

REV
NO.

TITLE

P3K-AL-0461-A01

MSV POSITION CONTROL (MSV-2)

CIRCUIT BOARD ASSEMBLY 118D1307 G1, G2 1F1-A101

CONT ON SHEET

2

SH NO.

1

FIRST MADE FOR EHC MARK II

REVISIONS

A. BOARD CONTENTS

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

+22 to pin 37
-22 to pin 41
Com to pin 39

B. POWER SUPPLIES

1. $V_{TP1} = 15.7 \pm 1$ VDC
2. $V_{TP2} = -15.7 \pm 1$ VDC
3. I pin 37 = ma DC
4. I pin 41 = ma DC

ACTIVE

FOR

all groups

BY

LTC

DATE

7/10/97

C. NORMALIZING AMPLIFIER (IC1)

1. Null Adjust (VR51)

Ground TP9

Insure that adjusting VR51 runs V_{TP7} through zero.

2. Amplifier Gains - Steady State
Null IC1, then

 $+1 \text{ VDC } TP9 \text{ } TP7$

$$-0.062 < V_{TP7}/V_{TP9} < -0.059; \quad (0 \leq V_{TP9} \leq 10 \text{ VDC}, \text{ VR9 CCW})$$

$$-1.2 < V_{TP7}/V_{TP9} < -0.95; \quad (0 \leq V_{TP9} \leq 10 \text{ VDC}, \text{ VR9 CW})$$

3. Saturation Protection (CR5, CR6, IC1)

Pin 2 & 3 of IC1

$$|V_{pin 2} - V_{pin 3}| < 0.6 \text{ VDC};$$

$$|V_{TP9}| > 0$$

4. Transient State

Null IC1

$$\text{Set } VR9 \quad V_{TP7}/V_{TP9} = -1.00$$

Apply +2 VDC step input to TP9

Verify V_{TP7} by Figure 1.

273-2

273-12

273-71

273-138

273-221

273-227

PRINTS TO

MADE BY

SEP 26 1977

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SEP 26 1977

APPROVALS

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

LOCATION

P3K-AL-0461-A01

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SH NO.

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CODE IDENT NO.

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TITLE

CONT ON SHEET 3

SH NO. 2

P3K-AL-0461-A01

MSV POSITION CONTROL (MSV-2)

CIRCUIT BOARD ASSEMBLY 118D1307 G1, G2 1F1-A101

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D. METER AMPLIFIER (IC3)

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

$-6.85 < V_{TP53} < -5.8 \text{ VDC}$, (VR10 CCW)

2. Null Adjust (VR50)

Ground TP5

Insure that VR50 adjust runs V_{TP4} through zero

3. $V_{TP4}/V_{TP5} = 1.00$; (IC3 nulled, $-10 \leq V_{TP5} \leq 0 \text{ VDC}$)

4. Attach milliammeter pin 24 to ground

Apply -10 VDC to TP5 THEN

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

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

Remove -10 V From TP5.

E. SUMMING AMPLIFIER (IC2)

1. Voltage ranges

a. $V_{TP60} = 0 \text{V}$, (VR4 CCW)

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

b. $11.8 < V_{TP61} < 12.5 \text{ VDC}$, (VR1 CW)

$8.30 < V_{TP61} < 8.55 \text{ VDC}$, (VR1 CCW)

c. $-10.9 < V_{TP10} < -10.5 \text{ VDC}$

d. TP63 grounded: $1.94 < V_{TP10} < 2.02 \text{ VDC}$

2. Limit Circuits

a. TP58 - TP59 shorted:

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

b. Short removed:

$V_{TP3} = 0.3 \pm 0.1 \text{ VDC}$ (hard limit)

*3.98
18.48*

6.26

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P3K-AL-0461-A01

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MSV POSITION CONTROL (MSV-2)
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FIRST MADE FOR EHC MARK II

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E. SUMMING AMPLIFIER (IC2) (continued)

