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GE Industrial Systems

Functional Testing Specification

*Renewal Services
Louisville, KY*

LOU-GED-145D3580

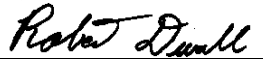
Test Procedure for a Card

DOCUMENT REVISION STATUS: Determined by the last entry in the "REV" and "DATE" column

REV.	DESCRIPTION	SIGNATURE	REV. DATE
A	Initial release	R. Duvall	05/30/03
B			
C			

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PREPARED BY R.Duvall	REVIEWED BY	REVIEWED BY	QUALITY APPROVAL 
DATE 05/30/03	DATE	DATE	DATE 05/30/03

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Functional test procedure for a Card

1. SCOPE

1.1 This is a functional testing procedure for a 3KHC Oscillator Card.

2. STANDARDS OF QUALITY

2.1 Refer to the current revision of the IPC-A-610 standard for workmanship standards.

3. APPLICABLE DOCUMENTS

3.1 The following document(s) shall form part of this specification to the extent specified herein. Unless otherwise indicated, the latest issue shall apply.

3.1.1 **Original Salem TI – No document number**

3.1.2 **P24B-AL-4819 – Original Schenectady TI (for Reference Only)**

4. ENGINEERING REQUIREMENTS

4.1 Equipment Cleaning

4.1.1 Equipment should be clean and free of debris prior to applying power unless performing an initial check. Refer to the local documented procedures for cleaning guidelines.

4.2 Equipment Inspection

4.2.1 Equipment should be visually inspected for any defects prior to applying power. This inspection should include the following as a minimum:

4.2.1.1 Wires broken or cracked

4.2.1.2 Terminal strips / connectors broken or cracked

4.2.1.3 Loose wires

4.2.1.4 Components visually damaged

4.2.1.5 Capacitors leaking

4.2.1.6 Solder joints damaged or cold

4.2.1.7 Circuit board burned or de-laminated

4.2.1.8 Printed wire runs burned or damaged

5. EQUIPMENT REQUIRED

5.1 The following equipment is required to perform the process requirements. Equipment may be substituted provided that all accuracy's and test ratios are equivalent or better.

Qty	Reference #	Description
1		Fluke 85 DMM (or Equivalent)
1		DC Power Supply
1		O-Scope
1		Resistance Decade Box

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6. TESTING PROCESS

6.1 Setup

6.1.1 See Attached



Note:

6.2 Testing Procedure

6.2.1 See Attached

6.3 *****TEST COMPLETE*****

7. NOTES

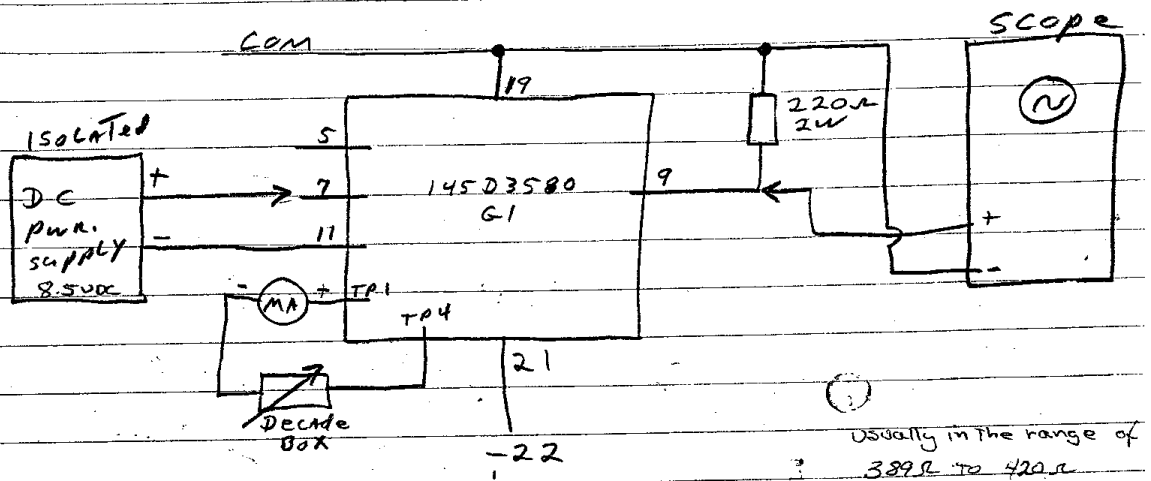
8. Oscilloscope Verification Examples:

Fig. 1

Fig. 2

6-22-88
JOC

Test Procedure For 145D3580G1
correct as shown below:




1- Select Resistor For 11 mA

- Adjust Decade box For $11 \text{ mA} \pm .1 \text{ mA}$
- Remove Decade box and solder resistor equal to value of decade box in R1 position

2 - Turn R_7 to mid-range and apply 8.5 Volts DC to pin 7.
Adjust R_{11} for 5 V PP sine wave at pin 1.
(This adjustment is touchy)

3- CK. output Freq. to be between 3030 and 3090 Hz. IF NOT Adj. L2. For Freq. of 3090 Hz

 <p>GE Power Generation Engineering Materials and Processes Engineering Schenectady, NY 12345</p>			PROCESS SPECIFICATION	
			P24B-AL-4819	
CIRCUIT BOARD TEST FOR 3KC OSCILLATOR				
DOCUMENT REVISION STATUS: DETERMINED BY THE LAST ENTRY IN THE "REV" AND "DATE" COLUMN				
REV.	AN NO.	DESCRIPTION	SIGNATURE	REV. DATE
A	YA00096	SPECIFICATION LISTED IN STEAM TURBINE/GENERATOR INDEX AS "INACTIVE" HAS BEEN FORMALLY REVISED AS "INACTIVE FOR NEW DESIGN". (PR BUDKA)	C.R. Trippe	DEC 02 1991
<div style="border: 2px solid black; padding: 10px; margin: 20px auto; width: 60%;"> <p>INACTIVE FOR NEW DESIGN</p> <p>AS OF <u>12/02/91</u></p> </div>				
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GENERAL ELECTRIC

P24B-AL-4819

REV. NO. <u>02A</u>	TITLE		CONT ON SHEET <u>12</u> SH NO. <u>81</u>
P24B-AL-4819	CIRCUIT BOARD TEST FOR 3KC OSCILLATOR		
CONT ON SHEET <u>12</u> SH NO. <u>81</u>	FIRST MADE FOR		CIRCUIT DWG. 716E602
<p><u>GENERAL</u></p> <p>The function of the 3KC-oscillator is to provide 3KC-power for the ac-transducers (LVDTs, pressure transducers, load reference signal converters).</p> <p>The 3KC-oscillator consists of three boards:</p> <ol style="list-style-type: none">1) OSCILLATOR BOARD2) POWER AMPLIFIER BOARD3) OUTPUT BOARD <p>The circuits of these boards are documented on the 3KC-oscillator circuit drawing (DWG. 716E602). This drawing should be consulted during the test procedure.</p> <p style="text-align: center;"><small>THIS DOCUMENT INCLUDING THE INFORMATION IT CONTAINS IS CONFIDENTIAL AND PROPRIETARY TO GENERAL ELECTRIC COMPANY AND IS MADE AVAILABLE SOLELY TO YOU IN RESPONSE TO THE REQUEST OF BUREAU OF A POTENTIAL VIOLATION OF AN AGREEMENT WITH GENERAL ELECTRIC. IT MAY NOT BE REPRODUCED OR DISCLOSED AND SHALL BE RETURNED IMMEDIATELY UPON REQUEST. RECIPIENT WILL TAKE ALL NECESSARY STEPS TO PROTECT THIS DOCUMENT AND THE INFORMATION IT CONTAINS.</small></p> <p>COPYRIGHT 1983 GENERAL ELECTRIC CO.</p>			<p>REVISIONS</p> <p>210 mpm - 04/20/79 No chg. this off</p> <p>TBCR</p> <p>273-71^E</p> <p>273-2</p> <p>273-12</p> <p>273-138</p> <p>273-132</p> <p>PRINTS TO</p>
MADE BY B. A. GIMMEL Apr. 8, 68	APPROVALS	STEAM TURBINE	DIV OR DEPT. P24B-AL-4819
ISSUED APR 18 1968		SCHENECTADY	LOCATION
FF-803-WA (2-68) PRINTED IN U.S.A.		CONT ON SHEET <u>12</u> SH NO. <u>81</u>	

