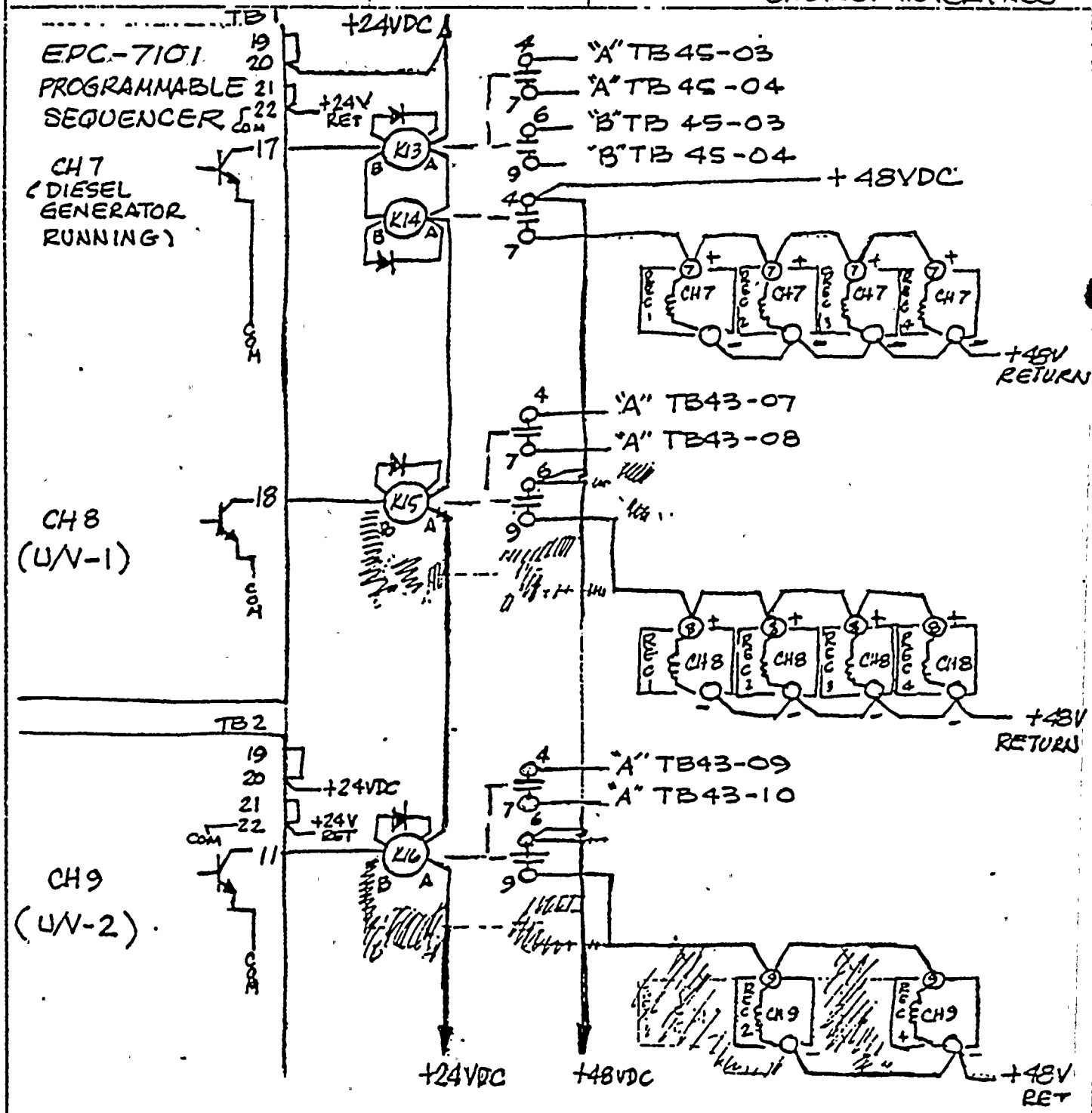
* FROM TEST 15B TO COMPLETION. CH4 WAS DRIVEN FROM EPC-7101 TB2 PIN4

J104-85-1

GENERAL ATOMIC COMPANY

PROJECT: NRC PROOF OF DESIGN TESTS: PVNGS BOP ESFAS

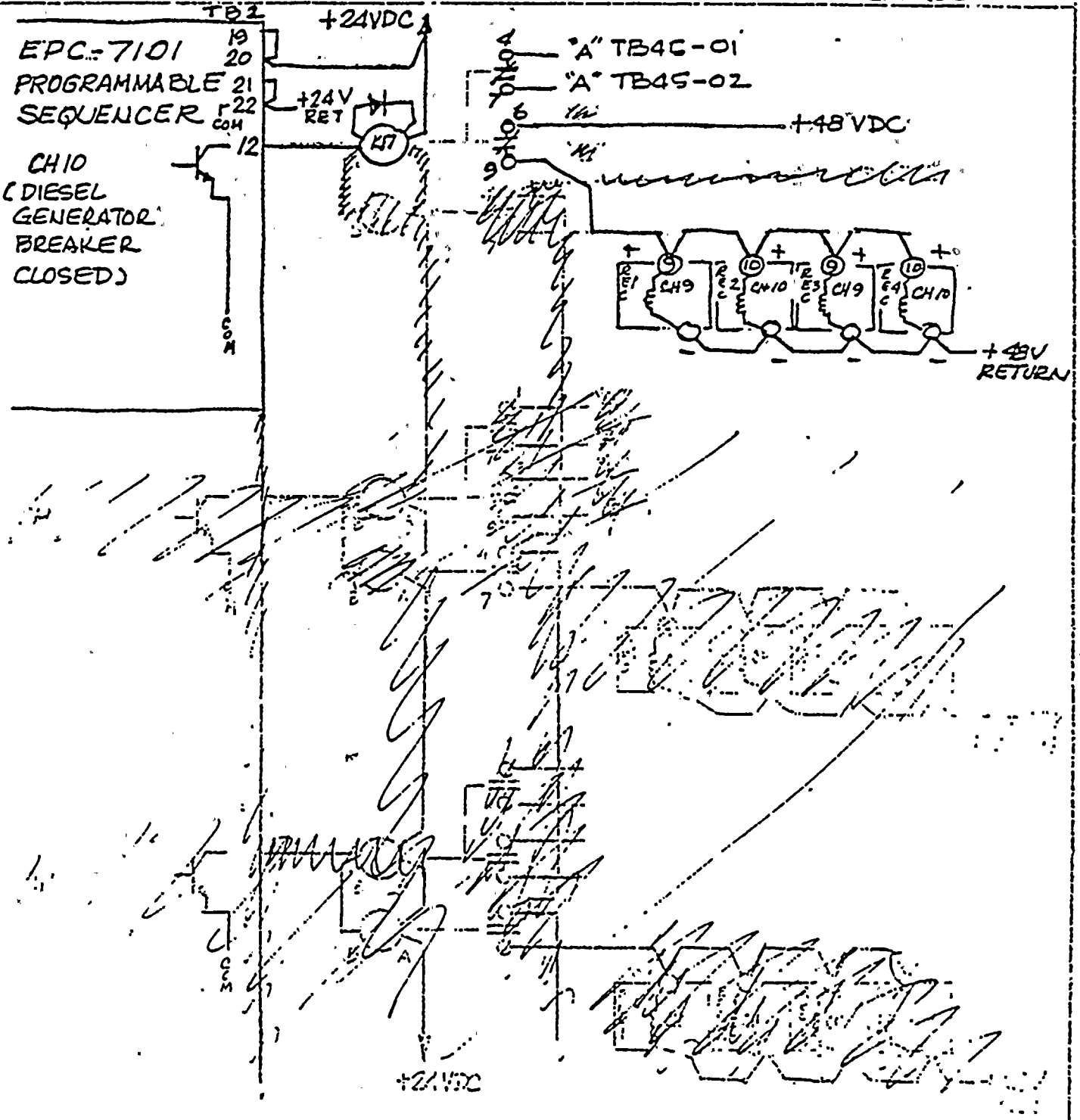
EQUIP. NO. 342-XXXX	PROJ. NO. 2192	CALC. NO.	PAGE OF
PREPARED BY R.C. WEDDLE	DATE 12/28/79	REF. DOCUMENTS: INPUT SEQUENCER / EXPANDER RELAY - CABINET INTERFACE	
REVIEWED BY	DATE		
APPROVED	DATE		



GENERAL ATOMIC COMPANY

CALCULATIONS FOR NRC PROOF OF DESIGN TESTS - PVNGS BOP ESFAS

PROJ. NO. 342-XXXX	PROJ. NO. 2192	CALC. NO.	PAGE OF
PREPARED BY R.C. WEDDLE	DATE 12/28/79	REF. DOCUMENTS: INPUT SEQUENCER EXPANDER RELAY - CABINET INTERFACE	
REVIEWED BY	DATE		
APPROVED BY	DATE		



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J1

Notations in this column indicate where changes have been made

TABLE 2
OUTPUTS

Letter	Description	Actuated State
(A)	Load shed signal (2 relays) - 1 sec pulse load shed 1: TB61-01, 02 (K202) Load shed 2: TB64-01, 02 (K204)	Relay energize
(B)	Diesel generator start signal TB77-09, 10 (K124)	Relay deenergize
(C)	Loss of offsite power signal - 60 sec off delay (2 relays) LOP1: (K203) TB66-01, 02 LOP 2: (K205) TB72-01, 02	Relay deenergize
(D)	High pressure safety injection pump start signal (K125) TB76-09, 10	Relay deenergize
(E)	Low pressure safety injection pump start signal (K126) TB76-11, 12	Relay deenergize
(F)	Control room essential AHU start signal (K127) TB77-03, 04	Relay deenergize
(G)	Diesel generator essential exhaust fan start signal (K128) TB81-01, 02	Relay deenergize
(H)	Fuel building essential exhaust AFU start signal (K221) TB 81-03, 04	Relay deenergize
(I)	Auxiliary feedwater pump start signal (K222) TB81-09, 10	Relay deenergize
(J)	Containment spray pump start signal (K223) TB82-07, 08	Relay deenergize
(K)	Essential cooling water pump start signal (K225) TB82-09, 10	Relay deenergize
(L)	Essential spray pond pump start signal (K226) TB83-09, 10	Relay deenergize
(M)	Essential chiller/chilled water pump start signal (K227) TB84-03, 04	Relay deenergize

Notations in this column indicate where changes have been made

TABLE 2 (continued)

Letter	Description	Actuated State
(N)	Battery charger/voltage regulator start signal (K232) TB85-05, 06	Relay deenergize
(O)	480 V load center breaker close signal (K233) TB86-03, 04	Relay deenergize
(P)	Normal chiller start signal (K236) TB87-11, 12	Relay deenergize
(Q)	Charging pump start permissive signal (K231) TB85-01, 02	Relay energize for specified time period (40 sec)
(R)	CEDM normal ACU start permissive signal (K234) TB87-03, 04	Relay energize for specified time period (5 sec)
(S)	Containment normal ACU start permissive signal (K235) TB87-07, 08	Relay energize for specified time period (5 sec)

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CALCULATIONS FOR NRC PROOF OF DESIGN TESTS: PVNGS BOP ESFAS			
EQUIP. NO. 342-XXXX	PROJ. NO. 2192	CALC. NO.	PAGE OF
PREPARED BY R.C. WEDDLE	DATE 12/28/79	REF. DOCUMENTS:	
REVIEWED BY	DATE		
APPROVED BY	DATE		

OUTPUT TO RECORDER CHANNEL ASSIGNMENTS:

	A CABINET	B CABINET
A	LOAD SHED 1 (K202) (1 SEC - PULSE) TB61-01 TO +48 VDC TB61-02 TO REC 1 CH 10	LOAD SHED 1 (K202) (1 SEC PULSE TB61-01 TO +48VDC TB61-02 TO REC 3 CH 10
A	LOAD SHED 2 (K204) (1 SEC - PULSE) TB64-01 TO +48VDC TB64-02 TO REC 1 CH 11	LOAD SHED 2 (K204) (1 SEC PULSE) TB64-01 TO +48VDC TB64-02 TO REC 3 CH 11
B	DIESEL GEN START (K124) TB77-09 TO +48VDC TB77-10 TO REC 1 CH 12	DIESEL GEN START (K124) TB77-09 TO +48 VDC TB77-10 TO REC 3 CH 12
C	LOP1 (K203) (60 SEC - OFF DELAY) TB66-01 TO +48VDC TB66-02 TO REC 1 CH 13	LOP1 (K203) (60 SEC - OFF DELAY) TB66-01 TO +48VDC TB66-02 TO REC 3 CH 13
C	LOP2 (K205) (60 SEC - OFF DELAY) TB72-01 TO +48VDC TB72-02 TO REC 1 CH 14	LOP2 (K205) (60 SEC - OFF DELAY) TB72-01 TO +48VDC TB72-02 TO REC 3 CH 14
D	HIGH PRESS. SAFETY INJ. PUMP START HPSI (K125) TB76-09 TO +48 VDC TB76-10 TO REC 1 CH 15	HPSI (K125) TB76-09 TO +48 VDC TB76-10 TO REC 3 CH 15
E	LOW PRESS. SAFETY INJ. PUMP START LPSI (K126) TB76-11 TO +48 VDC TB76-12 TO REC 1 CH 16	LPSI (K126) TB76-11 TO +48 VDC TB76-12 TO REC 3 CH 16
F	CONTROL ROOM ESS. AHU START CREAHU (K127) TB77-03 TO +48 VDC TB77-04 TO REC 1 CH 17	CREAHU (K127) TB77-03 TO +48 VDC TB77-04 TO REC 3 CH 17

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CALCULATIONS FOR NRC PROOF OF DESIGN TESTS: PVNGS BOP ESFAS			
EQUIP. NO. 342-XXXX	PROJ. NO. 2192	CALC. NO.	PAGE OF
PREPARED BY R.C. WEDDLE	DATE 12/28/79	REF. DOCUMENTS:	
REVIEWED BY	DATE		
APPROVED BY	DATE		

OUTPUT TO RECORDER CHANNEL ASSIGNMENTS: (CONT'D)

	A CABINET	B CABINET
G	DIESEL GEN. ESS EXH. FAN START (K128) TB81-01 TO +48 VDC TB81-02 TO REC 1 CH 18	DG ESS EXAFU (K128) TB81-01 TO +48VDC TB81-02 TO REC 3 CH 18
H	FUEL BLDG ESS. EXAFU (K221) TB81-03 TO +48VDC TB81-04 TO REC 1 CH 19	FBE EXAFU (K221) TB81-03 TO +48 VDC TB81-04 TO REC 3 CH 19
I	AUX FEEDWTR PUMP AF (K222) TB 81-09 TO +48 VDC TB 81-10 TO REC 1 CH 20	AF (K222) TB 81-09 TO +48 VDC TB 81-10 TO REC 3 CH 20
	CONTAINMENT SPRAY PUMP CS (K223) TB 82-07 TO +48 VDC TB 82-08 TO REC 2 CH 11	CS (K223) TB 82-07 TO +48 VDC TB 82-08 TO REC 4 CH 11
K	ESSENTIAL COOLING WTR PUMP ECW TB 82-09 TO +48VDC (K225) TB 82-10 TO REC 2 CH 12	ECW (K225) TB 82-09 TO +48VDC (TB 82-10 TO REC 4 CH 12
L	ESSENTIAL SPRAY POND PUMP ESP TB 83-09 TO +48VDC (K226) TB 83-10 TO REC 2 CH 13	ESP (K226) TB 83-09 TO +48VDC TB 83-10 TO REC 4 CH 13
M	ESSENTIAL CHILLER/CHILLED WTR PUMP TB 84-03 TO +48VDC ~~ESS~~ TB 84-04 TO REC 2 CH 14 CHILL (K227)	ESS CHILL (K227) TB 84-03 TO +48 VDC TB 84-04 TO REC 4 CH 14
N	BATT CHARGER/VOLT REG. BAT CH (K232) TB 85-05 TO +48 VDC TB 85-06 TO REC 2 CH 15	BAT CH (K232) TB 85-05 TO +48VDC TB 85-06 TO REC 4 CH 15

GA 268 Rev. 1-74

GENERAL ATOMIC COMPANY

CALCULATIONS FOR NRC PROOF OF DESIGN TESTS: PVNGS BOP ESFAS			
EQUIP. NO. 342-XXXX / PROJ. NO. 2192		CALC. NO.	PAGE OF
PREPARED BY R.C. WEDDLE	DATE 12/28/79	REF. DOCUMENTS:	
REVIEWED BY	DATE		
APPROVED BY	DATE		

OUTPUT TO RECORDER CHANNEL ASSIGNMENTS: (CONT'D)

	A CABINET	B CABINET
O	480 V LOAD GR BKR CLOSE (K233) TB 86-03 TO +48 VDC TB 86-04 TO REC 2 CH 16	480 LC (K233) TB 86-03 TO +48 VDC TB 86-04 TO REC 4 CH 16
P	NORMAL CHILLER (K236) TB 87-11 TO +48 VDC TB 87-12 TO REC 2 CH 17	NORM CHL (K236) TB 87-11 TO +48 VDC TB 87-12 TO REC 4 CH 17
Q	CHARGE PUMP PERMISSIVE (K231) TB 85-01 TO +48 VDC opens FOR 40 SEC TB 85-02 TO REC 2 CH 18	CHG PMP (K231) TB 85-01 TO +48 VDC TB 85-02 TO REC 4 CH 18
R	CEDM NORM ACU PERMISSIVE (K234) TB 87-03 TO +48 VDC opens FOR 5 SEC TB 87-04 TO REC 2 CH 19	CEDM NORM (K234) TB 87-03 TO +48 VDC TB 87-04 TO REC 4 CH 19
S	CONT NORM ACU PERMISSIVE (K235) TB 87-07 TO +48 VDC opens FOR 5 SEC TB 87-08 TO REC 2 CH 20	CONT NORM (K235) TB 87-07 TO +48 VDC TB 87-08 TO REC 4 CH 20

Notations in this column indicate where changes have been made

C. Initiate the field inputs using the field input sequencer as defined by the test timing diagrams initiating events. Times are specified in seconds and are to be within ±0.1 second. Times not specified are arbitrary.

D. Record inputs and outputs on the output data recorders. The required accuracy is ±0.1 second.

Notes for Test Timing Diagrams

1. Times shown are in seconds.

2. Sequencer modes are defined as follows:

(1)	SIAS without LOP	$SIAS \cdot \overline{LOP}$
(2)	SIAS with LOP and DG breaker closed	$SIAS \cdot LOP \cdot DG\ BKR$
(3)	LOP and DG breaker closed without SIAS	$\overline{SIAS} \cdot LOP \cdot DG\ BKR$
(4)	(AFAS-1 or AFAS-2 or CREFAS or CRVIAS or FBEVAS or DG running) without SIAS and without LOP	$\overline{SIAS} \cdot \overline{LOP} \cdot (AFAS\text{-}1 + AFAS\text{-}2 + CREFAS + CREVIAS + FBEVAS + DG\ RUN)$

Mode 4 sub-sequence outputs are developed by logically AND gating the timed outputs with the initiating signals for each actuated device

NOTE

The actual output time responses associated with each of the four modes (1), (2), (3), and (4)) are shown in Figs. 3 through 6).

MODE (1) TIMING DIAGRAM: SIAS·$\overline{\text{LOP}}$

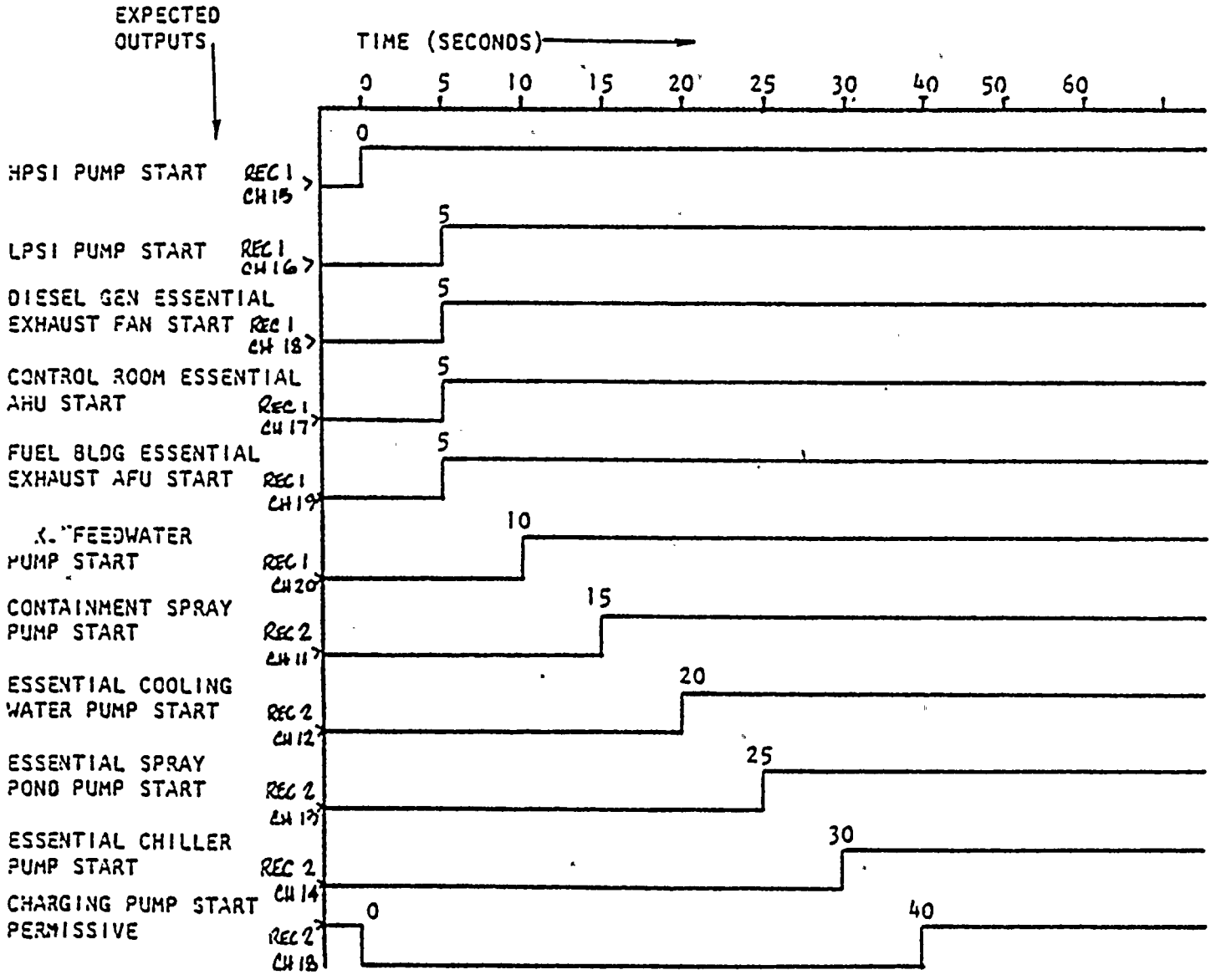

Figure 3

MODE (2) TIMING DIAGRAM: STAS?LOP?DG BKR?

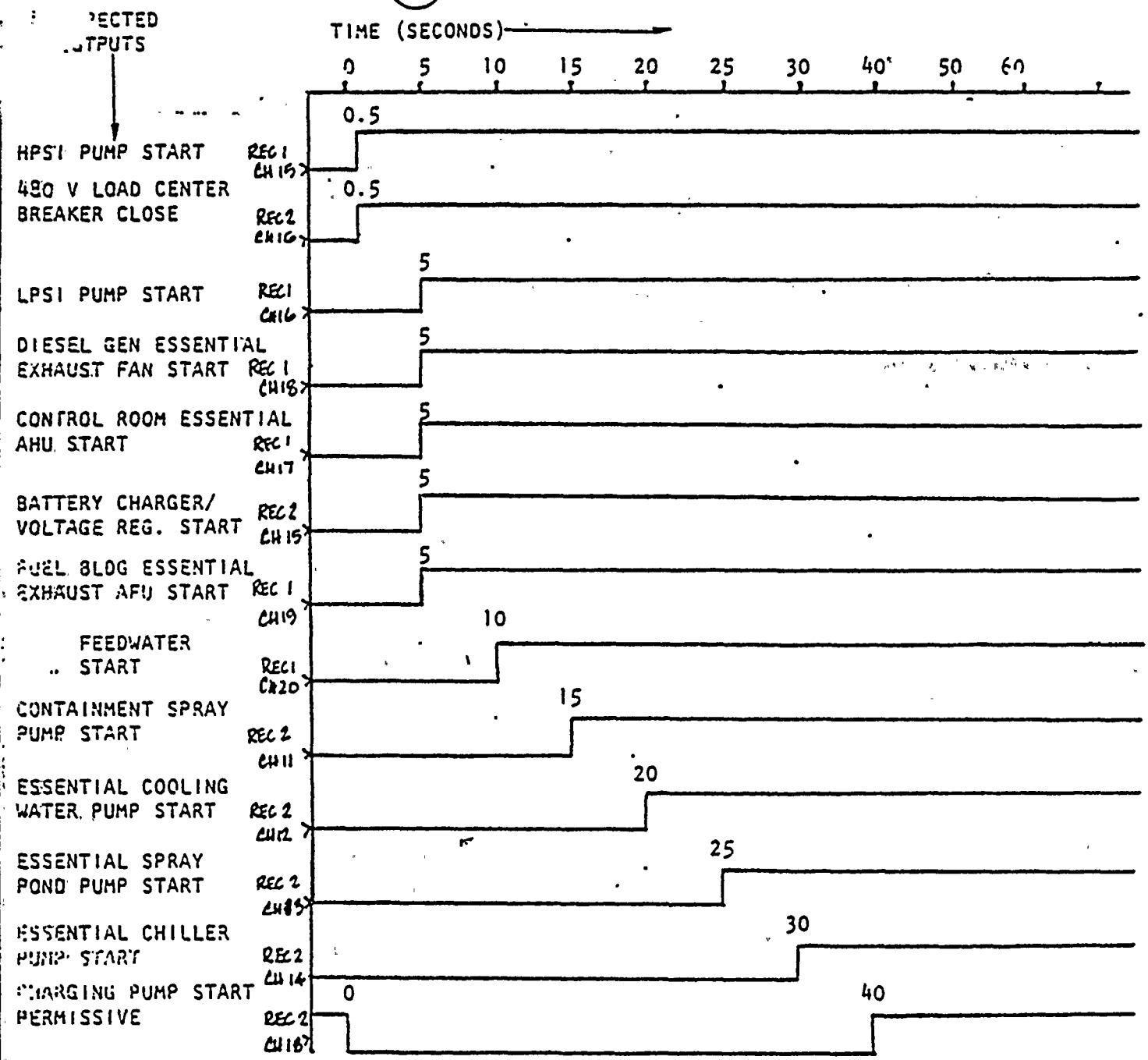

Figure 4

J704-85-1

GENERAL ATOMIC COMPANY SAN DIEGO, CALIFORNIA	SIZE A	CODE IDENT. NO. 32334	DWG. NO. 342-0063
	SCALE	REV.	SHEET 10 of 43

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FORM GA1024A-2

ELA001-1092A-2

MODE (3) TIMING DIAGRAM: $\overline{SIAS} \cdot LOP \cdot OG$ 8KR

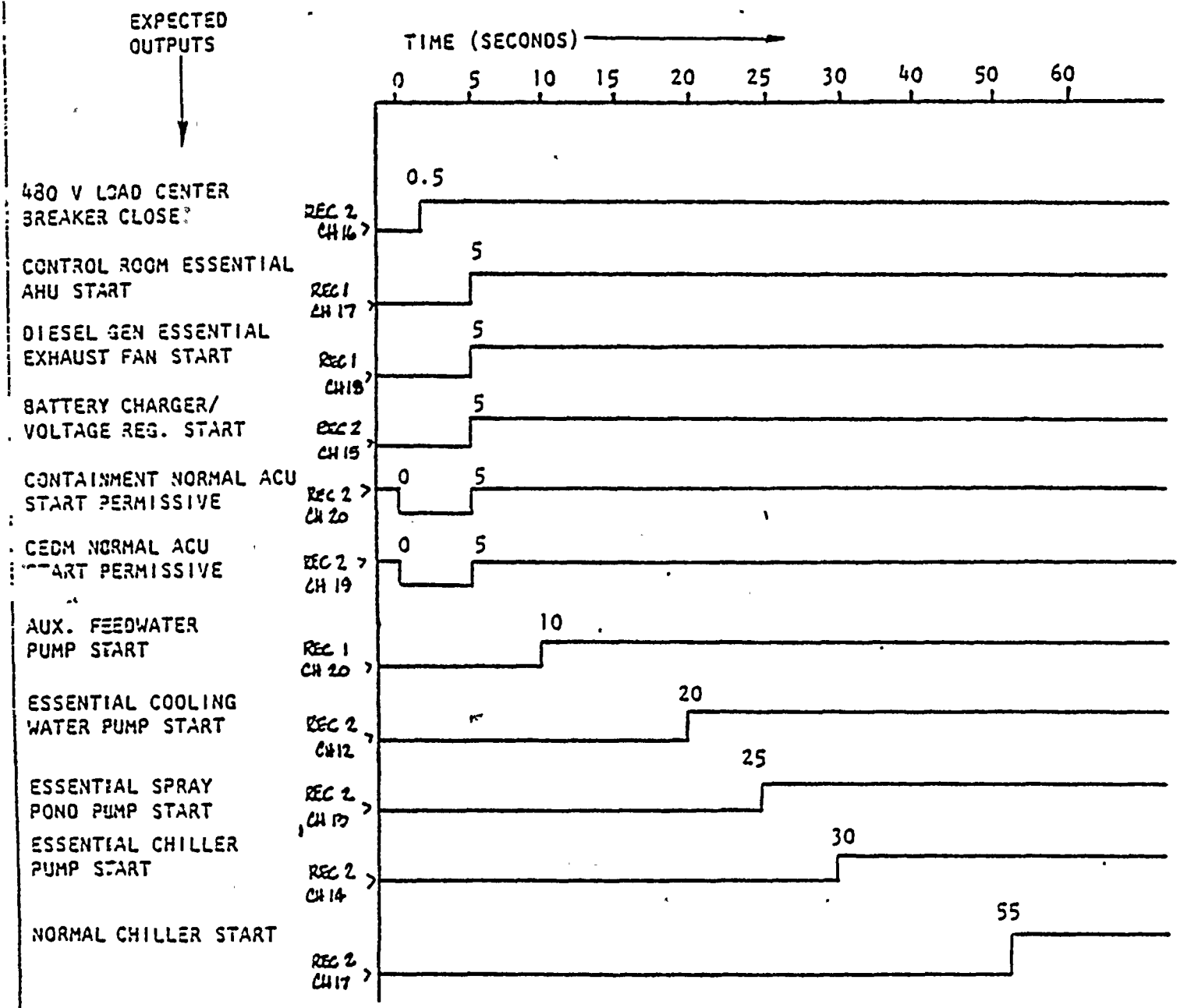

Figure 5

GENERAL ATOMIC COMPANY SAN DIEGO, CALIFORNIA	SIZE A	CODE IDENT. NO. 32334	DWG. NO. 342-0063
	SCALE	REV.	SHEET 11 of 43

30 J104-85-1

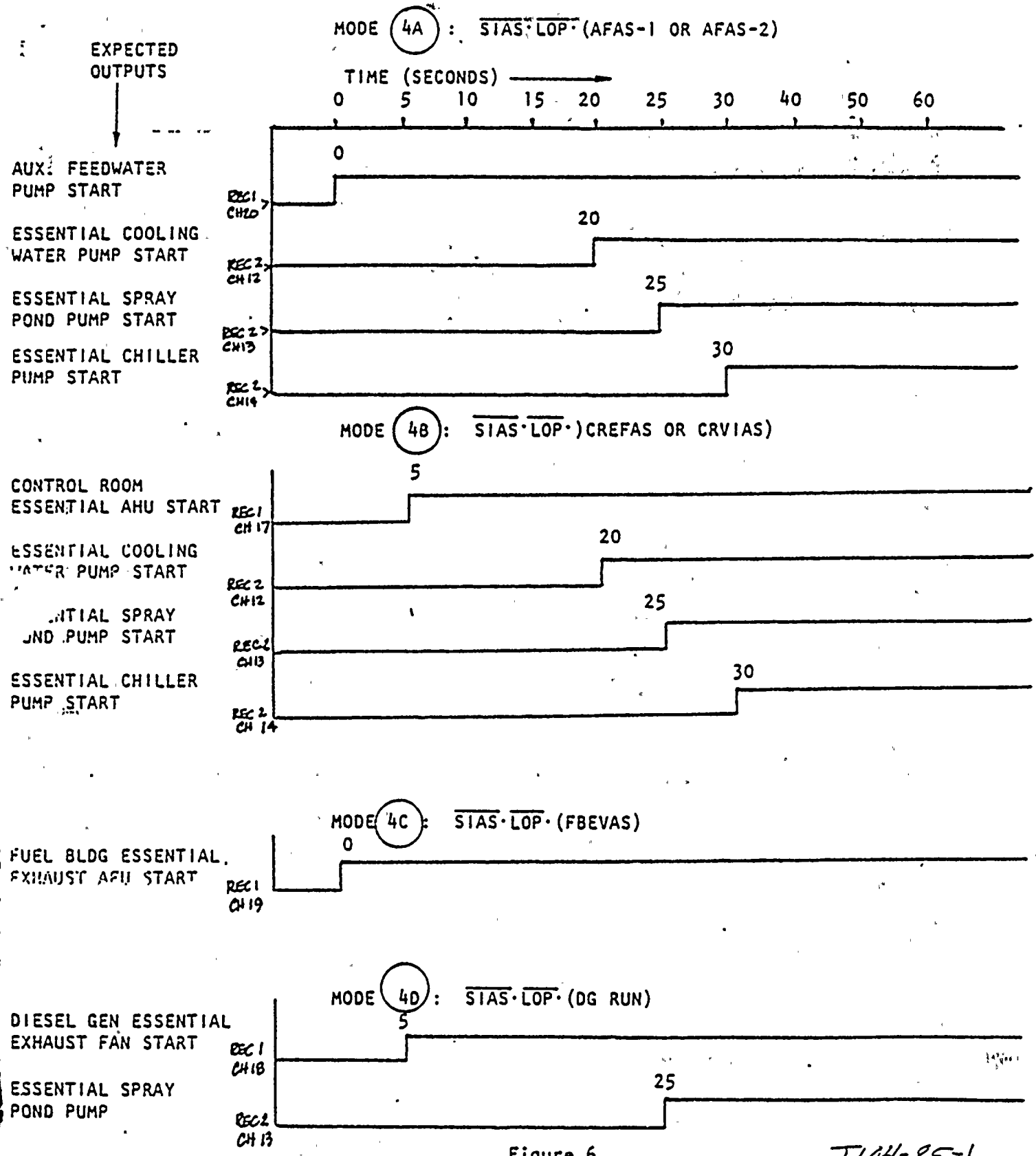

Figure 6

J104-85-1

GENERAL ATOMIC COMPANY SAN DIEGO, CALIFORNIA	SIZE A	CODE IDENT. NO. 32334	DWG. NO. 342-0063
	SCALE	REV.	SHEET 12 of 43

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FORM GA1024A-2

Notations in this column indicate where changes have been made

3.2. Test Conduction

A. Loss of offsite power (forced shutdown) tests:

Test 1 - ESF bus undervoltage followed by the diesel generator breaker closure and clearing of the undervoltage signals

Test 2 - ESF bus undervoltage followed by the diesel generator breaker closure and clearing of the undervoltage signals followed by the diesel generator breaker tripping prior to completion of sequencing

Test 3 - ESF bus undervoltage followed by the diesel generator breaker closure and clearing of the undervoltage signals followed by the diesel generator breaker tripping after completion of sequencing

Test 4 - ESF bus undervoltage followed by the diesel generator breaker closure followed by clearing of the undervoltage signals after completion of sequencing

Test 5 - ESF bus undervoltage followed by clearing of the undervoltage signals without closure of the diesel generator breaker

B. Initiating signal tests:

Test 6 - Initiating signal with the ESF bus available

Test 7 - Initiating signal followed by ESF bus undervoltage prior to completion of sequencing followed by the diesel generator breaker closure and clearing of the undervoltage signal

Test 8 - Initiating signal followed by ESF bus undervoltage after completion of sequencing followed by the diesel generator breaker closure and clearing of the undervoltage signals

Test 9 - Initiating signal coincident with ESF bus undervoltage followed by the diesel generator breaker closure and clearing of the undervoltage signals

Test 10 - Initiating signal coincident with ESF bus undervoltage followed by the diesel generator breaker closure followed by clearing of the undervoltage signals after completion of sequencing

Notations in this column indicate where changes have been made

Test 11 - Initiating signal coincident with ESF bus undervoltage followed by clearing of the undervoltage signals without closure of the diesel generator breaker

Test 12 - ESF bus undervoltage followed by an initiating signal followed by the diesel generator breaker closure and clearing of the undervoltage signals

Test 13 - ESF bus undervoltage followed by the diesel generator breaker closure and clearing of the undervoltage signals followed by an initiating signal prior to completion of sequencing

Test 14 - ESF bus undervoltage followed by the diesel generator breaker closure and clearing of the undervoltage signals followed by an initiating signal after completion of sequencing

Test 15A - Initiating signal coincident with ESF bus undervoltage followed by the diesel generator breaker closure without clearing of the undervoltage signals; the diesel generator breaker then trips before completion of sequencing

Test 15B - Initiating signal coincident with ESF bus undervoltage followed by the diesel generator breaker closure and clearing of the undervoltage; after completion of initial sequencing, the diesel generator breaker trips

C. Multiple initiating signal tests:

Test 16 - Two coincident initiating signals with the ESF bus available

Test 17 - Reserved

Test 18 - Reserved

Test 19 - Two initiating signals coincident with ESF bus undervoltage followed by the diesel generator breaker closure and clearing of the undervoltage signals

Test 20 - Reserved

Test 21 - Reserved

Test 22 - ESF bus undervoltage followed by two coincident initiating signals followed by the diesel generator breaker closure and clearing of the undervoltage signals

Notations in this column indicate where changes have been made

Test 23 - ESF bus undervoltage followed by the diesel generator breaker closure and clearing of the undervoltage signals followed by two coincident initiating signals prior to completion of sequencing

Test 24 - ESF bus undervoltage followed by the diesel generator breaker closure and clearing of the undervoltage signals followed by two coincident initiating signals after completion of sequencing

Test 25 - Initiating signal X followed by initiating signal Y prior to completion of sequencing with the ESF bus available

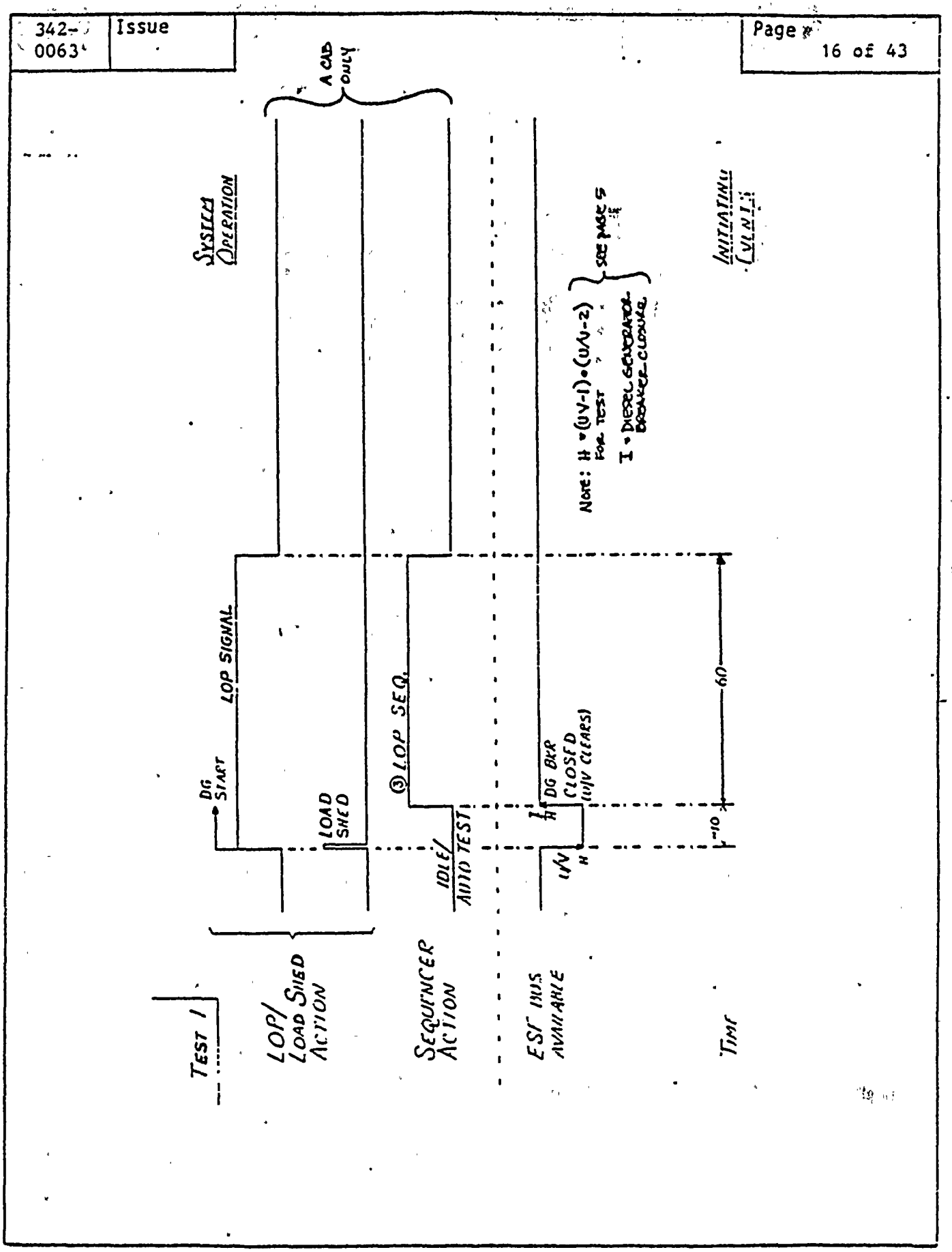
Test 26 - Initiating signal S followed by initiating signal Y after completion of sequencing with the ESF bus available

Test 27 - Initiating signal X coincident with ESF bus undervoltage followed by initiating signal Y followed by the diesel generator breaker closure and clearing of the undervoltage signals

Test 28 - Initiating signal X coincident with ESF bus undervoltage followed by the diesel generator breaker closure and clearing of the undervoltage signals followed by initiating signal Y prior to completion of sequencing

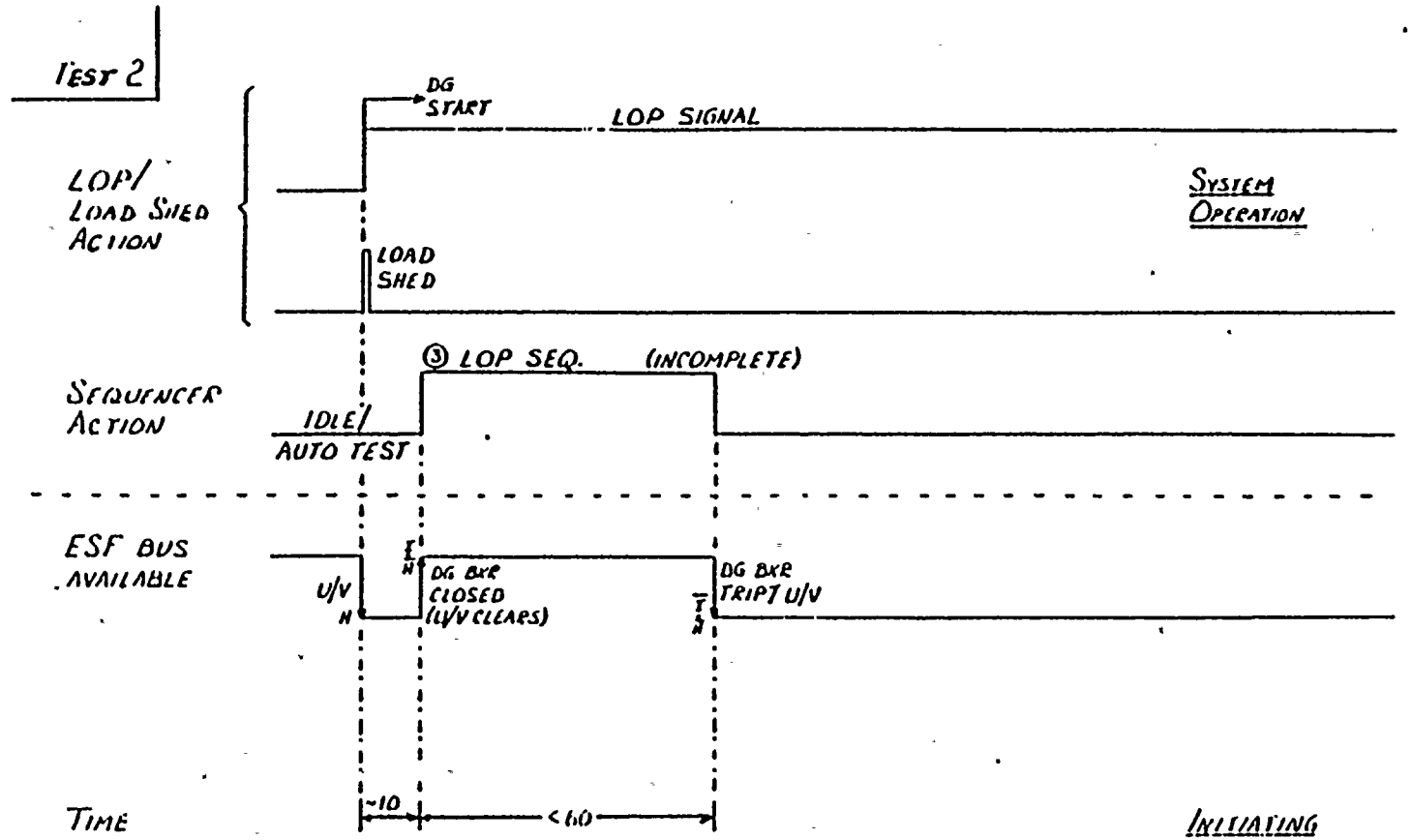
Test 29 - Initiating signal X coincident with ESF bus undervoltage followed by the diesel generator breaker closure and clearing of the undervoltage signals followed by initiating signal Y after completion of sequencing

Notations in this column indicate where changes have been made



Notations in this column indicate where changes have been made

TDH-85-1

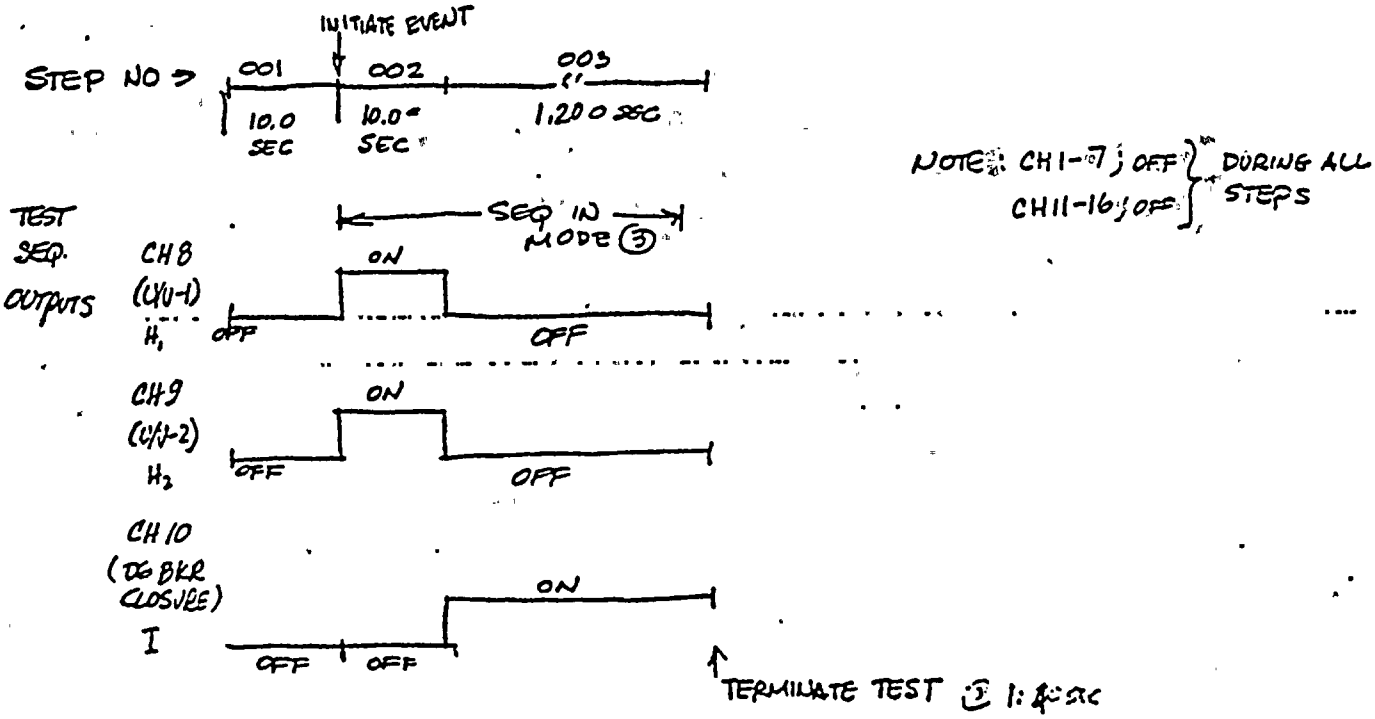


GA 268 Rev. 1-74

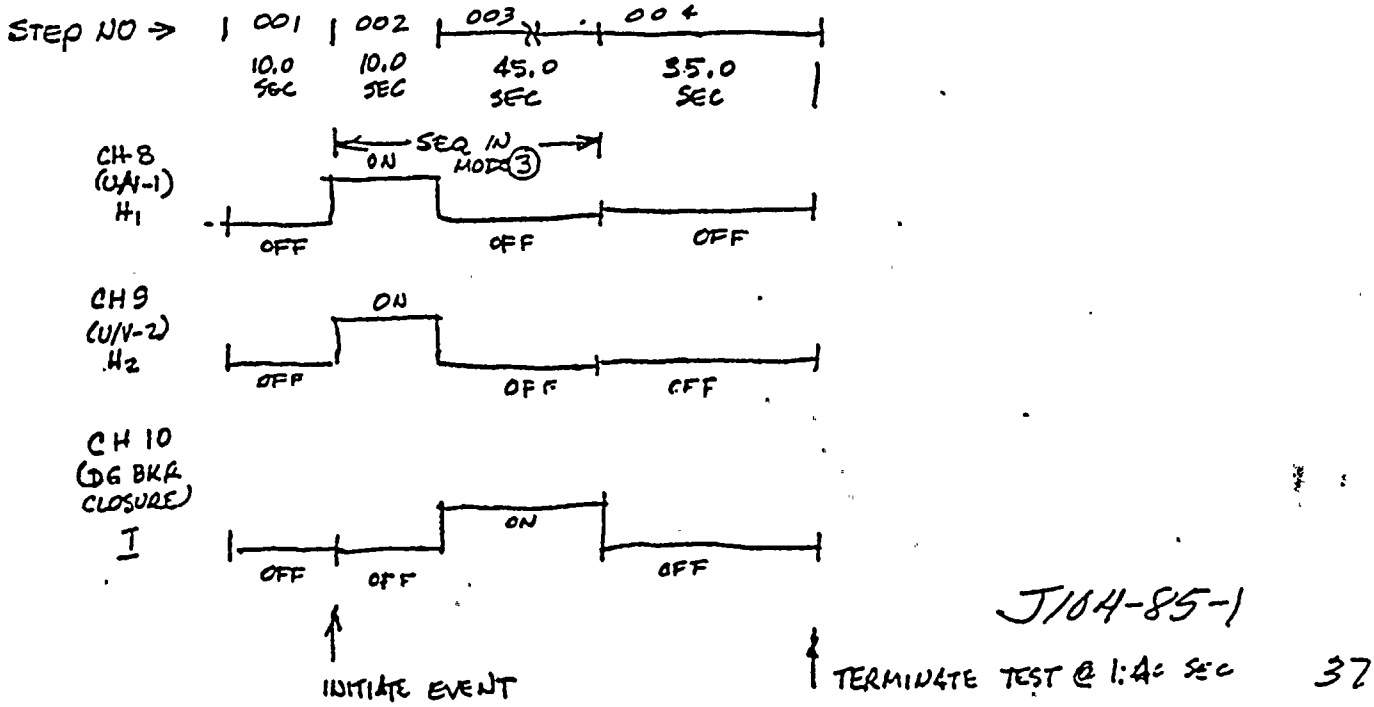
GENERAL ATOMIC COMPANY

CALCULATIONS FOR PVNGS Unit 1 ESFAS Block of Sequencers			
EQUIP. NO.	PROJ. NO.	CALC. NO.	PAGE OF
PREPARED BY	DATE	REF. DOCUMENTS:	
REVIEWED BY	DATE		
APPROVED BY	DATE		

TEST 1: ESF BUS U/V (U/V-1 & U/V-2 TRIP); FOLLOWED BY THE DIESEL GENERATOR BREAKER CLOSURE AND CLEARING OF U/V SIGNALS



TEST 2: ESF BUS U/V (U/V-1 & U/V-2 TRIP); FOLLOWED BY DIESEL GENERATOR BREAKER CLOSURE AND CLEARING OF THE U/V SIGNAL; FOLLOWED BY DIESEL GEN BREAKER TRIP PRIOR TO COMPLETION OF SEQUENCING



J104-85-1

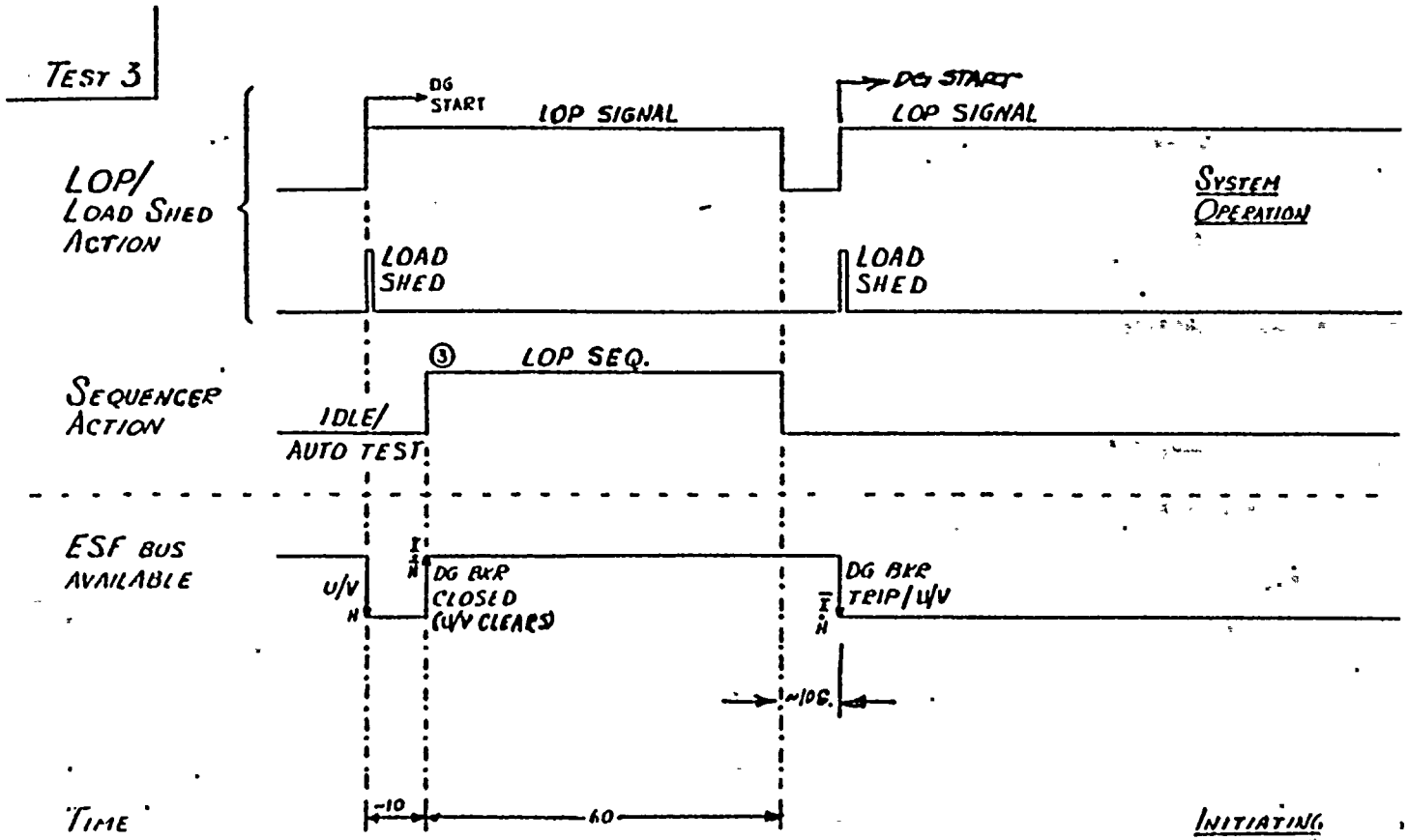
TESTS 1 & 2 . LOP (FORCED SHUTDOWN) TESTS

EPC - 7101
PROGRAM CODING FORM

SYSTEM PVNGS BOP ESFAS PROOF OF DESIGN TESTS
DRAWN BY _____ DATE 1/2/80
CHECKED BY _____ PAGE _____ OF _____

STEP NO.	OUTPUTS ACTUATED	"HOLD FOR"	"THEN"	*INPUTS REQUIRED
001	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 0010.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes: ALL OFF St. 001 ↑			
002	1 2 3 4 5 6 7 (8) (9) 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 0010.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
003	1 2 3 4 5 6 7 8 9 (10) 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 01:10.0	[ ] ADVANCE [X] JUMP TO 001 [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
001	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 0010.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes: ALL OFF St. 001 ↑			
002	1 2 3 4 5 6 7 (8) (9) 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 0010.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 : 9 10 11 12 13 14 15 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
003	1 2 3 4 5 6 7 8 9 (10) 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 0045.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
004	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 0035.0	[ ] ADVANCE [X] JUMP TO 001 [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes: ALL OFF St 004			
	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* [ ] T1 (hm) [ ] T2 (ms)	[ ] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* [ ] T1 (hm) [ ] T2 (ms)	[ ] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
	Notes:			
	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* [ ] T1 (hm) [ ] T2 (ms)	[ ] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			

Notations in this column indicate where changes have been made



JT04-85-1

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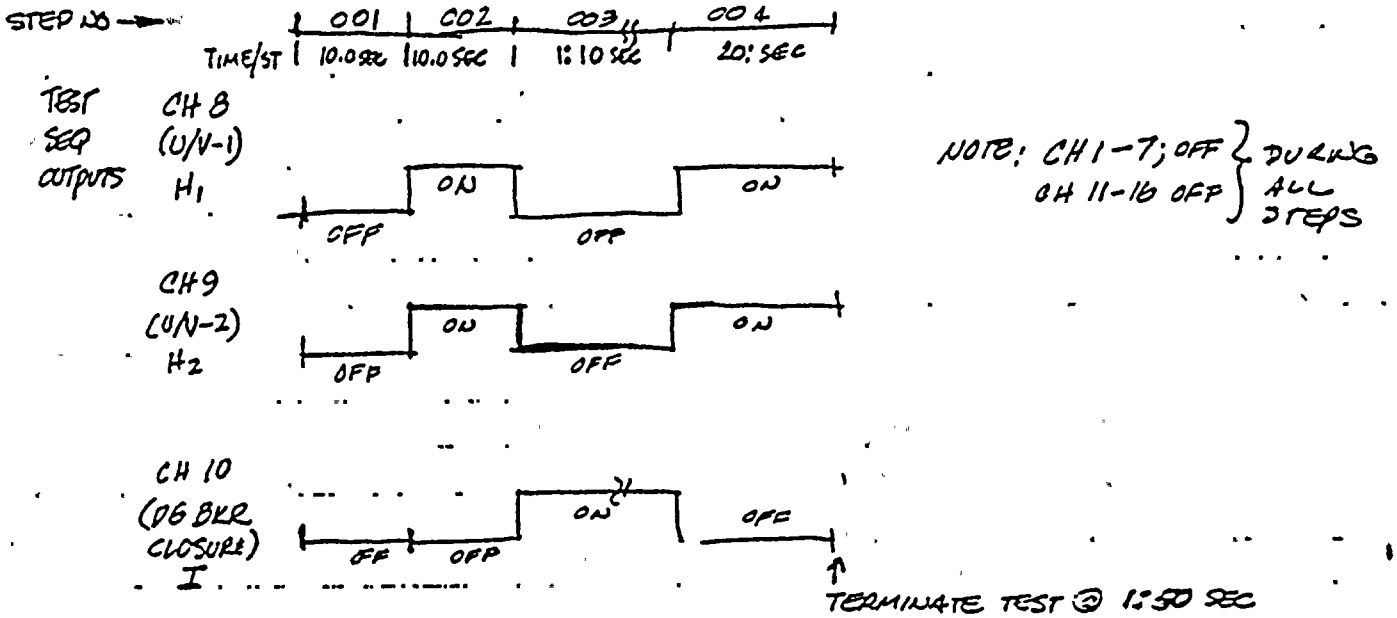
LOP (FORCED SHUTDOWN) TEST

GA 268 Rev. 1-74

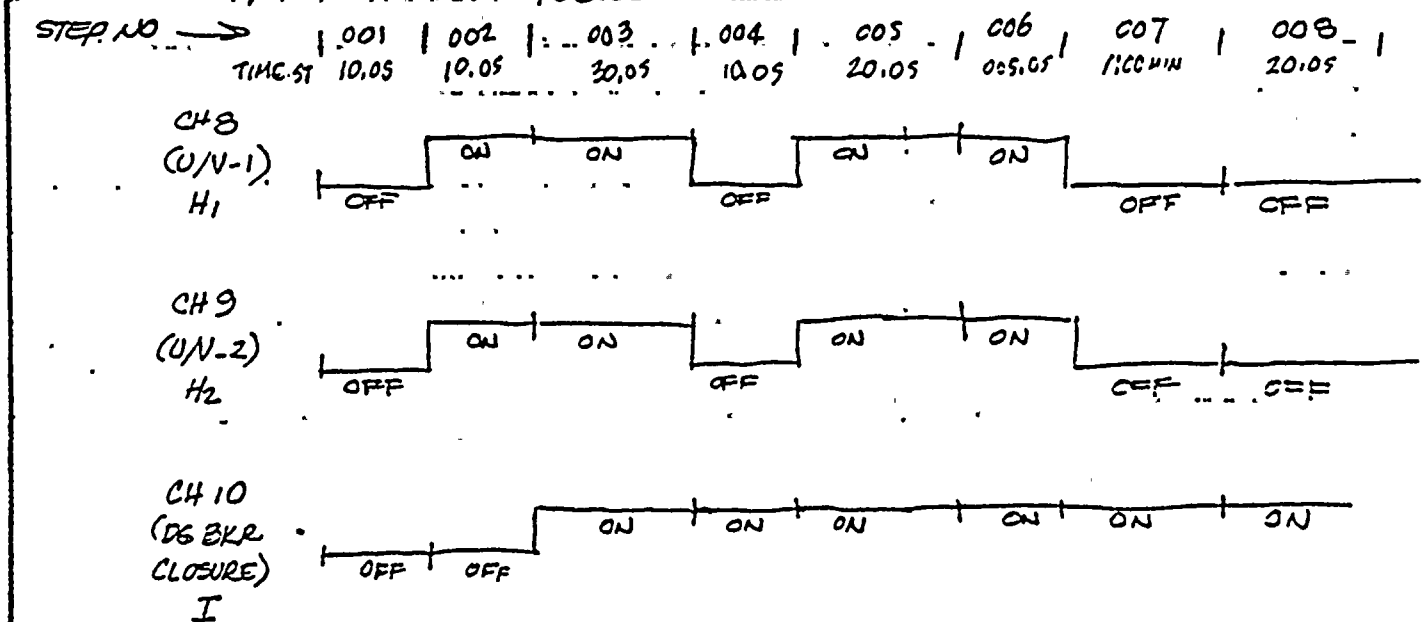
GENERAL ATOMIC COMPANY

CALCULATIONS FOR PVNGS BOP ESFAS PROOF OF DESIGN TESTS			
EQUIP. NO.	PROJ. NO.	CALC. NO.	PAGE OF
PREPARED BY	DATE	REF. DOCUMENTS:	
REVIEWED BY	DATE		
APPROVED BY	DATE		

TEST 3: ESF BUS U/V (U/V-1 & U/V-2 TRIP); FOLLOWED BY DIESEL GENERATOR BREAKER CLOSURE AND CLEARING OF U/V SIGNALS; FOLLOWED BY DG BREAKER TRIP AFTER COMPLETION OF SEQUENCING



TEST 4: ESF BUS U/V (U/V-1 & U/V-2 TRIP); FOLLOWED BY DIESEL GENERATOR BREAKER CLOSURE; FOLLOWED BY CLEARING OF U/V SIGNALS AFTER COMPLETION OF SEQUENCING.



