g GE Energy	**Functional Testing Specification**
Parts & Repair Services ***Louisville, KY***	**LOU-GED-137D5138**

Test Procedure for a Card 137D5138G0004 & G0007 cards

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A	Initial release	G. Chandler	3/8/2012
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G. Chandler			Charlie Wade
DATE	**DATE**	**DATE**	**DATE**
3/8/2012			3/8/2012

1. SCOPE

1.1 This is a functional testing procedure for a 137D5138G0004 & G0007 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** Check board's electronic folder for more information
- **3.1.2** Referenced Test Instruction P3K-AL-0021

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 site specific SRA's 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, cracked, or loosely connected
  - **4.2.1.2** Terminal strips / connectors - broken or cracked
  - **4.2.1.3** Components - visually damaged
  - **4.2.1.4** Capacitors - bloated or leaking
  - **4.2.1.5** Solder joints - damaged or cold
  - **4.2.1.6** Circuit board - burned or de-laminated
  - **4.2.1.7** Printed wire runs / Traces - 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 87 DMM (or Equivalent)
1		Fluke 85 DMM (or Equivalent)
1		GP Turbine Card GP Test Box
1		30V DC PS
1		-22V DC PS
1		Fluke 715 Precision Voltage Source (or equivalent)

6. Test Setup - Initial Adjustment

6.1 Initial Slope Adjustment (Perform with B1 open).

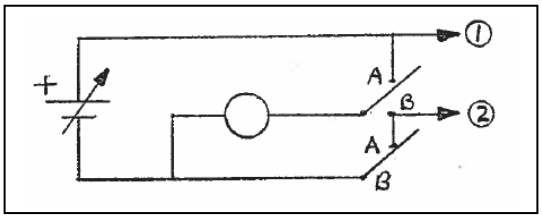

Figure 4

Note: Make sure digital voltmeter (DVM) reads zero when input terminals are shorted. If not adjust DVM. Formulas are located in section 9, Figure 3.

6.1.1 The test set-up shown in figure 4 can be used for 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" of the terminal.