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REV. NO. 12	TITLE	CONT. ON SHEET 3	SH. NO. 24
P24B-AL-4819	TEST INSTRUCTION FOR 3KC Osc. Boards		
CONT. ON SHEET 23	SH. NO. 22	FIRST MADE FOR	
<p>Test A for 3 KC Oscillator board #1</p> <p>NOTE: Manufacturing should leave out R1 and have installed for CR4, CR5, CR6, and CR7 the matched diodes - according to the teradyne test shown below.</p> <div style="display: flex; justify-content: space-around; align-items: flex-start;"> <div style="text-align: center;"> <p>TEST 1</p> </div> <div style="text-align: center;"> <p>TEST 2</p> </div> </div> <p>NOTE: Positions of toggle switches</p> <ol style="list-style-type: none"> A. Wire up the patchboard (if not already done) to handle all three boards on the plug in panel, as per Figure 1 and wiring diagram #1. B. Plug in our "House Test" boards into PCR-3 and PCR-4. C. Plug in the manufactured board into PCR-2 and close SW4. (Down position) D. Connect a resistance decade box between TP1 and TP4 of 3KC OSC Bd. #1 with the resistance initially set to 260 ohms and in series with a reliable milliammeter as in Figure 11. <div style="text-align: center; margin-top: 20px;"> <p>FIGURE 11</p> </div>			
<p>MADE BY B.A. Gimmel Apr. 8, 1968</p> <p>ISSUED DEC 21 1970</p>		<p>APPROVALS</p> <p>Steam Turbine</p> <p>Schenectady, N.Y.</p> <p>DIV OR DEPT.</p> <p>LOCATION</p>	
COPYRIGHT 1983 GENERAL ELECTRIC CO.		<p>P24B-AL-4819</p> <p>CONT. ON SHEET 3</p> <p>SH. NO. 24</p>	

REV. NO. **12**

CONT. ON SHEET **3**

SH. NO. **24**

TEST INSTRUCTION FOR 3KC Osc. Boards

TEST A for 3 KC Oscillator board #1

NOTE: Manufacturing should leave out R1 and have installed for CR4, CR5, CR6, and CR7 the matched diodes - according to the teradyne test shown below.

TEST 1

TEST 2

NOTE: Positions of toggle switches

A. Wire up the patchboard (if not already done) to handle all three boards on the plug in panel, as per Figure 1 and wiring diagram #1.

B. Plug in our "House Test" boards into PCR-3 and PCR-4.

C. Plug in the manufactured board into PCR-2 and close SW4. (Down position)

D. Connect a resistance decade box between TP1 and TP4 of 3KC OSC Bd. #1 with the resistance initially set to 260 ohms and in series with a reliable milliammeter as in Figure 11.

