Page 1 of 1

REFERENCE: SO123 VI-1.0
SO123 VI-1.1

ENCODE: AC10AC
SO______
(When form filled out)

TEMPORARY CHANGE NOTICE

***NOTE:** Technical Specification Violation if not processed within the stated time limits.*

Procedure No. 5023-II-3.3 Revision No. 1 TCN No. 9

Procedure Title PPS Response Time Testing for Channel C

Procedure Author ______ PAX ______ (If known, Writer) ______ PAX ______

1. The following change shall be in effect. Attach a copy of the effected page(s), if applicable on attachment 8.1 page 10 & 11, show the following at the bottom of the page.

Contaimment Press High CCW Valve ≤ 21.0 sec (Unit 3), ≤ 20.9 sec (Unit 2) Note 4a

Contaimment Press High CCW Valves ≤ 23.0 sec* Unit 2+3 - Note 4b

RECEIVED
FEB 3 1983
CDM SITE

2. Reason

Correct omission on TCN 8

SITE FILE COPY

3. Date originated 1-27-83
4. Issuance Date JAN 28 1983 CDM (For CDM Use Only)
5. Does this change affect FSAR or Tech. Spec. commitments? *Yes* ___ *No* ✓
6. Does this change affect the nonradiological environment of any offsite area previously undisturbed during site preparation and plant construction? *Yes* ___ *No* ✓
7. Is the intent of the original document altered? *Yes* ___ *No* ✓
8. Is the document to be changed an Emergency and Abnormal Operating Instruction? *Yes* ___ *No* ✓

(If the answer to 5, 6, 7 or 8 is YES, a TCN is NOT Authorized.)

9. Does this change affect licensing commitment requirements as stated in the Reference Section? *Yes* ___ *No* ✓
10. Originator RL Clift 1-27-83 1550 (DATE / TIME)
11. Is the TCN to be incorporated into next permanent revision within 60 days of issuance date? *Yes* ✓ *No** ___

** One time change only against Procedure/Station Order No.* ______ *Rev. No.* ______

12. Copy sent to the Nuclear Safety Group M. Cuiton (CDM SIGNATURE) 2-3-83 (DATE)
13. Signatures Required Approved by (at least one (1) SRO)

1) ______

2) ______

Final approval by ______

3) Brian Katz
COGNIZANT FUNCTIONAL STATION MANAGER

2-1-83
DATE — MUST BE WITHIN 14 DAYS

Approval must be by two members of the plant management staff at least one of whom holds an SRO license on the unit affected. (For TCN approval, members of the plant management staff are defined as any Station Supervisor, including the level of foreman, exercising responsibility in the specific area and unit addressed by the change.)

REFERENCE: SO123-VI-1.0
SO123-VI-1.1

Page 1 of 19

ENCODE: AC10AC
SO____
(When form filled out)

TEMPORARY CHANGE NOTICE

NOTE: Technical Specification Violation if not processed within the stated time limits.

Procedure No. SO23-II-3.3 Revision No. 1 TCN No. 8

Procedure Title PPS Response Time Test for Channel C

Procedure Author VM Rodriguez PAX 57-564 (If known, Writer) R. BIALECKI PAX 59276

1. The following change shall be in effect: Attach a copy of the effected page(s), if applicable
   see attached pages
2. Reason: correct errors and add missing steps
3. Date originated 1-17-83
4. Issuance Date JAN 17 1983 CDM (For CDM Use Only)
5. Does this change affect FSAR or Tech. Spec. commitments? *Yes* ___ *No* ✓
6. Does this change affect the nonradiological environment of any offsite area previously undisturbed during site preparation and plant construction? *Yes* ___ *No* ✓
7. Is the intent of the original document altered? *Yes* ___ *No* ✓
8. Is the document to be changed an Emergency and Abnormal Operating Instruction? *Yes* ___ *No* ✓
   (If the answer to 5, 6, 7 or 8 is YES, a TCN is NOT Authorized.)
9. Does this change affect licensing commitment requirements as stated in the Reference Section? *Yes* ___ *No* ✓
10. Originator VM Rodriguez VR 1-17-83 / 0800
    DATE / TIME
11. Is the TCN to be incorporated into next permanent revision within 60 days of issuance date? *Yes* ✓ *No** ___
    ** One time change only against Procedure/Station Order No.* ___ *Rev. No.* ___
12. Copy sent to the Nuclear Safety Group Laura Granado 1-24-83
    CDM SIGNATURE DATE
13. Signatures Required:

SITE FILE COPY

SO1 **(Series)

Approved by two OSRC members

1) ___

2) ___

Reviewed by entire Committee on: ** ___

DATE — MUST BE WITHIN 7 DAYS

RECEIVED
JAN 24 1983
CORP. DOC. MGMT.

SO2, SO3, or SO23 (Series)

Approved by: *** (at least one (1) SRO)

1) ___

2) ___

Final approval by

3) Brian Katz
COGNIZANT FUNCTIONAL STATION MANAGER

1-19-83
DATE — MUST BE WITHIN 14 DAYS

SO123 **(Series)

Approved by two OSRC members:

1) ___

2) ___

Reviewed by entire Committee on: ** ___

DATE — MUST BE WITHIN 7 DAYS

Approved by: *** (at least one (1) SRO)

1) ___

2) ___

Approved by:

3) ___
COGNIZANT FUNCTIONAL STATION MANAGER

___
DATE — MUST BE WITHIN 14 DAYS

** *SO1 and SO123 (series) TCNs will be routed to the OSRC with Routing Document SO(123) 109 which will be signed by the Station Manager.*

*** *Approval must be by two members of the plant management staff at least one of whom holds an SRO license on the unit affected. (For TCN approval, members of the plant management staff are defined as any Station Supervisor, including the level of foreman, exercising responsibility in the specific area and unit addressed by the change.)*

SCE SO(123) 110 REV. 3 08/06/82

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Procedure #SO23-II-3.3

TCN8 ~~TCN#9~~ R-1

add following steps:

6.24.27 Disconnect the "Bistable test" leads and replace the input simulator leads on the terminals they were removed from in step 6.24.2

Date / Technician

6.24.28 Reset all bistables.

Date / Technician

6.24.29 Record the largest response time value of steps 6.24.22, 6.24.25 and 6.24.26 in the Data Collection table

Date / Technician

(1)

DATA COLLECTION TABLE

3 of 19 ~~TCN# 7~~

TCN 8 ~~Page 3 of 16~~

STEP NO.	DESCRIPTION	VALUE	UNITS
6.2.12	PT-0101-3 High Pzr Press		
6.3.12	PT-0102-3 Low Pzr Press		
6.4.12	PT-1013-3 Low SG-1 Press		
6.5.12	PT-1023-3 Low SG-2 Press		
6.6.12	LT-1113-3 Low SG-1 Level		
6.7.12	LT-1123-3 Low SG-2 Level		
6.8.12	PT-0351-3 High Cont. Press		
6.9.12	PT-0352-3 High High Cont. Press		
6.10.12	LT-0305-3 Low RWT Level		
6.11.12	PDT-0978-3 Low SG-1 Flow		
6.12.12	PDT-0979-3 Low SG-2 Flow		
6.14.16	TE-0112-3		
6.15.16	TE-9178-3		
6.16.16	TE-0122-3		
6.17.16	TE-9179-3		
6.18.4	RTSG Uncorrected		
6.19.35	High Linear Power to RTSG		
6.20.13	High Log Bistable to RTSG		
6.20.28	High Log Preamp		
6.23 .20	Low Temperature ~~TI112CA~~ TT-9178-3		
6..23 .40	Low Temperature ~~TI122CA~~ TT-9179-3		
6.23 .60	High Temperature ~~TI112HA~~ TT-0112-3		
6.23 .80	High Temperature ~~TI122HA~~ TT-0122-3		
6.23.93.21	Pzr Pressure		
6.23.04.28	Excore Power		
6.23.85,23	ST 113A W1 RCP Speed		
6.23.85.35	ST 123 W2 RCP Speed		
6.23.85.46	ST 133 W3 RCP Speed		
6.23.85.58	ST 143 W4 RCP Speed		
6.24.29	High Pzr Press to RTSG		
6.25.29	Low Pzr Press to RTSG		
6.26.28	Low Pzr Press to SIAS		
6.26.42	Low Pzr Press to CCAS		
6.27.29	Low SG-1 Level to RTSG		
6.28.29	Low SG-1 Level to EFAS-1		
6.29.29	Low SG-2 Level to RTSG		
6.30.29	Low SG-2 Level to EFAS-2		
6.31.29	Low SG-1 Press to RTSG		
6.32.29	Low SG-1 Press to MSIS		
6.33.29	Low SG-2 Press to RTSG		
6.34.29	Low SG-2 Press to MSIS		
6.35.29	High Cont. Press to RTSG		
6.36.28	High Cont. Press to CIAS		
6.36.41	High Cont. Press to CCAS		
6.36.55	High Cont. Press to SIAS		
6.37.29	Low SG-1 Flow to RTSG		
6.38.29	Low SG-2 Flow to RTSG		
6.39.29	High-High Cont. Press to CSAS		
6.40.29	Low RWT Level to RAS		
6.41.29	HighΔP SG-1 to EFAS-1		
6.42.29	HighΔP SG-2 to EFAS-2		

S023-II-3.5

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~~R-7 TCN#-7~~

- Low

a. SIAS (see Safety Injection)

2. Safety Injection

a. High Pressure Safety Injection

Field Comp.	Rec. Time	Test No.	Relay Time	Test No.	Total Time
*P017 *P018 (If aligned) *HV-9324 *HV-9327 *HV-9330 *HV-9333					

b. Low Pressure Safety Injection

*P015 *HV-9325 *HV-9328					

c. Charging Pumps

P-190 P-191 (If Aligned)					

3. Containment Isolation
Emerg. Diesel Start Delay of 10 sec + instr. and Logic Response Only

4. Containment Spray Pumps

TCN /

~~*P-102~~ P-012					

5. Containment Emergency Cooling

a. CCW Pumps

*P-024 *P-025 (If Aligned)					

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TCN 8

R-1 16

(Non Critical Loop Isolation)

Field Comp.	Rec. Time	Test No.	Relay Time	Test No.	Total Time
HV-6212 HV-6218					

c. C.C.W. Valves (Emergency Cooler Isolation)

HV-6366 HV-6367 HV-6370 HV-6371					

d. Emergency Cooling Fans

*E-399 *E-401					

6. Containment Pressure High
   a. SIAS (see Pressurizer Pressure Low)
   b. CIAS
      (1) Containment Isolation (See Items)
7. Containment Pressure High High
   a. CSAS
      (1) Containment Spray

*HV-9367 *HV-6501					

8. Steam Generator Pressure Low
   a. MSIS
      (1) Main Steam Isolation (MSIV)

HV-8204 HV-8205					

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TCN 8

~~Page 6 of 16~~
~~R-1 TCN-7~~

(2) Main Feedwater Isolation

Field Comp.	Rec. Time	Test No.	Relay Time	Test No.	Total Time
HV-4048 HV-4052					

(3) Steam, Blowdown, Sample and Drain Isolation

TCN-1

HV-4054 HV-4058 HV-8203 HV-8248 ~~HV-8219~~ HV-8419					

(4) Auxiliary Feedwater Isolation

TCN-1

HV-4705 ~~HV-5713~~ HV-4713 HV-4730 HV-4731					

9. Refueling Water Storage Tank

a. RAS

(1) Containment Sump Valves Open

*HV-9303					

(2) ECCS Miniflow Valves Shut

*HV-9306 *HV-9307					

10. 4.16 KV. Emergency Bus Undervoltage

a. LOV (Loss of voltage and degraded voltage)

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TCN 8

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~~RT-TCN #7~~

11. Steam Generator Level-Low With Either No Pressure-Low Trip or ΔP-High

a. EFAS

(1) Aux. F.W. (AC Train)

Field Comp.	Rec. Time	Test No.	Relay Time	Test No.	Total Tim
P-141 *HV-4713 *HV-4731 *HV-4054					

(2) Aux. F.W. (Steam/DC Train)

S/G #1 (E089) P-140 HV-4706 HV-4716 HV-4715 HV-4054 S/G #2 (E088) P-140 HV-4716 HV-4705 HV-4730 Hv-4053					

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TCN 8

SO23-II-3.(
~~Page 8 of 16~~
R-1 ~~TCN 1-7~~

1. Pre...rizer Pressure - Low
   a. SIAS (See Safety Injection)
2. Safety Injection
   a. High Pressure Safety Injection

Field Comp.	Rec. Time	Test No.	Relay Time	Test No.	Total Time
*P019 *P018 (If aligned) *HV-9323 *HV-9326 *HV-9329 *HV-9332					

   b. Low Pressure Safety Injection

*P016 *HV-9322 *HV-9331					

   c. Charging Pumps

P-192 P-191 (If Aligned)					

3. Containment Isolation
Emerg. Diesel Start Delay of 10 sec + instr. and Logic Response Only

4. Containment Spray Pumps

TCN-1

~~*P-103~~ P-013					

5. Containment Emergency Cooling
   a. CCW Pumps

*P-026 *P-025 (If Aligned)					

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TCN 8

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~~RT-TCN#7~~

11. Steam Generator Level-Low With Either No Pressure-Low Trip or ΔP-High

   a. EFAS

      (1) Aux. F.W. (AC Train)

Field Comp.	Rec. Time	Test No.	Relay Time	Test No.	Total Tim
P-141 *HV-4713 *HV-4731 *HV-4054					

      (2) Aux. F.W. (Steam/DC Train)

S/G #1 (E089) P-140 HV-4705 HV-4716 HV-4715 HV-4054					
S/G #2 (E088) P-140 HV-4716 HV-4705 HV-4730 Hv-4053					

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TCN 8

SO23-II-3.
~~Page 8 of 16~~
R-1 ~~TCN 1-7~~

1. Pressurizer Pressure - Low
   a. SIAS (See Safety Injection)
2. Safety Injection
   a. High Pressure Safety Injection

Field Comp.	Rec. Time	Test No.	Relay Time	Test No.	Total Time
*P019 *P018 (If aligned) *HV-9323 *HV-9326 *HV-9329 *HV-9332					

   b. Low Pressure Safety Injection

*P016 *HV-9322 *HV-9331					

   c. Charging Pumps

P-192 P-191 (If Aligned)					

3. Containment Isolation
   Emerg. Diesel Start Delay of 10 sec + instr. and Logic Response Only
4. Containment Spray Pumps

TCN-1

~~*P-103~~ P-013					

5. Containment Emergency Cooling
   a. CCW Pumps

*P-026 *P-025 (If Aligned)					

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TCN 8

TCN# 7

Field Comp.	Rec. Time	Test No.	Relay Time	Test No.	Total Time
HV-6213 HV-6219					

c. C.C.W. Valves Emergency Cooler Isolation

HV-6368 HV-6369 HV-6372 HV-6373					

4. Emergency Cooling Fans

TCN-1

*E-400 ~~*E-401~~ E-402					

6. Containment Pressure High
   a. SIAS (see Pressurizer Pressure Low)
   b. CIAS
      (1) Containment Isolation (See Items)
7. Containment Pressure High High
   a. CSAS
      (1) Containment Spray

*HV-9358 *HV-6500					

8. Steam Generator Pressure Low
   a. MSIS
      (1) Main Steam Isolation (MSIV)

HV-8204 HV-8205					

TCN 8

(2) Main Feedwater Isolation

~~R-1 TCN-17~~

Field Comp.	Rec. Time	Test No.	Relay Time	Test No.	Total Time
HV-4048 HV-4052					

(3) Steam, Blowdown, Sample and Drain Isolation

HV-4053 HV-4057 HV-8202 HV-8249 ~~HV-8221~~ HV-8421					

TCN-1

(4) Auxiliary Feedwater Isolation

HV-4706 ~~HV-5712~~ HV-4712 HV-4714 HV-4715					

TCN-1

9. Refueling Water Storage Tank

a. RAS

(1) Containment Sump Valves Open

*HV-9302					

(2) ECCS Miniflow Valves Shut

*HV-9347 *HV-9348					

10. 4.16 KV. Emergency Bus Undervoltage

a. LOV (Loss of voltage and degraded voltage)

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TCN 8

~~Page 11 of 16~~

R-1 ~~TCN #7~~

11. Steam Generator Level-Low (With Either No Pressure-Low Trip or ΔP-High)

   a. EFAS

      (1) Aux. F.W. AC Train

Field Comp.	Rec. Time	Test No.	Relay Time	Test No.	Total Time
*P-504 *HV-4712 *HV-4714 *HV-4053					

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TCN 8

~~[illegible]~~ 16
~~TCN 7~~

RESPONSE TIME TABLE

Reactor Trips

Function	Sensor	Trip Unit to RTSG	RTSG (Corrected)	Total Response Time	Tech. Spec. Accept. Crit.	Verified Initial/Date
cw/ Linear Power High	*					
Log Pwr High					≤ .40 sec*	
PZR Press High					≤ .45 sec*	
PZR Press Low					≤ .90 sec	
Cntmt. Press High					≤ .90 sec	
SG-1 Press Low					≤ .90 sec	
SG-2 Press Low					≤ .90 sec	
SG-1 LVL Low					≤ .90 sec	
SG-2 LVL Low					≤ .90 sec	
SG-1 Low Flow					≤ .90 sec	
SG-2 Low Flow					≤ .90 sec	
FOOTNOTES:					≤ .90 sec	

*Neutron detectors are exempt from response time testing. Response time of the neutron flux signal portion of the channel shall be measured from detector output or input of first electronic component in channel.

**Response time shall be measured from the onset of a single CEA drop.

#Response time shall be measured from the onset of a 2 out of 4 Reactor Coolant Pump coastdown.

##Response time shall be measured from the output of the sensor. RTD response time shall be measured at least once per 18 months by means of the Loop Current Step Response (LCSR) method. The measured R_T of the slowest RTD shall be less than or equal to 6.0 seconds.

###Response time shall be measured from the output of the pressure transmitter. The transmitter response time constant shall be less than or equal to 0.7 seconds where the pressure transmitter response time is equivalent to the time interval required for the transmitter to achieve 63.2% of its total change when subjected to a step change in pressure transmitter pressure.

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TCN 8

RESPONSE TIME TABLE (Continued)

Reactor Trips

Function	CPC Signal Processing	RTSG (Corrected)	Total Response Time	Tech. Spec. Accept. Crit.	Verified Initial/Date
Local Power Density Hi					
1. Ex-Core Detectors				.68 sec*	
TN- 2. CEA Positions				~~.53~~ .68 sec**	
3. CEA Positions-Penalty Factor				.53 Sec	
DNBR Low					
1. Ex-Core Detectors				.68 sec*	
2. CEA Position				.68 sec**	
3. Cold Leg Temp.				.68 sec##	
4. Hot Leg Temp.				.68 sec##	
5. RC Pump Shaft Speed				.68 sec#	
TN- 6. PRSZR Pressure				.68 sec###	
7. CEA Positions-Penalty Factor				.53 Sec	

NOTE: Cold and Hot Leg Temperature sensors are response time tested on a stand alone basis. Record the time constants separately.

		Acceptance Criteria	Verified
1. Cold Leg Temp. Sensors	______ value/units	5.4 sec	______ Initial/date
2. Hot Leg Temp. Sensors	______ value units	5.4 sec	______ Initial/date

FOOTNOTES:

*Neutron detectors are exempt from response time testing. Response time of the neutron flux signal portion of the channel shall be measured from detector output or input of first electronic component in channel.

**Response time shall be measured from the onset of a single CEA drop.

#Response time shall be measured from the onset of a 2 out of 4 Reactor Coolant Pump coastdown.

##Response time shall be measured from the output of the sensor. RTD response time shall be measured at least nce per 18 months by means of the Loop Current Step Response (LCSR) method. The measured R of the slowest TD shall be less than or equal to 6.0 seconds. (5.4 sec. minus allowance for a +/- accuracy of the test equipment)

###Response time shall be measured from the output of the pressure transmitter. The transmitter response time onstant shall be less than or equal to 0.7 seconds where the pressure transmitter response time is equivalent to e time interval required for the transmitter to achieve 63.2% of its total change when subjected to a step change pressure transmitter pressure.

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TCN 8

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TCN 8

RESPONSE TIME TABLE

ESFAS

Function	Sensor	Trip Unit to ESFAS	Field Components	Total Response Time	Tech. Spec. Accept. Crit.	Verified Initial/Date
PZR Press Low HPSI					≤ 31.2 sec*	
PZR Press Low LPSI					≤ 41.2 sec*	
PZR Press Low Cntmt. Isol.					≤ 11.2 sec* Note 2 and 3	
PZR Press Low Cntmt. Spray Pumps					≤ 25.6 sec*	
PZR Press Low CCW Pumps					≤ 31.2 sec*	
PZR Press Low CCW Valves					≤ $\overset{2}{7}$4.2 sec Note 4 a.	
PZR press low CCW valves					≤ 23.2 sec Note 4b *	TCN
PZR Press Low Emer. Clg. Fans					≤ 21.2 sec*	
Cntmt. Press High HPSI					≤ 41.0 sec*	
Cntmt. Press High LPSI					≤ 41.0 sec*	
Cntmt. Press High Cntmt. Spray Pumps					≤ 25.4 sec*	
Cntmt. Press High CCW Pumps					≤ 31.0 sec*	

FOOTNOTES:

1. Response ti[illegible] movement of valves and attainment of pump or blower discharge pressure as applicable.

* Emergency di[illegible]ator starting delay (10 sec.) and sequence loading delays for SIAS are included.

2. Response time [illegible] emergency diesel generator starting delay (applicable to AC motor operated valves other than containment [illegible] valves), instrumentation and logic response only. Refer to table 3.6-1 for containment isolation valve closure times.

3. All CIAS-Actuated valves except MSIVs and MFIVs.

4a. CCW non-critical loop isolation valves HV-6212, HV-6213, HV-6218 and HV-6219 are closed.

5. Response time includes instrumentation, logic, and isolation damper closure times only.

4b. Containment emergency cooler ccw isolation valves HV-6366, HV-6367, HV-6368, HV-6369 HV-6370, HV-6371, HV-6372, HV-6373 are ~~open~~.

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TCN#9

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TCN 8

RESPONSE TIME TABLE

ESFAS

(Continued)

Function	Sensor	Trip Unit to ESFAS	Field Components	Total Response Time	Tech. Spec. Accept. Crit.	Verified Initial/Date
~~Cntmt. Press High CCW Valves~~					~~≤ 11.0 sec Note 5~~	
Cntmt. Press High Emer. Clg. Fans					≤ 21.0 sec*	
Cntmt. Press High Cntmt. Isol.					≤ 10.9 sec* Note 2	
Cntmt. Press High-High Cntmt. Spray					≤ 21.0 sec*	
SG-1 Press Low MSIV					≤ 20.9 sec	
SG-1 Press Low MFW Isol.					≤ 10.9 sec	
SG-2 Press Low MSIV					≤ 20.9 sec	
TCN Cntmt Press High CCW Valves					≤ 21.0 sec note 4a	
TCN Cntmt Press High CCW Valves					≤ 21.0 sec* note 3/4	

FOOTNOTES:

1. Response times include movement of valves and attainment of pump or blower discharge pressure as applicable.

* Emergency diesel generator starting delay (10 sec.) and sequence loading delays for SIAS are included.

2. Response time includes emergency diesel generator starting delay (applicable to AC motor operated valves other than containment purge valves), instrumentation and logic response only. Refer to table 3.6-1 for containment isolation valve closure times.

3. All CIAS-Actuated valves except MSIVs and MFIVs.

4a. CCW non-critical loop isolation valves HV-6212, HV-6213, HV-6218 and HV-6219 are closed.

5. Response time includes instrumentation, logic and isolation damper closure times only.

4b. Containment emergency cooler ccw isolation valves HV-6366, HV-6367, HV-6368, HV-6369
HV-6370, HV6371, HV6372 and HV-6373 are open

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TCN 8

RESPONSE TIME TABLE

ESFAS

(Continued)

Function	Sensor	Trip Unit to ESFAS	Field Components	Total Response Time	Tech. Spec. Accept. Crit.	Verified Initial/Date
SG-2 Press Low MFW Isol.					≤ 10.9 sec	
Low RWT LVL Cntmt. Sump VLVs Open					≤ 50.7 sec*	
Low RWT LVL ECCS Miniflow VLVs Shut					≤ 40.7 sec* (unit 2) ≤ 60.7 sec* (unit 3)	
SG-1 LVL Low Aux. FW AC Trains					≤ 40.9 sec*	
SG-1 LVL Low Aux. FW Stm./DC Train					≤ 30.9 sec	
SG-2 LVL Low Aux. FW AC Trains					≤ 40.9 sec*	
SG-2 LVL Low Aux. FW Stm./DC Train					≤ 30.9 sec	

FOOTNOTES:

1. Response times include movement of valves and attainment of pump or blower discharge pressure as applicable.

* Emergency diesel generator starting delay (10 sec.) and sequence loading delays for SIAS are included.

2. Response time includes emergency diesel generator starting delay (applicable to AC motor operated valves other than containment purge valves), instrumentation and logic response only. Refer to table 3.6-1 for containment isolation valve closure times.

3. All CIAS-Actuated valves except MSIVs and MFIVs.

4a. CCW non-critical loop isolation valves HV-6212, HV-6213, HV-6218 and HV-6219 are closed.

5. Response time includes instrumentation, logic, and isolation damper closure times only.

4b. Containment emergency cooler CCW isolation valves HV-6366, HV-6367, HV-6368, HV-6369 HV-6370, HV-6371, HV-6372 and HV-6373 are open

TRAIN B

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TCN

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TCN 8

RESPONSE TIME TABLE

ESFAS

Function	Sensor	Trip Unit to ESFAS	Field Components	Total Response Time	Tech. Spec. Accept. Crit.		Verified Initial/Date
PZR Press Low HPSI					≤ 31.2 sec*		
PZR Press Low LPSI					≤ 41.2 sec*		
PZR Press Low Cntmt. Isol.					≤ 11.2 sec*	Note 2 and 3	
PZR Press Low Cntmt. Spray Pumps					≤ 25.6 sec*		
PZR Press Low CCW Pumps					≤ 31.2 sec*		
PZR Press Low CCW Valves					2 ≤ 41.2 sec	Note 4a	
PZR Press Low CCW Valves					≤ 23.2 sec	note 4b*	
PZR Press Low Emer. Clg. Fans					≤ 21.2 sec*		
Cntmt. Press High HPSI					≤ 41.0 sec*		
Cntmt. Press High LPSI					≤ 41.0 sec*		
Cntmt. Press High Cntmt. Spray Pumps					≤ 25.4 sec*		
Cntmt. Press High CCW Pumps					≤ 31.0 sec*		

| TCN |

FOOTNOTES:

1. Response times include movement of valves and attainment of pump or blower discharge pressure as applicable.

* Emergency diesel generator starting delay (10 sec.) and sequence loading delays for SIAS are included.

2. Response time includes emergency diesel generator starting delay (applicable to AC motor operated valves other than containment purge valves), instrumentation and logic response only. Refer to table 3.6-1 for containment isolation valve closure times.

3. All CIAS-Actuated valves except MSIVs and MFIVs.

4a. CCW non-critical loop isolation valves HV-6212, HV-6213, HV-6218 and HV-6219 are closed.

5. Response time includes instrumentation, logic, and isolation damper closure times only.

4b. Containment emergency cooler CCW isolation valves HV-6366, HV-6367, HV-6368, HV-6369, HV-6370 H.V-6371, HV-6372, and HV6373 are open.

TRAIN B

~~TCN 9~~

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TCN 8

RESPONSE TIME TABLE

ESFAS

(Continued)

Function	Sensor	Trip Unit to ESIAS	Field Components	Total Response Time	Tech. Spec. Accept. Crit.	Verified Initial/Date
~~Cntmt. Press High CCW Valves~~					~~≤ 11.0 sec Note 4~~	
Cntmt. Press High Emer. Clg. Fans					≤ 21.0 sec*	
Cntmt. Press High Cntmt. Isol.					≤ 10.9 sec* Note 2	
Cntmt. Press High-High Cntmt. Spray					≤ 21.0 sec*	
SG-1 Press Low MSIV					≤ 20.9 sec	
SG-1 Press Low MFW Isol.					≤ 10.9 sec	
SG-2 Press Low MSIV					≤ 20.9 sec	

FOOTNOTES:

1. Response times include movement of valves and attainment of pump or blower discharge pressure as applicable.
* Emergency diesel generator starting delay (10 sec.) and sequence loading delays for SIAS are included.
2. Response time includes emergency diesel generator starting delay (applicable to AC motor operated valves other than containment purge valves), instrumentation and logic response only. Refer to table 3.6-1 for containment isolation valve closure times.
3. All CIAS-Actuated valves except MSIVs and MFIVs.
4a. CCW non-critical loop isolation valves HV-6212, HV-6213, HV-6218 and HV-6219 are closed.
5. Response time includes instrumentation, logic and isolation damper closure times only.
4b. Containment emergency cooler ccw isolation valves HV-6366, HV-6367, HV-6368, HV-6369 HV-6370, HV6371, HV6372 and HV-6373 are open

TCN | Cntmt Press High CCW Valves ≤ 21.0 sec Note 4a

TCN | Cntmt Press High - CCW Valves ≤ 83.0 sec* Note 4b

TRAIN B

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TCN8

RESPONSE TIME TABLE

ESFAS

(Continued)

Function	Sensor	Trip Unit to ESFAS	Field Components	Total Response Time	Tech. Spec. Accept. Crit.	Verified Initial/Date
SG-2 Press Low MFW Isol.					≤ 10.9 sec	
Low RWT LVL Cntmt. Sump VLVs Open					≤ 50.7 sec*	
Low RWT LVL ECCS Miniflow VLVs Shut					≤ 40.7 sec* (unit 2) ≤ 50.7 sec* (unit 3)	
SG-1 LVL Low Aux. FW AC Trains					≤ 40.9 sec*	
SG-1 LVL Low Aux. FW Stm./DC Train					≤ 30.9 sec	
SG-2 LVL Low Aux. FW AC Trains					≤ 40.9 sec*	
SG-2 LVL Low Aux. FW Stm./DC Train					≤ 30.9 sec	

FOOTNOTES:

1. Response times include movement of valves and attainment of pump or blower discharge pressure as applicable.

* Emergency diesel generator starting delay (10 sec.) and sequence loading delays for SIAS are included.

2. Response time includes emergency diesel generator starting delay (applicable to AC motor operated valves other than containment purge valves), instrumentation and logic response only. Refer to table 3.6-1 for containment isolation valve closure times.

3. All CIAS-Actuated valves except MSIVs and MFIVs.

4a. CCW non-critical loop isolation valves HV-6212, HV-6213, HV-6218 and HV-6219 are closed.

5. Response time includes instrumentation, logic, and isolation damper closure times only.

TDU3b

4b Containment emergency cooler CCW isolation valves HV-6366, HV-6367, HV-6368, HV-6369, HV-6370, HV-6371, HV-6372, and HV6373 are open.

Page 1 of 16

REFERENCE: SO123-VI-1.0
SO123-VI-1.1

ENCODE: AC10AC
SO________
(When form filled out)

TEMPORARY CHANGE NOTICE

NOTE: Technical Specification Violation if not processed within the stated time limits.

Procedure No. SO23-II-3.3 Revision No. 1 TCN No. 7

Procedure Title PPS Response time test for channel C

Procedure Author ________ PAX ______ (If known, Writer) ________ PAX ______

1. The following change shall be in effect: Attach a copy of the effected page(s), if applicable
   see attached pages
2. Reason added devices, missing procedural steps and revise attachment 8.1 for clarity.
3. Date originated 12-10-82 4. Issuance Date 12-11-82 (For CDM Use Only)
5. Does this change affect FSAR or Tech. Spec. commitments? *Yes* ____ *No* X
6. Does this change affect the nonradiological environment of any offsite area previously undisturbed during site preparation and plant construction? *Yes* ____ *No* X
7. Is the intent of the original document altered? *Yes* ____ *No* X
8. Is the document to be changed an Emergency and Abnormal Operating Instruction? *Yes* ____ *No* X
   (If the answer to 5, 6, 7 or 8 is YES, a TCN is NOT Authorized.)
9. Does this change affect licensing commitment requirements as stated in the Reference Section? *Yes* ____ *No* X
10. Originator ________ ________ DATE / TIME
11. Is the TCN to be incorporated into next permanent revision within 60 days of issuance date? *Yes* X *No** ____
    ** One time change only against Procedure/Station Order No.* ______ *Rev. No.* ______
12. Copy sent to the Nuclear Safety Group Laura Granado 12-21-82
    CDM SIGNATURE DATE
13. Signatures Required:

DEC 21 1982 CDM SITE FILE COPY

SO1 **(Series)	SO2, SO3, or SO23 (Series)	SO123 **(Series)
Approved by two OSRC members: 1) ______ 2) ______ Reviewed by entire Committee on: ** ______ DATE — MUST BE WITHIN 7 DAYS	Approved by: *** (at least one (1) SRO) 1) ______ 2) ______ SRO Final approval by: 3) Brian Katz COGNIZANT FUNCTIONAL STATION MANAGER 12-15-82 DATE — MUST BE WITHIN 14 DAYS	Approved by two OSRC members: 1) ______ 2) ______ Reviewed by entire Committee on: ** ______ DATE — MUST BE WITHIN 7 DAYS Approved by: *** (at least one (1) SRO) 3) ______ 4) ______ Approved by: 5) ______ COGNIZANT FUNCTIONAL STATION MANAGER ______ DATE — MUST BE WITHIN 14 DAYS

** *SO1 and SO123 (series) TCNs will be routed to the OSRC with Routing Document SO(123) 109 which will be signed by the Station Manager.*

*** *Approval must be by two members of the plant management staff at least one of whom holds an SRO license on the unit affected. (For TCN approval, members of the plant management staff are defined as any Station Supervisor, including the level of foreman, exercising responsibility in the specific area and unit addressed by the change.)*

SCE SO(123) 110 REV. 3 08/06/82

procedure #SO23-II-3.3 R-1
TCN #7

add following steps:

6.24.27 Disconnect the "Bistable test" leads and replace the input simulator leads on the terminals they were removed from in step 6.24.2

________ / ________
Date / Technician

6.24.28 Reset all bistables.

________ / ________
Date / Technician

6.24.29 Record the largest response time value of steps 6.24.22, 6.24.25 and 6.24.26 in the Data Collection table

________ / ________
Date / Technician

TCN# 7
Page 3 of 16

(1)

DATA COLLECTION TABLE

STEP NO.	DESCRIPTION	VALUE	UNITS
6.2.12	PT-0101-3 High Pzr Press		
6.3.12	PT-0102-3 Low Pzr Press		
6.4.12	PT-1013-3 Low SG-1 Press		
6.5.12	PT-1023-3 Low SG-2 Press		
6.6.12	LT-1113-3 Low SG-1 Level		
6.7.12	LT-1123-3 Low SG-2 Level		
6.8.12	PT-0351-3 High Cont. Press		
6.9.12	PT-0352-3 High High Cont. Press		
6.10.12	LT-0305-3 Low RWT Level		
6.11.12	PDT-0978-3 Low SG-1 Flow		
6.12.12	PDT-0979-3 Low SG-2 Flow		
6.14.16	TE-0112-3		
6.15.16	TE-9178-3		
6.16.16	TE-0122-3		
6.17.16	TE-9179-3		
6.18.4	RTSG Uncorrected		
6.19.35	High Linear Power to RTSG		
6.20.13	High Log Bistable to RTSG		
6.20.28	High Log Preamp		
6.23 .20	Low Temperature ~~TI112CA~~ TT-9178-3		
6..23 .40	Low Temperature ~~TI122CA~~ TT-9179-3		
6.23 .60	High Temperature ~~TI112HA~~ TT-0112-3		
6.23 .80	High Temperature ~~TI122HA~~ TT-0122-3		
6.23.93.21	Pzr Pressure		
6.23.84.28	Excore Power		
6.23.85,23	ST 113A W1 RCP Speed		
6.23.85.35	ST 123 W2 RCP Speed		
6.23.85.46	ST 133 W3 RCP Speed		
6.23.85.58	ST 143 W4 RCP Speed		
6.24.29	High Pzr Press to RTSG		
6.25.29	Low Pzr Press to RTSG		
6.26.28	Low Pzr Press to SIAS		
6.26.42	Low Pzr Press to CCAS		
6.27.29	Low SG-1 Level to RTSG		
6.28.29	Low SG-1 Level to EFAS-1		
6.29.29	Low SG-2 Level to RTSG		
6.30.29	Low SG-2 Level to EFAS-2		
6.31.29	Low SG-1 Press to RTSG		
6.32.29	Low SG-1 Press to MSIS		
6.33.29	Low SG-2 Press to RTSG		
6.34.29	Low SG-2 Press to MSIS		
6.35.29	High Cont. Press to RTSG		
6.36.28	High Cont. Press to CIAS		
6.36.41	High Cont. Press to CCAS		
6.36.55	High Cont. Press to SIAS		
6.37.29	Low SG-1 Flow to RTSG		
6.38.29	Low SG-2 Flow to RTSG		
6.39.29	High-High Cont. Press to CSAS		
6.40.29	Low RWT Level to RAS		
6.41.29	HighΔP SG-1 to EFAS-1		
6.42.29	HighΔP SG-2 to EFAS-2		

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Page 4 of 16
R-1 TCN# 7

TRAIN A

1. Pressurizer Pressure - Low
   a. SIAS (see Safety Injection)
2. Safety Injection
   a. High Pressure Safety Injection

Field Comp.	Rec. Time	Test No.	Relay Time	Test No.	Total Time
*P017 *P018 (If aligned) *HV-9324 *HV-9327 *HV-9330 *HV-9333					

   b. Low Pressure Safety Injection

*P015 *HV-9325 *HV-9328					

   c. Charging Pumps

P-190 P-191 (If Aligned)					

3. Containment Isolation
   Emerg. Diesel Start Delay of 10 sec + instr. and Logic Response Only
4. Containment Spray Pumps

*P-102					

5. Containment Emergency Cooling
   a. CCW Pumps

*P-024 *P-025 (If Aligned)					

b. C.C.W. Valves (Non Critical Loop Isolation)

Field Comp.	Rec. Time	Test No.	Relay Time	Test No.	Total Time
HV-6212 HV-6218					

c. C.C.W. Valves (Emergency Cooler Isolation)

HV-6366 HV-6367 HV-6370 HV-6371					

d. Emergency Cooling Fans

*E-399 *E-401					

6. Containment Pressure High

   a. SIAS (see Pressurizer Pressure Low)
   b. CIAS

      (1) Containment Isolation (See Items)

7. Containment Pressure High High

   a. CSAS

      (1) Containment Spray

*HV-9367 *HV-6501					

8. Steam Generator Pressure Low

   a. MSIS

      (1) Main Steam Isolation (MSIV)

HV-8204 HV-8205					

(2) Main Feedwater Isolation

Field Comp.	Rec. Time	Test No.	Relay Time	Test No.	Total Time
HV-4048 HV-4052					

(3) Steam, Blowdown, Sample and Drain Isolation

HV-4054 HV-4058 HV-8203 HV-8248 HV-8219					

(4) Auxiliary Feedwater Isolation

HV-4705 HV-5713 HV-4730 HV-4731					

9. Refueling Water Storage Tank

a. RAS

(1) Containment Sump Valves Open

*HV-9303					

(2) ECCS Miniflow Valves Shut

*HV-9306 *HV-9307					

10. 4.16 KV. Emergency Bus Undervoltage

a. LOV (Loss of voltage and degraded voltage)

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page 7 of 16
R-1 TCN#7

11. Steam Generator Level-Low With Either No Pressure-Low Trip or △P-High

a. EFAS

(1) Aux. F.W. (AC Train)

Field Comp.	Rec. Time	Test No.	Relay Time	Test No.	Total Time
P-141 *HV-4713 *HV-4731 *HV-4054					

(2) Aux. F.W. (Steam/DC Train)

S/G #1 (E089) P-140 HV-4706 HV-4716 HV-4715 HV-4054 S/G #2 (E088) P-140 HV-4716 HV-4705 HV-4730 Hv-4053					

TRAIN B

SO23-II-3.3
page 8 of 16
R-1 TCN#7

1. **Pressurizer Pressure - Low**
   a. SIAS (See Safety Injection)
2. **Safety Injection**
   a. **High Pressure Safety Injection**

Field Comp.	Rec. Time	Test No.	Relay Time	Test No.	Total Time
*P019 *P018 (If aligned) *HV-9323 *HV-9326 *HV-9329 *HV-9332					

   b. **Low Pressure Safety Injection**

*P016 *HV-9322 *HV-9331					

   c. **Charging** Pumps

P-192 P-191 (If Aligned)					

3. **Containment Isolation**
   Emerg. Diesel Start Delay of 10 sec + instr. and Logic Response Only
4. **Containment Spray** Pumps

*P-103					

5. **Containment Emergency Cooling**
   a. **CCW Pumps**

*P-026 *P-025 (If Aligned)					

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TCN# 7
C-1

b. **C.C.W. Valves (Non Critical Loop Isolation)**

Field Comp.	Rec. Time	Test No.	Relay Time	Test No.	Total Time
HV-6213 HV-6219					

c. **C.C.W. Valves** Emergency Cooler Isolation

HV-6368 HV-6369 HV-6372 HV-6373					

d. **Emergency Cooling Fans**

*E-400 *E-401					

6. **Containment Pressure High**

a. SIAS **(see Pressurizer Pressure Low)**
b. CIAS

(1) **Containment Isolation (See Items)**

7. **Containment Pressure High High**

a. CSAS

(1) **Containment Spray**

*HV-9368 *HV-6500					

8. **Steam Generator Pressure Low**

a. **MSIS**

(1) **Main Steam Isolation (MSIV)**

HV-8204 HV-8205					

(2) Main Feedwater Isolation

Field Comp.	Rec. Time	Test No.	Relay Time	Test No.	Total Time
HV-4048 HV-4052					

(3) Steam, Blowdown, Sample and Drain Isolation

HV-4053 HV-4057 HV-8202 HV-8249 HV-8221					

(4) Auxiliary Feedwater Isolation

HV-4706 HV-5712 HV-4714 HV-4715					

9. Refueling Water Storage Tank

a. RAS

(1) Containment Sump Valves Open

*HV-9302					

(2) ECCS Miniflow Valves Shut

*HV-9347 *HV-9348					

10. 4.16 KV. Emergency Bus Undervoltage

a. LOV (Loss of voltage and degraded voltage)

SO23-II-3.3

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R1 TCN #7

11. Steam Generator Level-Low (With Either No Pressure-Low Trip or ΔP-High)

a. EFAS

(1) Aux. F.W. AC Train

Field Comp.	Rec. Time	Test No.	Relay Time	Test No.	Total Time
*P-504 *HV-4712 *HV-4714 *HV-4053					

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TCN# 7

RESPONSE TIME TABLE

Reactor Trips

Function	Sensor	Trip Unit to RISG	RISG (Corrected)	Total Response Time	Tech. Spec. Accept. Crit.	Verified Initial/Date
Linear Power High					≤ .40 sec*	
Log Pwr High					≤ .45 sec*	
PZR Press High					≤ .90 sec	
PZR Press Low					≤ .90 sec	
Cntmt. Press High					≤ .90 sec	
SG-1 Press Low					≤ .90 sec	
SG-2 Press Low					≤ .90 sec	
SG-1 LVL Low					≤ .90 sec	
SG-2 LVL Low					≤ .90 sec	
SG-1 Low Flow					≤ .90 sec	
SG-2 Low Flow					≤ .90 sec	

FOOTNOTES:

*Neutron detectors are exempt from response time testing. Response time of the neutron flux signal portion of the channel shall be measured from detector output or input of first electronic component in channel.

**Response time shall be measured from the onset of a single CEA drop.

#Response time shall be measured from the onset of a 2 out of 4 Reactor Coolant Pump coastdown.

##Response time shall be measured from the output of the sensor. RTD response time shall be measured at least once per 18 months by means of the Loop Current Step Response (LCSR) method. The measured R_T of the slowest RTD shall be less than or equal to 6.0 seconds.

###Response time shall be measured from the output of the pressure transmitter. The transmitter response time constant shall be less than or equal to 0.7 seconds where the pressure transmitter response time is equivalent to the time interval required for the transmitter to achieve 63.2% of its total change when subjected to a step change in pressure transmitter pressure.

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TCN #7

RESPONSE TIME TABLE (Continued)

Reactor Trips

Function	CPC Signal Processing	RTSG (Corrected)	Total Response Time	Tech. Spec. Accept. Crit.	Verified Initial/Date
Local Power Density Hi					
1. Ex-Core Detectors					
2. CEA Positions				.68 sec*	
DNBR Low				~~.53~~ .68 sec**	
1. Ex-Core Detectors					
2. CEA Position				.68 sec*	
3. Cold Leg Temp.				.68 sec**	
4. Hot Leg Temp.				.68 sec##	
5. RC Pump Shaft Speed				.68 sec##	
6. PRSRZR Pressure				.68 sec#	
				.68 sec###	

NOTE: Cold and Hot Leg Temperature sensors are response time tested on a stand alone basis. Record the time constants separately.

1. Cold Leg Temp. Sensors ____________ value/units — Acceptance Criteria 5.4 sec — Verified ____________ initial/date

2. Hot Leg Temp. Sensors ____________ value units — 5.4 sec — ____________ initial/date

FOOTNOTES:

*Neutron detectors are exempt from response time testing. Response time of the neutron flux signal portion of the channel shall be measured from detector output or input of first electronic component in channel.

**Response time shall be measured from the onset of a single CEA drop.

#Response time shall be measured from the onset of a 2 out of 4 Reactor Coolant Pump coastdown.

##Response time shall be measured from the output of the sensor. RTD response time shall be measured at least once per 18 months by means of the Loop Current Step Response (LCSR) method. The measured R of the slowest RTD shall be less than or equal to 6.0 seconds. (5.4 sec. makes allowance for a +/- accuracy of the test equipment)

###Response time shall be measured from the output of the pressure transmitter. The transmitter response time constant shall be less than or equal to 0.7 seconds where the pressure transmitter response time is equivalent to the time interval required for the transmitter to achieve 63.2% of its total change when subjected to a step change in pressure transmitter pressure.

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TCN# 17

RESPONSE TIME TABLE

ESFAS

Function	Sensor	Trip Unit to ESFAS	Field Components	Total Response Time	Tech. Spec. Accept. Crit.	Verified Initial/Date
PZR Press Low HPSI					≤ 31.2 sec*	
PZR Press Low LPSI					≤ 41.2 sec*	
PZR Press Low Cntmt. Isol.					≤ 11.2 sec* Note 2 and 3	
PZR Press Low Cntmt. Spray Pumps					≤ 25.6 sec*	
PZR Press Low CCW Pumps					≤ 31.2 sec*	
PZR Press Low CCW Valves					≤ ~~1~~21.2 sec Note 4a	
PZR press low CCW valves					≤23.2 sec note 4b	
PZR Press Low Emer. Clg. Fans					≤ 21.2 sec*	
Cntmt. Press High HPSI					≤ 41.0 sec*	
Cntmt. Press High LPSI					≤ 41.0 sec*	
Cntmt. Press High Cntmt. Spray Pumps					≤ 25.4 sec*	
Cntmt. Press High CCW Pumps					≤ 31.0 sec*	

FOOTNOTES:

1. Response times include movement of valves and attainment of pump or blower discharge pressure as applicable.

* Emergency diesel generator starting delay (10 sec.) and sequence loading delays for SIAS are included.

2. Response time includes emergency diesel generator starting delay (applicable to AC motor operated valves other than containment purge valves), instrumentation and logic response only. Refer to table 3.6-1 for containment isolation valve closure times.

3. All CIAS-Actuated valves except MSIVs and MFIVs.

4a CCW non-critical loop isolation valves HV-6212, HV-6213, HV-6218 and HV-6219 are closed.

5. Response time includes instrumentation, logic, and isolation damper closure times only.

4b. Containment emergency cooler ccw isolation valves HV-6366, HV-6367, HV-6368, HV-6369 HV-6370, HV-6371, HV-6372, HV-6373 are open.

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TCN# 7

RESPONSE TIME TABLE

ESFAS

(Continued)

Function	Sensor	Trip Unit to ESFAS	Field Components	Total Response Time	Tech. Spec. Accept. Crit.	Verified Initial/Date
~~Cntmt Press High CCW Valves~~					~~≤ 11.0 sec Note 4~~	
Cntmt. Press High Emer. Clg. Fans					≤ 21.0 sec*	
Cntmt. Press High Cntmt. Isol.					≤ 10.9 sec* Note 2	
Cntmt. Press High-High Cntmt. Spray					≤ 21.0 sec*	
SG-1 Press Low MSIV					≤ 20.9 sec	
SG-1 Press Low MFW Isol.					≤ 10.9 sec	
SG-2 Press Low MSIV					≤ 20.9 sec	

FOOTNOTES:

1. Response times include movement of valves and attainment of pump or blower discharge pressure as applicable.

* Emergency diesel generator starting delay (10 sec.) and sequence loading delays for SIAS are included.

2. Response time includes emergency diesel generator starting delay (applicable to AC motor operated valves other than containment purge valves), instrumentation and logic response only. Refer to table 3.6-1 for containment isolation valve closure times.

3. All CIAS-Actuated valves except MSIVs and MFIVs.

4a. CCW non-critical loop isolation valves HV-6212, HV-6213, HV-6218 and HV-6219 are closed.

4b Containment emergency cooler CCW isolation valves HV-6366, HV-6367, HV-6368, HV-6369 HV-6370, HV-6371, HV-6372 and HV-6373 are open

5. Response time includes instrumentation, logic and isolation damper closure times only.

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TCW # 7

RESPONSE TIME TABLE

ESFAS

(Continued)

Function	Sensor	Trip Unit to ESFAS	Field Components	Total Response Time	Tech. Spec. Accept. Crit.	Verified Initial/Date
SG-2 Press Low MFW Isol.					≤ 10.9 sec*	
Low RWT LVL Cntmt. Sump VLVs Open					≤ 50.7 sec*	
Low RWT LVL ECCS Miniflow VLVs Shut					≤ 40.7 sec* (unit 2) ≤ 50.7 sec* (unit 3)	
SG-1 LVL Low Aux. FW AC Trains					≤ 40.9 sec*	
SG-1 LVL Low Aux. FW Stm./DC Train					≤ 30.9 sec	
SG-2 LVL Low Aux. FW AC Trains					≤ 40.9 sec*	
SG-2 LVL Low Aux. FW Stm./DC Train					≤ 30.9 sec	

FOOTNOTES:

1. Response times include movement of valves and attainment of pump or blower discharge pressure as applicable.

* Emergency diesel generator starting delay (10 sec.) and sequence loading delays for SIAS are included.

2. Response time includes emergency diesel generator starting delay (applicable to AC motor operated valves other than containment purge valves), instrumentation and logic response only. Refer to table 3.6-1 for containment isolation valve closure times.

3. All CIAS-Actuated valves except MSIVs and MFIVs.

4a. CCW non-critical loop isolation valves HV-6212, HV-6213, HV-6218 and HV-6219 are closed.

5. Response time includes instrumentation, logic, and isolation damper closure times only.

1965b

4b. Containment emergency cooler CCW isolation valves HV-6366, HV-6367, HV-6368, HV-6369 HV-6370, HV-6371, HV-6372 and HV-6373 are open

PLANT PROTECTION SYSTEM
RESPONSE TIME TEST FOR CHANNEL C
(Eighteen Month Interval)

TABLE OF CONTENTS

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PLANT PROTECTION SYSTEM
RESPONSE TIME TEST FOR CHANNEL C
(Eighteen Month Interval)

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Attachment 8.5 Pages (1 - 4)	1
Attachment 8.6 Pages (1 - 3)	1
Attachment 8.7 Pages (1)	1
Attachment 8.8 Pages (1 - 3)	1
Attachment 8.9 Pages (1 - 5)	1
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Attachment 8.11 Pages (1 - 3)	1
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PLANT PROTECTION SYSTEM
RESPONSE TIME TEST FOR CHANNEL C
(Eighteen Month Interval)

1.0 OBJECTIVES

1.1 To verify that the PPS trip paths response times are in accordance with Technical Specifications 4.3.1.3 and 4.3.2.3. and tables 3.3-2 and 3.3-5.

2.0 REFERENCES

2.1 San Onofre Units 2&3 Final Safety Analysis Report, Amendment 24, dated April 1981.

2.2 Applicable Logic, Functional, P&ID Elementary, and Interconnection diagrams.

2.3 Applicable Manufacturers technical manuals.

2.4 Calibration procedures are specified in this instruction.

3.0 PREREQUISITES

3.1 The Watch Engineer's approval is required prior to the beginning of the work.

3.2 Equipment clearance(s) or permission, as applicable, must be obtained from the Control Operator Before beginning work.

3.3 An approved equipment outage request (OD-16) if required, is on file in the Control Room.

3.4 Check the applicable radiation and contamination survey information BEFORE entering the job area. Use this survey information to assist in maintaining your exposure ALARA.

3.5 Measuring and test equipment to be used for this calibration shall have an accuracy at least four times the allowable accuracy of the device to be calibrated.

3.0 PREREQUISITE (Continued)

3.5.1 Measuring and Test Equipment

.1 Test gauges (.5% accuracy or better)

.1.1 Two 0-3000 psig

.1.2 Two 0-1000 psig

.1.3 Two 0-200 psig

.1.4 One 0-1500 psig

.1.5 One 0-950 inch H_2O

.2 Pressure Transmitter Validyne DP15TL or equivalent

.3 Recorder dual trace (frequency response 100 Hz)

.4 DVM Fluke 9600A or equivalent

3.5.2 Special Measuring and Test Equipment

.1 C-E procured test box, Electro Mechanics Model 39300

.2 EPRI designed pressure sensor test box Industrial Design and Engineering Association Model ID-100

.3 LCSR test equipment - Analysis and measurement services ERT-1 and ELC-1B

3.5.3 Noncalibrated Test Equipment

.1 Four 6 Vdc power supplies

.2 250 ohm test resistor

.3 PPS response time test panel L151

.4 Four PPS input simulator boxes

.5 Eight LED's (6.0 Volt, 20 ma)

.6 Assorted test leads, coaxial cables

3.6 Record the description, model and serial number, calibration due date for each measuring and test instrument used for this calibration at Step 7.3, Records section.

4.0 PRECAUTIONS

4.1 Observe proper electrical precautions when working on energized equipment.

4.2 Follow proper procedures when connecting and disconnecting the pressure test rig to ensure that no damage occurs to the pressure and level (differential pressure) transmitters.

4.3 Use only grade A demineralized water in the pressure test rig.

4.4 Nuclear instrument cable connectors must be kept clean during safety channel testing.

4.5 Advise operations of the status of all signal outputs from a transmitter prior to tagging the transmitter out of service and isolate the signal outputs as necessary to maintain the plant in a safe condition.

4.6 Do not open the ID-100 "sight gauge/fill" valve when the unit is pressurized.

4.7 The rated pressures and currents of the transmitters and components being tested should not be exceeded.

4.8 In the event any unanticipated conditions occur during calibration, the Technician shall immediately notify the Control Operator.

4.9 Receiving approval to begin work does not in any way obviate the responsibility of the Technician to determine for himself that it is prudent and safe to begin work.

4.10 If the calibration data do not meet the acceptance criteria, the device shall be identified as "nonconforming" and the responsible Instrument Foreman shall be notified immediately. Under no circumstances shall a nonconforming device be returned to service.

5.0 CHECK-OFF LIST

5.1 Assure the following calibrations and/or tests have been satisfactorily completed on the appropriate channel. Sign and date.

5.1.1 Excore safety channnel C calibration S023-II-5.1

_____________/_____________
Date Technician

5.0 CHECK-OFF LIST

5.1.2 Pressurizer pressure wide range channel 0102-3 calibration SO23-II-9.503

________/________
Date Technician

5.1.3 Pressurizer pressure wide range channel 0102-3 calibration SO23-II-9.504

________/________
Date Technician

5.1.4 S/G pressure (PPS and ESFAS) calibration SO23-II-9.512

________/________
Date Technician

5.1.5 S/G level (PPS and ESFAS) calibration SO23-II-9.513

________/________
Date Technician

5.1.6 RWT level (ESFAS) calibration SO23-II-9.515

________/________
Date Technician

5.1.7 Containment press (PPS and ESFAS) calibration SO23-II-9.511

________/________
Date Technician

5.1.8 S/G differential pressure calibration SO23-II-9.581

________/________
Date Technician

5.1.9 Reactor coolant system differential pressure calibration SO23-II-9.540

________/________
Date Technician

5.1.10 Reactor coolant system hot leg temperature to CPCS calibration SO23-II-9.509

________/________
Date Technician

5.0 CHECK-OFF LIST

5.1.11 Reactor coolant system cold leg temperature to CPCS calibration SO23-II-9.508

Date / Technician

5.1.12 CPC calibration SO23-II-6.2.2

Date / Technician

5.1.13 CEAC calibration SO23-II-6.2.4

Date / Technician

6.0 PROCEDURE

6.1 Equipment Setup

6.1.1 Disconnect transmitter wiring at the Foxboro cabinets and connect PPS input simulator leads to the following T.B. locations and adjust for the listed input values as read on the PPS panel meters. The adjusted tolerance is +0.1 VDC. Connect jumpers to the contact input terminals with the normal input leads lifted.

