



GE Power Generation Engineering

Materials and Processes Engineering
Schenectady, NY 12345

PROCESS SPECIFICATION

P3K-AL-0021

CV DIODE FUNCTION GEN. BD.CIRCUIT BOARD TEST

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. Trippi	DEC 02 1991
D	--	REVISION LEVEL CORRECTED ON TITLE SHEET. (PR BUKDA)	C.R. Trippi	1999 JUN 02

INACTIVE FOR NEW DESIGN

AS OF 12/02/91

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PREPARED BY: P.R. BUDKA

ORIG. ISSUE DATE: --

REV NO.

A

TITLE

CV DIODE FUNCTION GEN. BD. CIRCUIT BOARD TEST

P3K-AL-0021

CONT ON SHEET

3

SH NO.

2

FIRST MADE FOR PL 994D153 (Schem. 994D189)

PL 137D5138 } See Sheet 9 for suggested adjustment procedures

REVISIONS

I) GENERAL DESCRIPTION

This board compensates for the nonlinear, steam valve flow characteristics. It receives an input (E_L) from the load control unit and provides a signal (E_{DFG}) to the PREAMPLIFIER BOARD. E_L represents load demand (or flow demand); and varies from 0V to +5V corresponding to E_L variation between E_{LMIN} and E_{LMAX} . ($E_{DFG} = 5 - E_{SL}$)

 $E_L = E_{LMIN}$ - steady state, cracking point (valve closed)

 $E_L = E_{LMAX}$ - steady state, valve wide open point.

CRACKING POINT

 $E_L = E_{LMIN}$, $E_{SL} = 0.0$, $E_{DFG} = +5V$

OPEN END

 $E_L = E_{LMAX}$, $E_{SL} = +5V$, $E_{DFG} = 0V$

R48 provides a +5V offset so that $E_{DFG} = 0.0$ for valves fully open.

R40 provides the cracking point bias E_{LMIN} , and a -5V bias to overcome the +5V bias of R48.

DATA SHEETS

For each valve of each turbine the following test data sheets are prepared:

- 1) A DFG BD. curve (E_{SL} vs. E_L). (See Fig. 2.)
- 2) A Valve Pos. Unit data sheet.
(DFG ADJ., CP ADJ., OP. AMP FDB. ADJ., RATE LIMIT ADJ.)
(See Fig. 3.)

The data is to be used with this test instruction to provide specific numerical values for a given turbine.

11 CHANGES MADE
JUN 10 1988
A. J. J.

273-71
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MADE BY
T.B. White Sept. 26, 1969

APPROVALS

Steam Turbine

DIV OR
DEPT.

P3K-AL-0021

ISSUED

Oct. 10, 1969

Schenectady, N. Y.

LOCATION

CONT ON SHEET

3

SH NO.

2

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P3K-AL-0021

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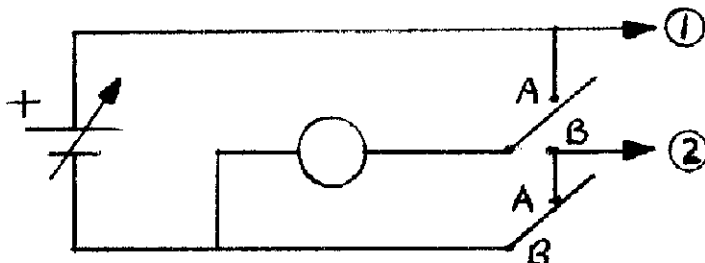
SH NO.

FIRST MADE FOR PL 994D153 (Schem. 994D189)

REVISIONS

II) INITIAL SLOPE ADJ. (PERFORM WITH B1 OPEN)

1) Test Set-Up



Note: Make sure digital voltmeter (DVM) reads zero when input terminals are shorted. If not, adjust DVM.

The test set-up shown in Fig. 1 can be used for the adjustment of all three slopes. During these adjustments the circuit board has to be disconnected. Note that the PLUS-side of the variable power supply is connected to the 1 terminal.

Note: See Data Sheets for a particular turbine for appropriate numerical values.

2) M_1 - Slope Adj. (Lower Slope)

1. Set switch SW to A - position.
2. Adj. variable voltage source until voltmeter reads voltage V_1 .
3. Connect terminal 1 with TP8 (YL). (TP means Test Point).
4. Connect terminal 2 with B4.
5. Set switch SW to B - position.
6. Adj. M1 - potentiometer R43 until ammeter reads current I_1 .

