REV NO. ( )	TITLE	CONT ON SHEET 2	SH NO. 1
P3K-AL-0495-A01	TEST INSTRUCTIONS CONTROL VALVE POSITION CONTROL BWR		1F1-B2
CONT ON SHEET 2 SH NO. 1	FIRST MADE FOR CKT. BOARD ASSEMBLY 118D1364 G1, G2*		

*G2 instructions same as C1 except section E.1.c

REVISIONS

A. BOARD CONTENTS

1. 2 each regulated power supplies.
2. Normalizing amplifier (IC1).
3. Summing amplifier (IC2).
4. Meter amplifier (IC3).

B. POWER SUPPLIES TURN VR1 CW

1. $V_{TP1} = 15.7 \pm 1$ VDC
2. $V_{TP2} = -15.7 \pm 1$ VDC
3. I Pin 37 = 63 ± 15 ma DC
4. I Pin 41 = 62 ± 15 ma DC

Voltge

C. NORMALIZING AMPLIFIER (IC1)

1. Voltage Ranges

$1.45 < V_{TP50} < 1.9$ VDC (VR8 CW)

$-7.5 < V_{TP50} < -6.2$ VDC (VR8 CCW)

2. Amplifier Gains

a. Ground TP9

THEN:

$-1.02 < V_{TP7} / V_{TP50} < -.975$ (VR9 CCW), ($|V_{TP50}| \leq 5$ VDC)

b. Ground TP50 — Remove 9 from ground.

THEN:

$-0.512 < V_{TP7} / V_{TP9} < -0.485$ (VR9 CCW), ($0 < V_{TP9} < 10$ VDC)

$-11.7 < V_{TP7} / V_{TP9} < -9.4$ (VR9 CW), ($0 < V_{TP9} < 1$ VDC)

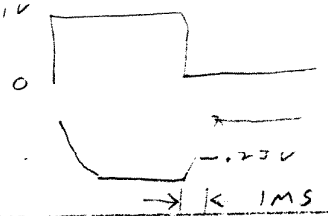
3. Transient States

a. -Ground TP50

-VR9 CCW

Apply a +1.0 VDC step input to TP9. THEN:

V_{TP7} = 0.23 volts (nominal) @ t = 1 ms



273-2
273-12
273-71
273-13
273-220
273-227
PRINTS

MADE BY Strand SEP 27 1977	APPROVALS	Steam Turbine DIV OR DEPT.	P3K-AL-0495-A01
ISSUED Sept 27, 1977		Schenectady, N.Y. LOCATION	CONT ON SHEET 2 SH NO. 1

TITLE
TEST INSTRUCTIONS
CONTROL VALVE POSITION CONTROL BWR 1F1-B2
FIRST MADE FOR CKT. BOARD ASSEMBLY 118D1364 G1,G2*

*G2 instructions same as G1 except section E.1.c

REVISIONS

D. METER AMPLIFIER (IC3)

1. V_{TP53} = -22 VDC, (VR10 CW)

2. Attach milliammeter from pin 24 to ground.
   Ground TP5 and null IC3.
   Insure that VR50 runs V_{TP4} through zero.

3. $V_{TP4} / V_{TP5} = 1.00$ $(-10 \leq V_{TP5} \leq 0$ VDC)

4. Apply -10 VDC to TP5. THEN:

   $1.5 < I_{meter} < 1.6$ ma DC (VR5 CW)

   $0.82 < I_{meter} < 0.92$ ma DC (VR5 CCW)

E. SUMMING AMPLIFIER (IC2) - STEADY STATE

1. Voltage Ranges

   a. V_{TP60} = 0 VDC, (VR4 CCW)

   $-6.0 < V_{TP60} < -5.0$ VDC, (VR4 CW)

   b. V_{TP55} = 0 VDC, (VR7 CCW) } (VR53 CCW)

   $-14.1 < V_{TP55} < -12.0$ VDC, (VR7 CW) }

   c. $6.3 < V_{TP61} < 6.6$ VDC, (VR1 CCW) } (VR2 CW) G1

   $15.5 < V_{TP61} < 16.4$ VDC, (VR1 CW) }

   $4.7 < V_{TP61} < 4.9$ VDC, (VR1 CCW) } (VR2 CW) G2

   $17.2 < V_{TP61} < 17.8$ VDC, (VR1 CW) }

   d. V_{TP64} = 0 VDC, (VR3 CCW) (VR54 CW)

