Electromagnetic Emissions Test Report
and
Application for Grant of Equipment Authorization
pursuant to
FCC Part 15, Subpart C Specifications for an
Intentional Radiator on the
ShareWave, Inc.
Model: PowerWave 2.4GHz Radio

FCC ID:	N9PSW1-2450
GRANTEE:	ShareWave, Inc. 5175 Hillsdale Circle El Dorado Hills, CA 95762
TEST SITE:	Elliott Laboratories, Inc. 684 W. Maude Avenue Sunnyvale, CA 94086
REPORT DATE:	October 20, 1998
FINAL TEST DATE:	September 11, 1998

AUTHORIZED SIGNATORY: _____

Mark Briggs
Manager, EMC Consulting Services

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SCOPE

An electromagnetic emissions test has been performed on the ShareWave spread spectrum transceiver model PowerWave 2.4GHz Radio pursuant to Subpart C of Part 15 of FCC Rules for intentional radiators. Conducted and radiated emissions data has been collected, reduced, and analyzed within this report in accordance with measurement guidelines set forth in ANSI C63.4-1992.

The intentional radiator above has been tested in a simulated typical installation to demonstrate compliance with the relevant FCC performance and procedural standards.

Final system data was gathered in a mode that tended to maximize emissions by varying orientation of EUT, orientation of power and I/O cabling, antenna search height, and antenna polarization.

Every practical effort was made to perform an impartial test using appropriate test equipment of known calibration. All pertinent factors have been applied to reach the determination of compliance.

The test results recorded herein are based on a single type test of the ShareWave model PowerWave 2.4GHz Radio and therefore apply only to the tested sample. The sample was selected and prepared by Mike Perkins of ShareWave, Inc..

OBJECTIVE

The primary objective of the manufacturer is compliance with Subpart C of Part 15 of FCC Rules for the radiated and conducted emissions of intentional radiators. Certification of these devices is required as a prerequisite to marketing as defined in Part 2 the FCC Rules.

Certification is a procedure where the manufacturer or a contracted laboratory makes measurements and submits the test data and technical information to the FCC. The FCC issues a grant of equipment authorization upon successful completion of their review of the submitted documents. Once the equipment authorization has been obtained, the label indicating compliance must be attached to all identical units which are subsequently manufactured.

STATEMENT OF COMPLIANCE

The tested sample of ShareWave model PowerWave 2.4GHz Radio complied with the requirements of Subpart C of Part 15 of the FCC Rules for low power intentional radiators.

Maintenance of FCC compliance is the responsibility of the manufacturer. Any modification of the product which may result in increased emissions should be checked to ensure compliance has been maintained (i.e., printed circuit board layout changes, different line filter, different power supply, harnessing or I/O cable changes, etc.).

EMISSION TEST RESULTS

The following emissions tests were performed on the ShareWave model PowerWave 2.4GHz Radio. The actual test results are contained in an exhibit of this report.

LIMITS OF CONDUCTED INTERFERENCE VOLTAGE

No testing was performed in accordance with FCC Part 15 Section 15.207 as the unit was powered from a battery cell during testing.

LIMITS OF ANTENNA CONDUCTED POWER

The EUT tested complied with the limits detailed in FCC Rules Part 15 Section 15.247 (d) The highest out-of-band (Un-restricted) emission recorded in any 100 kHz band was more than 20 dB below the hihgest in-band level with the device operating on center, top or bottom channel.

The actual test data and any correction factors are contained an exhibit of this report.

LIMITS OF RADIATED INTERFERENCE FIELD STRENGTH

The EUT tested complied with the limits detailed in FCC Rules Part 15 Section 15.209 in the case of emissions falling within the frequency bands specified in Section 15.205.

The following measurement was extracted from the data recorded during the radiated electric field emissions scan and represents the highest amplitude emission relative to the specification limit. The actual test data and any correction factors are contained in an exhibit of this report.

1-24 GHz High Channel

Frequency MHz	Level dBuV/m	Pol v/h	FCC 15.209 Limit	FCC 15.209 Margin	Detector	Azimuth degrees	Height meters	Comments
7363.750	51.7	h	54.0	**-2.3**	Pk	180	1.0	Peak Reading, Average Limit

1-24 GHz Central Channel

Frequency MHz	Level dBuV/m	Pol v/h	FCC 15.209 Limit	FCC 15.209 Margin	Detector	Azimuth degrees	Height meters	Comments
7326.700	51.2	v	54.0	**-2.8**	Pk	0	1.0	Peak Reading, Average Limit

1-24 GHz Low Channel

Frequency MHz	Level dBuV/m	Pol v/h	FCC 15.209 Limit	FCC 15.209 Margin	Detector	Azimuth degrees	Height meters	Comments
7664.200	51.7	h	54.0	**-1.9**	Pk	180	1.0	Peak Reading, Average Limit

LIMITS OF POWER AND BANDWIDTH

The EUT tested complied with the limits detailed in FCC Rules Part 15 Section 15.247(a)(2). The minimum 6 dB bandwidth was 18.23 MHz on the Low Channel.

The EUT tested complied with the limits detailed in FCC Rules Part 15 Section 15.247(b). The maximum power output was 19.4 dBm on the high channel.

The EUT tested complied with the limits detailed in FCC Rules Part 15 Section 15.247(d). The highest output power desnity in a 3 KHz band averaged over a 1 second period was 1.2dBm on the low channel.

The actual test data and any correction factors are contained in an exhibit of this report.

PROCESSING GAIN

The Processing Gain was measured by the manufacturer to be 13.075 dB, meeting FCC Rules Part 15 Section 15.247(e).

The actual test data and any correction factors are contained in an exhibit of this report.

SPECIFIC ABSORPTION RATE (SAR) MEASUREMENTS

A test report from APREL Laboratories, 51 Spectrum Way, Nepean, ON K2R 1E6 detailing the specific absorption rate measurements made on the ShareWave Power Wave 2.4 GHz Radio has been prepared. The measurements made showed that the product met the requirements for an uncontrolled RF Exposure environment as set forth in FCC 96-326, "Guidelines For Evaluating The Environmental Effects Of Radio Frequency Radiation". A copy of the Certificate and Engineering Summary are included in the Exhibits of this report.

EQUIPMENT UNDER TEST (EUT) DETAILS

GENERAL

The ShareWave model PowerWave 2.4GHz Radio is an spread spectrum transceiver which is designed to communicate digital information. The sample was received and tested on September 11, 1998. The EUT consisted of the following component(s):

Manufacturer/Model/Description	Serial Number
ShareWave/ PowerWave/ Radio	DEMO21

INPUT POWER

The EUT is powered from internal batteries.

PRINTED WIRING BOARDS

The EUT contained the following printed wiring boards during emissions testing:

Manufacturer/Description	Assembly #	Rev.	Serial #	Crystals (MHz)
ShareWave/Radio	200-0103-000	3	-	44

ENCLOSURE

The EUT enclosure is primarily constructed of sheet metal. It measures approximately 6.4 cm wide by 14 cm deep by .64 cm high.

SUPPORT EQUIPMENT

The following equipment was used as local support equipment for emissions testing:

Manufacturer/Model/Description	Serial Number	FCC ID Number
Dell D1025HT Monitor	8096677	AK8GDM17SE2T
Dell MMS P200s Host PC	8C74Q	E2KTERMIND
Microsoft 58264 Mouse	0372411	C3KAZB1
Dell SK-1000REV Keyboard	00087998	GYUR43SK
HP ThinkJet 2225C Printer (used during T28178 radiated emissions)	2636S40326	DSI6XU2225C

EXTERNAL I/O CABLING

The I/O cabling configuration during emissions testing was as follows:

Cable Description	Length (m)	From Unit/Port	To Unit/Port
Shielded Serial	2.0	Host PC	Keyboard
Shielded Parallel (used during T28178; radiated emissions)	1.5	Host PC	Printer
Shielded Serial	1.5	Host PC	Mouse
Shielded VGA	2.0	Host PC	Monitor
Shielded multiconductor	1.4	Host PC	EUT I/O
Coax	0.3	EUT/ Ant	Ant./connector

TEST SOFTWARE

The EUT contained test software running during testing which continuously exercised the system by transmitting and receiving network traffic. The network traffic density was approximately 80% to simulate the worst case expected in the end user environment.

TEST SITE

GENERAL INFORMATION

Final test measurements were taken on September 10, 1998 at the Elliott Laboratories Open Area Test Site #2 and September 11, 1998 at the Elliott Laboratories Open Area Test Site #3 located at 684 West Maude Avenue, Sunnyvale, California. The test sites contain separate areas for radiated and conducted emissions testing. Pursuant to section 2.948 of the Rules, construction, calibration, and equipment data has been filed with the Commission.

The FCC recommends that ambient noise at the test site be at least 6 dB below the allowable limits. Ambient levels are below this requirement with the exception of predictable local TV, radio, and mobile communications traffic. Considerable engineering effort has been expended to ensure that the facilities conform to all pertinent FCC requirements.

CONDUCTED EMISSIONS CONSIDERATIONS

Conducted emissions testing is performed in conformance with ANSI C63.4-1992. Measurements are made with the EUT connected to the public power network through a nominal, standardized RF impedance, which is provided by a line impedance stabilization network, known as a LISN. A LISN is inserted in series with each current-carrying conductor in the EUT power cord.

RADIATED EMISSIONS CONSIDERATIONS

The FCC has determined that radiation measurements made in a shielded enclosure are not suitable for determining levels of radiated emissions. Radiated measurements are performed in an open field environment. The test site is maintained free of conductive objects within the CISPR defined elliptical area incorporated in ANSI C63.4 guidelines.

MEASUREMENT INSTRUMENTATION

RECEIVER SYSTEM

An EMI receiver as specified in CISPR 16-1 is used for emissions measurements. The receivers used can measure over the frequency range of 9 kHz up to 2000 MHz. These receivers, allow both ease of measurement and high accuracy to be achieved. The receivers have Peak, Average, and CISPR (Quasi-peak) detectors built into their design so no external adapters are necessary. The receiver automatically sets the required bandwidth for the CISPR detector used during measurements.

For measurements above the frequency range of the receivers, a spectrum analyzer is utilized because it provides visibility of the entire spectrum along with the precision and versatility required to support engineering analysis. Average measurements above 1000MHz are performed on the spectrum analyzer using the linear-average method with a resolution bandwidth of 1 MHz and a video bandwidth of 10 Hz.

INSTRUMENT CONTROL COMPUTER

The receivers utilize either a Rohde and Schwarz EZM Spectrum Monitor/Controller or contain an internal Spectrum Monitor/Controller to view and convert the receiver measurements to the field strength at an antenna or voltage developed at the LISN measurement port, which is then compared directly with the appropriate specification limit. This provides faster, more accurate readings by performing the conversions described under Sample Calculations within the Test Procedures section of this report. Results are printed in a graphic and/or tabular format, as appropriate. A personal computer is used to record all measurments made with the receivers.

The Spectrum Monitor provides a visual display of the signal being measured. In addition, the controller or a personal computer run automated data collection programs which control the receivers. This provides added accuracy since all site correction factors, such as cable loss and antenna factors are added automatically.

LINE IMPEDANCE STABILIZATION NETWORK (LISN)

Line conducted measurements utilize a fifty microhenry Line Impedance Stabilization Network as the monitoring point. The LISN used also contains a 250 uH CISPR adapter. This network provides for calibrated radio frequency noise measurements by the design of the internal low pass and high pass filters on the EUT and measurement ports, respectively.

POWER METER

A power meter and thermister mount are used for all output power measurements from transmitters as they provides a broadband indication of the power output. The power meter used was the Hewlett Packard model 432A, S/N 992-05509 and the thermister mount was the Hewlett Packard model 478A, S/N 46397.

FILTERS/ATTENUATORS

External filters and precision attenuators are often connected between the receiving antenna or LISN and the receiver. This eliminates saturation effects and non-linear operation due to high amplitude transient events.

ANTENNAS

A biconical antenna is used to cover the range from 30 MHz to 300 MHz and a log periodic antenna is utilized from 300 MHz to 1000 MHz. Narrowband tuned dipole antennas are used over the entire 30 to 1000 MHz range for precision measurements of field strength.

The antenna calibration factors are included in site factors which are programmed into the test receivers

ANTENNA MAST AND EQUIPMENT TURNTABLE

The antennas used to measure the radiated electric field strength are mounted on a non-conductive antenna mast equipped with a motor-drive to vary the antenna height.

ANSI C63.4 specifies that the test height above ground for table mounted devices shall be 80 centimeters. Floor mounted equipment shall be placed on the ground plane if the device is normally used on a conductive floor or separated from the ground plane by insulating material from 3 to 12 mm if the device is normally used on a non-conductive floor. During radiated measurements, the EUT is positioned on a motorized turntable in conformance with this requirement.

INSTRUMENT CALIBRATION

All test equipment is regularly checked to ensure that performance is maintained in accordance with the manufacturer's specifications. All antennas are calibrated at regular intervals with respect to tuned half-wave dipoles. An exhibit of this report contains the list of test equipment used and calibration information.

TEST PROCEDURES

EUT AND CABLE PLACEMENT

The FCC requires that interconnecting cables be connected to the available ports of the unit and that the placement of the unit and the attached cables simulate the worst case orientation that can be expected from a typical installation, so far as practicable. To this end, the position of the unit and associated cabling is varied within the guidelines of ANSI C63.4, and the worst case orientation is used for final measurements.

CONDUCTED EMISSIONS

Conducted emissions are measured at the plug end of the power cord supplied with the EUT. Excess power cord length is wrapped in a bundle between 30 and 40 centimeters in length near the center of the cord. Preliminary measurements are made to determine the highest amplitude emission relative to the specification limit for all the modes of operation. Placement of system components and varying of cable positions are performed in each mode. A final peak mode scan is then performed in the position and mode for which the highest emission was noted on all current carrying conductors of the power cord.

