EMC EMISSIONS - TEST REPORT

Test Report No.	**BC107362-1**	Issue Date	November 8, 2001
Model / Serial No.	**HG200B / 485485**		
Product Type	**HG9010#2**		
Client	**BI Incorporated**		
Manufacturer	BI Incorporated		
License holder	BI Incorporated		
Address	6400 Lookout Rd. Boulder, CO 80301		
Test Criteria Applied	**FCC Part 15 Class B & 15.231e**	47 CFR 15: Radio Frequency Devices	
Test Result	**PASS**		
Test Project Number References	**BC107362**		
Total Pages Including Appendices:	20		

Reviewed By : Todd Seeley

Reviewed By : Robert Cresswell

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TÜV Product Service Inc reports apply only to the specific samples tested under stated test conditions. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. TÜV Product Service Inc shall have no liability for any deductions, inferences or generalizations drawn by the client or others from TÜV Product Service Inc issued reports.

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TÜV PRODUCT SERVICE INC 5541 Central Avenue Boulder, Colorado 80301 Tel: 303 786 7999 Fax: 303 449 3004 Rev.No 1.0

DIRECTORY

STATEMENT OF MEASUREMENT UNCERTAINTY

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities that can account for a nominal measurement error. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

EUT Received Date: 06 November 2001

Testing Start Date: 06 November 2001

Testing End Date: 06 November 2001

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The tests were performed according to following regulations :

■ **- FCC Part 15:2001** ■**Class B**

Emission Test Results:

Conducted emissions, Powerline 450 kHz- 30 MHz				
Test Result	**N/A**			
Minimum limit margin	_____ dB	at	_____	MHz
Maximum limit exceeding	_____ dB	at	_____	MHz
Remarks: Battery Powered				

Radiated emissions (electric field) 30 MHz - 1000 MHz				
Test Result	**PASS**			
Minimum limit margin	21.3 dB	at	44.95	MHz
Maximum limit exceeding	_____ dB	at	_____	MHz
Remarks:				

Radiated emissions (electric field) Intentional Radiating				
Test Result	**PASS**			
Minimum limit margin	0.6 dB	at	314.2	MHz
Maximum limit exceeding	_____ dB	at	_____	MHz
Remarks:				

GENERAL REMARKS:

This device has a means for automatically limiting operation so that the duration of each transmission shall not be greter than one second and the silent period between transmissions shall be at least 30 times the duration of the transmission but in no case less than 10 seconds. – CFR 47 15.231 (e)

Modifications required to pass:

None

Test Specification Deviations: Additions to or Exclusions from:

None

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Appendix A

Test Data Sheets

and

Test Equipment Used

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Intentional Radiator Data

TÜV PRODUCT SERVICE INC 5541 Central Avenue Boulder, Colorado 80301 Tel: 303 786 7999 Fax: 303 449 3004 Rev.No 1.0

Date: 13-Nov-01 **Measured @**
EUT: Ankle-Mount Low Power RF Transmitter 314.2 MHz
Manufacturer: BI Inc.
Representative: Don Melton

Miscellaneous Measurements:	**FCC Specification kHz**	**Measurement kHz**	**Bandwidth Margin kHz**
1) 20 dB Bandwidth	785	376	409.0

Tx Mode: **Radiated Measurements**

Calculated Averaging Factor: -20 dB (20*Log(duty cycle))
Averaging Factor Applied: -20 dB

	Average Specification		**Peak Measurement dBuV/m @ MHz**		**Average Measurement dBuV/m @ MHz**		**Delta dB**
Fundamental Field Strength:	67.6	dBuV/m	87	314.2	67	314.2	-0.6