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Steam Turbine

DIV OF
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P3K-AL-0021

SH NO

CODE IDENT NO.

REV NO. A	TITLE	CONT ON SHEET 5	SH NO. 4
P3K-AL-0021	CV DIODE FUNCTION GEN. BD. CIRCUIT BOARD TEST		
CONT ON SHEET 5	SH NO. 4	FIRST MADE FOR PL 994D153 (Schem. 994D189)	

II) INITIAL SLOPE ADJ. (Continued)

3) M₂ - Slope Adj. (Medium Slope)

1. Set switch SW to A - position.
2. Adj. variable voltage source until voltmeter reads voltage V_2 .
3. Connect terminal 1 with TP7 (BLU).
4. Connect terminal 2 with B4.
5. Set switch SW to B - position.
6. Adj. M2 - potentiometer R41 until ammeter reads current I_2 .

4) M₃ - Slope Adj. (Upper Slope)

1. Set switch SW to A - position.
2. Adj. variable voltage source until voltmeter reads voltage V_3 .
3. Connect terminal 1 with B4.
4. Connect terminal 2 with TP4 (BRN).
5. Set switch SW to B - position.
6. Adj. M3 - potentiometer R42 until ammeter reads current I_3 .

REVISIONS

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JUN 10 1988
Sg. [signature]*

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R3A
PRINTS TO*

MADE BY T.B. White Sept. 26, '69	APPROVALS	DIV OR DEPT. Steam Turbine	P3K-AL-0021
ISSUED OCT 10 1969		LOCATION Schenectady, N. Y.	CONT ON SHEET 5 SH NO. 4

REV NO. AT A	TITLE
P3K-AL-0021	CV DIODE FUNCTION GEN. BD. CIRCUIT BOARD TEST
CONT ON SHEET 6	SH NO. 5

FIRST MADE FOR PL 994D153 (Schem. 994D189)	REV NO. 5
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III) FINAL TEST

Note: See Data Sheets for a particular turbine for appropriate numerical values.

A) Test Set Up

Fig. 1 shows a test set up which can be used, along with the VPU data sheets, to carry out the following adjustment procedures.

Start with following (as shown) switch positions:

S5, S3, S15, and S16 in Pos. A
S7 in Pos. Off
S9 Closed

Apply -22V to pin 21
+30V to pin 17
signal ground to pin 19.

Insert B1.

B) Voltage Test (Zener Check)

- 1) Measure voltage at B12. It should be $+13V \pm 2.6V$.
- 2) Measure voltage at B13. It should be $-13V \pm 2.6V$.
- 3) Turn R44 fully CW.
- 4) Measure voltage at TP5. It should be $+6.2V \pm 1.2V$.
- 5) Turn R45 fully CW.
- 6) Measure voltage at TP6. It should be $+6.2V \pm 1.2 V$.

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P3K-AL-0021

CV DIODE FUNCTION GEN. BD. CIRCUIT BOARD TEST

CONT ON SHEET

SH NO.

FIRST MADE FOR PL 994D153 (Schem. 994D189)