RADIATED EMISSIONS

Radiated emissions measurements are performed in two phases as well. A preliminary scan of emissions is conducted in which all significant EUT frequencies are identified with the system in a nominal configuration. At least two scans are performed from 30 to 1000 MHz. One or more of these is with the antenna polarized vertically while the one or more of these is with the antenna polarized horizontally. During the preliminary scans, the EUT is rotated through 360°, the antenna height is varied and cable positions are varied to determine the highest emission relative to the limit.

A speaker is provided in the receiver to aid in discriminating between EUT and ambient emissions. Other methods used during the preliminary scan for EUT emissions involve scanning with near field magnetic loops, monitoring I/O cables with RF current clamps, and cycling power to the EUT.

Final maximization is a phase in which the highest amplitude emissions identified in the spectral search are viewed while the EUT azimuth angle is varied from 0 to 360 degrees relative to the receiving antenna. The azimuth which results in the highest emission is then maintained while varying the antenna height from one to four meters. The result is the identification of the highest amplitude for each of the highest peaks. Each recorded level is corrected in the receiver using appropriate factors for cables, connectors, antennas, and preamplifier gain. Emissions which have values close to the specification limit may also be measured with a tuned dipole antenna to determine compliance.

CONDUCTED EMISSIONS FROM ANTENNA PORT

Direct measurements are performed with the antenna port of the EUT connected to either the power meter or spectrum analyzer via a suitable attenuator and/or filter. These are used to ensure that the front end of the measurement instrument is not overloaded by the fundamental transmission.

SPECIFICATION LIMITS AND SAMPLE CALCULATIONS

The limits for conducted emissions are given in units of microvolts, and the limits for radiated emissions are given in units of microvolts per meter at a specified test distance. Data is measured in the logarithmic form of decibels relative to one microvolt, or dB microvolts (dBuV). For radiated emissions, the measured data is converted to the field strength at the antenna in dB microvolts per meter (dBuV/m). The results are then converted to the linear forms of uV and uV/m for comparison to published specifications.

For reference, converting the specification limits from linear to decibel form is accomplished by taking the base ten logarithm, then multiplying by 20. These limits in both linear and logarithmic form are as follows:

CONDUCTED EMISSIONS SPECIFICATION LIMITS, SECTION 15.207

Frequency Range (MHz)	Limit (uV)	Limit (dBuV)
0.450 to 30.000	250	48

RADIATED EMISSIONS SPECIFICATION LIMITS, SECTION 15.209

Frequency Range (MHz)	Limit (uV/m @ 3m)	Limit (dBuV/m @ 3m)
0.009-0.490	$2400/F_{KHz}$ @ 300m	$67.6-20*\log_{10}(F_{KHz})$ @ 300m
0.490-1.705	$24000/F_{KHz}$ @ 30m	$87.6-20*\log_{10}(F_{KHz})$ @ 30m
1.705 to 30	30 @ 30m	29.5 @ 30m
30 to 88	100	40
88 to 216	150	43.5
216 to 960	200	46.0
Above 960	500	54.0

SAMPLE CALCULATIONS - CONDUCTED EMISSIONS

Receiver readings are compared directly to the conducted emissions specification limit (decibel form) as follows:

$$R_r - B = C$$

and

$$C - S = M$$

where:

R_r = Receiver Reading in dBuV

B = Broadband Correction Factor*

C = Corrected Reading in dBuV

S = Specification Limit in dBuV

M = Margin to Specification in +/- dB

* Broadband Level - Per ANSI C63.4, 13 dB may be subtracted from the quasi-peak level if it is determined that the emission is broadband in nature. If the signal level in the average mode is six dB or more below the signal level in the peak mode, the emission is classified as broadband.

SAMPLE CALCULATIONS - RADIATED EMISSIONS

Receiver readings are compared directly to the specification limit (decibel form). The receiver internally corrects for cable loss, preamplifier gain, and antenna factor. The calculations are in the reverse direction of the actual signal flow, thus cable loss is added and the amplifier gain is subtracted. The Antenna Factor converts the voltage at the antenna coaxial connector to the field strength at the antenna elements. A distance factor, when used for electric field measurements, is calculated by using the following formula:

$$F_d \ = \ 20 * LOG_{10}\,(D_m/D_s)$$

where:

F_d = Distance Factor in dB

D_m = Measurement Distance in meters

D_s = Specification Distance in meters

Measurement Distance is the distance at which the measurements were taken and Specification Distance is the distance at which the specification limits are based. The antenna factor converts the voltage at the antenna coaxial connector to the field strength at the antenna elements.

The margin of a given emission peak relative to the limit is calculated as follows:

$$R_c \ = \ R_r \ + \ F_d$$

and

$$M \ = \ R_c \ - \ L_s$$

where:

R_r = Receiver Reading in dBuV/m

F_d = Distance Factor in dB

R_c = Corrected Reading in dBuV/m

L_s = Specification Limit in dBuV/m

M = Margin in dB Relative to Spec

EXHIBIT 1: Test Equipment Calibration Data

Test Equipment List - SVOATS#2

	Manufacturer/Description		Model	Asset #	Interval	Last Cal	Cal Due
☐	Com-Power	Comb Generator, 1 / 5 MHz Step	CG-515	467	6	7/29/98	1/29/99
☐	Elliott Laboratories	FCC / CISPR LISN	LISN-4, OATS	362	12	6/30/98	6/30/99
☐	Elliott Laboratories	2 x (Solar 8028 LISN + 6512 Caps)	LISN-5,	379	12	6/26/98	6/26/99
☐	EMCO	Double Ridge Horn Antenna, 1-18	3115	487	12	6/18/98	6/18/99
☑	EMCO	Double Ridge Horn Antenna, 1-18	3115	786	12	11/13/97	5/13/99
☑	EMCO	Biconical Antenna	3110B	801		6/4/97	12/4/98
☑	EMCO	Antenna, Log Periodic	3146A	802	12	6/13/97	12/13/98
☐	Hewlett Packard	Power Meter	432A	259, (F304)	12	3/10/98	3/10/99
☑	Hewlett Packard	Spectrum Analyzer	8563E	284, (F194)	24	1/14/98	1/14/2000
☑	Hewlett Packard	Microwave Preamplifier, 1-26.5	8449B	263, (F303)	12	6/8/98	6/8/99
☐	Hewlett Packard	Thermistor Mount	478A	652	12	3/10/98	3/10/99
☐	Hewlett Packard	EMC Receiver /Analyzer	8595EM	780	24	10/24/97	10/24/99
☐	Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	785	12	11/10/97	11/10/98
☐	Hewlett Packard	EMC Receiver /Analyzer	8595EM	787	12	10/27/97	10/27/98
☐	Narda-West	EMI Filter 5.6 GHz, High Pass	60583 HXF370	247	12	8/10/98	8/10/99
☑	Narda-West	EMI Filter 2.4 GHz, High Pass	60583 HPF-161	248	12	8/10/98	8/10/99
☑	Rohde & Schwarz	Test Receiver	ESN	775	12	6/22/98	6/22/99
☐	Rohde& Schwarz	Pulse Limiter	ESH3Z2	811	12	2/5/98	2/5/99

File Number: T28178

Date: 9/10/98
Engr: Rudy Suy

Test Equipment List - SVOATS#3

	Manufacturer/Description		Model	Asset #	Interval	Last Cal	Cal Due
☐	Elliott Laboratories	Biconical Antenna, 30-300 MHz	EL30.300	54, (F131)	12	11/24/97	11/24/98
☐	Elliott Laboratories	300-1000 MHz Log Periodic	EL300.1000	297, (F113)	12	11/10/97	11/10/98
☐	EMCO	Double Ridge Horn Antenna, 1-18	3115	487	12	6/18/98	6/18/99
☐	EMCO	Double Ridge Horn Antenna, 1-18	3115	786	12	11/13/97	5/13/99
☑	Fischer	LISN	FCC-LISN-50/2	810	12	1/29/98	1/29/99
☐	Hewlett Packard	Power Meter	432A	259, (F304)	12	3/10/98	3/10/99
☐	Hewlett Packard	Spectrum Analyzer	8563E	284, (F194)	24	1/14/98	1/14/2000
☐	Hewlett Packard	Microwave Preamplifier, 1-26.5	8449B	263, (F303)	12	6/8/98	6/8/99
☐	Hewlett Packard	Thermistor Mount	478A	652	12	3/10/98	3/10/99
☐	Hewlett Packard	EMC Receiver /Analyzer	8595EM	780	24	10/24/97	10/24/99
☐	Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	785	12	11/10/97	11/10/98
☐	Hewlett Packard	EMC Receiver /Analyzer	8595EM	787	12	10/27/97	10/27/98
☐	Narda-West	EMI Filter 5.6 GHz, High Pass	60583 HXF370	247	12	4/27/98	4/27/99
☐	Narda-West	EMI Filter 2.4 GHz, High Pass	60583 HPF-161	248	12	4/27/98	4/27/99
☐	Rohde &Schwarz	Test Receiver, 20-1300MHz	ESVP	213, (F196)	12	10/3/97	10/3/98
☑	Rohde & Schwarz	Test Receiver, 0.009-30 MHz	ESH3	274	12	4/8/98	4/8/99
☑	Rohde& Schwarz	Pulse Limiter	ESH3Z2	812	12	2/5/98	2/5/99
☑	Solar Electronics	High Pass Filter, fc = 8 kHz	7930-8.0	223	12	7/27/98	7/27/99

