1. INTRODUCTORY DESCRIPTION

A. This procedure establishes the methods for testing a DS200DCFB.
B. Environmental ranges: 70 +/- 10 Deg. F. with 20-75% R.H.
C. Unit warm-up/stabilization period requirement: None
D. Personnel using this procedure are expected to have a high degree of confidence and expertise in related testing and calibration procedures.
E. Procedures not explained here are considered to be understood as common practice.

2. TEST EQUIPMENT VERIFICATION

A. Verify the accuracy of the standard(s) used in the repair/calibration process by evidence of recent calibration labeling affixed to the test equipment.
B. All measurement standards used in this procedure shall be traceable to the NATIONAL INSTITUTE of STANDARDS and TECHNOLOGY (N.I.S.T.) and shall have the accuracy, stability, range and resolution required for the intended use.
C. Unless otherwise specified, the collective uncertainty of the Measurement Standard(s) shall not exceed twenty five percent of the acceptable tolerance for each characteristic being calibrated.
D. All deviations shall be documented.

3. EQUIPMENT CLEANING

A. All equipment clean will be performed as instructed in the GE T&IC SOP Sec. 14.0

4. EQUIPMENT INSPECTION

A. The following criteria should be used as a guideline or basis for the inspection process of this unit:
    1. Wires broken or cracked.
    2. Terminal strips / connectors broken or cracked.
    3. Loose wires.
    4. Components visually damaged.
    5. Capacitors leaking.
    6. Solder joint, cold or otherwise inadequate.
    7. Circuit board discolored or burned.
    8. Printed wire runs burned or damaged.

5. REVISION HISTORY

Revision	Date	Initials	Reason for Revision
A	07/01/99	JDS	Initial Procedure – After Verification
B	07/13/99	LFG	TP IDENTIFIED WRONG IN PROCEDURE
C	06/14/02	RKD	Modified header, Added initial column to section 5.
D	8/28/03	RKD	Added Photo of test Fixture
E	9/25/2006	CW	Added G2 Freq notes
F	1/16/2008	CW	Added notes for clarity Pages 3,4,5,9,10
G	7/22/2014	CW	Added functional testing section line 38 through 53 and picture of test drive H190112
H			
I			
J			
K			

6. REFERENCE DOCUMENTATION

- Reference: DS200DCFB

7. Notes

- Frequency counter setup using HP5315B – freq A pushed in and gate time delay should be at midpoint. All frequencies when measured will be quadrupled compared to a G1, except steps 26 and 27.
- Please replace the following components if over 5 years old, C44, C87-C89, C91, U32, & U43.

8. TEST EQUIPMENT TO BE USED

- OSCILLOSCOPE
- MULTI-METER
- DS200DCFB FIXTURE #H033801
- DS200DCFBG1B Test Drive H190112

9. FINAL TEST AND OPERATION PROCESS

1. Connect all connectors from test fixture to the card under test.
2. Turn **POWER SWITCH** to **ON.**
3. Check power supplies voltages on card using test points on card.

TP Name	VOLT. Range		Additional Checks	
P5	+4.9 – 5.1 VDC		Across C62	≈24.0 VDC
P15	+14.7–15.2 VDC		Across C63	≈5.00 VDC
N15	-14.7–15.2 VDC			

4. Connect oscilloscope to BNC on right side of test fixture.
5. Connect Multi-Meter to red and black jacks on test fixture.
6. Turn switch on right side of test fixture to GATE PULSE.
7. Set oscilloscope to 5V/DIV and time 50 uS.
8. Set Multi-Meter to DC volts.

.

9. Verify that **U28 XILINX PROGRAMMED** LED is on. If this LED is out, replace U28 before continuing.

10. Verify forward gate pulses with table below.

11. **NOTE**: After changing thumbwheel switch you must toggle 1PL-17 /ENFWD down then back up to select a gate pulse output.

12. NOTE: Pushbutton 1PL-27 SCR TST is 1 all the time unless pressed.

GATE SIGNAL SELECT THUMBWHEEL	OUTPUT	1PL-17 / ENFWD	1PL-27 SCRTST	PAGE	WAVEFORM or Output Voltage
FWD 6	5PL-1	1	0	4JA	+13 VDC
FWD 6	5PL-1	0	1	4JA	+13 VDC
FWD 6	5PL-1	1	1	4JA	FIG. 1
FWD 5	5PL-3	1	1	4JA	FIG. 1
FWD 4	5PL-5	1	1	4JA	FIG. 1
FWD 3	5PL-7	1	1	4JA	FIG. 1
FWD 2	5PL-9	1	1	4JA	FIG. 1
FWD 1	5PL-11	1	1	4JA	FIG. 1

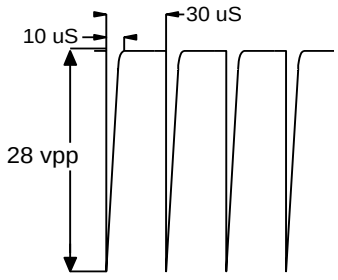


FIG. 1

FORWARD GATE PULSES

Note: Scope Settings (5V & 50uS)

13. **NOTE**: Table below show inputs applied to board by Thumbwheel switch. This is for trouble shooting only.