3. Saturation Protection (IC2)

$$|V_{pin\ 2} - V_{pin\ 3}| \leq 0.6\ VDC; \quad |V_{inputs}| > 0$$

4. Amplifier Gains - Steady State

- a. ^{Pin 6} TP5, ^{Pin 33} TP61, ^{Pin 35} TP65, ^{Pin 38} TP62, TP66 grounded

~~TP58 - TP59 shorted~~ ^{Pin 10 to +22V}

$$\left. \begin{array}{l} -7.1 < V_{TP3}/V_{TP56} < -6.9 \quad (VR6\ CW) \\ -1.53 < V_{TP3}/V_{TP56} < -1.47 \quad (VR6\ CCW) \end{array} \right\} (V_{TP56} = 1.00\ VDC)$$

- b. TP52 - TP57 shorted

~~TP58 - TP59 shorted~~ ^{Pin 10 to +22V}
TP61, TP65, TP66, TP62, TP56 grounded
^{Pin 33} ^{Pin 38} ^{Pin 35}

$$-1.02 < V_{TP3}/V_{TP5} < -0.98 \quad (0 < V_{TP5} < 10\ VDC)$$

- c. TP52 - TP57 shorted

TP58 - TP59 shorted
TP5, TP65, TP66, TP62, TP56 grounded

$$-1.02 < V_{TP3}/V_{TP61} < -0.98 \quad (V_{TP61} \approx 8.4\ VDC)$$

- d. TP52 - TP57 shorted

TP58 - TP59 shorted
TP5, TP61, TP8, TP66, TP62, TP56 grounded
^{Pin 6} ^{Pin 32} ^{Pin 38} ^{Pin 35}

$$-1.70 < V_{TP3}/V_{TP65} < -1.62 \quad (0 < V_{TP65} < 5\ VDC)$$

- e. TP52 - TP57 shorted

TP58 - TP59 shorted
TP5, TP61, TP66, TP62, TP56 grounded
^{Pin 6} ^{Pin 38} ^{Pin 35}

$$-1.03 < V_{TP3}/V_{TP8} < -0.89\ VDC \quad (0 < V_{TP8} < 10\ VDC)$$

- f. TP52 - TP57 shorted

TP58 - TP59 shorted
TP5, TP61, TP65, TP10, TP62, TP56 grounded
^{Pin 6} ^{Pin 33} ^{Pin 35}

$$-1.70 < V_{TP3}/V_{TP66} < -1.62 \quad (0 < V_{TP66} < 5\ VDC)$$

^{Pin 38}

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SH NO. 3

REV NO. 0
P3K-AL-0461-A01
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TITLE
MSV POSITION CONTROL (MSV-2)
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E. SUMMING AMPLIFIER (IC2) (continued)

4. g. TP52 - TP57 shorted
TP58 - TP59 shorted
TP5, TP61, TP65, TP63, TP62, TP56 grounded
P6 P33 Pin34 P35
 $-1.03 < V_{TP3/V_{TP10}} < -0.89$ ($0 < V_{TP10} < 10 \text{ VDC}$)
- h. TP52 - TP57 shorted
TP58 - TP59 shorted
TP5, TP61, TP65, TP66, TP7, TP56 grounded
P6 P33 Pin38 Pin35
 $-1.02 < V_{TP3/V_{TP62}} < -0.98$ ($0 < V_{TP62} < 10 \text{ VDC}$)
- i. TP52 - TP57 shorted
TP58 - TP59 shorted
TP5, TP61, TP65, TP66, TP56 grounded
P6 P33 P38
 $-0.205 < V_{TP3/V_{TP7}} < -0.194$ (VR9 CW, $-10 < V_{TP9} < 0 \text{ VDC}$)

5. Amplifier Gains - transients

- a. TP52 - TP57 shorted
TP58 - TP59 shorted
TP5, TP61, TP65, TP66, TP62 grounded
P6 P33 Pin38 Pin35
Verify $V(t)_{TP3}$ ($V(t)_{TP56}$); $V(t)_{TP56} = 1 \text{ u(t)}$
According to Figure 2.
- b. TP52-TP57 shorted
TP58 - TP59 shorted
TP5, TP61, TP65, TP66, TP7, TP56 grounded
Pin38 Pin35
Verify $V(t)_{TP3}$ ($V(t)_{TP62}$); $V(t)_{TP62} = 1 \text{ u(t)}$
According to Figure 3
- c. TP52 - TP57 shorted
TP58 - TP59 shorted
TP5, TP61, TP65, TP10, TP62, TP56 grounded
Pin38
Verify $V(t)_{TP3}$ ($V(t)_{TP66}$); $V(t)_{TP66} = 1 \text{ u(t)}$
According to Figure 3.