File Number: _T28186_

Date: _9/11/98_

Eng: _Jay D_

EXHIBIT 2: Test Data Log Sheets

ELECTROMAGNETIC EMISSIONS

TEST LOG SHEETS

AND

MEASUREMENT DATA

T28186   18 Pages
Processing Gain Data   25 Pages

Elliott

EMC Test Log

Client:	ShareWave, Inc.	Date:	9/11/98	Test Engr:	Rudy Suy/J. Dickinson
Product:	PowerWave 2.4GHz Radio	File:	T28186	Proj. Eng:	Mark Briggs
Objective:	Final Qualification	Site:	SVOATS #2&3	Contact:	Dale Dorando
Spec:	FCC Part 15	Page:	1 of 6	Approved:	
Revision	1.0				

```
          Ambient Conditions
    Temperature:    1 6 °C
       Humidity:    8 5 %
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Test Objective

The objective of this test session is to perform final qualification testing the EUT defined below relative to the specification(s) defined above.

Note: Runs #1-#4 were performed on 9/10/98 as T28178 at SVOATS#2.

Test Summary

Run #1a - Maximized Spurious Radiated Emissions Scan in Restricted Bands, 30-24000MHz, High Channel 2455 MHz (Peak reading-Avg Limit)

PASS   Results: FCC   -2.3 dB Pk   @ 7363.750 MHz   Horizontal

Run #1b - Maximized Radiated Emissions Scan in Restricted Bands, 30-24000MHz, Center Channel 2440 MHz (Peak reading-Avg Limit)

PASS   Results: FCC   -2.8 dB Pk   @ 7326.700 MHz   Vertical

Run #1c - Maximized Radiated Emissions Scan in Restricted Bands, 30-24000MHz, Low Channel 2425 MHz (Peak reading-Avg Limit)

PASS   Results: FCC   -1.9 dB Pk   @ 7664.200 MHz   Vertical

Run #2a - 6dB Bandwidth measurement MHz In Accordance With §15.247 (a) (2), High Channel

PASS   Results: the minimum 6dB bandwidth was 18.60 MHz, measured via direct connection meeting the minimum requirement of 500 KHz.

Run #2b - 6dB Bandwidth measurement MHz In Accordance With §15.247 (a) (2), Center Channel

PASS   Results: the minimum 6dB bandwidth was 18.3 MHz, measured via direct connection meeting the minimum requirement of 500 KHz.

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EMC Test Log

Client:	ShareWave, Inc.	Date:	9/11/98	Test Engr:	Rudy Suy/J. Dickinson
Product:	PowerWave 2.4GHz Radio	File:	T28186	Proj. Eng:	Mark Briggs
Objective:	Final Qualification	Site:	SVOATS #2&3	Contact:	Dale Dorando
Spec:	FCC Part 15	Page:	2 of 6	Approved:	
Revision	1.0				

Run #2c - 6dB Bandwidth measurement MHz In Accordance With §15.247 (a) (2), Low Channel

PASS   Results: the minimum 6dB bandwidth was 18.23 MHz, measured via direct connection meeting the minimum requirement of 500 KHz.

Run #3a - Transmitted Power Measurements In Accordance With 15.247 (b), High Channel

PASS   Results: Output power was measured to be 19.4 dBm

Run #3b - Transmitted Power Measurements In Accordance With 15.247 (b), Center Channel

PASS   Results: Output power was measured to be 19.2 dBm

Run #3c - Transmitted Power Measurements In Accordance With 15.247 (b), Low Channel

PASS   Results: Output power was measured to be 18.6 dBm

Run #4a - Power Density Measurements In Accordance With 15.247 (d), High Channel

PASS   Results: Maximum Output power density in 3 KHz bandwidth was -0.13 dBm

Run #4b - Power Density Measurements In Accordance With 15.247 (d), Center Channel

PASS   Results: Maximum Output power density in 3 KHz bandwidth was 0.87 dBm

Run #4c - Power Density Measurements In Accordance With 15.247 (d), Low Channel

PASS   Results: Maximum Output power density in 3 KHz bandwidth was 1.2 dBm

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EMC Test Log

Run #5a - Spurious Emissions In Accordance With 15.247 (d), 1MHz-26 GHz, High Channel

PASS Results: All emissions were more than 20 dB below the in-band level when measured in a 100kHz bandwidth

Run #5b - Spurious Emissions In Accordance With 15.247 (d), 1MHz-26 GHz, Center Channel

PASS Results: All emissions were more than 20 dB below the in-band level when measured in a 100kHz bandwidth

Run #5c - Spurious Emissions In Accordance With 15.247 (d), 1MHz-26 GHz, Low Channel

PASS Results: All emissions were more than 20 dB below the in-band level when measured in a 100kHz bandwidth

Note: Conducted Emissions Scan – not performed, Transmitter is powered from internal batteries.

Equipment Under Test (EUT) General Description

The EUT is a spread spectrum transceiver which is designed to communicate digital information. Normally, the EUT would be placed on a table top during operation. The EUT was, therefore, placed in this position during emissions testing to simulate the end user environment. The electrical rating of the EUT is 5 VDC, at .65 Amps.

Equipment Under Test (EUT)

Manufacturer/Model/Description	Serial Number	FCC ID Number
ShareWave/ PowerWave/ Radio	DEMO21	**TBD**

Elliott

EMC Test Log

Power Supply and Line Filters

Description	Manufacturer	Model
None	-	-

The EUT is powered from internal batteries.

Printed Wiring Boards in EUT

Manufacturer/Description	Assembly #	Rev.	Serial Number	Crystals (MHz)
ShareWave/Radio	200-0103-000	3	-	44

Subassemblies in EUT

Manufacturer/Description	Assembly Number	Rev.	Serial Number
None	-	-	-

EUT Enclosure(s)

The EUT enclosure is primarily constructed of sheet metal. It measures approximately 6.4 cm wide by 14 cm deep by .64 cm high.

EMI Suppression Devices (filters, gaskets, etc.)

Description	Manufacturer	Part Number
None	-	-

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EMC Test Log

Local Support Equipment

Manufacturer/Model/Description	Serial Number	FCC ID Number
Dell D1025HT Monitor	8096677	AK8GDM17SE2T
Dell MMS P200s Host PC	8C74Q	E2KTERMIND
Microsoft 58264 Mouse	0372411	C3KAZB1
Dell SK-1000REV Keyboard	00087998	GYUR43SK
HP ThinkJet 2225C Printer (used during T28178 radiated emissions)	2636S40326	DSI6XU2225C

Remote Support Equipment

Manufacturer/Model/Description	Serial Number	FCC ID Number
None	-	-

Interface Cabling

Cable Description	Length (m)	From Unit/Port	To Unit/Port
Shielded Serial	2.0	Host PC	Keyboard
Shielded Parallel (used during T28178; radiated emissions)	1.5	Host PC	Printer
Shielded Serial	1.5	Host PC	Mouse
Shielded VGA	2.0	Host PC	Monitor
Shielded multiconductor	1.4	Host PC	EUT I/O
Coax	0.3	EUT/ Ant	Ant./connector

Test Software

The EUT contained test software running during testing which continuously exercised the system by transmitting and receiving network traffic. The network traffic density was approximately 80% to simulate the worst case expected in the end user environment.

Client:	ShareWave, Inc.	Date:	9/11/98	Test Engr:	Rudy Suy/J. Dickinson
