TITLE
SPECIFICATIONS AND TEST INSTRUCTIONS
VALVE POSITION DRIVER (25 GPM) CKT. BD. ASM. DWG. 115D2280*
FIRST MADE FOR EHC MARK II 1F1-F0

* *G1=G2 except Section K2

REVISIONS
1 | J Polacek FEB 28 1978 | * Chg made
@ G Paulin OCT 27 1981 | no chg. this sht

A. BOARD CONTENTS

1. Servoamplifier with meter drive.
2. 3 KHz oscillator
3. Phase-sensitive demodulator
4. Low-pass filter
5. Feedback amplifier
6. 6 each regulated power supplies

B. TEST SETUP

See Figure 1.

C. POWER SUPPLIES (INITIAL CHECK)

1. $V_{TP1} = 15.7 \pm 1.0$ VDC
2. $V_{TP2} = -15.7 \pm 1.0$ VDC
3. $V_{TP3} = 18.7 \pm 1.5$ VDC
4. $V_{TP4} = -18.7 \pm 1.5$ VDC
5. $V_{TP53} = 15.0 \pm 0.75$ VDC @ T_{room}; < 16.5 VDC, hot
6. $V_{TP54} = -15.0 \pm 0.75$ VDC @ T_{room}; > -16.5 VDC, hot

D. SERVOAMPLIFIER (IC5) - STEADY STATE

1. $|V_{TP5}| <$ 0.525 VDC over full range of VR1. set TP5 for +0.6 VDC using VR
2. VR2 fully ~~CW~~ CCW, TP55 ~~TP9~~ grounded, ~~Zero V_{TP9} by adjusting V_{TP55}~~ then:
   ~~$-8.2 < V_{TP9}/V_{TP5} < -7.2$~~ $-4.1V < V_{TP9} < -3.9$ ($|V_{TP5}| \leq$ 0.05 VDC)
3. ~~With VR2 fully CW~~, adjust VR1 so that ~~when~~ V_{TP5} = 0 ~~then $V_{TP9} = 0$~~.
   a. Then the average gains are: Remove TP55 from gR, put +1.0 VDC into pin 11.
      $-4.2 < \frac{-4.0V}{V_{TP9}/V_{TP55}} < -3.5$
      ~~$|V_{TP55}| \leq$ 0.2 VDC~~
      ~~$11 < V_{TP10}/V_{TP55} < 12$~~
   b. The Servo Amp current meter should read approximately 15ma @ V_{TP55} = 0.2 VDC. .0230 ma max
      VR2 Full CW $|V_{TP10} - V_{TP9}| \geq 1.9$ VDC after $|V_{TP55}| = 0.25$ VDC is applied for 1 min.
      If $|V_{TP10} - V_{TP9}| < 1.9$ VDC, change IC5

OVER

273-2
273-12
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273-221
273-227
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make sure VR2 is fully CCW.

b) Set TP9 for 6.0 volt DC (using voltage info pin 11).

Read current across pin 12 to 18. ~~Should~~ Should read about .025MA.

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D. SERVOAMPLIFIER - STEADY STATE (continued)

4. Adjust VR2 fully CCW. Then:

$-4.1 < V_{TP9}/V_{TP55} < -3.9$

$-4.6 < V_{TP10}/V_{TP55} < -4.3$

} $|V_{TP55}| \leq 3.0$ VDC

Gv = 4.0

The servoamp meter should read approx. 14 ma at V_{TP55} = 3.0 VDC.

.2796 EC

E. SERVOAMPLIFIER - TRANSIENT STATE

Adjust VR1 so that when $V_{TP55} = 0$ then $V_{TP9} = 0$; VR2 fully CCW.
Apply a step input to TP55 where:

$V_{STEP} \leq 0.25V$

Then: $-18.6 < (V_{TP9}/V_{TP55})_{PEAK} < -14.5$ and:

$0.65 \text{ ms} < t_{peak} < 0.8 \text{ ms}$

SEE FIGURE 2

F. CONTINUITY

Pin 23 to Pin 24.

G. 3 KHZ OSCILLATOR

All tests, except that for temperature sensitivity, are to be done with the oscillator normally loaded.