CHANNEL A

Transmitter	PPS Parameter	Terminal Board Location	Initial Signal Value/Status	
PT-0101-1	High Pzr. Press.	L-121 TB 1-39/40	4.00 VDC	Date / Tech
PT-0102-1	Low Pzr. Press. Pzr. Press. Bypass	L-121 TB 1-36/37	4.00 VDC	Date / Tech
LT-1113-1	Low SG-1 Level High SG-1 Level	L-121 TB 1-24/25	3.50 VDC	Date / Tech
LT-1123-1	Low SG-2 Level High SG-2 Level	L-121 TB 1-21/22	3.50 VDC	Date / Tech
PT-1013-1	Low SG-1 Press. SG-1 P	L-121 TB 1-33/34	3.50 VDC	Date / Tech
PDT-0978-1	SG-1 Low Flow	L-121 TB 3-13/14	5.00 VDC	Date / Tech
PDT-0979-1	SG-2 Low Flow	L-121 TB 3-19/20	5.00 VDC	Date / Tech

6.0 PROCEDURE

6.1.1 (Continued)

CHANNEL A (Continued)

Transmitter	PPS Parameter	Terminal Board Location	Initial Signal Value/Status	
Contact	DNBR Trip	TBA2-62/63	CLOSED	/ Date Tech
Contact	DNBR Pretrip	TBA2-64/65	CLOSED	/ Date Tech
Contact	LPD Trip	TBA2-66/67	CLOSED	/ Date Tech
Contact	LPD Pretrip	TBA2-68/69	CLOSED	/ Date Tech
Contact	CWP	TBA2-70/71	CLOSED	/ Date Tech
Contract	Turbine Trip	TBA2-123/124	CLOSED	/ Date Tech
Contact	55% Power	TBA7-24/25	CLOSED	/ Date Tech
Contact	10^{-4}% CPC Bypass	TBA7-42/43	CLOSED	/ Date Tech
PT-1023-1	Low SG-2 Press. SG-2 P	L-121 TB 1-30/31	3.70 VDC	/ Date Tech
PT-0351-1	High Cont. Press. RPS High Cont. Press. ESF	L-121 TB 1-43/44	1.00 VDC	/ Date Tech
PT-0352-1	Hi-Hi Cont. Press.	L-121 TB 1-46/47	1.00 VDC	/ Date Tech
LT-0305-1	Low RWT Level	L-121 TB 1-27/28	2.50 VDC	/ Date Tech

CHANNEL B

Transmitter	PPS Parameter	Terminal Board Location	Initial Signal Value/Status	
PT-0101-2	High Pzr. Press.	L-125 TB 1-39/40	4.00 VDC	/ Date Tech

6.0 PROCEDURE

6.1.1 (Continued)

CHANNEL B (Continued)

Transmitter	PPS Parameter	Terminal Board Location	Initial Signal Value/Status	
PT-0102-2	Low Pzr. Press. Pzr. Press. Bypass	L-125 TB 1-33/34	4.00 VDC	/ Date Tech
LT-1113-2	Low SG-1 Level High SG-1 Level	L-125 TB 1-24/25	3.50 VDC	/ Date Tech
LT-1123-2	Low SG-2 Level High SG-2 Level	L-125 TB 1-21/22	3.50 VDC	/ Date Tech
PT-1013-2	Low SG-1 Press. SG-1 P	L-125 TB 1-30/31	3.70 VDC	/ Date Tech
PT-1023-2	Low SG-2 Press. SG-2 P	L-125 TB 1-27/28	3.70 VDC	/ Date Tech
PT-0351-2	High Cont. Press. RPS High Cont. Press. ESF	L-125 TB 1-43/44	1.00 VDC	/ Date Tech
PT-0352-2	Hi-Hi Cont. Press.	L-125 TB 1-46/47	1.00 VDC	/ Date Tech
LT-0305-2	Low RWT Level	L-125 TB 1-35/37	2.50 VDC	/ Date Tech
PDT-0978-2	SG-1 Low Flow	L-125 TB 3-13/14	5.00 VDC	/ Date Tech
PDT-0979-2	SG-2 Low Flow	L-125 TB 3-19/20	5.00 VDC	/ Date Tech
Contact	DNBR Trip	TBB2-62/63	CLOSED	/ Date Tech
Contact	DNBR Pretrip	TBB2-64/65	CLOSED	/ Date Tech
Contact	LPD Trip	TBB2-66/67	CLOSED	/ Date Tech
Contact	LPD Pretrip	TBB2-68/69	CLOSED	/ Date Tech

5.0 PROCEDURE

6.1.1 (Continued)

CHANNEL B (Continued)

Transmitter	PPS Parameter	Terminal Board Location	Initial Signal Value/Status	
Contact	CWP	TBB2-70/71	CLOSED	Date / Tech
Contact	Turbine Trip	TBB2-123/124	CLOSED	Date / Tech
Contact	55% Power	TBB7-24/25	CLOSED	Date / Tech
Contact	10^{-4}% CPC Bypass	TBB7-42/43	CLOSED	Date / Tech

CHANNEL C

Transmitter	PPS Parameter	Terminal Board Location	Initial Signal Value/Status	
PT-0101-3	High Pzr. Press.	L-129 TB 1-42/43	4.00 VDC	Date / Tech
PT-0102-3	Low Pzr. Press. Pzr. Press. Bypass	L-129 TB 1-39/40	4.00 VDC	Date / Tech
LT-1113-3	Low SG-1 Level High SG-1 Level	L-129 TB 1-24/25	3.50 VDC	Date / Tech
LT-1123-3	Low SG-2 Level High SG-2 Level	L-129 TB 1-21/22	3.50 VDC	Date / Tech
PT-1013-3	Low SG-1 Press. SG-1 P	L-129 TB 1-36/37	3.70 VDC	Date / Tech
PT-1023-3	Low SG-2 Press. SG-2 P	L-129 TB 1-33/34	3.70	Date / Tech

6.0 PROCEDURE

6.1.1 (Continued)

CHANNEL C (Continued)

Transmitter	PPS Parameter	Terminal Board Location	Initial Signal Value/Status	
PT-0351-3	High Cont. Press. RPS High Cont. Press. ESF	L-129 TB 1-46/47	1.00 VDC	/ Date Tech
PT-0352-3	Hi-Hi Cont. Press.	L-129 TB 1-49/50	1.00 VDC	/ Date Tech
LT-0305-3	Low RWT Level	L-129 TB 1-30/31	2.50 VDC	/ Date Tech
PDT-0978-3	SG-1 Low Flow	L-129 TB 3-13/14	5.00 VDC	/ Date Tech
PDT-0979-3	SG-2 Low Flow	L-129 TB 3-19/20	5.00 VDC	/ Date Tech
Contact	DNBR Trip	TBC2-62/63	CLOSED	/ Date Tech
Contact	DNBR Pre-trip	TBC2-64/65	CLOSED	/ Date Tech
Contact	LPD Trip	TBC2-66/67	CLOSED	/ Date Tech
Contact	LPD Pre-trip	TBC2-68/69	CLOSED	/ Date Tech
Contact	CWP	TBC2-70/71	CLOSED	/ Date Tech
Contact	Turbine Trip	TBC2-123/124	CLOSED	/ Date Tech
Contact	55% Power	TBC7-24/25	CLOSED	/ Date Tech
Contact	10^{-4}% CPC Bypass	TBC7-42/43	CLOSED	/ Date Tech

6.0 PROCEDURE

6.1.1 (Continued)

CHANNEL D

Transmitter	PPS Parameter	Terminal Board Location	Initial Signal Value/Status	
PT-0101-4	High Pzr. Press.	L-133 TB 1- 7/8	4.00 VDC	/ Date Tech
PT-0102-4	Low Pzr. Press. Pzr. Press. Bypass	L-133 TB 1- 1/2	4.00 VDC	/ Date Tech
LT-1113-4	Low SG-1 Level High SG-1 Level	L-133 TB 1-33/34	3.50 VDC	/ Date Tech
LT-1123-4	Low SG-2 Level High SG-2 Level	L-133 TB 1-30/31	3.50 VDC	/ Date Tech
PT-1013-4	Low SG-1 Press. SG-1 P	L-133 TB 1-39/40	3.70 VDC	/ Date Tech
PT-1023-4	Low SG-2 Press. SG-2 P	L-133 TB 1-36/37	3.70	/ Date Tech
PT-0351-4	High Cont. Press. RPS High Cont. Press. ESF	L-133 TB 1-43/44	1.00 VDC	/ Date Tech
PT-0352-4	Hi-Hi Cont. Press.	L-133 TB 1-46/47	1.00 VDC	/ Date Tech
LT-0305-4	Low RWT Level	L-133 TB 1- 4/5	2.50 VDC	/ Date Tech
PDT-0978-4	SG-1 Low Flow	L-133 TB 3-13/14	5.00 VDC	/ Date Tech
PDT-0979-4	SG-2 Low Flow	L-133 TB 3-19/20	5.00 VDC	/ Date Tech
Contact	DNBR Trip	TBD2-52/53	CLOSED	/ Date Tech
Contact	DNBR Pre-trip	TBD2-64/65	CLOSED	/ Date Tech

6.0 PROCEDURE

6.1.1 (Continued)

CHANNEL D (Continued)

Transmitter	PPS Parameter	Terminal Board Location	Initial Signal Value/Status	
Contact	LPD Trip	TBD2-55/57	CLOSED	/ Date Tech
Contact	LPD Pre-trip	TBD2-68/69	CLOSED	/ Date Tech
Contact	CWP	TBD2-70/71	CLOSED	/ Date Tech
Contact	Turbine Trip	TBD2-123/124	CLOSED	/ Date Tech
Contact	55% Power	TBD7-24/25	CLOSED	/ Date Tech
Contact	10^{-4}% CPC Bypass	TBD7-42/43	CLOSED	/ Date Tech

6.1.2 Verify all pre-trip (P) and trip (T) lights are deenergized on all four bistable control panels.

/
Date Technician

NOTE: If any unexpected trips occur during this test and cannot be reset, the cause should be investigated prior to continuing.

6.1.3 Verify core protection calculators (CPC's) are energized and operational to the extent required to perform this test.

/
Date Technician

6.0 PROCEDURE

6.1.4 Install jumpers in 2L034 and 2L035 on TB-55, TB-65, TB-75, and TB-85 between the following terminals: 25 and 27, 28 and 30, 31 and 33, 34 and 36, 37 and 39, 40 and 42, 43 and 45, 46 and 48. (64 jumpers total) and isolate the field wiring. This is to prevent inadvertent ESF actuations during the performance of response time testing.

_______________ / _______________
Date Technician

CAUTION
=======
Do not work on more than one bay in 2L034 and one bay in 2L035 at one time.

6.1.5 Perform the following steps on the ID-100 hydraulic signal generator to prepare it for response time testing: Refer to Figure A-1, A-2, and A-4.

.1 Connect a regulated supply of pressurized gas to the GAS inlet connection on the rear panel of the TIME RESPONSE TEST SET. The pressure and capacity of the source should be adequate to provide the pressures required by the pressure sensor to be tested. Do not pressurize unit.

_______________ / _______________
Date Technician

.2 Connect a pressure gauge of the appropriate range to the GAUGE connection on the rear panel.

_______________ / _______________
Date Technician

.3 Ensure the transmitter to be tested is tagged out of service observing the precautions of Section 4.

_______________ / _______________
Date Technician

6.1.5.4 Open the process transmitter bypass valve (if applicable) and connect the hydraulic signal generator to the process transmitter using 1/4" OD stainless tubing.

__________ / __________
Date Technician

NOTE: The length of the signal tubing is not critical, but it should be as short and straight as practical. The tubing is connected to the "SIGNAL OUTPUT" fitting on the rear panel of the unit.

.5 Filling

Observe the following sequence to fill the hydraulic accumulator and output signal lines. Line up the valves as shown below. Add water through the sight gauge until a level of 9 is indicated.

Gas Isolation	CLOSED
Gauge Isolation	OPEN
Pressurize	INITIAL
Signal Isolation	OPEN
Pressure Bleed	OPEN
Vent/Drain	CLOSED
Sight Gauge/Fill	OPEN
Drain	CLOSED

NOTE: Overfilling will not damage the unit but may cause water to enter the pneumatic lines momentarily affecting the signal waveshape.

__________ / __________
Date Technician

6.0 PROCEDURE

6.1.5.6 Once the water has stabilized at the 9 level, close the SIGHT GAUGE/FILL valve.

_______________ / _______________
Date Technician

.7 Bleeding

Observe the following sequence to bleed the signal output lines, the reference transducer, and process sensor. Line up the valves as follows:

Gas Isolation	CLOSED
Gauge Isolation	OPEN
Pressurize	INITIAL
Signal Isolation	OPEN
Pressure Bleed	CLOSED
Vent/Drain	CLOSED
Sight Gauge/Fill	CLOSED
Drain	CLOSED

_______________ / _______________
Date Technician

.8 Partially open the GAS ISOLATION valve and pressurize the unit to 5-10 psig. Carefully bleed air from the following points:

- o Drain valve
- o Process sensor vent
- o Reference Transducer bleed port (use allen wrench supplied with the unit)
- o Close the process transmitter bypass valve (if applicable)

_______________ / _______________
Date Technician

6.0 PROCEDURE

6.1.5.9 After all air has been bled from the system, open the PRESSURE BLEED valve and bleed off any remaining pressure. The hydraulic accumulator can now be filled or drained to the level required for the current test sequence.

To fill-open the PRESSURE BLEED and SIGHT GAUGE/FILL valves, add water through the sight gauge until desired level is reached.

To drain-open the PRESSURE BLEED and SIGHT GAUGE/FILL valves, slowly open the DRAIN valve to adjust the level in the hydraulic accumulator.

______ / ______
Date Technician

NOTE: The following valves <u>must</u> always be closed prior to pressurizing the unit.
- Pressure Bleed
- Vent/Drain
- Sight Gauge/Fill
- Drain

.10 Pressure Stability Check

The test for pressure stability is basically a check for leaks in the system.

Connect a 0.5% accuracy, 3000 psig range, pressure gauge to the TEST SET and install a 3000 psid diaphragm in the Reference Transducer. Align the valves as shown below:

Gas Isolation	CLOSED
Gauge Isolation	OPEN
Pressurize	DRIVE
Signal Isolation	CLOSED
Pressure Bleed	CLOSED

6.0 PROCEDURE

6.1.5.10

Drain/Vent	CLOSED
Sight Gauge/Fill	CLOSED
Drain	CLOSED

______ / ______
Date Technician

.11 Connect the unit to a 3000 psig source of gas. A lower pressure source may be used, but it should not be less than 2000 psig. Open the GAS ISOLATION valve and pressurize the unit to 3000 psig. Allow several minutes and repeat until the pressure is stable at 3000 psig. Monitor the pressure for 5 minutes. A drop in pressure indicates leakage. The unit should be depressurized and all valve packings tightened. Repeat the pressurization procedure and verify pressure stability. If the pressure is still not stable, depressurize the unit, remove the back, and check for water leaks. Gas leaks may be detected by applying leak detecting fluids to the joints.

______ / ______
Date Technician

.12 Reference Stability Check

Connect test equipment as follows referring to Figure A-4 of Appendix A. Connect one pair of leads to the REF. SENSOR OUT terminals on the side of the TIME RESPONSE TEST SET and to one channel of the recorder. Connect another pair of leads to the PROCESS SENSOR OUT terminals and to the second recorder channel. Connect a DVM to the DIGITAL VOLTMETER terminals. Connect 115 VAC power to the test equipment.

______ / ______
Date Technician

5.0 PROCEDURE

5.1.5.13 Open the pressure transmitter current loop and connect the transmitter current signal to the TIME RESPONSE TEST SET. It is important that the polarity of the signal is correct. This can be verified by setting the SIGNAL CONDITIONING switch to the correct loop current and placing the DVM MONITOR switch in the PROCESS SENSOR position. With no pressure applied to the transmitter, the DVM should read approximately +1 VDC.

_______________ / _______________
Date Technician

.14 Install a 5 psid diaphragm and 0.5% accuracy pressure gauge and pressurize the unit to 5 psig. Close the GAS ISOLATION valve. Place the DVM MONITOR in the REFERENCE XMTR position and adjust the SPAN control for 10 VDC. After allowing several minutes for warmup, monitor the reference transducer output for 5 minutes, periodically verifying that the pressure has remained constant. Random drift in excess of ±5 millivolts indicates a need to replace the reference demodulator.

_______________ / _______________
Date Technician

NOTE: The following major procedure subsections may be performed in any order at the discretion of the technician.

5.2 Response Time Testing of High Pressurizer Pressure Sensor PT-0101-2

NOTE: REFERENCE TRANSDUCER AND PROCESS TRANSMITTER OUTPUT ADJUSTMENT. The electrical outputs of the reference transducer and the process transmitter must be adjusted prior to any test sequence. The following steps provide a means of achieving maximum vertical deflection of the recorder within the required pressure range.

6.2 PROCEDURE

6.2.1 Line up valves as shown below on the ID-100.

Gas Isolation	CLOSED
Gauge Isolation	OPEN
Pressurize	INITIAL
Signal Isolation	OPEN
Pressure Bleed	CLOSED
Vent/Drain	CLOSED
Sight Gauge/Fill	CLOSED
Drain	CLOSED

/
Date Technician

6.2.2 Open the PRESSURE BLEED valve to ensure system pressure is at zero. Place DVM MONITOR switch in the REFERENCE XMTR position. Adjust the SPAN control to the fully counterclockwise position. Note the reading on the DVM.

/
Date Technician

6.2.3 Adjust the SPAN control to the fully clockwise position. Adjust the ZERO control until the DVM indicates the voltage noted in paragraph 6.2.2 and with the same polarity (e.g., if the voltage in 6.2.2 was -15MV, adjust the ZERO control for a reading of -15MV).

/
Date Technician

CAUTION
======= Use EXTREME CARE IN PRESSURIZING THE UNIT to avoid exceeding the pressure range of the reference transducer diaphragm and causing possible damage. It is good practice to set the gas supply regulator to a pressure slightly above the highest to be used in the test.

6.0 PROCEDURE

6.2.3 (Continued)

NOTE: Use the definitions and equations below to help perform the following steps:

Definitions

P_{SETPT} - The pressure at which the response time is to be determined (usually the pressure at which the sensor output causes a specific action).

$P_{INITIAL}$ - The pressure on the hydraulic accumulator, reference transducer, and process sensor at the beginning of the test.

P_{DRIVE} - The pressure in the pneumatic accumulator at the beginning of the test.

Span - The absolute range of the pressure senor.

UP-RAMP

$P_{INITIAL} = P_{SETPT} - .05$ span

$P_{DRIVE} = P_{INITIAL} + .5$ span

NOTE: Should the set point be close to the upper limit of the sensor range, the value for P_{DRIVE} should be kept within the limits of a safe overrange for the sensor.

DOWN-RAMP

$P_{INITIAL} = P_{SETPT} + .05$ span

$P_{DRIVE} = P_{INITIAL} - .5$ span

6.2.4 Close the PRESSURE BLEED valve and pressurize the unit by slowly opening the GAS ISOLATION valve. Pressurize to P_{SETPT} or $P_{INITIAL}$, whichever is greater. Table 1 of Appendix C lists the specific values for each transmitter.

_______________ / _______________
Date Technician

6.0 PROCEDURE

6.2.5 Adjust the SPAN control for maximum output or null point + 10 VDC, whichever is less.

_______ / _______
Date Technician

6.2.6 Pressurize the unit to $P_{INITIAL}$.

_______ / _______
Date Technician

6.2.7 Operate REFERENCE XMTR BIAS and PROCESS XMTR BIAS controls to place the recorder traces in an appropriate position on the recorder chart. For an up-ramp test, the traces should appear on the bottom quarter of the chart. For a down-ramp test, the traces should appear on the top quarter of the chart. The process trace should always be slightly below the reference trace.

_______ / _______
Date Technician

6.2.8 Vary unit pressure between $P_{INITIAL}$ and P_{SETPT} while adjusting the recorder amplifier and TRTS BIAS controls to maintain the traces on the recorder chart and in the same relative position. Repeat until no further adjustments are necessary.

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Date Technician

6.2.9 Adjust the signal rate to the value specified in Table 1 of Appendix C.

_______ / _______
Date Technician

6.0 PROCEDURE

6.2.9 (Continued)

NOTE: The signal rate is a function of four variables; pressure, differential pressure, fluid level in the hydraulic accumulator, and the setting on the SIGNAL RATE metering valve. The SIGNAL RATE valve has been sized to provide the range of signal rates most frequently required with the fluid level at 8 on the sight gauge (approximate hydraulic accumulator level). Turning the SIGNAL RATE control in a clockwise direction will decrease the rate, turning in a counterclockwise direction will increase the rate. If higher rates are desired, fully depressurize the unit and add fluid. In a similar manner, if slower signal rates are required, fully depressurize the unit and drain the appropriate amount of fluid by opening the DRAIN valve.

NOTE: Opening the PRESSURE BLEED valve provides a vent for filling or draining.

By adding or removing fluid from the unit, the range of signal rates may be varied from approximately one inch of water per second to over 1000 pounds per second without loss of signal linearity. Extremely high signal rates are attained at higher pressures. For those applications requiring high rates at low pressures, optional equipment is available from the manufacturer. Figure A-5 shows how signal rate is determined from sample trace.

6.2.10 Diagnostic Self-Test of ID-100

.1 Line up the valves on the hydraulic signal generator as follows:

Gas Isolation	CLOSED
Gauge Isolation	OPEN
Pressurize	DRIVE
Signal Isolation	CLOSED
Pressure Bleed	CLOSED

[illegible] [illegible]

6.2.10.1	Vent/Drain	CLOSED
	Sight Gauge/Fill	CLOSED
	Drain	CLOSED

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Date Technician

6.2.11 Up Ramp Generation

.1 Determine the initial, driving, and set point pressure from Table 1 of Appendix C.

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Date Technician

.2 Slowly open the "signal isolation" valve.

_______________/_______________
Date Technician

.3 Slowly open the GAS ISOLATION valve and pressurize the unit to the driving pressure (P_{DRIVE}). Close the GAS ISOLATION valve.

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Date Technician

.4 Once the pressure has stabilized, turn the PRESSURIZE valve to the INITIAL position. Slowly open the GAS ISOLATION valve and bring the pressure up to P_{SETPT}.

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Date Technician

.5 Run the recorder at a slow chart drive speed to record a short reference trace at this pressure. Be sure there is a separation between the reference trace and the process transmitter trace. Verify both traces are in appropriate relative positions.

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Date Technician

6.2.11.6 Slowly open the GAS ISOLATION valve and pressurize the unit to the initial pressure ($P_{INITIAL}$).

NOTE: Make sure the SIGNAL INITIATE switch is off during the set up. Premature opening of this valve will invalidate the test. Verify both traces are in appropriate positions.

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Date Technician

.7 The unit is ready to generate the appropriate up-ramp. Check the recorder to make sure the proper chart drive speed has been selected.

______________ / ______________
Date Technician

NOTE: The record chart drive speed selection has a strong bearing on how well the data can be evaluated. The chart drive speed should be slowest at which adequate resolution of desired timing marks is attained. The greater the angle the signal trace makes with the horizontal, the more clearly defined is the point of intersection with the reference trace. As a rough guide, the chart drive speed should be proportional to the ramp rate.

.8 To run the test, start the recorder chart drive then depress the signal initiate switch. Record the appropriate data on the recorder chart. Include $P_{Initial}$, P_{Drive}, P_{Setpt}, signal rate setting, fluid level, timing mark interval, date, chart drive speed, and the words: "diagnostic self-test."

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Date Technician

6.0 PROCEDURE

6.2.11.9 Perform the diagnostic self-test twice and compare the results with the signal traces for the same tests supplied with the unit.

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Date Technician

.10 Examine the trace of each signal for the following qualitative waveform characteristics. Verify the results are acceptable as follows:

(a) Linear within a visual "best fit" from P to P_{SETPT}.

(b) Complete absence of high frequency components (noise).

(c) Sharp and clearly defined "knee" on leading edge of test signal.

(d) The signal ramp rate has not decreased more than 5% of the ramp rate of the original base line signal traces supplied with the unit.

_______________ / _______________
Date Technician

6.2.12 If diagnostic self-test is satisfactory, produce another dual trace as in step 6.2.11.8. Use this trace to compute the response time of the transmitter. Record this response time in the data collection table at the back of this procedure. Figure A-6 shows calculation method for time delay (response time). Also record on the chart "High Pressurizer Pressure Sensor," "PT-0101-3"

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Date Technician

6.2.13 Disconnect all test leads and reconnect the normal signal leads at the process transmitter.

_______________ / _______________
Date Technician

6.0 PROCEDURE

6.2.14 Ensure the hydraulic signal generator is vented and disconnect it from the process transmitter.

_______________ / _______________
Date Technician

6.2.15 Following appropriate procedures, return process transmitter to service.

_______________ / _______________
Date Technician

6.3 Response Time Testing of Low Pressurizer Pressure Sensor PT-0102-3

NOTE: REFERENCE TRANSDUCER AND PROCESS TRANSMITTER OUTPUT ADJUSTMENT. The electrical outputs of the reference transducer and the process transmitter must be adjusted prior to any test sequence. The following steps provide a means of achieving maximum vertical deflection of the recorder within the required pressure range.

6.3.1 Line up valves as shown below on ID-100:

Gas Isolation	CLOSED
Gauge Isolation	OPEN
Pressurize	INITIAL
Signal Isolation	OPEN
Pressure Bleed	CLOSED
Vent/Drain	CLOSED
Sight Gauge/Fill	CLOSED

Drain CLOSED

6.3.2 Open the PRESSURE BLEED valve to ensure system pressure is at zero. Place DVM MONITOR switch in the REFERENCE XMTR position. Adjust the SPAN control to the fully counterclockwise position. Note the reading on the DVM.

_______________ / _______________
Date Technician

ROCEDURE

6.3.3 Adjust the SPAN control to the fully clockwise position. Adjust the ZERO control until the DVM indicates the voltage noted in paragraph 6.3.2 and with the same polarity (e.g., if the voltage on 6.3.2 was -15MV, adjust the ZERO control for a reading of -15MV).

__________ / __________
Date Technician

CAUTION Use EXTREME CARE IN PRESSURIZING THE UNIT to avoid exceeding the pressure range of the reference transducer diaphragm and causing possible damage. It is good practice to set the gas supply regulator to a pressure slightly above the highest to be used in the test.

NOTE: Use the definitions and equations below to help perform the following steps.

Definitions:

P_{SETPT} - The pressure at which the response time is to be determined (usually the pressure at which the sensor output causes a specific action).

$P_{INITIAL}$ - The pressure on the hydraulic accumulator, reference transducer, and process sensor at the beginning of the test.

P_{DRIVE} - The pressure in the pneumatic accumulator at the beginning of the test.

Span- The absolute range of the pressure sensor.

UP-RAMP

$P_{INITIAL} = P_{SETPT} - .05$ span

$P_{DRIVE} = P_{INITIAL} + .5$ span

NOTE: Should the set point be close to the upper limit of the sensor range, the value for P_{DRIVE} should be kept within the limits of a safe overrange for the sensor.

6.0 PROCEDURE

6.3.3 (Continued)

DOWN-RAMP

$$P_{INITIAL} = P_{SETPT} + .05 \text{ span}$$

$$P_{DRIVE} = P_{INITIAL} - .5 \text{ span}$$

6.3.4 Close the PRESSURE BLEED valve and pressurize the unit by slowly opening the GAS ISOLATION valve. Pressurize to P_{SETPT} or $P_{INITIAL}$, whichever is greater. Table 1 of Appendix C lists the specific values for each transmitter.

______ / ______
Date Technician

6.3.5 Adjust the SPAN control for maximum output or null point + 10 VDC, whichever is less.

______ / ______
Date Technician

6.3.6 Pressurize the unit to $P_{INITIAL}$.

______ / ______
Date Technician

6.3.7 Operate REFERENCE XMTR BIAS and PROCESS XMTR BIAS controls to place the recorder traces in an appropriate position on the recorder chart. For an up ramp test, the traces should appear on the bottom quarter of the chart. For a down-ramp test, the traces should appear on the top quarter of the chart. The process trace should always be slightly below the reference trace.

______ / ______
Date Technician

6.3.8 Vary unit pressure between $P_{INITIAL}$ and P_{SETPT} while adjusting the recorder amplifier and TRTS BIAS controls to maintain the traces on the recorder chart and in the same relative position. Repeat until no further adjustments are necessary.

______ / ______
Date Technician

6.0 PROCEDURE

6.3.9 Adjust the signal rate to the value specified in Table 1 of Appendix C.

_______________/_______________
Date Technician

NOTE: The signal rate is a function of four variables; pressure, differential pressure, fluid level in the hydraulic accumulator, and the setting on the SIGNAL RATE metering valve. The SIGNAL RATE valve has been sized to provide the range of signal rates most frequently required with the fluid level at 8 on the sight gauge (approximate hydraulic accumulator level). Turning the SIGNAL RATE control in a clockwise direction will decrease the rate, turning in a counterclockwise direction will increase the rate. If higher rates are desired, fully depressurize the unit and add fluid. In a similar manner, if slower signal rates are required, fully depressurize the unit and drain the appropriate amount of fluid by opening the DRAIN valve.

NOTE: Opening the PRESSURE BLEED valve provides a vent for filling or draining.

By adding or removing fluid from the unit, the range of signal rates may be varied from approximately one inch of water per second to over 1000 pounds per second without loss of signal linearity. Extremely high signal rates are attained at higher pressures. For those applications requiring high rates at low pressures, optional equipment is available from the manufacturer. Figure A-5 shows how signal rate is determined from sample trace.

6.3.10 Diagnostic Self-Test of ID-100

.1 Line up the valves on the hydraulic signal generator as follows:

Gas Isolation	CLOSED
Gauge Isolation	OPEN
Pressurize	DRIVE
Signal Isolation	CLOSED
Pressure Bleed	CLOSED

6.3.10.1 (Continued)

Drain/Vent CLOSED

Sight Gauge/Fill CLOSED

Drain CLOSED

_______ / _______
Date Technician

6.3.11 Down-Ramp Generation

.1 Determine the initial, driving, and set point pressures for the transmitter to be tested from Table 1 of Appendix C.

_______ / _______
Date Technician

.2 Slowly open the "signal isolation" valve.

_______ / _______
Date Technician

.3 Slowly open the GAS ISOLATION valve and pressurize the unit to the driving pressure (P_{DRIVE}). Close the GAS ISOLATION valve.

_______ / _______
Date Technician

.4 Once the pressure has stabilized, turn the PRESSURIZE valve to the INITIAL position. Slowly open the GAS ISOLATION valve and bring the pressure up to P_{SETPT}.

_______ / _______
Date Technician

.5 Run the recorder at a slow chart drive speed to record a short reference trace at this pressure. Be sure there is a separation between the reference trace and the process transmitter trace. Verify both traces are in appropriate relative positions.

_______ / _______
Date Technician

6.0 PROCEDURE

6.3.11.6 Slowly open the GAS ISOLATION valve and pressurize the unit to the initial pressure ($P_{INITIAL}$).

NOTE: Make sure the SIGNAL INITIATE switch is off during the set up. Premature opening of this valve will invalidate the test. Verify both traces are in appropriate positions.

_______________ / _______________
Date Technician

.7 The unit is ready to generate the appropriate downramp. Check the recorder to make sure the proper chart drive speed has been selected.

_______________ / _______________
Date Technician

NOTE: The record chart drive speed selection has a strong bearing on how well the data can be evaluated. The chart drive speed should be s lowest at which adequate resolution of desired timing marks is attained. The greater the angle the signal trace makes with the horizontal, the more clearly defined is the point of intersection with the reference trace. As a rough guide, the chart drive speed should be proportional to the ramp rate.

.8 To run the test, start the recorder chart drive then depress the signal initiate switch. Record the appropriate data on the recorder chart. Include $P_{Initial}$, P_{Drive}, P_{Setpt}, signal rate setting, fluid level, timing mark interval, date, chart drive speed, and the words: "diagnostic self-test."

_______________ / _______________
Date Technician

6.0 PROCEDURE

6.3.11.9 Perform the diagnostic self-test twice and compare the results with the signal traces for the same tests supplied with the unit.

_______________/_______________
Date Technician

.10 Examine the trace of each signal for the following qualitative waveform characteristics. Verify the results are acceptable as follows:

(a) Linear within a visual "best fit" from P to P_{SETPT}.

(b) Complete absence of high frequency components (noise).

(c) Sharp and clearly defined "knee" on leading edge of test signal.

(d) The signal ramp rate has not decreased more than 5% of the ramp rate of the original base line signal traces supplied with the unit.

_______________/_______________
Date Technician

6.3.12 If diagnostic self-test is satisfactory, produce another dual trace as in step 6.3.11.8. Use this trace to compute the response time of the transmitter. Record this response time in the data collection table at the back of this procedure. Figure A-6 shows calculation method for time delay (response time). Also record on the chart "Low Pressurizer Pressure Sensor," "PT-0102-3"

_______________/_______________
Date Technician

6.3.13 Disconnect all test leads and reconnect the normal signal leads at the process transmitter.

_______________/_______________
Date Technician

6.0 PROCEDURE

6.3.14 Ensure the hydraulic signal generator is vented and disconnect it from the process transmitter.

_______________ / _______________
Date Technician

6.3.15 Following appropriate procedures, return process transmitter to service.

_______________ / _______________
Date Technician

6.4 Response Time Testing of Low SG-1 Pressure Sensor PT-1013-3

NOTE: REFERENCE TRANSDUCER AND PROCESS TRANSMITTER OUTPUT ADJUSTMENT. The electrical outputs of the reference transducer and the process transmitter must be adjusted prior to any test sequence. The following steps provide a means of achieving maximum vertical deflection of the recorder within the required pressure range.

6.4.1 Line up valves as shown below on ID-100:

Gas Isolation	CLOSED
Gauge Isolation	OPEN
Pressurize	INITIAL
Signal Isolation	OPEN
Pressure Bleed	CLOSED
Vent/Drain	CLOSED
Sight Gauge/Fill	CLOSED
Drain	CLOSED

6.4.2 Open the PRESSURE BLEED valve to ensure system pressure is at zero. Place DVM MONITOR switch in the REFERENCE XMTR position. Adjust the SPAN control to the fully counterclockwise position. Note the reading on the DVM.

_______________ / _______________
Date Technician

6.0 PROCEDURE

6.4.3 Adjust the SPAN control to the fully clockwise position. Adjust the ZERO control until the DVM indicates the voltage noted in paragraph 5.4.2 and with the same polarity (e.g., if the voltage in 5.4.2 was -15MV, adjust the ZERO control for a reading of -15MV).

______________/______________
Date Technician

CAUTION Use EXTREME CARE IN PRESSURIZING THE UNIT to avoid exceeding the pressure range of the reference transducer diaphragm and causing possible damage. It is good practice to set the gas supply regulator to a pressure slightly above the highest to be used in the test.

NOTE: Use the definitions and equations below to help perform the following steps:

Definitions

P_{SETPT} - The pressure at which the response time is to be determined (usually the pressure at which the sensor output causes a specific action).

$P_{INITIAL}$ - The pressure on the hydraulic accumulator, reference transducer, and process sensor at the beginning of the test.

P_{DRIVE} - The pressure in the pneumatic accumulator at the beginning of the test.

Span - The absolute range of the pressure senor.

UP-RAMP

$P_{INITIAL} = P_{SETPT} - .05 \text{ span}$

$P_{DRIVE} = P_{INITIAL} + .5 \text{ span}$

NOTE: Should the set point be close to the upper limit of the sensor range, the value for P_{DRIVE} should be kept within the limits of a safe overrange for the sensor.

6.0 PROCEDURE

6.4.3 DOWN-RAMP

$P_{INITIAL} = P_{SETPT} + .05$ span

$P_{DRIVE} = P_{INITIAL} - .5$ span

6.4.4 Close the PRESSURE BLEED valve and pressurize the unit by slowly opening the GAS ISOLATION valve. Pressurize to P_{SETPT} or $P_{INITIAL}$, whichever is greater. Table I of Appendix C lists the specific values for each transmitter.

_____________/_____________
Date Technician

6.4.5 Adjust the SPAN control for maximum output or null point + 10 VDC, whichever is less.

_____________/_____________
Date Technician

6.4.6 Pressurize the unit to $P_{INITIAL}$.

_____________/_____________
Date Technician

6.4.7 Operate REFERENCE XMTR BIAS and PROCESS XMTR BIAS controls to place the recorder traces in an appropriate position on the recorder chart. For an up-ramp test, the traces should appear on the bottom quarter of the chart. For a down-ramp test, the traces should appear on the top quarter of the chart. The process trace should always be slightly below the reference trace.

_____________/_____________
Date Technician

6.4.8 Vary unit pressure between $P_{INITIAL}$ and P_{SETPT} while adjusting the recorder amplifier and TRTS BIAS controls to maintain the traces on the recorder chart and in the same relative position. Repeat until no further adjustments are necessary.

_____________/_____________
Date Technician

6.0 PROCEDURE

6.4.9 Adjust the signal rate to the value specified in Table 1 of Appendix C.

/
Date Technician

NOTE: The signal rate is a function of four variables; pressure, differential pressure, fluid level in the hydraulic accumulator, and the setting on the SIGNAL RATE metering valve. The SIGNAL RATE valve has been sized to provide the range of signal rates most frequently required with the fluid level at 8 on the sight gauge (approximate hydraulic accumulator level). Turning the SIGNAL RATE control in a clockwise direction will decrease the rate, turning in a counterclockwise direction will increase the rate. If higher rates are desired, fully depressurize the unit and add fluid. In a similar manner, if slower signal rates are required, fully depressurize the unit and drain the appropriate amount of fluid by opening the DRAIN valve.

NOTE: Opening the PRESSURE BLEED valve provides a vent for filling or draining.

By adding or removing fluid from the unit, the range of signal rates may be varied from approximately one inch of water per second to over 1000 pounds per second without loss of signal linearity. Extremely high signal rates are attained at higher pressures. For those applications requiring high rates at low pressures, optional equipment is available from the manufacturer. Figure A-5 shows how signal rate is determined from sample trace.

6.4.10 Diagnostic Self-Test of ID-100

.1 Line up the valves on the hydraulic signal generator as follows:

Gas Isolation CLOSED

Gauge Isolation OPEN

Pressurize DRIVE

Signal Isolation CLOSED

6.0 PROCEDURE

6.4.10.1.1	Pressure Bleed	CLOSED
	Drain/Vent	CLOSED
	Sight Gauge/Fill	CLOSED
	Drain	CLOSED

_______________/_______________
Date Technician

6.4.11 Down-Ramp Generation

.1 Determine the initial, driving, and set point pressures for the transmitter to be tested from Table 1 of Appendix C.

_______________/_______________
Date Technician

.2 Slowly open the "signal isolation" valve.

_______________/_______________
Date Technician

.3 Slowly open the GAS ISOLATION valve and pressurize the unit to the driving pressure (P_{DRIVE}). Close the GAS ISOLATION valve.

_______________/_______________
Date Technician

.4 Once the pressure has stabilized, turn the PRESSURIZE valve to the INITIAL position. Slowly open the GAS ISOLATION valve and bring the pressure up to P_{SETPT}.

_______________/_______________
Date Technician

.5 Run the recorder at a slow chart drive speed to record a short reference trace at this pressure. Be sure there is a separation between the reference trace and the process transmitter trace. Verify both traces are in appropriate relative positions.

_______________/_______________
Date Technician

6.0 PROCEDURE

6.4.11.6 Slowly open the GAS ISOLATION valve and pressurize the unit to the initial pressure ($P_{INITIAL}$).

NOTE: Make sure the SIGNAL INITIATE switch is off during the set up. Premature opening of this valve will invalidate the test. Verify both traces are in appropriate positions.

_______ / _______
Date Technician

.7 The unit is ready to generate the appropriate down-ramp. Check the recorder to make sure the proper chart drive speed has been selected.

_______ / _______
Date Technician

NOTE: The record chart drive speed selection has a strong bearing on how well the data can be evaluated. The chart drive speed should be slowest at which adequate resolution of desired timing marks is attained. The greater the angle the signal trace makes with the horizontal, the more clearly defined is the point of intersection with the reference trace. As a rough guide, the chart drive speed should be proportional to the ramp rate.

.8 To run the test, start the recorder chart drive then depress the signal initiate switch. Record the appropriate data on the recorder chart. Include $P_{Initial}$, P_{Drive}, P_{Setpt}, signal rate setting, fluid level, timing mark interval, date, chart drive speed, and the words: "diagnostic self-test."

_______ / _______
Date Technician

6.0 PROCEDURE

6.4.11.9 Perform the diagnostic self-test twice and compare the results with the signal traces for the same tests supplied with the unit.

____________/____________
Date Technician

.10 Examine the trace of each signal for the following qualitative waveform characteristics. Verify the results are acceptable as follows:

(a) Linear within a visual "best fit" from P to P_{SETPT}.

(b) Complete absence of high frequency components (noise).

(c) Sharp and clearly defined "knee" on leading edge of test signal.

(d) The signal ramp rate has not decreased more than 5% of the ramp rate of the original base line signal traces supplied with the unit.

____________/____________
Date Technician

6.4.12 If diagnostic self-test is satisfactory, produce another dual trace as in step 6.4.11.8. Use this trace to compute the response time of the transmitter. Record this response time in the data collection table at the back of this procedure. Figure A-6 shows calculation method for time delay (response time). Also record on the chart "Lo SG-1 Pressure Sensor," "PT-1013-3"

____________/____________
Date Technician

6.4.13 Disconnect all test leads and reconnect the normal signal leads at the process transmitter.

____________/____________
Date Technician

6.0 PROCEDURE

6.4.14 Ensure the hydraulic signal generator is vented and disconnect it from the process transmitter.

_____________/_____________
Date Technician

6.4.15 Following appropriate procedures, return process transmitter to service.

_____________/_____________
Date Technician

6.5 Response Time Testing of Low SG-2 Pressure Sensor PT-1023-3

NOTE: REFERENCE TRANSDUCER AND PROCESS TRANSMITTER OUTPUT ADJUSTMENT. The electrical outputs of the reference transducer and the process transmitter must be adjusted prior to any test sequence. The following steps provide a means of achieving maximum vertical deflection of the recorder within the required pressure range.

6.5.1 Line up valves as shown below on ID-100:

Gas Isolation	CLOSED
Gauge Isolation	OPEN
Pressurize	INITIAL
Signal Isolation	OPEN
Pressure Bleed	CLOSED
Vent/Drain	CLOSED
Sight Gauge/Fill	CLOSED
Drain	CLOSED

6.5.2 Open the PRESSURE BLEED valve to ensure system pressure is at zero. Place DVM MONITOR switch in the REFERENCE XMTR position. Adjust the SPAN control to the fully counterclockwise position. Note the reading on the DVM.

_____________/_____________
Date Technician

6.0 PROCEDURE

6.5.3 Adjust the SPAN control to the fully clockwise position. Adjust the ZERO control until the DVM indicates the voltage noted in paragraph 6.5.2 and with the same polarity (e.g., if the voltage in 6.5.2 was -15MV, adjust the ZERO control for a reading of -15MV).

______________/______________
Date Technician

CAUTION Use EXTREME CARE IN PRESSURIZING THE UNIT to avoid exceeding the pressure range of the reference transducer diaphragm and causing possible damage. It is good practice to set the gas supply regulator to a pressure slightly above the highest to be used in the test.

NOTE: Use the definitions and equations below to help perform the following steps:

Definitions

P_{SETPT} - The pressure at which the response time is to be determined (usually the pressure at which the sensor output causes a specific action).

$P_{INITIAL}$ - The pressure on the hydraulic accumulator, reference transducer, and process sensor at the beginning of the test.

P_{DRIVE} - The pressure in the pneumatic accumulator at the beginning of the test.

Span - The absolute range of the pressure senor.

UP-RAMP

$P_{INITIAL} = P_{SETPT} - .05$ span

$P_{DRIVE} = P_{INITIAL} + .5$ span

NOTE: Should the set point be close to the upper limit of the sensor range, the value for P_{DRIVE} should be kept within the limits of a safe overrange for the sensor.

6.0 PROCEDURE

6.5.3 DOWN-RAMP

$$P_{INITIAL} = P_{SETPT} + .05 \text{ span}$$

$$P_{DRIVE} = P_{INITIAL} - .5 \text{ span}$$

6.5.4 Close the PRESSURE BLEED valve and pressurize the unit by slowly opening the GAS ISOLATION valve. Pressurize to P_{SETPT} or $P_{INITIAL}$, whichever is greater. Table 1 of Appendix C lists the specific values for each transmitter.

______________/______________
Date Technician

6.5.5 Adjust the SPAN control for maximum output or null point + 10 VDC, whichever is less.

______________/______________
Date Technician

6.5.6 Pressurize the unit to $P_{INITIAL}$.

______________/______________
Date Technician

6.5.7 Operate REFERENCE XMTR BIAS and PROCESS XMTR BIAS controls to place the recorder traces in an appropriate position on the recorder chart. For an up-ramp test, the traces should appear on the bottom quarter of the chart. For a down-ramp test, the traces should appear on the top quarter of the chart. The process trace should always be slightly below the reference trace.

______________/______________
Date Technician

6.5.8 Vary unit pressure between $P_{INITIAL}$ and P_{SETPT} while adjusting the recorder amplifier and TRTS BIAS controls to maintain the traces on the recorder chart and in the same relative position. Repeat until no further adjustments are necessary.

______________/______________
Date Technician

6.0 PROCEDURE

6.5.9 Adjust the signal rate to the value specified in Table 1 of Appendix C.

______ / ______
Date Technician

NOTE: The signal rate is a function of four variables; pressure, differential pressure, fluid level in the hydraulic accumulator, and the setting on the SIGNAL RATE metering valve. The SIGNAL RATE valve has been sized to provide the range of signal rates most frequently required with the fluid level at 9 on the sight gauge (approximate hydraulic accumulator level). Turning the SIGNAL RATE control in a clockwise direction will decrease the rate, turning in a counterclockwise direction will increase the rate. If higher rates are desired, fully depressurize the unit and add fluid. In a similar manner, if slower signal rates are required, fully depressurize the unit and drain the appropriate amount of fluid by opening the DRAIN valve.

NOTE: Opening the PRESSURE BLEED valve provides a vent for filling or draining.

By adding or removing fluid from the unit, the range of signal rates may be varied from approximately one inch of water per second to over 1000 pounds per second without loss of signal linearity. Extremely high signal rates are attained at higher pressures. For those applications requiring high rates at low pressures, optional equipment is available from the manufacturer. Figure A-5 shows how signal rate is determined from sample trace.

6.5.10 Diagnostic Self-Test of ID-100

.1 Line up the valves on the hydraulic signal generator as follows:

Gas Isolation CLOSED

Gauge Isolation OPEN

Pressurize DRIVE

Signal Isolation CLOSED

6.0 PROCEDURE

6.5.10.1	Pressure Bleed	CLOSED
	Drain/Vent	CLOSED
	Sight Gauge/Fill	CLOSED
	Drain	CLOSED

Date / Technician

6.5.11 Down-Ramp Generation

.1 Determine the initial, driving, and set point pressures for the transmitter to be tested from Table 1 of Appendix C.

Date / Technician

.2 Slowly open the "signal isolation" valve.

Date / Technician

.3 Slowly open the GAS ISOLATION valve and pressurize the unit to the driving pressure (P_{DRIVE}). Close the GAS ISOLATION valve.

Date / Technician

.4 Once the pressure has stabilized, turn the PRESSURIZE valve to the INITIAL position. Slowly open the GAS ISOLATION valve and bring the pressure up to P_{SETPT}.

Date / Technician

.5 Run the recorder at a slow chart drive speed to record a short reference trace at this pressure. Be sure there is a separation between the reference trace and the process transmitter trace. Verify both traces are in appropriate relative positions.

Date / Technician

6.0 PROCEDURE

6.5.11.6 Slowly open the GAS ISOLATION valve and pressurize the unit to the initial pressure ($P_{INITIAL}$).

NOTE: Make sure the SIGNAL INITIATE switch is off during the set up. Premature opening of this valve will invalidate the test. Verify both traces are in appropriate positions.

_______________ / _______________
Date Technician

.7 The unit is ready to generate the appropriate down-ramp. Check the recorder to make sure the proper chart drive speed has been selected.

_______________ / _______________
Date Technician

NOTE: The record chart drive speed selection has a strong bearing on how well the data can be evaluated. The chart drive speed should be slowest at which adequate resolution of desired timing marks is attained. The greater the angle the signal trace makes with the horizontal, the more clearly defined is the point of intersection with the reference trace. As a rough guide, the chart drive speed should be proportional to the ramp rate.

.8 To run the test, start the recorder chart drive then depress the signal initiate switch. Record the appropriate data on the recorder chart. Include $P_{Initial}$, P_{Drive}, P_{Setpt}, signal rate setting, fluid level, timing mark interval, date, chart drive speed, and the words: "diagnostic self-test."

_______________ / _______________
Date Technician

6.0 PROCEDURE

6.5.11.9 Perform the diagnostic self-test twice and compare the results with the signal traces for the same tests supplied with the unit.

_______________/_______________
Date Technician

.10 Examine the trace of each signal for the following qualitative waveform characteristics. Verify the results are acceptable as follows:

(a) Linear within a visual "best fit" from P to P_{SETPT}.

(b) Complete absence of high frequency components (noise).

(c) Sharp and clearly defined "knee" on leading edge of test signal.

(d) The signal ramp rate has not decreased more than 5% of the ramp rate of the original base line signal traces supplied with the unit.

_______________/_______________
Date Technician

6.5.12 If diagnostic self-test is satisfactory, produce another dual trace as in step 6.5.11.8. Use this trace to compute the response time of the transmitter. Record this response time in the data collection table at the back of this procedure. Figure A-6 shows calculation method for time delay (response time). Also record on the chart "Low SG-2 Pressure Sensor," "PT-1023-3"

_______________/_______________
Date Technician

6.5.13 Disconnect all test leads and reconnect the normal signal leads at the process transmitter.

_______________/_______________
Date Technician

5.0 PROCEDURE

6.5.14 Ensure the hydraulic signal generator is vented and disconnect it from the process transmitter.

/
Date Technician

6.5.15 Following appropriate procedures, return process transmitter to service.

/
Date Technician

6.6 Response Time Testing of Low SG-1 Level Sensor LT-1113-3

NOTE: REFERENCE TRANSDUCER AND PROCESS TRANSMITTER OUTPUT ADJUSTMENT. The electrical outputs of the reference transducer and the process transmitter must be adjusted prior to any test sequence. The following steps provide a means of achieving maximum vertical deflection of the recorder within the required pressure range.

6.6.1 Line up valves as shown below on ID-100:

Gas Isolation	CLOSED
Gauge Isolation	OPEN
Pressurize	INITIAL
Signal Isolation	OPEN
Pressure Bleed	CLOSED
Vent/Drain	CLOSED
Sight Gauge/Fill	CLOSED
Drain	CLOSED

6.6.2 Open the PRESSURE BLEED valve to ensure system pressure is at zero. Place DVM MONITOR switch in the REFERENCE XMTR position. Adjust the SPAN control to the fully counterclockwise position. Note the reading on the DVM.

/
Date Technician

6.0 PROCEDURE

6.6.3 Adjust the SPAN control to the fully clockwise position. Adjust the ZERO control until the DVM indicates the voltage noted in paragraph 6.6.2 and with the same polarity (e.g., if the voltage in 6.6.2 was -15MV, adjust the ZERO control for a reading of -15MV).

_____/_____
Date Technician

CAUTION Use EXTREME CARE IN PRESSURIZING THE UNIT to avoid exceeding the pressure range of the reference transducer diaphragm and causing possible damage. It is good practice to set the gas supply regulator to a pressure slightly above the highest to be used in the test.

NOTE: Use the definitions and equations below to help perform the following steps:

Definitions

P_{SETPT} - The pressure at which the response time is to be determined (usually the pressure at which the sensor output causes a specific action).

$P_{INITIAL}$ - The pressure on the hydraulic accumulator, reference transducer, and process sensor at the beginning of the test.

P_{DRIVE} - The pressure in the pneumatic accumulator at the beginning of the test.

Span - The absolute range of the pressure senor.

UP-RAMP

$P_{INITIAL} = P_{SETPT} - .05$ span

$P_{DRIVE} = P_{INITIAL} + .5$ span

NOTE: Should the set point be close to the upper limit of the sensor range, the value for P_{DRIVE} should be kept within the limits of a safe overrange for the sensor.

6.0 PROCEDURE

6.6.3 DOWN-RAMP

$$P_{INITIAL} = P_{SETPT} + .05 \text{ span}$$

$$P_{DRIVE} = P_{INITIAL} - .5 \text{ span}$$

6.6.4 Close the PRESSURE BLEED valve and pressurize the unit by slowly opening the GAS ISOLATION valve. Pressurize to P_{SETPT} or $P_{INITIAL}$, whichever is greater. Table 1 of Appendix C lists the specific values for each transmitter.

_______________ / _______________
Date Technician

6.6.5 Adjust the SPAN control for maximum output or null point + 10 VDC, whichever is less.

_______________ / _______________
Date Technician

6.6.6 Pressurize the unit to $P_{INITIAL}$.

_______________ / _______________
Date Technician

6.6.7 Operate REFERENCE XMTR BIAS and PROCESS XMTR BIAS controls to place the recorder traces in an appropriate position on the recorder chart. For an up-ramp test, the traces should appear on the bottom quarter of the chart. For a down-ramp test, the traces should appear on the top quarter of the chart. The process trace should always be slightly below the reference trace.

_______________ / _______________
Date Technician

6.6.8 Vary unit pressure between $P_{INITIAL}$ and P_{SETPT} while adjusting the recorder amplifier and TRTS BIAS controls to maintain the traces on the recorder chart and in the same relative position. Repeat until no further adjustments are necessary.

_______________ / _______________
Date Technician

6.0 PROCEDURE

6.6.9 Adjust the signal rate to the value specified in Table 1 of Appendix C.

/
Date Technician

NOTE: The signal rate is a function of four variables; pressure, differential pressure, fluid level in the hydraulic accumulator, and the setting on the SIGNAL RATE metering valve. The SIGNAL RATE valve has been sized to provide the range of signal rates most frequently required with the fluid level at 8 on the sight gauge (approximate hydraulic accumulator level). Turning the SIGNAL RATE control in a clockwise direction will decrease the rate, turning in a counterclockwise direction will increase the rate. If higher rates are desired, fully depressurize the unit and add fluid. In a similar manner, if slower signal rates are required, fully depressurize the unit and drain the appropriate amount of fluid by opening the DRAIN valve.

NOTE: Opening the PRESSURE BLEED valve provides a vent for filling or draining.

By adding or removing fluid from the unit, the range of signal rates may be varied from approximately one inch of water per second to over 1000 pounds per second without loss of signal linearity. Extremely high signal rates are attained at higher pressures. For those applications requiring high rates at low pressures, optional equipment is available from the manufacturer. Figure A-5 shows how signal rate is determined from sample trace.

6.6.10 Diagnostic Self-Test of ID-100

.1 Line up the valves on the hydraulic signal generator as follows:

Gas Isolation	CLOSED
Gauge Isolation	OPEN
Pressurize	DRIVE
Signal Isolation	CLOSED

5.0 PROCEDURE

6.6.10.1 Pressure Bleed CLOSED

Drain/Vent CLOSED

Sight Gauge/Fill CLOSED

Drain CLOSED

_____________/_____________
Date Technician

6.6.11 Down-Ramp Generation

.1 Determine the initial, driving, and set point pressures for the transmitter to be tested from Table 1 of Appendix C.

_____________/_____________
Date Technician

.2 Slowly open the "signal isolation" valve.

_____________/_____________
Date Technician

.3 Slowly open the GAS ISOLATION valve and pressurize the unit to the driving pressure (P_{DRIVE}). Close the GAS ISOLATION valve.

_____________/_____________
Date Technician

.4 Once the pressure has stabilized, turn the PRESSURIZE valve to the INITIAL position. Slowly open the GAS ISOLATION valve and bring the pressure up to P_{SETPT}.

_____________/_____________
Date Technician

.5 Run the recorder at a slow chart drive speed to record a short reference trace at this pressure. Be sure there is a separation between the reference trace and the process transmitter trace. Verify both traces are in appropriate relative positions.

_____________/_____________
Date Technician

6.0 PROCEDURE

6.6.11.6 Slowly open the GAS ISOLATION valve and pressurize the unit to the initial pressure ($P_{INITIAL}$).

NOTE: Make sure the SIGNAL INITIATE switch is off during the set up. Premature opening of this valve will invalidate the test. Verify both traces are in appropriate positions.

______ / ______
Date Technician

.7 The unit is ready to generate the appropriate down-ramp. Check the recorder to make sure the proper chart drive speed has been selected.

______ / ______
Date Technician

NOTE: The record chart drive speed selection has a strong bearing on how well the data can be evaluated. The chart drive speed should be slowest at which adequate resolution of desired timing marks is attained. The greater the angle the signal trace makes with the horizontal, the more clearly defined is the point of intersection with the reference trace. As a rough guide, the chart drive speed should be proportional to the ramp rate.