   $-14.1 < V_{TP64} < -12.0$ VDC (VR3 CW)

2. Amplifier Gains

   a. - VR1 CW
   - VR7 CCW
   - TP7, TP54, TP5, TP65 grounded
   - TP57-TP52 shorted
   - TP58 - TP59 shorted
   THEN:

   VR6 CCW
   VR55 CCW

   $-1.05 < V_{TP3} / V_{TP61} < -1.0$ (VR2 CW) } ($V_{TP61} \approx +1.0$ VDC)

   $-1.025 < V_{TP3} / V_{TP61} < -.95$ (VR2 CCW) }

PRINTS TO

*G2 instructions same as G1 except seciton E.1.c

REVISIONS

E. SUMMING AMPLIFIER (IC2) - STEADY STATE (continued)

2. (continued)

b. - TP7, TP54, TP61, TP5, TP65 grounded 67, 62
- TP58 - TP59 shorted Take out TP52 & TP57 short.
THEN:

$-1.02 < V_{TP3} / V_{TP56} < -.98$ (VR55, VR6 CCW)
$(0 < V_{TP56} < 1.5$ VDC)

$-47.6 < V_{TP3} / V_{TP56} < -38.4$ (VR55, VR6 CW) 100mV
$(0 < V_{TP56} < 0.2$ VDC)

c. Series Gains

- TP57 - TP52 shorted
- TP66, TP63, TP61 grounded 67
- Set $-10 < V_{TP55} < 0$ VDC VR7
- Apply necessary $V_{TP56} > 0$ to keep amplifier from limiting VR8 at TP7 +1VDC

THEN when IC2 not limiting:

(1) VR51 CCW, VR53 CCW

$-2.56 < V_{TP3} / V_{TP7} < -2.45$ $(V_{TP7} > V_{TP55})$

$-3.57 < V_{TP3} / V_{TP7} < -3.45$ $(V_{TP7} < V_{TP55})$

(2) VR51 CCW, VR53 CW

$-2.56 < V_{TP3} / V_{TP7} < -2.45$ $(V_{TP7} > V_{TP55})$

$-2.77 < V_{TP3} / V_{TP7} < -2.64$ $(V_{TP7} < V_{TP55})$

(3) VR51 CW, VR53 CW

$-.107 < V_{TP3} / V_{TP7} < -.087$ $(V_{TP7} > V_{TP55})$

$-.325 < V_{TP3} / V_{TP7} < -.27$ $(V_{TP7} < V_{TP55})$

(4) VR51 CW, VR53 CCW

$-.107 < V_{TP3} / V_{TP7} < -.087$ $(V_{TP7} > V_{TP55})$

$-1.13 < V_{TP3} / V_{TP7} < -1.07$ $(V_{TP7} < V_{TP55})$

PRINTS TO

*G2 instructions same as G1 except section E.1.c

REVISIONS

E. SUMMING AMPLIFIER (IC2) - STEADY STATE (continued)

2. (continued)

d. Feedback Gains

- TP57 - TP52 shorted
- TP7, TP54, TP61 grounded
- Apply necessary $V_{TP56} > 0$ to keep amplifier from limiting

THEN with IC2 not limiting:

(1) VR52 CCW, VR54 CCW

$-.107 < V_{TP3} / V_{TP5} < -.087 \qquad (V_{TP5} > V_{TP64})$

$-.217 < V_{TP3} / V_{TP5} < -.168 \qquad (V_{TP5} < V_{TP64})$

(2) VR52 CCW, VR54 CW

$-.107 < V_{TP3} / V_{TP5} < -.087 \qquad (V_{TP5} > V_{TP64})$

$-1.13 < V_{TP3} / V_{TP5} < -1.06 \qquad (V_{TP5} < V_{TP64})$

(3) VR52 CW, VR54 CW

$-2.5 < V_{TP3} / V_{TP5} < -2.46 \qquad (V_{TP5} > V_{TP64})$

$-3.57 < V_{TP3} / V_{TP5} < -3.43 \qquad (V_{TP5} < V_{TP64})$

(4) VR52 CW, VR54 CCW

$-2.5 < V_{TP3} / V_{TP5} < -2.46 \qquad (V_{TP5} > V_{TP64})$

$-2.67 < V_{TP3} / V_{TP5} < -2.48 \qquad (V_{TP5} < V_{TP64})$

3. Limit Circuit

a. TP58 - TP59 shorted:

$V_{TP3} = \pm 2.5 \pm 0.5$ VDC (soft limit) 4.3 ✓

b. Short removed:

$V_{TP3} = 0.3 \pm 0.1$ VDC (hard limit) .243 ✓

4. Saturation Protection (CR10, CR11)

$|V \text{ Pin 2 IC2} - V \text{ Pin 3 IC2}| \leq 0.6$ VDC

PRINTS TO

REV NO. 0

P3K-AL-0495-A01

CONT ON SHEET 6 SH NO. 5

TITLE
TEST INSTRUCTIONS
CONTROL VALVE POSITION CONTROL BWR 1F1-B2
FIRST MADE FOR CKT. BOARD ASSEMBLY 118D1364 G1,G2*

*G2 instructions same as G1 except section E.1.c

REVISIONS

F. SUMMING AMPLIFIER - TRANSIENT STATE

VR55 CW
TP61, TP62, TP67, TP66, TP63 grounded

(a). Adjust VR6 so that $V_{TP3} / V_{TP56} = -2.00$
Ground TP56, TP54; Remove TP62, TP67, TP63 grounds

(b). Adjust VR52 so that $V_{TP3} / V_{TP5} = -2.00$
Remove TP66 ground and:

(c). Ground TP63 and adjust VR54 so that $V_{TP3} / V_{TP65} = -2.00$

THEN:

(1) With TP63 grounded:

Apply V_{TP65} = +0.5 VDC step and observe V_{TP3}.

(2) Remove TP63 ground and ground TP66

Apply V_{TP5} = +0.5 VDC step and observe V_{TP3}.

See Figure 2.

PRINTS TO

MADE BY Stalder SEP 27 1977
ISSUED Sept 27, 1977

APPROVALS

Steam Turbine DIV OR DEPT.
Schenectady, N.Y. LOCATION

P3K-AL-0495-A01
CONT ON SHEET 6 SH NO. 5

REV. NO. 0

P3K-AL-0495-AU1

CONT ON SHEET 7 SH NO. 6

TITLE
TEST INSTRUCTIONS
CONTROL VALVE POSITION CONTROL BWR 1F1-B2
FIRST MADE FOR CKT. BOARD ASSEMBLY 118D1364 G1,G2*

*G2 instructions same as G1 except section E.1.c

REVISIONS

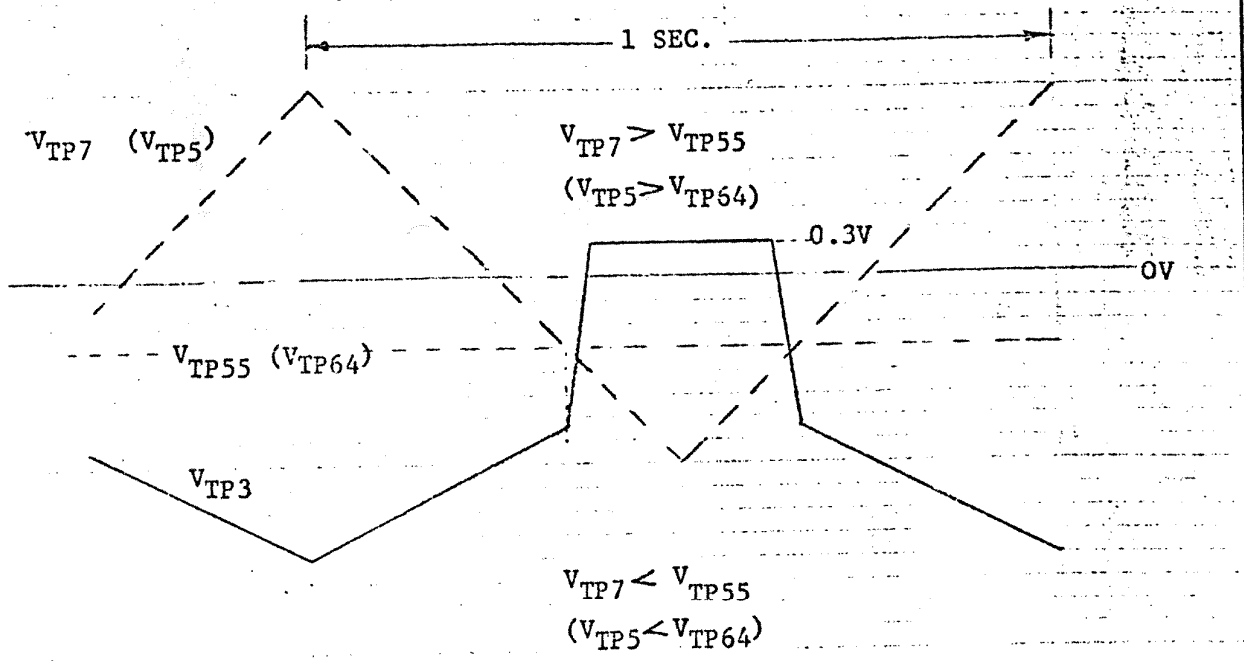


FIGURE 1: Using a 1 HZ triangle signal to check V_{TP3}/V_{TP7} (V_{TP3}/V_{TP5}) Section E.2.c. (d).