PAGE	GATE SIGNAL SELECT THUMBWHEEL	1PL-26 A36F	1PL-25 A25F	1PL-24 A14F
4HA	FWD 6	1	1	0
4HA	FWD 5	1	0	1
4HA	FWD 4	1	0	0
4HA	FWD 3	0	1	1
4HA	FWD 2	0	1	0
4HA	FWD 1	0	0	1

14. Verify reverse gate pulses with table below. Switch 1PL-17 must be in the down position.

15. **NOTE**: After changing thumbwheel switch you must toggle 1PL-16 /ENREV down then back up to select a gate pulse output.

16. **NOTE**: Pushbutton 1PL-27 SCR TST is 1 all the time unless pressed

17. REVERSE GATE PULSES

GATE SIGNAL SELECT THUMBWHEEL	OUTPUT	1PL-16 / ENREV	1PL-27 SCRTST	PAGE	WAVE FORM
REV 1	5PL-13	1	1	4KA	FIG. 1
REV 2	5PL-15	1	1	4KA	FIG. 1
REV 3	5PL-17	1	1	4KA	FIG. 1
REV 4	5PL-19	1	1	4KA	FIG. 1
REV 5	5PL-21	1	1	4KA	FIG. 1
REV 6	5PL-23	1	1	4KA	FIG. 1
REV 6	5PL-23	1	0	4KA	+13 VDC
REV 6	5PL-23	0	1	4KA	+13 VDC

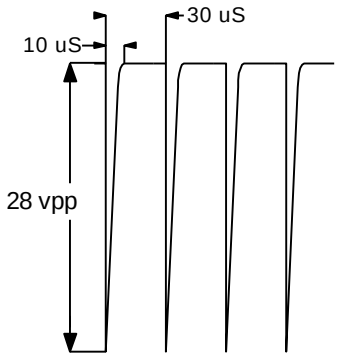


FIG. 1

18. **NOTE**: Table below shows inputs applied to board by Thumbwheel switch. This is for trouble shooting only.

PAGE	GATE SIGNAL SELECT THUMBWHEEL	1PL-22 A36R	1PL-21 A25R	1PL-20 A14R
4HA	REV 6	1	1	0
4HA	REV 5	1	0	1
4HA	REV 4	1	0	0
4HA	REV 3	0	1	1
4HA	REV 2	0	1	0
4HA	REV 1	0	0	1

19. Verify field gate pulses with table below. When the outputs are addressed both are at .483vdc. If your square wave is about half of the voltage, make sure your multimeter is not on the ohm range.

OUTPUT	/FF1 1PL-19	/FF2 1PL-18	FLD1CTRL 1PL-32	FLD2CTRL 1PL-33	PAGE	WAVE-FORM
1FPL-2	1	0	1	0	4BA	FIG.2
1FPL-4	1	0	1	0	4BA	FIG.2
1FPL-6	0	0	1	0	4BA	FIG.2
1FPL-8	0	0	1	0	4BA	FIG.2
2FPL-2	0	1	0	1	4BA	FIG.2
2FPL-4	0	1	0	1	4BA	FIG.2
2FPL-6	0	0	0	1	4BA	FIG.2
2FPL-8	0	0	0	1	4BA	FIG.2
NPL-2	0	0	1	0	4BA	FIG.3
PPL-2	1	0	1	0	4BA	FIG.3