Product:	PowerWave 2.4GHz Radio	File:	T28186	Proj. Eng:	Mark Briggs
Objective:	Final Qualification	Site:	SVOATS #2&3	Contact:	Dale Dorando
Spec:	FCC Part 15	Page:	6 of 6	Approved:	
Revision	1.0				

General Test Conditions

During radiated testing, the EUT was connected to 120V, 60Hz power input. The EUT and all local support equipment were located on the turntable for radiated testing and conducted testing.

During conducted emissions testing, the EUT was connected to 120V, 60Hz power input as noted. A 2.5 meter X 2.5 meter ground plane was raised to a vertical position 40 cm from the EUT as shown below:

Vertical Ground Plane Raised on Outside of Building During Conducted Testing Only

Equipment Under Test Placed on Non Conductive Table Inside Non Conductive Turntable Building

2.5 meter X 2.5 meter Vertical Ground Plane Electrically Connected to OATS Ground Plane Along Bottom Edge
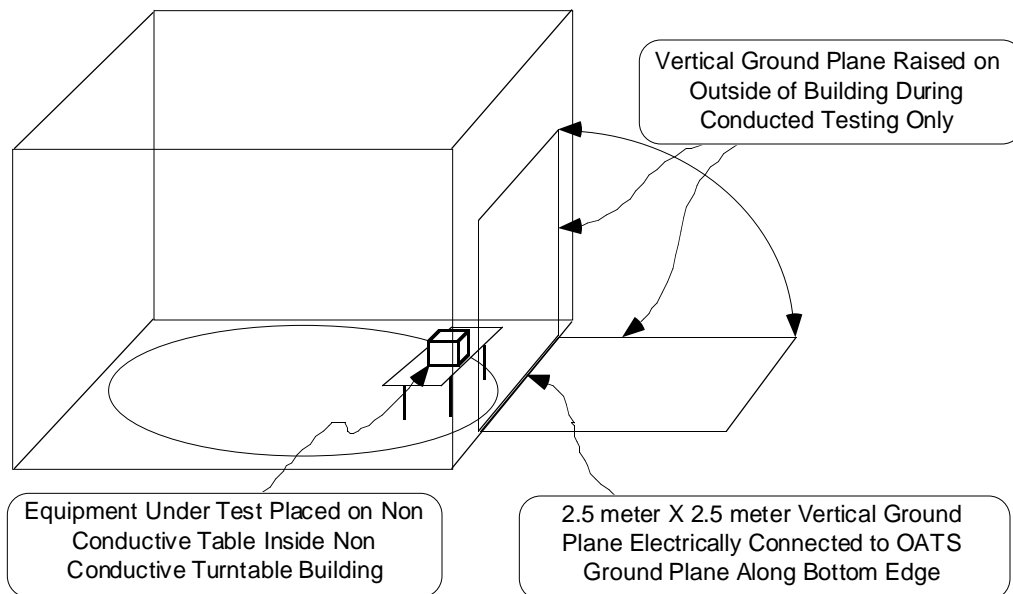
Test Data Tables

See attached data

Elliott   *Emissions Test Data*

Client:	ShareWave	Date:	9/11/98	Test Engr:	Rudy Suy
Product:	PowerWave 2.4GHz Radio	File:	D28186	Proj. Engr:	Mark Briggs
Objective	Final Qualification	Site:	SVOATS #2&3	Contact:	Dale Dorando
Spec:	FCC Part 15	Distance:	3m	Approved:	

Ambient Conditions
Temperature: 16 °C
Humidity: 85 %

Runs #1-#4 performed 9/10/98 28178 at SVOATS #2.

Run #1a: Maximized radiated scan, 1-24 GHz, Restricted Band
High Channel

Frequency	Level	Pol	FCC B	FCC B	Detector	Azimuth	Height	Comments
MHz	dBuV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
7363.750	51.7	h	54.0	**-2.3**	Pk	180	1.0	Peak Reading, Avg Limit
2488.186	43.2	v	54.0	**-10.8**	Pk	0	1.0	Peak Reading, Avg Limit
4909.583	40.6	h	54.0	**-13.4**	Avg	0	1.0	
4909.583	37.6	v	54.0	**-16.4**	Avg	180	1.0	
4909.583	51.3	h	74.0	**-22.8**	Pk	0	1.0	
4909.583	48.8	v	74.0	**-25.2**	Pk	180	1.0	

Note: Frequencies above 8GHz the antenna was placed at 1 meter distance and no emissions were seen.

Run #2a: 6 dB bandwidth measurement in accordance with part 15.247(a)(2), High Channel
RESULTS: 6dB Bandwidth Measured Directly to Antenna Port To Be 18.6MHz.

Run #3a: Transmitted Power Measurements in accordance with part 15.247(b), High Channel
RESULTS: Transmit Power Measured with Power Meter to be 19.4dBm.

Run #4a: Power Density Measurements in accordance with part 15.247(d), High Channel
RESULTS: Power Density Measured Directly to Antenna Port To Be -0.13dBm.

Run #5a: Spurious Emissions in accordance with part 15.247(d), 1 MHz - 26 GHz, High Channel
RESULTS: All emissions were more than 20 dB below the in-band level when measured in a
**   100 kHz bandwidth**

Elliott

Emissions Test Data

Client:	ShareWave	Date:	9/11/98	Test Engr:	Rudy Suy
Product:	PowerWave 2.4GHz Radio	File:	D28186	Proj. Engr:	Mark Briggs
Objective	Final Qualification	Site:	SVOATS #2&3	Contact:	Dale Dorando
Spec:	FCC Part 15	Distance:	3m	Approved:	

Run #1b: Maximized radiated scan, 1-24 GHz, Restricted Band
Center Channel

Frequency	Level	Pol	FCC B	FCC B	Detector	Azimuth	Height	Comments
MHz	dBuV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
7326.700	51.2	v	54.0	**-2.8**	Pk	0	1.0	Peak Reading, Avg Limit
4881.000	48.2	h	54.0	**-5.8**	Pk	0	1.0	Peak Reading, Avg Limit
2488.186	43.2	v	54.0	**-10.8**	Pk	0	1.0	Peak Reading, Avg Limit
4879.833	42.1	v	54.0	**-11.9**	Avg	210	1.0	
4879.833	55.4	v	74.0	**-18.6**	Pk	210	1.0	

Note: Frequencies above 8GHz the antenna was placed at 1 meter distance and no emissions were seen.

Run #2b: 6 dB bandwidth measurement in accordance with part 15.247(a)(2), Center Channel
RESULTS: 6dB Bandwidth Measured Directly to Antenna Port To Be 18.3MHz.

Run #3b: Transmitted Power Measurements in accordance with part 15.247(b), Center Channel
RESULTS: Transmit Power Measured with Power Meter to be 19.2dBm.

Run #4b: Power Density Measurements in accordance with part 15.247(d), Center Channel
RESULTS: Power Density Measured Directly to Antenna Port To Be 0.87dBm.

Run #5b: Spurious Emissions in accordance with part 15.247(d), 1 MHz-26 GHz, Center Channel
RESULTS: All emissions were more than 20 dB below the in-band level when measured in a
**   100 kHz bandwidth**

Elliott

Emissions Test Data

Client:	ShareWave	Date:	9/11/98	Test Engr:	Rudy Suy
Product:	PowerWave 2.4GHz Radio	File:	D28186	Proj. Engr:	Mark Briggs
Objective	Final Qualification	Site:	SVOATS #2&3	Contact:	Dale Dorando
Spec:	FCC Part 15	Distance:	3m	Approved:	

Run #1c: Maximized radiated scan, 1-24 GHz, Restricted Band
Low Channel

Frequency	Level	Pol	FCC B	FCC B	Detector	Azimuth	Height	Comments
MHz	dBuV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
7664.200	52.1	v	54.0	**-1.9**	Pk	0	1.0	Peak Reading, Avg Limit
2488.186	43.2	v	54.0	**-10.8**	Pk	0	1.0	Peak Reading, Avg Limit
4850.230	38.6	v	54.0	**-15.4**	Avg	20	1.0	
4850.230	38.3	h	54.0	**-15.7**	Avg	0	1.0	
4850.230	49.5	v	74.0	**-24.5**	Pk	20	1.0	
4850.230	47.8	h	74.0	**-26.2**	Pk	0	1.0	

Note: Frequencies above 8GHz the antenna was placed at 1 meter distance and no emissions were seen.

Run #2c: 6 dB bandwidth measurement in accordance with part 15.247(a)(2), Low Channel
RESULTS: 6dB Bandwidth Measured Directly to Antenna Port To Be 18.23MHz.

Run #3c: Transmitted Power Measurements in accordance with part 15.247(b), Low Channel
RESULTS: Transmit Power Measured with Power Meter to be 18.6dBm.

Run #4c: Power Density Measurements in accordance with part 15.247(d), Low Channel
RESULTS: Power Density Measured Directly to Antenna Port To Be 1.2dBm.

Run #5c: Spurious Emissions in accordance with part 15.247(d), 1 MHz-26 GHz, Low Channel
RESULTS: All emissions were more than 20 dB below the in-band level when measured in a
**   100 kHz bandwidth**

Low Channel
2425MHz

T28186

ATTEN 30dB   MKR −1.03dBm
RL 10.3dBm   10dB/   2.419GHz

DISPLAY LINE
−20.0 dBm

D
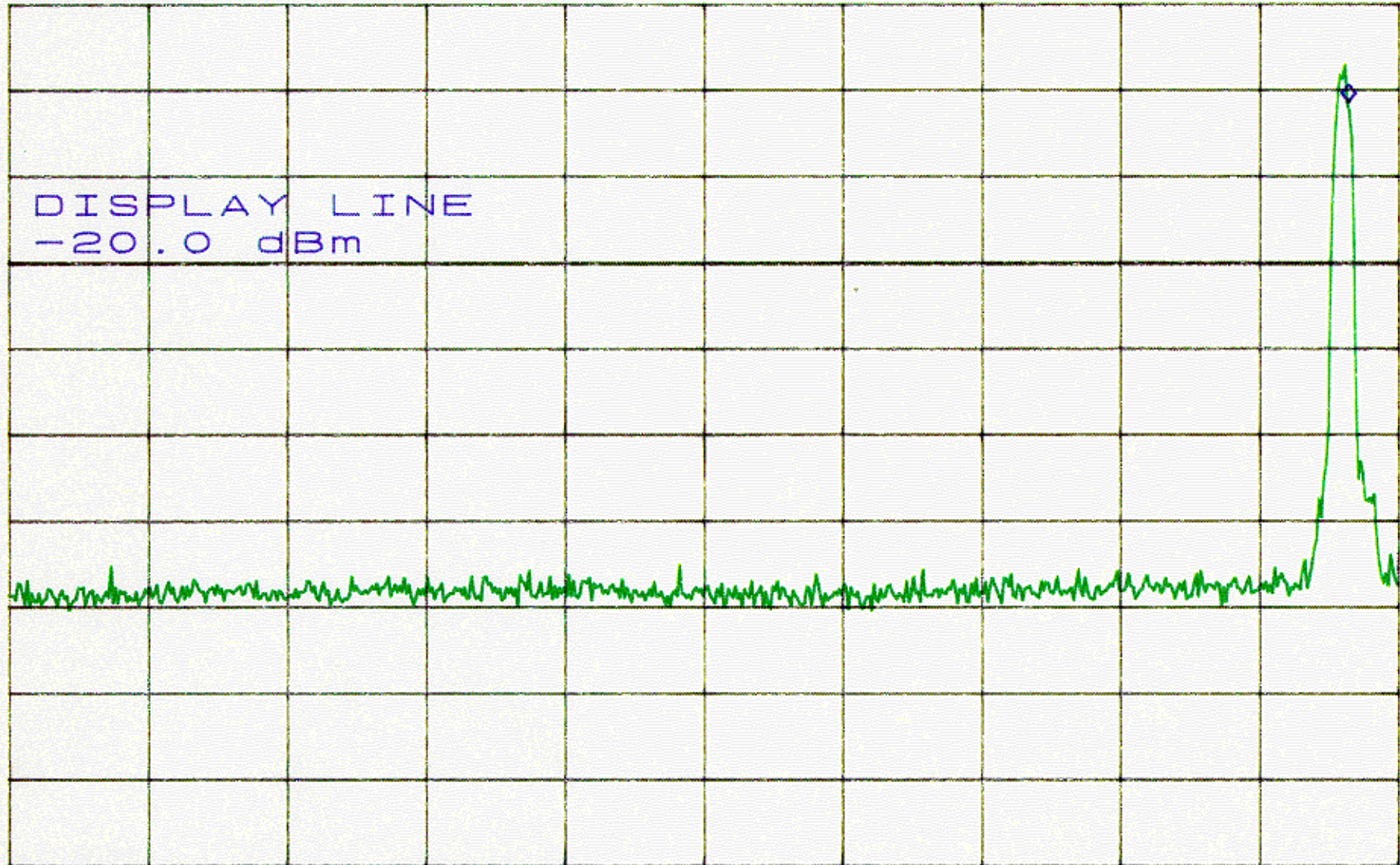
CENTER 1.398GHz   SPAN 2.203GHz
*RBW 100kHz   *VBW 300kHz   SWP 560ms

Low Channel 2425 MHz — T28186

ATTEN 20dB MKR 2.17dBm
RL 5.5dBm 10dB/ 2.428GHz

D

DISPLAY LINE
-20.0 dBm
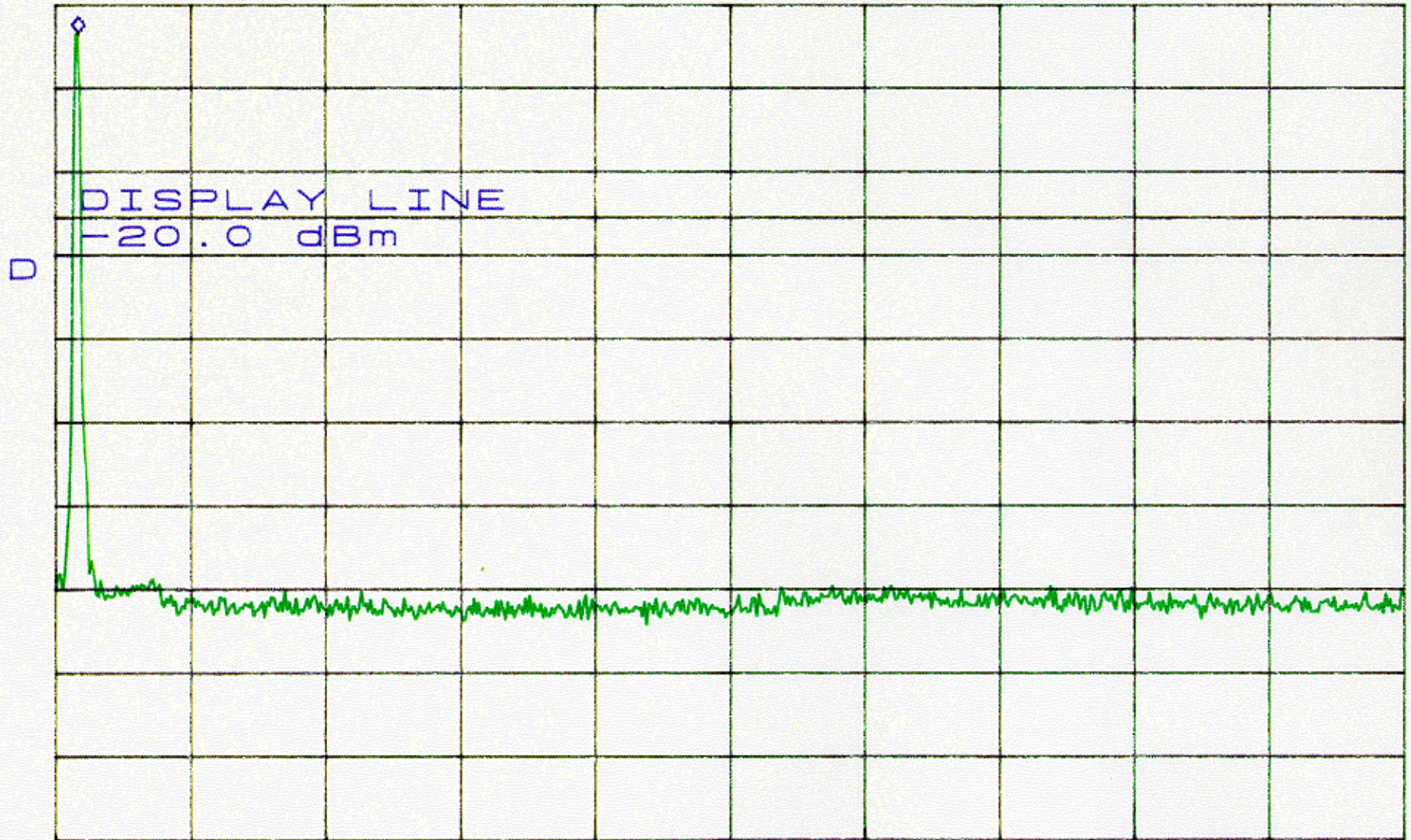
START 2.300GHz STOP 10.000GHz
*RBW 100kHz *VBW 300kHz *SWP 2.0sec

Low Channel

T28186

ATTEN 20dB

MKR −66.00dBm

RL 5.5dBm   10dB/   10.27GHz
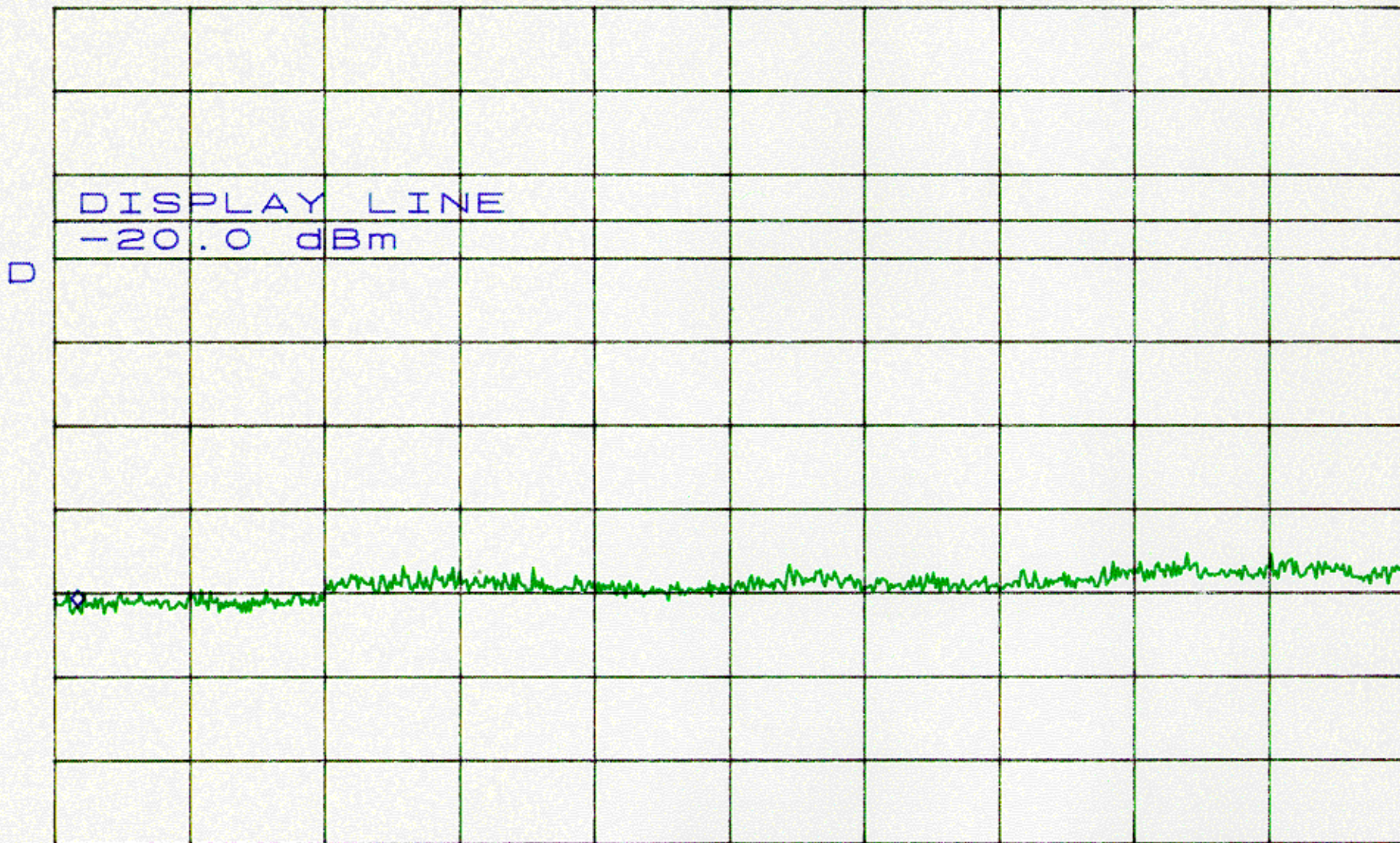
D

DISPLAY LINE
−20.0 dBm

START 10.00GHz   STOP 26.00GHz

*RBW 100kHz   *VBW 300kHz   *SWP 5.0sec

2440MHz CENTER CHANNEL   T28186

ATTEN 20dB   MKR 3.67dBm
RL 5.5dBm   10dB/   2.441GHz

D