T1A4-85-1

TEST 3 · LOP (FORCED SHUTDOWN) TESTS

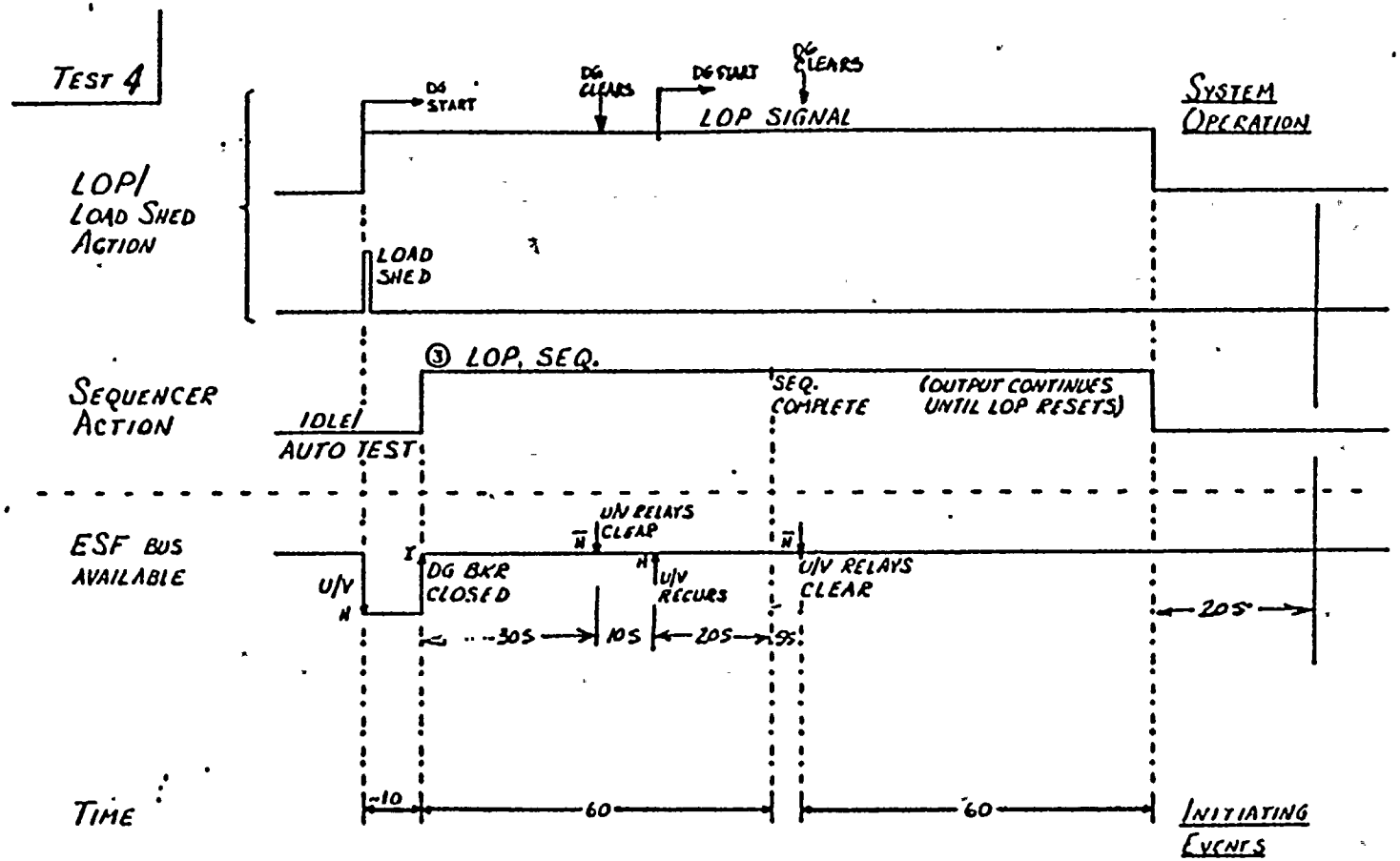
EPC-7101
PROGRAM CODING FORM

SYSTEM PVNGS BOP ESFAS PROOF OF DESIGN TESTS
DRAWN BY _____ DATE 1/2/90
CHECKED BY _____ PAGE _____ OF _____

TEST #3

P J.	OUTPUTS ACTUATED	"HOLD FOR"	"THEN"	*INPUTS REQUIRED
001	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 0010.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes: ALL OF ST 001			
002	1 2 3 4 5 6 7 (8) (9) 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 0010.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
003	1 2 (3) 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 01:10	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
004	1 2 3 4 5 6 7 (8) (9) 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 0020.0	[ ] ADVANCE [X] JUMP TO 001 [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* [ ] T1 (hm) [ ] T2 (ms)	[ ] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* [ ] T1 (hm) [ ] T2 (ms)	[ ] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* [ ] T1 (hm) [ ] T2 (ms)	[ ] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* [ ] T1 (hm) [ ] T2 (ms)	[ ] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* [ ] T1 (hm) [ ] T2 (ms)	[ ] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			

Notations in this column indicate where changes have been made



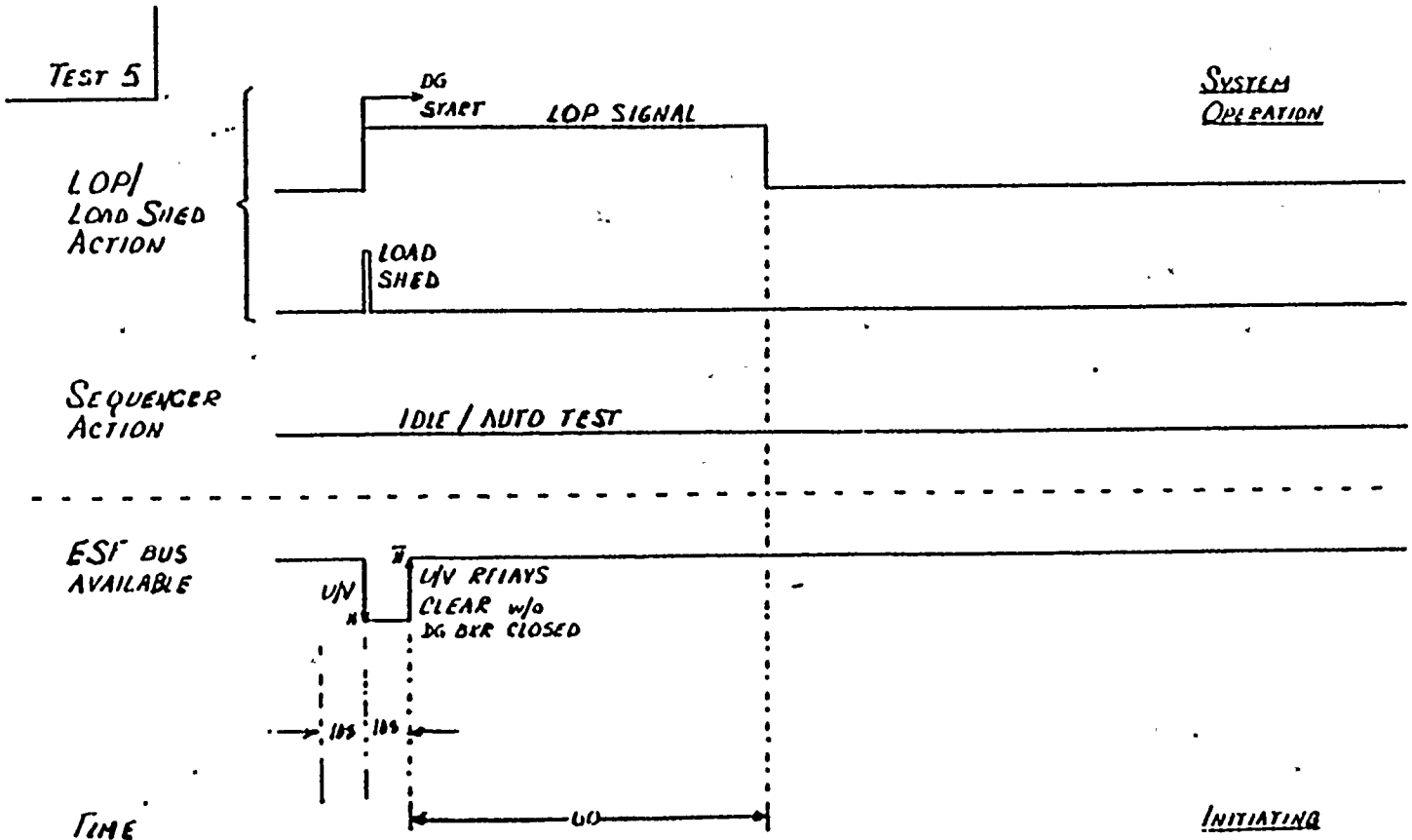
TEST 4 LOP (FORCED SHUTDOWN) TESTS

EPC - 7101
PROGRAM CODING FORM

SYSTEM
DRAWN BY ____ DATE ____
CHECKED BY ____ PAGE ____ OF ____

	OUTPUTS ACTUATED	"HOLD FOR"	"THEN"	*INPUTS REQUIRED
001	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00 10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes: ALL OFF ST. 001			
002	1 2 3 4 5 6 7 (8) (9) 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00 10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
003	1 2 3 4 5 6 7 (8) (9) (10) 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 0030.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
004	1 2 3 4 5 6 7 8 9 (10) 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 0010.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
005	1 2 3 4 5 6 7 (8) (9) (10) 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 0020.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
006	1 2 3 4 5 6 7 (8) 9 (10) 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 0005.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
007	1 2 3 4 5 6 7 8 9 (10) 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 01:00.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
008	1 2 3 4 5 6 7 8 9 (10) 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:20.0	[ ] ADVANCE [X] JUMP TO 001 [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* [ ] T1 (hm) [ ] T2 (ms)	[ ] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* [ ] T1 (hm) [ ] T2 (ms)	[ ] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			

Notations in this column indicate where changes have been made



T1044-85-1

LOP (FORCED SHUTDOWN) TEST

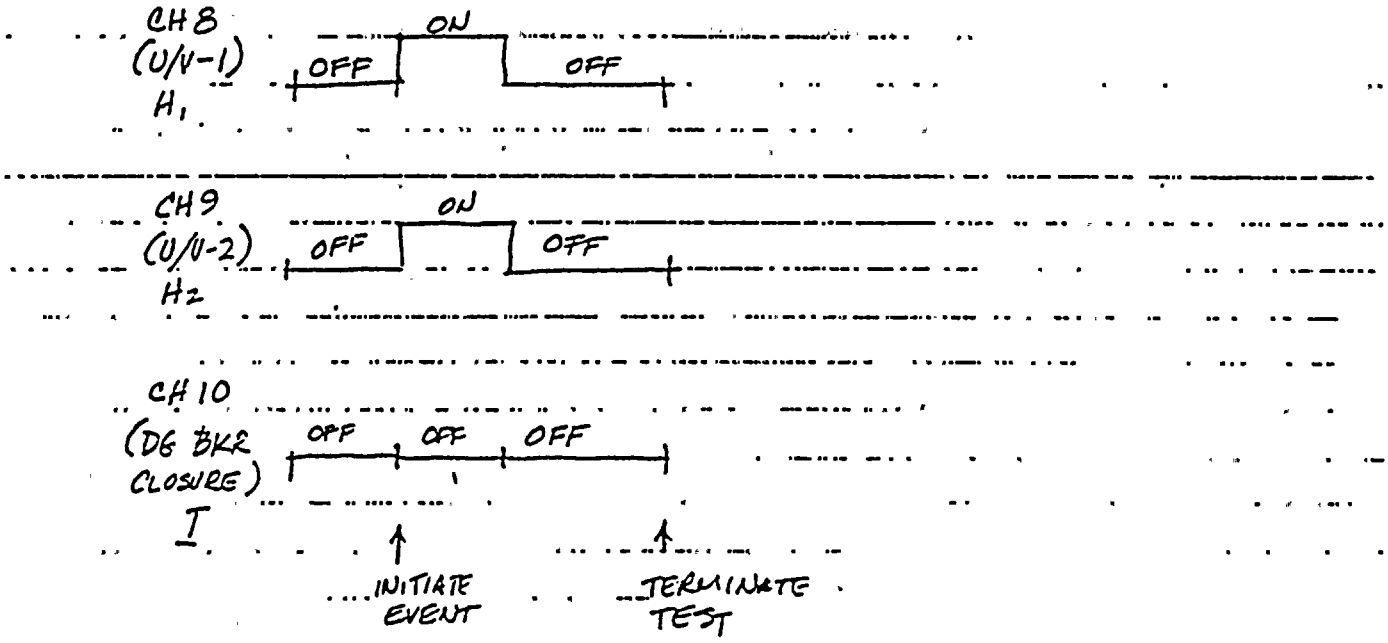
GA 268 Rev. 1-74

GENERAL ATOMIC COMPANY

CALCULATIONS FOR PVNGS ZOP ESFAS PROOF OF DESIGN TESTS			
EQUIP. NO.	PROJ. NO.	CALC. NO.	PAGE OF
PREPARED BY	DATE	REF. DOCUMENTS:	
REVIEWED BY	DATE		
APPROVED BY	DATE		

TEST 5: ESF BUS U/V (U/V-1 & U/V-2 TRIP); FOLLOWED BY CLEARING OF UNDERVOLTAGE SIGNALS WITHOUT CLOSURE OF THE DG BKR.

STEP, NO →	001	002	003
TIME/STEP	10.0	10.0	1:10



J104-85-1

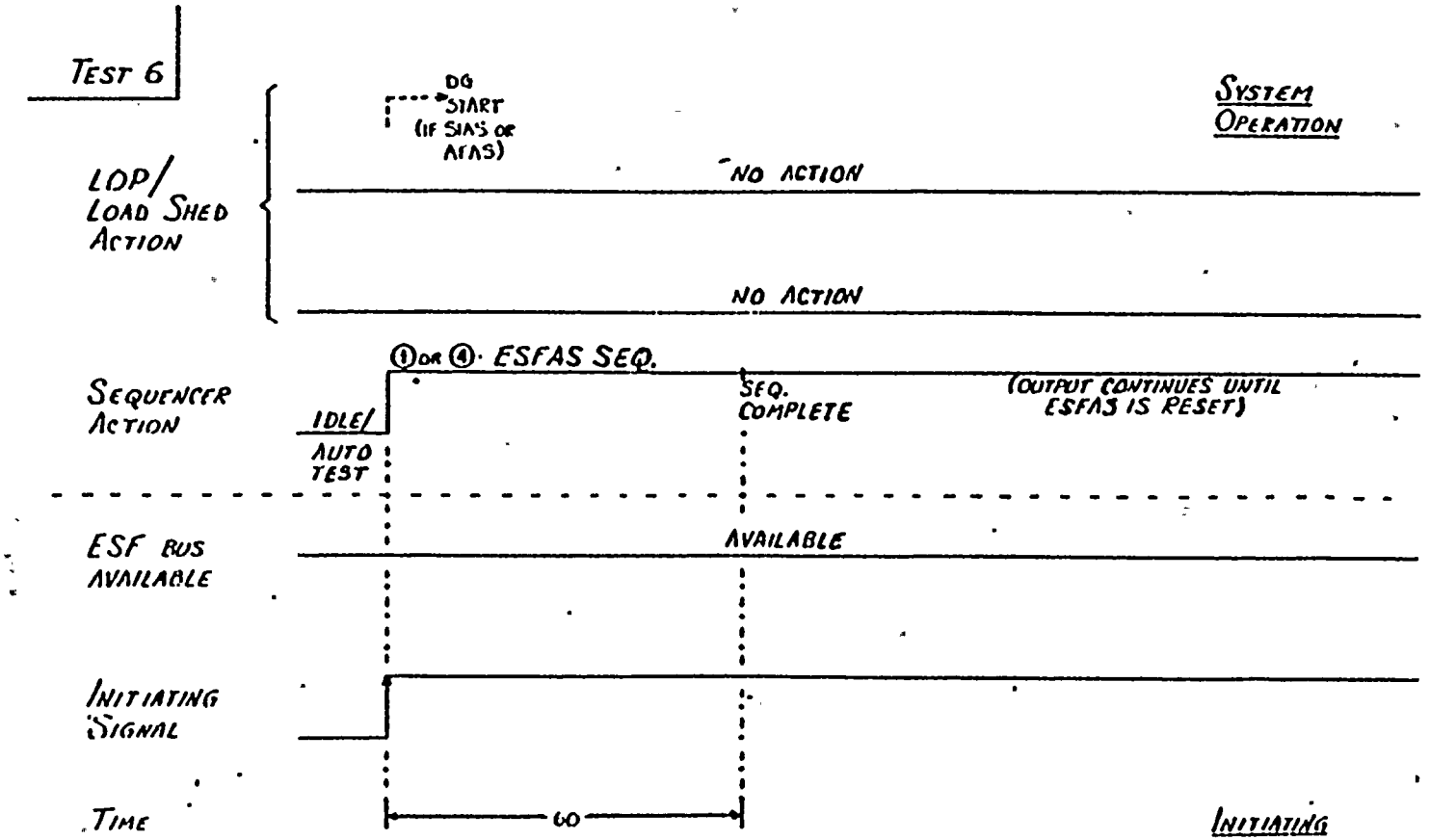
Notations in this column indicate where changes have been made

INITIATING SIGNAL TESTS:

	CH1.	CH2	CH3	CH4	CH5	CH6	CH7
	INITIATING SIGNALS						
TEST NUMBER:	SIAS (A)	AFAS-1 (B)	AFAS-2 (C)	CREFAS (D)	CRVIAS (E)	FBEVAS (F)	DG RUN (G)
6	X	X	X	X	X	X	X
7	X	X					
8	X	X					
9	X	X	X	X	X	X	X
10	X	X					
11	X	X	-				
12	X	X					
13	X	X	X	X	X	X	X
14	X	X	X	X	X	X	X
15A	X	X					
15B	X	X					

CH8 = 4V-1 = H_1
CH9 = 4V-2 = H_2
CH10 = DG BKR CLOSURE = I

Notations in this column indicate where changes have been made



TI 041-85-1

47

TEST 5 & 6

EPC - 7101
PROGRAM CODING FORM

SYSTEM
DRAWN BY ____ DATE ____
CHECKED BY ____ PAGE ____ OF ____

STEP NO.	OUTPUTS ACTUATED	"HOLD FOR"	"THEN"	*INPUTS REQUIRED
001	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			
002	1 2 3 4 5 6 7 8 / (9) 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			
003	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 01:10.0	[ ] ADVANCE [X] JUMP TO 001 [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes: ALL OFF ST. 003			
C01	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes: ALL OFF ST 001			
002	(1) 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 01:10.0	[ ] ADVANCE [X] JUMP TO 001 [ ] BRANCH*TO	1 2 3 4 5 6 7 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			
001	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes: ALL OFF ST 001			
002	1 (2) 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 01:10.0	[ ] ADVANCE [X] JUMP TO 001 [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			
C01	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2.(ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes: ALL OFF ST 001			
CC2	1 2 (3) 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 01:10:0	[ ] ADVANCE [X] JUMP TO 001 [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31
	Notes:			
	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* [ ] T1 (hm) [ ] T2 (ms)	[ ] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			

APIS-1 (1)

APIS-2 (1)

TEST 6 (CONT'D)

EPC - 7101
PROGRAM CODING FORM

SYSTEM
DRAWN BY ____ DATE ____
CHECKED BY ____ PAGE ____ OF ____

P	OUTPUTS ACTUATED	"HOLD FOR"	"THEN"	*INPUTS REQUIRED
001	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00 10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes: ALL OFF ST. 0 ↑			
002	1 2 3 (4) 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 01:10.0	[ ] ADVANCE [X] JUMP TO 001 [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			
001	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00 10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes: ALL OFF ST. 0 ↑			
002	1 2 3 4 (5) 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 01:10.0	[ ] ADVANCE [X] JUMP TO 001 [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			
001	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes: ALL OFF ST. 0 ↑			
002	1 2 3 4 5 (6) 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 01:10.0	[ ] ADVANCE [X] JUMP TO 001 [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			
001	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes: ALL OFF ST. 0 ↑			
002	1 2 3 4 5 6 (7) 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 01:10.0	[ ] ADVANCE [X] JUMP TO 001 [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			
	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* [ ] T1 (hm) [ ] T2 (ms)	[ ] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			
	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* [ ] T1 (hm) [ ] T2 (ms)	[ ] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			

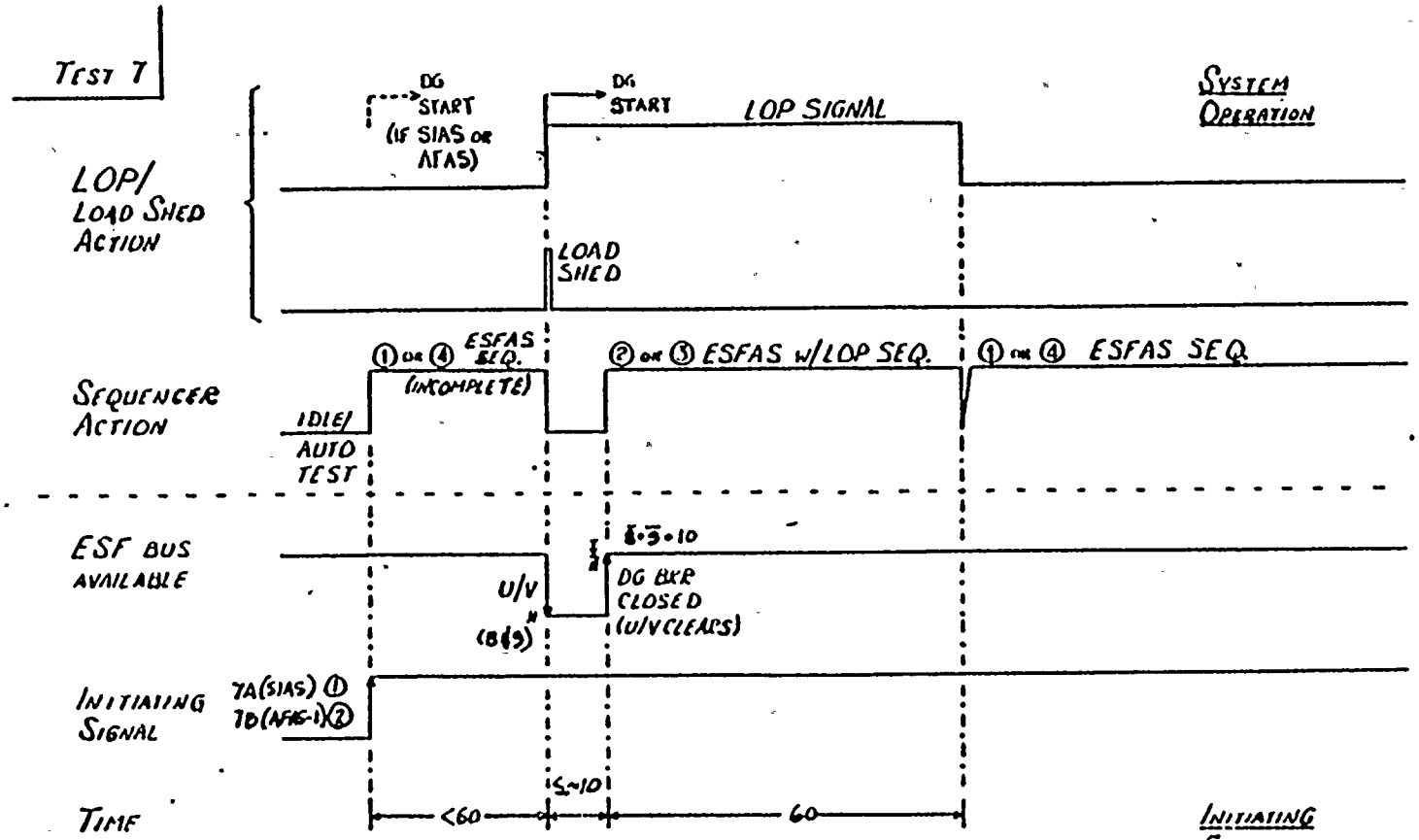
CREEPS

CRAWLS

FRUIT

JT04-85-1

Notations in this column indicate where changes have been made



GA 268 Rev. 1-74

GENERAL ATOMIC COMPANY

CALCULATIONS FOR			
EQUIP. NO.	PROJ. NO.	CALC. NO.	PAGE OF
PREPARED BY R.C. Weddle	DATE 1/29/80	REF. DOCUMENTS:	
REVIEWED BY	DATE		
APPROVED BY	DATE		

NOTE: FALSE ERROR DETECTION WHEN TRANSFERRING TO AUTO TEST ON A RANDOM BASIS OCCURRED DURING CONDUCTION OF TESTS 8A & 8B.

THIS FALSE ERROR DETECTION DICTATES THE NEED OF INSERTION OF A TWO SECOND DELAY INTO THE µP PROGRAM BEFORE ACTUAL EXECUTION OF THE AUTO TEST FUNCTION

STAN SKOAGLUND TO ACCOMPLISH REPROGRAMMING EFFORT DURING 2ND WEEK OF FEBRUARY

→ SEEMS TO OCCUR AT "SIMULTANEOUS" RESET TRANSFER OF SIAS/AFAS-1 AND DG BKR

THIS WOULD INDICATE THAT THE AUTO TEST FEATURE BEGINS TO TEST PRIOR TO TOTAL RESET OF DG BKR INPUT. THIS ACTION WOULD FURTHER UNDERLINE THE NEED FOR DELAY INSERTION FOR THE AUTO TEST FEATURE FUNCTION TO ALLOW ADEQUATE SYSTEM SETTLING TIME

S. SKOAGLAND REPROGRAMMED PROMS TO ACCOMPLISH IN EFFECT A DELAY ON TEST WHEN INPUTS CLEAR, UNIT PROMS WERE RE-PROGRAMMED 2-19-80 AND REINSTALLED ON 3/12/80. RE. RAN TEST 8A AND NO FALSE ERROR DETECTION OCCURRED.

R.C. Weddle
3/12/80

BECHTEL
FIELD INSPECTOR
WITNESS

BECHTEL
493

3/14/80

TMI-85-1

TESTS 8A & 8B

EPC-7101
PROGRAM CODING FORM

SYSTEM PVNGS BOP ESFAS TRAIN OF DIESEL
DRAWN BY _____ DATE _____
CHECKED BY _____ PAGE _____ OF _____

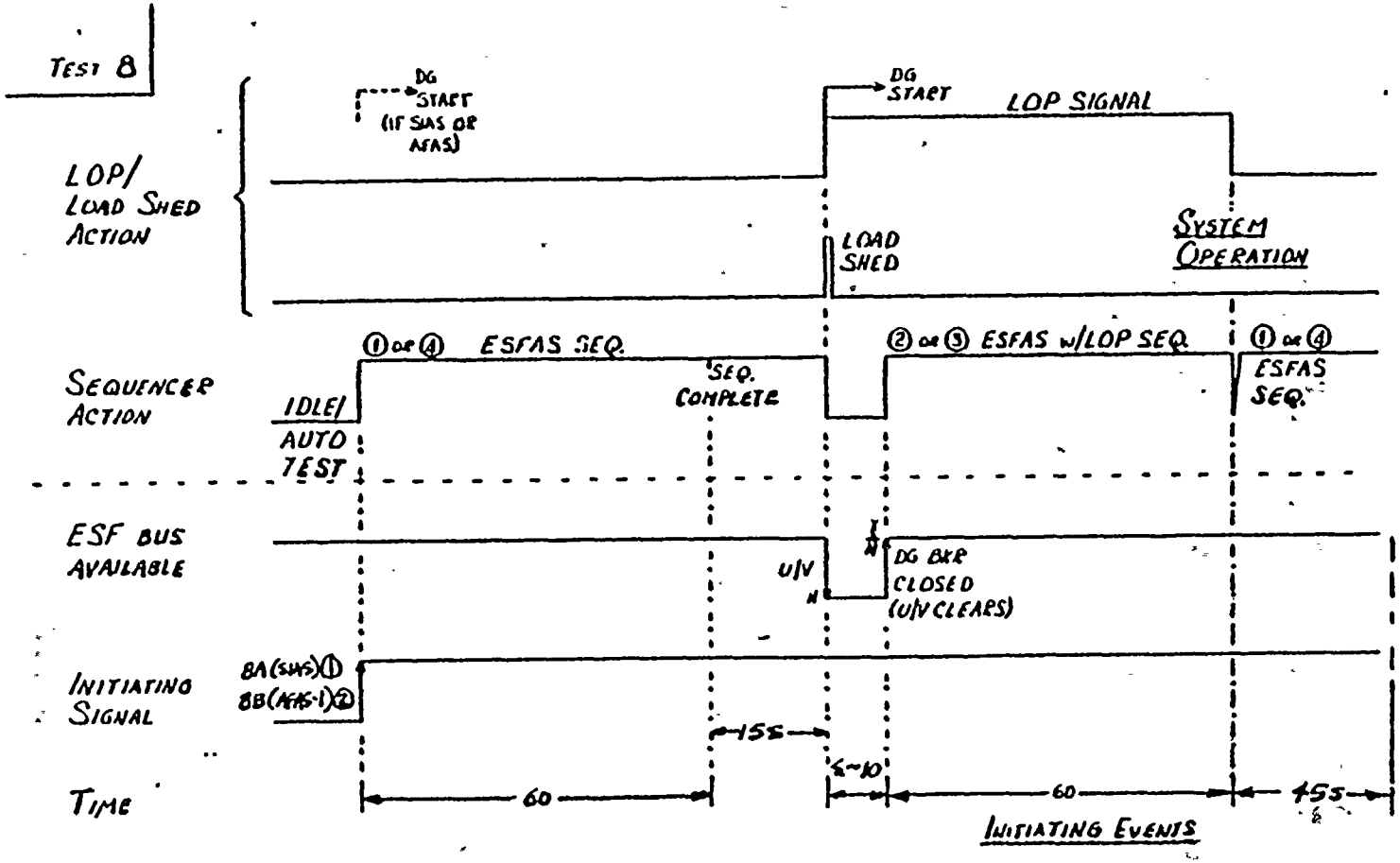
SP	OUTPUTS ACTUATED	"HOLD FOR"	"THEN"	*INPUTS REQUIRED
001	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes: ALL OFF ST 001			
002	(1) 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 01:15.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			
003	(1) 2 3 4 5 6 7 (8) / (9) 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			
004	(1) 2 3 4 5 6 7 8 / 9 (10) 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 01:25	[ ] ADVANCE [X] JUMP TO 001 [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			
	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* [ ] T1 (hm) [ ] T2 (ms)	[ ] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			
001	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes: ALL OFF ST 001			
002	1 (2) 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 01:15.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			
003	1 (2) 3 4 5 6 7 (8) / (9) 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			
004	1 (2) 3 4 5 6 7 8 / 9 (10) 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 01:25.0	[ ] ADVANCE [X] JUMP TO 001 [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			
	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* [ ] T1 (hm) [ ] T2 (ms)	[ ] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			

SMS

AFIS

J104-85-1

Notations in this column indicate where changes have been made



TEST 7A (SIAS) & 7B (AFES-1)

EPC 7101
PROGRAM CODING FORM

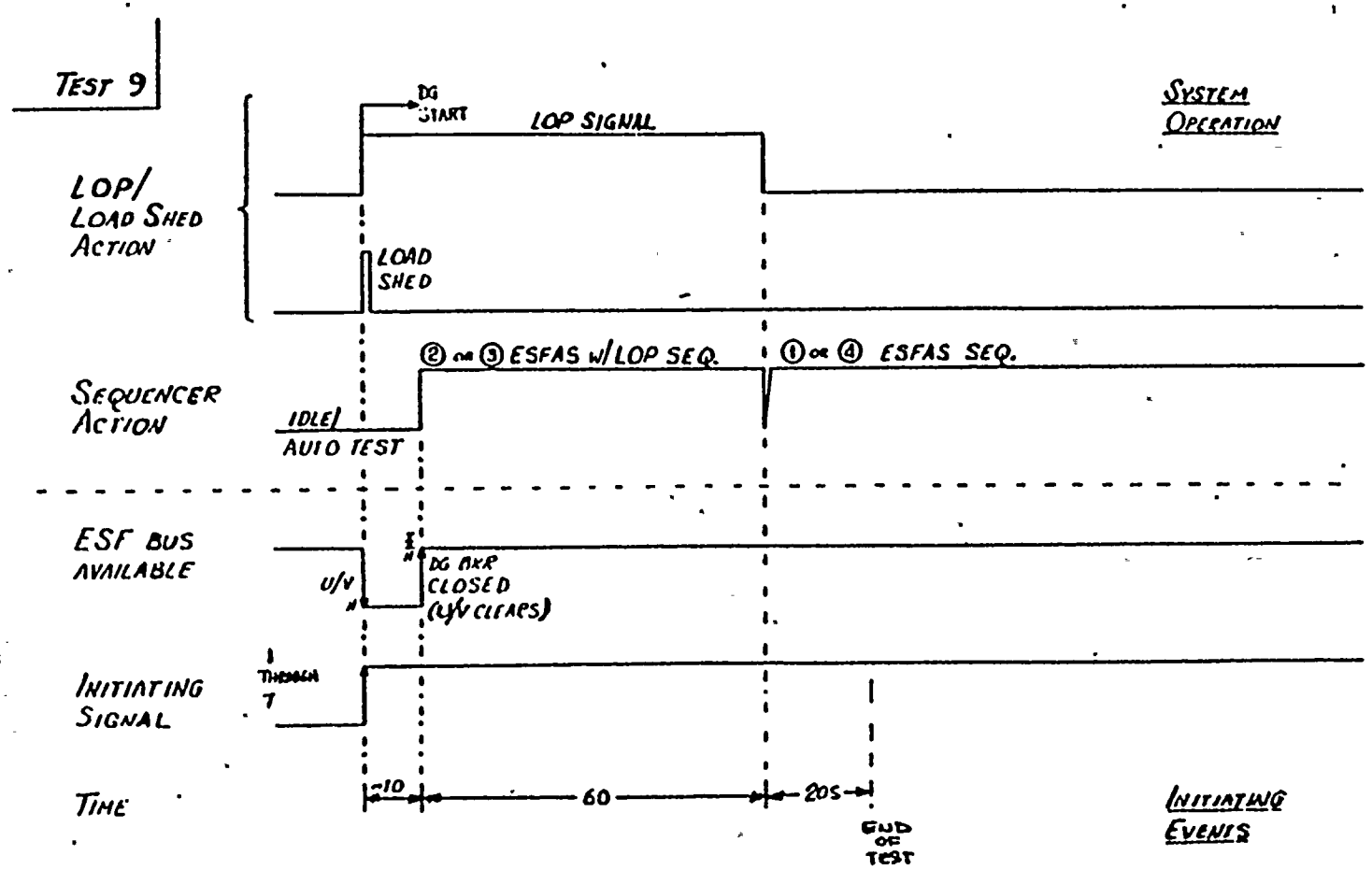
SYSTEM PVNGS EOP ESFAS PROOF & ESFAS TEST
DRAWN BY _____ DATE _____
CHECKED BY _____ PAGE _____ OF _____

	OUTPUTS ACTUATED	"HOLD FOR"	"THEN"	*INPUTS REQUIRED
001	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	INPUT TEST* N/A; T1 (hm); X T2 (ms) 00:10.0	X ADVANCE; JUMP TO; BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes: ALL OFF ST 001			
002	(1) 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	INPUT TEST* N/A; T1 (hm); X T2 (ms) 00:30.0	X ADVANCE; JUMP TO; BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			
003	(1) 2 3 4 5 6 7 (8) / (9) 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	INPUT TEST* N/A; T1 (hm); X T2 (ms) 00:10.0	X ADVANCE; JUMP TO; BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			
004	(1) 2 3 4 5 6 7 8 / (9) (10) 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	INPUT TEST* N/A; T1 (hm); X T2 (ms) 01:45	ADVANCE; X JUMP TO 001; BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			
001	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	INPUT TEST* N/A; T1 (hm); X T2 (ms) 00:10.0	X ADVANCE; JUMP TO; BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes: ALL OFF ST 001			
002	1 (2) 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	INPUT TEST* N/A; T1 (hm); X T2 (ms) 00:30.0	X ADVANCE; JUMP TO; BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			
003	1 (2) 3 4 5 6 7 (8) / (9) 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	INPUT TEST* N/A; T1 (hm); X T2 (ms) 00:10.0	X ADVANCE; JUMP TO; BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			
004	1 (2) 3 4 5 6 7 8 / 9 (10) 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	INPUT TEST* N/A; T1 (hm); X T2 (ms) 01:45	ADVANCE; X JUMP TO 001; BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			
	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	INPUT TEST*; T1 (hm); T2 (ms)	ADVANCE; JUMP TO; BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			
	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	INPUT TEST*; T1 (hm); T2 (ms)	ADVANCE; JUMP TO; BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			

SIAS

AFAS-1

Notations in this column indicate where changes have been made



TIGH-85-1

55

TEST 9

EPC-7101
PROGRAM CODING FORM

SYSTEM DINGS 300 ESFAS PROOF OF DESIGN
DRAWN BY _____ DATE _____
CHECKED BY _____ PAGE _____ OF _____

STEP NO.	OUTPUTS ACTUATED	"HOLD FOR"	"THEN"	*INPUTS REQUIRED
C01	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
Notes: ALL OFF ST 001				
C02	(1) 2 3 4 5 6 7 (8) / (9) 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
Notes:				
C03	(1) 2 3 4 5 6 7 8 / 9 (10) 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 01:20.0	[ ] ADVANCE [X] JUMP TO 001 [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
Notes:				
001	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
Notes: ALL OFF ST 001				
C02	1 (2) 3 4 5 6 7 (8) / (9) 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
Notes:				
C03	1 (2) 3 4 5 6 7 8 / 9 (10) 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 01:20.0	[ ] ADVANCE [X] JUMP TO 001 [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
Notes:				
C01	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* NA [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
Notes: ALL OFF ST 001				
C02	1 2 (3) 4 5 6 7 (8) / (9) 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
Notes:				
C03	1 2 (3) 4 5 6 7 8 / 9 (10) 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 01:20.0	[ ] ADVANCE [X] JUMP TO 001 [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31
Notes:				
	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* [ ] T1 (hm) [ ] T2 (ms)	[ ] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
Notes:				

SIAS

T1AH-24-1

EPC-7101
PROGRAM CODING FORM

SYSTEM PVNGS BOP ESFAS PROOF OF DESIGN
DRAWN BY _____ DATE _____
CHECKED BY _____ PAGE _____ OF _____

	OUTPUTS ACTUATED	"HOLD FOR"	"THEN"	*INPUTS REQUIRED
CREFAS	001	INPUT TEST* N/A; T1 (hm); T2 (ms) X 00:10.0	ADVANCE X; JUMP TO; BRANCH*TO	
	Notes: ALL OFF ST 001			
	002 (4) (8) (9)	INPUT TEST* N/A; T1 (hm); T2 (ms) X 00:10.0	ADVANCE X; JUMP TO; BRANCH*TO	
	Notes:			
	003 (4) (10)	INPUT TEST* N/A; T1 (hm); T2 (ms) X 01:20.0	ADVANCE; JUMP TO 001; BRANCH*TO	
	Notes:			
	001	INPUT TEST* N/A; T1 (hm); T2 (ms) X 00:10.0	ADVANCE X; JUMP TO; BRANCH*TO	
	Notes: ALL OFF ST 001			
	002 (5) (8) (9)	INPUT TEST* N/A; T1 (hm); T2 (ms) X 00:10.0	ADVANCE X; JUMP TO; BRANCH*TO	
	Notes:			
CPVNGS	003 (5) (10)	INPUT TEST* N/A; T1 (hm); T2 (ms) X 01:20.0	ADVANCE; JUMP TO 001; BRANCH*TO	
	Notes:			
	001	INPUT TEST* N/A; T1 (hm); T2 (ms) X 00:10.0	ADVANCE X; JUMP TO; BRANCH*TO	
	Notes: ALL OFF ST 001			
	002 (6) (8) (9)	INPUT TEST* N/A; T1 (hm); T2 (ms) X 00:10.0	ADVANCE X; JUMP TO; BRANCH*TO	
	Notes:			
	003 (6) (10)	INPUT TEST* N/A; T1 (hm); T2 (ms) X 01:20.0	ADVANCE; JUMP TO 001; BRANCH*TO	
	Notes:			
		INPUT TEST*; T1 (hm); T2 (ms)	ADVANCE; JUMP TO; BRANCH*TO	
	Notes:			

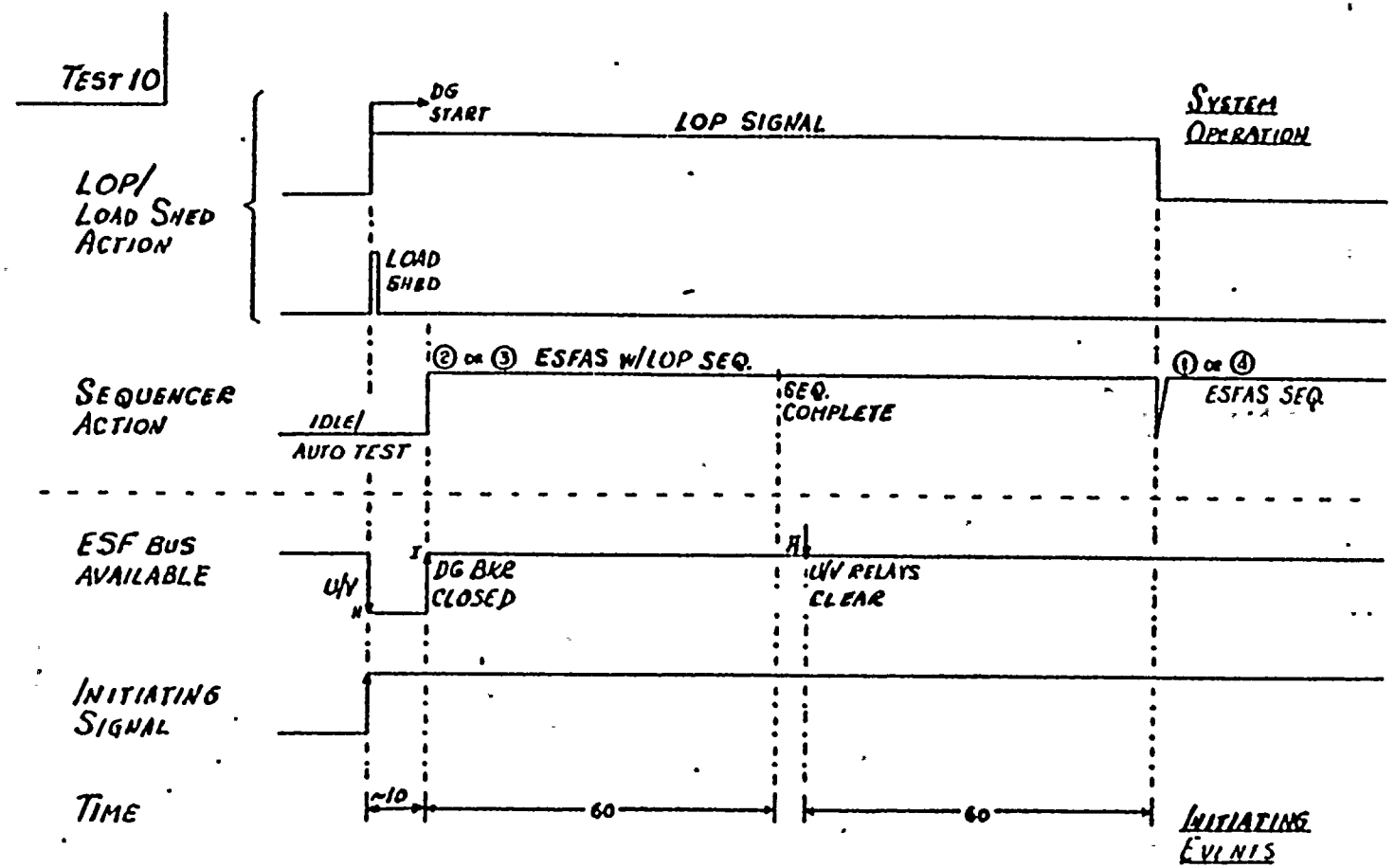
TEST 9 (cont'd)

EPC-7101
PROGRAM CODING FORM

SYSTEM: RINGS BOP FIRE PROOF OF TEST
DRAWN BY _____ DATE _____
CHECKED BY _____ PAGE _____ OF _____

STEP NO.	OUTPUTS ACTUATED	"HOLD FOR"	"THEN"	*INPUTS REQUIRED
001	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
002	1 2 3 4 5 6 (7) (8) (9) 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
003	1 2 3 4 5 6 (7) 8 9 (10) 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 01:20.0	[ ] ADVANCE [X] JUMP TO 001 [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* [ ] T1 (hm) [ ] T2 (ms)	[ ] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* [ ] T1 (hm) [ ] T2 (ms)	[ ] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* [ ] T1,(hm) [ ] T2 (ms)	[ ] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* [ ] T1 (hm) [ ] T2 (ms)	[ ] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* [ ] T1 (hm) [ ] T2 (ms)	[ ] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* [ ] T1 (hm) [ ] T2 (ms)	[ ] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			

Notations in this column indicate where changes have been made



JT04-85-1

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TEST 10

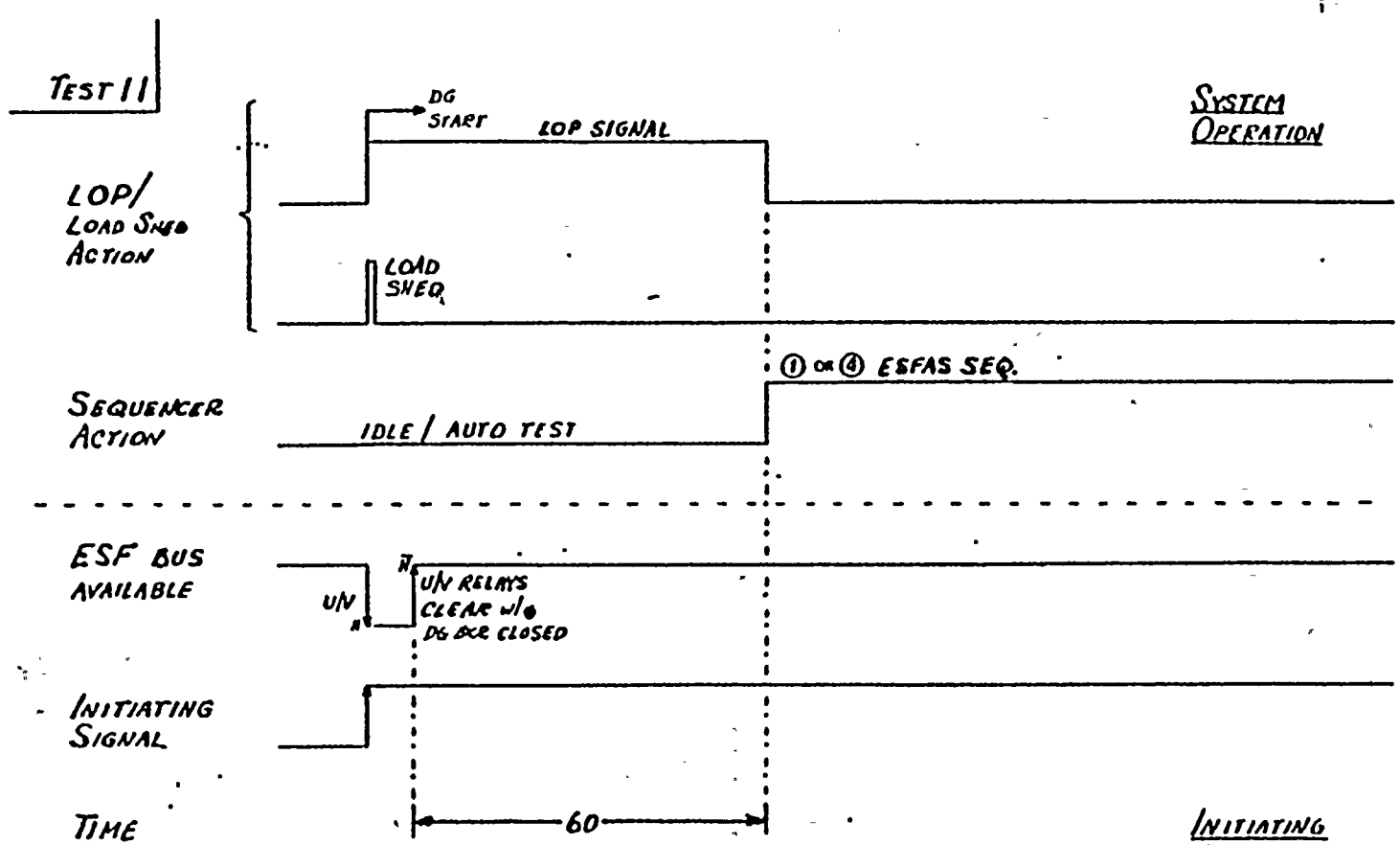
EPC - 7101
PROGRAM CODING FORM

SYSTEM PVNGS BOP ESFAS PROOF OF DESIGN
DRAWN BY _____ DATE _____
CHECKED BY _____ PAGE _____ OF _____

STEP NO.	OUTPUTS ACTUATED	"HOLD FOR"	"THEN"	*INPUTS REQUIRED
001	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	INPUT TEST* N/A T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE JUMP TO BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes: ALL OFF ST 001			
002	(1) 2 3 4 5 6 7 (8) (9) 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	INPUT TEST* N/A T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE JUMP TO BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
003	(1) 2 3 4 5 6 7 (8) (9) (10) 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	INPUT TEST* N/A T1 (hm) [X] T2 (ms) 01:10.0	[X] ADVANCE JUMP TO BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
CC4	(1) (2) 3 4 5 6 7 8 9 (10) 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	INPUT TEST* N/A T1 (hm) [X] T2 (ms) 01:45	[X] JUMP TO 001 ADVANCE BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
001	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	INPUT TEST* N/A T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE JUMP TO BRANCH*TO	1 2 3 4 5 6 7 9 10 11 12 13 14 15 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes: ALL OFF ST 001			
002	1 (2) 3 4 5 6 7 (8) (9) 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	INPUT TEST* N/A T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE JUMP TO BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
CC3	1 (2) 3 4 5 6 7 (8) (9) (10) 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	INPUT TEST* N/A T1 (hm) [X] T2 (ms) 01:10.0	[X] ADVANCE JUMP TO BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
CC4	1 (2) 3 4 5 6 7 8 9 (10) 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	INPUT TEST* N/A T1 (hm) [X] T2 (ms) 01:45	[X] JUMP TO 001 ADVANCE BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	INPUT TEST* T1 (hm) T2 (ms)	ADVANCE JUMP TO BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
	Notes:			
	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	INPUT TEST* T1 (hm) T2 (ms)	ADVANCE JUMP TO BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			

J104-851.

Notations in this column indicate where changes have been made



TDH-85-1

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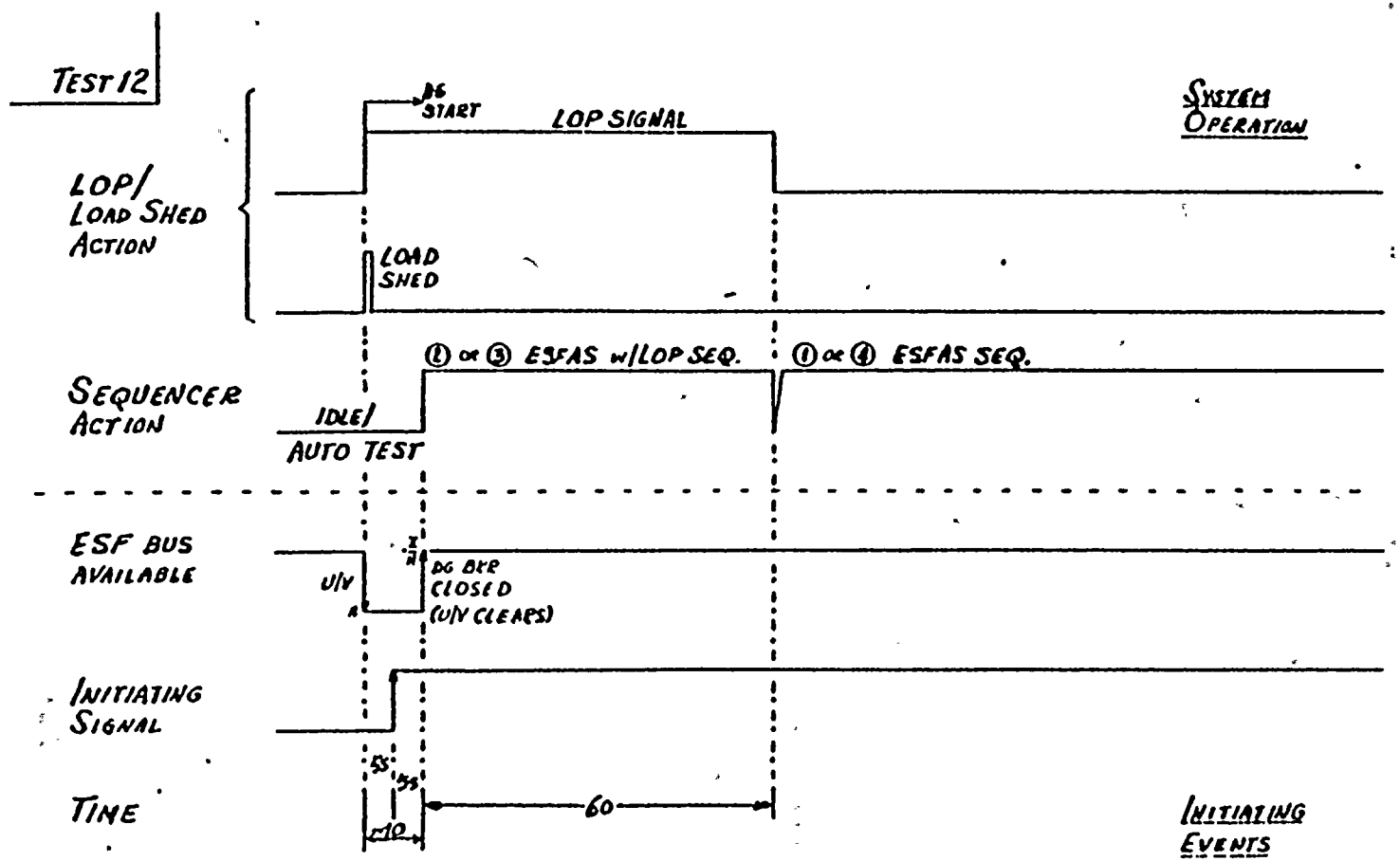
TEST 11

EPC-7101
PROGRAM CODING FORM

SYSTEM PVNGS EOF ESFAS PROOF OF DESIGN
DRAWN BY _____ DATE _____
CHECKED BY _____ PAGE _____ OF _____

STEP NO.	OUTPUTS ACTUATED	"HOLD FOR"	"THEN"	*INPUTS REQUIRED
001	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.5	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes: ALL OFF ST 001			
002	(1) 2 3 4 5 6 7 (8) (9) 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
003	(1) 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 01:45	[ ] ADVANCE [X] JUMP TO 001 [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
001	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* [X] T1 (hm) [X] T2 (ms) 00:10.5	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes: ALL OFF ST 001			
002	(1) (2) 3 4 5 6 7 (8) (9) 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
003	1 (2) 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* [ ] T1 (hm) [X] T2 (ms) 01:45	[ ] ADVANCE [X] JUMP TO 001 [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* [ ] T1 (hm) [ ] T2 (ms)	[ ] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* [ ] T1 (hm) [ ] T2 (ms)	[ ] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* [ ] T1 (hm) [ ] T2 (ms)	[ ] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* [ ] T1 (hm) [ ] T2 (ms)	[ ] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			

Notations in this column indicate where changes have been made



T/04-85-1

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TEST 12

EPC - 7101
PROGRAM CODING FORM

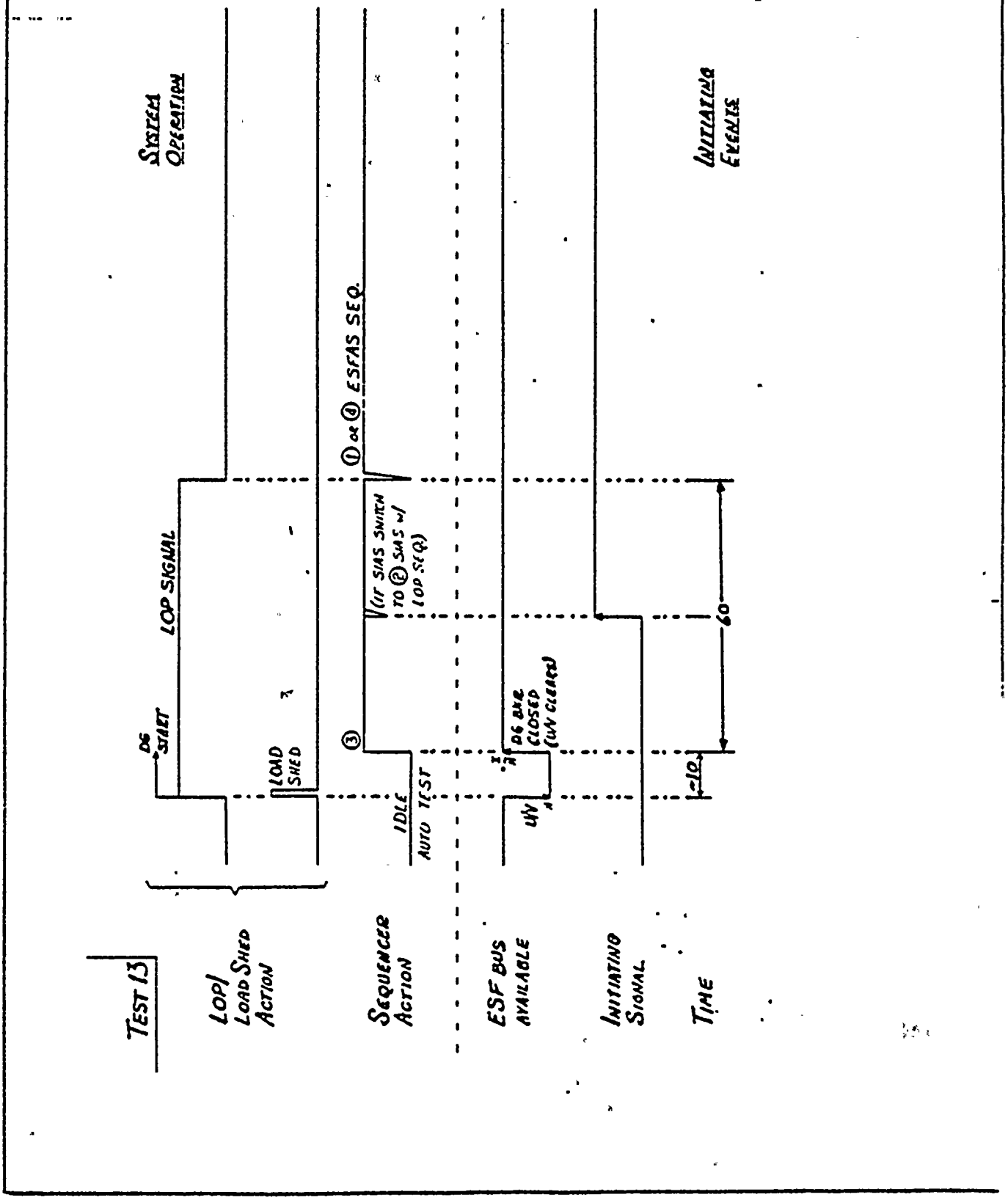
SYSTEM PUNGS -BOP EIFAS
DRAWN BY _____ DATE _____
CHECKED BY _____ PAGE _____ OF _____

STEP NO.	OUTPUTS ACTUATED	"HOLD FOR"	"THEN"	*INPUTS REQUIRED
001	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes: ALL OFF ST 001			
002	1 2 3 4 5 6 7 (8) / (9) 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:05.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			
003	(1) 2 3 4 5 6 7 (8) / (9) 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:05.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			
004	(1) 2 3 4 5 6 7 8 / 9 (10) 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 01:45.0	[ ] ADVANCE [X] JUMP TO 001 [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			
001	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes: ALL OFF ST001			
002	1 2 3 4 5 6 7 (8) / (9) 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:05.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			
003	1 (2) 3 4 5 6 7 (8) / (9) 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:05.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			
004	1 (2) 3 4 5 6 7 8 / 9 (10) 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 01:45.0	[ ] ADVANCE [X] JUMP TO 001 [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			
	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* [ ] T1 (hm) [ ] T2 (ms)	[ ] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			
	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* [ ] T1 (hm) [ ] T2 (ms)	[ ] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			

END OF 1

GENERAL ATOMIC COMPANY - ELECTRONIC SYSTEMS STANDARD

Notations in this column indicate where changes have been made



J104-85-1

TEST 13

EPC-7101
PROGRAM CODING FORM

SYSTEM P/NSS BOP ESFAS PROOF OF DESIGN
DRAWN BY _____ DATE _____
CHECKED BY _____ PAGE _____ OF _____

STEP NO.	OUTPUTS ACTUATED	"HOLD FOR"	"THEN"	*INPUTS REQUIRED
001	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes: ALL OFF ST 001			
002	1 2 3 4 5 6 7 8 / (9) 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			
003	1 (2) 3 4 5 6 7 8 / 9 (10) 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:30	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			
004	(1) 2 3 4 5 6 7 8 / 9 (10) 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 01:20	[ ] ADVANCE [X] JUMP TO 001 [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			
001	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 / 9 10 11 12 13 14 15 / 17 18 19 20 21 22 23 / 25 26 27 28 29 30 31 32
	Notes: ALL OFF ST001			
002	1 2 3 4 5 6 7 8 / (9) 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			
003	1 2 3 4 5 6 7 8 / 9 (10) 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:30.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			
004	1 (2) 3 4 5 6 7 8 / 9 (10) 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 01:20.0	[ ] ADVANCE [X] JUMP TO 001 [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			
001	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes: ALL OFF ST001			
002	1 2 3 4 5 6 7 8 / (9) 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			

TEST 13 (cont'd.)

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P	OUTPUTS ACTUATED	"HOLD FOR"	"THEN"	*INPUTS REQUIRED
003	1 2 3 4 5 6 7 8 / 9 (10) 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:30.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			
004	1 2 (3) 4 5 6 7 8 / 9 (10) 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 01:20.0	[ ] ADVANCE [X] JUMP TO 001 [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			
001	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes: ALL OFF ST 001			
002	1 2 3 4 5 6 7 (8) / (9) 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			
003	1 2 3 4 5 6 7 8 / 9 (10) 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:30.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			
004	1 2 3 (4) 5 6 7 8 / 9 (10) 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 01:20.0	[ ] ADVANCE [X] JUMP TO 001 [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			
001	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes: ALL OFF ST 001			
002	1 2 3 4 5 6 7 (8) / (9) 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			
003	1 2 3 4 5 6 7 8 / 9 (10) 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:30.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			
004	1 2 3 4 (5) 6 7 8 / 9 (10) 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 01:20.0	[ ] ADVANCE [X] JUMP TO 001 [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			

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TEST 13 (CONT'D)

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STEP NO.	OUTPUTS ACTUATED	"HOLD FOR"	"THEN"	*INPUTS REQUIRED
001	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes: ALL OFF ST.001			
002	1 2 3 4 5 6 7 (8) (9) 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
003	1 2 3 4 5 6 7 8 9 (10) 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:30.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
004	1 2 3 4 5 (6) 7 8 9 (10) 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 01:20.0	[ ] ADVANCE [X] JUMP TO 001 [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
001	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 9 10 11 12 13 14 15 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes: ALL OFF ST001			
002	1 2 3 4 5 6 7 (8) (9) 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
003	1 2 3 4 5 6 7 8 9 (10) 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:30.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
004	1 2 3 4 5 6 (7) 8 9 (10) 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 01:20.0	[ ] ADVANCE [X] JUMP TO 001 [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* [ ] T1 (hm) [ ] T2 (ms)	[ ] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
	Notes:			
	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* [ ] T1 (hm) [ ] T2 (ms)	[ ] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			

TEST 14

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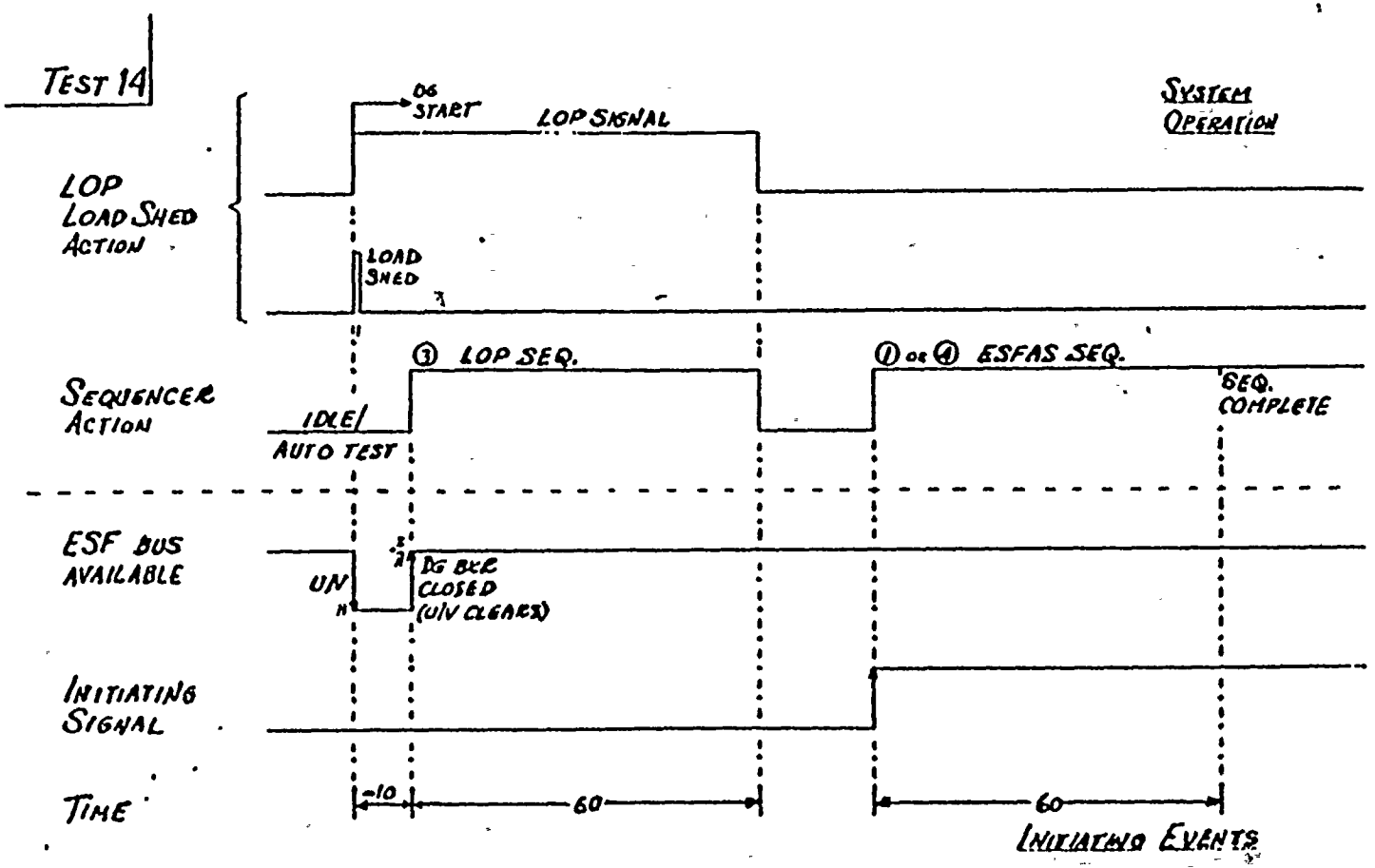
STEP NO.	OUTPUTS ACTUATED	"HOLD FOR"	"THEN"	*INPUTS REQUIRED
CC1	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	INPUT TEST* N/A T1 (hm) X T2 (ms) 00:10.0	X ADVANCE JUMP TO BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
Notes: ALL OFF ST 001				
CC2	1 2 3 4 5 6 7 (8) (9) 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	INPUT TEST* N/A T1 (hm) X T2 (ms) 00:10.0	X ADVANCE JUMP TO BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
Notes:				
003	1 2 3 4 5 6 7 8 9 (10) 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	INPUT TEST* N/A T1 (hm) X T2 (ms) 01:10.0	X ADVANCE JUMP TO BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
Notes:				
CC4	(1) 2 3 4 5 6 7 8 9 (10) 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	INPUT TEST* N/A T1 (hm) X T2 (ms) 01:10.0	X JUMP TO 001 BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
Notes:				
CO1	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	INPUT TEST* N/A T1 (hm) X T2 (ms) 00:10.0	X ADVANCE JUMP TO BRANCH*TO	1 2 3 4 5 6 9 10 11 12 13 14 15 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
Notes: ALL OFF ST 001				
CC2	1 2 3 4 5 6 7 (8) (9) 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	INPUT TEST* N/A T1 (hm) X T2 (ms) 00:10.0	X ADVANCE JUMP TO BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
Notes:				
CC3	1 2 3 4 5 6 7 8 9 (10) 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	INPUT TEST* N/A T1 (hm) X T2 (ms) 01:10	X ADVANCE JUMP TO BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
Notes:				
CC4	1 (2) 3 4 5 6 7 8 9 (10) 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	INPUT TEST* N/A T1 (hm) X T2 (ms) 01:10	X JUMP TO 001 BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
Notes:				
CO1	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	INPUT TEST* N/A T1 (hm) X T2 (ms) 00:10.0	X ADVANCE JUMP TO BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 3
Notes: ALL OFF ST.001				
CC2	1 2 3 4 5 6 7 (8) (9) 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	INPUT TEST* N/A T1 (hm) X T2 (ms) 00:10.0	X ADVANCE JUMP TO BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
Notes:				

Notations in this column indicate where changes have been made



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TEST 14 (CONT'D)

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PROGRAM CODING FORM

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FBEVAS

STEP NO.	OUTPUTS ACTUATED	"HOLD FOR"	"THEN"	*INPUTS REQUIRED
CC1	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	☐ INPUT TEST* N/A ☐ T1 (hm) ☒ T2 (ms) 00:10.0	☒ ADVANCE ☐ JUMP TO ☐ BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
Notes: ALL OFF ST 001				
CC2	1 2 3 4 5 6 7 [✓ 8] [✓ 9] 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	☐ INPUT TEST* N/A ☐ T1 (hm) ☒ T2 (ms) 00:10.0	☒ ADVANCE ☐ JUMP TO ☐ BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
Notes:				
CC3	1 2 3 4 5 6 7 8 9 [✓ 10] 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	☐ INPUT TEST* N/A ☐ T1 (hm) ☒ T2 (ms) 01:10.0	☒ ADVANCE ☐ JUMP TO ☐ BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
Notes:				
CC4	1 2 3 4 5 [✓ 6] 7 8 9 [✓ 10] 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	☐ INPUT TEST* N/A ☐ T1 (hm) ☒ T2 (ms) 01:10.0	☐ ADVANCE ☒ JUMP TO 001 ☐ BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
Notes:				

DG RUN

001	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	☐ INPUT TEST* N/A ☐ T1 (hm) ☒ T2 (ms) 00:10.0	☒ ADVANCE ☐ JUMP TO ☐ BRANCH*TO	1 2 3 4 5 6 7 9 10 11 12 13 14 15 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
Notes: ALL OFF ST 001				
002	1 2 3 4 5 6 7 [✓ 8] [✓ 9] 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	☐ INPUT TEST* N/A ☐ T1 (hm) ☒ T2 (ms) 00:10.0	☒ ADVANCE ☐ JUMP TO ☐ BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
Notes:				
003	1 2 3 4 5 6 7 8 9 [✓ 10] 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	☐ INPUT TEST* N/A ☐ T1 (hm) ☒ T2 (ms) 01:10.0	☒ ADVANCE ☐ JUMP TO ☐ BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
Notes:				
004	1 2 3 4 5 6 [✓ 7] 8 9 [✓ 10] 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	☐ INPUT TEST* N/A ☐ T1 (hm) ☒ T2 (ms) 01:10.0	☐ ADVANCE ☒ JUMP TO 001 ☐ BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
Notes:				
	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	☐ INPUT TEST* ☐ T1 (hm) ☐ T2 (ms)	☐ ADVANCE ☐ JUMP TO ☐ BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
Notes:				
	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	☐ INPUT TEST* ☐ T1 (hm) ☐ T2 (ms)	☐ ADVANCE ☐ JUMP TO ☐ BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
Notes:				

TEST 14 (CONT'D)

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	OUTPUTS ACTUATED	"HOLD FOR"	"THEN"	*INPUTS REQUIRED
C03	1 2 3 4 5 6 7 8 9 **10** 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 01:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
C04	1 2 **3** 4 5 6 7 8 9 **10** 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 01:10.0	[ ] ADVANCE [X] JUMP TO 001 [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
C01	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes: ALL OFF ST 001			
C02	1 2 3 4 5 6 7 **8** **9** 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
?	1 2 3 4 5 6 7 8 9 **10** 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 01:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
C04	1 2 3 **4** 5 6 7 8 9 **10** 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 01:10.0	[ ] ADVANCE [X] JUMP TO 001 [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
C01	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes: ALL OFF ST 001			
002	1 2 3 4 5 6 7 **8** **9** 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
003	1 2 3 4 5 6 7 8 9 **10** 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 01:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
004	1 2 3 4 **5** 6 7 8 9 **10** 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms)	[ ] ADVANCE [X] JUMP TO 001 [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			