FIGURE 11

MADE BY
B.A. Gimmel Apr. 8, 1968

ISSUED
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SH. NO. **24**

PRINTS TO

GENERAL ELECTRIC		P24B-AL-4819										
REV NO. 1A	TITLE	CONT ON SHEET	SH NO.									
P24B-AL-4819	TEST INSTRUCTION FOR 3KC Osc. Boards											
CONT ON SHEET 24	FIRST MADE FOR											
		REVISIONS DEC 21 1970 1 A. O. C. / P. B. By C. H. Tappin										
<p>E. Adjust the decade box until the millimeter reads 11 ma ± .005 ma. This value ± 1% of resistance should then be installed on the board permanently.</p> <p>NOTE: If this value is not available, select and R1 and R2 to the 1% tolerance based on the sum of R1 and R2.</p> <p>F. On the test data sheet, record the boards serial number.</p> <p>G. Close SW6 (down position) and open SW5 (up position). This selects a 15 ohm load on the network.</p> <p>H. Adjust R7 (Bd.#1) to its middle position (11 turns from either end). Adjust R11 for 16.97 VPP with a calibrated oscilloscope between BP1 and BP2. It may be necessary to trim R7 for the desired output voltage and the sine wave on the scope should be free of harmonics. Use ungrounded scope. (Differential input.)</p> <p>I. Read and record the sine wave frequency with a frequency counter and double checking with a scope. It should be 3030 to 3150 Hz. **</p> <p>J. Load regulation: Set SW6 open (up). Read and record the output voltage with the scope. It should be less than 18.21 volts p-p.</p> <p>K. Close SW6 (down) and then close SW5 (down). There should be <u>no</u> distortion of the 3KC sine wave.</p> <p>L. On Bd. #1 with dvm (-) lead on tp3 and (+) lead on tp2, read +7.0 to +8.0 volts. With oscilloscope (ungrounded and differential input,) read 16.97 to 17.53 volts p-p.</p> <p>*NOTE: If the frequency is out of the allowable limits, lift one side of C6 and C7 and measure their capacitance using the Wayne Kerr Bridge.</p> <p>They should agree with table shown below or with formula</p> $C7 = \frac{.2/9 C6}{C6 - 2/9}$ <p style="text-align: center;">(All values in mfd's.)</p> <table border="1" style="margin-left: auto; margin-right: auto; border-collapse: collapse;"> <caption>TABLE 1</caption> <thead> <tr> <th>C6 (mfd)</th> <th>C7 (mfd)</th> </tr> </thead> <tbody> <tr><td>.255</td><td>1.70 - 1.79</td></tr> <tr><td>.254</td><td>1.73 - 1.83</td></tr> <tr><td>.253</td><td>1.79 - 1.89</td></tr> <tr><td>.252</td><td>1.84 - 1.94</td></tr> </tbody> </table>		C6 (mfd)	C7 (mfd)	.255	1.70 - 1.79	.254	1.73 - 1.83	.253	1.79 - 1.89	.252	1.84 - 1.94	
C6 (mfd)	C7 (mfd)											
.255	1.70 - 1.79											
.254	1.73 - 1.83											
.253	1.79 - 1.89											
.252	1.84 - 1.94											
		ET-273 273-2 273-12 273-13 273-138 273-71										
		PRINTS TO										
MADE BY B.A. Gimmel Apr. 8, '68	APPROVALS	DIV OR DEPT. Turbine	P24B-AL-4819									
ISSUED DEC 21 1970		LOCATION Schenectady	CONT ON SHEET 4 SH NO. 28									

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SH NO. 14

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TEST INSTRUCTION FOR 3KC Osc. Boards

CONT ON SHEET 15

SH NO. 14

FIRST MADE FOR

TABLE 1 (continued)

C6 (mfd)	C7 (mfd)
.251	1.90 - 2.05
.250	1.96 - 2.06
.249	2.03 - 2.13
.248	2.10 - 2.20
.247	2.18 - 2.28
.246	2.26 - 2.36
.245	2.35 - 2.40

M. With no load selected SW6 (up) monitor BP1 - BP2 with an oscilloscope, open SW4 and close SW4. This test will insure the oscillator will start up -- perform the same test under 15 ohm load (SW6 (down).)