DISPLAY LINE
−20.0 dBm

START 2.300GHz   STOP 10.000GHz
*RBW 100kHz   *VBW 300kHz   *SWP 2.0sec

T28186

2455 MHz High Channel
ATTEN 30dB   MKR 2.80dBm
RL 10.3dBm   10dB/   2.438GHz

DISPLAY LINE
-20.0 dBm

D

CENTER 1.409GHz   SPAN 2.203GHz
*RBW 100kHz   *VBW 300kHz   *SWP 2.0sec

2455 High Channel

ATTEN 20dB   MKR 3.13dBm
RL 4.8dBm   10dB/   2.454GHz

DISPLAY LINE
−20.0 dBm

D
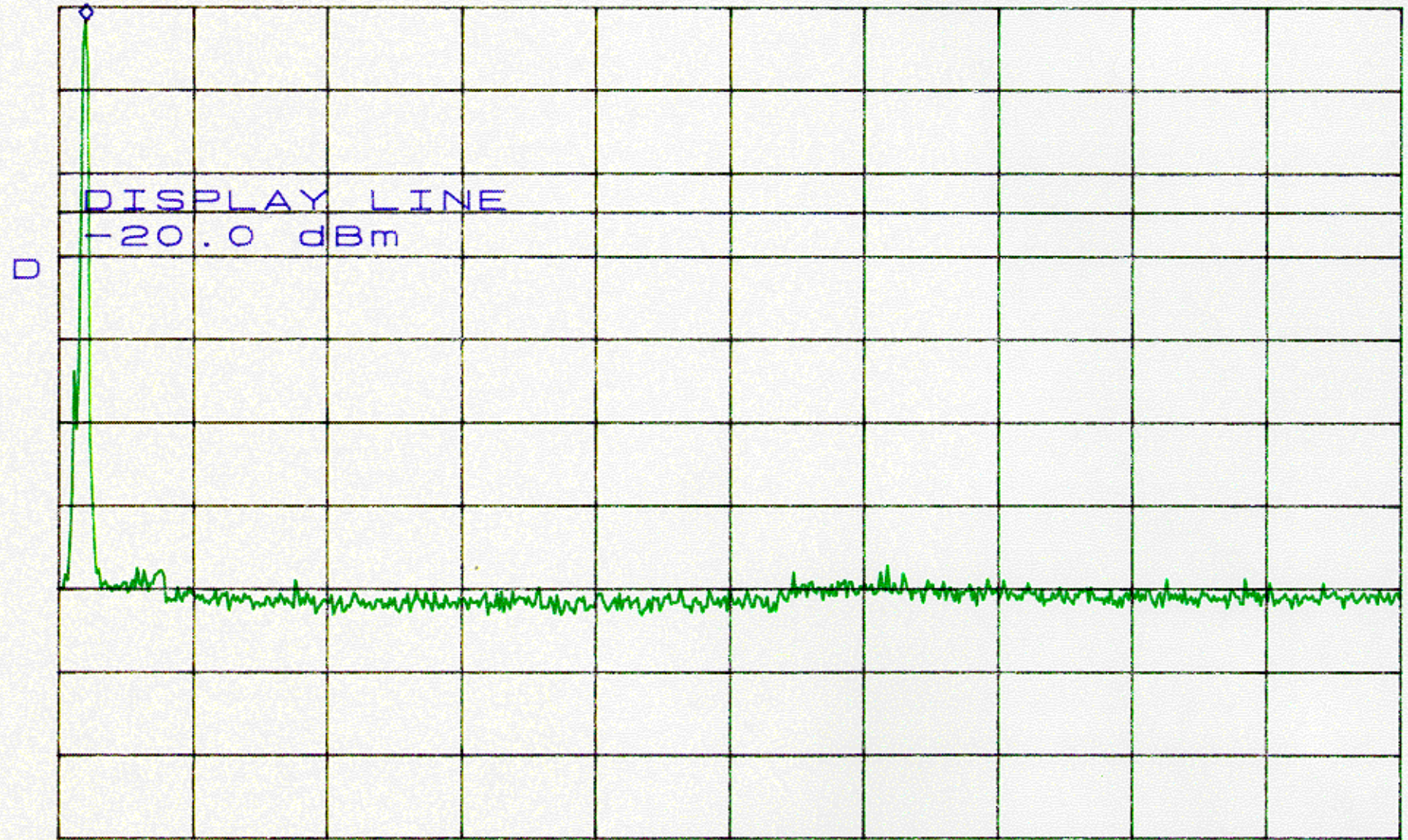
T28186

START 2.300GHz   STOP 10.000GHz
*RBW 100kHz   *VBW 300kHz   *SWP 2.0sec

2455 High Channel   T28186

ATTEN 20dB   MKR −65.33dBm
RL 5.5dBm   10dB/   10.27GHz

DISPLAY LINE
−20.0 dBm
D
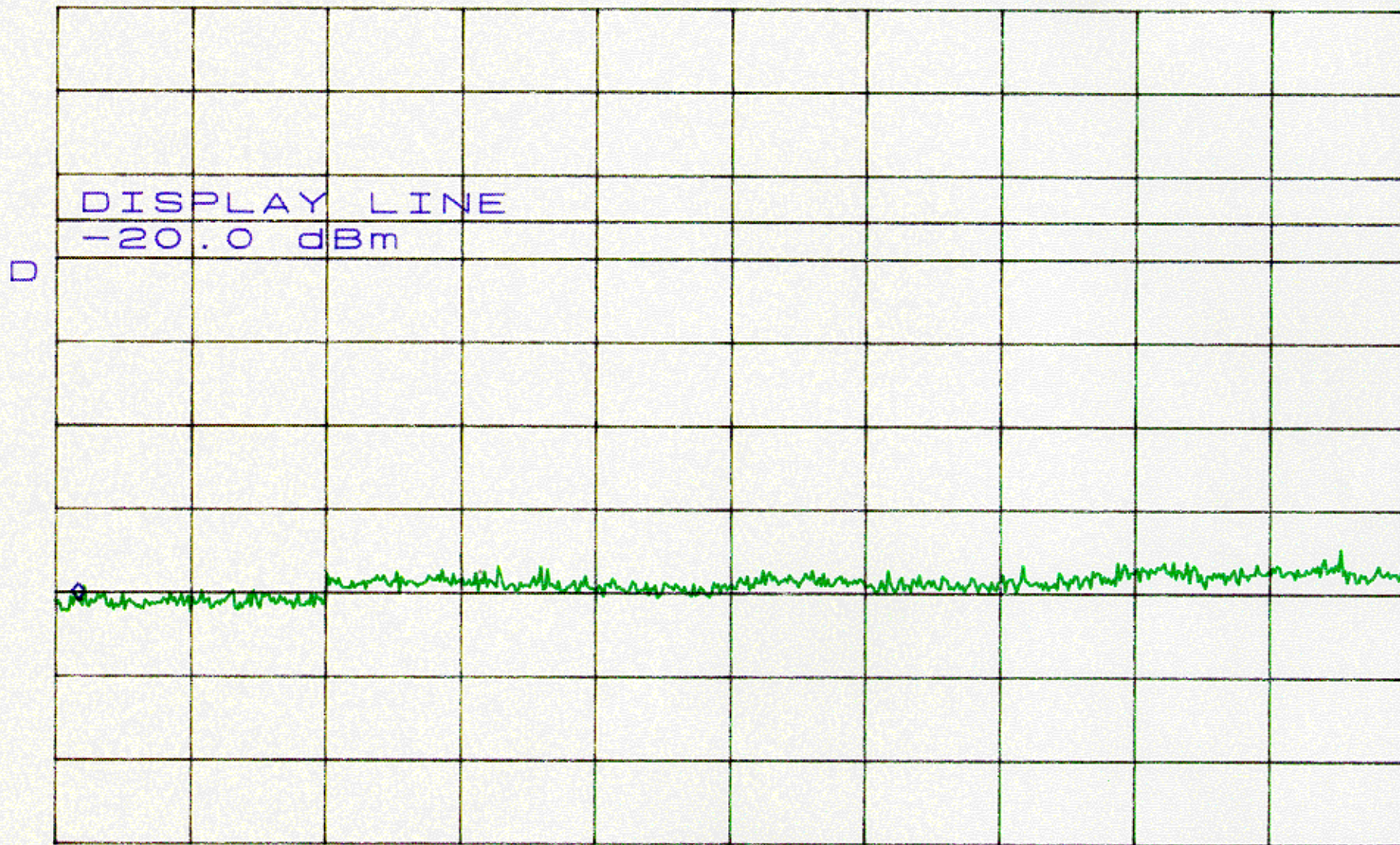
START 10.00GHz   STOP 26.00GHz
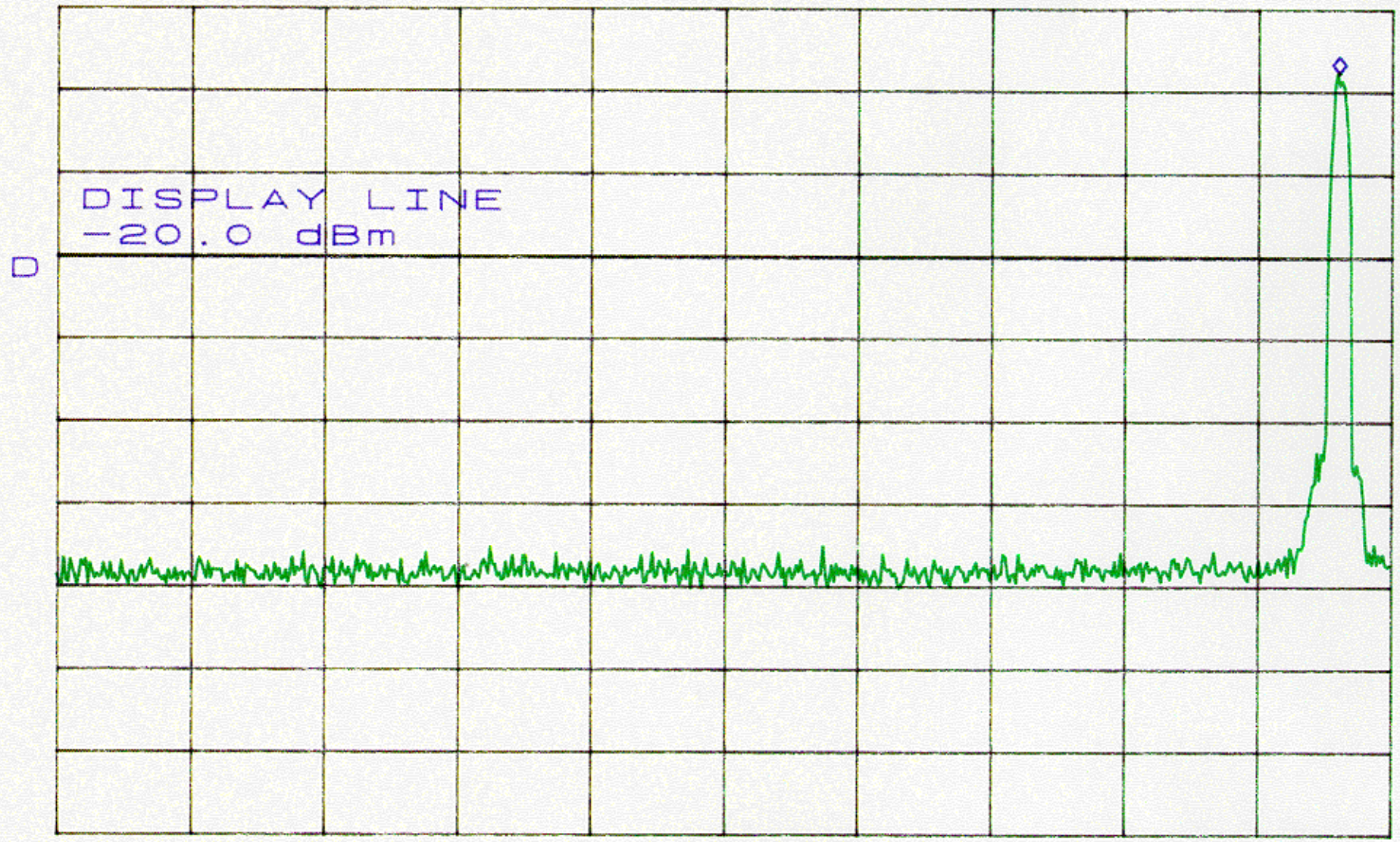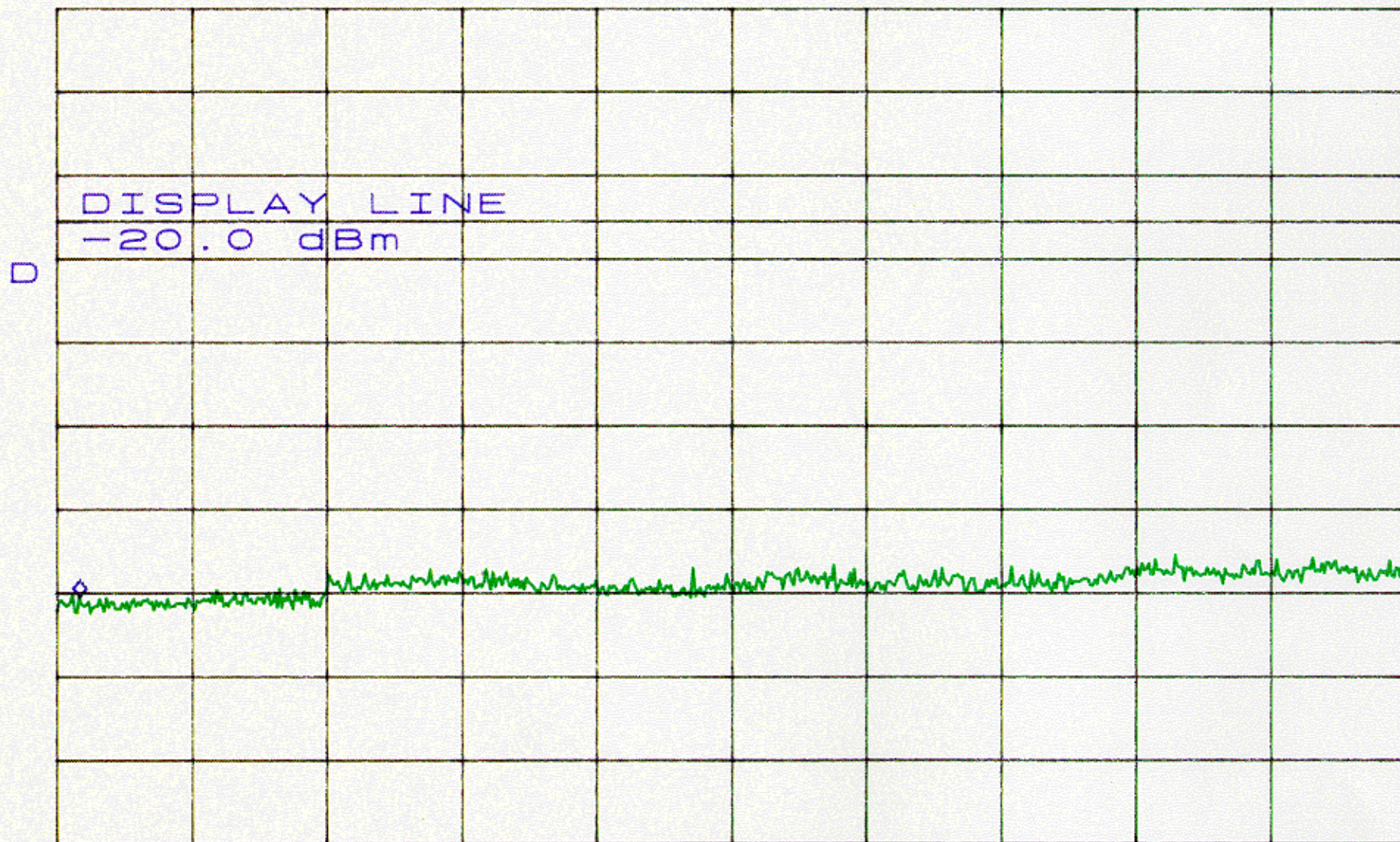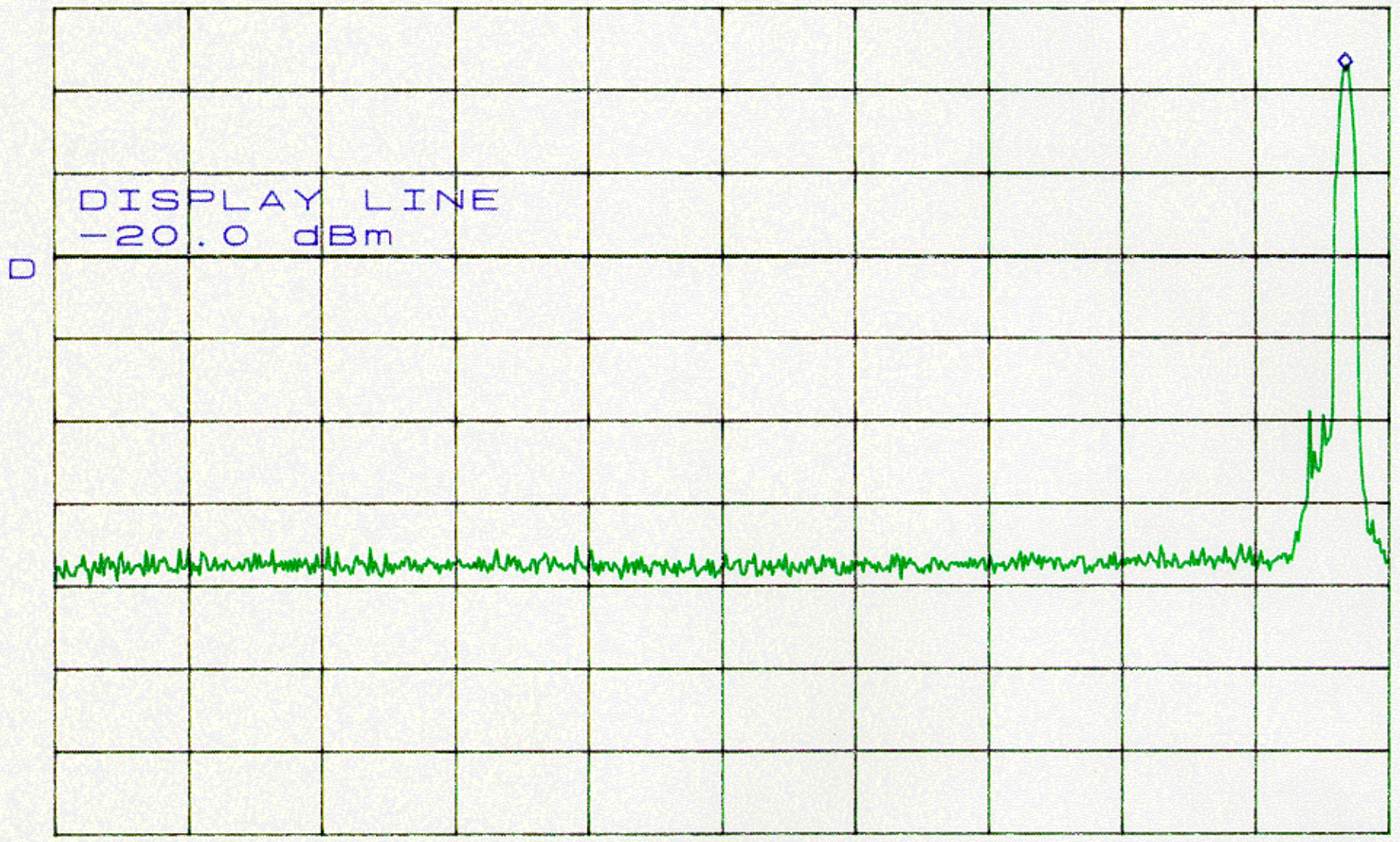*RBW 100kHz   *VBW 300kHz   *SWP 5.0sec

Process Gain of a Direct Sequence Spread Spectrum. FCC CFR 47, Para 15.247(e)

Product Name: PowerWave 3, ShareWave Inc.

FCC Requirements:

The processing gain of a direct sequence system shall be at least 10 dB. The process gain shall be determined from the ratio in dB of the signal-to-noise ratio with the system spreading code turned off to the signal-to-noise ratio with the system spreading code turned on, as measured at the demodulated output of the receiver.

Power Input
Using a 5 volt supply regulated down from a 6 Volt battery for the transmitter.
The receiver obtains its 5 V power from a PC.

Equipment:

Transmitter, ShareWave serial no.35
    Output power: 19 dBm

    Tx Controller: ShareWave set-top rev 4
    Attenuator HP 8496B set to 50 dB
    Coax, RG-316 12 feet, SMA to SMA
    Output level set to -43.2 dBm

Receiver, ShareWave serial no. 21.
    Rx Controller: ShareWave host PCI card, rev 4.

    Dell Dimension XPS P200s connected to receiver and transmitter controller via serial port.

    Coax 11" SMA to radio

    Power Splitter: HP 11667B, DC to 26.5 GHz

Generator: ESG D4000A, model E4433A, ser no. US37230713

Power Meter: Gigatronics 8542C, serial no. 1832028

Test Method - Jamming Margin Method:

The processing gain may be measured using the CW jamming margin method. Figure 1 shows the test configuration.   The test consists of stepping a signal generator in 50 kHz increments across the passband of the system.   At each point, the generator level required to produce the recommended Bit Error Rate (BER) is recorded.   This level is the jamming level.   The output power of the transmitting unit and generator are measured at the same point with the power meter.   The Jammer to Signal (J/S) ratio is calculated.   Discard the worst 20% of the J/S data points.   The lowest remaining J/S ratio is used when calculating the Process Gain.

The signal to noise ratio for an 'ideal' differentially coherent detection of a differentially encoded QPSK receiver can be derived from the Bit Error Probability (Pb) versus the Signal-to-Noise ratio $(S/N)_0$.

For the measurements of the $(S/N)_0$ we use the Pb of 1.0xE-6 minimum.

Ref: Viterbi, A.J. Principles of Coherent Communications (New York: McGraw-Hill 1966), Pg. 207.
Haykin, Simon. Digital Communications (New York: John Wiley & Sons, Inc. 1988) p-p 289, 343

Using equation (7.48) shown on page 289 of Haykin, calculate the signal to noise ratio required for your chosen BER. This value and the measured J/S ratio are used in the following equation to calculate the process gain (Gp) of the system.

Gp = (S/N)$_0$ + Mj + Lsys

Where

(S/N)$_0$: The theoretical signal to noise ratio required to maintain normal operation just before the limit of the BER. In real measurements the maximum error of 0.001 is allowed in an ideal system using this modulation scheme with all codes turned off (i.e., no spreading or process gain).

Mj: Maximum Jammer to Signal Ratio that was recorded at the detected BER.

Lsys: System losses such as non-ideal synchronization, tracking circuitry, non-optimal baseband filtering, and etc… These losses can be in excess of 3 dB for each transmitter and receiver pair, For the purpose of this processing gain calculation we assume an Lsys of 2 dB.

Ref.:   Dixon, R, Spread Spectrum Systems. (New York: Wiley, 1984), Chapter 1.

Test results

The minimum processing gain after discarding the worst 20% of the data was 13.075 dB.

Test personnel

Dale Dorando

Date

Sept. 28, 1998

Processing gain of a direct sequence spread spectrum, FCC CFR 47, Part 15.247 (e)

Measured Data:

Sig. Gen. Freq. [MHz]	Bit error rate (BER)	(S/N)o [dB]	L sys [dB]	Sig. Gen. Total Peak Power @ RX [dBm]	TX Total Peak Power @ RX [dBm]	Jammer to Signal Ratio Mj [dB]	Processing Gain (PG) [dB]
2420.000	6.60E-07	10.68	2	-34.02	-43.2	9.18	21.861
2420.050	5.58E-07	10.74	2	-34.12	-43.2	9.08	21.821
2420.100	4.33E-07	10.83	2	-34.32	-43.2	8.88	21.709
2420.150	3.40E-07	10.91	2	-34.32	-43.2	8.88	21.792
2420.200	2.10E-07	11.07	2	-34.52	-43.2	8.68	21.753
2420.250	3.40E-07	10.91	2	-34.52	-43.2	8.68	21.592
2420.300	4.36E-07	10.83	2	-34.72	-43.2	8.48	21.307
2420.350	5.55E-07	10.74	2	-34.72	-43.2	8.48	21.223
2420.400	6.40E-07	10.69	2	-34.82	-43.2	8.38	21.072
2420.450	4.43E-07	10.82	2	-34.92	-43.2	8.28	21.101
2420.500	4.23E-07	10.84	2	-35.02	-43.2	8.18	21.017
2420.550	4.10E-07	10.85	2	-35.02	-43.2	8.18	21.028
2420.600	5.30E-07	10.76	2	-35.52	-43.2	7.68	20.439
2420.650	2.60E-07	11	2	-35.52	-43.2	7.68	20.682
2420.700	3.50E-07	10.9	2	-35.72	-43.2	7.48	20.382
2420.750	4.00E-07	10.86	2	-36.02	-43.2	7.18	20.037
2420.800	3.60E-07	10.89	2	-36.32	-43.2	6.88	19.773
2420.850	4.00E-07	10.86	2	-36.52	-43.2	6.68	19.537
2420.900	5.30E-07	10.76	2	-37.02	-43.2	6.18	18.939
2420.950	6.75E-07	10.67	2	-37.02	-43.2	6.18	18.853
2421.000	7.34E-07	10.64	2	-37.32	-43.2	5.88	18.523
2421.050	4.38E-07	10.83	2	-37.32	-43.2	5.88	18.705
2421.100	3.27E-07	10.93	2	-37.52	-43.2	5.68	18.605
2421.150	2.44E-07	11.02	2	-37.52	-43.2	5.68	18.703
2421.200	6.75E-07	10.67	2	-37.62	-43.2	5.58	18.253
2421.250	7.30E-07	10.65	2	-37.52	-43.2	5.68	18.325
2421.300	4.35E-07	10.83	2	-37.72	-43.2	5.48	18.308
2421.350	3.00E-07	10.95	2	-37.82	-43.2	5.38	18.334
2421.400	2.44E-07	11.02	2	-37.62	-43.2	5.58	18.603
2421.450	4.20E-07	10.84	2	-37.62	-43.2	5.58	18.42
2421.500	7.50E-07	10.64	2	-37.62	-43.2	5.58	18.215
2421.550	6.73E-07	10.67	2	-37.82	-43.2	5.38	18.054
2421.600	5.63E-07	10.74	2	-37.82	-43.2	5.38	18.118
2421.650	3.28E-07	10.92	2	-37.82	-43.2	5.38	18.304
2421.700	7.22E-07	10.65	2	-37.82	-43.2	5.38	18.029

