

EMC EMISSION - TEST REPORT

Test Report No.

B953301

Issue Date

January 5, 2000

Model / Serial No.

Tracker / 28160

Product Type

457 kHz Avalanche Rescue Transceiver

Client

Rescue Technology, Inc.

Manufacturer

Rescue Technology, Inc.

License holder

Rescue Technology, Inc.

Address

2400 Central Avenue, Suite B-1

Boulder, CO 80301

Test Criteria Applied

FCC Part 15 15.209C

Test Start Date:

27 December 1999

Test End Date:

27 December 1999

Test Result

PASS **FAIL**

Test Report Project No.

BC1G953301

Total Pages including
Appendices

29



Reviewed By : Shawn Singh



Reviewed By : Jeffrey V. Doolittle

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FCC ID: OUNDTS1

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TÜV PRODUCT SERVICE INC

40 Meadow Road

Pinewood Springs, Lyons, CO 80540

Tel: 303 786 7999 Fax: 303 449 3004

Rev. No 1.0

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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 of ± 4 dB. 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.

EMISSIONS TEST REGULATIONS :

The tests were performed according to following regulations :

■ - Federal Communication Commission part 15	<input type="checkbox"/> - Class A	■ - Class B
■ - Federal Communication Commission part 15, Subpart C		■ - 15.209

All tests performed according to ANSI C63.4.

Emission Test Results:

Conducted emissions 150 kHz - 30 MHz

Test Result	<input type="checkbox"/> - PASS	<input type="checkbox"/> - FAIL	■ - Not Applicable
Passing Margin	_____ dB	at	_____ MHz
Failing Margin	_____ dB	at	_____ MHz
Remarks:	_____		

Radiated emissions (electric field) 30 MHz - 1000 MHz (Unintentional Radiator)

Test Result	<input type="checkbox"/> - PASS	<input type="checkbox"/> - FAIL	□ - Not Applicable
Passing Margin	_____ 23.9 dB	at	_____ 30.3 MHz
Failing Margin	_____ dB	at	_____ MHz
Remarks:	_____		

Radiated emissions (Magnetic field) 0.457 MHz - 4.57 MHz (Intentional Radiator)

Test Result	<input type="checkbox"/> - PASS	<input type="checkbox"/> - FAIL	□ - Not Applicable
Passing Margin	_____ 10.1 dB	at	_____ 0.457 MHz
Failing Margin	_____ dB	at	_____ MHz
Remarks:	_____		

GENERAL REMARKS:

Modifications required to pass: None

Test Specification Deviations: Additions to or Exclusions from: None

Test Equipment Used



Equipment Report

05-Jan-2000

Project Number: B953301

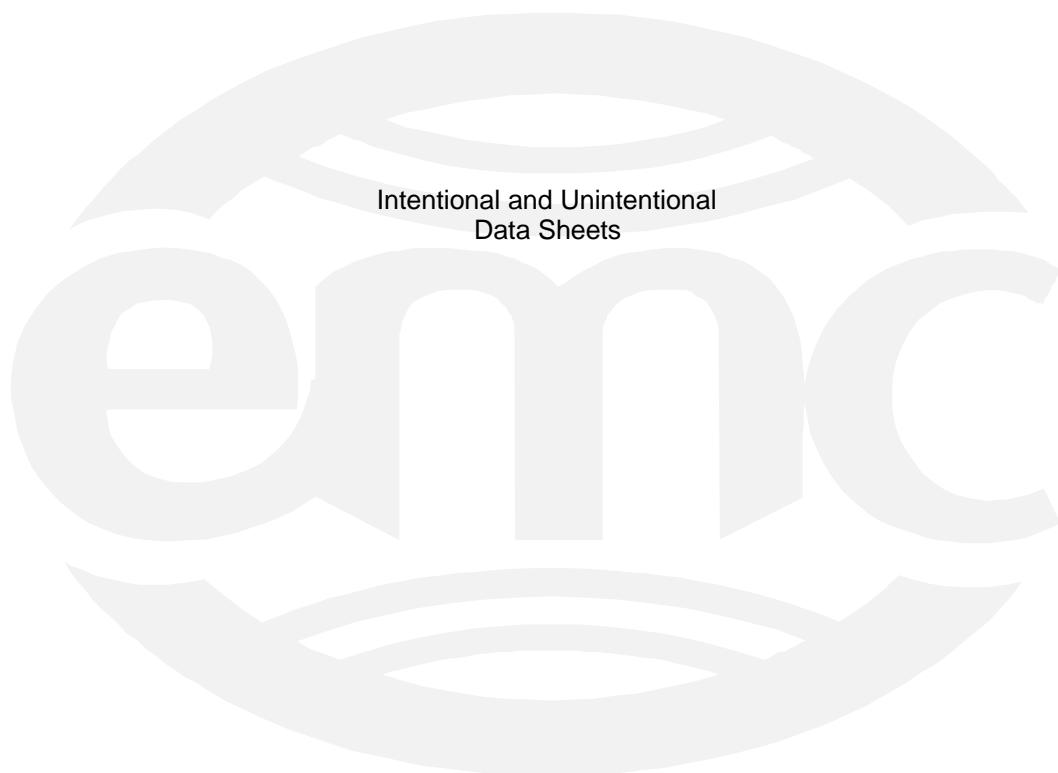
Project Date: 27-Dec-1999

Company Name: Rescue Technology, Inc.