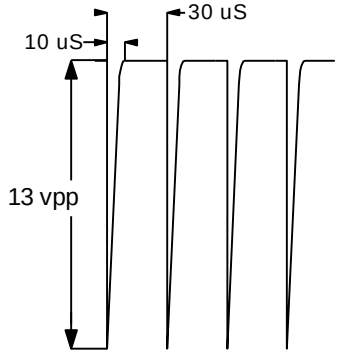


FIG. 2

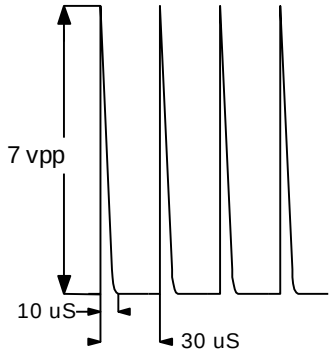


FIG. 3

20. Turn switch on right side of test fixture to SELECTOR SW-1.

21. Set Multi-Meter to Hz.

22. Verify VCO's operation with table below.

Selector Switch CH2 Position V1-3	DIPSWITCH	1	2	3	4	VCO Polarity	Output	G1 Freq.	G2 Freq.	Waveform	Page
	SW3	ON	ON	ON	ON	Positive	1PL-12	262 KHz	1.04 MHz	Figure 5	4CA
	SW3	OFF	OFF	OFF	OFF	Positive	1PL-12	300 KHz	1.2 MHz	Figure 5	4CA
	SW3	OFF	OFF	OFF	OFF	Negative	TCPL-3	200 KHz	800 KHz	Figure 4	4CA

Selector Switch CH2 Position V1-2	DIPSWITCH	1	2	3	4	VCO Polarity	Output	G1 Freq.	G2 Freq.	Waveform	Page
	SW1	ON	ON	ON	ON	Positive	1PL-11	262 KHz	1.04 MHz	Figure 5	4CA
	SW1	OFF	OFF	OFF	OFF	Positive	1PL-11	300 KHz	1.2 MHz	Figure 5	4CA
	SW1	OFF	OFF	OFF	OFF	Negative	TCPL-1	200 KHz	800 KHz	Figure 4	4CA

23. Turn Selector Switch 1 to **1PL-38** and verify Fluke Meter reads 0.168 VDC +/- .001 VDC. Special Note; G1ACA, 1PL-38 will read 5.0 VDC.

24. Verify VCO's operation with table below.

Selector Switch CH2 Position VMIA-VMIB	DIPSWITCH	1	2	3	4	VCO Polarity	Output	G1 Freq.	G2 Freq.	Waveform	Page
	SW5	ON	ON	ON	ON	Positive	1PL-39	262 KHz	1.04 MHz	Figure 5	4DA
	SW5	OFF	OFF	OFF	OFF	Positive	1PL-39	300 KHz	1.2 MHz	Figure 5	4DA
	SW5	OFF	OFF	OFF	OFF	Negative	1PL-39	200 KHz	800 KHz	Figure 4	4DA

Selector Switch CH2 Position P1A-P1B	DIPSWITCH	1	2	3	4	VCO Polarity	Output	G1 Freq.	G2 Freq.	Waveform	Page
	SW4	ON	ON	ON	ON	Positive	1PL-13	262 KHz	1.04 MHz	Figure 5	4DA
	SW4	OFF	OFF	OFF	OFF	Positive	1PL-13	300 KHz	1.2 MHz	Figure 5	4DA
	SW4	OFF	OFF	OFF	OFF	Negative	1PL-13	200 KHz	800 KHz	Figure 4	4DA

25. Verify VFBB operation with table below.

VCO Polarity	Selector Switch 2	DIPSWITCH 4 1	2	3	4	Output	Page	DC Volts Out
Negative	P1A-P1B	OFF	OFF	OFF	OFF	1PL-37	4DA	9.7 V
Positive	P1A-P1B	OFF	OFF	OFF	OFF	1PL-37	4DA	7.6 V
Positive	P1A-P1B	ON	ON	ON	ON	1PL-37	4DA	8.4 V

26. Verify VCO operation with table below. When testing a G2 model the output did not quadruple compared to a 1MHz crystal. This pertains to steps 26 & 27 only. Some multimeters have a problem reading steps 26 & 27. A Fluke 87 has read the appropriate frequencies, if there is any doubt go to a scope

Shunt Input Switch	JP13 Position	Output Selector Switch 1	G1 Freq.	G2 Freq.	Page	Waveform
50 mV	1-2	1PL-40	293 KHz	1.41 MHz	4FA	Figure 5
100 mV	1-2	1PL-40	98 KHz	1.8 MHz	4FA	Figure 5
100 mV	2-3	1PL-40	255 KHz	1.02 MHz	4FA	Figure 4

- Return JP13 to the 1-2 position

27. Verify VCO operation with table below.

Shunt Input Switch	Output Selector Switch 1	G1 Freq.	G2 Freq.	Page	Waveform
50 mV	1PL-9	293 KHz	1.41 MHz	4FA	Figure 5
100 mV	1PL-9	98 KHz	1.8 MHz	4FA	Figure 5