.8 To run the test, start the recorder chart drive then depress the signal initiate switch. Record the appropriate data on the recorder chart. Include $P_{INITIAL}$, P_{DRIVE}, P_{SETPT}, signal rate setting, fluid level, timing mark interval, date, chart drive speed, and the words: "diagnostic self-test."

______ / ______
Date Technician

6.0 PROCEDURE

6.6.11.9 Perform the diagnostic self-test twice and compare the results with the signal traces for the same tests supplied with the unit.

_______ / _______
Date Technician

.10 Examine the trace of each signal for the following qualitative waveform characteristics. Verify the results are acceptable as follows:

(a) Linear within a visual "best fit" from $P_{INITIAL}$ to P_{SETPT}.

(b) Complete absence of high frequency components (noise).

(c) Sharp and clearly defined "knee" on leading edge of test signal.

(d) The signal ramp rate has not decreased more than 5% of the ramp rate of the original base line signal traces supplied with the unit.

_______ / _______
Date Technician

6.6.12 If diagnostic self-test is satisfactory, produce another dual trace as in step 6.6.11.8. Use this trace to compute the response time of the transmitter. Record this response time in the data collection table at the back of this procedure. Figure A-6 shows calculation method for time delay (response time). Also record on the chart "Low SG-1 Level Sensor," "LT-1113-3"

_______ / _______
Date Technician

6.6.13 Disconnect all test leads and reconnect the normal signal leads at the process transmitter.

_______ / _______
Date Technician

6.0 PROCEDURE

6.6.14 Ensure the hydraulic signal generator is vented and disconnect it from the process transmitter.

______________ / ______________
Date Technician

6.6.15 Following appropriate procedures, return process transmitter to service.

______________ / ______________
Date Technician

6.7 Response Time Testing of Low SG-2 Level Sensor LT-1123-3

NOTE: REFERENCE TRANSDUCER AND PROCESS TRANSMITTER OUTPUT ADJUSTMENT. The electrical outputs of the reference transducer and the process transmitter must be adjusted prior to any test sequence. The following steps provide a means of achieving maximum vertical deflection of the recorder within the required pressure range.

6.7.1 Line up valves as shown below on ID-100:

Gas Isolation CLOSED

Gauge Isolation OPEN

Pressurize INITIAL

Signal Isolation OPEN

Pressure Bleed CLOSED

Vent/Drain CLOSED

Sight Gauge/Fill CLOSED

Drain CLOSED

6.7.2 Open the PRESSURE BLEED valve to ensure system pressure is at zero. Place DVM MONITOR switch in the REFERENCE XMTR position. Adjust the SPAN control to the fully counterclockwise position. Note the reading on the DVM.

______________ / ______________
Date Technician

6.0 PROCEDURE

6.7.3 Adjust the SPAN control to the fully clockwise position. Adjust the ZERO control until the DVM indicates the voltage noted in paragraph 6.7.2 and with the same polarity (e.g., if the voltage in 6.7.2 was -15MV, adjust the ZERO control for a reading of -15MV).

_______ / _______
Date Technician

CAUTION
=======
Use EXTREME CARE IN PRESSURIZING THE UNIT to avoid exceeding the pressure range of the reference transducer diaphragm and causing possible damage. It is good practice to set the gas supply regulator to a pressure slightly above the highest to be used in the test.

NOTE: Use the definitions and equations below to help perform the following steps:

Definitions

P_{SETPT} - The pressure at which the response time is to be determined (usually the pressure at which the sensor output causes a specific action).

$P_{INITIAL}$ - The pressure on the hydraulic accumulator, reference transducer, and process sensor at the beginning of the test.

P_{DRIVE} - The pressure in the pneumatic accumulator at the beginning of the test.

Span - The absolute range of the pressure senor.

UP-RAMP

$P_{INITIAL} = P_{SETPT} - .05$ span

$P_{DRIVE} = P_{INITIAL} + .5$ span

NOTE: Should the set point be close to the upper limit of the sensor range, the value for P_{DRIVE} should be kept within the limits of a safe overrange for the sensor.

6.0 PROCEDURE

6.7.3 DOWN-RAMP

$$P_{INITIAL} = P_{SETPT} + .05 \text{ span}$$

$$P_{DRIVE} = P_{INITIAL} - .5 \text{ span}$$

6.7.4 Close the PRESSURE BLEED valve and pressurize the unit by slowly opening the GAS ISOLATION valve. Pressurize to P_{SETPT} or $P_{INITIAL}$, whichever is greater. Table 1 of Appendix C lists the specific values for each transmitter.

_______________ / _______________
Date Technician

6.7.5 Adjust the SPAN control for maximum output or null point + 10 VDC, whichever is less.

_______________ / _______________
Date Technician

6.7.6 Pressurize the unit to $P_{INITIAL}$.

_______________ / _______________
Date Technician

6.7.7 Operate REFERENCE XMTR BIAS and PROCESS XMTR BIAS controls to place the recorder traces in an appropriate position on the recorder chart. For an up-ramp test, the traces should appear on the bottom quarter of the chart. For a down-ramp test, the traces should appear on the top quarter of the chart. The process trace should always be slightly below the reference trace.

_______________ / _______________
Date Technician

6.7.8 Vary unit pressure between $P_{INITIAL}$ and P_{SETPT} while adjusting the recorder amplifier and TRTS BIAS controls to maintain the traces on the recorder chart and in the same relative position. Repeat until no further adjustments are necessary.

_______________ / _______________
Date Technician

6.0 PROCEDURE

6.7.9 Adjust the signal rate to the value specified in Table 1 of Appendix C.

_____ / _____
Date Technician

NOTE: The signal rate is a function of four variables; pressure, differential pressure, fluid level in the hydraulic accumulator, and the setting on the SIGNAL RATE metering valve. The SIGNAL RATE valve has been sized to provide the range of signal rates most frequently required with the fluid level at 8 on the sight gauge (approximate hydraulic accumulator level). Turning the SIGNAL RATE control in a clockwise direction will decrease the rate, turning in a counterclockwise direction will increase the rate. If higher rates are desired, fully depressurize the unit and add fluid. In a similar manner, if slower signal rates are required, fully depressurize the unit and drain the appropriate amount of fluid by opening the DRAIN valve.

NOTE: Opening the PRESSURE BLEED valve provides a vent for filling or draining.

By adding or removing fluid from the unit, the range of signal rates may be varied from approximately one inch of water per second to over 1000 pounds per second without loss of signal linearity. Extremely high signal rates are attained at higher pressures. For those applications requiring high rates at low pressures, optional equipment is available from the manufacturer. Figure A-6 shows how signal rate is determined from sample trace.

6.7.10 Diagnostic Self-Test of ID-100

.1 Line up the valves on the hydraulic signal generator as follows:

Gas Isolation	CLOSED
Gauge Isolation	OPEN
Pressurize	DRIVE
Signal Isolation	CLOSED

6.0 PROCEDURE

6.7.10.1 Pressure Bleed CLOSED

Drain/Vent CLOSED

Sight Gauge/Fill CLOSED

Drain CLOSED

__________/__________
Date Technician

6.7.11 Down-Ramp Generation

.1 Determine the initial, driving, and set point pressures for the transmitter to be tested from Table 1 of Appendix C.

__________/__________
Date Technician

.2 Slowly open the "signal isolation" valve.

__________/__________
Date Technician

.3 Slowly open the GAS ISOLATION valve and pressurize the unit to the driving pressure (P_{DRIVE}). Close the GAS ISOLATION valve.

__________/__________
Date Technician

.4 Once the pressure has stabilized, turn the PRESSURIZE valve to the INITIAL position. Slowly open the GAS ISOLATION valve and bring the pressure up to P_{SETPT}.

__________/__________
Date Technician

.5 Run the recorder at a slow chart drive speed to record a short reference trace at this pressure. Be sure there is a separation between the reference trace and the process transmitter trace. Verify both traces are in appropriate relative positions.

__________/__________
Date Technician

6.0 PROCEDURE

6.7.11.6 Slowly open the GAS ISOLATION valve and pressurize the unit to the initial pressure ($P_{INITIAL}$).

NOTE: Make sure the SIGNAL INITIATE switch is off during the set up. Premature opening of this valve will invalidate the test. Verify both traces are in appropriate positions.

Date / Technician

.7 The unit is ready to generate the appropriate down-ramp. Check the recorder to make sure the proper chart drive speed has been selected.

Date / Technician

NOTE: The record chart drive speed selection has a strong bearing on how well the data can be evaluated. The chart drive speed should be slowest at which adequate resolution of desired timing marks is attained. The greater the angle the signal trace makes with the horizontal, the more clearly defined is the point of intersection with the reference trace. As a rough guide, the chart drive speed should be proportional to the ramp rate.

.8 To run the test, start the recorder chart drive then depress the signal initiate switch. Record the appropriate data on the recorder chart. Include $P_{INITIAL}$, P_{DRIVE}, P_{SETPT}, signal rate setting, fluid level, timing mark interval, date, chart drive speed, and the words: "diagnostic self-test."

Date / Technician

6.0 PROCEDURE

6.7.11.9 Perform the diagnostic self-test twice and compare the results with the signal traces for the same tests supplied with the unit.

Date / Technician

.10 Examine the trace of each signal for the following qualitative waveform characteristics. Verify the results are acceptable as follows:

(a) Linear within a visual "best fit" from $P_{INITIAL}$ to P_{SETPT}.

(b) Complete absence of high frequency components (noise).

(c) Sharp and clearly defined "knee" on leading edge of test signal.

(d) The signal ramp rate has not decreased more than 5% of the ramp rate of the original base line signal traces supplied with the unit.

Date / Technician

6.7.12 If diagnostic self-test is satisfactory, produce another dual trace as in step 6.7.11.8. Use this trace to compute the response time of the transmitter. Record this response time in the data collection table at the back of this procedure. Figure A-6 shows calculation method for time delay (response time). Also record on the chart "Lo SG-2 Level Sensor," "LT-1123-3"

Date / Technician

6.7.13 Disconnect all test leads and reconnect the normal signal leads at the process transmitter.

Date / Technician

6.0 PROCEDURE

6.7.14 Ensure the hydraulic signal generator is vented and disconnect it from the process transmitter.

/
Date Technician

6.7.15 Following appropriate procedures, return process transmitter to service.

/
Date Technician

6.8 Response Time Testing of Hi Containment Pressure Sensor PT-0351-2

NOTE: REFERENCE TRANSDUCER AND PROCESS TRANSMITTER OUTPUT ADJUSTMENT. The electrical outputs of the reference transducer and the process transmitter must be adjusted prior to any test sequence. The following steps provide a means of achieving maximum vertical deflection of the recorder within the required pressure range.

6.8.1 Line up valves as shown below on ID-100:

Gas Isolation CLOSED

Gauge Isolation OPEN

Pressurize INITIAL

Signal Isolation OPEN

Pressure Bleed CLOSED

Vent/Drain CLOSED

Sight Gauge/Fill CLOSED

Drain CLOSED

6.8.2 Open the PRESSURE BLEED valve to ensure system pressure is at zero. Place DVM MONITOR switch in the REFERENCE XMTR position. Adjust the SPAN control to the fully counterclockwise position. Note the reading on the DVM.

/
Date Technician

6.0 PROCEDURE

6.8.3 Adjust the SPAN control to the fully clockwise position. Adjust the ZERO control until the DVM indicates the voltage noted in paragraph 6.8.2 and with the same polarity (e.g., if the voltage in 6.8.2 was -15MV, adjust the ZERO control for a reading of -15MV).

____________ / ____________
Date Technician

CAUTION: Use EXTREME CARE IN PRESSURIZING THE UNIT to avoid exceeding the pressure range of the reference transducer diaphragm and causing possible damage. It is good practice to set the gas supply regulator to a pressure slightly above the highest to be used in the test.

NOTE: Use the definitions and equations below to help perform the following steps:

Definitions

P_{SETPT} - The pressure at which the response time is to be determined (usually the pressure at which the sensor output causes a specific action).

$P_{INITIAL}$ - The pressure on the hydraulic accumulator, reference transducer, and process sensor at the beginning of the test.

P_{DRIVE} - The pressure in the pneumatic accumulator at the beginning of the test.

Span - The absolute range of the pressure senor.

UP-RAMP

$P_{INITIAL} = P_{SETPT} - .05$ span

$P_{DRIVE} = P_{INITIAL} + .5$ span

NOTE: Should the set point be close to the upper limit of the sensor range, the value for P_{DRIVE} should be kept within the limits of a safe overrange for the sensor.

6.0 PROCEDURE

6.8.3 DOWN-RAMP

$P_{INITIAL} = P_{SETPT} + .05$ span

$P_{DRIVE} = P_{INITIAL} - .5$ span

6.8.4 Close the PRESSURE BLEED valve and pressurize the unit by slowly opening the GAS ISOLATION valve. Pressurize to P_{SETPT} or $P_{INITIAL}$, whichever is greater. Table 1 of Appendix C lists the specific values for each transmitter.

/
Date Technician

6.8.5 Adjust the SPAN control for maximum output or null point + 10 VDC, whichever is less.

/
Date Technician

6.8.6 Pressurize the unit to $P_{INITIAL}$.

/
Date Technician

6.8.7 Operate REFERENCE XMTR BIAS and PROCESS XMTR BIAS controls to place the recorder traces in an appropriate position on the recorder chart. For an up-ramp test, the traces should appear on the bottom quarter of the chart. For a down-ramp test, the traces should appear on the top quarter of the chart. The process trace should always be slightly below the reference trace.

/
Date Technician

6.8.8 Vary unit pressure between $P_{INITIAL}$ and P_{SETPT} while adjusting the recorder amplifier and TRTS BIAS controls to maintain the traces on the recorder chart and in the same relative position. Repeat until no further adjustments are necessary.

/
Date Technician

6.0 PROCEDURE

6.8.9 Adjust the signal rate to the value specified in Table 1 of Appendix C.

_______ / _______
Date Technician

NOTE: The signal rate is a function of four variables; pressure, differential pressure, fluid level in the hydraulic accumulator, and the setting on the SIGNAL RATE metering valve. The SIGNAL RATE valve has been sized to provide the range of signal rates most frequently required with the fluid level at 8 on the sight gauge (approximate hydraulic accumulator level). Turning the SIGNAL RATE control in a clockwise direction will decrease the rate, turning in a counterclockwise direction will increase the rate. If higher rates are desired, fully depressurize the unit and add fluid. In a similar manner, if slower signal rates are required, fully depressurize the unit and drain the appropriate amount of fluid by opening the DRAIN valve.

NOTE: Opening the PRESSURE BLEED valve provides a vent for filling or draining.

By adding or removing fluid from the unit, the range of signal rates may be varied from approximately one inch of water per second to over 1000 pounds per second without loss of signal linearity. Extremely high signal rates are attained at higher pressures. For those applications requiring high rates at low pressures, optional equipment is available from the manufacturer. Figure A-6 shows how signal rate is determined from sample trace.

6.8.10 Diagnostic Self-Test of ID-100

.1 Line up the valves on the hydraulic signal generator as follows:

Gas Isolation CLOSED

Gauge Isolation OPEN

Pressurize DRIVE

Signal Isolation CLOSED

6.0 PROCEDURE

6.8.10.1 Pressure Bleed CLOSED

Drain/Vent CLOSED

Sight Gauge/Fill CLOSED

Drain CLOSED

Date / Technician

6.8.11 Up-Ramp Generation

.1 Determine the initial, driving, and set point pressures for the transmitter to be tested from Table 1 of Appendix C.

Date / Technician

.2 Slowly open the "signal isolation" valve.

Date / Technician

.3 Slowly open the GAS ISOLATION valve and pressurize the unit to the driving pressure (P_{DRIVE}). Close the GAS ISOLATION valve.

Date / Technician

.4 Once the pressure has stabilized, turn the PRESSURIZE valve to the INITIAL position. Slowly open the GAS ISOLATION valve and bring the pressure up to P_{SETPT}.

Date / Technician

.5 Run the recorder at a slow chart drive speed to record a short reference trace at this pressure. Be sure there is a separation between the reference trace and the process transmitter trace. Verify both traces are in appropriate relative positions.

Date / Technician

6.0 PROCEDURE

6.8.11.6 Slowly open the GAS ISOLATION valve and pressurize the unit to the initial pressure ($P_{INITIAL}$).

NOTE: Make sure the SIGNAL INITIATE switch is off during the set up. Premature opening of this valve will invalidate the test. Verify both traces are in appropriate positions.

__________/__________
Date Technician

.7 The unit is ready to generate the appropriate up-ramp. Check the recorder to make sure the proper chart drive speed has been selected.

__________/__________
Date Technician

NOTE: The record chart drive speed selection has a strong bearing on how well the data can be evaluated. The chart drive speed should be slowest at which adequate resolution of desired timing marks is attained. The greater the angle the signal trace makes with the horizontal, the more clearly defined is the point of intersection with the reference trace. As a rough guide, the chart drive speed should be proportional to the ramp rate.

.8 To run the test, start the recorder chart drive then depress the signal initiate switch. Record the appropriate data on the recorder chart. Include $P_{INITIAL}$, P_{DRIVE}, P_{SETPT}, signal rate setting, fluid level, timing mark interval, date, chart drive speed, and the words: "diagnostic self-test."

__________/__________
Date Technician

6.0 PROCEDURE

6.8.11.9 Perform the diagnostic self-test twice and compare the results with the signal traces for the same tests supplied with the unit.

______ / ______
Date Technician

.10 Examine the trace of each signal for the following qualitative waveform characteristics. Verify the results are acceptable as follows:

(a) Linear within a visual "best fit" from $P_{INITIAL}$ to P_{SETPT}

(b) Complete absence of high frequency components (noise)

(c) Sharp and clearly defined "knee" on leading edge of test signal

(d) The signal ramp rate has not decreased more than 5% of the ramp rate of the original base line signal traces supplied with the unit.

______ / ______
Date Technician

6.8.12 If diagnostic self-test is satisfactory, produce another dual trace as in step 6.8.11.8. Use this trace to compute the response time of the transmitter. Record this response time in the data collection table at the back of this procedure. Figure A-6 shows calculation method for time delay (response time). Also record on the chart "Hi Containment Pressure Sensor," "PT-0351-3"

______ / ______
Date Technician

6.8.13 Disconnect all test leads and reconnect the normal signal leads at the process transmitter.

______ / ______
Date Technician

6.0 PROCEDURE

6.8.14 Ensure the hydraulic signal generator is vented and disconnect it from the process transmitter.

Date / Technician

6.8.15 Following appropriate procedures, return process transmitter to service.

Date / Technician

6.9 Response Time Testing of Hi-Hi Containment Pressure Sensor PT-0352-2

NOTE: REFERENCE TRANSDUCER AND PROCESS TRANSMITTER OUTPUT ADJUSTMENT. The electrical outputs of the reference transducer and the process transmitter must be adjusted prior to any test sequence. The following steps provide a means of achieving maximum vertical deflection of the recorder within the required pressure range.

6.9.1 Line up valves as shown below on ID-100:

Gas Isolation CLOSED

Gauge Isolation OPEN

Pressurize INITIAL

Signal Isolation OPEN

Pressure Bleed CLOSED

Vent/Drain CLOSED

Sight Gauge/Fill CLOSED

Drain CLOSED

6.9.2 Open the PRESSURE BLEED valve to ensure system pressure is at zero. Place DVM MONITOR switch in the REFERENCE XMTR position. Adjust the SPAN control to the fully counterclockwise position. Note the reading on the DVM.

Date / Technician

6.0 PROCEDURE

6.9.3 Adjust the SPAN control to the fully clockwise position. Adjust the ZERO control until the DVM indicates the voltage noted in paragraph 6.9.2 and with the same polarity (e.g., if the voltage in 6.9.2 was -15MV, adjust the ZERO control for a reading of -15MV).

_______ / _______
Date Technician

CAUTION: Use EXTREME CARE IN PRESSURIZING THE UNIT to avoid exceeding the pressure range of the reference transducer diaphragm and causing possible damage. It is good practice to set the gas supply regulator to a pressure slightly above the highest to be used in the test.

NOTE: Use the definitions and equations below to help perform the following steps:

Definitions

P_{SETPT} - The pressure at which the response time is to be determined (usually the pressure at which the sensor output causes a specific action).

$P_{INITIAL}$ - The pressure on the hydraulic accumulator, reference transducer, and process sensor at the beginning of the test.

P_{DRIVE} - The pressure in the pneumatic accumulator at the beginning of the test.

Span - The absolute range of the pressure senor.

UP-RAMP

$$P_{INITIAL} = P_{SETPT} - .05 \text{ span}$$

$$P_{DRIVE} = P_{INITIAL} + .5 \text{ span}$$

NOTE: Should the set point be close to the upper limit of the sensor range, the value for P_{DRIVE} should be kept within the limits of a safe overrange for the sensor.

6.0 PROCEDURE

6.9.3 DOWN-RAMP

$P_{INITIAL} = P_{SETPT} + .05$ span

$P_{DRIVE} = P_{INITIAL} - .5$ span

6.9.4 Close the PRESSURE BLEED valve and pressurize the unit by slowly opening the GAS ISOLATION valve. Pressurize to P_{SETPT} or $P_{INITIAL}$, whichever is greater. Table 1 of Appendix C lists the specific values for each transmitter.

_____________/_____________
Date Technician

6.9.5 Adjust the SPAN control for maximum output or null point + 10 VDC, whichever is less.

_____________/_____________
Date Technician

6.9.6 Pressurize the unit to $P_{INITIAL}$.

_____________/_____________
Date Technician

6.9.7 Operate REFERENCE XMTR BIAS and PROCESS XMTR BIAS controls to place the recorder traces in an appropriate position on the recorder chart. For an up-ramp test, the traces should appear on the bottom quarter of the chart. For a down-ramp test, the traces should appear on the top quarter of the chart. The process trace should always be slightly below the reference trace.

_____________/_____________
Date Technician

6.9.8 Vary unit pressure between $P_{INITIAL}$ and P_{SETPT} while adjusting the recorder amplifier and TRTS BIAS controls to maintain the traces on the recorder chart and in the same relative position. Repeat until no further adjustments are necessary.

_____________/_____________
Date Technician

6.0 PROCEDURE

6.9.9 Adjust the signal rate to the value specified in Table 1 of Appendix C.

_______ / _______
Date Technician

NOTE: The signal rate is a function of four variables; pressure, differential pressure, fluid level in the hydraulic accumulator, and the setting on the SIGNAL RATE metering valve. The SIGNAL RATE valve has been sized to provide the range of signal rates most frequently required with the fluid level at 8 on the sight gauge (approximate hydraulic accumulator level). Turning the SIGNAL RATE control in a clockwise direction will decrease the rate, turning in a counterclockwise direction will increase the rate. If higher rates are desired, fully depressurize the unit and add fluid. In a similar manner, if slower signal rates are required, fully depressurize the unit and drain the appropriate amount of fluid by opening the DRAIN valve.

NOTE: Opening the PRESSURE BLEED valve provides a vent for filling or draining.

By adding or removing fluid from the unit, the range of signal rates may be varied from approximately one inch of water per second to over 1000 pounds per second without loss of signal linearity. Extremely high signal rates are attained at higher pressures. For those applications requiring high rates at low pressures, optional equipment is available from the manufacturer. Figure A-6 shows how signal rate is determined from sample trace.

6.9.10 Diagnostic Self-Test of ID-100

.1 Line up the valves on the hydraulic signal generator as follows:

Gas Isolation	CLOSED
Gauge Isolation	OPEN
Pressurize	DRIVE
Signal Isolation	CLOSED

6.0 PROCEDURE

6.9.10.1 Pressure Bleed CLOSED

Drain/Vent CLOSED

Sight Gauge/Fill CLOSED

Drain CLOSED

__________/__________
Date Technician

6.9.11 Up-Ramp Generation

.1 Determine the initial, driving, and set point pressures for the transmitter to be tested from Table 1 of Appendix C.

__________/__________
Date Technician

.2 Slowly open the "signal isolation" valve.

__________/__________
Date Technician

.3 Slowly open the GAS ISOLATION valve and pressurize the unit to the driving pressure (P_{DRIVE}). Close the GAS ISOLATION valve.

__________/__________
Date Technician

.4 Once the pressure has stabilized, turn the PRESSURIZE valve to the INITIAL position. Slowly open the GAS ISOLATION valve and bring the pressure up to P_{SETPT}.

__________/__________
Date Technician

.5 Run the recorder at a slow chart drive speed to record a short reference trace at this pressure. Be sure there is a separation between the reference trace and the process transmitter trace. Verify both traces are in appropriate relative positions.

__________/__________
Date Technician

6.0 PROCEDURE

6.9.11.6 Slowly open the GAS ISOLATION valve and pressurize the unit to the initial pressure ($P_{INITIAL}$).

NOTE: Make sure the SIGNAL INITIATE switch is off during the set up. Premature opening of this valve will invalidate the test. Verify both traces are in appropriate positions.

______/______
Date Technician

.7 The unit is ready to generate the appropriate up-ramp. Check the recorder to make sure the proper chart drive speed has been selected.

______/______
Date Technician

NOTE: The record chart drive speed selection has a strong bearing on how well the data can be evaluated. The chart drive speed should be slowest at which adequate resolution of desired timing marks is attained. The greater the angle the signal trace makes with the horizontal, the more clearly defined is the point of intersection with the reference trace. As a rough guide, the chart drive speed should be proportional to the ramp rate.

.8 To run the test, start the recorder chart drive then depress the signal initiate switch. Record the appropriate data on the recorder chart. Include $P_{INITIAL}$, P_{DRIVE}, P_{SETPT}, signal rate setting, fluid level, timing mark interval, date, chart drive speed, and the words: "diagnostic self-test."

______/______
Date Technician

6.0 PROCEDURE

6.9.11.9 Perform the diagnostic self-test twice and compare the results with the signal traces for the same tests supplied with the unit.

__________ / __________
Date Technician

.10 Examine the trace of each signal for the following qualitative waveform characteristics. Verify the results are acceptable as follows:

(a) Linear within a visual "best fit" from $P_{INITIAL}$ to P_{SETPT}.

(b) Complete absence of high frequency components (noise).

(c) Sharp and clearly defined "knee" on leading edge of test signal.

(d) The signal ramp rate has not decreased more than 5% of the ramp rate of the original base line signal traces supplied with the unit.

__________ / __________
Date Technician

6.9.12 If diagnostic self-test is satisfactory, produce another dual trace as in step 6.9.11.8. Use this trace to compute the response time of the transmitter. Record this response time in the data collection table at the back of this procedure. Figure A-6 shows calculation method for time delay (response time). Also record on the chart "HI-HI Containment Sensor," "PT-0352-3"

__________ / __________
Date Technician

6.9.13 Disconnect all test leads and reconnect the normal signal leads at the process transmitter.

__________ / __________
Date Technician

6.0 PROCEDURE

6.9.14 Ensure the hydraulic signal generator is vented and disconnect it from the process transmitter.

_______ / _______
Date Technician

6.9.15 Following appropriate procedures, return process transmitter to service.

_______ / _______
Date Technician

6.10 Response Time Testing of Low Refueling Water Tank Level Sensor LT-0305-3

NOTE: REFERENCE TRANSDUCER AND PROCESS TRANSMITTER OUTPUT ADJUSTMENT. The electrical outputs of the reference transducer and the process transmitter must be adjusted prior to any test sequence. The following steps provide a means of achieving maximum vertical deflection of the recorder within the required pressure range.

6.10.1 Line up valves as shown below on ID-100:

Gas Isolation CLOSED

Gauge Isolation OPEN

Pressurize INITIAL

Signal Isolation OPEN

Pressure Bleed CLOSED

Vent/Drain CLOSED

Sight Gauge/Fill CLOSED

Drain CLOSED

6.10.2 Open the PRESSURE BLEED valve to ensure system pressure is at zero. Place DVM MONITOR switch in the REFERENCE XMTR position. Adjust the SPAN control to the fully counterclockwise position. Note the reading on the DVM.

_______ / _______
Date Technician

6.0 PROCEDURE

6.10.3 Adjust the SPAN control to the fully clockwise position. Adjust the ZERO control until the DVM indicates the voltage noted in paragraph 5.10.2 and with the same polarity (e.g., if the voltage in 6.10.2 was -15MV, adjust the ZERO control for a reading of -15MV).

_______ / _______
Date Technician

CAUTION: Use EXTREME CARE IN PRESSURIZING THE UNIT to avoid exceeding the pressure range of the reference transducer diaphragm and causing possible damage. It is good practice to set the gas supply regulator to a pressure slightly above the highest to be used in the test.

NOTE: Use the definitions and equations below to help perform the following steps:

Definitions

P_{SETPT} - The pressure at which the response time is to be determined (usually the pressure at which the sensor output causes a specific action).

$P_{INITIAL}$ - The pressure on the hydraulic accumulator, reference transducer, and process sensor at the beginning of the test.

P_{DRIVE} - The pressure in the pneumatic accumulator at the beginning of the test.

Span - The absolute range of the pressure senor.

UP-RAMP

$P_{INITIAL} = P_{SETPT} - .05 \text{ span}$

$P_{DRIVE} = P_{INITIAL} + .5 \text{ span}$

NOTE: Should the set point be close to the upper limit of the sensor range, the value for P_{DRIVE} should be kept within the limits of a safe overrange for the sensor.

6.0 PROCEDURE

6.10.3 DOWN-RAMP

$$P_{INITIAL} = P_{SETPT} + .05 \text{ span}$$

$$P_{DRIVE} = P_{INITIAL} - .5 \text{ span}$$

6.10.4 Close the PRESSURE BLEED valve and pressurize the unit by slowly opening the GAS ISOLATION valve. Pressurize to P_{SETPT} or $P_{INITIAL}$, whichever is greater. Table 1 of Appendix C lists the specific values for each transmitter.

____________/____________
Date Technician

6.10.5 Adjust the SPAN control for maximum output or null point + 10 VDC, whichever is less.

____________/____________
Date Technician

6.10.6 Pressurize the unit to $P_{INITIAL}$.

____________/____________
Date Technician

6.10.7 Operate REFERENCE XMTR BIAS and PROCESS XMTR BIAS controls to place the recorder traces in an appropriate position on the recorder chart. For an up-ramp test, the traces should appear on the bottom quarter of the chart. For a down-ramp test, the traces should appear on the top quarter of the chart. The process trace should always be slightly below the reference trace.

____________/____________
Date Technician

6.10.8 Vary unit pressure between $P_{INITIAL}$ and P_{SETPT} while adjusting the recorder amplifier and TRTS BIAS controls to maintain the traces on the recorder chart and in the same relative position. Repeat until no further adjustments are necessary.

____________/____________
Date Technician

6.0 PROCEDURE

6.10.9 Adjust the signal rate to the value specified in Table 1 of Appendix C.

_______________ / _______________
Date Technician

NOTE: The signal rate is a function of four variables; pressure, differential pressure, fluid level in the hydraulic accumulator, and the setting on the SIGNAL RATE metering valve. The SIGNAL RATE valve has been sized to provide the range of signal rates most frequently required with the fluid level at 8 on the sight gauge (approximate hydraulic accumulator level). Turning the SIGNAL RATE control in a clockwise direction will decrease the rate, turning in a counterclockwise direction will increase the rate. If higher rates are desired, fully depressurize the unit and add fluid. In a similar manner, if slower signal rates are required, fully depressurize the unit and drain the appropriate amount of fluid by opening the DRAIN valve.

NOTE: Opening the PRESSURE BLEED valve provides a vent for filling or draining.

By adding or removing fluid from the unit, the range of signal rates may be varied from approximately one inch of water per second to over 1000 pounds per second without loss of signal linearity. Extremely high signal rates are attained at higher pressures. For those applications requiring high rates at low pressures, optional equipment is available from the manufacturer. Figure A-6 shows how signal rate is determined from sample trace.

6.10.10 Diagnostic Self-Test of ID-100

.1 Line up the valves on the hydraulic signal generator as follows:

Gas Isolation	CLOSED
Gauge Isolation	OPEN
Pressurize	DRIVE
Signal Isolation	CLOSED

6.0 PROCEDURE

6.10.10.1 Pressure Bleed CLOSED

Drain/Vent CLOSED

Sight Gauge/Fill CLOSED

Drain CLOSED

______ / ______
Date Technician

6.10.11 Down-Ramp Generation

.1 Determine the initial, driving, and set point pressures for the transmitter to be tested from Table 1 of Appendix C.

______ / ______
Date Technician

.2 Slowly open the "signal isolation" valve.

______ / ______
Date Technician

.3 Slowly open the GAS ISOLATION valve and pressurize the unit to the driving pressure (P_{DRIVE}). Close the GAS ISOLATION valve.

______ / ______
Date Technician

.4 Once the pressure has stabilized, turn the PRESSURIZE valve to the INITIAL position. Slowly open the GAS ISOLATION valve and bring the pressure up to P_{SETPT}.

______ / ______
Date Technician

.5 Run the recorder at a slow chart drive speed to record a short reference trace at this pressure. Be sure there is a separation between the reference trace and the process transmitter trace. Verify both traces are in appropriate relative positions.

______ / ______
Date Technician

6.0 PROCEDURE

6.10.11.6 Slowly open the GAS ISOLATION valve and pressurize the unit to the initial pressure ($P_{INITIAL}$).

NOTE: Make sure the SIGNAL INITIATE switch is off during the set up. Premature opening of this valve will invalidate the test. Verify both traces are in appropriate positions.

_____ / _____
Date Technician

.7 The unit is ready to generate the appropriate down-ramp. Check the recorder to make sure the proper chart drive speed has been selected.

_____ / _____
Date Technician

NOTE: The record chart drive speed selection has a strong bearing on how well the data can be evaluated. The chart drive speed should be slowest at which adequate resolution of desired timing marks is attained. The greater the angle the signal trace makes with the horizontal, the more clearly defined is the point of intersection with the reference trace. As a rough guide, the chart drive speed should be proportional to the ramp rate.

.8 To run the test, start the recorder chart drive then depress the signal initiate switch. Record the appropriate data on the recorder chart. Include $P_{INITIAL}$, P_{DRIVE}, P_{SETPT}, signal rate setting, fluid level, timing mark interval, date, chart drive speed, and the words: "diagnostic self-test."

_____ / _____
Date Technician

6.0 PROCEDURE

6.10.11.9 Perform the diagnostic self-test twice and compare the results with the signal traces for the same tests supplied with the unit.

Date / Technician

.10 Examine the trace of each signal for the following qualitative waveform characteristics. Verify the results are acceptable as follows:

(a) Linear within a visual "best fit" from $P_{INITIAL}$ to P_{SETPT}

(b) Complete absence of high frequency components (noise).

(c) Sharp and clearly defined "knee" on leading edge of test signal.

(d) The signal ramp rate has not decreased more than 5% of the ramp rate of the original base line signal traces supplied with the unit.

Date / Technician

6.10.12 If diagnostic self-test is satisfactory, produce another dual trace as in step 6.10.11.8. Use this trace to compute the response time of the transmitter. Record this response time in the data collection table at the back of this procedure. Figure A-6 shows calculation method for time delay (response time). Also record on the chart "Low RWT Level Sensor," "LT-0305-3"

Date / Technician

6.10.13 Disconnect all test leads and reconnect the normal signal leads at the process transmitter.

Date / Technician

6.0 PROCEDURE

6.10.14 Ensure the hydraulic signal generator is vented and disconnect it from the process transmitter.

_______________/_______________
Date Technician

6.10.15 Following appropriate procedures, return process transmitter to service.

_______________/_______________
Date Technician

6.11 Response Time Testing of LOW SG-1 Flow Sensor PDT-0978-3

NOTE: REFERENCE TRANSDUCER AND PROCESS TRANSMITTER OUTPUT ADJUSTMENT. The electrical outputs of the reference transducer and the process transmitter must be adjusted prior to any test sequence. The following steps provide a means of achieving maximum vertical deflection of the recorder within the required pressure range.

6.11.1 Line up valves as shown below on ID-100:

Gas Isolation CLOSED

Gauge Isolation OPEN

Pressurize INITIAL

Signal Isolation OPEN

Pressure Bleed CLOSED

Vent/Drain CLOSED

Sight Gauge/Fill CLOSED

Drain CLOSED

6.11.2 Open the PRESSURE BLEED valve to ensure system pressure is at zero. Place DVM MONITOR switch in the REFERENCE XMTR position. Adjust the SPAN control to the fully counterclockwise position. Note the reading on the DVM.

_______________/_______________
Date Technician

6.0 PROCEDURE

6.11.3 Adjust the SPAN control to the fully clockwise position. Adjust the ZERO control until the DVM indicates the voltage noted in paragraph 6.11.2 and with the same polarity (e.g., if the voltage in 6.11.2 was -15MV, adjust the ZERO control for a reading of -15MV).

_______________ / _______________
Date Technician

CAUTION: Use EXTREME CARE IN PRESSURIZING THE UNIT to avoid exceeding the pressure range of the reference transducer diaphragm and causing possible damage. It is good practice to set the gas supply regulator to a pressure slightly above the highest to be used in the test.

NOTE: Use the definitions and equations below to help perform the following steps:

Definitions

P_{SETPT}	- The pressure at which the response time is to be determined (usually the pressure at which the sensor output causes a specific action).
$P_{INITIAL}$	- The pressure on the hydraulic accumulator, reference transducer, and process sensor at the beginning of the test.
P_{DRIVE}	- The pressure in the pneumatic accumulator at the beginning of the test.
Span	- The absolute range of the pressure senor.

UP-RAMP

$$P_{INITIAL} = P_{SETPT} - .05 \text{ span}$$

$$P_{DRIVE} = P_{INITIAL} + .5 \text{ span}$$

NOTE: Should the set point be close to the upper limit of the sensor range, the value for P_{DRIVE} should be kept within the limits of a safe overrange for the sensor.

6.0 PROCEDURE

6.11.3 DOWN-RAMP

$$P_{INITIAL} = P_{SETPT} + .05 \text{ span}$$

$$P_{DRIVE} = P_{INITIAL} - .5 \text{ span}$$

6.11.4 Close the PRESSURE BLEED valve and pressurize the unit by slowly opening the GAS ISOLATION valve. Pressurize to P_{SETPT} or $P_{INITIAL}$, whichever is greater. Table 1 of Appendix C lists the specific values for each transmitter.

__________ / __________
Date Technician

6.11.5 Adjust the SPAN control for maximum output or null point + 10 VDC, whichever is less.

__________ / __________
Date Technician

6.11.6 Pressurize the unit to $P_{INITIAL}$.

__________ / __________
Date Technician

6.11.7 Operate REFERENCE XMTR BIAS and PROCESS XMTR BIAS controls to place the recorder traces in an appropriate position on the recorder chart. For an up-ramp test, the traces should appear on the bottom quarter of the chart. For a down-ramp test, the traces should appear on the top quarter of the chart. The process trace should always be slightly below the reference trace.

__________ / __________
Date Technician

6.11.8 Vary unit pressure between $P_{INITIAL}$ and P_{SETPT} while adjusting the recorder amplifier and TRTS BIAS controls to maintain the traces on the recorder chart and in the same relative position. Repeat until no further adjustments are necessary.

__________ / __________
Date Technician

6.0 PROCEDURE

6.11.9 Adjust the signal rate to the value specified in Table 1 of Appendix C.

_______ / _______
Date Technician

NOTE: The signal rate is a function of four variables; pressure, differential pressure, fluid level in the hydraulic accumulator, and the setting on the SIGNAL RATE metering valve. The SIGNAL RATE valve has been sized to provide the range of signal rates most frequently required with the fluid level at 8 on the sight gauge (approximate hydraulic accumulator level). Turning the SIGNAL RATE control in a clockwise direction will decrease the rate, turning in a counterclockwise direction will increase the rate. If higher rates are desired, fully depressurize the unit and add fluid. In a similar manner, if slower signal rates are required, fully depressurize the unit and drain the appropriate amount of fluid by opening the DRAIN valve.

NOTE: Opening the PRESSURE BLEED valve provides a vent for filling or draining.

By adding or removing fluid from the unit, the range of signal rates may be varied from approximately one inch of water per second to over 1000 pounds per second without loss of signal linearity. Extremely high signal rates are attained at higher pressures. For those applications requiring high rates at low pressures, optional equipment is available from the manufacturer. Figure A-6 shows how signal rate is determined from sample trace.

6.11.10 Diagnostic Self-Test of ID-100

.1 Line up the valves on the hydraulic signal generator as follows:

Gas Isolation	CLOSED
Gauge Isolation	OPEN
Pressurize	DRIVE
Signal Isolation	CLOSED

6.0 PROCEDURE

6.11.10.1 Pressure Bleed CLOSED

Drain/Vent CLOSED

Sight Gauge/Fill CLOSED

Drain CLOSED

______________/______________
Date Technician

6.11.11 Down-Ramp Generation

.1 Determine the initial, driving, and set point pressures for the transmitter to be tested from Table 1 of Appendix C.

______________/______________
Date Technician

.2 Slowly open the "signal isolation" valve.

______________/______________
Date Technician

.3 Slowly open the GAS ISOLATION valve and pressurize the unit to the driving pressure (P_{DRIVE}). Close the GAS ISOLATION valve.

______________/______________
Date Technician

.4 Once the pressure has stabilized, turn the PRESSURIZE valve to the INITIAL position. Slowly open the GAS ISOLATION valve and bring the pressure up to P_{SETPT}.

______________/______________
Date Technician

.5 Run the recorder at a slow chart drive speed to record a short reference trace at this pressure. Be sure there is a separation between the reference trace and the process transmitter trace. Verify both traces are in appropriate relative positions.

______________/______________
Date Technician

6.0 PROCEDURE

6.11.11.6 Slowly open the GAS ISOLATION valve and pressurize the unit to the initial pressure ($P_{INITIAL}$).

NOTE: Make sure the SIGNAL INITIATE switch is off during the set up. Premature opening of this valve will invalidate the test. Verify both traces are in appropriate positions.

______/______
Date Technician

.7 The unit is ready to generate the appropriate down-ramp. Check the recorder to make sure the proper chart drive speed has been selected.

______/______
Date Technician

NOTE: The record chart drive speed selection has a strong bearing on how well the data can be evaluated. The chart drive speed should be slowest at which adequate resolution of desired timing marks is attained. The greater the angle the signal trace makes with the horizontal, the more clearly defined is the point of intersection with the reference trace. As a rough guide, the chart drive speed should be proportional to the ramp rate.

.8 To run the test, start the recorder chart drive then depress the signal initiate switch. Record the appropriate data on the recorder chart. Include $P_{INITIAL}$, P_{DRIVE}, P_{SETPT}, signal rate setting, fluid level, timing mark interval, date, chart drive speed, and the words: "diagnostic self-test."

______/______
Date Technician

6.0 PROCEDURE

6.11.11.9 Perform the diagnostic self-test twice and compare the results with the signal traces for the same tests supplied with the unit.

_______/_______
Date Technician

.10 Examine the trace of each signal for the following qualitative waveform characteristics. Verify the results are acceptable as follows:

(a) Linear within a visual "best fit" from $P_{INITIAL}$ to P_{SETPT}

(b) Complete absence of high frequency components (noise).

(c) Sharp and clearly defined "knee" on leading edge of test signal.

(d) The signal ramp rate has not decreased more than 5% of the ramp rate of the original base line signal traces supplied with the unit.

_______/_______
Date Technician

6.11.12 If diagnostic self-test is satisfactory, produce another dual trace as in step 6.11.11.8. Use this trace to compute the response time of the transmitter. Record this response time in the data collection table at the back of this procedure. Figure A-6 shows calculation method for time delay (response time). Also record on the chart "LOW SG-1 Flow Sensor 2PDT-0978-3"

_______/_______
Date Technician

6.11.13 Disconnect all test leads and reconnect the normal signal leads at the process transmitter.

_______/_______
Date Technician

6.0 PROCEDURE

6.11.14 Ensure the hydraulic signal generator is vented and disconnect it from the process transmitter.

_______ / _______
Date Technician

6.11.15 Following appropriate procedures, return process transmitter to service.

_______ / _______
Date Technician

6.12 Response Time Testing of LOW SG-2 Flow Sensor PDT-0979-3

NOTE: REFERENCE TRANSDUCER AND PROCESS TRANSMITTER OUTPUT ADJUSTMENT. The electrical outputs of the reference transducer and the process transmitter must be adjusted prior to any test sequence. The following steps provide a means of achieving maximum vertical deflection of the recorder within the required pressure range.

6.12.1 Line up valves as shown below on ID-100:

Gas Isolation CLOSED

Gauge Isolation OPEN

Pressurize INITIAL

Signal Isolation OPEN

Pressure Bleed CLOSED

Vent/Drain CLOSED

Sight Gauge/Fill CLOSED

Drain CLOSED

6.12.2 Open the PRESSURE BLEED valve to ensure system pressure is at zero. Place DVM MONITOR switch in the REFERENCE XMTR position. Adjust the SPAN control to the fully counterclockwise position. Note the reading on the DVM.

_______ / _______
Date Technician

6.0 PROCEDURE

6.12.3 Adjust the SPAN control to the fully clockwise position. Adjust the ZERO control until the DVM indicates the voltage noted in paragraph 6.12.2 and with the same polarity (e.g., if the voltage in 6.12.2 was -15MV, adjust the ZERO control for a reading of -15MV).

_______ / _______
Date   Technician

CAUTION: Use EXTREME CARE IN PRESSURIZING THE UNIT to avoid exceeding the pressure range of the reference transducer diaphragm and causing possible damage. It is good practice to set the gas supply regulator to a pressure slightly above the highest to be used in the test.

NOTE: Use the definitions and equations below to help perform the following steps:

Definitions

P_{SETPT} - The pressure at which the response time is to be determined (usually the pressure at which the sensor output causes a specific action).

$P_{INITIAL}$ - The pressure on the hydraulic accumulator, reference transducer, and process sensor at the beginning of the test.

P_{DRIVE} - The pressure in the pneumatic accumulator at the beginning of the test.

Span - The absolute range of the pressure senor.

UP-RAMP

$$P_{INITIAL} = P_{SETPT} - .05 \text{ span}$$

$$P_{DRIVE} = P_{INITIAL} + .5 \text{ span}$$

NOTE: Should the set point be close to the upper limit of the sensor range, the value for P_{DRIVE} should be kept within the limits of a safe overrange for the sensor.

6.0 PROCEDURE

6.12.3 DOWN-RAMP

$P_{INITIAL} = P_{SETPT} + .05$ span

$P_{DRIVE} = P_{INITIAL} - .5$ span

6.12.4 Close the PRESSURE BLEED valve and pressurize the unit by slowly opening the GAS ISOLATION valve. Pressurize to P_{SETPT} or $P_{INITIAL}$, whichever is greater. Table I of Appendix C lists the specific values for each transmitter.

__________/__________
Date Technician

6.12.5 Adjust the SPAN control for maximum output or null point + 10 VDC, whichever is less.

__________/__________
Date Technician

6.12.6 Pressurize the unit to $P_{INITIAL}$.

__________/__________
Date Technician

6.12.7 Operate REFERENCE XMTR BIAS and PROCESS XMTR BIAS controls to place the recorder traces in an appropriate position on the recorder chart. For an up-ramp test, the traces should appear on the bottom quarter of the chart. For a down-ramp test, the traces should appear on the top quarter of the chart. The process trace should always be slightly below the reference trace.

__________/__________
Date Technician

6.12.8 Vary unit pressure between $P_{INITIAL}$ and P_{SETPT} while adjusting the recorder amplifier and TRTS BIAS controls to maintain the traces on the recorder chart and in the same relative position. Repeat until no further adjustments are necessary.

__________/__________
Date Technician

6.0 PROCEDURE

6.12.9 Adjust the signal rate to the value specified in Table 1 of Appendix C.

______ / ______
Date Technician

NOTE: The signal rate is a function of four variables; pressure, differential pressure, fluid level in the hydraulic accumulator, and the setting on the SIGNAL RATE metering valve. The SIGNAL RATE valve has been sized to provide the range of signal rates most frequently required with the fluid level at 8 on the sight gauge (approximate hydraulic accumulator level). Turning the SIGNAL RATE control in a clockwise direction will decrease the rate, turning in a counterclockwise direction will increase the rate. If higher rates are desired, fully depressurize the unit and add fluid. In a similar manner, if slower signal rates are required, fully depressurize the unit and drain the appropriate amount of fluid by opening the DRAIN valve.

NOTE: Opening the PRESSURE BLEED valve provides a vent for filling or draining.

By adding or removing fluid from the unit, the range of signal rates may be varied from approximately one inch of water per second to over 1000 pounds per second without loss of signal linearity. Extremely high signal rates are attained at higher pressures. For those applications requiring high rates at low pressures, optional equipment is available from the manufacturer. Figure A-5 shows how signal rate is determined from sample trace.

6.12.10 Diagnostic Self-Test of ID-100

.1 Line up the valves on the hydraulic signal generator as follows:

Gas Isolation	CLOSED
Gauge Isolation	OPEN
Pressurize	DRIVE
Signal Isolation	CLOSED

6.0 PROCEDURE

6.12.10.1 Pressure Bleed CLOSED

Drain/Vent CLOSED

Sight Gauge/Fill CLOSED

Drain CLOSED

_____/_____
Date Technician

6.12.11 Down-Ramp Generation

.1 Determine the initial, driving, and set point pressures for the transmitter to be tested from Table 1 of Appendix C.

_____/_____
Date Technician

.2 Slowly open the "signal isolation" valve.

_____/_____
Date Technician

.3 Slowly open the GAS ISOLATION valve and pressurize the unit to the driving pressure (P_{DRIVE}). Close the GAS ISOLATION valve.

_____/_____
Date Technician

.4 Once the pressure has stabilized, turn the PRESSURIZE valve to the INITIAL position. Slowly open the GAS ISOLATION valve and bring the pressure up to P_{SETPT}.

_____/_____
Date Technician

.5 Run the recorder at a slow chart drive speed to record a short reference trace at this pressure. Be sure there is a separation between the reference trace and the process transmitter trace. Verify both traces are in appropriate relative positions.

_____/_____
Date Technician

6.0 PROCEDURE

6.12.11.6 Slowly open the GAS ISOLATION valve and pressurize the unit to the initial pressure. ($P_{INITIAL}$).

NOTE: Make sure the SIGNAL INITIATE switch is off during the set up. Premature opening of this valve will invalidate the test. Verify both traces are in appropriate positions.

_____________/_____________
Date Technician

.7 The unit is ready to generate the appropriate down-ramp. Check the recorder to make sure the proper chart drive speed has been selected.

_____________/_____________
Date Technician

NOTE: The record chart drive speed selection has a strong bearing on how well the data can be evaluated. The chart drive speed should be slowest at which adequate resolution of desired timing marks is attained. The greater the angle the signal trace makes with the horizontal, the more clearly defined is the point of intersection with the reference trace. As a rough guide, the chart drive speed should be proportional to the ramp rate.

.8 To run the test, start the recorder chart drive then depress the signal initiate switch. Record the appropriate data on the recorder chart. Include Pinitial, Pdrive, Psetpt, signal rate setting, fluid level, timing mark interval, date, chart drive speed, and the words: "diagnostic self-test."

_____________/_____________
Date Technician

6.0 PROCEDURE

6.12.11.9 Perform the diagnostic self-test twice and compare the results with the signal traces for the same tests supplied with the unit.

__________/__________
Date Technician

.10 Examine the trace of each signal for the following qualitative waveform characteristics. Verify the results are acceptable as follows:

(a) Linear within a visual "best fit" from P to P_{SETPT}

(b) Complete absence of high frequency components (noise).

(c) Sharp and clearly defined "knee" on leading edge of test signal.

(d) The signal ramp rate has not decreased more than 5% of the ramp rate of the original base line signal traces supplied with the unit.

__________/__________
Date Technician

.11 If diagnostic self-test is satisfactory, produce another dual trace as in step 6.12.11.8. Use this trace to compute the response time of the transmitter. Record this response time in the data collection table at the back of this procedure. Figure A-6 shows calculation method for time delay (response time). Also record on the chart "LOW SG-2 Flow Sensor 2PDT-0979-3"

__________/__________
Date Technician

.12 Disconnect all test leads and reconnect the normal signal leads at the process transmitter.

__________/__________
Date Technician

6.0 PROCEDURE

6.12.11.13 Ensure the hydraulic signal generator is vented and disconnect it from the process transmitter.

_______________ / _______________
Date Technician

.14 Following appropriate procedures, return process transmitter to service.

_______________ / _______________
Date Technician

6.13 Test Equipment Set Up for Loop Current Step Response Testing of Resistance Temperature Detectors

NOTE: The LCSR Analyzer and Response Test Instrument which SCE has purchased from AMS will be used to perform this portion of the test. Some of the following steps will be performed using this equipment and the analyzer will produce the appropriate response times. Refer to AMS technical manuals if necessary.

NOTE: Each temperature element (RTD) channel will have five (5) connection points in the Spec. 200 cabinet. Two are the leads from the RTD resistance element, two are referred to as dummy leads and the fifth is a cable shield ground.

NOTE: For best results, this test should be performed only when the plant is at normal operating temperature and primary coolant flow rate.

6.13.1 Position the front controls on the ERT-1 as follows:

.1 Voltmeter selector switch to position "D".

.2 Trim switch in UP position.

.3 Power Supply internal-external switch in the "INT" position.

VJS:1952b/js/mr
Continued to 1953b

6.0 PROCEDURE

6.13.1.4 "Voltage Adjustment" fully counterclockwise.

.5 Current selector switch in LOW position.

.6 Range selector to "20" VDC.

.7 Voltmeter internal/external switch in "INT" position.

_______ / _______
Date Technician

6.13.2 Ensure ERT-1 power switch, located in back, is in the OFF position, then connect 115 VAC power to the ERT-1 and the ELC-1.

_______ / _______
Date Technician

NOTE: Refer to Figure A-5 for the following steps:

6.13.3 Connect a cable from the ERT-1 "OUTPUT" BNC connector to the ELC-1B "ANALOG IN" BNC connector.

_______ / _______
Date Technician

6.13.4 Connect a cable from ELC-1B "TRIGGER BNC" connector to the ERT-1 "CONTROL IN" BNC connector.

_______ / _______
Date Technician

6.13.5 Place ERT-1 power ON/OFF toggle switch to the "ON" position and verify "POWER" LED energized.

_______ / _______
Date Technician

6.13.6 Press ELC-1B "ON/OFF" pushbutton and verify that the light energizes. The "START" light, "TEST/DUMP" light, and "READY" LED should also energize.

_______ / _______
Date Technician

6.0 PROCEDURE

6.13.7 Allow 10 minutes for equipment to warm up.

/
Date Technician

6.14 Loop Current Step Response Testing of Hot Leg Temperature Sensor TE-0112-3

NOTE: For most consistent results, the temperature of the reactor coolant should be approximately 540°F.

6.14.1 In Spec. 200 cabinet L-129, remove the RTD leads from terminals 18 and 17 of TB-1 and connect them to the sensor connector strip on the ERT-1.

/
Date Technician

6.14.2 Adjust the "TRIM" pot on ERT-1 until the amplifier offset voltage is zero. (Trim switch UP).

NOTE: The amplifier offset voltage must be checked and set to zero whenever the gain is changed.

/
Date Technician

6.14.3 Place the "TRIM" switch in the DOWN position.

/
Date Technician

6.14.4 Place the current selector switch in the "HIGH" position.

/
Date Technician

6.0 PROCEDURE

6.14.5 Balance the wheatstone bridge by adjusting the coarse resistor network switches and the fine decade resistors until the bridge output reads zero.

__________/__________
Date Technician

NOTE: Bridge output is only indicated on the voltmeter when the voltmeter selector switch is in the "D" position. Allow at least three minutes for the reading to stabilize.

6.14.6 Move the voltmeter selector switch on ERT-1 to the "B" or "C" position and adjust the supply voltage to approximately 60 VDC. This provides 60 madc through the RTD assuming the bridge is still balanced. Allow three minutes for stabilization time.

__________/__________
Date Technician

6.14.7 Repeat steps 6.14.5 and 6.14.6 until no further adjustments are necessary. Allow at least three minutes for the readings to stabilize.

__________/__________
Date Technician

6.14.8 Move the current selector switch to the "LOW" position and rebalance the bridge. Allow three minutes for stabilization time.

__________/__________
Date Technician

6.14.9 Place the current selector switch to "HIGH." Allow reading to stabilize. Do not rebalance the bridge.

__________/__________
Date Technician

6.0 PROCEDURE

6.14.10 Adjust the amplifier gain of ERT-1 to obtain as close as possible to 5.0 VDC on the voltmeter with the voltmeter selector switch in position "D." With this 5.0 VDC to the analog input BNC of the ELC-1B, the ELC-1B digital indicator should read approximately 4095 when ELC-1B is in "READY" mode with "TEST/PUMP" pushbutton pressed.

NOTE: The amplifier offset voltage must be checked and set to zero whenever the GAIN is changed. Trim switch must be up to adjust the offset and down at all other times.

_______________/_______________
Date Technician

6.14.11 Place current selector switch in "LOW" position and ensure bridge returns to a balanced condition. A slight adjustment of the decade resistors may be necessary.