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REV. NO. 2 A

TITLE

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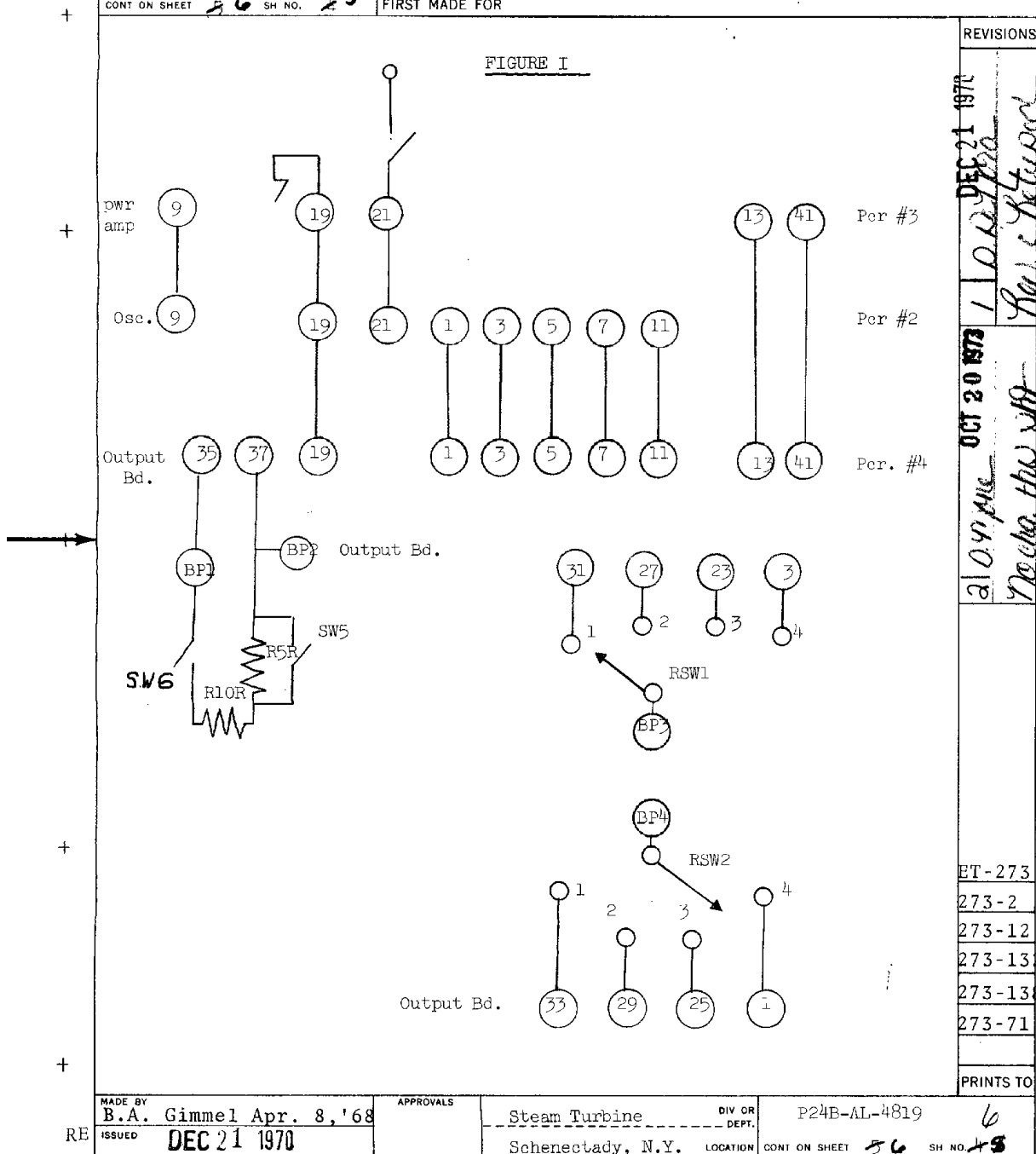
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TEST INSTRUCTION FOR 3KC Osc. Boards

CONT ON SHEET 56 SH NO. 45

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1 0.027 100

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2 0.01 100

2 0.01 100

2 0.01 100

2 0.01 100

2 0.01 100

2 0.01 100

2 0.01 100

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TEST INSTRUCTION FOR 3KC Osc. Boards

CONT ON SHEET 67 SH NO. 56

FIRST MADE FOR

WIRING DIAGRAM #1

3KC Board Test

POWER L21 to F21 to C27

C26 to B11

FOR Gnd B12 to L19 to F19 to R19
L9 to F9
L13 to R13
M9 to S9
F1 to R1 to B22
F3 to R3 to K28
F5 to K5
F7 to R7
F11 to R11
N27 to R10n
S5 to B16 to R5n - G26
S3 to N26 to B15
junction of R5n & R10n - G-27

