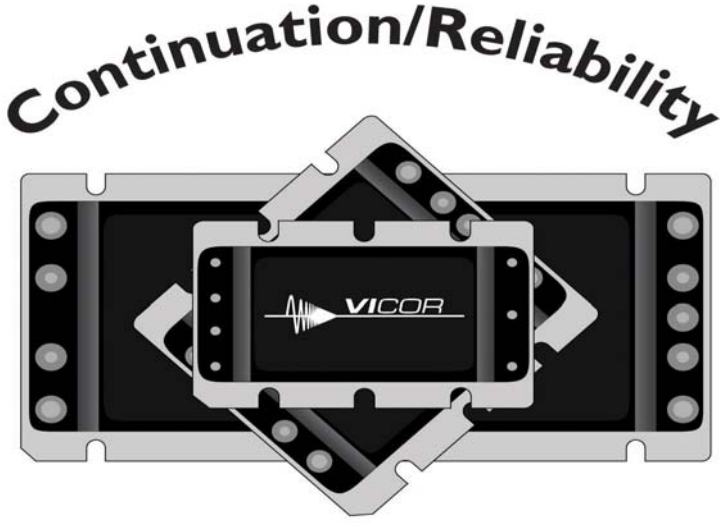
Qualification of Fastrak & First Gen Product to Railway applications – Shock and Vibration Standard EN 61373

(Governing Standard BS EN 50155 Railway Applications – Electronic equipment used on rolling stock) Dated 05/10/06



Engineering Department

1. PURPOSE:

To demonstrate compliance of Vicor product to the environmental (EN 50125-1), shock and vibration (EN 61373) standards from EN 50155, the European Standard for electronic equipment used in Railway applications.

2. EXECUTIVE SUMMARY:

Representative DC-DC power conversion modules were selected from both the Fastrak and First Gen platforms. VI-810423B was selected from Fastrak and VI-2T3-CU from First Gen.

Each group was tested as outlined below to demonstrate compliance to EN 50155. Both groups successfully completed the testing with no deterioration in the performance of the modules as demonstrated in the test results.

3 REQUIREMENTS:

3.1 **Test Samples:** 15 pieces of VI-810423B were selected from the Fastrak product line and 15 pieces of VI-2T3-CU were selected as representative samples from the 1st Generation product line.

3.2 **Production Requirements:** All test samples will be manufactured with the standard process.

3.3 **Testing Requirements:**

- All modules must be tested on the standard production ATE tester for that specific model, passing all tests before initiating qualification testing.
- During qualification testing the product must operate as outlined in the test requirement.
- Upon the completion of each test set each module must be tested to verify that there are no electrical failures. Each module must also be visually inspected to verify that there are no visual defects.

3.4 **Definition of Electrical Failure:** A failure will be a module that changes in electrical performance (parameters outside acceptable tolerance limits of specification) or other criteria specific to an environmental test. If the cause of the failure is caused by fixture failure or operator error it will not be counted as a failure.

4 TEST SEQUENCE

1. Initial Electrical Performance Test At Rated Operating Temperatures:

Test Method: Functional ATE test.

2. Shock & Vibration Test: Test performed at outside LAB – The report from the outside Lab has been added to the end of this report.

Test Condition: Nominal input voltage, no load, output monitored to verify continuous operation.

Test Parameters:

Random Vibration:
Category <0.3Kg
Freq range: 5-150Hz @ 5grms:
5hrs per axis

Shock:
Long./Trans./Vert. Axis
Peak acceleration:5g/2g/1g
Duration: 50ms/ 20ms/ 20ms.

3. Electrical Performance Tests At Rated Operational Temperatures:

Test Method: Functional ATE test

4. Temperature/Relative Humidity Test

Test Condition: Non-biased.

Test Parameters		
	Time	10 hours
	Temperature	55°C
	Relative Humidity	95%RH

5. Operating Temperature Test

Test Condition: Nominal Input Full load, continuous operation.

Test Parameters		
	Time	8 hrs
	Temperature	85°C for 6 hrs followed by 2 hrs at –40°C

6. Electrical Performance Tests At Rated Operational Temperatures:

Test Method: Functional ATE test.

5. TEST DATA

VI-2T3- CU – Vibration And Shock Test Results

CONTINUATION / RELIABILITY ENGINEERING DEPARTMENT

RANDOM VIBRATION: (5GRMS 5-150HZ)

SHOCK: (1G 20MS, 2G 20MS, 5G 50MS)

ENG TECHNICIAN: EDWARD MEJIA / NATIONAL TECHNICAL SYSTEMS 978.263.2933

MODEL NUMBER: VI-2T3-CU

Y AXIS												
Serial #	**Date**	**V HR 1**	**V HR 2**	**V HR 3**	**V HR 4**	**V HR 5**	**S 1G+**	**S 1G-**	**S 2G+**	**S 2G-**	**S 5G+**	**S 5G-**
210511282417	02/15/2006	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
210511282406	02/15/2006	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
210512083211	02/15/2006	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
210511291590	02/15/2006	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
210512083212	02/17/2006	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
210511291592	02/17/2006	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
210512083215	02/17/2006	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
210512083225	02/17/2006	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
210511282400	02/17/2006	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
210512083207	02/17/2006	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
210512083219	02/17/2006	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
210511282420	02/17/2006	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
210512083213	02/17/2006	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
210511282418	02/17/2006	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
210512083208	02/17/2006	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS

VI-2T3- CU – Vibration And Shock Test Results - Continued

VI-2T3-CU

X AXIS												
Serial #	Date	V HR 1	V HR 2	V HR 3	V HR 4	V HR 5	S 1G+	S 1G-	S 2G+	S 2G-	S 5G+	S 5G-
210511282400	02/20/2006	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
210511282406	02/20/2006	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
210511282417	02/20/2006	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
210511282418	02/20/2006	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
210511282420	02/20/2006	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
210511291590	02/20/2006	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
210511291592	02/20/2006	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
210512083207	02/20/2006	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
210512083208	02/20/2006	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
210512083211	02/20/2006	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
210512083212	02/20/2006	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
210512083213	02/20/2006	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
210512083215	02/20/2006	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
210512083219	02/20/2006	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
210512083225	02/20/2006	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS

VI-2T3-CU

Z AXIS												
Serial #	Date	V HR 1	V HR 2	V HR 3	V HR 4	V HR 5	S 1G+	S 1G-	S 2G+	S 2G-	S 5G+	S 5G-
210511282417	02/21/2006	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
210511282406	02/21/2006	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
210512083211	02/21/2006	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
210511291590	02/21/2006	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
210512083212	02/21/2006	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
210511291592	02/21/2006	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
210512083215	02/21/2006	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
210512083225	02/21/2006	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
210511282400	02/21/2006	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
210512083207	02/21/2006	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
210512083219	02/21/2006	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
210511282420	02/21/2006	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
210512083213	02/21/2006	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
210511282418	02/21/2006	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
210512083208	02/21/2006	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS

VI-2T3- CU – ATE Test Data

Start Date	Result	Testkind	Part Number	Serial Number
2005-11-28 18:00:10	Device Passed	Functional Test	VI-2T3-CV	210511282400
2006-03-07 11:11:11	Device Passed	Functional Test	VI-2T3-CV	210511282400
2006-03-09 14:25:07	Device Passed	Functional Test	VI-2T3-CV	210511282400
2005-11-28 18:01:21	Device Passed	Functional Test	VI-2T3-CV	210511282406
2006-03-07 11:10:06	Device Passed	Functional Test	VI-2T3-CV	210511282406
2006-03-09 15:23:03	Device Passed	Functional Test	VI-2T3-CV	210511282406
2005-11-28 17:59:35	Device Passed	Functional Test	VI-2T3-CV	210511282417
2006-03-07 11:09:44	Device Passed	Functional Test	VI-2T3-CV	210511282417
2006-03-09 14:25:08	Device Passed	Functional Test	VI-2T3-CV	210511282417
2005-11-28 17:59:22	Device Passed	Functional Test	VI-2T3-CV	210511282418
2006-03-07 11:12:58	Device Passed	Functional Test	VI-2T3-CV	210511282418
2006-03-09 14:23:29	Device Passed	Functional Test	VI-2T3-CV	210511282418
2005-11-28 17:55:02	Device Passed	Functional Test	VI-2T3-CV	210511282420
2006-03-07 11:12:31	Device Passed	Functional Test	VI-2T3-CV	210511282420
2006-03-09 15:18:33	Device Passed	Functional Test	VI-2T3-CV	210511282420
2005-11-29 13:56:24	Device Passed	Functional Test	VI-2T3-CV	210511291590
2006-03-07 11:10:58	Device Passed	Functional Test	VI-2T3-CV	210511291590
2006-03-09 14:22:38	Device Passed	Functional Test	VI-2T3-CV	210511291590
2005-11-29 14:02:12	Device Passed	Functional Test	VI-2T3-CV	210511291592
2006-03-07 11:13:18	Device Passed	Functional Test	VI-2T3-CV	210511291592
2006-03-09 15:17:20	Device Passed	Functional Test	VI-2T3-CV	210511291592
2005-12-08 21:44:11	Device Passed	Functional Test	VI-2T3-CV	210512083207
2006-03-07 11:12:18	Device Passed	Functional Test	VI-2T3-CV	210512083207
2006-03-09 14:20:32	Device Passed	Functional Test	VI-2T3-CV	210512083207

Start Date	Result	Testkind	Part Number	Serial Number
2005-12-08 21:44:52	Device Passed	Functional Test	VI-2T3-CV	210512083208
2006-03-07 11:12:45	Device Passed	Functional Test	VI-2T3-CV	210512083208
2006-03-09 14:24:42	Device Passed	Functional Test	VI-2T3-CV	210512083208
2005-12-08 21:44:23	Device Passed	Functional Test	VI-2T3-CV	210512083211
2006-03-07 11:11:41	Device Passed	Functional Test	VI-2T3-CV	210512083211
2006-03-09 15:20:36	Device Passed	Functional Test	VI-2T3-CV	210512083211
2005-12-08 21:45:17	Device Passed	Functional Test	VI-2T3-CV	210512083212
2006-03-07 11:13:27	Device Passed	Functional Test	VI-2T3-CV	210512083212
2006-03-09 14:22:26	Device Passed	Functional Test	VI-2T3-CV	210512083212
2005-12-08 21:47:56	Device Passed	Functional Test	VI-2T3-CV	210512083213
2006-03-07 11:10:30	Device Passed	Functional Test	VI-2T3-CV	210512083213
2006-03-09 14:23:55	Device Passed	Functional Test	VI-2T3-CV	210512083213
2005-12-08 21:47:07	Device Passed	Functional Test	VI-2T3-CV	210512083215
2006-03-07 11:12:06	Device Passed	Functional Test	VI-2T3-CV	210512083215
2006-03-09 15:19:29	Device Passed	Functional Test	VI-2T3-CV	210512083215
2005-12-08 21:48:32	Device Passed	Functional Test	VI-2T3-CV	210512083219
2006-03-07 11:10:46	Device Passed	Functional Test	VI-2T3-CV	210512083219
2006-03-09 14:20:51	Device Passed	Functional Test	VI-2T3-CV	210512083219
2005-12-08 21:46:43	Device Passed	Functional Test	VI-2T3-CV	210512083225
2006-03-07 11:11:53	Device Passed	Functional Test	VI-2T3-CV	210512083225
2006-03-09 15:21:42	Device Passed	Functional Test	VI-2T3-CV	210512083225

VI-810423B – Vibration And Shock Test Results -

CONTINUATION / RELIABILITY ENGINEERING DEPARTMENT

RANDOM VIBRATION: (5G RMS 5-150HZ)

SHOCK: (1G 20MS, 2G 20MS, 5G 50MS)

ENG TECHNICIAN: EDWARD MEJIA / NATIONAL TECHNICAL SYSTEMS 978.263.2933

MODEL NUMBER: VI-810423B

Y AXIS												
Serial #	Date	V HR 1	V HR 2	V HR 3	V HR 4	V HR 5	S 1G+	S 1G-	S 2G+	S 2G-	S 5G+	S 5G-
01051202143150	02/28/2006	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
01051202143151	02/22/2006	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
01051202143152	02/22/2006	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
01051202143153	02/22/2006	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
01051202143154	02/22/2006	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
01051202143434	02/27/2006	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
01051202143436	02/24/2006	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
01051202143437	02/26/2006	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
01051202143438	02/22/2006	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
01051202143440	02/23/2006	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
01051202143442	02/22/2006	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
01051202143448	02/22/2006	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
01051202143449	02/22/2006	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
01051202143450	02/22/2006	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
01051202143451	02/25/2006	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS

VI-810423B

X AXIS												
Serial #	Date	V HR 1	V HR 2	V HR 3	V HR 4	V HR 5	S 1G+	S 1G-	S 2G+	S 2G-	S 5G+	S 5G-
01051202143153	02/23/2006	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
01051202143450	02/23/2006	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
01051202143152	02/23/2006	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
01051202143449	02/23/2006	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
01051202143442	02/23/2006	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
01051202143154	02/23/2006	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
01051202143151	02/24/2006	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
01051202143438	02/24/2006	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
01051202143448	02/24/2006	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
01051202143440	02/24/2006	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
01051202143436	02/24/2006	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
01051202143451	02/24/2006	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
01051202143437	02/24/2006	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
01051202143434	02/24/2006	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
01051202143150	02/24/2006	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS

VI-810423B – Vibration And Shock Test Results - Continued

Z AXIS												
Serial #	**Date**	**V HR 1**	**V HR 2**	**V HR 3**	**V HR 4**	**V HR 5**	**S 1G+**	**S 1G-**	**S 2G+**	**S 2G-**	**S 5G+**	**S 5G-**
01051202143153	03/01/2006	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
01051202143450	03/01/2006	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
01051202143152	03/01/2006	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
01051202143449	03/01/2006	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
01051202143442	03/01/2006	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
01051202143154	03/01/2006	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
01051202143151	03/01/2006	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
01051202143438	03/01/2006	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
01051202143448	03/01/2006	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
01051202143440	03/01/2006	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
01051202143436	03/01/2006	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
01051202143451	03/02/2006	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
01051202143437	03/02/2006	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
01051202143434	03/02/2006	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
01051202143150	03/02/2006	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS

VI-810423B – Test Data

Start Date	Bin	Testkind	Part Number	Serial Number
2005-12-06 08:23:56	Device Passed	Functional Test	VI-810423B	01051202143150
2006-03-02 16:43:54	Device Passed	Functional Test	VI-810423B	01051202143150
2006-03-07 12:47:46	Device Passed	Functional Test	VI-810423B	01051202143150
2005-12-06 08:11:45	Device Passed	Functional Test	VI-810423B	01051202143151
2006-03-02 16:42:16	Device Passed	Functional Test	VI-810423B	01051202143151
2006-03-07 11:52:11	Device Passed	Functional Test	VI-810423B	01051202143151
2005-12-06 08:22:25	Device Passed	Functional Test	VI-810423B	01051202143152
2006-03-02 16:55:07	Device Passed	Functional Test	VI-810423B	01051202143152
2006-03-07 11:42:38	Device Passed	Functional Test	VI-810423B	01051202143152
2005-12-06 08:23:13	Device Passed	Functional Test	VI-810423B	01051202143153
2006-03-02 16:54:23	Device Passed	Functional Test	VI-810423B	01051202143153
2006-03-07 11:37:03	Device Passed	Functional Test	VI-810423B	01051202143153
2005-12-06 08:25:15	Device Passed	Functional Test	VI-810423B	01051202143154
2006-03-02 16:47:38	Device Passed	Functional Test	VI-810423B	01051202143154
2006-03-07 11:50:42	Device Passed	Functional Test	VI-810423B	01051202143154
2005-12-06 08:24:18	Device Passed	Functional Test	VI-810423B	01051202143434
2006-03-02 16:58:05	Device Passed	Functional Test	VI-810423B	01051202143434
2006-03-07 12:46:25	Device Passed	Functional Test	VI-810423B	01051202143434
2005-12-06 08:21:01	Device Passed	Functional Test	VI-810423B	01051202143436
2006-03-02 16:57:18	Device Passed	Functional Test	VI-810423B	01051202143436
2006-03-07 12:40:31	Device Passed	Functional Test	VI-810423B	01051202143436
2005-12-06 08:17:28	Device Passed	Functional Test	VI-810423B	01051202143437
2006-03-02 16:45:43	Device Passed	Functional Test	VI-810423B	01051202143437
2006-03-07 12:44:29	Device Passed	Functional Test	VI-810423B	01051202143437
2005-12-06 08:20:19	Device Passed	Functional Test	VI-810423B	01051202143438
2006-03-07 11:56:17	Device Passed	Functional Test	VI-810423B	01051202143438
2005-12-06 08:23:35	Device Passed	Functional Test	VI-810423B	01051202143440
2006-03-02 17:00:45	Device Passed	Functional Test	VI-810423B	01051202143440
2006-03-07 12:39:17	Device Passed	Functional Test	VI-810423B	01051202143440
2005-12-06 08:22:37	Device Passed	Functional Test	VI-810423B	01051202143442
2006-03-02 16:51:06	Device Passed	Functional Test	VI-810423B	01051202143442
2006-03-07 11:48:31	Device Passed	Functional Test	VI-810423B	01051202143442

Start Date	Bin	TestKind	Part Number	Serial Number
2005-12-06 08:19:39	Device Passed	Functional Test	VI-810423B	01051202143448
2006-03-02 16:59:36	Device Passed	Functional Test	VI-810423B	01051202143448
2006-03-07 11:57:47	Device Passed	Functional Test	VI-810423B	01051202143448
2005-12-06 08:19:16	Device Passed	Functional Test	VI-810423B	01051202143449
2006-03-02 16:50:01	Device Passed	Functional Test	VI-810423B	01051202143449
2006-03-07 11:44:48	Device Passed	Functional Test	VI-810423B	01051202143449
2005-12-06 08:20:35	Device Passed	Functional Test	VI-810423B	01051202143450
2006-03-07 11:41:12	Device Passed	Functional Test	VI-810423B	01051202143450
2006-03-07 11:59:42	Device Passed	Functional Test	VI-810423B	01051202143450
2005-12-06 08:24:56	Device Passed	Functional Test	VI-810423B	01051202143451
2006-03-02 16:46:43	Device Passed	Functional Test	VI-810423B	01051202143451
2006-03-07 12:42:48	Device Passed	Functional Test	VI-810423B	01051202143451

Test Report No. TR-300814-05E, Rev. 0

Vibration and Shock Testing
of
Power Supplies

Prepared For: Vicor Corporation
400 Federal Street
Andover, MA 01810
P.O. Number: 158432SEV

Prepared By: National Technical Systems
1146 Massachusetts Avenue
Boxborough, MA 01719
(978) 266-1001
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Issued: March 17, 2006

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0214.14-17

Revision Page

Rev. No	Date	Page No.	Para. No.	Description
Original	March 17, 2006			

Signatures

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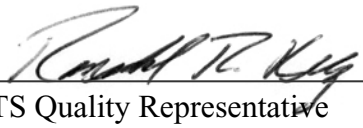
Reviewed by 
NTS Quality Representative

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1.0 Purpose

This report presents the test procedures used and the results obtained during the performance of a Vibration and Shock test program. The test program was conducted to assess the ability of 30 Power Supplies to successfully satisfy the requirements specified in the references listed in Section 2.0 of this report.

2.0 References

2.1 Vicor Corporation Purchase Order Number 158432SEV dated December 20, 2005

2.2 NTS Quotation Number B-1105E-7257-1 dated December 20, 2005

2.3 ISO/IEC 17025:2005(E), *General Requirements for the Competence of Testing and Calibration Laboratories*, May 15, 2005

2.4 British Standard BS EN 50155:2001, *Railway Applications – Electronic Equipment Used on Rolling Stock*, dated August 2001

3.0 Test Items

3.1 Description

Qty.	Item	P/N	S/N
15	Power Supply	VI-2T3-CU	N/A
15	Power Supply	VI-810-423B	N/A

3.2 Security Classification of Items

Unclassified

4.0 Test Dates and Equipment

4.1 Test Dates

February 17-28 and March 2, 2006

4.2 Test Equipment

A list of the test equipment used is included in Appendix A of this report. This equipment is calibrated according to ISO/IEC 17025:2005(E) and calibration is traceable to the National Institute of Standards and Technology (NIST). Calibration records are maintained on file at National Technical Systems.

5.0 Test Descriptions and Results

- The test items were inspected upon receipt at NTS. No damage was noted.
- All testing was performed in accordance with Section 2.0 of this test report.

5.1 Test Summary

The Power Supplies met the requirements of Section 2.0 of this test report. There was no damage or deterioration following the Vibration and Shock test program.

Four incidents of deviation occurred during Random Vibration testing.

- Test #5 in the X-axis was aborted at 36 minutes, 10 seconds. It was noted that the spanners on the piston had loosened during vibration. The spanners were tightened and testing continued. Reference Appendix C for Notice of Deviation Number D-1 dated February 20, 2006.

- Test #5 in the X-axis was aborted at 38 minutes, 59 seconds. It was noted that two of the flange bolts on one side of the piston had broken, causing hydraulic oil to spray from the pit. The bolts were replaced and testing continued. Reference Appendix C for Notice of Deviation Number D-2 dated February 20, 2006.

- Test #13 in the X-axis was aborted at 3 hours, 54 minutes, 11 seconds. A hairline crack was found near a weld on one of the flanges on the piston, causing hydraulic oil to spray from the pit. The flange was re-welded to cover the crack and testing continued. Reference Appendix C for Notice of Deviation Number D-3 dated February 22, 2006.

- Test #21 in the Z-axis was aborted at 8 minutes, 36 seconds. Two of the flange bolts on one side of the piston had broken, causing hydraulic oil to spray from the pit. Testing at that point had been split-banded. Testing in the range from 20 Hz to 150 Hz was completed on the NTS T-4000 Electro-dynamic Shaker. Testing in the range from 5 Hz to 20 Hz was completed on the Electro-hydraulic Shaker. Reference Appendix C for Notice of Deviation D-4 dated February 24, 2006.

Reference Sections 5.2 through 5.3 for test details and Appendix B for Vibration and Shock test data.