AFAS-2

CRYAS

CRYIAS

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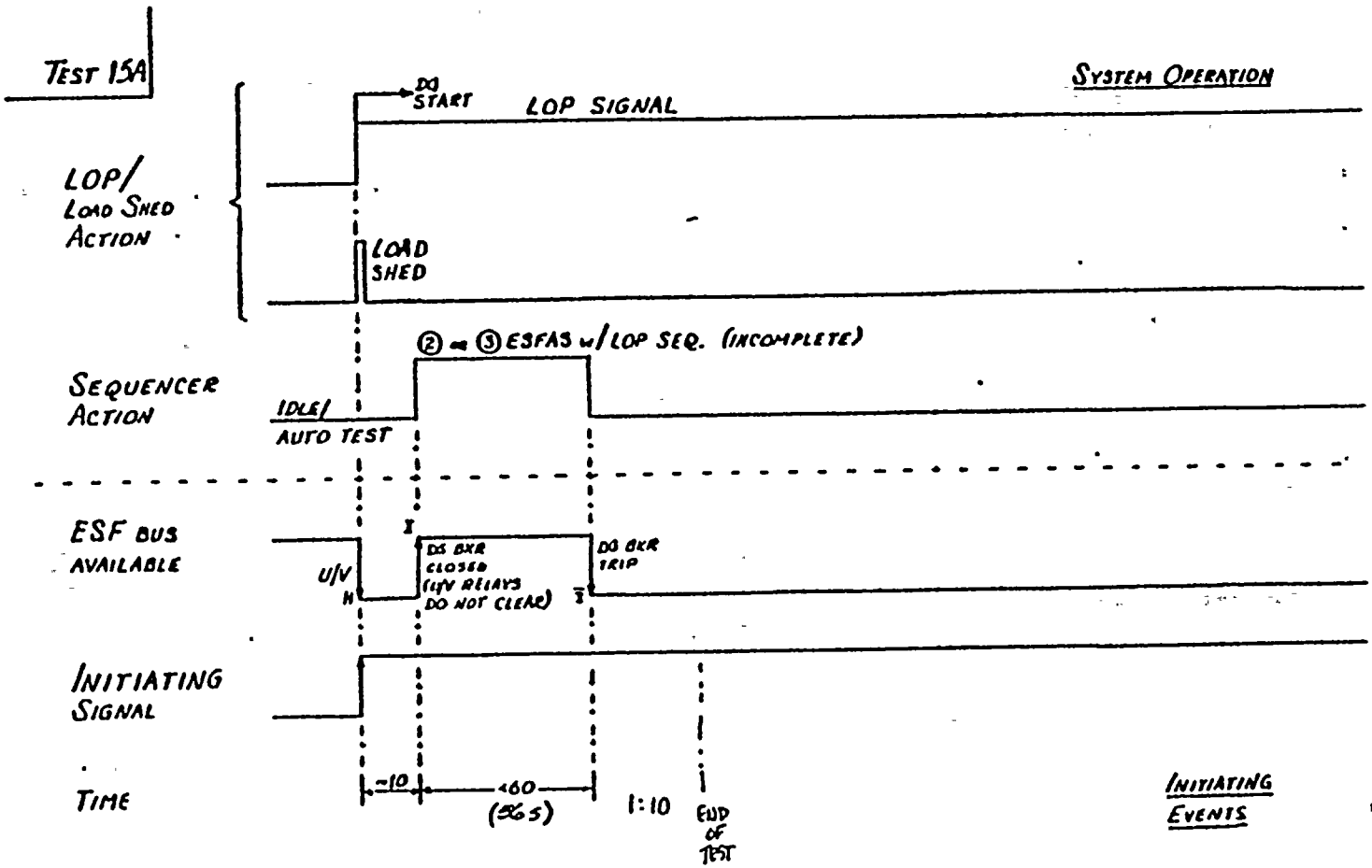
Notations in this column indicate where changes have been made



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TEST 15A

EPC - 7101
PROGRAM CODING FORM

SYSTEM PINGS BOP ESFAS Proof of Design
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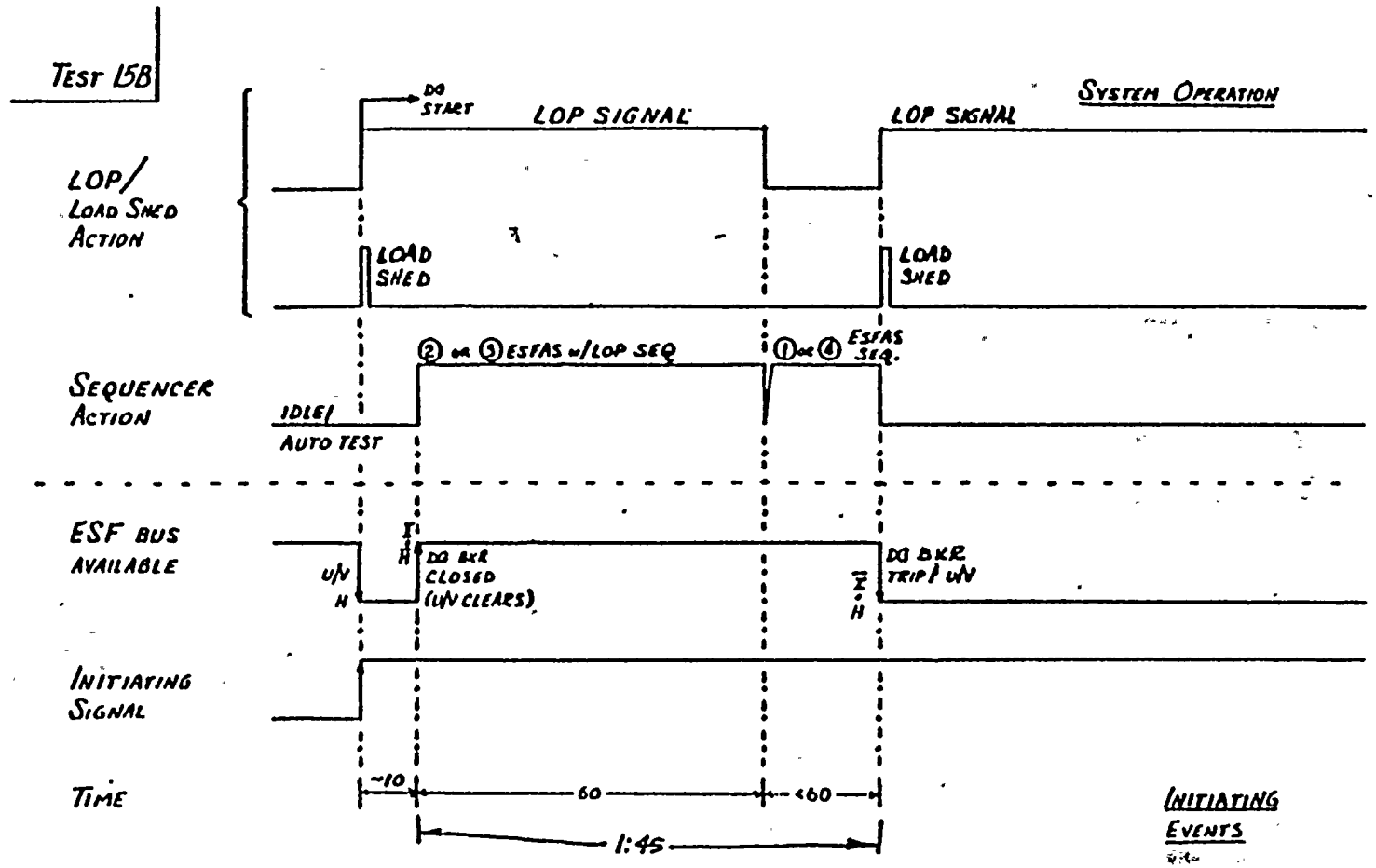
CHECKED BY _____ PAGE _____ OF _____

STEP NO.	OUTPUTS ACTUATED	"HOLD FOR"	"THEN"	*INPUTS REQUIRED
001	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes: ALL OFF ST 001			
002	(1) 2 3 4 5 6 7 (8) / (9) 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			
003	(1) (2) 3 4 5 6 7 (8) / (9) (10) 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* [ ] T1 (hm) [X] T2 (ms) 00:56.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			
004	(1) 2 3 4 5 6 7 (8) / (9) 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* [ ] T1 (hm) [X] T2 (ms) 01:10.0	[ ] ADVANCE [X] JUMP TO 001 [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			
001	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes: ALL OFF ST 001			
002	1 (2) 3 4 5 6 7 (8) / (9) 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* [ ] T1 (hm) [X] T2 (ms) 00:100	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			
003	1 (2) 3 4 5 6 7 (8) / (9) (10) 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* [ ] T1 (hm) [X] T2 (ms) 00:56.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			
004	1 (2) 3 4 5 6 7 (8) / (9) 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* [ ] T1 (hm) [X] T2 (ms) 01:10.0	[ ] ADVANCE [X] JUMP TO 001 [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			
	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* [ ] T1 (hm) [ ] T2 (ms)	[ ] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31
	Notes:			
	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* [ ] T1 (hm) [ ] T2 (ms)	[ ] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			


TEST 15B
SYSTEM OPERATION
DG START
LOP SIGNAL
LOP SIGNAL
LOP/ LOAD SHED ACTION
LOAD SHED
LOAD SHED
② or ⑤ ESFAS w/LOP SEQ
①or④ ESFAS SEQ.
SEQUENCER ACTION
IDLE/ AUTO TEST
ESF BUS AVAILABLE
U/V H
DG BKR CLOSED (U/V CLEARS)
DG BKR TRIP/ U/V
INITIATING SIGNAL
TIME
~10
60
<60
1:45
INITIATING EVENTS

T1H-85-1

75

TEST 15B

EPC - 7101
PROGRAM CODING FORM

SYSTEM PVNGS BOP ESFAS PROOF OF DECISION
DRAWN BY _____ DATE _____
CHECKED BY _____ PAGE _____ OF _____

STEP NO.	OUTPUTS ACTUATED	"HOLD FOR"	"THEN"	*INPUTS REQUIRED
001	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes: ALL OFF ST001			
002	(1) 2 3 4 5 6 7 (8) (9) 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
003	(1) 2 3 4 5 6 7 8 9 (10) 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* [ ] T1 (hm) [X] T2 (ms) 01:45.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
004	(1) 2 3 4 5 6 7 (8) (9) 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* [ ] T1 (hm) [X] T2 (ms) 00:10.0	[ ] ADVANCE [X] JUMP TO 001 [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
001	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 9 10 11 12 13 14 15 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes: ALL OFF ST001			
002	1 (2) 3 4 5 6 7 (8) (9) 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
003	1 (2) 3 4 5 6 7 8 9 (10) 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* [ ] T1 (hm) [X] T2 (ms) 01:45.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
004	1 (2) 3 4 5 6 7 (8) (9) 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* [ ] T1 (hm) [X] T2 (ms) 00:10.0	[ ] ADVANCE [X] JUMP TO 001 [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* [ ] T1 (hm) [ ] T2 (ms)	[ ] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
	Notes:			
	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* [ ] T1 (hm) [ ] T2 (ms)	[ ] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			

Multiple Initiating Signal Tests:

	Initiating Signals x/y (y/x)								
Test Number	SIAS (A)/(B) AFAS-1	SIAS (A)/(C) AFAS-2	SIAS (A)/(D) CREFAS	SIAS (A)/(E) CRVIAS	SIAS (A)/(F) FBEVAS	SIAS (A)/(G) DG RUN	AFAS-1 (H)/(G) DG RUN	AFAS-2 (C)/(G) DG RUN	CREFAS (D)/(F) FBEVAS
16	X	X	X	X	X	X	X	X	X
19	X	X	X	X	X	X	X	X	X
22	X								
23	X	X	X	X	X	X	X	X	X
24	X	X	X	X	X	X	X	X	X
25	X (X)	X (X)	X (X)	X (X)	X (X)	X (X)	X (X)	X (X)	X (X)
26	X (X)						X (X)		X (X)
27	X (X)					X (X)	X (X)		
28	X (X)	X (X)	X (X)	X (X)	X (X)				
29	X (X)	X (X)	X (X)	X (X)	X (X)				

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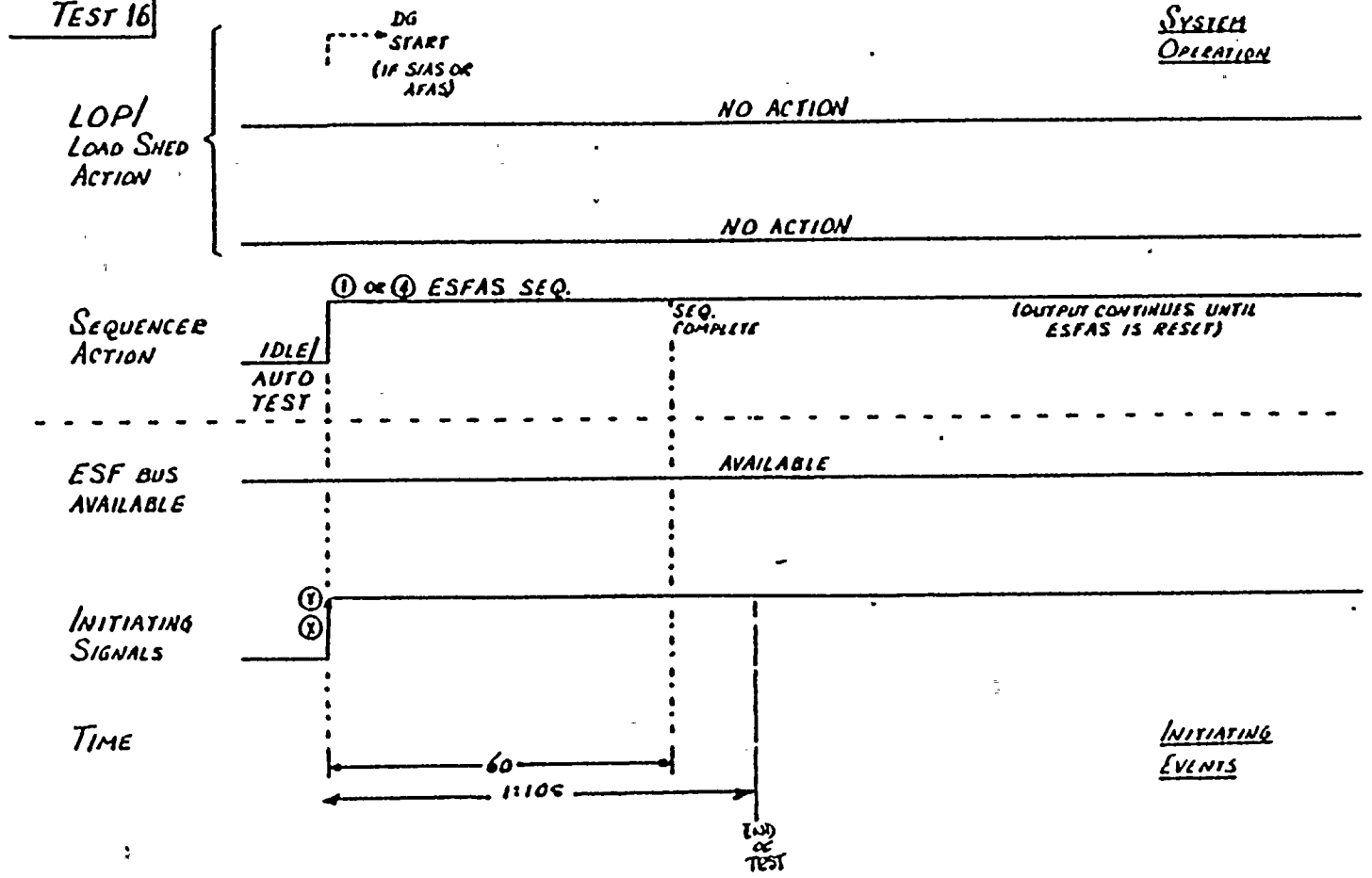
Notations in this column indicate where changes have been made

TEST 16



TEST 16

SIAS • LOF

EPC - 7101

PROGRAM CODING FORM

SYSTEM RINGS OF ESELS PROOF OF DESIGN

DRAWN BY _____ DATE _____

CHECKED BY _____ PAGE _____ OF _____

P	OUTPUTS ACTUATED	"HOLD FOR"	"THEN"	*INPUTS REQUIRED
	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	INPUT TEST* N/A T1 (hm) T2 (ms)	ADVANCE JUMP TO BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	OC1	[X] T2 (ms) 00:10.0	[X] ADVANCE	
	Notes: ALL OFF ST C01			
	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	INPUT TEST* N/A T1 (hm) T2 (ms)	ADVANCE JUMP TO BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	002	[X] T2 (ms) 01:10	[X] JUMP TO 001	
	Notes:			
	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	INPUT TEST* N/A T1 (hm) T2 (ms)	ADVANCE JUMP TO BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	001	[X] T2 (ms) 00:10.0	[X] ADVANCE	
	Notes: ALL OFF ST001			
	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	INPUT TEST* N/A T1 (hm) T2 (ms)	ADVANCE JUMP TO BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	CC2	[X] T2 (ms) 01:10.0	[X] JUMP TO 001	
	Notes:			
	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	INPUT TEST* N/A T1 (hm) T2 (ms)	ADVANCE JUMP TO BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	01	[X] T2 (ms) 00:10.0	[X] ADVANCE	
	Notes: ALL OFF ST 001			
	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	INPUT TEST* N/A T1 (hm) T2 (ms)	ADVANCE JUMP TO BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	CC2	[X] T2 (ms) 01:10.0	[X] JUMP TO 001	
	Notes:			
	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	INPUT TEST* N/A T1 (hm) T2 (ms)	ADVANCE JUMP TO BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	001	[X] T2 (ms) 00:10.0	[X] ADVANCE	
	Notes: ALL OFF ST001			
	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	INPUT TEST* N/A T1 (hm) T2 (ms)	ADVANCE JUMP TO BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	002	[X] T2 (ms) 01:10.0	[X] JUMP TO 001	
	Notes:			
	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	INPUT TEST* N/A T1 (hm) T2 (ms)	ADVANCE JUMP TO BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	001	[X] T2 (ms) 00:10.0	[X] ADVANCE	
	Notes: ALL OFF ST 001			
	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	INPUT TEST* N/A T1 (hm) T2 (ms)	ADVANCE JUMP TO BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	CC2	[X] T2 (ms) 01:10.0	[X] JUMP TO 001	
	Notes:			

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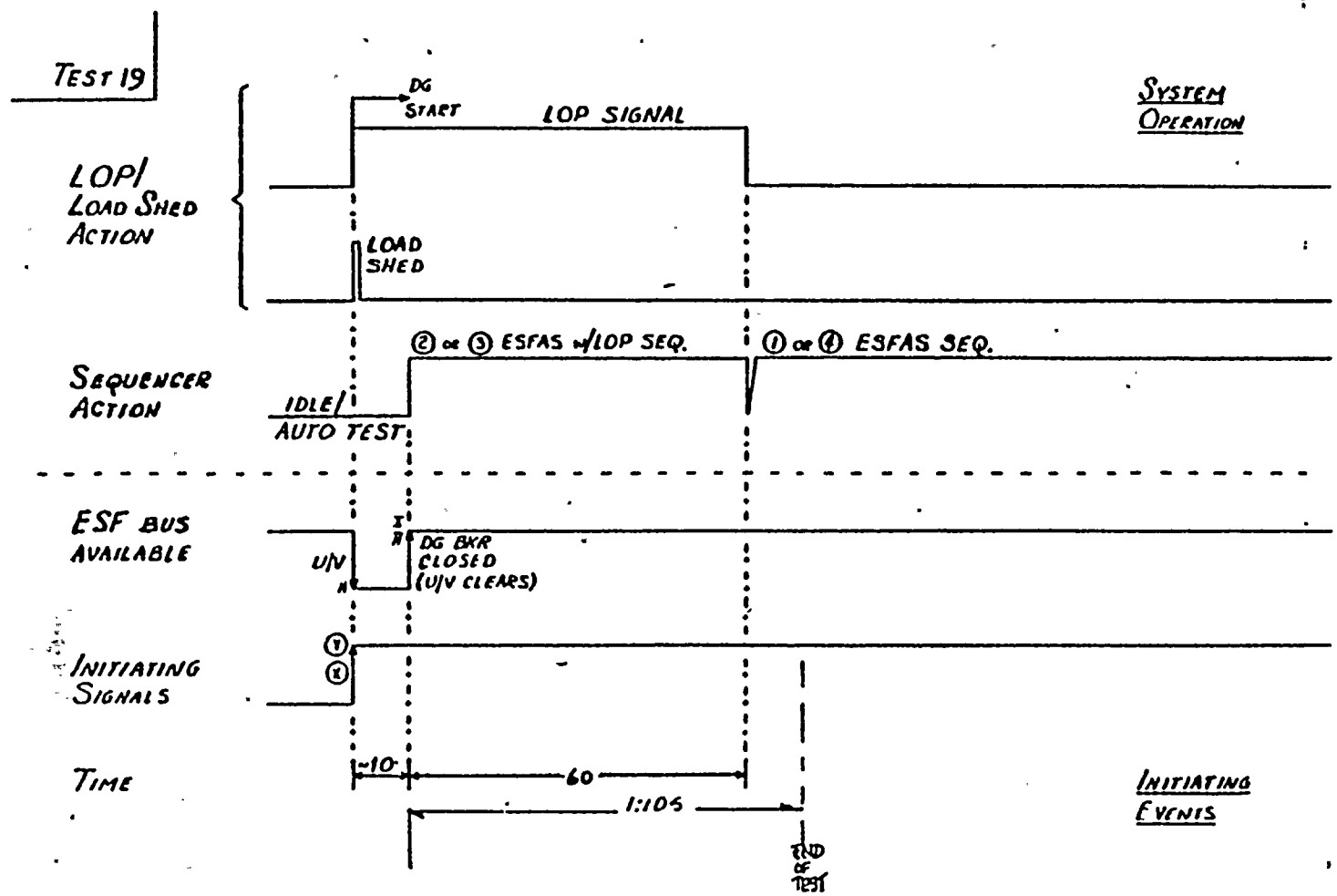
TEST 16 (CONT'D)

EPC-7101
PROGRAM CODING FORM

SYSTEM PVNGS BOP ESFAS PROOF OF DESIGN
DRAWN BY _____ DATE _____
CHECKED BY _____ PAGE _____ OF _____

STEP NO.	OUTPUTS ACTUATED	"HOLD FOR"	"THEN"	*INPUTS REQUIRED
001	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes: ALL OFF ST 001			
002	(1) 2 3 4 5 6 (7) 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 01:10.0	[ ] ADVANCE [X] JUMP TO 001 [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			
001	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes: ALL OFF ST 001			
002	1 (2) 3 4 5 6 (7) 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 01:10.0	[ ] ADVANCE [X] JUMP TO 001 [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			
001	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 / 9 10 11 12 13 14 15 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes: ALL OFF ST 001			
002	1 2 (3) 4 5 6 (7) 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 01:10.0	[ ] ADVANCE [X] JUMP TO 001 [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			
001	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes: ALL OFF ST 001			
002	1 2 3 (4) 5 (6) 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 01:10.0	[ ] ADVANCE [X] JUMP TO 001 [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			
	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* [ ] T1 (hm) [ ] T2 (ms)	[ ] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			
	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* [ ] T1 (hm) [ ] T2 (ms)	[ ] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			

Notations in this column indicate where changes have been made



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TEST 19

EPC - 7101
PROGRAM CODING FORM

SYSTEM PVNGS BOP ESFAS PROOF OF DESIGN
DRAWN BY _____ DATE _____
CHECKED BY _____ PAGE _____ OF _____

STEP NO.	OUTPUTS ACTUATED	"HOLD FOR"	"THEN"	*INPUTS REQUIRED
C01	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
Notes: ALL OFF ST 001				
C02	(1) (2) 3 4 5 6 7 (8) (9) 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
Notes:				
C03	(1) (2) 3 4 5 6 7 8 9 (10) 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 01:10.0	[ ] ADVANCE [X] JUMP TO 001 [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
Notes:				
C01	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
Notes: ALL OFF ST 001				
C02	(1) 2 (3) 4 5 6 7 (8) (9) 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 9 10 11 12 13 14 15 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
Notes:				
C03	(1) 2 (3) 4 5 6 7 8 9 (10) 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 01:10.0	[ ] ADVANCE [X] JUMP TO 001 [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
Notes:				
C01	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
Notes: ALL OFF ST 001				
C02	(1) 2 3 (4) 5 6 7 (8) (9) 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
Notes:				
C03	(1) 2 3 (4) 5 6 7 8 9 (10) 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 01:10.0	[ ] ADVANCE [X] JUMP TO 001 [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
Notes:				
C01	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
Notes: ALL OFF ST 001				

EPC - 7101
PROGRAM CODING FORM

SYSTEM PINGS BOP ESFAS PROOF OF DESIGN
DRAWN BY _____ DATE _____
CHECKED BY _____ PAGE _____ OF _____

P	OUTPUTS ACTUATED	"HOLD FOR"	"THEN"	*INPUTS REQUIRED
002	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			
003	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 01:10.0	[ ] ADVANCE [X] JUMP TO 001 [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			
001	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes: ALL OFF ST 001			
002	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			
003	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 01:10.0	[ ] ADVANCE [X] JUMP TO 001 [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			
001	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes: ALL OFF ST 001			
002	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			

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EPC FORM 200

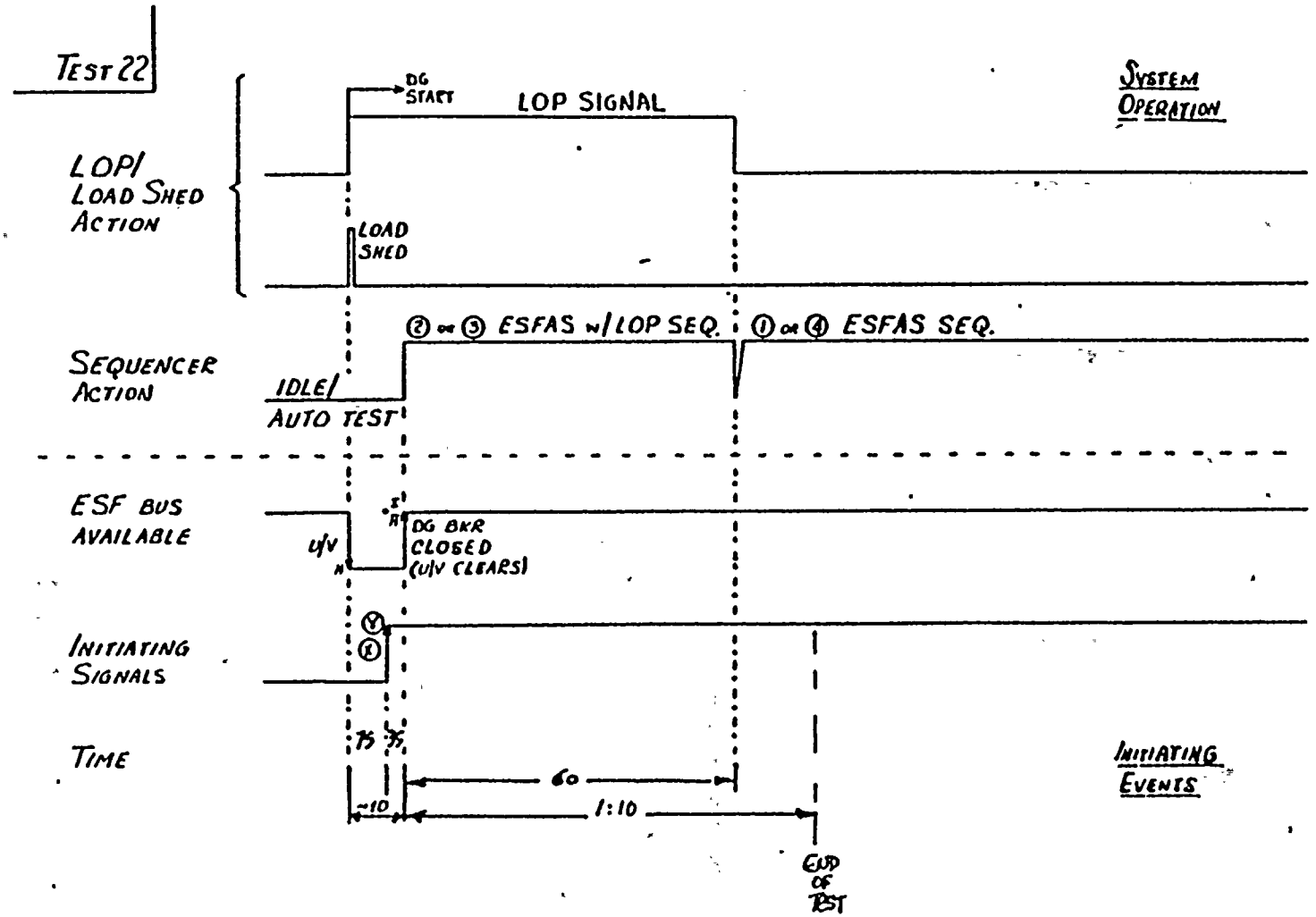
TEST 19 (CONT'D).

EPC-7101
PROGRAM CODING FORM

SYSTEM PINGS EOP ESFAS PROOF OF DESIGN
DRAWN BY _____ DATE _____
CHECKED BY _____ PAGE _____ OF _____

STEP NO.	OUTPUTS ACTUATED	"HOLD FOR"	"THEN"	*INPUTS REQUIRED
003	1 (2) 3 4 5 6 (7) 8 9 (10) 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	INPUT TEST* N/A T1 (hm) [X] T2 (ms) 01:10.0	[ ] ADVANCE [X] JUMP TO 001 [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
001	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	INPUT TEST* N/A T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes: ALL OFF ST 001			
002	1 2 (3) 4 5 6 (7) (8) (9) 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	INPUT TEST* N/A T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
003	1 2 (3) 4 5 6 (7) 8 9 (10) 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	INPUT TEST* N/A T1 (hm) [X] T2 (ms) 01:10.0	[ ] ADVANCE [X] JUMP TO 001 [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
001	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	INPUT TEST* N/A T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 9 10 11 12 13 14 15 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes: ALL OFF ST 001			
002	1 2 3 (4) 5 (6) 7 (8) (9) 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	INPUT TEST* N/A T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
003	1 2 3 (4) 5 (6) 7 8 9 (10) 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	INPUT TEST* N/A T1 (hm) [X] T2 (ms) 01:10.0	[ ] ADVANCE [X] JUMP TO 001 [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	INPUT TEST* T1 (hm) T2 (ms)	[ ] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	INPUT TEST* T1 (hm) T2 (ms)	[ ] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	INPUT TEST* T1 (hm) T2 (ms)	[ ] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			

Notations in this column indicate where changes have been made



J104-85-1

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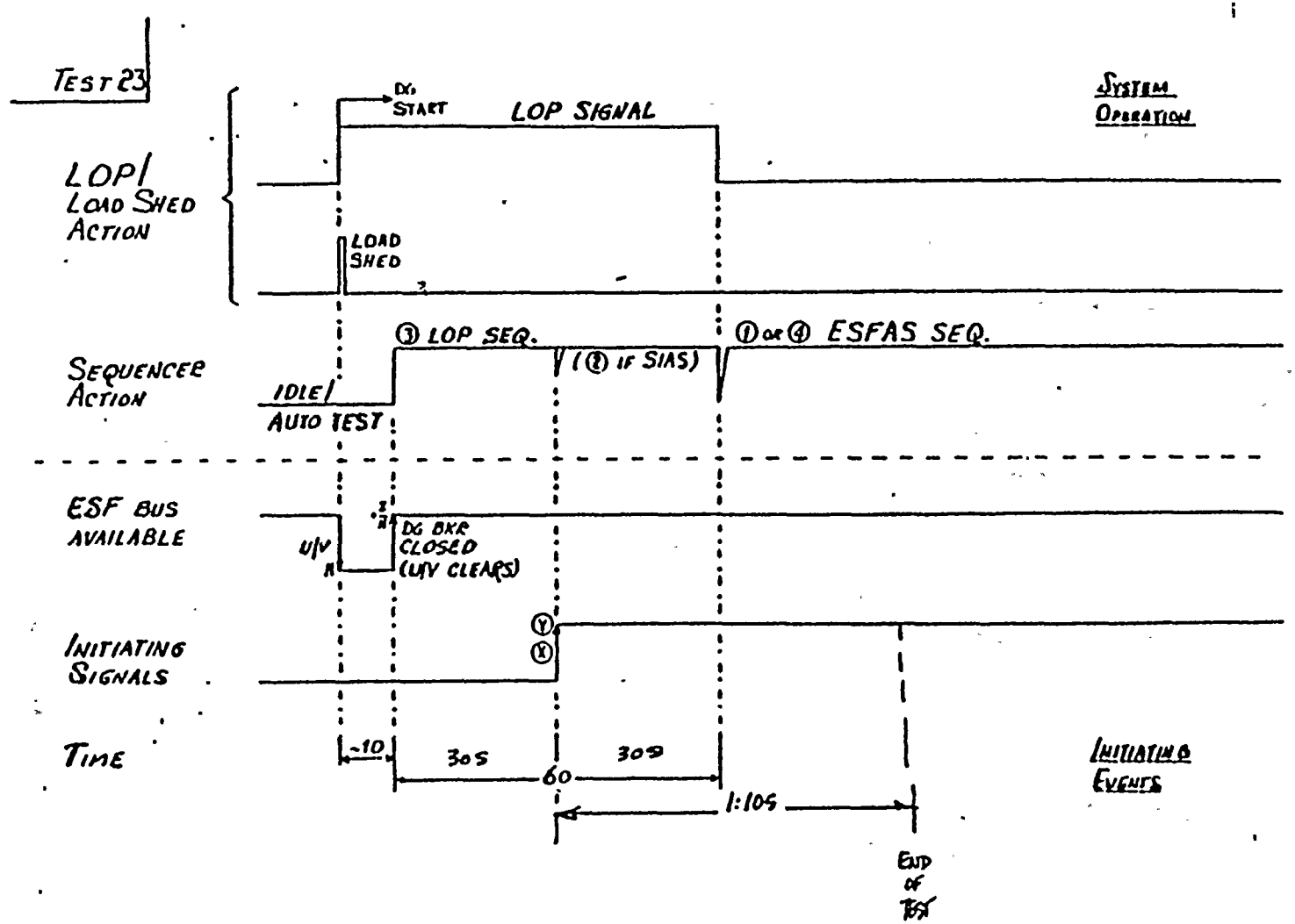
TEST 22

EPC · 7101
PROGRAM CODING FORM

SYSTEM RINGS: EOP ESFAS. FROCT SE LESAI
DRAWN BY _____ DATE _____
CHECKED BY _____ PAGE _____ OF _____

STEP NO.	OUTPUTS ACTUATED	"HOLD FOR"	"THEN"	*INPUTS REQUIRED
001	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes: ALL CFTs STC01			
002	1 2 3 4 5 6 7 (8) (9) 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:07.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
003	(1) (2) 3 4 5 6 7 (8) (9) 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:03.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
004	(1) (2) 3 4 5 6 7 8 9 (10) 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 01:10.0	[ ] ADVANCE [X] JUMP TO 001 [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* [ ] T1 (hm) [ ] T2 (ms)	[ ] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 9 10 11 12 13 14 15 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* [ ] T1 (hm) [ ] T2 (ms)	[ ] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* [ ] T1 (hm) [ ] T2 (ms)	[ ] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* [ ] T1 (hm) [ ] T2 (ms)	[ ] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* [ ] T1 (hm) [ ] T2 (ms)	[ ] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			


TEST 23
DG START
LOP SIGNAL
SYSTEM OPERATION
LOP/ LOAD SHED ACTION
LOAD SHED
③ LOP SEQ.
(① IF SIAS)
①or④ ESFAS SEQ.
SEQUENCER ACTION
IDLE/ AUTO TEST
ESF BUS AVAILABLE
U/V
DG BKR CLOSED (U/V CLEARS)
INITIATING SIGNALS
TIME
~10
30s
60
30s
1:10s
INITIATING EVENTS
END OF TEST

J704-85-1

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TEST 23

EPC - 7101
PROGRAM CODING FORM

SYSTEM PINGS #05 FOR AFAS, Joint + Design
DRAWN BY _____ DATE _____
CHECKED BY _____ PAGE _____ OF _____

STEP NO.	OUTPUTS ACTUATED	"HOLD FOR"	"THEN"	*INPUTS REQUIRED
C01	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
Notes: ALL OFF ST 001				
C02	1 2 3 4 5 6 7 (8) / (9) 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
Notes:				
C03	1 2 3 4 5 6 7 8 / 9 (10) 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:30.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
Notes:				
C04	(1) (2) 3 4 5 6 7 8 / 9 (10) 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 01:10.0	[ ] ADVANCE [X] JUMP TO 001 [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
Notes:				
001	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:00.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 / 9 10 11 12 13 14 15 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
Notes: ALL OFF ST 001				
C02	1 2 3 4 5 6 7 (8) / (9) 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
Notes:				
C03	1 2 3 4 5 6 7 8 / 9 (10) 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:30.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
Notes:				
C04	(1) 2 (3) 4 5 6 7 8 / 9 (10) 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 01:10.0	[ ] ADVANCE [X] JUMP TO 001 [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
Notes:				
C01	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) 0 [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31
Notes: ALL OFF ST 001				
C02	1 2 3 4 5 6 7 (8) / (9) 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
Notes:				

SIAS - AFAS-1

SIAS - AFAS-2

SIAS - CH1

TEST 23 (cont'd.)

EPC - 7101
PROGRAM CODING FORM

SYSTEM PVNGS BOP ESFAS PROOF OF DESIGN
DRAWN BY _____ DATE _____
CHECKED BY _____ PAGE _____ OF _____

	OUTPUTS ACTUATED	"HOLD FOR"	"THEN"	*INPUTS REQUIRED
003	1 2 3 4 5 6 7 8 9 (10) 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:30.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
004	(1) 2 3 (4) 5 6 7 8 9 (10) 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 01:10.0	[ ] ADVANCE [X] JUMP TO 001 [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
001	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes: ALL OFF ST001			
002	1 2 3 4 5 6 7 (8) (9) 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
003	1 (2) 3 4 5 6 7 8 9 (10) 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:30.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
004	(1) 2 3 4 (5) 6 7 8 9 (10) 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 01:10.0	[ ] ADVANCE [X] JUMP TO 001 [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
001	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes: ALL OFF ST001			
002	1 2 3 4 5 6 7 (8) (9) 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
003	1 2 3 4 5 6 7 8 9 (10) 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:30.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
004	(1) 2 3 4 5 (6) 7 8 9 (10) 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 01:10.0	[ ] ADVANCE [X] JUMP TO 001 [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			

TEST 23 (CONT'D)

EPC-7101
PROGRAM CODING FORM

SYSTEM PVNGS BOP ESFAS FROM DESIGN
DRAWN BY _____ DATE _____
CHECKED BY _____ PAGE _____ OF _____

STEP NO.	OUTPUTS ACTUATED	"HOLD FOR"	"THEN"	*INPUTS REQUIRED
001	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes: ALL REF ST 001			
002	(1) 2 3 4 5 6 7 (8) / (9) 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			
003	1 (2) 3 4 5 6 7 8 / 9 (10) 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:30.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			
004	(1) 2 3 4 5 6 (7) 8 / 9 (10) 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 01:10.0	[ ] ADVANCE [X] JUMP TO 001 [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			
001	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 / 9 10 11 12 13 14 15 / 17 18 19 20 21 22 23 / 25 26 27 28 29 30 31 32
	Notes: ALL OFF ST 001			
002	1 2 3 4 5 6 7 (8) / (9) 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			
003	1 2 3 4 5 6 7 8 / 9 (10) 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:30.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			
004	1 (2) 3 4 5 6 (7) 8 / 9 (10) 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 01:10.0	[ ] ADVANCE [X] JUMP TO 001 [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			
001	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:30.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			
002	(1) 2 3 4 5 6 7 (8) / (9) 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 01:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			

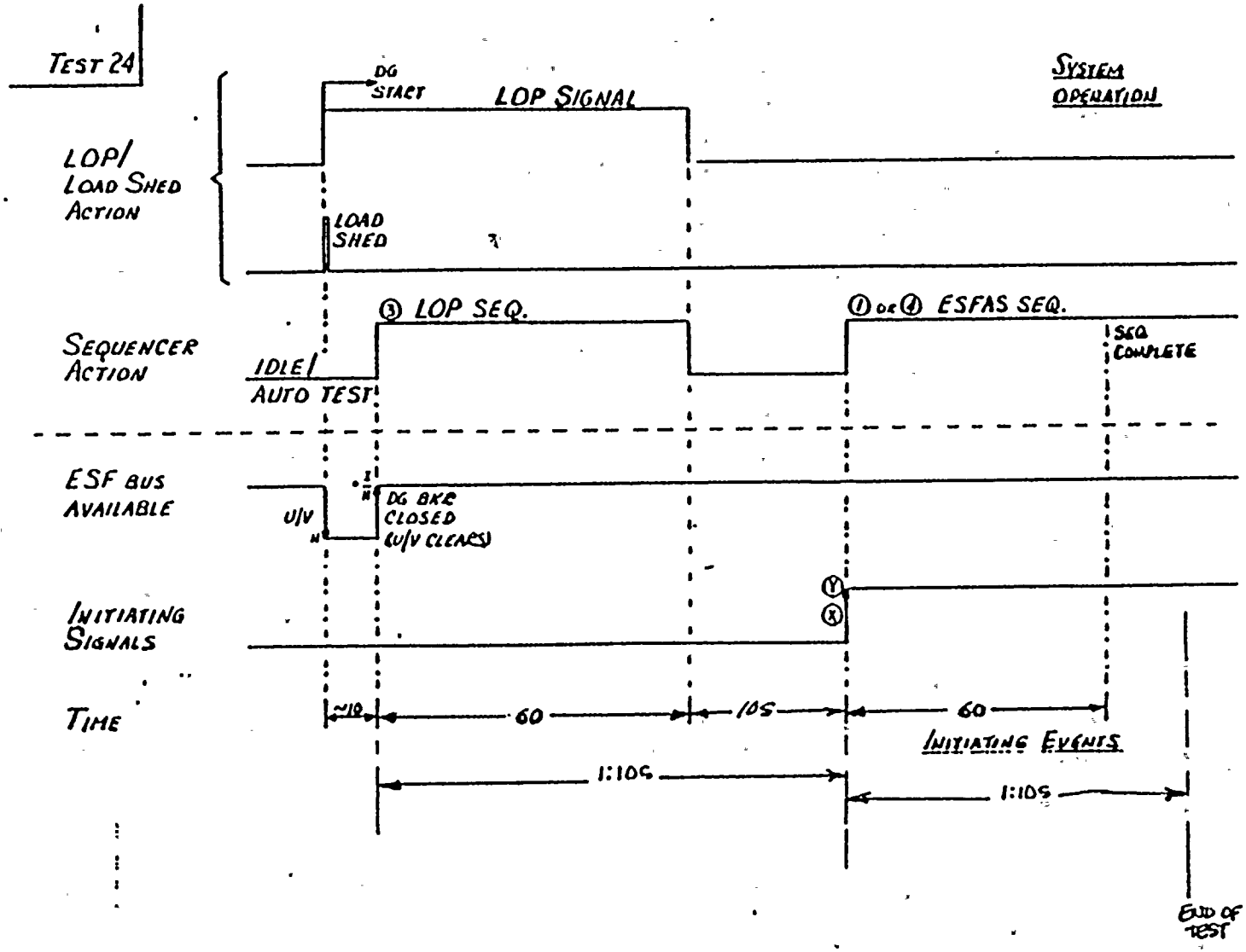
TEST 23 (CONT'D)

EPC-7101
PROGRAM CODING FORM

SYSTEM PUNGS BOP ESFAS
DRAWN BY _____ DATE _____
CHECKED BY _____ PAGE _____ OF _____

	OUTPUTS ACTUATED	"HOLD FOR"	"THEN"	*INPUTS REQUIRED
003	1 2 3 4 5 6 7 8 9 (10) 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:30.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
004	1 2 (3) 4 5 6 (7) 8 9 (10) 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 01:10.0	[ ] ADVANCE [X] JUMP TO 001 [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
001	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes: ALL OFF ST 001			
002	1 2 3 4 5 6 7 (8) (9) 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
003	1 2 3 4 5 6 7 8 9 (10) 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm). [X] T2 (ms) 00:30.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
004	1 2 3 (4) 5 (6) 7 8 9 (10) 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 01:10.0	[ ] ADVANCE [X] JUMP TO 001 [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* [ ] T1 (hm) [ ] T2 (ms)	[ ] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* [ ] T1 (hm) [ ] T2 (ms)	[ ] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* [ ] T1 (hm) [ ] T2 (ms)	[ ] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* [ ] T1 (hm) [ ] T2 (ms)	[ ] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			

Notations in this column indicate where changes have been made



TEST 4T

EPC-7101

PROGRAM CODING FORM

SYSTEM PVNGS BOP ESFAS PROOF OF DESIGN
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	OUTPUTS ACTUATED	"HOLD FOR"	"THEN"	*INPUTS REQUIRED
001	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes: ALL OFF ST 001			
002	1 2 3 4 5 6 7 (8) (9) 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
003	1 2 3 4 5 6 7 8 9 (10) 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 01:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
004	(1) (2) 3 4 5 6 7 8 9 (10) 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 01:10	[ ] ADVANCE [X] JUMP TO 001 [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
001	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes: ALL OFF ST 001			
002	1 2 3 4 5 6 7 (8) (9) 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
003	1 2 3 4 5 6 7 8 9 (10) 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 01:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
004	(1) 2 (3) 4 5 6 7 8 9 (10) 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 01:10.0	[ ] ADVANCE [X] JUMP TO 001 [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
001	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes: ALL OFF ST 001			
002	1 2 3 4 5 6 7 (8) (9) 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			

SIAS-CKTS

TEST 24 (CONT'D)

EPC - 7101
PROGRAM CODING FORM

SYSTEM PVNGS BOP ESFAS PROOF OF DESIGN
DRAWN BY _____ DATE _____
CHECKED BY _____ PAGE _____ OF _____

STEP NO.	OUTPUTS ACTUATED	"HOLD FOR"	"THEN"	*INPUTS REQUIRED
C03	1 2 3 4 5 6 7 8 / 9 (10) 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	INPUT TEST* N/A; T1 (hm); X T2 (ms) 01:10.0	X ADVANCE; JUMP TO; BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			
004	(1) 2 3 (4) 5 6 7 8 / 9 (10) 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	INPUT TEST* N/A; T1 (hm); X T2 (ms) 01:10.0	ADVANCE; X JUMP TO 001; BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			
001	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	INPUT TEST* N/A; T1 (hm); X T2 (ms) 00:10.0	X ADVANCE; JUMP TO; BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes: ALL OFF ST 001			
C02	1 2 3 4 5 6 7 (8) / (9) 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	INPUT TEST* N/A; T1 (hm); X T2 (ms) 00:10.0	X ADVANCE; JUMP TO; BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			
003	1 2 3 4 5 6 7 8 / 9 (10) 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	INPUT TEST* N/A; T1 (hm); X T2 (ms) 01:10.0	X ADVANCE; JUMP TO; BRANCH*TO	1 2 3 4 5 6 7 / 9 10 11 12 13 14 15 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			
C04	(1) 2 3 4 (5) 6 7 8 / 9 (10) 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	INPUT TEST* N/A; T1 (hm); X T2 (ms) 01:10.0	ADVANCE; X JUMP TO 001; BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			
001	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	INPUT TEST* N/A; T1 (hm); X T2 (ms)	X ADVANCE; JUMP TO; BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes: ALL OFF ST 001			
002	1 2 3 4 5 6 7 (8) / (9) 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	INPUT TEST* N/A; T1 (hm); X T2 (ms)	X ADVANCE; JUMP TO; BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			
003	1 2 3 4 5 6 7 8 / 9 (10) 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	INPUT TEST* N/A; T1 (hm); X T2 (ms)	X ADVANCE; JUMP TO; BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			
004	(1) 2 3 4 5 (6) 7 8 / 9 (10) 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	INPUT TEST* N/A; T1 (hm); X T2 (ms)	ADVANCE; X JUMP TO C01; BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			

TEST 24 (CONT'D)

EPC - 7101
PROGRAM CODING FORM

SYSTEM PVNGS BOP ESFAS PROOF OF DESIGN
DRAWN BY _____ DATE _____
CHECKED BY _____ PAGE _____ OF _____

	OUTPUTS ACTUATED	"HOLD FOR"	"THEN"	*INPUTS REQUIRED
C01	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes: ALL OFF ST 001			
C02	(1) 2 3 4 5 6 7 (8) (9) 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
C03	1 (2) 3 4 5 6 7 8 9 (10) 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 01:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
C04	(1) 2 3 4 5 6 (7) 8 9 (10) 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 01:10.0	[ ] ADVANCE [X] JUMP TO 001 [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
001	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes: ALL OFF ST 001			
002	(1) 2 3 4 5 6 7 (8) (9) 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
003	1 (2) 3 4 5 6 7 8 9 (10) 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 01:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
004	1 (2) 3 4 5 6 (7) 8 9 (10) 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 01:10.0	[ ] ADVANCE [X] JUMP TO 001 [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
001	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes: ALL OFF ST 001			
002	(1) 2 3 4 5 6 7 (8) (9) 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			

TEST 24 (CONT'D)

EPC - 7101
PROGRAM CODING FORM

SYSTEM
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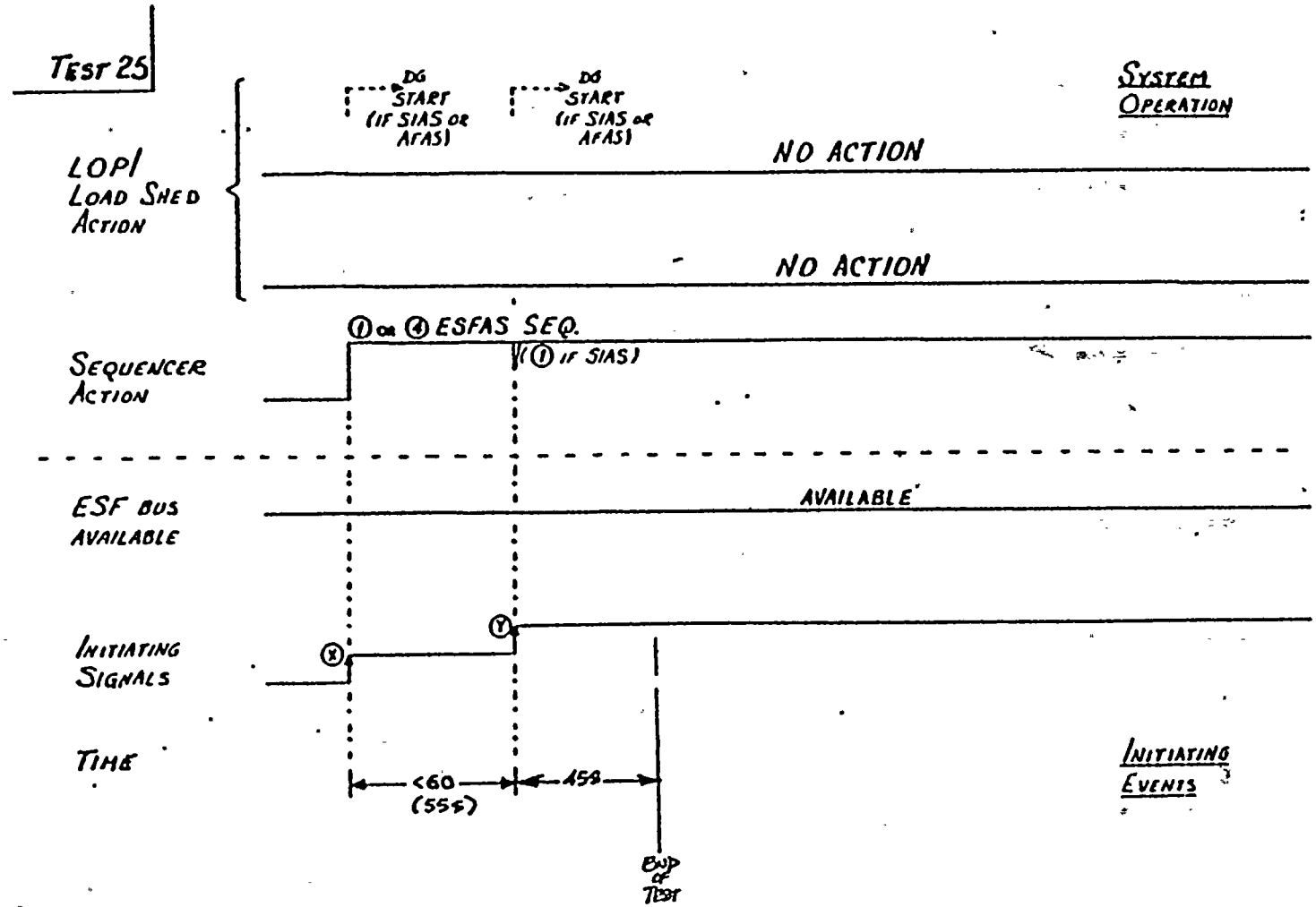
CHECKED BY ____ PAGE ____ OF ____

STEP NO.	OUTPUTS ACTUATED	"HOLD FOR"	"THEN"	*INPUTS REQUIRED
003	10	INPUT TEST* N/A; T1 (hm); T2 (ms) X 01:10.0	ADVANCE X; JUMP TO; BRANCH*TO	
	Notes:			
004	3, 7, 10	INPUT TEST* N/A; T1 (hm); T2 (ms) X 01:10.0	ADVANCE; JUMP TO X 001; BRANCH*TO	
	Notes:			
001		INPUT TEST* N/A; T1 (hm); T2 (ms) X 00:10.0	ADVANCE X; JUMP TO; BRANCH*TO	
	Notes: ALL OFF ST 001			
002	8, 9	INPUT TEST* N/A; T1 (hm); T2 (ms) X 00:10.0	ADVANCE X; JUMP TO; BRANCH*TO	
	Notes:			
003	10	INPUT TEST* N/A; T1 (hm); T2 (ms) X 01:10.0	ADVANCE X; JUMP TO; BRANCH*TO	
	Notes:			
004	0, 4, 6	INPUT TEST*; T1 (hm); T2 (ms) X 01:10.0	ADVANCE; JUMP TO X 001; BRANCH*TO	
	Notes:			
		INPUT TEST*; T1 (hm); T2 (ms)	ADVANCE; JUMP TO; BRANCH*TO	
	Notes:			
		INPUT TEST*; T1 (hm); T2 (ms)	ADVANCE; JUMP TO; BRANCH*TO	
	Notes:			
		INPUT TEST*; T1 (hm); T2 (ms)	ADVANCE; JUMP TO; BRANCH*TO	
	Notes:			
		INPUT TEST*; T1 (hm); T2 (ms)	ADVANCE; JUMP TO; BRANCH*TO	
	Notes:			

AFAS-2 - LAS VEGAS

CREFAS - FREMONT

Notations in this column indicate where changes have been made



J104-85-1

9-

TEST 25

EPC - 7101
PROGRAM CODING FORM

SYSTEM PVNGS BOP ESFAS PROOF OF DESIGN
DRAWN BY _____ DATE _____
CHECKED BY _____ PAGE _____ OF _____

STEP NO.	OUTPUTS ACTUATED	"HOLD FOR"	"THEN"	*INPUTS REQUIRED
C01	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
Notes: ALL OFF ST C01				
C02	(1) 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:55.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
Notes:				
C03	(1) (2) 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:45.0	[ ] ADVANCE [X] JUMP TO 001 [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
Notes:				
C01	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
Notes: ALL OFF ST C01				
C02	(1) 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:55.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 / 9 10 11 12 13 14 15 / 17 18 19 20 21 22 23 / 25 26 27 28 29 30 31 32
Notes:				
C03	(1) 2 (3) 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:45.0	[ ] ADVANCE [X] JUMP TO 001 [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
Notes:				
C01	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
Notes: ALL OFF ST C01				
C02	(1) 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:55.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
Notes:				
C03	(1) 2 3 (4) 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:45	[ ] ADVANCE [X] JUMP TO C01 [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
Notes:				
C01	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
Notes: ALL OFF ST C01				

IEDI 25 (UNIT 1)

EPC - 7101
PROGRAM CODING FORM

SYSTEM DVNGS BOP ESFAS PROOF OF DESIGN
DRAWN BY _____ DATE _____
CHECKED BY _____ PAGE _____ OF _____

	OUTPUTS ACTUATED	"HOLD FOR"	"THEN"	*INPUTS REQUIRED
002	(1) 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	INPUT TEST* N/A T1 (hm) X T2 (ms) 00:55.0	X ADVANCE JUMP TO BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
003	1 2 3 4 (5) 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	INPUT TEST* N/A T1 (hm) X T2 (ms) 00:45.0	ADVANCE X JUMP TO 001 BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
001	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	INPUT TEST* N/A T1 (hm) X T2 (ms) 00:10.0	X ADVANCE JUMP TO BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes: ALL OFF ST 001			
002	(1) 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	INPUT TEST* N/A T1 (hm) X T2 (ms) 00:55.0	X ADVANCE JUMP TO BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
	1 2 3 4 5 (6) 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	INPUT TEST* N/A T1 (hm) X T2 (ms) 00:45.0	ADVANCE X JUMP TO 001 BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
001	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	INPUT TEST* N/A T1 (hm) X T2 (ms) 00:10.0	X ADVANCE JUMP TO BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes: ALL OFF ST 001			
002	(1) 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	INPUT TEST* N/A T1 (hm) X T2 (ms) 00:55.0	X ADVANCE JUMP TO BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
003	1 2 3 4 5 6 (7) 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	INPUT TEST* N/A T1 (hm) X T2 (ms) 00:45.0	ADVANCE X JUMP TO 001 BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
001	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	INPUT TEST* N/A T1 (hm) X T2 (ms) 00:10.0	X ADVANCE JUMP TO BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes: ALL OFF ST 001			
002	1 (2) 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	INPUT TEST* N/A T1 (hm) X T2 (ms) 00:55.0	X ADVANCE JUMP TO BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			

TEST 25 (CONT'D)

EPC-7101
PROGRAM CODING FORM

SYSTEM PVNGS BOP ESFAS PROOF OF DESIGN
DRAWN BY _____ DATE _____
CHECKED BY _____ PAGE _____ OF _____

STEP NO.	OUTPUTS ACTUATED	"HOLD FOR"	"THEN"	*INPUTS REQUIRED
003	1 (2) 3 4 5 6 (7) 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:45.0	[ ] ADVANCE [X] JUMP TO 001 [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			
001	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes: ALL OFF ST 001			
002	1 2 (3) 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:55.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			
003	1 2 (3) 4 5 6 (7) 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:45	[ ] ADVANCE [X] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			
001	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:0.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 / 9 10 11 12 13 14 15 / 17 18 19 20 21 22 23 / 25 26 27 28 29 30 31 32
	Notes: ALL OFF ST 001			
002	1 2 3 (4) 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:55.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			
003	1 2 3 (4) 5 (6) 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* [ ] T1 (hm) [X] T2 (ms) 00:45.0	[ ] ADVANCE [X] JUMP TO 001 [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			
001	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes: ALL OFF ST 001			
002	1 (2) 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* [ ] T1 (hm) [X] T2 (ms) 00:55.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			
003	(1) (2) 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* [ ] T1 (hm) [X] T2 (ms) 00:45.0	[ ] ADVANCE [X] JUMP TO CC1 [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			

TEST 23 (CONT'D)

EPC-7101

PROGRAM CODING FORM

SYSTEM PVNGS BOP ESFAS PROOF & DESIGN

DRAWN BY _____ DATE _____

CHECKED BY _____ PAGE _____ OF _____

	OUTPUTS ACTUATED	"HOLD FOR"	"THEN"	*INPUTS REQUIRED
001	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes: ALL OFF ST 001			
002	1 2 (3) 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:55.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
003	(1) 2 (3) 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:45.0	[ ] ADVANCE [X] JUMP TO 001 [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
001	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes: ALL OFF ST 001			
002	1 2 3 (4) 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:55.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
003	(1) 2 3 (4) 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:45.0	[ ] ADVANCE [X] JUMP TO 001 [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
001	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes: ALL OFF ST 001			
002	1 2 3 4 (5) 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* [ ] T1 (hm) [X] T2 (ms) 00:55.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
003	(1) 2 3 4 (5) 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* [ ] T1 (hm) [X] T2 (ms) 00:45.0	[ ] ADVANCE [X] JUMP TO 001 [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
001	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes: ALL OFF ST 001			

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101

TEST 25 (CONT'D)

EPC - 7101
PROGRAM CODING FORM

SYSTEM PVNGS. BOP ESFAS. PROOF OF DESIGN
DRAWN BY _____ DATE _____
CHECKED BY _____ PAGE _____ OF _____

STEP NO.	OUTPUTS ACTUATED	"HOLD FOR"	"THEN"	*INPUTS REQUIRED
002	1 2 3 4 5 (6) 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A; [ ] T1 (hm); [X] T2 (ms) 00:55.0	[X] ADVANCE; [ ] JUMP TO; [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			
003	(1) 2 3 4 5 (6) 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A; [ ] T1 (hm); [X] T2 (ms) 00:25.0	[ ] ADVANCE; [X] JUMP TO 001; [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			
001	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A; [ ] T1 (hm); [X] T2 (ms) 00:10.0	[X] ADVANCE; [ ] JUMP TO; [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes: ALL OFF ST 001			
002	1 2 3 4 5 6 (7) 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A; [ ] T1 (hm); [X] T2 (ms) 00:55.0	[X] ADVANCE; [ ] JUMP TO; [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			
003	1 (2) 3 4 5 6 (7) 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A; [ ] T1 (hm); [X] T2 (ms) 00:45.0	[ ] ADVANCE; [X] JUMP TO 001; [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			
001	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A; [ ] T1 (hm); [X] T2 (ms) 00:10.0	[X] ADVANCE; [ ] JUMP TO; [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes: ALL OFF ST 001			
002	1 2 3 4 5 6 (7) 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A; [ ] T1 (hm); [X] T2 (ms) 00:55.0	[X] ADVANCE; [ ] JUMP TO; [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			

TEST 25 (cont'd)

EPC-7101

PROGRAM CODING FORM

SYSTEM PVNGS BOP ESFAS PROOF OF DESIGN

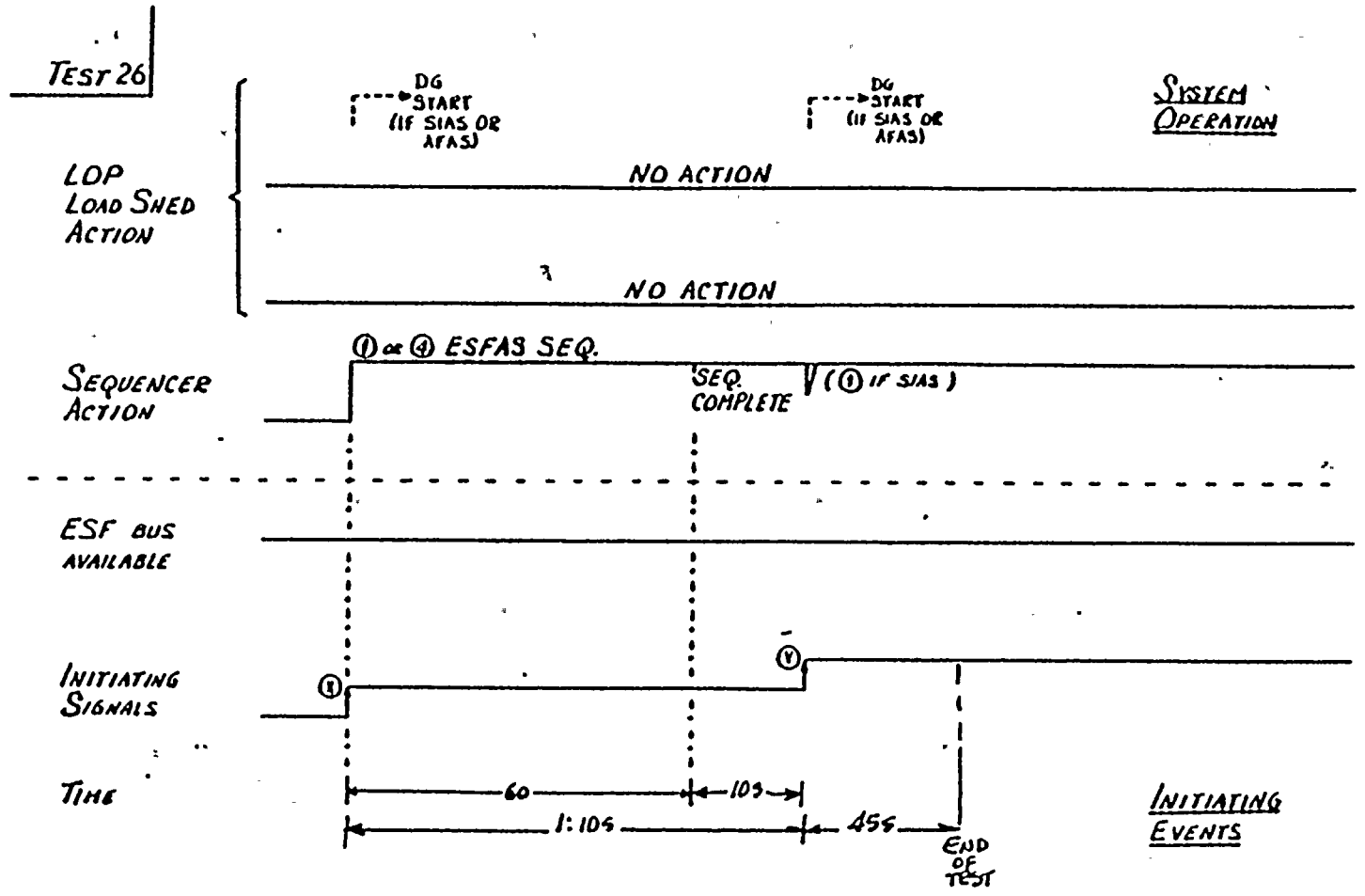
DRAWN BY _____ DATE _____

CHECKED BY _____ PAGE _____ OF _____

	OUTPUTS ACTUATED	"HOLD FOR"	"THEN"	*INPUTS REQUIRED
003	1 2 (3) 4 5 6 (7) 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:45.0	[ ] ADVANCE [X] JUMP TO 001 [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
001	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes: ALL OFF ST 001			
002	1 2 3 4 5 (6) 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:55.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
003	1 2 3 (4) 5 (6) 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:45.0	[ ] ADVANCE [X] JUMP TO 001 [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* [ ] T1 (hm) [ ] T2 (ms)	[ ] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* [ ] T1 (hm) [ ] T2 (ms)	[ ] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* [ ] T1 (hm) [ ] T2 (ms)	[ ] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* [ ] T1 (hm) [ ] T2 (ms)	[ ] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* [ ] T1 (hm) [ ] T2 (ms)	[ ] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			

TESTAS: ESFAS

Notations in this column indicate where changes have been made



EPC-7101

PROGRAM CODING FORM

SYSTEM PVNGS TOP ESFAS PROOF OF DESIGN
DRAWN BY _____ DATE _____
CHECKED BY _____ PAGE _____ OF _____

	OUTPUTS ACTUATED	"HOLD FOR"	"THEN"	*INPUTS REQUIRED
001	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes: ALL OFF ST 001			
002	(1) 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 01:10	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			
003	(1) (2) 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:45.0	[ ] ADVANCE [X] JUMP TO 001 [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			
001	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes: ALL OFF ST 001			
	1 (2) 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 01:10	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			
003	1 (2) 3 4 5 6 (7) 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:45.0	[ ] ADVANCE [X] JUMP TO 001 [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			
001	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes: ALL OFF ST001			
002	1 2 3 (4) 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* [ ] T1 (hm) [X] T2 (ms) 01:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			
003	1 2 3 (4) 5 (6) 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* [ ] T1 (hm) [X] T2 (ms) 00:45.0	[ ] ADVANCE [X] JUMP TO 001 [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			
	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	[ ] INPUT TEST* [ ] T1 (hm) [ ] T2 (ms)	[ ] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			

JIC4-85-1

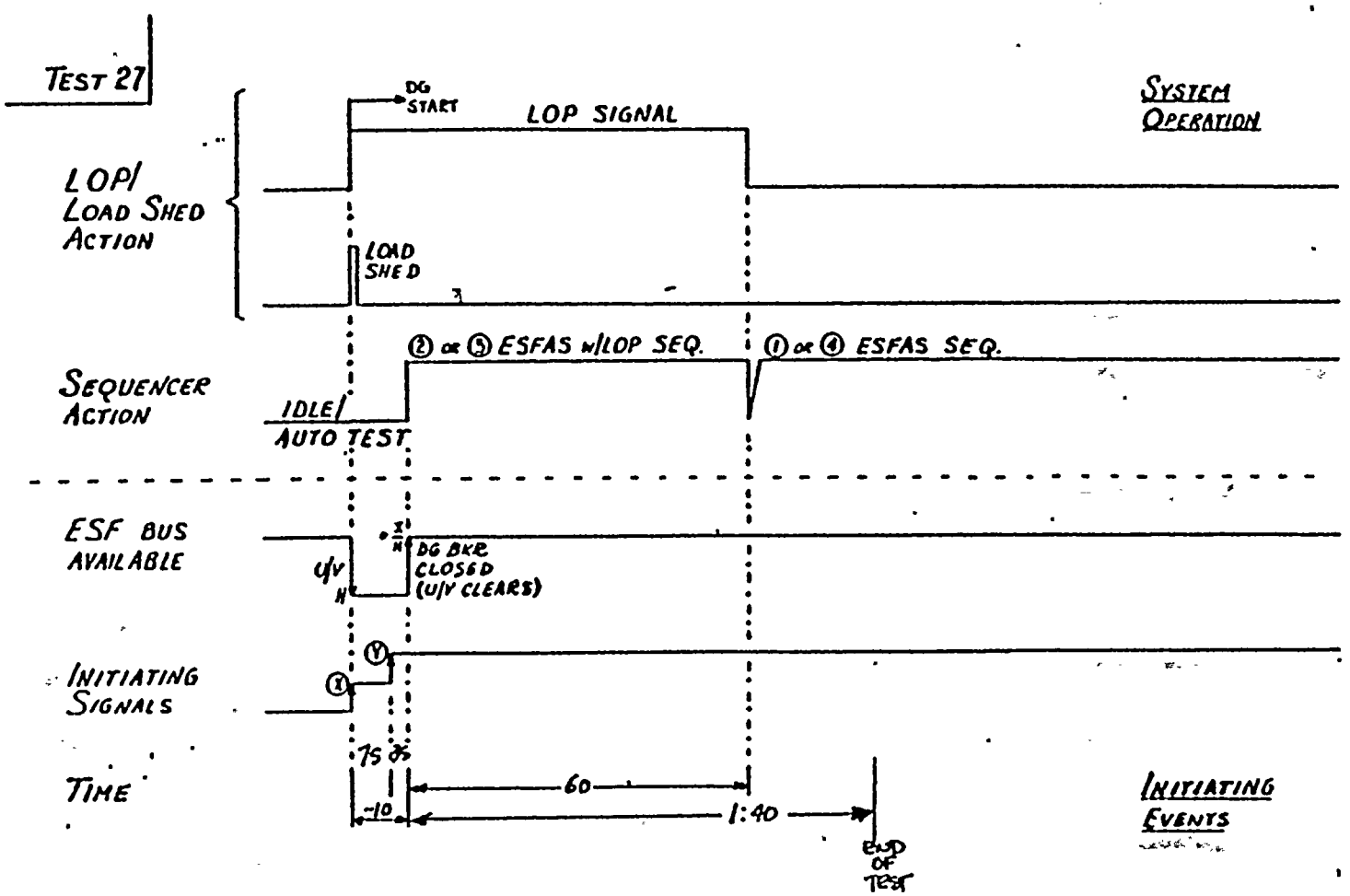
TEST 26

EPC - 7101
PROGRAM CODING FORM

SYSTEM PINGS BOP ESFAS PROOF OF DESIGN
DRAWN BY _____ DATE _____
CHECKED BY _____ PAGE _____ OF _____

STEP NO.	OUTPUTS ACTUATED	"HOLD FOR"	"THEN"	*INPUTS REQUIRED
001		INPUT TEST* N/A; T1 (hm); T2 (ms) X 00:10.0	ADVANCE X; JUMP TO; BRANCH*TO	
	Notes: ALL OFF ST001			
002	2	INPUT TEST* N/A; T1 (hm); T2 (ms) X 01:10.0	ADVANCE X; JUMP TO; BRANCH*TO	
	Notes:			
003	1 2	INPUT TEST* N/A; T1 (hm); T2 (ms) X 00:35	ADVANCE; JUMP TO X 001; BRANCH*TO	
	Notes:			
001		INPUT TEST* N/A; T1 (hm); T2 (ms) X 00:10.0	ADVANCE X; JUMP TO; BRANCH*TO	
	Notes: ALL OFF ST001			
002	7	INPUT TEST* N/A; T1 (hm); T2 (ms) X 01:10.0	ADVANCE X; JUMP TO; BRANCH*TO	
	Notes:			
003	2 7	INPUT TEST* N/A; T1 (hm); T2 (ms) X 00:25.0	ADVANCE; JUMP TO X 001; BRANCH*TO	
	Notes:			
001		INPUT TEST* N/A; T1 (hm); T2 (ms) X 00:10.0	ADVANCE X; JUMP TO; BRANCH*TO	
	Notes: ALL OFF ST001			
002	6	INPUT TEST* N/A; T1 (hm); T2 (ms) X 01:10.0	ADVANCE X; JUMP TO; BRANCH*TO	
	Notes:			
003	4 6	INPUT TEST* N/A; T1 (hm); T2 (ms) X 00:35.0	ADVANCE; JUMP TO X 001; BRANCH*TO	
	Notes:			
		INPUT TEST*; T1 (hm); T2 (ms)	ADVANCE; JUMP TO; BRANCH*TO	
	Notes:			

