

REV NO. 0

TITLE

TEST INSTRUCTIONS FOR TBWD POS. IND. DRIVER 1TM1-B001  
(ASSEMBLY DRAWING 118D1319 G1)

P3K-AL-0425-A01

CONT ON SHEET 2 SH NO. 1

FIRST MADE FOR EHC MARK II

REVISION

I. SCOPE

This instruction outlines the Test Specifications of Circuit Board 1TM1-B001 (Reference Drawing 118D1319).

ACTIVE FOR Test  
BY HC DATE 7-10-97

II. CIRCUIT DESCRIPTION

The Thrust Bearing Wear Detector Position Indicator Driver is an electronic oscillator circuit which is designed to supply 6 VRMS, 400 HZ power to the primary winding of the Thrust Bearing Wear Detector Linear Variable Differential Transformer (Electrical identification number 5TM-S002-LT1).

The oscillator is of the Wien-bridge type and uses a LM741 operational amplifier (IC1) as the gain element. Oscillation occurs when the signal applied to the non-inverting input of IC1 is in phase with the output of the amplifier. The frequency at which this occurs is determined by the phase shifting network consisting of R7, C7, R8 and C8:

$$f_o = \frac{1}{2 \pi \sqrt{R_7 C_7 R_8 C_8}} = 400 \text{ HZ}$$

To sustain constant amplitude oscillations it is necessary to maintain the balance between the positive and negative feedback applied to IC1. The amount of positive feedback equals the fraction of the output voltage (Vout) applied to the non-inverting input (V3):

$$\frac{V_3}{V_{OUT}} = \frac{2 \pi R_7 C_8}{R_7 (C_7 + C_8) + R_8 C_8} = 0.0476 \text{ volts/volt}$$

For constant amplitude oscillations, the same fraction of output voltage must be applied to the inverting input. This is accomplished with a self adjusting voltage divider consisting of a negative feedback resistor (R9) and a variable impedance network (Q1, R5, R6, VR50 and C6) which is output voltage regulated by a half wave rectifier and filter network (CR3, R3, R4, VR51 and C1). The automatic gain control works in the following manner: Should the oscillator output amplitude increase above the desired value, the half wave rectifier and filter network will increase the gate voltage on the field effect transistor (Q1). The source to drain resistance of Q1 will then increase and this will increase the impedance to ground seen at the inverting input to IC1. This will increase the negative feedback voltage applied to the integrated circuit and will restore the amplitude of the oscillator output to its rated value. Conversely, if the output voltage decreases below the rated value, the automatic gain control action reverses, decreasing the negative feedback and raising oscillator output to its rated value.

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273-12  
273-71  
273-138  
273-221  
273-227  
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ISSUED SEP 22 1977

APPROVALS

Steam Turbine

DIV OR  
DEPT.

Schenectady, N.Y.

LOCATION

P3K-AL-0425-A01

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REV NO. 0  
P3K-AL-0425-A01  
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TITLE  
TEST INSTRUCTIONS FOR TBWD POS. IND. DRIVER 1TMI-B001  
(ASSEMBLY DRAWING 118D1319 G1)  
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II. CIRCUIT DESCRIPTION (continued)

In order to isolate the oscillator from Load disturbances and to provide the power gain necessary to excite the low impedance LVDT primary, IC1 drives a voltage follower power amplifier, IC2.

This circuit is capable of driving a 70 ohm load with a 6 VRMS, 400 HZ sine wave.

III. CIRCUIT SPECIFICATION

## A. Power Supply Requirements

1. Power Supply 1:  $+22.000 \pm 0.002$  VDC  
(Pin 37) at 220 ma (approx.)
2. Power Supply 2:  $-22.000 \pm 0.002$  VDC  
(Pin 41) at 220 ma (approx.)