28. Verify VCO operation with table below. Leaving J13 in the 2-3 setting will affect the frequency.

Shunt Input Switch	Jumper Settings										Output	G1 Freq	G2 Freq	Page	Wave form
	JP3	JP4	JP5	JP6	JP7	JP8	JP9	JP10	JP11	JP12					
50 mV	1-2	1-2	1-2	1-2	1-2	X	X	X	X	X	1PL-8	275 KHz	1.1 MHz	4GA	Figure 5
100 mV	1-2	1-2	1-2	1-2	1-2	X	X	X	X	X	1PL-8	300 KHz	1.2 MHz	4GA	Figure 5
50 mV	X	X	X	X	X	1-2	1-2	1-2	1-2	1-2	1PL-10	275 KHz	1.1 MHz	4GA	Figure 5
100 mV	X	X	X	X	X	1-2	1-2	1-2	1-2	1-2	1PL-10	300 KHz	1.2 MHz	4GA	Figure 5

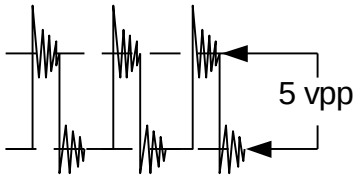


FIG. 4

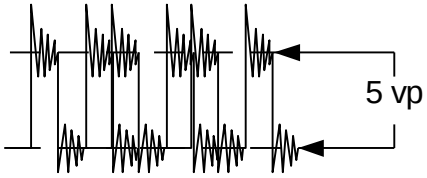


FIG. 5

29. Turn Selector Switch1 to **1PL-1** and **ACCT 1 / 2** to **ACCT 1;** verify that a 5 Vpp fullwave pulsating DC is present.

30. Push **ACCT 1 / 2** to **ACCT 2;** verify that a 5 Vpp fullwave pulsating DC is present.

31. Verify a short is present between the green test jacks on test fixture.

32. Verify 15 to 16 VAC between 2 and 3, 1 and 4 @ SQPL.

33. Verify a short between **FAPL-1, 4PL-1** and **CPTPL-1.**

34. Verify table below.

SELECTOR SWITCH2 POSITION	DIPSWITCH	1	2	3	4	VCO POLARITY	OUTPUT	VDC	WAVEFORM
V2-3	SW2	ON	ON	ON	ON	POSITIVE	1PL-29	0 VDC	N/A
	SW2	OFF	OFF	OFF	OFF	NEGATIVE	1PL-29	+5 VDC	N/A

SELECTOR SWITCH2 POSITION	DIPSWITCH	1	2	3	4	VCO POLARITY	OUTPUT	VDC	WAVEFORM
VM2A-VM2B	SW6	ON	ON	ON	ON	POSITIVE	1PL-6	+2.7 VDC	N/A
	SW6	OFF	OFF	OFF	OFF	NEGATIVE	1PL-6	+1.48 VDC	N/A

35. Verify table below.

Contactor Input Switch	Output	Reading
Off	MACPL-1*	24 to 28 VDC
On	MACPL-1*	0V
Off	MACPL-3*	24 to 28 VDC
On	MACPL-3*	0V
Off	4PL-5 to 4PL-4**	Open
Off	4PL-5 to 4PL-3**	0 Ohms
Off	CNPL-2 to FAPL-1**	Open
On	CNPL-2 to FAPL-1**	0 Ohms
On	4PL-5 to 4PL-4**	0 Ohms
On	4PL-5 to 4PL-3**	Open
(*) Located on Selector Switch 2		
(**) Located on K2 Relay		

36. Turn Selector Switch1 to **2PL-1** and verify 0 VDC (0.011VDC).

37. Turn Selector Switch1 to **TCPL-5** and verify a short between JP1 pin 3 and **RED** jack located on the right side of test fixture.