Harmonics	**Average Specification**		**Peak Measurement dBuV/m @ MHz**		**Average Measurement dBuV/m @ MHz**		**Delta dB**
2nd harmonic (628.4 MHz)	47.6	dBuV/m	51.9	628.4	31.9	628.4	-15.7
3rd harmonic (942.6 MHz)	47.6	dBuV/m	46.5	942.6	26.5	942.6	-21.1
4th harmonic (1256.8 MHz)	54	dBuV/m	46.6	1256.8	26.6	1256.8	-27.4
5th harmonic (1571 MHz)	54	dBuV/m	40.6	1571.0	20.6	1571.0	-33.4
6th harmonic (1885.2 MHz)	54	dBuV/m	44.1	1885.2	24.1	1885.2	-29.9
7th harmonic (2199.4 MHz)	54	dBuV/m	49.2	2199.5	29.2	2199.5	-24.8
8th harmonic (2513.6 MHz)	54	dBuV/m	53.9	2513.6	33.9	2513.6	-20.1
9th harmonic (2827.8 MHz)	54	dBuV/m	46.4	2827.8	26.4	2827.8	-27.6
10th harmonic (3142 MHz)	54	dBuV/m	46.7	3142.1	26.7	3142.1	-27.3

Minumum Passing Margin: **-0.6 dB**

Note 1: The harmonics of the fundamental are compaired to the limits stated in CISPR Class B, and FCC CFR47 Part 15, Class B for the fact that this limit reflects the lowest limit in the concerned bands.

Note 2: The table above stated the "Worst-case" measurement at each frequency.

Note 3: Transmission = 7.12 msec with an interval of 14.5 to 29 seconds. This is under hardware and microprocessor control

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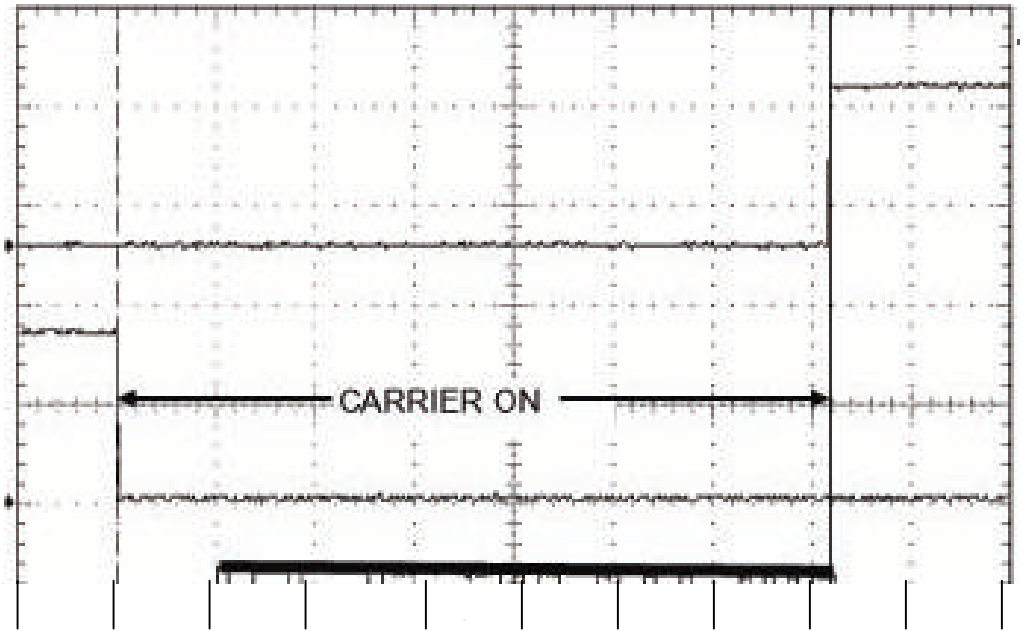

Time base = 1msec/div

Worst case carrier on time is 10 msec, normal carrier on time is 7.18 msec.