_______________/_______________
Date Technician

6.14.12 Ensure the "AVERAGE/SINGLE SHOT" selector switch on the ELC-1B is in the "AVERAGE" position.

_______________/_______________
Date Technician

6.14.13 With the ELC-1B in the "READY" mode, press the "START" pushbutton. The ELC-1B should go the "SAMPLE" mode for 20 seconds during which time the analog output of the ERT-1 should rise. Then the ELC-1B should return to the "READY" mode.

_______________/_______________
Date Technician

6.14.14 Allow the bridge to return to a balanced condition.

_______________/_______________
Date Technician

6.0 PROCEDURE

6.14.15 Repeat steps 6.14.13 and 6.14.14 nine additional times. On the tenth sample the ELC-1B should go to the "SAMPLE" mode for 20 seconds, then "ANALYZE" mode until the calculations are complete. Then the ELC-1B will go to the "DISPLAY" mode.

______/______
Date Technician

6.14.16 With the ELC-1B selector switch in position "D", the digital indicator should read the average total time constant for all ten samples.

NOTE: This value represents the amount of time, in seconds, that it takes for the RTD resistance to reach 63.2% of the step change. Record this response time in the "DATA COLLECTION TABLE" at the back of this procedure.

______/______
Date Technician

6.14.17 In Spec. 200 cabinet L-129, replace the RTD leads on terminals 18 and 17 of TB-1.

______/______
Date Technician

6.14.18 Turn the "VOLTAGE ADJUSTMENT" on the ERT-1 fully counterclockwise.

______/______
Date Technician

6.14.19 Press the "RESET" pushbutton on the ELC-1B and verify that the analyzer returns to the "READY" mode.

______/______
Date Technician

6.0 PROCEDURE

6.15 Loop Current Step Response Testing of Cold Leg Temperature Sensor TE-9178-3

NOTE: For most consistent results, the temperature of the reactor coolant should be approximately 540°F.

6.15.1 In Spec 200 cabinet L-129, remove the RTD leads from terminals 8 and 7 of TB-1 and connect them to the sensor connector strip on the ERT-1.

__________/__________
Date Technician

6.15.2 Adjust the "TRIM" pot on ERT-1 until the amplifier offset voltage is ZERO. (Trim switch UP).

NOTE: The amplifier offset voltage must be checked and set to zero whenever the GAIN is changed.

__________/__________
Date Technician

6.15.3 Place the "TRIM" switch in the DOWN position.

__________/__________
Date Technician

6.15.4 Place current selector switch in the "HIGH" position.

__________/__________
Date Technician

6.15.5 Balance the Wheatstone bridge by adjusting the coarse resistor network switches and the fine decade resistors until the bridge output reads ZERO.

__________/__________
Date Technician

NOTE: Bridge output is only indicated on the voltmeter when the voltmeter selector switch is in the "D" position. Allow at least three minutes for the reading to stabilize.

6.0 PROCEDURE

6.15.6 Move the voltmeter selector switch on ERT-1 to the "B" or "C" position and adjust the supply voltage to approximately 50 Vdc. This provides 50 madc through the RTD assuming the bridge is still balanced. Allow three minutes for stabilization time.

______________/______________
Date Technician

6.15.7 Repeat steps 6.15.5 and 6.15.6 until no further adjustments are necessary. Allow at least three minutes for the readings to stabilize.

______________/______________
Date Technician

6.15.8 Move the current selector switch to the "LOW" position and rebalance the bridge. Allow three minutes for stabilization time.

______________/______________
Date Technician

6.15.9 Place the current selector switch to "HIGH". Allow reading to stabilize. Do NOT rebalance the bridge.

______________/______________
Date Technician

6.15.10 Adjust the amplifier gain of ERT-1 to obtain as close as possible to 5.0 Vdc on the voltmeter with the voltmeter selector switch in position "D". With this 5.0 Vdc to the analog input BNC of the ELC-1B, the ELC-1B digital indicator should read approximately 4095 when ELC-1B is in "READY" mode with "Test/Dump" pushbutton pressed.

NOTE: The amplifier offset voltage must be checked and set to zero whenever the GAIN is changed. Trim switch must be up to adjust the offset and down at all other times.

______________/______________
Date Technician

6.0 PROCEDURE

6.15.11 Place current selector switch in "LOW" position and ensure bridge returns to a balanced condition. A slight adjustment of the decade resistors may be necessary.

Date / Technician

6.15.12 Ensure the "AVERAGE/SINGLE SHOT" selector switch on the ELC-1B is in the "AVERAGE" position.

Date / Technician

6.15.13 With the ELC-1B in the "READY" mode, press the "START" pushbutton. The ELC-1B should go the "SAMPLE" mode for 20 seconds during which time the analog output of the ERT-1 should rise. Then the ELC-1B should return to the "READY" mode.

Date / Technician

6.15.14 Allow the bridge to return to a balanced condition.

Date / Technician

6.15.15 Repeat steps 6.15.13 and 6.15.14 nine additional times. On the tenth sample the ELC-1B should go to the "SAMPLE" mode for 20 seconds, then "ANALYZE" mode until the calculations are complete. Then the ELC-1B will go the "DISPLAY" mode.

Date / Technician

6.15.16 With the ELC-1B selector switch in position "D", the digital indicator should read the average total time constant for all ten samples.

NOTE: This value represents the amount of time, in seconds, that it takes for the RTD to reach 63.2% of the step change. Record this response time in the "DATA COLLECTION TABLE" at the back of this procedure.

Date / Technician

6.0 PROCEDURE

6.15.17 In Spec 200 cabinet L-129, replace the RTD leads on terminals 8 and 7 of TB-1.

__________ / __________
Date Technician

6.15.18 Turn the "VOLTAGE ADJUSTMENT" on the ERT-1 fully counterclockwise.

__________ / __________
Date Technician

6.15.19 Press the "RESET" pushbutton on the ELC-1B and verify that the analyzer returns to the "READY" mode.

__________ / __________
Date Technician

6.16 Loop Current Step Response Testing of Hot Leg Temperature Sensor TE-0122-3

NOTE: For most consistent results, the temperature of the reactor coolant should be approximately 540°F.

6.16.1 In Spec 200 cabinet L-129, remove the RTD leads from terminals 13 and 12 of TB-1 and connect them to the sensor connector strip on the ERT-1.

__________ / __________
Date Technician

6.16.2 Adjust the "TRIM" pot on ERT-1 until the amplifier offset voltage is zero. (Trim switch up).

NOTE: The amplifier offset voltage must be checked and set to zero whenever the GAIN is changed.

__________ / __________
Date Technician

6.0 PROCEDURE

6.16.3 Place the "TRIM" switch in the DOWN position.

______________/______________
Date Technician

6.16.4 Place current selector switch in the "HIGH" position.

______________/______________
Date Technician

6.16.5 Balance the Wheatstone bridge by adjusting the coarse resistor network switches and the fine decade resistors until the bridge output reads zero.

______________/______________
Date Technician

NOTE: Bridge output is only indicated on the voltmeter when the voltmeter selector switch is in the "D" position. Allow at least three minutes for the reading to stabilize.

6.16.6 Move the voltmeter selector switch on ERT-1 to the "B" or "C" position and adjust the supply voltage to approximately 60 Vdc. This provides 60 madc through the RTD assuming the bridge is still balanced. Allow three minutes for stabilization time.

______________/______________
Date Technician

6.16.7 Repeat steps 6.18.6 and 6.18.7 until no further adjustments are necessary. Allow at least three minutes for the readings to stabilize.

______________/______________
Date Technician

6.16.8 Move the current selector switch to the "LOW" position and rebalance the bridge. Allow three minutes for stabilization time.

______________/______________
Date Technician

6.0 PROCEDURE

6.16.9 Place the current selector switch to "HIGH". Allow reading to stabilize. Do NOT rebalance the bridge.

________/________
Date Technician

6.16.10 Adjust the amplifier gain of ERT-1 to obtain as close as possible to 5.0 Vdc on the voltmeter with the voltmeter selector switch in position "D". With this 5.0 Vdc to the analog input BNC of the ELC-1B, the ELC-1B digital indicator should read approximately 4095 when ELC-1B is in "READY" mode with "Test/Dump" pushbutton pressed.

NOTE: The amplifier offset voltage must be checked and set to zero whenever the GAIN is changed. Trim switch must be up to adjust the offset and down at all other times.

________/________
Date Technician

6.16.11 Place current selector switch in "LOW" position and ensure bridge returns to a balanced condition. A slight adjustment of the decade resistors may be necessary.

________/________
Date Technician

6.16.12 Ensure the "AVERAGE/SINGLE SHOT" selector switch on the ELC-1B is in the "AVERAGE" position.

________/________
Date Technician

6.16.13 With the ELC-1B in the "READY" mode, press the "START" pushbutton. The ELC-1B should go the "SAMPLE" mode for 20 seconds during which time the analog output of the ERT-1 should rise. Then the ELC-1B should return to the "READY" mode.

________/________
Date Technician

6.0 PROCEDURE

6.16.14 Allow the bridge to return to a balanced condition.

_______/_______
Date Technician

6.16.15 Repeat steps 6.16.13 and 6.16.14 nine additional times. On the tenth sample the ELC-1B should go to the "SAMPLE" mode for 20 seconds, then "ANALYZE" mode until the calculations are complete. Then the ELC-1B will go the "DISPLAY" mode.

_______/_______
Date Technician

6.16.16 With the ELC-1B selector switch in position "D", the digital indicator should read the average total time constant for all ten samples.

NOTE: This value represents the amount of time, in seconds, that it takes for the RTD to reach 63.2% of the step change. Record this response time in the "DATA COLLECTION TABLE" at the back of this procedure.

_______/_______
Date Technician

6.16.17 In Spec 200 cabinet L-129, replace the RTD leads on terminals 13 and 12 of TB-1.

_______/_______
Date Technician

6.16.18 Turn the "VOLTAGE ADJUSTMENT" on the ERT-1 fully counterclockwise.

_______/_______
Date Technician

6.16.19 Press the "RESET" pushbutton on the ELC-1B and verify that the analyzer returns to the "READY" mode.

_______/_______
Date Technician

6.0 PROCEDURE

6.17 Loop Current Step Response Testing of Cold Leg Temperature Sensor 2TE-9179-3

NOTE: For most consistent results, the temperature of the reactor coolant should be approximately 540°F.

6.17.1 In Spec 200 cabinet L-129, remove the RTD leads from terminals 3 and 2 of TB-1 and connect them to the sensor connector strip on the ERT-1.

_______ / _______
Date Technician

6.17.2 Adjust the "TRIM" pot on ERT-1 until the amplifier offset voltage is zero. (Trim switch up).

NOTE: The amplifier offset voltage must be checked and set to zero whenever the GAIN is changed.

_______ / _______
Date Technician

6.17.3 Place the "TRIM" switch in the DOWN position.

_______ / _______
Date Technician

6.17.4 Place current selector switch in the "HIGH" position.

_______ / _______
Date Technician

6.17.5 Balance the Wheatstone bridge by adjusting the coarse resistor network switches and the fine decade resistors until the bridge output reads zero.

_______ / _______
Date Technician

NOTE: Bridge output is only indicated on the voltmeter when the voltmeter selector switch is in the "D" position. Allow at least three minutes for the reading to stabilize.

6.0 PROCEDURE

6.17.6 Move the voltmeter selector switch on ERT-1 to the "B" or "C" position and adjust the supply voltage to approximately 60 Vdc. This provides 60 madc through the RTD assuming the bridge is still balanced. Allow three minutes for stabilization time.

__________/__________
Date Technician

6.17.7 Repeat steps 6.17.6 and 6.17.7 until no further adjustments are necessary. Allow at least three minutes for the readings to stabilize.

__________/__________
Date Technician

6.17.8 Move the current selector switch to the "LOW" position and rebalance the bridge. Allow three minutes for stabilization time.

__________/__________
Date Technician

6.17.9 Place the current selector switch to "HIGH". Allow reading to stabilize. Do <u>NOT</u> rebalance the bridge.

__________/__________
Date Technician

6.17.10 Adjust the amplifier gain of ERT-1 to obtain as close as possible to 5.0 Vdc on the voltmeter with the voltmeter selector switch in position "D". With this 5.0 Vdc to the analog input BNC of the ELC-1B, the ELC-1B digital indicator should read approximately 4095 when ELC-1B is in "READY" mode with "TEST/DUMP" pushbutton pressed.

NOTE: The amplifier offset voltage must be checked and set to zero whenever the GAIN is changed. Trim switch must be up to adjust the offset and down at all other times.

__________/__________
Date Technician

6.0 PROCEDURE

6.17.11 Place current selector switch in "LOW" position and ensure bridge returns to a balanced condition. A slight adjustment of the decade resistors may be necessary.

Date / Technician

6.17.12 Ensure the "AVERAGE/SINGLE SHOT" selector switch on the ELC-1B is in the "AVERAGE" position.

Date / Technician

6.17.13 With the ELC-1B in the "READY" mode, press the "START" pushbutton. The ELC-1B should go the "SAMPLE" mode for 20 seconds during which time the analog output of the ERT-1 should rise. Then the ELC-1B should return to the "READY" mode.

Date / Technician

6.17.14 Allow the bridge to return to a balanced condition.

Date / Technician

6.17.15 Repeat steps 6.17.13 and 6.17.14 nine additional times. On the tenth sample the ELC-1B should go to the "SAMPLE" mode for 20 seconds, then "ANALYZE" mode until the calculations are complete. Then the ELC-1B will go the "DISPLAY" mode.

Date / Technician

6.0 PROCEDURE

6.17.16 With the ELC-1B selector switch in position "D", the digital indicator should read the average total time constant for all ten samples.

NOTE: This value represents the amount of time, in seconds, that it takes for the RTD to reach 63.2% of the step change. Record this response time in the "DATA COLLECTION TABLE" at the back of this procedure.

______ / ______
Date Technician

6.17.17 In Spec 200 cabinet L-129, replace the RTD leads on terminals 3 and 2 of TB-1.

______ / ______
Date Technician

6.17.18 Turn the "VOLTAGE ADJUSTMENT" on the ERT-1 fully counterclockwise.

______ / ______
Date Technician

6.17.19 Press the "RESET" pushbutton on the ELC-1B and verify that the analyzer returns to the "READY" mode.

______ / ______
Date Technician

NOTE: While equipment is set up and access is being made to the Spec 200 cabinets, it would be convenient to do the CPC LPD/DNBR calculator tests which use temperature input.

NOTE: Position 1 High Linear Power, Position 3 High Local Power Density, and Position 4 Low Departure from Nucleate Boiling Ratio will use an external signal during the Response Time Test. Since the setup will be different for the performance of these sections, it is recommended that they be performed before the other sections of the Response Time Test.

6.0 PROCEDURE

CAUTION Detector power supply voltages up to 1000 volts are present within the safety channel. Use extreme caution when working beneath the chassis or near rear panel high voltage connectors. The 1000 volt power supply may be deenergized for this portion of the test.

CAUTION Always discharge DC signal cables before connecting to the input jack. During reactor operation, normal chamber current can charge the distributed capacity of an unterminated coaxial cable to levels thay may destroy the input stages of this equipment. This charge buildup may be prevented by maintaining a short circuit across input signal cables when they are not attached to the input of the channel. Always switch the associated input rotary switch (S6) to the zero position before reconnecting the signal cables to J8, J9, or J10. DO NOT short circuit the log signal lead from the PA-501 preamplifier to J5 of the safety channel drawer.

6.13 Reactor Trip Switchgear Response Time Uncorrected

NOTE: This section of the Response Time Test measures the response time from the intitiation of a trip signal to the tripping of the RTSG breakers. The time measured for the tripping of the rotary relays will be subtracted from this value later to represent the response time of the RTSG alone. The trip function to be used for this measurement may be chosen at the discretion of the technician. However, it is recommended that "High Linear Power" be used since the equipment will be set up for section 6.21.

NOTE: Any trips initiated after this section will be performed with the RTSG breakers open to prevent unnecessary cycling of the RTSG breakers.

6.0 PROCEDURE

6.18.1 The following part of the test requires that an LED jumper wire (a length of wire with an LED in the middle) be connected across some terminals in the trip status panel. For convenience, eight LED jumper wires should be preconnected in accordance with the following table.

RTT Test	LED(+) Connection	Connection	
TCB-1 (GRN)	TB1301-6	TB1306-1	Date Completed/ Technician
TCB-2 (GRN)	TB1301-3	TB1306-1	Date Completed/ Technician
TCB-3 (GRN)	TB1302-13	TB1307-1	Date Completed/ Technician
TCB-4 (GRN)	TB1302-16	TB1307-1	Date Completed/ Technician
TCB-5 (GRN)	TB1302-3	TB1306-1	Date Completed/ Technician
TCB-6 (GRN)	TB1301-17	TB1306-1	Date Completed/ Technician
TCB-7 (GRN)	TB1303-10	TB1307-1	Date Completed/ Technician
TCB-8 (GRN)	TB1303-13	TB1307-1	Date Completed/ Technician

6.0 PROCEDURE

6.18.2 Perform any response time section between 6.19. and 6.39.29 (at the discretion of the technician) step by step as written with the following exception: Instead of connecting the "STOP" optical pickups to the temporary LED's across the contacts of the rotary relays, connect the "STOP" optical pickups over the LED's installed in step 6.18.1 for TCB 1, 2. The 3 and 4 RTSG breakers should be reset prior to tripping for response time measurement. Record the response time in this space.

______/______ ________/__________
Value Units Date Technicial

6.18.3 Repeat step 6.18.2 substituting TCB 5, 6, 7 and 8.

______/______ ________/__________
Value Units Date Technicial

6.18.4 Record the longest time measured in steps 6.18.2 and 6.18.3 in the data collection table at the back of this procedure.

________/__________
Date Technician

6.18.5 Remove the temporary LED's that were installed in step 6.18.1.

________/__________
Date Technician

6.19 High Linear Power to RTSG Response Time

NOTE: The following section of the test measures the response time from the initiation of a signal using the CE test box to the tripping of the rotary relays. The safety channel preamp should be available to be located near the rear of the PPS cabinet.

6.0 PROCEDURE

6.19.1 Isolate the RTSG leads from the following terminals located in the back of each PPS cabinet.

.1 Bay A: TBA2 terminals 20, 21

_____ / _____
Date Technican

.2 Bay B: TBB2 terminals 20, 21

_____ / _____
Date Technican

.3 Bay C: TBC2 terminals 20, 21

_____ / _____
Date Technican

.4 Bay D: TBD2 terminals 20, 21

_____ / _____
Date Technican

6.19.2 Connect an LED (6 volt, 20 ma) in series with a 6 Vdc power supply across the terminals listed in 6.19.1 for bay A on the cabinet side of the terminal board.

_____ / _____
Date Technician

6.19.3 Repeat step 6.19.2 for bays B, C, and D.

_____ / _____
Date Technician

6.19.4 In the channel to be tested, place the "AC POWER" switch of the safety channel drawer in the "OFF" position.

_____ / _____
Date Technician

6.19.5 Verify the "POWER ON" Lamp DS-1 is extinguished on the channel to be tested.

_____ / _____
Date Technician

6.19.6 At the rear of the safety channel, disconnect the high voltage cable from J-3 and connect this cable to the high voltage discharge J-4.

_______________ / _______________
Date Technician

6.19.7 Disconnect plug P-8 from J-8 and place a grouding cap on the plug.

_______________ / _______________
Date Technician

6.19.8 Connect one end plug of a coaxial cable to BNC number 1 in the "Function Signal Outputs" section of the C-E test box and the other end plug to the input jack J-8 of the safety channel drawer.

_______________ / _______________
Date Technician

6.19.9 Connect a ground wire at the chassis J-7 plug and the other end to the ground connection at the C-E test box.

_______________ / _______________
Date Technician

6.19.10 Disconnect plug P-9 from J-9 of the safety channel drawer and place a grounding cap on the plug.

_______________ / _______________
Date Technician

6.19.11 Connect one end plug of a coaxial cable to BNC jack number 2 in the "Function Signal Outputs" section of the C-E test box and the other end plug to the "signal in" jack (J8) of the PA501 preamp.

_______________ / _______________
Date Technician

6.19.12 Connect another coaxial cable between the "DC return 2" jack (J7) of the preamp and J9 of the safety channel drawer.

_______________ / _______________
Date Technician

6.0 PROCEDURE

6.19.13 Connect a ground wire at the chassis J-9 plug and the other end to the ground connector at the C-E test box.

_______________/_______________
Date Technician

6.19.14 Disconnect plug P-10 from J-10 of the safety channel drawer and place a grounding cap on the plug.

_______________/_______________
Date Technician

6.19.15 Connect one end plug of a coaxial cable to BNC jack number 3 in the "Function Signal Outputs" section of the C-E test box and the other end plug to input jack J-10 on safety channel drawer.

_______________/_______________
Date Technician

6.19.16 Connect a ground wire at the chassis J-10 plug and the other end to the ground connector at the C-E test box

_______________/_______________
Date Technician

6.19.17 Place the linear calibrate switch of the safety drawer to the "operate" position.

_______________/_______________
Date Technician

6.19.18 Place the "AC POWER" switch of safety channel drawer to "ON" position.

_______________/_______________
Date Technician

6.19.19 Attach the optical detector pickups over the four temporary LED's installed in steps 6.19.2 and 6.19.3.

_______________/_______________
Date Technician

6.0 PROCEDURE

6.19.20 Connect the double banana plug end of the LED pickup leads to L1, L2, L3 and L4 of the "STOP LAMPS" section of the C-E test box.

______/______
Date Technician

6.19.21 Position the stop lamp toggle switches of the C-E test box as follows:

.1 "L1" - "ON" ______/______ Date Technician

.2 "L2" - "ON" ______/______ Date Technician

.3 "L3" - "ON" ______/______ Date Technician

.4 "L4" - "ON" ______/______ Date Technician

.5 "L5" - "OFF" ______/______ Date Technician

.6 "L6" - "OFF" ______/______ Date Technician

NOTE: The source current has been preadjusted in the C-E test box to provide a trip. Adjust if necessary.

6.19.22 On channel 'B' SAFETY CHANNEL DRAWER, place the "LINEAR CALIBRATE" switch in the "200%" position. This should cause the "High Linear Power" trip light to energize on channel 'B' bistable control panel.

______/______
Date Technician

6.0 PROCEDURE

6.19.23 Energize the test equipment and allow it to stabilize.

_____________ / _____________
Date   Technician

6.19.24 Ensure the start and stop "TIMER MODES" switches are selected to the step up (increasing) position.

_____________ / _____________
Date   Technician

6.19.25 Ensure timer on the C-E test box is reset.

_____________ / _____________
Date   Technician

6.19.26 Push the "STEP" toggle switch to the "START" position, then release the switch. The start LED should energize.

_____________ / _____________
Date   Technician

6.19.27 Record the elapsed time as indicated on the C-E test box timer digital indicator.

_____________   _____________ / _____________
value / units   Date   Technician

6.19.28 Push the "STEP" toggle switch to the "RESET" position, then release the switch. The RESET LED should energize.

_____________ / _____________
Date   Technician

6.19.29 On channel 'B' SAFETY CHANNEL DRAWER, place the "LINEAR CALIBRATE" switch in the "OPERATE" POSITION AND RESET THE "HIGH LINEAR POWER" bistable in Channel 'B'.

_____________ / _____________
Date   Technician

6.0 PROCEDURE

6.19.30 On channel 'C' SAFETY CHANNEL DRAWER, place the "LINEAR CALIBRATE" switch in the "200%" position. Verify channel 'C' "HIGH LINEAR POWER" trip light is energized on the bistable control panel.

Date / Technician

6.19.31 Repeat steps 6.19.24 through 6.19.27.

Value / Units   Date / Technicial

6.19.32 On channel 'C' SAFETY CHANNEL DRAWER, place the "LINEAR CALIBRATE" switch in the "OPERATE" position and reset the "HIGH LINEAR POWER" bistable in Channel 'C'.

Date / Technician

6.19.33 On channel 'D' SAFETY CHANNEL DRAWER, place the "LINEAR CALIBRATE" switch in the "200%" position. Verify channel 'D' "HIGH LINEAR POWER" trip light is energized on the bistable control panel.

Date / Technician

6.19.34 Repeat steps 6.19.24 through 6.19.27.

Value / Units   Date / Technicial

6.19.35 Record the largest value of steps 6.19.27, 6.19.31, 6.19.34 in the "DATA COLLECTION TABLE".

Date / Technician

6.19.36 Disconnect the preamp from the (safety channel drawer) and replace the preamp in its normal location.

Date / Technician

6.0 PROCEDURE

6.19.37 Disconnect the C-E test box from the safety channel drawer and return all four safety channel drawers to normal operation.

_______________ / _______________
Date Technician

6.19.38 Reset all bistables from the bistable control panels.

_______________ / _______________
Date Technician

6.20 High Log PWR Level to RTSG Response Time Test

NOTE: The following section of the test measures the response time from the depression of the bistable pushbutton (S608) on the bistable control panel through the tripping of the rotary relays.

6.20.1 On the bistable control panel being tested, rotate the bistable selector switch to position number 2.

_______________ / _______________
Date Technician

6.20.2 Rotate the meter input selector switch to "TRIP SP" position and record the indicated SP voltage.

_______________ / Volts
Value Units

_______________ / _______________
Date Technicial

6.20.3 Remove plug P-13 from J-13 at rear of the safety channel drawer being tested.

_______________ / _______________
Date Technician

6.20.4 Rotate the Meter Input Selector switch to the "Input" position.

_______________ / _______________
Date Technician

6.0 PROCEDURE

6.20.5 Rotate the coarse potentiometer (R501) on the bistable control panel while holding down the bistable pushbutton until the digital voltage indicator reads approximately .IV on the tripped side of the setpoint recorded in step 6.22.2. Then release the bistable pushbutton and record the adjusted voltage.

_____ / Volts _____ / _____
Value Units Date Technicial

6.20.6 Turn on the power to the C-E test box and line up the switches as follows:

_____ / _____
Date Technician

.1 L1 "STOP LAMPS" toggle switch "ON" _____ / _____
Date Technician

.2 L2 "STOP LAMPS" toggle switch "ON" _____ / _____
Date Technician

.3 L3 "STOP LAMPS" toggle switch "ON" _____ / _____
Date Technician

.4 L4 "STOP LAMPS" toggle switch "ON" _____ / _____
Date Technician

.5 L5 "STOP LAMPS" toggle switch "OFF" _____ / _____
Date Technician

.6 L6 "STOP LAMPS" toggle switch "OFF" _____ / _____
Date Technician

6.20.7 Connect the four optical detector pickup cables to the "STOP LAMPS" section at "L1, L2, L3 and L4".

_____ / _____
Date Technician

6.0 PROCEDURE

6.20.8 Attach these four optical pickups over the temporary LED's installed in steps 6.21.1 through 6.21.3.

____________/____________
Date Technician

6.20.9 Ensure the START and STOP "TIMER MODE" switches are in the step up or increasing mode.

____________/____________
Date Technician

6.20.10 Insert an extender card into the Test and Calibration card slot and place a hook probe from pin 51 of the Test and Calibration connector to the red (+) jack of the "EXT 10V START" in the "TIMER INPUTS" section of the C-E test box. Place another hook probe from pin 59 to the black (-) jack of the same section.

____________/____________
Date Technician

6.20.11 Ensure the timer is reset on the C-E test box.

____________/____________
Date Technician

6.20.12 Depress the bistable pushbutton until the timer stops incrementing.

____________/____________
Date Technician

6.20.13 Record the response time (as indicated on the timer digital indicator or the C-E test box) in the DATA COLLECTION TABLE.

____________/____________
Date Technician

6.0 PROCEDURE

6.20.14 Reset the bistable.

_____ / _____
Date Technician

6.20.15 Reconnect the plug P-13 to J-13 at the rear of the safety channel drawer.

_____ / _____
Date Technician

NOTE: The remainder of this section of the test may be conducted any time it is convenient to setup the required equipment. The Nuclear Instrumentation ·CPC-LPD/DNBR calculators response time test (sections 6.23 and 6.24) may be conducted while the test equipment is set up at the nuclear instrumentation drawer.

CAUTION
=======
DETECTOR POWER SUPPLY VOLTAGES UP TO 1000 V ARE PRESENT WITHIN THIS UNIT. USE EXTREME CAUTION WHEN WORKING BENEATH THE CHASSIS OR NEAR REAR PANEL HIGH VOLTAGE CONNECTORS.

CAUTION
=======
THIS TEST DOES NOT REQUIRE DISCONNECTING INPUT SIGNAL CABLES. HOWEVER, THIS CAUTION IS RESTATED HERE SO THAT PERSONS ARE AWARE OF DAMAGE THAT COULD RESULT FROM IMPROPER PROCEDURES. ALWAYS DISCHARGE DC SIGNAL CABLES BEFORE CONNECTING TO THE INPUT JACK. DURING REACTOR OPERATION, NORMAL CHAMBER CURRENT CAN CHARGE THE DISTRIBUTED CAPACITY OF AN UNTERMINATED COAXIAL CABLE TO LEVELS THAT MAY DESTROY THE INPUT STAGES OF THIS EQUIPMENT. THIS CHARGE BUILDUP MAY BE PREVENTED BY MAINTAINING A SHORT CIRCUIT ACROSS INPUT SIGNAL CABLES WHEN THEY ARE NOT ATTACHED TO THE INPUT OF THE CHANNEL. ALWAYS SWITCH THE ASSOCIATED INPUT ROTARY SWITCH (S5) TO THE ZERO POSITION BEFORE RECONNECTING THE SIGNAL CABLES TO JACKS J8, J9, or J10. DO NOT SHORT CIRCUIT THE LOG SIGNAL LEAD FROM THE PA-501 PREAMPLIFIER TO J5.

CAUTION
=======
Make certain to use a variable attenuator network to interface between the PPS and the high speed recorder. Failure to attenuate the test inputs to the high speed recorder may damage the unit.

6.0 PROCEDURE

6.20.16 In the channel to be tested, place the "AC POWER" switch of the safety channel drawer in the OFF position.

________ / ________
Date Technician

6.20.17 Verify the "POWER ON" lamp DS-1 is extinguished.

________ / ________
Date Technician

6.20.18 Connect a test jumper from the "Log Calibrate" switch S1M-1 to S1M-6 per Appendix A, Figure A-3.

________ / ________
Date Technician

6.20.19 Connect pen 1 of the recorder to S1M-C and chassis ground.

________ / ________
Date Technician

6.20.20 Turn the linear calibrate switch to "ZERO" position.

________ / ________
Date Technician

6.20.21 Place the "AC POWER" switch of the safety channel drawer to the "ON" position.

________ / ________
Date Technician

6.0 PROCEDURE

6.20.22 Attach a second channel of the high speed recorder to terminals 1 and 2 of terminal strip TBA2 in L032B. This is a signal that is sent to the log power meter. Adjust this pen for 0.10 Vdc full scale. Adjust pen 1 for a resonable trace when the "LOG CALIBRATE" switch is transferred from position 5 to position 6. (approximately 10 Vdc change)

____________/____________
Date Technician

6.20.23 On the safety channel drawer front, turn the "LOG CALIBRATE" switch to position number 5. This position should produce a 5 microsecond square wave pulse with an amplitude of 0.9 volts for a frequency of 10 KHz.

____________/____________
Date Technician

NOTE: This will produce a trip signal. When the switch is moved from operate, an 8.2 volt signal is sent to the trip circuit.

6.20.24 Set the high speed recorder chart speed at approximately 20 inches per second (IPS) or more as required to provide an analyzable chart trace.

____________/____________
Date Technician

6.20.25 Start the high speed recorder and quickly turn the log calibrate switch from position 5 to position 6. Position 6 should produce a 5 microsecond square wave pulse with an amplitude of 10 volts for a frequency of 10 KHz.

____________/____________
Date Technician

6.0 PROCEDURE

NOTE: The pulse change is sent to the preamplifier and returned to the processing drawer where it is sent through a buffer to the connector J-73 and then to the terminal strip.

6.20.26 After the high speed recorder trace indicates that the new pulse has been received, turn off the high speed recorder.

_____________/_____________
Date Technician

6.20.27 Record the following data on the high speed recorder strip chart:

.1 Procedure number

.2 Step number

.3 Date, initials

.4 Pen numbers

.5 Pen range

.6 Input parameter

.7 Recorder no.

.8 Chart speed

_____________/_____________
Date Technician

6.20.28 Record the response time in the DATA COLLECTION TABLE.

_____________/_____________
Date Technician

NOTE: The response time is the time necessary for the signal initiated at the PPS cabinet terminal strip to go through 63.2% of its total increase after moving the switch from position 5 to position 6.

6.0 PROCEDURE

6.20.29 Return all connections and switches to the normal operate position. Place the channel into normal operating mode. Leave the bistables of Ch "A" bypassed. Do not disconnect the PPS input simulator box.

Date / Technician

6.21 Positions 3 and 4 High LPD and Low DNBR

NOTE: The High Local Power Density and Low Departure from Nucleate Boiling Ratio functions are contact inputs from the core protection calculators (CPC) and do not include a bistable card. These functions shall be tested in section 6.22.

6.22 CPC/CEAC Response Time Testing

NOTE: This section checks the response time of the CPC/CEAC System from the time that it receives an input signal until the time the system outputs a trip signal. This portion of the test requires that special test software be loaded into the computer system. External signals are provided by the CE RTT Test Equipment box.

6.22.1 Initialization of CPC/CEAC for Testing

.1 Set the CALCULATOR SELECT switch on the operator's module to load the CPC (CEAC) calculator.

Date / Technician

NOTE: When one calculator is selected, in channels B and C, the other calculator is memory protected. No changes can be made to the protected calculator.

6.0 PROCEDURE

6.22.2 Set up the AED 2500 Floppy Disk Drive, as follows:

.1 Turn ON the AED Floppy Disk Drive.

Date / Technician

.2 Set the drive select switches so that drive A is unit 0, drive B is unit 1 and drive C is unit 2.

Date / Technician

CAUTION NEVER TURN THE AED 2500 POWER ON OR OFF WITH A DISK IN THE DRIVE.

.3 Place the floppy disk containing the test software into the AED 2500 Floppy Disk Drive.

Date / Technician

.4 Set the INIT and WP switches UP.

Date / Technician

.5 Lift the IPL switch.

Date / Technician

6.22.3 Place the CPC Coldstart Loader paper tape into the teletypewriter (TTY) paper tape reader and connect the TTY to the CPC calculator A cable connector.

Date / Technician

6.0 PROCEDURE

6.22.4 Hit the "FUNCTION" button, then hit the "LOCATION" button to stop the calculator.

_______ / _______
Date Technician

6.22.5 Set up the following memory locations via the Interdata Hexidecimal Panel.

Location	Contents
30	0000
32	0000
34	0000
36	0050
50	D500
52	00CF
54	4300
56	0080
78	0294

_______ / _______
Date Technician

6.22.6 Read through these same locations to verify the correct contents.

_______ / _______
Date Technician

6.22.7 Start the processor at location 30.

_______ / _______
Date Technician

6.22.8 Start the teletype paper tape reader by setting the READER/PUNCH switch to the "MANUAL START" position.

_______ / _______
Date Technician

6.22.9 Respond to the TEST TRACK prompt with 55.

_______ / _______
Date Technician

6.0 PROCEDURE

6.22.10 Turn the MEMORY PROTECT key switch on the operators module to "OFF". The MEMORY PROTECT switch must remain in OFF during the part 1 Interactive I/O System Test. Other switches will protect memory when appropriate.

_______ / _______
Date Technician

6.22.11 Respond to the calculator request prompt with CPCC or CEAC depending upon the calculator to be loaded.

_______ / _______
Date Technician

6.22.12 Verify that the TRIP BYPASS switch is OFF.

_______ / _______
Date Technician

6.22.13 Remove the disk from the AED 2500 disk drive to prevent damage to the disk.

_______ / _______
Date Technician

6.22.14 Display the LOWTOD Point ID on the operators module. The point ID is 40.

_______ / _______
Date Technician

6.22.15 While synchronizing with the second hand of a watch press the "INIT" button on the hexadecimal display panel of the processor to be checked.

_______ / _______
Date Technician

NOTE: This results in a system auto-restart which resets LOWTOD to zero.

6.0 PROCEDURE

6.22.16 Press the "FN" button on the hexadecimal display panel.

_____________/_______________
Date Technician

6.22.17 Press the "LOC" button on the hexadecimal display panel in synchronization with the ending of a five (5) minute interval on the watch.

_____________/_______________
Date Technician

NOTE: This halts the processor which in turn stops the LOWTOD.

6.22.18 Read LOWTOD from the operator's module. The display should read 6000 ± 40.

_____________/_______________
Date Technician

NOTE: The following steps will be used to load the Interactive I/O System CPC/CEAC System Response Time Test software. The disk will be referred to as the Part 1 disk.

6.22.19 Set the CALCULATOR SELECT rotary switch on the OPERATOR's MODULE to load the CPC (CEAC) calculator. The calculator not selected is memory protected.

_____________/_______________
Date Technician

6.22.20 Set up the AED 2500 Floppy Disk Drive as follows:

.1 Turn ON the AED Floppy Disk Drive.

_____________/_______________
Date Technician

6.0 PROCEDURE

6.22.20.2 Set the drive select switches so that drive A is unit 0, drive B is unit 1 and drive C is unit 2.

_____/_____
Date Technician

.3 Place the floppy disk containing the Part 1 RTT software into the AED 2500 Floppy Disk Drive.

_____/_____
Date Technician

.4 Set the INIT and WP switches UP.

_____/_____
Date Technician

.5 Lift the IPL switch.

_____/_____
Date Technician

6.22.21 Place the CPC Coldstart Leader paper tape into the teletypewriter (TTY) paper tape reader and connect the TTY to the CPC calculator A cable connection point indicated.

_____/_____
Date Technician

6.22.22 Hit the "FUNCTION" button, then hit the "LOCATION" button.

_____/_____
Date Technician

6.0 PROCEDURE

6.22.23 Set up the following memory locations via the Interdata Hexidecimal Panel.

Location	Contents
30	0000
32	0000
34	0000
36	0050
50	D500
52	00CF
54	4300
56	0080
78	0294

/
Date Technician

6.22.24 Read through these same locations to verify the correct contents.

/
Date Technician

6.22.25 Start the processor at location 30.

/
Date Technician

6.22.26 Start the teletype paper tape reader by setting the READER/PUNCH switch to the "MANUAL START" position.

/
Date Technician

6.22.27 Respond to the TEST TRACT prompt with 55.

/
Date Technician

6.0 PROCEDURE

6.22.28 Verify that the MEMORY PROTECT keyswitch is OFF

_____/_____
Date Technician

6.22.29 Respond to the calculator request prompt with CPCC (CEAC).

_____/_____
Date Technician

6.22.30 Remove the disk from the AED 2500 disk drive.

_____/_____
Date Technician

6.23 RTD-CPC I/O RTT

6.23.1 Reset the CPC calculator by pushing the white (SPARE) pushbutton on the Operator's Module.

_____/_____
Date Technician

6.23.2 Enter the following on the TTY keyboard to check the operation of the TTY-CPCP interface:

```
*EX TC1

*EX TC2

*EX TH1

*EX TH2
```

The resultant printout is as indicated in Table F1 of Appendix F.

_____/_____
Date Technician

NOTE: For convenience, the following tests should be run concurrently with or immediately after the Loop Current Step Response (LCSR) test of the RTD's.

6.0 PROCEDURE

6.23.3 On the C-E test box, set the "FUNCTION SELECT" switch to RESISTANCE to prepare to run the response time test for loop 1 cold leg temperature (TC1).

_____ / _____
Date / Technician

6.23.4 On the C-E test box, plug the meter into the "VOLTAGE, HIGH CURRENT, FREQUENCY, RESISTANCE" jacks in the "FUNCTION SIGNAL OUTPUT" section.

_____ / _____
Date / Technician

NOTE: In the following steps, whenever it is required that an initial value or a final value be set using the DVM, this value as read on the DVM should be recorded below the applicable step.

6.23.5 Using the potentiometers under "RESISTANCE" in the "STEPPED FUNCTIONS" section, adjust the initial resistance in the C-E test box so that the resistance value is 420 ohms as read on the DVM when the STEPPED FUNCTIONS STEP toggle switch is in the RESET position. Note the value.

_____ / Volts _____ / _____
Value / Units Date / Technicial

6.23.6 Adjust the final resistance in the C-E test box so that the value is 432 ohms as read on the DVM when the STEPPED FUNCTIONS STEP toggle switch is in the START position. Note the value.

_____ / Volts _____ / _____
Value / Units Date / Technicial

6.23.7 Disconnect the meter and return the STEPPED FUNCTIONS STEP toggle switch to the RESET position.

_____ / _____
Date / Technician

6.0 PROCEDURE

6.23.8 At the Foxboro Spec. 200 cabinet L-129, remove the leads that go to the temperature transmitter from terminals 8 and 7 on terminal strip TB-1.

Date / Technician

NOTE: These are the leads on the other side of the terminal strip that were removed for the LCSR test. A check should be made to ascertain whether the correct two leads to the temperature transmitter are being used. If leads other than those specified are used, note the appropriate numbers here.

6.23.9 Connect the resistance test leads from the C-E RTT test box to the leads removed in the step above.

Date / Technician

6.23.10 Place three optical pickups over the three LED's in column 3 and three optical pickups over the three LED's in column 4 (Hi Local Power and Low DNBR respectively) on the Bistable Control Panel. Leave in place for the remainder of the channel test.

Date / Technician

6.23.11 Place the other end of the optical pickups cables to all six STOP LAMP jacks on the C-E RTT test box.

Date / Technician

6.23.12 Turn the switches next to these lamp jacks to ON.

Date / Technician

NOTE: If the base line data is desired, turn three switches to OFF and run the test twice.

6.0 PROCEDURE

6.23.13 Ensure that the STOP TIMER MODE switch is in the increasing or low to high mode.

_____________/_____________
Date Technician

NOTE: The following section of the test measures the response time from an externally produced signal in the Spec. 200 cabinets through the tripping of the bistable relays by a signal produced in the CPC calculators.

CAUTION THIS TEST, IF NOT PROPERLY CONDUCTED, MAY CAUSE A TRIP OF THE RPS REACTOR TRIP SWITCHGEAR. FOR THIS PREOPERATIONAL TEST, WITH THE CEA M-G SETS NOT RUNNING, THE ONLY PORTION OF THE PPS THAT NEED BE ENERGIZED IS THAT PART BEING TESTED.

6.23.14 At the CPC/CEAC TTY, enter the command LI TC1,558, IN, BOTH CR to make the parameter TC1 (Loop 1 Cold Leg Temperature) live input.

_____________/_____________
Date Technician

6.23.15 At the CPC/CEAC TTY, enter the live input status command ST CR . The TTY should respond with the data entered in the step above (the setpoint number may be rounded off).

_____________/_____________
Date Technician

6.23.16 On the C-E RTT Test Box, reset the timer to ZERO.

_____________/_____________
Date Technician

6.0 PROCEDURE

6.23.17 At the CPC/CEAC TTY, enter the command GO CR . Verify that the point I.D. displayed is 043 and the valve is +33.000.

_____________ / _____________
Date Technician

6.23.18 On the RPS section of the PPS, clear any LPD or DNR trip conditions.

_____________ / _____________
Date Technician

6.23.19 Move the STEPPED FUNCTIONS STEP toggle switch to START.

_____________ / _____________
Date Technician

6.23.20 When the timer stops incrementing, note the value in the "DATA COLLECTION TABLE."

_____________ / _____________
Date Technician

6.23.21 Return the STEPPED FUNCTIONS STEP toggle switch to the RESET position.

_____________ / _____________
Date Technician

NOTE: Leave the test setup unchanged except as follows:

6.23.22 Reconnect all the leads in the Spec. 200 cabinets that were removed for the above test.

_____________ / _____________
Date Technician

6.23.23 On the C-E test box, verify that the "FUNCTION SELECT" switch is set to RESISTANCE.

_____________ / _____________
Date Technician

6.0 PROCEDURE

6.23.24 On the C-E test box, plug the meter into the "VOLTAGE, HIGH CURRENT, FREQUENCY, RESISTANCE" jacks in the "FUNCTION SIGNAL OUTPUT" section.

______ / ______
Date Technician

6.23.25 Using the potentiometers under "RESISTANCE" in the "STEPPED FUNCTIONS" section, adjust the initial resistance in the C-E test box so that the resistance value is 420 ohms as read on the DVM when the STEPPED FUNCTION toggle switch is in the RESET position. Note the value.

______ / Volts ______ / ______
Value Units Date Technicial

6.23.26 Adjust the final resistance in the C-E test box so that the value is 432 ohms as read on the DVM when the START switch is actuated. Note the value.

______ / Volts ______ / ______
Value Units Date Technicial

6.23.27 Disconnect the meter and return the STEPPED FUNCTIONS STEP toggle switch to the RESET position.

______ / ______
Date Technician

6.23.28 At the Foxboro Spec. 200 cabinet L-125, remove the leads that go to the temperature transmitter from terminals 12 and 13 on terminal strip TB-1.

______ / ______
Date Technician

NOTE: These are the leads on the other side of the terminal strip that were removed for the LCSR test. A check should be made to ascertain whether the correct two leads to the temperature transmitter are being used. If leads other than those specified are used, note the appropriate numbers here.

6.0 PROCEDURE

6.23.29 Connect the resistance test leads from the C-E RTT test box to the leads removed in the step above.

_______________ / _______________
Date Technician

6.23.30 Place three optical pickups over the three LED's in column 3 and three optical pickups over the three LED's in column 4 (Hi Local Power and Low DNBR respectively) on the Bistable Control Panel.

_______________ / _______________
Date Technician

6.23.31 Verify that the switches next to the six step lamp jacks are ON.

_______________ / _______________
Date Technician

6.23.32 Ensure that the STOP TIMER MODE switch is in the increasing or low to high mode.

_______________ / _______________
Date Technician

NOTE: The following section of the test measures the response time from an externally produced signal in the Spec. 200 cabinets through the tripping of the bistable relays by a signal produced in the CPC calculators.

CAUTION THIS TEST, IF NOT PROPERLY CONDUCTED, MAY CAUSE A TRIP OF THE RPS REACTOR TRIP SWITCHGEAR. FOR THIS TEST, WITH THE CEA M-G SETS NOT RUNNING, THE ONLY PORTION OF THE PPS THAT NEED BE ENERGIZES IS THAT PART BEING TESTED.

6.0 PROCEDURE

6.23.33 Reset the CPC calculator trip by pushing the white (SPARE) pushbutton on the Operator's Module and entering an R (for Restart) when prompted by the TTY.

______ / ______
Date Technician

6.23.34 At the CPC/CEAC TTY, enter the command LI TC2,568, IN, BOTH CR to make the parameter TC2 (Loop 2 Cold Leg Temperature) a live input.

______ / ______
Date Technician

6.23.35 At the CPC/CEAC TTY, enter the command NOP TC1 to revert the live input to a constant input.

______ / ______
Date Technician

6.23.36 At the CPC/CEAC TTY, enter the command ST CR . Only TC2 should be a live input.

______ / ______
Date Technician

6.23.37 Reset the C-E RTT test box timer to zero.

______ / ______
Date Technician

6.23.38 At the CPC/CEAC TTY, enter the command "GO" to start the program. Verify that the point ID displayed is 043 and the value is +33.000.

______ / ______
Date Technician

6.23.39 Reset all DNBR/LPD trip conditions on the Bistable Control Panel of the PPS.

______ / ______
Date Technician

6.0 PROCEDURE

6.23.40 Toggle the "STEP" switch to "START." When the timer stops incrementing, note the value and enter in the "DATA COLLECTION TABLE."

_____ / _____
Date Technician

6.23.41 Return the STEPPED FUNCTIONS STEP toggle switch to the RESET position.

_____ / _____
Date Technician

NOTE: Leave the test setup unchanged except as follows:

6.23.42 Reconnect all the leads in the Spec. 200 cabinets that were removed for the above test.

_____ / _____
Date Technician

6.23.43 On the C-E test box, verify that the "FUNCTION SELECT" switch is set to RESISTANCE.

_____ / _____
Date Technician

6.23.44 On the C-E test box, plug the meter into the "VOLTAGE, HIGH CURRENT, FREQUENCY, RESISTANCE" jacks in the "FUNCTION SIGNAL OUTPUT" section.

_____ / _____
Date Technician

6.23.45 Using the potentiometers under "RESISTANCE" in the "STEPPED FUNCTIONS" section, adjust the initial resistance in the C-E test box so that the resistance value is 440 ohms as read on the DVM when the STEP switch is in the RESET position. Note the value.

_____ / Volts _____ / _____
Value Units Date Technicial

6.0 PROCEDURE

6.23.46 Adjust the final resistance in the C-E test box so that the value is 452 ohms as read on the DVM when the START switch is actuated. Note the value.

_____ / Volts
Value / Units

_____ / _____
Date / Technician

6.23.47 Disconnect the meter and return the STEPPED FUNCTIONS STEP toggle switch to the RESET position.

_____ / _____
Date / Technician

6.23.48 At the Foxboro Spec. 200 cabinet L-129, remove the leads that go to the temperature transmitter from terminals 18 and 17 on terminal strip TB-1.

_____ / _____
Date / Technician

NOTE: These are the leads on the other side of the terminal strip that were removed for the LCSR test. A check should be made to ascertain whether the correct two leads to the temperature transmitter are being used. If leads other than those specified are used, note the appropriate numbers here.

6.23.49 Connect the resistance test leads from the C-E RTT test box to the leads removed in the step above.

_____ / _____
Date / Technician

6.23.50 Place three optical pickups over the three LED's in column 3 and three optical pickups over the three LED's in column 4 (Hi Local Power and Low DNBR respectively) on the Bistable Control Panel.

_____ / _____
Date / Technician

6.0 PROCEDURE

6.23.51 Verify that the switches next to the six step lamp jacks are ON.

__________/__________
Date Technician

6.23.52 Ensure that the STOP TIMER MODE switch is in the increasing or low to high mode.

__________/__________
Date Technician

NOTE: The following section of the test measures the response time from an externally produced signal in the Spec. 200 cabinets through the tripping of the bistable relays by a signal produced in the CPC calculators.

CAUTION
=======
THIS TEST, IF NOT PROPERLY CONDUCTED, MAY CAUSE A TRIP OF THE RPS REACTOR TRIP SWITCHGEAR. FOR THIS TEST, WITH THE CEA M-G SETS NOT RUNNING, THE ONLY PORTION OF THE PPS THAT NEED BE ENERGIZED IS THAT PART BEING TESTED.

6.23.53 Reset the CPC calculator trip by pushing the white (SPARE) pushbutton on the Operator's Module and entering an "R" (for Restart) when prompted by the TTY.

__________/__________
Date Technician

6.23.54 At the CPC/CEAC TTY, enter the command LI TH1,618, IN, BOTH CR to make the parameter TH1 (Loop 1 Hot Leg Temperature) a live input.

__________/__________
Date Technician

6.0 PROCEDURE

6.23.55 At the CPC/CEAC TTY, enter the command NOP TC2 to revert the live input to a constant input.

______________/______________
Date Technician

6.23.56 At the CPC/CEAC TTY, enter the command ST CR . Only TH1 should be a live input.

______________/______________
Date Technician

6.23.57 Reset the C-E RTT test box timer.

______________/______________
Date Technician

6.23.58 At the CPC/CEAC TTY, type in the command GO to start the program. Verify that the point I.D. displayed is 043 and the value is +33.000.

______________/______________
Date Technician

6.23.59 Reset all DNBR/LPD trip conditions on the Bistable Control Panel of the PPS.

______________/______________
Date Technician

6.23.60 Toggle the "STEP" switch to "START." When the timer stops incrementing, note the value and enter in the "DATA COLLECTION TABLE."

______________/______________
Date Technician

6.23.61 Return the STEPPED FUNCTIONS STEP toggle switch to the RESET position.

______________/______________
Date Technician

NOTE: Leave the test setup unchanged except as follows:

6.0 PROCEDURE

6.23.62 Reconnect all the leads in the Spec. 200 cabinets that were removed for the above test.

________/________
Date Technician

6.23.63 On the C-E test box, verify that the "FUNCTION SELECT" switch is set to RESISTANCE.

________/________
Date Technician

6.23.64 On the C-E test box, plug the meter into the "VOLTAGE, HIGH CURRENT, FREQUENCY, RESISTANCE" jacks in the "FUNCTION SIGNAL OUTPUT" section.

________/________
Date Technician

6.23.65 Using the potentiometers under "RESISTANCE" in the "STEPPED FUNCTIONS" section, adjust the initial resistance in the C-E test box so that the resistance value is 440 ohms as read on the DVM when the STEP switch is in the RESET position. Note the value.

________/ Volts
Value Units

________/________
Date Technicial

6.23.66 Adjust the final resistance in the C-E test box so that the value is 452 ohms as read on the DVM when the START switch is actuated. Note the value.

________/ Volts
Value Units

________/________
Date Technicial

6.23.67 Disconnect the meter and return the STEPPED FUNCTIONS STEP toggle switch to the RESET position.

________/________
Date Technician

6.23.68 At the Foxboro Spec. 200 cabinet L-129, remove the leads that go to the temperature transmitter from terminals 13 and 12 on terminal strip TB-1.

________/________
Date Technician

6.0 PROCEDURE

6.23.68

NOTE: These are the leads on the other side of the terminal strip that were removed for the LCSR test. A check should be made to ascertain whether the correct two leads to the temperature transmitter are being used. If leads other than those specified are used, note the appropriate numbers here.

6.23.69 Connect the resistance test leads from the C-E RTT test box to the leads removed in the step above.

_______________ / _______________
Date Technician

6.23.70 Place three optical pickups over the three LED's in column 3 and three optical pickups over the three LED's in column 4 (Hi Local Power and Low DNBR respectively) on the Bistable Control Panel.

_______________ / _______________
Date Technician

6.23.71 Verify that the switches next to the six step lamp jacks are ON.

_______________ / _______________
Date Technician

6.23.72 Ensure that the STOP TIMER MODE switch is in the increasing or low to high move.

_______________ / _______________
Date Technician

NOTE: The following section of the test measures the response time from the externally produced signal in the Spec. 200 cabinets through the tripping of the bistable relays by a signal produced in the CPC calculators.

6.0 PROCEDURE

6.23.72

CAUTION THIS TEST, IF NOT PROPERLY CONDUCTED, MAY CAUSE A TRIP OF THE RPS REACTOR TRIP SWITCHGEAR. FOR THIS TEST, WITH THE CEA M-G SETS NOT RUNNING, THE ONLY PORTION OF THE PPS THAT NEED BE ENERGIZED IS THAT PART BEING TESTED.

6.23.73 Reset the CPC calculator trip by pushing the white (SPARE) pushbutton on the Operator's Module and entering an R (for Restart) when prompted by the TTY.

__________/__________
Date Technician

6.23.74 At the CPC/CEAC TTY, enter the command LI TH2,618, IN, BOTH CR to make the parameter TH2 (Loop 2 Hot Leg Temperature) a live input.

__________/__________
Date Technician

6.23.75 At the CPC/CEAC TTY, enter the command NOP TH1 to revert the live input to a constant input.

__________/__________
Date Technician

6.23.76 At the CPC/CEAC TTY, enter the command ST CR . Only TH2 should be a live input.

__________/__________
Date Technician

6.23.77 Reset the C-E RTT test box timer to zero.

__________/__________
Date Technician

6.23.78 At the CPC/CEAC TTY, enter the command GO to start the program. Verify that the point I.D. displayed is 043 and the value is +33.00.

__________/__________
Date Technician

6.0 PROCEDURE

6.23.79 Reset all DNBR/LPD trip conditions on the Bistable Control Panel of the PPS.

_______/_______
Date Technician

6.23.80 Toggle the "STEP" switch to "START." When the timer stops incrementing, note the value and enter in the "DATA COLLECTION TABLE."

_______/_______
Date Technician

6.23.81 Return the STEPPED FUNCTIONS STEP toggle switch to the RESET position.

_______/_______
Date Technician

NOTE: Leave the test setup unchanged except as follows:

6.23.82 Reconnect all the leads in the Spec. 200 cabinets that were removed for the above test.

_______/_______
Date Technician

6.23.83 Pressurizer Pressure - CPC I/O RTT

6.23.83.1 On the C-E RTT box, rotate the function select switch to the HIGH CURRENT position. Output from the box will now be at the "VOLTAGE, HIGH CURRENT, FREQUENCY, RESISTANCE" banana jacks in the FUNCTION SIGNAL OUTPUTS section.

_______/_______
Date Technician

.2 Short circuit the output at the jacks.

_______/_______
Date Technician

6.0 PROCEDURE

6.23.83.3 Connect the ma meter (DC range) to the HIGH CURRENT jacks in the CALIBRATION section and move the calibration switch to C (calibrate). The meter should indicate current.

_____________/_____________
Date Technician

.4 Move the momentary contact STEP switch in the STEPPED FUNCTIONS section to RESET and release. The RESET light should turn ON.

_____________/_____________
Date Technician

.5 Set the initial high current value to a current of 15 milliamperes. Note the value.

_______/ Volts
Value Units

_____________/_____________
Date Technicial

.6 Move the momentary contact STEP switch to START and release. The START light should illuminate and the timer should start incrementing. Stop the timer.

_____________/_____________
Date Technician

.7 Set the final high current value to a current of 12 milliamperes. Note the value.