END OF 1


TEST 27
DG START
LOP SIGNAL
SYSTEM OPERATION
LOP/ LOAD SHED ACTION
LOAD SHED
② or ⑤ ESFAS w/LOP SEQ.
① or ④ ESFAS SEQ.
SEQUENCER ACTION
IDLE/ AUTO TEST
ESF BUS AVAILABLE
U/V
DG BKR CLOSED (U/V CLEARS)
INITIATING SIGNALS
TIME
15
60
10
1:40
END OF TEST
INITIATING EVENTS

JT/04-85-1

TEST 27

PEC — EPC-7101
PROGRAM CODING FORM

SYSTEM PVNGS BOP ESFAS PROOF OF DESIGN
DRAWN BY _____ DATE _____
CHECKED BY _____ PAGE _____ OF _____

STEP NO.	OUTPUTS ACTUATED	"HOLD FOR"	"THEN"	*INPUTS REQUIRED
C01	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	INPUT TEST* N/A; T1 (hm); X T2 (ms) 00:10.0	X ADVANCE; JUMP TO; BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes: ALL OFF ST 001			
002	(1) 2 3 4 5 6 7 (8) / (9) 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	INPUT TEST* N/A; T1 (hm); X T2 (ms) 00:07.0	X ADVANCE; JUMP TO; BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			
003	(1) (2) 3 4 5 6 7 (8) / (9) 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	INPUT TEST* N/A; T1 (hm); X T2 (ms) 00:03.0	X ADVANCE; JUMP TO; BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			
004	(1) (2) 3 4 5 6 7 8 / 9 (10) 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	INPUT TEST* N/A; T1 (hm); X T2 (ms) 01:40	ADVANCE; X JUMP TO 001; BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			
C01	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	INPUT TEST* N/A; T1 (hm); X T2 (ms) 00:10.0	X ADVANCE; JUMP TO; BRANCH*TO	1 2 3 4 5 6 7 / 9 10 11 12 13 14 15 / 17 18 19 20 21 22 23 / 25 26 27 28 29 30 31 32
	Notes: ALL OFF ST 001			
002	(1) 2 3 4 5 6 7 (8) / (9) 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	INPUT TEST* N/A; T1 (hm); X T2 (ms) 00:07.0	X ADVANCE; JUMP TO; BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			
C03	(1) 2 3 4 5 6 (7) (8) / (9) 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	INPUT TEST* N/A; T1 (hm); X T2 (ms) 00:03.0	X ADVANCE; JUMP TO; BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			
C04	(1) 2 3 4 5 6 (7) 8 / 9 (10) 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	INPUT TEST* N/A; T1 (hm); X T2 (ms) 01:40.0	ADVANCE; X JUMP TO 001; BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			
C01	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	INPUT TEST* N/A; T1 (hm); X T2 (ms) 00:10.0	X ADVANCE; JUMP TO; BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes: ALL OFF ST 001			
C02	1 (2) 3 4 5 6 7 (8) / (9) 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	INPUT TEST* N/A; T1 (hm); X T2 (ms) 00:07.0	X ADVANCE; JUMP TO; BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			

EPC-7101

PROGRAM CODING FORM

SYSTEM PINGS BOP ESFAS PROOF OF DESIGN

DRAWN BY _____ DATE _____

CHECKED BY _____ PAGE _____ OF _____

	OUTPUTS ACTUATED	"HOLD FOR"	"THEN"	*INPUTS REQUIRED
003	1 (2) 3 4 5 6 (7) (8) (9) 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [\] T2 (ms) 00:03.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
004	1 (2) 3 4 5 6 (7) 8 9 (10) 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 01:40	[ ] ADVANCE [X] JUMP TO 001 [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
001	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes: ALL OFF ST 001			
002	1 (2) 3 4 5 6 7 (8) (9) 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:07.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
	1 (2) 3 4 5 6 7 (8) (9) 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:03.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
004	(1) (2) 3 4 5 6 7 8 9 (10) 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 01:40	[ ] ADVANCE [X] JUMP TO 001 [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
001	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes: ALL OFF ST 001			
002	1 2 3 4 5 6 (7) (8) (9) 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:07.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
003	(1) 2 3 4 5 6 (7) (8) (9) 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:03.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
004	(1) 2 3 4 5 6 (7) 8 9 (10) 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 01:40.0	[ ] ADVANCE [X] JUMP TO 00 [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			

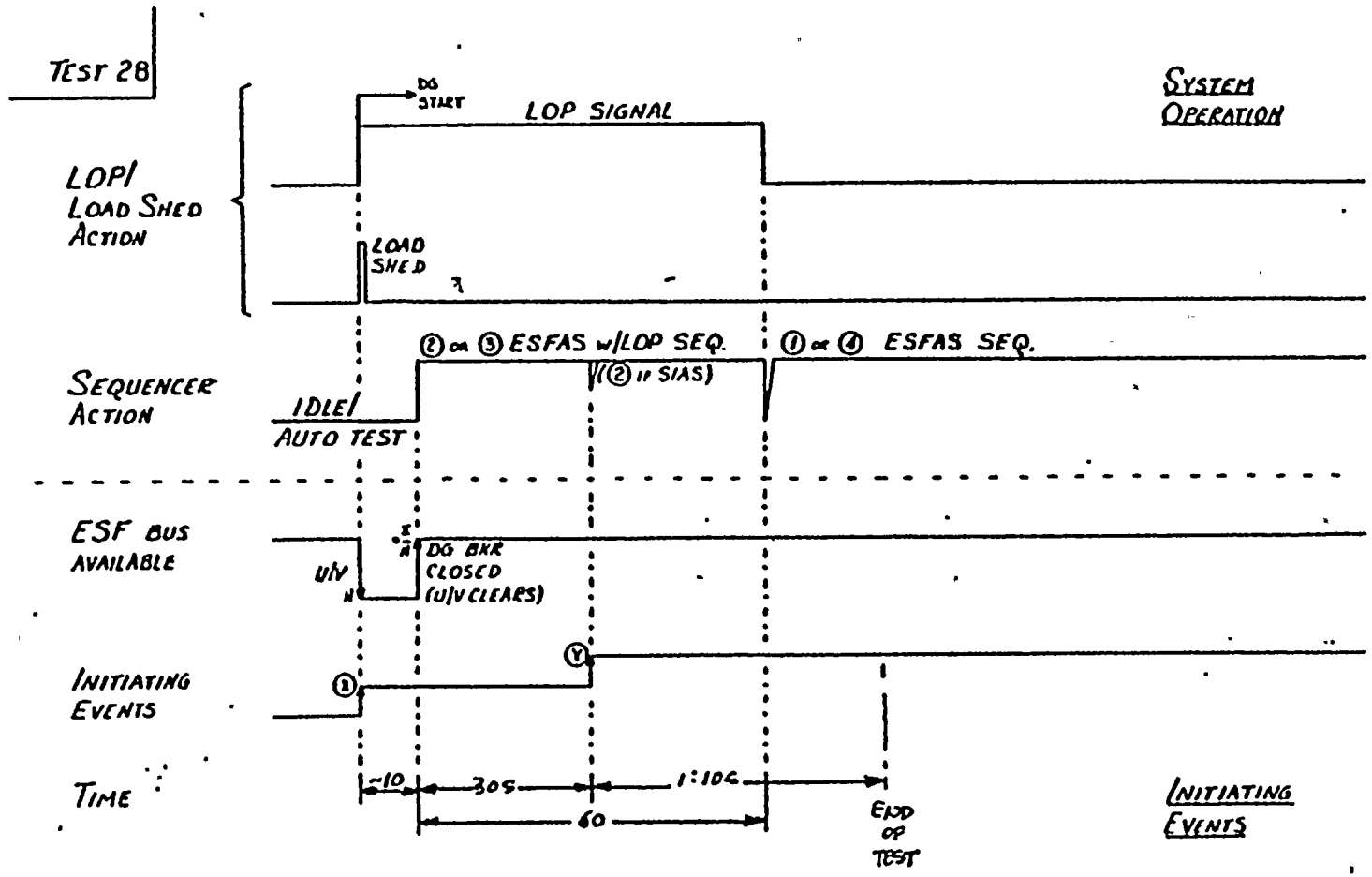
TEST 27 (cont'd)

EPC - 7101
PROGRAM CODING FORM

SYSTEM PVNGS TOP ESFAS PROOF OF DESIGN
DRAWN BY _____ DATE _____
CHECKED BY _____ PAGE _____ OF _____

STEP NO.	OUTPUTS ACTUATED	"HOLD FOR"	"THEN"	*INPUTS REQUIRED
001	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes: ALL OF STOOI			
002	1 2 3 4 5 6 (7) (8) (9) 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:07.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
003	1 (2) 3 4 5 6 (7) (8) (9) 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:03.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
004	1 (2) 3 4 5 6 (7) 8 9 (10) 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 01:40.0	[ ] ADVANCE [X] JUMP TO 001 [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* [ ] T1 (hm) [ ] T2 (ms)	[ ] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 9 10 11 12 13 14 15 17 18 19 20 21 22 23 25 26 27 28 29 30 31 32
	Notes:			
	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* [ ] T1 (hm) [ ] T2 (ms)	[ ] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* [ ] T1 (hm) [ ] T2 (ms)	[ ] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* [ ] T1 (hm) [ ] T2 (ms)	[ ] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* [ ] T1 (hm) [ ] T2 (ms)	[ ] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			

Notations in this column indicate where changes have been made



J104-85-1

TEST 28

PLC — EPC-7101

PROGRAM CODING FORM

SYSTEM PVNGS BOP ESFAS PROOF OF DESIGN

DRAWN BY _____ DATE _____

CHECKED BY _____ PAGE _____ OF _____

STEP NO.	OUTPUTS ACTUATED	"HOLD FOR"	"THEN"	*INPUTS REQUIRED
001	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
Notes: ALL OFF ST001				
002	(1) 2 3 4 5 6 7 (8) (9) 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
Notes:				
003	(1) (2) 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:30.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
Notes:				
004	(1) (2) 3 4 5 6 7 8 9 (10) 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 01:10.0	[ ] ADVANCE [X] JUMP TO 001 [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
Notes:				
001	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 9 10 11 12 13 14 15 17 18 19 20 21 22 23 25 26 27 28 29 30 31 32
Notes: ALL OFF ST001				
002	(1) 2 3 4 5 6 7 (8) (9) 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
Notes:				
003	(1) 2 3 4 5 6 7 8 9 (10) 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:30.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
Notes:				
004	(1) 2 (3) 4 5 6 7 8 9 (10) 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 01:10.0	[ ] ADVANCE [X] JUMP TO 001 [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
Notes:				
001	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
Notes: ALL OFF ST001				
001	(1) 2 3 4 5 6 7 (8) (9) 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
Notes:				

MASTER ESFAS-1

SLAVE ESFAS-1

MASTER ESFAS-2

SLAVE ESFAS-2

EPC-7101

PROGRAM CODING FORM

SYSTEM PVNGS BOP ESFAS PROOF OF DESIGN

DRAWN BY _____ DATE _____

CHECKED BY _____ PAGE _____ OF _____

	OUTPUTS ACTUATED	"HOLD FOR"	"THEN"	*INPUTS REQUIRED
003	(1) 2 3 4 5 6 7 8 9 (10) 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [ ] [X] T2 (ms) 00:30	[X] ADVANCE [ ] JUMP TO [ ] [ ] BRANCH*TO [ ]	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
004	(1) 2 3 (4) 5 6 7 8 9 (10) 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [ ] [X] T2 (ms) 01:10.0	[ ] ADVANCE [X] JUMP TO 001 [ ] BRANCH*TO [ ]	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
001	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [ ] [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] [ ] BRANCH*TO [ ]	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes: ALL OFF ST001			
002	(1) 2 3 4 5 6 7 (8) (9) 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [ ] [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] [ ] BRANCH*TO [ ]	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
	(1) 2 3 4 5 6 7 8 9 (10) 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [ ] [X] T2 (ms) 00:30.0	[X] ADVANCE [ ] JUMP TO [ ] [ ] BRANCH*TO [ ]	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
004	1 2 3 4 (5) 6 7 8 9 (10) 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [ ] [X] T2 (ms) 01:10.0	[ ] ADVANCE [X] JUMP TO 001 [ ] BRANCH*TO [ ]	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
001	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [ ] [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] [ ] BRANCH*TO [ ]	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes: ALL OFF ST001			
002	(1) 2 3 4 5 6 7 (8) (9) 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [ ] [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] [ ] BRANCH*TO [ ]	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
003	(1) 2 3 4 5 6 7 8 9 (10) 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [ ] [X] T2 (ms) 00:30.0	[X] ADVANCE [ ] JUMP TO [ ] [ ] BRANCH*TO [ ]	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
004	1 2 3 4 5 (6) 7 8 9 (10) 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [ ] [X] T2 (ms) 01:10.0	[ ] ADVANCE [X] JUMP TO 001 [ ] BRANCH*TO [ ]	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			

EPC FORM 390

TEST 28 (cont'd)

EPC - 7101
PROGRAM CODING FORM

SYSTEM PVNGS BOP ESFAS PROOF OF DESIGN
DRAWN BY _____ DATE _____
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STEP NO.	OUTPUTS ACTUATED	"HOLD FOR"	"THEN"	*INPUTS REQUIRED
001	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	INPUT TEST* N/A; T1 (hm); T2 (ms) X 00:10.0	ADVANCE X; JUMP TO; BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes: ALL OFF ST001			
002	1 (2) 3 4 5 6 7 (8) / (9) 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	INPUT TEST* N/A; T1 (hm); T2 (ms) X 00:10.0	ADVANCE X; JUMP TO; BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			
003	1 (2) 3 4 5 6 7 8 / 9 (10) 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	INPUT TEST* N/A; T1 (hm); T2 (ms) X 00:30.0	ADVANCE X; JUMP TO; BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			
004	(1) (2) 3 4 5 6 7 8 / 9 (10) 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	INPUT TEST* N/A; T1 (hm); T2 (ms) X 01:10.0	ADVANCE; JUMP TO X 001; BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			

1 AFAS-1 & SIAS

STEP NO.	OUTPUTS ACTUATED	"HOLD FOR"	"THEN"	*INPUTS REQUIRED
001	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	INPUT TEST* N/A; T1 (hm); T2 (ms) X 00:10.0	ADVANCE X; JUMP TO; BRANCH*TO	1 2 3 4 5 6 7 / 9 10 11 12 13 14 15 / 17 18 19 20 21 22 23 / 25 26 27 28 29 30 31 32
	Notes: ALL OFF ST001			
002	1 2 (3) 4 5 6 7 (8) / (9) 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	INPUT TEST* N/A; T1 (hm); T2 (ms) X 00:10.0	ADVANCE X; JUMP TO; BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			
003	1 2 (3) 4 5 6 7 8 / 9 (10) 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	INPUT TEST* N/A; T1 (hm); T2 (ms) X 00:30.0	ADVANCE X; JUMP TO; BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			
004	(1) 2 (3) 4 5 6 7 8 / 9 (10) 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	INPUT TEST* N/A; T1 (hm); T2 (ms) X 01:10.0	ADVANCE; JUMP TO X 001; BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			

2 AFAS-2 & SIAS

STEP NO.	OUTPUTS ACTUATED	"HOLD FOR"	"THEN"	*INPUTS REQUIRED
001	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	INPUT TEST* N/A; T1 (hm); T2 (ms) X 00:10.0	ADVANCE X; JUMP TO; BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes: ALL OFF ST001			
002	1 (2) 3 4 5 6 7 (8) / (9) 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32	INPUT TEST* N/A; T1 (hm); T2 (ms) X 00:10.0	ADVANCE X; JUMP TO; BRANCH*TO	1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 / 17 18 19 20 21 22 23 24 / 25 26 27 28 29 30 31 32
	Notes:			

ESFAS-1 & SIAS

EPC-7101

PROGRAM CODING FORM

SYSTEM PVNGS BOP ESFAS PROOF OF DESIGN
DRAWN BY _____ DATE _____
CHECKED BY _____ PAGE _____ OF _____

PRO	OUTPUTS ACTUATED	"HOLD FOR"	"THEN"	*INPUTS REQUIRED
003	1 2 3 (4) 5 6 7 8 9 (10) 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	INPUT TEST* N/A T1 (hm) X T2 (ms) 00;30.0	X ADVANCE JUMP TO BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
004	(1) 2 3 (4) 5 6 7 8 9 (10) 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	INPUT TEST* N/A T1 (hm) X T2 (ms) 01;10.0	ADVANCE X JUMP TO 001 BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
001	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	INPUT TEST* N/A T1 (hm) X T2 (ms) 00;10.0	X ADVANCE JUMP TO BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes: ALL OFF ST001			
002	1 2 3 4 (5) 6 7 (8) (9) 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	INPUT TEST* N/A T1 (hm) X T2 (ms) 00;10.0	X ADVANCE JUMP TO BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
	1 2 3 4 (5) 6 7 8 9 (10) 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	INPUT TEST* N/A T1 (hm) Y T2 (ms) 00;30.0	X ADVANCE JUMP TO BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
004	(1) 2 3 4 (5) 6 7 8 9 (10) 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	INPUT TEST* N/A T1 (hm) X T2 (ms) 01;10.0	ADVANCE X JUMP TO 001 BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
001	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	INPUT TEST* T1 (hm) T2 (ms) 00;10.0	X ADVANCE JUMP TO BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes: ALL OFF ST001			
002	1 2 3 4 5 (6) 7 (8) (9) 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	INPUT TEST* T1 (hm) T2 (ms) 00;10.0	X ADVANCE JUMP TO BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
003	1 2 3 4 5 (6) 7 8 9 (10) 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	INPUT TEST* T1 (hm) T2 (ms) 00;30.0	X ADVANCE JUMP TO BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
004	(1) 2 3 4 5 (6) 7 8 9 (10) 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	INPUT TEST* T1 (hm) T2 (ms) 01;10.0	ADVANCE X JUMP TO 001 BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			

CREFAS : SIAS
CRVIAS : SIAS
FBEVAS : SIAS

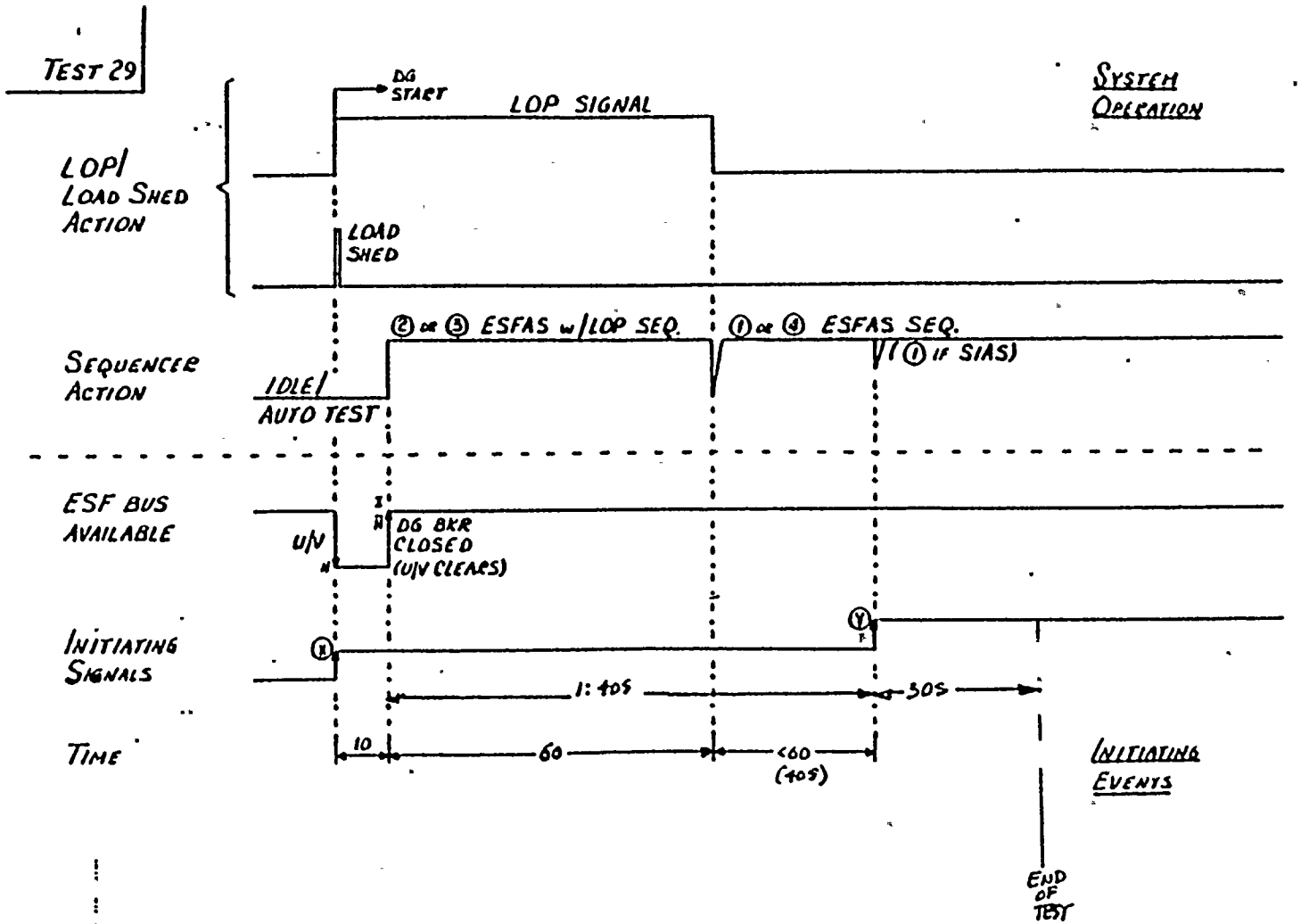
J104-85-1

115

EPC FORM 330

Notations in this column indicate where changes have been made

TDG 4-85-1



EFC-7101

PROGRAM CODING FORM

SYSTEM SVNGS DOP ESFLS PROOF OF DESIGN
DRAWN BY _____ DATE _____
CHECKED BY _____ PAGE _____ OF _____

	OUTPUTS ACTUATED	"HOLD FOR"	"THEN"	*INPUTS REQUIRED
001	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes: ALL OFF ST001			
002	(1) 2 3 4 5 6 7 (8) (9) 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
003	(1) (2) 3 4 5 6 7 8 9 (10) 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 01:40.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
004	(1) (2) 3 4 5 6 7 8 9 (10) 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:30.0	[ ] ADVANCE [X] JUMP TO 001 [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes: ALL OFF ST001			
002	(1) 2 3 4 5 6 7 (8) (9) 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
03	(1) 2 3 4 5 6 7 8 9 (10) 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* [ ] T1 (hm) [X] T2 (ms) 01:40.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
4	(1) 2 (3) 4 5 6 7 8 9 (10) 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* [ ] T1 (hm) [X] T2 (ms) 00:30.0	[ ] ADVANCE [X] JUMP TO 001 [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes: ALL OF ST 001			
	(1) 2 3 4 5 6 7 (8) (9) 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			

TEST 29 (CONT'D)

EPC-7101
PROGRAM CODING FORM

SYSTEM PVNGS BOP ESFAS PROOF OF DESIGN
DRAWN BY _____ DATE _____
CHECKED BY _____ PAGE _____ OF _____

STEP NO.	OUTPUTS ACTUATED	"HOLD FOR"	"THEN"	*INPUTS REQUIRED
C03	(1) (10)	INPUT TEST* N/A; T2 (ms) X 01:40.0	ADVANCE X	1 9 10 17 25
Notes: SIAS: CREFAS				
004	(1) (4) (10)	INPUT TEST* N/A; T2 (ms) X 00:30.0	JUMP TO X 001	1 9 10 17 25
Notes:				
001		INPUT TEST* N/A; T2 (ms) X 00:10.0	ADVANCE X	1 9 10 17 25
Notes: ALL OFF ST 001				
002	(1) (8) (9)	INPUT TEST* N/A; T2 (ms) X 00:10.0	ADVANCE X	1 9 10 17 25
Notes: SIAS: CRVIAS				
003	(1) (10)	INPUT TEST* N/A; T2 (ms) X 01:40	ADVANCE X	1 9 10 17 25
Notes:				
004	(1) (5) (10)	INPUT TEST* N/A; T2 (ms) X 60:30.0	JUMP TO X 001	1 9 10 17 25
Notes:				
001		INPUT TEST* N/A; T2 (ms) X 00:10.0	ADVANCE X	1 9 10 17 25
Notes: ALL OFF ST 001				
002	(1) (8) (9)	INPUT TEST* N/A; T2 (ms) X 00:10.0	ADVANCE X	1 9 10 17 25
Notes: SIAS: FZEVAS				
003	(1) (10)	INPUT TEST* N/A; T2 (ms) X 01:40.0	ADVANCE X	1 9 10 17 25
Notes:				
004	(1) (6) (10)	INPUT TEST* N/A; T2 (ms) X 00:30.0	JUMP TO X 001	1 9 10 17 25
Notes:				

TEST 27 (CONT'D)

EPC-7101
PROGRAM CODING FORM

SYSTEM PVNGS BOP ESFAS PROOF OF DESIGN
DRAWN BY _____ DATE _____
CHECKED BY _____ PAGE _____ OF _____

	OUTPUTS ACTUATED	"HOLD FOR"	"THEN"	*INPUTS REQUIRED
001	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes: ALL OFF ST001			
002	1 (2) 3 4 5 6 7 (8) (9) 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
003	1 (2) 3 4 5 6 7 8 9 (10) 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 01:40.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
004	(1) (2) 3 4 5 6 7 8 9 (10) 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:30.0	[ ] ADVANCE [X] JUMP TO 001 [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes: ALL OFF ST001			
002	1 2 (3) 4 5 6 7 (8) (9) 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
003	1 2 (3) 4 5 6 7 8 9 (10) 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 01:40.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
004	(1) (2) (3) 4 5 6 7 8 9 (10) 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:30.0	[ ] ADVANCE [X] JUMP TO 001 [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
001	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			
002	1 2 3 (4) 5 6 7 (8) (9) 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
	Notes:			

TEST 47 (CONT'D)

EPC-7101
PROGRAM CODING FORM

SYSTEM PINGS EOP ESFAS PROOF OF DESIGN
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STEP NO.	OUTPUTS ACTUATED	"HOLD FOR"	"THEN"	*INPUTS REQUIRED
003	4, 10	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 01:40.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	
	Notes:			
004	1, 4, 10	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:30.0	[ ] ADVANCE [X] JUMP TO 001 [ ] BRANCH*TO	
	Notes:			
001		[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	
	Notes: ALL OFF ST001			
002	5, 8, 9	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	
	Notes:			
003	5, 10	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 01:40.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	
	Notes:			
004	1, 5, 10	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:30.0	[ ] ADVANCE [X] JUMP TO 001 [ ] BRANCH*TO	
	Notes:			
001		[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	
	Notes: ALL OFF ST001			
002	6, 8, 9	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:10.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	
	Notes:			
003	6, 10	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 01:40.0	[X] ADVANCE [ ] JUMP TO [ ] BRANCH*TO	
	Notes:			
004	1, 6, 10	[ ] INPUT TEST* N/A [ ] T1 (hm) [X] T2 (ms) 00:30.0	[ ] ADVANCE [X] JUMP TO 001 [ ] BRANCH*TO	
	Notes:			

GA 1025 (9/79)

GENERAL ATOMIC COMPANY - ELECTRONIC SYSTEMS STANDARD

TEST EQUIPMENT RECORD

For [redacted]-342-0063 Issue A

Description	Manufacturer	Model	Serial No.	Calibration Date Last	Due
EVENT RECORDER	ESTERLINE ANGUS	620-T 1	187401	12-19-79	5-19-80
		2	217629	1-4-80	7-4-80
EVENT RECORDER	ESTERLINE ANGUS	620-T 3	217628	1-4-80	7-4-80
		4	217629	1-4-80	7-4-80
PROGRAMMABLE SEQUENCER	ENCODER PRODUCTS COMPANY	EPC-7101	41777		
POWER SUPPLY (+24V MEAS. 24.04VDC)	TRYGON	HR20-1.5	GA 13232	9-26-79	3-26-80
			GA 13229	10-29-79	4-29-80
POWER SUPPLY (+48V NOM. MEAS. 41.65VDC)	GENERAL ATOMIC COMPANY	V-008	LAB 003	N/A OUTPUT MEAS. W METER	N/A OUTPUT MEAS. W. METER
DIGITAL MULTIMETER	FLUKE	8800 A	GAC 3819	1-22-80	7-22-80

Date of Test START 1/23/80 COMPLETE 3/12/80

Test Operator Signature R. C. Weller

QC Signature or Stamp Joe Burgher 3/12/80

Serial Numbers of Items Tested PALO VERDE NGS BOP ESFAS SYSTEM II

"A" & "B" CABINETS WITH THE FOLLOWING COMPLEMENT OF LOGIC MODULES:

"A" CAB. MODULE ASSY		SER #	"B" CAB MODULE ASSY	& SER #
FBEVAS	342-5000	6938-010	342-5000	6938-018
CREFAS	342-5000	6938-019	342-5000	6938-014
CPIAS	342-5000	6938-011	342-5000	6938-008
LOP/LS	342-5200	6942-006	342-5200	6942-010
CRVIAS	342-5300	6945-010	342-5300	6945-007
DGSS	342-5100	6940-004	342-5100	6940-009
ESF LOAD SEQ	342-5400	6948-005	342-5400	6948-007

J104-85-1

"A" CAB ASSY 2-J-SAA-C02A

"B" CAB ASSY 2-J-SAB-C02B

APPENDIX B

ANNOTATED MULTI-PEN RECORDER RUNS

(Submitted as 136 microfiche cards under separate cover)

(available on request)

J104-85-1

Ques 11

GENERAL ATOMIC

E-115-751 (Rev.)

RELIABILITY ANALYSIS REPORT
FOR
BALANCE OF PLANT
ENGINEERED SAFETY FEATURES ACTUATION SYSTEM

Contained in

Arizona Nuclear Power Project
Palo Verde Nuclear Generating Station
Units 1, 2 and 3

January 1979

CHANGE RECORD

Issue	Date	Pages Affected
Original	10/78	All
Rev.	1/79	Cover, 8-2, 8-3, A-2, A-4, A-6, A-7, A-8, Appendix C (all), Appendix D (all)

CONTENTS

TABLES

FIGURES

1. SCOPE

The steps to be performed in arriving at the final Reliability Analysis Report are to:

1. Develop the reliability model.

2. Establish the probability of input challenges.

3. Determine the relationships between input and outputs; i.e., determine which inputs determine each output.

4. Develop input-to-output probability relationships using decision trees.

5. Determine the failure rate for each component in the decision tree.

6. Compute the reliability for each component in the decision tree for a mission time of 30 days (Ref. 1, page 4-25, Para. 4.6.2.9).

7. Determine the probability of success, given that the system is challenged.

8. Determine the required automatic testing interval to increase the probability of success to $1 - 1 \times 10^{-6}$ (Ref. 1, page 4-25, Para. 4.6.2.9). This may be an iterative calculation resulting from the intractable nature of the equations for component reliability calculation.

2. THE MODEL

Figure 1 is an oversimplified model of the Engineered Safety Features Actuation System (ESFAS), but it will aid in understanding the ESFAS reliability prediction.

In general, there are n inputs to the ESFAS system. These inputs are logic command signals, e.g., Fuel Building Essential Ventilation Actuation Signal (FBEVAS), etc. The system can be generalized as a set of logic functions that generate m output signals, e.g., Fuel Building Nonessential Ventilation Actuation Signal, etc. See drawing ELE 342-0100, Block Diagram, BOP ESFAS, for a more detailed view of the inputs, outputs, and logic interconnections.

Given the generalized physical model, we need a mathematical model to permit a quantitative prediction of the reliability of the ESFAS system. The mathematical model can be constructed as follows:

Let $P(I_i)/C$ = the probability that input I_i is stimulated given a system challenge.

Let $P(SO_j)/I_i$ = the probability of a successful output O_j given a stimulus at input I_i, where i ranges from 0 to n and j ranges from 0 to m.

Let $P(S)/C$ = the probability of a successful system response given a system challenge.

Let $P(SO_j)/C$ = the probability of a successful output j given a system challenge.

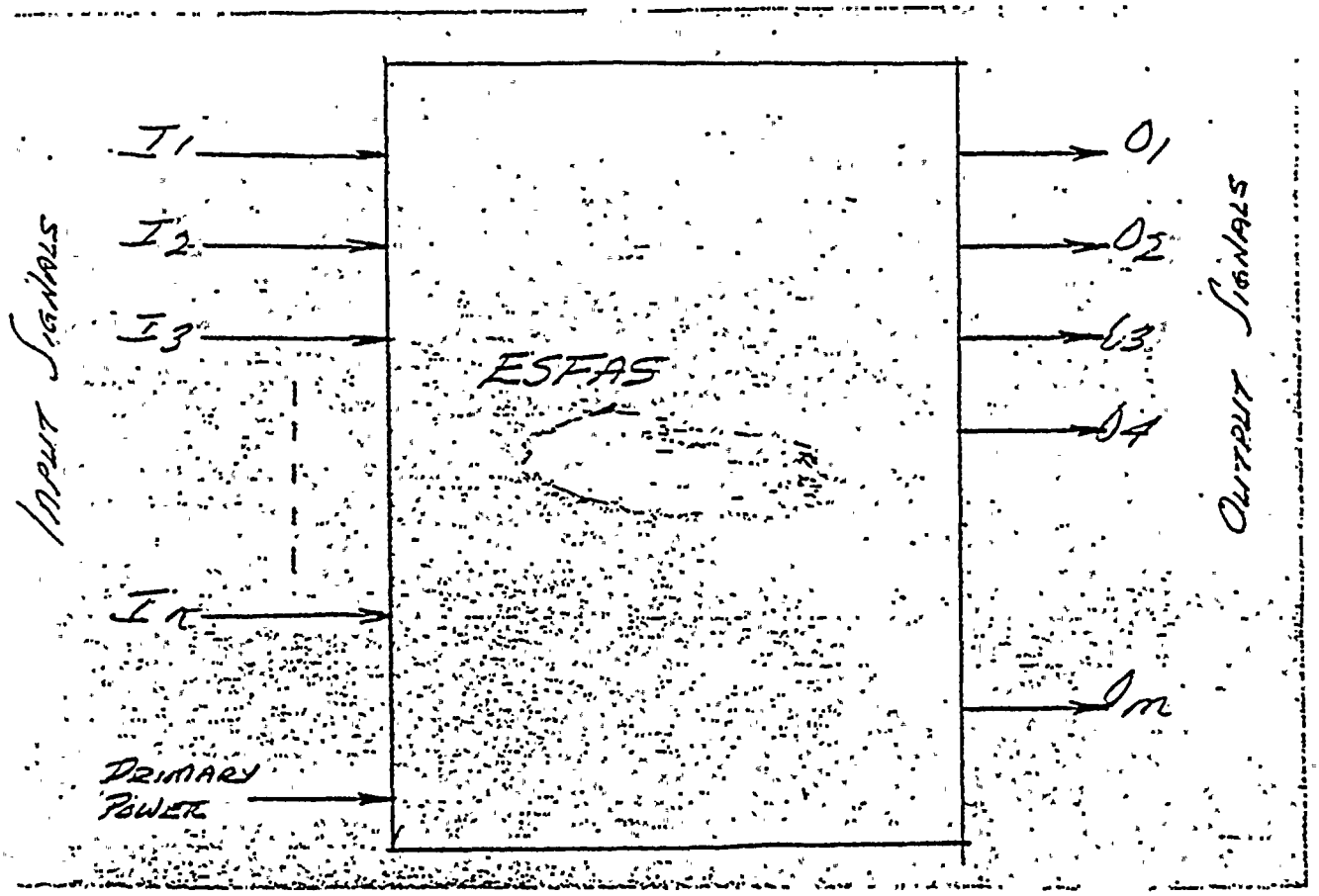


Fig. 1. Simplified model of ESFAS

Based on the above definitions and making the simplifying assumption that there is a simple one-to-one correspondence (m = n) between the input and outputs we obtain:

$$P(S)/C = P(I_1)/C \cdot P(SO_1)/I_1 + P(I_2)/C \cdot P(SO_2)/I_2 \vdots + P(I_n)/C \cdot P(SO_n)/I_n$$

$$P(S)/C = P(SO_1)/C + P(SO_2)/C + \ldots P(SO_m)/C$$

In simple words, this states that the probability of a successful system response given a system challenge is the sum of the products of the probabilities of a given input stimulus, I_i, and the probability of successful operation of the logic components that generate the output O_i.

When there are multiple outputs for a given input the equations become slightly more complex. For simplicity assume output 2, O_2, occurs when either input 1, I_1, or input 2, I_2, occurs. Then for this specific case

$$P(S)/C = P(SO_2)/C = (P(I_1)/C \cdot P(SO_2)/I_1) + (P(I_2)/C \cdot P(SO_2)I_2)$$

The complementary situation, multiple inputs for a given output must also be satisfied. Assume that outputs O_1 and O_2 should both result from input I_1. Then

$$P(S)/C = P(SO_1)/C \cdot P(SO_2)/C$$

implies that the system success depends on obtaining both required outputs. Expanding this for the specific case, we obtain

$$P(S)/C = (P(I_1)/C \cdot P(SO_1)/I_1) \cdot (P(I_1)/C \cdot P(SO_2)/I_1)$$
$$= P(I_1/C)\ P(SO_1)/I_1 \cdot P(SO_2)/I_1) \quad .$$

Based on the above logic, the equation for the generalized model is

$$P(S)/C = P(I_1)/C\ (P(SO_1)/I_1 \times P(SO_2)/I_1 \times \ldots P(SO_m)/I_1)$$
$$+ P(I_2)/C\ (P(SO_1)/I_2 \times P(SO_2)/I_2 \times \ldots P(SO_m)/I_2)$$
$$\vdots$$
$$+ P(I_n)/C\ (P(SO_1)/I_n \times P(SO_2)/I_n \times \ldots P(SO_m)/I_n)$$

In the limiting case, $P(SO_j)/I_i = 1$ when there is no required output at O_j for an input I_i. This may seem irrational at first, but the reason will become apparent when one considers that where there is no required coupling between input I_i and output O_i, then there can be no failure, i.e.,

$P(FO_j)/I_i = 0$ = probability of failure at output O_j given input I_i

$P(SO_j)/I_i = 1 - P(FO_j)/I_i = 1 - 0 = 1$

Therefore,

$P(SO_j)/I_i = 1$ if there is not a required response at output O_j from an input I_i .

3. INPUT SIGNAL ENUMERATION

The generalized model established a relationship between input or challenges to the system and the resulting output or responses by the system. We now need to enumerate those inputs. Drawing ELE 342-0100 established the block diagram between inputs and outputs.

The simple one-to-one relationship becomes more complex for the Diesel Generator Start Signal (DGSS), Loss of Power (LOP) and Load Sequencer modules. For the latter units we will consider an input to be a stimulus or combination of stimuli that would normally cause an output from the respective module. The breakdown of model inputs and their relationship to the physical system becomes:

I_1 FBEVIAS
I_2 CREFAS
I_3 CPIAS
I_4 CREVIAS (SMCROA)
I_5 CREVIAS (HCG CROA)
I_6 DGSS (Subsystem)
- LOP
- SIAS
- AFAS-1
- AFAS-2

I_7 LOP (Subsystem)
- Undervoltage 1
- Undervoltage 2
- Undervoltage 3
- Undervoltage 4

I_8 ESF Load Sequencer

FBEVAS

CREFAS

CREVIAS

LOP

DG RUN

DG BKR

SIAS

AFAS-1

AFAS-2

4. INPUT SIGNAL PROBABILITIES

With the mathematical model defined, it is necessary to determine the probability values to be used in the computations. First, the input probabilities $P(I_i)/C$ will be determined.

A system challenge is defined as the stimulus of one of the system inputs, I_i.

Let $P(IS)/C$ be defined as the probability of an input stimulus given a system challenge which is obviously equal to unity

$$P(IS)/C = \sum_{i=1}^{n} P(I_i)/C = 1.0$$

where $P(I_i)/C$ is, as previously established, the probability that input I_i is stimulated as a result of challenge, C.

Because of a lack of knowledge regarding the probability distribution among the various inputs, it will be assumed that they are equally probable, i.e.,

$$P(I_1)/C = P(I_2)/C = P(I_i)/C$$

Therefore $$\sum_{i=1}^{n} P(I_i)/C = n \cdot P(I_i)/C = 1$$

or $$P(I_i)/C = \frac{1}{n}$$

When a more rational evaluation of the distribution becomes known, it may be substituted for the equally probable distribution and the system reliability computions recalculated.

5. OUTPUT-SIGNAL ENUMERATION

The system output signals applicable to the system reliability analysis are:

O_1 FBEVAS
O_2 CREFAS
O_3 CPIAS
O_4 CREVIAS
O_5 DGSS
O_6 LOP/LS
O_7 Load Sequence

6. INPUT-TO-OUTPUT RELATIONSHIPS

The Specification (Ref. 1, page 4-24, Para. 4.6.2.3) states that the "Scope of analysis shall be limited to elements of the BOP ESFAS shown in attachment 4-1." General Atomic Company (GA) prefers to use GA drawing ELE 342-0100 in place of attachment 4-1 because the drawing is more explicit in the actual implementation of the system.

The input-output relationships are estimated from drawing ELE 342-0100 as shown in Table 1. The next objective is to establish the probabilities associated with these input-output relationships.

TABLE 1
INPUT-TO-OUTPUT RELATIONSHIPS FOR EACH LOGIC MODULE

		Input Sources															
		I_1		I_2		I_3		I_4 & I_5				I_6					
		FBEVAS		CREFAS		CPIAS		CRVIAS				DCSS					
												SIAS		AFAS-1		AFAS-2	
Outputs		A	B	A	B	A	B	A_1	A_2	B_1	B_2	A_1	B_1	A_2	B_2	A_3	B_3
O_1 FBEVAS Actuated Devices	A	1	1	0	0	0	0	0	0	0	0						
	B	1	1	0	0	0	0	0	0	0	0						
O_2 CREFAS Actuated Devices	A	1	0	1	1	1	0	0	0	0	0						
	B	0	1	1	1	0	1	0	0	0	0						
O_3 CPIAS Actuated Devices	A	0	0	0	0	1	1	0	0	0	0						
	B	0	0	0	0	1	1	0	0	0	0						
O_4 CRVIAS Actuated Devices	A	0	0	0	0	0	0	1	1	1	1						
	B	0	0	0	0	0	0	1	1	1	1						
O_5 DCSS	A											1	0	1	0	1	0
	B											0	1	0	1	0	1
O_6 Load Shed Actuated Devices[1]	A	0	0	0	0	0	0	0	0	0	0						
	B	0	0	0	0	0	0	0	0	0	0						
O_7 Load Sequencer Actuated Devices	A																
	B																

		Input Sources																									
		I_7								I_8																	
		LOP/Load Shed								FBEVAS Output		CREFAS Output		CRVIAS Output		LOP		DG				DCSS Outputs					
		1		2		3		4										Run		BKR		SIAS		AFAS-1		AFAS-2	
Outputs		A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
O_1 FBEVAS Actuated Devices	A	0	0	0	0	0	0	0	0																		
	B	0	0	0	0	0	0	0	0																		
O_2 CREFAS Actuated Devices	A	0	0	0	0	0	0	0	0																		
	B	0	0	0	0	0	0	0	0																		
O_3 CPIAS Actuated Devices	A	0	0	0	0	0	0	0	0																		
	B	0	0	0	0	0	0	0	0																		
O_4 CRVIAS Actuated Devices	A	0	0	0	0	0	0	0	0																		
	B	0	0	0	0	0	0	0	0																		
O_5 DCSS	A															1	0										
	B															0	1										
O_6 Load Shed Actuated Devices[1]	A	1	0	1	0	1	0	1	0																		
	B	0	1	0	1	0	1	0	1																		
O_7 Load Sequencer Actuated Devices	A									1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0
	B									0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1

[1] For complementary module B inputs are true and A inputs are false

7. INPUT-TO-OUTPUT PROBABILITY RELATIONSHIPS

As an aid to developing the input-to-output probability relationships we should start with a block diagram of the system components that are involved. Figure 2 is a suitable block diagram:

A decision tree that "is a model that expresses system reliability in terms of component reliability" (Ref. 2) can be used as an aid to computing the probability of success in the input-to-output logical response of the ESFAS. To arrive at the decision tree, let us redraw the block diagram of Fig. 2 as a cascade of elements for which we can compute or assign reliability values. Figure 3 shows this arrangement.

The logical relationship of the elements is probably obvious, but let us review it briefly. The system can operate on the input signal if either power source and power converter are functional, i.e., we have power redundancy in the system.

The balance of the elements in this input-output relationship are in series and the output depends on all elements being operational. (There is further redundancy in the system but this is accounted for in the mathematical model by redundant paths from input to output.)

The isolator is shown as if it always appeared in the system. Only half the input-output paths have the isolator but assuming it is always present is a conservative assumption that simplifies calculation by making the successful input-to-output probabilities equal for A-input to A-output as for A-input to B-outputs.

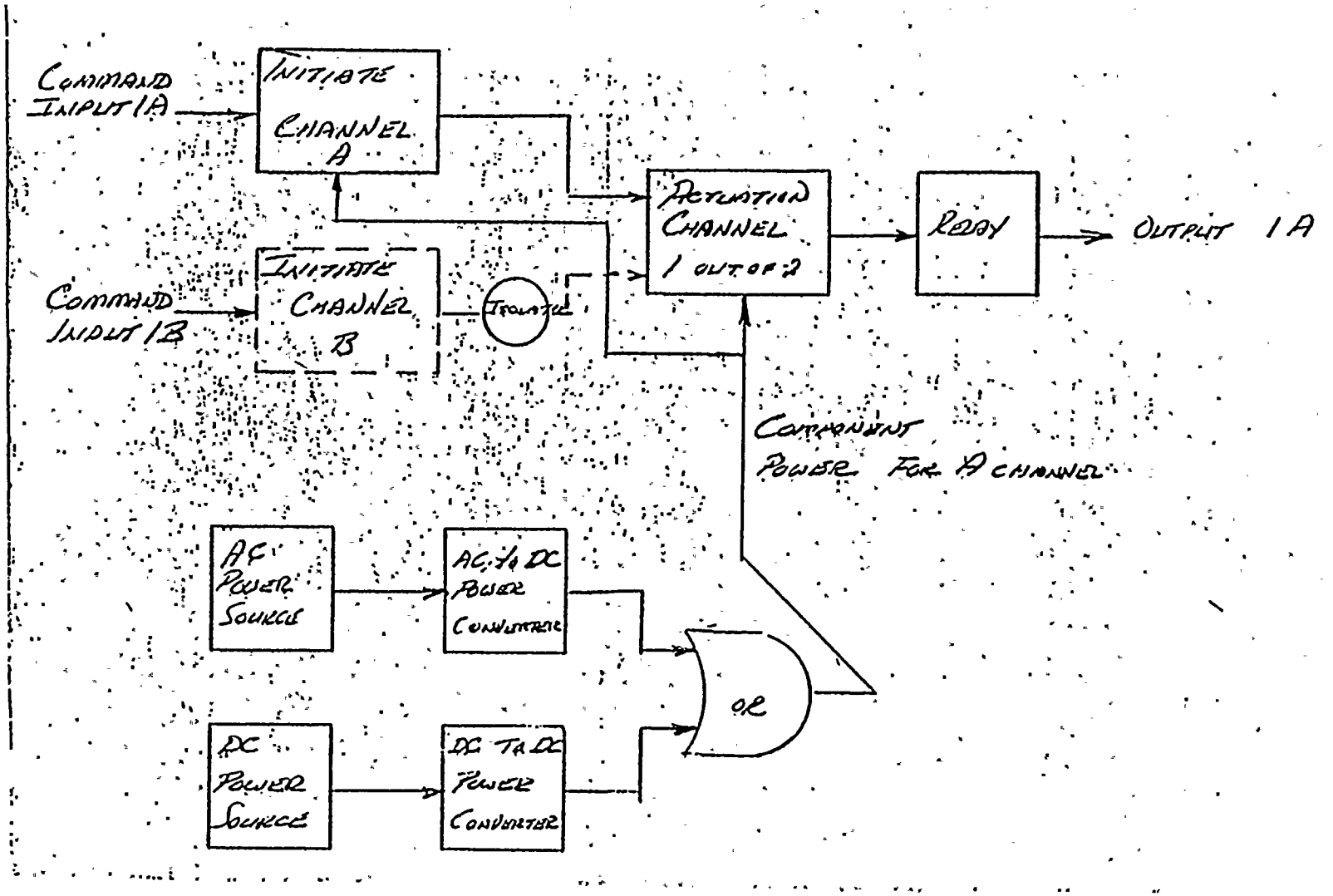


Fig. 2. Block diagram of typical input-to-output relationship

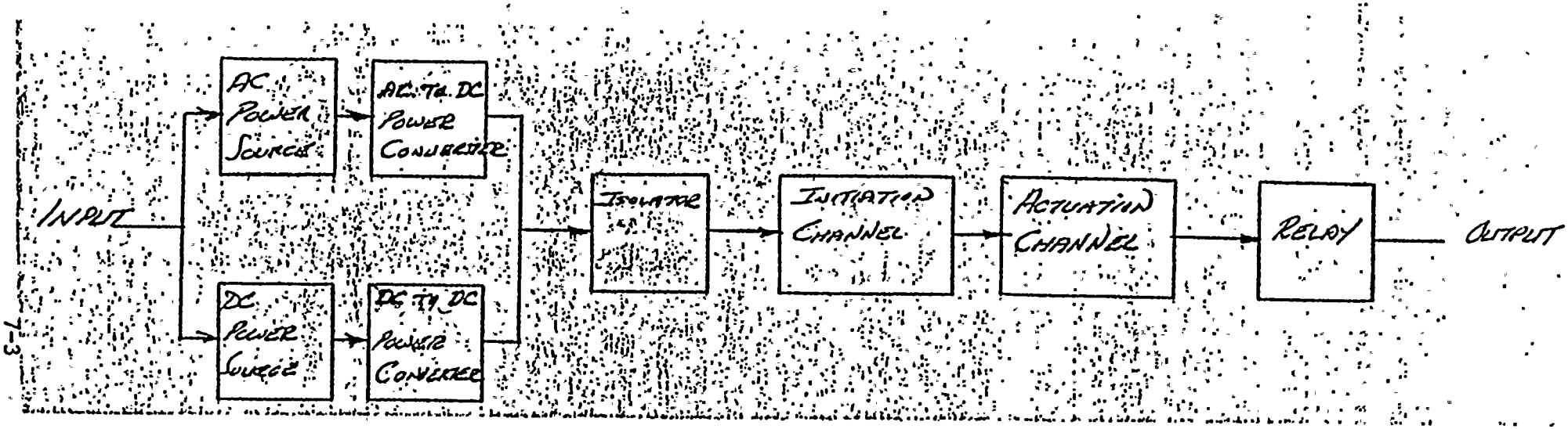


Fig. 3. Cascade model of elements required to obtain input-to-output response

The initiation-channel and the actuation-channel are the elements contained in the logic modules. The relay is directly associated with the modules but is shown separately for clarity.

Based on the model of Fig. 3, we can generate a decision tree following the ideas of Lambert (Ref. 2). To simplify our decision tree let us re-arrange the series elements so that the portion with parallel or redundant elements is at the right side of the diagram as shown in Fig. 4.

7.1. DECISION TREE

A decision tree for the model of Fig. 4 is shown in Fig. 5. Each branch is labelled by the probability of success P(S) and probability of failure $P(f) = P(\bar{S}) = 1 - P(S)$. The subsystem reliability or probability of success can be computed for this tree. The equation for the probability of success of this tree is:

$$\begin{aligned} P(S) = {} & P(A) \cdot P(B) \cdot P(C) \cdot P(D) \cdot P(E) \\ & + P(A) \cdot P(B) \cdot P(C) \cdot P(D) \cdot P(\bar{E}) \cdot P(F) \cdot P(G) \\ & + P(A) \cdot P(B) \cdot P(C) \cdot P(\bar{D}) \cdot P(F) \cdot P(G) \end{aligned}$$

Before we can proceed it is necessary to consider how to combine the probabilities for the redundant one-out-of-two logic.

7.2. EFFECT OF ONE-OUT-OF-TWO REDUNDANCY ON SYSTEM RELIABILITY

The 1-out-of-2 logical combination of actuation signals within the logic is effectively a parallel redundancy. From an overall system viewpoint there is one source of input, i.e., the physical input parameter being sensed or measured and (generally) one ultimate output action, e.g., closing the dampers or starting a motor. Figure 6 depicts the situation in block diagram format.

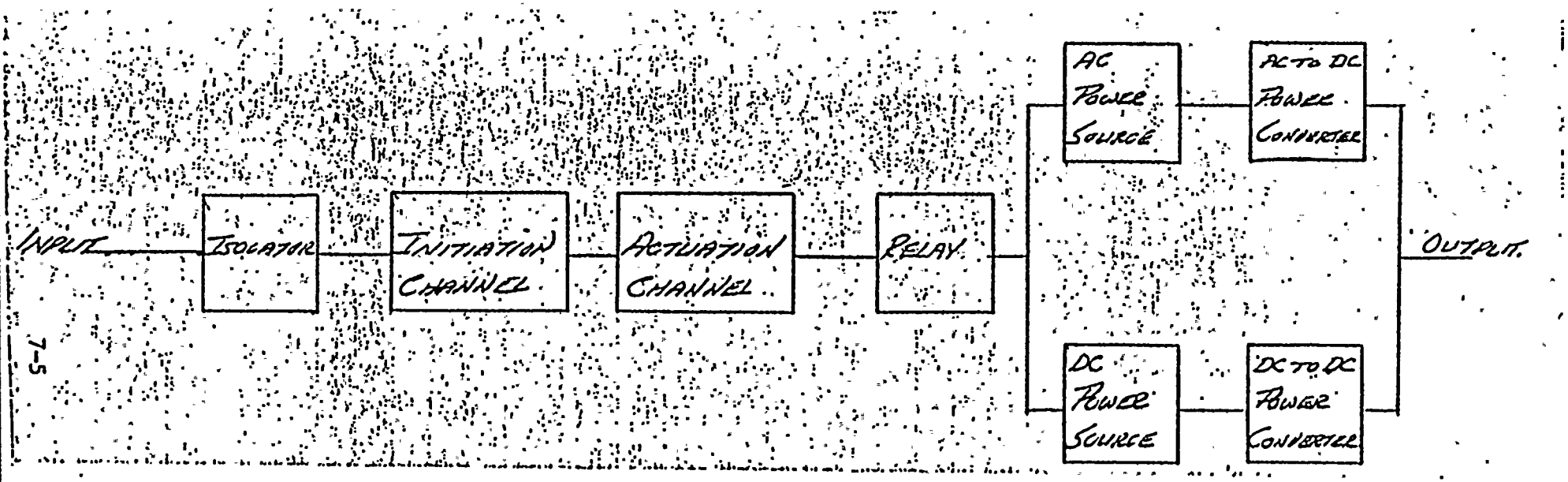


Fig. 4. Rearranged cascade model of typical input-to-output subsystem

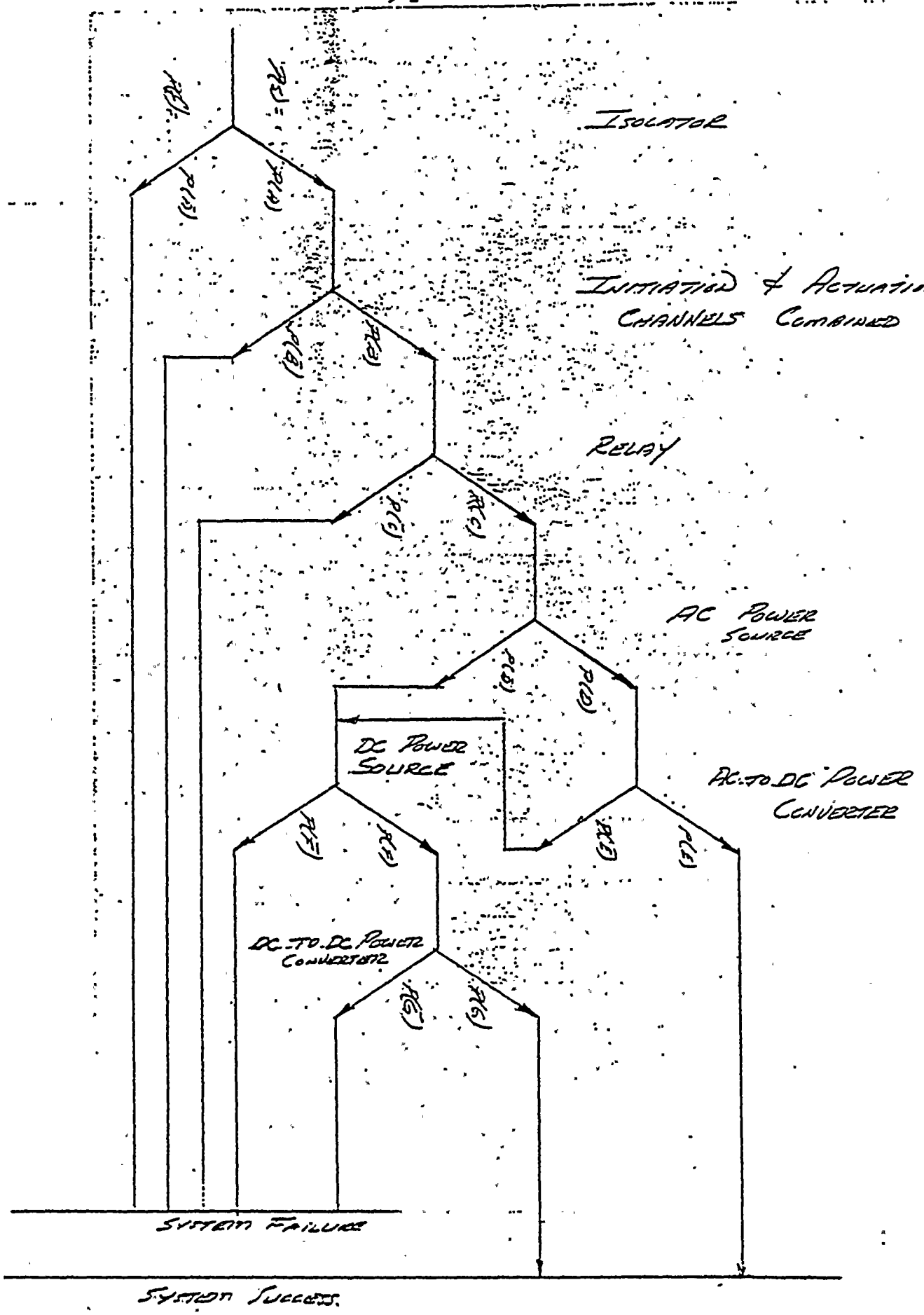


Fig. 5. Decision tree for typical input-to-output subsystem

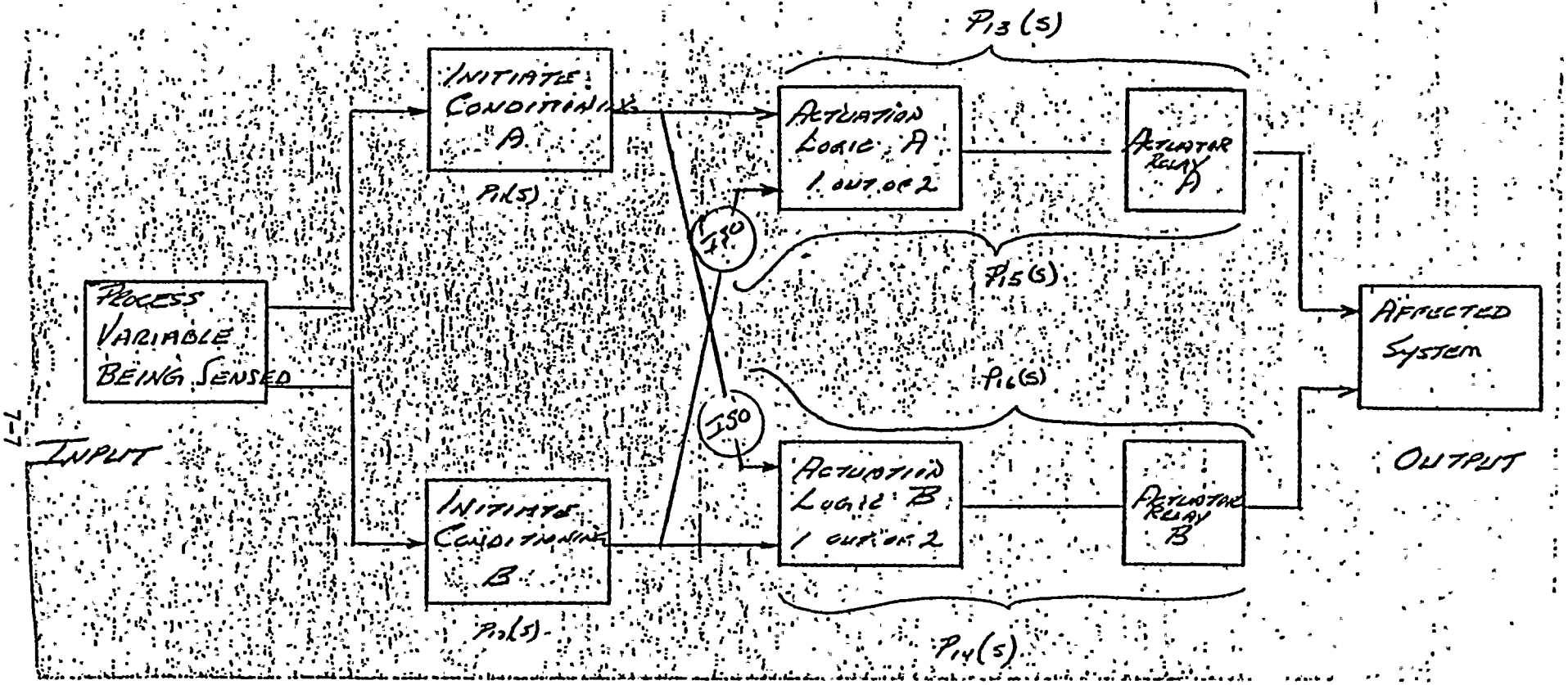


Fig. 6. Block diagram of one-out-of-two redundant logic system

Figure 7 shows the decision tree for this arrangement. The probability equation for this decision tree is

$$\begin{aligned} P\cdot(\text{Channel Success}) = {} & P_{11}(S) \cdot P_{13}(S) \\ & + (1 - P_{11}(S)) \cdot P_{12}(S) \cdot P_{14}(S) \\ & + P_{11}(S) \cdot (1 - P_{13}(S)) \cdot P_{16}(S) \\ & + (1 - P_{11}(S)) \cdot P_{12}(S) \cdot (1 - P_{14}(S)) \\ & \cdot P_{15}(S) \end{aligned}$$

This can be factored to

$$\begin{aligned} P(CS) = {} & P_{11}(S) \left\{P_{13}(S) + (1 - P_{13}(S)\, P_{16}(S)\right\} \\ & + (1 - P_{11}(\bar{S}) \cdot P_{12}(S) \left\{P_{14}(S) + (1 - P_{14}(S))\, P_{15}(S)\right\} \end{aligned}$$

where $P(CS) = P(OS_j)/I_i$

as $P(OS_j)/I_i$ was previously defined.

7.3. INCLUDING POWER SUPPLY RELIABILITY

It is now necessary to include the probability impact of the power supplies and power conversion equipment to complete our model for an individual input-to-output channel model. Figure 8 shows the logic tree of Fig. 7 with the power system shown as block elements. Figure 9 is a cascade diagram for the power supply systems shown as blocks in Fig. 8. Figure 10 shows the logic tree for the power supply subsystem.