Equip ID	Manufacturer	Model Number	Serial Number	Description	Date	Calibration Interval	Due	Cal Code
<u>Test Performed</u> R <u>Radiated Emissions</u>								
2679	HEWLETT-PACKARD	85650A	2430A00550	Quasi Peak Adapter	07-Jun-1999	12	06-Jun-2000	G
7514	A.H.SYSTEMS	SAS-200/512	104	Log Periodic Antenna (200-1500 MHz)	28-Jul-1999	12	27-Jul-2000	G
<u>Test Performed</u> R <u>Radiated Emissions</u>								
8169	EMCO	6502	9205-2738	Magnetic loop	30-Oct-1997	36	29-Oct-2000	G
8179	EMCO	3108	2149	Biconical Dipole Antenna (30-300 MHz)	28-Jun-1999	12	27-Jun-2000	G
8212	MINI CIRCUITS	ZHL-1042J-SMA	D020499-5	Amplifier	12-Feb-1999	12	12-Feb-2000	Y
8213	HEWLETT PACKARD	8566B	2410A00154	Spectrum Analyzer (dc-22 GHz)	15-Apr-1999	12	14-Apr-2000	G
8214	HEWLETT PACKARD	85662A	2403A08749	Display Section	15-Apr-1999	12	14-Apr-2000	G

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

Appendix A



Radiated Electromagnetic Emissions

Test Report #:	B9533 Run 1	Test Area:	Pinewood Site 1 (10m)		
Test Method:	15.209C	Test Date:	12-27-1999		
EUT Model #:	Tracker	EUT Power:	4.5 VDC (Fresh batteries)		
EUT Serial #:	28160				
Manufacturer:	Rescue Technology, Inc.			Temperature:	19.3 °C
EUT Description:	457 KHz Avalanche rescue transceiver.			Relative Humidity:	<18 %
Notes:	In transmit and receive mode.			Air Pressure:	81 kPa
				Page:	1 of 2

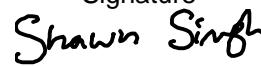
FREQ (MHz)	LEVEL (dBuV)	CABLE / ANT / PREAMP (dB)	FINAL (dBuV/m)	POL/HGT/AZ (m)/(deg)	DELTA 1 15.209C	DELTA2 None
Prescan was done to determine worst case.						
Face down was worst case.						
All frequencies are maximized, rotated loop antenna to maximize emissions.						
X axis is vertical and Y axis is horizontal.						
0.457	53.3Pk	0.0 / 10.0 / 0.0	63.3	V / 1.0 / 0.0	-10.1	N/A
No harmonics found to 10 th harmonic.						

Tested by: Dan Dillon
Printed



Signature

Reviewed by: Shawn Singh



Signature

Radiated Electromagnetic Emissions

Test Report #:	B9533 Run 1	Test Area:	Pinewood Site 1 (10m)		
Test Method:	15.209C	Test Date:	12-27-1999		
EUT Model #:	Tracker	EUT Power:	4.5 VDC (Fresh batteries)		
EUT Serial #:	28160				
Manufacturer:	Rescue Technology, Inc.			Temperature:	19.3 °C
EUT Description:	457 KHz Avalanche rescue transceiver.			Relative Humidity:	<18 %
Notes:	In transmit and receive mode.			Air Pressure:	81 kPa
				Page:	2 of 2

FREQ (MHz)	LEVEL (dBuV)	CABLE / ANT / PREAMP (dB)	FINAL (dBuV/m)	POL/HGT/AZ (m)/(deg)	DELTA 1	DELTA2
0.457	53.3Pk	0.0 / 10.0 / 0.0	63.3	V / 1.0 / 0.0	-10.1	N/A

***** MEASUREMENT SUMMARY *****

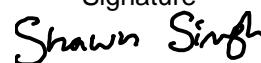
0.457	53.3Pk	0.0 / 10.0 / 0.0	63.3	V / 1.0 / 0.0	-10.1	N/A