Averaging Factor = 20 log $\frac{\text{carrier on}}{100\ \text{msec}}$

= 20 log $\frac{10\text{msec}}{100\text{msec}}$

= 20 dB

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Non-Intentional Radiator Data

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Radiated Electromagnetic Emissions

Test Report #:	**BC107362 Run 03**	Test Area:	Pinewood Site 1 (3m)		
Test Method:	FCC Part 15	Test Date:	06-Nov-2001		
EUT Model #:	HG200B	EUT Power:	3.6 VDC		
EUT Serial #:	485485			Temperature:	23.3 °C
Manufacturer:	BI Incorpotated			Relative Humidity:	<26 %
EUT Description:	HG9010#2			Air Pressure:	80 kPa
Notes:	R114 = 4.3K, RF turned off			Page:	1 of 3

FREQ (MHz)	LEVEL (dBuV)	CABLE / ANT / PREAMP (dB) (dB\m) (dB)	FINAL (dBuV/m)	POL / HGT / AZ (m) (DEG)	DELTA1 (dB) FCC B (< 1GHz)	DELTA2 (dB) N/A
200 - 1000 MHz, Horizontal						
No emissions found: 0 Deg, horizontal						
No emissions found: 90 Deg, horizontal						
No emissions found: 180 Deg, horizontal						
No emissions found: 270 Deg, horizontal						
200 - 1000 MHz, Vertical						
No emissions found: 0 Deg, vertical						
No emissions found: 90 Deg, vertical						
No emissions found: 180 Deg, vertical						
No emissions found: 270 Deg, vertical						
The following are noise floor readings between 200 and 1000 MHz						
202.04	23.9 Qp	0.8 / 11.7 / 27.4	8.9	V / 1.0 / 180.0	-34.6	N/A
226.22	25.1 Qp	0.8 / 14.2 / 27.3	12.7	V / 1.0 / 180.0	-33.3	N/A
298.52	21.2 Qp	0.9 / 14.4 / 27.0	9.5	V / 1.0 / 180.0	-36.5	N/A
428.42	21.0 Qp	1.2 / 16.7 / 27.8	11.1	V / 1.0 / 180.0	-34.9	N/A
558.02	21.4 Qp	1.4 / 19.4 / 28.1	14.0	V / 1.0 / 180.0	-32.0	N/A

Tested by: Dan Dillon

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Reviewed by: Todd Seeley

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Radiated Electromagnetic Emissions

Test Report #:	**BC107362 Run 03**	Test Area:	Pinewood Site 1 (3m)			
Test Method:	FCC Part 15	Test Date:	06-Nov-2001			
EUT Model #:	HG200B	EUT Power:	3.6 VDC			
EUT Serial #:	485485			Temperature:	23.3	°C
Manufacturer:	BI Incorpotated			Relative Humidity:	<26	%
EUT Description:	HG9010#2			Air Pressure:	80	kPa
Notes:	R114 = 4.3K, RF turned off			Page:	2 of 3	

FREQ (MHz)	LEVEL (dBuV)	CABLE / ANT / PREAMP (dB) (dB\m) (dB)	FINAL (dBuV/m)	POL / HGT / AZ (m) (DEG)	DELTA1 (dB) FCC B (< 1GHz)	DELTA2 (dB) N/A
663.62	21.3 Qp	1.5 / 20.9 / 28.0	15.7	V / 1.0 / 180.0	-30.3	N/A
826.52	20.8 Qp	1.6 / 22.5 / 27.8	17.1	V / 1.0 / 180.0	-28.9	N/A
970.52	20.7 Qp	1.9 / 25.8 / 27.3	21.0	V / 1.0 / 180.0	-33.0	N/A
44.95	35.0 Qp	0.3 / 11.3 / 27.9	18.7	V / 1.0 / 0.0	-21.3	N/A
72.05	34.5 Qp	0.4 / 8.7 / 27.8	15.8	V / 1.0 / 0.0	-24.2	N/A
44.95	34.6 Qp	0.3 / 11.3 / 27.9	18.3	V / 1.0 / 90.0	-21.7	N/A
72.05	35.3 Qp	0.4 / 8.7 / 27.8	16.6	V / 1.0 / 90.0	-23.4	N/A
No higher emissions found: 180 Deg, vertical						
44.95	34.9 Qp	0.3 / 11.3 / 27.9	18.5	V / 1.0 / 270.0	-21.5	N/A
No emissions found within 10 dB, nothing maximized						
44.95	34.5 Qp	0.3 / 11.3 / 27.9	18.1	H / 1.0 / 0.0	-21.9	N/A
72.05	32.2 Qp	0.4 / 8.7 / 27.8	13.6	H / 1.0 / 0.0	-26.4	N/A
44.95	34.4 Qp	0.3 / 11.3 / 27.9	18.1	H / 1.0 / 90.0	-21.9	N/A
No higher emissions found: 180 Deg, horizontal						
No higher emissions found: 270 Deg, horizontal						
No emissions within 10 dB, nothing maximized						

