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. Trupp	DEC [illegible]
D	--	REVISION LEVEL CORRECTED ON TITLE SHEET. (PR BUKDA)	C.R. Trupp	1999 JUN 01

INACTIVE FOR NEW DESIGN

AS OF 12/02/91

PREPARED BY: P.R. BUDKA

ORIG. ISSUE DATE: --

TITLE

CV DIODE FUNCTION GEN. BD. CIRCUIT BOARD TEST

FIRST MADE FOR PL 994D153 } (Schem. 994D189)
PL 137D5138 } See Sheet 9 for suggested adjustment procedures

REVISIONS

1 CHANGES MADE JUN 10 1988 Adjust

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.

PRINTS TO

E 273-71 273-5 273-12 273-314 273-138

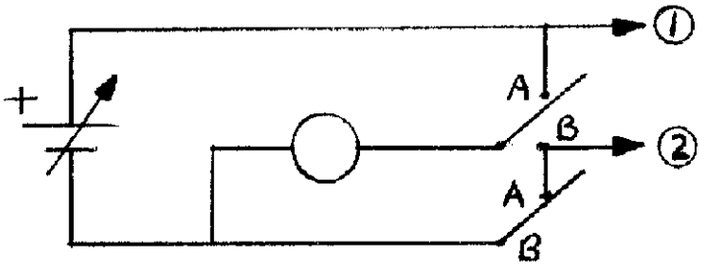
TITLE
CV DIODE FUNCTION GEN. BD. CIRCUIT BOARD TEST

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

REVISIONS
NO CHG. THIS SHT. 11 JUN 10 1988

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.

PRINTS TO

II) INITIAL SLOPE ADJ. (Continued)

3) M_2 - 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) M_3 - 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

1/ NO CHG. THIS SHT. JUN 10 1988

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 ± 2.6V.

2) Measure voltage at B13. It should be -13V ± 2.6V.

3) Turn R44 fully CW.

4) Measure voltage at TP5. It should be +6.2V ± 1.2V.

5) Turn R45 fully CW.

6) Measure voltage at TP6. It should be +6.2V ± 1.2 V.

FL4
FL7
~~ET273~~
~~273-71~~ 2
~~273-2~~
~~273-12~~ 3
~~273-132~~
~~273-138~~
~~R3A~~
PRINTS TO

GENERAL ELECTRIC

P3K-AL-0021
CONT ON SHEET 9 SH NO 6.

REV NO. A

P3K-AL-0021
CONT ON SHEET 9 SH NO. 6

TITLE
CV DIODE FUNCTION GEN. BD. CIRCUIT BOARD TEST

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

REVISIONS
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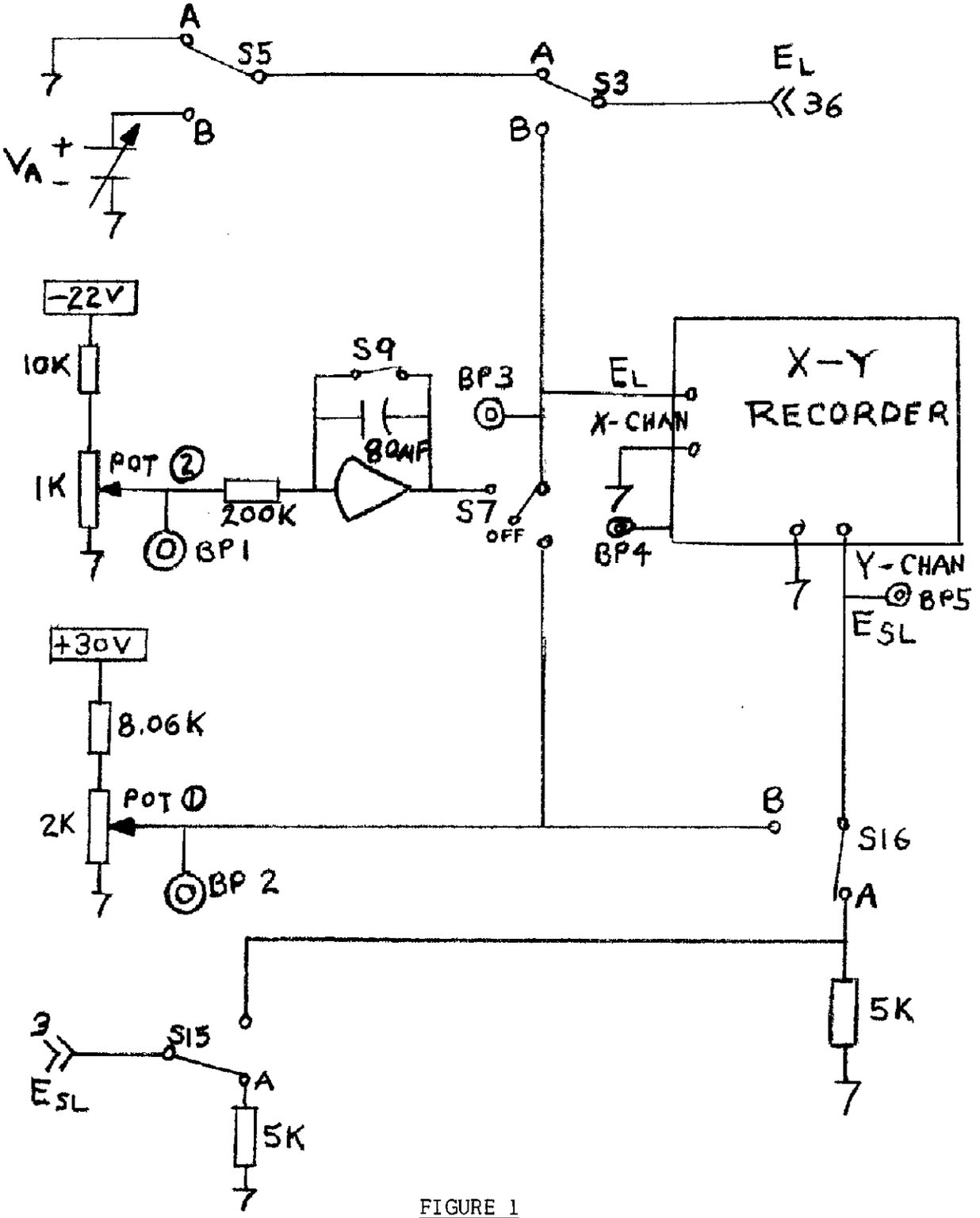