Processing gain of a direct sequence spread spectrum, FCC CFR 47, Part 15.247 (e)

Measured Data:

Sig. Gen. Freq. [MHz]	Bit error rate (BER)	(S/N)o [dB]	L sys [dB]	Sig. Gen. Total Peak Power @ RX [dBm]	TX Total Peak Power @ RX [dBm]	Jammer to Signal Ratio Mj [dB]	Processing Gain (PG) [dB]
2421.750	3.38E-07	10.91	2	-37.82	-43.2	5.38	18.294
2421.800	5.20E-07	10.77	2	-37.82	-43.2	5.38	18.146
2421.850	4.80E-07	10.79	2	-37.72	-43.2	5.48	18.274
2421.900	3.65E-07	10.89	2	-37.72	-43.2	5.48	18.368
2421.950	6.00E-07	10.72	2	-37.82	-43.2	5.38	18.095
2422.000	5.56E-07	10.74	2	-37.82	-43.2	5.38	18.122
2422.050	4.33E-07	10.83	2	-37.31	-43.2	5.89	18.719
2422.100	3.48E-07	10.9	2	-37.42	-43.2	5.78	18.684
2422.150	2.11E-07	11.07	2	-37.42	-43.2	5.78	18.851
2422.200	3.43E-07	10.91	2	-37.42	-43.2	5.78	18.689
2422.250	4.30E-07	10.83	2	-37.42	-43.2	5.78	18.612
2422.300	5.50E-07	10.75	2	-37.52	-43.2	5.68	18.426
2422.350	5.68E-07	10.74	2	-37.72	-43.2	5.48	18.215
2422.400	4.43E-07	10.82	2	-37.72	-43.2	5.48	18.301
2422.450	4.23E-07	10.84	2	-37.72	-43.2	5.48	18.317
2422.500	4.11E-07	10.85	2	-37.92	-43.2	5.28	18.127
2422.550	5.00E-07	10.78	2	-37.92	-43.2	5.28	18.059
2422.600	2.44E-07	11.02	2	-37.92	-43.2	5.28	18.303
2422.650	3.33E-07	10.92	2	-37.92	-43.2	5.28	18.199
2422.700	4.34E-07	10.83	2	-38.02	-43.2	5.18	18.008
2422.750	3.55E-07	10.9	2	-38.02	-43.2	5.18	18.077
2422.800	4.86E-07	10.79	2	-38.02	-43.2	5.18	17.969
2422.850	5.32E-07	10.76	2	-38.02	-43.2	5.18	17.938
2422.900	6.70E-07	10.68	2	-39.02	-43.2	4.18	16.856
2422.950	7.30E-07	10.65	2	-39.02	-43.2	4.18	16.825
2423.000	4.30E-07	10.83	2	-39.02	-43.2	4.18	17.012
2423.050	3.22E-07	10.93	2	-39.02	-43.2	4.18	17.11
2423.100	2.44E-07	11.02	2	-39.02	-43.2	4.18	17.203
2423.150	1.10E-07	11.28	2	-40.02	-43.2	3.18	16.459
2423.200	2.24E-07	11.05	2	-39.02	-43.2	4.18	17.231
2423.250	2.66E-07	11	2	-40.02	-43.2	3.18	16.175
2423.300	2.00E-07	11.09	2	-40.02	-43.2	3.18	16.269
2423.350	4.30E-07	10.83	2	-40.02	-43.2	3.18	16.012
2423.400	3.20E-07	10.93	2	-40.02	-43.2	3.18	16.113
2423.450	3.33E-07	10.92	2	-40.02	-43.2	3.18	16.099

Processing gain of a direct sequence spread spectrum, FCC CFR 47, Part 15.247 (e)

Measured Data:

Sig. Gen. Freq. [MHz]	Bit error rate (BER)	(S/N)o [dB]	L sys [dB]	Sig. Gen. Total Peak Power @ RX [dBm]	TX Total Peak Power @ RX [dBm]	Jammer to Signal Ratio Mj [dB]	Processing Gain (PG) [dB]
2423.500	2.10E-07	11.07	2	-39.02	-43.2	4.18	17.253
2423.550	1.10E-07	11.28	2	-39.02	-43.2	4.18	17.459
2423.600	2.30E-07	11.04	2	-39.02	-43.2	4.18	17.223
2423.650	6.80E-07	10.67	2	-39.52	-43.2	3.68	16.351
2423.700	7.10E-07	10.66	2	-39.52	-43.2	3.68	16.335
2423.750	5.50E-07	10.75	2	-39.52	-43.2	3.68	16.426
2423.800	4.20E-07	10.84	2	-39.02	-43.2	4.18	17.02
2423.850	3.86E-07	10.87	2	-39.02	-43.2	4.18	17.049
2423.900	2.11E-07	11.07	2	-39.02	-43.2	4.18	17.251
2423.950	5.10E-07	10.77	2	-39.32	-43.2	3.88	16.652
2424.000	5.65E-07	10.74	2	-39.32	-43.2	3.88	16.616
2424.050	6.11E-07	10.71	2	-39.32	-43.2	3.88	16.589
2424.100	4.20E-07	10.84	2	-39.52	-43.2	3.68	16.52
2424.150	3.40E-07	10.91	2	-39.52	-43.2	3.68	16.592
2424.200	5.58E-07	10.74	2	-39.52	-43.2	3.68	16.421
2424.250	4.38E-07	10.83	2	-39.52	-43.2	3.68	16.505
2424.300	2.10E-07	11.07	2	-39.52	-43.2	3.68	16.753
2424.350	1.10E-07	11.28	2	-39.72	-43.2	3.48	16.759
2424.400	2.30E-07	11.04	2	-39.72	-43.2	3.48	16.523
2424.450	6.80E-07	10.67	2	-39.72	-43.2	3.48	16.151
2424.500	7.10E-07	10.66	2	-39.72	-43.2	3.48	16.135
2424.550	5.50E-07	10.75	2	-39.72	-43.2	3.48	16.226
2424.600	4.20E-07	10.84	2	-39.62	-43.2	3.58	16.42
2424.650	3.80E-07	10.87	2	-39.62	-43.2	3.58	16.454
2424.700	2.11E-07	11.07	2	-39.72	-43.2	3.48	16.551
2424.750	5.10E-07	10.77	2	-39.72	-43.2	3.48	16.252
2424.800	5.65E-07	10.74	2	-39.72	-43.2	3.48	16.216
2424.850	5.57E-07	10.74	2	-39.92	-43.2	3.28	16.021
2424.900	4.20E-07	10.84	2	-39.92	-43.2	3.28	16.12
2424.950	3.40E-07	10.91	2	-39.72	-43.2	3.48	16.392
2425.000	2.35E-07	11.04	2	-39.92	-43.2	3.28	16.316
2425.050	3.22E-07	10.93	2	-39.92	-43.2	3.28	16.21
2425.100	3.12E-07	10.94	2	-40.02	-43.2	3.18	16.121
2425.150	6.47E-07	10.69	2	-39.92	-43.2	3.28	15.968
2425.200	5.25E-07	10.76	2	-40.02	-43.2	3.18	15.942

Processing gain of a direct sequence spread spectrum, FCC CFR 47, Part 15.247 (e)

Measured Data:

Sig. Gen. Freq. [MHz]	Bit error rate (BER)	(S/N)o [dB]	L sys [dB]	Sig. Gen. Total Peak Power @ RX [dBm]	TX Total Peak Power @ RX [dBm]	Jammer to Signal Ratio Mj [dB]	Processing Gain (PG) [dB]
2425.250	5.68E-07	10.74	2	-40.02	-43.2	3.18	15.915
2425.300	4.43E-07	10.82	2	-40.02	-43.2	3.18	16.001
2425.350	4.23E-07	10.84	2	-40.02	-43.2	3.18	16.017
2425.400	4.11E-07	10.85	2	-41.02	-43.2	2.18	15.027
2425.450	5.00E-07	10.78	2	-40.02	-43.2	3.18	15.959
2425.500	2.44E-07	11.02	2	-40.02	-43.2	3.18	16.203
2425.550	3.33E-07	10.92	2	-41.02	-43.2	2.18	15.099
2425.600	4.34E-07	10.83	2	-40.02	-43.2	3.18	16.008
2425.650	3.55E-07	10.9	2	-40.02	-43.2	3.18	16.077
2425.700	4.86E-07	10.79	2	-40.02	-43.2	3.18	15.969
2425.750	5.32E-07	10.76	2	-40.02	-43.2	3.18	15.938
2425.800	6.70E-07	10.68	2	-40.02	-43.2	3.18	15.856
2425.850	7.30E-07	10.65	2	-40.02	-43.2	3.18	15.825
2425.900	4.30E-07	10.83	2	-40.02	-43.2	3.18	16.012
2425.950	3.22E-07	10.93	2	-40.02	-43.2	3.18	16.11
2426.000	2.44E-07	11.02	2	-40.02	-43.2	3.18	16.203
2426.050	1.10E-07	11.28	2	-40.02	-43.2	3.18	16.459
2426.100	3.11E-07	10.94	2	-40.02	-43.2	3.18	16.122
2426.150	3.22E-07	10.93	2	-40.02	-43.2	3.18	16.11
2426.200	6.67E-07	10.68	2	-40.02	-43.2	3.18	15.857
2426.250	5.20E-07	10.77	2	-41.02	-43.2	2.18	14.946
2426.300	2.13E-07	11.07	2	-41.02	-43.2	2.18	15.248
2426.350	9.00E-08	11.34	2	-41.02	-43.2	2.18	15.522
2426.400	8.80E-08	11.35	2	-41.02	-43.2	2.18	15.529
2426.450	2.11E-07	11.07	2	-41.02	-43.2	2.18	15.251
2426.500	3.20E-07	10.93	2	-41.02	-43.2	2.18	15.113
2426.550	2.67E-07	10.99	2	-41.02	-43.2	2.18	15.173
2426.600	3.60E-07	10.89	2	-42.02	-43.2	1.18	14.073
2426.650	4.48E-07	10.82	2	-41.02	-43.2	2.18	14.997
2426.700	3.21E-07	10.93	2	-41.02	-43.2	2.18	15.112
2426.750	3.56E-07	10.9	2	-41.02	-43.2	2.18	15.076
2426.800	4.95E-07	10.78	2	-41.02	-43.2	2.18	14.963
2426.850	5.10E-07	10.77	2	-41.02	-43.2	2.18	14.952
2426.900	6.30E-07	10.7	2	-41.02	-43.2	2.18	14.878
2426.950	3.36E-07	10.92	2	-41.02	-43.2	2.18	15.096

Processing gain of a direct sequence spread spectrum, FCC CFR 47,
Part 15.247 (e)

Measured Data:

Sig. Gen. Freq. [MHz]	Bit error rate (BER)	(S/N)o [dB]	L sys [dB]	Sig. Gen. Total Peak Power @ RX [dBm]	TX Total Peak Power @ RX [dBm]	Jammer to Signal Ratio Mj [dB]	Processing Gain (PG) [dB]