_______/ Volts
Value Units

_____________/_____________
Date Technicial

.8 Move the momentary contact STEP toggle switch to RESET and release.

.9 Repeat above steps as necessary, then disconnect the meter and turn the HIGH CURRENT switch to N (normal).

_____________/_____________
Date Technician

6.0 PROCEDURE

6.23.33.10 At the Foxboro Spec. 200 cabinet L-130, remove the leads that go to the pressurizer pressure I/E converter (PY-0101-33) input terminals nest 3, slot 3A (+ and -).

_____ / _____
Date Technician

.11 Connect the high current test output jacks to the I/E terminals (+ and -).

_____ / _____
Date Technician

.12 Place three optical pickups from the first three STOP LAMPS jacks on the C-E RTT box over the three LED's in column 4 (low DNBR) on the bistable control panel.

_____ / _____
Date Technician

NOTE: The following section of the test measures the response time from an externally produced signal in the Spec. 200 cabinets through the tripping of the bistable relays by a signal produced in the CPC calculators.

CAUTION
=======
THIS TEST, IF NOT PROPERLY CONDUCTED, MAY CAUSE A TRIP AT THE RPS REACTOR TRIP SWITCHGEAR. FOR THIS TEST, WITH THE CEA M-G SETS NOT RUNNING, THE ONLY PORTION OF THE PPS THAT NEED BE ENERGIZED IS THAT PART BEING TESTED.

5.0 PROCEDURE

5.23.83.13 Arrange the test equipment so that a signal will not be produced until the three LED's are illuminated. Turn the switches to OFF at the unused STOP LAMPS terminal jacks L4, L5, and L6.

_______ / _______
Date Technician

.14 Reset the CPC calculator trip by puhing the white (SPARE) pushbutton on the Operator's Module and entering an R (for Restart) when prompted by the TTY.

_______ / _______
Date Technician

.15 At the CPC/CEAC TTY, enter the command LI PR,2100, DE, DNBR CR to make the parameter PR (pressurizer pressure) a live input.

_______ / _______
Date Technician

.16 At the CPC/CEAC TTY, enter the command NOP TH2 to revert the live input to a constant input.

_______ / _______
Date Technician

.17 At the CPC/CEAC TTY, enter the command ST CR . Only the parameter PR should be a live input.

_______ / _______
Date Technician

.18 Reset the C-E RTT box timer to zero.

_______ / _______
Date Technician

.19 At the CPC/CEAC TTY, enter the command GO to start the test. Verify that the POINT I.D. displayed is 043 and the value is +33.000.

_______ / _______
Date Technician

6.0 PROCEDURE

6.23.83.20 Reset all low DNBR trip conditions on the Bistable Control Panel at the PPS.

_______________ / _______________
Date Technician

.21 Toggle the "STEP" switch to "START." When the timer stops incrementing, note the value and enter in the "DATA COLLECTION TABLE."

_______________ / _______________
Date Technician

.22 Move the momentary contact STEP switch to RESET and release. The RESET light should turn ON.

_______________ / _______________
Date Technician

6.23.84 Ex-Core Power - CPC I/O RTT

.1 Verify that the "CPC TEST" indicator lamp on the Operator's Module is illuminated.

_______________ / _______________
Date Technician

.2 On the C-E RTT box, rotate the function select switch to the LOW CURRENT position. Output from the box will now be at the "LOW CURRENT" BNC jacks in the FUNCTION SIGNAL OUTPUTS section.

_______________ / _______________
Date Technician

.3 Short circuit the output at jack number 1.

_______________ / _______________
Date Technician

.4 Connect the mA meter (DC range) to LOW CURRENT banana jack number 1 in the CALIBRATION section.

_______________ / _______________
Date Technician

6.0 PROCEDURE

6.24.81.5 Turn the switch at jack number 1 to "C" (calibrate). The meter should indicate current.

_____ / _____
Date Technician

.6 Move the momentary contact STEP switch in the STEPPED FUNCTIONS section to RESET and release. The RESET light should turn ON.

_____ / _____
Date Technician

.7 Set the initial current value to 0.65 milliamperes by adjusting the VOLTAGE CURRENT, FREQUENCY "INITIAL" potentiometer until the mA meter reads the desired value. Note the value.

_____ / Volts
Value Units

_____ / _____
Date Technician

.8 Move the momentary contact STEP switch to START and release. The START light should illuminate and the timer should start incrementing. Stop the timer.

_____ / _____
Date Technician

.9 Set the final current value to 0.91 milliamperes by adjusting the VOLTAGE, CURRENT, FREQUENCY "FINAL" potentiometer until the mA meter reads the desired value. Note the value.

_____ / Volts
Value Units

_____ / _____
Date Technician

.10 Move the momentary contact STEP toggle switch to RESET and release.

_____ / _____
Date Technician

6.0 PROCEDURE

6.23.84.11 Repeat the above steps as necessary for jack number 1, then return the LOW CURRENT switch for the position to N (normal).

_____________/_____________
Date Technician

.12 Remove the short circuit plugs from jack number 1 and insert in jack number 2.

_____________/_____________
Date Technician

.13 Repeat all steps from 6.23.4.4 through 6.23.4.11 inclusive for jack number 2.

The initial value is _________ amperes.

The final value is _________ amperes.

_____________/_____________
Date Technician

.14 Remove the short circuit plugs from jack number 2 and insert in jack number 3.

_____________/_____________
Date Technician

.15 Repeat all steps from 6.23.4.4 through 6.23.4.11 inclusive for jack number 3.

The initial value is _________ amperes.

The final value is _________ amperes.

_____________/_____________
Date Technician

NOTE: The following section of the test measures the response time from three externally produced current signals in the C-E test box through connections in the rear of the nuclear instrumentation safety drawer, through the CPC to the PPS bistable trip units. It is recommended that this test be performed immediately after the RPS High linear Power response time test to reduce set up time.

6.0 PROCEDURE

6.23.84.15

CAUTION THIS TEST, IF NOT PROPERLY CONDUCTED, MAY
======= CAUSE A TRIP OF THE RPS REACTOR TRIP SWITCHGEAR. FOR THIS TEST, WITH THE CEA M-G SETS NOT RUNNING, THE ONLY PORTION OF THE PPS THAT NEED BE ENERGIZED IS THAT PART BEING TESTS.

.16 Place the optical pickups from the six STOP LAMPS jacks on the C-E RTT box over the three LED's in column 3 and the three LED's in column 4 (Hi Local Power and Low DNBR respectively) on the bistable control panel.

______/______
Date Technician

.17 Arrange the test equipment so that a signal will not be produced until all six LED's are illuminated. All switches at the jacks should be turned to ON.

______/______
Date Technician

.18 Reset the CPC calculator trip by pushing the white (SPARE) pushbutton on the Operator's Module and entering on R (for Restart) when prompted by the TTY.

______/______
Date Technician

.19 At the CPC/CEAC TTY enter the command LI D1,124,IN, BOTH CR to make the parameter D1 (Upper Excore Neutron Flux Detector) a live input.

______/______
Date Technician

.20 At the CPC/CEAC TTY enter the command LI D2,124,IN, BOTH CR to make the parameter D2 (Middle Excore Neutron Flux Detector) a live input.

______/______
Date Technician

6.0 PROCEDURE

6.23.84.21 At the CPC/CEAC TTY enter the command LI D3,124,IN, BOTH CR to make the parameter D3 (Lower Excore Neutron Flux Detector) a live input.

Date / Technician

NOTE: In the above three steps, all three simulated detector signals are made live. If it is required that only one signal at a time be made live, the test will have to be run three times. In addition the Hi Local Power and Low DNBR trip functions could be run as separate tests by turning only three STOP LAMPS switches on at one time.

.22 Enter the command NOP PR at the CPC/CEAC TTY to revert the live input to a constant input.

Date / Technician

.23 At the CPC/CEAC TTY, enter the command ST CR . The TTY should list out the three parameters with the data entered for each. Only these three parameters should be live.

Date / Technician

.24 Perform all steps of Appendix E Power Range Safety Channel Setup for Testing.

Date / Technician

.25 Reset the C-E RTT box timer to zero.

Date / Technician

6.0 PROCEDURE

6.23.84.26 At the CPC/CEAC TTY, enter the command GO to start the test. Verify that the point I.D. displayed is 043 and the value is +33.000.

_____________ / _____________
Date Technician

.27 Reset all Low DNBR and Hi LPD trip conditions on the Bistable Control Panel of the PPS.

_____________ / _____________
Date Technician

.28 Toggle the "STEP" switch to "START." When the timer stops incrementing, note the value and enter in the "DATA COLLECTION TABLE."

_____________ / _____________
Date Technician

.29 Move the momentary contact STEP switch to RESET and release. The RESET light should turn ON.

_____________ / _____________
Date Technician

.30 Place the "AC POWER" switch in the safety channel drawer in the OFF position.

_____________ / _____________
Date Technician

.31 Verify that the "POWER ON" lamp DS-1 is extinguished.

_____________ / _____________
Date Technician

.32 Disconnect the test cable from jack J-10 and reconnect the system cable.

_____________ / _____________
Date Technician

6.0 PROCEDURE

6.23.84.33 Disconnect the test cable from jack J-8 and reconnect the system cable.

______ / ______
Date Technician

.34 Disconnect the test cable from jack J-9 and reconnect the system cable.

______ / ______
Date Technician

.35 Disconnect the high voltage cable from jack J-4 and reconnect to jack J-3.

______ / ______
Date Technician

.35 Disconnect the ground wires from the chassis at the J-8, J-9 and J-10 plugs.

______ / ______
Date Technician

.37 Return all caps and other equipment to the condition in - which found before the start of the test.

______ / ______
Date Technician

.38 Place the "AC POWER" switch in the safety channel drawer to the ON position.

______ / ______
Date Technician

6.23.85 Reactor Coolant Pump Speed - CPC I/O RTT

.1 On the C-E RTT box, rotate the function select switch to the FREQUENCY position. Output from the C-E RTT box is now available at the F1 and F2 jacks in the CALIBRATION section and at the "VOLTAGE, HIGH CURRENT, FREQUENCY, RESISTANCE" banana jacks in the FUNCTION SIGNAL OUTPUTS section.

______ / ______
Date Technician

6.0 PROCEDURE

6.23.85.1

NOTE: It is recommended that reference be made to the Operation and Maintenance Instructions for Response Time Test Equipment for a description of the arrangement for frequency outputs. Note that the output from the banana jack on the FUNCTION SIGNAL OUTPUTS section is tied directly to the F1 test jack when the FUNCTION SELECT switch is in the FREQUENCY position.

NOTE: Steps 6.23.5.2, 6.23.5.3, 6.23.5.4 and 6.23.5.10 need not be performed if the equipment has been recently calibrated. If skipping the steps sign below.

Date Calibrated _______ Signature _____________

.2 Place a _ 30K (or open circuit) local impedance across the "VOLTAGE, HIGH CURRENT, FREQUENCY, RESISTANCE" banana jacks in the FUNCTION SIGNAL OUTPUTS section.

__________/__________
Date Technician

.3 Connect an oscilloscope across the F2 test jacks and measure the pulse width. The pulse width shall be between 200 seconds and 550 seconds, but the width is not significant to the test.

__________/__________
Date Technician

.4 Check the pulse amplitude. It must be between 9 and 10 volts with the _ 30K local impedance connected. If it is not, refer to the technical manual for the C-E RTT box and correct.

__________/__________
Date Technician

.5 Move the momentary contact STEP switch in the STEPPED FUNCTIONS section to RESET and release. The RESET light should turn ON.

__________/__________
Date Technician

6.0 PROCEDURE

6.23.85.6 Using the FREQUENCY meter on the front panel, adjust the initial frequency by using the INITIAL potentiometer in the VOLTAGE, CURRENT, FREQUENCY section to a value of 869 Hz. Note the value.

______ / Volts ______ ______ / ______
Value Units Date Technicial

.7 Move the STEP switch to START position and release. The START light should illuminate and the timer should start incrementing. Stop the timer.

______ / ______
Date Technician

.8 Using the FREQUENCY meter on the front panel, adjust the final frequency by using the FINAL potentiometer in the VOLTAGE, CURRENT, FREQUENCY section to a value of 782 Hz. Note the value.

______ / Volts ______ ______ / ______
Value Units Date Technicial

.9 Verify that the TIMER MODE STOP switch is in the increasing or low to high move.

______ / ______
Date Technician

.10 Disconnect the dummy load and the oscilloscope.

______ / ______
Date Technician

.11 Insert the test cable plug for the "frequency test" in the "VOLTAGE, HIGH CURRENT, FREQUENCY, RESISTANCE" banana jack in the FUNCTION SIGNAL OUTPUTS section on the RTT.

NOTE: The stepped input signal will be connected inside the Reliance-Custom Controls Auxiliary Protective Cabinet L-91. The connection will be made to a terminal strip on the probe side of the pulse shaper. Since the pulse shaper will be utilized for this test, it will be necessary to maintain the +15 volt power supply to each pulse shaper unit.

6.0 PROCEDURE

6.23.95.12 In the Auxiliary Protective Cabinet (L-91) on terminal strip OT x 4, check the voltage between terminal 37 and ground using any portable voltmeter. The voltage should be +15 volts DC Record the voltage _______ Vdc.

_______ / _______
Date Technician

.13 In the cabinet L-91, remove transmitter cables on terminals 38 and 39 from terminal strip OT x 4. Connect the C-E RTT box cable signal lead to terminal 39 and the other cable to terminal 38.

_______ / _______
Date Technician

.14 Place three optical pickups from the first three STOP LAMPS jacks on the C-E RTT box over the three LED's in column 4 (Low DNBR) on the bistable control panel. Turn STOP LAMPS switches for L1, L2, and L3 ON and L4, L5, and L5 OFF. Leave this setup unchanged for the pump speed tests.

_______ / _______
Date Technician

CAUTION
=======
THIS TEST, IF NOT PROPERLY CONDUCTED, MAY CAUSE A TRIP OF THE RPS REACTOR TRIP SWITCHGEAR. FOR THIS PREOPERATIONAL TEST, WITH THE CEA M-G SETS NOT RUNNING, THE ONLY SECTION OF THE PPS THAT NEED BE ENERGIZED IS THAT PART BEING TESTED.

.15 Reset the CPC calculator trip by pushing the white (SPARE) pushbutton on the Operator's Module and entering an R (for Restart) when prompted by the TTY.

_______ / _______
Date Technician

6.0 PROCEDURE

6.23.35.16 At the CPC/CEAC TTY, enter the commands NOP D1, NOP D2 and NOP D3 to return these parameters to constant input.

____________/____________
Date Technician

.17 At the CPC/CEAC TTY, enter the command LI W1, 2699,IN, DNBR CR to make the parameter W1, Reactor Coolant Pump 1 Speed (in counts per second) a live input. See Response Time Test Software User's Manual for explanation.

____________/____________
Date Technician

.18 At the CPC/CEAC TTY enter the command ST CR . The only input that should be live is parameter W1.

____________/____________
Date Technician

.19 Reset the FREQUENCY meter to zero.

____________/____________
Date Technician

.20 Reset the C-E RTT box timer to zero. At the CPC/CEAC TTY, enter the command GO to start the test. Verify that the point I.D. displayed is 043 and the value is +33.000.

____________/____________
Date Technician

.21 Reset all Low DNBR trip conditions on the Bistable Control Panel of the PPS.

____________/____________
Date Technician

.22 Move the STEP toggle switch on the C-E RTT box to START, then release.

____________/____________
Date Technician

6.0 <u>PROCEDURE</u>

6.23.35.23 When the timer stops incrementing, note the value and enter in the "DATA COLLECTION TABLE."

_______ / _______
Date Technician

.24 Disconnect the test leads in cabinet L-91 and reconnect the normal system leads.

_______ / _______
Date Technician

.25 Move the momentary contact STEPPED FUNCTIONS STEP switch to RESET and release. The RESET light should be turned ON.

_______ / _______
Date Technician

.26 In the Auxiliary Protective Cabinet (L-91) on terminal strip OT x 4, check the voltage between terminal 41 and ground using any portable voltmeter. The voltage should be +15 volts DC. Record the voltage. _________ Vdc.

_______ / _______
Date Technician

.27 In the cabinet L-91, remove the transmitter cables (but leave the pulse shaper cables) from terminal strip OT x 4. Connect the C-E RTT box cable signal lead to terminal 43 and the other cable to terminal 42.

_______ / _______
Date Technician

.28 Reset the CPC calculator trip by pushing the white (SPARE) pushbutton on the Operator's Module and entering an R (for Restart) when prompted by the TTY.

_______ / _______
Date Technician

.29 At the CPC/CEAC TTY enter the command NOP W1 to return that parameter to constant input.

_______ / _______
Date Technician

6.0 PROCEDURE

6.23.85.30 At the CPC/CEAC TTY enter the command LI W2,2599, IN DNBR CR to make the parameter live.

Date / Technician

.31 At the CPC/CEAC TTY, enter the command ST CR . The only input that should be live is parameter W2.

Date / Technician

.32 Reset the FREQUENCY meter and the timer on the C-E RTT box to zero.

Date / Technician

.33 At the CPC/CEAC TTY, enter the command GO to start the program. Verify that the point I.D. is 043 and the value is +33.000.

Date / Technician

.34 Reset all Low DNBR trip conditions on the RPS.

Date / Technician

.35 Toggle the "STEP" switch to "START." When the timer stops incrementing, note the value and enter in the "DATA COLLECTION TABLE."

Date / Technician

.36 Disconnect the test leads in cabinet L-91 and reconnect the normal system leads.

Date / Technician

6.0 PROCEDURE

6.23.85.37 In the Auxiliary Protective Cabinet (L-91) on terminal strip OT x 4, check the voltage between terminal 45 and ground using any portable voltmeter. The voltage should be +15 volts dc. Record the voltage. ______ Vdc

__________/__________
Date Technician

.38 In the cabinet L-91, remove the transmitter cables (but leave the pulse shaper cables) from terminal strip OT x 4. Connect the C-E RTT box cable signal lead to terminal 47 and the other cable to terminal 45.

__________/__________
Date Technician

.39 Reset the CPC calculator trip by pushing the white (SPARE) pushbutton on the Operator's Module and entering an R (for Restart) when prompted by the TTY.

__________/__________
Date Technician

.40 At the CPC/CEAC TTY enter the command NOP W2 to return that parameter to constant input.

__________/__________
Date Technician

.41 At the CPC/CEAC TTY enter the command LI W3,2599, IN, DNBR CR to make the parameter live.

__________/__________
Date Technician

.42 At the CPC/CEAC TTY, enter the COMMAND ST CR . The only input that should be live is parameter W3.

__________/__________
Date Technician

.43 Reset the FREQUENCY meter and the timer on the C-E RTT box to zero.

__________/__________
Date Technician

6.0 PROCEDURE

6.23.85.44 At the CPC/CEAC TTY, enter the command GO to start the program. Verify that the point I.D. is 043 and the value is +33.000.

_______________ / _______________
Date Technician

.45 Reset all Low DNBR trip conditions on the RPS.

_______________ / _______________
Date Technician

.46 Toggle the "STEP" switch to "START." When the timer stops incrementing, note the value and enter in the "DATA COLLECTION TABLE."

_______________ / _______________
Date Technician

.47 Disconnect the test leads in cabinet L-91 and reconnect the normal system leads.

_______________ / _______________
Date Technician

.43 Move the momentary contact STEPPED FUNCTIONS STEP switch to RESET and release. The RESET light should be turned ON.

_______________ / _______________
Date Technician

.49 In the Auxiliary Protective Cabinet (L-91) on terminal strip OT x 4, check the voltage between terminal 49 and ground using any portable voltmeter. The voltage should be +15 volts DC. Record the voltage. __________ Vdc

_______________ / _______________
Date Technician

.50 In the cabinet L-91, remove the transmitter cables (but leave the pulse shaper cables) from terminal strip OT x 4. Connect the C-E RTT box cable signal lead to terminal 51 and the other cable to terminal 50.

_______________ / _______________
Date Technician

6.0 PROCEDURE

6.23.85.51 Reset the CPC calculator trip by pushing the white (SPARE) pushbutton on the Operator's Module and entering an R (for Restart) when prompted by the TTY.

Date / Technician

.52 At the CPC/CEAC TTY enter the command NOP W3 to return that parameter to constant input.

Date / Technician

.53 At the CPC/CEAC TTY enter the command LI W4,2599,IN DNBR CR to make the parameter live.

Date / Technician

.54 At the CPC/CEAC TTY, enter the command ST CR . The only input that should be live is parameter W4.

Date / Technician

.55 Reset the FREQUENCY meter and the timer on the C-E RTT box to zero.

Date / Technician

.56 At the CPC/CEAC TTY, enter the command GO to start the program. Verify that the point I.D. is 043 and the value is +33.000.

Date / Technician

.57 Reset all Low DNBR trip conditions on the RPS.

Date / Technician

6.0 PROCEDURE

6.23.85.58 Toggle the step switch to "START." When the timer stops incrementing, note the value and enter in the "DATA COLLECTION TABLE."

Date / Technician

.59 Disconnect the test leads in cabinet L-91 and reconnect the normal system leads.

Date / Technician

.60 Do not break down test equipment if the next section is to follow immediately.

Date / Technician

6.23.86 Target CEA Positions - CPC I/O RTT

NOTE: In this part of the test, the C-E Response Time Test Equipment will produce a voltage step which will simulate a change in a CEA position. This change will be detected directly by the core protection calculator which will in turn produce a trip signal. For convenience and to perform the test expeditiously, it is recommended that two or more persons be assigned stations for the test.

.1 Move the momentary contact STEPPED FUNCTIONS STEP switch to RESET and release. The RESET light should be turned ON.

Date / Technician

.2 On the C-E RTT box, rotate the FUNCTION SELECT switch to the VOLTAGE position. Output will now be at the "VOLTAGE, HIGH CURRENT, FREQUENCY, RESISTANCE" banana jacks in the FUNCTION SIGNAL OUTPUTS section. The black terminal is reference.

Date / Technician

6.0 PROCEDURE

6.23.86.3 Connect the C-E RTT box digital voltmeter (DVM) across the output jacks.

_____/_____
Date Technician

.4 Set the initial voltage value to a voltage of 10.0 volts by adjusting the "VOLTAGE, CURRENT, FREQUENCY" INITIAL potentiometer until the desired voltage is obtained. This value is equivalent to 150 inches withdrawn. Note the value.

_____/ Volts
Value Units

_____/_____
Date Technician

.5 Place the START switch in the TIMER MODE section in the low to high position.

_____/_____
Date Technician

.6 Move the momentary contact STEP switch to START and release. The START light should illuminate and the timer should start incrementing. Stop the timer.

_____/_____
Date Technician

.7 Set the final voltage value to a voltage of 8.333 volts by adjusting "VOLTAGE, CURRENT, FREQUENCY" FINAL potentiometer until the desired voltage is obtained. This value is equivalent to 100.0 inches withdrawn. Note the value.

_____/ Volts
Value Units

_____/_____
Date Technician

.8 Repeat the above steps as necessary to obtain the voltages desired, then disconnect the meter and remove the leads.

_____/_____
Date Technician

6.0 PROCEDURE

6.23.85.9 Move the momentary contact STEP toggle switch to reset and release, and place STOP switch in the TIMER MODE section in the low to high position.

_____ / _____
Date   Technician

NOTE: The simulated input signal will be connected to a terminal strip in the Auxiliary Protective Cabinet (L-91). For this CEA position test, it will not be necessary to disconnect the normally attached wires.

NOTE: In the following sections, it is assumed that the most expeditious way to perform the test is to leave the C-E RTT box set up in front of one calculator and move the input signal probes until all CEA's in that channel and calculator are tested. Actual field experience may determine a more expeditious method.

.10 Attach one end of the test probes to the "VOLTAGE, CURRENT, FREQUENCY, RESISTANCE" banana jacks in the FUNCTION SIGNAL OUTPUTS section of the C-E RTT box.

_____ / _____
Date   Technician

.11 Use six optical pickups. Place the optical pickups ends over the LED's in Channel A column 3 (Hi Local Power) and column 4 (Low DNBR). Insert other ends in the six STOP LAMPS banana jacks and turn ON all stop lamp switches.

_____ / _____
Date   Technician

.12 Reset the CPC calculator by pushing the white (SPARE) pushbutton on the Operator's Module and entering an R (for Restart) when prompted by the TTY.

_____ / _____
Date   Technician

6.0 PROCEDURE

6.23.86.13 Connect a TTY to the channel C CPC calculator and enter the command ST CR . If there are any live inputs, made them constant by entering the command NOP x CR .

_____/_____
Date Technician

.14 Inside Channel C of cabinet L-91, the Auxiliary Protection cabinet, connect the signal lead to terminal 3 and the reference lead to terminal 4 on terminal strip OTA1.

_____/_____
Date Technician

.15 At the CPC/CEAC TTY type in the command LI SG01,120,DE, BOTH CR to make parameter SG01, CEA subgroup 1 position a live input.

_____/_____
Date Technician

.16 At the CPC/CEAC TTY, enter the command GO to start the program. Verify that the point I.D. is 043 and the value is +33.000.

_____/_____
Date Technician

.17 Reset the C-E RTT box digital timer to zero.

_____/_____
Date Technician

.18 Reset the low DNBR and Hi LPD trips on the Bistable Control Panel of the PPS.

_____/_____
Date Technician

.19 Toggle the "STEP" switch to "START." When the timer stops incrementing, note the value and enter in the "DATA COLLECTION TABLE."

_____/_____
Date Technician

6.0 PROCEDURE

6.23.35.20 Repeat steps 6.23.6.12 through 6.23.6.19 for the following parameters"

CHANNEL C

OTB1

Parameter Number XX	CEA Number	Signal X	Reference Y	Performed
SG01	3	3	4	
SG02	5	7	8	Date / Technician
SG03	9	11	12	Date / Technician
SG04	14	15	16	Date / Technician
SG05	15	19	20	Date / Technician
SG06	21	23	24	Date / Technician
SG07	25	27	28	Date / Technician
SG08	30	31	32	Date / Technician
SG09	31	35	36	Date / Technician
SG10	37	39	40	Date / Technician
SG11	38	43	44	Date / Technician
SG12	45	47	48	Date / Technician
SG13	50	51	52	Date / Technician

6.0 PROCEDURE

6.23.85.20

CHANNEL C (Continued)

OTB1

Parameter Number XX	CEA Number	Signal X	Referance Y	
SG14	51	55	56	/ Date Technician
SG15	57	59	60	/ Date Technician
SG16	61	63	64	/ Date Technician
SG17	62	67	68	/ Date Technician
SG18	70	71	72	/ Date Technician
SG19	71	75	76	/ Date Technician
SG20	72	79	80	/ Date Technician

OTA2

Parameter Number XX	CEA Number	Signal X	Reference Y	
SG21	80	3	4	/ Date Technician
SG22	83	7	8	/ Date Technician
SG23	89	11	12	/ Date Technician

6.0 PROCEDURE

6.23.85.21 RTT Part 2 - Processor Timing Test

.1 Set the Calculator Select rotary switch on the OPERATOR'S MODULE to load the CPC (CEAC) calculator. The calculator not selected is memory protected.

______/______
Date Technician

.2 Set up the AED 2500 Floppy Disk Drive as follows:

2.1 Turn ON the AED Floppy Disk Drive.

______/______
Date Technician

2.2 Set the drive select switches so that drive A is Unit 0, drive B is Unit 1 and drive C is Unit 2.

______/______
Date Technician

2.3 Place the floppy disk containing the Part 2 RTT software into the AED 2500 Floppy Disk Drive.

______/______
Date Technician

2.4 Set the INIT and WP switches UP.

______/______
Date Technician

2.5 Lift the IPL switch.

______/______
Date Technician

2.3 Place the CPC Coldstart Loader paper tape into the TTY paper tape reader and connect the TTY to the CPC (CEAC) calculator.

______/______
Date Technician

6.0 PROCEDURE

6.23.95.21.4 Hit "FUNCTION" button, then hit "LOCATION" button on the Hexadecimal Display Panel.

_____/_____
Date Technician

.5 Set up the following memory locations via the Interdata Hexadecimal Display Panel:

Location	Contents
30	0000
32	0000
34	0000
36	0050
50	D500
52	00CF
54	4300
56	0080
78	0294

_____/_____
Date Technician

.6 Read through these same locations to verify the correct contents.

_____/_____
Date Technician

.7 Start the processor at location 30.

_____/_____
Date Technician

.8 Start the TTY paper tape reader by setting the READER/PUNCH switch to the "MANUAL START" position.

_____/_____
Date Technician

.9 Respond to the TEST TRACK prompt with 55.

_____/_____
Date Technician

6.0 PROCEDURE

6.23.36.21.10 Verify that the MEMORY PROTECT key switch is OFF.

_____ / _____
Date Technician

.11 Remove the disk from the AED 2500 disk drive.

_____ / _____
Date Technician

.12 After approximately 10 minutes a TEST REPORT will be output to the TTY. Remove the TEST REPORT from the TTY.

_____ / _____
Date Technician

.13 Verify that the actual times are within +5% of the expected time shown in Figures H-1 and H-2 in the column labeled MAX EX. of Appendix H.

_____ / _____
Date Technician

.14 Attach the TEST REPORT printout to this procedure as a record of the test.

_____ / _____
Date Technician

Continued from 1952b
Continued to 1954b

6.0 PROCEDURE

6.23.95.22 CEA Positions - CEAC to CPC RTT

NOTE: The setup for this test is similar to that for the previous test except that two CPC/CEAC TTY's are required. Operation commonds must be entered in both the CPC and CEAC TTY's. It would be desirable to have three persons available for the performance of this test.

.22.1 Move the momentary contact STEPPED FUNCTIONS STEP switch to RESET and release. The RESET light should be turned ON.

NOTE: It is assumed that the calibration of the voltage signal that was performed on the C-E RTT box for the previous test will be satisfactory for this test. If not, repeat steps 6.23.6.2 through 6.23.6.11.

.22.2 On the Bay C Operator's Module, select the CPC calculator.

.22.3 To set up the TTY's, connect one TTY to the channel C, CPC calculator and enter the command ST CR . If there are any live inputs, make them constant by entering the command NOP X CR .

.22.4 On the Bay C Operator's Module, select the CEAC calculator. The CPC memory in channel is now protected.

.22.5 Connect another TTY to the channel C CEAC calculator and enter the command ST CR . If there are any live inputs make them constant by entering the command NOP X CR . CEAC 1 in Bay B will be used for channel B tests.

.22.6 To set up the C-E RTT box, inside channel C of cabinet L-91, the Auxiliary Protection Cabinet, connect the signal lead to terminal No. 15 (and subsequently as indicated on the following tables) and the reference lead to terminal No. 15 (and subsequently as indicated on the following tables).

6.0 PROCEDURE

6.23.86.22.7 Connect the other end of the probe leads to the C-E RTT box "VOLTAGE, HIGH CURRENT, FREQUENCY, RESISTANCE" banana jacks in the FUNCTION SIGNAL OUTPUTS section.

NOTE: The output from the terminals is connected to the core protection calculators in channel C, and to an isolation amplifier for transmission to CEA calculator No. 2 in Bay C. This test utilizes the signal that is directed to the CEAC.

.22.8 Use six optical pickups. Place the optical pickup ends over the LED's in Channel C, column three (Hi Local Power) and column four (Low DNBR). Insert other ends in the six STOP LAMPS banana jacks and turn ON all stop lamps switches.

.22.9 To initialize the signals, at the CEAC TTY, type in the command LI CEAXX,120,DE CR to make the parameter CEAXX a live input. At the CEAC TTY, enter the command GO to start the program then refer to the following tables for the values that should be substituted for XX.

.22.10 On the Bay C, Operator's Module, select the CPC calculator.

.22.11 At the CPC TTY, type in the command LI PF2 BOTH CR to make the parameter Penalty Factor 2 from CEAC No. 2 a live input. PF2 will be used when checking channel C at the CPC TTY, type in the command "GO".

.22.12 Reset the CEAC calculator trip by pushing the white (SPARE) pushbutton on the Operator's Module and entering an R (for Restart) when prompted by the TTY.

.22.13 Reset the CPC calculator trip by pushing the whete (SPARE) pushbutton on the Operators Module and entering an R (for Restart) when prompted by the TTY.

6.0 PROCEDURE

6.23.85.22.14 With the appropriate selector switch selecting the CEAC, type GO on the CEAC TTY. Verify that the point I.D. displayed on the Operator's Module is 043 and the value is +33.000.

.22.15 With the appropriate selector switch selecting the CPC, type GO on the CPC TTY. Verify that the point I.D. displayed on the Operator's Module is 043 and the value is +33.000.

.22.16 Reset the Low DNBR and Hi LPD trips on the Bistable Control Panel of the PPS.

.22.17 Reset the C-E RTT box digital timer to zero.

.22.18 Move the STEP toggle switch on the C-E RTT box to START, then release.

.22.19 When the timer stops incrementing, note the value.

____
value

.22.20 Select the CEAC calculator and using the CEAC TTY, enter ST CR . Make all existing live inputs constant by entering the command NOP CEAXX, where CEAXX is the live parameter.

.22.21 Repeat steps 6.23.7.9 and 6.23.7.12 through 6.23.7.20 for all the parameters on the following list for channel C.

CEAC #1
CPC CHANNEL C

PARAMETER NUMBER XX		SIGNAL X	SIGNAL Y	PERFORMED INITIAL/DATE
CEA 01	OTC2-	15	16	/
CEA 02	OTC1-	3	4	/
CEA 03	OTD1-	3	4	/
CEA 04	OTC2-	7	8	/
CEA 05	OTC1-	19	20	/
CEA 06	OTC2-	7	8	/
CEA 07	OTD1-	23	24	/
CEA 08	OTC2-	11	12	/
CEA 09	OTC1-	27	28	/
CEA 10	OTC2-	11	12	/
CEA 11	OTD1-	31	32	/
CEA 12	OTD2-	15	16	/
CEA 13	OTC2-	19	20	/
CEA 14	OTC1-	35	36	/
CEA 15	OTC1-	39	40	/
CEA 16	OTC2-	15	16	/
CEA 17	OTC2-	19	20	/
CEA 18	OTB1-	43	44	/
CEA 19	OTD1-	47	48	/
CEA 20	OTC2-	23	24	/
CEA 21	OTC1-	51	52	/
CEA 22	OTC2-	23	24	/

CEAC #1
CPC CHANNEL C

PARAMETER NUMBER XX		SIGNAL X	SIGNAL Y	PERFORMED INITIAL/DATE
CEA 23	OTB2-	55	56	/
CEA 24	OTA1-	27	28	/
CEA 25	OTB2-	59	60	/
CEA 26	OT 1-	27	28	/
CEA 27	OTB2-	63	64	/
CEA 28	OTA1-	31	32	/
CEA 29	OTA1-	35	36	/
CEA 30	OTB2-	67	68	/
CEA 31	OTA2-	71	72	/
CEA 32	OTB1-	31	32	/
CEA 33	OT 1-	35	36	/
CEA 34	OTB2-	75	76	/
CEA 35	OTB2-	79	80	/
CEA 36	OTA1-	39	40	/
CEA 37	OTB3-	3	4	/
CEA 38	OTB3-	7	8	/
CEA 39	OTB1-	39	40	/
CEA 40	OTB1	43	44	/
CEA 41	OTB3	11	12	/
CEA 42	OTB3-	15	16	/

CEAC #1
CPC CHANNEL C

PARAMETER NUMBER XX		SIGNAL X	SIGNAL Y	PERFORMED INITIAL/DATE
CEA 43	OTA1-	43	44	/
CEA 44	OTA1-	47	48	/
CEA 45	OTB3-	19	20	/
CEA 46	OTB1-	47	48	/
CEA 47	OTB3-	23	24	/
CEA 48	OTA1-	51	52	/
CEA 49	OTA1-	55	56	/
CEA 50	OTB3-	27	28	/
CEA 51	OTB3-	31	32	/
CEA 52	OTB1-	51	52	/
CEA 53	OTB1-	55	56	/
CEA 54	OTB3-	35	36	/
CEA 55	OTB3-	39	40	/
CEA 56	OTA1-	59	60	/
CEA 57	OTB3-	43	44	/
CEA 58	OTB1-	59	60	/
CEA 59	OTB3-	47	48	/
CEA 60	OTA1-	63	64	/
CEA 61	OTB3-	43	44	/
CEA 62	OTB3-	59	60	/
CEA 63	OTB1-	47	48	/

CEAC #1
CPC CHANNEL C

PARAMETER NUMBER XX		SIGNAL X	SIGNAL Y	PERFORMED INITIAL/DATE
CEA 64	OTB1-	63	64	/
CEA 65	OTB3-	63	64	/
CEA 66	OTB3-	43	44	/
CEA 67	OTA1-	59	60	/
CEA 68	OTA1-	47	48	/
CEA 69	OTA1-	63	64	/
CEA 70	OTB3-	43	44	/
CEA 71	OTB3-	59	60	/
CEA 72	OTB3-	47	48	/
CEA 73	OTB1-	71	72	/
CEA 74	OTB1-	75	76	/
CEA 75	OTB1-	79	80	/
CEA 76	OTB3-	79	80	/
CEA 77	OTB5-	53	54	/
CEA 78	OTB5-	57	58	/
CEA 79	OTA1-	79	80	/
CEA 80	OTA2-	2	3	/
CEA 81	OTA2-	6	7	/
CEA 82	OTB5-	51	52	/
CEA 83	OTB5-	65	66	/
CEA 84	OTB2-	3	4	/

CEAC #1
CPC CHANNEL C

PARAMETER NUMBER XX		SIGNAL X	SIGNAL Y	PERFORMED INITIAL/DATE
CEA 85	OTB2-	7	7	/
CEA 86	OTB5-	69	70	/
CEA 87	OTB5-	73	74	/
CEA 88	OTA2-	10	11	/
CEA 89	OTB5-	77	78	/
CEA 90	OTB2-	11	12	/
CEA 91	OTB5-	81	82	/

6.0 PROCEDURE

6.24 High Pressurizer Pressure to RTSG Response Time

NOTE: The following section measures the response time from the simulation of a trip signal into the Foxboro Cabinet (using the PPS Response Time Test panel L151) to the time when the rotary relays trip. The C-E test box will be used as the response time measuring device.

6.24.1 Ensure the temporary LED's are installed across the rotary relay contacts per steps 6.19.1 through 6.19.3.

Date / Technician

6.24.2 Remove the PPS input simulator box leads from terminals 42 and 43 on TB-1 of L129, if not already removed.

Date / Technician

6.24.3 Connect the "Bistable Test" leads of L151 to terminals 42 and 43 on TB-1 of L129, if not already connected.

Date / Technician

6.0 PROCEDURE

6.24.4 On the bistable control panel being tested, rotate the bistable selector switch to position number 5.

______ / ______
Date Technician

6.24.5 Rotate the meter input selector switch to the "TRIP SP" position.

______ / ______
Date Technician

6.24.6 Record the value indicated on the bistable control panel digital indicator.

______ Volts
Value/Units

______ / ______
Date Technician

6.24.7 Rotate the meter input selector switch to the "INPUT" position.

______ / ______
Date Technician

6.24.8 In the "Bistable Test" section of L151 place the toggle switch in the "OPEN" position. The LED should extinguish.

______ / ______
Date Technician

6.24.9 Adjust the "HIGH COARSE" and the "HIGH FINE" potentiometers in the "Bistable Test" section of L151 until the digital indicator at the bistable control panel reads 4.00 Vdc ±.1 Vdc.

______ / ______
Date Technician

6.24.10 In the "Bistable Test" section of L151, place the toggle switch in the "CLOSE" position. The LED should energize.

______ / ______
Date Technician

6.24.11 Adjust the "LOW COARSE" and "LOW FINE" potentiometers in the "Bistable Test" section of 2L151 until the digital indicator on the bistable control panel reads approximately .1 Vdc on the tripped side of the value recorded in step 6.24.6.

______ / ______
Date Technician

6.0 PROCEDURE

6.24.12 Record the adjusted voltage.

Volts
_______ Value/Units _______ Date / _______ Technician

6.24.13 Connect the optical end of a C-E test box pickup cable to the "Bistable Test" section LED of L151.

_______ Date / _______ Technician

6.24.14 Connect the other end of this pickup cable to the "LED 1" jacks in the "Start Lamps" section of the C-E test box.

_______ Date / _______ Technician

6.24.15 Connect the optical end of four pickup cables to the temporary LED's installed in steps 6.19.1 through 6.19.3.

_______ Date / _______ Technician

6.24.16 Connect the other end of these four pickup cables to the "L1", "L2", "L3", and "L4" jacks in the "STOP LAMPS" section of the C-E test box.

6.24.17 Energize the C-E test box and ensure the following switches are in the correct positions.

.1 "L1", "L2", "L3", "L4" stop lamps toggle switches are in the "ON" position.

_______ Date / _______ Technician

.2 "START LAMPS" toggle switch is in the "1/1" position.

_______ Date / _______ Technician

.3 Start "TIMER MODES" switch is in the step up position.

_______ Date / _______ Technician

.4 Stop "TIMER MODES" switch is in the step up position.

_______ Date / _______ Technician

6.0 PROCEDURE

6.24.17.5 "L5" and "L5" stop lamps toggle switches are in the "OFF" position.

_______________ / _______________
Date Technician

6.24.18 Adjust the input simulator box potentiometer in channel 'A' corresponding to bistable number 5 until the bistable is tripped.

_______________ / _______________
Date Technician

6.24.19 Ensure the toggle switch in the "Bistable Test" section of 2L151 is in the "OPEN" position.

_______________ / _______________
Date Technician

6.24.20 Ensure the C-E test box timer is reset.

_______________ / _______________
Date Technician

6.24.21 After the test equipment has stabilized, place the "Bistable Test" section toggle switch on 2L151 in the "CLOSED" position. The timer should start.

_______________ / _______________
Date Technician

6.24.22 Record the response time.

_______________ Volts _______________ / _______________
Value/Units Date Technician

6.24.23 Adjust the input simulator box potentiometer in channel 'A' corresponding to bistable number 5 until the bistable input is returned to the value adjusted for in step 6.1.1.

6.24.24 Reset bistable number 5 in channel A.

_______________ / _______________
Date Technician

6.24.25 Repeat steps 6.24.18 through 6.24.24 substituting channel 'B' in place of channel 'A'.

_______________ Volts _______________ / _______________
Value/Units Date Technician

6.0 PROCEDURE

6.24.25 Repeat steps 6.24.18 through 6.24.24 substituting channel 'D' in place of channel 'B'.

Volts
Value/Units   Date / Technician

6.25 Low Pressurizer Pressure to RTSG Response Time

NOTE: The following section measures the response time from the simulation of a trip signal into the Foxboro Cabinet (using the PPS Response Time Test panel L151) to the time when the rotary relays trip. The C-E test box will be used as the response time measuring device.

6.25.1 Ensure the temporary LED's are installed across the rotary relay contacts per steps 6.19.1 through 6.19.3.

Date / Technician

6.25.2 Remove the PPS input simulator box leads from terminals 39 and 40 on TB-1 of L-129, if not already removed.

Date / Technician

6.25.3 Connect the "Bistable Test" leads of L151 to terminals 39 and 40 on TB-1 of L-129, if not already connected.

Date / Technician

6.25.4 On the bistable control panel being tested, rotate the bistable selector switch to position number 6.

Date / Technician

6.24.5 Rotate the meter input selector switch to the "TRIP SP" position.

Date / Technician

6.0 PROCEDURE

6.25.6 Record the value indicated on the bistable control panel digital indicator.

Volts
Value/Units   Date / Technician

6.25.7 Rotate the meter input selector switch to the "INPUT" position.

Date / Technician

6.25.8 In the "Bistable Test" section of L151 place the toggle switch in the "OPEN" position. The LED should extinguish.

Date / Technician

6.25.9 Adjust the "HIGH COARSE" and the "HIGH FINE" potentiometers in the "Bistable Test" section of 2L151 until the digital indicator on the bistable control panel reads approximately .1 VDC on the tripped side of the value recorded in step 6.26.6.

Date / Technician

6.25.10 In the "Bistable Test" section of L151, place the toggle switch in the "CLOSE" position. The LED should energize.

Date / Technician

6.25.11 Adjust the "LOW COURSE" and "LOW FINE" potentiometers in the "Bistable Test" section of L151 until the digital indicator on the bistable control panel reads 4.00 VDC ±.1 VDC.

Date / Technician

6.25.12 Record the adjusted voltage.

Volts
Value/Units   Date / Technician

6.0 PROCEDURE

6.25.13 Connect the optical end of a C-E test box pickup cable to the "Bistable Test" section LED of L151.

_____/_____
Date Technician

6.25.14 Connect the other end of this pickup cable to the "LED 1" jacks in the "START LAMPS" section of the C-E test box.

_____/_____
Date Technician

6.25.15 Connect the optical end of four pickup cables to the temporary LED's installed in steps 6.21.1 through 6.21.3.

_____/_____
Date Technician

6.25.16 Connect the other end of these four pickup cables to the "L1", "L2", "L3", and "L4" jacks in the "STOP LAMPS" section of the C-E test box.

6.25.17 Energize the C-E test box and ensure the following switches are in the correct positions.

.1 "L1", "L2", "L3", "L4" STOP LAMPS toggle switches are in the "ON" position.

_____/_____
Date Technician

.2 "START LAMPS" toggle switch is in the "1/1" position.

_____/_____
Date Technician

.3 Start "TIMER MODES" switch is in the step DOWN position.

_____/_____
Date Technician

.4 Stop "TIMER MODES" switch is in the step up position.

_____/_____
Date Technician

6.0 PROCEDURE

6.25.17.5 "L5" and "L5" STOP LAMPS toggle switches are in the "OFF" position.

__________ / __________
Date Technician

6.25.18 Adjust the input simulator box potentiometer in channel 'A' corresponding to bistable number 5 until the bistable is tripped.

__________ / __________
Date Technician

6.25.19 Ensure the toggle switch in the "Bistable Test" section of 2L151 is in the "CLOSE" position.

__________ / __________
Date Technician

6.25.20 Ensure the C-E test box timer is reset and channel C bistable is reset.

__________ / __________
Date Technician

6.25.21 After the test equipment has stabilized, place the "Bistable Test" section toggle switch on 2L151 in the "OPEN" position. The timer should start.

__________ / __________
Date Technician

6.25.22 Record the response time.

__________ Volts
Value/Units

__________ / __________
Date Technician

6.25.23 Adjust the input simulator box potentiometer in channel 'A' corresponding to bistable number 5 until the bistable input is returned to the value adjusted for in step 6.1.1.

6.25.24 Reset bistable number 6 in channel A.

__________ / __________
Date Technician

6.0 PROCEDURE

6.25.25 Repeat steps 6.25.18 through 6.25.24 substituting channel 'B' in place of channel 'A'.

Volts
Value/Units ______ Date / Technician ______

6.25.26 Repeat steps 6.25.18 through 6.25.24 substituting channel 'D' in place of channel 'A'.

Value/Units ______ Date / Technician ______

6.25.27 Disconnect the "Bistable Test" leads and replace the input simulator leads on the terminals they were removed from in step 6.25.1

Date / Technician ______

6.25.28 Reset all bistables.

Date / Technician ______

6.25.29 Record the largest response time value of steps 6.25.22, 6.25.25, 6.25.26 in the Data Collection Table.

Date / Technician ______

6.26 Low Pressurizer Pressure to ESFAS Response Time

NOTE: The following section measures the response time from the simulation of a trip signal into the Foxboro cabinet (using the PPS Response Time Test Panel L151) to the time when the mechanical or solid state relays trip. The C-E test box will be used as the response time measuring device.

6.26.1 Remove the input simulator box leads from terminals 40 and 39 on TB-1 of L129, if not already removed.

Date / Technician ______

6.0 PROCEDURE

6.26.2 Connect the "Bistable Test" leads of L151 to terminals 39 and 40 on TB-1 of L129, if not already connected.

______/______
Date Technician

6.26.3 In bay 6 of cabinet A (L034), connect an LED jumper cable in series with a six VDC power supply across terminals 25 and 27 on terminal strip TB65. This monitors contacts on the mechanical relay MR1A. (SIAS)

______/______
Date Technician

6.26.4 In bay 5 of cabinet B (L035), connect an LED jumper cable in series with a six volt DC power supply across terminals 25 and 27 on terminal strip TB55. This monitors contacts on the mechanical relay MR1B. (SIAS)

______/______
Date Technician

6.26.5 Connect the optical end of a stop cable to the LED installed in step 6.26.3 and connect the double banana plug end to the "L1" jacks of the C-E test box.

______/______
Date Technician

6.26.6 Connect the optical end of a second stop cable to the LED installed in step 6.26.4 and connect the double banana plug end to the "L2" jacks of the C-E test box.

______/______
Date Technician

6.26.7 Connect the optical end of a start cable to the LED in the "Bistable Test" section of L151 and connect the double banana plug end to the "LED 1" jacks on the C-E test box.

______/______
Date Technician

6.0 PROCEDURE

6.26.8 On channel 'C' bistable control panel, rotate the bistable selector switch to position number 6.

__________/__________
Date Technician

6.26.9 Rotate the meter input selector switch to the "TRIP SP" position.

__________/__________
Date Technician

6.26.10 Record the value indicated on the bistable control panel digital indicator.

__________Volts
Value/Units

__________/__________
Date Technician

6.26.11 Rotate the meter input selector switch to the "INPUT" position.

__________/__________
Date Technician

6.26.12 In the "Bistable Test" section of L151 place the toggle switch in the "OPEN" position. The LED should extinguish.

__________/__________
Date Technician

6.26.13 Adjust the "HIGH COARSE" and the "HIGH FINE" potentiometers in the "Bistable Test" section of L151 until the digital indicator at the bistable control panel reads approximately .1 VDC on the trip side of the value recorded in step 6.26.10.

__________/__________
Date Technician

6.26.14 In the "Bistable Test" section of L151, place the toggle switch in the "CLOSED" position. The LED should energize.

__________/__________
Date Technician

6.0 PROCEDURE

6.26.15 Adjust the "LOW COARSE" and "LOW FINE" potentiometers in the "Bistable Test" section of L151 until the digital indicator on the bistable control panel reads 4.00 ±.1 VDC.

_______________ / _______________
Date Technician

6.26.16 Record the adjusted voltage.

_______________ Volts
Value/Units

_______________ / _______________
Date Technician

6.26.17 Energize the C-E test box and ensure the following switches are in the correct positions.

.1 "L1" and "L2" stop lamps toggle switches are in the "ON" position.

_______________ / _______________
Date Technician

.2 "L3", "L4", "L5", "L5" stop lamps toggle switches are in the "OFF" position.

_______________ / _______________
Date Technician

.3 "START LAMPS" toggle switch is in the "1/1" position.

_______________ / _______________
Date Technician

.4 Start "Timer Modes" switch is in the step down position.

_______________ / _______________
Date Technician

.5 Stop "Timer Modes" switch is in the step up position.

_______________ / _______________
Date Technician

6.0 PROCEDURE

6.26.18 Adjust the input simulator box potentiometer in channel 'A' corresponding to bistable number 6 until the bistable is tripped.

______________ / ______________
Date Technician

6.26.19 Ensure the toggle switch in the "Bistable Test" section of L151 is in the "CLOSED" position.

______________ / ______________
Date Technician

6.26.20 Ensure the C-E test box timer is reset and the bistable is reset in channel 'C'.

______________ / ______________
Date Technician

6.26.21 After the test equipment has stabilized, place the "Bistable Test" section toggle switch on L151 in the "OPEN" position. The timer should start.

______________ / ______________
Date Technician

6.26.22 Record the response time.

______________ ______________ / ______________
Value/Units Date Technician

6.26.23 Adjust the input simulator box potentiometer in channel 'A' corresponding to bistable number 6 until the bistable input is returned to the value adjusted for in step 6.1.1.

6.26.24 Reset bistable number 6 in channel A.

______________ / ______________
Date Technician

6.26.25 Repeat steps 6.26.18 through 6.26.24 substituting channel 'B' in place of channel 'A'.

______________ ______________ / ______________
Value/Units Date Technician

6.0 PROCEDURE

6.26.26 Repeat steps 6.26.18 through 6.26.24 substituting channel 'D' in place of channel 'A'.

Value/Units ________ Date ________ / Technician ________

6.26.27 Reset all bistables.

Date ________ / Technician ________

6.26.28 Record the largest response time value of steps 6.26.22, 6.26.25, 6.26.26 in the "Data Collection Table".

Date ________ / Technician ________

6.26.29 In bay 6 of cabinet A (L034), move the optical pickup setup to terminals 43 and 45 on terminal strip 65. This monitors contacts on the solid state relay SSR1A. (CCAS)

Date ________ / Technician ________

6.26.30 In bay 5 of cabinet B (L035), move the optical pickup setup to terminals 43 and 45 on terminal strip 55. This monitors contacts on the solid state relay SSR1B. (CCAS)

Date ________ / Technician ________

6.26.31 Adjust the input simulator box potentiometer in channel 'A' corresponding to bistable number 6 until the bistable is tripped.

Date ________ / Technician ________

6.26.32 Ensure the toggle switch in the "Bistable Test" section of L151 is in the "CLOSED" position.

Date ________ / Technician ________

6.0 PROCEDURE

6.26.33 Ensure the C-E test box timer and the channel 'C' bistable are both reset.

_______________ / _______________
Date Technician

6.26.34 Place the "Bistable Test" section toggle switch on L151 in the "OPEN" position. The timer should start.

_______________ / _______________
Date Technician

6.26.35 Record the response time.

Volts
_______________ _______________ / _______________
Value/Units Date Technician

6.26.36 Adjust the input simulator box potentiometer in channel 'A' corresponding to bistable number 6 until the bistable input is returned to the value adjusted for in step 6.1.1.

_______________ / _______________
Date Technician

6.26.37 Reset bistable number 6 in channel 'A'.

_______________ / _______________
Date Technician

6.26.38 Repeat steps 6.26.31 through 6.26.37 substituting channel 'B' in place of channel 'A'.

_______________ / _______________
Date Technician

6.26.39 Repeat steps 6.26.31 through 6.26.37 substituting channel 'D' in place of channel 'A'.

_______________ / _______________
Date Technician

6.0 PROCEDURE

6.26.40 Disconnect the "Bistable Test" leads and replace the input simulator leads on the terminals they were removed from in step 6.26.1.

______________/______________
Date Technician

6.26.41 Reset all bistables.

______________/______________
Date Technician

6.26.42 Record the largest response time value of steps 6.26.35, 6.26.38, 6.26.39 in the "Data Collection Table".

______________/______________
Date Technician

6.27 Low SG-1 Level to RTSG Response Time

NOTE: The following section measures the response time from the simulation of a trip signal into the Foxboro cabinet (using the PPS Response Time Test panel L151) to the time when the rotary relays trip. The C-E test box will be used as the response time measuring device.

6.27.1 Ensure the temporary LED's are installed across the rotary relay contacts per steps 6.19.1 through 6.19.3.

______________/______________
Date Technician

6.27.2 Remove the PPS input simulator box leads from terminals 24 and 25 on TB-1 of L129.

______________/______________
Date Technician

6.27.3 Connect the "Bistable Test" leads of L151 to terminals 24 and 25 on TB-1 of L129.

______________/______________
Date Technician

6.0 PROCEDURE

6.27.4 On the bistable control panel being tested, rotate the bistable selector switch to position number 7.

________________/________________
Date Technician

6.27.5 Rotate the meter input selector switch to the "TRIP SP" position.

________________/________________
Date Technician

6.27.6 Record the value indicated on the bistable control panel digital indicator.

____________Volts ________________/________________
Value/Units Date Technician

6.27.7 Rotate the meter input selector switch to the "INPUT" position.

________________/________________
Date Technician

6.27.8 In the "Bistable Test" section of L151 place the toggle switch in the "OPEN" position. The LED should extinguish.

________________/________________
Date Technician

6.27.9 Adjust the "HIGH COARSE" and the "HIGH FINE" potentiometers in the "Bistable Test" section of L151 until the digital indicator at the bistable control panel reads 3.50 VDC ±.1 VDC.

________________/________________
Date Technician

6.27.10 In the "Bistable Test" section of L151, place the toggle switch in the "CLOSE" position. The LED should energize.

________________/________________
Date Technician

6.0 PROCEDURE

6.27.11 Adjust the "LOW COARSE" and "LOW FINE" potentiometers in the "Bistable Test" section of L151 until the digital indicator on the bistable control panel reads approximately .1 VDC on the tripped side of the value recorded in step 6.27.6.

_______________ / _______________
Date Technician

6.27.12 Record the adjusted voltage.

_______________ Volts _______________ / _______________
Value/Units Date Technician

6.27.13 Connect the optical end of a C-E test box pickup cable to the "Bistable Test" section LED of L151.

_______________ / _______________
Date Technician

6.27.14 Connect the other end of this pickup cable to the "LED 1" jacks in the "Start Lamps" section of the C-E test box.

_______________ / _______________
Date Technician

6.27.15 Connect the optical end of four pickup cables to the temporary LED's installed in steps 6.19.1 through 6.19.3.

_______________ / _______________
Date Technician

6.27.16 Connect the other end of these four pickup cables to the "L1", "L2", "L3" and "L4" jacks in the "STOP LAMPS" section of the C-E test box.