Test	Section	Reference	Met Criteria: Y/N
Random Vibration	5.2	British Standard BS EN 50155:2001, *Railway Applications – Electronic Equipment Used on Rolling Stock*, dated August 2001	Y
Shock	5.3		Y

5.2 Random Vibration Test

The Power Supplies, in an operating mode, were securely attached to a fixture plate, which was securely mounted to the Electro-hydraulic Shaker (the NTS T-4000 Electro-dynamic Shaker was used for one axis). One control accelerometer was located on the test fixture during all Random Vibration testing to monitor and record testing for later playback and plotting. The vibration system was programmed as follows:

Table I: Random Vibration Test

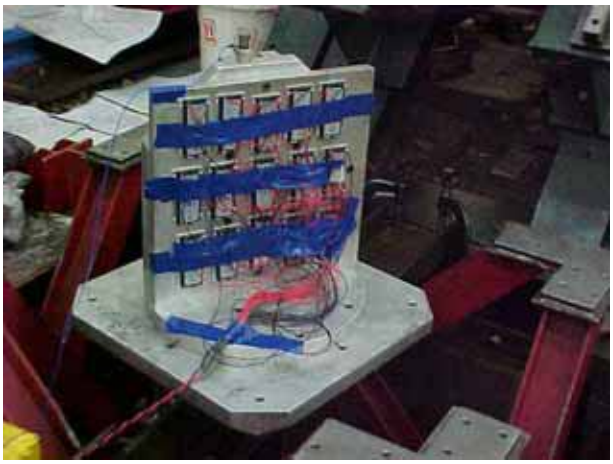
TEST PROFILE
5 grms Total
5 Hz to 150 Hz @ 0.1725 g^2/Hz
5 hours/axis
Three mutually perpendicular axes

Random Vibration Test Setup

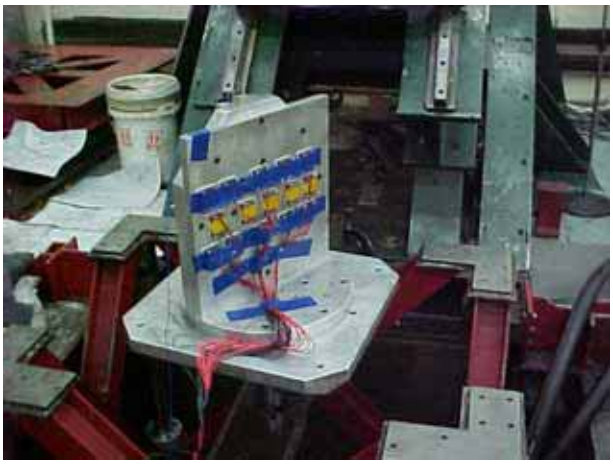
X-axis VI-2T3-CU

X-axis VI-810-423B

Y-axis VI-2T3-CU

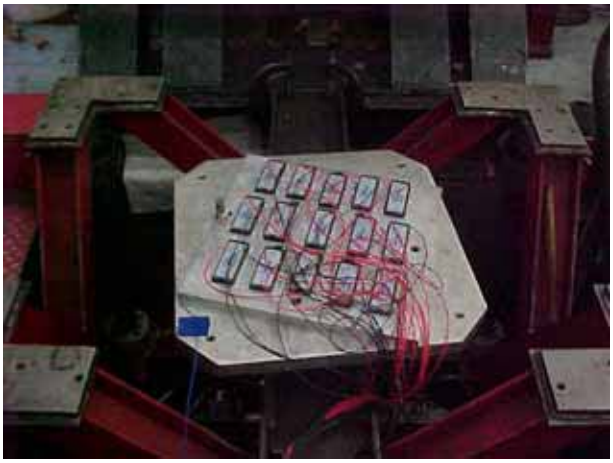


Y-axis VI-810-423B

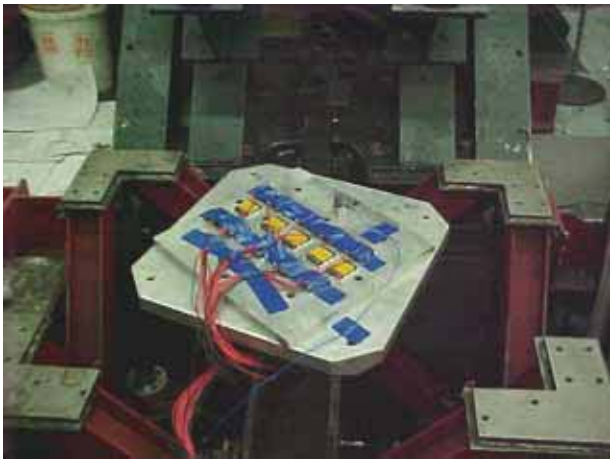


Random Vibration Test Setup

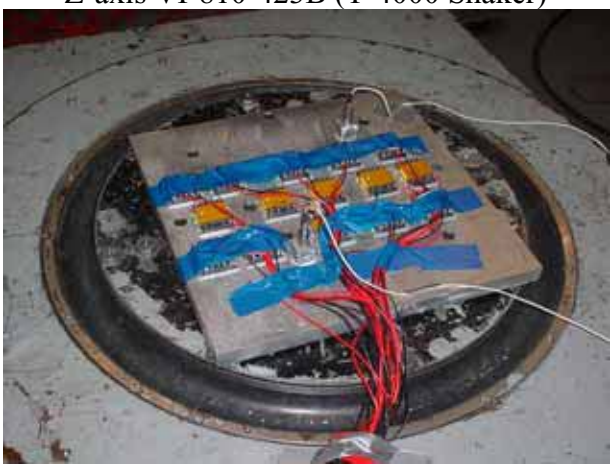
Z-axis VI-2T3-CU



Z-axis VI-810-423B



Z-axis VI-810-423B (T-4000 Shaker)



Comments

The Power Supplies showed no damage or deterioration following the Random Vibration testing. Reference Appendix B for Vibration and Shock Test Data.

Test #5 in the X-axis was aborted at 36 minutes, 10 seconds. It was noted that the spanners on the piston had loosened during vibration. The spanners were tightened and testing continued. Reference Appendix C for Notice of Deviation Number D-1 dated February 20, 2006.

Test #5 in the X-axis was aborted at 38 minutes, 59 seconds. It was noted that two of the flange bolts on one side of the piston had broken, causing hydraulic oil to spray from the pit. The bolts were replaced and testing continued. Reference Appendix C for Notice of Deviation Number D-2 dated February 20, 2006.

Test #13 in the X-axis was aborted at 3 hours, 54 minutes, 11 seconds. A hairline crack was found near a weld on one of the flanges on the piston, causing hydraulic oil to spray from the pit. The flange was re-welded to cover the crack and testing continued. Reference Appendix C for Notice of Deviation Number D-3 dated February 22, 2006.

Test #21 in the Z-axis was aborted at 8 minutes, 36 seconds. Two of the flange bolts on one side of the piston had broken, causing hydraulic oil to spray from the pit. Testing at that point had been split-banded. Testing in the range from 20 Hz to 150 Hz was completed on the NTS T-4000 Electro-dynamic Shaker. Testing in the range from 5 Hz to 20 Hz was completed on the Electro-hydraulic Shaker. Reference Appendix C for Notice of Deviation D-4 dated February 24, 2006.

5.3 Shock Test

The Power Supplies, in an operating mode, were securely attached to a fixture plate, which was securely mounted to the NTS Electro-hydraulic Shaker. One control accelerometer was located on the test fixture during all Shock testing to monitor and record testing for later playback and plotting. The vibration system was programmed as follows:

Table II: Mechanical Shock Test

TEST PROFILE
1 g half-sine waveform
20 millisecond duration
1 shocks in each ∂ directions/axis
6 total shocks
Three mutually perpendicular axes

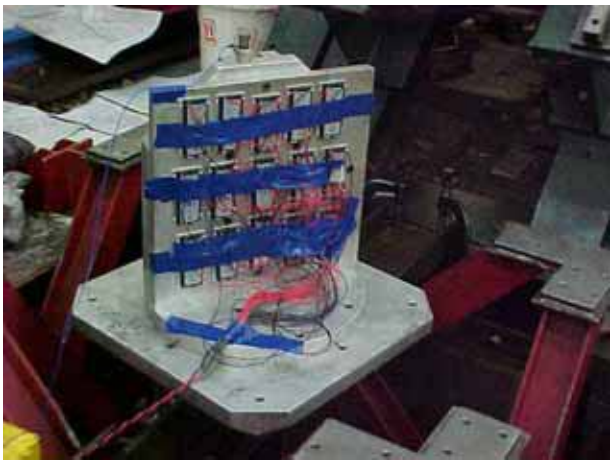
TEST PROFILE
5 g's half-sine waveform
50 millisecond duration
1 shocks in each ∂ directions/axis
6 total shocks
Three mutually perpendicular axes

Shock Test Setup

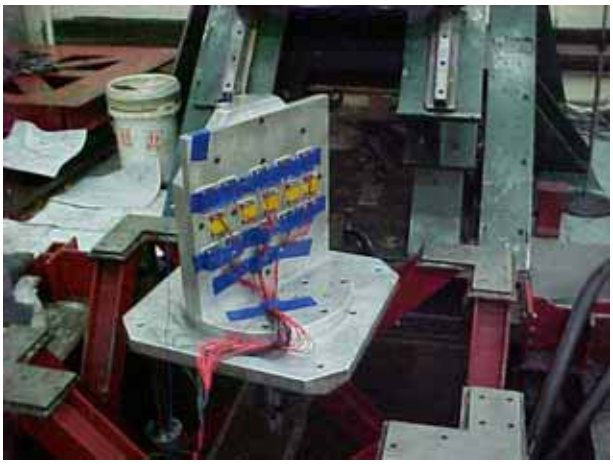
X-axis VI-2T3-CU

X-axis VI-810-423B

Y-axis VI-2T3-CU

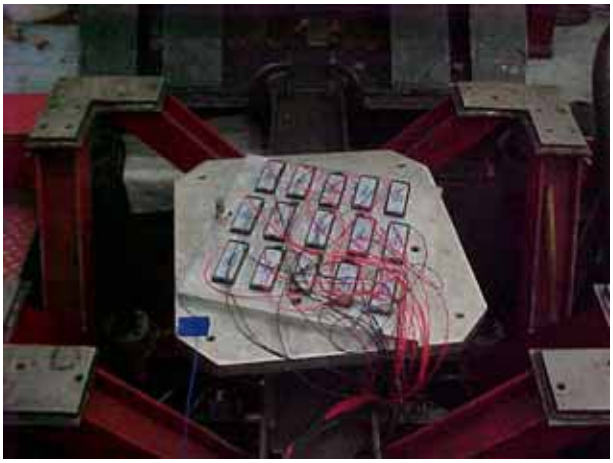


Y-axis VI-810-423B

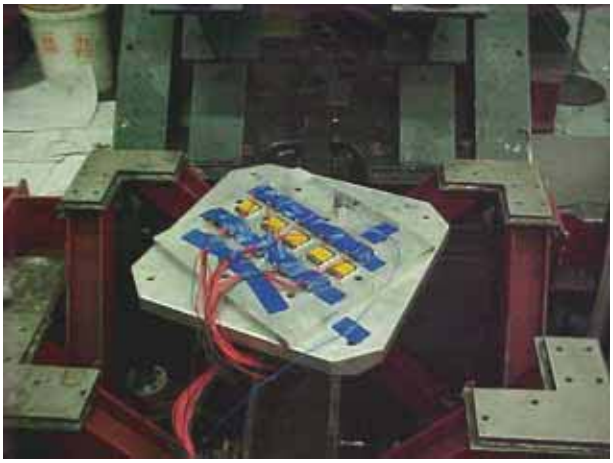


Shock Test Setup

Z-axis VI-2T3-CU



Z-axis VI-810-423B



Comments

The Power Supplies showed no damage or deterioration following the Mechanical Shock testing. Reference Appendix B for Vibration and Shock Test Data.

Appendix A

Test Equipment List

Shortcut#	Invent #	Description/Manufacturer	Model #/Serial #	Range/Accuracy	Frq/Due Dt	Calibration Status
AC0454	PE440	EARTHQUAKE SIMULATOR	204.63S		000	UWCE
		MTS SYSTEMS	101			
AC0789	AC647	ACCELEROMETER	353B33	1HZ TO 4KHZ	012	CAL
		PCB	53972	+/-5%	7/01/06	
AC1871	AC1871	VIBRATION CONTROLLER	8500	1 - 20 KHZ	012	CAL
		VIBRATION RESEARC	079cbb,038bfa,0	+/-2% 5-10 HZ	12/07/06	
BX0393	PE446E	KEYBOARD	C1405A		000	NCR
		HEWLETT PACKARD	3028S53673			
BX0894	PE523	VIBRATION CONTROL SYSTEM	2552B	0 TO 20 KHZ	006	CAL
		GENERAL RADIO	2932-7662D	+/-1%	5/05/06	
BX1677		ACCELEROMETER	353B17	1-10000HZ, 10MV/G	006	CAL
		PCB PIEZOTRONICS	98201	+/-5%	3/28/06	

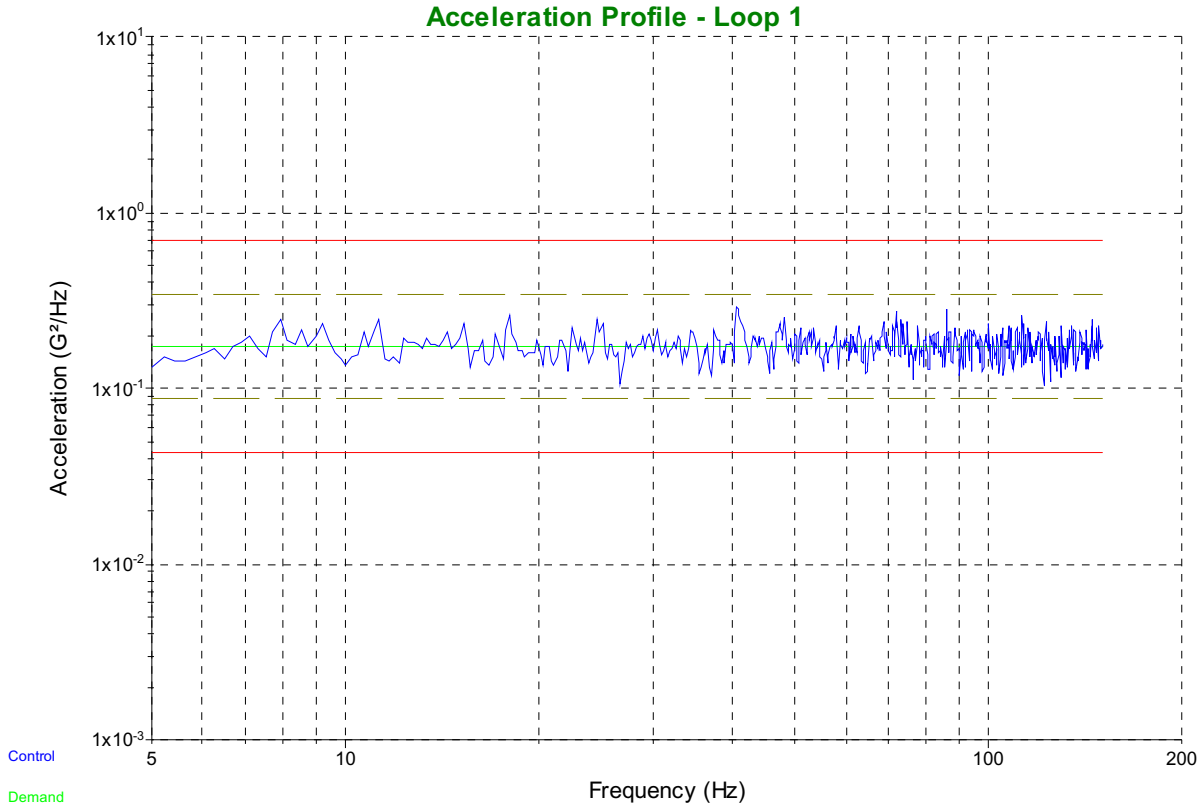
Calibration Abbreviations
UWCE - use with calibrated equipment
CBU - calibrate before use
NQM - not used for quantitative measurement
CAL - calibrated
NCR - no calibration required

Appendix B

Vibration and Shock Test Data

Vibration and Shock Test Data

Data stored on February 17, 2006 16:10:14
MJO# 300814 Vicor VI-2T3-CU (15)
Test# 1 Axis: Z Random Vibration 5-150 Hz
End of Test



Vibration and Shock Test Data

Data stored on February 17, 2006 16:10:14
MJO# 300814 Vicor VI-2T3-CU (15)
Test# 1 Axis: Z Random Vibration 5-150 Hz

Breakpoint table

Frequency	G²/Hz	dB/Octave
5 Hz	0.1725	0
150 Hz	0.1725	

Test level schedule:

	Duration	Level
1)	5:00:00	100 %

** Test started February 17, 2006 11:01:02, running for 5:06:20
** Current level: 1, running at 100 % for 5:00:00 of 5:00:00

Measurements:

Demand: 5.0037 G RMS	1.29079 in pk-pk
Control: 5.03356 G RMS	1.30556 in pk-pk
Ch1: 0.000193413 G RMS	Ch1 in-band: 0.000128444 G RMS
Ch2: 0.0157477 G RMS	Ch2 in-band: 0.00712682 G RMS
Ch3: 0.000484965 G RMS	Ch3 in-band: 0.000121223 G RMS
Ch4: 0.000791943 G RMS	Ch4 in-band: 0.00010393 G RMS
Drive voltage: 0 Vrms	

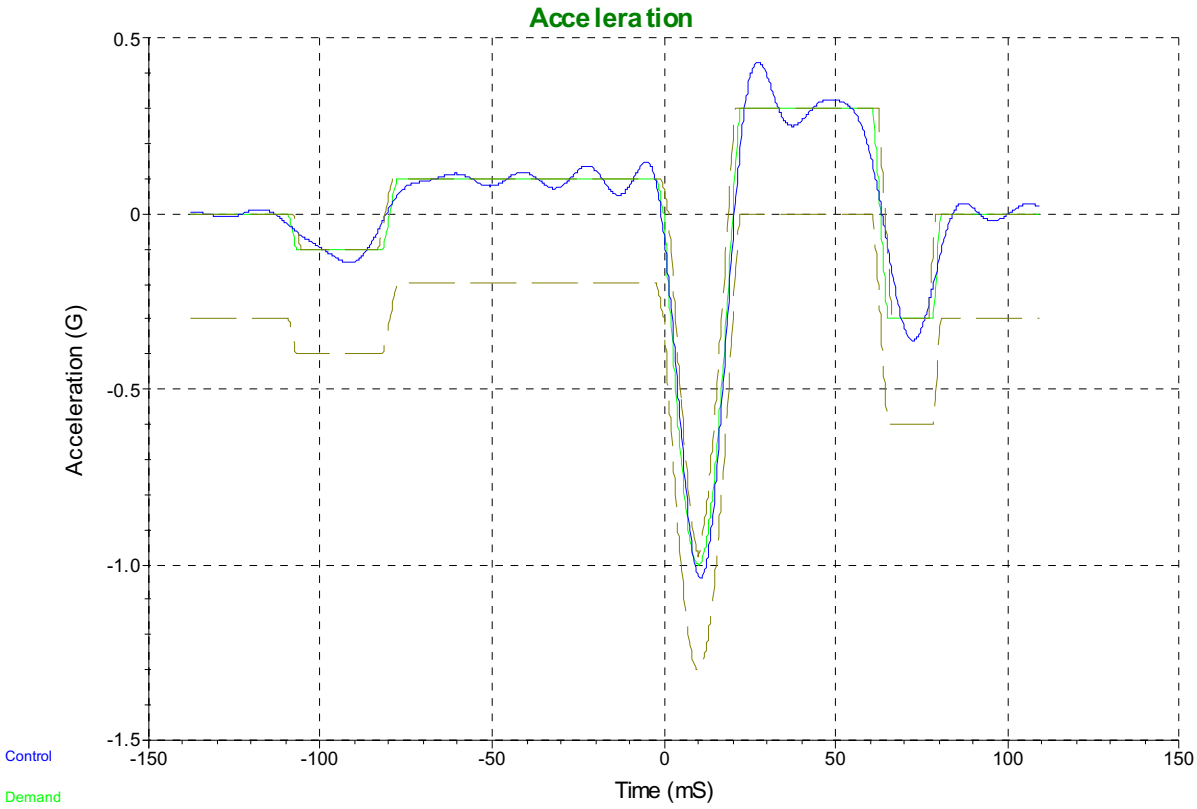
System gain is 0 Volts/G (Max system gain limit = 5)

Accelerometer calibration details:

Ch1: 104.4 mV/G	(75954, 8/07/05)
Ch2: 103.9 mV/G	(53972, 7/1/06)
Ch3: 102.1 mV/G	(57970, 10/26/06)
Ch4: 102.3 mV/G	(57976, 10/26/06)

Vibration and Shock Test Data

Data stored on February 17, 2006 16:34:10
MJO# 300814 Vicor VI-2T3-CU (15) - Test# 2 Axis: Z Shock 1G 20ms
Stop Button Pressed



Test Profile:

20 ms Half Sine Pulse with amplitude 1 G (Negative)
Pre-pulse amplitude: 10 % of the peak acceleration
Post-pulse amplitude: 30 % of the peak acceleration
Normal limits used
Control channels: Control

Test level schedule:

	Pulses	Level	
1)	1	100 %	(Memorized drive)

** Test started February 17, 2006 16:33:54
** Current level: 1, running at 100 % for 0 of 1 pulses

Measurements:

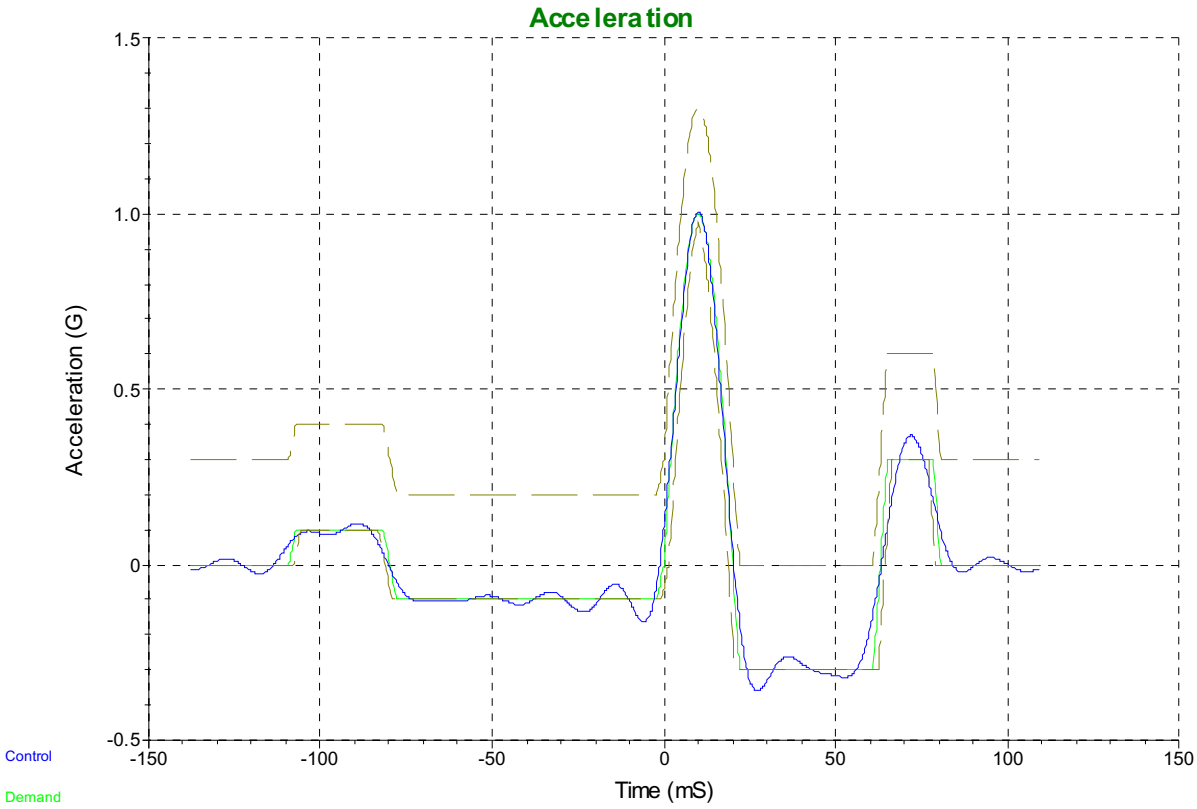
Control amplitude: 1.03959 G
Output voltage: 0.0892149 Volts peak

Accelerometer calibration details:

Ch1: 104.4 mV/G (75954, 8/07/05)
Ch2: 103.9 mV/G (53972, 7/1/06)
Ch3: 102.1 mV/G (57970, 10/26/06)
Ch4: 102.3 mV/G (57976, 10/26/06)

Vibration and Shock Test Data

Data stored on February 17, 2006 16:32:18
MJO# 300814 Vicor VI-2T3-CU (15) - Test# 2 Axis: Z Shock 1G 20ms
Starting with Memorized Drive



Test Profile:

20 ms Half Sine Pulse with amplitude 1 G (Positive)
Pre-pulse amplitude: 10 % of the peak acceleration
Post-pulse amplitude: 30 % of the peak acceleration
Normal limits used
Control channels: Control

Test level schedule:

	Pulses	Level	
1)	1	100 %	(Memorized drive)

** Test started February 17, 2006 16:31:51
** Current level: 1, running at 100 % for 0 of 1 pulses

Measurements:

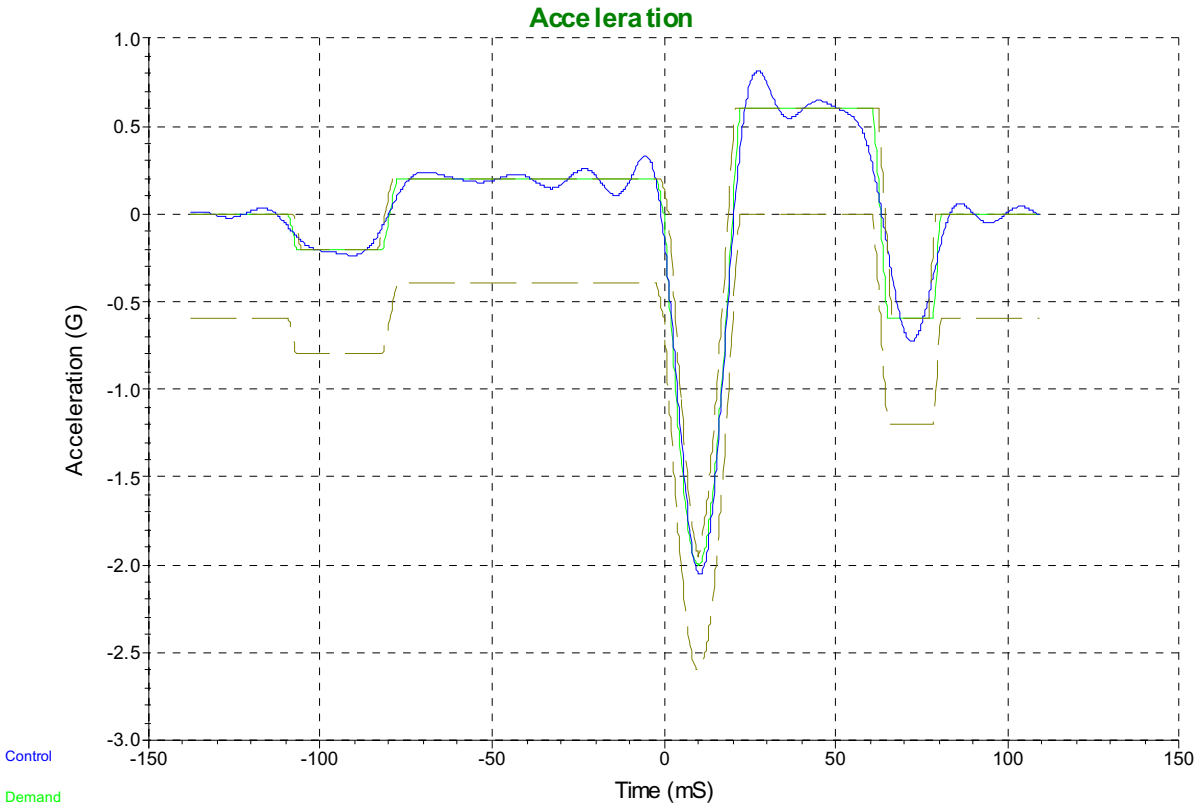
Control amplitude: 1.00422 G
Output voltage: 0.0953548 Volts peak

Accelerometer calibration details:

Ch1: 104.4 mV/G	(75954, 8/07/05)
Ch2: 103.9 mV/G	(53972, 7/1/06)
Ch3: 102.1 mV/G	(57970, 10/26/06)
Ch4: 102.3 mV/G	(57976, 10/26/06)

Vibration and Shock Test Data

Data stored on February 17, 2006 16:36:55
MJO# 300814 Vicor VI-2T3-CU (15) - Test# 3 Axis: Z Shock 2G 20ms
Stop Button Pressed



Test Profile:

20 ms Half Sine Pulse with amplitude 2 G (Negative)
Pre-pulse amplitude: 10 % of the peak acceleration
Post-pulse amplitude: 30 % of the peak acceleration
Normal limits used
Control channels: Control

Test level schedule:

	Pulses	Level	
1)	1	100 %	(Memorized drive)

** Test started February 17, 2006 16:36:35
** Current level: 1, running at 100 % for 0 of 1 pulses

Measurements:

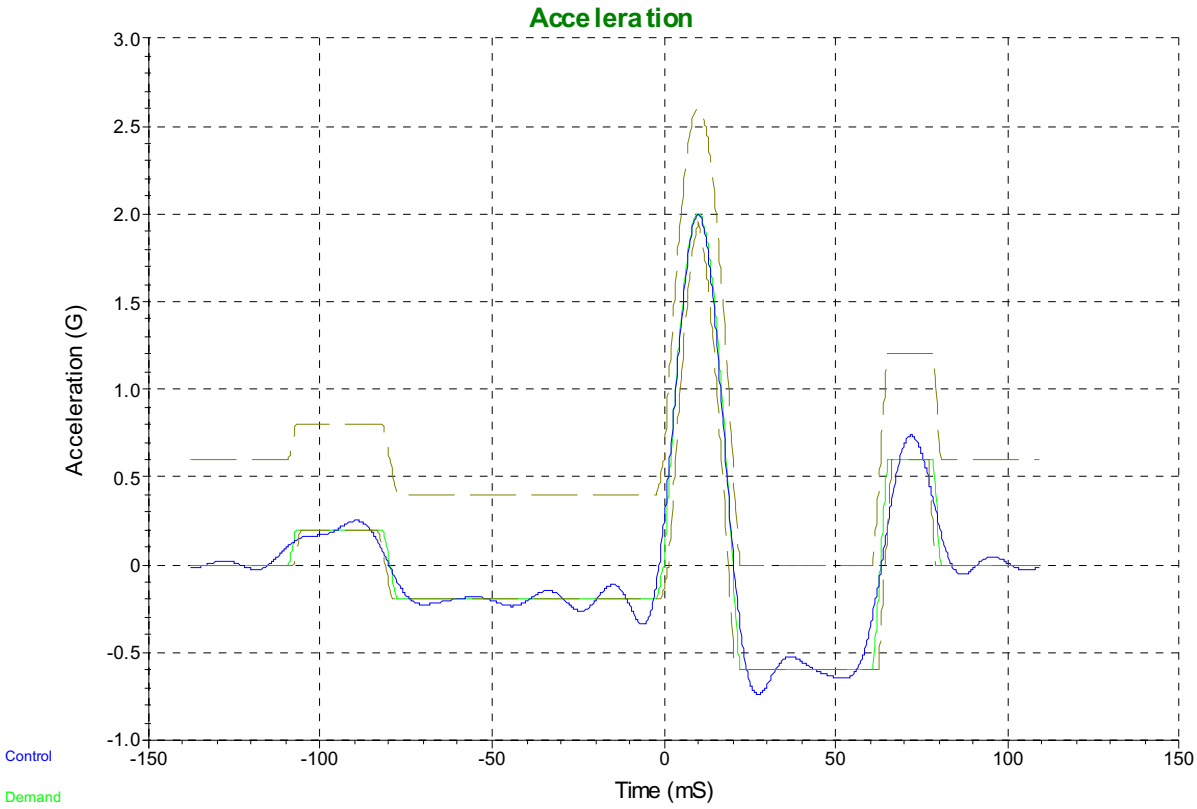
Control amplitude: 2.05841 G
Output voltage: 0.184918 Volts peak

Accelerometer calibration details:

Ch1: 104.4 mV/G	(75954, 8/07/05)
Ch2: 103.9 mV/G	(53972, 7/1/06)
Ch3: 102.1 mV/G	(57970, 10/26/06)
Ch4: 102.3 mV/G	(57976, 10/26/06)

Vibration and Shock Test Data

Data stored on February 17, 2006 16:36:21
MJO# 300814 Vicor VI-2T3-CU (15) - Test# 3 Axis: Z Shock 2G 20ms
Stop Button Pressed



Test Profile:

20 ms Half Sine Pulse with amplitude 2 G (Positive)
Pre-pulse amplitude: 10 % of the peak acceleration
Post-pulse amplitude: 30 % of the peak acceleration
Normal limits used
Control channels: Control

Test level schedule:

	Pulses	**Level**	
1)	1	100 %	(Memorized drive)

** Test started February 17, 2006 16:34:58
** Current level: 1, running at 100 % for 0 of 1 pulses

Measurements:

Control amplitude: 1.99425 G
Output voltage: 0.192144 Volts peak

Accelerometer calibration details:

Ch1: 104.4 mV/G	(75954, 8/07/05)
Ch2: 103.9 mV/G	(53972, 7/1/06)
Ch3: 102.1 mV/G	(57970, 10/26/06)
Ch4: 102.3 mV/G	(57976, 10/26/06)

Vibration and Shock Test Data

Data stored on February 17, 2006 16:39:28
MJO# 300814 Vicor VI-2T3-CU (15) - Test# 4 Axis: Z Shock 5G 50ms
Stop Button Pressed

Test Profile:

50 ms Half Sine Pulse with amplitude 5 G (Negative)
Pre-pulse amplitude: 10 % of the peak acceleration
Post-pulse amplitude: 30 % of the peak acceleration
Normal limits used
Control channels: Control

Test level schedule:

	Pulses	Level	
1)	1	100 %	(Memorized drive)

** Test started February 17, 2006 16:39:06
** Current level: 1, running at 100 % for 0 of 1 pulses

Measurements:

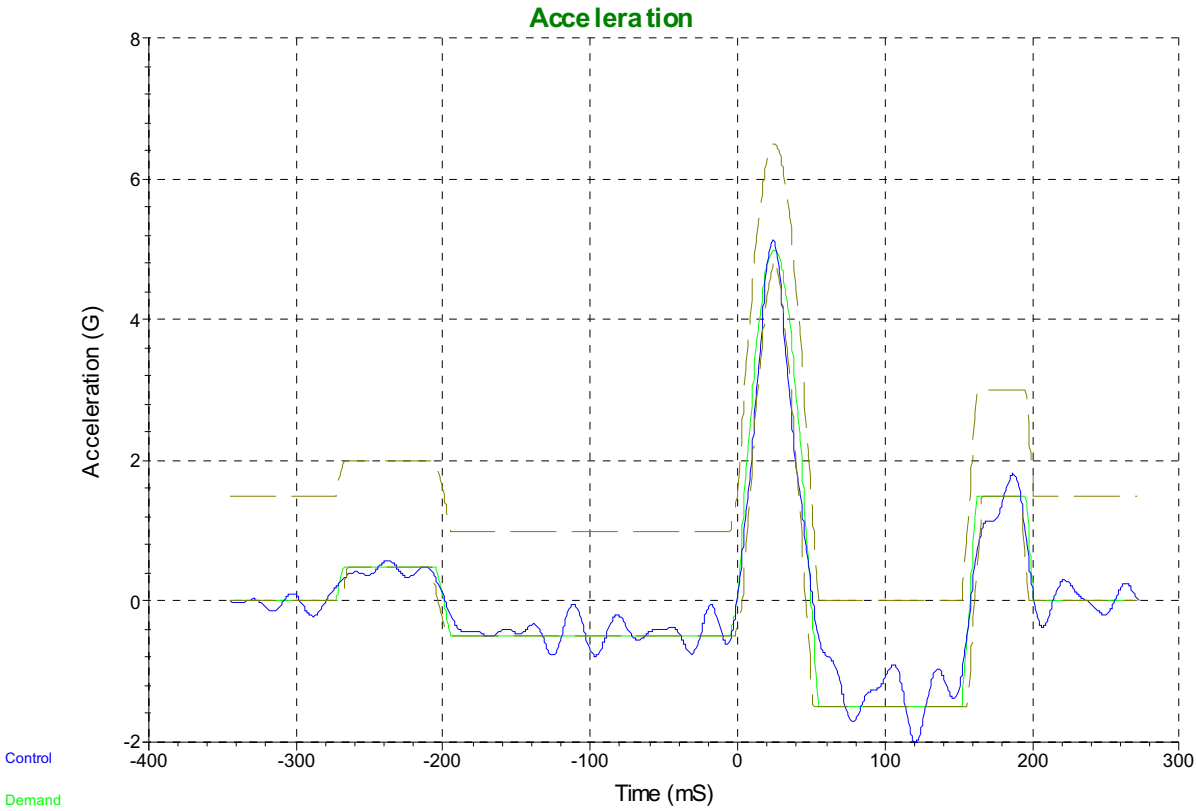
Control amplitude: 6.28054 G
Output voltage: 1.45773 Volts peak

Accelerometer calibration details:

Ch1: 104.4 mV/G (75954, 8/07/05)
Ch2: 103.9 mV/G (53972, 7/1/06)
Ch3: 102.1 mV/G (57970, 10/26/06)
Ch4: 102.3 mV/G (57976, 10/26/06)

Vibration and Shock Test Data

Data stored on February 17, 2006 16:38:56
MJO# 300814 Vicor VI-2T3-CU (15) - Test# 4 Axis: Z Shock 5G 50ms
Stop Button Pressed



Test Profile:

50 ms Half Sine Pulse with amplitude 5 G (Positive)
Pre-pulse amplitude: 10 % of the peak acceleration
Post-pulse amplitude: 30 % of the peak acceleration
Normal limits used
Control channels: Control

Test level schedule:

	Pulses	Level	
1)	1	100 %	(Memorized drive)

** Test started February 17, 2006 16:37:40
** Current level: 1, running at 100 % for 0 of 1 pulses

Measurements:

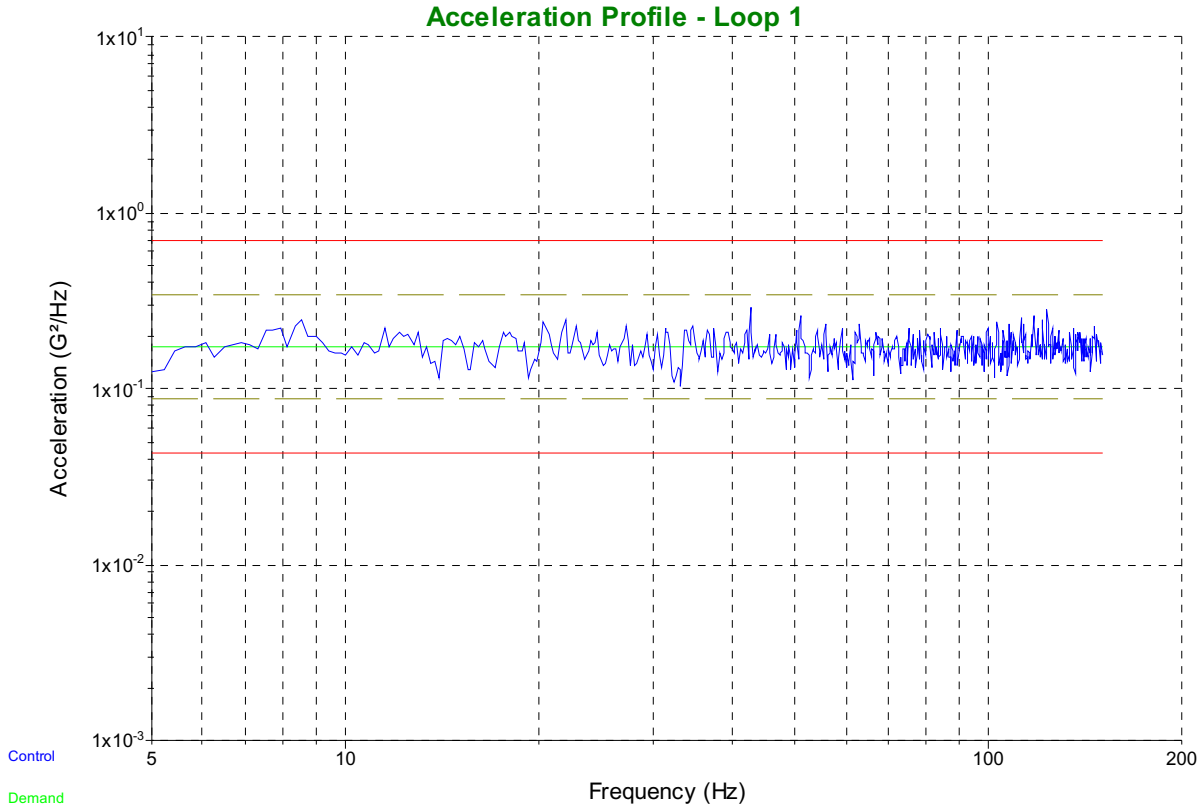
Control amplitude: 5.13672 G
Output voltage: 1.38425 Volts peak

Accelerometer calibration details:

Ch1: 104.4 mV/G (75954, 8/07/05)
Ch2: 103.9 mV/G (53972, 7/1/06)
Ch3: 102.1 mV/G (57970, 10/26/06)
Ch4: 102.3 mV/G (57976, 10/26/06)

Vibration and Shock Test Data

Data stored on Feb 21, 2006 16:13:50
MJO# 300814 Vicor VI-2T3-CU (15)
Test# 5 Axis: X Random Vibration 5-150 Hz
End of Test



Vibration and Shock Test Data

Data stored on Feb 21, 2006 16:13:50
MJO# 300814 Vicor VI-2T3-CU (15)
Test# 5 Axis: X Random Vibration 5-150 Hz

Breakpoint table

Frequency	G²/Hz	dB/Octave
5 Hz	0.1725	0
150 Hz	0.1725	

Test level schedule:

	Duration	Level
1)	5:00:00	100 %

** Test started February 20, 2006 09:34:54, running for 5:22:10
** Current level: 1, running at 100 % for 5:00:00 of 5:00:00

Measurements:

Demand: 5.0037 G RMS	1.29079 in pk-pk
Control: 5.00012 G RMS	1.38474 in pk-pk
Ch1: 0.000476867 G RMS	Ch1 in-band: 0.000132451 G RMS
Ch2: 0.00620958 G RMS	Ch2 in-band: 0.0026277 G RMS
Ch3: 0.000468269 G RMS	Ch3 in-band: 0.000181327 G RMS
Ch4: 0.000500854 G RMS	Ch4 in-band: 0.000152943 G RMS

Drive voltage: 0 Vrms

System gain is 0 Volts/G (Max system gain limit = 5)

Accelerometer calibration details:

Ch1: 104.4 mV/G	(75954, 8/07/05)
Ch2: 103.9 mV/G	(53972, 7/1/06)
Ch3: 102.1 mV/G	(57970, 10/26/06)
Ch4: 102.3 mV/G	(57976, 10/26/06)

Vibration and Shock Test Data

Data stored on February 21, 2006 16:18:41
MJO# 300814 Vicor VI-2T3-CU (15) - Test# 6 Axis: X Shock 1G 20ms
Stop Button Pressed

Test Profile:

20 ms Half Sine Pulse with amplitude 1 G (Negative)
Pre-pulse amplitude: 10 % of the peak acceleration
Post-pulse amplitude: 30 % of the peak acceleration
Normal limits used
Control channels: Control

Test level schedule:

	Pulses	Level	
1)	1	100 %	(Memorized drive)

** Test started February 21, 2006 16:18:20
** Current level: 1, running at 100 % for 0 of 1 pulses

Measurements:

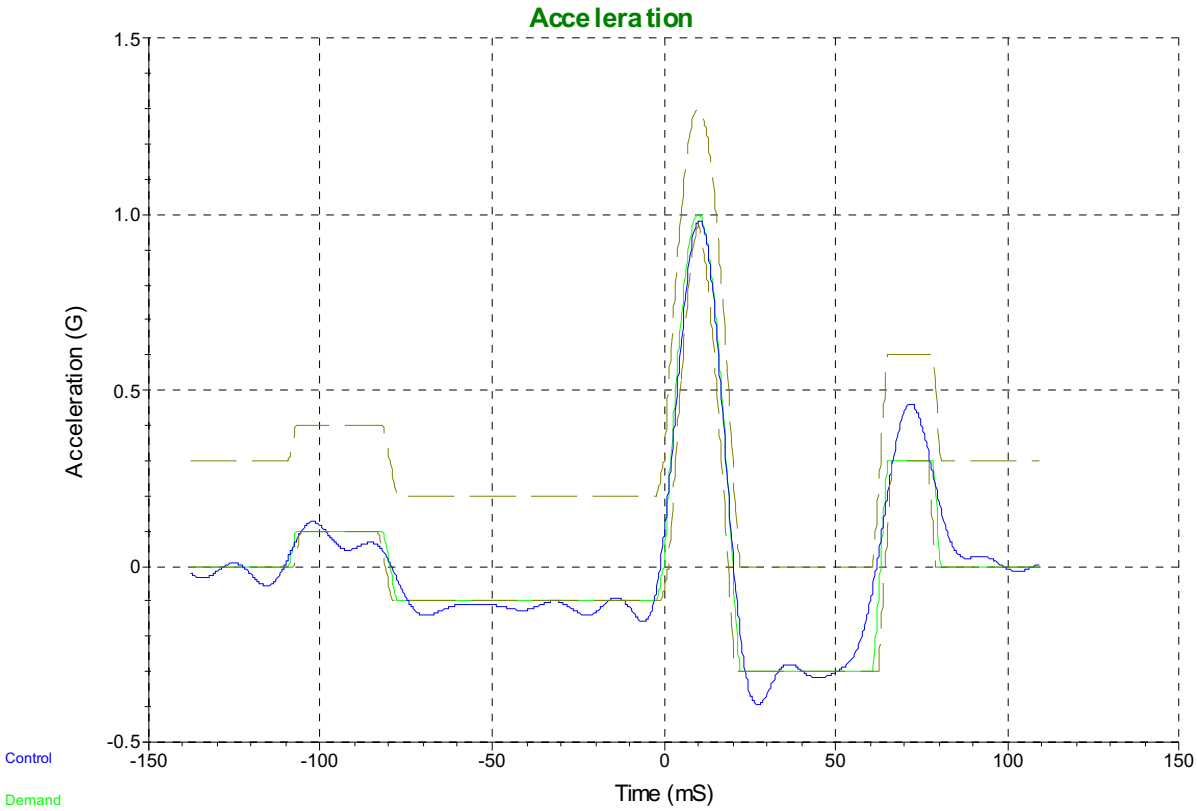
Control amplitude: 1.02543 G
Output voltage: 0.0861669 Volts peak

Accelerometer calibration details:

Ch1: 104.4 mV/G (75954, 8/07/05)
Ch2: 103.9 mV/G (53972, 7/1/06)
Ch3: 102.1 mV/G (57970, 10/26/06)
Ch4: 102.3 mV/G (57976, 10/26/06)

Vibration and Shock Test Data

Data stored on February 21, 2006 16:17:49
MJO# 300814 Vicor VI-2T3-CU (15) - Test# 6 Axis: X Shock 1G 20ms
Stop Button Pressed



Test Profile:

20 ms Half Sine Pulse with amplitude 1 G (Positive)
Pre-pulse amplitude: 10 % of the peak acceleration
Post-pulse amplitude: 30 % of the peak acceleration
Normal limits used
Control channels: Control

Test level schedule:

	Pulses	Level	
1)	1	100 %	(Memorized drive)

** Test started February 21, 2006 16:17:33
** Current level: 1, running at 100 % for 0 of 1 pulses

Measurements:

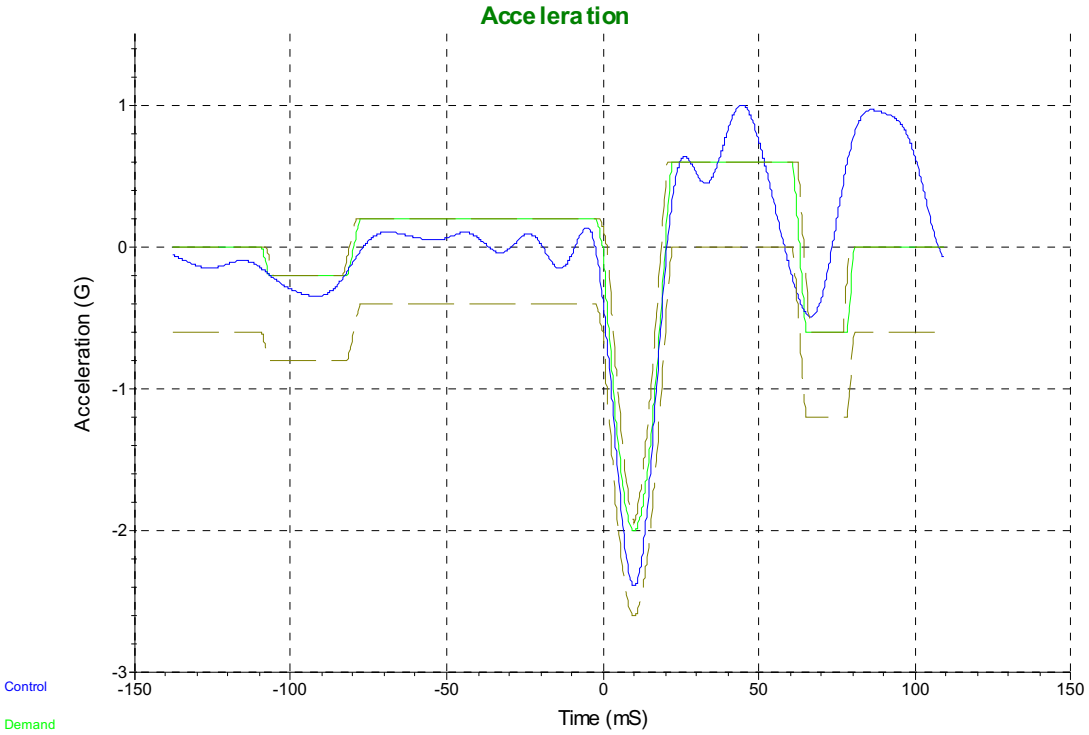
Control amplitude: 0.983675 G
Output voltage: 0.0951946 Volts peak

Accelerometer calibration details:

Ch1: 104.4 mV/G (75954, 8/07/05)
Ch2: 103.9 mV/G (53972, 7/1/06)
Ch3: 102.1 mV/G (57970, 10/26/06)
Ch4: 102.3 mV/G (57976, 10/26/06)

Vibration and Shock Test Data

Data stored on February 21, 2006 16:21:11
MJO# 300814 Vicor VI-2T3-CU (15) - Test# 7 Axis: X Shock 2G 20ms -
Stop Button Pressed



Test Profile:

20 ms Half Sine Pulse with amplitude 2 G (Negative)
Pre-pulse amplitude: 10 % of the peak acceleration
Post-pulse amplitude: 30 % of the peak acceleration
Normal limits used
Control channels: Control

Test level schedule:

	Pulses	Level	
1)	1	100 %	(Memorized drive)

** Test started February 21, 2006 16:20:55
** Current level: 1, running at 100 % for 0 of 1 pulses

Measurements:

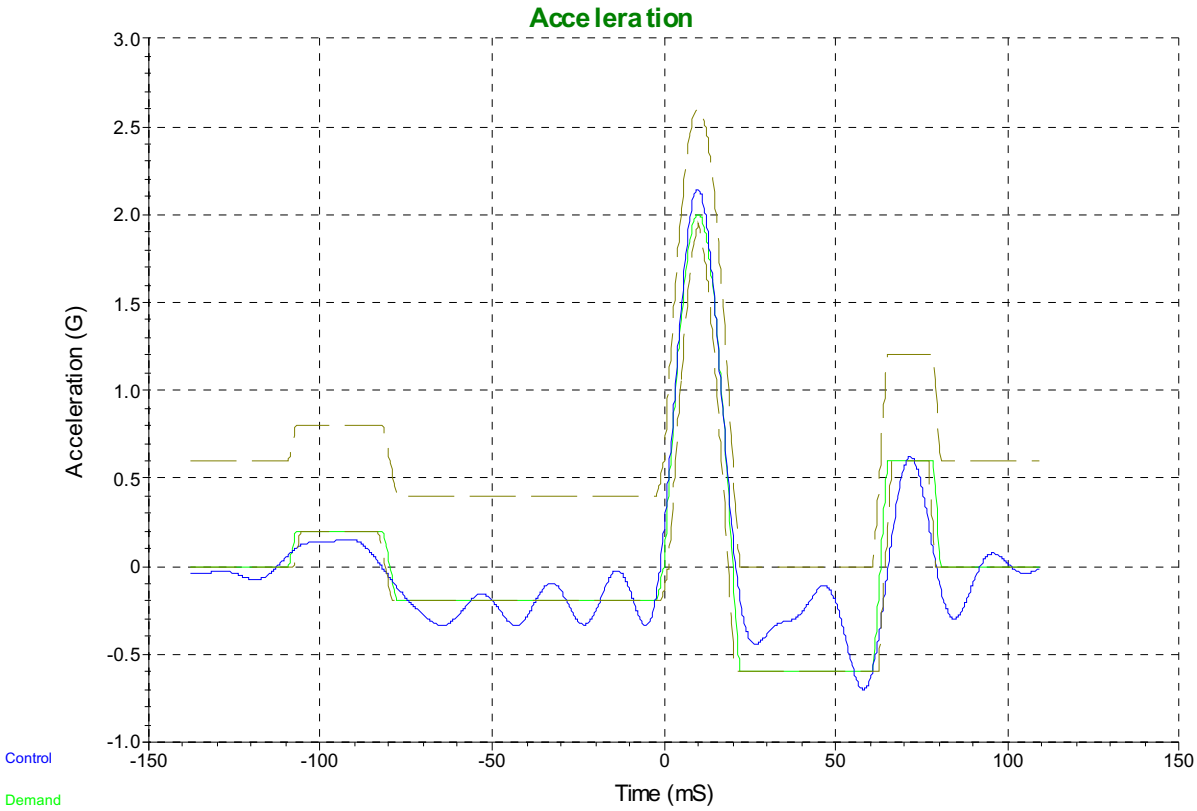
Control amplitude: 2.39075 G
Output voltage: 0.271932 Volts peak

Accelerometer calibration details:

Ch1: 104.4 mV/G	(75954, 8/07/05)
Ch2: 103.9 mV/G	(53972, 7/1/06)
Ch3: 102.1 mV/G	(57970, 10/26/06)
Ch4: 102.3 mV/G	(57976, 10/26/06)

Vibration and Shock Test Data

Data stored on February 21, 2006 16:20:44
MJO# 300814 Vicor VI-2T3-CU (15) - Test# 7 Axis: X Shock 2G 20ms -
Stop Button Pressed



Test Profile:

20 ms Half Sine Pulse with amplitude 2 G (Positive)
Pre-pulse amplitude: 10 % of the peak acceleration
Post-pulse amplitude: 30 % of the peak acceleration
Normal limits used
Control channels: Control

Test level schedule:

	Pulses	**Level**	
1)	1	100 %	(Memorized drive)

** Test started February 21, 2006 16:19:21
** Current level: 1, running at 100 % for 0 of 1 pulses

Measurements:

Control amplitude: 2.14132 G
Output voltage: 0.212374 Volts peak

Accelerometer calibration details:

Ch1: 104.4 mV/G	(75954, 8/07/05)
Ch2: 103.9 mV/G	(53972, 7/1/06)
Ch3: 102.1 mV/G	(57970, 10/26/06)
Ch4: 102.3 mV/G	(57976, 10/26/06)

Vibration and Shock Test Data

Data stored on February 21, 2006 16:41:34
MJO# 300814 Vicor VI-2T3-CU (15) - Test# 8 Axis: X Shock 5G 50ms -
Stop Button Pressed

Test Profile:

48 ms Half Sine Pulse with amplitude 5 G (Negative)
Pre-pulse amplitude: 10 % of the peak acceleration
Post-pulse amplitude: 30 % of the peak acceleration
Normal limits used
Control channels: Control

Test level schedule:

	Pulses	Level	
1)	1	100 %	(Memorized drive)

** Test started February 21, 2006 16:39:37
** Current level: 1, running at 100 % for 0 of 1 pulses

Measurements:

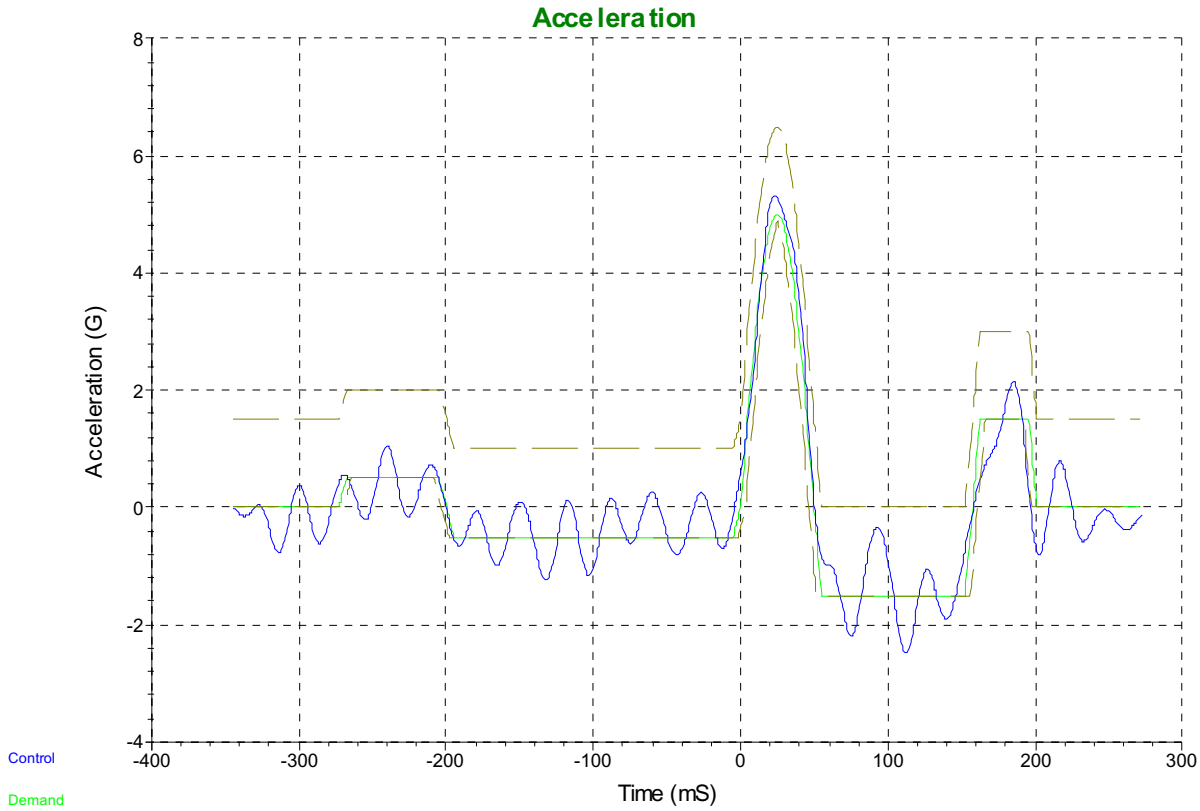
Control amplitude: 6.30898 G
Output voltage: 1.22725 Volts peak

Accelerometer calibration details:

Ch1: 104.4 mV/G (75954, 8/07/05)
Ch2: 103.9 mV/G (53972, 7/1/06)
Ch3: 102.1 mV/G (57970, 10/26/06)
Ch4: 102.3 mV/G (57976, 10/26/06)

Vibration and Shock Test Data

Data stored on February 21, 2006 16:27:28
MJO# 300814 Vicor VI-2T3-CU (15) - Test# 8 Axis: X Shock 5G 50ms -
Stop Button Pressed



Test Profile:

50 ms Half Sine Pulse with amplitude 5 G (Positive)
Pre-pulse amplitude: 10 % of the peak acceleration
Post-pulse amplitude: 30 % of the peak acceleration
Normal limits used
Control channels: Control

Test level schedule:

	Pulses	Level	
1)	1	100 %	(Memorized drive)

** Test started February 21, 2006 16:25:09
** Current level: 1, running at 100 % for 0 of 1 pulses

Measurements:

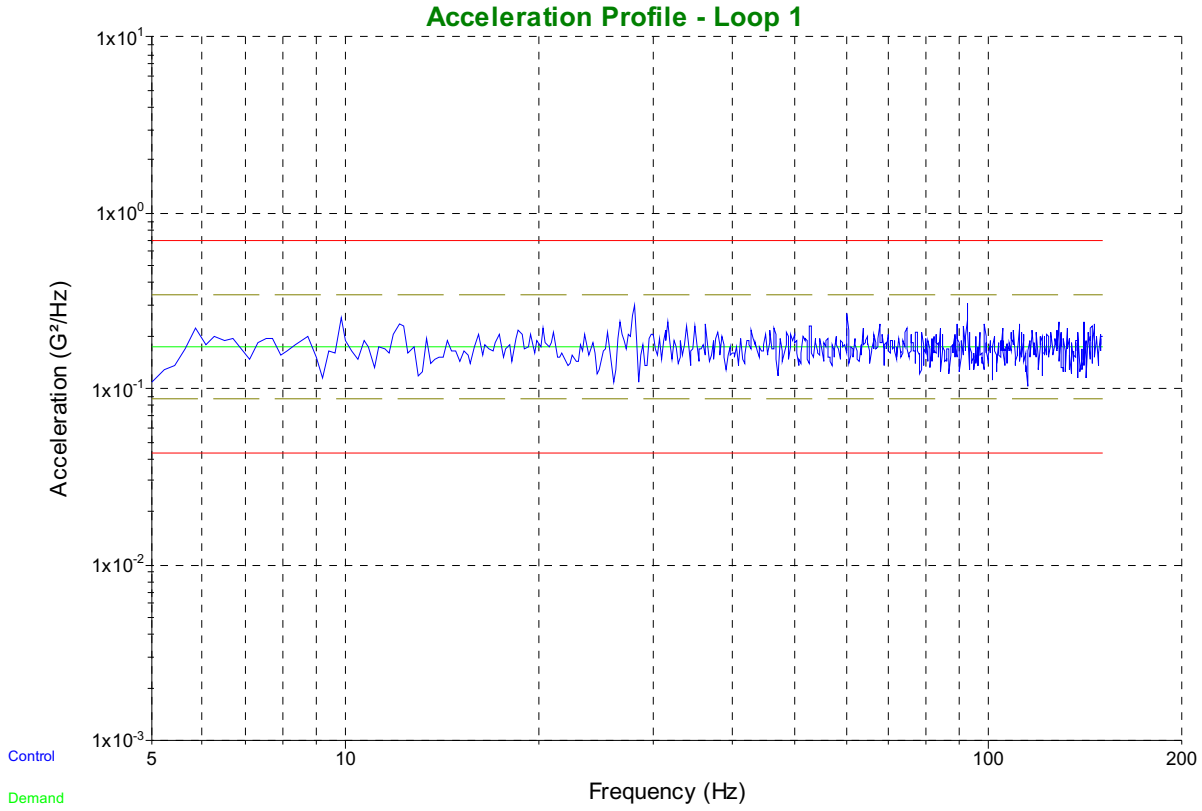
Control amplitude: 5.31558 G
Output voltage: 1.30775 Volts peak

Accelerometer calibration details:

Ch1: 104.4 mV/G	(75954, 8/07/05)
Ch2: 103.9 mV/G	(53972, 7/1/06)
Ch3: 102.1 mV/G	(57970, 10/26/06)
Ch4: 102.3 mV/G	(57976, 10/26/06)

Vibration and Shock Test Data

Data stored on February 21, 2006 22:09:05
MJO# 300814 Vicor VI-2T3-CU (15)
Test# 9 Axis: Y Random Vibration 5-150 Hz
End of Test



Vibration and Shock Test Data

Data stored on February 21, 2006 22:09:05
MJO# 300814 Vicor VI-2T3-CU (15)
Test# 9 Axis: Y Random Vibration 5-150 Hz

Breakpoint table

Frequency	G²/Hz	dB/Octave
5 Hz	0.1725	0
150 Hz	0.1725	

Test level schedule:

	Duration	Level
1)	5:00:00	100 %

** Test started February 21, 2006 17:05:20, running for 5:03:19
** Current level: 1, running at 100 % for 5:00:00 of 5:00:00

Measurements:

Demand: 5.0037 G RMS	1.29079 in pk-pk
Control: 5.00331 G RMS	1.339 in pk-pk
Ch1: 0.000181205 G RMS	Ch1 in-band: 0.000146051 G RMS
Ch2: 0.00892392 G RMS	Ch2 in-band: 0.00362944 G RMS
Ch3: 0.000245581 G RMS	Ch3 in-band: 0.000234214 G RMS
Ch4: 0.000454197 G RMS	Ch4 in-band: 0.000153521 G RMS

Drive voltage: 0 Vrms

System gain is 0 Volts/G (Max system gain limit = 5)

Accelerometer calibration details:

Ch1: 104.4 mV/G	(75954, 8/07/05)
Ch2: 103.9 mV/G	(53972, 7/1/06)
Ch3: 102.1 mV/G	(57970, 10/26/06)
Ch4: 102.3 mV/G	(57976, 10/26/06)

Vibration and Shock Test Data

Data stored on February 22, 2006 08:19:58
MJO# 300814 Vicor VI-2T3-CU (15) - Test# 10 Axis: Y Shock 1G 20ms
Stop Button Pressed

Test Profile:

20 ms Half Sine Pulse with amplitude 1 G (Negative)
Pre-pulse amplitude: 10 % of the peak acceleration
Post-pulse amplitude: 30 % of the peak acceleration
Normal limits used
Control channels: Control

Test level schedule:

	Pulses	**Level**	
1)	1	100 %	(Memorized drive)

** Test started February 22, 2006 08:19:32
** Current level: 1, running at 100 % for 0 of 1 pulses

Measurements:

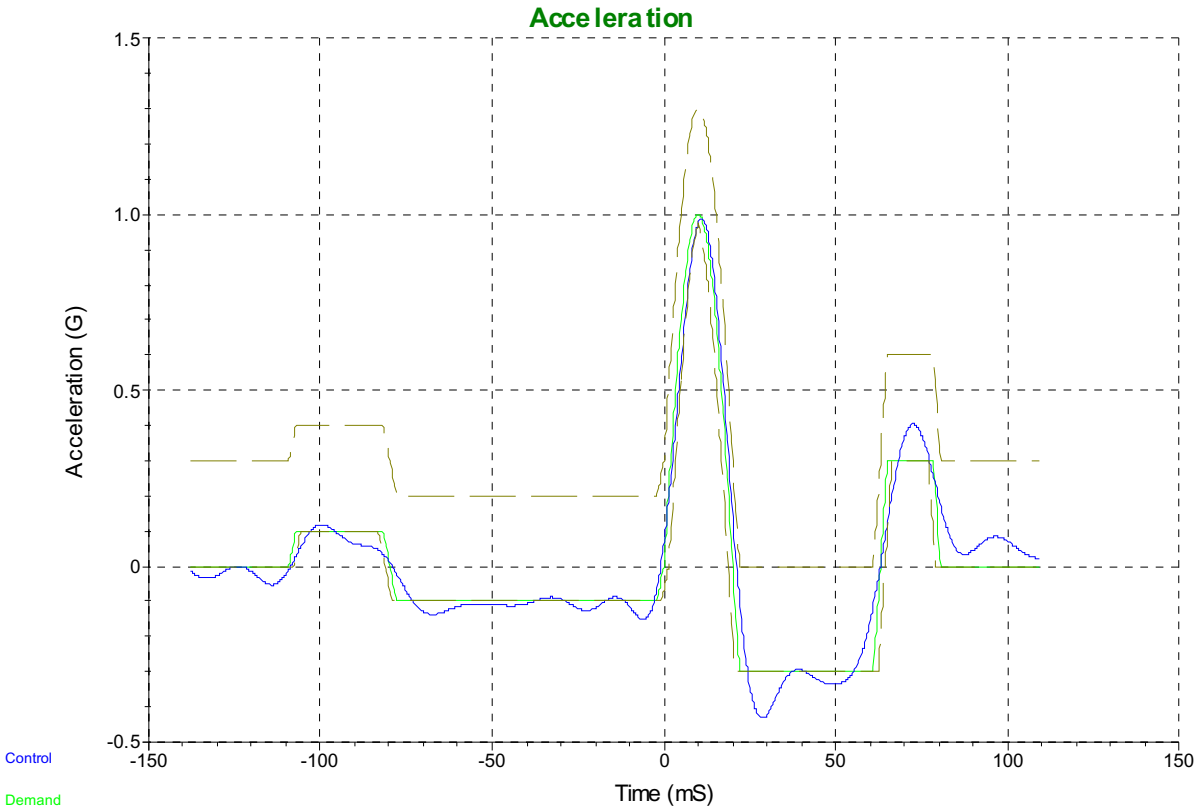
Control amplitude: 1.04996 G
Output voltage: 0.0750762 Volts peak

Accelerometer calibration details:

Ch1: 104.4 mV/G (75954, 8/07/05)
Ch2: 103.9 mV/G (53972, 7/1/06)
Ch3: 102.1 mV/G (57970, 10/26/06)
Ch4: 102.3 mV/G (57976, 10/26/06)

Vibration and Shock Test Data

Data stored on February 22, 2006 08:19:16
MJO# 300814 Vicor VI-2T3-CU (15) - Test# 10 Axis: Y Shock 1G 20ms
Stop Button Pressed



Test Profile:

20 ms Half Sine Pulse with amplitude 1 G (Positive)
Pre-pulse amplitude: 10 % of the peak acceleration
Post-pulse amplitude: 30 % of the peak acceleration
Normal limits used
Control channels: Control

Test level schedule:

	Pulses	Level	
1)	1	100 %	(Memorized drive)

** Test started February 22, 2006 08:18:46
** Current level: 1, running at 100 % for 0 of 1 pulses

Measurements:

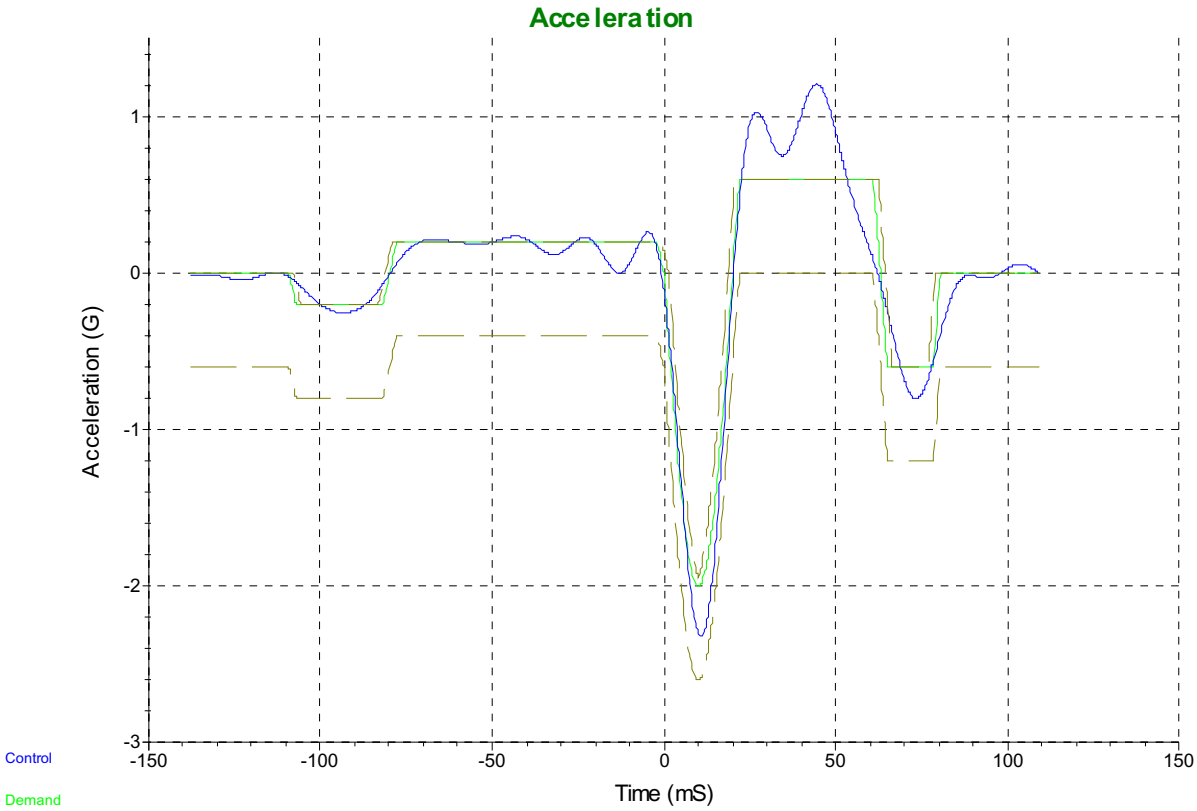
Control amplitude: 0.987858 G
Output voltage: 0.081205 Volts peak

Accelerometer calibration details:

Ch1: 104.4 mV/G (75954, 8/07/05)
Ch2: 103.9 mV/G (53972, 7/1/06)
Ch3: 102.1 mV/G (57970, 10/26/06)
Ch4: 102.3 mV/G (57976, 10/26/06)

Vibration and Shock Test Data

Data stored on February 22, 2006 08:22:13
MJO# 300814 Vicor VI-2T3-CU (15) - Test# 11 Axis: Y Shock 2G 20ms
Stop Button Pressed



Test Profile:

20 ms Half Sine Pulse with amplitude 2 G (Negative)
Pre-pulse amplitude: 10 % of the peak acceleration
Post-pulse amplitude: 30 % of the peak acceleration
Normal limits used
Control channels: Control

Test level schedule:

	Pulses	**Level**	
1)	1	100 %	(Memorized drive)

** Test started February 22, 2006 08:21:57
** Current level: 1, running at 100 % for 0 of 1 pulses

Measurements:

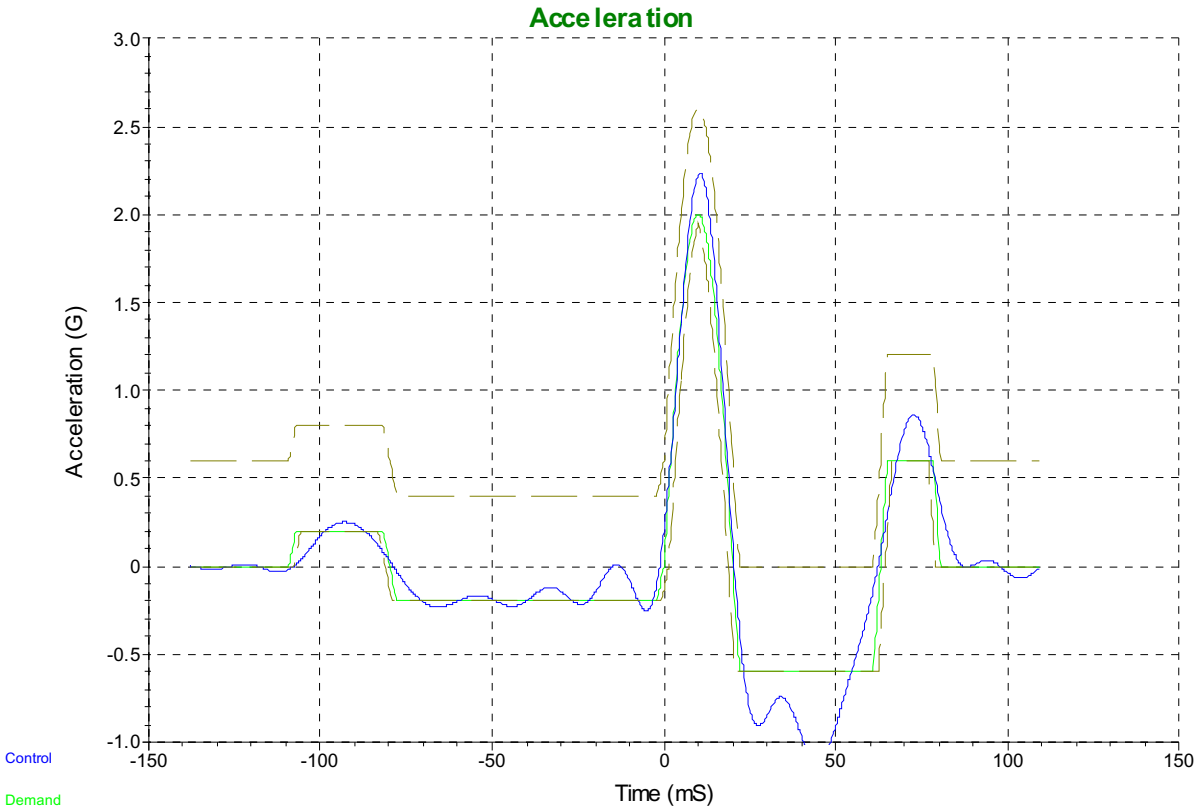
Control amplitude: 2.32744 G
Output voltage: 0.165198 Volts peak

Accelerometer calibration details:

Ch1: 104.4 mV/G	(75954, 8/07/05)
Ch2: 103.9 mV/G	(53972, 7/1/06)
Ch3: 102.1 mV/G	(57970, 10/26/06)
Ch4: 102.3 mV/G	(57976, 10/26/06)

Vibration and Shock Test Data

Data stored on February 22, 2006 08:21:43
MJO# 300814 Vicor VI-2T3-CU (15) - Test# 11 Axis: Y Shock 2G 20ms
Stop Button Pressed



Test Profile:

20 ms Half Sine Pulse with amplitude 2 G (Positive)
Pre-pulse amplitude: 10 % of the peak acceleration
Post-pulse amplitude: 30 % of the peak acceleration
Normal limits used
Control channels: Control

Test level schedule:

	Pulses	Level	
1)	1	100 %	(Memorized drive)

** Test started February 22, 2006 08:21:24
** Current level: 1, running at 100 % for 0 of 1 pulses

Measurements:

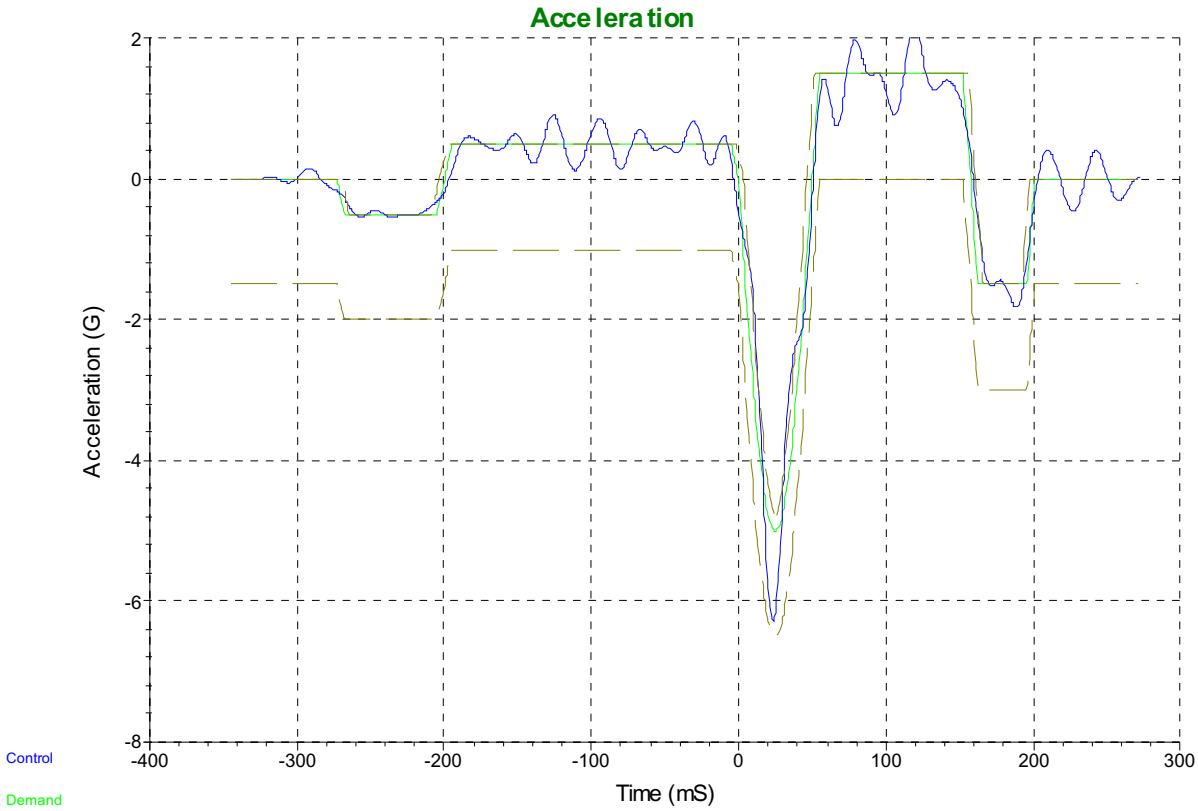
Control amplitude: 2.23007 G
Output voltage: 0.176248 Volts peak

Accelerometer calibration details:

Ch1: 104.4 mV/G (75954, 8/07/05)
Ch2: 103.9 mV/G (53972, 7/1/06)
Ch3: 102.1 mV/G (57970, 10/26/06)
Ch4: 102.3 mV/G (57976, 10/26/06)

Vibration and Shock Test Data

Data stored on February 22, 2006 08:29:34
MJO# 300814 Vicor VI-2T3-CU (15) - Test# 12 Axis: Y Shock 5G 50ms
Stop Button Pressed



Test Profile:

50 ms Half Sine Pulse with amplitude 5 G (Negative)
Pre-pulse amplitude: 10 % of the peak acceleration
Post-pulse amplitude: 30 % of the peak acceleration
Normal limits used
Control channels: Control

Test level schedule:

	Pulses	Level	
1)	1	100 %	(Memorized drive)

** Test started February 22, 2006 08:27:53
** Current level: 1, running at 100 % for 0 of 1 pulses

Measurements:

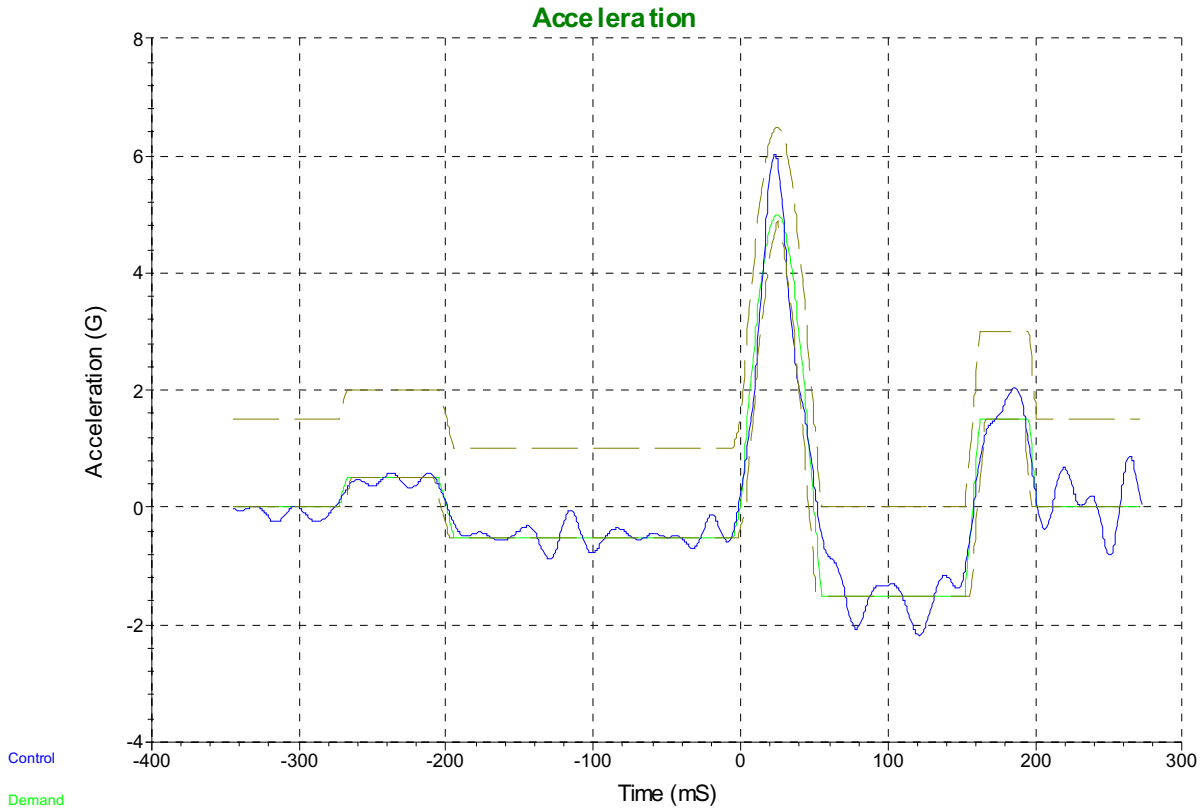
Control amplitude: 6.28992 G
Output voltage: 1.30584 Volts peak

Accelerometer calibration details:

Ch1: 104.4 mV/G	(75954, 8/07/05)
Ch2: 103.9 mV/G	(53972, 7/1/06)
Ch3: 102.1 mV/G	(57970, 10/26/06)
Ch4: 102.3 mV/G	(57976, 10/26/06)

Vibration and Shock Test Data

Data stored on February 22, 2006 08:25:56
MJO# 300814 Vicor VI-2T3-CU (15) - Test# 12 Axis: Y Shock 5G 50ms
Stop Button Pressed



Test Profile:

50 ms Half Sine Pulse with amplitude 5 G (Positive)
Pre-pulse amplitude: 10 % of the peak acceleration
Post-pulse amplitude: 30 % of the peak acceleration
Normal limits used
Control channels: Control

Test level schedule:

	Pulses	**Level**	
1)	1	100 %	(Memorized drive)

** Test started February 22, 2006 08:24:02
** Current level: 1, running at 100 % for 0 of 1 pulses

Measurements:

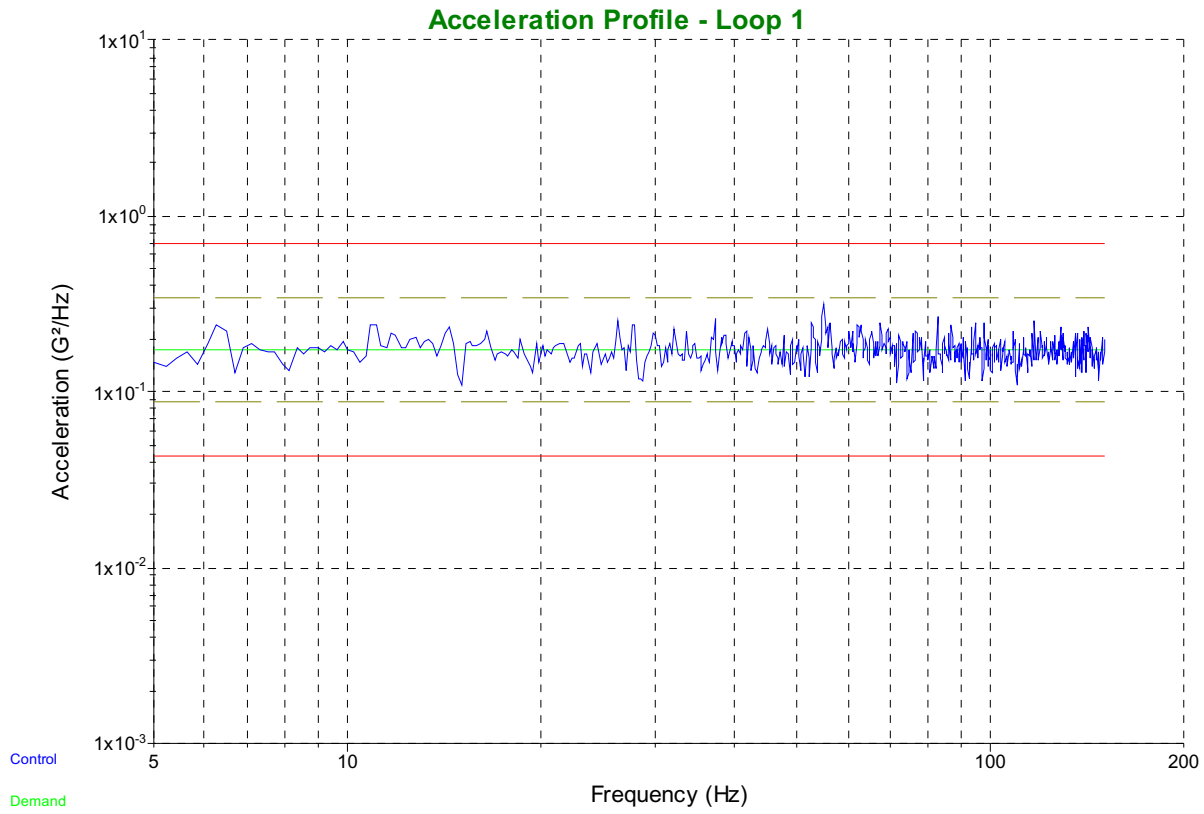
Control amplitude: 6.02651 G
Output voltage: 1.51031 Volts peak

Accelerometer calibration details:

Ch1: 104.4 mV/G (75954, 8/07/05)
Ch2: 103.9 mV/G (53972, 7/1/06)
Ch3: 102.1 mV/G (57970, 10/26/06)
Ch4: 102.3 mV/G (57976, 10/26/06)

Vibration and Shock Test Data

Data stored on February 23, 2006 16:29:11
MJO# 300814 Vicor VI-810-423B
Test# 13 Axis: X Random Vibration 5-150 Hz
End of Test



Vibration and Shock Test Data

Data stored on February 23, 2006 16:29:11
MJO# 300814 Vicor VI-810-423B
Test# 13 Axis: X Random Vibration 5-150 Hz

Breakpoint table

Frequency	G²/Hz	dB/Octave
5 Hz	0.1725	0
150 Hz	0.1725	

Test level schedule:

	Duration	Level
1)	5:00:00	100 %

** Test started Feb 22, 2006 09:45:59, running for 5:07:17
** Current level: 1, running at 100 % for 5:00:00 of 5:00:00

Measurements:

Demand: 5.0037 G RMS	1.29079 in pk-pk
Control: 5.00839 G RMS	1.38593 in pk-pk
Ch1: 0.000767322 G RMS	Ch1 in-band: 0.000131015 G RMS
Ch2: 0.00879462 G RMS	Ch2 in-band: 0.00400285 G RMS
Ch3: 0.000660705 G RMS	Ch3 in-band: 0.000236433 G RMS
Ch4: 0.000487542 G RMS	Ch4 in-band: 0.000170112 G RMS

Drive voltage: 0 Vrms

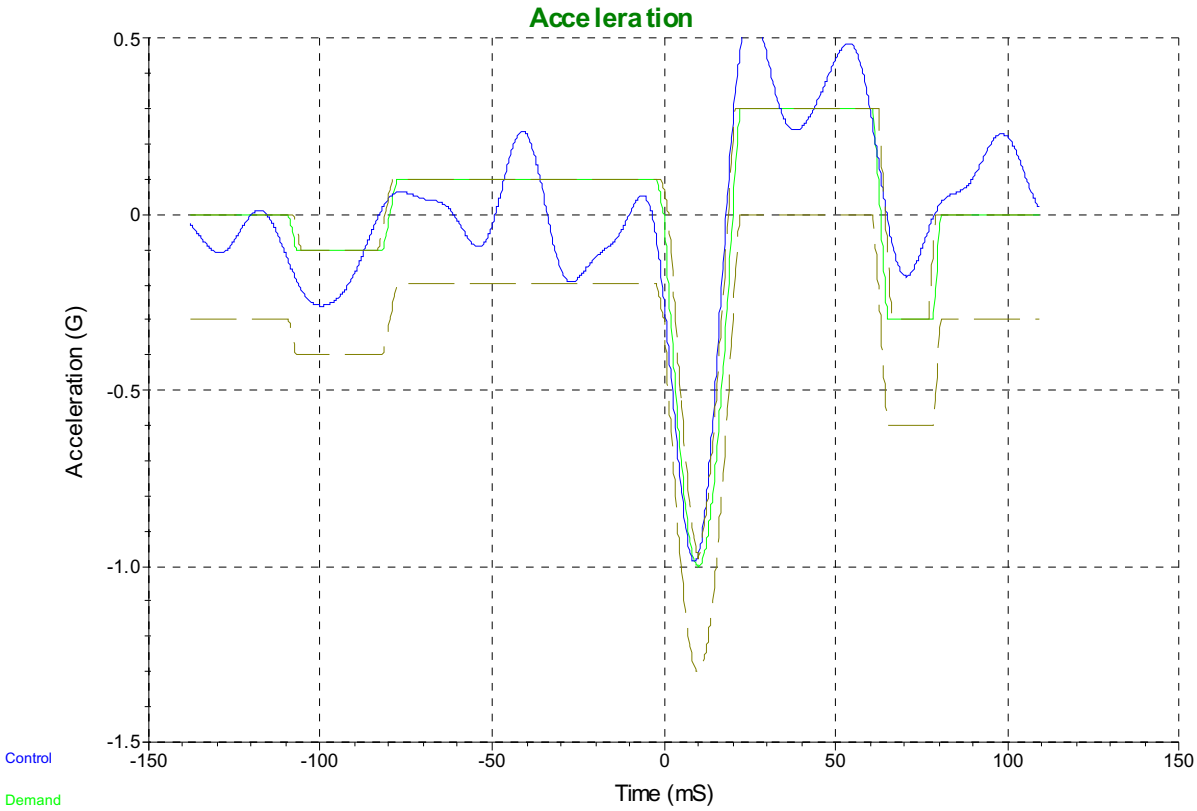
System gain is 0 Volts/G (Max system gain limit = 5)

Accelerometer calibration details:

Ch1: 104.4 mV/G	(75954, 8/07/05)
Ch2: 103.9 mV/G	(53972, 7/1/06)
Ch3: 102.1 mV/G	(57970, 10/26/06)
Ch4: 102.3 mV/G	(57976, 10/26/06)

Vibration and Shock Test Data

Data stored on February 23, 2006 16:43:32
MJO# 300814 Vicor VI-810-423B - Test# 14 Axis: X Shock 1G 20ms
Stop Button Pressed



Test Profile:

20 ms Half Sine Pulse with amplitude 1 G (Negative)
Pre-pulse amplitude: 10 % of the peak acceleration
Post-pulse amplitude: 30 % of the peak acceleration
Normal limits used
Control channels: Control

Test level schedule:

	Pulses	Level	
1)	1	100 %	(Memorized drive)

** Test started February 23, 2006 16:43:17
** Current level: 1, running at 100 % for 0 of 1 pulses

Measurements:

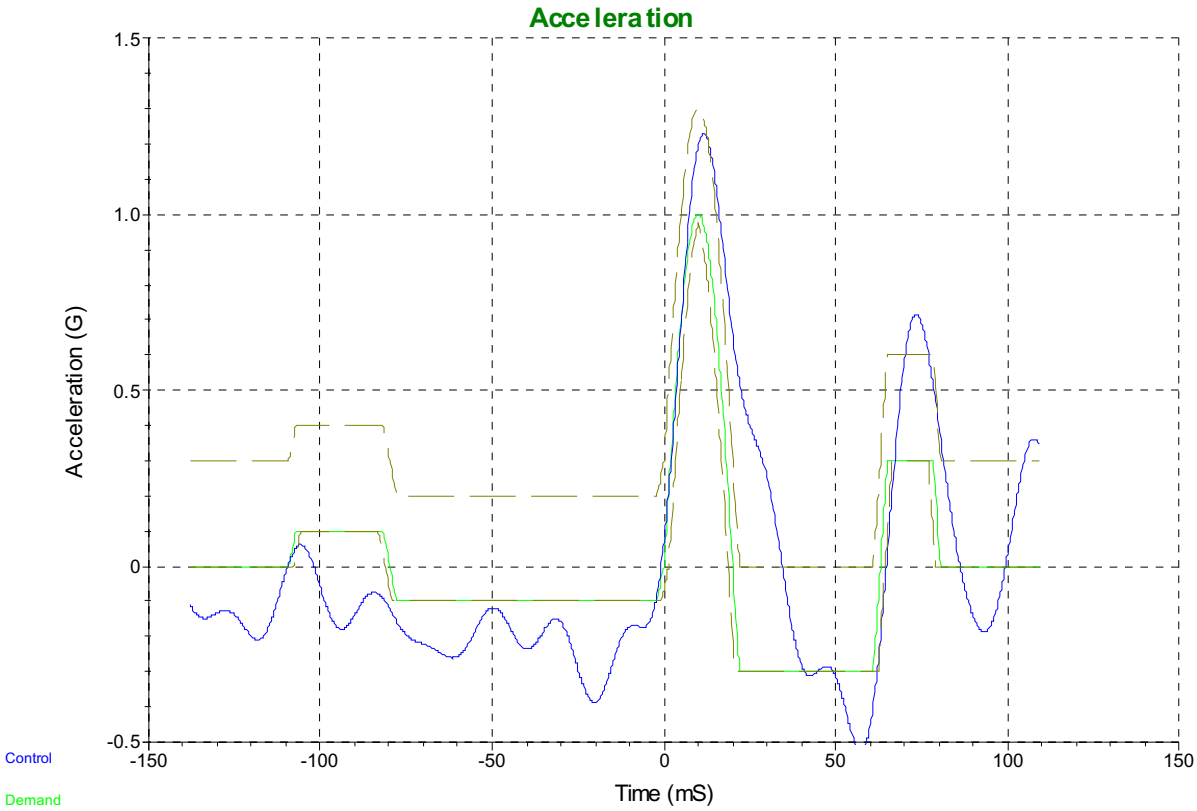
Control amplitude: 0.987201 G
Output voltage: 0.0690943 Volts peak

Accelerometer calibration details:

Ch1: 104.4 mV/G (75954, 8/07/05)
Ch2: 103.9 mV/G (53972, 7/1/06)
Ch3: 102.1 mV/G (57970, 10/26/06)
Ch4: 102.3 mV/G (57976, 10/26/06)

Vibration and Shock Test Data

Data stored on February 23, 2006 16:43:09
MJO# 300814 Vicor VI-810-423B - Test# 14 Axis: X Shock 1G 20ms -
Stop Button Pressed



Test Profile:

20 ms Half Sine Pulse with amplitude 1 G (Positive)
Pre-pulse amplitude: 10 % of the peak acceleration
Post-pulse amplitude: 30 % of the peak acceleration
Normal limits used
Control channels: Control

Test level schedule:

	Pulses	**Level**	
1)	1	100 %	(Memorized drive)

** Test started February 23, 2006 16:41:49
** Current level: 1, running at 100 % for 0 of 1 pulses

Measurements:

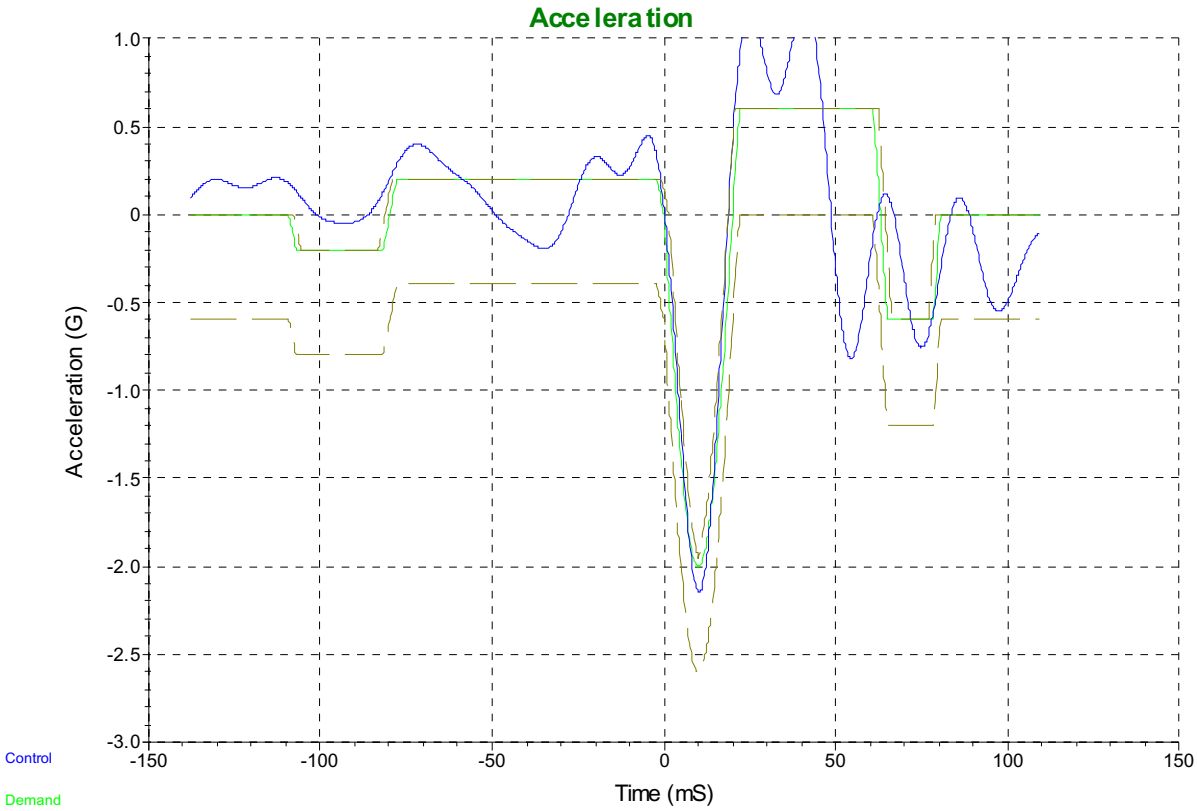
Control amplitude: 1.22913 G
Output voltage: 0.0803908 Volts peak

Accelerometer calibration details:

Ch1: 104.4 mV/G (75954, 8/07/05)
Ch2: 103.9 mV/G (53972, 7/1/06)
Ch3: 102.1 mV/G (57970, 10/26/06)
Ch4: 102.3 mV/G (57976, 10/26/06)

Vibration and Shock Test Data

Data stored on February 23, 2006 16:44:49
MJO# 300814 Vicor VI-810-423B - Test# 15 Axis: X Shock 2G 20ms -
Stop Button Pressed



Test Profile:

20 ms Half Sine Pulse with amplitude 2 G (Negative)
Pre-pulse amplitude: 10 % of the peak acceleration
Post-pulse amplitude: 30 % of the peak acceleration
Normal limits used
Control channels: Control

Test level schedule:

	Pulses	**Level**	
1)	1	100 %	(Memorized drive)

** Test started February 23, 2006 16:44:35
** Current level: 1, running at 100 % for 0 of 1 pulses

Measurements:

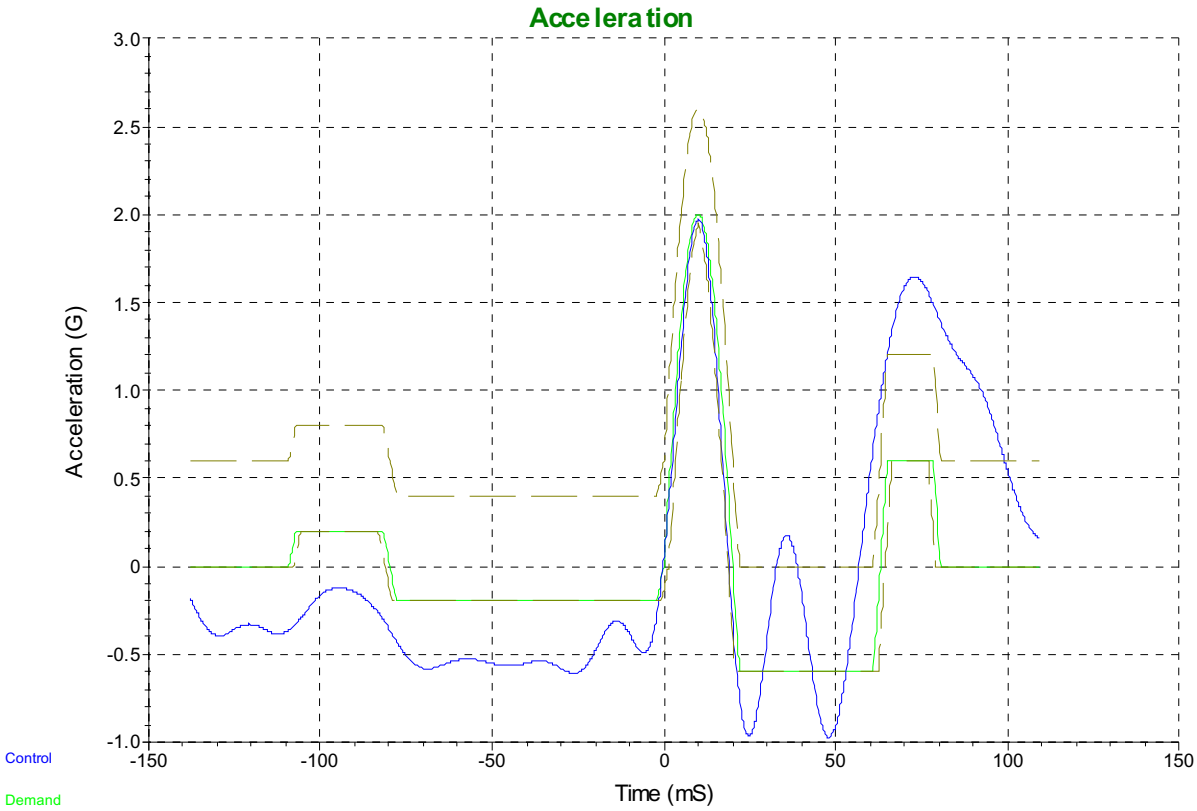
Control amplitude: 2.14693 G
Output voltage: 0.219859 Volts peak

Accelerometer calibration details:

Ch1: 104.4 mV/G (75954, 8/07/05)
Ch2: 103.9 mV/G (53972, 7/1/06)
Ch3: 102.1 mV/G (57970, 10/26/06)
Ch4: 102.3 mV/G (57976, 10/26/06)

Vibration and Shock Test Data

Data stored on February 23, 2006 16:44:27
MJO# 300814 Vicor VI-810-423B - Test# 15 Axis: X Shock 2G 20ms -
Stop Button Pressed



Test Profile:

20 ms Half Sine Pulse with amplitude 2 G (Positive)
Pre-pulse amplitude: 10 % of the peak acceleration
Post-pulse amplitude: 30 % of the peak acceleration
Normal limits used
Control channels: Control

Test level schedule:

	Pulses	Level	
1)	1	100 %	(Memorized drive)

** Test started February 23, 2006 16:44:03
** Current level: 1, running at 100 % for 0 of 1 pulses

Measurements:

Control amplitude: 1.97138 G
Output voltage: 0.201524 Volts peak

Accelerometer calibration details:

Ch1: 104.4 mV/G	(75954, 8/07/05)
Ch2: 103.9 mV/G	(53972, 7/1/06)
Ch3: 102.1 mV/G	(57970, 10/26/06)
Ch4: 102.3 mV/G	(57976, 10/26/06)

Vibration and Shock Test Data

Data stored on February 23, 2006 16:46:38
MJO# 300814 Vicor VI-810-423B - Test# 16 Axis: X Shock 5G 50ms
Stop Button Pressed

Test Profile:

50 ms Half Sine Pulse with amplitude 5 G (Negative)
Pre-pulse amplitude: 10 % of the peak acceleration
Post-pulse amplitude: 30 % of the peak acceleration
Normal limits used
Control channels: Control

Test level schedule:

	Pulses	Level	
1)	1	100 %	(Memorized drive)

** Test started February 23, 2006 16:46:18
** Current level: 1, running at 100 % for 0 of 1 pulses

Measurements:

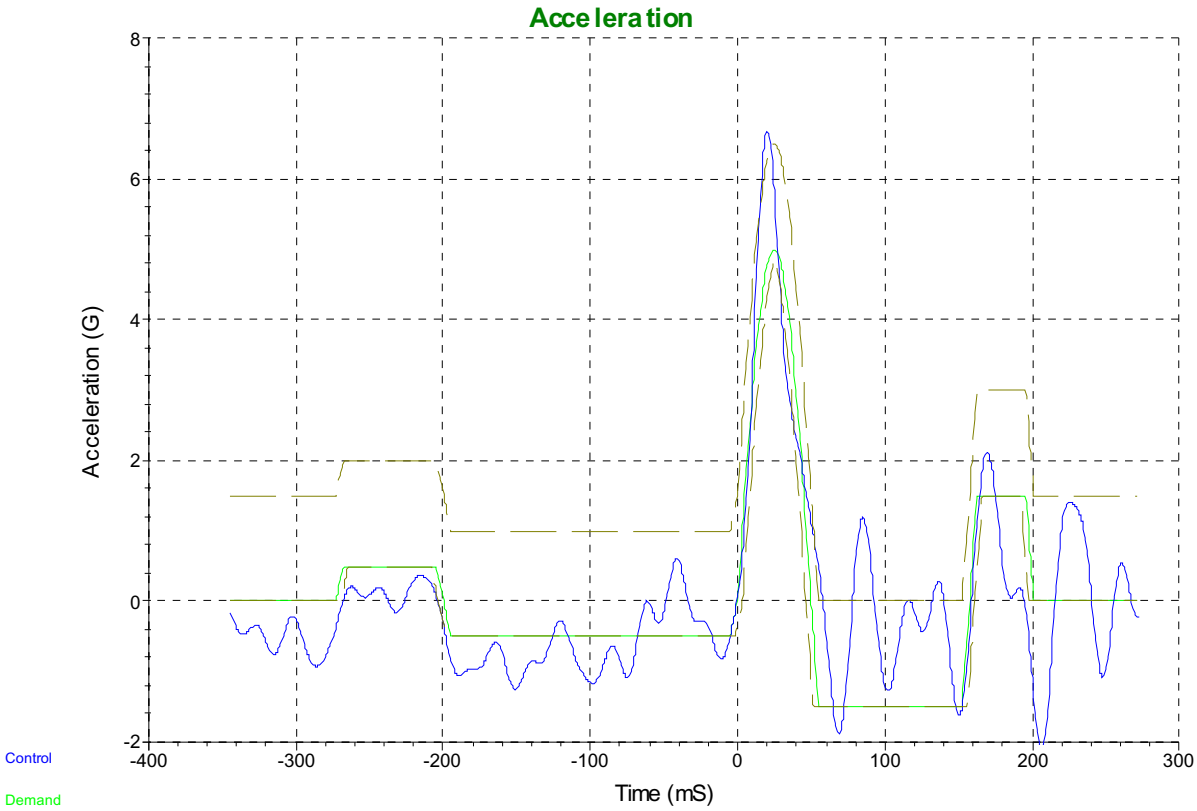
Control amplitude: 6.39892 G
Output voltage: 1.26351 Volts peak

Accelerometer calibration details:

Ch1: 104.4 mV/G (75954, 8/07/05)
Ch2: 103.9 mV/G (53972, 7/1/06)
Ch3: 102.1 mV/G (57970, 10/26/06)
Ch4: 102.3 mV/G (57976, 10/26/06)

Vibration and Shock Test Data

Data stored on February 23, 2006 16:46:08
MJO# 300814 Vicor VI-810-423B - Test# 16 Axis: X Shock 5G 50ms
Stop Button Pressed



Test Profile:

50 ms Half Sine Pulse with amplitude 5 G (Positive)
Pre-pulse amplitude: 10 % of the peak acceleration
Post-pulse amplitude: 30 % of the peak acceleration
Normal limits used
Control channels: Control

Test level schedule:

	Pulses	Level	
1)	1	100 %	(Memorized drive)

** Test started February 23, 2006 16:45:46
** Current level: 1, running at 100 % for 0 of 1 pulses

Measurements:

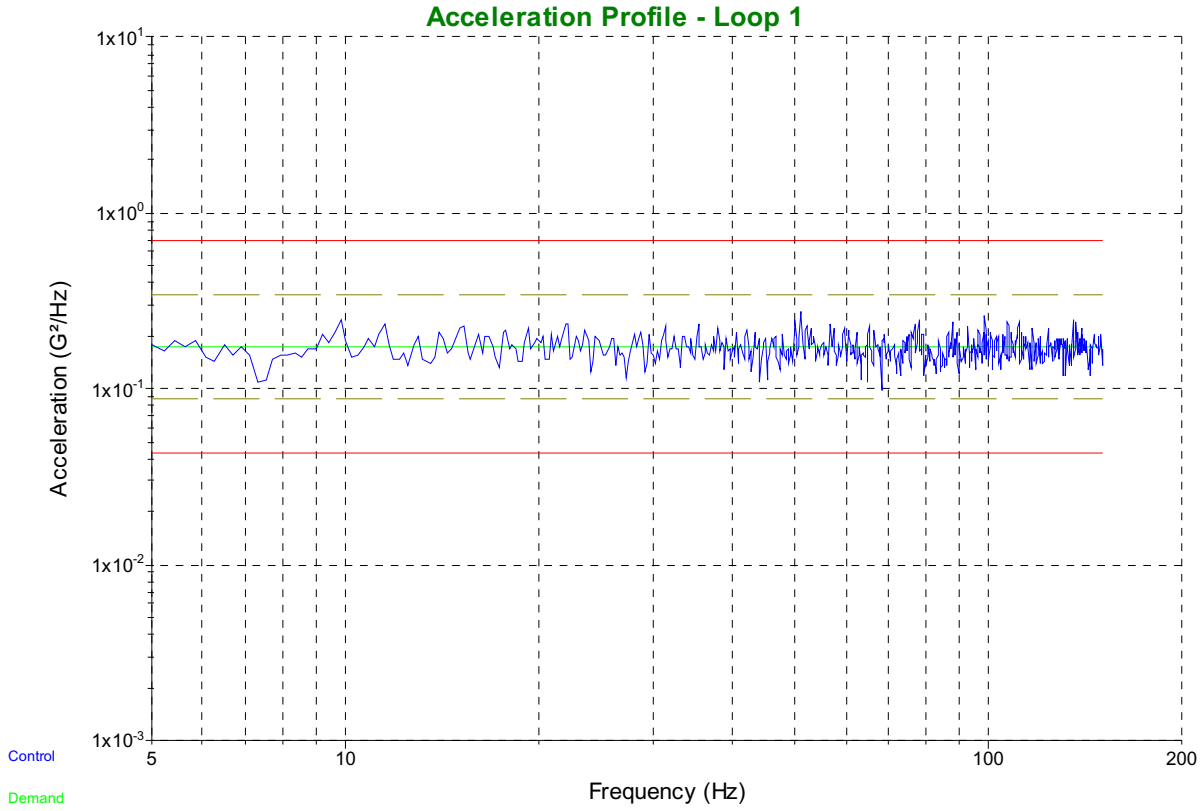
Control amplitude: 6.68202 G
Output voltage: 1.59115 Volts peak

Accelerometer calibration details:

Ch1: 104.4 mV/G (75954, 8/07/05)
Ch2: 103.9 mV/G (53972, 7/1/06)
Ch3: 102.1 mV/G (57970, 10/26/06)
Ch4: 102.3 mV/G (57976, 10/26/06)

Vibration and Shock Test Data

Data stored on February 24, 2006 13:05:28
MJO# 300814 Vicor VI-810-423B
Test# 17 Axis: Y Random Vibration 5-150 Hz
End of Test



Vibration and Shock Test Data

Breakpoint table

Frequency	G²/Hz	dB/Octave
5 Hz	0.1725	0
150 Hz	0.1725	

Test level schedule:

	Duration	Level
1)	5:00:00	100 %

** Test started Feb 24, 2006 08:01:48, running for 5:03:25
** Current level: 1, running at 100 % for 5:00:00 of 5:00:00

Measurements:

Demand: 5.0037 G RMS	1.29079 in pk-pk
Control: 4.99023 G RMS	1.39153 in pk-pk
Ch1: 0.000310243 G RMS	Ch1 in-band: 0.00015369 G RMS
Ch2: 0.00980801 G RMS	Ch2 in-band: 0.0108155 G RMS
Ch3: 0.000896484 G RMS	Ch3 in-band: 0.000262389 G RMS
Ch4: 0.000516645 G RMS	Ch4 in-band: 0.000193795 G RMS

Drive voltage: 0 Vrms

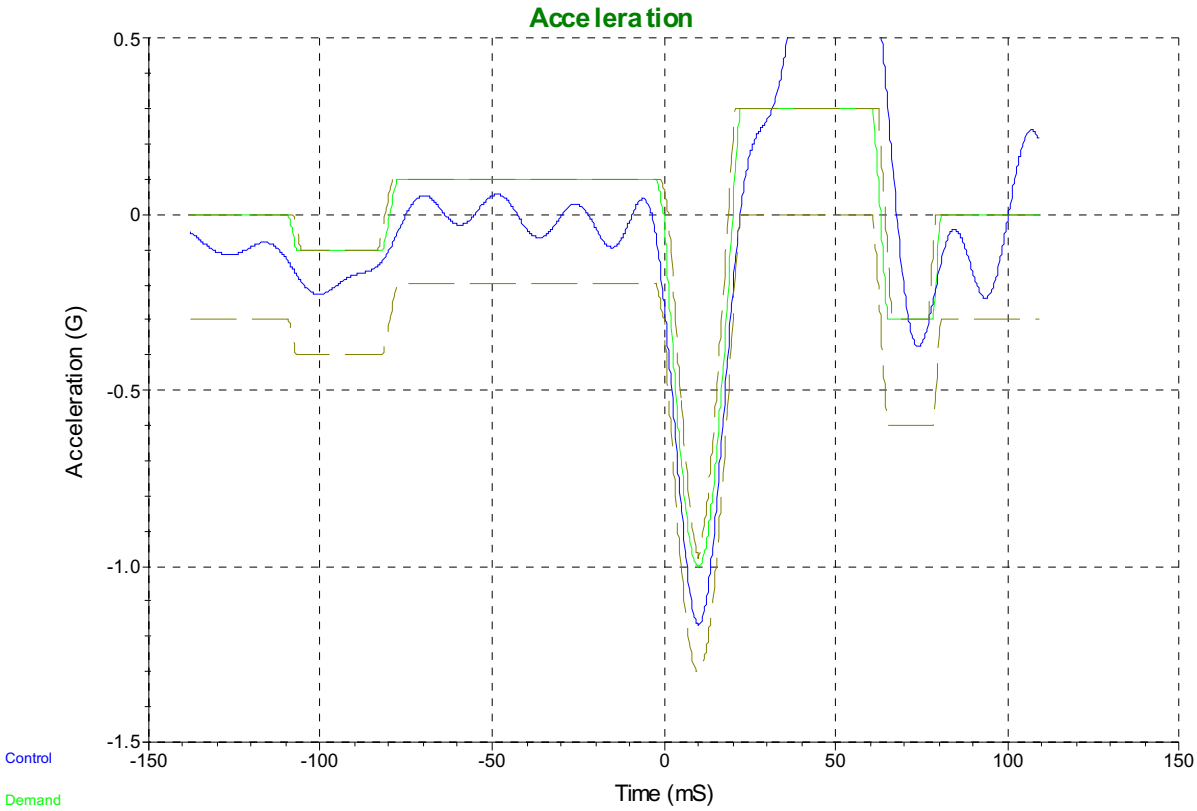
System gain is 0 Volts/G (Max system gain limit = 5)

Accelerometer calibration details:

Ch1: 104.4 mV/G	(75954, 8/07/05)
Ch2: 103.9 mV/G	(53972, 7/1/06)
Ch3: 102.1 mV/G	(57970, 10/26/06)
Ch4: 102.3 mV/G	(57976, 10/26/06)

Vibration and Shock Test Data

Data stored on February 24, 2006 13:08:03
MJO# 300814 Vicor VI-810-423B - Test# 18 Axis: Y Shock 1G 20ms
Stop Button Pressed



Test Profile:

20 ms Half Sine Pulse with amplitude 1 G (Negative)
Pre-pulse amplitude: 10 % of the peak acceleration
Post-pulse amplitude: 30 % of the peak acceleration
Normal limits used
Control channels: Control

Test level schedule:

	Pulses	Level	
1)	1	100 %	(Memorized drive)

** Test started February 24, 2006 13:07:48
** Current level: 1, running at 100 % for 0 of 1 pulses

Measurements:

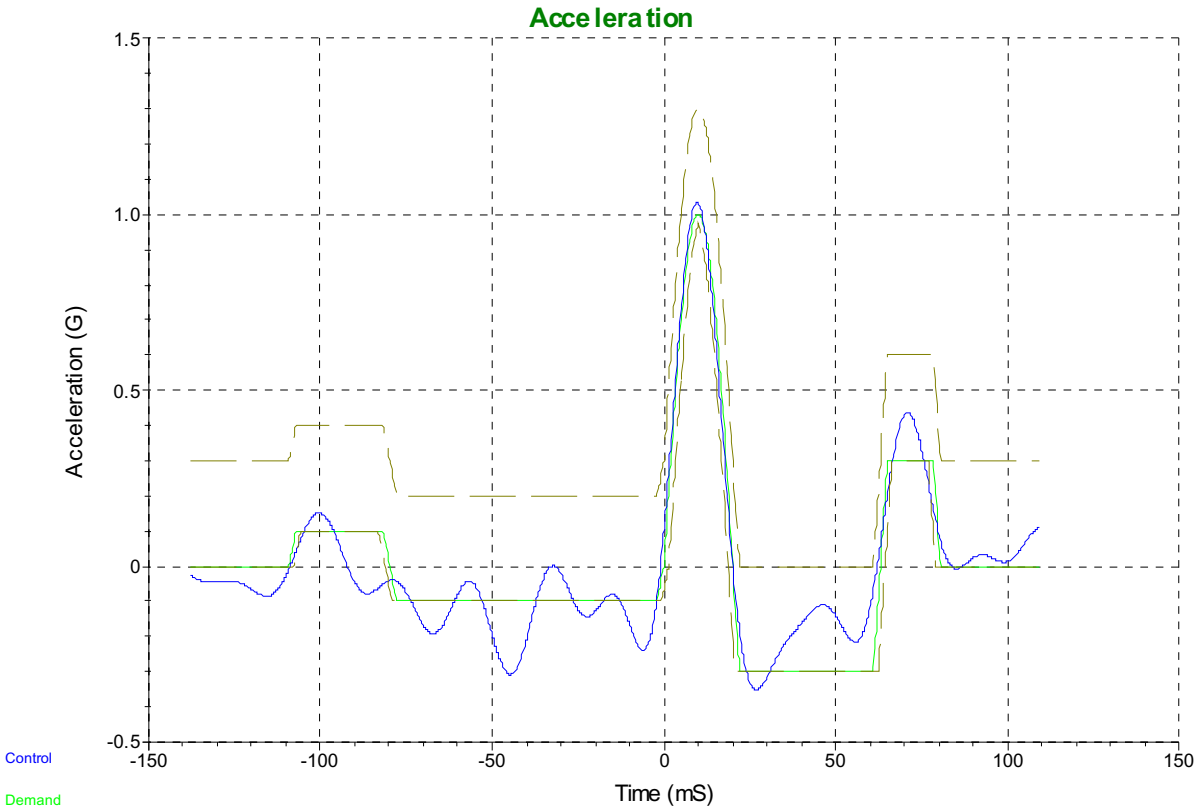
Control amplitude: 1.16557 G
Output voltage: 0.0788941 Volts peak

Accelerometer calibration details:

Ch1: 104.4 mV/G (75954, 8/07/05)
Ch2: 103.9 mV/G (53972, 7/1/06)
Ch3: 102.1 mV/G (57970, 10/26/06)
Ch4: 102.3 mV/G (57976, 10/26/06)

Vibration and Shock Test Data

Data stored on February 24, 2006 13:07:36
MJO# 300814 Vicor VI-810-423B - Test# 18 Axis: Y Shock 1G 20ms
Stop Button Pressed



Test Profile:

20 ms Half Sine Pulse with amplitude 1 G (Positive)
Pre-pulse amplitude: 10 % of the peak acceleration
Post-pulse amplitude: 30 % of the peak acceleration
Normal limits used
Control channels: Control

Test level schedule:

	Pulses	Level	
1)	1	100 %	(Memorized drive)

** Test started February 24, 2006 13:06:22
** Current level: 1, running at 100 % for 0 of 1 pulses

Measurements:

Control amplitude: 1.03108 G
Output voltage: 0.116048 Volts peak

Accelerometer calibration details:

Ch1: 104.4 mV/G (75954, 8/07/05)
Ch2: 103.9 mV/G (53972, 7/1/06)
Ch3: 102.1 mV/G (57970, 10/26/06)
Ch4: 102.3 mV/G (57976, 10/26/06)

Vibration and Shock Test Data

Data stored on February 24, 2006 13:14:57
MJO# 300814 Vicor VI-810-423B - Test# 19 Axis: Y Shock 2G 20ms
Stop Button Pressed

Test Profile:

20 ms Half Sine Pulse with amplitude 2 G (Negative)
Pre-pulse amplitude: 10 % of the peak acceleration
Post-pulse amplitude: 30 % of the peak acceleration
Normal limits used
Control channels: Control

Test level schedule:

	Pulses	**Level**	
1)	1	100 %	(Memorized drive)

** Test started February 24, 2006 13:14:43
** Current level: 1, running at 100 % for 0 of 1 pulses

Measurements:

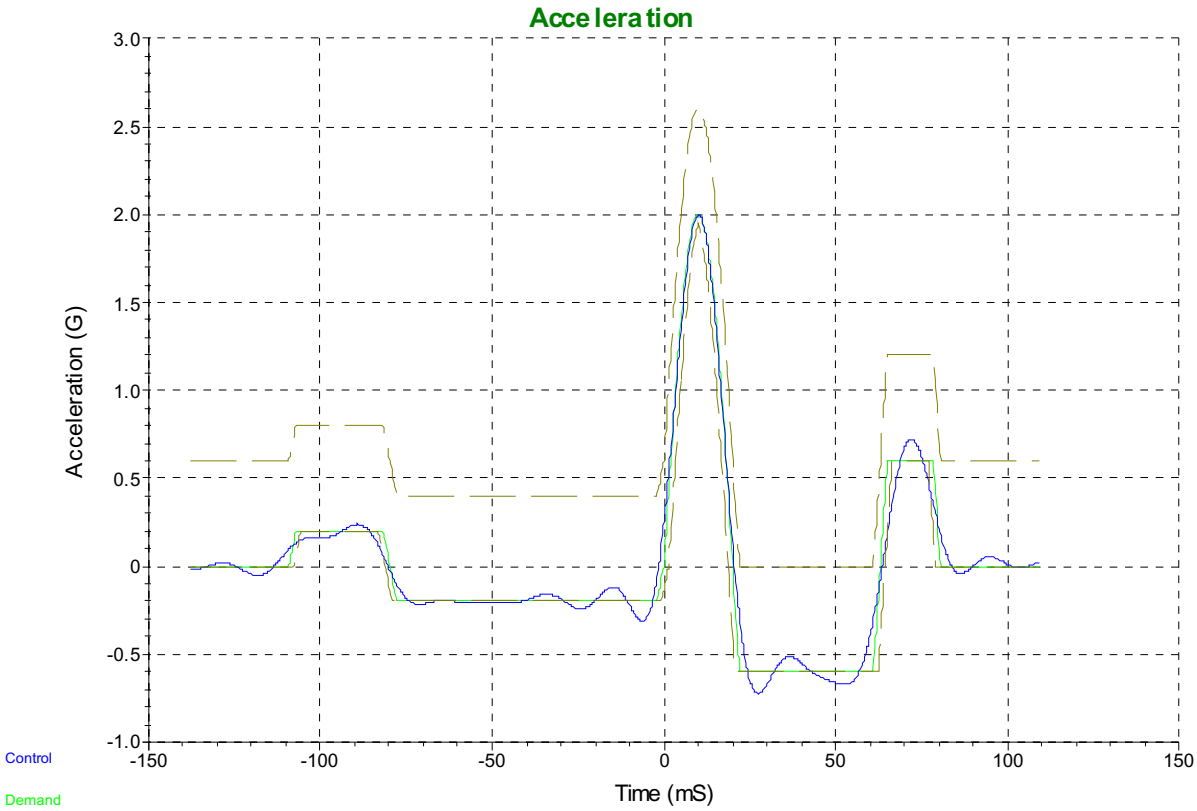
Control amplitude: 2.10161 G
Output voltage: 0.178913 Volts peak

Accelerometer calibration details:

Ch1: 104.4 mV/G (75954, 8/07/05)
Ch2: 103.9 mV/G (53972, 7/1/06)
Ch3: 102.1 mV/G (57970, 10/26/06)
Ch4: 102.3 mV/G (57976, 10/26/06)

Vibration and Shock Test Data

Data stored on February 24, 2006 13:14:34
MJO# 300814 Vicor VI-810-423B - Test# 19 Axis: Y Shock 2G 20ms
Stop Button Pressed



Test Profile:

20 ms Half Sine Pulse with amplitude 2 G (Positive)
Pre-pulse amplitude: 10 % of the peak acceleration
Post-pulse amplitude: 30 % of the peak acceleration
Normal limits used
Control channels: Control

Test level schedule:

	Pulses	Level	
1)	1	100 %	(Memorized drive)

** Test started February 24, 2006 13:13:06
** Current level: 1, running at 100 % for 0 of 1 pulses

Measurements:

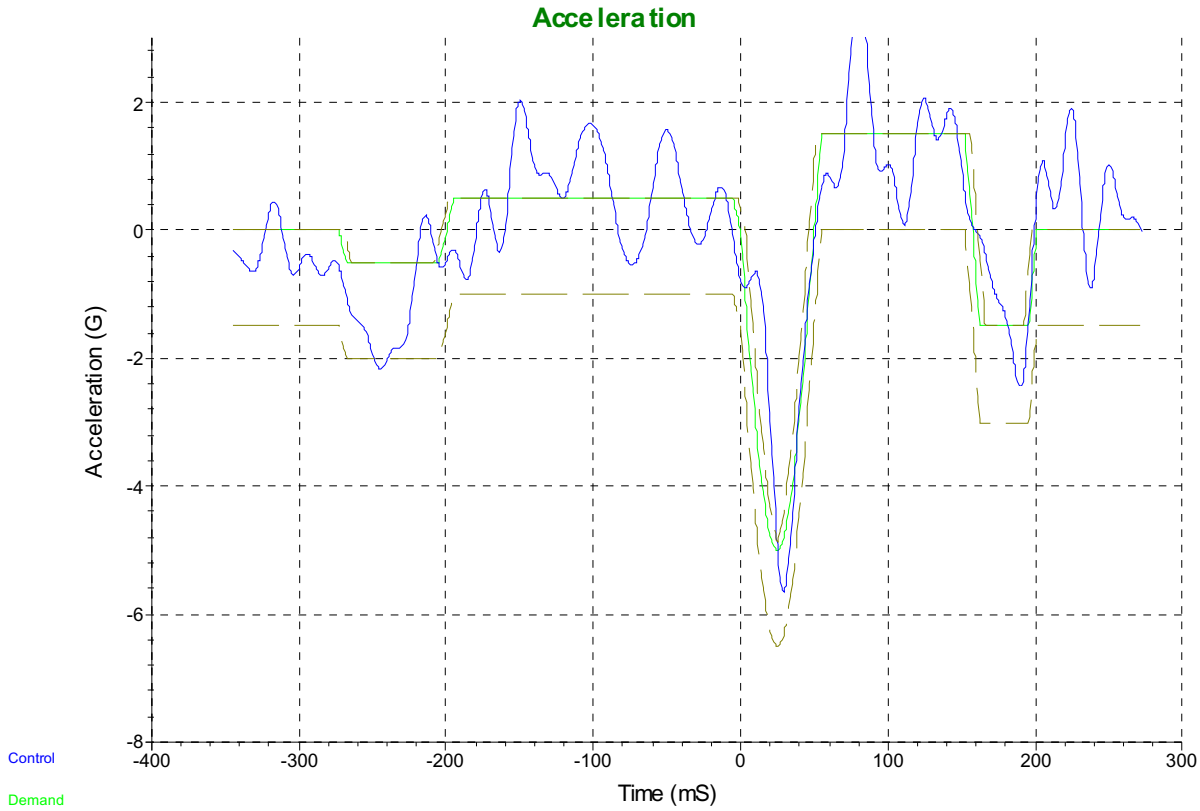
Control amplitude: 1.99561 G
Output voltage: 0.191043 Volts peak

Accelerometer calibration details:

Ch1: 104.4 mV/G (75954, 8/07/05)
Ch2: 103.9 mV/G (53972, 7/1/06)
Ch3: 102.1 mV/G (57970, 10/26/06)
Ch4: 102.3 mV/G (57976, 10/26/06)

Vibration and Shock Test Data

Data stored on February 24, 2006 13:19:20
MJO# 300814 Vicor VI-810-423B - Test# 20 Axis: Y Shock 5G 50ms
Stop Button Pressed



Test Profile:

50 ms Half Sine Pulse with amplitude 5 G (Negative)
Pre-pulse amplitude: 10 % of the peak acceleration
Post-pulse amplitude: 30 % of the peak acceleration
Normal limits used
Control channels: Control

Test level schedule:

	Pulses	Level	
1)	1	100 %	(Memorized drive)

** Test started February 24, 2006 13:17:26
** Current level: 1, running at 100 % for 0 of 1 pulses

Measurements:

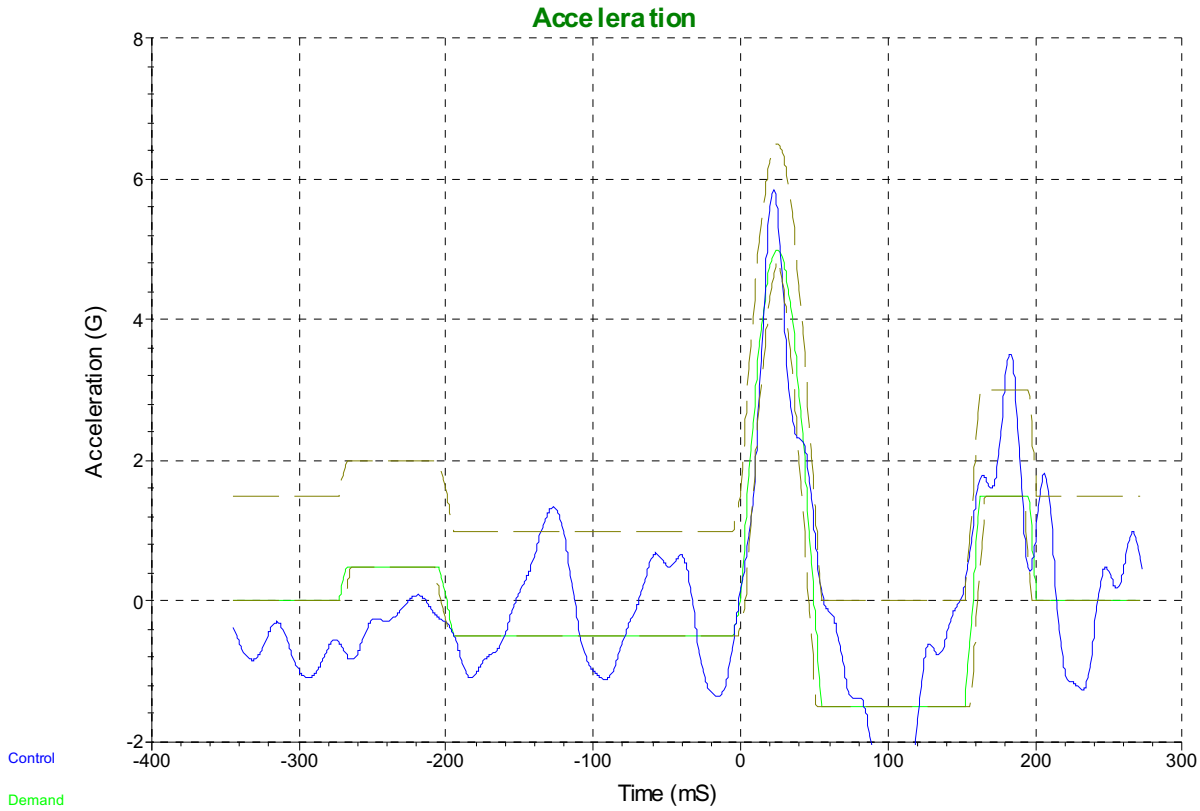
Control amplitude: 5.65205 G
Output voltage: 1.52962 Volts peak

Accelerometer calibration details:

Ch1: 104.4 mV/G	(75954, 8/07/05)
Ch2: 103.9 mV/G	(53972, 7/1/06)
Ch3: 102.1 mV/G	(57970, 10/26/06)
Ch4: 102.3 mV/G	(57976, 10/26/06)

Vibration and Shock Test Data

Data stored on February 24, 2006 13:17:10
MJO# 300814 Vicor VI-810-423B - Test# 20 Axis: Y Shock 5G 50ms -
Stop Button Pressed



Test Profile:

50 ms Half Sine Pulse with amplitude 5 G (Positive)
Pre-pulse amplitude: 10 % of the peak acceleration
Post-pulse amplitude: 30 % of the peak acceleration
Normal limits used
Control channels: Control

Test level schedule:

	Pulses	Level	
1)	1	100 %	(Memorized drive)

** Test started February 24, 2006 13:15:20
** Current level: 1, running at 100 % for 0 of 1 pulses

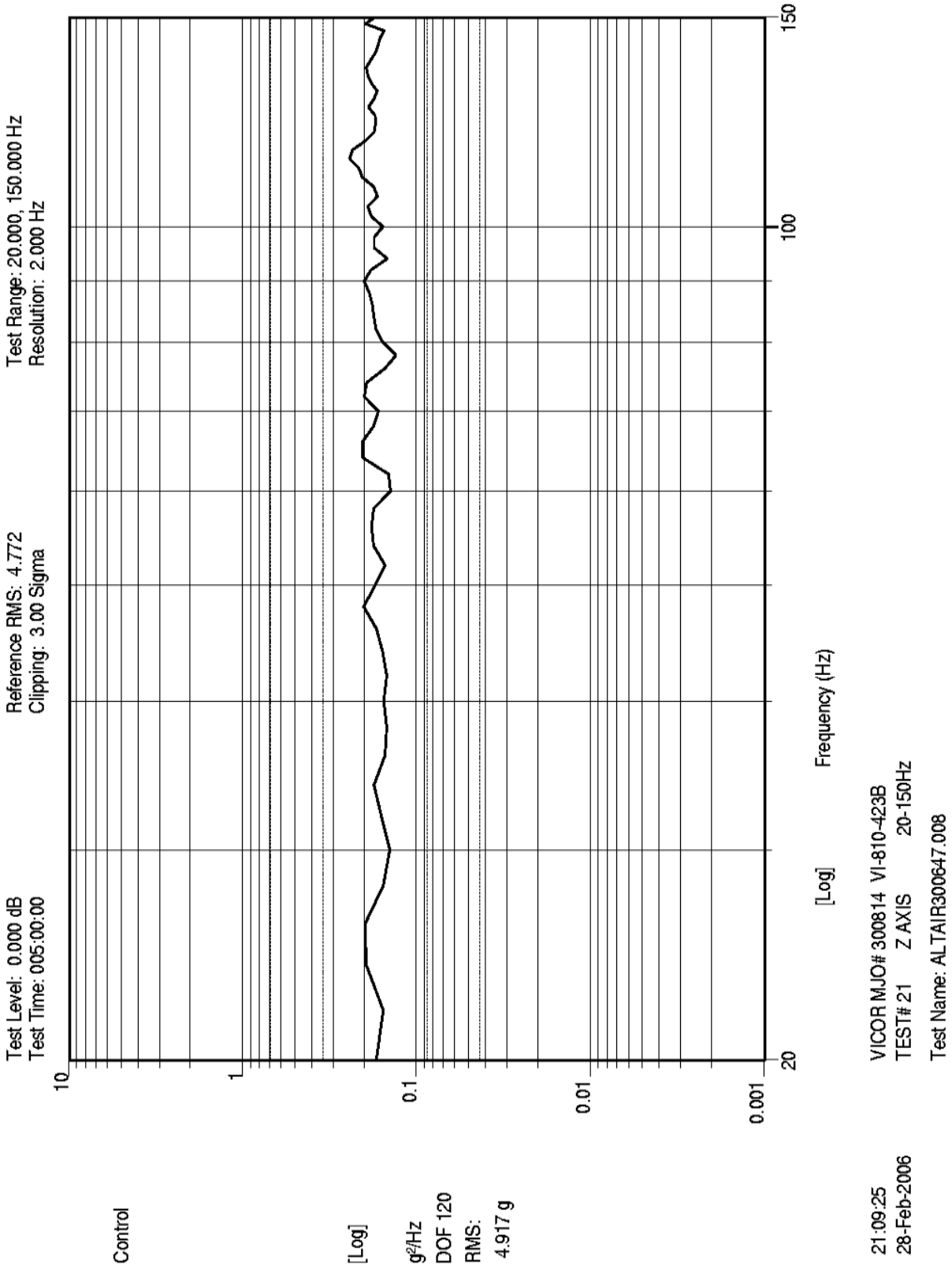
Measurements:

Control amplitude: 5.83422 G
Output voltage: 1.39589 Volts peak

Accelerometer calibration details:

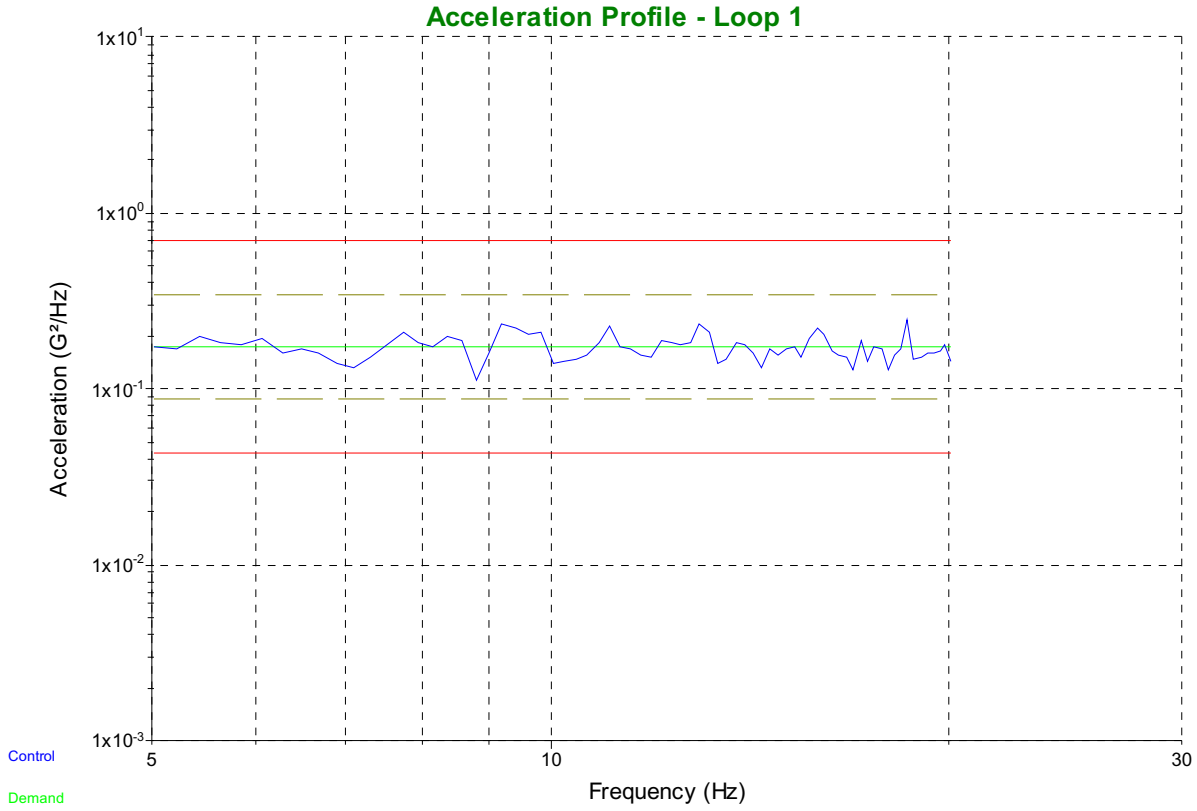
Ch1: 104.4 mV/G (75954, 8/07/05)
Ch2: 103.9 mV/G (53972, 7/1/06)
Ch3: 102.1 mV/G (57970, 10/26/06)
Ch4: 102.3 mV/G (57976, 10/26/06)

Vibration and Shock Test Data



Vibration and Shock Test Data

Data stored on March 1, 2006 13:55:56
MJO# 300814 Vicor VI-810-423B
Test# 21 Axis: Z Random Vibration 5-20 Hz
End of Test



Vibration and Shock Test Data

Breakpoint table

Frequency	G²/Hz	dB/Octave
5 Hz	0.1725	0
20 Hz	0.1725	

Test level schedule:

	Duration	Level
1)	5:00:00	100 %

** Test started March 1, 2006 08:52:25, running for 5:02:21
** Current level: 1, running at 100 % for 5:00:00 of 5:00:00

Measurements:

Demand: 1.62283 G RMS	1.28145 in pk-pk
Control: 1.63052 G RMS	1.33083 in pk-pk
Ch1: 0.000520615 G RMS	Ch1 in-band: 0.000103879 G RMS
Ch2: 0.00669764 G RMS	Ch2 in-band: 0.000219127 G RMS
Ch3: 0.000290839 G RMS	Ch3 in-band: 8.31055e-005 G RMS
Ch4: 0.000245413 G RMS	Ch4 in-band: 9.73282e-005 G RMS

Drive voltage: 0 Vrms

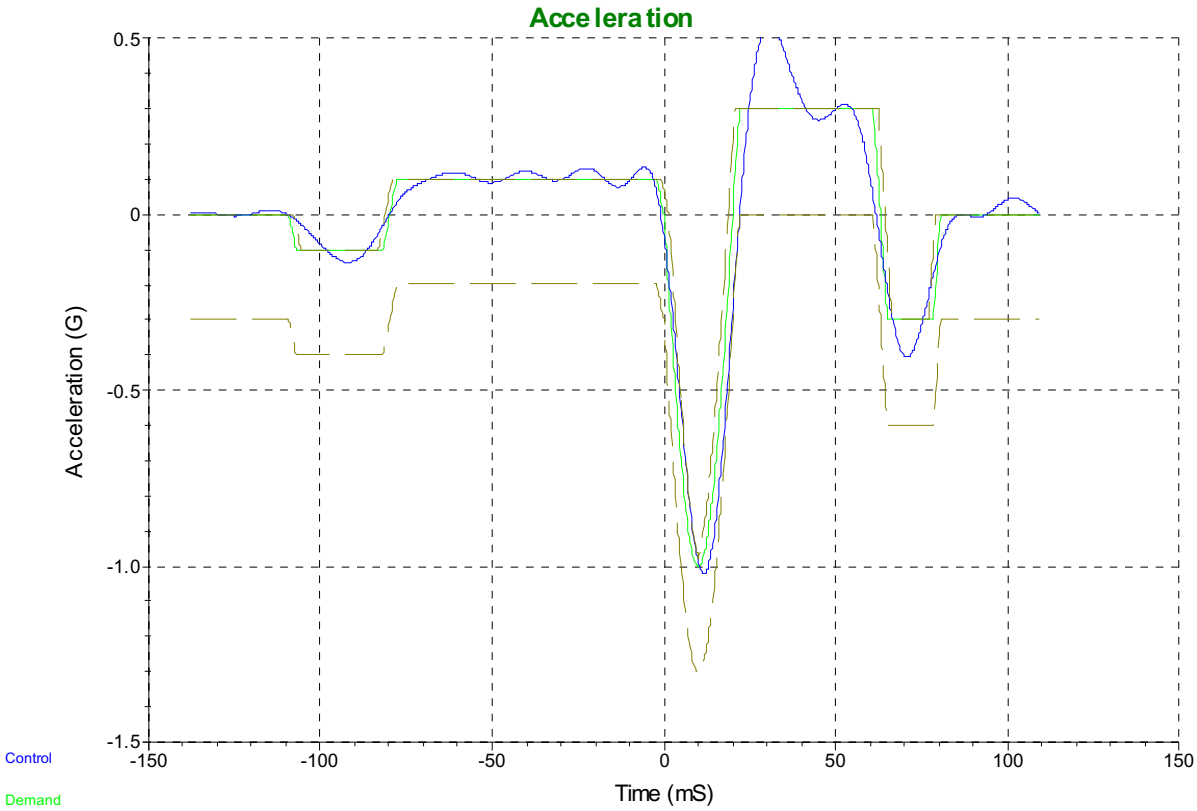
System gain is 0 Volts/G (Max system gain limit = 5)