1. Initial Starting

Adjust VR50 to mid range and observe TP12 with a scope (2 volt/div amplitude, 50 us/div. sweep.) If necessary readjust for a non-distorted sine wave.

2. Distortion

a. FET (2N3822) Distortion

Adjusting VR50 too far CW will cause the output TP12 to distort. Check distortion by centering the signal on both the amplitude and sweep coordinates as shown in Figure 3. Distortion occurs when $|T_1 - T_2| > 10$ usec and can be eliminated by backing down on VR50 (TP50).

FEB 28 19.. / OCT 27 1981 (a) See Sh 1 + 5 / no chg this sht.

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G. 3 KHZ OSCILLATOR (continued)

2. Distortion (continued)

b. Saturation Distortion

Saturation will occur when V_{peak} TP12 > Vzener and is eliminated by decreasing VR51.

3. V_{GATE} (VTP50) Setting

Adjust VR50 so that the oscillator runs at the upper limit of linearity ($|T_1 - T2| \approx 10$ usec); ie:

$$|V_{GATE}| \approx |V_{GATE\ FET\ DIST}| - .010$$

Operation around this point gives maximum temperature and load change stability. A sampling of 25 FET's has shown the upper limit to be:

$$-2.6 < V_{GATE} < -1.0$$

4. Amplitude Setting

Adjust VR51 for $V_{TP12} = 6.000 \pm .010$V RMS.

5. Frequency

* $3000 < f < 3400$ Hz @ TP12

6. Regeneration

The oscillator must restart in all of the following situations:

a. Simultaneously interrupt the +22 VDC and the -22 VDC power. Reconnect.

b. Interrupt the +22 VDC power. Reconnect.

c. -22 VDC power. Reconnect.

d. Withdraw and insert the Valve Position Driver Board.

7. Temperature Stability

This test may be conducted with oscillator unloaded.

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G. 3 KHZ OSCILLATOR (continued)

7. Temperature Stability (continued)

MAY need to change R51 to 2 meg to get gain + Temp stability

With V_G set as in Step 3 at ambient temperature (T_A) then: set

$$|\Delta V_{TP12}| \leq .060 \text{ V RMS} \quad (T_A \leq T \leq 130^oF)$$

A small change in V_G may be necessary to meet this spec. If $\Delta V_{TP12} >$ +.060 for $T_A \leq T \leq 130^oF$, decrease V_{GATE}. If $\Delta V_{TP12} > -.060$, increase V_{GATE}.

7.1 DC Component - @ TP51 - DVM on VDC setting - adjust VR51 for minimum DC component - <.1 VDC>

8. Load Variance

No transducer position should change V_{TP12} more than 15mv RMS.

$$\Delta V_{TP12} \leq .015 \text{ V RMS}$$

9. Envelope Modulation

Envelope modulation should not exceed .015V ptp.

H. POWER SUPPLIES

a. Oscillator loaded at 6V RMS output
b. VR1 and VR2 fully CW
c. $V_{TP55} = 0$

1. Steady State

a. +22 VDC: $I_{board} = 200 \pm 50$ ma DC

b. -22 VDC: $I_{board} = 215 \pm 50$ ma DC

2. Transients

To check C5 and C7, connect +22V and -22V DC to the board. In both cases at:

TP54 and TP53:

$$t_{rise} > 0.5 \text{ m sec.}$$

Trigger on +22 for TP53 & -22 for TP54

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(a) OCT 27 1981 G. Phillips no chg. this sht

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

CODE IDENT NO

FF-803-WA (4-73) PRINTED IN U.S.A.

REV NO. 12

P3K-AL-0395-A01
CONT ON SHEET 6 SH NO. 5

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I. DEMODULATOR

V_{TP12} = 6V RMS

1. Fully extend the transducer to its linear limit (as in valves wide open position) and adjust VR3 so that

$$V_{TP8} = 0.000 \pm 0.010 \text{ VDC}$$

   a. Verify V_{TP7} by Figure 4.