Tested by: Dan Dillon

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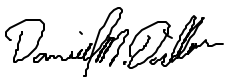

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Reviewed by: Todd Seeley

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Radiated Electromagnetic Emissions

Test Report #:	**BC107362 Run 03**	Test Area:	Pinewood Site 1 (3m)			
Test Method:	FCC Part 15	Test Date:	06-Nov-2001			
EUT Model #:	HG200B	EUT Power:	3.6 VDC			
EUT Serial #:	485485			Temperature:	23.3	°C
Manufacturer:	BI Incorpotated			Relative Humidity:	<26	%
EUT Description:	HG9010#2			Air Pressure:	80	kPa
Notes:	R114 = 4.3K, RF turned off			Page:	3 of 3	

FREQ (MHz)	LEVEL (dBuV)	CABLE / ANT / PREAMP (dB) (dB\m) (dB)	FINAL (dBuV/m)	POL / HGT / AZ (m) (DEG)	DELTA1 (dB) FCC B (< 1GHz)	DELTA2 (dB) N/A
********** **MEASUREMENT SUMMARY** **********						
44.95	35.0 Qp	0.3 / 11.3 / 27.9	18.7	V / 1.0 / 0.0	-21.3	N/A
72.05	35.3 Qp	0.4 / 8.7 / 27.8	16.6	V / 1.0 / 90.0	-23.4	N/A
826.52	20.8 Qp	1.6 / 22.5 / 27.8	17.1	V / 1.0 / 180.0	-28.9	N/A
663.62	21.3 Qp	1.5 / 20.9 / 28.0	15.7	V / 1.0 / 180.0	-30.3	N/A
558.02	21.4 Qp	1.4 / 19.4 / 28.1	14.0	V / 1.0 / 180.0	-32.0	N/A
970.52	20.7 Qp	1.9 / 25.8 / 27.3	21.0	V / 1.0 / 180.0	-33.0	N/A
226.22	25.1 Qp	0.8 / 14.2 / 27.3	12.7	V / 1.0 / 180.0	-33.3	N/A
202.04	23.9 Qp	0.8 / 11.7 / 27.4	8.9	V / 1.0 / 180.0	-34.6	N/A
428.42	21.0 Qp	1.2 / 16.7 / 27.8	11.1	V / 1.0 / 180.0	-34.9	N/A
298.52	21.2 Qp	0.9 / 14.4 / 27.0	9.5	V / 1.0 / 180.0	-36.5	N/A

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Equipment Report

06-Nov-2001

Project Number: BC107362 **Project Date:** 06-Nov-2001

Company Name: BI Inc.

Equip ID	Manufacturer	Model Number	Serial Number	Description	Calibration Date	Interval	Due	Cal Code
Test Performed								
8264	EMCO	3115	9205-3886	Horn Antenna	23-Jun-2001	12	23-Jun-2002	G
Test Performed R		Radiated Emissions						
7514	A.H.SYSTEMS	SAS-200/512	104	Log Periodic Antenna (200-1500 MHz)	26-Sep-2001	12	26-Sep-2002	G
7617	MINI-CIRCUITS LAB	ZHL-42	N052792-2	Amplifier	23-Apr-2001	12	23-Apr-2002	B
8005	HEWLETT PACKARD	8447F	3113A04923	Option H64 Dual Preamp	04-Apr-2001	12	04-Apr-2002	B
8179	EMCO	3108	2149	Biconical Dipole Antenna (30-300 MHz)	18-Jun-2001	12	18-Jun-2002	G
8213	HEWLETT PACKARD	8566B	2410A00154	Spectrum Analyzer (dc-22 GHz)	04-May-2001	12	04-May-2002	G
8214	HEWLETT PACKARD	85662A	2403A08749	Display Section	04-May-2001	12	04-May-2002	G
8215	HEWLETT PACKARD	85650A	2043A00256	Quasi Peak Adapter (set 1)	24-Aug-2001	12	24-Aug-2002	G