R31 - K25
R27 - K26
R23 - K27
K31 - B17 Bp3

S1 - B19
R29 - B20
R25 - B21
B25 - B18 Bp4

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12 A		P24B-AL-4819		78		87		78		87	
TITLE				TEST INSTRUCTION FOR 3KC Osc. Boards							
FIRST MADE FOR											
TEST DATA SHEET for 3KC Board #1											
872D421											
Serial No. _____											
Measured Freq. _____ Hz (3030 - 3150)											
Output at Max. Load (10n) _____ VP-P											
Output at No Load _____ VP-P Max. 18.21 VP-P											
With 15r load, check between pin 35 and 37 _____ Vpp (16.38 - 17.51 Vpp)											
DC voltage with respect to TP3 (-22V Pwr)											
To C24 cathode _____ V (16.83 to 17.17)											
To TP4 _____ V (7.98 to 8.82)											
To CR6 cathode _____ V (16.83 to 17.17)											
DC voltage TP1 to TP4 : V1 _____ V											
DC Current through R1 = $\frac{V1}{R1}$ = _____ ma (10.89 to 11.11)											
<div> <div> <div>ET-273</div> <div>273-2</div> <div>273-12</div> <div>273-132</div> <div>273-138</div> <div>273-71</div> </div> <div> <div>PRINTS TO</div> </div> </div>											
MADE BY				APPROVALS				DIV OR DEPT.		P24B-AL-4819	
B.A. Gimmel Apr. 8, '68								Steam Turbine		8	
ISSUED								Schenectady, N.Y.		78 SH NO. 87	
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GENERAL ELECTRIC		P24B-AL-4819 CONT ON SHEET 89 SH NO. 7	
REV MO. 12 A	TITLE TEST INSTRUCTION FOR 3KC Osc. Boards		
P24B-AL-4819	FIRST MADE FOR		
CONT ON SHEET 89 SH NO. 7			
<p>Test B for 3KC power amplifier board (Bd.#2)</p> <ol style="list-style-type: none"> A. Wire up the patchboard (if not already done) to handle all three boards on the plug in panel as per Figure 1 and wiring diagram #1 of Test Instruction <u>A.</u> B. Plug in our "House Test" boards into PCR3 and PC24. C. Plug in the manufactured board into PCR3 and close SW4 (down position). D. On the applicable test data sheet, record the boards serial number. E. Close SW6 (down position) and open SW5 (up position). This selects a 15 ohm load on the network. F. Connect a d.v.m. between TP3 and TP4 on the power amp. board, turn R102 fully in both directions to see that the d.v.m. reads 0.740 to 0.860 volts, record end values on data sheet. Adjust R102 for 0.800, this should correspond to 400 ma through each collector. * G. Record on the data sheet in space provided, the voltage drop on the power amplifier board between V1 = TP5 (+) TP3 (-) and V2=TP2 (+) to TP3 (-). Calculate $1000 \times (V_2 - V_1)$ - this should be less than 10 volts (absolute value). H. If this value (in magnitude) is not less than 5 volts, the transistors HS101 and HS102 are probably the cause if all component values agree with the print. I. Load regulation: Set SW6 to the open position (this selects no load on the circuit) read and record the output voltage between BP1 and BP2 using a calibrated scope. It should be less than 18.21 VPP. Using the load switches, record maximum load without distortion. This should be less than or equal to 10 ohms. J. Reset the load to 15 ohms. The output between BP1 and BP2 should be 16.96 VPP. K. On the power amplifier board, check and record the DC voltage between TP6 (+) and TP5 (-) should be 0.5 to 1.0. L. Also check and record the DC voltage between TP1 (*) and TP2 (-) which should also be 0.5 to 1.0 V. M. Read and record the voltage drop between TP2 (*) and TP4(-). N. With an oscilloscope, monitor the output voltage between BP1 and BP2 - set SW6 up and SW5 up - open SW4 (SW4 up), then close SW4 (SW4 down) this test will insure oscillator will start up every time; perform the same test with SW6 down. 		<div style="border: 1px solid black; padding: 5px;"> REVISIONS DEC 11 1970 1 D.O.C. R. H. Hefley OCT 20 1973 D.O.M. *-chg made </div> <div style="margin-top: 10px;"> ET-273 273-2 273-12 273-13 273-13 273-7 </div>	
<div style="display: flex; justify-content: space-between;"> <div> MADE BY B.A. Gimmel Apr. 8'68 ISSUED DEC 21 1970 </div> <div> APPROVALS Steam Turbine Schenectady, N.Y. </div> <div> DIV OR DEPT. P24B-AL-4819 LOCATION CONT ON SHEET 89 SH NO. 7 </div> </div>		PRINTS TO	

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TITLE

TEST INSTRUCTION FOR JKC Osc. Boards

CONT ON SHEET 10 SH NO. 8

CONT ON SHEET 10 SH NO. 8

FIRST MADE FOR

Test Data Sheet for JKC Oscillator Bd. #2

Board Serial No. _____

Sect. F. TP3 to TP4 Min _____ V Max. _____ V

Sect. G. TP5 (+) to TP3 (-) = V1 = _____ V

TP2 (+) to TP3 (-) = V2 = _____ V

* $1000 \times (V_2 - V_1)$ should be less than 10V.

record valve _____ V

Sect. I. Output _____ VPP

Sect. J. Output _____ VPP

Sect. K. TP6 (*) to TP5 (-) _____ V (0.5 to 1.0)

Sect. L. TP1 (+) to TP2 (-) _____ V (0.5 to 1.0)

Sect. M. TP2 to TP4 _____ V

DATE _____

INITIALS _____

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REV. NO. *V2A*

TITLE

CONT ON SHEET *20 11* SH NO. *9 45*

P24B-AL-4819

TEST INSTRUCTION FOR 3KC Osc. Boards

CONT ON SHEET *20 11* SH NO. *9 10*

FIRST MADE FOR

Test C for 3KC output board (BD.#3)