6.27.17 Energize the C-E test box and ensure the following switches are in the correct positions.

.1 "L1", "L2", "L3", "L4" stop lamps toggle switches are in the "ON" position.

_______________ / _______________
Date Technician

6.0 PROCEDURE

6.27.17.2 "START LAMPS" toggle switch is in the "1/1" position.

______________/______________
Date Technician

.3 Start "TIMER MODES" switch is in the step up position.

______________/______________
Date Technician

.4 Stop "TIMER MODES" switch is in the step up position.

______________/______________
Date Technician

.5 "L5" and "L6" stop lamps toggle switches are in the "OFF" position.

______________/______________
Date Technician

6.27.18 Adjust the input simulator box potentiometer in channel 'A' corresponding to bistable number 7 until the bistable is tripped.

______________/______________
Date Technician

6.27.19 Ensure the toggle switch in the "Bistable Test" section of L151 is in the "OPEN" position.

______________/______________
Date Technician

6.27.20 Ensure the C-E test box timer is reset.

______________/______________
Date Technician

6.27.21 After the test equipment has stabilized, place the "Bistable Test" section toggle switch on L151 in the "CLOSED" position. The timer should start.

______________/______________
Date Technician

5.0 PROCEDURE

6.27.22 Record the response time.

_______________ Value/Units   _______ Date / _______ Technician

6.27.23 Adjust the input simulator box potentiometer in channel 'A' corresponding to bistable number 7 until the bistable input is returned to the value adjusted for in step 6.1.1.

6.27.24 Reset bistable number 7 in channel A.

_______ Date / _______ Technician

6.27.25 Repeat steps 6.27.18 through 5.27.24 substituting channel 'B' in place of channel 'A'.

_______________ Value/Units   _______ Date / _______ Technician

5.27.26 Repeat steps 6.27.18 through 6.27.24 substituting channel 'D' in place of channel 'B'.

_______________ Value/Units   _______ Date / _______ Technician

5.27.27 Disconnect the "Bistable Test" leads and replace the input simulator leads on the terminals they were removed from in step 5.27.1

_______ Date / _______ Technician

NOTE: This step may be omitted if section 6.28 is to be performed next.

6.27.28 Reset all bistables.

_______ Date / _______ Technician

6.0 PROCEDURE

6.27.29 Record the largest response time value of steps 6.27.22, 6.27.25, 6.27.26 in the Data Collection Table.

________/________
Date Technician

6.28 Low SG-1 Level to ESFAS Response Time

NOTE: The following section measures the response time from the simulation of a trip signal into the Foxboro cabinet (using the PPS Response Time Test panel L151) to the time when the solid state relays trip. The C-E test box will be used as the response time measuring device.

6.28.1 Remove the input simulator box leads from terminals 24 and 25 on TB-1 of L121. If not already connected.

________/________
Date Technician

6.28.2 Connect the "Bistable Test" leads of L151 to terminals 24 and 25 on TB-1 of L121, if not already removed.

________/________
Date Technician

6.28.3 In bay 6 of cabinet A (L034), connect an LED jumper cable in series with a six VDC power supply across terminals 37 and 39 on terminal strip TB65. This monitors contacts on the solid state relay SSR1A. (EFAS-1)

________/________
Date Technician

6.28.4 In bay 5 of cabinet B (L035), connect an LED jumper cable in series with a six volt DC power supply across terminals 37 and 39 on terminal strip TB55. This monitors contacts on the solid state relay SSR1B. (EFAS-1)

________/________
Date Technician

6.0 PROCEDURE

6.28.5 Connect the optical end of a stop cable to the LED installed in step 6.28.3 and connect the double banana plug end to the "L1" jacks of the C-E test box.

________ / ________
Date Technician

6.28.6 Connect the optical end of a second stop cable to the LED installed in step 6.28.4 and connect the double banana plug end to the "L2" jacks of the C-E test box.

________ / ________
Date Technician

6.28.7 Connect the optical end of a start cable to the LED installed in the "Bistable Test" section of L151 and connect the double banana plug end to the "LED 1" jacks on the C-E test box.

________ / ________
Date Technician

6.28.8 On the channel 'A' bistable control panel, rotate the bistable selector switch to position number 7.

________ / ________
Date Technician

6.28.9 Rotate the meter input selector switch to the "TRIP SP" position.

________ / ________
Date Technician

6.28.10 Record the value indicated on the bistable control panel digital indicator.

________ Volts
Value/Units

________ / ________
Date Technician

6.28.11 Rotate the meter input selector switch to the "INPUT" position.

________ / ________
Date Technician

6.0 PROCEDURE

6.28.12 In the "Bistable Test" section of L151, place the toggle switch in the "OPEN" position. The LED should extinguish.

Date / Technician

6.28.13 Adjust the "HIGH COARSE" and the "HIGH FINE" potentiometers in the "Bistable Test" section of L151 until the digital indicator on the bistable control panel reads 3.50 VDC ±.1 VDC.

Date / Technician

6.28.14 In the "Bistable Test" section of L151, place the toggle switch in the "CLOSED" position. The LED should energize.

Date / Technician

6.28.15 Adjust the "LOW COARSE" and "LOW FINE" potentiometers in the "Bistable Test" section of L151 until the digital indicator on the bistable control panel reads approximately .1 VDC on the tripped side of the value recorded in step 6.28.10.

Date / Technician

6.28.16 Record the adjusted voltage.

Volts
Value/Units Date / Technician

6.28.17 Energize the C-E test box and ensure the following switches are in the correct positions.

.1 "L1" and "L2" stop lamps toggle switches are in the "ON" position.

Date / Technician

6.0 PROCEDURE

6.28.17.2 "L3", "L4", "L5" and "L6" stop lamps toggle switches are in the "OFF" position.

_____________/_____________
Date Technician

.3 "START LAMPS" toggle switch is in the "1/1" position.

_____________/_____________
Date Technician

.4 Start "TIMER MODES" switch is in the step up position.

_____________/_____________
Date Technician

.5 Stop "TIMER MODES" switch is in the step up position.

_____________/_____________
Date Technician

6.28.18 Adjust the input simulator box potentiometer in channel 'A' corresponding to bistable number 7 until the bistable is tripped.

_____________/_____________
Date Technician

6.28.19 Ensure the toggle switch in the "Bistable Test" section of 2L151 is in the "OPEN" position.

_____________/_____________
Date Technician

6.28.20 Ensure the C-E test box timer is reset, and channel 'C' bistable is reset.

_____________/_____________
Date Technician

6.28.21 After the test equipment has stabilized, place the "Bistable Test" section toggle switch on L151 in the "CLOSE" position. The timer should start.

_____________/_____________
Date Technician

6.0 PROCEDURE

6.28.22 Record the response time.

Value/Units ____________ Date ________ / Technician ____________

6.28.23 Adjust the input simulator box potentiometer in channel 'A' corresponding to bistable number 7 until the bistable input is returned to the value adjusted for in step 6.1.1.

6.28.24 Reset bistable number 7 in channel A.

Date ________ / Technician ____________

6.28.25 Repeat steps 6.28.18 through 6.28.24 substituting channel 'B' in place of channel 'A'.

Volts
Value/Units ____________ Date ________ / Technician ____________

6.28.26 Repeat steps 6.28.18 through 6.28.24 substituting channel 'D' in place of channel 'A'.

Volts
Value/Units ____________ Date ________ / Technician ____________

6.28.27 Disconnect the "Bistable Test" leads and replace the input simulator leads on the terminals they were removed from in step 6.28.1

Date ________ / Technician ____________

6.28.28 Reset all bistables.

Date ________ / Technician ____________

6.28.29 Record the largest response time value of steps 6.28.22, 6.28.25, 6.28.26 in the "Data Collection Table".

Date ________ / Technician ____________

6.29 Low SG-2 Level to RTSG Response Time

NOTE: The following section measures the response time from the simulation of a trip signal into the Foxboro cabinet (using the PPS Response Time Test panel L151) to the time when the rotary relays trip. The C-E test box will be used as the response time measuring device.

6.29.1 Ensure the temporary LED's are installed across the rotary relay contacts per steps 5.21.1 through 5.21.3.

_______ / _______
Date Technician

5.29.2 Remove the PPS input simulator box leads from terminals 21 and 22 on TB-1 of L129.

_______ / _______
Date Technician

6.29.3 Connect the "Bistable Test" leads of L151 to terminals 21 and 22 on TB-1 of L129.

_______ / _______
Date Technician

6.29.4 On the bistable control panel being tested, rotate the bistable selector switch to position number 8.

_______ / _______
Date Technician

6.29.5 Rotate the meter input selector switch to the "TRIP SP" position.

_______ / _______
Date Technician

6.29.6 Record the value indicated on the bistable control panel digital indicator.

_______ Volts _______ / _______
Value/Units Date Technician

6.0 PROCEDURE

6.29.7 Rotate the meter input selector switch to the "INPUT" position.

Date / Technician

6.29.8 In the "Bistable Test" section of L151 place the toggle switch in the "OPEN" position. The LED should extinguish.

Date / Technician

6.29.9 Adjust the "HIGH COARSE" and the "HIGH FINE" potentiometers in the "Bistable Test" section of L151 until the digital indicator at the bistable control panel reads 3.50 VDC ±.1 VDC.

Date / Technician

6.29.10 In the "Bistable Test" section of L151, place the toggle switch in the "CLOSE" position. The LED should energize.

Date / Technician

6.29.11 Adjust the "LOW COARSE" and "LOW FINE" potentiometers in the "Bistable Test" section of L151 until the digital indicator on the bistable control panel reads approximately .1 VDC on the tripped side of the value recorded in step 6.29.6.

Date / Technician

6.29.12 Record the adjusted voltage.

Volts
Value/Units Date / Technician

6.29.13 Connect the optical end of a C-E test box pickup cable to the "Bistable Test" section LED of L151.

Date / Technician

6.0 PROCEDURE

6.29.14 Connect the other end of this pickup cable to the "LED 1" jacks in the "START LAMPS" section of the C-E test box.

________/________
Date Technician

6.29.15 Connect the optical end of four pickup cables to the temporary LED's installed in steps 5.19.1 through 5.19.3.

________/________
Date Technician

6.29.16 Connect the other end of these four pickup cables to the "L1", "L2", "L3", and "L4" jacks in the "STOP LAMPS" section of the C-E test box.

5.29.17 Energize the C-E test box and ensure the following switches are in the correct positions.

.1 "L1", "L2", "L3", "L4" stop lamps toggle switches are in the "ON" position.

________/________
Date Technician

.2 "START LAMPS" toggle switch is in the "1/1" position.

________/________
Date Technician

.3 Start "TIMER MODES" switch is in the step up position.

________/________
Date Technician

.4 Stop "TIMER MODES" switch is in the step up position.

________/________
Date Technician

.5 "L5" and "L6" stop lamps toggle switches are in the "OFF" position.

________/________
Date Technician

6.0 PROCEDURE

6.29.18 Adjust the input simulator box potentiometer in channel 'A' corresponding to bistable number 8 until the bistable is tripped.

______________/______________
Date Technician

6.29.19 Ensure the toggle switch in the "Bistable Test" section of L151 is in the "OPEN" position.

______________/______________
Date Technician

6.29.20 Ensure the C-E test box timer is reset.

______________/______________
Date Technician

6.29.21 After the test equipment has stabilized, place the "Bistable Test" section toggle switch on 2L151 in the "CLOSE" position. The timer should start.

______________/______________
Date Technician

6.29.22 Record the response time.

______________ ______________/______________
Value/Units Date Technician

6.29.23 Adjust the input simulator box potentiometer in channel 'A' corresponding to bistable number 8 until the bistable input is returned to the value adjusted for in step 6.1.1.

6.29.24 Reset bistable number 8 in channel 'A'.

______________/______________
Date Technician

6.29.25 Repeat steps 6.29.18 through 6.29.24 substituting channel 'B' in place of channel 'A'.

______________ ______________/______________
Value/Units Date Technician

6.0 PROCEDURE

6.29.26 Repeat steps 6.29.18 through 6.29.24 substituting channel 'D' in place of channel 'A'.

Value/Units Date / Technician

6.29.27 Disconnect the "Bistable Test" leads and replace the input simulator leads on the terminals they were removed from in step 6.29.1

Date / Technician

NOTE: This step may be omitted if section 6.30 is to be performed next.

6.29.28 Reset all bistables.

Date / Technician

6.29.29 Record the largest response time value of steps 6.29.22, 6.29.25, 6.29.26 in the Data Collection Table.

Date / Technician

6.30 Low SG-2 Level to ESFAS Response Time

NOTE: The following section measures the response time from the simulation of a trip signal into the Foxboro cabinet (using the PPS Response Time Test panel L151) to the time when the solid state relays trip. The C-E test box will be used as the response time measuring device.

6.30.1 Remove the input simulator box leads from terminals 21 and 22 on TB-1 of 129, if not already removed.

Date / Technician

6.0 PROCEDURE

6.30.2 Connect the "Bistable Test" leads of L151 to terminals 21 and 22 on TB-1 of L129, if not already connected.

________/________
Date Technician

6.30.3 In bay 6 of cabinet A (L034), connect an LED jumper cable in series with a six VDC power supply across terminals 40 and 42 on terminal strip TB65. This monitors contacts on the solid state relay SSR1A. (EFAS-2)

________/________
Date Technician

6.30.4 In bay 5 of cabinet B (L035), connect an LED jumper cable in series with a six volt DC power supply across terminals 40 and 42 on terminal strip TB55. This monitors contacts on the solid state relay SSR1B. (EFAS-2)

________/________
Date Technician

6.30.5 Connect the optical end of a stop cable to the LED installed in step 6.30.3 and connect the double banana plug end to the "L1" jacks of the C-E test box.

________/________
Date Technician

6.30.6 Connect the optical end of a second stop cable to the LED installed in step 6.23.4 and connect the double banana plug end to the "L2" jacks of the C-E test box.

________/________
Date Technician

6.30.7 Connect the optical end of a start cable to the LED installed in the "Bistable Test" section of L151 and connect the double banana plug end to the "LED 1" jacks on the C-E test box.

________/________
Date Technician

URE

6.40.17.4 Start "TIMER MODES" switch is in the step up position.

_______ / _______
Date Technician

.5 Stop "TIMER MODES" switch is in the step up position.

_______ / _______
Date Technician

.40.18 Adjust the input simulator box potentiometer in channel 'A' corresponding to bistable number 20 until the bistable is tripped.

_______ / _______
Date Technician

.40.19 Ensure the toggle switch in the "Bistable Test" section of L151 is in the "OPEN" position.

_______ / _______
Date Technician

.40.20 Ensure the C-E test box timer is reset.

_______ / _______
Date Technician

40.21 After the test equipment has stabilized, place the "Bistable Test" section toggle switch on L151 in the "CLOSE" position. The timer should start.

_______ / _______
Date Technician

40.22 Record the response time.

_______ _______ / _______
Value/Units Date Technician

0.23 Adjust the input simulator box potentiometer in channel 'A' corresponding to bistable number 20 until the bistable input is returned to the value adjusted for in step 6.1.1.

6.0 PROCEDURE

6.30.15 Adjust the "LOW COARSE" and "LOW FINE" potentiometers in the "Bistable Test" section of L151 until the digital indicator on the bistable control panel reads approximately .1 VDC on the tripped side of the value recorded in step 6.30.10.

Date / Technician

6.30.16 Record the adjusted voltage.

Volts Value/Units Date / Technician

6.30.17 Energize the C-E test box and ensure the following switches are in the correct positions.

.1 "L1" and "L2" stop lamps toggle switches are in the "ON" position.

Date / Technician

.2 "L3", "L4", "L5" and "L6" stop lamps toggle switches are in the "OFF" position.

Date / Technician

.3 "START LAMPS" toggle switch is in the "1/1" position.

Date / Technician

.4 Start "TIMER MODES" switch is in the step up position.

Date / Technician

.5 Stop "TIMER MODES" switch is in the step up position.

Date / Technician

6.0 PROCEDURE

6.30.18 Adjust the input simulator box potentiometer in channel 'A' corresponding to bistable number 8 until the bistable is tripped.

Date / Technician

6.30.19 Ensure the toggle switch in the "Bistable Test" section of L151 is in the "OPEN" position.

Date / Technician

6.30.20 Ensure the C-E test box timer is reset.

Date / Technician

6.30.21 After the test equipment has stabilized, place the "Bistable Test" section toggle switch on L151 in the "CLOSE" position. The timer should start.

Date / Technician

6.30.22 Record the response time.

Value/Units Date / Technician

6.30.23 Adjust the input simulator box potentiometer in channel 'A' corresponding to bistable number 8 until the bistable input is returned to the value adjusted for in step 6.1.1.

6.30.24 Reset bistable number 8 in channel 'A'.

Date / Technician

6.30.25 Repeat steps 6.30.18 through 6.30.24 substituting channel 'B' in place of channel 'A'.

Value/Units Date / Technician

6.0 PROCEDURE

6.30.26 Repeat steps 6.30.18 through 6.30.21 substituting channel 'D' in place of channel 'A'.

_______________ Value/Units ______ Date / Technician ______

6.30.27 Disconnect the "Bistable Test" leads and replace the input simulator leads on the terminals they were removed from in step 6.30.1

______ Date / Technician ______

6.30.28 Reset all bistables.

______ Date / Technician ______

6.30.29 Record the largest response time value of steps 6.30.22, 6.30.25, 6.30.26 in the "Data Collection Table".

______ Date / Technician ______

6.31 Low SG-1 Pressure to RTSG Response Time

NOTE: The following section measures the response time from the simulation of a trip signal into the Foxboro cabinet (using the PPS Response Time Test panel L151) to the time when the rotary relays trip. The C-E test box will be used as the response time measuring device.

6.31.1 Ensure the temporary LED's are installed across the rotary relay contacts per steps 6.19.1 through 6.19.3.

______ Date / Technician ______

6.31.2 Remove the PPS input simulator box leads from terminals 36 and 37 on TB-1 of L129.

______ Date / Technician ______

6.0 PROCEDURE

6.31.3 Connect the "Bistable Test" leads of L151 to terminals 36 and 37 on TB-1 of L129.

_______/_______
Date Technician

6.31.4 On the bistable control panel being tested, rotate the bistable selector switch to position number 11.

_______/_______
Date Technician

6.31.5 Rotate the meter input selector switch to the "TRIP SP" position.

_______/_______
Date Technician

6.31.6 Record the value indicated on the bistable control panel digital indicator.

_______ Volts
Value/Units

_______/_______
Date Technician

6.31.7 Rotate the meter input selector switch to the "INPUT" position.

_______/_______
Date Technician

6.31.8 In the "Bistable Test" section of L151 place the toggle switch in the "OPEN" position. The LED should extinguish.

_______/_______
Date Technician

6.31.9 Adjust the "HIGH COARSE" and the "HIGH FINE" potentiometers in the "Bistable Test" section of L151 until the digital indicator on the bistable control panel reads approximately .1 VDC on the tripped side of the value recorded in step 6.31.5.

_______/_______
Date Technician

6.0 PROCEDURE

6.31.10 In the "Bistable Test" section of L151, place the toggle switch in the "CLOSE" position. The LED should energize.

_______________/_______________
Date Technician

6.31.11 Adjust the "LOW COARSE" and "LOW FINE" potentiometers in the "Bistable Test" section of L151 until the digital indicator on the bistable control panel reads 3.70 VDC ±.1 VDC.

_______________/_______________
Date Technician

6.31.12 Record the adjusted voltage.

_______________Volts
Value/Units

_______________/_______________
Date Technician

6.31.13 Connect the optical end of a C-E test box pickup cable to the "Bistable Test" section LED of L151.

_______________/_______________
Date Technician

6.31.14 Connect the other end of this pickup cable to the "LED 1" jacks in the "START LAMPS" section of the C-E test box.

_______________/_______________
Date Technician

6.31.15 Connect the optical end of four pickup cables to the temporary LED's installed in steps 6.19.1 through 6.19.3.

_______________/_______________
Date Technician

6.31.16 Connect the other end of these four pickup cables to the "L1", "L2", "L3" and "L4" jacks in the "STOP LAMPS" section of the C-E test box.

6.0 PROCEDURE

6.31.17 Energize the C-E test box and ensure the following switches are in the correct positions.

.1 "L1", "L2", "L3", "L4" stop lamps toggle switches are in the "ON" position.

_______________/_______________
Date Technician

.2 "START LAMPS" toggle switch is in the "1/1" position.

_______________/_______________
Date Technician

.3 Start "TIMER MODES" switch is in the step up position.

_______________/_______________
Date Technician

.4 Stop "TIMER MODES" switch is in the step down position.

_______________/_______________
Date Technician

.5 "L5" and "L6" stop lamps toggle switches are in the "OFF" position.

_______________/_______________
Date Technician

6.31.18 Adjust the input simulator box potentiometer in channel 'A' corresponding to bistable number 11 until the bistable is tripped.

_______________/_______________
Date Technician

6.31.19 Ensure the toggle switch in the "Bistable Test" section of L151 is in the "CLOSED" position.

_______________/_______________
Date Technician

6.0 PROCEDURE

6.31.20 Ensure the C-E test box timer is reset .

_____ / _____
Date Technician

6.31.21 After the test equipment has stabilized, place the "Bistable Test" section toggle switch on L151 in the "OPEN" position. The timer should start.

_____ / _____
Date Technician

6.31.22 Record the response time.

_____ _____ / _____
Value/Units Date Technician

6.31.23 Adjust the input simulator box potentiometer in channel 'A' corresponding to bistable number 11 until the bistable input is returned to the value adjusted for in step 6.1.1.

6.31.24 Reset bistable number 11 in channel 'A'.

_____ / _____
Date Technician

6.31.25 Repeat steps 6.31.18 through 6.31.24 substituting channel 'B' in place of channel 'A'.

_____ Volts _____ / _____
Value/Units Date Technician

6.31.26 Repeat steps 6.31.18 through 6.31.24 substituting channel 'D' in place of channel 'A'.

_____ Volts _____ / _____
Value/Units Date Technician

6.31.27 Disconnect the "Bistable Test" leads and replace the input simulator leads on the terminals they were removed from in step 6.31.1

_____ / _____
Date Technician

6.0 PROCEDURE

NOTE: This step may be omitted if section 6.32 is to be performed next.

6.31.28 Reset all bistables.

______________/______________
Date Technician

6.31.29 Record the largest response time value of steps 6.31.22, 6.31.25, 6.31.25 in the "Data Collection Table".

______________/______________
Date Technician

6.32 Low SG-1 Pressure to ESFAS Response Time

NOTE: The following section measures the response time from the simulation of a trip signal into the Foxboro cabinet (using the PPS Response Time Test panel L151) to the time when the solid state relays trip. The C-E test box will be used as the response time measuring device.

6.32.1 Remove the input simulator box leads from terminals 36 and 37 on TB-1 of L129, if not already removed.

______________/______________
Date Technician

6.32.2 Connect the "Bistable Test" leads of L151 to terminals 36 and 37 on TB-1 of L129, if not already connected.

______________/______________
Date Technician

6.32.3 In bay 6 of cabinet A (L034), connect an LED jumper cable in series with a six VDC power supply across terminals 34 and 36 on terminal strip TB65. This monitors contacts on the solid state relay SSR1A. (MSIS)

______________/______________
Date Technician

6.0 PROCEDURE

6.32.4 In bay 5 of cabinet 3 (L035), connect an LED jumper cable in series with a six volt DC power supply across terminals 34 and 35 on terminal strip TB55. This monitors contacts on the solid state relay SSR1B. (MSIS)

_____ / _____
Date Technician

6.32.5 Connect the optical end of a stop cable to the LED installed in step 6.32.3 and connect the double banana plug end to the "L1" jacks of the C-E test box.

_____ / _____
Date Technician

6.32.6 Connect the optical end of a second stop cable to the LED installed in step 6.32.4 and connect the double banana plug end to the "L2" jacks of the C-E test box.

_____ / _____
Date Technician

6.32.7 Connect the optical end of a start cable to the LED installed in the "Bistable Test" section of L151 and connect the double banana plug end to the "LED 1" jacks on the C-E test box.

_____ / _____
Date Technician

6.32.8 On the channel 'A' bistable control panel, rotate the bistable selector switch to position number 11.

_____ / _____
Date Technician

6.32.9 Rotate the meter input selector switch to the "TRIP SP" position.

_____ / _____
Date Technician

6.32 10 Record the value indicated on the bistable control panel digital indicator.

_____ Volts _____ / _____
Value/Units Date Technician

6.0 PROCEDURE

6.32.11 Rotate the meter input selector switch to the "INPUT" position.

_______________ / _______________
Date Technician

6.32.12 In the "Bistable Test" section of L151, place the toggle switch in the "OPEN" position. The LED should extinguish.

_______________ / _______________
Date Technician

6.32.13 Adjust the "HIGH COARSE" and the "HIGH FINE" potentiometers in the "Bistable Test" section of L151 until the digital indicator on the bistable control panel reads approximately .1 VDC on the tripped side of the value recorded in step 6.32.6.

_______________ / _______________
Date Technician

6.32.14 In the "Bistable Test" section of L151, place the toggle switch in the "CLOSED" position. The LED should energize.

_______________ / _______________
Date Technician

6.32.15 Adjust the "LOW COARSE" and "LOW FINE" potentiometers in the "Bistable Test" section of L151 until the digital indicator on the bistable control panel reads 3.70 VDC ±.1 VDC.

_______________ / _______________
Date Technician

6.32.16 Record the adjusted voltage.

_______________ Volts
Value/Units

_______________ / _______________
Date Technician

6.0 PROCEDURE

6.32.17 Energize the C-E test box and ensure the following switches are in the correct positions.

.1 "L1" and "L2" stop lamps toggle switches are in the "ON" position.

/
Date Technician

.2 "L3", "L4", "L5" and "L6" stop lamps toggle switches are in the "OFF" position.

/
Date Technician

.3 "START LAMPS" toggle switch is in the "1/1" position.

/
Date Technician

.4 Start "TIMER MODES" switch is in the step DOWN position.

/
Date Technician

.5 Stop "TIMER MODES" switch is in the step up position.

/
Date Technician

6.32.18 Adjust the input simulator box potentiometer in channel 'A' corresponding to bistable number 11 until the bistable is tripped.

/
Date Technician

6.32.19 Ensure the toggle switch in the "Bistable Test" section of L151 is in the "CLOSED" position.

/
Date Technician

6.32.20 Ensure the C-E test box timer is reset.

/
Date Technician

6.0 PROCEDURE

6.32.21 After the test equipment has stabilized, place the "Bistable Test" section toggle switch on L151 in the "OPEN" position. The timer should start.

______/______
Date Technician

6.32.22 Record the response time.

______ Value/Units ______/______ Date Technician

6.32.23 Adjust the input simulator box potentiometer in channel 'B' corresponding to bistable number 11 until the bistable input is returned to the value adjusted for in step 6.1.1.

6.32.24 Reset bistable number 11 in channel 'A'.

______/______
Date Technician

6.32.25 Repeat steps 6.32.18 through 6.32.24 substituting channel 'B' in place of channel 'A'.

______ Value/Units ______/______ Date Technician

6.32.26 Repeat steps 6.32.18 through 6.32.24 substituting channel 'D' in place of channel 'B'.

______ Value/Units ______/______ Date Technician

6.32.27 Disconnect the "Bistable Test" leads and replace the input simulator leads on the terminals they were removed from in step 6.32.1

______/______
Date Technician

6.32.28 Reset all bistables.

______/______
Date Technician

6.0 PROCEDURE

6.32.29 Record the largest response time value of steps 6.32.22, 6.32.25, 6.32.26 in the "Data Collection Table".

Date / Technician

6.33 Low SG-2 Pressure to RTSG Response Time

NOTE: The following section measures the response time from the simulation of a trip signal into the Foxboro cabinet (using the PPS Response Time Test panel L151) to the time when the rotary relays trip. The C-E test box will be used as the response time measuring device.

6.33.1 Ensure the temporary LED's are installed across the rotary relay contacts per steps 6.19.1 through 6.19.3.

Date / Technician

6.33.2 Remove the PPS input simulator box leads from terminals 32 and 34 on TB-1 of L129, if not already removed.

Date / Technician

6.33.3 Connect the "Bistable Test" leads of L151 to terminals 33 and 34 on TB-1 of L129, if not already connected.

Date / Technician

6.33.4 On the bistable control panel being tested, rotate the bistable selector switch to position number 12.

Date / Technician

6.33.5 Rotate the meter input selector switch to the "TRIP SP" position.

Date / Technician

6.0 PROCEDURE

6.33.6 Record the value indicated on the bistable control panel digital indicator.

Volts
________ Value/Units ________ Date / Technician

6.33.7 Rotate the meter input selector switch to the "INPUT" position.

________ Date / Technician

6.33.8 In the "Bistable Test" section of L151 place the toggle switch in the "OPEN" position. The LED should extinguish.

________ Date / Technician

6.33.9 Adjust the "HIGH COARSE" and the "HIGH FINE" potentiometers in the "Bistable Test" section of L151 until the digital indicator on the bistable control panel reads approximately .1 VDC on the tripped side of the value recorded in step 6.33.6.

________ Date / Technician

6.33.10 In the "Bistable Test" section of L151, place the toggle switch in the "CLOSE" position. The LED should energize.

________ Date / Technician

6.33.11 Adjust the "Low Course" and "Low Fine" potentiometers in the "Bistable Test" section of L151 until the digital indicator at the bistable control panel reads 3.70 VDC ±.1 VDC.

________ Date / Technician

6.33.12 Record the adjusted voltage.

Volts
________ Value/Units ________ Date / Technician

6.0 PROCEDURE

6.33.13 Connect the optical end of a C-E test box pickup cable to the "Bistable Test" section LED of LY51.

______ / ______
Date Technician

6.33.14 Connect the other end of this pickup cable to the "LED 1" jacks in the "START LAMPS" section of the C-E test box.

______ / ______
Date Technician

6.33.15 Connect the optical end of four pickup cables to the temporary LED's installed in steps 6.19.1 through 6.21.3.

______ / ______
Date Technician

6.32.16 Connect the other end of these four pickup cables to the "L1", "L2", "L3" and "L4" jacks in the "STOP LAMPS" section of the C-E test box.

6.33.17 Energize the C-E test box and ensure the following switches are in the correct positions.

.1 "L1", "L2", "L3", "L4" stop lamps toggle switches are in the "ON" position.

______ / ______
Date Technician

.2 "START LAMPS" toggle switch is in the "1/1" position.

______ / ______
Date Technician

.3 Start "TIMER MODES" switch is in the step DOWN position.

______ / ______
Date Technician

.4 Stop "TIMER MODES" switch is in the step up position.

______ / ______
Date Technician

6.0 PROCEDURE

6.33.17.5 "L5" and "L6" stop lamps toggle switches are in the "OFF" position.

_______________ / _______________
Date / Technician

6.33.18 Adjust the input simulator box potentiometer in channel 'A' corresponding to bistable number 12 until the bistable is tripped.

_______________ / _______________
Date / Technician

6.33.19 Ensure the toggle switch in the "Bistable Test" section of L151 is in the "CLOSED" position.

_______________ / _______________
Date / Technician

6.33.20 Ensure the C-E test box timer is reset.

_______________ / _______________
Date / Technician

6.33.21 After the test equipment has stabilized, place the "Bistable Test" section toggle switch on L151 in the "OPEN" position. The timer should start.

_______________ / _______________
Date / Technician

6.33.22 Record the response time.

_______________ Volts
Value/Units

_______________ / _______________
Date / Technician

6.33.23 Adjust the input simulator box potentiometer in channel 'A' corresponding to bistable number 12 until the bistable input is returned to the value adjusted for in step 6.1.1.

6.33.24 Reset bistable number 12 in channel 'A'.

_______________ / _______________
Date / Technician

6.0 PROCEDURE

6.33.25 Repeat steps 6.33.18 through 6.33.24 substituting channel 'B' in place of channel 'A'.

Value/Units   Date / Technician

6.33.25 Repeat steps 6.33.18 through 6.33.24 substituting channel 'D' in place of channel 'A'.

Value/Units   Date / Technician

6.33.27 Disconnect the "Bistable Test" leads and replace the input simulator leads on the terminals they were removed from in step 6.32.1

Date / Technician

NOTE: This step may be omitted if section 6.34 is to be performed next.

6.33.28 Reset all bistables.

Date / Technician

6.33.29 Record the largest response time value of steps 6.33.22, 6.33.25, 6.33.25 in the "Data Collection Table".

Date / Technician

6.34 Low SG-2 Level to ESFAS Response Time

NOTE: The following section measures the response time from the simulation of a trip signal into the Foxboro cabinet (using the PPS Response Time Test panel L151) to the time when the solid state relays trip. The C-E test box will be used as the response time measuring device.

6.0 PROCEDURE

6.34.1 Remove the input simulator box leads from terminals 33 and 34 on TB-1 of L129, if not already removed.

______/______
Date Technician

6.34.2 Connect the "Bistable Test" leads of L151 to terminals 30 and 31 on TB-1 of L121, if not already connected.

______/______
Date Technician

6.34.3 In bay 6 of cabinet A (L034), connect an LED jumper cable in series with a six VDC power supply across terminals 34 and 36 on terminal strip TB55. This monitors contacts on the solid state relay SSR1A. (MSIS)

______/______
Date Technician

6.34.4 In bay 5 of cabinet B (L035), connect an LED jumper cable in series with a six volt DC power supply across terminals 34 and 36 on terminal strip TB55. This monitors contacts on the solid state relay SSR1B. (MSIS)

______/______
Date Technician

6.34.5 Connect the optical end of a stop cable to the LED installed in step 6.34.3 and connect the double banana plug end to the "L1" jacks of the C-E test box.

______/______
Date Technician

6.34.6 Connect the optical end of a second stop cable to the LED installed in step 6.34.4 and connect the double banana plug end to the "L2" jacks of the C-E test box.

______/______
Date Technician

6.0 PROCEDURE

6.34.7 Connect the optical end of a start cable to the LED installed in the "Bistable Test" section of L151 and connect the double banana plug end to the "LED 1" jacks on the C-E test box.

__________/__________
Date Technician

6.34.8 On the channel 'C' bistable control panel, rotate the bistable selector switch to position number 12.

__________/__________
Date Technician

6.34.9 Rotate the meter input selector switch to the "TRIP SP" position.

__________/__________
Date Technician

6.34.10 Record the value indicated on the bistable control panel digital indicator.

__________ Volts __________/__________
Value/Units Date Technician

6.34.11 Rotate the meter input selector switch to the "INPUT" position.

__________/__________
Date Technician

6.34.12 In the "Bistable Test" section of L151, place the toggle switch in the "OPEN" position. The LED should extinguish.

__________/__________
Date Technician

6.34.13 Adjust the "HIGH COARSE" and the "HIGH FINE" potentiometers in the "Bistable Test" section of L151 until the digital indicator on the bistable control panel reads approximately .1 VDC on the tripped side of the value recorded in step 6.34.5.

__________/__________
Date Technician

6.0 PROCEDURE

6.34.14 In the "Bistable Test" section of L151, place the toggle switch in the "CLOSED" position. The LED should energize.

_______/_______
Date Technician

6.34.15 Adjust the "LOW COARSE" and "LOW FINE" potentiometers in the "Bistable Test" section of L151 until the digital indicator on the bistable control panel reads 3.70 VDC ± .1 VDC.

_______/_______
Date Technician

6.34.16 Record the adjusted voltage.

_______ Volts _______/_______
Value/Units Date Technician

6.34.17 Energize the C-E test box and ensure the following switches are in the correct positions.

.1 "L1" and "L2" stop lamps toggle switches are in the "ON" position.

_______/_______
Date Technician

.2 "L3", "L4", "L5" and "L6" stop lamps toggle switches are in the "OFF" position.

_______/_______
Date Technician

.3 "START LAMPS" toggle switch is in the "1/1" position.

_______/_______
Date Technician

.4 Start "TIMER MODES" switch is in the step DOWN position.

_______/_______
Date Technician

6.0 PROCEDURE

6.34.17.5 Stop "TIMER MODES" switch is in the step up position.

_______________/_______________
Date Technician

6.34.18 Adjust the input simulator box potentiometer in channel 'A' corresponding to bistable number 12 until the bistable is tripped.

_______________/_______________
Date Technician

6.34.19 Ensure the toggle switch in the "Bistable Test" section of L151 is in the "CLOSED" position.

_______________/_______________
Date Technician

6.34.20 Ensure the C-E test box timer is reset.

_______________/_______________
Date Technician

6.34.21 After the test equipment has stabilized, place the "Bistable Test" section toggle switch on L151 in the "OPEN" position. The timer should start.

_______________/_______________
Date Technician

6.34.22 Record the response time.

_______________ _______________/_______________
Value/Units Date Technician

6.34.23 Adjust the input simulator box potentiometer in channel 'A' corresponding to bistable number 12 until the bistable input is returned to the value adjusted for in step 6.1.1.

6.34.24 Reset bistable number 12 in channel A.

_______________/_______________
Date Technician

6.0 PROCEDURE

6.34.25 Repeat steps 6.34.18 through 6.34.24 substituting channel 'B' in place of channel 'A'.

Value/Units Date / Technician

6.34.26 Repeat steps 6.34.18 through 6.34.24 substituting channel 'D' in place of channel 'A'.

Value/Units Date / Technician

6.34.27 Disconnect the "Bistable Test" leads and replace the input simulator leads on the terminals they were removed from in step 6.34.1

Date / Technician

6.34.28 Reset all bistables.

Date / Technician

6.34.29 Record the largest response time value of steps 6.34.22, 6.34.25, 6.34.26 in the Data Collection Table.

Date / Technician

6.35 High Containment Pressure to RTSG Response Time

NOTE: The following section measures the response time from the simulation of a trip signal into the Foxboro cabinet (using the PPS Response Time Test panel L151) to the time when the rotary relays trip. The C-E test box will be used as the response time measuring device.

6.35.1 Ensure the temporary LED's are installed across the rotary relay contacts per steps 6.19.1 through 6.19.3.

Date / Technician

6.0 PROCEDURE

6.35.2 Remove the PPS input simulator box leads from terminals 46 and 47 on TB-1 of L129, if not already removed.

_____ / _____
Date Technician

6.35.3 Connect the "Bistable Test" leads of L151 to terminals 46 and 47 on TB-1 of L129, if not already connected.

_____ / _____
Date Technician

6.35.4 On the bistable control panel being tested, rotate the bistable selector switch to position number 13.

_____ / _____
Date Technician

6.35.5 Rotate the meter input selector switch to the "TRIP SP" position.

_____ / _____
Date Technician

6.35.6 Record the value indicated on the bistable control panel digital indicator.

_____ Volts
Value/Units

_____ / _____
Date Technician

6.35.7 Rotate the meter input selector switch to the "INPUT" position.

_____ / _____
Date Technician

6.35.8 In the "Bistable Test" section of L151 place the toggle switch in the "OPEN" position. The LED should extinguish.

_____ / _____
Date Technician

6.0 PROCEDURE

6.35.9 Adjust the "HIGH COARSE" and the "HIGH FINE" potentiometers in the "Bistable Test" section of L151 until the digital indicator at the bistable control panel reads 1.00 VDC ± .1 VDC.

______________ / ______________
Date Technician

6.35.10 In the "Bistable Test" section of L151, place the toggle switch in the "CLOSE" position. The LED should energize.

______________ / ______________
Date Technician

6.35.11 Adjust the "LOW COARSE" and "LOW FINE" potentiometers in the "Bistable Test" section of L151 until the digital indicator on the bistable control panel reads approximately .1 VDC on the tripped side of the value recorded in step 6.35.6.

______________ / ______________
Date Technician

6.35.12 Record the adjusted voltage.

______________ Volts
Value/Units

______________ / ______________
Date Technician

6.35.13 Connect the optical end of a C-E test box pickup cable to the "Bistable Test" section LED of L151.

______________ / ______________
Date Technician

6.35.14 Connect the other end of this pickup cable to the "LED 1" jacks in the "START LAMPS" section of the C-E test box.

______________ / ______________
Date Technician

6.35.15 Connect the optical end of four pickup cables to the temporary LED's installed in steps 6.19.1 through 6.19.3.

______________ / ______________
Date Technician

6.0 PROCEDURE

6.35.16 Connect the other end of these four pickup cables to the "L1", "L2", "L3" and "L4" jacks in the "STOP LAMPS" section of the C-E test box.

6.35.17 Energize the C-E test box and ensure the following switches are in the correct positions.

.1 "L1", "L2", "L3", "L4" stop lamps toggle switches are in the "ON" position.

____________/____________
Date Technician

.2 "START LAMPS" toggle switch is in the "1/1" position.

____________/____________
Date Technician

.3 Start "TIMER MODES" switch is in the step up position.

____________/____________
Date Technician

.4 Stop "TIMER MODES" switch is in the step up position.

____________/____________
Date Technician

.5 "L5" and "L6" stop lamps toggle switches are in the "OFF" position.

____________/____________
Date Technician

6.35.18 Adjust the input simulator box potentiometer in channel 'A' corresponding to bistable number 13 until the bistable is tripped.

____________/____________
Date Technician

6.35.19 Ensure the toggle switch in the "Bistable Test" section of L151 is in the "OPEN" position.

____________/____________
Date Technician

6.0 PROCEDURE

6.35.20 Ensure the C-E test box timer is reset.

____________/____________
Date Technician

6.35.21 After the test equipment has stabilized, place the "Bistable Test" section toggle switch on L151 in the "CLOSED" position. The timer should start.

____________/____________
Date Technician

6.35.22 Record the response time.

____________ ____________/____________
Value/Units Date Technician

6.35.23 Adjust the input simulator box potentiometer in channel 'A' corresponding to bistable number 13 until the bistable input is returned to the value adjusted for in step 6.1.1.

6.35.24 Reset bistable number 13 in channel 'A'.

____________/____________
Date Technician

6.35.25 Repeat steps 6.35.18 through 6.35.24 substituting channel 'B' in place of channel 'A'.

____________ ____________/____________
Value/Units Date Technician

6.35.26 Repeat steps 6.35.18 through 6.35.24 substituting channel 'D' in place of channel 'A'.

____________ ____________/____________
Value/Units Date Technician

6.35.27 Disconnect the "Bistable Test" leads and replace the input simulator leads on the Terminals they were removed from in step 6.35.1

____________/____________
Date Technician

NOTE: This step may be omitted if section 6.36 is to be performed next.

6.0 PROCEDURE

6.35.28 Reset all bistables.

________/________
Date Technician

6.35.29 Record the largest response time value of steps 6.35.22, 6.35.25, 6.35.25 in the Data Collection Table.

________/________
Date Technician

6.36 High Containment Pressure to ESFAS Response Time

NOTE: The following section measures the response time from the simulation of a trip signal into the Foxboro cabinet (using the PPS Response Time Test panel L151) to the time when the solid state or mechanical relays trip. The C-E test box will be used as the response time measuring device.

6.36.1 Remove the input simulator box leads from terminals 46 and 47 on TB-1 of L129.

________/________
Date Technician

6.36.2 Connect the "Bistable Test" leads of L151 to terminals 46 and 47 on TB-1 of L129.

________/________
Date Technician

6.36.3 In bay 6 of cabinet A (L034), connect an LED jumper cable in series with a six VDC power supply across terminals 28 and 30 on terminal strip TB65. This monitors contacts on the mechanical relay 1R1A. (CIAS)

________/________
Date Technician

6.0 PROCEDURE

6.36.4 In bay 5 of cabinet B (L035), connect an LED jumper cable in series with a six volt DC power supply across terminals 28 and 30 on terminal strip TB55. This monitors contacts on the mechanical relay MRID. : (CIAS)

______________ / ______________
Date Technician

6.36.5 Connect the optical end of a stop cable to the LED installed in step 6.36.3 and connect the double banana plug end to the "L1" jacks of the C-E test box.

______________ / ______________
Date Technician

6.36.6 Connect the optical end of a second stop cable to the LED installed in step 6.36.4 and connect the double banana plug end to the "L2" jacks of the C-E test box.

______________ / ______________
Date Technician

6.36.7 Connect the optical end of a start cable to the LED in the "Bistable Test" section of L151 and connect the double banana plug end to the "LED 1" jacks on the C-E test box.

______________ / ______________
Date Technician

6.36.8 On the channel 'C' bistable control panel, rotate the bistable selector switch to position number 18.

______________ / ______________
Date Technician

6.36.9 Rotate the meter input selector switch to the "TRIP SP" position.

______________ / ______________
Date Technician

6.36.10 Record the value indicated on the bistable control panel digital indicator.

__________ Volts ______________ / ______________
Value/Units Date Technician

6.0 PROCEDURE

6.36.11 Rotate the meter input selector switch to the "INPUT" position.

_______ / _______
Date Technician

6.36.12 In the "Bistable Test" section of L151, place the toggle switch in the "OPEN" position. The LED should extinguish.

_______ / _______
Date Technician

6.36.13 Adjust the "HIGH COARSE" and the "HIGH FINE" potentiometers in the "Bistable Test" section of L151 until the digital indicator at the bistable control panel reads 1.00 VDC ± .1 VDC.

_______ / _______
Date Technician

6.36.14 In the "Bistable Test" section of L151, place the toggle switch in the "CLOSED" position. The LED should energize.

_______ / _______
Date Technician

6.36.15 Adjust the "LOW COARSE" and "LOW FINE" potentiometers in the "Bistable Test" section of L151 until the digital indicator on the bistable control panel reads approximately .1 VDC on the tripped side of the value recorded in step 6.36.10.

_______ / _______
Date Technician

6.36.16 Record the adjusted voltage.

_______ Volts _______ / _______
Value/Units Date Technician

6.0 PROCEDURE

6.36.17 Energize the C-E test box and ensure the following switches are in the correct positions.

.1 "L1" and "L2" stop lamps toggle switches are in the "ON" position.

_______________ / _______________
Date Technician

.2 "L3", "L4", "L5" and "L6" stop lamps toggle switches are in the "OFF" position.

_______________ / _______________
Date Technician

.3 "START LAMPS" toggle switch is in the "1/1" position.

_______________ / _______________
Date Technician

.4 Start "TIMER MODES" switch is in the step up position.

_______________ / _______________
Date Technician

.5 Stop "TIMER MODES" switch is in the step up position.

_______________ / _______________
Date Technician

6.36.18 Adjust the input simulator box potentiometer in channel 'A' corresponding to bistable number 18 until the bistable is tripped.

_______________ / _______________
Date Technician

6.36.19 Ensure the toggle switch in the "Bistable Test" section of L151 is in the "OPEN" position.

_______________ / _______________
Date Technician

6.36.20 Ensure the C-E test box timer is reset.

_______________ / _______________
Date Technician

6.0 PROCEDURE

6.36.21 After the test equipment has stabilized, place the "Bistable Test" section toggle switch on L151 in the "CLOSE" position. The timer should start.

_______/_______
Date Technician

6.36.22 Record the response time.

_______ Value/Units
_______/_______
Date Technician

6.36.23 Adjust the input simulator box potentiometer in channel 'A' corresponding to bistable number 18 until the bistable input is returned to the value adjusted for in step 6.1.1.

6.36.24 Reset bistable number 18 in channel 'A'.

_______/_______
Date Technician

6.36.25 Repeat steps 6.36.18 through 6.36.24 substituting channel 'B' in place of channel 'A'.

_______ Value/Units
_______/_______
Date Technician

6.36.26 Repeat steps 6.36.18 through 6.36.24 substituting channel 'D' in place of channel 'A'.

_______ Value/Units
_______/_______
Date Technician

6.36.27 Reset all bistables.

_______/_______
Date Technician

6.36.28 Record the largest response time value of steps 6.36.22, 6.36.25, 6.36.26 in the "Data Collection Table."

_______/_______
Date Technician

6.0 PROCEDURE

6.36.29 In bay 5 of cabinet A (L034), move the optical pickup setup to terminals 43 and 45 on terminal strip 65. This monitors contacts on the solid state relay SSR1A. (CCAS)

__________/__________
Date Technician

6.36.30 In bay 5 of cabinet B (L035), move the optical pickup setup to terminals 43 and 45 on terminal strip 55. This monitors contacts on the solid state relay SSR1B. (CCAS)

__________/__________
Date Technician

6.36.31 Adjust the input simulator box potentiometer in channel 'A' corresponding to bistable number 18 until the bistable is tripped.

6.36.32 Ensure the toggle switch in the "Bistable Test" section of L151 is in the "OPEN" position.

__________/__________
Date Technician

6.36.33 Ensure the C-E test box timer and the channel 'C' bistable are both reset.

__________/__________
Date Technician

6.36.34 Place the "Bistable Test" section toggle switch on L151 in the "CLOSE" position. The timer should start.

__________/__________
Date Technician

6.36.35 Record the response time.

__________/__________
Date Technician

6.36.35 Adjust the input simulator box potentiometer in channel 'A' corresponding to bistable number 18 until the bistable input is returned to the value adjusted for in step 6.1.1.

6.0 PROCEDURE

6.36.37 Reset bistable number 13 in channel 'A'.

_______________/_______________
Date Technician

6.36.38 Repeat steps 6.36.31 through 6.36.37 substituting channel 'B' in place of channel 'A'.

_______________/_______________
Date Technician

6.36.39 Repeat steps 6.36.31 through 6.36.37 substituting channel 'D' in place of channel 'A'.

_______________/_______________
Date Technician

6.36.40 Reset all bistables.

_______________/_______________
Date Technician

6.36.41 Record the largest response time value of steps 6.36.35, 6.36.38, 6.36.39 in the "Data Collection Table".

_______________/_______________
Date Technician

6.36.42 In bay 6 of cabinet A (L034), move the optical pickup setup to terminals 25 and 27 on terminal strip 55. This monitors contacts on the mechanical relay MR1A. (SIAS)

_______________/_______________
Date Technician

6.36.43 In bay 5 of cabinet B (L035), move the optical pickup setup to terminals 25 and 27 on terminal strip 55. This monitors contacts on the mechanical relay MR1B. (SIAS)

_______________/_______________
Date Technician

6.36.44 Adjust the input simulator box potentiometer in channel 'A' corresponding to bistable number 18 until the bistable is tripped.

6.0 PROCEDURE

6.36.45 Ensure the toggle switch in the "Bistable Test" section of L151 is in the "OPEN" position.

Date / Technician

6.36.46 Ensure the C-E test box timer and the channel 'C' bistable are both reset.

Date / Technician

6.36.47 Place the "Bistable Test" section toggle switch on L151 in the "CLOSE position. The timer should start.

Date / Technician

6.36.48 Record the response time.

Volts
Value/Units   Date / Technician

6.36.49 Adjust the input simulator box potentiometer in channel 'A' corresponding to bistable number 18 until the bistable input is returned to the value adjusted for in step 6.1.1.

6.36.50 Reset bistable number 18 in channel 'A'.

Date / Technician

6.36.51 Repeat steps 6.36.44 through 6.36.50 substituting channel 'B' in place of channel 'A'.

Value/Units   Date / Technician

6.36.52 Repeat steps 6.36.44 through 6.36.50 substituting channel 'D' in place of channel 'A'.

Value/Units   Date / Technician

6.0 PROCEDURE

6.36.53 Disconnect the "Bistable Test" leads and replace the input simulator leads on the terminals they were removed from in step 6.36.1

Date / Technician

6.36.54 Reset all bistables.

Date / Technician

6.36.55 Record the largest response time value of steps 6.36.35, 6.36.33, 6.36.39 in the "Data Collection Table".

Date / Technician

6.37 Low SG-1 Flow to RTSG Response Time

NOTE: The following section measures the response time from the simulation of a trip signal into the Foxboro cabinet (using the PPS Response Time Test panel L151) to the time when the rotary relays trip. The C-E test box will be used as the response time measuring device.

6.37.1 Ensure the temporary LED's are installed across the rotary relay contacts per steps 6.19.1 through 6.19.3.

Date / Technician

6.37.2 Remove the PPS input simulator box leads from terminals 13 and 14 on TB-3 of L129.

Date / Technician

6.37.3 Connect the "Bistable Test" leads of L151 to terminals 13 and 14 on TB-3 of L129.

Date / Technician

6.0 PROCEDURE

6.37.4 On the bistable control panel being tested, rotate the bistable selector switch to position number 15.

Date / Technician

6.37.5 Rotate the meter input selector switch to the "TRIP SP" position.

Date / Technician

6.37.6 Record the value indicated on the bistable control panel digital indicator.

Volts
Value/Units

Date / Technician

6.37.7 Rotate the meter input selector switch to the "INPUT" position.

Date / Technician

6.37.8 In the "Bistable Test" section of L151 place the toggle switch in the "OPEN" position. The LED should extinguish.

Date / Technician

6.37.9 Adjust the "HIGH COARSE" and the "HIGH FINE" potentiometers in the "Bistable Test" section of L151 until the digital indicator at the bistable control panel reads approximately .1 VDC on the tripped side of the value recorded in step 6.37.6.

Date / Technician

6.37.10 In the "Bistable Test" section of L151, place the toggle switch in the "CLOSE" position. The LED should energize.

Date / Technician

6.0 PROCEDURE

6.37.11 Adjust the "LOW COARSE" and "LOW FINE" potentiometers in the "Bistable Test" section of L151 until the digital indicator at the bistable control panel reads 5.00 VDC ± .1 VDC.

_______________ / _______________
Date Technician

6.37.12 Record the adjusted voltage.

_______ Volts _______ / _______________
Value/Units Date Technician

6.37.13 Connect the optical end of a C-E test box pickup cable to the "Bistable Test" section LED of L151.

_______________ / _______________
Date Technician

6.37.14 Connect the other end of this pickup cable to the "LED 1" jacks in the "START LAMPS" section of the C-E test box.

_______________ / _______________
Date Technician

6.37.15 Connect the optical end of four pickup cables to the temporary LED's installed in steps 6.19.1 through 6.19.3.

_______________ / _______________
Date Technician

6.37.16 Connect the other end of these four pickup cables to the "L1", "L2", "L3" and "L4" jacks in the "STOP LAMPS" section of the C-E test box.

6.37.17 Energize the C-E test box and ensure the following switches are in the correct positions.

.1 "L1", "L2", "L3", "L4" stop lamps toggle switches are in the "ON" position.

_______________ / _______________
Date Technician

.2 "START LAMPS" toggle switch is in the "1/1" position.

_______________ / _______________
Date Technician

6.0 PROCEDURE

6.37.17.3 Start "TIMER MODES" switch is in the step down position.

______/______
Date Technician

.4 Stop "TIMER MODES" switch is in the step up position.

______/______
Date Technician

.5 "L5" and "L6" STOP LAMPS toggle switches are in the "OFF" position.

______/______
Date Technician

6.37.18 Adjust the input simulator box potentiometer in channel 'A' corresponding to bistable number 15 until the bistable is tripped.

______/______
Date Technician

6.37.19 Ensure the toggle switch in the "Bistable Test" section of L151 is in the "CLOSE" position.

______/______
Date Technician

6.37.20 Ensure the C-E test box timer is reset.

______/______
Date Technician

6.37.21 After the test equipment has stabilized, place the "Bistable Test" section toggle switch on L151 in the "OPEN" position. The timer should start.

______/______
Date Technician

6.37.22 Record the response time.

______ ______/______
Value/Units Date Technician

6.0 PROCEDURE

6.37.23 Adjust the input simulator box potentiometer in channel 'A' corresponding to bistable number 15 until the bistable input is returned to the value adjusted for in step 6.1.1.

6.37.24 Reset bistable number 15 in channel A.

______/______
Date Technician

6.37.25 Repeat steps 6.36.18 through 6.36.24 substituting channel 'B' in place of channel 'A'.

______ ______/______
Value/Units Date Technician

6.37.26 Repeat steps 6.37.18 through 6.37.24 substituting channel 'D' in place of channel 'A'.

______ ______/______
Value/Units Date Technician

6.37.27 Disconnect the "Bistable Test" leads and replace the input simulator leads on the terminals they were removed from in step 6.37.1

______/______
Date Technician

6.37.28 Reset all bistables.

______/______
Date Technician

6.37.29 Record the largest response time value of steps 6.37.22, 6.37.25, 6.37.26 in the "Data Collection Table".

______/______
Date Technician

6.0 PROCEDURE

6.38 Low SG-2 Flow to RTSG Response Time

NOTE: The following section measures the response time from the simulation of a trip signal into the Foxboro cabinet (using the PPS Response Time Test panel L151) to the time when the rotary relays trip. The C-E test box will be used as the response time measuring device.

6.38.1 Ensure the temporary LED's are installed across the rotary relay contacts per steps 6.19.1 through 6.19.3

_______ / _______
Date Technician

6.38.2 Remove the PPS input simulator box leads from terminals 19 and 20 on TB-3 of L129.

_______ / _______
Date Technician

6.38.3 Connect the "Bistable Test" leads of L151 to terminals 19 and 20 on TB-3 of L129.

_______ / _______
Date Technician

6.38.4 On the bistable control panel being tested, rotate the bistable selector switch to position number 16.

_______ / _______
Date Technician

6.38.5 Rotate the meter input selector switch to the "TRIP SP" position.

_______ / _______
Date Technician

6.38.6 Record the value indicated on the bistable control panel digital indicator.

_______ Volts
Value/Units

_______ / _______
Date Technician

6.38.7 Rotate the meter input selector switch to the "INPUT" position.

_______ / _______
Date Technician

6.0 PROCEDURE

6.38.8 In the "Bistable Test" section of L151, place the toggle switch in the "OPEN" position. The LED should extinguish.