Tested by: Dan Dillon
Printed



Signature

Reviewed by: Shawn Singh
Printed



Signature

Radiated Electromagnetic Emissions

Test Report #:	B9533 Run 2	Test Area:	Pinewood Site 1 (30m)		
Test Method:	15.209C	Test Date:	12-27-1999		
EUT Model #:	Tracker	EUT Power:	4.5 VDC (Fresh batteries)		
EUT Serial #:	28160				
Manufacturer:	Rescue Technology, Inc.			Temperature:	19.3 °C
EUT Description:	457 KHz Avalanche rescue transceiver.			Relative Humidity:	<18 %
Notes:	In transmit and receive mode.			Air Pressure:	81 kPa
				Page:	1 of 1

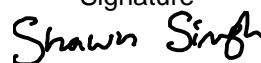
FREQ (MHz)	LEVEL (dBuV)	CABLE / ANT / PREAMP (dB)	FINAL (dBuV/m)	POL/HGT/AZ (m)/(deg)	DELTA 1 15.209	DELTA2 None
Rotated EUT 360 Deg, No emissions found.						
Checked emissions to 10 th harmonic.						

Tested by: Dan Dillon
Printed



Signature

Reviewed by: Shawn Singh



Signature

Radiated Electromagnetic Emissions

Test Report #:	B9533 Run 3	Test Area:	Pinewood Site 1 (3m)		
Test Method:	FCC B	Test Date:	12-27-1999		
EUT Model #:	Tracker	EUT Power:	4.5 VDC (Fresh batteries)		
EUT Serial #:	28160				
Manufacturer:	Rescue Technology, Inc.			Temperature:	19.3 °C
EUT Description:	457 KHz Avalanche rescue transceiver.			Relative Humidity:	<18 %
Notes:	In transmit and receive mode.			Air Pressure:	81 kPa
				Page:	1 of 5

FREQ (MHz)	LEVEL (dBuV)	CABLE / ANT / PREAMP (dB)	FINAL (dBuV/m)	POL/HGT/AZ (m)/(deg)	DELTA 1 FCC B (< 1GHz)	DELTA2 None
0 deg						
No emissions found above the receiver's noise floor.						
90 Deg						
No emissions found above the receiver's noise floor.						
180 Deg						
No emissions found above the receiver's noise floor.						
270 Deg						
No emissions found above the receiver's noise floor.						
The following are noise floor readings.						
30.30	32.4Qp	0.4 / 13.4 / 30.0	16.1	V / 1.0 / 0.0	-23.9	N/A
32.35	31.9Qp	0.4 / 13.1 / 30.0	15.4	V / 1.0 / 0.0	-24.6	N/A
56.67	31.8Qp	0.5 / 9.9 / 30.0	12.1	V / 1.0 / 0.0	-27.9	N/A
74.38	28.1Qp	0.5 / 8.2 / 30.0	6.8	V / 1.0 / 0.0	-33.2	N/A
112.00	27.2Qp	0.6 / 10.2 / 30.0	8.0	V / 1.0 / 0.0	-35.5	N/A
141.22	25.8Qp	0.7 / 12.0 / 30.0	8.4	V / 1.0 / 0.0	-35.1	N/A
Bicon antenna, horizontal polarization.						

Tested by: Dan Dillon

Printed



Signature

Reviewed by: Shawn Singh

FCC ID: OUNDTS1

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TÜV PRODUCT SERVICE INC

40 Meadow Road

Pinewood Springs, Lyons, CO 80540 Tel: 303 786 7999 Fax: 303 449 3004 Rev.No 1.0

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Radiated Electromagnetic Emissions

Test Report #:	B9533 Run 3	Test Area:	Pinewood Site 1 (3m)		
Test Method:	FCC B	Test Date:	12-27-1999		
EUT Model #:	Tracker	EUT Power:	4.5 VDC (Fresh batteries)		
EUT Serial #:	28160				
Manufacturer:	Rescue Technology, Inc.			Temperature:	19.3 °C
EUT Description:	457 KHz Avalanche rescue transceiver.			Relative Humidity:	<18 %
Notes:	In transmit and receive mode.			Air Pressure:	81 kPa
				Page:	2 of 5

FREQ (MHz)	LEVEL (dBuV)	CABLE / ANT / PREAMP (dB)	FINAL (dBuV/m)	POL/HGT/AZ (m)/(deg)	DELTA 1 FCC B (< 1GHz)	DELTA2 None
0 Deg						
No emissions found.						
90 Deg						
No emissions found.						
180 Deg						
No emissions found.						
270 Deg						
No emissions found.						
Log antenna, vertical polarization.						
0 deg						
No emissions found above the receiver's noise floor.						
90 Deg						
No emissions found.						
180 Deg						