The probability of a successful output from the power supply subsystem can be expressed as follows:

$$\begin{aligned} P(PS) = {} & P_{S1}(S)\, P_{S3}(S) + P_{S1}(S) \cdot P_{S3}(\bar{S}) \cdot P_{S2}(S) \cdot P_{S4}(S) \\ & + P_{S1}(\bar{S}) \cdot P_{S2}(S) \cdot P_{S4}(S) \end{aligned}$$

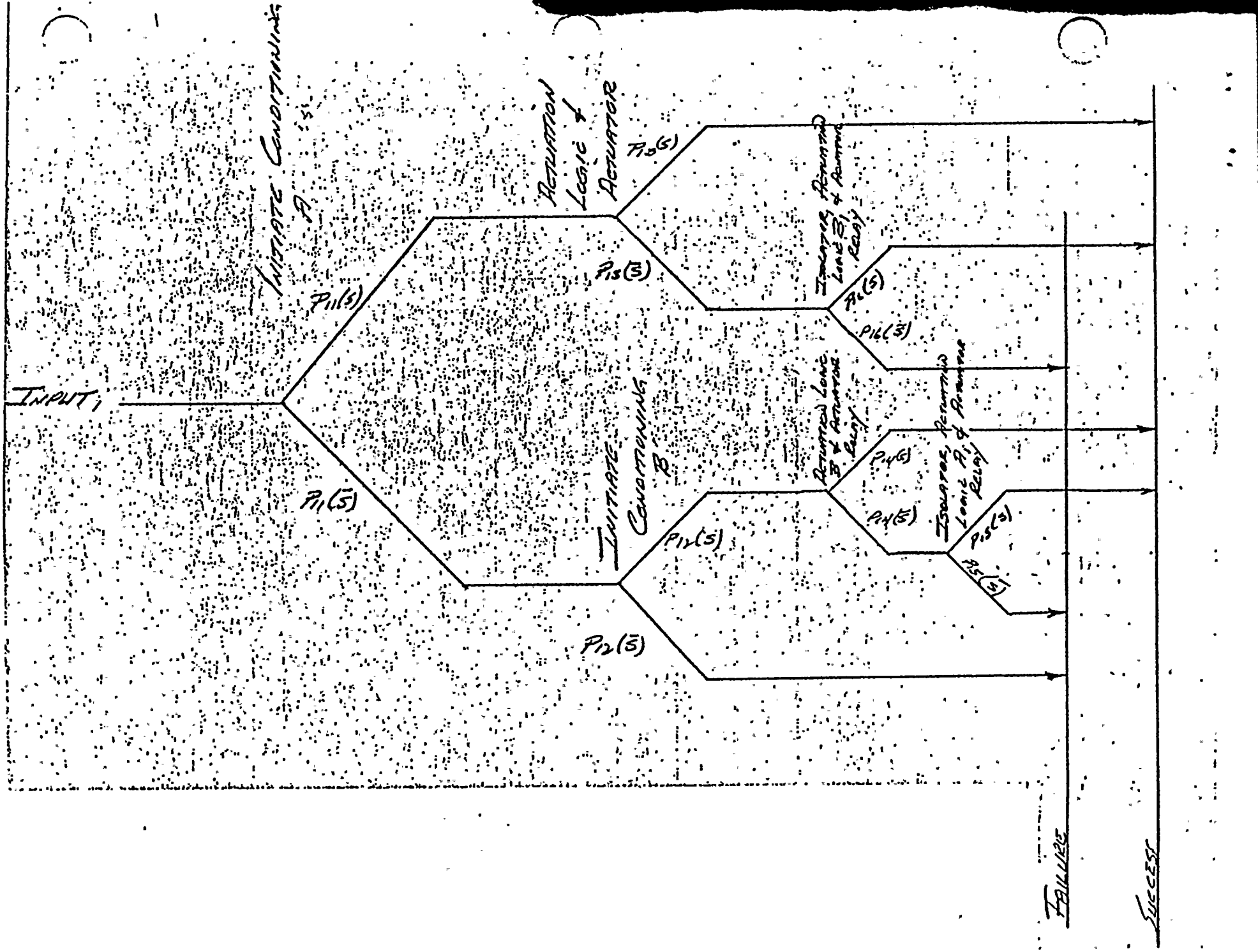


Fig. 7. Decision tree for one-out-of-two redundant logic system

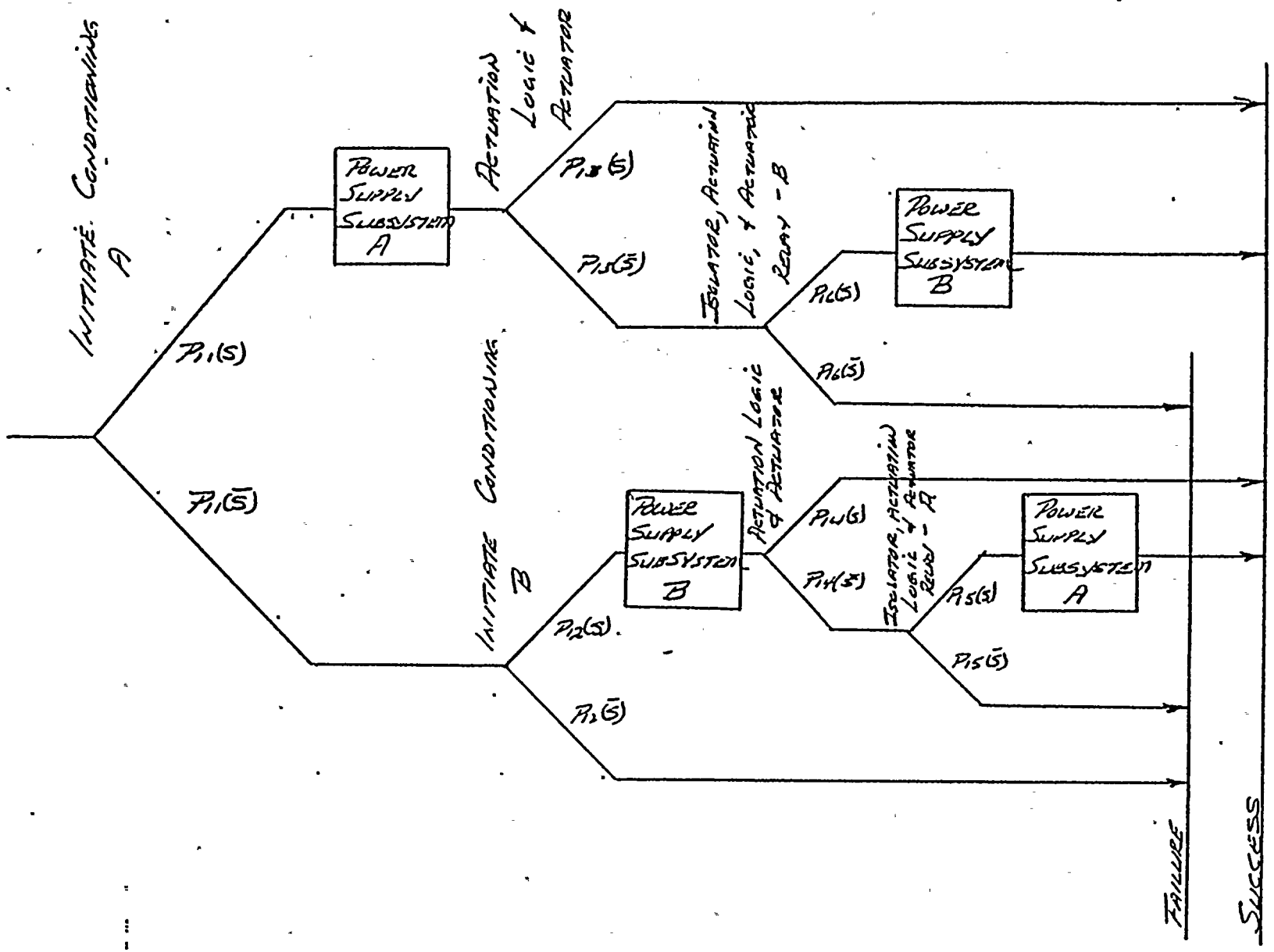


Fig. 8. Decision tree for one-out-of-two redundant logic system with power supply subsystem shown

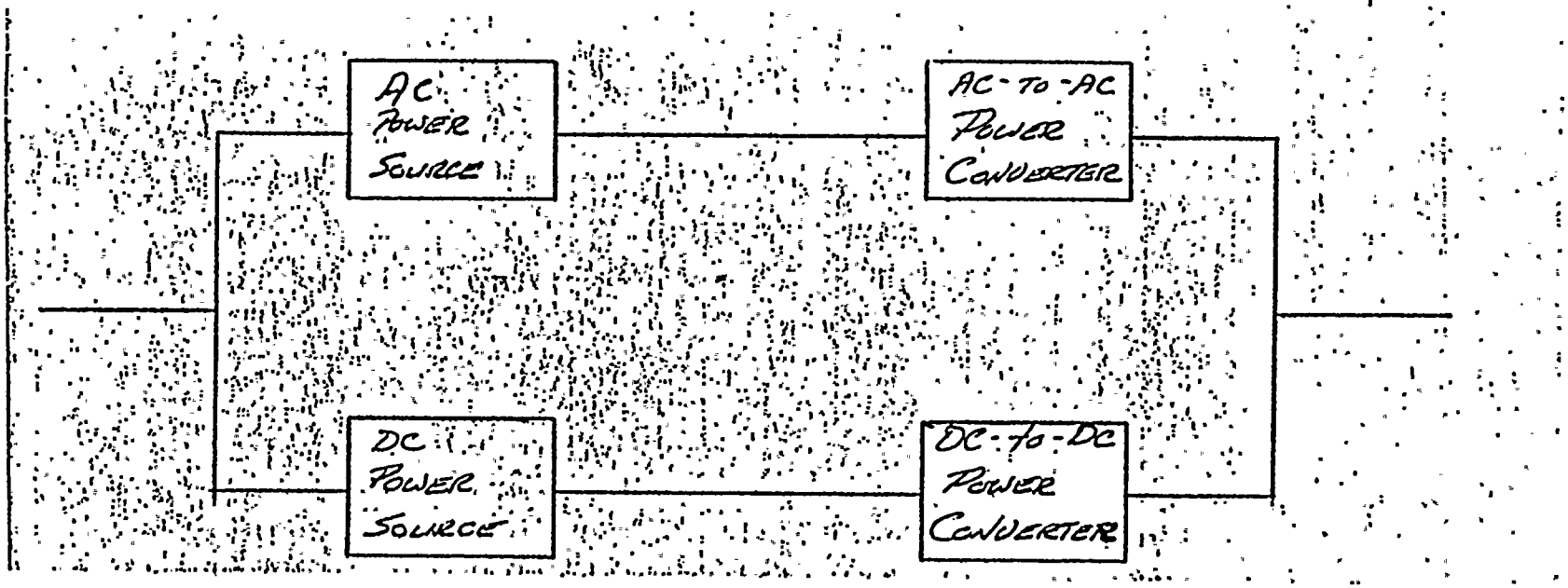


Fig. 9. Cascade diagram of power supply subsystem

Fig. 10. Decision tree for power supply subsystem

$$P(\overline{PS}) = P_{S1}(\overline{S}) \cdot P_{S2}(\overline{S}) + P_{S1}(\overline{S}) \cdot P_{S2}(S) \cdot P_{S4}(\overline{S})$$
$$+ P_{S1}(S) \cdot P_{S3}(\overline{S}) \cdot P_{S2}(\overline{S}) + P_{S1}(S)\, P_{S3}(\overline{S})\, P_{S2}(S)\, P_{S4}(\overline{S})$$

Now consider Fig. 11 which shows the logic tree of Fig. 7 with the power supply subsystem included. In generating the logic tree, it is necessary to take into account the dependence of the system on the power supplies.

We can now write the probability equations for the logic tree of Fig. 11 in terms of the individual decision probabilities shown. As previously defined

let $P(SO_1)/I$ = probability of a success output of channel 1 given an input to channel 1.

From the decision tree of Fig. 11 we find that

$$P(SO_1)/I_i = P_{11}(S) \cdot P_{SA}(S) \cdot P_{13}(S)$$
$$+ P_{11}(S) \cdot P_{SA}(S) \cdot P_{13}(\overline{S}) \cdot P_{16}(S) \cdot P_{SB}(S)$$
$$+ P_{11}(S) \cdot P_{SA}(\overline{S}) \cdot P_{12}(S) \cdot P_{SB}(S) \cdot P_{14}(S)$$
$$+ P_{11}(\overline{S}) \cdot P_{12}(S) \cdot P_{SB}(S) \cdot P_{14}(S)$$
$$+ P_{11}(\overline{S}) \cdot P_{12}(S) \cdot P_{SB}(S) \cdot P_{14}(\overline{S}) \cdot P_{15}(S) \cdot P_{SA}(S)$$

7.4. MULTIPLE OUTPUTS

With the power supply dependence incorporated into the model let us consider the complication of two or more outputs resulting from a single stimulus as shown in Fig. 12. The following analysis of Fig. 12 is predicated on the concept that all output functions resulting from a specified input function must result to have a successful operation. Mathematically this means

$$P(S)/C = \left\{P(SO_1)/I_i \cdot P(SO_2)/I_i\right\} \cdot P(I_i)/C$$

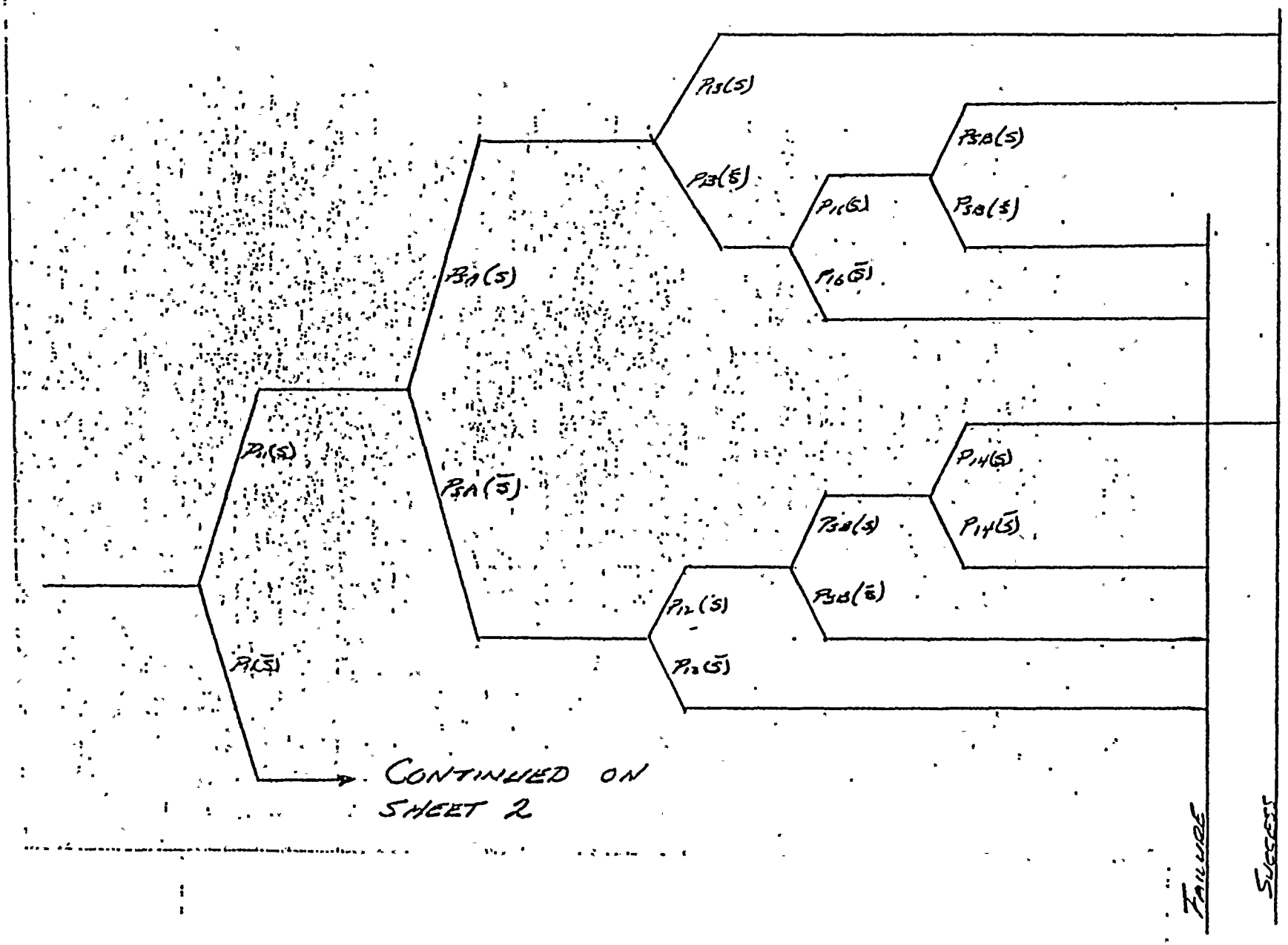


Fig. 11. Decision tree for one-out-of-two redundant logic system with power supply subsystem included (sheet 1 of 2)

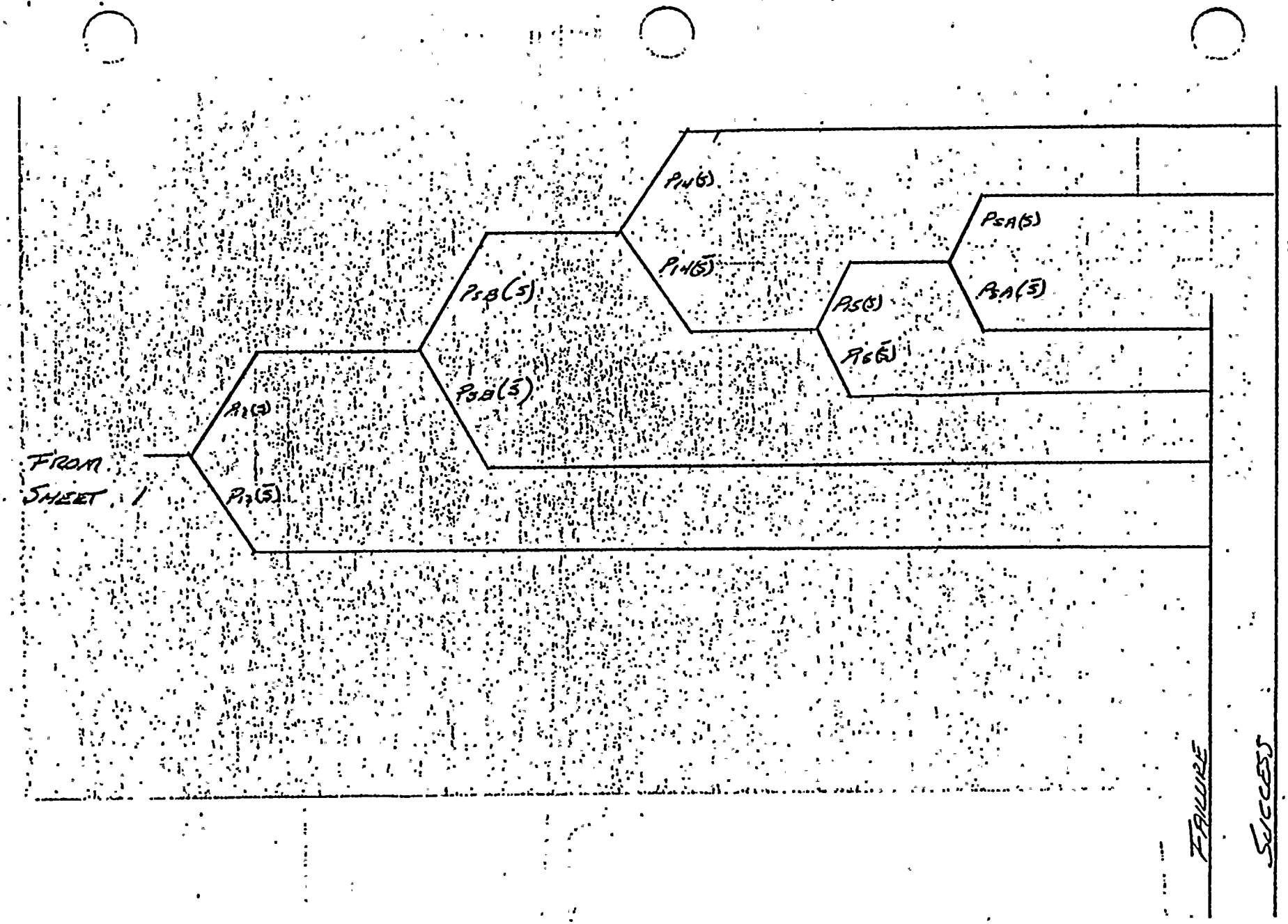


Fig. 11. Decision tree for one-out-of-two redundant logic system with power supply subsystem included (sheet 2 of 2)

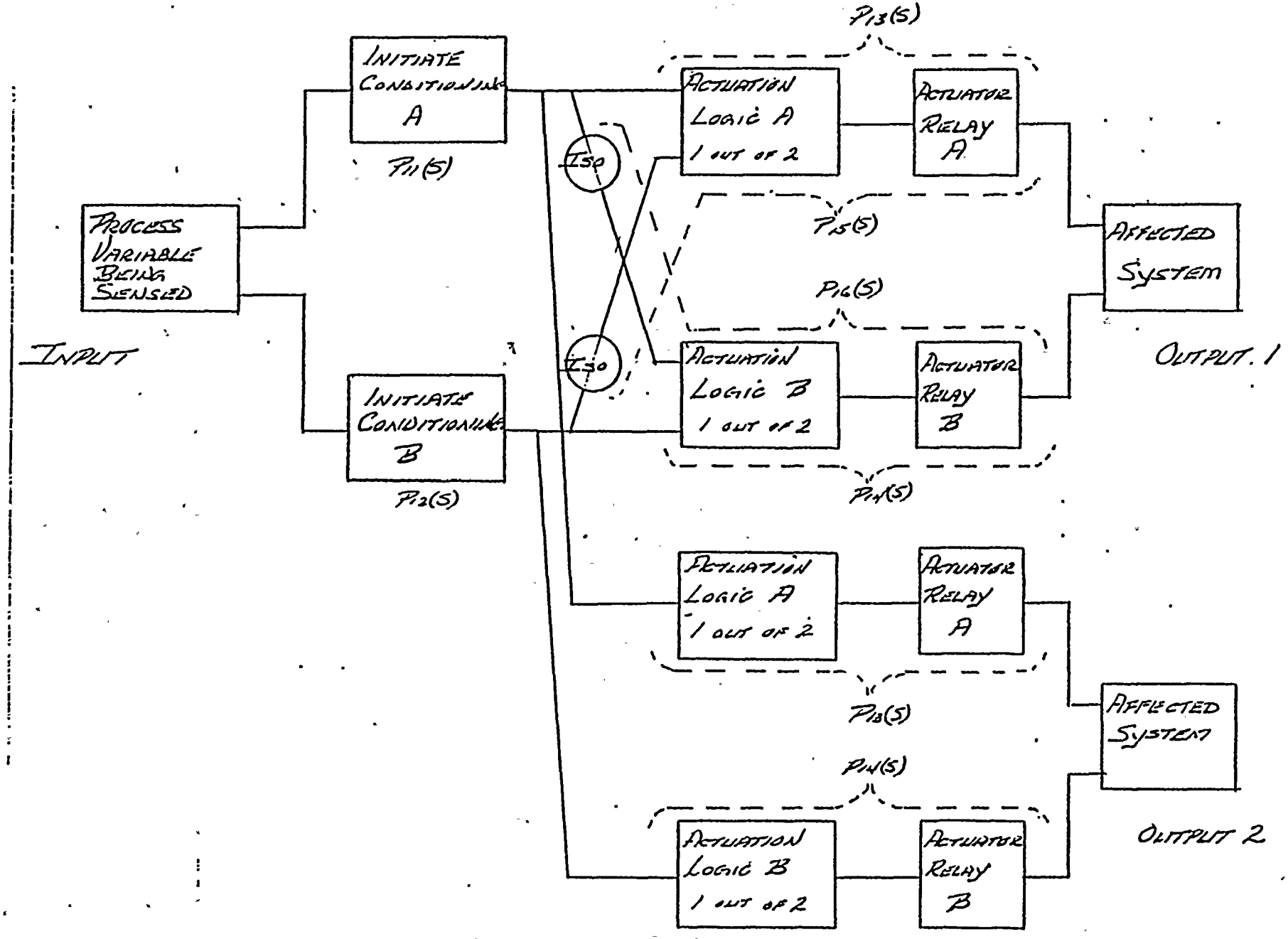


Fig. 12. Block diagram of input/two output subsystem

$P(SO_1)/I_1$ was defined in the previous paragraph. $P(SO_2)/I_1$, the probability of output 2 given input I_1, is somewhat simpler and is based on the argument that the power supply dependence has been accounted for in $P(SO_1)/I_1$. A simplified but conservative approximation to $P(SO_2)/I_1$ is

$$P(SO_2)/I_1 = P_{13}(S) + P_{13}(\overline{S})\ P_{16}(S) \quad .$$

In general terms this implies that the probability of success for two outputs is the probability of success for a single output multiplied by the probability that Actuation Logic A or B and Actuator Relays A or B function in the output 2 train.

With the defining equations for $P(SO_1)/I_1$ and $P(SO_2)/I_1$ we have the basis for defining the probability equations for the FBEVAS, CREFAS, CPIAS and the CRVIAS channels. In general terms these are:

$$P(SO_i)/I_j = P(SO_1)/I_1 \text{ for } i = j$$

$$P(SO)_i/I_j = P(SO_2)/I_1 \text{ for } i \neq j$$

7.5. DIESEL GENERATOR START SIGNAL (DGSS) SUBSYSTEM

The DGSS module has three direct external input signals and a fourth signal which is an output of the LOP module.

Basically the DGSS module is a logical OR gate that produces an output if any input is present. Figure 13 is a block diagram for the decision tree representation for the DGSS subsystem. The decision tree is elementary as shown in Fig. 14 where $P_{DA}(S)$ and $P_{DB}(S)$ are the probability of success for the DGSS modules and $P_{SA}(S)$ and $P_{SB}(S)$ are as previously defined.

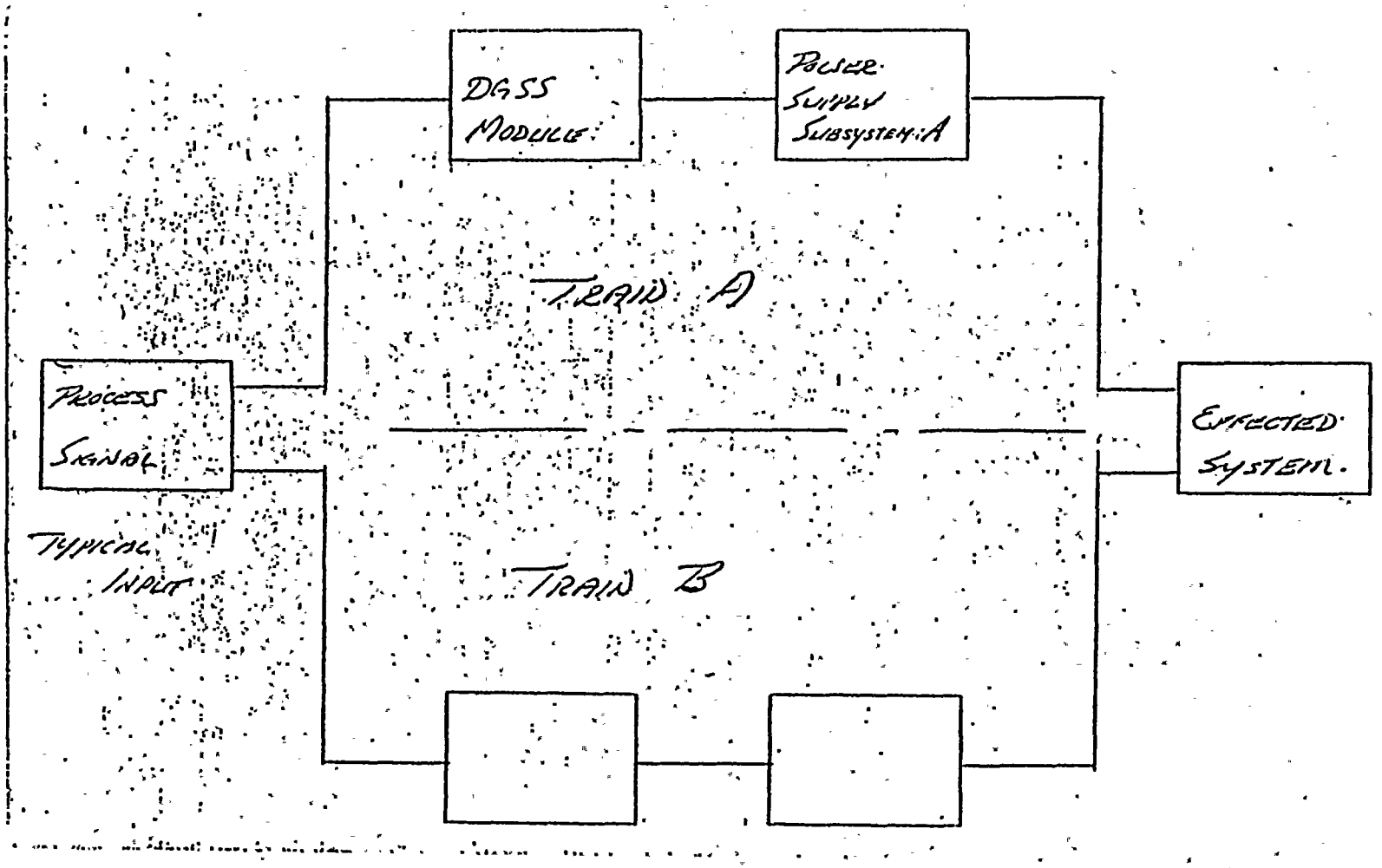


Fig. 13. Block diagram of diesel generator start signal (DGSS) subsystem

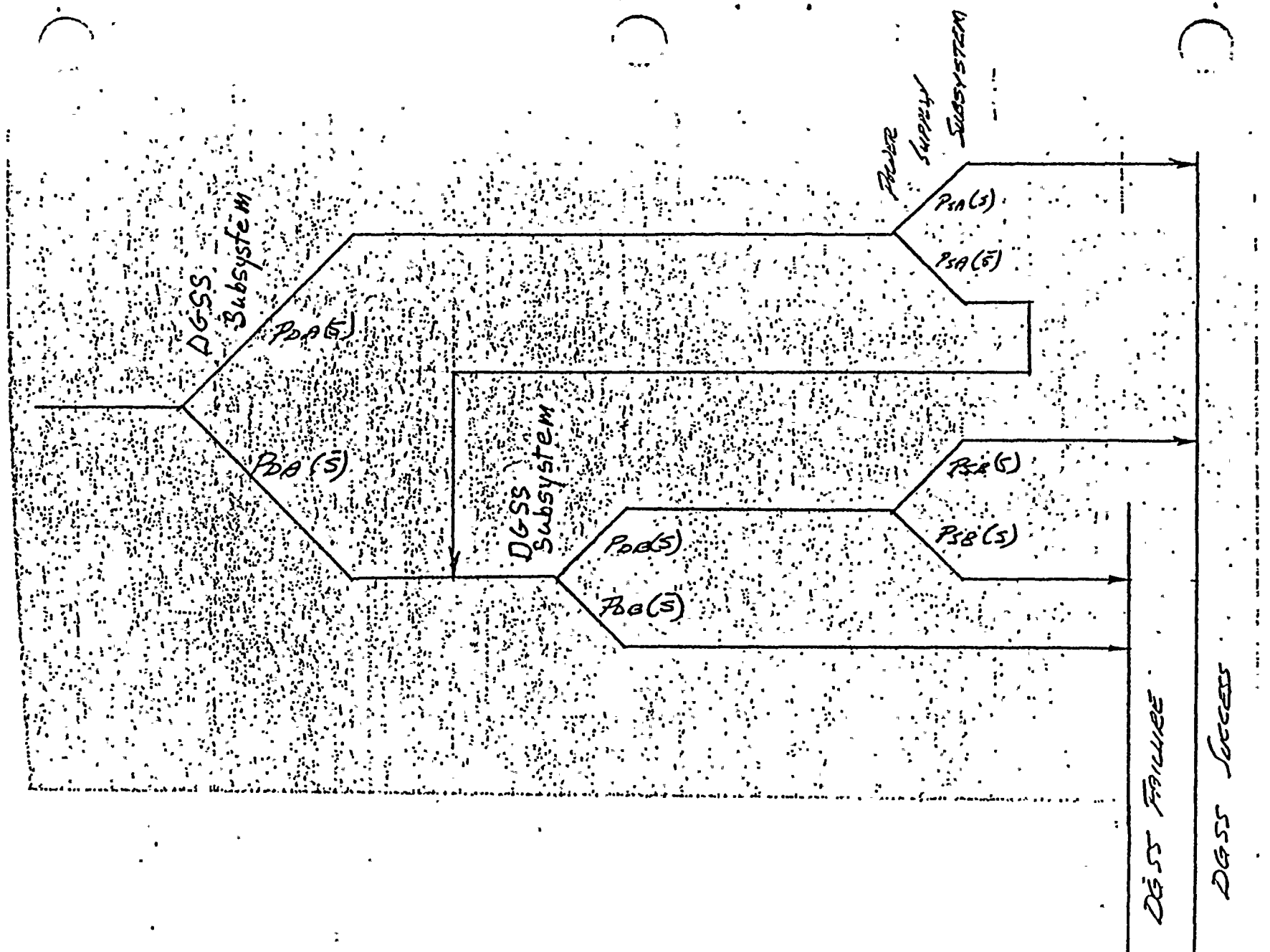


Fig. 14. Decision tree for typical input to diesel generator start signal (DGSS) subsystem

The subsystem probability of success can be written as

$$P_{DSS}(S)/I = P_{DA}(S) \cdot P_{SA}(S) + P_{DA}(S) \cdot P_{SA}(\overline{S}) \cdot P_{SB}(S) + P_{DA}(\overline{S}) \cdot P_{DB}(S) \cdot P_{SB}(S)$$

substituting $P_{DA}(S) = P_{DB}(S)$

and $P_{SA}(S) = P_{SB}(S)$

we obtain $P_{DSS}(S)/I = P_{DA}(S) \cdot P_{SA}(S) + P_{DA}(S) \cdot (1 - P_{SA}(S)) \cdot P_{SA}(S) + (1 - P_{DA}(S)) \cdot P_{DA}(S) \cdot P_{SA}(S)$.

7.6. LOSS-OF-POWER (LOP) LOAD SHED SUBSYSTEM

The Loss-of-Power Load Shed (LOP) subsystem is somewhat different from the subsystems discussed thus far and will require a separate though less detailed analysis.

Figure 15 shows a simplified block diagram similar to Fig. 6, but for the LOP subsystem. The significant difference is the four redundant initiation blocks and the lack of cross connection in the initiation section (see Fig. 6).

Before generating a decision tree for the LOP subsystem we will determine the probability of success for the two-out-of-four (2/4) initiation section. Figure 16 is the 2/4 decision tree. The multiple success paths are analogous to the logical success paths in the two-out-of-four logic. If A, B, C and D represent the input paths, then an output can be generated

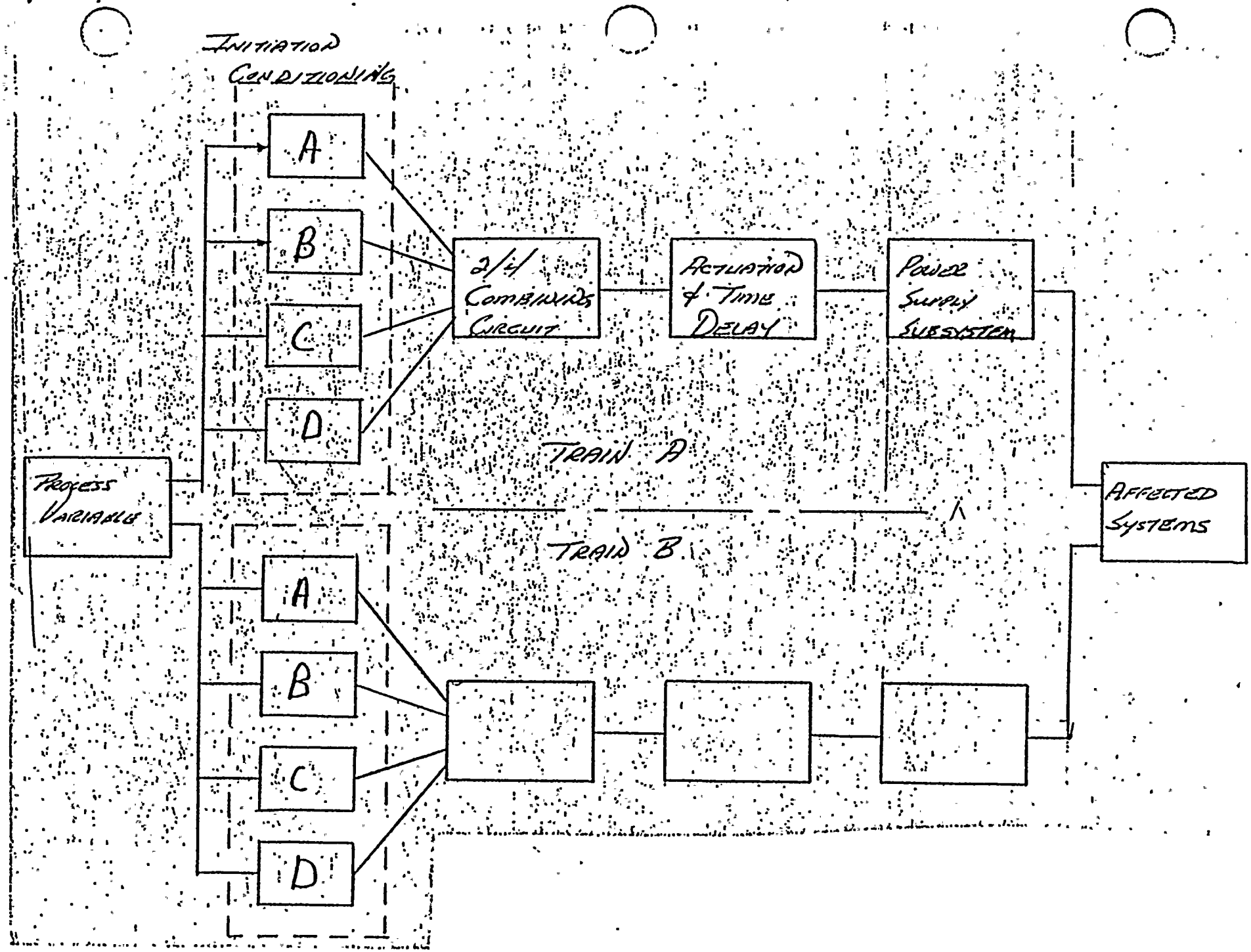


Fig. 15. Block diagram of loss-of-power (LOP) load shed subsystem

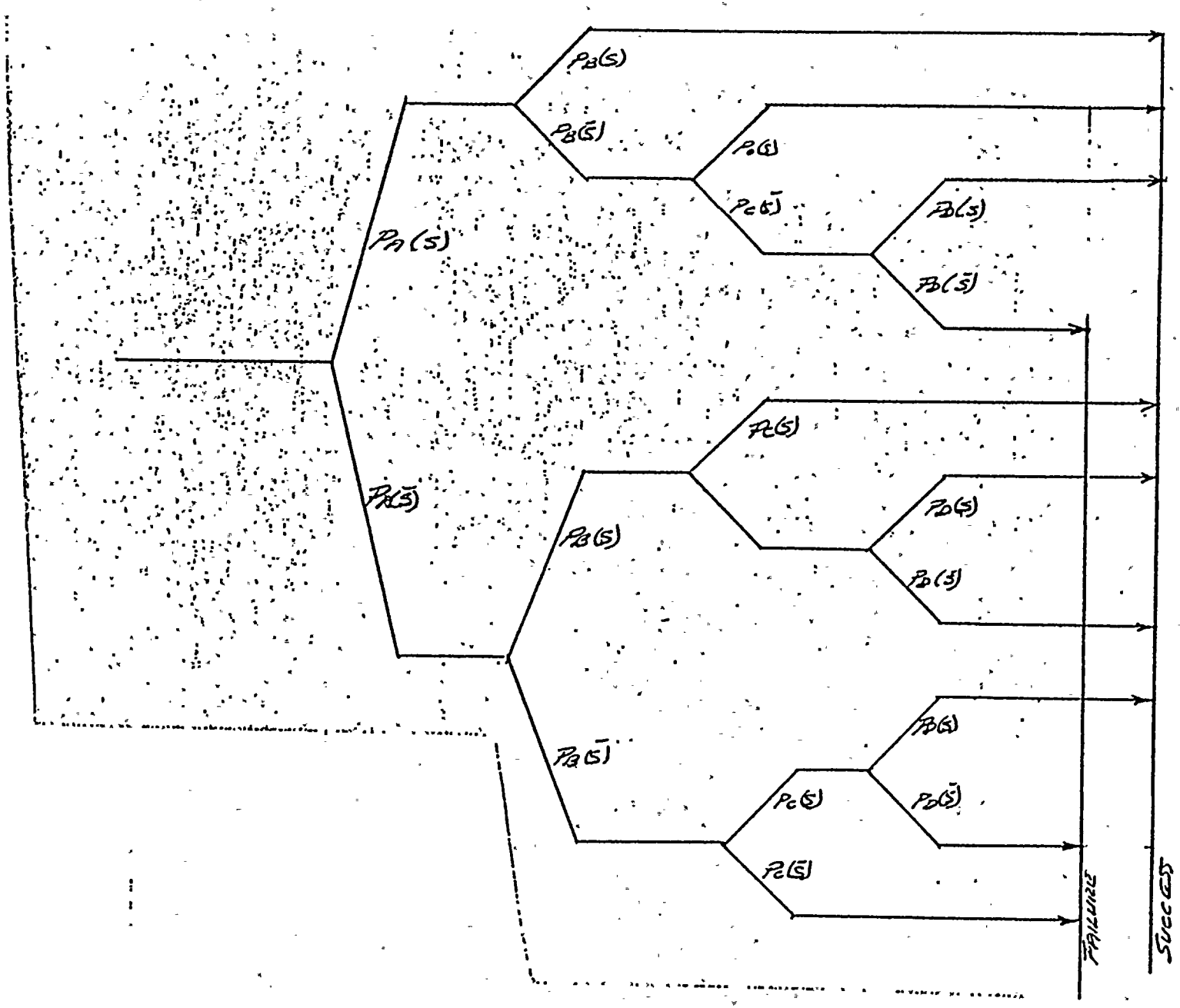


Fig. 16. Decision tree for t[illegible]t-of-four initiation section

by AB + AC + AD + BC + BD + CD. The probability of success is the same for any path and is defined as $P_A(S)$. Therefore the probability of success for the 2/4 initiation network is:

$$P_I(S) = P_A(S) \cdot P_B(S)$$
$$+ P_A(S) \cdot P_B(\bar{S}) \cdot P_C(S)$$
$$+ P_A(S) \cdot P_B(\bar{S}) \cdot P_C(\bar{S}) \cdot P(D)$$
$$+ P_A(\bar{S}) \cdot P_B(S) \cdot P_C(S)$$
$$+ P_A(\bar{S}) \cdot P_B(S) \cdot P_C(\bar{S}) \cdot P_D(S)$$
$$+ P_A(\bar{S}) \cdot P_B(\bar{S}) \cdot P_C(S) \cdot P_D(S)$$

Based on $P_A(S) = P_B(S) = \ldots P_D(S)$

$$P_I(S) = (P_A(S))^2$$
$$+ (1 - P_A(S))\, P_A(S)^2$$
$$+ (1 - P_A(S))^2\, P_A(S)^2$$
$$+ (1 - P_A(S))\, P_A(S)^2$$
$$+ (1 - P_A(S))^2\, P_A(S)^2$$
$$+ (1 - P_A(S))^2\, P_A(S)^2$$
$$= P_A(S)^2 + 2(1 - P_A(S))\, P_A(S)^2 + 3(1 - P_A(S))^2\, P_A(S)^2$$
$$P_I(S) = P_A(S)^2\,(1 + 2\,(1 - P_A(S)) + 3(1 - P_A(S))^2)$$

We can now write the probability expression for the LOP subsystem from the decision tree of Fig. 17.

$$P_{LOP}(S) = P_I(S) \cdot P_{24}(S) \cdot P_{AD}(S) \cdot P_{SA}(S)$$
$$+ \{1 - (P_I(S) \cdot P_{24}(S) \cdot P_{AD}(S) \cdot P_{SA}(S))\}$$
$$\cdot P_I(S) \cdot P_{24}(S) \cdot P_{AD}(S) \cdot P_{SA}(S)$$

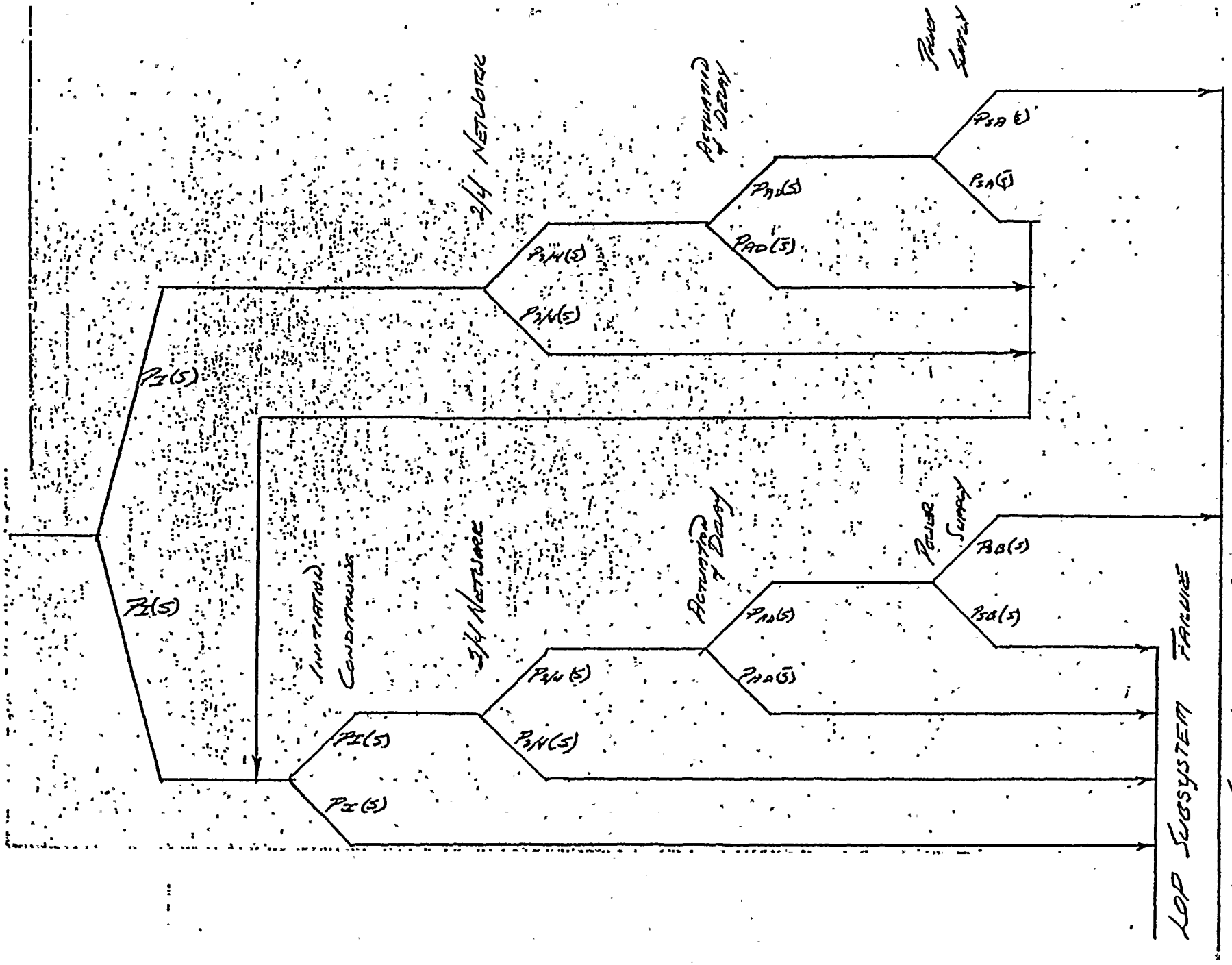


Fig. 17. Decision tree for : of-power (LOP) load shed subsystem

Let $P_L(S) = P_I(S) \cdot P_{24}(S) \cdot P_{AD}(S) \cdot P_{SA}(S)$

$$P_{LOP}(S) = P_L(S) + (1 - P_L(S))\, P_L(S)$$

where $P_I(S)$ = Probability of successful operation of the 2/4 redundant initiation section

$P_{24}(S)$ = Probability of successful operation of the 2/4 combining network

P_{AD} = Probability of successful operation of the actuation and time delay circuits

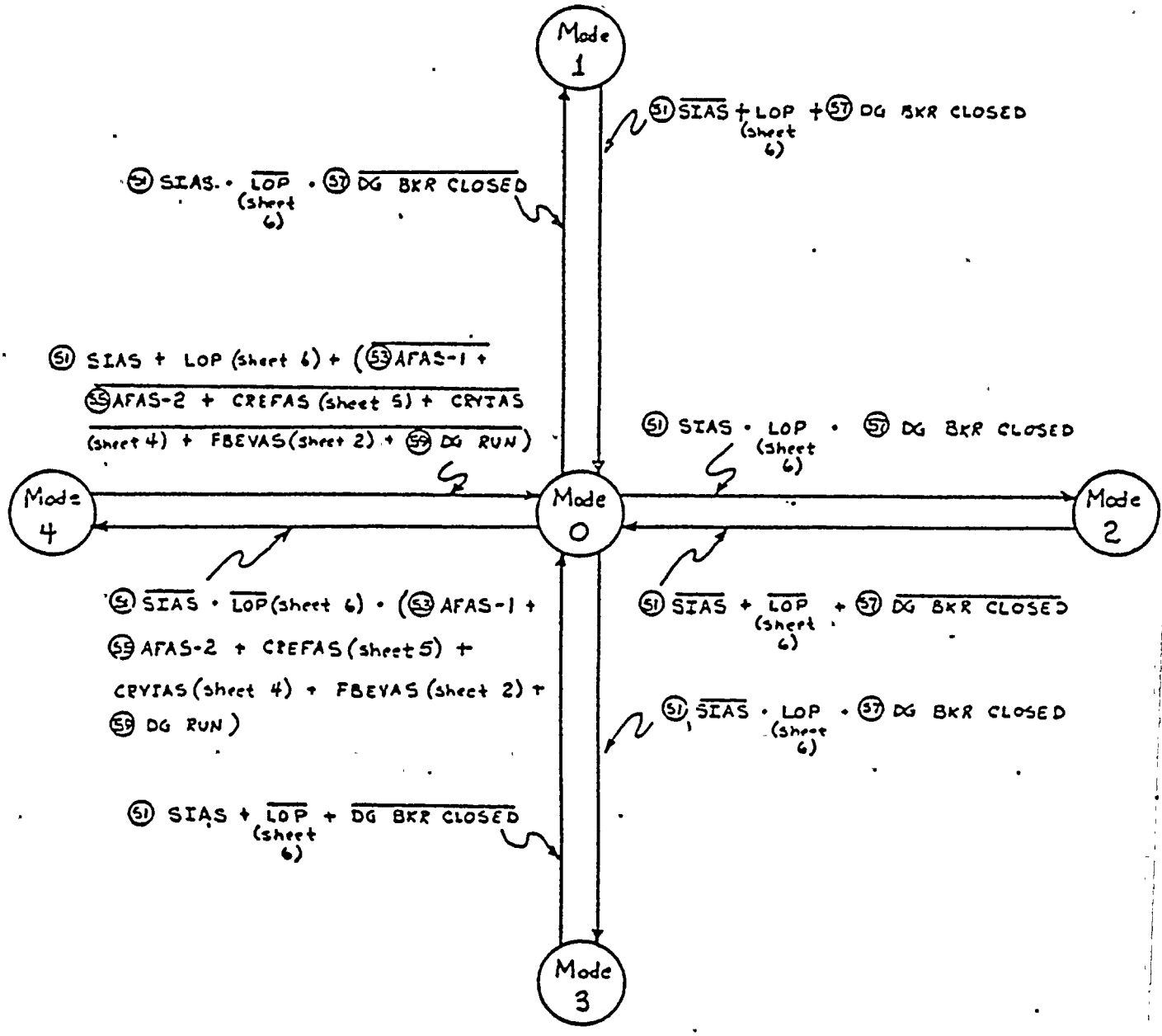
$P_{SA}(S) = P_{SB}(S)$ = Probability of successful operation of the power supply subsystem.

7.7. LOAD SEQUENCER AND AUTO TEST

The load sequencer has 10 possible input signals, 8 of which are generated within the ESFAS and two, DG RUN and DG BKR, are generated externally from LOP module output signals. See drawing ELE 342-0100 for details.

To determine the probability of subsystem success it is necessary to determine how much of the supporting subsystems must be functional: Examination of the ESF Load Sequencer State Diagram of Ref. 1 (see Fig. 18) reveals that three input signal sections must function to go from the normal state, Mode 0, to one of the active states, Mode 1, Mode 2, Mode 3, or Mode 4. SIAS and LOP signals appear in all 4. The third signal varies with mode. For analysis we will use DG BKR because it is involved in the greatest number of modes.

The decision tree block diagram is shown in Fig. 19.



NOTES:

1. STATE DIAGRAM SHOWN FOR SUBSYSTEM A ONLY, SAME FOR SUBSYSTEM B.
2. MODE 4 SUB-SEQUENCE OUTPUTS ARE DEVELOPED BY LOGICALLY AND GATING THE TIMED OUTPUTS WITH THE ACCIDENT SIGNALS AS OUTLINED IN ATTACH. 4-2, TABLE 9.

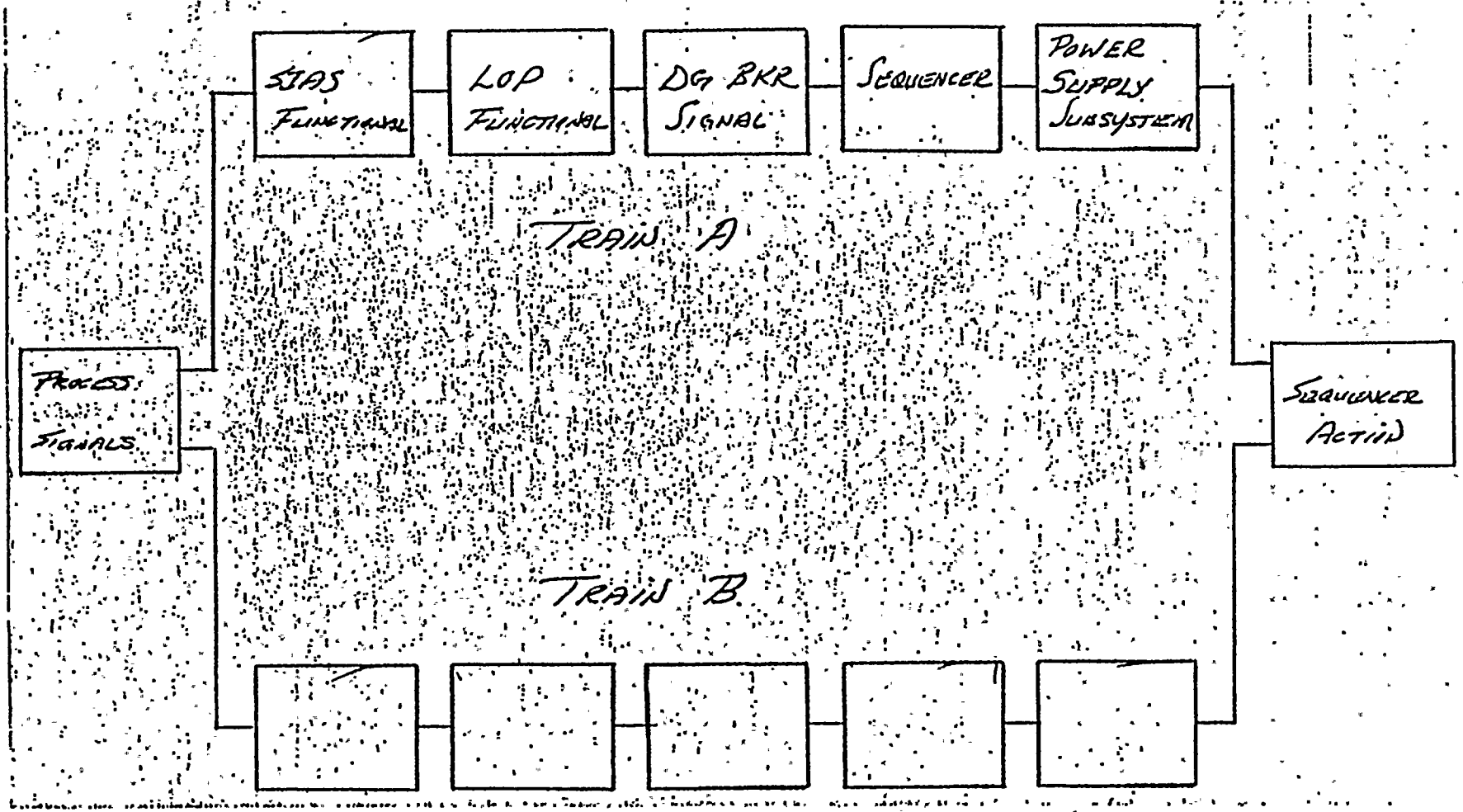


Fig. 19. Block diagram of load sequencer and auto test

Figure 20 shows the load sequencer decision tree from which the probability of success for the sequencer can be written by inspection.

To simplify writing the probability of success for the tree, let

$$P_{LS_A}(S) = P_{SI}(S) \cdot P_{LOP}(S) \cdot P_{BKR}(S) \cdot P_{Q}(S) \cdot P_{SA}(S)$$

Then

$P_{LS}(S)$ = Probability of successful operation of the load sequencer

$$P_{LS}(S) = P_{LS_A}(S) + (1 - P_{LS_A}(S))\, P_{LS_A}(S) \quad .$$

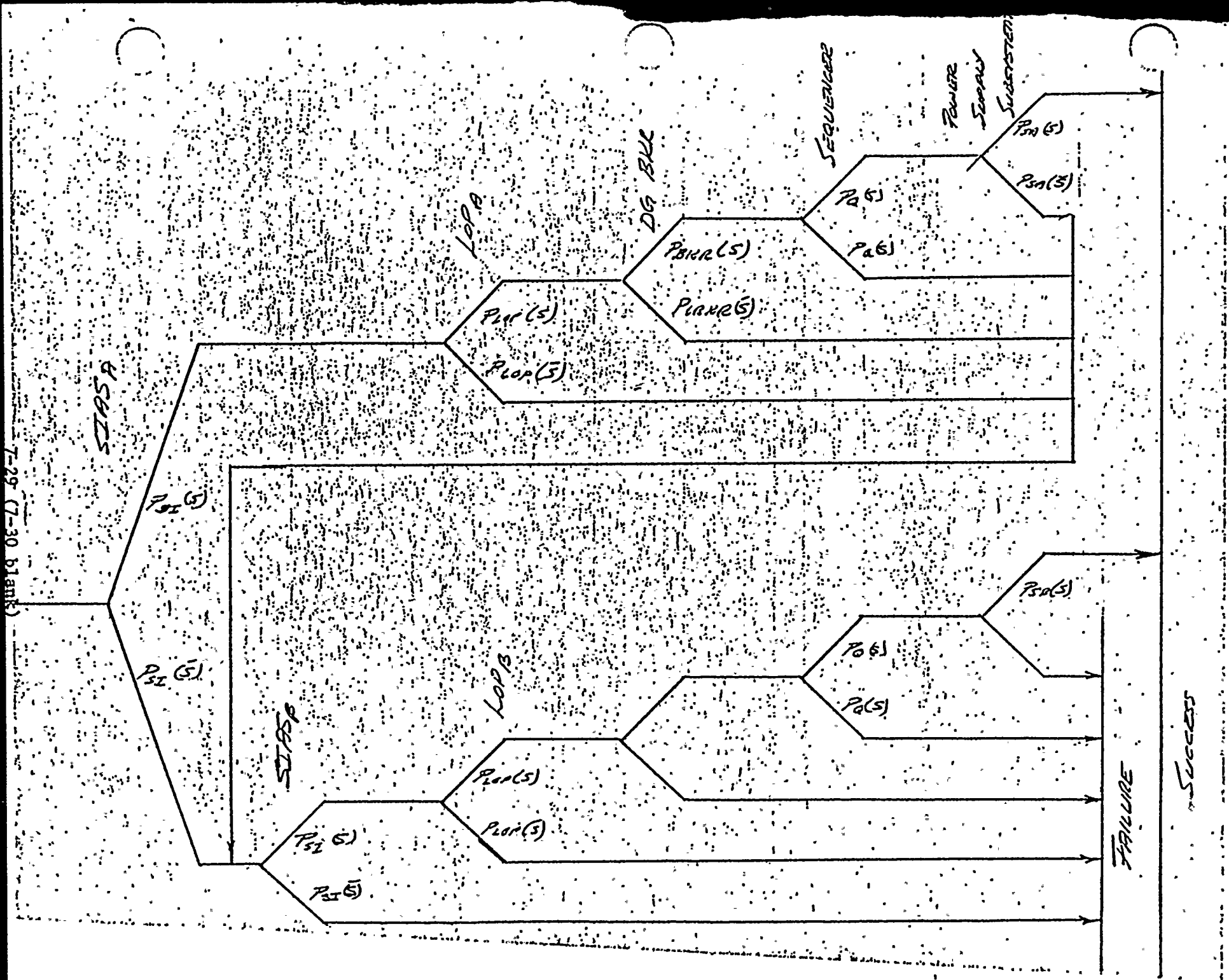


Fig. 20. Decision tree for load sequencer and auto test

8. EQUATIONS FOR COMPOSITE SYSTEM RELIABILITY

In the preceding sections the system model was established and a generalized set of probability equations were derived. Following the generalization, equations were presented for the individual subsystems. This section ties the generalized approach to the individual subsystem equations and permits computation of the system reliability for any mission time.

Table 2 summarizes the subsystem component failure rate values that will be substituted in the model equations to compute the system reliability.

$$
\begin{aligned}
P(S)/C = {} & P(I_1)/C \cdot \{P(SO_1)/I_1 \cdot P(SO_2)/I_1 \cdot P(SO_3)/I_1 \\
& \cdot P(SO_4)I_1 \cdot P(SO_5)/I_1 \cdot P(SO_6)/I_1 \cdot P(SO_7/I_1\} \\
& + P(I_2)/C \cdot \{P(SO_1)/I_2 \cdot P(SO_2)/I_2 \cdot P(SO_3)/I_2 \\
& \cdot P(SO_4/I_2 \cdot P(SO_5)/I_2 \cdot P(SO_6)/I_2 \cdot P(SO_7)/I_2\} \\
& + P(I_3)/C \cdot \{P(SO_1)/I_3 \cdot P(SO_2)/I_3 \cdot P(SO_3)/I_3 \\
& \cdot P(SO_4)/I_3 \cdot P(SO_5)/I_3 \cdot P(SO_6)/I_3 \cdot P(SO_7)/I_3\} \\
& + P(I_4)/C \cdot \{P(SO_1)/I_4 \cdot P(SO_2)/I_4 \cdot P(SO_3)/I_4 \\
& \cdot P(SO_4)/I_4 \cdot P(SO_5)/I_4 \cdot P(SO_6)/I_4 \cdot P(SO_7)/I_4\} \\
& + P(I_5)/C \cdot \{P(SO_1)/I_5 \cdot P(SO_2)/I_5 \cdot P(SO_3)/I_5 \\
& \cdot P(SO_4)/I_5 \cdot P(SO_5)/I_5 \cdot P(SO_6)/I_5 \cdot P(SO_7)/I_5\} \\
& + P(I_6)/C \cdot \{P(SO_1)/I_6 \cdot P(SO_2)/I_6 \cdot P(SO_3)/I_6 \\
& \cdot P(SO_4)/I_6 \cdot P(SO_5)/I_6 \cdot P(SO_6)/I_6 \cdot P(SO_7)/I_6\} \\
& + P(I_7)/C \cdot \{P(SO_1)/I_7 \cdot P(SO_2)/I_7 \cdot P(SO_3)/I_7 \\
& \cdot P(SO_4)/I_7 \cdot P(SO_5)/I_7 \cdot P(SO_6)/I_7 \cdot P(SO_7)/I_7\}
\end{aligned}
$$

TABLE 2
SUBSYSTEM COMPONENT FAILURE RATE VALUES

Subsystem Component	Failure Rate $\times 10^{-6}$	Reliability for 720 hr	Prob Symbol	Source of Failure Rate Data
Initiating Channel for FBEVAS, CREFAS, CPIAS	12.5	0.9910	P_{11}, P_{12}	Calculated by MIL-HBK 217A
Actuating Channel and Relays for FBEVAS, CREFAS, CPIAS	7.17	0.9948	P_{13}, P_{14}, P_{15}, P_{16}	Calculated by MIL-HBK 217A
Ac Power Source	40	0.9716	P_{S1}	Provided in Ref. 1 MTBF = 2.85 yr or 25,966 hr
Dc Power Source	4	0.9971	P_{S2}	Estimated
Ac to dc power supply	25	0.9822	P_{S3}	Power supply mfg data; see Appendix B
Dc to dc power supply	25	0.9822	P_{S4}	Power supply mfg data; see Appendix B
Initiating Channel for CRVIAS	15.8	0.9887	P_{11A}, P_{12A}	Calculated by MIL-HBK 217A
Actuating Channel for CRVIAS	7.87	0.9944	P_{13A}, P_{14A}, P_{15A}, P_{16A}	Calculated by MIL-HBK 217A
LOP/LS Module				
a. Trip Section	5.77	0.9958	$P_A(S)$	Calculated by MIL-HBK 217A
b. 2/4 and output actuation	11.78	0.9915	$P_{24}(S)$ $P_{AD}(S)$	Calculated by MIL-HBK 217A

TABLE 2 (continued)

Subsystem Component	Failure Rate $x10^{-6}$	Reliability for 720 hr	Prob Symbol	Source of Failure Rate Data
DGSS Module	11.6	0.9917	$P_{AD}(S)$	Calculated by MIL-HBK-217A
ESF Load Sequencer	20.7	0.9852	$P_{Q}(S)$	Calculated by MIL-HBK 217A

$$+ P(I_8)/C \cdot \{P(SO_1)/I_8 \cdot P(SO_2)/I_8 \cdot P(SO_3)/I_8$$
$$\cdot P(SO_4)/I_8 \cdot P(SO_5)/I_8 \cdot P(SO_6)/I_8 \cdot P(SO_7)/I_8\}$$

The variables for the preceding equations are summarized below.

As previously defined $P(I_1)/C = P(I_2)/C = \ldots P(I_8)/C = 1/n = 1/8 = 0.1$.

Now consider the outputs dependent on input I_1, FBEVAS

$$P(SO_1)/I_1 = P_{11}(S) \cdot P_{SA}(S) \cdot P_{13}(S)$$
$$+ P_{11}(S) \cdot P_{SA}(S) \cdot P_{15}(\overline{S}) \cdot P_{16}(S) \cdot P_{SB}(S)$$
$$+ P_{11}(S) \cdot P_{SA}(\overline{S}) \cdot P_{12}(S) \cdot P_{SB}(S) \cdot P_{14}(S)$$
$$+ P_{11}(\overline{S}) \cdot P_{12}(S) \cdot P_{SB}(S) \cdot P_{14}(S)$$
$$+ P_{11}(\overline{S}) \cdot P_{12}(S) \cdot P_{SB}(S) \cdot P_{14}(\overline{S}) \cdot P_{15}(S) \cdot P_{SA}(S)$$
$$P(SO_2)/I_1 = P_{13}(S) + (1 - P_{13}(S)) \cdot P_{16}(S)$$
$$P(SO_3)/I_1 = P(SO_4)/I_1 = P(SO_5)/I_1 = P(SO_6)/I_1 = P(SO_7)/I_1 = 1 ,$$
$$P_{11} = \text{See Table 2}$$
$$P_{13} = \text{See Table 2}$$
$$P_{15} = \text{See Table 2}$$
$$P_{16} = \text{See Table 2} .$$

Now consider outputs dependent on input I_2, CREFAS

$$P(SO_1)/I_2 = 1$$

because output O_1 is independent of input I_2

$$P(SO_2)/I_2 = P(SO_1)/I_1$$

because the same relationship holds true

$$P(SO_3)/I_2 = P(SO_2)/I_1$$

because this subsystem is the same as the preceding FBEVAS subsystem

$$P(SO_4)/I_2 = P(SO_5)/I_2 = P(SO_6)/I_2 = P(SO_7)/I_2 = 1$$

because these outputs are independent of the I_2, CREFAS, input.

The power supply subsystem was defined by the following equation:

$$\begin{aligned} P_{PSA}(S) = P_{PSB}(S) = {} & P_{S1}(S) \cdot P_{S3}(S) \\ & + P_{S1}(S) \cdot P_{S3}(\bar{S}) \cdot P_{S2}(S) \cdot P_{S4}(S) \\ & + P_{S1}(\bar{S}) \cdot P_{S2}(S) \cdot P_{S4}(S) \end{aligned}$$

where $P_{S1}(S)$, $P_{S2}(S)$, $P_{S3}(S)$ and $P_{S4}(S)$ are defined in Table 2.

Now consider outputs dependent on input, I_3, CPIAS.

$$P(SO_1)/I_3 = P(SO_2)/I_3 = 1$$

because outputs are independent of input I_3.

$$P(SO_3)/I_3 = P(SO_1)/I_1$$

because the same 1-out-of-2 configuration as the FBEVAS subsystem.

$$P(SO_4)/I_3 = P(SO_5)/I_3 = P(SO_6)/I_3 = P(SO_7)/I_3 = 1$$

because outputs are independent of input.

Now consider outputs dependent on input I_4, CRVIAS (SMCROA)

$$P(SO_1)/I_4 = P(SO_2)/I_4 = P(SO_3)/I_4 = 1$$

because these outputs are independent of input I_4.

$$P(SO_4)/I_4$$

is almost equal to $P(SO_1)/I_1$.

Examination of Table 2 reveals that the failure rates for the CRVIAS channel components are somewhat greater than for the FBEVAS channel components. Therefore,

$$\begin{aligned} P(SO_4)/I_4 = {} & P_{11A}(S) \cdot P_{SA}(S) \cdot P_{13A}(S) \\ & + P_{11A}(S) \cdot P_{SA}(S) \cdot P_{15A}(\bar{S}) \cdot P_{16A}(S) \cdot P_{SB}(S) \\ & + P_{11A}(S) \cdot P_{SA}(\bar{S}) \cdot P_{12A}(S) \cdot P_{SB}(S) \cdot P_{14A}(S) \\ & + P_{11A}(\bar{S}) \cdot P_{12A}(S) \cdot P_{SB}(S) \cdot P_{14A}(S) \\ & + P_{11A}(\bar{S}) \cdot P_{12A}(S) \cdot P_{SB}(S) \cdot P_{14A}(\bar{S}) \cdot P_{15A}(S) \\ & \cdot P_{SA}(S) \quad . \end{aligned}$$

$$P(SO_5)/I_4 = P(SO_6)/I_4 = P(SO_7)/I_4 = 1$$

because these outputs are independent of input I_4, CRVIAS (SMCROA).

Now consider outputs dependent on input I_5, CREVIAS, (HGC CROA).

$$P(SO_4)/I_5 = P(SO_4)/I_4$$

because of the same 1-out-of-2 relationship.

$$P(SO_1)/I_5 = P(SO_2)/I_5 = P(SO_3)/I_5 = P(SO_5)/I_5 =$$
$$P(SO_6)/I_5 = P(SO_7)/I_5 = 1$$

because these outputs are independent of input I_5, CRVIAS (HGC CROA).

Now consider outputs dependent on input I_6 DGSS. O_5, the DGSS output, is the only output dependent on I_6, the DGSS input. From a previous section we have

$$\begin{aligned} P(SO_5)/I_6 &= P_{DSS}(S)/I \\ &= P_{DA}(S) \quad P_{SA}(S) \\ &\quad + P_{DA}(S) \quad (1 - P_{SA}(S)) \quad P_{SA}(S) \\ &\quad + (1 - P_{DA}(S)) \quad P_{DA}(S) \quad P_{SA}(S) \end{aligned}$$

and

$$P(SO_1)/I_6 = P(SO_2)/I_6 = P(SO_3)/I_6 = P(SO_4)/I_6$$
$$= P(SO_6)/I_6 = P(SO_7)/I_6 = 1$$

because of the independence of these outputs.

$P_{DA}(S)$ is defined by Table 2.

$P_{SA}(S)$ is the power system reliability as previously defined.

Now consider outputs dependent on input I_7, the LOP subsystem. Output O_6 is the only dependent output. The previously established relationship is

$$P(SO_6)/I_7 = P_L(S) + (1 - P_L(S))\, P_L(S)$$

where $$P_L(S) = P_I(S) \cdot P_{24}(S) \cdot P_{AD}(S) \cdot P_{SA}(S)$$

and $$P_I(S) = P_A(S)^2 \left\{1 + 2(1 - P_A(S)) + 3(1 - P_A(S))^2\right\}$$

and $$P(SO_1)/I_7 = P(SO_2)/I_7 = P(SO_3)/I_7 = P(SO_4)/I_7$$
$$= P(SO_5)/I_7 = P(SO_7)/I_7 = 1$$

because of independence.