FIGURE 1
TEST SET-UP

PRINTS TO
~~ET-273~~
~~273-71~~ 2
~~273-2~~
~~273-12~~ B
~~273-132~~
~~273-136~~
~~R3A~~

MADE BY T.B. White Sept 26, '69
ISSUED OCT 10 1969
APPROVALS
Steam Turbine DIV OR DEPT.
Schenectady, N. Y. LOCATION
P3K-AL-0021
CONT ON SHEET 9 SH NO. 6
~~1370~~ CODE IDENT NO.

FF-803-WA (2-69)
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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 ± 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 o.oV.

12) Reset S5 to Pos. A.

REVISIONS

1/ NO CHG. THIS SHT. JUN 10 1988 dg dessart

PRINTS TO

~~273-71~~ 2

~~273-2~~

~~273-12~~ 3

~~273-132~~

~~273-138~~

~~R2A~~

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 OV ± 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 ± 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 ± 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

11 NO CHG. THIS SHT. JUN 10 1988 sglessnut

PRINTS TO

GENERAL ELECTRIC

P3K-AL-0021

CONT ON SHEET 10 SH NO. 9

REV NO. 1A

P3K-AL-0021

CONT ON SHEET 10 SH NO. 9

TITLE

CV DIODE FUNCTION GEN. BD. CIRCUIT BOARD TEST

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

REVISIONS

1/ NO CHG. THIS SHT. JUN 10 1988

TURBINE:
VALVE:
SERIAL NUMBER:
SIGNATURE:
DATE:

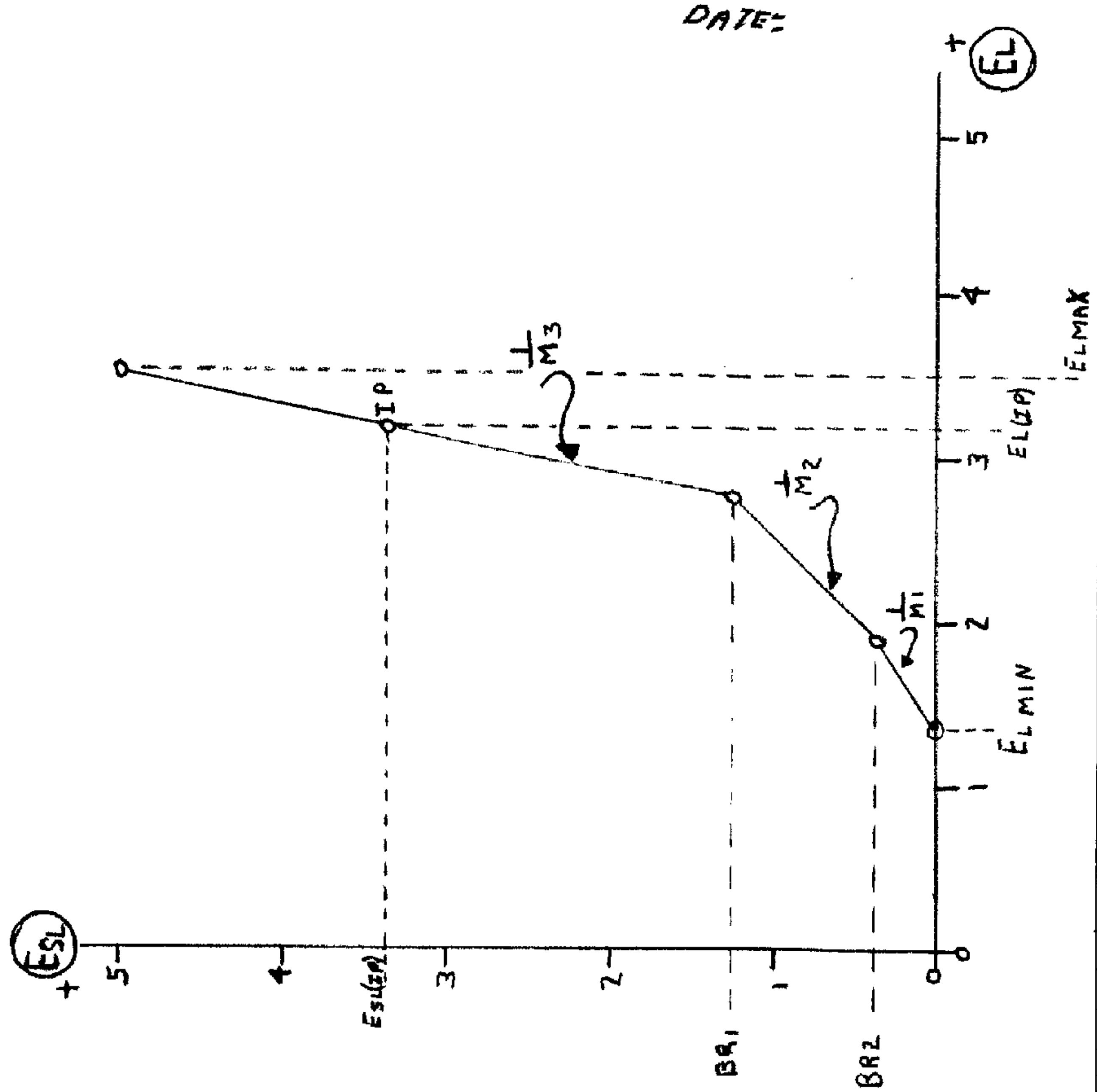

FIGURE 2

PRINTS TO

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

ISSUED OCT 10 1969

APPROVALS

Steam Turbine DIV OR DEPT.

Schenectady, N. Y. LOCATION

P3K-AL-0021

CONT ON SHEET 10 SH NO. 9

CODE IDENT NO.

FF-803-WA (2-69)
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REVISIONS

1/ NO CHG. THIS SHT. JUN 10 1988

M_1-SLOPE: V_1 = volts I_1 = uamp $R_5 = V_1/I_1$ = KOHM

M_2-SLOPE: V_2 = volts I_2 = uamp $R_4 = V_2/I_2$ = KOHM

M_3-SLOPE: V_3 = volts I_3 = uamp $R_3 = V_3/I_3$ = 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} =

~~ET-273~~
~~273-71~~ 2
~~273-2~~
~~273-12~~ 3
~~273-152~~ 2
~~273-138~~
~~R3A~~

PRINTS TO

TITLE
CV DIODE FUNCTION GEN. BD. CIRCUIT BOARD TEST

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

REVISIONS
11 CHANGES MADE JUN 10 1988 Adhesive

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.

5/31/88

PREPARED BY: T. B. White DATE 10/6/69
T. B. White
Turbine Control Design Engineering

APPROVED BY: P. C. Callan DATE 10/7/69
P. C. Callan, Manager
Turbine Control Design Engineering

REVIEWED BY: _____ DATE _____
R. J. Dellorfano
EHC Test Engineer

EF-273
273-71 2
273-2
273-12 3
273-132
273-138
R2A
PRINTS TO

MADE BY T.B. White Sept. 26, '69
ISSUED OCT 10 1988
APPROVALS
Steam Turbine DIV OR DEPT.
Schenectady, N. Y. LOCATION
P3K-AL-0021
CONT ON SHEET 13 SH NO. 4
CODE IDENT NO. 12276

TITLE
CV DIODE FUNCTION GEN, BD, CIRCUIT BOARD TEST

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

REVISIONS
1 ADDED SHEET JUN 10 1988 JG Schust

IV. DFG BOARDS 137D5138 G_ _

1. SET WITH DIGITAL OHMMETER

   VR54 + R16 = R5 K Ω
   VR52 + R14 = R4 K Ω
   VR53 + R15 = R3 K Ω
   } 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 Ω
   R41 + R15 = R4 K Ω
   R42 + R16 = R3 K Ω
   } 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.

PRINTS TO