

# 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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### 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  $\pm 4$  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 :

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

-----  
All tests performed according to ANSI C63.4.

## Emission Test Results:

### Conducted emissions 150 kHz - 30 MHz

Test Result ☐ - PASS ☐ - 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 ☒ - PASS ☐ - 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 ☒ - PASS ☐ - 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

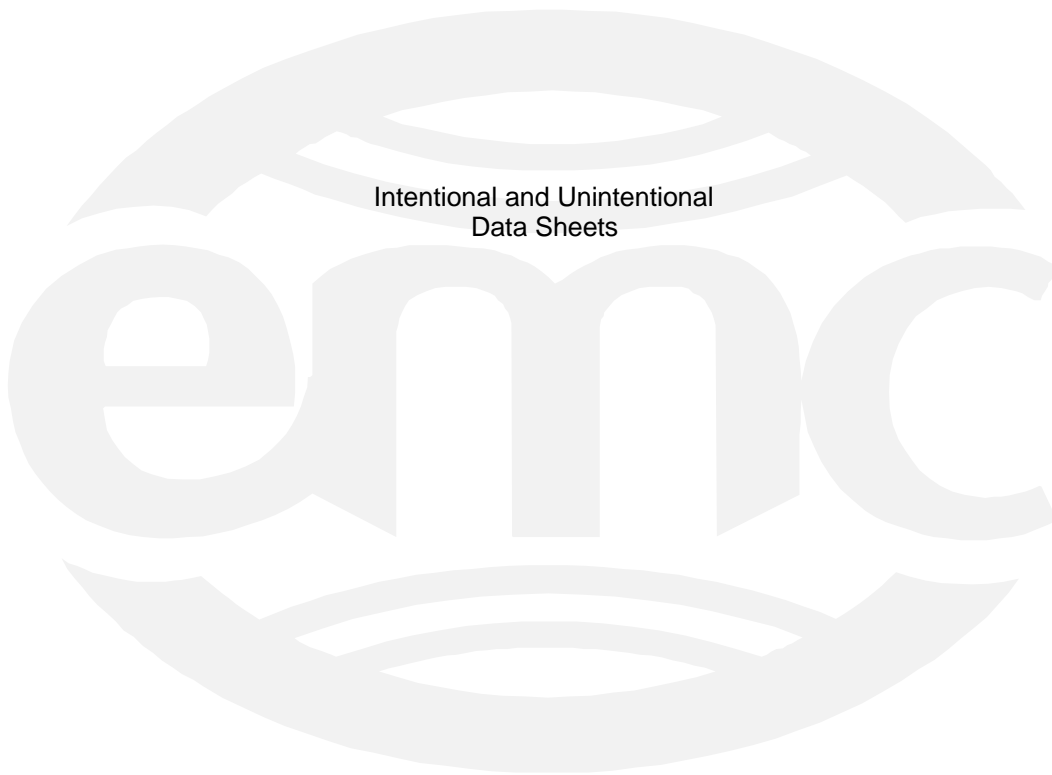
Company Name: Rescue Technology, Inc.

| Equip ID                | Manufacturer    | Model Number              | Serial Number | Description                           | Date        | Calibration Interval | Due         | Cal Code |
|-------------------------|-----------------|---------------------------|---------------|---------------------------------------|-------------|----------------------|-------------|----------|
| <u>Test Performed R</u> |                 | <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        |
| 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

Intentional and Unintentional  
Data Sheets



# Radiated Electromagnetic Emissions



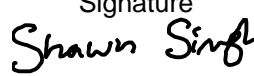
Test Report #: **B9533 Run 1** Test Area: Pinewood Site 1 (10m)  
Test Method: 15.209C Test Date: 12-27-1999  
EUT Model #: Tracker EUT Power: 4.5 VDC (Fresh batteries)  
EUT Serial #: 28160 Temperature: 19.3 °C  
Manufacturer: Rescue Technology, Inc. Relative Humidity: <18 %  
EUT Description: 457 KHz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

| FREQ<br>(MHz)  | LEVEL<br>(dBuV) | CABLE / ANT / PREAMP<br>(dB) | FINAL<br>(dBuV/m) | POL/HGT/AZ<br>(m)/(deg) | DELTA 1<br>15.209C | DELTA2<br>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 <sup>th</sup> harmonic.                           |                 |                              |                   |                         |                    |                |
|  |                 |                              |                   |                         |                    |                |

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# 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 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: 2 of 2

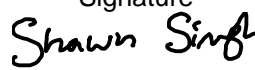
| FREQ<br>(MHz) | LEVEL<br>(dBuV) | CABLE / ANT / PREAMP<br>(dB) | FINAL<br>(dBuV/m) | POL/HGT/AZ<br>(m)/(deg) | DELTA 1<br>15.209C | DELTA2<br>None |
|---------------|-----------------|------------------------------|-------------------|-------------------------|--------------------|----------------|
|---------------|-----------------|------------------------------|-------------------|-------------------------|--------------------|----------------|

| ***** MEASUREMENT SUMMARY ***** |        |                  |      |               |       |     |
|---------------------------------|--------|------------------|------|---------------|-------|-----|
| 0.457                           | 53.3Pk | 0.0 / 10.0 / 0.0 | 63.3 | V / 1.0 / 0.0 | -10.1 | N/A |
|                                 |        |                  |      |               |       |     |

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# Radiated Electromagnetic Emissions



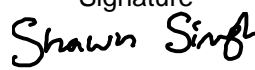
Test Report #: **B9533 Run 2** Test Area: Pinewood Site 1 (30m)  
Test Method: 15.209C Test Date: 12-27-1999  
EUT Model #: Tracker EUT Power: 4.5 VDC (Fresh batteries)  
EUT Serial #: 28160 Temperature: 19.3 °C  
Manufacturer: Rescue Technology, Inc. Relative Humidity: <18 %  
EUT Description: 457 KHz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