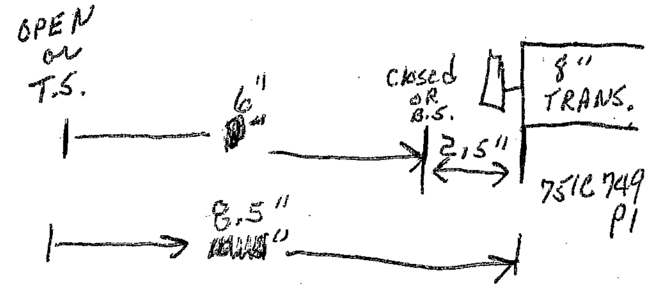
   b. Verify V_{TP52} by Figure 5.

SCOPE MUST BE ON AC

2. Insert the transducer by 8"

   a. Verify V_{TP7} by Figure 6.

   b. Verify V_{TP52} by Figure 7.



J. FILTER

1. With the board inactive:

~~$0.88 < V_{TP8}/V_{TP52} < 0.94 \quad (f \leq 100 \text{ HZ})$~~

GPL 5/5/89

2. Under normal operating conditions with V_{TP12} = 6V RMS:

   a. Transducer fully extended to its linear limit:

   $V_{TP8} = 0.000 \pm .010$ VDC

   $V_{TP8} < 10$mv ptp ; 3 KHZ fundamental

   b. Transducer inserted by 8"

   $4.5 < V_{TP8} < 5.2$ VDC

   $V_{TP8} < 10$mV ptp ; 3 KHZ fundamental.

K. FEEDBACK AMPLIFIER

1. Ground TP8 and null IC4 (TP13). Insure that VR52 will drive V_{TP13} through zero. Remove TP8 From Ground And Adjust Transducer For 1VDC AT TP8.

2. $-1.24 < V_{TP13}/V_{TP8} < -1.18$, VR4 CCW (G1, G2)

* $-4.61 < V_{TP13}/V_{TP8} < -3.88$, VR4 CW (G1)

   $-7.97 < V_{TP13}/V_{TP8} < -6.58$, VR4 CW (G2)

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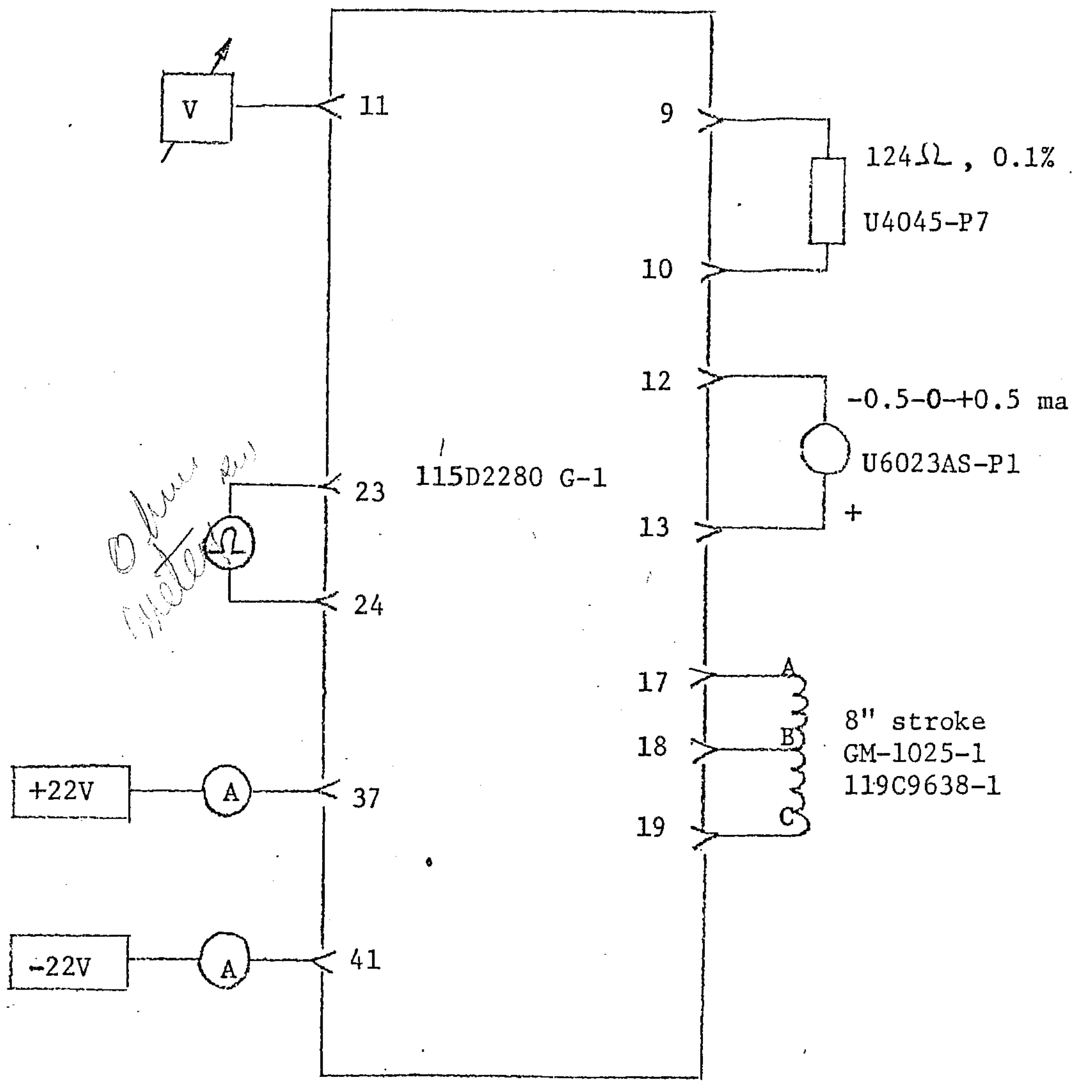