______________ / ______________
Date Technician

6.38.9 Adjust the "HIGH COARSE" and the "HIGH FINE" potentiometers in the "Bistable Test" section of L151 until the digital indicator on the bistable control panel reads approximately .1 VDC on the tripped side of the value recorded in step 6.38.5.

______________ / ______________
Date Technician

6.38.10 In the "Bistable Test" section of L151, place the toggle switch in the "CLOSE" position. The LED should energize.

______________ / ______________
Date Technician

6.38.11 Adjust the "LOW COARSE" and "LOW FINE" potentiometers in the "Bistable Test" section of L151 until the digital indicator on the bistable control panel reads 5.00 VDC ± .1 VDC.

______________ / ______________
Date Technician

6.38.12 Record the adjusted voltage.

______________ Volts ______________ / ______________
Value/Units Date Technician

6.38.13 Connect the optical end of a C-E test box pickup cable to the "Bistable Test" section LED of L151.

______________ / ______________
Date Technician

6.38.14 Connect the other end of this pickup cable to the "LED 1" jacks in the "START LAMPS" section of the C-E test box.

______________ / ______________
Date Technician

6.0 PROCEDURE

6.38.15 Connect the optical end of four pickup cables to the temporary LED's installed in steps 6.19.1 through 6.19.3.

_______________/_______________
Date Technician

6.38.16 Connect the other end of these four pickup cables to the "L1", "L2", "L3" and "L4" jacks in the "STOP LAMPS" section of the C-E test box.

6.38.17 Energize the C-E test box and ensure the following switches are in the correct positions.

.1 "L1", "L2", "L3", "L4" stop lamps toggle switches are in the "ON" position.

_______________/_______________
Date Technician

.2 "START LAMPS" toggle switch is in the "1/1" position.

_______________/_______________
Date Technician

.3 Start "TIMER MODES" switch is in the step down position.

_______________/_______________
Date Technician

.4 Stop "TIMER MODES" switch is in the step up position.

_______________/_______________
Date Technician

.5 "L5" and "L5" stop lamps toggle switches are in the "OFF" position.

_______________/_______________
Date Technician

6.38.18 Adjust the input simulator box potentiometer in channel 'A' corresponding to bistable number 15 until the bistable is tripped.

_______________/_______________
Date Technician

6.0 PROCEDURE

6.38.19 Ensure the toggle switch in the "Bistable Test" section of L151 is in the "CLOSED" position.

Date / Technician

6.38.20 Ensure the C-E test box timer is reset.

Date / Technician

6.38.21 After the test equipment has stabilized, place the "Bistable Test" section toggle switch on L151 in the "OPEN" position. The timer should start.

Date / Technician

6.38.22 Record the response time.

Value/Units Date / Technician

6.38.23 Adjust the input simulator box potentiometer in channel 'B' corresponding to bistable number 16 until the bistable input is returned to the value adjusted for in step 6.1.1.

6.38.24 <u>Reset bistable number 16 in channel 'A'</u>.

Date / Technician

6.38.25 Repeat steps 6.38.18 through 6.38.24 substituting channel 'C' in place of channel 'A'.

Value/Units Date / Technician

6.38.26 Repeat steps 6.38.18 through 6.38.24 substituting channel 'D' in place of channel 'A'.

Value/Units Date / Technician

6.0 PROCEDURE

6.38.27 Disconnect the "Bistable Test" leads and replace the input simulator leads on the terminals they were removed from in step 6.38.1

______________/______________
Date   Technician

6.38.28 Reset all bistables.

______________/______________
Date   Technician

6.38.29 Record the largest response time value of steps 6.38.22, 6.38.25, 6.38.25 in the "Data Collection Table".

______________/______________
Date   Technician

6.39 High-High Containment Pressure to ESFAS Response Time

NOTE: The following section measures the response time from the simulation of a trip signal into the Foxboro cabinet (using the PPS Response Time Test panel L151) to the time when the solid state relays trip. The C-E test box will be used as the response time measuring device.

6.39.1 Remove the input simulator box leads from terminals 49 and 50 on TB-1 of L129.

______________/______________
Date   Technician

6.39.2 Connect the "Bistable Test" leads of L151 to terminals 49 and 50 on TB-1 of L129.

______________/______________
Date   Technician

6.39.3 In bay 6 of cabinet A (L034), connect an LED jumper cable in series with a six VDC power supply across terminals 46 and 48 on terminal strip TB65. This monitors contacts on the solid state relay SSR1A (CCAS)

______________/______________
Date   Technician

6.0 PROCEDURE

6.39.11 Rotate the meter input selector switch to the "INPUT" position.

Date / Technician

6.39.12 In the "Bistable Test" section of L151, place the toggle switch in the "OPEN" position. The LED should extinguish.

Date / Technician

6.39.13 Adjust the "HIGH COARSE" and the "HIGH FINE" potentiometers in the "Bistable Test" section of L151 until the digital indicator at the bistable control panel reads 1.00 VDC ± .1 VDC.

Date / Technician

6.39.14 In the "Bistable Test" section of L151, place the toggle switch in the "CLOSED" position. The LED should energize.

Date / Technician

6.39.15 Adjust the "LOW COARSE" and "LOW FINE" potentiometers in the "Bistable Test" section of L151 until the digital indicator on the bistable control panel reads approximately .1 VDC on the tripped side of the value recorded in step 6.39.10.

Date / Technician

6.39.16 Record the adjusted voltage.

Volts
Value/Units Date / Technician

6.39.17 Energize the C-E test box and ensure the following switches are in the correct positions.

6.0 PROCEDURE

6.39.17.1 "L1" and "L2" stop lamps toggle switches are in the "ON" position.

_______ / _______
Date Technician

.2 "L3", "L4", "L5" and "L6" stop lamps toggle switches are in the "OFF" position.

_______ / _______
Date Technician

.3 "START LAMPS" toggle switch is in the "1/1" position.

_______ / _______
Date Technician

.4 Start "TIMER MODES" switch is in the step up position.

_______ / _______
Date Technician

.5 Stop "TIMER MODES" switch is in the step up position.

_______ / _______
Date Technician

6.39.18 Adjust the input simulator box potentiometer in channel 'A' corresponding to bistable number 19 until the bistable is tripped.

_______ / _______
Date Technician

6.39.19 Ensure the toggle switch in the "Bistable Test" section of L151 is in the "OPEN" position.

_______ / _______
Date Technician

6.39.20 Ensure the C-E test box timer is reset.

_______ / _______
Date Technician

6.0 PROCEDURE

6.39.21 After the test equipment has stabilized, place the "Bistable Test" section toggle switch on L151 in the "CLOSE" position. The timer should start.

Date / Technician

6.39.22 Record the response time.

Value/Units Date / Technician

6.39.23 Adjust the input simulator box potentiometer in channel 'A' corresponding to bistable number 19 until the bistable input is returned to the value adjusted for in step 6.1.1.

6.39.24 Reset bistable number 19 in channel 'A'.

Date / Technician

6.39.25 Repeat steps 6.39.18 through 6.39.24 substituting channel 'C' in place of channel 'B'.

Value/Units Date / Technician

6.39.26 Repeat steps 6.39.18 through 6.39.24 substituting channel 'D' in place of channel 'B'.

Value/Units Date / Technician

6.39.27 Disconnect the "Bistable Test" leads and replace the input simulator leads on the terminals they were removed from in step 6.39.1.

Date / Technician

6.39.28 Reset all bistables.

Date / Technician

6.0 PROCEDURE

6.39.29 Record the largest response time value of steps 6.39.22, 6.39.25, 6.39.26 in the "Data Collection Table."

Date / Technician

6.40 Low RWT Level to ESFAS Response Time

NOTE: The following section measures the response time from the simulation of a trip signal into the Foxboro cabinet (using the PPS Response Time Test panel L151) to the time when the solid state relays trip. The C-E test box will be used as the response time measuring device.

6.40.1 Remove the input simulator box leads from terminals 30 and 31 on T3-1 of L129.

Date / Technician

6.40.2 Connect the "Bistable Test" leads of L151 to terminals 30 and 31 on T3-1 of L129.

Date / Technician

6.40.3 In bay 6 of cabinet A (L034), connect an LED jumper cable in series with a six VDC power supply across terminals 31 and 33 on terminal strip TB65. This monitors contacts on the solid state relay SSR1A. (RAS)

Date / Technician

6.40.4 In bay 5 of cabinet B (L035), connect an LED jumper cable in series with a six volt DC power supply across terminals 31 and 33 on terminal strip TB55. This monitors contacts on the solid state relay SSR1B. (RAS)

Date / Technician

6.40.5 Connect the optical end of a stop cable to the LED installed in step 6.40.3 and connect the double banana plug end to the "L1" jacks of the C-E test box.

Date / Technician

6.0 PROCEDURE

6.40.6 Connect the optical end of a second stop cable to the LED installed in step 6.40.4 and connect the double banana plug end to the "L2" jacks of the C-E test box.

_______________ / _______________
Date Technician

6.40.7 Connect the optical end of a start cable to the LED installed in the "Bistable Test" section of L151 and connect the double banana plug end to the "LED 1" jacks on the C-E test box.

_______________ / _______________
Date Technician

6.40.8 On the channel 'C' bistable control panel, rotate the bistable selector switch to position number 20.

_______________ / _______________
Date Technician

6.40.9 Rotate the meter input selector switch to the "TRIP SP" position.

_______________ / _______________
Date Technician

6.40.10 Record the value indicated on the bistable control panel digital indicator.

_______________ Volts _______________ / _______________
Value/Units Date Technician

6.40.11 Rotate the meter input selector switch to the "INPUT" position.

_______________ / _______________
Date Technician

6.40.12 In the "Bistable Test" section of L151, place the toggle switch in the "OPEN" position. The LED should extinguish.

_______________ / _______________
Date Technician

6.0 PROCEDURE

6.40.13 Adjust the "HIGH COARSE" and the "HIGH FINE" potentiometers in the "Bistable Test" section of L151 until the digital indicator at the bistable control panel reads 2.50 VDC ± .1 VDC.

______________/______________
Date Technician

6.40.14 In the "Bistable Test" section of L151, place the toggle switch in the "CLOSED" position. The LED should energize.

______________/______________
Date Technician

6.40.15 Adjust the "LOW COARSE" and "LOW FINE" potentiometers in the "Bistable Test" section of L151 until the digital indicator on the bistable control panel reads approximately .1 VDC on the tripped side of the value recorded in step 6.40.10.

______________/______________
Date Technician

6.40.15 Record the adjusted voltage.

______________Volts ______________/______________
Value/Units Date Technician

6.40.17 Energize the C-E test box and ensure the following switches are in the correct positions.

.1 "L1" and "L2" stop lamps toggle switches are in the "ON" position.

______________/______________
Date Technician

.2 "L3", "L4", "L5" and "L6" stop lamps toggle switches are in the "OFF" position.

______________/______________
Date Technician

.3 "START LAMPS" toggle switch is in the "1/1" position.

______________/______________
Date Technician

6.0 PROCEDURE

6.40.17.4 Start "TIMER MODES" switch is in the step up position.

Date / Technician

.5 Stop "TIMER MODES" switch is in the step up position.

Date / Technician

6.40.18 Adjust the input simulator box potentiometer in channel 'A' corresponding to bistable number 20 until the bistable is tripped.

Date / Technician

6.40.19 Ensure the toggle switch in the "Bistable Test" section of L151 is in the "OPEN" position.

Date / Technician

6.40.20 Ensure the C-E test box timer is reset.

Date / Technician

6.40.21 After the test equipment has stabilized, place the "Bistable Test" section toggle switch on L151 in the "CLOSE" position. The timer should start.

Date / Technician

6.40.22 Record the response time.

Value/Units Date / Technician

6.40.23 Adjust the input simulator box potentiometer in channel 'A' corresponding to bistable number 20 until the bistable input is returned to the value adjusted for in step 6.1.1.

6.0 PROCEDURE

6.40.24 Reset bistable number 20 in channel 'B'.

Date / Technician

6.40.25 Repeat steps 6.40.18 through 6.40.24 substituting channel 'B' in place of channel 'A'.

Value/Units   Date / Technician

6.40.26 Repeat steps 6.40.18 through 6.40.24 substituting channel 'D' in place of channel 'A'.

Value/Units   Date / Technician

6.40.27 Disconnect the "Bistable Test" leads and replace the input simulator leads on the terminals they were removed from in step 6.40.1

Date / Technician

6.40.28 Reset all bistables.

Date / Technician

6.40.29 Record the largest response time value of steps 6.40.22, 6.40.25, 6.40.26 in the "Data Collection Table".

Date / Technician

6.41 High SG-1 Differential Pressure to ESFAS Response Time

NOTE: The following section measures the response time from the simulation of a trip signal into the Foxboro cabinet (using the PPS Response Time Test panel L151) to the time when the solid state relays trip. The C-E test box will be used as the response time measuring device.

6.0 PROCEDURE

6.41.1 Remove the input simulator box leads from terminals 36 and 37 on TB-1 of L129.

____________/____________
Date Technician

6.41.2 Connect the "Bistable Test" leads of L151 to terminals 36 and 37 on TB-1 of L129.

____________/____________
Date Technician

6.41.3 In bay 6 of cabinet A (L034), connect an LED jumper cable in series with a six VDC power supply across terminals 37 and 39 on terminal strip TB65. This monitors contacts on the solid state relay SSR1A. (EFAS-1)

____________/____________
Date Technician

6.41.4 In bay 5 of cabinet B (L035), connect an LED jumper cable in series with a six volt DC power supply across terminals 37 and 39 on terminal strip TB55. This monitors contacts on the solid state relay SSR1B. (EFAS-1)

____________/____________
Date Technician

6.41.5 Connect the optical end of a stop cable to the LED installed in step 6.30.3 and connect the double banana plug end to the "L1" jacks of the C-E test box.

____________/____________
Date Technician

6.41.6 Connect the optical end of a second stop cable to the LED installed in step 6.40.4 and connect the double banana plug end to the "L2" jacks of the C-E test box.

____________/____________
Date Technician

6.0 PROCEDURE

6.41.7 Connect the optical end of a start cable to the LED installed in the "Bistable Test" section of L151 and connect the double banana plug end to the "LED 1" jacks on the C-E test box.

_______ / _______
Date Technician

6.41.8 On channel 'C' bistable control panel, rotate the bistable selector switch to position number 21.

_______ / _______
Date Technician

6.41.9 Rotate the meter input selector switch to the "TRIP SP" position.

_______ / _______
Date Technician

6.41.10 Record the value indicated on the bistable control panel digital indicator.

_______ Volts _______ / _______
Value/Units Date Technician

6.41.11 Rotate the meter input selector switch to the "INPUT" position.

_______ / _______
Date Technician

6.41.12 In the "Bistable Test" section of L151, place the toggle switch in the "OPEN" position. The LED should extinguish.

_______ / _______
Date Technician

6.41.13 Adjust the "HIGH COARSE" and the "HIGH FINE" potentiometers in the "Bistable Test" section of L151 until the digital indicator at the bistable control panel reads 3.70 VDC ± .1 VDC.

_______ / _______
Date Technician

6.0 PROCEDURE

6.41.14 In the "Bistable Test" section of L151, place the toggle switch in the "CLOSED" position. The LED should energize.

Date / Technician

6.41.15 Adjust the "LOW COARSE" and "LOW FINE" potentiometers in the "Bistable Test" section of L151 until the digital indicator on the bistable control panel reads approximately the sum of: .1 VDC plus the input value of position 22 plus the value recorded in step 6.41.10.

Date / Technician

6.41.16 Record the adjusted voltage.

Volts
Value/Units Date / Technician

6.41.17 Energize the C-E test box and ensure the following switches are in the correct positions.

.1 "L1" and "L2" stop lamps toggle switches are in the "ON" position.

Date / Technician

.2 "L3", "L4", "L5" and "L6" stop lamps toggle switches are in the "OFF" position.

Date / Technician

.3 "START LAMPS" toggle switch is in the "1/1" position.

Date / Technician

.4 Start "TIMER MODES" switch is in the step up position.

Date / Technician

6.0 PROCEDURE

6.41.17.5 Stop "TIMER MODES" switch is in the step up position.

_____ / _____
Date Technician

6.41.18 Adjust the input simulator box potentiometer in channel 'A' corresponding to bistable number 21 until the bistable is tripped.

_____ / _____
Date Technician

6.41.19 Ensure the toggle switch in the "Bistable Test" section of L151 is in the "OPEN" position.

_____ / _____
Date Technician

6.41.20 Ensure the C-E test box timer is reset.

_____ / _____
Date Technician

6.41.21 After the test equipment has stabilized, place the "Bistable Test" section toggle switch on L151 in the "CLOSE" position. The timer should start.

_____ / _____
Date Technician

6.41.22 Record the response time.

_____ _____ / _____
Value/Units Date Technician

6.41.23 Adjust the input simulator box potentiometer in channel 'A' corresponding to bistable number 21 until the bistable input is returned to the value adjusted for in step 6.1.1.

6.41.24 Reset bistable number 21 in channel 'A'.

_____ / _____
Date Technician

6.0 PROCEDURE

6.41.25 Repeat steps 6.41.18 through 6.41.24 substituting channel 'B' in place of channel 'A'.

__________ Value/Units __________ Date / Technician

6.41.26 Repeat steps 6.41.18 through 6.41.24 substituting channel 'D' in place of channel 'A'.

__________ Value/Units __________ Date / Technician

6.41.27 Disconnect the "Bistable Test" leads and replace the input simulator leads on the terminals they were removed from in step 6.41.1

__________ Date / Technician

6.41.28 Reset all bistables.

__________ Date / Technician

6.41.29 Record the largest response time value of steps 6.41.22, 6.41.25, 6.41.26 in the "Data Collection Table".

__________ Date / Technician

6.42 High SG-2 Differential Pressure to ESFAS Response Time

NOTE: The following section measures the response time from the simulation of a trip signal into the Foxboro cabinet (using the PPS Response Time Test panel L151) to the time when the solid state relays trip. The C-E test box will be used as the response time measuring device.

6.42.1 Remove the input simulator box leads from terminals 33 and 34 on TB-1 of L129.

__________ Date / Technician

6.0 PROCEDURE

6.42.2 Connect the "Bistable Test" leads of L151 to terminals 33 and 34 on TB-1 of L129.

____________/____________
Date Technician

6.42.3 In bay 6 of cabinet A (L034), connect an LED jumper cable in series with a six VDC power supply across terminals 40 and 42 on terminal strip TB65. This monitors contacts on the solid state relay SSR1A. (EFAS-2)

____________/____________
Date Technician

6.42.4 In bay 5 of cabinet B (L035), connect an LED jumper cable in series with a six volt DC power supply across terminals 40 and 42 on terminal strip TB55. This monitors contacts on the solid state relay SSR1B. (EFAS-2)

____________/____________
Date Technician

6.42.5 Connect the optical end of a stop cable to the LED installed in step 6.42.3 and connect the double banana plug end to the "L1" jacks of the C-E test box.

____________/____________
Date Technician

6.42.6 Connect the optical end of a second stop cable to the LED installed in step 6.42.4 and connect the double banana plug end to the "L2" jacks of the C-E test box.

____________/____________
Date Technician

6.42.7 Connect the optical end of a start cable to the LED in the "Bistable Test" section of L151 and connect the double banana plug end to the "LED 1" jacks on the C-E test box.

____________/____________
Date Technician

6.0 PROCEDURE

6.42.8 On channel 'C' bistable control panel, rotate the bistable selector switch to position number 22.

Date / Technician

6.42.9 Rotate the meter input selector switch to the "TRIP SP" position.

Date / Technician

6.42.10 Record the value indicated on the bistable control panel digital indicator.

Volts
Value/Units Date / Technician

6.42.11 Rotate the meter input selector switch to the "INPUT" position.

Date / Technician

6.42.12 In the "Bistable Test" section of L151, place the toggle switch in the "OPEN" position. The LED should extinguish.

Date / Technician

6.42.13 Adjust the "HIGH COARSE" and the "HIGH FINE" potentiometers in the "Bistable Test" section of L151 until the digital indicator at the bistable control panel reads 3.70 VDC ± .1 VDC.

Date / Technician

6.42.14 In the "Bistable Test" section of L151, place the toggle switch in the "CLOSED" position. The LED should energize.

Date / Technician

6.0 PROCEDURE

6.42.15 Adjust the "LOW COARSE" and "LOW FINE" potentiometers in the "Bistable Test" section of L151 until the digital indicator on the bistable control panel reads approximately the sum of: .1 VDC plus the input value of position 21 plus value recorded in step 6.42.10.

______________/______________
Date Technician

6.42.16 Record the adjusted voltage.

______________ Volts ______________/______________
Value/Units Date Technician

6.42.17 Energize the C-E test box and ensure the following switches are in the correct positions.

.1 "L1" and "L2" stop lamps toggle switches are in the "ON" position.

______________/______________
Date Technician

.2 "L3", "L4", "L5" and "L6" stop lamps toggle switches are in the "OFF" position.

______________/______________
Date Technician

.3 "START LAMPS" toggle switch is in the "1/1" position.

______________/______________
Date Technician

.4 Start "TIMER MODES" switch is in the step up position.

______________/______________
Date Technician

.5 Stop "TIMER MODES" switch is in the step up position.

______________/______________
Date Technician

6.0 PROCEDURE

6.42.18 Adjust the input simulator box potentiometer in channel 'A' corresponding to bistable number 22 until the bistable is tripped.

_______________ / _______________
Date Technician

6.42.19 Ensure the toggle switch in the "Bistable Test" section of L151 is in the "OPEN" position.

_______________ / _______________
Date Technician

6.42.20 Ensure the C-E test box timer is reset.

_______________ / _______________
Date Technician

6.42.21 After the test equipment has stabilized, place the "Bistable Test" section toggle switch on L151 in the "CLOSE" position. The timer should start.

_______________ / _______________
Date Technician

6.42.22 Record the response time.

_______________ _______________ / _______________
Value/Units Date Technician

6.42.23 Adjust the input simulator box potentiometer in channel 'A' corresponding to bistable number 22 until the bistable input is returned to the value adjusted for in step 6.1.1.

6.42.24 Reset bistable number 22 in channel 'A'.

_______________ / _______________
Date Technician

6.42.25 Repeat steps 6.42.18 through 6.42.24 substituting channel 'B' in place of channel 'A'.

_______________ _______________ / _______________
Value/Units Date Technician

6.0 PROCEDURE

6.42.26 Repeat steps 6.42.18 through 6.42.24 substituting channel 'D' in place of channel 'A'.

_______________ Value/Units _______ Date / Technician _______

6.42.27 Disconnect the "Bistable Test" leads and replace the input simulator leads on the terminals they were removed from in step 6.42.1

_______ Date / Technician _______

6.42.28 Reset all bistables.

_______ Date / Technician _______

6.42.29 Record the largest response time value of steps 6.42.22, 6.42.25, 6.42.26 in the "Data Collection Table".

_______ Date / Technician _______

6.42.30 After completing the "DATA COLLECTION TABLE", use the data to fill in the "RESPONSE TIME TABLE" and verify that the total response time value meets the technical specifications listed on table 3.3-2.

NOTE: The ESFAS field component response time values will be supplied by engineering personnel.

NOTE: If more than one combination of integral response times exist for a given function, use the most conservative (longest) response time value when filling in the time response table.

6.43 Restoration

6.43.1 Disconnect all test boxes and reconnect proper leads to terminals.

_______ Date / Technician _______

6.0 PROCEDURE

6.43.2 Reconnect P34 and P35 in all four channels.

_______________/_______________
Date Technician

6.43.3 Verify the RPS/ESFAS per press bypass is enabled on all four channels.

_______________/_______________
Date Technician

6.43.4 Verify the DNBR/LOCAL POWER DENSITY BYPASS is enabled on all four channels.

_______________/_______________
Date Technician

6.43.5 Verify the LOSS OF LOAD BYPASS is enabled on all four channels.

_______________/_______________
Date Technician

6.43.6 Verify the HI LOG POWER BYPASS is <u>not</u> enabled on any channel.

_______________/_______________
Date Technician

6.43.7 Verify the TEST POWER SUPPLY is deenergized.

_______________/_______________
Date Technician

6.43.8 Step the variable SG pressure setpoint down to its minimum to clear the LO SG PRESS trips.

NOTE: Depending on actual RWT level and steam generator levels, it may not be possible to clear the LOW SG LEVEL and LOW RWT LEVEL trips.

6.43.9 Verify no bistable Pretrip, Trip, or Bypass lights are energized on any of the four channels.

_______________/_______________
Date Technician

6.0 PROCEDURE

6.43.10 Verify all PPS bay doors are closed and locked.

_____ / _____
Date Technician

6.43.11 Remove all jumpers that were installed in step 6.1.4 and unisolate all the field wiring that was isolated in step 6.1.4.

_____ / _____
Date Technician

6.43.12 Inform the watch engineer that the test has been completed.

_____ / _____
Date Technician

7.0 RECORDS

7.1 On completion of this test, this procedure shall be signed by the technician and responsible Instrument Foreman. The Supervisor of Nuclear Plant Instrumentation shall review and approve the data.

7.2 Transfer of data shall be made to the CDM Center per SO23-IC-4 on completion of this test. Copies of this procedure may be made for retention in the Instrument and Test Shop Files.

7.3 List the test equipment as instructed in Step 3.5.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

7.0 RECORDS

7.4 Record the date test completed ____________________

Technician(s) ____________ ________ ________

Foreman ____________________

Approved by ______ ____________ Date ____________

Remarks ______________________________

____

____

8.0 ATTACHMENTS

8.1 Data Collection Tables (11 pages)

8.2 Drawings and Diagrams (7 pages)

8.3 Pressure Transient Information (Appendix C) (1 pages)

8.4 Rotary Select Switch Positions (Appendix D) (3 pages)

8.5 ESFAS Actuation Relays Electrical Lineup (Appendix E) (4 pages)

8.6 ESFAS Actuation Relays (Appendix F) (3 pages)

8.7 ESFAS Interposing Relays (Appendix G) (1 page)

8.8 CPC/CEAC Response Time Test (Appendix H) (9 pages)

8.9 Valid User Entries (Table H1) (5 pages)

8.10 RTT Part 2 CPC Sample Run (2 pages)

8.11 CPC Point ID Assignments (Table H2) (3 pages)

8.12 CPC Point ID Assignments (Table H3) (8 pages)

Baron Katz

B. KATZ
Station Technical Manager

VSteinman:1954b/mr
Continued from 1953b

DATA COLLECTION TABLE

STEP NO.	DESCRIPTION	VALUE	UNITS
6.2.12	PT-0101-1 High Pzr Press		
6.3.12	PT-0102-1 Low Pzr Press		
6.4.12	PT-1013-1 Low SG-1 Press		
6.5.12	PT-1023-1 Low SG-2 Press		
6.6.12	LT-1113-1 Low SG-1 Level		
6.7.12	LT-1123-1 Low SG-2 Level		
6.8.12	PT-0351-1 High Cont. Press		
6.9.12	PT-0352-1 High High Cont. Press		
6.10.12	LT-0305-1 Low RWT Level		
6.11.12	PDT-0978-1 Low SG-1 Flow		
6.12.12	PDT-0979-1 Low SG-2 Flow		
6.14.16	TE-0112-1		
6.15.16	TE-9178-1		
6.16.16	TE-0122-1		
6.17.16	TE-9179-1		
6.18.4	RTSG Uncorrected		
6.19.35	High Linear Power to RTSG		
6.20.13	High Log Bistable to RTSG		
6.20.28	High Log Preamp		
6.22.2.20	Low Temperature TT112CA		
6.22.2.40	Low Temperature TT122CA		
6.22.2.60	High Temperature TT112HA		
6.22.2.80	High Temperature TT122HA		
6.22.3.21	Pzr Pressure		
6.22.4.28	Ex core Power		
6.22.5.23	ST 113A W1 RCP Speed		
6.22.5.46	ST 123 W2 RCP Speed		
6.22.5.58	ST 133 W3 RCP Speed		
6.22.6.19	ST 143 W4 RCP Speed		
6.23.29	High Pzr Press to RTSG		
6.24.29	Low Pzr Press to RTSG		
6.25.28	Low Pzr Press to SIAS		
6.25.42	Low Pzr Press to CCAS		
6.26.29	Low SG-1 Level to RTSG		
6.27.29	Low SG-1 Level to EFAS-1		
6.28.29	Low SG-2 Level to RTSG		
6.29.29	Low SG-2 Level to EFAS-2		
6.30.29	Low SG-1 Press to RTSG		
6.31.29	Low SG-1 Press to MSIS		
6.32.29	Low SG-2 Press to RTSG		
6.33.29	Low SG-2 Press to MSIS		
6.34.29	High Cont. Press to RTSG		
6.35.28	High Cont. Press to CIAS		
6.35.41	High Cont. Press to CCAS		
6.35.55	High Cont. Press to SIAS		

DATA COLLECTION TABLE

(Continued)

STEP NO.	DESCRIPTION	VALUE	UNITS
6.36.29	Low SG-1 Flow to RTSG		
6.37.29	Low SG-2 Flow to RTSG		
6.38.29	High-High Cont. Press to CSAS		
6.39.29	Low RWT Level to RAS		
6.40.29	HighΔP SG-1 to EFAS-1		
6.41.29	HighΔP SG-2 to EFAS-2		

TRAIN A

1. Pressurizer Pressure-Low

a. SIAS
(1). Safety Injection
a. High Pressure Safety Injection

Field Comp.	Rec. Time	Test No.	Relay Time	Test No.	Total Time
*P017					
*P018					
*HV-9324					
*HV-9327					
*HV-9330					
*HV-9333					

b. Low Pressure Safety Injection
*P015
*HV-9325
*HV-9328

3. Containment Isolation
Emerg. Diesel Start Delay of 10 sec + Instr. and Logic Response Only

4. Containment Spray (pumps)

*P-012
*HV-6501

5. Containment Emergency Cooling

a. Field Comp.	Rec. Time	Test No.	Relay Time	Test No.	Total Time
a. CCW. Pumps					
*P-024					
*P-025					

b. C.C.W. Valves
HV-6212
HV-6218
HV-6366
HV-6367
HV-6370
HV-6371

c. Emergency Cooling Fans

A-071
A-074
* E-399
* E-401

3. Containment Pressure High

a. SIAS (see Pressurizer Pressure Low)
b. CIAS
(1.) Containment Isolation (See Items)

4. Containment Pressure High High

a. CSAS
(1) Containment Spray
* HV-9367

5. Steam Generator Pressure Low

Field Comp.	Rec. Time	Test No.	Relay Time	Test No.	Total Time
a. MSIS					
(1) Main Steam Isolation (MSIV)					
HV-8204					
HV-8205					
(2) Main Feedwater Isolation					
HV-4048					
HV-4052					

6. Refueling Water Storage Tank

a. RAS
(1) Containment Sump Valves Open
* HV-9303
* HV-9305
(2) ECCS Miniflow Valves Shut
* HV-9306
* HV-9307

7. 4.16 KV. Emergency Bus Undervoltage
a. LOV (Loss of voltage and degraded voltage)

8. Steam Generator #1 Level-Low

Field Comp.	Rec. Time	Test No.	Relay Time	Test No.	Total Time
Aux. F.W. AC Train EFAS					
HV-4713					
HV-4731					
Aux. F.W. DC Train EFAS					
P-141					
HV-4730					
HV-4716					
HV-4705					
HV-8201					
HV-4054					

TRAIN B

1. Pressurizer Pressure-Low

a. SIAS
(1). Safety Injection
a. High Pressure Safety Injection

Field Comp. Rec. Time Test No. Relay Time Test No. Total Time
- * P019

- * HV-9323
- * HV-9326
- * HV-9329
- * HV-9333

b. Low Pressure SAfety Injection

- * P016
- * HV-9322
- * HV-9331

3. Containment Isolation
Emerg. Diesel Start Delay of 10 Sec + Instr. and Logic Response Only

4. Containment Spray (Pumps)

- * P-013
- * HV-6500

5. Containment Emergency Cooling

a. Field Comp. Rec. Time Test No. Relay Time Test No. Total Time
a. CCW. Pumps
*P-026

b. C.C.W. Valves
HV-6213
HV-6219
HV-6368
HV-6369
HV-6372
HV-6373

c. Emergency Cooling Fans

A-072
A-073
- * E-400
- * E-402

3. Containment Pressure High

a. SIAS (see Pressurizer Pressure Low)
b. CIAS
(1.) Containment Isolation (See Items)

4. Containment Pressure High High

a. CSAS
(1) Containment Spray
- * HV-9368

5. Steam Generator Pressure Low

Field Comp.	Rec. Time	Test No.	Relay Time	Test No.	Total Time
a. MSIS					
(1) Main Steam Isolation (MSIV)					
HV-8204					
HV-8205					
(2) Main Feedwater Isolation					
HV-4048					
HV-4052					

6. Refueling Water Storage Tank

a. RAS
(1) Containment Sump Valves Open
* HV-9302
* HV-9304
(2) ECCS Miniflow Valves Shut
* HV-9347
* HV-9348

7. 4.16 KV. Emergency Bus Undervoltage
a. LOV (Loss of voltage and degraded voltage)

8. Steam Generator #2 Level-Low

Field Comp.	Rec. Time	Test No.	Relay Time	Test No.	Total Time
Aux. F.W. AC Train EFAS					
P-145					
HV-4715					
HV-4706					
HV-4716					
HV-4712					
HV-4714					
Aux. F.W. DC Train EFAS					
HV-8200					
HV-4053					
P-504					

RESPONSE TIME TABLE

Reactor Trips

Function	Sensor	Trip Unit to RISG	RISG (Corrected)	Total Response Time	Tech. Spec. Accept. Crit.	Verified Initial/Date
Linear Power High		≤ .40 sec*				
Log Pwr High		≤ .45 sec*				
PZR Press High		≤ .90 sec				
PZR Press Low		≤ .90 sec				
Cntmt. Press High		≤ .90 sec				
SG-1 Press Low		≤ .90 sec				
SG-2 Press Low		≤ .90 sec				
SG-1 LVL Low		≤ .90 sec				
SG-2 LVL Low		≤ .90 sec				
SG-1 Low Flow		≤ .90 sec				
SG-2 Low Flow		≤ .90 sec				

FOOTNOTES:

*Neutron detectors are exempt from response time testing. Response time of the neutron flux signal portion of the channel shall be measured from detector output or input of first electronic component in channel.

**Response time shall be measured from the onset of a single CEA drop.

#Response time shall be measured from the onset of a 2 out of 4 Reactor Coolant Pump coastdown.

##Response time shall be measured from the output of the sensor. RTD response time shall be measured at least once per 18 months by means of the Loop Current Step Response (LCSR) method. The measured R of the slowest RTD shall be less than or equal to 6.0 seconds.

###Response time shall be measured from the output of the pressure transmitter. The transmitter response time constant shall be less than or equal to 0.7 seconds where the pressure transmitter response time is equivalent to the time interval required for the transmitter to achieve 63.2% of its total change when subjected to a step change in pressure transmitter pressure.

RESPONSE TIME TABLE (Continued)

Reactor Trips

Function	CPC Signal Processing	RTSG (Corrected)	Total Response Time	Tech. Spec. Accept. Crit.	Verified Initial/Date
Local Power Density Hi					
1. Ex-Core Detectors				.68 sec*	
2. CEA Positions				.53 sec**	
DNBR Low					
1. Ex-Core Detectors				.68 sec*	
2. CEA Position				.53 sec**	
3. Cold Leg Temp.				.68 sec##	
4. Hot Leg Temp.				.68 sec##	
5. RC Pump Shaft Speed				.68 sec#	
6. PRSRZR Pressure				.68 sec###	

NOTE: Cold and Hot Leg Temperature sensors are response time tested on a stand alone basis. Record the time constants separately.

		acceptance criteria	Verified
1. Cold Leg Temp. sensors	____________ value/units	5.4 sec	____________ initial/date
2. Hot Leg Temp. sensors	____________ value units	5.4 sec	____________ initial/date

FOOTNOTES:

*Neutron detectors are exempt from response time testing. Response time of the neutron flux signal portion of the channel shall be measured from detector output or input of first electronic component in channel.

**Response time shall be measured from the onset of a single CEA drop.

#Response time shall be measured from the onset of a 2 out of 4 Reactor Coolant Pump coastdown.

##Response time shall be measured from the output of the sensor. RTD response time shall be measured at least once per 18 months by means of the Loop Current Step Response (LCSR) method. The measured R of the slowest RTD shall be less than or equal to 6.0 seconds.

###Response time shall be measured from the output of the pressure transmitter. The transmitter response time constant shall be less than or equal to 0.7 seconds where the pressure transmitter response time is equivalent to the time interal required for the transmitter to achieve 63.2% of its total change when subjected to a step change in pressure transmitter pressure.

RESPONSE TIME TABLE

ESFAS

Function	Sensor	Trip Unit to ESFAS	Field Components	Total Response Time	Tech. Spec. Accept. Crit.	Verified Initial/Date
PZR Press Low HPSI					≤ 31.2 sec*	
PZR Press Low LPSI					≤ 41.2 sec*	
PZR Press Low Cntmt. Isol.					≤ 11.2 sec* Note 2 and 3	
PZR Press Low Cntmt. Spray Pumps					≤ 25.6 sec*	
PZR Press Low CCW Pumps					≤ 31.2 sec*	
PZR Press Low CCW Valves					≤ 21.2 sec Note 4a ≤ 23.2 sec Note 4b	
PZR Press Low Emer. Clg. Fans					≤ 21.2 sec*	
Cntmt. Press High HPSI					≤ 41.0 sec*	
Cntmt. Press High LPSI					≤ 41.0 sec*	
Cntmt. Press High Cntmt. Spray Pumps					≤ 25.4 sec*	
Cntmt. Press High CCW Pumps					≤ 31.0 sec*	

FOOTNOTES:

1. Response times include movement of valves and attainment of pump or blower discharge pressure as applicable.

* Emergency diesel generator starting delay (10 sec.) and sequence loading delays for SIAS are included.

2. Response time includes emergency diesel generator starting delay (applicable to AC motor operated valves other than containment purge valves), instrumentation and logic response only. Refer to table 3.6-1 for containment isolation valve closure times.

3. All CIAS-Actuated valves except MSIVs and MFIVs.

4. a. CCW non-critical loop isolation valves HV-6212, HV-6213, HV-6218 and HV-6219.Close

   b. Containment Emergency Cooler CCW Isolation Valves HV-6366, HV-6367, HV-6368, HV-6369, HV-6370, HV-6371, HV-6372 and HV-6373 Open.

5. Response time includes instrumentation, logic, and isolation damper closure times only.

RESPONSE TIME TABLE

ESFAS

(Continued)

Function	Sensor	Trip Unit to ESFAS	Field Components	Total Response Time	Tech. Spec. Accept. Crit.	Verified Initial/Date
Cntmt Press High CCW Valves					≤ 21.0 sec Note 4a ≤ 23.0 sec Note 4b	
Cntmt. Press High Emer. Clg. Fans					≤ 21.0 sec*	
Cntmt. Press High Cntmt. Isol.					≤ 10.9 sec* Note 2	
Cntmt. Press High- High Cntmt. Spray					≤ 21.0 sec*	
SG-1 Press Low MSIV					≤ 20.9 sec	
SG-1 Press Low MFW Isol.					≤ 10.9 sec	
SG-2 Press Low MSIV					≤ 20.9 sec	

<u>FOOTNOTES</u>:

1. Response times include movement of valves and attainment of pump or blower discharge pressure as applicable.

* Emergency diesel generator starting delay (10 sec.) and sequence loading delays for SIAS are included.

2. Response time includes emergency diesel generator starting delay (applicable to AC motor operated valves other than containment purge valves), instrumentation and logic response only. Refer to table 3.6-1 for containment isolation valve closure times.

3. All CIAS-Actuated valves except MSIVs and MFIVs.

4. a. CCW non-critical loop isolation valves HV-6212, HV-6213, HV-6218 and HV-6219 Close.
   b. Containment Emergency Cooler CCW Isolation Valves HV-6366, HV-6367, HV-6368, HV-6369, HV-6370, HV-6371, HV-6372 and HV-6373 Open.

5. Response time includes instrumentation, logic, and isolation damper closure times only.

RESPONSE TIME TABLE

ESFAS

(Continued)

Function	Sensor	Trip Unit to ESFAS	Field Components	Total Response Time	Tech. Spec. Accept. Crit.	Verified Initial/Date
SG-2 Press Low MFW Isol.					≤ 10.9 sec*	
Low RWT LVL Cntmt. Sump VLVs Open					≤ 50.7 sec*	
Low RWT LVL ECCS Miniflow VLVs Shut					≤ 40.7 sec*	
SG-1 LVL Low Aux. FW AC Trains					≤ 50.9 sec*	
SG-1 LVL Low Aux. FW Stm./DC Train					≤ 30.9 sec	
SG-2 LVL Low Aux. FW AC Trains					≤ 40.9 sec*	
SG-2 LVL Low Aux. FW Stm./DC Train					≤ 30.9 sec	

FOOTNOTES:

1. Response times include movement of valves and attainment of pump or blower discharge pressure as applicable.

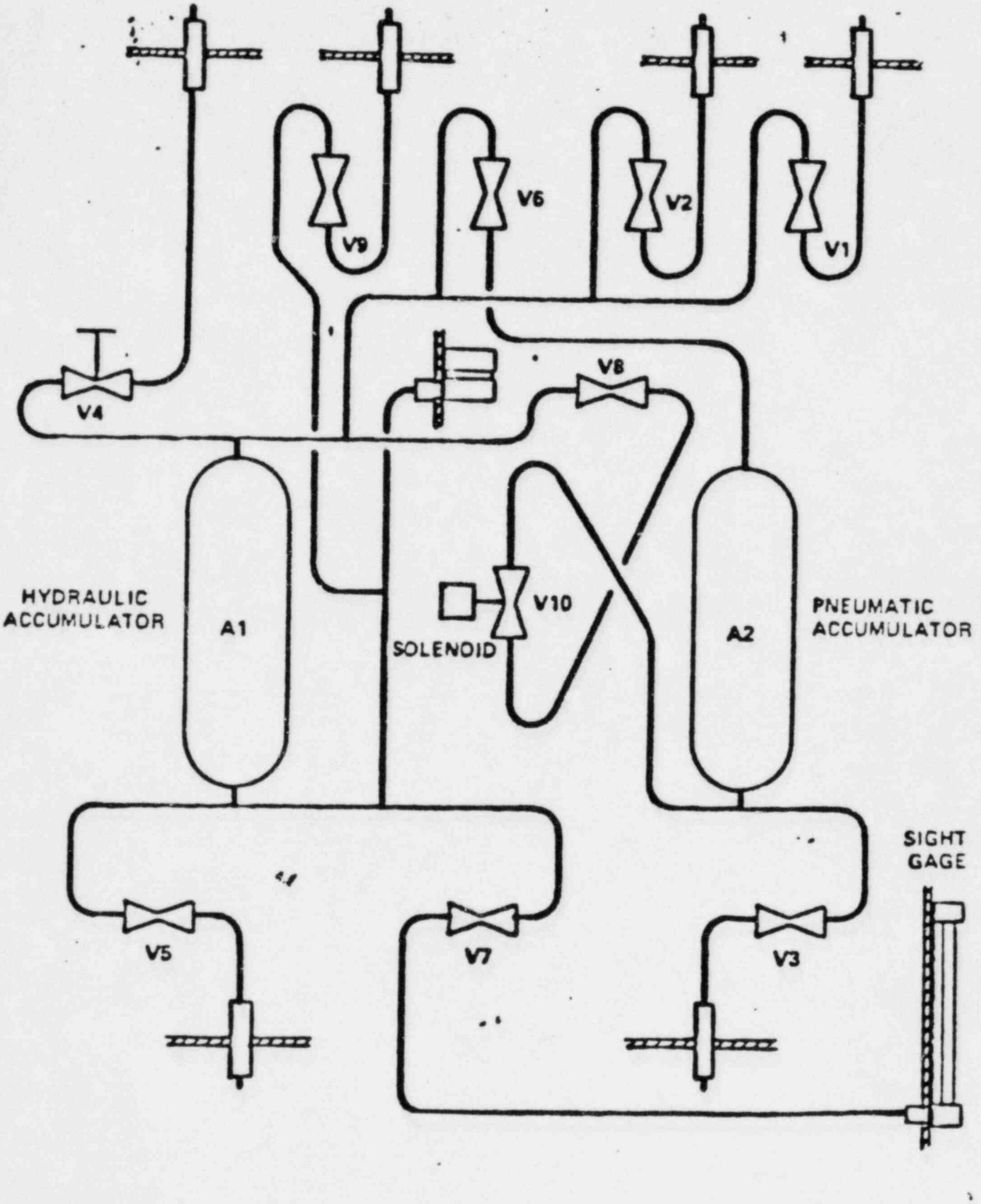
* Emergency diesel generator starting delay (10 sec.) and sequence loading delays for SIAS are included.

2. Response time includes emergency diesel generator starting delay (applicable to AC motor operated valves other than containment purge valves), instrumentation and logic response only. Refer to table 3.6-1 for containment isolation valve closure times.

3. All CIAS-Actuated valves except MSIVs and MFIVs.

4. a. CCW non-critical loop isolation valves HV-6212, HV-6213, HV-6218 and HV-6219 Close.
   b. Containment Emergency Cooler CCW Isolation Valves HV-6366, HV-6367, HV-6368, HV-6369, HV-6370, HV-6371, HV-6372 and HV-6373 Open.

5. Response time includes instrumentation, logic, and isolation damper closure times only.



APPENDIX A
FIGURE A-1
HYDRAULIC SIGNAL GENERATOR
REAR VIEW

TIME RESPONSE TEST SET CONTROLS

IDENTIFICATION		FUNCTION
A	Sight Gage	Accumulator level indication and filling point
V1	Gas Isolation	Isolation valve
V2	Gage Isolation	Isolation valve
V6	Pressurize	Accumulator pressurization select valve
V9	Signal Isolation	Output Isolation valve
V8	Signal Rate	Throttle valve
V4	Pressure Bleed	Bleed valve
B	Zero	Reference transmitter zero adjust
C	Span	Reference transmitter span adjust
D	Ref-Bias	Reference transmitter output bias adjust
E	Process-Bias	Process transmitter output bias adjust
F	Signal Conditioning	Process transmitter input signal select
G	DVM Monitor	DVM test point select
H	Pressure Switch Output Voltage	Pressure switch output voltage
SI	Signal Initiate	Solenoid valve actuation switch
J	Power	On-Off switch
RT	Reference transducer	Reference signal source
V3	Vent/Drain	Vent-Drain valve for pneumatic accumulator
V5	Drain	Drain valve for hydraulic accumulator
V7	Sight Gage/Fill	Sight gage isolation valve

APPENDIX A

Figure A-2

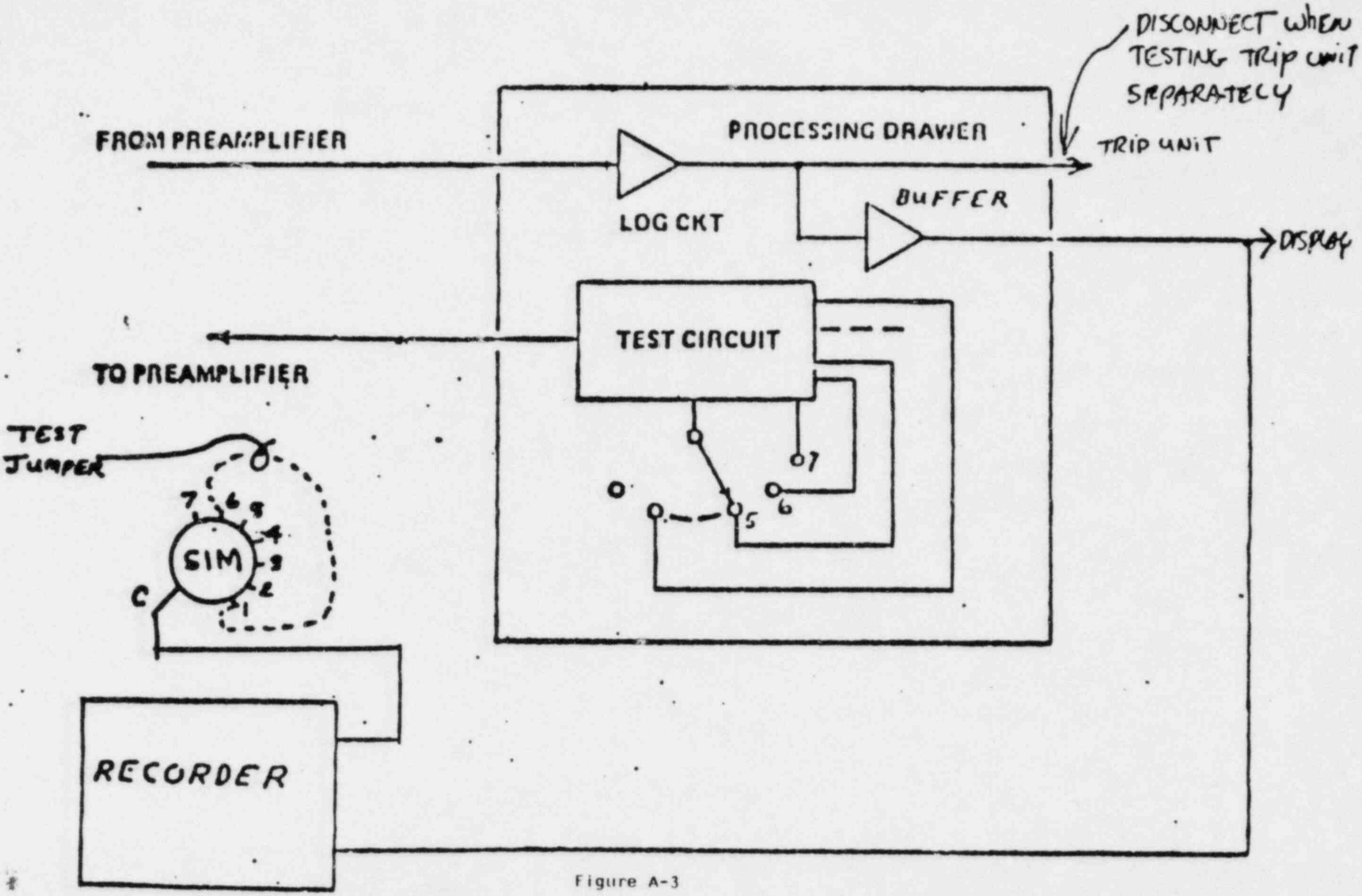

DISCONNECT when TESTING Trip unit SEPARATELY
FROM PREAMPLIFIER
PROCESSING DRAWER
TRIP UNIT
LOG CKT
BUFFER
DISPLAY
TEST CIRCUIT
TO PREAMPLIFIER
TEST JUMPER
7
6
5
4
3
2
1
SIM
C
7
6
5
RECORDER

Figure A-3

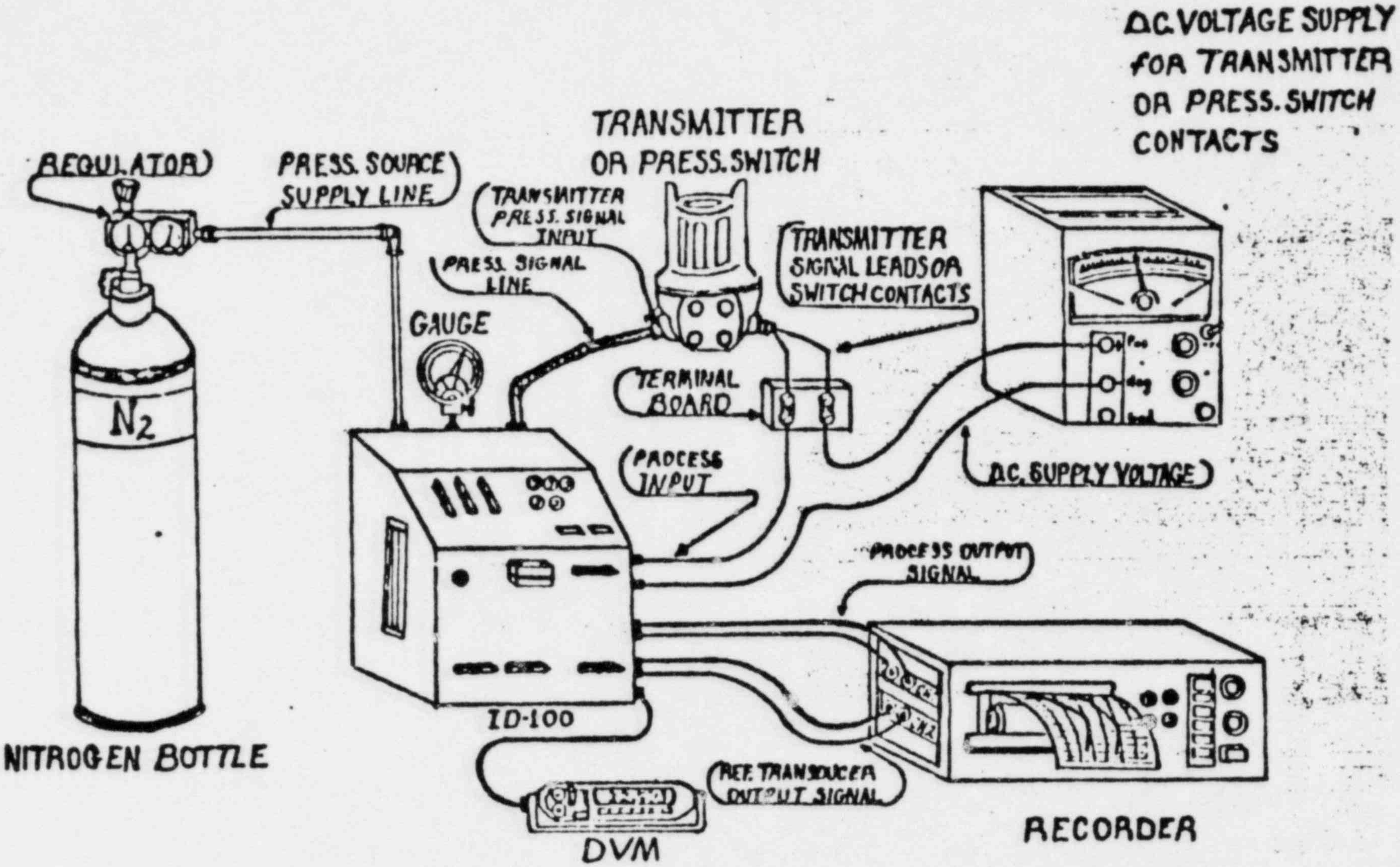

D.C. VOLTAGE SUPPLY
FOR TRANSMITTER
OR PRESS. SWITCH
CONTACTS
TRANSMITTER
OR PRESS. SWITCH
REGULATOR
PRESS. SOURCE
SUPPLY LINE
TRANSMITTER
PRESS. SIGNAL
INPUT
PRESS. SIGNAL
LINE
TRANSMITTER
SIGNAL LEADS OR
SWITCH CONTACTS
GAUGE
N2
TERMINAL
BOARD
PROCESS
INPUT
D.C. SUPPLY VOLTAGE
PROCESS OUTPUT
SIGNAL
ID-100
NITROGEN BOTTLE
REF. TRANSDUCER
OUTPUT SIGNAL
DVM
RECORDER