2427.000	2.17E-07	11.06	2	-41.02	-43.2	2.18	15.242
2427.050	6.60E-07	10.68	2	-41.02	-43.2	2.18	14.861
2427.100	4.85E-07	10.79	2	-41.02	-43.2	2.18	14.97
2427.150	4.60E-07	10.81	2	-41.02	-43.2	2.18	14.988
2427.200	1.20E-07	11.25	2	-41.02	-43.2	2.18	15.432
2427.250	3.63E-07	10.89	2	-41.02	-43.2	2.18	15.07
2427.300	1.75E-07	11.13	2	-41.02	-43.2	2.18	15.312
2427.350	2.71E-07	10.99	2	-41.02	-43.2	2.18	15.168
2427.400	4.00E-07	10.86	2	-41.02	-43.2	2.18	15.037
2427.450	6.60E-07	10.68	2	-42.02	-43.2	1.18	13.861
2427.500	8.80E-08	11.35	2	-41.02	-43.2	2.18	15.529
2427.550	2.11E-07	11.07	2	-41.02	-43.2	2.18	15.251
2427.600	3.20E-07	10.93	2	-41.02	-43.2	2.18	15.113
2427.650	2.67E-07	10.99	2	-41.02	-43.2	2.18	15.173
2427.700	3.60E-07	10.89	2	-41.02	-43.2	2.18	15.073
2427.750	4.48E-07	10.82	2	-41.02	-43.2	2.18	14.997
2427.800	3.21E-07	10.93	2	-41.02	-43.2	2.18	15.112
2427.850	3.58E-07	10.9	2	-41.02	-43.2	2.18	15.075
2427.900	4.34E-07	10.83	2	-41.02	-43.2	2.18	15.008
2427.950	3.54E-07	10.9	2	-41.02	-43.2	2.18	15.078
2428.000	4.77E-07	10.8	2	-41.02	-43.2	2.18	14.976
2428.050	5.30E-07	10.76	2	-42.02	-43.2	1.18	13.939
2428.100	6.00E-07	10.72	2	-41.02	-43.2	2.18	14.895
2428.150	7.00E-07	10.66	2	-41.02	-43.2	2.18	14.84
2428.200	4.30E-07	10.83	2	-41.02	-43.2	2.18	15.012
2428.250	3.20E-07	10.93	2	-41.02	-43.2	2.18	15.113
2428.300	2.50E-07	11.02	2	-42.02	-43.2	1.18	14.195
2428.350	1.15E-07	11.27	2	-41.02	-43.2	2.18	15.446
2428.400	3.30E-07	10.92	2	-41.02	-43.2	2.18	15.102
2428.450	3.33E-07	10.92	2	-41.02	-43.2	2.18	15.099
2428.500	6.40E-07	10.69	2	-41.52	-43.2	1.68	14.372
2428.550	5.20E-07	10.77	2	-41.52	-43.2	1.68	14.446
2428.600	3.28E-07	10.92	2	-41.02	-43.2	2.18	15.104
2428.650	4.21E-07	10.84	2	-41.02	-43.2	2.18	15.019
2428.700	5.72E-07	10.73	2	-41.02	-43.2	2.18	14.912

Processing gain of a direct sequence spread spectrum, FCC CFR 47, Part 15.247 (e)

Measured Data:

Sig. Gen. Freq. [MHz]	Bit error rate (BER)	(S/N)o [dB]	L sys [dB]	Sig. Gen. Total Peak Power @ RX [dBm]	TX Total Peak Power @ RX [dBm]	Jammer to Signal Ratio Mj [dB]	Processing Gain (PG) [dB]
2428.750	8.00E-07	10.61	2	-41.02	-43.2	2.18	14.792
2428.800	4.00E-07	10.86	2	-41.02	-43.2	2.18	15.037
2428.850	3.50E-07	10.9	2	-41.02	-43.2	2.18	15.082
2428.900	7.00E-08	11.42	2	-41.52	-43.2	1.68	15.099
2428.950	1.10E-07	11.28	2	-41.52	-43.2	1.68	14.959
2429.000	1.20E-07	11.25	2	-41.52	-43.2	1.68	14.932
2429.050	1.42E-07	11.2	2	-41.52	-43.2	1.68	14.879
2429.100	2.78E-07	10.98	2	-41.02	-43.2	2.18	15.16
2429.150	1.33E-07	11.22	2	-42.02	-43.2	1.18	14.4
2429.200	1.40E-07	11.2	2	-41.02	-43.2	2.18	15.383
2429.250	5.80E-07	10.73	2	-41.02	-43.2	2.18	14.907
2429.300	5.70E-07	10.73	2	-41.02	-43.2	2.18	14.913
2429.350	3.50E-07	10.9	2	-41.72	-43.2	1.48	14.382
2429.400	6.40E-07	10.69	2	-41.72	-43.2	1.48	14.172
2429.450	5.20E-07	10.77	2	-41.72	-43.2	1.48	14.246
2429.500	3.28E-07	10.92	2	-41.02	-43.2	2.18	15.104
2429.550	4.21E-07	10.84	2	-42.02	-43.2	1.18	14.019
2429.600	5.72E-07	10.73	2	-42.02	-43.2	1.18	13.912
2429.650	1.40E-07	11.2	2	-41.62	-43.2	1.58	14.783
2429.700	2.30E-07	11.04	2	-41.62	-43.2	1.58	14.623
2429.750	5.30E-07	10.76	2	-42.02	-43.2	1.18	13.939
2429.800	8.20E-08	11.37	2	-42.02	-43.2	1.18	14.55
2429.850	7.70E-08	11.39	2	-42.02	-43.2	1.18	14.57
2429.900	1.80E-07	11.12	2	-41.72	-43.2	1.48	14.603
2429.950	7.70E-08	11.39	2	-41.72	-43.2	1.48	14.87
2430.000	2.30E-07	11.04	2	-42.02	-43.2	1.18	14.223
2430.050	1.30E-07	11.23	2	-41.72	-43.2	1.48	14.707
2430.100	1.93E-07	11.1	2	-41.02	-43.2	2.18	15.28
2430.150	1.40E-07	11.2	2	-42.02	-43.2	1.18	14.383
2430.200	2.30E-07	11.04	2	-42.02	-43.2	1.18	14.223
2430.250	5.30E-07	10.76	2	-41.02	-43.2	2.18	14.939
2430.300	6.80E-08	11.43	2	-41.02	-43.2	2.18	15.607
2430.350	7.70E-08	11.39	2	-42.02	-43.2	1.18	14.57
2430.400	1.80E-07	11.12	2	-42.02	-43.2	1.18	14.303
2430.450	2.33E-07	11.04	2	-42.02	-43.2	1.18	14.218

Processing gain of a direct sequence spread spectrum, FCC CFR 47, Part 15.247 (e)

Measured Data:

Sig. Gen. Freq. [MHz]	Bit error rate (BER)	(S/N)o [dB]	L sys [dB]	Sig. Gen. Total Peak Power @ RX [dBm]	TX Total Peak Power @ RX [dBm]	Jammer to Signal Ratio Mj [dB]	Processing Gain (PG) [dB]
2430.500	4.00E-07	10.86	2	-42.02	-43.2	1.18	14.037
2430.550	5.50E-07	10.75	2	-42.02	-43.2	1.18	13.926
2430.600	4.20E-07	10.84	2	-42.02	-43.2	1.18	14.02
2430.650	3.86E-07	10.87	2	-42.02	-43.2	1.18	14.049
2430.700	2.11E-07	11.07	2	-42.02	-43.2	1.18	14.251
2430.750	5.10E-07	10.77	2	-43.02	-43.2	0.18	12.952
2430.800	5.65E-07	10.74	2	-42.52	-43.2	0.68	13.416
2430.850	6.11E-07	10.71	2	-42.52	-43.2	0.68	13.389
2430.900	4.20E-07	10.84	2	-43.02	-43.2	0.18	13.02
2430.950	3.40E-07	10.91	2	-43.02	-43.2	0.18	13.092
2431.000	5.58E-07	10.74	2	-43.02	-43.2	0.18	12.921
2431.050	4.38E-07	10.83	2	-43.02	-43.2	0.18	13.005
2431.100	2.10E-07	11.07	2	-42.52	-43.2	0.68	13.753
2431.150	1.10E-07	11.28	2	-42.62	-43.2	0.58	13.859
2431.200	2.30E-07	11.04	2	-42.62	-43.2	0.58	13.623
2431.250	7.80E-08	11.39	2	-43.02	-43.2	0.18	13.566
2431.300	2.40E-07	11.03	2	-42.52	-43.2	0.68	13.709
2431.350	1.90E-07	11.11	2	-42.52	-43.2	0.68	13.785
2431.400	8.70E-08	11.35	2	-43.02	-43.2	0.18	13.532
2431.450	2.30E-07	11.04	2	-43.02	-43.2	0.18	13.223
2431.500	5.00E-07	10.78	2	-43.02	-43.2	0.18	12.959
2431.550	3.50E-07	10.9	2	-43.02	-43.2	0.18	13.082
2431.600	3.50E-07	10.9	2	-42.02	-43.2	1.18	14.082
2431.650	6.50E-07	10.69	2	-42.02	-43.2	1.18	13.867
2431.700	7.10E-07	10.66	2	-42.02	-43.2	1.18	13.835
2431.750	2.20E-07	11.06	2	-43.02	-43.2	0.18	13.237
2431.800	1.40E-07	11.2	2	-42.52	-43.2	0.68	13.883
2431.850	2.00E-07	11.09	2	-42.02	-43.2	1.18	14.269
2431.900	7.40E-08	11.4	2	-43.02	-43.2	0.18	13.582
2431.950	6.30E-08	11.45	2	-43.02	-43.2	0.18	13.63
2432.000	3.58E-07	10.9	2	-43.02	-43.2	0.18	13.075
2432.050	4.00E-07	10.86	2	-43.02	-43.2	0.18	13.037
2432.100	2.10E-07	11.07	2	-42.62	-43.2	0.58	13.653
2432.150	1.10E-07	11.28	2	-42.52	-43.2	0.68	13.959
2432.200	2.30E-07	11.04	2	-43.02	-43.2	0.18	13.223

Processing gain of a direct sequence spread spectrum, FCC CFR 47, Part 15.247 (e)

Measured Data:

Sig. Gen. Freq. [MHz]	Bit error rate (BER)	(S/N)o [dB]	L sys [dB]	Sig. Gen. Total Peak Power @ RX [dBm]	TX Total Peak Power @ RX [dBm]	Jammer to Signal Ratio Mj [dB]	Processing Gain (PG) [dB]
2432.250	5.30E-07	10.76	2	-43.02	-43.2	0.18	12.939
2432.300	2.60E-07	11	2	-43.02	-43.2	0.18	13.182
2432.350	3.30E-07	10.92	2	-43.02	-43.2	0.18	13.102