Tested by: _____

Dan Dillon

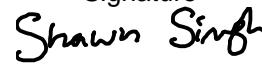
Printed



Signature

Reviewed by: _____

Shawn Singh



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FCC ID: OUNDTS1

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TÜV PRODUCT SERVICE INC

40 Meadow Road

Pinewood Springs, Lyons, CO 80540 Tel: 303 786 7999 Fax: 303 449 3004 Rev.No 1.0

Radiated Electromagnetic Emissions

Test Report #:	B9533 Run 3	Test Area:	Pinewood Site 1 (3m)		
Test Method:	FCC B	Test Date:	12-27-1999		
EUT Model #:	Tracker	EUT Power:	4.5 VDC (Fresh batteries)		
EUT Serial #:	28160				
Manufacturer:	Rescue Technology, Inc.				
EUT Description:	457 KHz Avalanche rescue transceiver.			Temperature:	19.3 °C
Notes:	In transmit and receive mode.			Relative Humidity:	<18 %
				Air Pressure:	81 kPa
				Page:	3 of 5

FREQ (MHz)	LEVEL (dBuV)	CABLE / ANT / PREAMP (dB)	FINAL (dBuV/m)	POL/HGT/AZ (m)/(deg)	DELTA 1 FCC B (< 1GHz)	DELTA2
No emissions found.						
270 Deg						
No emissions found.						
The following are noise floor readings.						
200.42	23.6Qp	0.8 / 12.2 / 30.0	6.6	V / 1.0 / 0.0	-36.9	N/A
217.89	23.4Qp	0.8 / 13.4 / 30.0	7.7	V / 1.0 / 0.0	-38.3	N/A
233.91	24.2Qp	0.8 / 14.6 / 30.0	9.7	V / 1.0 / 0.0	-36.3	N/A
298.65	23.3Qp	1.0 / 13.7 / 30.0	8.0	V / 1.0 / 0.0	-38.0	N/A
516.39	22.9Qp	1.3 / 16.9 / 30.0	11.1	V / 1.0 / 0.0	-34.9	N/A
604.29	22.9Qp	1.5 / 19.8 / 30.0	14.2	V / 1.0 / 0.0	-31.8	N/A
Log antenna, horizontal polarization.						
0 Deg						
No emissions found.						
90 Deg						
No emissions found.						
180 Deg						
No emissions found.						

Tested by: _____ Dan Dillon

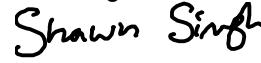
Printed



Signature

Reviewed by: _____ Shawn Singh

Printed



Signature

File No. BC1G953301, Page A7 of A9

Radiated Electromagnetic Emissions

Test Report #:	B9533 Run 3	Test Area:	Pinewood Site 1 (3m)
Test Method:	FCC B	Test Date:	12-27-1999
EUT Model #:	Tracker	EUT Power:	4.5 VDC (Fresh batteries)
EUT Serial #:	28160	Temperature:	19.3 °C
Manufacturer:	Rescue Technology, Inc.	Relative Humidity:	<18 %
EUT Description:	457 KHz Avalanche rescue transceiver.	Air Pressure:	81 kPa
Notes:	In transmit and receive mode.	Page:	4 of 5

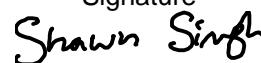
FREQ (MHz)	LEVEL (dBuV)	CABLE / ANT / PREAMP (dB)	FINAL (dBuV/m)	POL/HGT/AZ (m)/(deg)	DELTA 1 FCC B (< 1GHz)	DELTA2 None
270 Deg						
No emissions found.						

Tested by: Dan Dillon
Printed



Signature

Reviewed by: Shawn Singh
Printed



Signature

Radiated Electromagnetic Emissions

Test Report #:	B9533 Run 3	Test Area:	Pinewood Site 1 (3m)		
Test Method:	FCC B	Test Date:	12-27-1999		
EUT Model #:	Tracker	EUT Power:	4.5 VDC (Fresh batteries)		
EUT Serial #:	28160				
Manufacturer:	Rescue Technology, Inc.				
EUT Description:	457 KHz Avalanche rescue transceiver.			Temperature:	19.3 °C
Notes:	In transmit and receive mode.			Relative Humidity:	<18 %
				Air Pressure:	81 kPa
				Page:	5 of 5

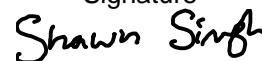
FREQ (MHz)	LEVEL (dBuV)	CABLE / ANT / PREAMP (dB)	FINAL (dBuV/m)	POL/HGT/AZ (m)/(deg)	DELTA 1 FCC B (< 1GHz)	DELTA2