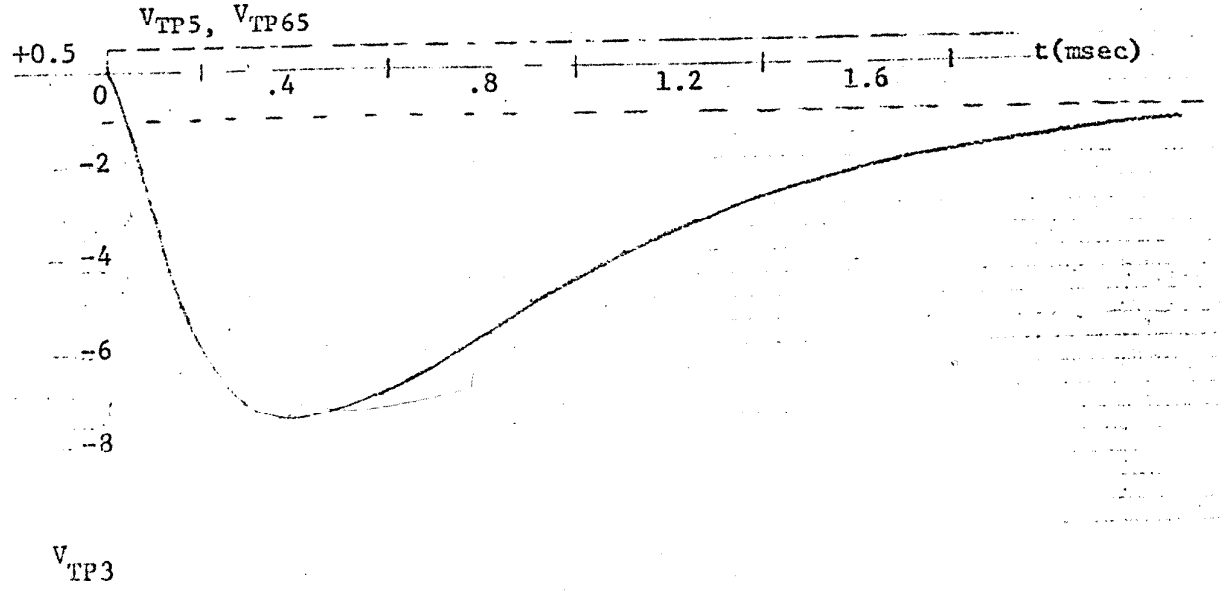


FIGURE 2: Step response (V_{TP3}) to F.1. and F. 2.

PRINTS

MADE BY Glacer, SEP 27 1977
ISSUED Sept 27, 1977

APPROVALS

Steam Turbine DIV OR DEPT.
Schenectady, N.Y. LOCATION

P3K-AL-0495-A01
CONT ON SHEET 7 SH NO. 6

REV NO. 0	TITLE	CONT ON SHEET —	SH NO. 7
P3K-AL-0495-A01	TEST INSTRUCTIONS CONTROL VALVE POSITION CONTROL		
CONT ON SHEET — SH NO. 7	FIRST MADE FOR CKT BOARD ASSEMBLY 118D1364 G1		

REVISIONS

PREPARED BY S A Cabelus DATE 4/6/76

APPROVED BY P C Callan DATE 9-12-77
P.C. Callan - MANAGER
EHC DESIGN ENGINEERING

TEST PROCEDURE REVIEWED BY R. Debertolis DATE 9-9-77
R. Debertolis
EHC TEST ENGINEER

PRINTS TO

MADE BY STOLLER SEP 27 1977	APPROVALS	Steam Turbine DIV OR DEPT.	P3K-AL-0495-A01
ISSUED Sept 27, 1977		Schenectady, N.Y. LOCATION	CONT ON SHEET — SH NO. 7
			CODE IDENT NO