38. Drive Testing

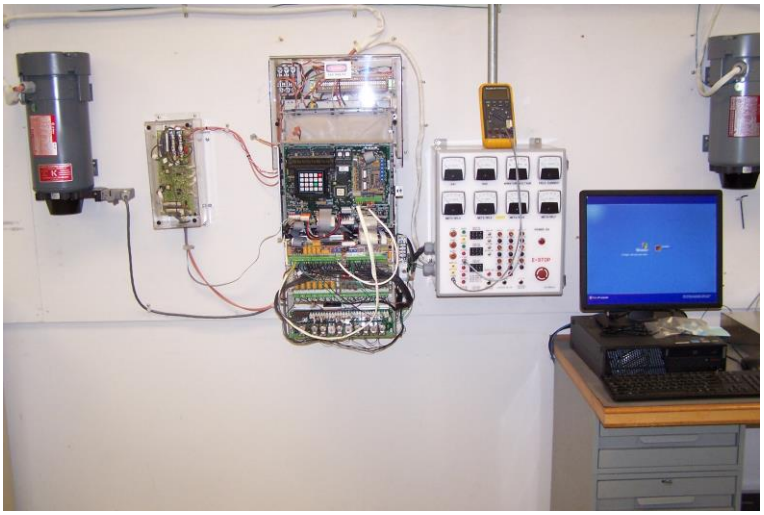
39. After UTS tes1t is complete, place card in the DC2000 “DCFB” drive, H190112 test fixture for burn in.
40. Connect the following cables to card:
41. V1, V2, V3, P1A, P2A, VM1A, VM1B, 1A1PL, 1F1PL, 1CPL, 1PL, MACPL, 1FPL, 5PL, 2PL, CPTPL, FAPL, 4PL, CNPL, PPL, NPL.
42. Verify all jumpers and dip switches match test card.

43. On Control Panel measure from COM to all red test jacks and verify no shorts are on the Power Supplies. If any shorts or low ohm readings are found, correct before powering Drive
44. Apply power by pulling E-stop out
45. Verify LDCC card displays “INITIALIZATION” then “MS 0 % I 0 %”.

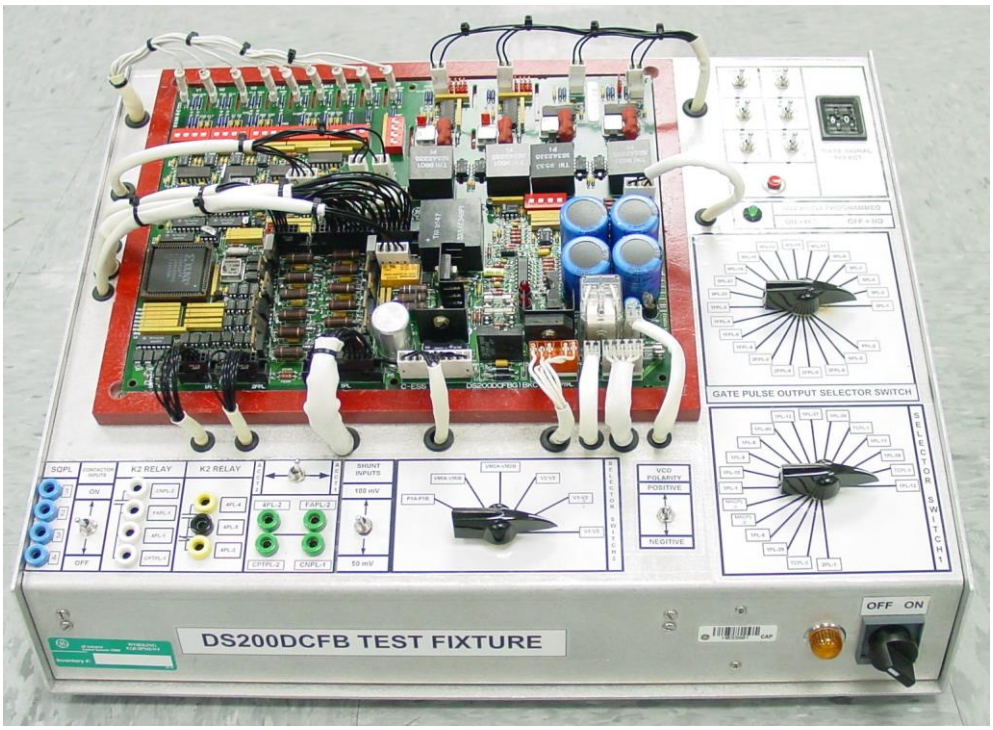
46. Check power supply voltage at Control Panel

+5 VDC	**+/-0.1**
+15 VDC	**+/-0.2**
-15 VDC	**+/-0.2**
+24 VDC	**+25-28**
-24 VDC	**-25-28**

47. Execute TEST 12 “SCR TEST”.
48. This can be done by entering the following in on the programmer: ([set], [drv], [7], [7], [Enter], [Reset],[Reset], [test], [1], [2], [Enter].
49. LDCC will display ”CELL TEST PASSED”.
50. Press RESET on Control Panel, this will take you out DIAGNOSTIC MODE.
51. Push RUN switch up on Control Panel.
52. Burn-in card for 15 minutes each direction: use the POL switch to change from FWD to REV.
53. Picture of drive fixture (H190112) located on wall.



END OF TEST



TEST WRITTEN BY: David Smith **DATE: 7-1-1999**

TEST VERIFIED BY: Lloyd F. Groves **DATE: 7-1-1999**