***** MEASUREMENT SUMMARY *****						
30.30	32.4Qp	0.4 / 13.4 / 30.0	16.1	V / 1.0 / 0.0	-23.9	N/A
32.35	31.9Qp	0.4 / 13.1 / 30.0	15.4	V / 1.0 / 0.0	-24.6	N/A
56.67	31.8Qp	0.5 / 9.9 / 30.0	12.1	V / 1.0 / 0.0	-27.9	N/A
604.29	22.9Qp	1.5 / 19.8 / 30.0	14.2	V / 1.0 / 0.0	-31.8	N/A
74.38	28.1Qp	0.5 / 8.2 / 30.0	6.8	V / 1.0 / 0.0	-33.2	N/A
516.39	22.9Qp	1.3 / 16.9 / 30.0	11.1	V / 1.0 / 0.0	-34.9	N/A
141.22	25.8Qp	0.7 / 12.0 / 30.0	8.4	V / 1.0 / 0.0	-35.1	N/A
112.00	27.2Qp	0.6 / 10.2 / 30.0	8.0	V / 1.0 / 0.0	-35.5	N/A
233.91	24.2Qp	0.8 / 14.6 / 30.0	9.7	V / 1.0 / 0.0	-36.3	N/A
200.42	23.6Qp	0.8 / 12.2 / 30.0	6.6	V / 1.0 / 0.0	-36.9	N/A
298.65	23.3Qp	1.0 / 13.7 / 30.0	8.0	V / 1.0 / 0.0	-38.0	N/A
217.89	23.4Qp	0.8 / 13.4 / 30.0	7.7	V / 1.0 / 0.0	-38.3	N/A

Tested by: Dan Dillon
Printed



Signature

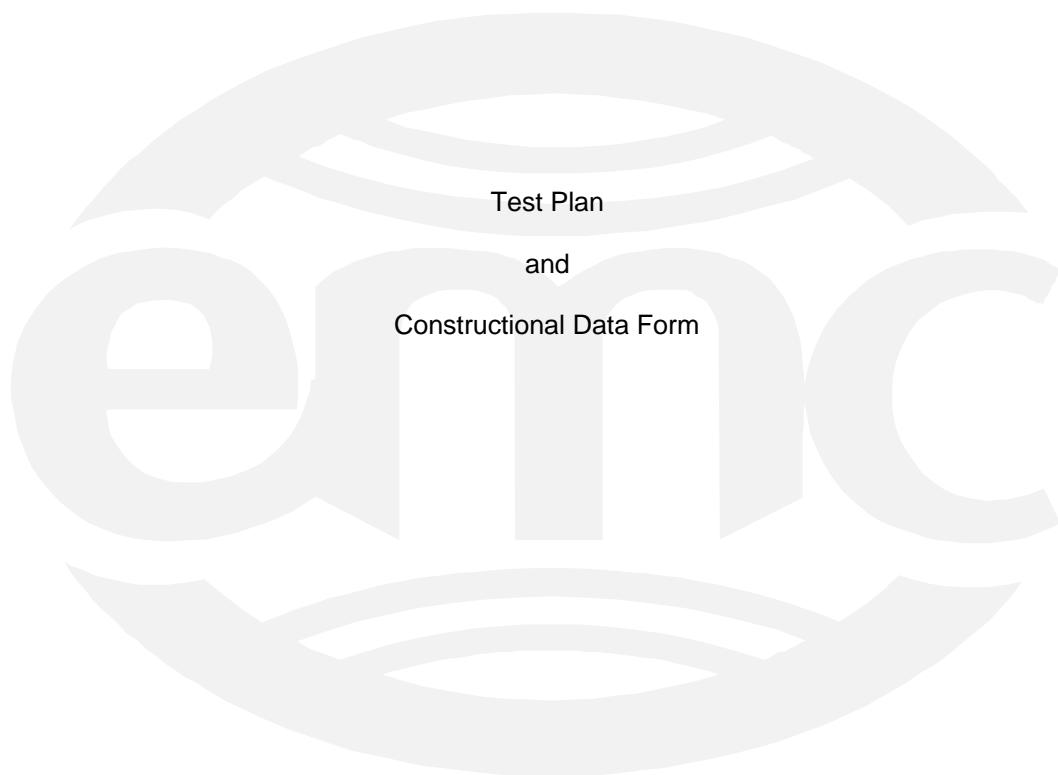


Reviewed by: Shawn Singh
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File No. BC1G953301, Page A9 of A9

Appendix B



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: Rescue Technology, Inc.
Address: 2400 Central Avenue
Suite B-1
Boulder, CO USA 80301-2843
Contact: John Hereford Position: President
Phone: 303-415-1890 Fax: 303-415-0242
E-mail Address: rescue@csd.net

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

EUT Description Avalanche Rescue Transceiver
EUT Name Tracker DTS
Model No.: Tracker Serial No.: 28160
Product Options: _____
Configurations to be tested: Transmit and receive mode