$P_A(S)$ is defined in Table 2.

$P_{24}(S) \cdots P_{AD}(S)$ is defined in Table 2.

$P_{SA}(S)$ is the power system reliability as previously defined.

The output dependent on I_8, the load sequencer inputs, is similar to those already done. As previously explained, the output is a function of the input state defined by several input signals defined by the input challenge I_8. The equation for the probability of success for the Load Sequencer was derived earlier as:

$$P(SO_7)/I_8 = P_{LS_A}(S) + (1 - P_{LS_A}(S)) P_{LS_A}(S)$$

where $$P_{LS_A}(S) = P_{SI}(S) \cdot P_{LOP}(S) \cdot P_{BKR}(S) \cdot P_Q(S) \cdot P_{SA}(S)$$

$P_{SI}(S) = 1$ (direct external signal from field contacts)

$P_{LOP}(S) = P(SO_6)/I_7$ (probability of successful operation of LOP subsystem)

$P_{BKR}(S) = 1$ (direct external signal from field contacts)

$P_Q(S)$ = Value stated in Table 2

$P_{SA}(S)$ = Power system reliability as previously defined.

9. COMPUTATION OF RELIABILITY

A computer program was employed to compute the system reliability for various mission times. Appendix C contains the results of the computer calculations. The module, subsystem, and system reliability results are presented for several operation or mission times ranging from 0 to 960 hrs. The mission time corresponding to 30 days is 720 hours.

The computer program used to perform the calculations was written in the BASIC language. A complete listing of the program is contained in Appendix D. The program computations parallel the equations stated in Section 8.

10. REFERENCES

1. "Section 4, Technical Requirements for Balance of Plant Engineering Safety Features Actuation System for the Arizona Public Service Company Palo Verde Nuclear Generating Station, Units 1, 2, and 3," Specification 13-JM-104, Rev. No. 1, September 14, 1976.
2. Lambert, H. E., "System Safety Analysis and Fault Tree Analysis," Lawrence Livermore Laboratory Report, March 14, 1973.

APPENDIX A

GENERAL ATOMIC COMPONENT RELIABILITY CALCULATIONS

(Component failure rates based on MIL-HBK 217A, Table IV-IX, pg. 4-32.)

NOTE

Failure rates chosen from Table IV-IX are either minimum or average values dependent on stress levels calculated for each part:

Stress ≤0.25 chose min. fig.

Stress >0.25 chose avg. fig.

FBEVAS, CREFAS, CPIAS MODULE FAILURE RATE - INITIATING CHANNEL

Component	Quantity	Failure Rate ($\times 10^{-6}$ hr)	Total Failure Rate (Failures/10^6 hr)
Semiconductors			
Diodes	15	0.1	1.5
Varistors	7	0.2	1.4
Resistors			
A. MIL-R-10509 fixed film (including R packs)			
1.	24	0.07	1.68
2.	4	1.5	6.0
B. MIL-R-26 fixed power wire-wound	4	0.07	0.28
Capacitors			
A. MIL-C-26655 solid tantalum	4	0.058	0.232
B. MIL-C-11015 general purpose ceramic	10	0.02	0.2
Connectors	5	0.01	0.05
Relays	3	0.01	0.03
Switches	7	0.02	0.14
Integrated Circuits	20	0.4	8.0
Low Population Parts (Table VII-XXV, pp 7.12-3; 217A)			
Incandescent lamps	5	1.0	5.0
λ_{total}/initiating channel =			24.5

= 12.5 neglecting lamps and associated components

FBEVAS, CREFAS, CPIAS MODULE FAILURE RATE - ACTUATING CHANNEL

Component	Quantity	Failure Rate ($\times 10^{-6}$ hr)	Total Failure Rate (Failures/10^6 hr)
Semiconductors			
Diodes	8	0.1	0.8
Varistors	3	0.2	0.6
Resistors			
A. MIL-R-10509 fixed film (including R-packs)			
1.	9	0.07	0.63
2.	3	1.5	4.5
B. MIL-R-26 fixed power wire-wound	4	0.07	0.28
Capacitors			
A. MIL-C-26655 solid tantalum	2	0.058	0.116
B. MIL-C-11015 general purpose ceramic	4	0.02	0.08
Connectors	3	0.01	0.03
Relays	5	0.01	0.05
Switches	1	0.02	0.02
Integrated Circuits	13	0.4	5.2
Low Population Parts (Table VII-XXVI, pp. 7.12-3; 217A)	3	1.0	3.0
λ_{total} =			15.306

= 7.17 neglecting lamps and associated circuits

CRVIAS MODULE FAILURE RATE - INITIATING CHANNELS (2 EA)

Component	Quantity	Failure Rate ($\times 10^{-6}$ hr)	Total Failure Rate (Failures/10^6 hr)
Semiconductors			
Diodes	26	0.1	2.6
Varistors	8	0.2	1.6
Resistors			
A. MIL-R-10509 fixed film (including R-packs)			
1.	32	0.07	2.24
2.	8	1.5	12.0
B. MIL-R-26 fixed power wire-wound	8	0.07	0.56
Capacitors			
A. MIL-C-26655 solid tantalum	5	0.058	0.29
B. MIL-C-11015 general purpose ceramic	14	0.02	0.28
Connectors	6	0.01	0.06
Relays	4	0.01	0.04
Switches	10	0.02	0.2
Integrated Circuits	25	0.4	10
Low Population Parts (Table VII-XXVI, pp. 7.12-3; 217A)	8	1.0	8
			37.87

λ_{total} =

= 15.83 neglecting lamps and associated components and annunciator relay

CRVIAS MODULE FAILURE RATE - ACTUATING CHANNEL

Component	Quantity	Failure Rate ($\times 10^{-6}$ hr)	Total Failure Rate (Failures/10^6 hr)
Semiconductors			
Diodes	11	0.1	1.1
Varistors	4	0.2	0.8
Resistors			
A. MIL-R-10509 fixed film (including R-packs)			
1.	12	0.07	0.84
2.	4	1.5	6.0
B. MIL-R-26 fixed power wire-wound	4	0.07	0.28
Capacitors			
A. MIL-C-26655 solid tantalum	4	0.058	0.232
B. MIL-C-11015 general purpose ceramic	3	0.02	0.06
Connectors	4	0.01	0.04
Relays	4	0.01	0.04
Switches	1	0.02	0.02
Integrated Circuits	13	0.4	5.2
Low Population Parts (Table VII-XXVI, pp. 7.12-3; 217A)	4	1.0	4
λ_{total} =			18.612

= 7.812 neglected lamps and associated components and annunciator relays

DGSS MODULE FAILURE RATE

Component	Quantity	Failure Rate ($\times 10^{-6}$ hr)	Total Failure Rate (Failures/10^6 hr)
Semiconductors			
Diodes	29	0.1	2.9
Varistors	3	0.2	0.6
Resistors			
A. MIL-R-10509 fixed film (including R-packs)			
1. (RN60, C,D)	24	0.07	1.68
2. (Corning C5)	6	1.5	9.0
B. MIL-R-26 fixed power wire-wound	3	0.07	0.21
Capacitors			
A. MIL-C-26655 solid tantalum	5	0.058	0.29
B. MIL-C-11015 general purpose ceramic	12	0.02	0.24
Connectors	6	0.01	0.06
Relays	3	0.01	0.03
Switches	9	0.02	0.18
Integrated Circuits	21	0.4	8.4
Lamps Incandescent (Low population parts Table VII-XXVI, pp. 7.12-3, 217A)	10	1.0	10.0
λ_{total} =			33.57

= 11.57 neglecting lamps, annunciators, relays and associated components

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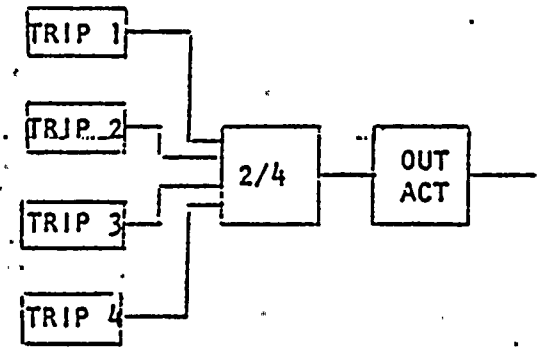
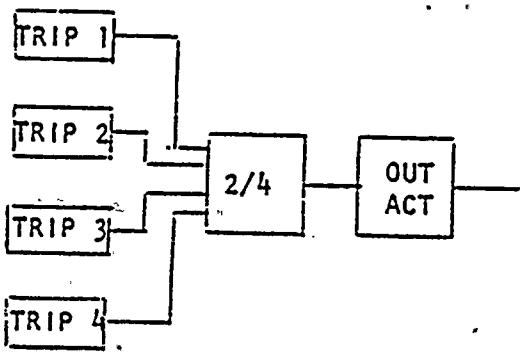


LOP/LS MODULE
FAILURE RATE FOR EACH TRIP SECTION

Component	Quantity	Failure Rate ($\times 10^{-6}$ hr)	Total Failure Rate (Failures/10^6 hr)
Semiconductors			
Diodes	2	0.1	0.2
Varistors	3	0.2	0.6
Resistors			
A. MIL-R-10509 fixed film	7	0.07	0.49
B. MIL-R-26 fixed power wire-wound	3	0.07	0.21
Capacitors			
A. MIL-C-26655 solid tantalum	2	0.058	0.116
B. MIL-C-11015 general purpose ceramic	4	0.02	0.08
Connectors	3	0.01	0.03
Relays	0		
Switches	2	0.02	0.04
Integrated Circuits	10	0.4	4.0
$\lambda_{\text{total/trip section}} = 5.766 \times 4 =$			23.064



LOP/LS MODULE
FAILURE RATE FOR 2/4 LOGIC AND OUTPUT ACTUATION
(Discounting lamps, annunciator outputs and associated components)

Component	Quantity	Failure Rate ($\times 10^{-6}$ hr)	Total Failure Rate (Failures/10^6 hr)
Semiconductors			
Diodes	0		
Varistors	0		
Resistors			
A. MIL-R-10509 fixed film	35	0.07	2.45
B. MIL-R-26 fixed power wire-wound	2	0.07	0.14
Capacitors			
A. MIL-C-26655 solid tantalum	2	0.058	0.116
B. MIL-C-11015 general purpose ceramic	8	0.02	0.16
Connectors	4	0.01	0.04
Relays	5	0.01	0.05
Switches	1	0.02	0.02
Integrated Circuits	22	0.4	8.8
λ_{total}/2x4 and Out Act =			11.776

ESF LOAD SEQUENCER/AUTO TEST MODULE FAILURE RATE

Component	Quantity	Failure Rate ($\times 10^{-6}$ hr)	Total Failure Rate (Failures/10^6 hr)
Semiconductors			
Diodes	19	0.01	0.19
Varistors	3	0.02	0.06
Resistors			
A. MIL-R-10509 fixed film			
1.	74	0.07	5.18
2.	39	1.5	50.5
B. MIL-R-26 fixed power wire-wound	6	0.07	0.42
Capacitors			
A. MIL-C-26655 solid tantalum	7	0.058	0.406
B. MIL-C-11015 general purpose ceramic	15	0.02	0.3
Connectors	13	0.01	0.13
Relays	21	0.01	0.21
Switches	24	0.02	0.48
Integrated Circuits	37	0.4	14.8
Lamps, Incandescent (Low Population Parts Table VII-XXVI, pp. 7.12-3; 217A)	39	1.0	39
λ_{total} =			119.7

= 20.7 neglecting lamps, annunciators, and associated components

APPENDIX B

SUPPLIER COMPONENT RELIABILITY CALCULATIONS

Pioneer Magnetics

July 19, 1978

Mr. Robert C. Weddle (SP251)
General Atomics Company
P. O. Box 81608
San Diego, California 92138

Subject: MTBF Calculations

Dear Mr. Weddle:

Pursuant to our conversations enclosed are MTBF calculations per MIL-HDBK-217A for the Model PM2497 power supply. The PM2722 is very similar in construction except that it has fewer components.

Very truly yours,

Arnold Hagiwara
Director of Administrative Operations

AH:mtt

Enclosure

cc: M. MacKrell

1745 Berkeley Street • Santa Monica, California 90404 • Telephone (213) 829-6751 • TWX 910-343-6249

September 25, 1974

MTBF Calculation for 6VDC, 100 Amp. Power Supply Model PM2497 2489

QTY.	COMP. TYPE	RATING	STRESS	λea	λtot.
43	RC20		-	.021	.903
.8	RN60C		-	.003	.024
3	Res. Var.	.25W	-	1.000	3.000
3	RC20		.52	.021	.063
2	RC30		.55	.021	.042
2	RC20		.60	.021	.042
1	RC30		-	.021	.021
2	Res. WW	10W	.25	.100	.200
1	Res. WW	20W	.80	.590	.590
1	Res. WW	5W	-	.067	.067
1	RC20		.38	.021	.021
2	Res. CC	2W	.54	.021	.042
1	Cap. Alum.	7.5 V	.80	.039	.039
1	Cap. Alum.	50 V	.70	.032	.032
1	Cap. Alum.	400 V	.80	.039	.039
4	Cap. Mica	500 V	-	.0003	.0012
2	Cap. Mylar	200 V	-	.002	.004
8	Cap. Mylar	100 V	-	.002	.016
2	Cap. Mylar	600 V	.54	.003	.006
2	Cap. Mylar	200 V	.90	.020	.040
1	Cap. Mylar	1600 V	.20	.002	.002
1	Cap. Mylar	400 V	-	.002	.002
1	Cap. Tant.	10 V	.50	.102	.102
1	Cap. Tant.	10 V	-	.018	.018
1	Cap. Tant.	50 V	.70	.039*	.039
1	Cap. Tant.	25 V	.50	.102	.102

* series impedance greater than 2 ohms

MTBF Calculation for 6VDC, 100 Amp. Power Supply Model PM2489

QTY.	COMP. TYPE	RATING	Tjn or TEMP.	λea	λtot.
8	NPN Sil.	> 1W	-	.200	1.600
1	SCR	> 1W	-	.200	.200
1	NPN Sil.	< 1W	.33	.432	.432
7	NPN Sil.	< 1W	-	.150	1.050
1	Triac	< 1W	-	.200	.200
1	SCR	< 1W	-	.200	.200
1	SCR	> 1W	.20	.390	.390
15	Diode Sil.	< 1W	-	.150	2.250
2	Diode Zener	< 1W	-	.300	.600
2	Diode Zener	< 1W	.17	.495	.990
24	Diode Sil.	> 1W	-	.100	2.400
3	I.C.		-	.400	1.200
2	Transf.	A	50° C	.350	.700
2	Transf.	A	60° C	.350	.700
2	Transf.	B	70° C	.350	.700
1	Transf.	B	90° C	.350	.350
1	Transf.	B	95° C	.350	.350
1	Fan		50° C	1.850	1.850
2	Therm. Sw.			.200	.200
1	Fuse			.100	.100
2	PNP Sil.	< 1W	-	.300	.600
			λTOTAL		22.5192
			MTBF		44,406 hrs.

PIONEER MAGNETICS, INC.
1745 Berkeley
Santa Monica, California 90404

September 25, 1974

MTBF Calculation for 17 VDC, 45 Amp. Power Supply Model PM2490

QTY.	COMP. TYPE	RATING	STRESS	λea	λtot.
43	RC20		-	.021	.903
8	RN60C		-	.003	.024
3	Res. Var.	.25W	-	1.000	3.000
4	RC20		.52	.021	.084
2	RC30		.55	.021	.042
1	RC20		.60	.021	.021
1	RC30		-	.021	.021
2	Res. WW	10W	.25	.100	.200
1	Res. WW	20W	.80	.590	.590
1	Res. WW	5W	-	.067	.067
1	RC20		.38	.021	.021
2	Res. CC	2W	.54	.021	.042
1	Cap. Alum.	25 V	.70	.032	.032
1	Cap. Alum.	50 V	.70	.032	.032
1	Cap. Alum	400 V	.80	.039	.039
4	Cap. Mica	500 V	-	.0003	.0012
2	Cap. Mylar	200 V	-	.002	.004
8	Cap. Mylar	100 V	-	.002	.016
2	Cap. Mylar	600 V	.54	.003	.006
2	Cap. Mylar	200 V	.90	.020	.040
1	Cap. Mylar	1600 V	.20	.002	.002
1	Cap. Mylar	400 V	-	.002	.002
1	Cap. Tant.	10 V	.50	.102	.102
1	Cap. Tant.	10 V	-	.018	.018
1	Cap. Tant.	50 V	.70	.039*	.039
1	Cap. Tant.	25 V	.50	.102	.102

* series impedance greater than 2 ohms

MTBF Calculation for 17VDC, 45 Amp. Power Supply Model PM2490

QTY.	COMP. TYPE	RATING	Tjn or TEMP.	λea	λtot.
8	NPN Sil.	> 1W	-	.200	1.600
1	SCR	> 1W	-	.200	.200
1	NPN Sil.	< 1W	.33	.432	.432
7	NPN Sil.	< 1W	-	.150	1.050
2	PNP Sil.	< 1W	-	.300	.600
1	Triac	< 1W	-	.200	.200
1	SCR	< 1W	-	.200	.200
1	SCR	> 1W	.20	.390	.390
15	Diode Sil.	< 1W	-	.150	2.250
2	Diode Zener	< 1W	-	.300	.600
2	Diode Zener	< 1W	.17	.495	.990
22	Diode Sil.	> 1W	-	.100	2.200
3	I.C.		-	.400	1.200
2	Transf.	A	50° C	.350	.700
2	Transf.	A	60° C	.350	.700
2	Transf.	B	70° C	.350	.700
1	Transf.	B	90° C	.350	.350
1	Transf.	B	95° C	.350	.350
1	Fan		50° C	1.850	1.850
2	Therm. Sw.			.200	.200
1	Fuse			.100	.100
			λTOTAL		22.3122
			MTBF		44,819 hrs.

PIONEER MAGNETICS, INC.
1745 Berkeley
Santa Monica, California 90404

Basis For Reliability Analysis

The reliability analyses were performed in accordance with the following guidelines:

a. The stress ratio vs. failure rate data is per MIL-HDBK-217A.

b. Ground K factors were used throughout.

c. All stress ratios and normalized junction temperatures were calculated for a 25° C ambient.

d. When the manufacturer of a semiconductor did not state the temperature at which derating was to begin, 25° C was assumed.

e. For SCR and Triac devices, the failure rates for NPN silicon transistors were used.

f. For devices which operate only in a fault mode, e.g., the OVP SCR, the normal operating stresses and normalized junction temperatures were used.

g. A dash in the stress or normalized junction temperature column indicates a value of less than 0.1.

PIONEER MAGNETICS, INC.
1745 Berkeley
Santa Monica, California 90404

APPENDIX C
COMPUTER CALCULATIONS

APPENDIX C
COMPUTER CALCULATIONS

APPENDIX C

COMPUTER RELIABILITY COMPUTATION

FOR

PALO VERDE NUCLEAR GENERATING STATION
BALANCE OF PLANT ENGINEERED SAFETY
FEATURES ACTUATION SYSTEM

BECHTEL JOB 10407
PURCHASE ORDER 10407-13-JM-104

SEPTEMBER 22, 1978

PROJECT NO. 2192

GENERAL ATOMIC COMPANY
ELECTRONIC SYSTEMS DIVISION
P O BOX 81608
SAN DIEGO, CALIFORNIA 92138

MISSION TIME:0

COMPONENT RELIABILITY DATA TABLE

SUBSYSTEM COMPONENT	FAILURE RATE PER MILLION HRS	RELIABILITY FOR 0 HRS
INITIATING CHANNEL FOR FBEVAS, CREFAS, CPIAS	12.5	1
ACTUATING CHANNEL & RELAYS FOR FBEVAS, CREVAS, CPIAS	7.17	1
AC POWER SOURCE	40	1
DC POWER SOURCE	4	1
AC TO DC POWER SUPPLY	25	1
DC TO DC POWER SUPPLY	25	1
INITIATING CHANNEL FOR CREVIAS	15.8	1
ACTUATING CHANNEL FOR CREVIAS	7.87	1
LOP/LS MODULE		
A. TRIP SECTION	5.77	1
B. 2/4 AND OUTPUT	11.8	1
DGSS	11.6	1
ESF LOAD SEQUENCER	20.7	1

RELIABILITY BY SUBSYSTEM

SUBSYSTEM	RELIABILITY
POWER SUPPLY	1
FBEVAS	1
CREFAS	1
CPIAS	1
CREVIAS(SMCROA)	1
CREVIAS(HGCROA)	1
DGSS	1
LOSS OF POWER	1
LOAD SEQUENCER	1

TOTAL SYSTEM RELIABILITY FOR 0 HOUR MISSION TIME: 1

MISSION TIME:48

COMPONENT RELIABILITY DATA TABLE

SUBSYSTEM COMPONENT	FAILURE RATE PER MILLION HRS	RELIABILITY FOR 48 HRS
INITIATING CHANNEL FOR FBEVAS, CREFAS, CPIAS	12.5	.9994
ACTUATING CHANNEL & RELAYS FOR FBEVAS, CREVAS, CPIAS	7.17	.999656
AC POWER SOURCE	40	.998082
DC POWER SOURCE	4	.999808
AC TO DC POWER SUPPLY	25	.998801
DC TO DC POWER SUPPLY	25	.998801
INITIATING CHANNEL FOR CREVIAS	15.8	.999242
ACTUATING CHANNEL FOR CREVIAS	7.87	.999622
P/LS MODULE		
A. TRIP SECTION	5.77	.999723
B. 2/4 AND OUTPUT	11.8	.999434
DGSS	11.6	.999443
ESF LOAD SEQUENCER	20.7	.999007

RELIABILITY BY SUBSYSTEM

SUBSYSTEM	RELIABILITY
POWER SUPPLY	.999996
FBEVAS	.999999
CREFAS	.999999
CPIAS	.999999
CREVIAS(SMCROA)	.999999
CREVIAS(HGCROA)	.999999
DGSS	1
LOSS OF POWER	1
LOAD SEQUENCER	.999999

TAL SYSTEM RELIABILITY FOR 48 HOUR MISSION TIME: .999999

MISSION TIME:96

COMPONENT RELIABILITY DATA TABLE

SUBSYSTEM COMPONENT	FAILURE RATE PER MILLION HRS.	RELIABILITY FOR 96 HRS
INITIATING CHANNEL FOR FBEVAS, CREFAS, CPIAS	12.5	.998801
ACTUATING CHANNEL & RELAYS FOR FBEVAS, CREVAS, CPIAS	7.17	.999312
AC POWER SOURCE	40	.996167
DC POWER SOURCE	4	.999616
AC TO DC POWER SUPPLY	25	.997603
DC TO DC POWER SUPPLY	25	.997603
INITIATING CHANNEL FOR CREVIAS	15.8	.998484
ACTUATING CHANNEL FOR CREVIAS	7.87	.999245
LOP/LS MODULE		
A. TRIP SECTION	3.77	.999446
B. 2/4 AND OUTPUT	11.8	.998868
DGSS	11.6	.998887
ESF LOAD SEQUENCER	20.7	.998015

RELIABILITY BY SUBSYSTEM

SUBSYSTEM	RELIABILITY
POWER SUPPLY	.999983
FBEVAS	.999997
CREFAS	.999997
CPIAS	.999998
CREVIAS(SMCROA)	.999997
CREVIAS(HGCROA)	.999997
DGSS	.999999
LOSS OF POWER	.999999
LOAD SEQUENCER	.999996

TOTAL SYSTEM RELIABILITY FOR 96 HOUR MISSION TIME: .999997

MISSION TIME:144

COMPONENT RELIABILITY DATA TABLE

--SUBSYSTEM COMPONENT	FAILURE RATE PER MILLION HRS	RELIABILITY FOR 144 HRS
INITIATING CHANNEL FOR FBEVAS, CREFAS, CPIAS	12.5	.998201
ACTUATING CHANNEL & RELAYS FOR FBEVAS, CREVAS, CPIAS	7.17	.998968
AC POWER SOURCE	40	.994257
DC POWER SOURCE	4	.999424
AC TO DC POWER SUPPLY	25	.996406
DC TO DC POWER SUPPLY	25	.996406
INITIATING CHANNEL FOR CREVIAS	15.8	.997727
ACTUATING CHANNEL FOR CREVIAS	7.87	.998867
SP/LS MODULE		
A. TRIP SECTION	5.77	.999169
B. 2/4 AND OUTPUT	11.8	.998302
DGSS	11.6	.998331
ESF LOAD SEQUENCER	20.7	.997023

RELIABILITY BY SUBSYSTEM

SUBSYSTEM	RELIABILITY
POWER SUPPLY	.999961
FBEVAS	.999994
CREFAS	.999994
CPIAS	.999995
CREVIAS(SMCROA)	.999993
CREVIAS(HGCROA)	.999993
DGSS	.999997
LOSS OF POWER	.999997
LOAD SEQUENCER	.999991

TAL SYSTEM RELIABILITY FOR 144 HOUR MISSION TIME: .999995

MISSION TIME:192

COMPONENT RELIABILITY DATA TABLE

SUBSYSTEM COMPONENT	FAILURE RATE PER MILLION HRS	RELIABILITY FOR 192 HRS
INITIATING CHANNEL FOR FBEVAS, CREFAS, CPIAS	12.5	.997603
ACTUATING CHANNEL & RELAYS FOR FBEVAS, CREVAS, CPIAS	7.17	.998624
AC POWER SOURCE	40	.992349
DC POWER SOURCE	4	.999232
AC TO DC POWER SUPPLY	25	.995211
DC TO DC POWER SUPPLY	25	.995211
INITIATING CHANNEL FOR CREVIAS	15.8	.996971
ACTUATING CHANNEL FOR CREVIAS	7.87	.99849
LOP/LS MODULE		
A. TRIP SECTION	5.77	.998893
B. 2/4 AND OUTPUT	11.8	.997737
DGSS	11.6	.997775
ESF LOAD SEQUENCER	20.7	.996033

RELIABILITY BY SUBSYSTEM

SUBSYSTEM	RELIABILITY
POWER SUPPLY	.999931
FBEVAS	.99999
CREFAS	.99999
CPIAS	.999992
CREVIAS(SMCROA)	.999988
CREVIAS(HGCROA)	.999988
DGSS	.999995
LOSS OF POWER	.999995
LOAD SEQUENCER	.999984

TOTAL SYSTEM RELIABILITY FOR 192 HOUR MISSION TIME: .99999

MISSION TIME:240

COMPONENT RELIABILITY DATA TABLE

SUBSYSTEM COMPONENT	FAILURE RATE PER MILLION HRS	RELIABILITY FOR 240 HRS
INITIATING CHANNEL FOR FBEVAS, CREFAS, CPIAS	12.5	.997004
ACTUATING CHANNEL & RELAYS FOR FBEVAS, CREVAS, CPIAS	7.17	.998281
AC POWER SOURCE	40	.990446
DC POWER SOURCE	4	.99904
AC TO DC POWER SUPPLY	25	.994018
DC TO DC POWER SUPPLY	25	.994018
INITIATING CHANNEL FOR CREVIAS	15.8	.996215
ACTUATING CHANNEL FOR CREVIAS	7.87	.998113
P/LS MODULE		
A. TRIP SECTION	5.77	.998616
B. 2/4 AND OUTPUT	11.8	.997172
DGSS	11.6	.99722
ESF LOAD SEQUENCER	20.7	.995044

RELIABILITY BY SUBSYSTEM

SUBSYSTEM	RELIABILITY
POWER SUPPLY	.999893
FBEVAS	.999984
CREFAS	.999984
CPIAS	.999987
CREVIAS(SMCROA)	.999981
CREVIAS(HGCROA)	.999981
DGSS	.999992
LOSS OF POWER	.999991
LOAD SEQUENCER	.999974

TAL SYSTEM RELIABILITY FOR 240 HOUR MISSION TIME: .999984

MISSION TIME;288

COMPONENT RELIABILITY DATA TABLE

SUBSYSTEM COMPONENT	FAILURE RATE PER MILLION HRS	RELIABILITY FOR 288 HRS
INITIATING CHANNEL FOR FBEVAS, CREFAS, CPIAS	12.5	.996406
ACTUATING CHANNEL & RELAYS FOR FBEVAS, CREVAS, CPIAS	7.17	.997937
AC POWER SOURCE	40	.988546
DC POWER SOURCE	4	.998849
AC TO DC POWER SUPPLY	25	.992826
DC TO DC POWER SUPPLY	25	.992826
INITIATING CHANNEL FOR CREVIAS	15.8	.99546
ACTUATING CHANNEL FOR CREVIAS	7.87	.997736
LOP/LS MODULE		
A. TRIP SECTION	5.77	.99834
B. 2/4 AND OUTPUT	11.8	.996607
DGSS	11.6	.996665
ESF LOAD SEQUENCER	20.7	.994056

RELIABILITY BY SUBSYSTEM

SUBSYSTEM	RELIABILITY
POWER SUPPLY	.999846
FBEVAS	.999977
CREFAS	.999977
CPIAS	.999981
CREVIAS(SMCROA)	.999972
CREVIAS(HGCROA)	.999972
DGSS	.999988
LOSS OF POWER	.999987
LOAD SEQUENCER	.999963

TOTAL SYSTEM RELIABILITY FOR 288 HOUR MISSION TIME: .999977

MISSION TIME:336

COMPONENT RELIABILITY DATA TABLE

SUBSYSTEM COMPONENT	FAILURE RATE PER MILLION HRS	RELIABILITY FOR 336 HRS
INITIATING CHANNEL FOR FBEVAS, CREFAS, CPIAS	12.5	.995809
ACTUATING CHANNEL & RELAYS FOR FBEVAS, CREVAS, CPIAS	7.17	.997594
AC POWER SOURCE	40	.98665
DC POWER SOURCE	4	.998657
AC TO DC POWER SUPPLY	25	.991635
DC TO DC POWER SUPPLY	25	.991635
INITIATING CHANNEL FOR CREVIAS	15.8	.994705
ACTUATING CHANNEL FOR CREVIAS	7.87	.997359
P/LS MODULE		
A. TRIP SECTION	5.77	.998063
B. 2/4 AND OUTPUT	11.8	.996043
DGSS	11.6	.99611
ESF LOAD SEQUENCER	20.7	.993069

RELIABILITY BY SUBSYSTEM

SUBSYSTEM	RELIABILITY
POWER SUPPLY	.999791
FBEVAS	.999968
CREFAS	.999968
CPIAS	.999974
CREVIAS(SMCROA)	.999962
CREVIAS(HGCROA)	.999962
DGSS	.999984
LOSS OF POWER	.999983
LOAD SEQUENCER	.999949

TAL SYSTEM RELIABILITY FOR 336 HOUR MISSION TIME: .999969

MISSION TIME:384

COMPONENT RELIABILITY DATA TABLE

SUBSYSTEM COMPONENT	FAILURE RATE PER MILLION HRS	RELIABILITY FOR 384 HRS
INITIATING CHANNEL FOR FBEVAS, CREFAS, CPIAS	12.5	.995211
ACTUATING CHANNEL & RELAYS FOR FBEVAS, CREVAS, CPIAS	7.17	.99725
AC POWER SOURCE	40	.984757
DC POWER SOURCE	4	.998465
AC TO DC POWER SUPPLY	25	.990446
DC TO DC POWER SUPPLY	25	.990446
INITIATING CHANNEL FOR CREVIAS	15.8	.993951
ACTUATING CHANNEL FOR CREVIAS	7.87	.996982
LOP/LS MODULE		
A. TRIP SECTION	5.77	.997787
B. 2/4 AND OUTPUT	11.8	.995479
DGSS	11.6	.995556
ESF LOAD SEQUENCER	20.7	.992083

RELIABILITY BY SUBSYSTEM

SUBSYSTEM	RELIABILITY
POWER SUPPLY	.999727
FBEVAS	.999958
CREFAS	.999958
CPIAS	.999965
CREVIAS(SMCROA)	.999949
CREVIAS(HGCROA)	.999949
DGSS	.999979
LOSS OF POWER	.999977
LOAD SEQUENCER	.999933

TOTAL SYSTEM RELIABILITY FOR 384 HOUR MISSION TIME: .999959

MISSION TIME:432

COMPONENT RELIABILITY DATA TABLE

SUBSYSTEM COMPONENT	FAILURE RATE PER MILLION HRS	RELIABILITY FOR 432 HRS
INITIATING CHANNEL FOR FBEVAS, CREFAS, CPIAS	12.5	.994614
ACTUATING CHANNEL & RELAYS FOR FBEVAS, CREVAS, CPIAS	7.17	.996907
AC POWER SOURCE	40	.982868
DC POWER SOURCE	4	.998273
AC TO DC POWER SUPPLY	25	.989258
DC TO DC POWER SUPPLY	25	.989258
INITIATING CHANNEL FOR CREVIAS	15.8	.993198
ACTUATING CHANNEL FOR CREVIAS	7.87	.996606
P/LS MODULE		
A. TRIP SECTION	5.77	.99751
B. 2/4 AND OUTPUT	11.8	.994915
DGSS	11.6	.995001
ESF LOAD SEQUENCER	20.7	.991097

RELIABILITY BY SUBSYSTEM

SUBSYSTEM	RELIABILITY
POWER SUPPLY	.999655
FBEVAS	.999946
CREFAS	.999946
CPIAS	.999956
CREVIAS(SMCROA)	.999935
CREVIAS(HGCROA)	.999935
DGSS	.999973
LOSS OF POWER	.999971
LOAD SEQUENCER	.999914

TAL SYSTEM RELIABILITY FOR 432 HOUR MISSION TIME: .999947

MISSION TIME:480

COMPONENT RELIABILITY DATA TABLE

SUBSYSTEM COMPONENT	FAILURE RATE PER MILLION HRS	RELIABILITY FOR 480 HRS
INITIATING CHANNEL FOR FBEVAS, CREFAS, CPIAS	12.5	.994018
ACTUATING CHANNEL & RELAYS FOR FBEVAS, CREVAS, CPIAS	7.17	.996564
AC POWER SOURCE	40	.980983
DC POWER SOURCE	4	.998082
AC TO DC POWER SUPPLY	25	.988072
DC TO DC POWER SUPPLY	25	.988072
INITIATING CHANNEL FOR CREVIAS	15.8	.992445
ACTUATING CHANNEL FOR CREVIAS	7.87	.996229
LOP/LS MODULE		
A. TRIP SECTION	5.77	.997234
B. 2/4 AND OUTPUT	11.8	.994352
DGSS	11.6	.994447
ESF LOAD SEQUENCER	20.7	.990113

RELIABILITY BY SUBSYSTEM

SUBSYSTEM	RELIABILITY
POWER SUPPLY	.999575
FBEVAS	.999933
CREFAS	.999933
CPIAS	.999944
CREVIAS(SMCROA)	.999919
CREVIAS(HGCROA)	.999919
DGSS	.999967
LOSS OF POWER	.999963
LOAD SEQUENCER	.999893

TOTAL SYSTEM RELIABILITY FOR 480 HOUR MISSION TIME: .999934

MISSION TIME:528

COMPONENT RELIABILITY DATA TABLE

SUBSYSTEM COMPONENT	FAILURE RATE PER MILLION HRS	RELIABILITY FOR 528 HRS
INITIATING CHANNEL FOR FBEVAS, CREFAS, CPIAS	12.5	.993422
ACTUATING CHANNEL & RELAYS FOR FBEVAS, CREVAS, CPIAS	7.17	.996221
AC POWER SOURCE	40	.979101
DC POWER SOURCE	4	.99789
AC TO DC POWER SUPPLY	25	.986887
DC TO DC POWER SUPPLY	25	.986887
INITIATING CHANNEL FOR CREVIAS	15.8	.991692
ACTUATING CHANNEL FOR CREVIAS	7.87	.995853
P/LS MODULE		
A. TRIP SECTION	5.77	.996958
B. 2/4 AND OUTPUT	11.8	.993789
DGSS	11.6	.993894
ESF LOAD SEQUENCER	20.7	.98913

RELIABILITY BY SUBSYSTEM

SUBSYSTEM	RELIABILITY
POWER SUPPLY	.999487
FBEVAS	.999917
CREFAS	.999917
CPIAS	.999932
CREVIAS(SMCROA)	.999901
CREVIAS(HGCROA)	.999901
DGSS	.999959
LOSS OF POWER	.999955
LOAD SEQUENCER	.99987

TOTAL SYSTEM RELIABILITY FOR 528 HOUR MISSION TIME: .999919

MISSION TIME:576

COMPONENT RELIABILITY DATA TABLE

SUBSYSTEM COMPONENT	FAILURE RATE PER MILLION HRS	RELIABILITY FOR 576 HRS
INITIATING CHANNEL FOR FBEVAS, CREFAS, CPIAS	12.5	.992826
ACTUATING CHANNEL & RELAYS FOR FBEVAS, CREVAS, CPIAS	7.17	.995879
AC POWER SOURCE	40	.977223
DC POWER SOURCE	4	.997699
AC TO DC POWER SUPPLY	25	.985703
DC TO DC POWER SUPPLY	25	.985703
INITIATING CHANNEL FOR CREVIAS	15.8	.99094
ACTUATING CHANNEL FOR CREVIAS	7.87	.995477
LOP/LS MODULE		
A. TRIP SECTION	5.77	.996682
B. 2/4 AND OUTPUT	11.8	.993226
DGSS	11.6	.993341
ESF LOAD SEQUENCER	20.7	.988148

RELIABILITY BY SUBSYSTEM

SUBSYSTEM	RELIABILITY
POWER SUPPLY	.999391
FBEVAS	.999901
CREFAS	.999901
CPIAS	.999918
CREVIAS(SMCROA)	.999881
CREVIAS(HGCROA)	.999881
DGSS	.999951
LOSS OF POWER	.999946
LOAD SEQUENCER	.999843

TOTAL SYSTEM RELIABILITY FOR 576 HOUR MISSION TIME: .999903

MISSION TIME:624

COMPONENT RELIABILITY DATA TABLE

SUBSYSTEM COMPONENT	FAILURE RATE PER MILLION HRS	RELIABILITY FOR 624 HRS
INITIATING CHANNEL FOR FBEVAS, CREFAS, CPIAS	12.5	.99223
ACTUATING CHANNEL & RELAYS FOR FBEVAS, CREVAS, CPIAS	7.17	.995536
AC POWER SOURCE	40	.975349
DC POWER SOURCE	4	.997507
AC TO DC POWER SUPPLY	25	.984521
DC TO DC POWER SUPPLY	25	.984521
INITIATING CHANNEL FOR CREVIAS	15.8	.990189
ACTUATING CHANNEL FOR CREVIAS	7.87	.995101
P/LS MODULE		
A. TRIP SECTION	5.77	.996406
B. 2/4 AND OUTPUT	11.8	.992664
DGSS	11.6	.992788
ESF LOAD SEQUENCER	20.7	.987166

RELIABILITY BY SUBSYSTEM

SUBSYSTEM	RELIABILITY
POWER SUPPLY	.999287
FBEVAS	.999882
CREFAS	.999882
CPIAS	.999902
CREVIAS(SMCROA)	.999858
CREVIAS(HGCROA)	.999858
DGSS	.999942
LOSS OF POWER	.999935
LOAD SEQUENCER	.999815

TAL SYSTEM RELIABILITY FOR 624 HOUR MISSION TIME: .999884

MISSION TIME:672

COMPONENT RELIABILITY DATA TABLE

SUBSYSTEM COMPONENT	FAILURE RATE PER MILLION HRS	RELIABILITY FOR 672 HRS
INITIATING CHANNEL FOR FBEVAS, CREFAS, CPIAS	12.5	.991635
ACTUATING CHANNEL & RELAYS FOR FBEVAS, CREVAS, CPIAS	7.17	.995193
AC POWER SOURCE	40	.973478
DC POWER SOURCE	4	.997315
AC TO DC POWER SUPPLY	25	.98334
DC TO DC POWER SUPPLY	25	.98334
INITIATING CHANNEL FOR CREVIAS	15.8	.989438
ACTUATING CHANNEL FOR CREVIAS	7.87	.994725
LOP/LS MODULE		
A. TRIP SECTION	5.77	.99613
B. 2/4 AND OUTPUT	11.8	.992102
DGSS	11.6	.992235
ESF LOAD SEQUENCER	20.7	.986186

RELIABILITY BY SUBSYSTEM

SUBSYSTEM	RELIABILITY
POWER SUPPLY	.999175
FBEVAS	.999862
CREFAS	.999862
CPIAS	.999885
CREVIAS(SMCROA)	.999834
CREVIAS(HGCROA)	.999834
DGSS	.999933
LOSS OF POWER	.999924
LOAD SEQUENCER	.999784.

TOTAL SYSTEM RELIABILITY FOR 672 HOUR MISSION TIME: .999865

MISSION TIME:720

COMPONENT RELIABILITY DATA TABLE

SUBSYSTEM COMPONENT	FAILURE RATE PER MILLION HRS	RELIABILITY FOR 720 HRS
INITIATING CHANNEL FOR FBEVAS, CREFAS, CPIAS	12.5	.99104
ACTUATING CHANNEL & RELAYS FOR FBEVAS, CREVAS, CPIAS	7.17	.994851
AC POWER SOURCE	40	.971611
DC POWER SOURCE	4	.997124
AC TO DC POWER SUPPLY	25	.982161
DC TO DC POWER SUPPLY	25	.982161
INITIATING CHANNEL FOR CREVIAS	15.8	.988688
ACTUATING CHANNEL FOR CREVIAS	7.87	.99435
P/LS MODULE		
A. TRIP SECTION	5.77	.995854
B. 2/4 AND OUTPUT	11.8	.99154
DGSS	11.6	.991683
ESF LOAD SEQUENCER	20.7	.985206

RELIABILITY BY SUBSYSTEM

SUBSYSTEM	RELIABILITY
POWER SUPPLY	.999055
FBEVAS	.999839
CREFAS	.999839
CPIAS	.999866
CREVIAS(SMCROA)	.999808
CREVIAS(HGCROA)	.999808
DGSS	.999922
LOSS OF POWER	.999912
LOAD SEQUENCER	.99975

TAL SYSTEM RELIABILITY FOR 720 HOUR MISSION TIME: .999843

MISSION TIME:768

COMPONENT RELIABILITY DATA TABLE

SUBSYSTEM COMPONENT	FAILURE RATE PER MILLION HRS	RELIABILITY FOR 768 HRS
INITIATING CHANNEL FOR FBEVAS, CREFAS, CPIAS	12.5	.990446
ACTUATING CHANNEL & RELAYS FOR FBEVAS, CREVAS, CPIAS	7.17	.994509
AC POWER SOURCE	40	.969747
DC POWER SOURCE	4	.996933
AC TO DC POWER SUPPLY	25	.980983
DC TO DC POWER SUPPLY	25	.980983
INITIATING CHANNEL FOR CREVIAS	15.8	.987939
ACTUATING CHANNEL FOR CREVIAS	7.87	.993974
LOP/LS MODULE		
A. TRIP SECTION	5.77	.995578
B. 2/4 AND OUTPUT	11.8	.990979
DGSS	11.6	.991131
ESF LOAD SEQUENCER	20.7	.984228

RELIABILITY BY SUBSYSTEM

SUBSYSTEM	RELIABILITY
POWER SUPPLY	.998927
FBEVAS	.999815
CREFAS	.999815
CPIAS	.999845
CREVIAS(SMCROA)	.999779
CREVIAS(HGCROA)	.999779
DGSS	.999911
LOSS OF POWER	.999898
LOAD SEQUENCER	.999713

TOTAL SYSTEM RELIABILITY FOR 768 HOUR MISSION TIME: .99982

MISSION TIME:816

COMPONENT RELIABILITY DATA TABLE

SUBSYSTEM COMPONENT	FAILURE RATE PER MILLION HRS	RELIABILITY FOR 816 HRS
INITIATING CHANNEL FOR FBEVAS, CREFAS, CPIAS	12.5	.989852
ACTUATING CHANNEL & RELAYS FOR FBEVAS, CREVAS, CPIAS	7.17	.994166
AC POWER SOURCE	40	.967887
DC POWER SOURCE	4	.996741
AC TO DC POWER SUPPLY	25	.979807
DC TO DC POWER SUPPLY	25	.979807
INITIATING CHANNEL FOR CREVIAS	15.8	.98719
ACTUATING CHANNEL FOR CREVIAS	7.87	.993599
UP/LS MODULE		
A. TRIP SECTION	5.77	.995303
B. 2/4 AND OUTPUT	11.8	.990417
DGSS	11.6	.990579
ESF LOAD SEQUENCER	20.7	.983251

RELIABILITY BY SUBSYSTEM

SUBSYSTEM	RELIABILITY
POWER SUPPLY	.998792
FBEVAS	.999789
CREFAS	.999789
CPIAS	.999823
CREVIAS(SMCROA)	.999748
CREVIAS(HGCROA)	.999748
DGSS	.999899
LOSS OF POWER	.999884
LOAD SEQUENCER	.999674

TAL SYSTEM RELIABILITY FOR 816 HOUR MISSION TIME: .999794

MISSION TIME:864

COMPONENT RELIABILITY DATA TABLE

SUBSYSTEM COMPONENT	FAILURE RATE PER MILLION HRS	RELIABILITY FOR 864 HRS
INITIATING CHANNEL FOR FBEVAS, CREFAS, CPIAS	12.5	.989258
ACTUATING CHANNEL & RELAYS FOR FBEVAS, CREVAS, CPIAS	7.17	.993824
AC POWER SOURCE	40	.96603
DC POWER SOURCE	4	.99655
AC TO DC POWER SUPPLY	25	.978632
DC TO DC POWER SUPPLY	25	.978632
INITIATING CHANNEL FOR CREVIAS	15.8	.986441
ACTUATING CHANNEL FOR CREVIAS	7.87	.993223
LOP/LS MODULE		
A. TRIP SECTION	5.77	.995027
B. 2/4 AND OUTPUT	11.8	.989857
DGSS	11.6	.990028
ESF LOAD SEQUENCER	20.7	.982274

RELIABILITY BY SUBSYSTEM

SUBSYSTEM	RELIABILITY
POWER SUPPLY	.998649
FBEVAS	.999761
CREFAS	.999761
CPIAS	.9998
CREVIAS(SMCROA)	.999714
CREVIAS(HGCROA)	.999714
DGSS	.999885
LOSS OF POWER	.999868
LOAD SEQUENCER	.999632

TOTAL SYSTEM RELIABILITY FOR 864 HOUR MISSION TIME: .999767

MISSION TIME:912

COMPONENT RELIABILITY DATA TABLE

SUBSYSTEM COMPONENT	FAILURE RATE PER MILLION HRS	RELIABILITY FOR 912 HRS
INITIATING CHANNEL FOR FBEVAS, CREFAS, CPIAS	12.5	.988665
ACTUATING CHANNEL & RELAYS FOR FBEVAS, CREVAS, CPIAS	7.17	.993482
AC POWER SOURCE	40	.964177
DC POWER SOURCE	4	.996359
AC TO DC POWER SUPPLY	25	.977458
DC TO DC POWER SUPPLY	25	.977458
INITIATING CHANNEL FOR CREVIAS	15.8	.985694
ACTUATING CHANNEL FOR CREVIAS	7.87	.992848
LOP/LS MODULE		
A. TRIP SECTION	5.77	.994752
B. 2/4 AND OUTPUT	11.8	.989296
DGSS	11.6	.989477
ESF LOAD SEQUENCER	20.7	.981299

RELIABILITY BY SUBSYSTEM

SUBSYSTEM	RELIABILITY
POWER SUPPLY	.998498
FBEVAS	.999731
CREFAS	.999731
CPIAS	.999774
CREVIAS(SMCROA)	.999679
CREVIAS(HGCROA)	.999679
DGSS	.999871
LOSS OF POWER	.999851
LOAD SEQUENCER	.999587

TOTAL SYSTEM RELIABILITY FOR 912 HOUR MISSION TIME: .999738

MISSION TIME:960

COMPONENT RELIABILITY DATA TABLE

SUBSYSTEM COMPONENT	FAILURE RATE PER MILLION HRS.	RELIABILITY FOR 960 HRS
INITIATING CHANNEL FOR FBEVAS, CREFAS, CPIAS	12.5	.988072
ACTUATING CHANNEL & RELAYS FOR FBEVAS, CREVAS; CPIAS	7.17	.99314
AC POWER SOURCE	40	.962328
DC POWER SOURCE	4	.996167
AC TO DC POWER SUPPLY	25	.976286
DC TO DC POWER SUPPLY	25	.976286
INITIATING CHANNEL FOR CREVIAS	15.8	.984947
ACTUATING CHANNEL FOR CREVIAS	7.87	.992473
LOP/LS MODULE		
A. TRIP SECTION	5.77	.994476
B. 2/4 AND OUTPUT	11.8	.988736
DGSS	11.6	.988926
ESF LOAD SEQUENCER	20.7	.980324

RELIABILITY BY SUBSYSTEM

SUBSYSTEM	RELIABILITY
POWER SUPPLY	.998339
FBEVAS	.999699
CREFAS	.999699
CPIAS	.999746
CREVIAS(SMCROA)	.99964
CREVIAS(HGCROA)	.99964
DGSS	.999856
LOSS OF POWER	.999833
LOAD SEQUENCER	.999539

TOTAL SYSTEM RELIABILITY FOR 960 HOUR MISSION TIME: .999707

APPENDIX D

COMPUTER RELIABILITY COMPUTATION PROGRAM

```
BASIC B:ESFAS
BASIC-E COMPILER  VER 2.1
   1: REM                    FILE NAME:  ESFAS.BAS
   2: REM                                ---------
   3:
   4:
   5: REM                    RELIABILTY CALCULATIONS
   6:
   7: ------
   8:
   9: REM                          FOR
  10:
  11:
  12:
  13: REM              PALO VERDE NUCLEAR GENERATING STATION
  14: REM              BALANCE OF PLANT ENGINEERED SAFETY
  15: REM              FEATURES ACTUATION SYSTEM
  16:
  17:
  18: REM              BECHTEL JOB 10407
  19: REM              PURCHASE ORDER 10407-13-JM-104
  20:
  21:
  22:
  23: REM              PROJECT NO. 2192
  24:
  25: REM              GENERAL ATOMIC COMPANY
  26: REM              ELECTRONIC SYSTEMS DIVISION
  27: REM              P O BOX 81608
  28: REM              SAN DIEGO, CALIFORNIA 92138
  29:
  30:
  31:
  32: REM              SEE GENERAL ATOMIC REPORT E-115-751
  33: REM              FOR A DESCRIPTION OF THE RELIABILITY
  34: REM              ANALYSIS AND AN EXPLANATION OF THE
  35: REM              SYMBOLS USED IN THIS COMPUTER PROGRAM.
  36:
  37: REM              THIS PROGRAM CALCULATES AND PRINTS
  38: REM              THE RELIABILITY (THE PROBABILITY OF
  39: REM              SUCCESSFUL OPERATION) OF THE ENGINEERED
  40: REM              SAFETY FEATURES ACTUATION SYSTEM BASED
  41: REM              ON INPUTTED FAILURE RATE DATA FOR THE
  42: REM              SYSTEM MODULES.  THE MODULE FAILURE RATE
  43: REM              DATA IS DERIVED IN REPORT E-115-751
  44: REM              USING PART FAILURE RATES FROM
  45: REM              MIL-HBK-217A.
  46:
  47:
  48:
  49: REM              PROGRAMMER:  JAMES R. WARD
  50:
  51:
  52: REM              INITIAL RELEASE DATE: 22-SEPT-1978
  53:
  54: REM              REVISIONS:     1. 11-DEC-78   JRW
```

```
55:
56:
57:
58:  REM      MAIN PROGRAM
59:
60:  GOSUB 1000      REM  INITIALIZE & DEFINE FUNCTIONS
61:  GOSUB 2000      REM  PRINT TITLE PAGE
62:  GOSUB 3000.     REM  INPUT FAILURE RATE DATA
63:
64:  FOR TIME = START.TIME TO STOP.TIME STEP TIME.STEP
65:         GOSUB 4000      REM  CALCULATE COMPONENT
66:                        REM  RELIABILITY
67:         GOSUB 5000      REM  CALCULATE SUBSYSTEM
68:                        REM  RELIABILITY
69:         GOSUB 6000      REM  CALCULATE SYSTEM RELIABILITY
70:         GOSUB 7000      REM  PRINT RESULTS FOR 1 TIME STEP
71:  NEXT TIME
72:
73:
74:  STOP
75:
76:
77:  REM*************************************************************
78:
79:  1000     REM     SUBROUTINE TO INITIALIZE & DEFINE FUNCTIONS
80:
81:  REM      INPUT THE DATE
82:
83:  INPUT "DATE, MONTH DD, YEAR";DATE$
84:  INPUT "DATE, MM/DD/YY";DATE2$
85:
86:  REM      EQUATES
87:
88:  IN.NUM=8
89:  NEW.PAGE$=CHR$(12)
90:  OUT.NUM=7
91:
92:
93:  REM      TAB SETTINGS:
94:
95:  T1=10
96:  T2=36
97:  T3=41
98:  T4=57
99:
100:
101:  REM      DIMENSION OF VARIABLES
102:
103:  DIM P.GI1.SO(OUT.NUM)
104:  DIM P.GI2.SO(OUT.NUM)
105:  DIM P.GI3.SO(OUT.NUM)
106:  DIM P.GI4.SO(OUT.NUM)
107:  DIM P.GI5.SO(OUT.NUM)
108:  DIM P.GI6.SO(OUT.NUM)
109:  DIM P.GI7.SO(OUT.NUM)
110:  DIM P.SO.GI(IN.NUM)
```

```
111:  DIM P.GI8.SO(OUT.NUM)
112:  DIM SUB.SYS$(IN.NUM)
113:
114:
115:  REM     EQUATES
116:
117:  SUB.SYS$(1)="FBEVAS"
118:  SUB.SYS$(2)="CREFAS"
119:  SUB.SYS$(3)="CPIAS"
120:  SUB.SYS$(4)="CREVIAS(SMCROA)"
121:  SUB.SYS$(5)="CREVIAS(HGCROA)"
122:  SUB.SYS$(6)="DGSS"
123:  SUB.SYS$(7)="LOSS OF POWER"
124:  SUB.SYS$(8)="LOAD SEQUENCER"
125:
126:
127:  REM     THIS PROGRAM WILL CALCULATE THE RELIABILITY OVER
128:  REM     AN INTERVAL OF TIME IN STEPS OF INTEGER HOURS.
129:  REM     THE STARTING TIME, THE ENDING TIME AND THE
130:  REM     NUMBER OF HOURS IN EACH TIME STEP MUST BE
131:  REM     SPECIFIED.
132:
133:  INPUT "STARTING TIME"; START.TIME
134:  INPUT "ENDING TIME"; STOP.TIME
135:  INPUT "TIME STEP IN HOURS"; TIME.STEP
136:
137:
138:  REM     DEFINE FUNCTIONS
139:
140:  DEF FNRELIABILITY(N,T)=1/EXP(N*(1E-6)*T)
141:
142:
143:  RETURN
144:
145:
146:  REM*****************************************************
147:
148:  2000    REM    SUBROUTINE: PRINT FRONT PAGE OF APPENDIX
149:  REM     LIST TITLE LINES TO BE USED
150:
151:  TITLE1$="APPENDIX C"
152:  TITLE2$="COMPUTER RELIABILITY COMPUTATION"
153:  TITLE2A$="FOR"
154:  TITLE3$="PALO VERDE NUCLEAR GENERATING STATION"
155:  TITLE4$="BALANCE OF PLANT ENGINEERED SAFETY"
156:  TITLE5$="FEATURES ACTUATION SYSTEM"
157:  TITLE6$="BECHTEL JOB 10407"
158:  TITLE7$="PURCHASE ORDER 10407-13-JM-104"
159:  TITLE8$="PROJECT NO. 2192"
160:
161:  REM     INPUT TITLE SPACING DATA
162:
163:  READ N1,N2,N3,N4,N5,N6
164:  DATA  5, 6, 3, 8, 8, 0
165:
166:  REM     START NEW PAGE
```

```
167:
168:  PRINT NEW.PAGE$
169:  FOR I=1 TO N1
170:          PRINT
171:  NEXT I
172:
173:  REM      PRINT APPENDIX HEADING
174:
175:  Q=LEN(TITLE1$)
176:  R=(80-Q)/2
177:  PRINT TAB (R);TITLE1$
178:
179:  FOR I=1 TO N2
180:          PRINT
181:  NEXT I
182:
183:  Q=LEN(TITLE2$)
184:  PRINT TAB((80-Q)/2);TITLE2$
185:
186:  FOR I=1 TO N3
187:          PRINT
188:  NEXT I
189:  PRINT TAB((80-LEN(TITLE2A$))/2);TITLE2A$
190:  FOR I = 1 TO N3
191:          PRINT
192:  NEXT I
193:  Q=LEN(TITLE3$)
194:  PRINT TAB((80-Q)/2);TITLE3$
195:  Q=LEN(TITLE4$)
196:  PRINT TAB((80-Q)/2);TITLE4$
197:  Q=LEN(TITLE5$)
198:  PRINT TAB((80-Q)/2);TITLE5$
199:  FOR I=1 TO N3
200:          PRINT
201:  NEXT I
202:  PRINT TAB((80-LEN(TITLE6$))/2);TITLE6$
203:  PRINT TAB((80-LEN(TITLE7$))/2);TITLE7$
204:  FOR I = 1 TO N4
205:          PRINT
206:  NEXT I
207:  Q=LEN(DATE$)
208:  PRINT TAB((80-Q)/2);DATE$
209:  FOR I=1 TO N5
210:          PRINT
211:  NEXT I
212:  PRINT TAB((80-LEN(TITLE8$))/2);TITLE8$
213:  PRINT:PRINT
214:
215:  REM      WRITE COMPANY ADDRESS BLOCK
216:
217:  GOSUB 2500
218:
219:  REM      GO TO THE NEXT PAGE
220:
221:  PRINT NEW.PAGE$
222:
```

```
223:  RETURN
224:
225:
226:  REM*************************************************************
227:
228:  2500    REM    SUBROUTINE TO PRINT GENERAL ATOMIC
229:  REM    ADDRESS BLOCK
230:
231:  LINE1$="GENERAL ATOMIC COMPANY"
232:  LINE2$="ELECTRONIC SYSTEMS DIVISION"
233:  LINE3$="P O BOX 81608"
234:  LINE4$="SAN DIEGO, CALIFORNIA 92138"
235:
236:  PRINT TAB((80-LEN(LINE1$))/2);LINE1$
237:  PRINT TAB((80-LEN(LINE2$))/2);LINE2$
238:  PRINT TAB((80-LEN(LINE3$))/2);LINE3$
239:  PRINT TAB((80-LEN(LINE4$))/2);LINE4$
240:
241:  RETURN
242:
243:
244:  REM*************************************************************
245:
246:  3000    REM    SUBROUTINE FOR DATA INPUT
247:
248:  REM     INPUT THE FAILURE RATE DATA
249:
250:  READ L.11, L.13, L.S1, L.S2, L.S3, L.S4, L.11A
251:  READ L.13A,  L.A,  L.24.PLUS.L.AD, L.DA, L.Q
252:
253:  DATA 12.5, 7.17, 40.0, 4.00, 25.0, 25.0, 15.8
254:  DATA 7.87, 5.77, 11.8, 11.6, 20.7
255:
256:  RETURN
257:
258:
259:
260:  REM*************************************************************
261:
262:  4000    REM    SUBROUTINE TO CALCULATE COMPONENT
263:  REM            RELIABILITY
264:
265:  T=TIME
266:  P.11=FNRELIABILITY(L.11,T)
267:  P.13=FNRELIABILITY(L.13,T)
268:  P.S1=FNRELIABILITY(L.S1,T)
269:  P.S2=FNRELIABILITY(L.S2,T)
270:  P.S3=FNRELIABILITY(L.S3,T)
271:  P.S4=FNRELIABILITY(L.S4,T)
272:  P.11A =FNRELIABILITY(L.11A ,T)
273:  P.13A =FNRELIABILITY(L.13A ,T)
274:  P.A =FNRELIABILITY(L.A ,T)
275:  P.24XP.AD=FNRELIABILITY(L.24.PLUS.L.AD,T)
276:  P.DA=FNRELIABILITY(L.DA,T)
277:  P.Q =FNRELIABILITY(L.Q ,T)
278:
```

```
279:  RETURN
280:
281:
282:
283:  REM##################################################################
284:
285:  5000     REM     SUBROUTINE TO CALCULATE THE SUBSYSTEM
286:  REM     RELIABILITIES
287:
288:  REM      THE FOLLOWING EQUALITIES WERE ESTABLISHED
289:  REM      IN THE.REPORT.
290:
291:  P.12=P.11
292:  P.14=P.13
293:  P.15=P.13
294:  P.16=P.13
295:  P.12A=P.11A
296:  P.14A=P.13A
297:  P.15A=P.13A
298:  P.16A=P.13A
299:
300:  REM      THE COMPUTER DOES NOT ALLOW COMPLETE FLEXIBILITY
301:  REM      IN CHOOSING SYMBOLS IN THE COMPUTATIONAL SECTION
302:  REM      THEREFORE, THE FOLLOWING CHANGE OF SYMBOLS
303:  REM      WILL BE EMPLOYED.
304:  REM
305:  REM      SYMBOLS USE IN REPORT          SYMBOLS IN THIS SECTION
306:
307:  REM      P(SO1)/I1                      P.GI1.SO(1)
308:
309:  REM      EITHER IS READ AS 'THE PROBABILITY OF SUCCESS
310:  REM      AT OUTPUT ONE GIVEN INPUT ONE.
311:
312:
313:
314:  REM              ----------------
315:  REM      FOR THE POWER SUPPLY SUBSYSTEM
316:
317:  A=P.S1*P.S3
318:  B=P.S1*(1-P.S3)*P.S2*P.S4
319:  C=(1-P.S1)*P.S2*P.S4
320:  P.SA=A+B+C
321:  P.SB=P.SA
322:
323:
324:
325:
326:  REM              ----------------
327:  REM      FOR OUTPUTS RELATED TO INPUT I1 (FBVAS),
328:  REM      CALCULATE THE FOLLOWING:
329:
330:  REM      FOR S(SO1)/I1:
331:
332:  A=P.11*P.SA*P.13
333:  B=P.11*P.SA*(1-P.15)*P.16*P.SB
334:  C=P.11*(1-P.SA)*P.12*P.SB*P.14
```

```
335:  D=(1-P.11)*P.12*P.SB*P.14
336:  E=(1-P.11)*P.12*P.SB*(1-P.14)*P.15*P.SA
337:
338:  P.GI1.SO(1)=A+B+C+D+E
339:
340:
341:  REM      FOR P(SO2)/I1
342:
343:  P.GI1.SO(2)=P.13+(1-P.13)*P.16
344:
345:  FOR K = 3 TO OUT.NUM
346:        P.GI1.SO(K)=1
347:  NEXT K
348:
349:  P.SO.GI(1)=1
350:  FOR K = 1 TO OUT.NUM
351:        P.SO.GI(1)=P.SO.GI(1)*P.GI1.SO(K)
352:  NEXT K
353:
354:
355:
356:  REM              ----------------
357:  REM      FOR OUTPUTS RELATED TO INPUT I2 (CREFAS),
358:  REM      CALCULATE THE FOLLOWING:
359:
360:  P.GI2.SO(1)=1
361:
362:  REM      FOR P(SO2)/I2
363:
364:  P.GI2.SO(2)=P.GI1.SO(1)
365:
366:  REM      FOR P(SO3)/I2
367:
368:  P.GI2.SO(3)=P.GI1.SO(2)
369:
370:  FOR K = 4 TO OUT.NUM
371:        P.GI2.SO(K)=1
372:  NEXT K
373:
374:  P.SO.GI(2)=1
375:  FOR K = 1 TO OUT.NUM
376:        P.SO.GI(2)=P.SO.GI(2)*P.GI2.SO(K)
377:  NEXT K
378:
379:
380:
381:  REM              ----------------
382:  REM      FOR OUTPUTS RELATED TO INPUT I3 (CPIAS),
383:  REM      CALCULATE THE FOLLOWING:
384:
385:  FOR K= 1 TO 2
386:        P.GI3.SO(K)=1
387:  NEXT K
388:
389:  REM      FOR P(SO3)/I3
390:
```

```
391:  P.GI3.SO(3)=P.GI1.SO(1)
392:
393:  FOR K = 4 TO OUT.NUM
394:        P.GI3.SO(K)=1
395:  NEXT K
396:
397:  P.SO.GI(3)=1
398:  FOR K = 1 TO OUT.NUM
399:        P.SO.GI(3)=P.SO.GI(3)*P.GI3.SO(K)
400:  NEXT K
401:
402:
403:
404:  REM             ----------------
405:  REM      FOR OUTPUTS RELATED TO INPUT I4 (CREVIAS-SMCROA),
406:  REM     CALCULATE THE FOLLOWING:
407:
408:  FOR K = 1 TO 3
409:        P.GI4.SO(K)=1
410:  NEXT K
411:
412:  REM      FOR P(SO4)/I4
413:
414:  AA=P.11A*P.SA*P.13A
415:  BA=P.11A*P.SA*(1-P.15A)*P.16A*P.SB
416:  CA=P.11A*(1-P.SA)*P.12A*P.SB*P.14A
417:  DA=(1-P.11A)*P.12A*P.SB*P.14A
418:  EA=(1-P.11A)*P.12A*P.SB*(1-P.14A)*P.15A*P.SA
419:
420:  P.GI4.SO(4)=AA+BA+CA+DA+EA
421:
422:  FOR K = 5 TO OUT.NUM
423:        P.GI4.SO(K)=1
424:  NEXT K
425:
426:  P.SO.GI(4)=1
427:  FOR K = 1 TO OUT.NUM
428:        P.SO.GI(4)=P.SO.GI(4)*P.GI4.SO(K)
429:  NEXT K
430:
431:
432:
433:  REM             ----------------
434:  REM      FOR OUTPUTS RELATED TO INPUT I5 (CREVIAS-HGCROA),
435:  REM     CALCULATE THE FOLLOWING:
436:
437:  FOR K = 1 TO 3
438:        P.GI5.SO(K)=1
439:  NEXT K
440:
441:  REM      FOR P(SO4)/I5
442:
443:  P.GI5.SO(4)=P.GI4.SO(4)
444:
445:  FOR K = 5 TO OUT.NUM
446:        P.GI5.SO(K)=1
```

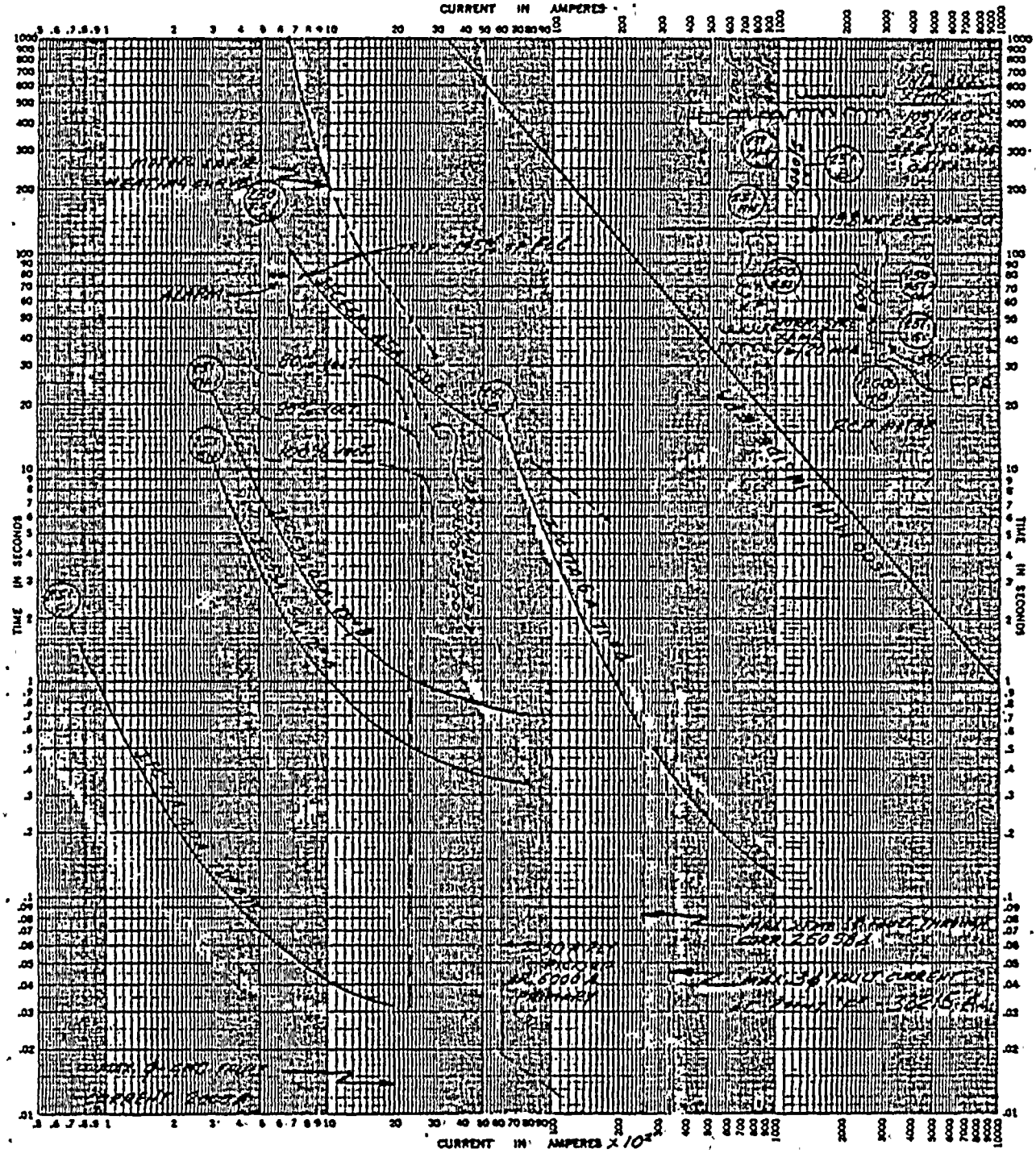
```
447:  NEXT K
448:
449:  P.SO.GI(5)=1
450:  FOR K = 1 TO OUT.NUM
451:        P.SO.GI(5)=P.SO.GI(5)*P.GI5.SO(K)
452:  NEXT K
453:
454:
455:  ------------------------------------------
456:  REM
457:  REM    FOR OUTPUTS RELATED TO INPUT I6 (DGSS),
458:  REM    CALCULATE THE FOLLOWING:
459:
460:
461:  FOR K = 1 TO 4
462:        P.GI6.SO(K)=1
463:  NEXT K
464:
465:
466:  REM     FOR P(SO5)/I6
467:
468:  F=P.DA*P.SA
469:  G=P.DA*(1-P.SA)*P.SA
470:  H=(1-P.DA)*P.DA*P.SA
471:
472:  P.GI6.SO(5)=F+G+H
473:
474:  FOR K = 6 TO OUT.NUM
475:        P.GI6.SO(K)=1
476:  NEXT K
477:
478:  P.SO.GI(6)=1
479:  FOR K = 1 TO OUT.NUM
480:        P.SO.GI(6)=P.SO.GI(6)*P.GI6.SO(K)
481:  NEXT K
482:
483:
484:
485:  REM          ------------------------
486:  REM     FOR OUTPUTS RELATED TO INPUT I7 (LOSS OF POWER),
487:  REM     CALCULATE THE FOLLOWING:
488:
489:
490:  FOR K = 1 TO 5
491:        P.GI7.SO(K)=1
492:  NEXT K
493:
494:  P.I=(P.A^2)*(1+2*(1-P.A)+3*(1-P.A)^2)
495:
496:  P.L=P.I*P.24XP.AD*P.SA
497:
498:  P.GI7.SO(6)=P.L+(1-P.L)*P.L
499:
500:  FOR K = 7 TO OUT.NUM
501:        P.GI7.SO(K)=1
502:  NEXT K
```

```
503:
504:  P.SO.GI(7)=1
505:  FOR K = 1 TO OUT.NUM
506:          P.SO.GI(7)=P.SO.GI(7)*P.GI7.SO(K)
507:  NEXT K
508:
509:
510:
511:  REM          ----------------
512:  REM      FOR OUTPUTS RELALATED TO INPUT I8 (LOAD SEQUENCER),
513:  REM      CALCULATE THE FOLLOWING:
514:
515:
516:  FOR K = 1 TO 6
517:          P.GI8.SO(K)=1.
518:  NEXT K
519:
520:  P.LOP=P.GI7.SO(6)
521:
522:  P.SI=1
523:  P.BKR=1
524:
525:  P.LS.A=P.SI*P.LOP*P.BKR*P.Q*P.SA
526:
527:  P.GI8.SO(7)=P.LS.A+(1-P.LS.A)*P.LS.A
528:
529:  P.SO.GI(8)=1
530:  FOR K = 1 TO OUT.NUM
531:          P.SO.GI(8)=P.SO.GI(8)*P.GI8.SO(K),
532:  NEXT K
533:
534:  RETURN
535:
536:
537:  REM*************************************************************
538:
539:  6000     REM     SUBROUTINE TO CALCULATE TOTAL SYSTEM RELIABILITY
540:
541:
542:  P.SYSTEM=0
543:  FOR K = 1 TO IN.NUM
544:          P.SYSTEM=P.SYSTEM+(1/IN.NUM)*P.SO.GI(K)
545:  NEXT K
546:
547:  RETURN
548:
549:
550:
551:  REM*************************************************************
552:
553:  7000     REM     SUBROUTINE TO PRINT THE RELIABILITY
554:  REM     RESULTS FOR ONE TIME STEP
555:
556:  REM      PRINT THE HEADING ON THE PAGE
557:
558:
```