FIGURE 1: TEST SETUP

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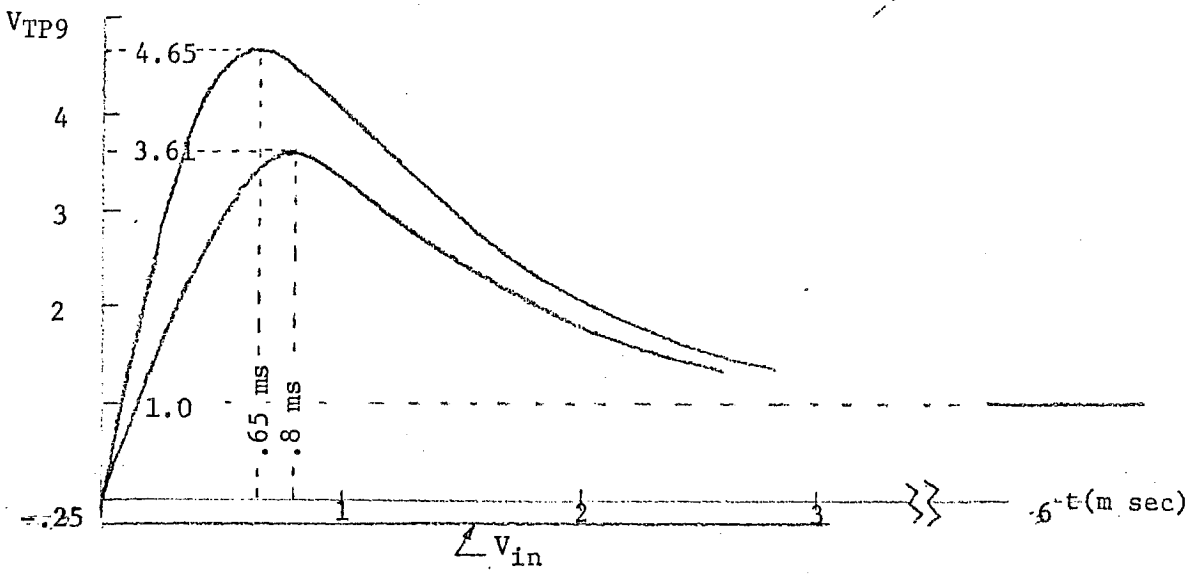