Test Objective

<input type="checkbox"/> EMC Directive 89/336/EEC (EMC) Std: _____	<input checked="" type="checkbox"/> FCC: Class <input type="checkbox"/> A <input checked="" type="checkbox"/> B Part <u>15</u>
<input type="checkbox"/> Machinery Directive 89/392/EEC (EMC) Std: _____	<input type="checkbox"/> VCCI: Class <input type="checkbox"/> A <input type="checkbox"/> B
<input type="checkbox"/> Medical Device Directive 93/42/EEC (EMC) Std: _____	<input type="checkbox"/> BCIQ: Class <input type="checkbox"/> A <input type="checkbox"/> B
<input type="checkbox"/> Vehicle Directive 72/245/EEC (EMC) Std: _____	<input checked="" type="checkbox"/> Canada: Class <input type="checkbox"/> A <input type="checkbox"/> B
<input type="checkbox"/> FDA Reviewers Guidance for Premarket Notification Submissions (EMC)	<input type="checkbox"/> Australia: Class <input type="checkbox"/> A <input type="checkbox"/> B
	<input checked="" type="checkbox"/> Other: <u>15.209C</u>

TÜV Product Service Certification Requested

<input type="checkbox"/> Attestation of Conformity (AoC)	<input type="checkbox"/> International EMC Mark (IEM)
<input type="checkbox"/> Certificate of Conformity (CoC)	<input type="checkbox"/> Compliance Document
Protection Class (N/A for vehicles)	<input type="checkbox"/> Class I <input type="checkbox"/> Class II <input type="checkbox"/> 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

EMC Test Plan and Constructional Data Form

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

If a failure occurs, TÜV 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: 5-3/4" Width: 3-1/4" Height: 1-1/4" Weight: 290 gms with strap

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: 3 - 4.6 VDC, 3 AAA batteries (If battery powered, make sure battery life is sufficient to complete testing.)

of Phases: _____

Current (Amps/phase(max)): 200 mA (for display) Current (Amps/phase(nominal)): 5 mA (receive mode)

Other _____

Other Special Requirements

Typical Installation and/or Operating Environment

(ie. Hospital, Small Business, Industrial/Factory, etc.)

Mountain Backcountry -- away from industry or residential areas

* used for skiing, snow shoeing, snow-mobiling, etc.

EUT Power Cable

<input type="checkbox"/> Permanent	OR	<input type="checkbox"/> Removable	Length (in meters): _____
<input type="checkbox"/> Shielded	OR	<input type="checkbox"/> Unshielded	
<input checked="" type="checkbox"/> Not Applicable			

EMC Test Plan and Constructional Data Form

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:	<input type="checkbox"/>	<input checked="" type="checkbox"/>	2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Foil over braid	Coaxial	Metallized 9-pin D-Sub	Characteristic Impedance	6	<input checked="" type="checkbox"/> <input type="checkbox"/>
RS232	<input type="checkbox"/>	<input checked="" type="checkbox"/>									<input type="checkbox"/> <input type="checkbox"/>
N/A	<input type="checkbox"/> <input type="checkbox"/>			<input type="checkbox"/> <input type="checkbox"/>							<input type="checkbox"/> <input type="checkbox"/>
	<input type="checkbox"/> <input type="checkbox"/>			<input type="checkbox"/> <input type="checkbox"/>							<input type="checkbox"/> <input type="checkbox"/>
	<input type="checkbox"/> <input type="checkbox"/>			<input type="checkbox"/> <input type="checkbox"/>							<input type="checkbox"/> <input type="checkbox"/>
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EMC Test Plan and Constructional Data Form**EUT Software.**

Revision Level: Trak301

Description: Firmware for 8-bit Microcontroller. Controls internal processing and user interface.

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. Transmit:

This is the default mode. The transceiver sends out a 457 kHz, A1A, CW series pulse, every 800 ms for 100 ms.

2. Receive:

In this mode, the RF, super-heterodyne system is enabled. The microcontroller processes the digitized signal strength indicator and determines the presence of a signal, calculates distance and direction, and displays it with the LED's.

3.

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

Description	Model #	Serial #	FCC ID #

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 #
N/A			

Oscillator Frequencies

Frequency	Derived Frequency	Component #/ Location	Description of Use
3.6560 MHz	457 kHz	U4	transmitter
4.036545 MHz		U1	Local Oscillator for generating IF
4.0960 MHz		U3	Microcontroller clock

Power Supply

Manufacturer	Model #	Serial #	Type
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			<input type="checkbox"/> Switched-mode: (Frequency) _____ <input type="checkbox"/> Linear <input type="checkbox"/> Other: _____

Power Line Filters

Manufacturer	Model #	Location in EUT

EMC Test Plan and Constructional Data Form

Critical EMI Components (Capacitors, ferrites, etc.)