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P3K-AL-0461-A01

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MSV POSITION CONTROL (MSV-2)

CIRCUIT BOARD ASSEMBLY 118D1307 G1, G2 1F1-A101

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REVISIONS

E. SUMMING AMPLIFIER (IC2) (continued)

5. (continued)

d. TP52 - TP57 shorted

TP58 - TP59 shorted

TP5, TP61, TP66, TP62, TP56 grounded

P6

P38

P35

Verify $V(t)_{TP3}$ ($V(t)_{TP65}$); $V(t)_{TP65}^{P133} = 1 u(t)$

According to Figure 3.

e. TP52 - TP57 shorted

TP58 - TP59 shorted

TP61, TP65, TP66, TP62, TP56 grounded

P33

Verify $V(t)_{TP3}$ ($V(t)_{TP5}$); $V(t)_{TP5}^{P136} = 1 u(t)$

According to Figure 3.

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LOCATION

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SH NO. 5

CODE IDENT NO.

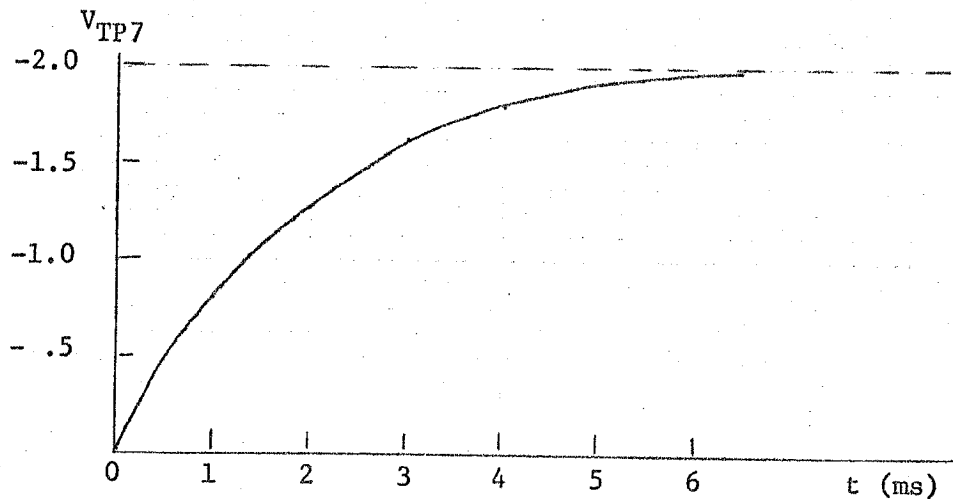


FIGURE 1: Nominal +2.0 VDC step response (Section C.4)