FIGURE 2: SERVOAMPLIFIER RESPONSE TO -0.25 STEP INPUT

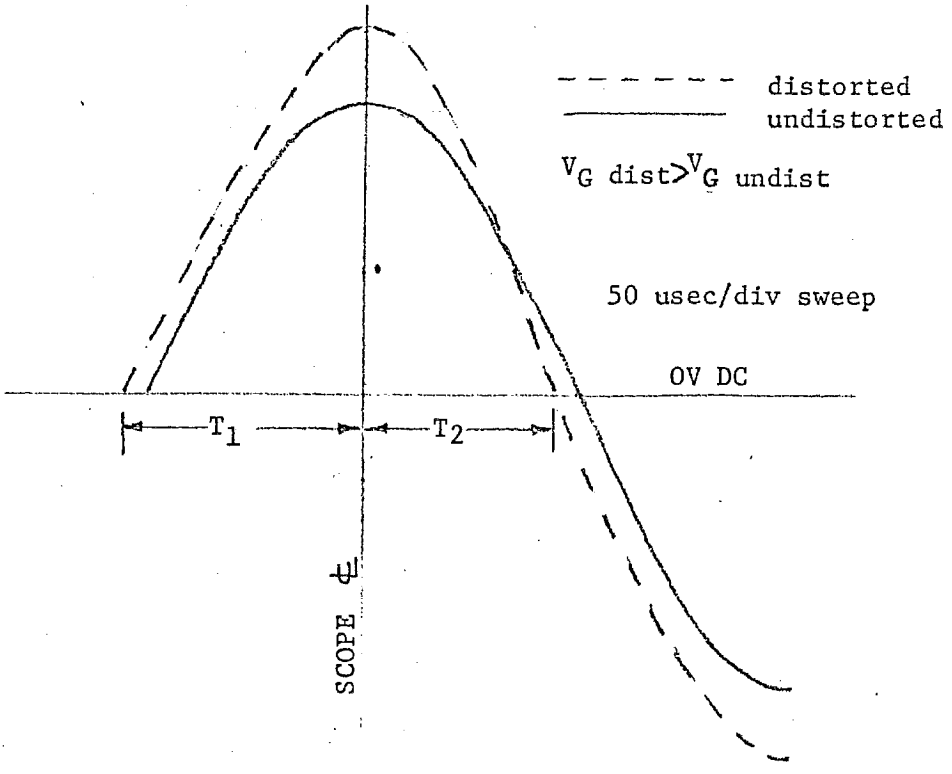

FIGURE 3: FET DISTORTION $|T_1 - T_2| > 10$ usec

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@ PAulisi OCT 27 19[illegible] Updated FEB 28 19[illegible]
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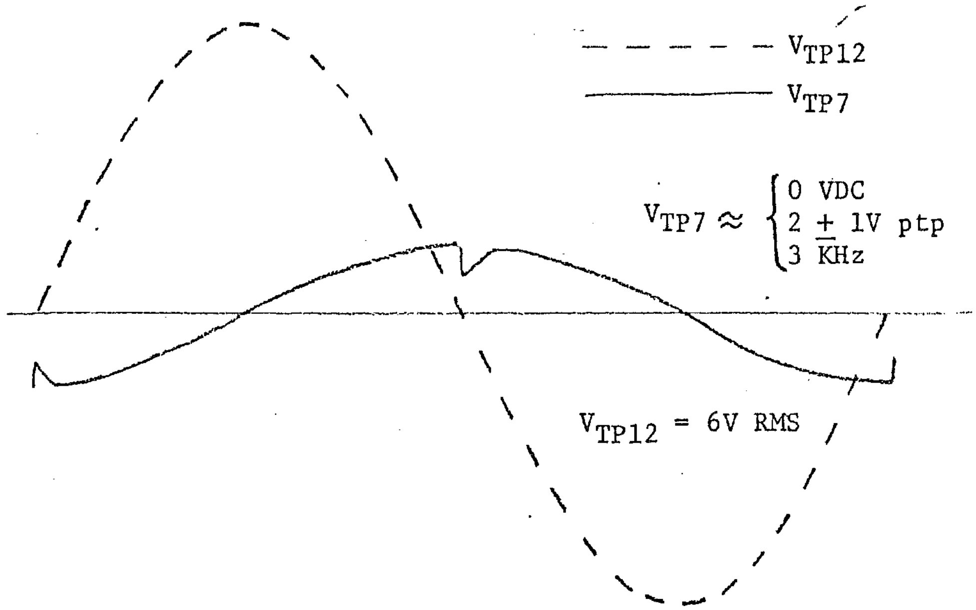