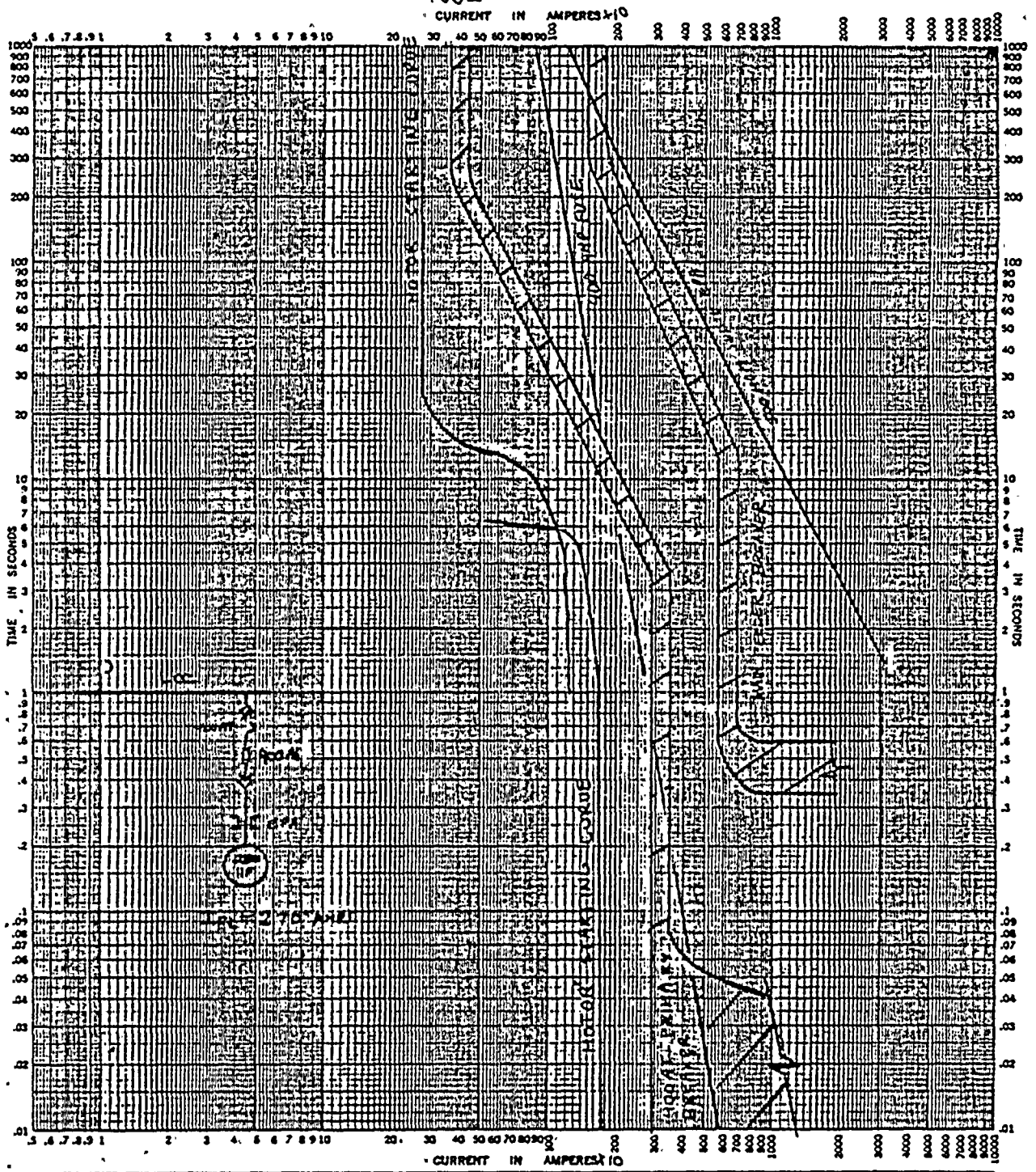
```
559:  PRINT TAB(55),"MISSION TIME:";TIME
560:
561:  REM     PRINT FAILURE RATE & RELIABILITY COMPONENT DATA
562:
563:  GOSUB 7020
564:
565:
566:
567:  REM --   PRINT SUBSYSTEM RELIABILITY DATA
568:
569:  GOSUB 7030
570:
571:
572:  REM      PRINT SYSTEM RELIABILITY
573:
574:  GOSUB 7040
575:
576:  FOR I = 1 TO 4
577:          PRINT
578:  NEXT I
579:
580:  PRINT DATE2$
581:  PRINT NEW.PAGE$
582:
583:
584:  RETURN
585:
586:
587:  REM*************************************************************
588:
589:  7020     REM     SUBROUTINE TO PRINT THE COMPONENT RELIABILITY DATA
590:
591:  PRINT
592:  PRINT TAB(20);"COMPONENT RELIABILITY DATA TABLE"
593:  PRINT:PRINT
594:
595:  PRINT "================================================";
596:  PRINT "====================="
597:  PRINT TAB(T3);"FAILURE";TAB(T4);"RELIABILITY"
598:  PRINT TAB(10);"SUBSYSTEM COMPONENT";TAB(T3);"RATE PER";
599:  PRINT TAB(T4);"FOR ";TIME;" HRS"
600:  PRINT TAB(T3);"MILLION HRS"
601:  PRINT "------------------------------------------------";
602:  PRINT "---------------------"
603:  PRINT
604:  PRINT "INITIATING CHANNEL FOR";TAB(T3);L.11;TAB(T4);P.11
605:  PRINT "FBEVAS, CREFAS, CPIAS"
606:  PRINT
607:  PRINT "ACTUATING CHANNEL & RELAYS";
608:  PRINT TAB(T3);L.13;TAB(T4);P.13
609:  PRINT "FOR FBEVAS, CREVAS, CPIAS"
610:  PRINT
611:  PRINT "AC POWER SOURCE";TAB(T3);L.S1;TAB(T4);P.S1
612:  PRINT
613:  PRINT "DC POWER SOURCE";TAB(T3);L.S2;TAB(T4);P.S2
614:  PRINT
```

```
615:  PRINT "AC TO DC POWER SUPPLY";TAB(T3);L.S3;TAB(T4);P.S3
616:  PRINT
617:  PRINT "DC TO DC POWER SUPPLY";TAB(T3);L.S4;TAB(T4);P.S4
618:  PRINT
619:  PRINT "INITIATING CHANNEL FOR CREVIAS";
620:  PRINT TAB(T3);L.11A;TAB(T4);P.11A
621:  PRINT
622:  PRINT "ACTUATING CHANNEL FOR CREVIAS";
623:  PRINT TAB(T3);L.13A;TAB(T4);P.13A
624:  PRINT
625:  PRINT "LOP/LS MODULE"
626:  PRINT "    A. TRIP SECTION";TAB(T3);L.A;TAB(T4);P.A
627:  PRINT "    B. 2/4 AND OUTPUT";TAB(T3);L.24.PLUS.L.AD\
628:         ;TAB(T4);P.24XP.AD                    REM  REV 1
629:  PRINT
630:  PRINT "DGSS";TAB(T3);L.DA;TAB(T4);P.DA
631:  PRINT
632:  PRINT "ESF LOAD SEQUENCER";TAB(T3);L.Q;TAB(T4);P.Q
633:  PRINT "-------------------------------------------------";
634:  PRINT "----------------------"
635:
636:
637:  RETURN
638:
639:
640:
641:  REM*************************************************************
642:
643:  7030    REM    SUBROUTINE TO PRINT THE SUBSYSTEM RELIABILITY DATA
644:
645:  PRINT
646:  PRINT TAB(15);"RELIABILITY BY SUBSYSTEM"
647:  PRINT TAB(15);"---------- -- ---------"
648:  PRINT
649:  PRINT TAB(T1),"SUBSYSTEM";TAB(T2);"RELIABILITY"
650:  PRINT
651:  PRINT TAB(T1);"POWER SUPPLY";TAB(T2);P.SA
652:  FOR I = 1 TO IN.NUM
653:        PRINT TAB(T1);SUB.SYS$(I);TAB(T2);P.SO.GI(I)
654:  NEXT I
655:
656:  RETURN
657:
658:
659:  REM*************************************************************
660:
661:  7040    REM    SUBROUTINE TO PRINT THE SYSTEM RELIABILITY FOR
662:  REM     THE CURRENT MISSION TIME
663:
664:  PRINT
665:  PRINT "TOTAL SYSTEM RELIABILITY FOR ";TIME;
666:  PRINT "HOUR MISSION TIME: ";P.SYSTEM
667:  RETURN
668:
669:
670:  REM*************************************************************
```

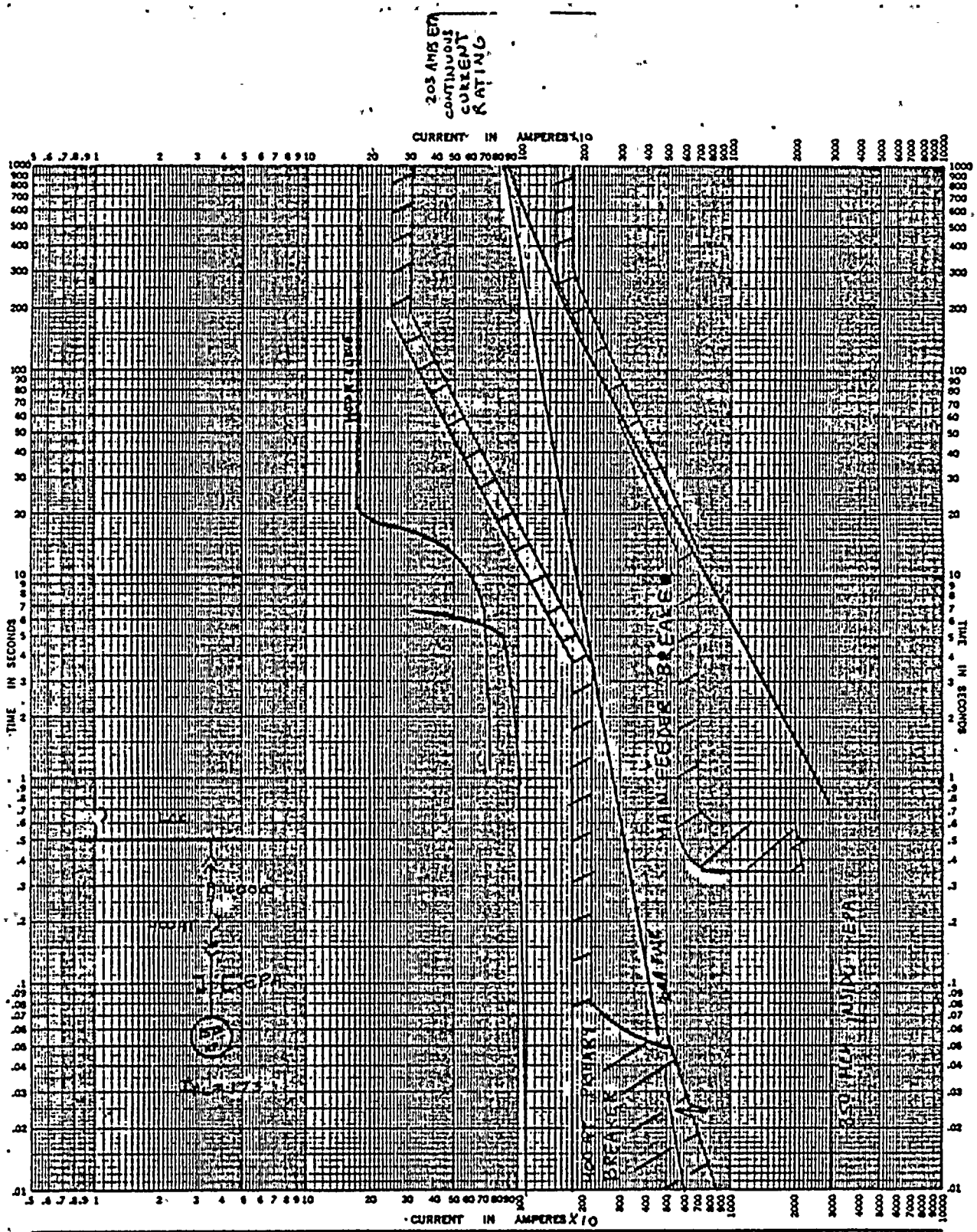
```
671:
672:
673:  END
 0 ERRORS DETECTED
```



K&E TIME-CURRENT CHARACTERISTIC · 46 5258-



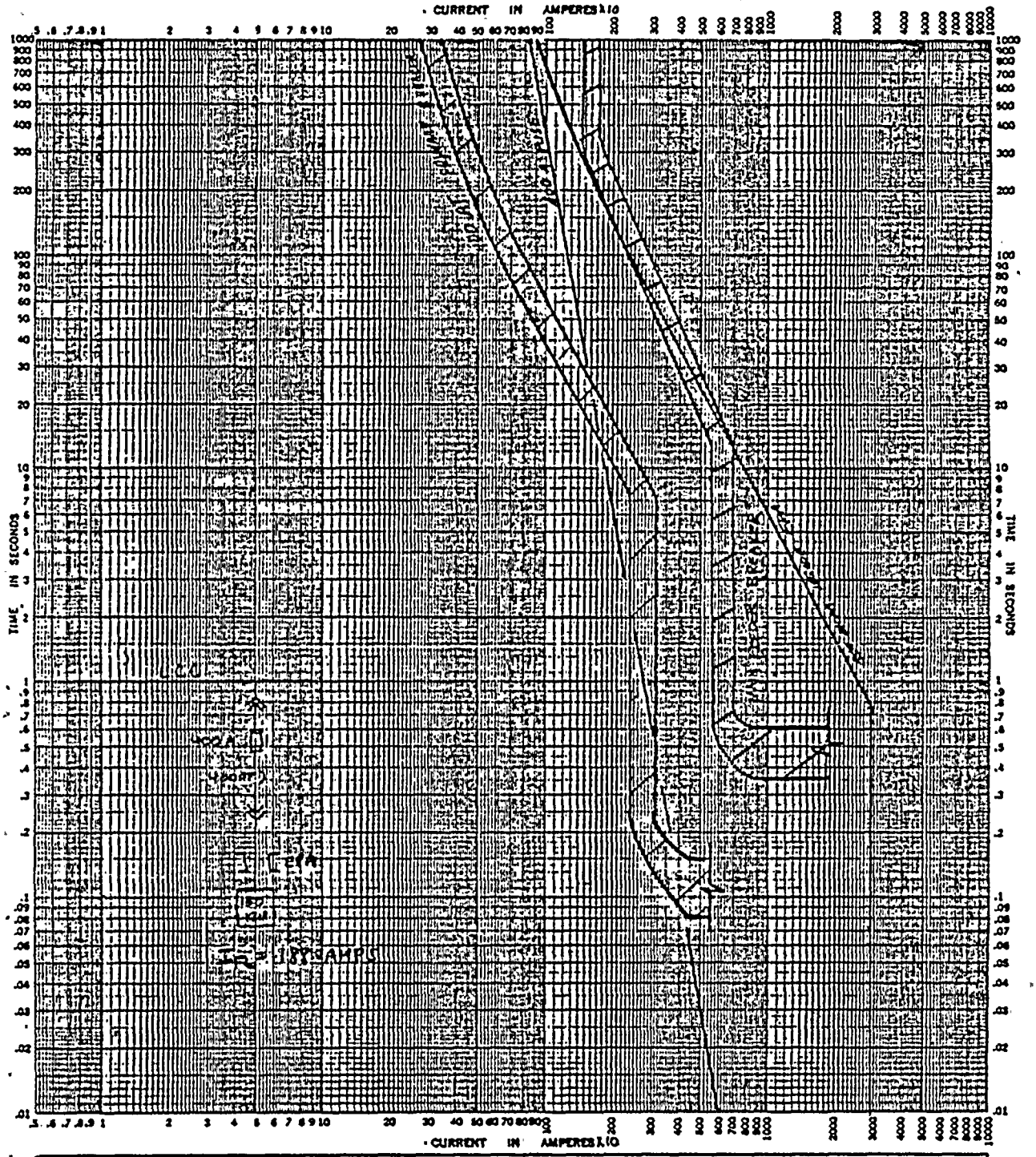
PROTECTION CURVES FOR 250 HP NON CLASS 1E MOTORS WITH 400 AMP FUSE AND 400 AT BREAKER. BREAKER SET AT 1.0X FOR LONG TIME PICK UP, MINIMUM LONG TIME DELAY BAND, AND 8X FOR INSTANEOUS PICK UP



K·E TIME-CURRENT CHARACTERISTIC KEUFFEL & ESSER CO. 48 5258

PROTECTION CURVES FOR 150 HP 800 V CLASS 1E MOTOR WITH 400 AT BREAKER AND 400 AMP FUSE. BREAKER SET AT 0.7X FOR LONG TIME PICKUP, MINIMUM LONG TIME DELAY BAND, AND 5X FOR INSTANEOUS PICKUP.

203 AMPS EPA CONTINUOUS CURRENT RATING



_____ TIME-CURRENT CHARACTERISTIC CURVES

For _____ Fuse Links, In _____

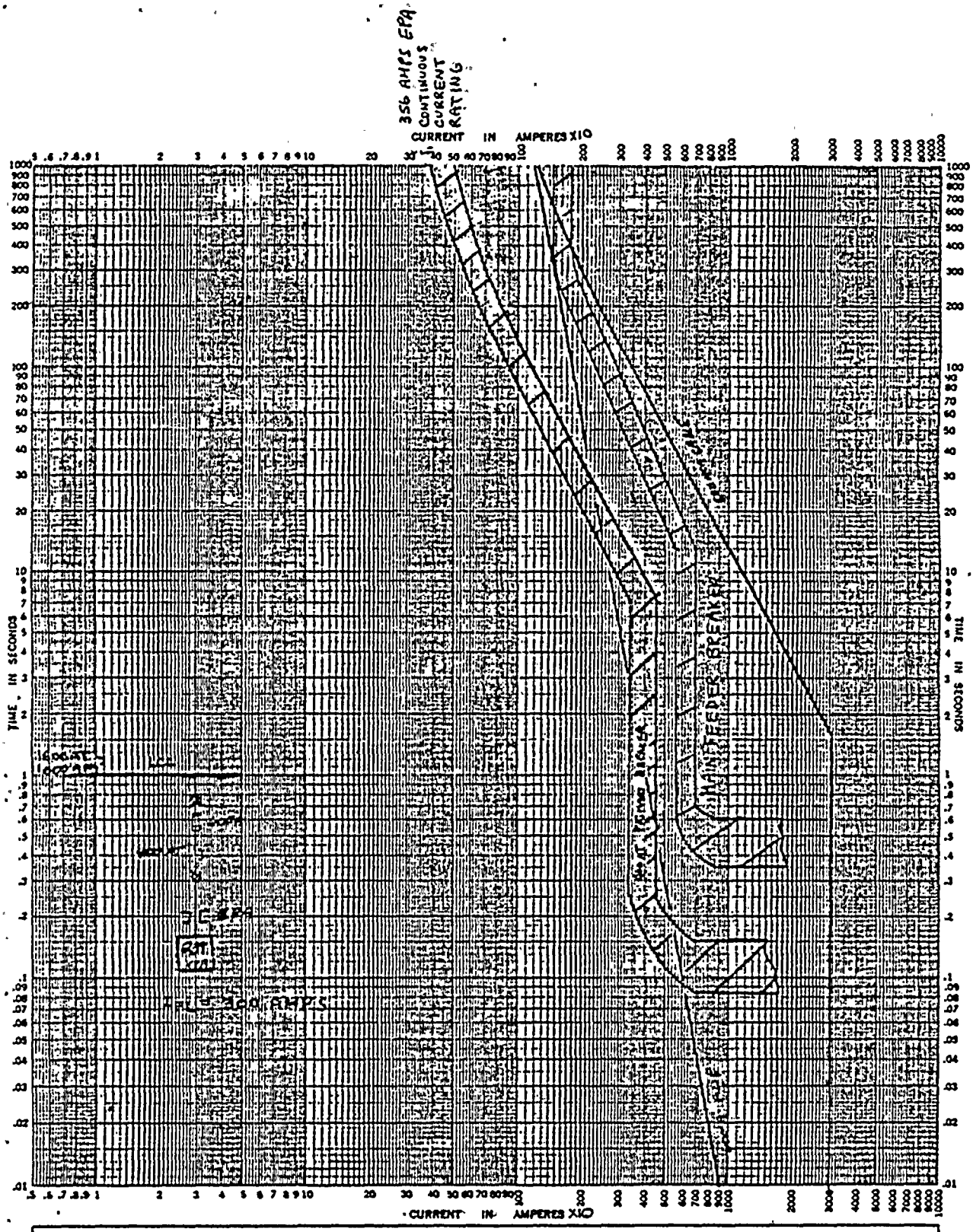
BASIS FOR DATA Standards _____ Dated _____

1. Tests made at _____ Volts a-c at _____ p-f., starting at 25C with no initial load _____
2. Curves are plotted to _____ Test points so variations should be _____

No. _____

Date _____

K·E TIME-CURRENT CHARACTERISTIC 46 3258 PROTECTION CURVES FOR 150KW PRESSURIZER BACK UP HEATERS WITH 400 AMP FUSE AND 400 AT BREAKER. BREAKER SET AT 0.8X FOR LONG TIME PICKUP, MAXIMUM LONG TIME DELAY BAND, 8X FOR SHORT TIME DELAY PICKUP, AND MINIMUM SHORT TIME DELAY BAND.



TIME-CURRENT CHARACTERISTIC CURVES

For _____ Fuse Links. In _____

BASIS FOR DATA Standards _____ Dated _____

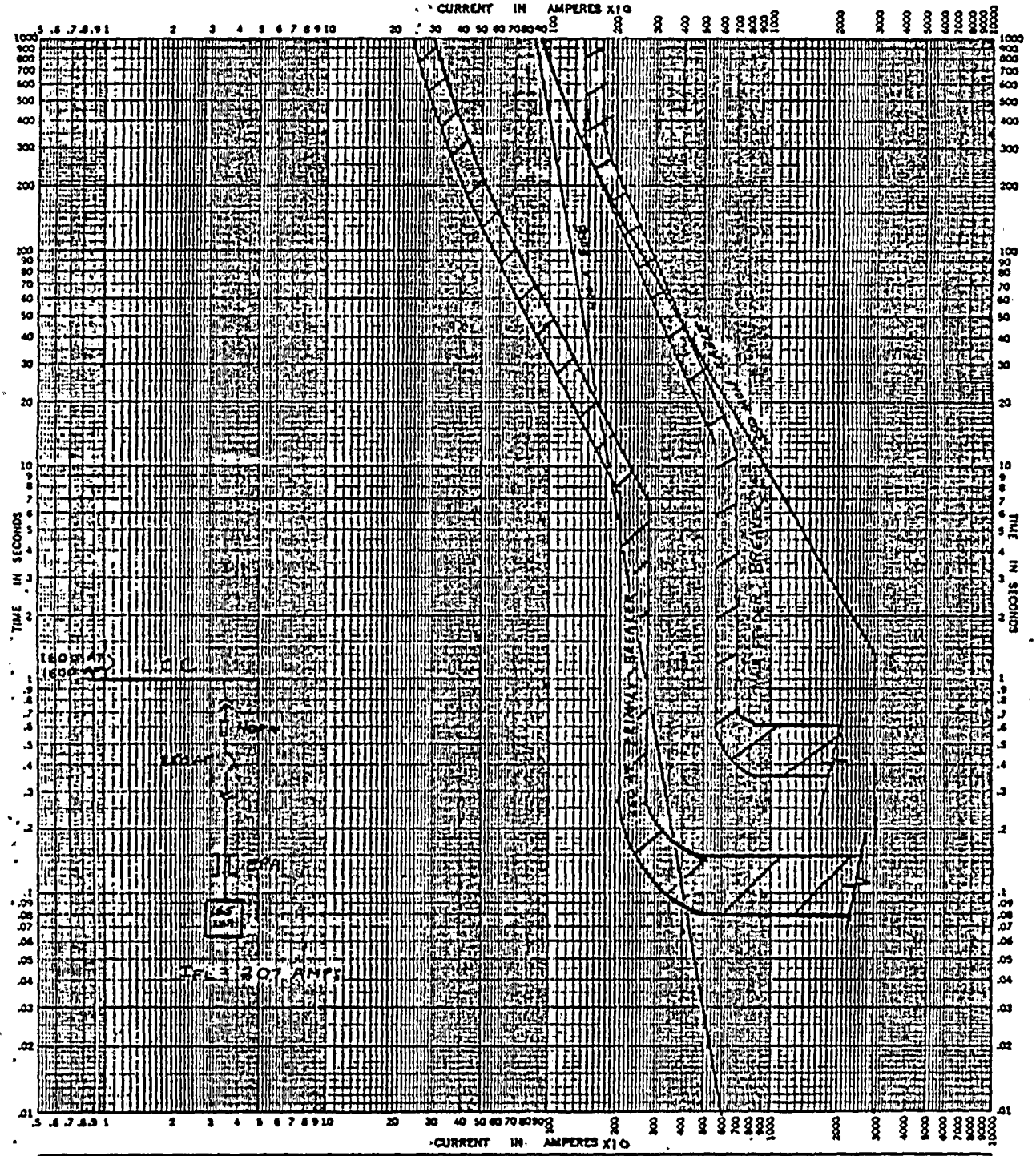
1. Tests made at _____ Volts a-c at _____ p-f., starting at 25C with no initial load _____

2. Curves are plotted in _____ Test points as variations should be _____

No. _____

Date _____

K·E TIME-CURRENT CHARACTERISTIC 46-3258 PROTECTION CURVES FOR 239 KVA DUCT HEATERS WITH 600 AMP FUSE AND 400AT BREAKER. BREAKER SET AT 1.0X LONG-TIME PICKUP, MAXIMUM LONG-TIME DELAY BAND, 10X FOR SHORT TIME DELAY PICKUP, AND MINIMUM SHORT-TIME DELAY BAND.



TIME-CURRENT CHARACTERISTIC CURVES

For _____ Fuse Units. In _____

BASIS FOR DATA Standards _____ Dated _____

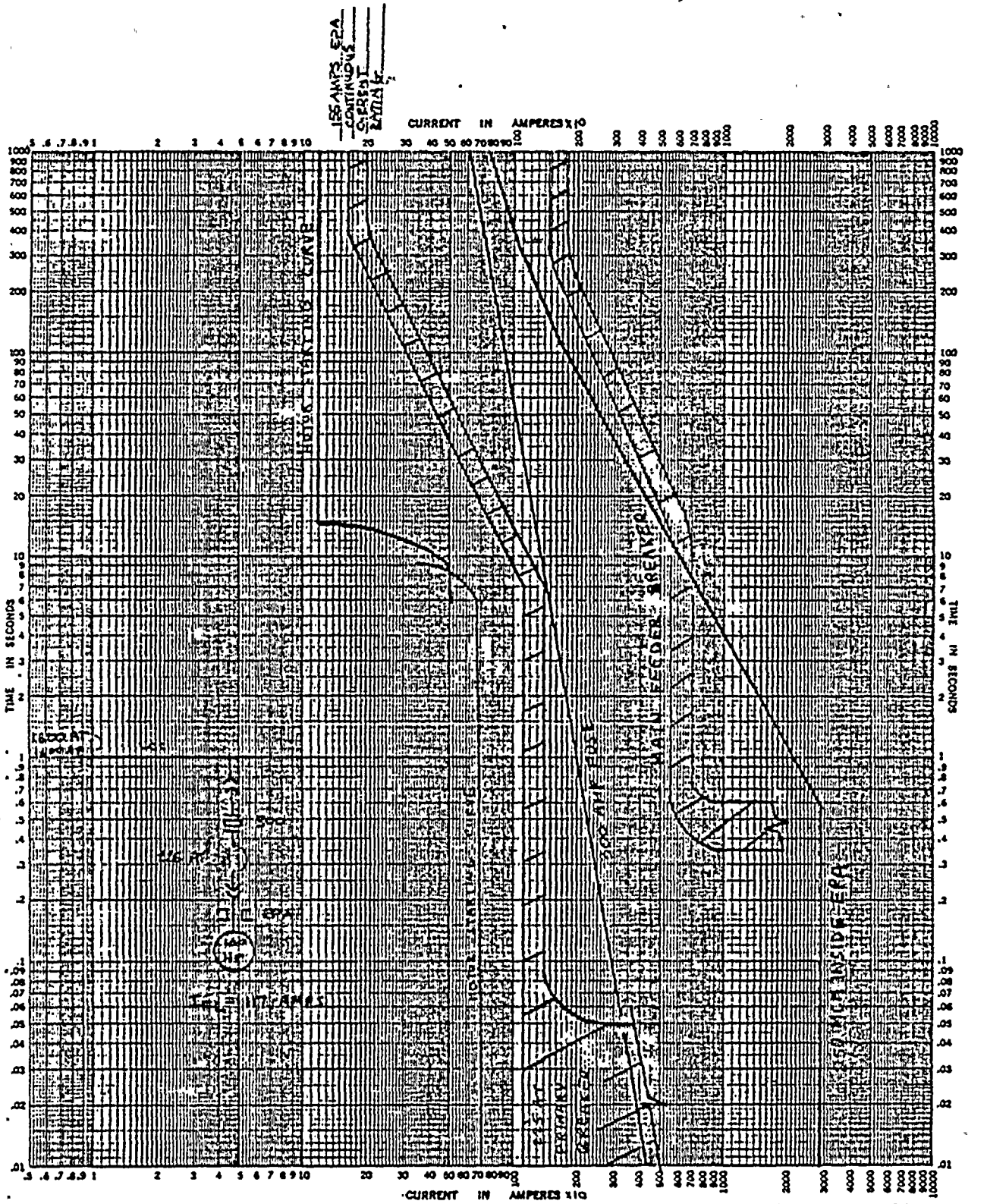
1. Tests made at _____ Volts a-c at _____ p-f., starting at 25C with no initial load _____

2. Curves are plotted to _____ Test points so variations should be _____

No. _____

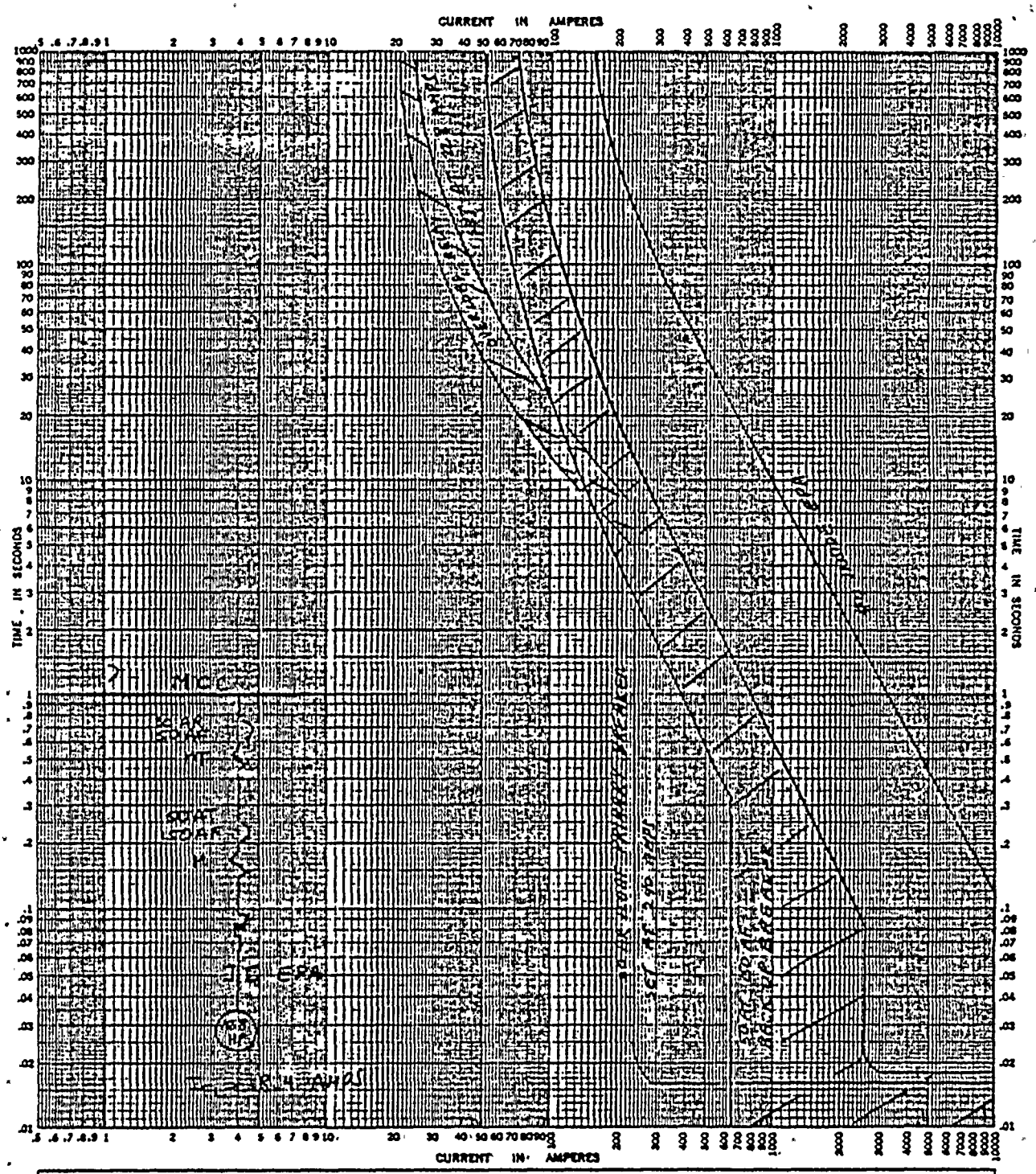
Date _____

K-E TIME-CURRENT CHARACTERISTIC KEUFFEL & ESSER CO. 46 5238 PROTECTION CURVES FOR 165 KVA NON CLASS 1E PACKAGE LOAD WITH 400 AMP FUSE AND 250 AT BREAKER. BREAKER SET AT 1.0X FOR LONG TIME PICKUP, MAXIMUM LONG TIME DELAY BAND, MINIMUM SHORT TIME DELAY BAND, AND 10X SHORT TIME DELAY PICKUP.

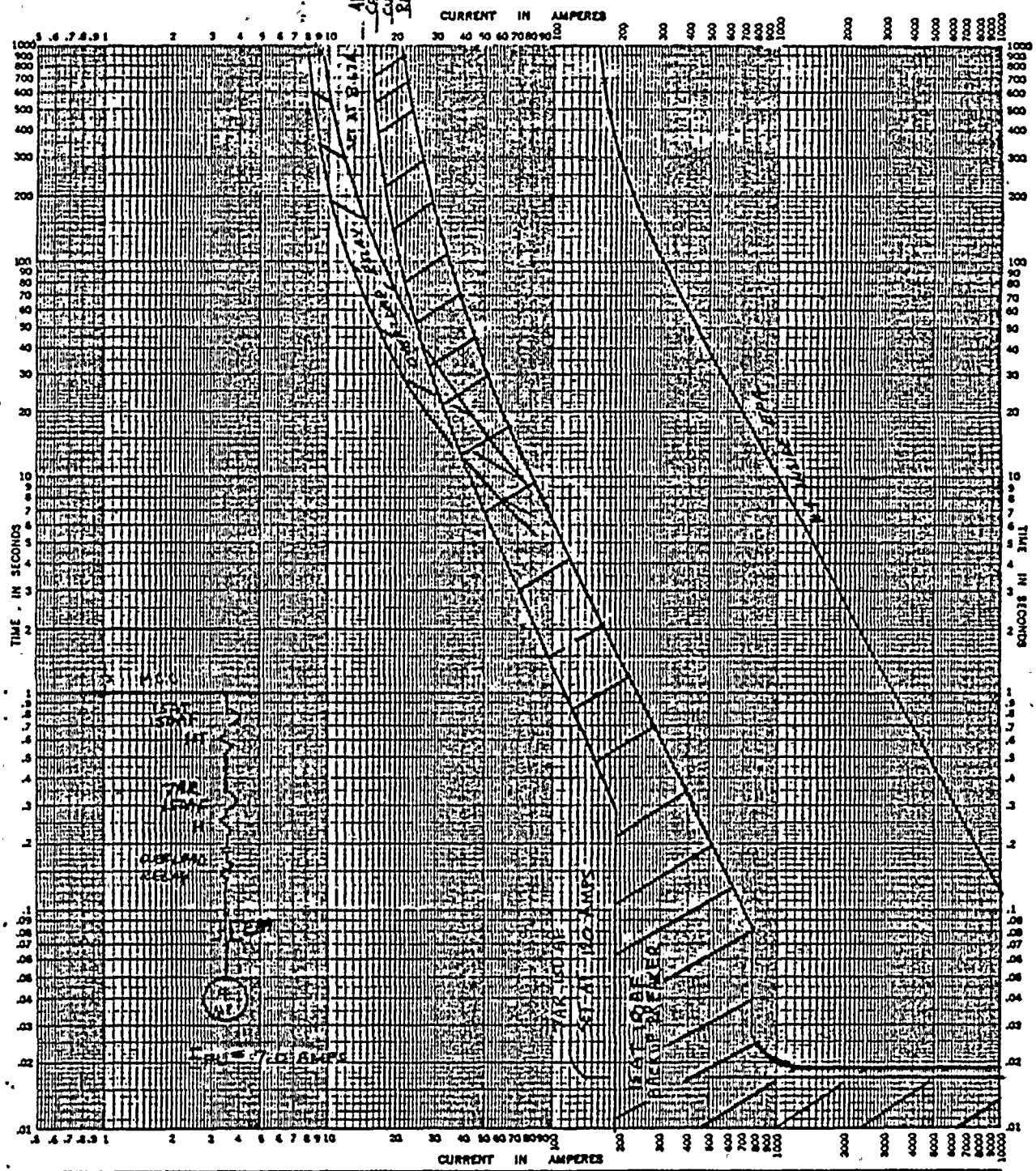


K·E TIME-CURRENT CHARACTERISTIC KEUFFEL & ESSER CO. 46 5258

PROTECTION CURVES FOR 100 HP NON CLASS 1E MOTOR WITH 300 AMP FUSE AND 225AT BREAKER. BREAKER IS SET AT .8X FOR LONGTIME PICKUP, INTERMEDIATE LONG TIME DELAY BAND, AND 5X FOR INSTANEOUS PICKUP.



K-E TIME-CURRENT CHARACTERISTIC 48 5288 PROTECTION CURVES FOR 12.8 HP CLASS 1E. MOTOR WITH 50 AT BACKUP AND 30 AR PRIMARY BREAKER.



TIME-CURRENT CHARACTERISTIC CURVES

For _____ Fuse Links, _____ In _____

BASIS FOR DATA Standards _____ Dated _____

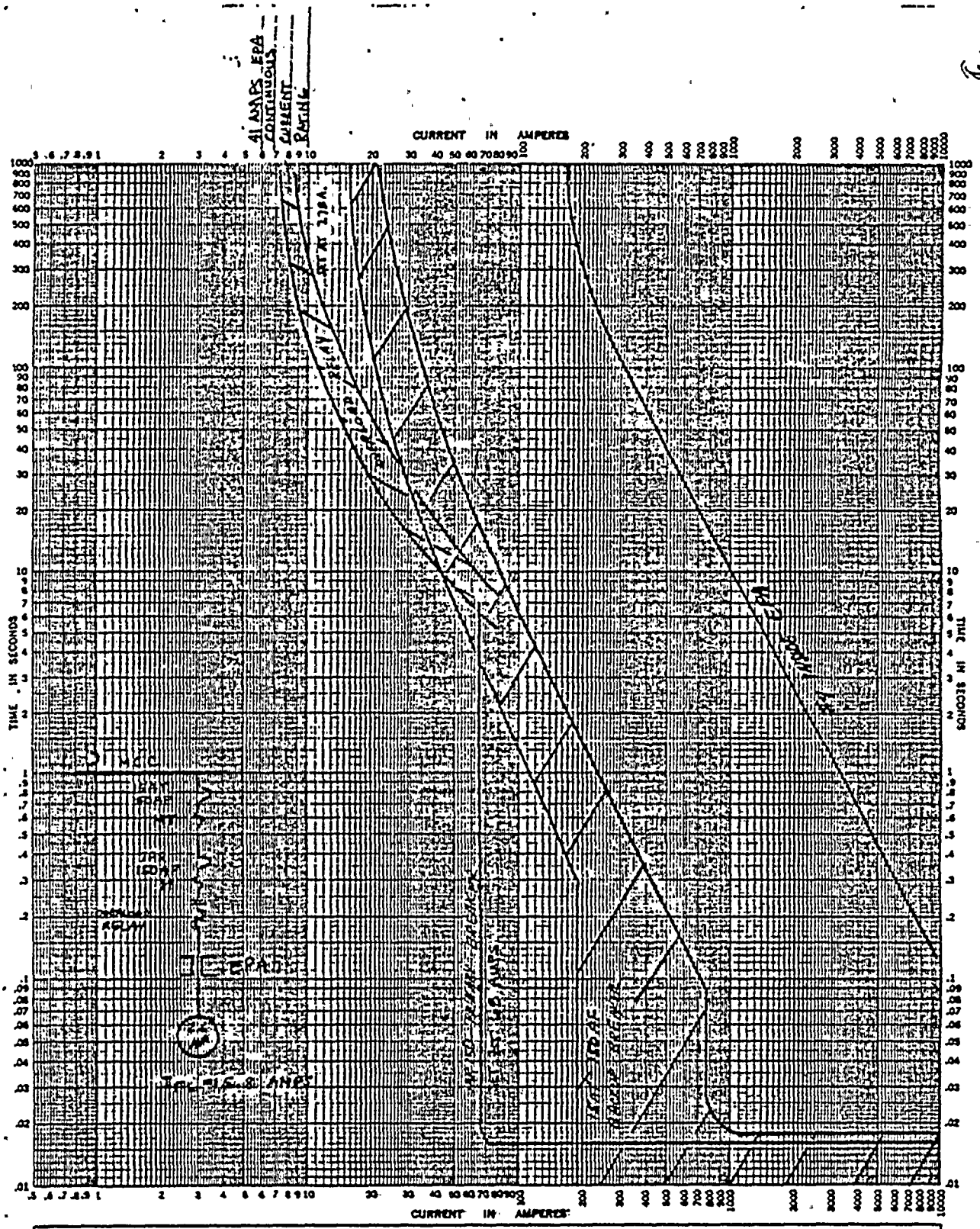
1. Tests made at _____ Volts a-c at _____ p-/- starting at 25C with no initial load _____

2. Curves are plotted to _____ Test points as variations should be _____

No. _____

Date _____

K•E TIME-CURRENT CHARACTERISTIC 46 5258
KEUFFEL & ESSER CO.



TIME-CURRENT CHARACTERISTIC CURVES

For _____ Fuse Links, In _____

BASIS FOR DATA Standards _____ Dated _____

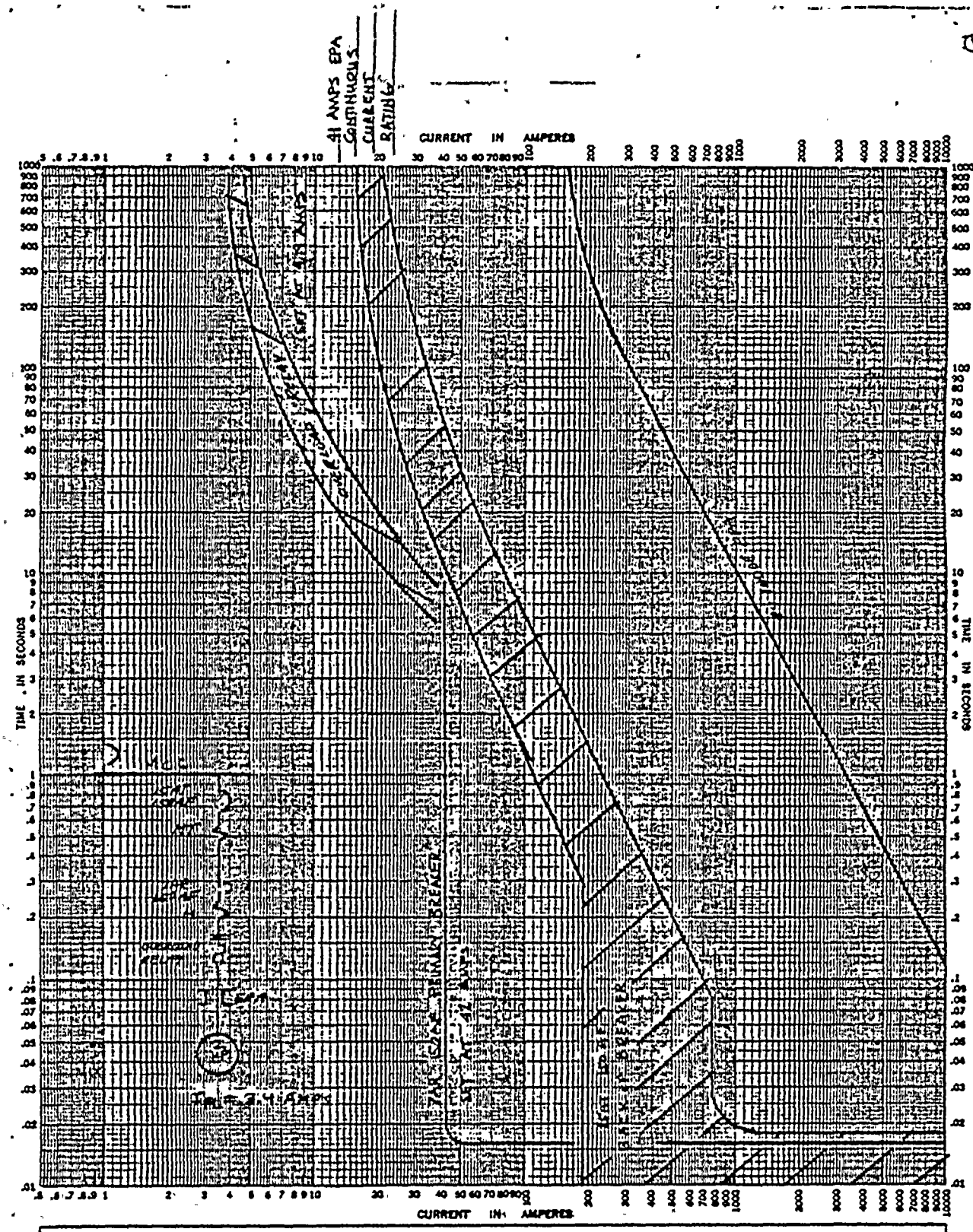
1. Tests made at _____ Volts a-c at _____ p.f., starting at 25C with no initial load _____
2. Curves are plotted to _____ Test points as variations should be _____

No. _____

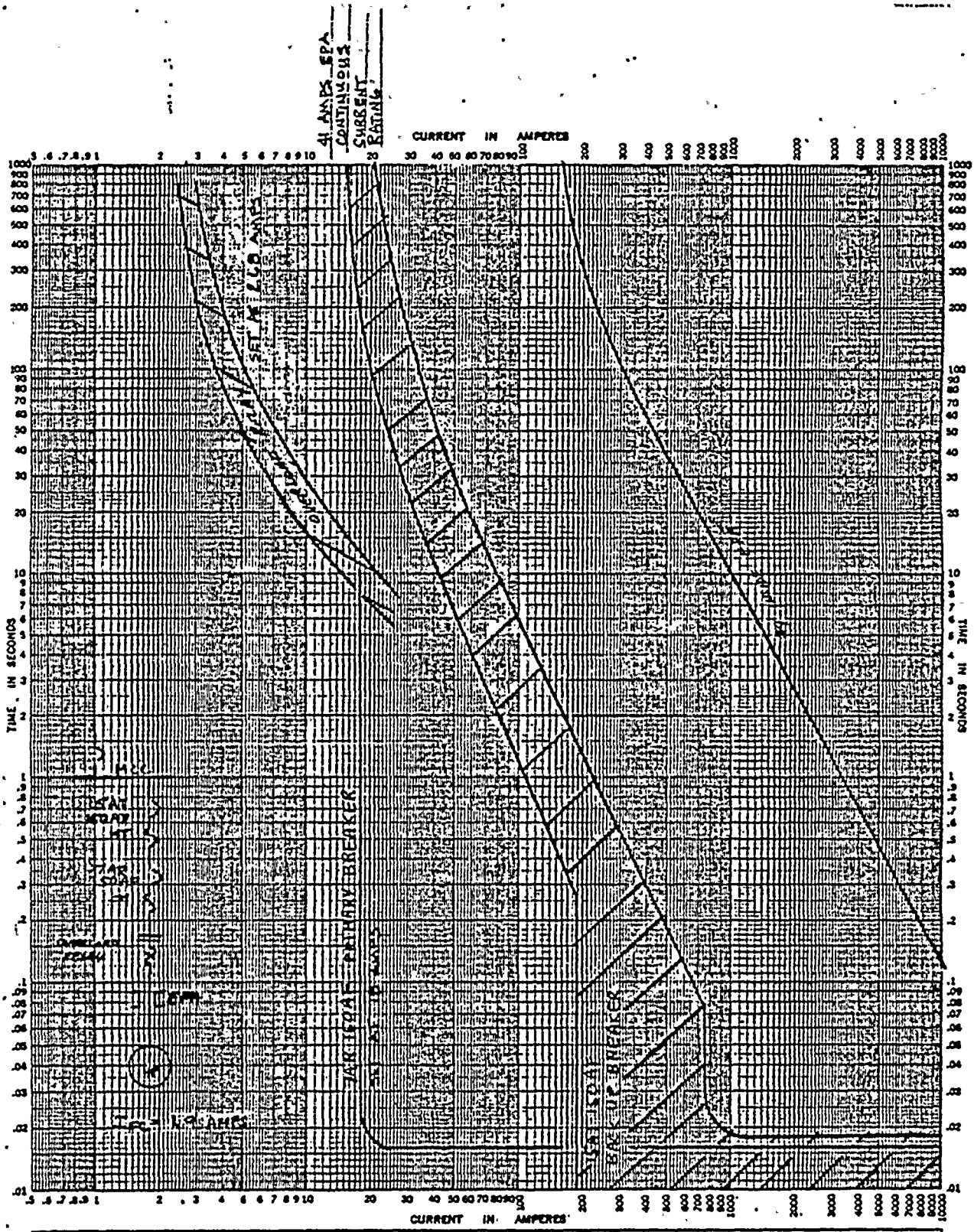
Date _____

K-E TIME-CURRENT CHARACTERISTIC KEUFFEL & ESSER CO. 46 5356

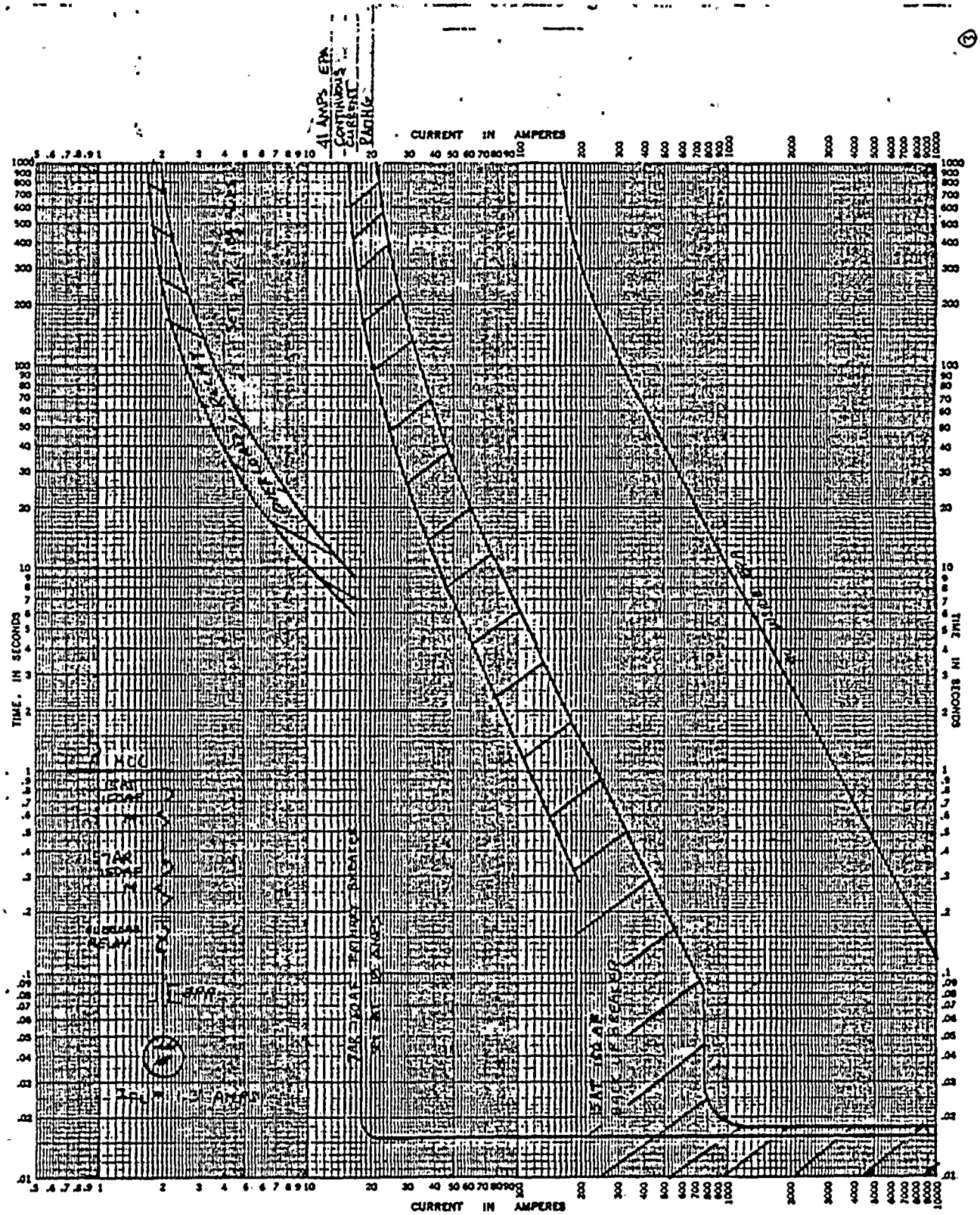
PROTECTION CURVES FOR 2.6 HP CLASS IE MOTOR WITH ISAT BACK UP BREAKER AND TAR PRIMARY BREAKER



PROTECTION CURVES FOR 2 HP CLASS 1E MOTOR WITH 1S AT BACKUP BREAKER AND 7AR PRIMARY BREAKER

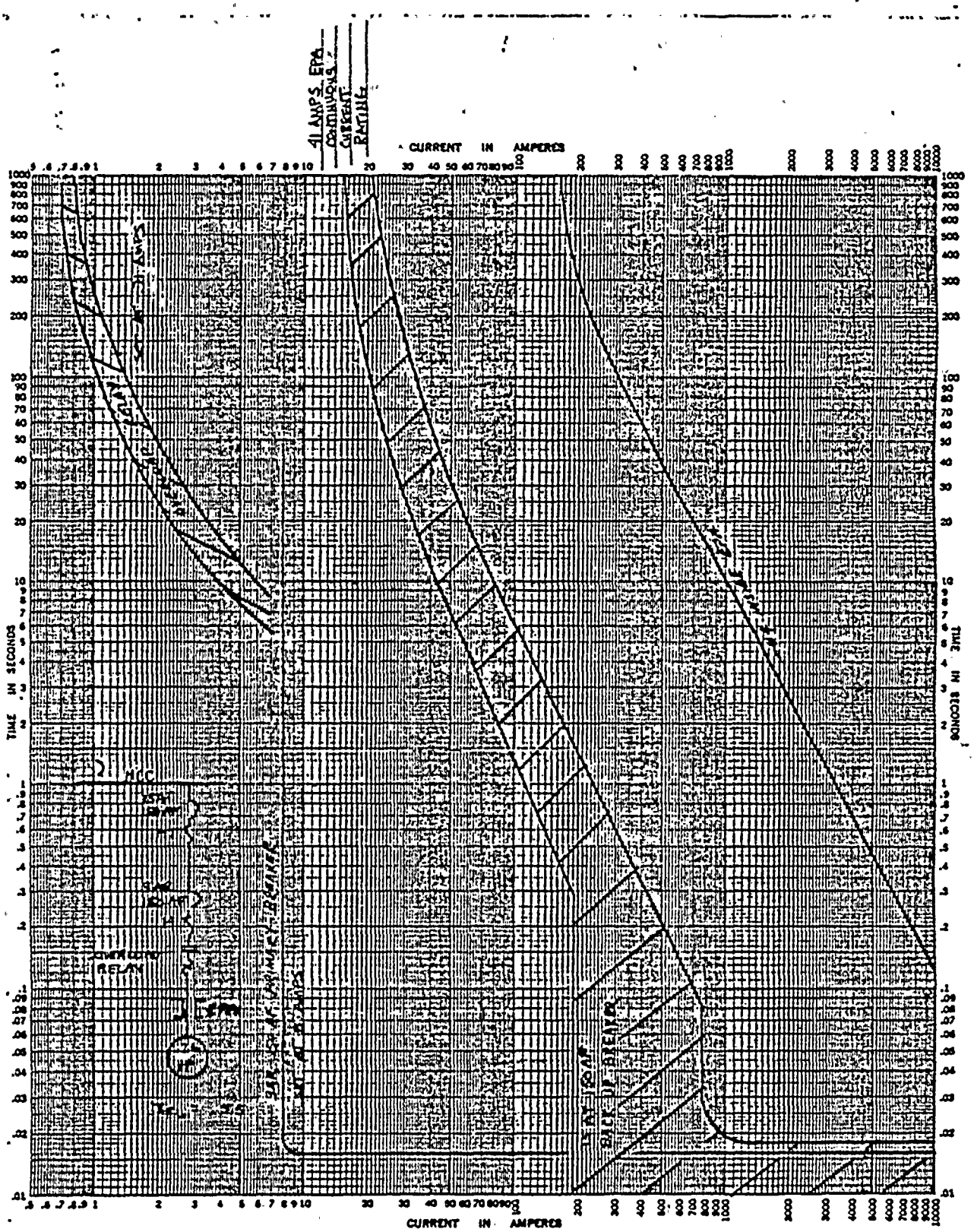


K-E TIME-CURRENT CHARACTERISTIC KEUFFEL & ESSER CO. 48 5258 PROTECTION CURVE FOR 1 HP CLASS 1E MOTOR WITH IS AT BACK UP BREAKER AND 7AR PRIMARY BREAKER



K-E TIME-CURRENT CHARACTERISTIC KEUFFEL & ESSER CO. 48 5258

PROTECTION CURVES FOR .66 HP CLASS 1E MOTOR WITH 1SAT BACK UP BREAKER AND 7AR--PRIMARY BREAKER



TIME-CURRENT CHARACTERISTIC CURVES

For _____ Fuse Links. In _____

BASIS FOR DATA: Standards _____ Dated _____

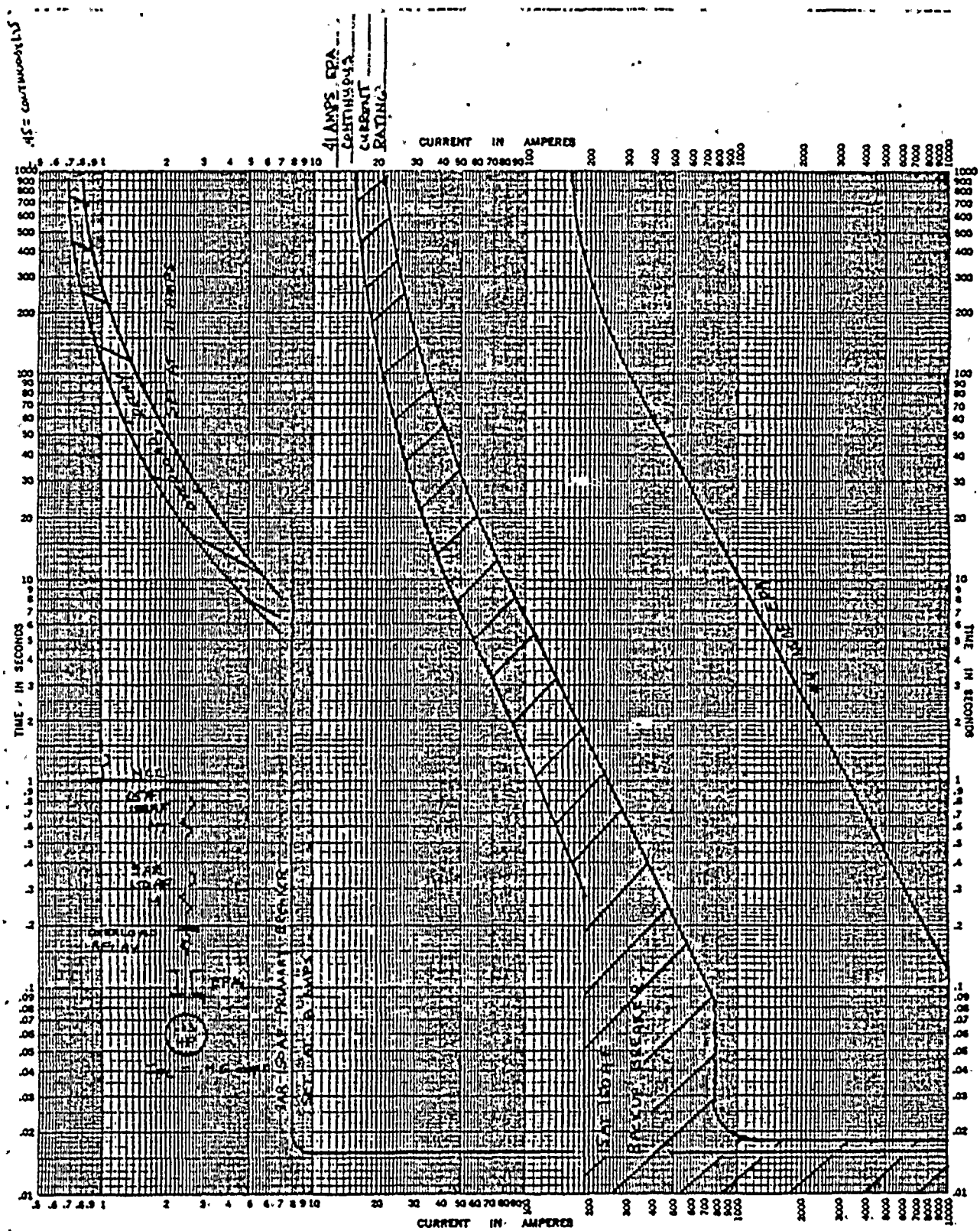
1. Tests made at _____ Volts a-c at _____ p-f., starting at 25C with no initial load _____

2. Curves are plotted to _____ Test points as variations should be _____

No. _____

Date _____

K-E TIME-CURRENT CHARACTERISTIC 48-3258 PROTECTION CURVES FOR .26 HP CLASS 1E MOTOR WITH ISAT BACK UP BREAKER AND 3 AR PRIMARY BREAKER



TIME-CURRENT CHARACTERISTIC CURVES

For _____ Fuse Units, In _____

BASIS FOR DATA Standards _____ Dated _____

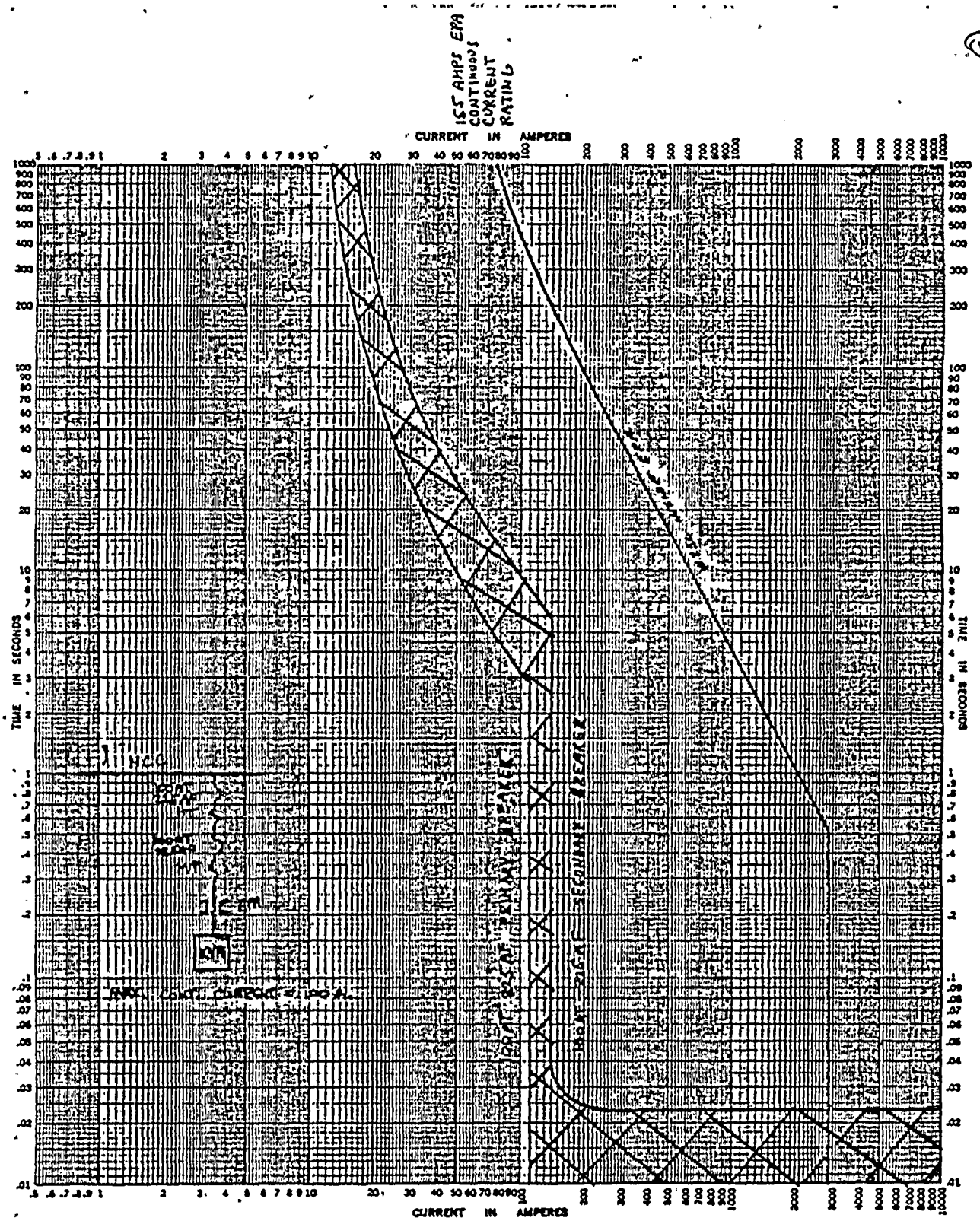
1. Tests made at _____ Volts a-c at _____ p-f., starting at 25C with no initial load _____

2. Curves are plotted to _____ Test points so variations should be _____

No. _____

Date _____

K·E TIME-CURRENT CHARACTERISTIC HELIPOT & GRAS CO. 46 8288- PROTECTION— CURVE —FOR .13 HP CLASS 1E MOTOR WITH ISAT BACK UP BREAKER AND TAR PRIMARY BREAKER.