## B. Output Load

1. Load: Primary Winding of LVDT  
(Pin 16) (5TM-S002 LT1) *1K resistor from Pin 16 to Pin 17*

## C. Individual Stage Performance Specifications

## 1. Power Supply (CR3 &amp; CR4)

- a.  $V_{TP1}$ :  $+15.0 \pm 0.8$  VDC at room temperature  $< +16.5$  VDC when hot
- b.  $V_{TP2}$ :  $-15.0 \pm 0.8$  VDC at room temperature  $> -16.5$  VDC when hot

## 2. Oscillator Stages (IC1, IC2)

- a. Oscillator Frequency (TP3):  $400 \pm 24$  Hz *Adj VR50 for peak voltage without clipping on scope*
- b. Oscillator Wave Form (TP3): Sinusoid
- c. Oscillator Amplitude (TP3):  $6.00 \pm 0.06$  VRMS *Adj VR51 for PART C.*  
(See Section IV)

## d. Regeneration

The oscillator must restart itself after the temporary loss of one or both 22 volt power supplies.

## e. Temperature Stability

Oscillator must perform within above specifications over the temperature range of 40°F to 130°F.

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P3K-AL-0425-A01

TEST INSTRUCTIONS FOR TBWD POS. IND. DRIVER 1T1-B001  
(ASSEMBLY DRAWING 118D1319 G1)

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SH NO.

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IV. SET POINTS

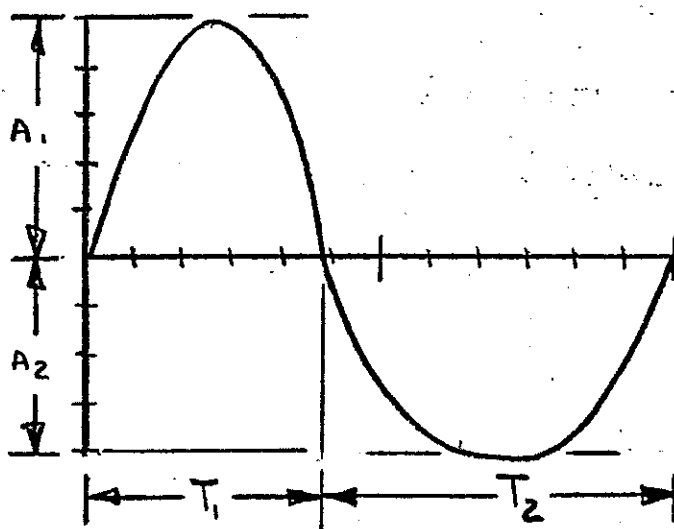
## A. Adjustment of VR51

This potentiometer sets the amplitude of the oscillator output.

VR51 should be adjusted to produce 6.000 VRMS at TP3.

## B. Adjustment of VR50

This potentiometer determines the operating point of the FET, Q1, and controls the wave shape of the oscillator output. VR50 should be adjusted to yield a low distortion sine wave output at TP3. A minimum test of distortion should include a comparison of consecutive half cycle amplitudes and periods as indicated in figure 1.



$$|A_1 - A_2| \leq 0.06 \text{ VOLTS}$$

$$|T_1 - T_2| \leq 10 \mu \text{ SEC}$$

FIGURE 1

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TEST INSTRUCTIONS FOR TBWD POS. IND. DRIVER 1TMB001  
(ASSEMBLY DRAWING 118D1319 G1)

P3K-AL-0425-A01

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SH NO. 4

FIRST MADE FOR EHC MARK II

## REVISION

SPECIFICATION PREPARED BY

R. S. Gordon

DATE 8-21-74

R.S. Gordon  
EHC DESIGN ENGINEERING

APPROVED BY

PC Column

DATE 8-23-74

P.C. Callan - MANAGER  
EHC DESIGN ENGINEERING

## TEST PROCEDURE

REVIEWED BY

OK Buzz

DATE 2/20/75

CR Bugg  
EHC TEST ENGINEER

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