FIGURE 4: V_{TP7} - TRANSDUCER FULLY EXTENDED

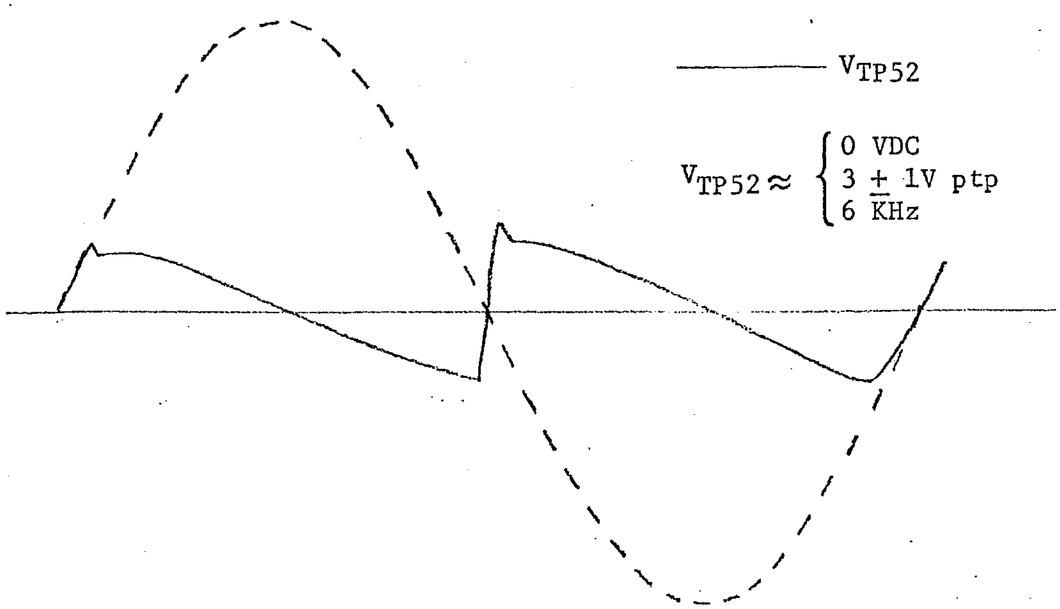

FIGURE 5: V_{TP52} - TRANSDUCER FULLY EXTENDED

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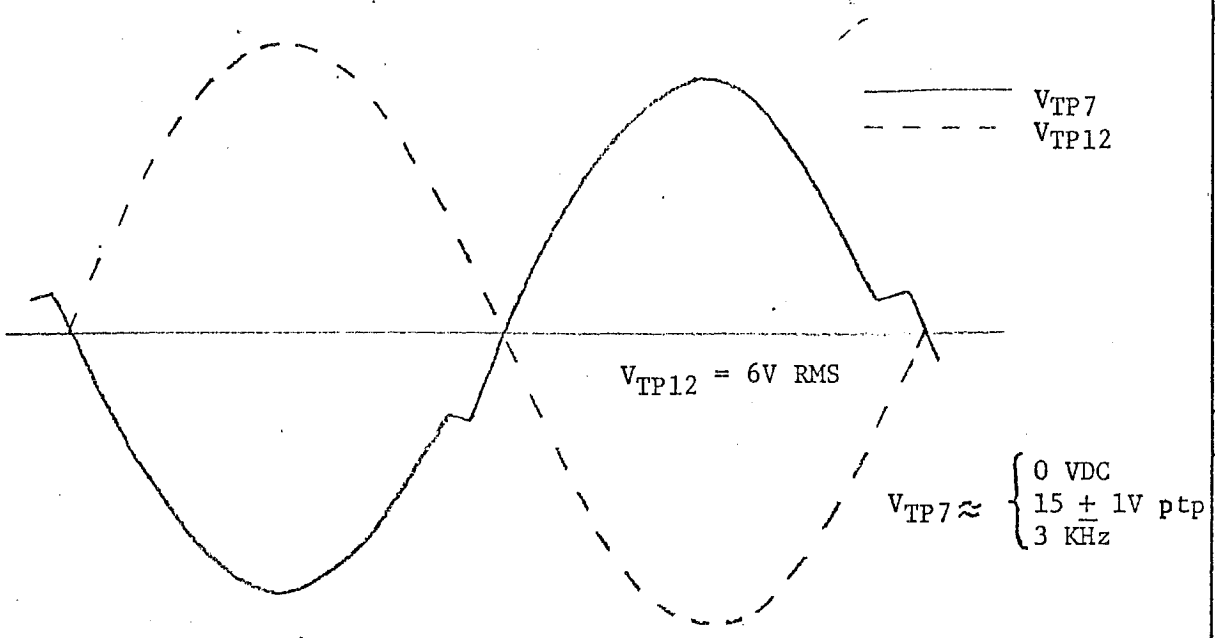