Description	Manufacturer	Part # or Value	Qty	Component # / Location
see schematic				

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

Filtered power directly from batteries (i.e., no linear or switching supplies). Four layer PCB, with several separate digital and analog ground and power planes. Choke and capacitive filtering/decoupling at each stage and functional block. Separation of digital, RF, and IF componentry.

(PLEASE INSERT "ELECTRONIC SIGNATURE" BELOW IF POSSIBLE)

Authorization Signatures



12/23/1999

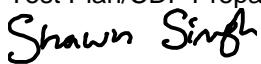
Customer authorization to perform tests according to this test plan.

Date

John W. Hereford / President

12/23/1999

Test Plan/CDF Prepared By (please print)



Date

Reviewed by TÜV Product Service Associate

12/29/1999

Date

FCC Emissions Test Plan Details

(ATTACHMENT)



If testing levels other than those desired, then indicate the requested test levels under Engineering Justifications / Test Deviations.

Standards to be Applied		
<input type="checkbox"/>	CISPR 22	
	<input type="checkbox"/> Class A	
	<input type="checkbox"/> Class B	
<input checked="" type="checkbox"/>	FCC Part <u>15.209C</u>	(list) Class _____ (list)
<input checked="" type="checkbox"/>	Other FCC Class <u>B</u>	(list)

Description	Basic Document	Requirement
Radiated & Conducted Emissions	ANSI 63.4	Reference Basic Document or Applicable Standard

Engineering Justifications / Test Deviations

Appendix C



MEASUREMENT PROTOCOL FOR FCC

GENERAL INFORMATION

Measurement Uncertainty

The test system for conducted emissions is defined as the LISN, tuned receiver or spectrum analyzer, and coaxial cable. The test system for radiated emissions is defined as the antenna, the pre-amplifier, the spectrum analyzer and the coaxial cable. These test systems have a measurement uncertainty of ± 4.5 dB. The equipment comprising the test systems are calibrated on an annual basis.

Justification

The Equipment Under Test (EUT) is configured in a typical user arrangement in accordance with the manufacturer's instructions. A cable is connected to each available port and either terminated with a peripheral into its characteristic impedance or left unterminated. When appropriate, the cables are manually manipulated with respect to each other to obtain maximum emissions from the unit.

CONDUCTED EMISSIONS

The final level, expressed in dB μ V, is arrived at by taking the reading directly from the EMI receiver. This level is compared directly to the FCC limit.

To convert between dB μ V and μ V, the following conversions apply:

$$\text{dB}\mu\text{V} = 20(\log \mu\text{V})$$

$$\mu\text{V} = \text{Inverse log}(\text{dB}\mu\text{V}/20)$$

RADIATED EMISSIONS

The final level, expressed in dB μ V/m, is arrived at by taking the reading from the spectrum analyzer (Level dB μ V) and adding the antenna correction factor and cable loss factor (Factor dB) to it. This result then has the FCC limit subtracted from it to provide the Delta which gives the tabular data as shown in the data sheets in Attachment B. The amplifier gain is automatically accounted for by using an analyzer offset.

Example:

Frequency (MHz)	Level (dB μ V)	+	Factor & Cable (dB)	=	Final (dB μ V/m)	-	FCC B Limit (dB μ V/m)	=	Delta FCC B (dB)
32.21	13.9	+	16.3	=	30.2	-	40.0	=	-9.8

DETAILS OF TEST PROCEDURES

General Standard Information

The test methods used comply with ANSI C63.4-1992 - "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz."

Conducted Emissions

Conducted emissions on the 60 Hz power interface of the EUT are measured in the frequency range of 450 kHz to 30 MHz. The measurements are performed using a receiver, which has CISPR characteristic bandwidth and quasi-peak detection, and a Line Impedance Stabilization Network (LISN), with 50 Ω/50 μH (CISPR 16) characteristics. Table top equipment is placed on a non-conducting table 80 centimeters above the floor and is positioned 40 centimeters from the vertical ground plane (wall) of the screen room. In some cases, a pre-scan using a spectrum analyzer is initially performed on the units comprising the system under test to locate the highest emissions. If the minimum passing margin appears to be less than 20 dB with a peak mode measurement, the emissions are re-measured using a tuned receiver or spectrum analyzer with quasi-peak and average detection and recorded on the data sheets.