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JUN 10 1988
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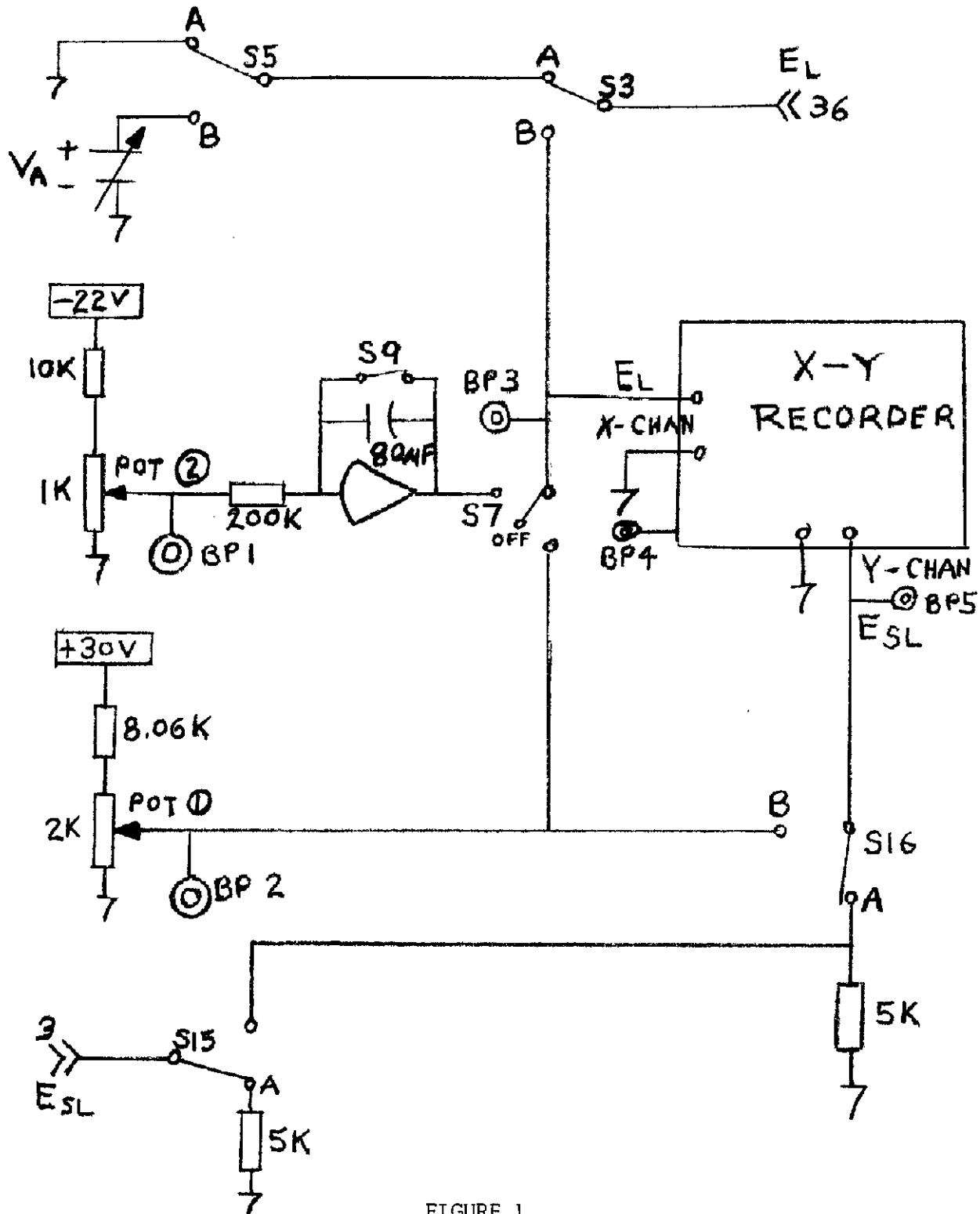


FIGURE 1
TEST SET-UP

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MADE BY
T.B. White Sept. 26, '69
ISSUED
OCT 10 1969

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Steam Turbine _____
Schenectady, N. Y.

DIV OR
DEPT.

LOCATION

P3K-AL-0021

SH NO.

CODE IDENT NO.

REV NO. 8	TITLE	CONT ON SHEET 8	SH NO. 9
P3K-AL-0021	CV DIODE FUNCTION GEN. BD. CIRCUIT BOARD TEST		
CONT ON SHEET 8	SH NO. 9	FIRST MADE FOR	PL 994D153 (Schem. 994D189)

III. FINAL TEST (Continued)

C) EB1, EB2 Break Point Adjustments

- 1) Turn pot R48 fully clockwise.
- 2) Measure E_{DFG} at TP4 with DVM. E_{DFG} should be $+6.2V \pm 1.2V$.
- 3) Adjust E_{B1} - R44 until voltage at TP5 reads E_{B1} .
- 4) Adjust E_{B2} - R45 until voltage at TP6 reads E_{B2} .

D) Bias Adjustment

- 1) With switches in the initial setting (Part III-A) except: B5 open.
- 2) Apply 0.0V on B5 (wiper) end of R39.
- 3) Adjust R48 until E_{DFG} (TP4) reads +5.0V.
- 4) Apply +5.0V on B5 end of R39.
- 5) Adjust R39 until $E_{DFG} = 0.0V$.
- 6) Remove +5.0V from B5 end of R39.
- 7) Insert B5.
- 8) If $E_{LMIN} = 0V$, set S5 in Pos. A.
If $E_{LMIN} \neq 0V$, set S5 in Pos. B.
- 9) Apply $E_L = E_{LMIN}$ at pin 36 by adjusting V_A .
- 10) Check TP1 to make sure it reads E_{LMIN} .
- 11) Adjust R40 until E_{SL} (TP2) reads 0.0V.
- 12) Reset S5 to Pos. A.