Cal Code Legend: G=Out Source, Y=No Cal required, R=Out of Service, B=In-House Verification Required ***1 of 1***

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Appendix B

Test Plan

and

Constructional Data Form

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Form

EMC Test Plan and Constructional Data Form

PLEASE COMPLETE THIS DOCUMENT IN FULL, ENTERING N/A IF THE FIELD IS NOT APPLICABLE.

Applicant -- ***NOTE: This information will be input into your test report as shown below.***
Press the F1 key at any time to get HELP for the current field selected.

Company: BI Incorporated

Address: 6400 Lookout Road

Boulder CO 80301

Contact: Don Melton Position: Principal Electrical Engineer

Phone: 303-218-1031 Fax: 303-218-1250

E-mail Address: don.melton@bi.com

General Equipment Description -- ***NOTE: This information will be input into your test report as shown below.***

EUT Description: Low power RF transmitter for Electronic House Arrest Monitoring

EUT Name: HomeGuard Standard Transmitter

Model No.: HG200B Serial No.: N/A

Product Options: N/A

Configurations to be tested: N/A

Test Objective

- ☐ EMC Directive 89/336/EEC (EMC)
  Std:
- ☐ Machinery Directive 89/392/EEC (EMC
  Std:
- ☐ Medical Device Directive 93/42/EEC (EMC)
  Std:
- ☐ Vehicle Directive 72/245/EEC (EMC)
  Std:
- ☐ FDA Reviewers Guidance for Premarket Notification Submissions (EMC)

- ☐ FCC: Class ☐ A ☐ B Part
- ☐ VCCI: Class ☐ A ☐ B
- ☐ BCIQ: Class ☐ A ☐ B
- ☐ Canada: Class ☐ A ☐ B
- ☐ Australia: Class ☐ A ☐ B
- ☐ Other: (1) FCC Part 15, para 15.231 (e)
  (2) Industry Canada RSS210, 6.1.1(e)

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EMC Test Plan and Constructional Data Form

TÜV Product Service Certification Requested

☐ Attestation of Conformity (AoC) ☐ International EMC Mark (IEM)
☐ Certificate of Conformity (CoC) ☐ Compliance Document
Protection Class (N/A for vehicles) ☐ Class I ☐ Class II ☐ Class III
(Press **F1** when field is selected to show additional information on Protection Class.)

Attendance

Test will be: ☒ Attended by the customer ☐ Unattended by the customer

Failure - ***Complete this section if testing will not be attended by the customer.***

If a failure occurs, TUV Product Service should:
☐ Call contact listed above, if not available then stop testing. (After hrs phone): _____
☐ Continue testing to complete test series.
☐ Continue testing to define corrective action.
☐ Stop testing.

EUT Specifications and Requirements

Length: 2" Width: .75" Height: 2.5" Weight: 3 oz

Power Requirements

Regulations require testing to be performed at typical power ratings in the countries of intended use. (i.e., European power is typically 230 VAC 50 Hz or 400 VAC 50 Hz, single and three phase, respectively)

Voltage: N/A (If battery powered, make sure battery life is sufficient to complete testing.)

# of Phases: _____

Current (Amps/phase(max)): _____ Current (Amps/phase(nominal)): _____

Other Lithium thionyl chloride primary cell, 3.6 VDC/750 mahr

Other Special Requirements

N/A

Typical Installation and/or Operating Environment

(ie. Hospital, Small Business, Industrial/Factory, etc.)
Typical installation, EUT is attached with a companion strap to the ankle of a person on Electronic House Arrest. Unit is waterproof, is worn 24 hours a day, and can operate between 0 and 50 degrees C.