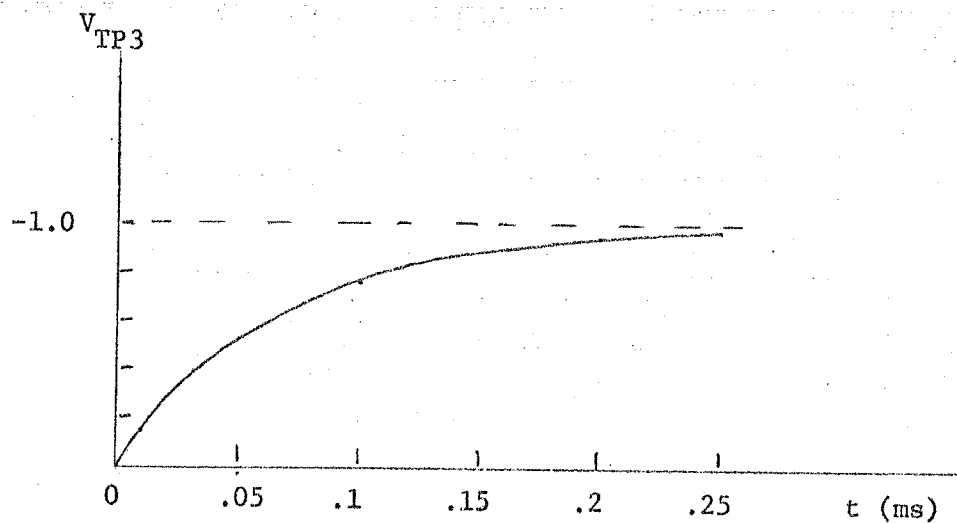


FIGURE 2: Nominal unit step response (Section E.5.a)

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P3K-AL-0461-A01

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CIRCUIT BOARD ASSEMBLY 118D1307 G1, G2 1F1-A101

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8 SH NO. 7

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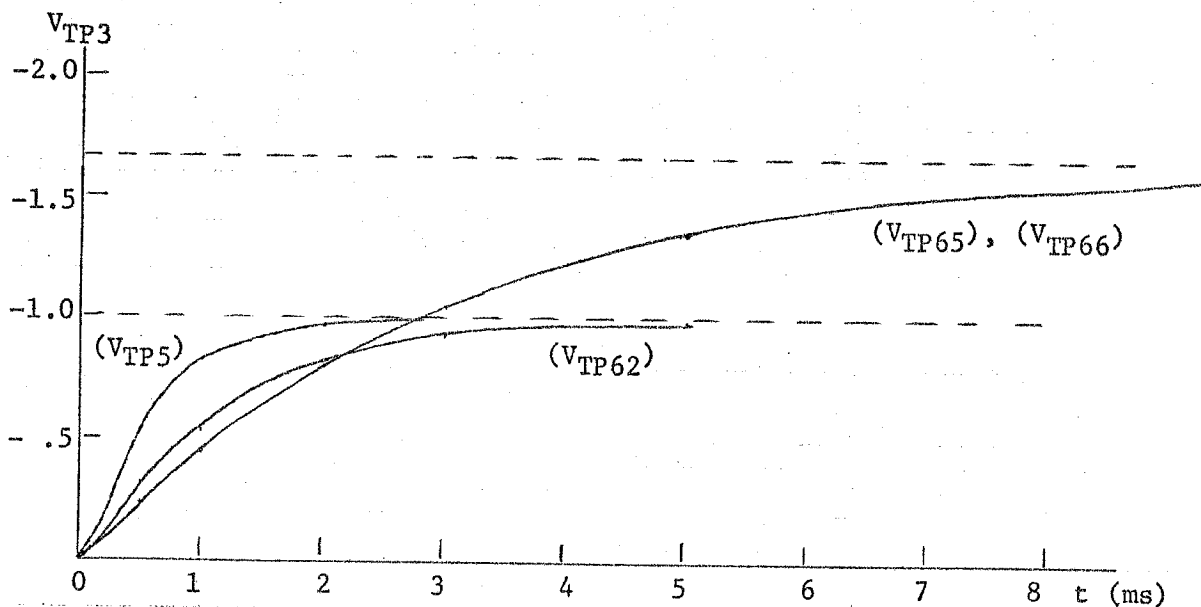


FIGURE 3: Nominal unit step response (Section E.5.b,c,d,e)

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P3K-AL-0461-A01

SH NO. 8

MSV POSITION CONTROL (MSV-2)
CIRCUIT BOARD ASSEMBLY 118D1307 G1
FIRST MADE FOR

EHC MARK II

REVISIONS

PREPARED BY

S.S. Abelson

DATE

12/4/75

S.S. Abelson

EHC DESIGN ENGINEERING

APPROVED BY

P.C. Callan

DATE

9-12-77

P.C. Callan - MANAGER
EHC DESIGN ENGINEERING

TEST PROCEDURE

REVIEWED BY

R. W. Debertolis

DATE

9-9-77

R. Debertolis
EHC TEST ENGINEER

PRINTS TO

MADE BY

J. Polacek

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