TIME-CURRENT CHARACTERISTIC CURVES

For _____ Fuse Links. In _____

BASIS FOR DATA Standards _____ Dated _____

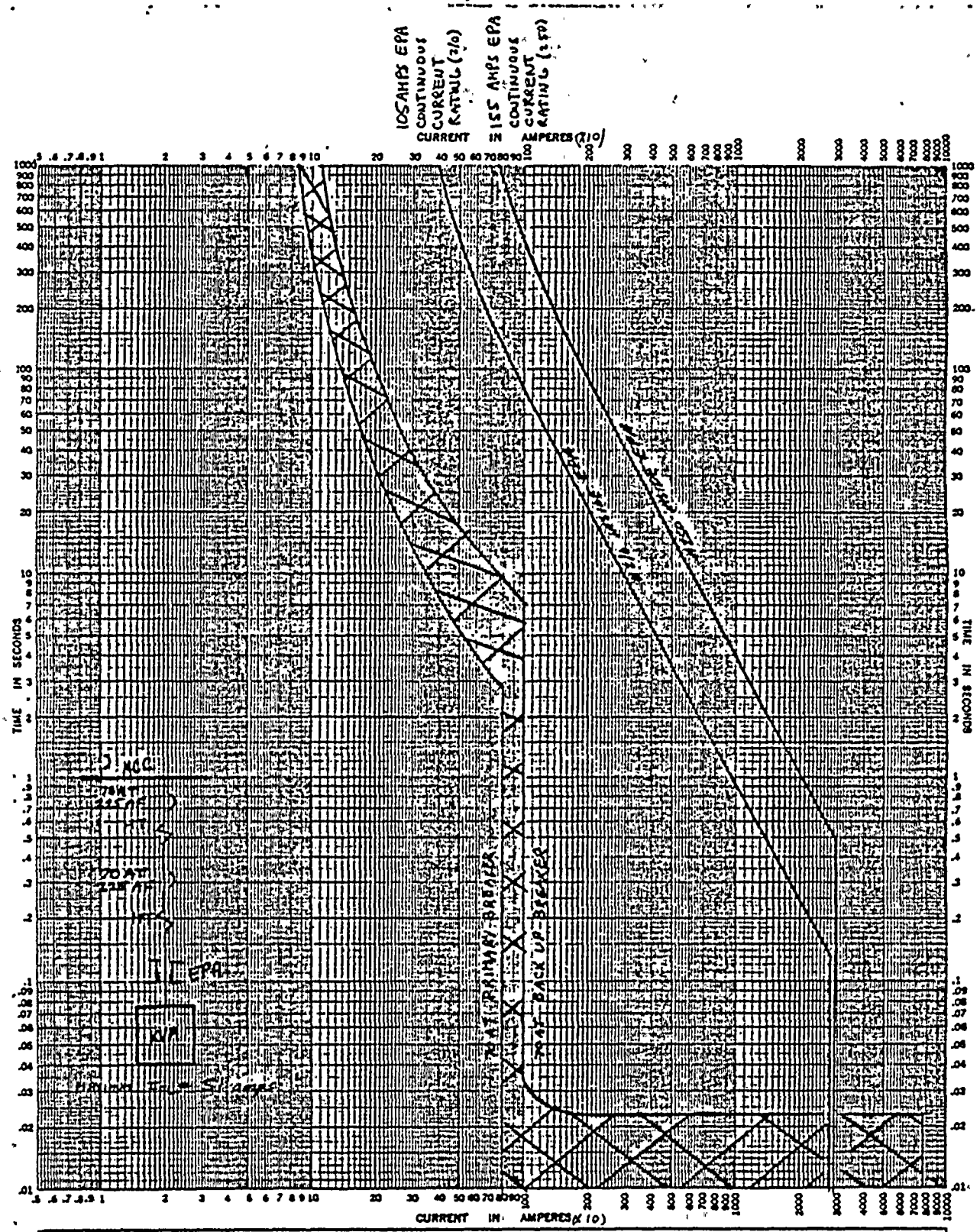
1. Tests made at _____ Volts a-c at _____ p-f., starting at 25C with no initial load _____
2. Curves are plotted to _____ Test points as variations should be _____

No. _____

Date _____

K&E TIME-CURRENT CHARACTERISTIC KEUFFEL & ESSER CO. 46 5288

PROTECTION CURVES FOR PACAGE LOAD UP TO 50KVA AND WELDING RECEPTACLES WITH 100AT BACKUP AND PRIMARY BREAKERS

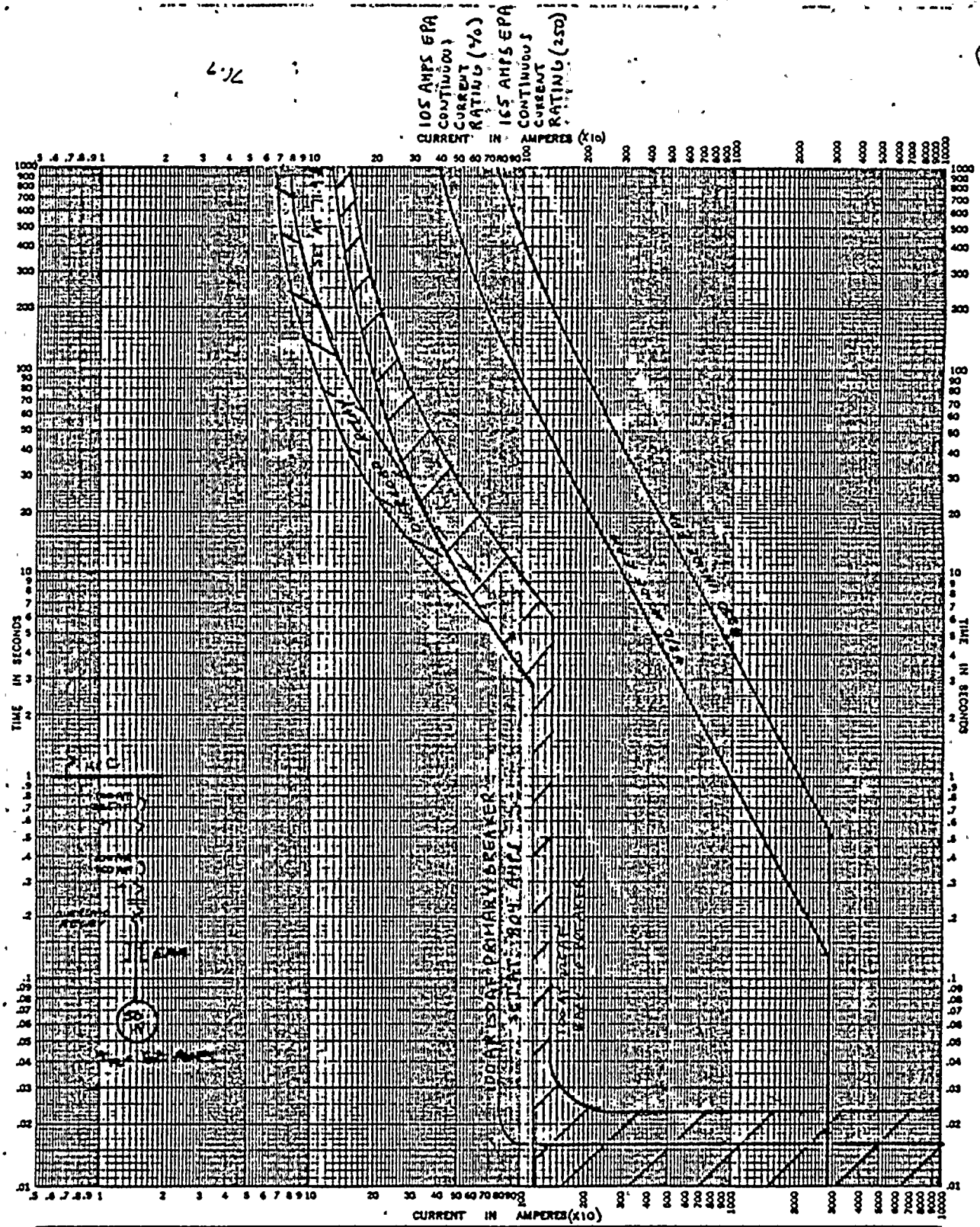


K·E TIME-CURRENT CHARACTERISTIC 46 3238

PROTECTION CURVES FOR PACKAGE LOADS UP TO 41 KVA WITH BACK UP AND PRIMARY BREAKS OF 70AT (DIFFERENT LOADS WITH SAME BREAKERS SIZES HAVE DIFFERENT SIZE CABLES INSIDE EPA)

7.7

(15)



TIME-CURRENT CHARACTERISTIC CURVES

For _____ Fuse Units. In _____

BASIS FOR DATA Standards _____ Dated _____

1. Tests made at _____ Volts a-c at _____ p.f., starting at 25C with no initial load _____

2. Curves are plotted to _____ Test points as variations should be _____

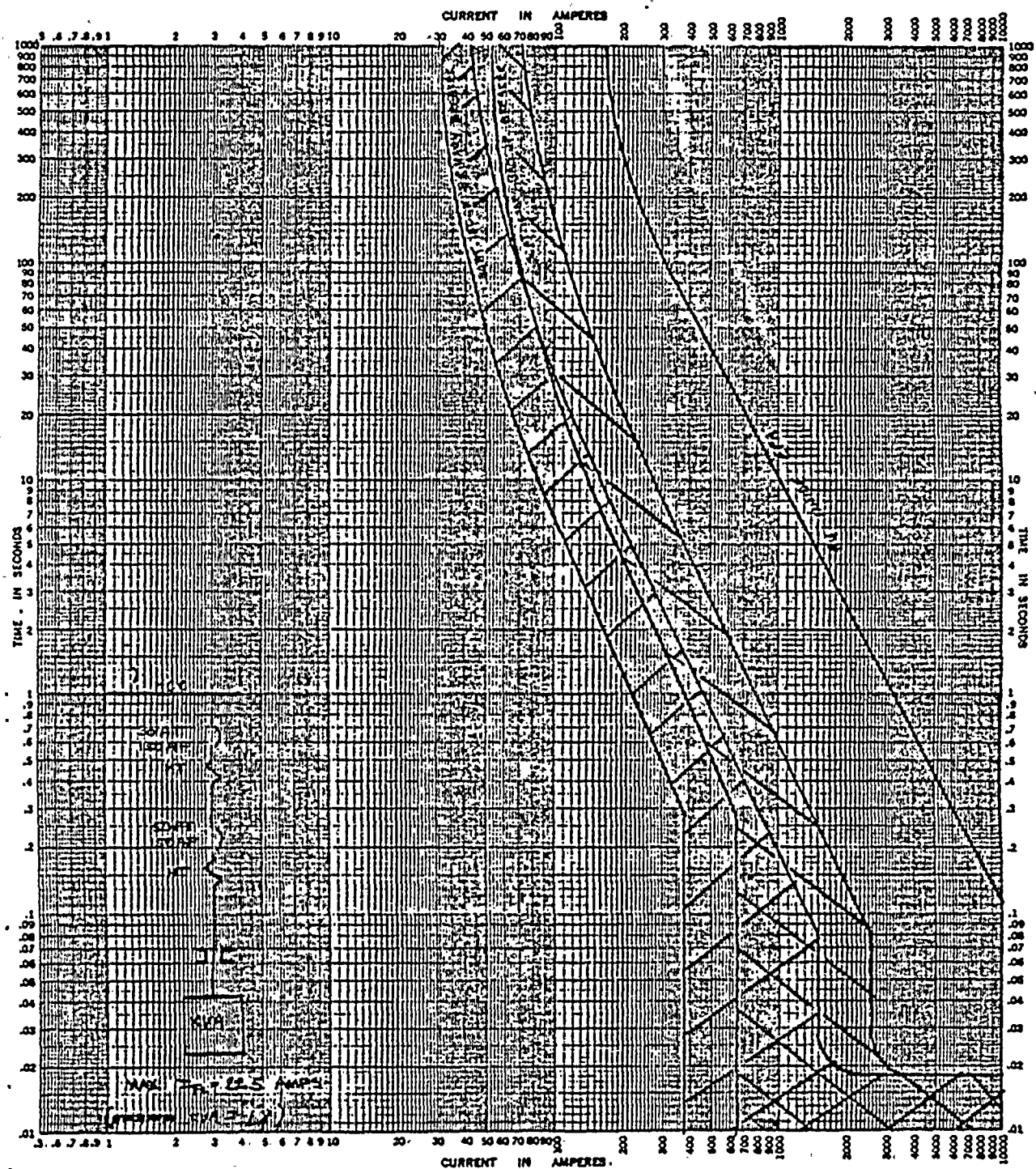
No. _____

Date _____

K·E TIME-CURRENT CHARACTERISTIC KEUFFEL & ESSER CO. 46 5258

PROTECTION CURVES FOR 50 HP NON CLASS IE MOTOR WITH 100AT 225AF BACK UP BREAKER AND 100AT 225AF PRIMARY BREAKER

41 AMPS EPA CONTINUOUS CURRENT RATING



TIME-CURRENT CHARACTERISTIC CURVES.

For _____ Fuse Links, In _____

SAE3 FOR DATA Standards _____ Dated _____

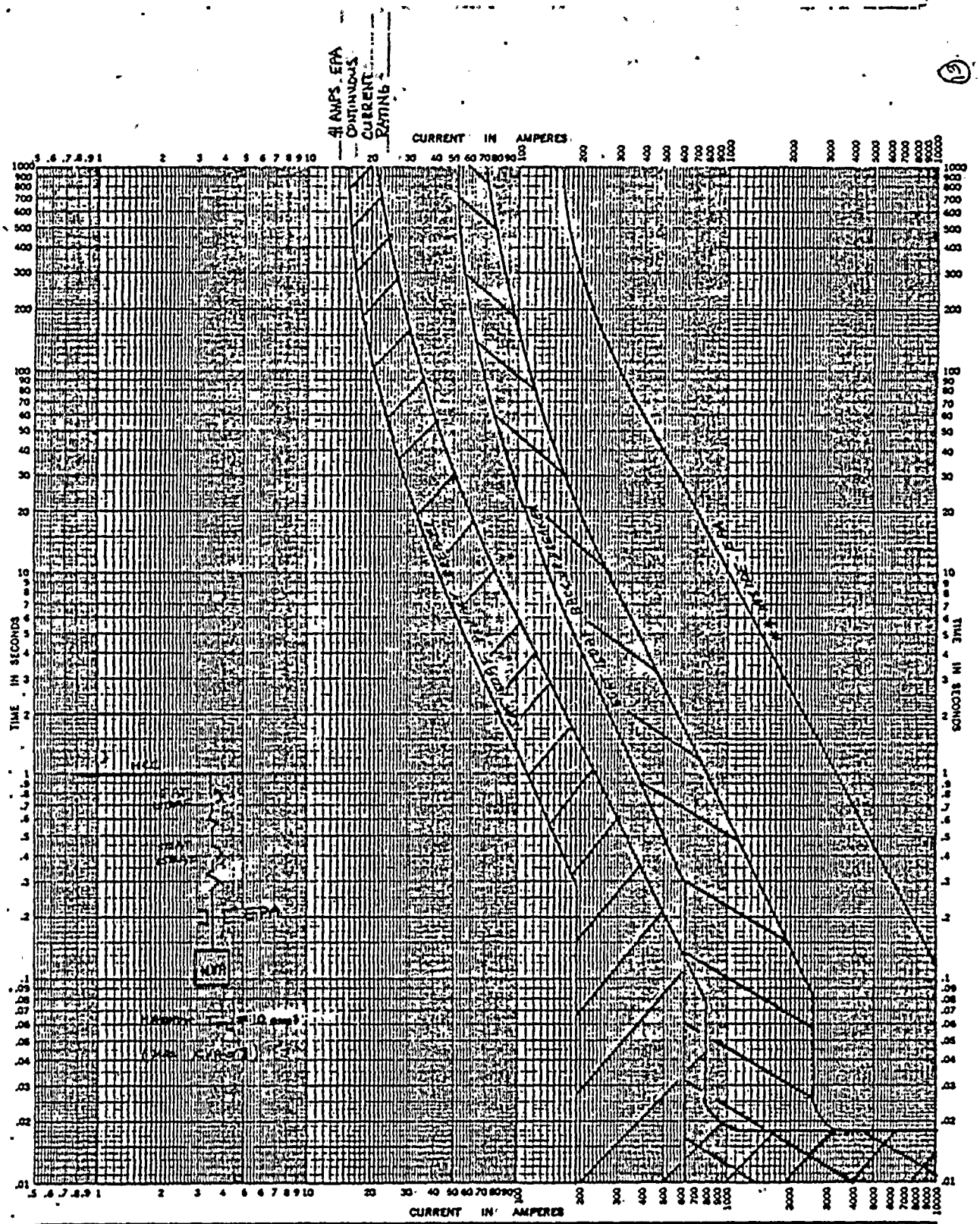
1. Tests made at _____ Volts a-c at _____ p-f., starting at 25C with no initial load _____

2. Curves are plotted to _____ Test points as variations should be _____

No. _____

Date _____

K·E TIME-CURRENT CHARACTERISTIC. 48 5288 PROTECTION CURVES FOR PACKAGE LOADS UP TO 18 KVA WITH 50 AT BACK UP BREAKER AND 30 AT PRIMARY BREAKER



TIME-CURRENT CHARACTERISTIC CURVES

For _____ Fuse Links, In _____

BASIS FOR DATA Standards _____ Detail _____

1. Tests made at _____ Volts and at _____ p-f., starting at 25C with no initial load _____

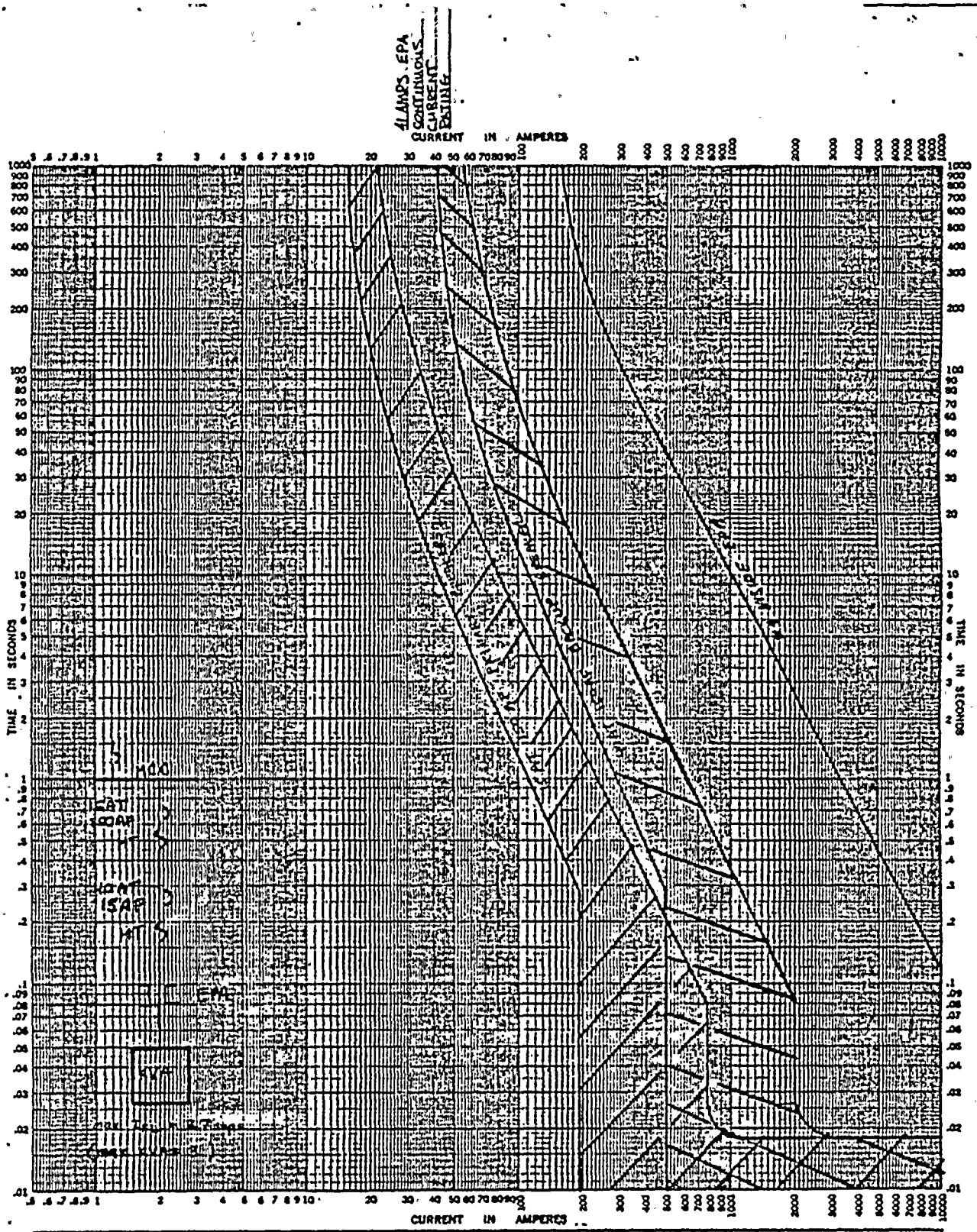
2. Curves are plotted to _____ Test points or variations should be _____

No. _____

Date _____

K·E TIME-CURRENT CHARACTERISTIC 46 8256

PROTECTION CURVES FOR PACKAGE LOADS UP TO 8KVA MAXIMUM WITH 50 AT BACK UP BREAKER AND 15 AT PRIMARY BREAKER



TIME-CURRENT CHARACTERISTIC CURVES

For _____ Fuse Links. In _____

BASIS FOR DATA: Standards _____ Dated _____

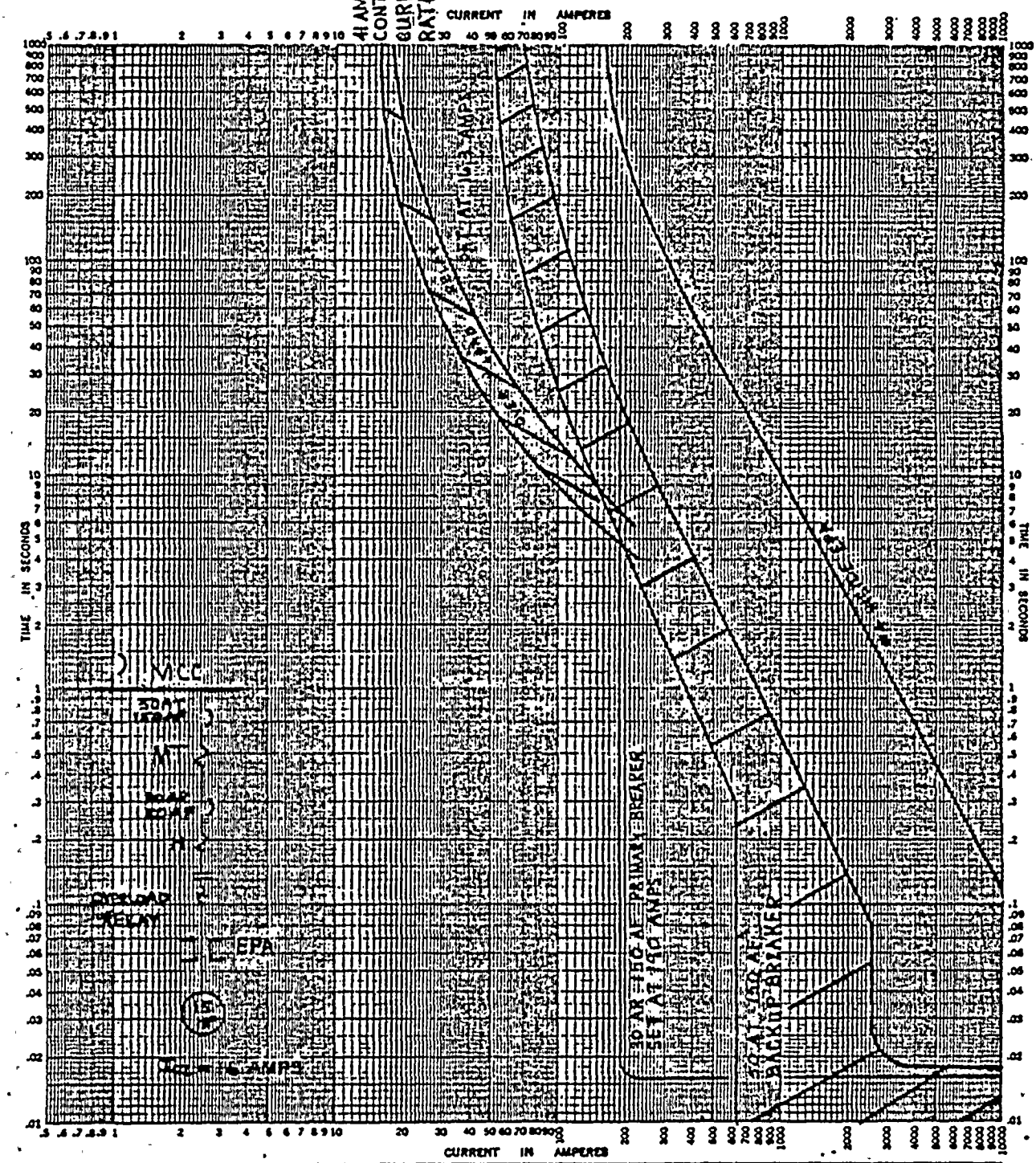
1. Tests made at _____ Volts a-c at _____ p-f., starting at 25C with no initial load _____

2. Curves are plotted to _____ Test points as variations should be _____

No. _____

Date _____

K-E TIME-CURRENT CHARACTERISTIC 46-3258 PROTECTION CURVE FOR PACKAGE LOADS UP TO 3 KVA MAXIMUM WITH 40 AT BACK UP BREAKER AND 15 AT PRIMARY BREAKER.



_____ TIME-CURRENT CHARACTERISTIC CURVES

For _____ Fuse Links, In _____

BASIS FOR DATA Standards _____ Dated _____

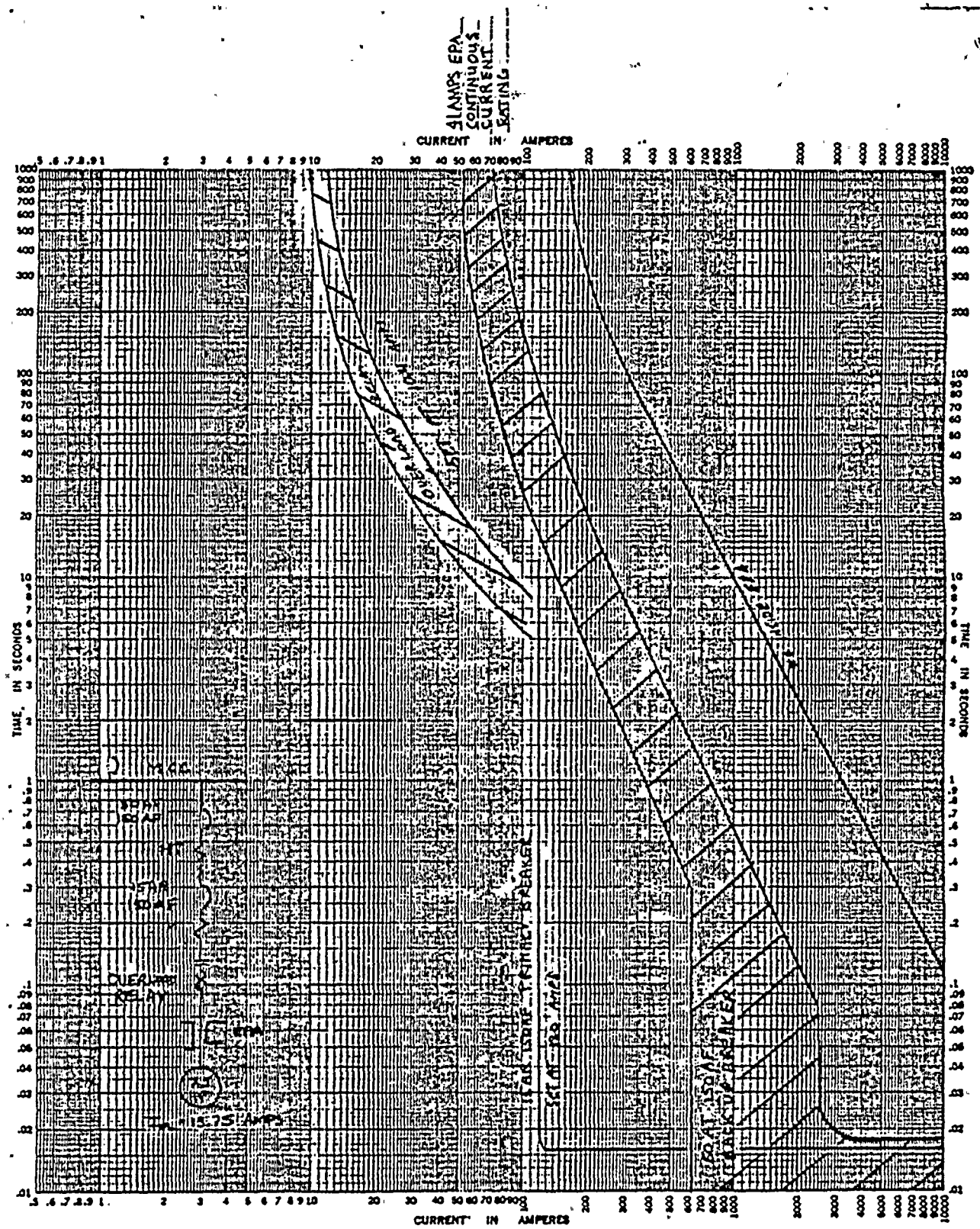
1. Tests made at _____ Volts a-c at _____ p-/-, starting at 25C with no initial load _____

2. Curves are plotted to _____ Test points as variations should be _____

No. _____

Date _____

K&E TIME-CURRENT CHARACTERISTIC 46-5258-



TIME-CURRENT CHARACTERISTIC CURVES

For _____ Fuse Links, Ia _____

BASIS FOR DATA Standards _____ Dated _____

1. Tests made at _____ Volts a-c at _____ p-f., starting at 25C with no initial load _____

2. Curves are plotted to _____ Test points as variations should be _____

No. _____

Date _____

K·E TIME-CURRENT CHARACTERISTIC 48-5258

PROTECTION CURVES FOR 7½ HP NON-CASS 1E MOTOR WITH SQAT BACK UP BREAKER AND .15AK PRIMARY BREAKER

TIME-CURRENT CHARACTERISTIC CURVES

For _____ Fuse Links. In _____

BASIS FOR DATA Standards _____ Dated _____

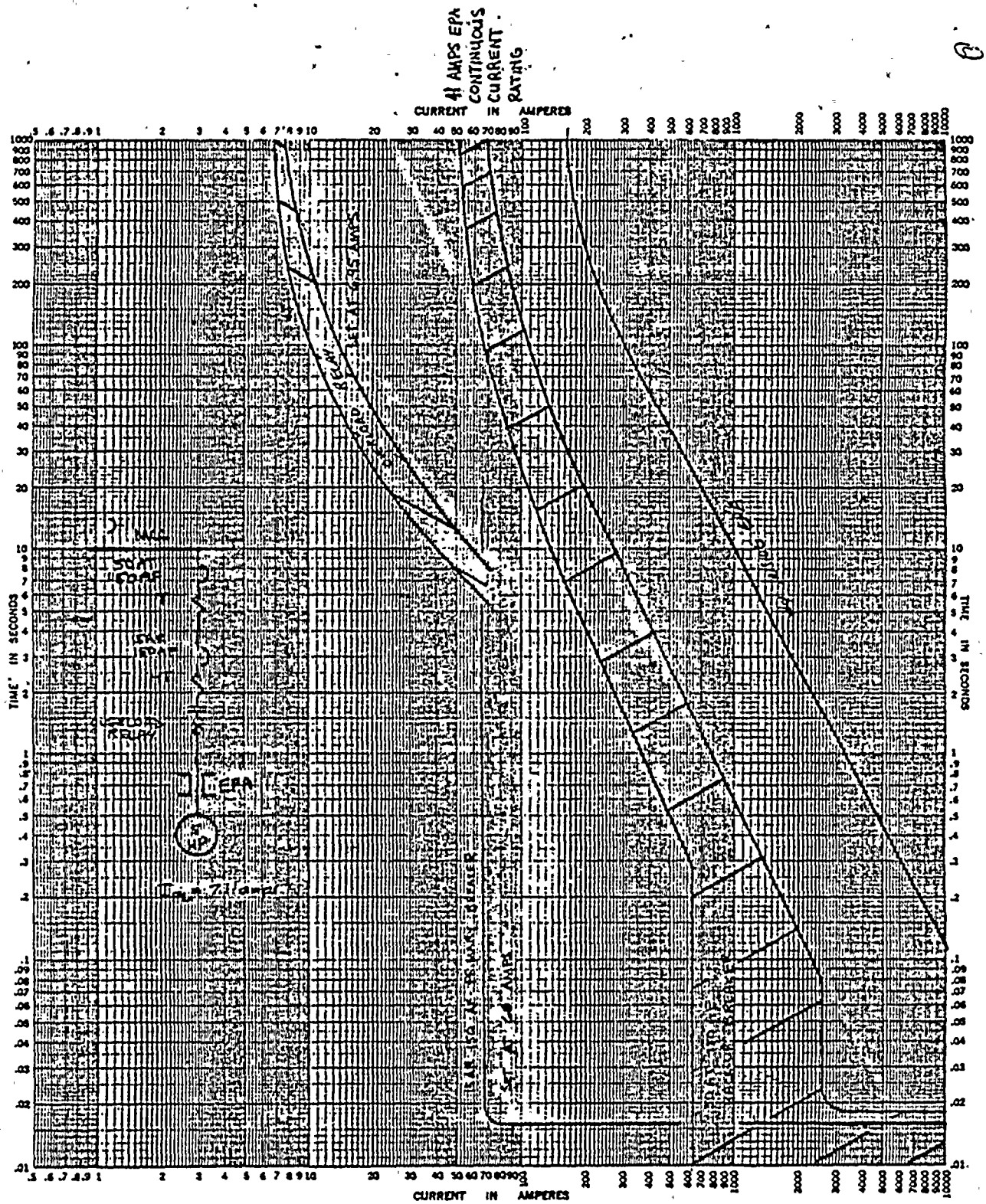
1. Tests made at _____ Volts a-c at _____ p-f., starting at 25C with no initial load _____

2. Curves are plotted to _____ Test points so variations should be _____

No. _____

Date _____

K·E. TIME-CURRENT CHARACTERISTIC 46 5268 PROTECTION CURVES FOR 7½HP NON-CLASS 1E MOTOR WITH 40AT BACK UP BREAKER AND 1SAR PRIMARY BREAKER



TIME-CURRENT CHARACTERISTIC CURVES

For _____ Fuse Links. In _____

BASIS FOR DATA Standards _____ Dated _____

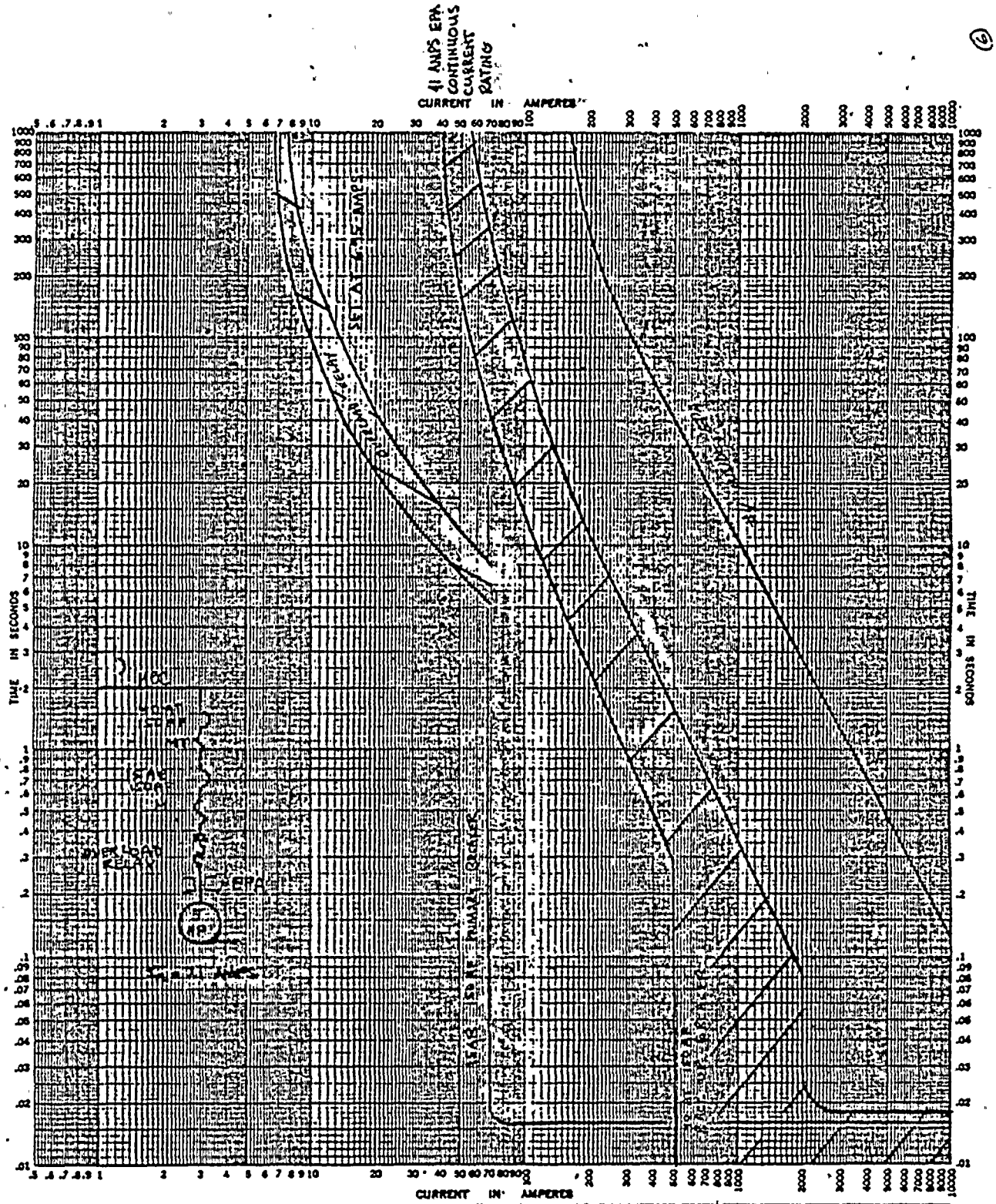
1. Tests made at _____ Volts a-c at _____ p-f., starting at 25C with no initial load _____
2. Curves are plotted to _____ Test points so variations should be _____

No. _____

Date _____

K·E TIME-CURRENT CHARACTERISTIC KEUFFEL & ESSER CO. 46 5258

PROTECTION CURVES FOR 5HP NON-CLASS I E MOTOR WITH SOAT BACK UP BREAKER AND ISAR PRIMARY BREAKER



TIME-CURRENT CHARACTERISTIC CURVES

For _____ Fuse Links, In _____

BASIS FOR DATA Standards _____ Dated _____

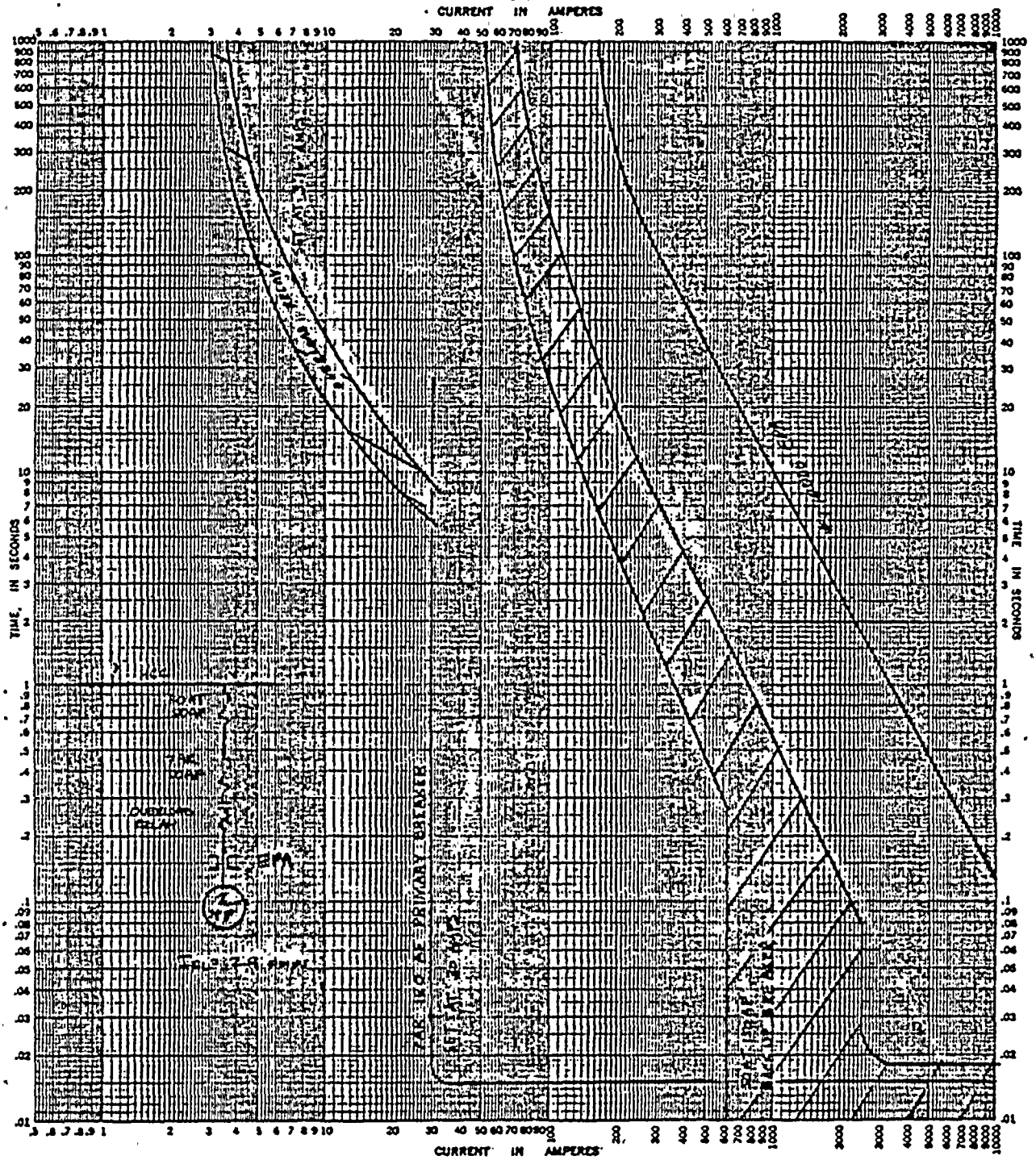
1. Tests made at _____ Volts a-c at _____ p-f., starting at 25C with no initial load _____
2. Curves are plotted to _____ Test points so variations should be _____

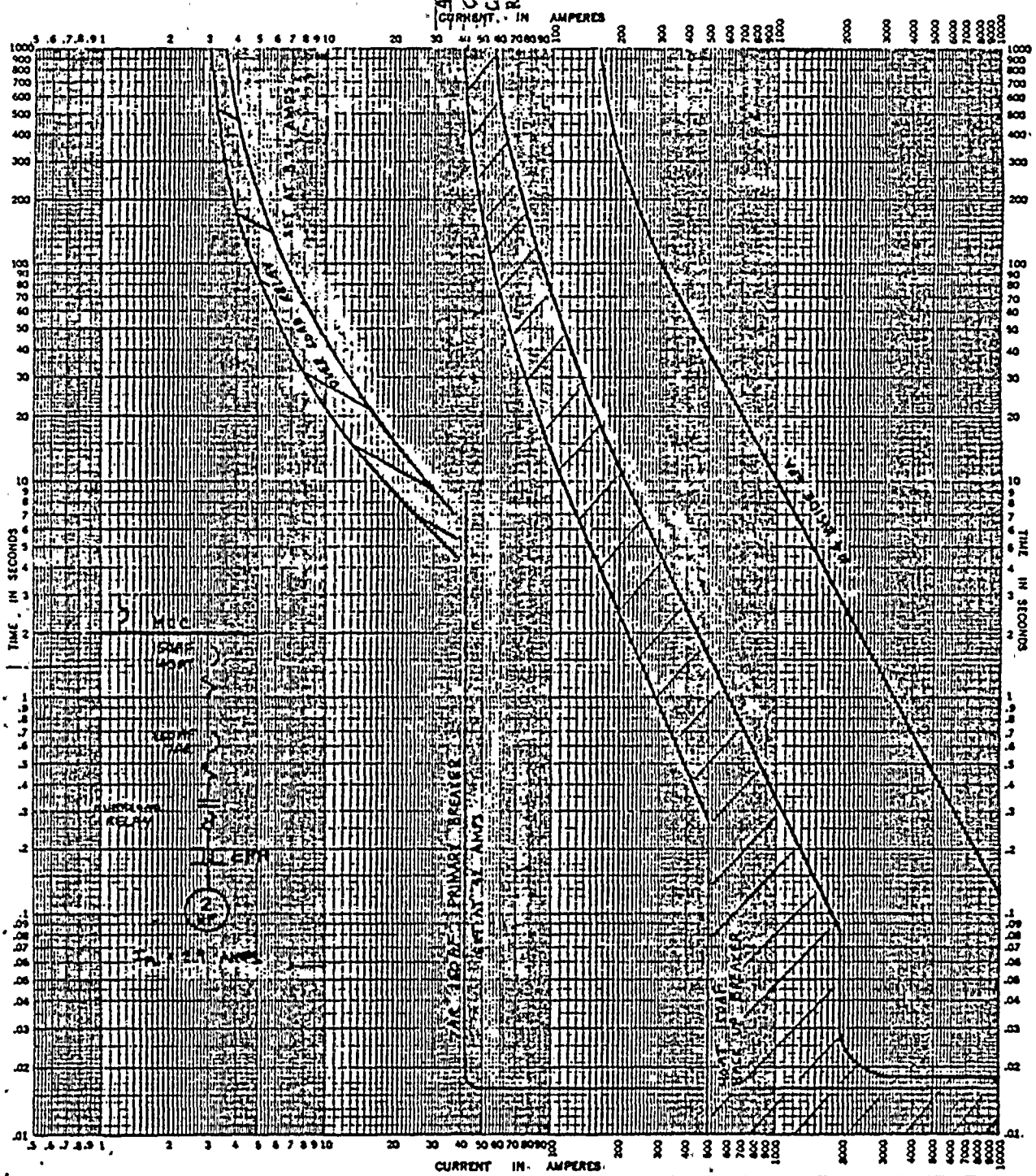
No. _____

Date _____

K&E. TIME-CURRENT CHARACTERISTIC 46 5258

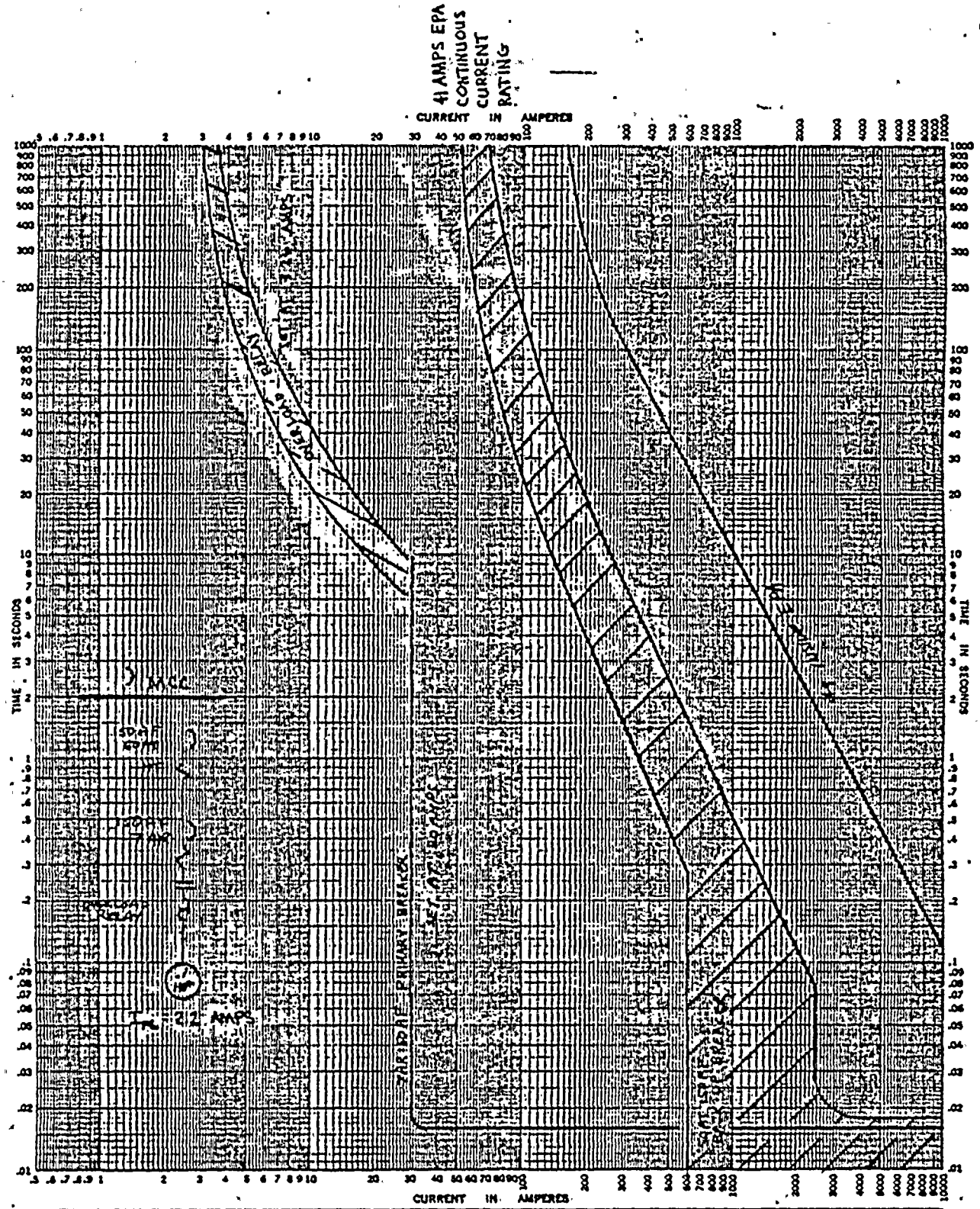
PROTECTION CURVES FOR 5HP NON-CLASS1E MOTOR WITH 40AT BACK UP BREAKER AND ISAR PRIMARY BREAKER


41 AMPS EPA CONTINUOUS CURRENT RATING
CURRENT IN AMPERES
TIME IN SECONDS
TIME, IN SECONDS
CURRENT IN AMPERES
FOR TWO AC PRIMARY BREAKER
OVERLOAD RELAY
TIME-CURRENT CHARACTERISTIC CURVES
For
Fuse Links. In
BASIS FOR DATA Standards
Dated
1. Tests made at
Volts a-c at
p-f., starting at 25C with no initial load
2. Curves are plotted to
Test points ad variations should be
No.
Date
K•Σ TIME-CURRENT CHARACTERISTIC
48 5256



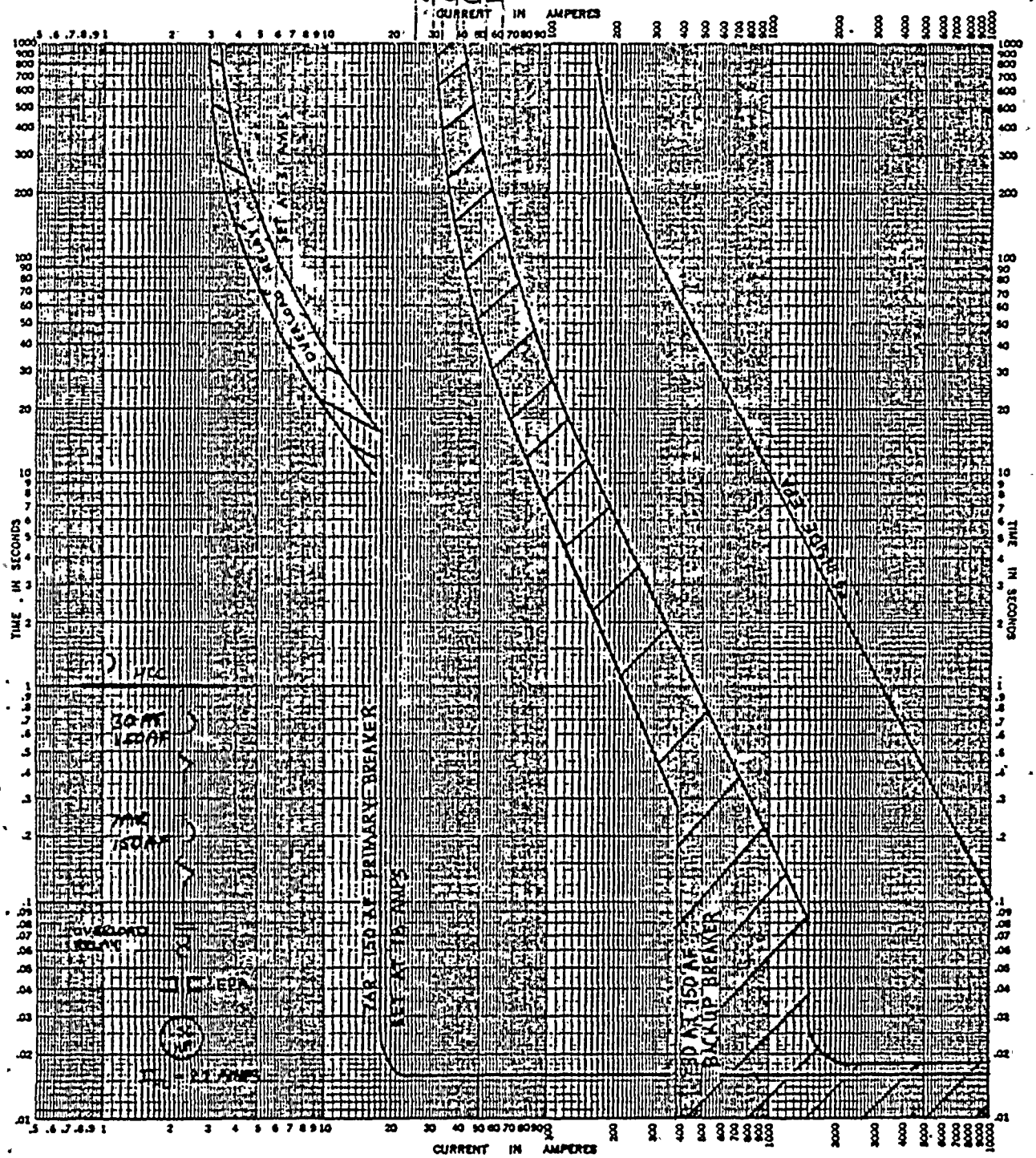
K-E TIME-CURRENT CHARACTERISTIC KEUFFEL & ESSER CO. MADE IN U.S.A. 46-5258

PROTECTION CURVES FOR 2 HP NON-CLASS 1E MOTORS WITH 40 AT BACK UP BREAKER AND 70AT PRIMARY BREAKER



K·E TIME-CURRENT CHARACTERISTIC 46 5258

PROTECTION CURVES FOR .7 HP NON CLASS 1E MOTOR WITH SD AT BACK UP BREAKER AND 7AK PRIMARY BREAKER



TIME-CURRENT CHARACTERISTIC CURVES

For _____ Fuse Links. In _____

BASIS FOR DATA Standards _____ Dated _____

1. Tests made at _____ Volts a-c at _____ p-f., starting at 25C with no initial load _____

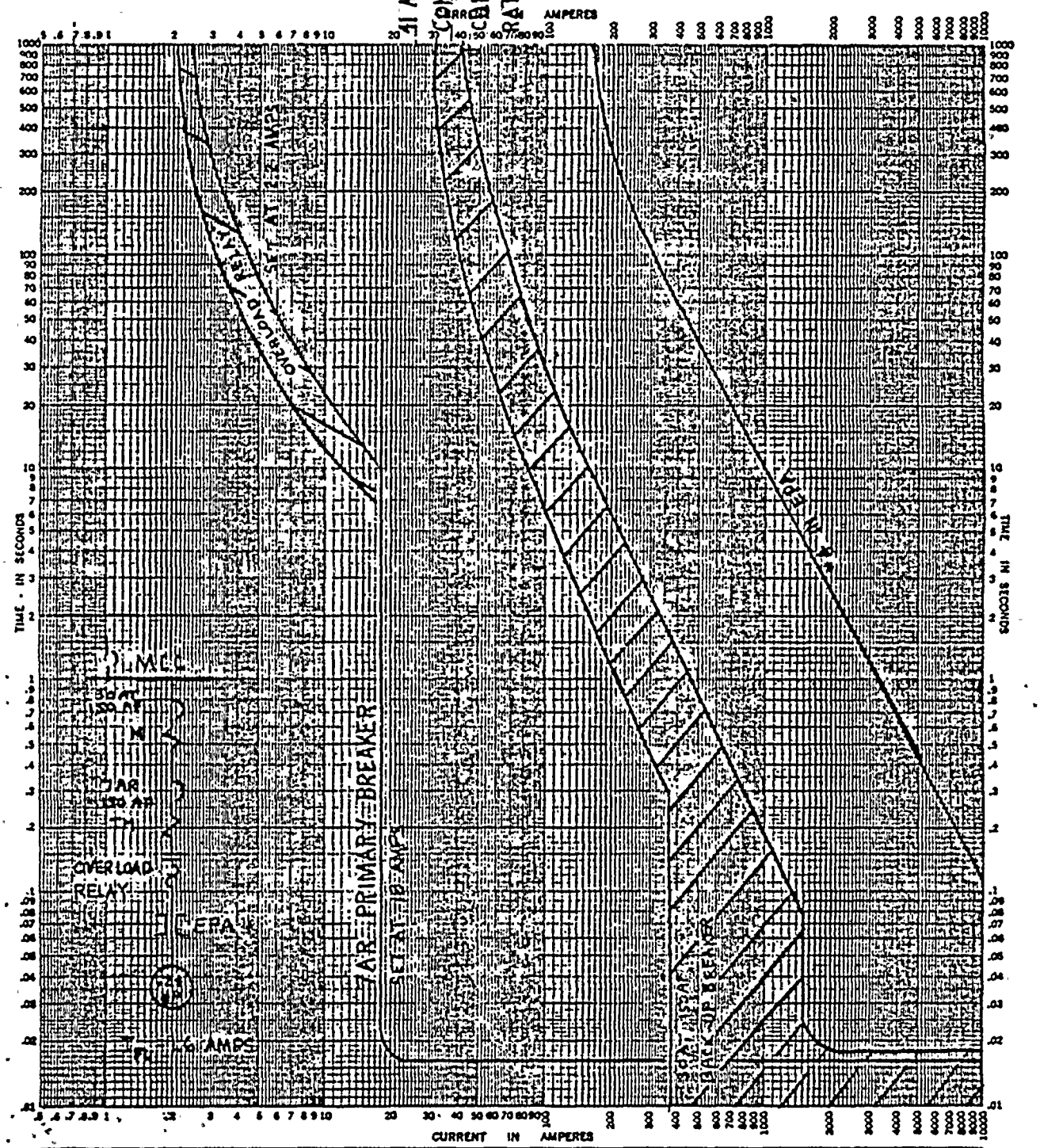
2. Curves are plotted to _____ Test points as variations should be _____

No. _____

Date _____

K·E TIME-CURRENT CHARACTERISTIC KEUFFEL & ESSER CO. 46 5258

PROTECTION CURVES FOR .36 HP NON CLASSIE MOTOR WITH 30AT BACK UP BREAKER AND 7AR PRIMARY BREAKER



TIME-CURRENT CHARACTERISTIC CURVES

For _____ Fuse Links, In _____

BASIS FOR DATA Standards _____ Dated _____

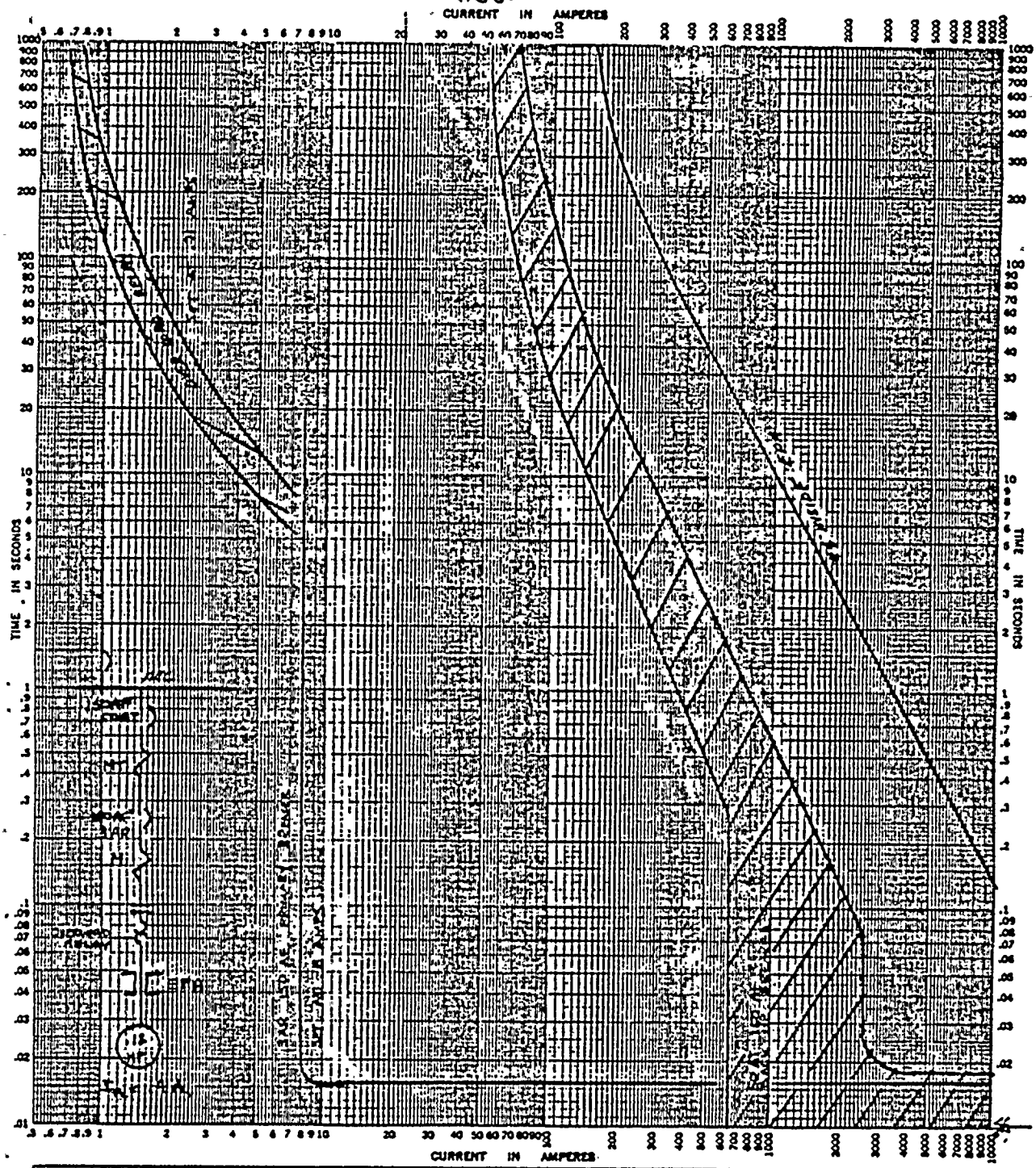
1. Tests made at _____ Volts a-c at _____ p-f., starting at 25C with no initial load _____
2. Curves are plotted to _____ Test points as variations should be _____

No. _____

Date _____

K•E TIME-CURRENT CHARACTERISTIC KEUFFEL & ESSER CO. 46 5358

PROTECTION CURVES FOR NON CLASS 1E .24 HP MOTOR WITH 30AT1SDAF BACK UP BREAKER AND 7AR1SDAF PRIMARY BREAKER



______________________________TIME-CURRENT CHARACTERISTIC CURVES

For______________________________Fuse Links. In______________________________

BASIS FOR DATA Standards______________________________Dated______________________________

1. Tests made at______________Volts a-c at______________p-f., starting at 25C with no initial load______________

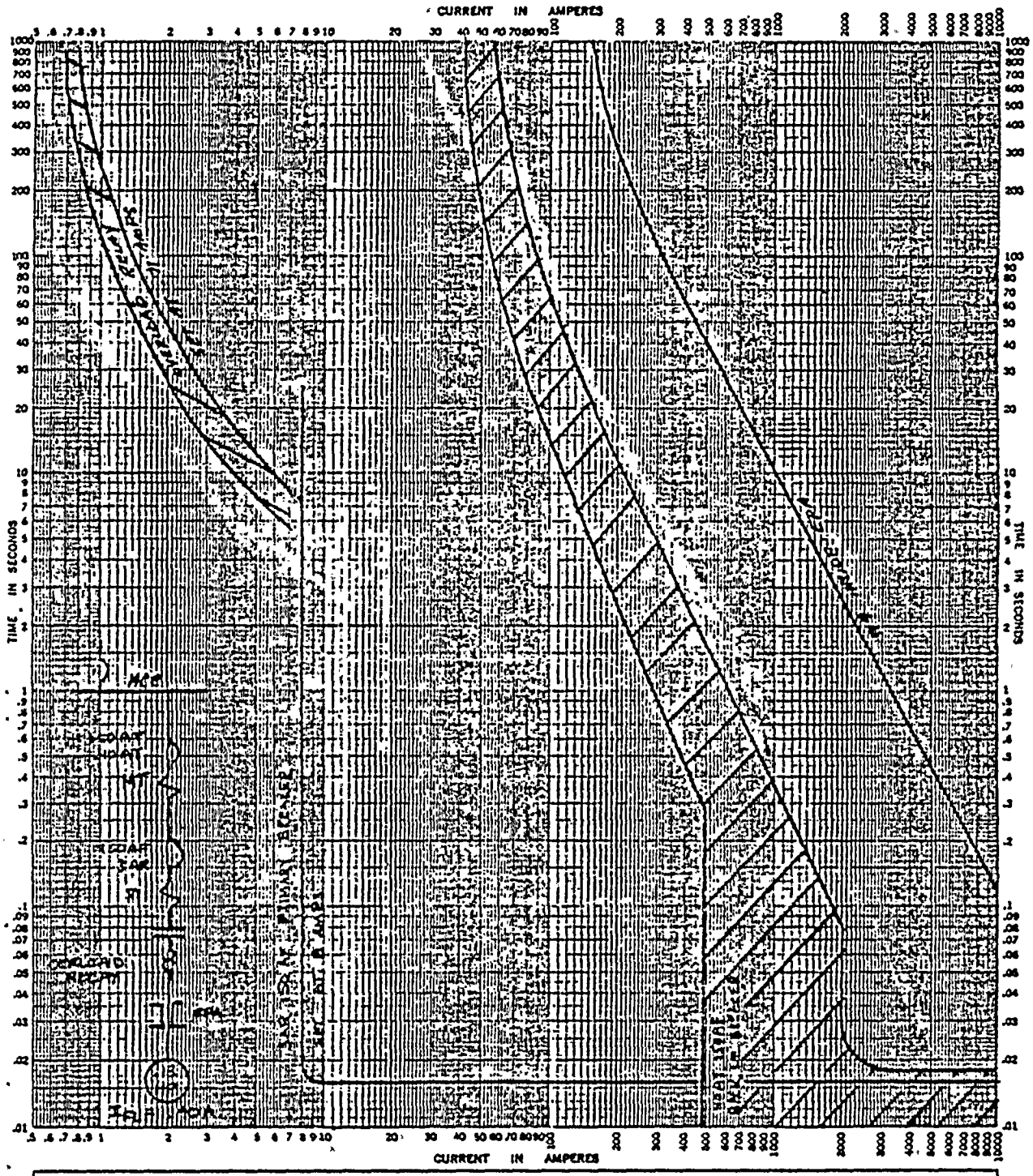
2. Curves are plotted to______________Test points as variations should be______________

No.______________

Date______________

K•E TIME-CURRENT CHARACTERISTIC 46 5258
KEUFFEL & ESSER CO. MADE IN U.S.A.

PROTECTION CURVES FOR NON CLASS IE .13 HP MOTOR WITH 50 AT BACK UP BREAKER AND 3AR PRIMARY BREAKER



TIME-CURRENT CHARACTERISTIC CURVES

For _____ Fuse Links. In _____

BASIS FOR DATA Standards _____ Dated _____

1. Tests made at _____ Volts a-c at _____ p-f., starting at 25C with no initial load _____

2. Curves are plotted to _____ Test points as variations should be _____

No. _____

Date _____

K•E TIME-CURRENT CHARACTERISTIC KEUFFEL & ESSER CO. MADE IN U.S.A. 46 5258

PROTECTION CURVES FOR NON-CLASS 1E .13 HP MOTOR WITH 40 AT BACK UP BREAKER AND 7AR PRIMARY BREAKER