REVISIONS

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JUN 10 1988
sg debeat

F-4
F-1

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~~R2A~~

PRINTS TO

MADE BY I.B. White Sept. 26, '69	APPROVALS	Steam Turbine	DIV OR DEPT.	P3K-AL-0021
ISSUED OCT 10 1969		Schenectady, N. Y.	LOCATION	CONT ON SHEET 8 SH NO. 9

REV NO. 1	TITLE	CONT ON SHEET 9	SH NO. 8
P3K-AL-0021	CV DIODE FUNCTION GEN. BD. CIRCUIT BOARD TEST		
CONT ON SHEET 9	FIRST MADE FOR	PL 994D153 (Schem. 994D189)	

III. FINAL TEST (Continued)

E) Recording of Static DFG-Curve

- 1) Turn on Recorder. Set sensitivity switch at 1 volt/inch on the X & Y inputs.
- 2) Turn Pot 1 to bottom position and make sure voltage at BP2 is $0V \pm 5MV$.
- 3) Insert curve sheet from engineering into X-Y plotter.
- 4) Set zero adjustments on X and Y channel such that pen coincides with (OV/OV) position marked on the lower left hand side of the sheet.
- 5) Set SW 16 to Pos. B. Turn Pot 1 upwards until BP2 reads +5V within $\pm 5 MV$. This should cause the pen to drive 5 inches upwards. If not, adjust gain Y-channel until this is the case. Turn Pot 1 downwards to the bottom. The pen should go to OV/OV.
- 6) Reset SW16 to Pos. A.
- 7) Place SW 7 in Pos. B. Turn Pot 1 upwards until BP2 reads +5V within $\pm 5 MV$. This should cause the pen to drive 5 inches to the right. If not, adjust gain of X-channel until this is the case. Turn Pot 1 downwards to the bottom. The pen should again go to the OV/OV position.
- 8) Place SW 7 in Pos. OFF.
- 9) Set Pot 2 for _____ V at BP1.
- 10) Set S3 and S15 to Pos. B.
- 11) Place S7 in Pos. A.
- 12) Open S9.
The plotter now starts plotting the curve. When it reaches the upper right corner the pen should be lifted first and then S9 should be closed.
- 13) If the curve deviates too much, the DFG must be readjusted.
- 14) If this is necessary: Open S7 Pos. A and close S7 Pos. B, to put in manual mode in order to use Pot 1 for readjustment.

REVISIONS

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273-2
273-12-3
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R&A
PRINTS TO

MADE BY T.B. White	DATE Sept. 26, '69	APPROVALS	DIV OR DEPT. Steam Turbine	P3K-AL-0021
ISSUED	OCT 10 1969		LOCATION Schenectady, N. Y.	CONT ON SHEET 9 SH NO. 8

P3K-AL-0021

CV DIODE FUNCTION GEN. BD. CIRCUIT BOARD TEST

CONT ON SHEET

SH NO.

FIRST MADE FOR PL 994D153 (Schem. 994D189)

TURBINE:

VALVE:

SERIAL NUMBER =

SIGNATURE:

DATE: _____

REVISIONS

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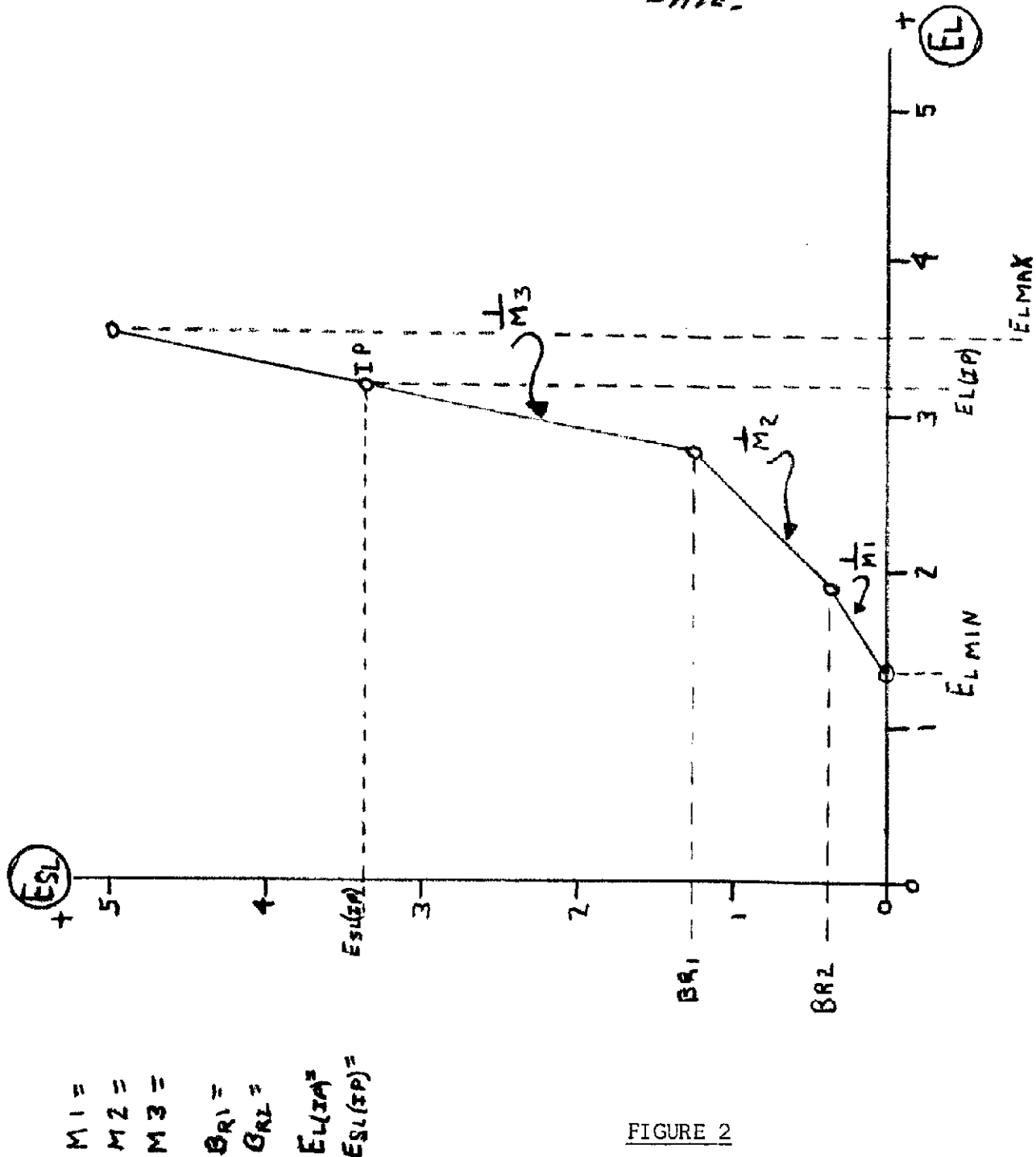


FIGURE 2

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MADE BY
T.B. White Sept. 26, '69

ISSUED
OCT 10 1969

APPROVALS

Steam Turbine

DIV OR
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P3K-AL-0021

Schenectady, N. Y.

LOCATION

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SH NO 

FF-503-WA (2-69)
PRINTED IN U.S.A.

CODE IDENT NO.

REV NO. **1A**

TITLE

TURBINE:

CONT ON SHEET **H**

SH NO. **10**

P3K-AL-0021

VPU SETTING DATA

VALVE:

TEST INSTR: P24B-AL-4945, P24B-AL-4946

CONT ON SHEET **H**

SH NO. **10**

3 SLOPE DFG.

FIRST MADE FOR

P24B-AL-4948

REVISIONS

M₁-SLOPE: V₁ = volts I₁ = uamp R₅ = V₁/I₁ = KOHM

M₂-SLOPE: V₂ = volts I₂ = uamp R₄ = V₂/I₂ = KOHM

M₃-SLOPE: V₃ = volts I₃ = uamp R₃ = V₃/I₃ = KOHM

BREAK POINT: B_{R1} = volt B_{R2} = volt

E_{B1} = volt E_{B2} = volt

CRACKING POINT: E_{LMIN} = E_{L(CP)} = volt

E_{DFG(CP)} = volts E_{SL(CP)} =

INTERCEPT POINT: E_{L(IP)} = volts

E_{DFG(IP)} = volts E_{SL(CP)} =

Y_{CP} = in

OPEN END POINT: E_{LMAX} = E_{L(OE)} = volts

E_{DFG(OE)} = volt E_{SL(OE)} = volt

Y_{OE} =

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J. J. Schenectady JUN 10 1988

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PRINTS TO

MADE BY T.B. White Sept. 26, '69

APPROVALS

Steam Turbine

DIV OR DEPT.