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

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# Radiated Electromagnetic Emissions



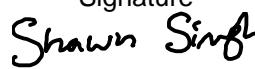
|                  |                                       |            |                           |                    |         |
|------------------|---------------------------------------|------------|---------------------------|--------------------|---------|
| Test Report #:   | <b>B9533 Run 3</b>                    | 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:              | 1 of 5  |

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

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# Radiated Electromagnetic Emissions



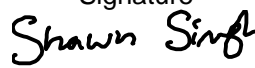
|                  |                                       |            |                           |                    |         |
|------------------|---------------------------------------|------------|---------------------------|--------------------|---------|
| Test Report #:   | <b>B9533 Run 3</b>                    | 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:              | 2 of 5  |

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

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# Radiated Electromagnetic Emissions



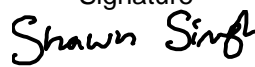
|                  |                                       |            |                           |                    |         |
|------------------|---------------------------------------|------------|---------------------------|--------------------|---------|
| Test Report #:   | <b>B9533 Run 3</b>                    | 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:              | 3 of 5  |

| FREQ<br>(MHz)                           | LEVEL<br>(dBuV) | CABLE / ANT / PREAMP<br>(dB) | FINAL<br>(dBuV/m) | POL/HGT/AZ<br>(m)/(deg) | DELTA 1<br>FCC B (< 1GHz) | DELTA2<br>None |
|---|-----------------|------------------------------|-------------------|-------------------------|---------------------------|----------------|
| 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.                     |                 |                              |                   |                         |                           |                |

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# Radiated Electromagnetic Emissions



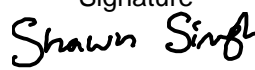
Test Report #: **B9533 Run 3** Test Area: Pinewood Site 1 (3m)  
Test Method: FCC B Test Date: 12-27-1999  
EUT Model #: Tracker EUT Power: 4.5 VDC (Fresh batteries)  
EUT Serial #: 28160 Temperature: 19.3 °C  
Manufacturer: Rescue Technology, Inc. Relative Humidity: <18 %  
EUT Description: 457 KHz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

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

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# Radiated Electromagnetic Emissions



|                  |                                       |            |                           |                    |         |
|------------------|---------------------------------------|------------|---------------------------|--------------------|---------|
| Test Report #:   | <b>B9533 Run 3</b>                    | 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:              | 5 of 5  |

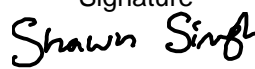
| FREQ<br>(MHz) | LEVEL<br>(dBuV) | CABLE / ANT / PREAMP<br>(dB) | FINAL<br>(dBuV/m) | POL/HGT/AZ<br>(m)/(deg) | DELTA 1<br>FCC B (< 1GHz) | DELTA2<br>None |
|---------------|-----------------|------------------------------|-------------------|-------------------------|---------------------------|----------------|
|---------------|-----------------|------------------------------|-------------------|-------------------------|---------------------------|----------------|

| ***** 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 |
|                                 |        |                   |      |               |       |     |

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## Appendix B

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

**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**

☐ Permanent      OR      ☐ Removable      Length (in meters): \_\_\_\_\_

☐ Shielded      OR      ☐ Unshielded

☒ 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                |
| <b>EXAMPLE:</b>                |                          |                                     |           |                                     |                          |                 |             |                        |                          |                    |                                     |                          |
| RS232                          | <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"/> |
| 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"/> |
|                                | <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"/> |
|                                | <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"/> |
|                                | <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"/> |
|                                | <input type="checkbox"/> | <input type="checkbox"/>            |           | <input type="checkbox"/>            | <input type="checkbox"/> |                 |             |                        |                          |                    | <input type="checkbox"/>            | <input type="checkbox"/> |

## 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. (ie. 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)

| <i>Description</i> | <i>Model #</i> | <i>Serial #</i> | <i>FCC ID #</i> |
|--------------------|----------------|-----------------|-----------------|
| N/A                |                |                 |                 |

**Oscillator Frequencies**

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

**Power Supply**

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

**Power Line Filters**

| <i>Manufacturer</i> | <i>Model #</i> | <i>Location in EUT</i> |
|---------------------|----------------|------------------------|
|                     |                |                        |
|                     |                |                        |

## 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

A handwritten signature in black ink, appearing to read 'John W. Hereford'.

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

A handwritten signature in black ink, appearing to read 'Shawn Singh'.

12/29/1999

Reviewed by TÜV Product Service Associate

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                         | 15.209C (list)     | Class _____ (list) |
| <input checked="" type="checkbox"/> | Other                            | FCC Class B (list) |                    |

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

| Engineering Justifications / Test Deviations |
|--|
|  |

## Appendix C

Measurement of Protocol



# 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  $\pm 4.5$  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 it's 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 $\mu$ 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 $\mu$ V and  $\mu$ 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 $\mu$ V/m, is arrived at by taking the reading from the spectrum analyzer (Level dB $\mu$ 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<br>(MHz) | Level<br>(dB $\mu$ V) | + | Factor &<br>Cable (dB) | = | Final<br>(dB $\mu$ V/m) | - | FCC B<br>Limit<br>(dB $\mu$ V/m) | = | Delta<br>FCC B<br>(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  $\Omega$ /50  $\mu$ H (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 Not Applicable**

Test Setup Photo(s)  
Radiated Emissions



Test Setup Photo(s)  
Radiated Emissions