Magnetic Field Radiated Emissions

Magnetic field radiated emissions from the EUT are measured in the frequency range of 457 kHz to 4.57 MHz using a spectrum analyzer and loop antenna. Measurements between 125 kHz and 150 kHz are made with 200 Hz/6 dB bandwidth and peak or quasi-peak detection and measurements above 150 kHz are made with 9 kHz/6dB bandwidth and peak or quasi-peak detection. Table top equipment is placed on a 1.0 X 1.5 meter non-conducting table 80 centimeters above the ground plane. Floor standing equipment is placed directly on the turntable/ground plane. Interface cables that are closer than 40 centimeters to the ground plane are bundled in the center in a serpentine fashion so they are at least 40 centimeters from the ground plane. Cables to simulators/testers (if used in this test) are routed through the center of the table and to a screen room located outside the test area. The antenna is positioned with its plane vertical at the specified distance from the EUT and rotated about its vertical axis for maximum response at each azimuth about the EUT. To locate maximum emissions from the test sample the antenna is varied in height from 1 to 4 meters, and the EUT are rotated 360 degrees.

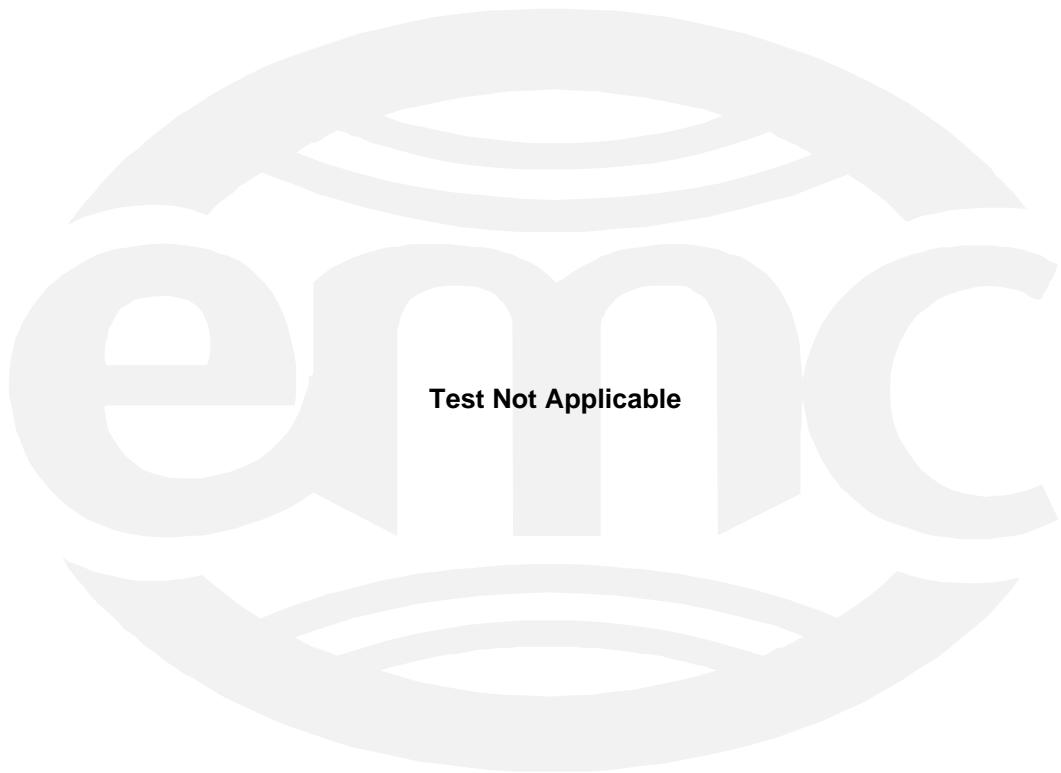
Electric Field Radiated Emissions

Radiated emissions from the EUT are measured in the frequency range of 30 to 1000 MHz using a spectrum analyzer and appropriate broadband linearly polarized antennas. Measurements between 30 MHz and 1000 MHz are made with 120 kHz/6 dB bandwidth and quasi-peak detection and measurements above 1000 MHz are made with a 1 MHz/6 dB bandwidth and peak detection. Table top equipment is placed on a 1.0 X 1.5 meter non-conducting table 80 centimeters above the ground plane. Floor standing equipment is placed directly on the turntable/ground plane. Interface cables that are closer than 40 centimeters to the ground plane are bundled in the center in a serpentine fashion so they are at least 40 centimeters from the ground plane. Cables to simulators/testers (if used in this test) are routed through the center of the table and to a screen room located outside the test area. The antenna is positioned 3 meters horizontally from the EUT . To locate maximum emissions from the test sample the antenna is varied in height from 1 to 4 meters, measurement scans are made with both horizontal and vertical antenna polarizations and the EUT are rotated 360 degrees. Intentional radiators are rotated through three orthogonal axes to determine the attitude that maximizes the emissions.

Appendix D

Test Setup Photographs
(see attached photos)

Test Setup Photo(s)
Conducted Emissions



Test Setup Photo(s)
Radiated Emissions



Test Setup Photo(s)
Radiated Emissions