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

6.2 M1 - Slope Adjustment (Lower Slope) (**R5**)

6.2.1 Set switch SW to A-Position

6.2.2 Adjust variable voltage source until voltmeter reads voltage (V-1).

6.2.3 Connect terminal 1 with TP8 (YELLOW). TP means test point.

6.2.4 Connect terminal 2 with B4.

6.2.5 Set switch SW to B-Position

6.2.6 Adjust M1 potentiometer R43 until ammeter reads current (I-1).

6.3 M2 - Slope Adjustment (Medium Slope) (**R4**)

6.3.1 Set switch SW to A-Position

6.3.2 Adjust variable voltage source until voltmeter reads voltage (V-2).

6.3.3 Connect terminal 1 with TP7 (BLUE).

6.3.4 Connect terminal 2 with B4.

6.3.5 Set switch SW to B-Position

6.3.6 Adjust M2 potentiometer R41 until ammeter reads current (I-2).

6.4 M3 - Slope Adjustment (Upper Slope) (**R3**)

6.4.1 Set switch SW to A-Position

6.4.2 Adjust variable voltage source until voltmeter reads voltage (V-3).

6.4.3 Connect terminal 1 with B4.

6.4.4 Connect terminal 2 with TP4 (BROWN).

6.4.5 Set switch SW to B-Position

6.4.6 Adjust M3 potentiometer R42 until ammeter reads current (I-3).

7. Testing Process - Final Test

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

7.1 Test Set Up

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

7.1.2 Start with the following (as shown) switch positions.

7.1.2.1 S3, S5, S15 and S16 in position A.

7.1.2.2 S7 in the off position

7.1.2.3 S9 will be closed.

7.1.2.4 Insert B1

7.2 Voltage Test (Zener Check)

7.2.1 Measure voltage at TP51, it should be +15.7V, +- 5%.

7.2.2 Measure voltage at TP52, it should be -15.7V, +- 5%.

7.2.3 Turn VR2 fully CW.

7.2.4 Measure voltage at TP1, it should be +10.0V, +- 1V.

7.2.5 Turn VR1 fully CW.

7.2.6 Measure voltage at TP2, it should be +10.0V, +- 1V.

7.3 EB1 and EB2 Break Point Adjustments

Note: EB = ESL - BP

7.3.1 Turn Pot VR58 fully clockwise.

7.3.2 Measure (E-DFG) at TP4 with DVM. (E-DFG) should be +11V +- 1.2V.

7.3.3 Adjust (E-B1) - R44 until voltage at TP5 reads (E-B1).

7.3.4 Adjust (E-B2) - R45 until voltage at TP6 reads (E-B2).

7.4 Bias Adjustment

7.4.1 Set switches to the initial setting in (7.1.2) except B7 is now open.

7.4.2 Apply 0.0V on B7 (wiper) end of R39.

7.4.3 Adjust R58 until (E-DFG) (TP4) reads +5.0V.

7.4.4 Apply +5.0V on VR57 end of B7.

7.4.5 Adjust R39 until (E-DFG) (TP4) reads +0.0V.

7.4.6 Insert B7.

7.4.7 If (E-LMIN) = 0V, set S5 in Position A.

7.4.8 If (E-LMIN) $\neq$ 0V, set S5 in Position B.

7.4.9 Apply (E-L) = (E-LMIN) at pin-36 by adjusting (V-A)

7.4.10 Check TP1 to make sure it reads (E-LMIN).

7.4.11 Adjust VR3 until (E-SL) (TP2) reads 0.0V.

7.4.12 Reset S5 to position A.

7.5 Recording of Static DFG-Curve (Figure 2)

7.5.1 Use Digital Scope in X/Y mode. This will be slightly different then using the plotter described below. Plotters are no longer available. See Figure 2 for sample of curve.

7.5.2 Turn on Recorder. Set sensitivity switch at 1 volt/inch on the X and Y inputs.

7.5.3 Turn Pot 1 to bottom position and make sure voltage at BP2 is 0V, +- 5mV.

7.5.4 Insert curve sheet from engineering into X/Y plotter.

7.5.5 Set zero adjustments on X and Y channel such that pen coincides with (0V/0V) position marked on the lower left hand side of the sheet.

7.5.6 Set SW16 to position B. Turn Pot 1 upwards until BP2 reads +5.0V, +-5mV. 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 (0V/0V).

7.5.7 Reset SW16 to position A.

7.5.8 Set SW7 to position B. Turn Pot 1 upwards until BP2 reads +5.0V, +-5mV. This should cause the pen to drive 5 inches to the right. If not, adjust gain X-channel until this is the case. Turn Pot 1 downwards to the bottom. The pen should go to (0V/0V).

7.5.9 Place SW7 in position "OFF".

7.5.10 Set Pot 2 for _____V at BP1.

7.5.11 Set S3 and S15 to position B.

7.5.12 Place S7 in position A.

7.5.13 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.

7.5.14 If the curve deviates too much, the DFG must be re-adjusted.

7.5.15 If this is necessary: Open S7 position A and close S7 position B, to put in manual mode in order to use Pot 1 for re-adjustment.

7.5.16 The pen can be moved manually along the curve by turning the knob of Pat 1. Slope pots, break point pots, and bias pot can be adjusted until plotted curve coincides with the curve supplied by Engineering.

7.5.17 Send the final recorded trace to EHC engineering (Bldg. 285-Room 241).

7.5.18 Apply red paint on slope pot - break pot adjustment screws.

7.5.19 Write serial number, signature, and date on each X/Y trace.

7.6 Post Testing Burn-in Required _X_ Yes ___ No

Note: All MARK I, II, & III Turbine related cards require a post testing burn-in of 100 hours.