FIGURE 6: V_{TP7} - TRANSDUCER INSERTED 8"

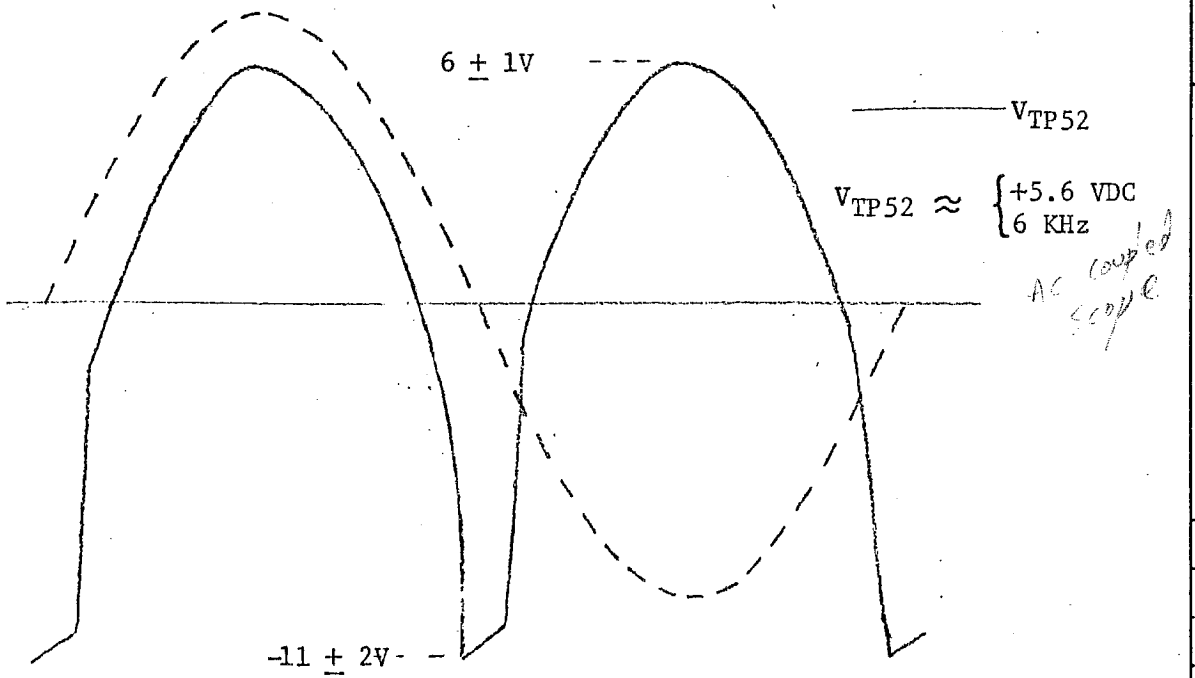

FIGURE 7: V_{TP52} - TRANSDUCER INSERTED 8"

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PREPARED BY S S Abelson DATE 3/2/74
S.S. Abelson
EHC DESIGN ENGINEERING SSA 9/24/81

APPROVED BY P C Callan DATE 9-6-77
P.C. Callan - MANAGER
EHC DESIGN ENGINEERING

TEST PROCEDURE REVIEWED BY [illegible] DATE [illegible]
R. Debertolis
EHC TEST ENGINEER

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