P3K-AL-0021

ISSUED OCT 10 1969

Schenectady, N.Y.

LOCATION

CONT ON SHEET **H**

SH NO. **10**

REV NO. 12	TITLE	CONT ON SHEET 12 SH NO. 4
P3K-AL-0021	CV DIODE FUNCTION GEN. BD. CIRCUIT BOARD TEST	
CONT ON SHEET 12 SH NO. 4	FIRST MADE FOR PL 994D153 (Schem. 994D189)	

III) FINAL TEST (Continued)

E) (Continued)

- 15) The pen can be moved manually along the curve by turning the knob of Pot. 1. Slope pots, break point pots, and bias pot can be adjusted until plotted curve coincides with the curve supplied by Engineering.
- 16) Send the final recorded trace to EHC Engineering (Bldg. 285-Room 241).
- 17) Apply red paint on slope pot - and break pot adjustment screws.

Note: Write serial number, signature and date on each XY trace.

PREPARED BY:

T. B. White
Turbine Control Design Engineering

DATE

10/6/69

APPROVED BY:

P. C. Callan
P. C. Callan, Manager
Turbine Control Design Engineering

DATE

10/7/69

REVIEWED BY:

R. J. Dellorfano
EHC Test Engineer

DATE

REVISIONS

11 CHANGES MADE
JUN 10 1988
sgdubrat

ET-273
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R2A
PRINTS TO

MADE BY T.B. White Sept. 26, '69	APPROVALS	DIV OR DEPT. Steam Turbine	P3K-AL-0021
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REV NO. **1 A**
 P3K-AL-0021
 CONT ON SHEET **12** SH NO.

TITLE
 CV DIODE FUNCTION GEN, BD, CIRCUIT BOARD TEST

CONT ON SHEET **12** SH NO.

FIRST MADE FOR PL 994D153

(Schem. 994D189)

REVISIONS

IV. DFG BOARDS 137D5138 G_

1. SET WITH DIGITAL OHMMETER

$$VR54 + R16 = R5 K \Omega$$

$$VR52 + R14 = R4 K \Omega$$

$$VR53 + R15 = R3 K \Omega$$

FROM DATA SHEETS

P3K-AL-0021-A_

2. GROUND TP3. ADJUST VR58 FOR VTP4 = +5.000 VDC.

3. REMOVE GROUND AT TP3 AND APPLY VTP3 = +5.000 VDC.

ADJUST VR57 FOR VTP4 = 0.000 VDC.

4. REMOVE VTP3 AND APPLY VTP53 = 0.000 VDC.

ADJUST VR3 FOR VTP3 = 0.000 VDC.

5. APPLY EL MID-PT SLOPE 2 AT TP53. ADJUST VR1 FOR ESL

MID-PT AT TP3. (READ EL & ESL FROM CURVE)

6. APPLY EL OE AT TP53. ADJUST VR2 FOR +5.000 ESL AT TP3.

DFG BOARD 994D153 G_

1. SET WITH DIGITAL OHMMETER

$$R43 + R17 = R5 K \Omega$$

$$R41 + R15 = R4 K \Omega$$

$$R42 + R16 = R3 K \Omega$$

FROM DATA SHEETS

P3K-AL-0021-A_

2. GROUND TP2. ADJUST R48 FOR VTP4 = +5.000 VDC.

3. REMOVE GROUND AT TP2 AND APPLY VTP2 = +5.000 VDC.

ADJUST VR39 FOR VTP4 = 0.000 VDC.

4. REMOVE VTP2 AND APPLY VTP1 = 0.000 VDC.

ADJUST R40 FOR VTP2 = 0.000 VDC.

5. APPLY EL MID-PT SLOPE 2 AT TP1. ADJUST R45 FOR ESL

MID-PT AT TP2. (READ EL & ESL FROM CURVE)

6. APPLY EL OE AT TP1. ADJUST R44 FOR +5.000 ESL AT TP2.

11 ADDED SHEET
 JUN 10 1988
 Sg debrat

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 ISSUED JUN 10 1988

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SCHENECTADY

LOCATION

CONT ON SHEET

SH NO. **12**

CODE IDENT NO.