Figure A-4

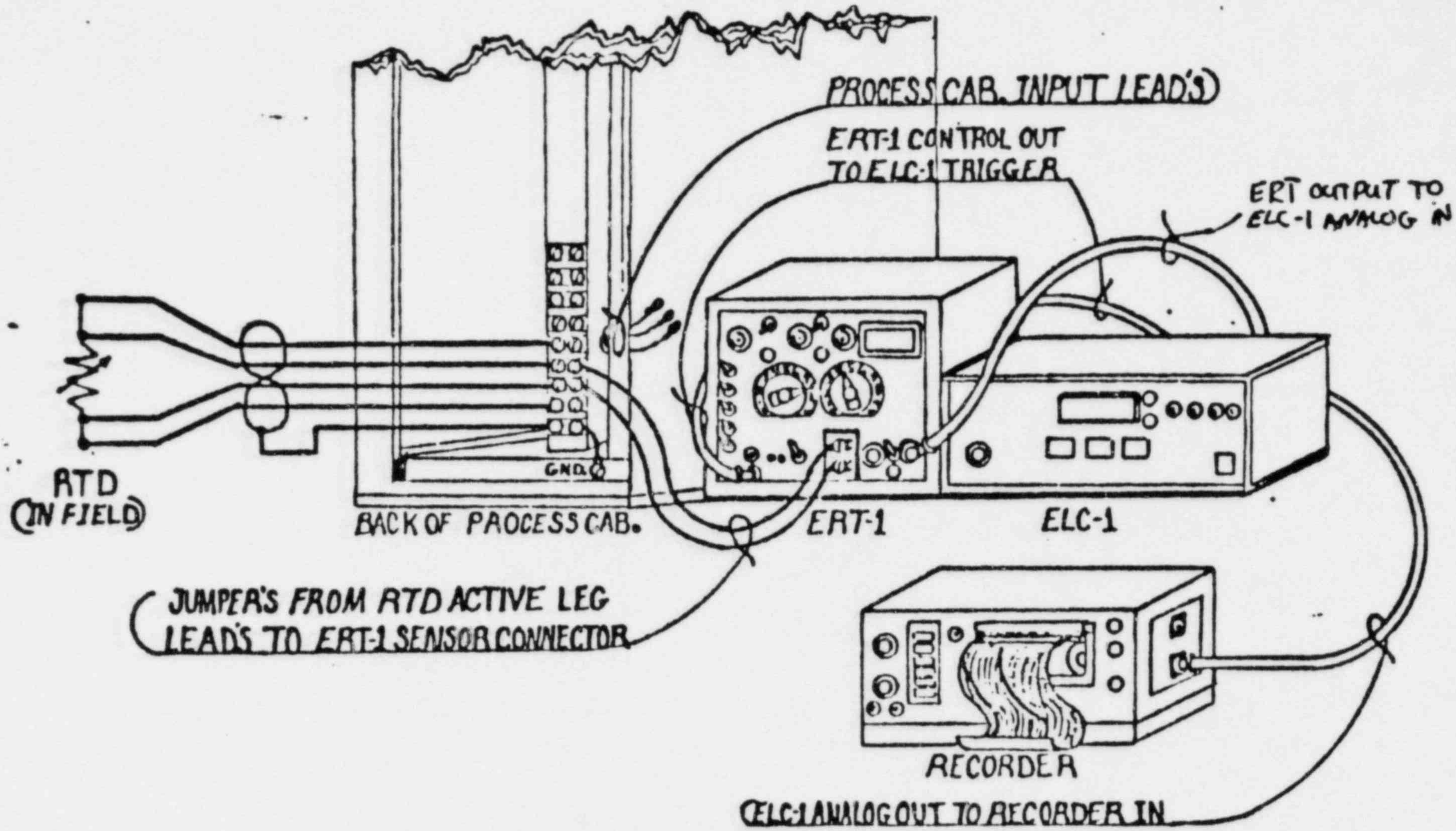

PROCESS CAB. INPUT LEAD'S)
ERT-1 CONTROL OUT
TO ELC-1 TRIGGER
ERT OUTPUT TO
ELC-1 ANALOG IN
RTD
(IN FIELD)
GND
BACK OF PROCESS CAB.
ERT-1
ELC-1
(JUMPER'S FROM RTD ACTIVE LEG
LEAD'S TO ERT-1 SENSOR CONNECTOR
RECORDER
(ELC-1 ANALOG OUT TO RECORDER IN

Figure A-5

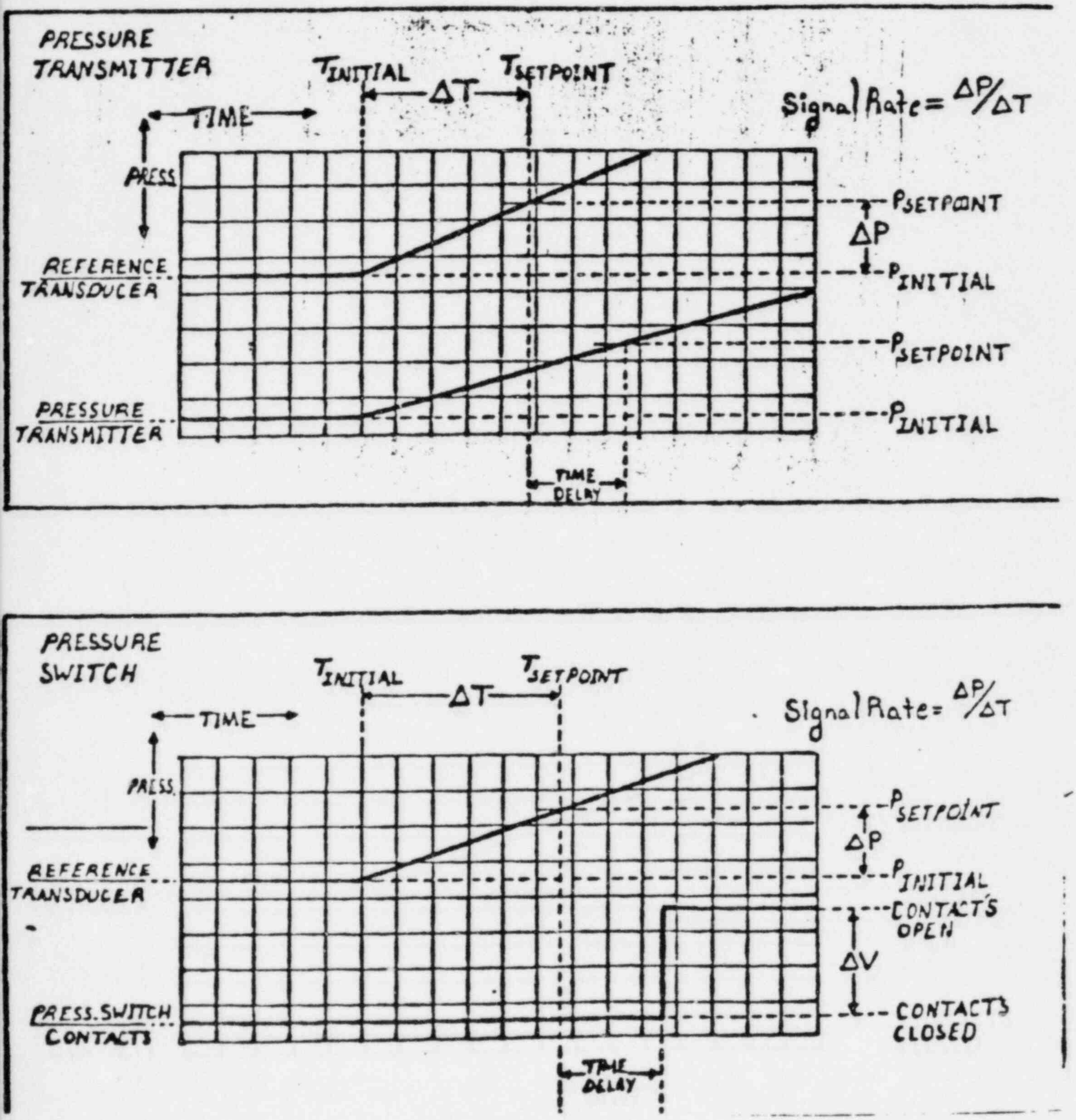
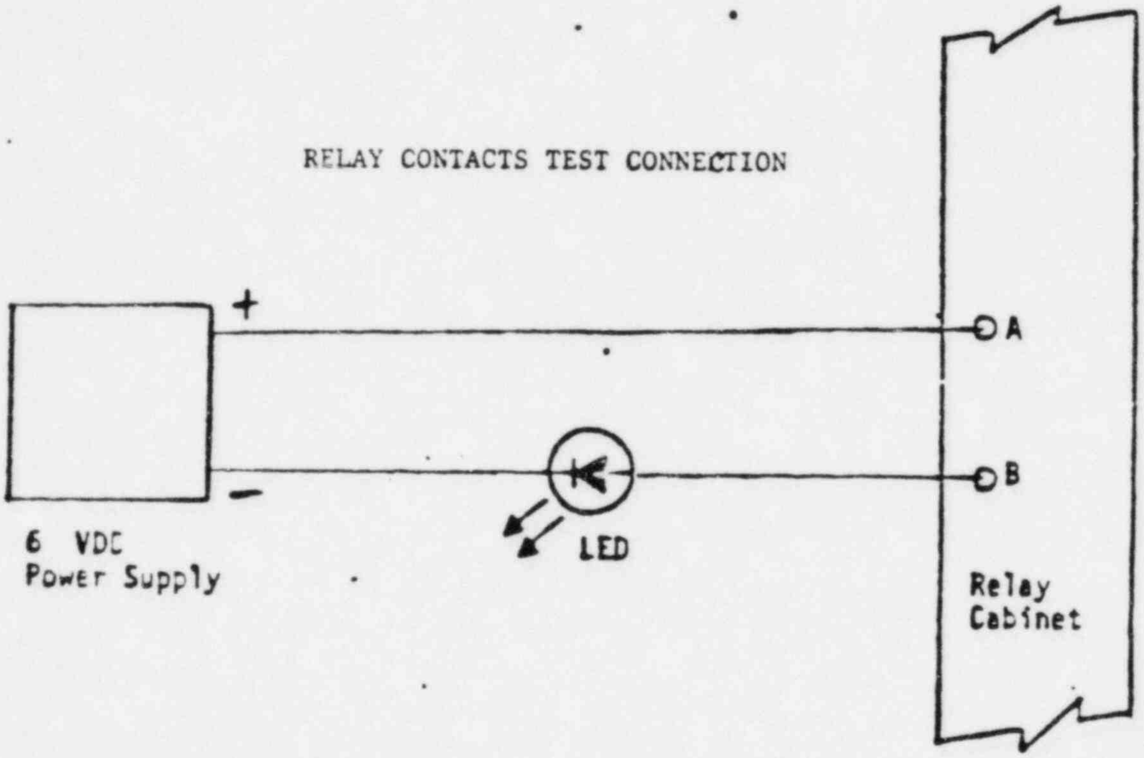

PRESSURE TRANSMITTER
T INITIAL
ΔT
T SETPOINT
TIME
PRESS
Signal Rate = ΔP/ΔT
P SETPOINT
ΔP
P INITIAL
REFERENCE TRANSDUCER
P SETPOINT
PRESSURE TRANSMITTER
P INITIAL
TIME DELAY
PRESSURE SWITCH
T INITIAL
ΔT
T SETPOINT
TIME
PRESS.
Signal Rate = ΔP/ΔT
P SETPOINT
ΔP
P INITIAL
REFERENCE TRANSDUCER
CONTACTS OPEN
ΔV
PRESS. SWITCH CONTACTS
CONTACTS CLOSED
TIME DELAY

Figure A-6



Where A is the first terminal given for the relay to be tested in.

and B is the second terminal given for the relay to be tested.

Example: K301 in 2L034
A = TB31-165
B = TB31-166

Figure A-7

APPENDIX C

TABLE 1

PRESSURE TRANSIENT INFORMATION

INSTRUMENT	SENSOR	UNITS	DIAPHRAGM RANGE	P_1 INITIAL	P_{SP} SETPOINT	P_2 FINAL	DESIRED RAMP RATE	ACTUAL RAMP RATE
Hi Pzr Press	2PT-0101	psia		1750	1850	2450	93.5/sec	
Lo Pzr Press	2PT-0102	psia		2100	1800	Atm	-300/sec	
Lo SG Press	2PT-1013 2PT-1023	psia		850	730	Atm	-140/sec	
Lo SG Level	2LT-1113 2LT-1123	% range		100	90	0	-7.6/sec	
Hi SG Level			No test required					
Hi Containment Press	2PT-0351	psig		1	3	18	7/sec	
Hi Hi Containment Press	2PT-0352	psig		7	8	18	5/sec	
Lo RWST Level	2LT-0305	% range		100	90	0	-7/sec	
Hi Steam Generator Differential Pressure	2PDT-0978 2PDT-0979	psid		67.5	45.0	0.0	-45.0/sec	

APPENDIX D

ROTARY SELECT SWITCH POSITIONS

Rotary Select Switches & Positions				Relay
S2	S3	S4	S5	Under Test
1				K301
2				K308
3				K101
4				K108
5				K401
6				K302
7				K409
8				K403
9				K109
10				K110
11				K410
12				K408
13				K102
14				K103
15				K311
16				K412
17-56	17			K201
17-56	18			K208
17-56	19			K202
17-56	20			K209

APPENDIX D

ROTARY SELECT SWITCH POSITIONS

(Continued)

Rotary Select Switches & Positions				Relay
S2	S3	S4	S5	Under Test
17-56	21			K203
17-56	22			K210
17-56	23			K205
17-56	24			K212
17-56	25			K206
17-56	26			K204
17-56	27			K213
17-56	28			K309
17-56	29			K104
17-56	30			K312
17-56	31			K405
17-56	32-56	32		K105
17-56	32-56	33		K305
17-56	32-56	34		K404
17-56	32-56	35		K411
17-56	32-56	36		K313
17-56	32-56	37		K406
17-56	32-56	38		K106
17-56	32-56	39		K113

APPENDIX D

ROTARY SELECT SWITCH POSITIONS

(Continued)

Rotary Select Switches & Positions				Relay
S2	S3	S4	S5	Under Test
17-56	32-56	40		K211
17-56	32-56	41		K402
17-56	32-56	42		K303
17-56	32-56	43		K112
17-56	32-56	44		K310
17-56	32-56	45-56	45	K306
17-56	32-56	45-56	46	K413
17-56	32-56	45-56	47	K107
17-56	32-56	45-56	48	K304
17-56	32-56	45-56	49	K111
17-56	32-56	45-56	50	K114

APPENDIX E

ESFAS ACTUATION RELAYS ELECTRICAL LINEUP

BREAKER	PANELS INVOLVED	CLOSED Verified By: Initial/Date	OPEN Verified By: Initial/Date
Y0109	2Y01 to 2L034 CH.A	/	/
Y0109	2Y01 to 2L034 CH.A	/	/
40209	2402 to 2L034 CH.B	/	/
Y0210	2Y02 to 2L034 CH.B	/	/
Y0309	2Y03 to 2L035 CH.C	/	/
Y0310	2Y03 to 2L035 CH.C	/	/
Y0409	2Y04 to 2L035 CH.D	/	/
Y0410	2Y04 to 2L035 CH.D	/	/
CB59	2L034 Bay 5	/	/
CB69	2L034 Bay 6	/	/
CB79	2L034 Bay 7	/	/
CB89	2L034 Bay 8	/	/
CB59	2L035 Bay 5	/	/
CB69	2L035 Bay 6	/	/

APPENDIX E

ESFAS ACTUATION RELAYS ELECTRICAL LINEUP

(Continued)

BREAKER	PANELS INVOLVED	CLOSED Verified By: Initial/Date	OPEN Verified By: Initial/Date
CB79	2L035 Bay 7	/	/
CB89	2L035 Bay 8	/	/
CB61	2L034 Bay 6	/	/
CB62	2L034 Bay 6	/	/
CB63	2L034 Bay 6	/	/
CB64	2L034 Bay 6	/	/
CB65	2L034 Bay 6	/	/
CB66	2L034 Bay 6	/	/
CB67	2L034 Bay 6	/	/
CB68	2L034 Bay 6	/	/
CB61	2L035 Bay 6	/	/
CB62	2L035 Bay 6	/	/

APPENDIX E

ESFAS ACTUATION RELAYS ELECTRICAL LINEUP

(Continued)

BREAKER	PANELS INVOLVED	CLOSED Verified By: Initial/Date	OPEN Verified By: Initial/Date
CB63	2L035 Bay 6	/	/
CB64	2L035 Bay 6	/	/
CB65	2L035 Bay 6	/	/
CB66	2L035 Bay 6	/	/
CB67	2L035 Bay 6	/	/
CB68	2L035 Bay 6	/	/
CB71	2L034 Bay 7	/	/
CB72	2L034 Bay 7	/	/
CB73	2L034 Bay 7	/	/
CB74	2L034 Bay 7	/	/
CB75	2L034 Bay 7	/	/
CB76	2L034 Bay 7	/	/

APPENDIX E

ESFAS ACTUATION RELAYS ELECTRICAL LINEUP

(Continued)

BREAKER	PANELS INVOLVED	CLOSED Verified By: Initial/Date	OPEN Verified By: Initial/Date
CB77	2L034 Bay 7	/	/
CB78	2L035 Bay 7	/	/
CB71	2L035 Bay 7	/	/
CB72	2L035 Bay 7	/	/
CB73	2L035 Bay 7	/	/
CB74	2L035 Bay 7	/	/
CB75	2L035 Bay 7	/	/
CB76	2L035 Bay 7	/	/
CB77	2L035 Bay 7	/	/
CB78	2L035 Bay 7	/	/

APPENDIX F

ESFAS ACTUATION RELAYS

Relay	Contact	Relay	Contact
K301	TB31-165&166	K210	TB26-657&658
K308	TB35-565&566	K205	TB23-392&393
K101	TB12-259&260	K212	TB27-789&790
K108	TB15-580&581	K206	TB24-457&458
K401	TB41-177&178	K204	TB22-257&258
K302	TB31-189&190	K213	TB28-862&863
K409	TB45-589&590	K309	TB35-586-587
K403	TB42-274&275	K104	TB13-365&366
K109	TB15-567&568	K312	TB38-867&868
K110	TB16-691&692	K405	TB44-480&481
K410	TB22-249&250	K105	TB13-389&390
K408	TB45-571&572	K305	TB33-389&390
K102	TB11-165&166	K404	TB43-377&378
K103	TB12-265&266	K411	TB47-765&766
K311	TB37-762&763	K313	TB38-877&878
K412	TB47-795&796	K406	TB44-467&468
K201	TB21-150&151	K106	TB14-485&486
K208	TB25-565&566	K113	TB18-885&886
K202	TB21-177&178	K211	TB27-750&751
K209	TB25-589&590	K402	TB44-461&462
K203	TB22-245&246	K303	TB32-277&278

APPENDIX F

ESFAS ACTUATION RELAYS

(Continued)

Relay	Contact	Relay	Contact
K112	TB17-780&781	K201	TB21-153&154
K310	TB36-674&574	K208	TB25-565&566
K306	TB34-477&478	K202	TB21-180&181
K413	TB48-877&878	K209	TB25-589&590
K107	TB14-491&492	K203	TB22-262&263
K304	TB33-365&366	K210	TB26-655&656
K111	TB15-565&566	K205	TB23-351&352
K114	TB18-891&892	K212	TB27-786&787
K301	TB21-147&148	K206	TB24-451&452
K308	TB35-565&566	K204	TB22-255&256
K101	TB22-255&256	K213	TB28-862&863
K108	TB15-580&581	K309	TB35-586&587
K401	TB41-177&178	K104	TB13-365&366
K302	TB31-186&187	K312	TB38-867&868
K409	TB45-589&590	K405	TB44-480&481
K403	TB42-274&275	K105	TB13-389&390
K109	TB15-567&568	K305	TB33-389&390
K110	TB16-691&692	K404	TB43-377&378
K410	TB46-674&675	K411	TB47-765&766
K408	TB45-565&566	K313	TB38-877&878
K102	TB11-165&166	K406	TB44-467&468
K103	TB12-265&266	K106	TB14-485&486

APPENDIX F

ESFAS ACTUATION RELAYS

(Continued)

Relay	Contact	Relay	Contact
K311	TB37-762&763	K113	TB18-887&888
K412	TB47-795&796	K211	TB27-753&754
K402	TB44-463&464		
K303	TB32-274&275		
K112	TB17-786&787		
K310	TB36-683&684		
K306	TB34-477&478		
K413	GB48-877&878		
K107	TB14-491&492		
K304	TB33-365&366		
K111	TB15-565&566		
K114	TB18-891&892		

APPENDIX G

ESFAS INTERPOSING RELAYS

Relay	Function	Control Panel Bay	Contacts	Relay	Function	Control Panel Bay	Contacts
K623	MSIS	6	TB67-42&41	K623	MSIS	6	TB67-42&41
K723	MSIS	7	TB77-5&6	K723	MSIS	7	TB77-5&6
K624	EFAS-1	6	TB67-27&26	K624	EFAS-1	6	TB67-15&14
K724	EFAS-1	7	TB77-32&33	K724	EFAS-1	7	TB77-32&33
K625	EFAS-2	6	TB66-14&15	K625	EFAS-2	6	TB66-14&15
K725	EFAS-2	7	TB76-21&25	K725	EFAS-2	7	TB76-27&28

APPENDIX H

CPC/CEAC

RESPONSE TIME TEST SOFTWARE

USER'S MANUAL

APPENDIX H

1.0 INTRODUCTION

The CPC System Response Time Test (RTT) software is an interactive, multiprogrammed system designed to set up and run test cases to be used to verify that CPC system hardware time response has not degraded to an unacceptable level. The RTT software is organized such that the RTT is run in two parts. Part 1 is called the Interactive I/O System Test and it exercises all of the CPC and CEAC input and output hardware. Part 2 is called the Processor Timing Test and it exercises the CPC and CEAC processors with software which is typical of CPC and CEAC application programs.

Two floppy disks are required to load the RTT software. Disk 1 is to be used to load the Interactive I/O System Test into each of the six processors. Disk 2 is to be used to load the Processor Timing Test. The procedure for loading the RTT software is identical to that which is used for normal system loads. The "CPC TEST" and CEAC TEST" indicator lamps on the Operators Module will always be lit while the special test software is in memory. In addition the CPC trip outputs will be set in the tripped fail-safe condition. Trips will be reset by software in a CPC only when a Teletype is connected during the Interactive I/O System Test.

2.0 TEST PREREQUISITES

The RTT Software utilizes the Precision Interval Clock (PIC) for scheduling programs and for timing the processor. Therefore, the accuracy of the PIC should be verified before loading the RTT software. The following procedure can be used to verify the PIC interrupt frequency for each processor.

Step 1: Load the online software and display the LOWTOD Point ID on the operator's module.

Step 2: Press the "INI" button on the hexadecimal display panel of the processor to be checked. This results in a system auto-restart which resets LOWTOD to zero. Synchronize the pressing of the "INI" button with the seconds hand of a watch.

Step 3: Press the "FN" button on the hexadecimal display panel.

Step 4: Press the "LOC" button on the hexadecimal display panel in sync with the ending of a 5 minute interval on the watch. This halts the processor which in turn stops the LOWTOD from accumulating.

Step 5: Read LOWTOD from the operator's module. Normally over this interval, a system that is running properly would display 6000 + 40 in LOWTOD.

In addition, it is recommended that the standard Interdata Universal Clock Module Test be run to verify the remaining PIC functions.

3.0 RTT PART I - INTERACTIVE I/O SYSTEM TEST

The Interactive I/O System Test Software monitors one or more user specified inputs and initiates a DNBR or LPD trip when a selected input reaches a user specified setpoint. The specified inputs will be sampled at the following rates:

Pump Speeds	50 msec
Temperatures	100 msec
Pressure	100 msec
Excore Detectors	100 msec
Penalty Factors	100 msec
CEA Positions (CPC)	1000 msec
CEA Positions (CEAC)	100 msec

In addition, the CPCs will read the CEAC-CPC data link once every 100 msec.

All inputs are preset to the steady state values (constants) contained in Table A1 (i.e., NOP inputs). The test engineer will be able to select one or more inputs to be accessed via the CPC/CEAC MACS (i.e., live inputs). The current value of all inputs are available via the Operator's Module Point ID Table. Table A2 contains the valid CPC Point ID list and Table A3 contains the valid CEAC Point ID list for the Interactive I/O System Test.

3.1 COMMAND STRUCTURE

This section describes the syntax, parameters, usage, and restrictions of the RTT SOFTWARE COMMANDS. User commands may only be entered when a test is not in progress. When the RTT software is waiting for a command, the test engineer will be prompted with either an asterisk (*) or a question mark (?). All commands entered by the user must be followed by a carriage return. If the RTT software responds with an "*", this will indicate that the command was accepted and the requested action was performed. If the RTT software responds with a "?", this will indicate that the command was rejected.

RTT commands are all of the form:

OP PARAM-LIST

where: a) OP is the operation code mnemonic.

b) PARAM-LIST are the various entries such as the input to be made live, the setpoint, the direction of approach, and the type of trip desire. All parameters must be separated by commas, and there must be no embedded blanks.

3.1.1 Examine Command

The Examine Command is used to obtain the status of a particular system input. When this command is encountered, the RTT software will output the status of the specified input to the Teletype. This information will include whether the input in question is currently being accessed via the CPC/CEAC MACS or if a constant value is being used. If the input is currently selected as live, then the associated parameter list will be output. The format of the Examine Command is:

```
EX x
```

Where: x is the input the user wishes to examine. Valid entries for x are contained in Table G1.

The following condition results in a syntax error and causes the command to be rejected:

a) If the specified input parameter is not in Table G1.

An example of the Examine Command is as follows:

```
*EX TH1

TH1,600,IN,LPD
```

In this case, the test engineer requested a printout of TH1. As shown, the TH1 setpoint is set at 600 Degrees Fahrenheit; a trip will be output when the setpoint is approached from a value less than 600 degrees; and when the setpoint is reached the RTT software will initiate an LPD trip.

3.1.2 Live Command

The Live Command is used to specify an input to be accessed via the CPC/CEAC MACS. When the RTT software encounters this command, it will enable that input to be read at the sampling rate stated above. The format of the Live Command is:

```
LI x,s,d,t
```

where: a) x is the input which is to be made live (see Table 1).

b) s is the setpoint which when reached will cause the trip to occur. The setpoint range for each input can be found in Table 1. Setpoints must be entered as integers without decimal points.

3.1.2 Live Command (Continued)

c) d is the direction from which the setpoint will be approached which will in turn trip the channel. The only two acceptable entries for this parameter are IN or DE. IN is used if the input should be increasing to initiate a trip. DE is used if the input should be decreasing to initiate a trip. If the setpoint is reached, in the opposite of the specified direction, a trip will not occur. It is important to remember that in the case of the reactor coolant pumps, if the pump speed is decreasing, the setpoint will be approached from the increasing direction. This is because the setpoint is entered in counts which are inversely proportional to RPM. If a pump speed input is set for IN then a trip will be output during increasing RPMs. Conversely, a DE entry will cause a trip output for decreasing RPMs. The relationship between RPMs and counts is:

$$w = \frac{h}{x}$$

where: W = pump speed in RPMs

h = a constant equal to 3×10^6

x = counts

d) t is the type of trip that will occur when the setpoint is reached for the specified input. Valid entries for this parameter are:

1) LPD for Local Power Density Trip

2) DNB for Departure from Nucleate Boiler Point Ratio Trip

3) ALL in which case both LPD and DNBR trips will be set

The following conditions result in a syntax error and cause the command to be rejected.

a) If the x parameter is not in Table G1

b) If the setpoint is out of range for that input (see Table G1)

c) If the d parameter is not IN or DE

d) If the t parameter is not LPD, DNB, or ALL

The following is an example of the Live Command:

With this command, the test engineer made Reactor Coolant Pump 1 a live input. The trip setpoint was set at 2815 counts. The type of trip requested was a DNBR trip. Therefore, if the Pump 1 input count increases (i.e., RPMs decreasing) to a value of 2815 counts, a DNBR trip will be output.

3.1.3 NOP Command

The purpose of the NOP command is to allow the test engineer to revert a live input back to a steady state (constant) input. The format of the NOP command is:

```
NOP x
```

where: a) x is the input the test engineer wishes to be reverted to a steady state. Valid entries for x are contained in Table 1.

The following condition results is a syntax error and causes the command to be rejected:

a) If the specified input parameter is not in Table G1.

The following is an example of the NOP command.

```
*EX TH1

TH1,600,IN,LPD

*NOP TH1

TH1 619.6
```

The test engineer first examined TH1, then issued a NOP command on that input. The RTT software responded by outputting the steady state value for that input.

3.1.4 Status Command

The Status Command may be used to obtain a complete list of which inputs have been selected live, what the setpoint is, the direction of approach for initiating a trip, and the type of trip desired for each selected input. It is recommended that this command be entered before starting each test case in order to obtain a hard copy of the test conditions. The format of the Status command is:

```
ST
```

The following is an example of the Status Command:

```
*ST

TH1,600,IN,LPD
W1,2020,DE,DNB
```

As shown, the test engineer requested the test status. The RTT software responded by printing the inputs which had been selected live, the setpoint values, the direction of approach, and the desired trip.

3.1.5 Go Command

The Go Command when issued will cause the test to start executing. When this command is read, the RTT software will respond with the following message:

```
RTT IN PROGRESS
```

The format of the Go Command is:

```
GO
```

3.2 TEST TERMINATION

In order to terminate an RTT in progress, it is necessary to press the white (spare) pushbutton on the Operator's Module. The RTT software will respond with "RESTART OR LOAD ? (R/L)". The responses to this question are:

a) R, when this entry is made, all trips will be reset and the RTT software will prompt the test engineer for new commands.

b) L, this entry will allow the test engineer to load the processor memory via the system warm start loader.

4.0 RTT PART 2 - PROCESSOR TIMING TEST

- The Processor Timing test schedules execution of tasks which contain sets of instructions that are typical of CPC and CEAC application programs. The CPC test will schedule four tasks as follows:

	Cycling Rate
TASK 1 (typical FLOW algorithm)	50 msec
TASK 2 (typical UPDATE algorithm)	100 msec
TASK 3 (typical POWER algorithm)	1 sec
TASK 4 (typical STATIC algorithm)	2 sec

The CEAC test will schedule one task as follows:

	Cycling Rate
TASK 1 (typical Penalty Factor algorithm)	100 msec

This test requires no user interaction and does not perform any I/O functions. All process inputs required by the test are set up as constants in appropriate memory locations. This test begins execution automatically after loading and will take approximately 10 minutes to complete. Upon completion, a test report will be output to the teletype. This report contains the expected maximum execution times and the actual maximum execution times for each task during the 10 minute interval. The actual times must be equal to or less than the expected times. This system also prints out the number of timing errors detected. A timing error occurs when the actual execution time for a task is greater than the expected execution time. If any errors are detected, the processor clock must be reset according to the procedures contained in the Interdata maintenance manuals. The Processor Timing Test should then be rerun. Examples of the test output are provided in Figures G1 and G2.

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TABLE H1
VALID USER ENTRIES FOR x and s PARAMETERS

x PARAMETER	DEFINITION	s PARAMATER RANGE	VALUE	UNITS	APPLICABLE CALCULATOR
W1	Reactor Coolant Pump 1 Speed	32767-2500	2531	Counts	CPC
W2	Reactor Coolant Pump 2 Speed	32767-2500	2531	Counts	CPC
W3	Reactor Coolant Pump 3 Speed	32767-2500	2531	Counts	CPC
W4	Reactor Coolant Pump 4 Speed	32767-2500	2531	Counts	CPC
TC1	Loop 1 Cold Leg Temperature	465-615	553.5	°F	CPC
TC2	Loop 2 Cold Leg Temperature	465-615	553.5	°F	CPC
TH1	Loop 1 Cold Leg Temperature	525-675	614.6	°F	CPC
TH2	Loop 2 Cold Leg Temperature	525-675	614.6	°F	CPC
PR	Pressurizer Pressure	1500-2500	2250	psia	CPC
D1	Upper Excore Neutron Flux Detector	0-200	95.3	% Power	CPC
D2	Middle Excore Neutron Flux Detector	0-200	125.85	% Power	CPC
D3	Lower Excore Neutron Flux Detector	0-200	90.18	% Power	CPC
SG01	CEA Subgroup 1 Position	0-150	150	Inches Withdrawn	CPC
SG02	CEA Subgroup 2 Position	0-150	150	Inches Withdrawn	CPC
SG03	CEA Subgroup 3 Position	0-150	150	Inches Withdrawn	CPC
SG04	CEA Subgroup 4 Position	0-150	150	Inches Withdrawn	CPC
SG05	CEA Subgroup 5 Position	0-150	150	Inches Withdrawn	CPC
SG06	CEA Subgroup 6 Position	0-150	150	Inches Withdrawn	CPC
SG07	CEA Subgroup 7 Position	0-150	150	Inches Withdrawn	CPC
SG08	CEA Subgroup 8 Position	0-150	150	Inches Withdrawn	CPC
SG09	CEA Subgroup 9 Position	0-150	150	Inches Withdrawn	CPC
SG10	CEA Subgroup 10 Position	0-150	150	Inches Withdrawn	CPC
SG11	CEA Subgroup 11 Position	0-150	150	Inches Withdrawn	CPC
SG12	CEA Subgroup 12 Position	0-150	150	Inches Withdrawn	CPC
SG13	CEA Subgroup 13 Position	0-150	150	Inches Withdrawn	CPC
SG14	CEA Subgroup 14 Position	0-150	150	Inches Withdrawn	CPC
SG15	CEA Subgroup 15 Position	0-150	150	Inches Withdrawn	CPC

TABLE H1
VALID USER ENTRIES FOR x and s PARAMETERS

x PARAMETER	DEFINITION	s PARAMATER RANGE	VALUE	UNITS	APPLICABLE CALCULATOR
SG16	CEA Subgroup 16 Position	0-150	150	Inches Withdrawn	CPC
SG17	CEA Subgroup 17 Position	0-150	150	Inches Withdrawn	CPC
SG18	CEA Subgroup 18 Position	0-150	150	Inches Withdrawn	CPC
SG19	CEA Subgroup 19 Position	0-150	150	Inches Withdrawn	CPC
SG20	CEA Subgroup 20 Position	0-150	150	Inches Withdrawn	CPC
SG21	CEA Subgroup 21 Position	0-150	150	Inches Withdrawn	CPC
SG22	CEA Subgroup 22 Position	0-150	150	Inches Withdrawn	CPC
SG23	CEA Subgroup 23 Position	0-150	150	Inches Withdrawn	CPC
PF1	Penalty Factor from CEAC 1	128-32767	128	(None)	CPC
PF2	Penalty Factor from CEAC 2	128-32767	128	(None)	CPC
CEA01	CEA # 1 Position	0-150	150	Inches Withdrawn	CEAC
CEA02	CEA # 2 Position	0-150	150	Inches Withdrawn	CEAC
CEA03	CEA # 3 Position	0-150	150	Inches Withdrawn	CEAC
CEA04	CEA # 4 Position	0-150	150	Inches Withdrawn	CEAC
CEA05	CEA # 5 Position	0-150	150	Inches Withdrawn	CEAC
CEA06	CEA # 6 Position	0-150	150	Inches Withdrawn	CEAC
CEA07	CEA # 7 Position	0-150	150	Inches Withdrawn	CEAC
CEA08	CEA # 8 Position	0-150	150	Inches Withdrawn	CEAC
CEA09	CEA # 9 Position	0-150	150	Inches Withdrawn	CEAC
CEA10	CEA # 10 Position	0-150	150	Inches Withdrawn	CEAC
CEA11	CEA # 11 Position	0-150	150	Inches Withdrawn	CEAC
CEA12	CEA # 12 Position	0-150	150	Inches Withdrawn	CEAC
CEA13	CEA # 13 Position	0-150	150	Inches Withdrawn	CEAC
CEA14	CEA # 14 Position	0-150	150	Inches Withdrawn	CEAC
CEA15	CEA # 15 Position	0-150	150	Inches Withdrawn	CEAC
CEA16	CEA # 16 Position	0-150	150	Inches Withdrawn	CEAC
CEA17	CEA # 17 Position	0-150	150	Inches Withdrawn	CEAC
CEA18	CEA # 18 Position	0-150	150	Inches Withdrawn	CEAC

TABLE H1
VALID USER ENTRIES FOR x and s PARAMETERS

x PARAMETER	DEFINITION	s PARAMATER RANGE	VALUE	UNITS	APPLICABLE CALCULATOR
CEA19	CEA # 19 Position	0-150	150	Inches Withdrawn	CEAC
CEA20	CEA # 20 Position	0-150	150	Inches Withdrawn	CEAC
CEA21	CEA # 21 Position	0-150	150	Inches Withdrawn	CEAC
CEA22	CEA # 22 Position	0-150	150	Inches Withdrawn	CEAC
CEA23	CEA # 23 Position	0-150	150	Inches Withdrawn	CEAC
CEA24	CEA # 24 Position	0-150	150	Inches Withdrawn	CEAC
CEA25	CEA # 25 Position	0-150	150	Inches Withdrawn	CEAC
CEA26	CEA # 26 Position	0-150	150	Inches Withdrawn	CEAC
CEA27	CEA # 27 Position	0-150	150	Inches Withdrawn	CEAC
CEA28	CEA # 28 Position	0-150	150	Inches Withdrawn	CEAC
CEA29	CEA # 29 Position	0-150	150	Inches Withdrawn	CEAC
CEA30	CEA # 30 Position	0-150	150	Inches Withdrawn	CEAC
CEA31	CEA # 31 Position	0-150	150	Inches Withdrawn	CEAC
CEA32	CEA # 32 Position	0-150	150	Inches Withdrawn	CEAC
CEA33	CEA # 33 Position	0-150	150	Inches Withdrawn	CEAC
CEA34	CEA # 34 Position	0-150	150	Inches Withdrawn	CEAC
CEA35	CEA # 35 Position	0-150	150	Inches Withdrawn	CEAC
CEA36	CEA # 36 Position	0-150	150	Inches Withdrawn	CEAC
CEA37	CEA # 37 Position	0-150	150	Inches Withdrawn	CEAC
CEA38	CEA # 38 Position	0-150	150	Inches Withdrawn	CEAC
CEA39	CEA # 39 Position	0-150	150	Inches Withdrawn	CEAC
CEA40	CEA # 40 Position	0-150	150	Inches Withdrawn	CEAC
CEA41	CEA # 41 Position	0-150	150	Inches Withdrawn	CEAC
CEA42	CEA # 42 Position	0-150	150	Inches Withdrawn	CEAC
CEA43	CEA # 43 Position	0-150	150	Inches Withdrawn	CEAC
CEA44	CEA # 44 Position	0-150	150	Inches Withdrawn	CEAC
CEA45	CEA # 45 Position	0-150	150	Inches Withdrawn	CEAC

TABLE H1
VALID USER ENTRIES FOR x and s PARAMETERS

x PARAMETER	DEFINITION	s PARAMATER RANGE	VALUE	UNITS	APPLICABLE CALCULATOR
CEA46	CEA # 46 Position	0-150	150	Inches Withdrawn	CEAC
CEA47	CEA # 47 Position	0-150	150	Inches Withdrawn	CEAC
CEA48	CEA # 48 Position	0-150	150	Inches Withdrawn	CEAC
CEA49	CEA # 49 Position	0-150	150	Inches Withdrawn	CEAC
CEA50	CEA # 50 Position	0-150	150	Inches Withdrawn	CEAC
CEA51	CEA # 51 Position	0-150	150	Inches Withdrawn	CEAC
CEA52	CEA # 52 Position	0-150	150	Inches Withdrawn	CEAC
CEA53	CEA # 53 Position	0-150	150	Inches Withdrawn	CEAC
CEA54	CEA # 54 Position	0-150	150	Inches Withdrawn	CEAC
CEA55	CEA # 55 Position	0-150	150	Inches Withdrawn	CEAC
CEA56	CEA # 56 Position	0-150	150	Inches Withdrawn	CEAC
CEA57	CEA # 57 Position	0-150	150	Inches Withdrawn	CEAC
CEA58	CEA # 58 Position	0-150	150	Inches Withdrawn	CEAC
CEA59	CEA # 59 Position	0-150	150	Inches Withdrawn	CEAC
CEA60	CEA # 60 Position	0-150	150	Inches Withdrawn	CEAC
CEA61	CEA # 61 Position	0-150	150	Inches Withdrawn	CEAC
CEA62	CEA # 62 Position	0-150	150	Inches Withdrawn	CEAC
CEA63	CEA # 63 Position	0-150	150	Inches Withdrawn	CEAC
CEA64	CEA # 64 Position	0-150	150	Inches Withdrawn	CEAC
CEA65	CEA # 65 Position	0-150	150	Inches Withdrawn	CEAC
CEA66	CEA # 66 Position	0-150	150	Inches Withdrawn	CEAC
CEA67	CEA # 67 Position	0-150	150	Inches Withdrawn	CEAC
CEA68	CEA # 68 Position	0-150	150	Inches Withdrawn	CEAC
CEA69	CEA # 69 Position	0-150	150	Inches Withdrawn	CEAC
CEA70	CEA # 70 Position	0-150	150	Inches Withdrawn	CEAC
CEA71	CEA # 71 Position	0-150	150	Inches Withdrawn	CEAC
CEA72	CEA # 72 Position	0-150	150	Inches Withdrawn	CEAC

TABLE H1
VALID USER ENTRIES FOR x and s PARAMETERS

x PARAMETER	DEFINITION	s PARAMATER RANGE	VALUE	UNITS	APPLICABLE CALCULATOR
CEA73	CEA # 73 Position	0-150	150	Inches Withdrawn	CEAC
CEA74	CEA # 74 Position	0-150	150	Inches Withdrawn	CEAC
CEA75	CEA # 75 Position	0-150	150	Inches Withdrawn	CEAC
CEA76	CEA # 76 Position	0-150	150	Inches Withdrawn	CEAC
CEA77	CEA # 77 Position	0-150	150	Inches Withdrawn	CEAC
CEA78	CEA # 78 Position	0-150	150	Inches Withdrawn	CEAC
CEA79	CEA # 79 Position	0-150	150	Inches Withdrawn	CEAC
CEA80	CEA # 80 Position	0-150	150	Inches Withdrawn	CEAC
CEA81	CEA # 81 Position	0-150	150	Inches Withdrawn	CEAC
CEA82	CEA # 82 Position	0-150	150	Inches Withdrawn	CEAC
CEA83	CEA # 83 Position	0-150	150	Inches Withdrawn	CEAC
CEA84	CEA # 84 Position	0-150	150	Inches Withdrawn	CEAC
CEA85	CEA # 85 Position	0-150	150	Inches Withdrawn	CEAC
CEA86	CEA # 86 Position	0-150	150	Inches Withdrawn	CEAC
CEA87	CEA # 87 Position	0-150	150	Inches Withdrawn	CEAC
CEA88	CEA # 88 Position	0-150	150	Inches Withdrawn	CEAC
CEA89	CEA # 89 Position	0-150	150	Inches Withdrawn	CEAC
CEA90	CEA # 90 Position	0-150	150	Inches Withdrawn	CEAC
CEA91	CEA # 91 Position	0-150	150	Inches Withdrawn	CEAC

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FIGURE H1

RTT Part 2 CPC Sample Run

```
CPC RESPONSE TIME TEST PART 2
ENABLE MEMORY PROTECT
TOTAL RUN- TIME= 600.0 SECONDS

 TASK     NUM EX          MINEX          AV GEX     MAXEX        %CPU

  0          0             0.0             0.0       0.0          0.0
  1       6000              .1              .2        .2           .2
  2       6000             8.2             8.3       8.3          8.3
  3       3000            14.8            14.9      14.9          7.4
  4       2000              .1              .1        .2           .0
  5        600              .9             1.0       1.0           .1
  6        300            26.9            27.0      27.1          1.3
  7        150           158.3           158.4     158.6          4.0
  8          0             0.0             0.0       0.0          0.0
  9          0             0.0             0.0       0.0          0.0
 10          0             0.0             0.0       0.0          0.0
 11          0             0.0             0.0       0.0          0.0
 12          0             0.0             0.0       0.0          0.0
 13          0             0.0             0.0       0.0          0.0
 14          0             0.0             0.0       0.0          0.0
 15          0             0.0             0.0       0.0          0.0


EXECUTION TIMES IN MILLLSECONDS
END RUN.
```

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FIGURE H2

RTT Part 2 CEAC Sample Run

```
CEAC RESPONSE TIME TEST PART 2
ENABLE MEMORY PROTECT
TOTAL RUN- TIME= 6000.0 SECONDS

 TASK      NUM EX          MINEX        AV GEX     MAXEX       %CPU

  0             0            0.0           0.0       0.0        0.0
  1         11999             .1            .1        .2         .2
  2          5999           22.3          22.3      35.8       22.3
  3             0            0.0           0.0       0.0        0.0
  4          3999             .1            .1        .2         .1
  5          1199             .9            .9       1.0         .2
  6             0            0.0           0.0       0.0        0.0
  7             0            0.0           0.0       0.0        0.0
  8             6             .1            .2        .2         .0
  9           299           14.5          16.5     515.3         .8
 10             0            0.0           0.0       0.0        0.0
 11             0            0.0           0.0       0.0        0.0
 12             0            0.0           0.0       0.0        0.0
 13             0            0.0           0.0       0.0        0.0
 14             0            0.0           0.0       0.0        0.0
 15             0            0.0           0.0       0.0       73.2




EXECUTION TIMES IN MILLLSECONDS
END RUN.
```

TABLE H2

CPC POINT ID ASSIGNMENTS FOR RTT PART 1

Point ID Number	Definition	Units
1	Pump Speed pulse count from reactor coolant pump 1	Counts
2	Pump Speed pulse count from reactor coolant pump 2	Counts
3	Pump Speed pulse count from reactor coolant pump 3	Counts
4	Pump Speed pulse count from reactor coolant pump 4	Counts
5	Raw loop 1 cold leg temperature signal	°F
6	Raw loop 2 cold leg temperature signal	°F
7	Raw loop 1 hot leg temperature signal	°F
8	Raw loop 2 hot leg temperature signal	°F
9	Raw pressurizer pressure signal	psia
10	Raw upper excore neutron flux detector response	% Power
11	Raw middle excore neutron flux detector response	% Power
12	Raw lower excore neutron flux detector response	% Power
13	Packed penalty factor wood from CEAC 1	None
14	Packed penalty factor word from CEAC 2	None
15	Raw CEA subgroup 1 position signal	Inches Withdrawn
16	Raw CEA subgroup 2 position signal	Inches Withdrawn
17	Raw CEA subgroup 3 position signal	Inches Withdrawn

TABLE H2

CPC POINT ID ASSIGNMENTS FOR RTT PART 1

Point ID Number	Definition	Units
18	Raw CEA subgroup 4 position signal	Inches Withdrawn
19	Raw CEA subgroup 5 position signal	Inches Withdrawn
20	Raw CEA subgroup 6 position signal	Inches Withdrawn
21	Raw CEA subgroup 7 position signal	Inches Withdrawn
22	Raw CEA subgroup 8 position signal	Inches Withdrawn
23	Raw CEA subgroup 9 position signal	Inches Withdrawn
24	Raw CEA subgroup 10 position signal	Inches Withdrawn
25	Raw CEA subgroup 11 position signal	Inches Withdrawn
26	Raw CEA subgroup 12 position signal	Inches Withdrawn
27	Raw CEA subgroup 13 position signal	Inches Withdrawn
28	Raw CEA subgroup 14 position signal	Inches Withdrawn
29	Raw CEA subgroup 15 position signal	Inches Withdrawn
30	Raw CEA subgroup 16 position signal	Inches Withdrawn
31	Raw CEA subgroup 17 position signal	Inches Withdrawn
32	Raw CEA subgroup 18 position signal	Inches Withdrawn
33	Raw CEA subgroup 19 position signal	Inches Withdrawn

TABLE H2

CPC POINT ID ASSIGNMENTS FOR RTT PART 1

Point ID Number	Definition	Units
34	Raw CEA subgroup 20 position signal	Inches Withdrawn
35	Raw CEA subgroup 21 position signal	Inches Withdrawn
36	Raw CEA subgroup 22 position signal	Inches Withdrawn
37	Raw CEA subgroup 23 position signal	Inches Withdrawn
38	Time of Day	Hours

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TABLE H3

CPC POINT ID ASSIGNMENTS FOR RTT PART 1

Point ID Number	Definition	Units
1	Raw CEA #1 Position Signal	Inches Withdrawn
2	Raw CEA #2 Position Signal	Inches Withdrawn
3	Raw CEA #3 Position Signal	Inches Withdrawn
4	Raw CEA #4 Position Signal	Inches Withdrawn
5	Raw CEA #5 Position Signal	Inches Withdrawn
6	Raw CEA #6 Position Signal	Inches Withdrawn
7	Raw CEA #7 Position Signal	Inches Withdrawn
8	Raw CEA #8 Position Signal	Inches Withdrawn
9	Raw CEA #9 Position Signal	Inches Withdrawn
10	Raw CEA #10 Position Signal	Inches Withdrawn
11	Raw CEA #11 Position Signal	Inches Withdrawn
12	Raw CEA #12 Position Signal	Inches Withdrawn
13	Raw CEA #13 Position Signal	Inches Withdrawn
14	Raw CEA #14 Position Signal	Inches Withdrawn

TABLE H3

CPC POINT ID ASSIGNMENTS FOR RTI PART 1

Point ID Number	Definition	Units
15	Raw CEA #15 Position Signal	Inches Withdrawn
16	Raw CEA #16 Position Signal	Inches Withdrawn
17	Raw CEA #17 Position Signal	Inches Withdrawn
18	Raw CEA #18 Position Signal	Inches Withdrawn
19	Raw CEA #19 Position Signal	Inches Withdrawn
20	Raw CEA #20 Position Signal	Inches Withdrawn
21	Raw CEA #21 Position Signal	Inches Withdrawn
22	Raw CEA #22 Position Signal	Inches Withdrawn
23	Raw CEA #23 Position Signal	Inches Withdrawn
24	Raw CEA #24 Position Signal	Inches Withdrawn
25	Raw CEA #25 Position Signal	Inches Withdrawn
26	Raw CEA #26 Position Signal	Inches Withdrawn

TABLE H3

CPC POINT ID ASSIGNMENTS FOR RTT PART 1

Point ID Number	Definition	Units
27	Raw CEA #27 Position Signal	Inches Withdrawn
28	Raw CEA #28 Position Signal	Inches Withdrawn
29	Raw CEA #29 Position Signal	Inches Withdrawn
30	Raw CEA #30 Position Signal	Inches Withdrawn
31	Raw CEA #31 Position Signal	Inches Withdrawn
32	Raw CEA #32 Position Signal	Inches Withdrawn
33	Raw CEA #33 Position Signal	Inches Withdrawn
34	Raw CEA #34 Position Signal	Inches Withdrawn
35	Raw CEA #35 Position Signal	Inches Withdrawn
36	Raw CEA #36 Position Signal	Inches Withdrawn
37	Raw CEA #37 Position Signal	Inches Withdrawn

TABLE H3

CPC POINT ID ASSIGNMENTS FOR RTT PART 1

Point ID Number	Definition	Units
38	Raw CEA #38 Position Signal	Inches Withdrawn
39	Raw CEA #39 Position Signal	Inches Withdrawn
40	Raw CEA #40 Position Signal	Inches Withdrawn
41	Raw CEA #41 Position Signal	Inches Withdrawn
42	Raw CEA #42 Position Signal	Inches Withdrawn
43	Raw CEA #43 Position Signal	Inches Withdrawn
44	Raw CEA #44 Position Signal	Inches Withdrawn
45	Raw CEA #45 Position Signal	Inches Withdrawn
46	Raw CEA #46 Position Signal	Inches Withdrawn
47	Raw CEA #47 Position Signal	Inches Withdrawn
48	Raw CEA #48 Position Signal	Inches Withdrawn
49	Raw CEA #49 Position Signal	Inches Withdrawn

TABLE H3

CPC POINT ID ASSIGNMENTS FOR RTT PART 1

Point ID Number	Definition	Units
50	Raw CEA #50 Position Signal	Inches Withdrawn
51	Raw CEA #51 Position Signal	Inches Withdrawn
52	Raw CEA #52 Position Signal	Inches Withdrawn
53	Raw CEA #53 Position Signal	Inches Withdrawn
54	Raw CEA #54 Position Signal	Inches Withdrawn
55	Raw CEA #55 Position Signal	Inches Withdrawn
56	Raw CEA #56 Position Signal	Inches Withdrawn
57	Raw CEA #57 Position Signal	Inches Withdrawn
58	Raw CEA #58 Position Signal	Inches Withdrawn
59	Raw CEA #59 Position Signal	Inches Withdrawn
60	Raw CEA #60 Position Signal	Inches Withdrawn
61	Raw CEA #61 Position Signal	Inches Withdrawn

TABLE H3

CPC POINT ID ASSIGNMENTS FOR RTT PART 1

Point ID Number	Definition	Units
62	Raw CEA #62 Position Signal	Inches Withdrawn
63	Raw CEA #63 Position Signal	Inches Withdrawn
64	Raw CEA #64 Position Signal	Inches Withdrawn
65	Raw CEA #65 Position Signal	Inches Withdrawn
66	Raw CEA #66 Position Signal	Inches Withdrawn
67	Raw CEA #67 Position Signal	Inches Withdrawn
68	Raw CEA #68 Position Signal	Inches Withdrawn
69	Raw CEA #69 Position Signal	Inches Withdrawn
70	Raw CEA #70 Position Signal	Inches Withdrawn
71	Raw CEA #71 Position Signal	Inches Withdrawn
72	Raw CEA #72 Position Signal	Inches Withdrawn
73	Raw CEA #73 Position Signal	Inches Withdrawn

TABLE H3

CPC POINT ID ASSIGNMENTS FOR RTT PART 1

Point ID Number	Definition	Units
74	Raw CEA #74 Position Signal	Inches Withdrawn
75	Raw CEA #75 Position Signal	Inches Withdrawn
76	Raw CEA #76 Position Signal	Inches Withdrawn
77	Raw CEA #77 Position Signal	Inches Withdrawn
78	Raw CEA #78 Position Signal	Inches Withdrawn
79	Raw CEA #79 Position Signal	Inches Withdrawn
80	Raw CEA #80 Position Signal	Inches Withdrawn
81	Raw CEA #81 Position Signal	Inches Withdrawn
82	Raw CEA #82 Position Signal	Inches Withdrawn
83	Raw CEA #83 Position Signal	Inches Withdrawn
84	Raw CEA #84 Position Signal	Inches Withdrawn
85	Raw CEA #85 Position Signal	Inches Withdrawn

TABLE B3

CPC POINT ID ASSIGNMENTS FOR RIT PART 1

Point ID Number	Definition	Units
86	Raw CEA #86 Position Signal	Inches Withdrawn
87	Raw CEA #87 Position Signal	Inches Withdrawn
88	Raw CEA #88 Position Signal	Inches Withdrawn
89	Raw CEA #89 Position Signal	Inches Withdrawn
90	Raw CEA #90 Position Signal	Inches Withdrawn
91	Raw CEA #91 Position Signal	Inches Withdrawn
92	Raw CEA #92 Position Signal	Inches Withdrawn
93	Raw CEA #93 Position Signal	Inches Withdrawn

VS:1961b/mr

March 13, 1983

MR. A. E. CHAFFEE

SUBJECT: NRC Requested Documents

Enclosed are copies of the following documents requested by the NRC:

1. Operating Instruction SO23-3-5.1, Rev. 7, "Emergency Plant Shutdown," which identifies operator actions following reactor trip or initiating reactor trip. It is provided in response to what was identified as item "I.d. Reactor Trip Followup (including ATWS)," on the "Paper" attachment to the NRC-prepared agenda.

2. Operating Instruction SO23-3-2.19.1, Rev. 5, "CEDM MG Set Operation," which specifies operator actions in performing testing of the Reactor Trip Circuit Breakers pursuant to Technical Specification 4.3.1.1, Table 4.3-1, item 1.

3. Instrument and Test Procedure SO23-II-1.1, Rev. 8, "Surveillance Requirement, Reactor Plant Protection System, Channel Functional Test (31 Day Interval)," including TCNs 42, 43 and 44. This procedure, in combination with item 4, below, specifies I&C testing of, among other things, the Reactor Trip Circuit Breakers pursuant to Technical Specification 4.3.1.1, Table 4.3-1, item 13.

4. Instrument and Test Procedure SO23-II-11.161, Rev. 2, "Surveillance Requirement, Reactor Breakers Undervoltage and Shunt Trip Device Circuit Test."

5. Instrument and Test Procedure SO23-II-3.1, Rev. 1, "Plant Protection System, Response Time Test for Channel A (Eighteen Month Interval)," including TCNs 7, 8, 9, 10 and 11. This procedure, in combination with items 6, 7 and 8 below, specifies I&C testing of, among other things, the Reactor Trip Circuit Breakers pursuant to Technical Specification 4.3.1.3.

6. Instrument and Test Procedure SO23-II-3.2, Rev. 1, "Plant Protection System, Response Time Test for Channel B (Eighteen Month Interval)," including TCNs 7, 8, 9 and 10.

7. Instrument and Test Procedure SO23-II-3.3, Rev. 1, "Plant Protection System, Response Time Test for Channel C (Eighteen Month Interval)," including TCNs 7, 8 and 9.

8. Instrument and Test Procedure SO23-II-3.4, Rev. 1, "Plant Protection System, Response Time Test for Channel D (Eighteen Month Interval)," including TCNs 6, 7 and 8.

Items 2 through 8, above, are provided in response to item VII.D.1 of the NRC-prepared agenda.

9. Station Procedure SO23-MPES008, Rev. 0, "Under-Voltage Tripping Device of GE AK-2-25 Circuit Breakers in the Reactor Trip Switchgear," which represents issuance, as a Station document, of Startup procedure MPES008, Rev. 1. Reference to "Tripping Device" in the title is reference to the Reactor Trip Circuit Breakers.

10. Maintenance Procedure SO23-I-4.36, Rev. 0, "Inspection and Adjustment of Under-Voltage Tripping Device (GE Circuit Breaker AK-15 and 25)," including TCN 1. This procedure represents the development of a Station procedure which would replace item 9, above, but has not been used in any maintenance of the Reactor Trip Circuit Breakers (item 9, above, has been used). Reference to "Tripping Device" in the title is reference to the Reactor Trip Circuit Breakers. Action has been initiated to cancel this procedure and its TCN. It will be reissued when what represented TCN 1 to the procedure can be incorporated into a revision rather than a TCN.

Items 9 and 10, above, are provided in response to item VII.E.1 of the NRC-prepared agenda.

11. A "Document History Summary" which identifies the chronological history of all revisions and TCNs for each of the procedures identified above.

WCM
W. C. MOODY

1620v/jms

cc: H. B. Ray
J. M. Price
CDM