7.6.1 Apply BUS or Operational power to the card for a period of 100 hours.

7.6.2 Re-test card while warm using the above procedure.

7.7 ***TEST COMPLETE *

8. Notes

8.1 None at this time.

9. Attachments

9.1 See following pages for attachments.

9.2 Test Setup for Final Test Figure 1

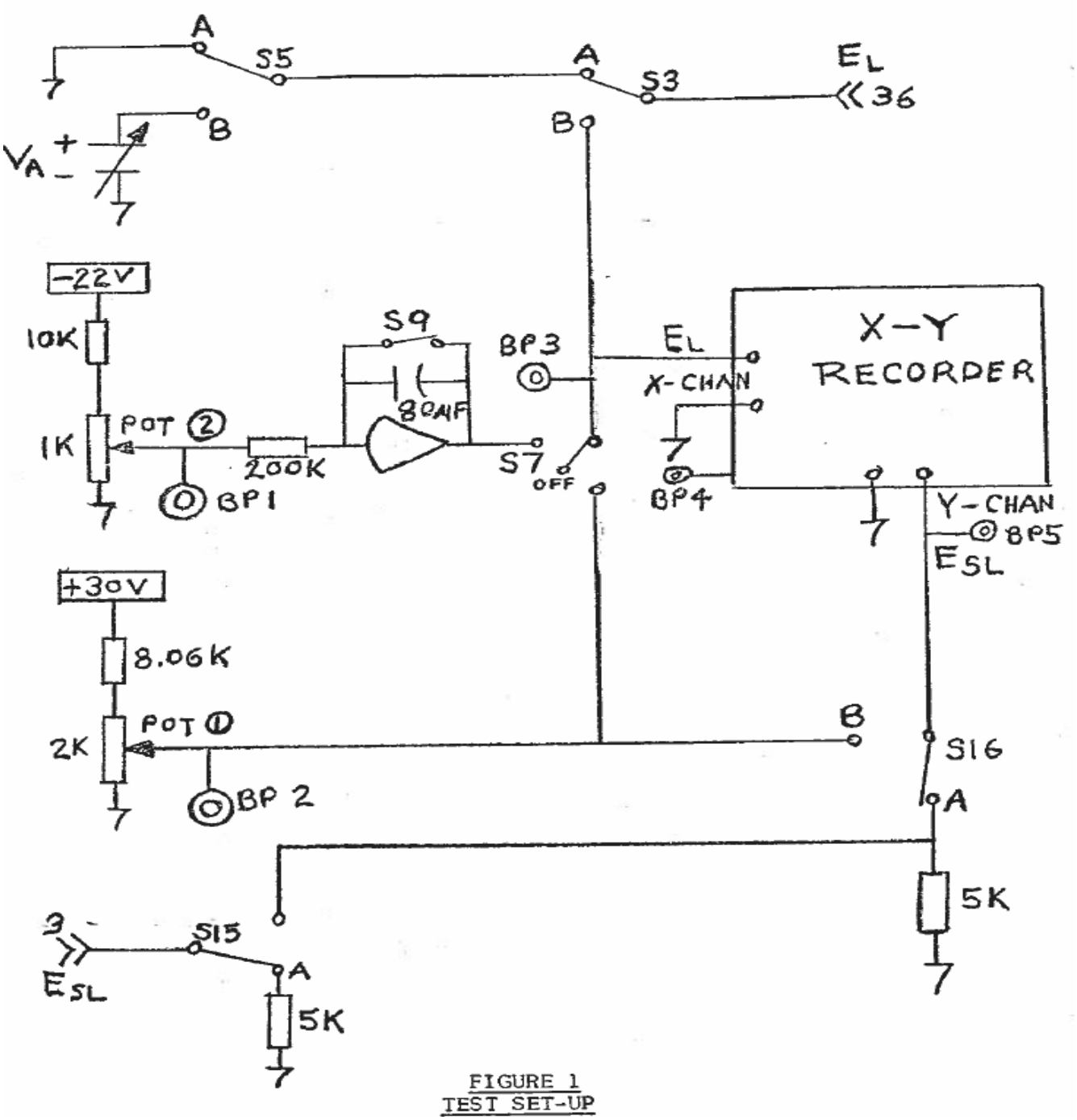

FIGURE 1
TEST SET-UP

9.3 Plotting curve sheet Figure 2

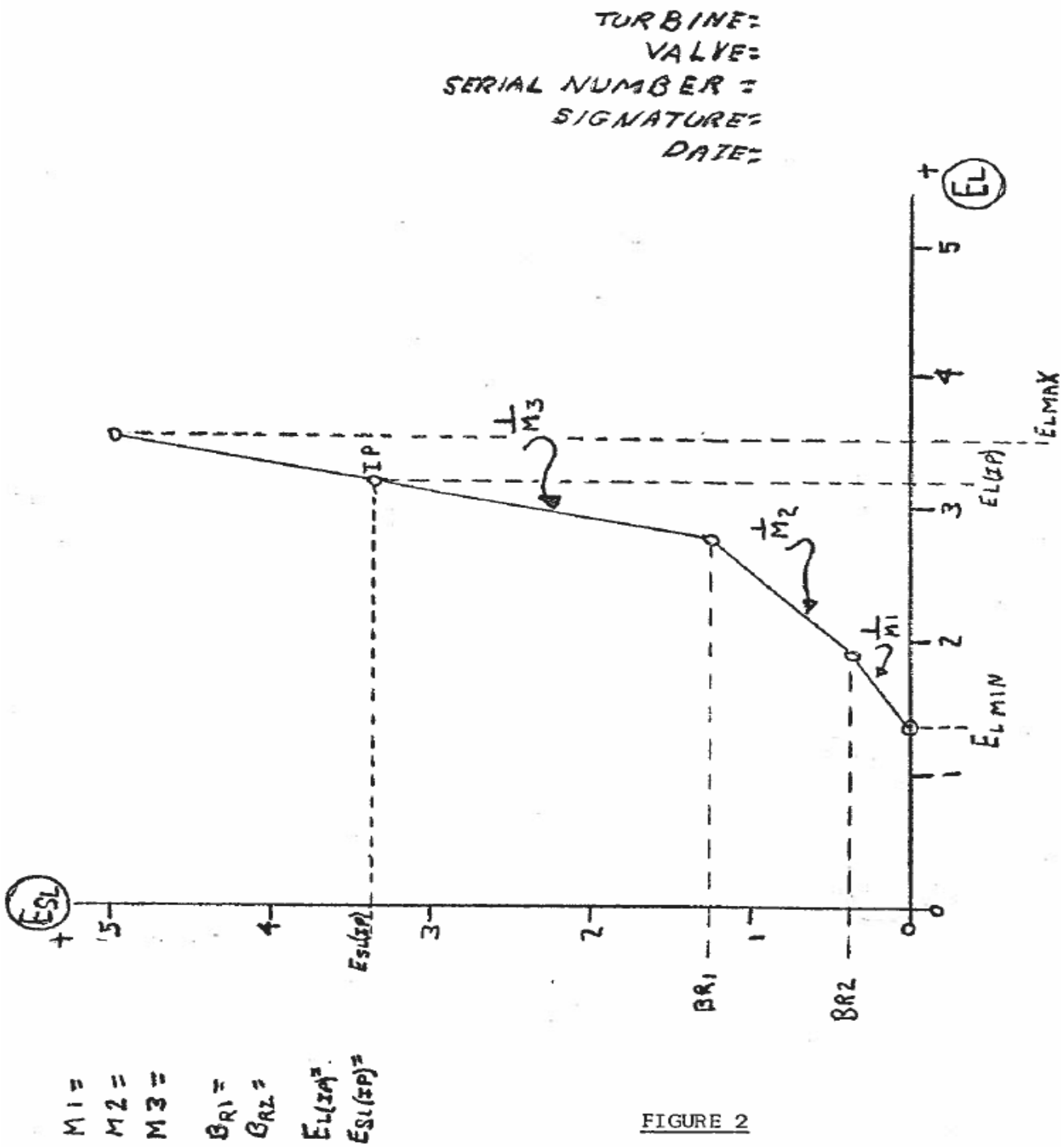

FIGURE 2

9.4 Formulas Figure 3

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} =

Figure 3