Accelerometer calibration details:

Ch1: 104.4 mV/G	(75954, 8/07/05)
Ch2: 103.9 mV/G	(53972, 7/1/06)
Ch3: 102.1 mV/G	(57970, 10/26/06)
Ch4: 102.3 mV/G	(57976, 10/26/06)

Vibration and Shock Test Data

Data stored on March 2, 2006 08:33:37
MJO# 300814 Vicor VI-810-423B - Test# 22 Axis: Z Shock 1G 20ms
Stop Button Pressed



Test Profile:

20 ms Half Sine Pulse with amplitude 1 G (Negative)
Pre-pulse amplitude: 10 % of the peak acceleration
Post-pulse amplitude: 30 % of the peak acceleration
Normal limits used
Control channels: Control

Test level schedule:

	Pulses	Level	
1)	1	100 %	(Memorized drive)

** Test started March 2, 2006 08:33:21
** Current level: 1, running at 100 % for 0 of 1 pulses

Measurements:

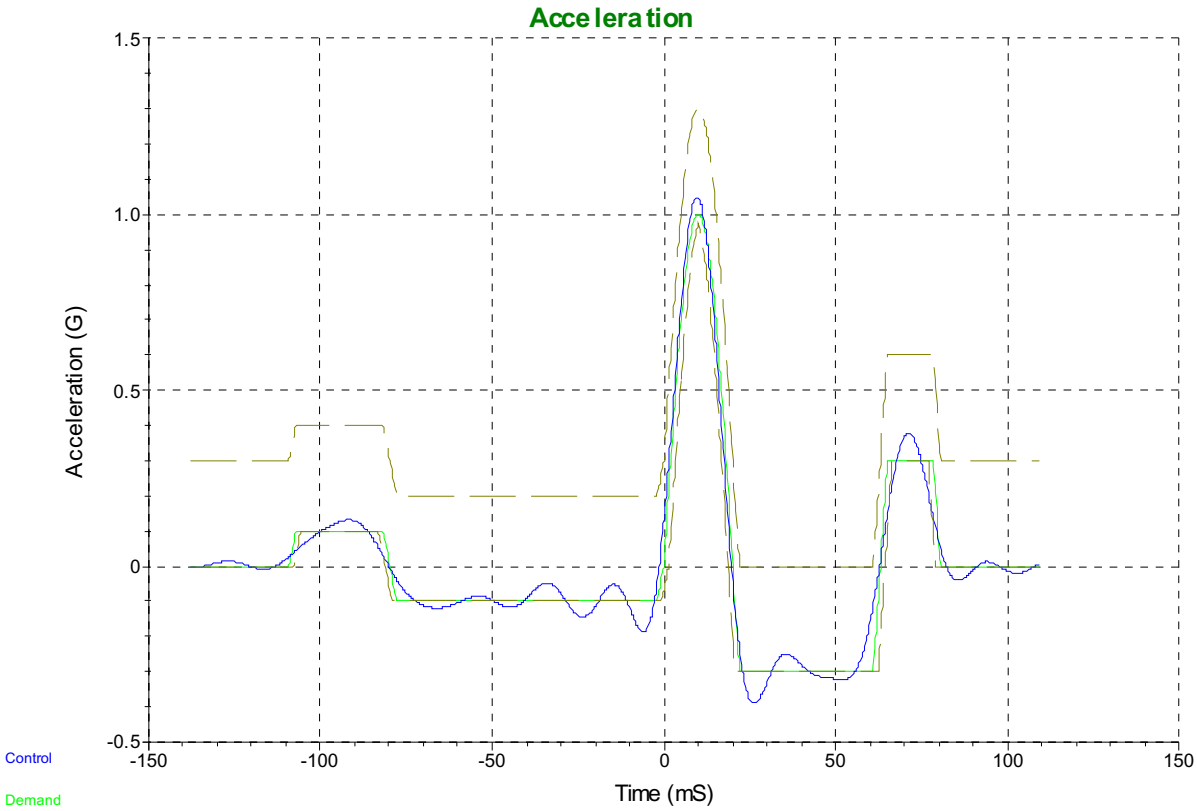
Control amplitude: 1.0215 G
Output voltage: 0.0704199 Volts peak

Accelerometer calibration details:

Ch1: 104.4 mV/G (75954, 8/07/05)
Ch2: 103.9 mV/G (53972, 7/1/06)
Ch3: 102.1 mV/G (57970, 10/26/06)
Ch4: 102.3 mV/G (57976, 10/26/06)

Vibration and Shock Test Data

Data stored on March 2, 2006 08:33:13
MJO# 300814 Vicor VI-810-423B - Test# 22 Axis: Z Shock 1G 20ms -
Stop Button Pressed



Test Profile:

20 ms Half Sine Pulse with amplitude 1 G (Positive)
Pre-pulse amplitude: 10 % of the peak acceleration
Post-pulse amplitude: 30 % of the peak acceleration
Normal limits used
Control channels: Control

Test level schedule:

	Pulses	**Level**	
1)	1	100 %	(Memorized drive)

** Test started March 2, 2006 08:31:54
** Current level: 1, running at 100 % for 0 of 1 pulses

Measurements:

Control amplitude: 1.04841 G
Output voltage: 0.0775076 Volts peak

Accelerometer calibration details:

Ch1: 104.4 mV/G (75954, 8/07/05)
Ch2: 103.9 mV/G (53972, 7/1/06)
Ch3: 102.1 mV/G (57970, 10/26/06)
Ch4: 102.3 mV/G (57976, 10/26/06)

Vibration and Shock Test Data

Data stored on March 2, 2006 08:36:20
MJO# 300814 Vicor VI-810-423B - Test# 23 Axis: Z Shock 2G 20ms
Stop Button Pressed

Test Profile:

20 ms Half Sine Pulse with amplitude 2 G (Negative)
Pre-pulse amplitude: 10 % of the peak acceleration
Post-pulse amplitude: 30 % of the peak acceleration
Normal limits used
Control channels: Control

Test level schedule:

	Pulses	**Level**	
1)	1	100 %	(Memorized drive)

** Test started March 2, 2006 08:36:05
** Current level: 1, running at 100 % for 0 of 1 pulses

Measurements:

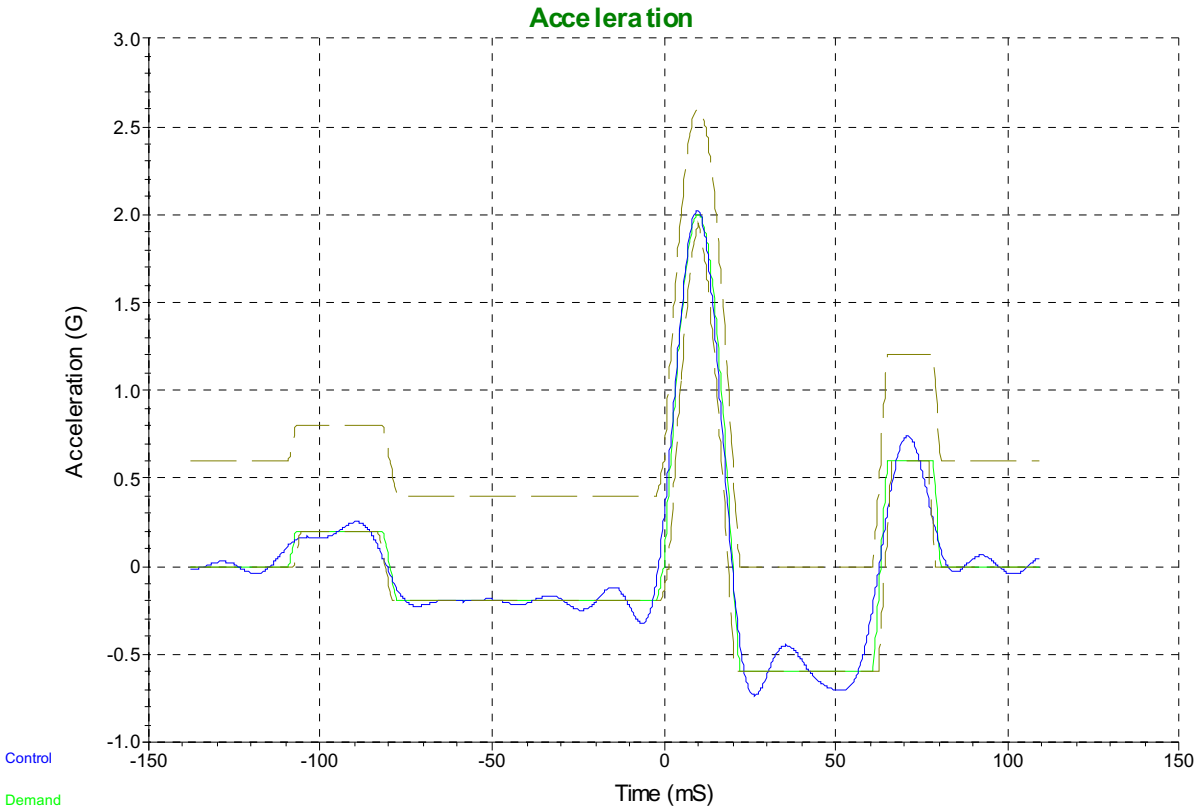
Control amplitude: 2.09725 G
Output voltage: 0.165604 Volts peak

Accelerometer calibration details:

Ch1: 104.4 mV/G (75954, 8/07/05)
Ch2: 103.9 mV/G (53972, 7/1/06)
Ch3: 102.1 mV/G (57970, 10/26/06)
Ch4: 102.3 mV/G (57976, 10/26/06)

Vibration and Shock Test Data

Data stored on March 2, 2006 08:35:47
MJO# 300814 Vicor VI-810-423B - Test# 23 Axis: Z Shock 2G 20ms -
Stop Button Pressed



Test Profile:

20 ms Half Sine Pulse with amplitude 2 G (Positive)
Pre-pulse amplitude: 10 % of the peak acceleration
Post-pulse amplitude: 30 % of the peak acceleration
Normal limits used
Control channels: Control

Test level schedule:

	Pulses	Level	
1)	1	100 %	(Memorized drive)

** Test started March 2, 2006 08:34:23
** Current level: 1, running at 100 % for 0 of 1 pulses

Measurements:

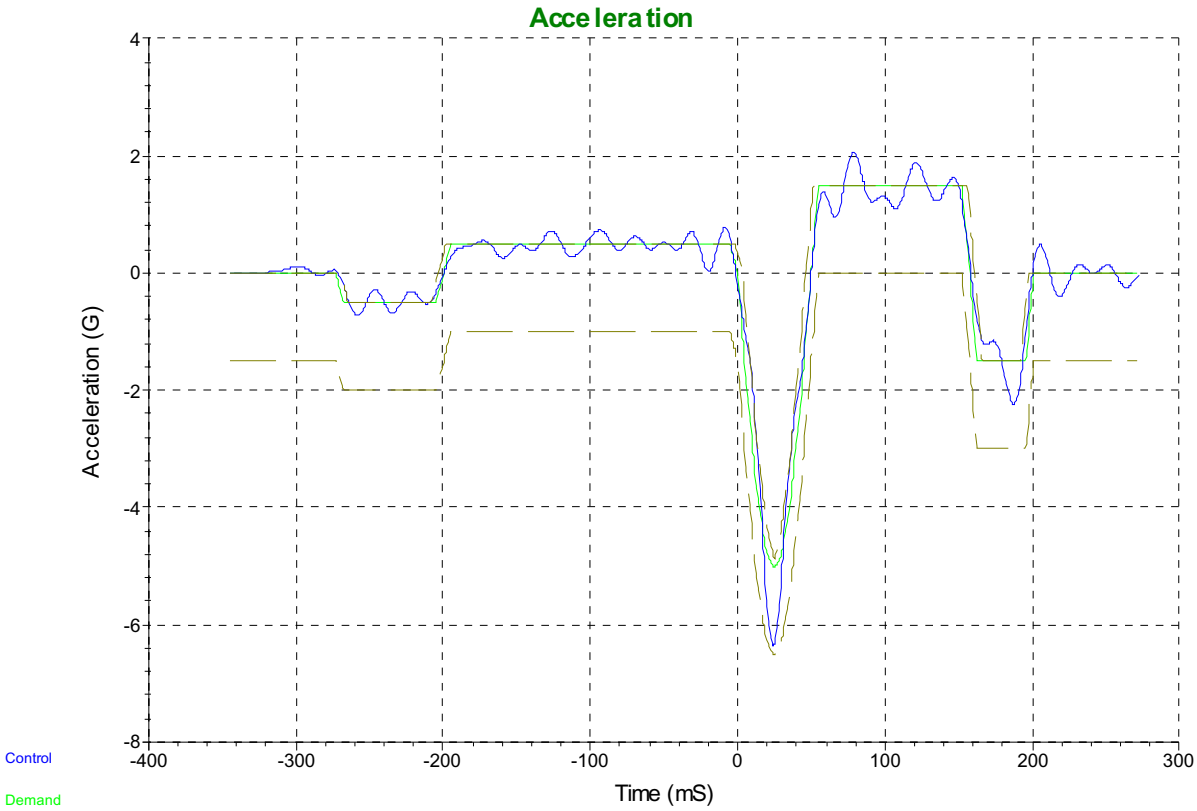
Control amplitude: 2.02144 G
Output voltage: 0.169957 Volts peak

Accelerometer calibration details:

Ch1: 104.4 mV/G (75954, 8/07/05)
Ch2: 103.9 mV/G (53972, 7/1/06)
Ch3: 102.1 mV/G (57970, 10/26/06)
Ch4: 102.3 mV/G (57976, 10/26/06)

Vibration and Shock Test Data

Data stored on March 2, 2006 08:41:07
MJO# 300814 Vicor VI-810-423B - Test# 24 Axis: Z Shock 5G 50ms
Stop Button Pressed



Test Profile:

50 ms Half Sine Pulse with amplitude 5 G (Negative)
Pre-pulse amplitude: 10 % of the peak acceleration
Post-pulse amplitude: 30 % of the peak acceleration
Normal limits used
Control channels: Control

Test level schedule:

	Pulses	Level	
1)	1	100 %	(Memorized drive)

** Test started March 2, 2006 08:40:48
** Current level: 1, running at 100 % for 0 of 1 pulses

Measurements:

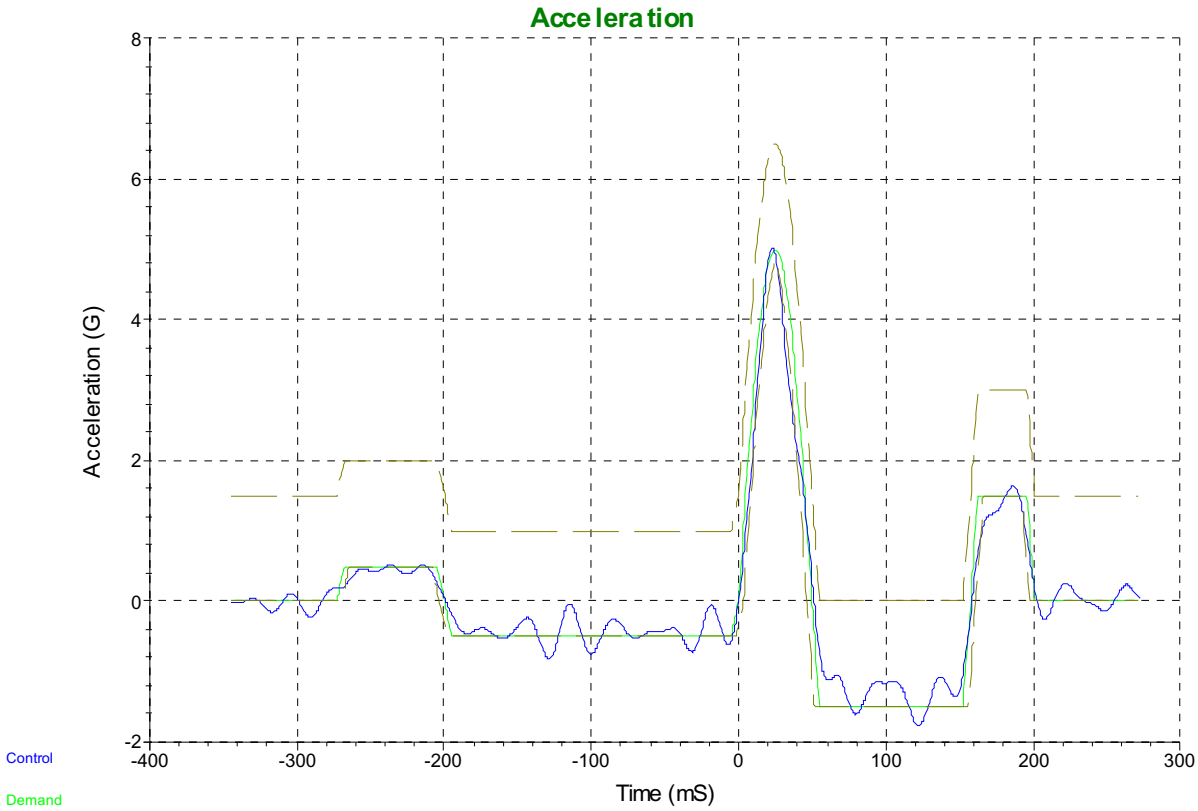
Control amplitude: 6.35263 G
Output voltage: 1.37596 Volts peak

Accelerometer calibration details:

Ch1: 104.4 mV/G (75954, 8/07/05)
Ch2: 103.9 mV/G (53972, 7/1/06)
Ch3: 102.1 mV/G (57970, 10/26/06)
Ch4: 102.3 mV/G (57976, 10/26/06)

Vibration and Shock Test Data

Data stored on March 2, 2006 08:40:41
MJO# 300814 Vicor VI-810-423B - Test# 24 Axis: Z Shock 5G 50ms -
Stop Button Pressed



Test Profile:

50 ms Half Sine Pulse with amplitude 5 G (Positive)
Pre-pulse amplitude: 10 % of the peak acceleration
Post-pulse amplitude: 30 % of the peak acceleration
Normal limits used
Control channels: Control

Test level schedule:

	Pulses	Level	
1)	1	100 %	(Memorized drive)

** Test started March 2, 2006 08:38:58
** Current level: 1, running at 100 % for 0 of 1 pulses

Measurements:

Control amplitude: 5.02076 G
Output voltage: 1.28512 Volts peak

Accelerometer calibration details:

Ch1: 104.4 mV/G	(75954, 8/07/05)
Ch2: 103.9 mV/G	(53972, 7/1/06)
Ch3: 102.1 mV/G	(57970, 10/26/06)
Ch4: 102.3 mV/G	(57976, 10/26/06)

Appendix C

Notices of Deviation

TR- 300814-05E

NOTICE OF DEVIATION

Note: It is the client's responsibility to analyze and disposition deviations on client test programs

Customer Name:	Vicor Corporation	Test Name:	Random Vibration
MJO #:	300814-05E	Unit(s) Under Test:	VI-2T3-CU
NOD #:	D-1	Specification:	EN 50155
CPAR #:	N/A	Revision:	-
P.O. #:	158432SEV	Date:	2001

Notification Made To:	Ed Mejia	Notification Made by:	Jon Arseneault
Notification Date:	2/20/06	Notified Via:	Witness

Requirements (Reference paragraph or section of specification):
Paragraph 10.2.11
5 Hz to 150 Hz @ 5 Grms
5 hours/axis
3 axes

Description of Deviation:
Test #5 in the X-axis was aborted at 36 minutes, 10 seconds. It was noted that the spanners on the piston had loosened during vibration.

Disposition/Comments/Recommendations:
The spanners were re-tightened and testing continued.

CAUSE OF DEVIATION	Code
Employee Error	1
Test Equipment Problem	2
Customer Item Problem	3
Weather	4
Power Failure	5
Equipment Limitations	6
Other	7

TRACKING CODE:	2

Client Test Witness (if applicable)	Date
	3/14/2006
Project Manager	Date
	3/15/2006
Quality Representative	Date
Government QAR (if applicable)	Date

TR- 300814-05E

NOTICE OF DEVIATION

Note: It is the client's responsibility to analyze and disposition deviations on client test programs

Customer Name:	Vicor Corporation	Test Name:	Random Vibration
MJO #:	300814-05E	Unit(s) Under Test:	VI-2T3-CU
NOD #:	D-2	Specification:	EN 50155
CPAR #:	N/A	Revision:	-
P.O. #:	158432SEV	Date:	2001

Notification Made To:	Ed Mejia	Notification Made by:	Jon Arseneault
Notification Date:	2/20/06	Notified Via:	Witness

Requirements (Reference paragraph or section of specification):
Paragraph 10.2.11
5 Hz to 150 Hz @ 5 Grms
5 hours/axis
3 axes

Description of Deviation:
Test #5 in the X-axis was aborted at 3 hours, 38 minutes, 59 seconds. Two of the flange bolts on one side of the piston had broken, causing hydraulic oil to spray from the pit.

Disposition/Comments/Recommendations:
The bolts were replaced and testing continued.

CAUSE OF DEVIATION	Code
Employee Error	1
Test Equipment Problem	2
Customer Item Problem	3
Weather	4
Power Failure	5
Equipment Limitations	6
Other	7

TRACKING CODE:	2

Client Test Witness (if applicable)	Date
	3/13/2006
Project Manager	Date
	3/15/2006
Quality Representative	Date
Government QAR (if applicable)	Date

TR- 300814-05E

NOTICE OF DEVIATION

Note: It is the client's responsibility to analyze and disposition deviations on client test programs

Customer Name:	Vicor Corporation	Test Name:	Random Vibration
MJO #:	300814-05E	Unit(s) Under Test:	VI-810-423B
NOD #:	D-3	Specification:	EN 50155
CPAR #:	N/A	Revision:	-
P.O. #:	158432SEV	Date:	2001

Notification Made To:	Ed Mejia	Notification Made by:	Jon Arseneault
Notification Date:	2/22/06	Notified Via:	Witness

Requirements (Reference paragraph or section of specification):
Paragraph 10.2.11
5 Hz to150 Hz @ 5 Grms
5 hours/axis
3 axes

Description of Deviation:
Test #13 in the X-axis was aborted at 3 hours, 54 minutes, 11 seconds. A hairline crack was found near a weld on one of the flanges on the piston, causing hydraulic oil to spray from the pit.

Disposition/Comments/Recommendations:
The flange was re-welded to cover the crack and testing continued.

CAUSE OF DEVIATION	Code
Employee Error	1
Test Equipment Problem	2
Customer Item Problem	3
Weather	4
Power Failure	5
Equipment Limitations	6
Other	7

TRACKING CODE:	2

Client Test Witness (if applicable)	Date
	3/13/2006
Project Manager	Date
	3/15/2006
Quality Representative	Date
Government QAR (if applicable)	Date

TR- 300814-05E

NOTICE OF DEVIATION

Note: It is the client's responsibility to analyze and disposition deviations on client test programs

Customer Name:	Vicor Corporation	Test Name:	Random Vibration
MJO #:	300814-05E	Unit(s) Under Test:	VI-810-423B
NOD #:	D-4	Specification:	EN 50155
CPAR #:	N/A	Revision:	-
P.O. #:	158432SEV	Date:	2001

Notification Made To:	Ed Mejia	Notification Made by:	Jon Arseneault
Notification Date:	2/24/06	Notified Via:	Witness

Requirements (Reference paragraph or section of specification):
Paragraph 10.2.11
5 Hz to 150 Hz @ 5 Grms
5 hours/axis
3 axes

Description of Deviation:
Test #21 in the Z-axis was aborted at 8 minutes, 36 seconds. Two of the flange bolts on one side of the piston had broken, causing hydraulic oil to spray from the pit.

Disposition/Comments/Recommendations:
Testing at this point had been split banded. The range from 20 Hz to 150 Hz was completed on the Electro-dynamic shaker in Boxboro (T-4000). The range from 5 Hz to 20 Hz was completed on the Electro-hydraulic shaker.

CAUSE OF DEVIATION	Code
Employee Error	1
Test Equipment Problem	2
Customer Item Problem	3
Weather	4
Power Failure	5
Equipment Limitations	6
Other	7

TRACKING CODE:	2

Client Test Witness (if applicable)	Date
	3/13/2006
Project Manager	Date
	3/15/2006
Quality Representative	Date
Government QAR (if applicable)	Date