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EMC Test Plan and Constructional Data Form

EUT Power Cable					
☐ Permanent	OR	☐ Removable	Length (in meters):		
☐ Shielded	OR	☐ Unshielded			
☒ Not Applicable					

EMC Test Plan and Constructional Data Form

TÜV PRODUCT SERVICE

EUT Interface Ports and Cables

Interface				Shielding								
Type	Analog	Digital	Qty	Yes	No	Type	Termination	Connector Type	Port Termination	Length (In meters)	Removable	Permanent
EXAMPLE: *RS232*	☐	☒	*2*	☒	☐	*Foil over braid*	*Coaxial*	*Metallized 9-pin D-Sub*	*Characteristic Impedance*	*6*	☒	☐
N/A	☐	☐		☐	☐						☐	☐
	☐	☐		☐	☐						☐	☐
	☐	☐		☐	☐						☐	☐
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	☐	☐		☐	☐						☐	☐

EMC Test Plan and Constructional Data Form

EUT Software.

Revision Level: N/A

Description: Special F/W for FCC test

EUT Operating Modes to be Tested -- list the operating modes to be used during test. It is recommended the equipment be tested while operating in a typical operation mode. FCC testing of personal computers and/or peripherals requires that a simple program generate a complete line of upper case H's. Provide a general description of all software, firmware, and PLD algorithms used in the equipment. List all code modules as described above, with the revision level used during testing.
Consult with your TÜV Product Service Representative if additional assistance is required.

1. EUT operating in Fast Turbo mode (normal mode is transmit in a pseudorandom time interval of 14.5 to 29 seconds. Fast turbo mode transmits the same data but at a rate of once every 0.25 second for test purposes).
2.
3.

EUT System Components -- List and describe all components which are part of the EUT. For FCC testing a minimum configuration is required. (ie. Mouse, Printer, Monitor, External Disk Drive, Motherboard, etc.)

Description	Model #	Serial #	FCC ID #
EUT Transmitter	HG200B	N/A	EUT

EMC Test Plan and Constructional Data Form

Support Equipment -- List and describe all support equipment which is not part of the EUT. (i.e. peripherals, simulators, etc)

Description	*Model #*	*Serial #*	*FCC ID #*
Activator	Tool	Tool #0687	N/A

Oscillator Frequencies

Frequency	*Derived Frequency*	*Component # / Location*	*Description of Use*
32.768 kHz	2 Hz	Y1 logic pcba	Wake-up timer @ .5-sec intervals
2.0 MHz	same	Y2 logic pcba	Microprocessor clock
9.8188 MHz	314.2 MHz	Y101 RF pcba	Generates 314.2 MHz carrier
314.2 MHz	same	U101 VCO/PLL	carrier

Power Supply

Manufacturer	*Model #*	*Serial #*	*Type*
Eagle-Picher	custom battery	N/A	☐ Switched-mode: (Frequency) _____ ☐ Linear ☒ Other: 3.6V/750ma LiSO2
			☐ Switched-mode: (Frequency) _____ ☐ Linear ☐ Other: _____

Power Line Filters

Manufacturer	*Model #*	*Location in EUT*
N/A		

EMC Test Plan and Constructional Data Form

Critical EMI Components (Capacitors, ferrites, etc.)				
Description	*Manufacturer*	*Part # or Value*	*Qty*	*Component # / Location*
N/A				

EMC Critical Detail -- Describe other EMC Design details used to reduce high frequency noise.

(PLEASE INSERT "**ELECTRONIC SIGNATURE**" BELOW IF POSSIBLE)

Authorization Signatures

Donald A. Melton	10/22/01
Customer authorization to perform tests according to this test plan.	Date
Donald A. Melton	10/22/01
Test Plan/CDF Prepared By (please print)	Date
Robert Cresswell	11/15/01
Reviewed by TÜV Product Service Associate	Date

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