- A. Wire up patchboard (if not already done) to handle all three boards on the plug in panel as per figure 1 and wiring diagram 1 of Test Instruction A.
- B. Plug in our "House Test" boards into PCR2 and PCR3
- C. Plug in the manufactured board into PCR4 and close SW⁴ down position.
- D. On the applicable test data sheet record the boards' serial number.
- E. Set load SW6 (Down) and SW5 (Down) check output BP1 - BP2 for distortion at 10n.
- F. Set the load switches (SW6 down) and SW5 (Up), this selects 15 ohm load. Read and record output voltage between BP3 and BP4 as listed on test data sheet according to "G" below.
- G. Start with RSW1 in pos: 1 and RSW2 in position 2, this corresponds to pin 31 on BP3 and pin 33 on BP4; by rotating RSW2 through positions 2, 3, and 4 on RSW1 through position 4, you will match all the positions on the test data sheet.

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210.9 ppc OCT 20 1973
Spec. this ydt

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MADE BY *D. DeNora* Dec. 17, 1970

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DEC 21 1970

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CONT ON SHEET *20 11*

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REV. A

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GE Industrial Systems
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Louisville, KY

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GENERAL ELECTRIC

P24B-AL-4819

12

REV. NO. 12 A

TITLE

CONT ON SHEET 11 12 SH NO. 10

P24B-AL-4819

TEST INSTRUCTION FOR 3KC Osc. Boards

CONT ON SHEET 11 12 SH NO. 10

FIRST MADE FOR

With 15n load check for output (16.38 to 17.51 VPP)

Board Serial No. _____

Between pin 35 and 37 _____ VPP

RSW 1
Pos 1
31 and 33 RSW 2 Pos 1
31 and 29 " 2 " 2
31 and 25 " 2 " 3
31 and 01 " 2 " 4

RSW 1
Pos 2
27 and 31 " 2 " 1
27 and 29 " 2 " 2
27 and 25 " 2 " 3
27 and 01 " 2 " 4

RSW 1
Pos 3
23 and 33 " 2 " 1
23 and 29 " 2 " 1
23 and 25 " 2 " 3
23 and 01 " 2 " 4

RSW 1
Pos 4
03 and 33 " 2 " 1
03 and 29 " 2 " 2
03 and 25 " 2 " 3
03 and 01 " 2 " 4

DATE _____

INITIAL _____

REVISIONS

DEC 21 1970
2.0 n.p.m. - OCT 20 1970
No chg. this chg. - New sig. added

ET-273
273-2
273-12
273-132
273-138
273-71

PRINTS TO

MADE BY
D. DeNora Dec. 17, 1970

APPROVALS

Steam Turbine

DIV OR
DEPT.

P24B-AL-4819

12

ISSUED

DEC 21 1970

Schenectady, N.Y.

LOCATION

CONT ON SHEET 11 12 SH NO. 10

CODE IDENT NO.

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GENERAL ELECTRIC		P24B-AL-4819 13	
REV. NO.	TITLE	CONT. ON SHEET	SH. NO.
2A	TEST INSTRUCTION FOR 3KC Osc. Boards	—	12
P24B-AL-4819	FIRST MADE FOR		
CONT. ON SHEET	SH. NO. 112		
PREPARED BY <u>C. J. Barrigher</u> DATE <u>12/12/70</u>		REVISIONS	
C.J. Barrigher Control Design Engineering		DEC 21 1970 1. O.K. per 11/10/70 Newly added	
APPROVED BY <u>P.C. Callan</u> DATE <u>12-14-70</u>		2. O.K. per DEC 20 1970 No chg. this old	
P.C. Callan - MANAGER CONTROL DESIGN ENGINEERING			
		ET-273	
		273-2	
		273-12	
		273-132	
		273-138	
		273-71	
		PRINTS TO	
MADE BY D. DeNora Dec. 17, 1970	APPROVALS	DIV OR DEPT. Steam Turbine	P24B-AL-4819 13
ISSUED DEC 21 1970		LOCATION Schenectady, N.Y.	CONT. ON SHEET — SH. NO. 112
FF-903-WA (1-70) PRINTED IN U.S.A.		CODE IDENT NO.	

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