2432.400	2.50E-07	11.02	2	-43.02	-43.2	0.18	13.195
2432.450	5.55E-07	10.74	2	-43.02	-43.2	0.18	12.923
2432.500	6.40E-07	10.69	2	-43.02	-43.2	0.18	12.872
2432.550	4.43E-07	10.82	2	-43.02	-43.2	0.18	13.001
2432.600	4.23E-07	10.84	2	-43.02	-43.2	0.18	13.017
2432.650	4.10E-07	10.85	2	-43.02	-43.2	0.18	13.028
2432.700	5.30E-07	10.76	2	-42.02	-43.2	1.18	13.939
2432.750	2.60E-07	11	2	-42.02	-43.2	1.18	14.182
2432.800	3.50E-07	10.9	2	-42.02	-43.2	1.18	14.082
2432.850	4.00E-07	10.86	2	-42.02	-43.2	1.18	14.037
2432.900	3.60E-07	10.89	2	-43.02	-43.2	0.18	13.073
2432.950	4.00E-07	10.86	2	-43.02	-43.2	0.18	13.037
2433.000	5.30E-07	10.76	2	-43.02	-43.2	0.18	12.939
2433.050	6.75E-07	10.67	2	-43.02	-43.2	0.18	12.853
2433.100	3.50E-07	10.9	2	-43.02	-43.2	0.18	13.082
2433.150	4.00E-07	10.86	2	-43.02	-43.2	0.18	13.037
2433.200	3.00E-07	10.95	2	-43.02	-43.2	0.18	13.134
2433.250	1.50E-07	11.18	2	-43.52	-43.2	-0.32	12.861
2433.300	1.20E-07	11.25	2	-43.52	-43.2	-0.32	12.932
2433.350	9.80E-08	11.32	2	-43.52	-43.2	-0.32	12.995
2433.400	7.60E-08	11.39	2	-43.52	-43.2	-0.32	13.074
2433.450	2.50E-07	11.02	2	-43.52	-43.2	-0.32	12.695
2433.500	2.20E-07	11.06	2	-43.52	-43.2	-0.32	12.737
2433.550	2.80E-07	10.98	2	-43.52	-43.2	-0.32	12.657
2433.600	3.30E-07	10.92	2	-43.52	-43.2	-0.32	12.602
2433.650	4.00E-07	10.86	2	-43.02	-43.2	0.18	13.037
2433.700	3.60E-07	10.89	2	-43.02	-43.2	0.18	13.073
2433.750	4.00E-07	10.86	2	-43.02	-43.2	0.18	13.037
2433.800	5.30E-07	10.76	2	-43.02	-43.2	0.18	12.939
2433.850	6.75E-07	10.67	2	-43.02	-43.2	0.18	12.853
2433.900	3.50E-07	10.9	2	-43.02	-43.2	0.18	13.082
2433.950	4.00E-07	10.86	2	-43.02	-43.2	0.18	13.037

Processing gain of a direct sequence spread spectrum, FCC CFR 47,
Part 15.247 (e)

Measured Data:

Sig. Gen. Freq. [MHz]	Bit error rate (BER)	(S/N)o [dB]	L sys [dB]	Sig. Gen. Total Peak Power @ RX [dBm]	TX Total Peak Power @ RX [dBm]	Jammer to Signal Ratio Mj [dB]	Processing Gain (PG) [dB]
2434.000	5.70E-07	10.73	2	-42.02	-43.2	1.18	13.913
2434.050	3.50E-07	10.9	2	-43.02	-43.2	0.18	13.082
2434.100	1.30E-07	11.23	2	-42.52	-43.2	0.68	13.907
2434.150	1.20E-07	11.25	2	-42.52	-43.2	0.68	13.932
2434.200	7.00E-08	11.42	2	-43.02	-43.2	0.18	13.599
2434.250	2.50E-07	11.02	2	-43.02	-43.2	0.18	13.195
2434.300	2.20E-07	11.06	2	-43.02	-43.2	0.18	13.237
2434.350	2.80E-07	10.98	2	-43.02	-43.2	0.18	13.157
2434.400	4.00E-07	10.86	2	-42.52	-43.2	0.68	13.537
2434.450	5.40E-07	10.75	2	-42.52	-43.2	0.68	13.432
2434.500	6.70E-07	10.68	2	-43.02	-43.2	0.18	12.856
2434.550	3.50E-07	10.9	2	-43.02	-43.2	0.18	13.082
2434.600	4.00E-07	10.86	2	-43.02	-43.2	0.18	13.037
2434.650	9.00E-08	11.34	2	-43.02	-43.2	0.18	13.522
2434.700	4.00E-07	10.86	2	-43.02	-43.2	0.18	13.037
2434.750	5.40E-07	10.75	2	-43.02	-43.2	0.18	12.932
2434.800	6.70E-07	10.68	2	-43.02	-43.2	0.18	12.856
2434.850	3.50E-07	10.9	2	-43.02	-43.2	0.18	13.082
2434.900	4.00E-07	10.86	2	-43.02	-43.2	0.18	13.037
2434.950	5.80E-07	10.73	2	-43.02	-43.2	0.18	12.907
2435.000	5.70E-07	10.73	2	-43.02	-43.2	0.18	12.913
2435.050	3.50E-07	10.9	2	-43.02	-43.2	0.18	13.082
2435.100	6.40E-07	10.69	2	-43.02	-43.2	0.18	12.872
2435.150	5.20E-07	10.77	2	-43.02	-43.2	0.18	12.946
2435.200	3.33E-07	10.92	2	-43.02	-43.2	0.18	13.099
2435.250	4.34E-07	10.83	2	-43.02	-43.2	0.18	13.008
2435.300	3.55E-07	10.9	2	-43.02	-43.2	0.18	13.077
2435.350	4.86E-07	10.79	2	-43.02	-43.2	0.18	12.969
2435.400	5.32E-07	10.76	2	-43.02	-43.2	0.18	12.938
2435.450	6.70E-07	10.68	2	-43.02	-43.2	0.18	12.856
2435.500	7.30E-07	10.65	2	-43.02	-43.2	0.18	12.825
2435.550	4.30E-07	10.83	2	-43.02	-43.2	0.18	13.012
2435.600	3.22E-07	10.93	2	-43.02	-43.2	0.18	13.11
2435.650	2.44E-07	11.02	2	-43.02	-43.2	0.18	13.203
2435.700	1.10E-07	11.28	2	-43.02	-43.2	0.18	13.459

Processing gain of a direct sequence spread spectrum, FCC CFR 47, Part 15.247 (e)

Measured Data:

Sig. Gen. Freq. [MHz]	Bit error rate (BER)	(S/N)o [dB]	L sys [dB]	Sig. Gen. Total Peak Power @ RX [dBm]	TX Total Peak Power @ RX [dBm]	Jammer to Signal Ratio Mj [dB]	Processing Gain (PG) [dB]
2435.750	4.88E-07	10.79	2	-42.02	-43.2	1.18	13.968
2435.800	5.49E-07	10.75	2	-42.02	-43.2	1.18	13.927
2435.850	3.33E-07	10.92	2	-43.02	-43.2	0.18	13.099
2435.900	3.00E-07	10.95	2	-43.02	-43.2	0.18	13.134
2435.950	3.33E-07	10.92	2	-43.02	-43.2	0.18	13.099
2436.000	4.34E-07	10.83	2	-42.02	-43.2	1.18	14.008
2436.050	3.55E-07	10.9	2	-42.02	-43.2	1.18	14.077
2436.100	4.86E-07	10.79	2	-43.02	-43.2	0.18	12.969
2436.150	5.32E-07	10.76	2	-43.02	-43.2	0.18	12.938
2436.200	6.70E-07	10.68	2	-42.02	-43.2	1.18	13.856
2436.250	4.75E-07	10.8	2	-43.02	-43.2	0.18	12.977
2436.300	5.50E-07	10.75	2	-43.02	-43.2	0.18	12.926
2436.350	5.80E-07	10.73	2	-43.02	-43.2	0.18	12.907
2436.400	3.33E-07	10.92	2	-42.02	-43.2	1.18	14.099
2436.450	4.34E-07	10.83	2	-42.02	-43.2	1.18	14.008
2436.500	3.55E-07	10.9	2	-43.02	-43.2	0.18	13.077
2436.550	4.86E-07	10.79	2	-43.02	-43.2	0.18	12.969
2436.600	5.32E-07	10.76	2	-43.02	-43.2	0.18	12.938
2436.650	6.70E-07	10.68	2	-43.02	-43.2	0.18	12.856
2436.700	7.30E-07	10.65	2	-42.02	-43.2	1.18	13.825
2436.750	4.30E-07	10.83	2	-42.02	-43.2	1.18	14.012
2436.800	3.22E-07	10.93	2	-43.02	-43.2	0.18	13.11
2436.850	2.44E-07	11.02	2	-43.02	-43.2	0.18	13.203
2436.900	6.70E-07	10.68	2	-43.02	-43.2	0.18	12.856
2436.950	7.30E-07	10.65	2	-42.02	-43.2	1.18	13.825
2437.000	4.30E-07	10.83	2	-43.02	-43.2	0.18	13.012
2437.050	3.22E-07	10.93	2	-43.02	-43.2	0.18	13.11
2437.100	2.44E-07	11.02	2	-43.02	-43.2	0.18	13.203
2437.150	1.10E-07	11.28	2	-44.02	-43.2	-0.82	12.459
2437.200	7.80E-07	10.62	2	-43.02	-43.2	0.18	12.801
2437.250	5.90E-07	10.72	2	-44.02	-43.2	-0.82	11.901
2437.300	3.30E-07	10.92	2	-44.02	-43.2	-0.82	12.102
2437.350	4.32E-07	10.83	2	-44.02	-43.2	-0.82	12.01
2437.400	3.36E-07	10.92	2	-43.02	-43.2	0.18	13.096
2437.450	4.30E-07	10.83	2	-43.02	-43.2	0.18	13.012

Processing gain of a direct sequence spread spectrum, FCC CFR 47, Part 15.247 (e)

Measured Data:

Sig. Gen. Freq. [MHz]	Bit error rate (BER)	(S/N)o [dB]	L sys [dB]	Sig. Gen. Total Peak Power @ RX [dBm]	TX Total Peak Power @ RX [dBm]	Jammer to Signal Ratio Mj [dB]	Processing Gain (PG) [dB]
2437.500	6.20E-07	10.7	2	-42.02	-43.2	1.18	13.883
2437.550	5.50E-07	10.75	2	-42.02	-43.2	1.18	13.926
2437.600	3.33E-07	10.92	2	-43.52	-43.2	-0.32	12.599
2437.650	4.34E-07	10.83	2	-43.02	-43.2	0.18	13.008
2437.700	3.55E-07	10.9	2	-44.52	-43.2	-1.32	11.577
2437.750	4.86E-07	10.79	2	-44.02	-43.2	-0.82	11.969
2437.800	5.32E-07	10.76	2	-43.02	-43.2	0.18	12.938
2437.850	6.70E-07	10.68	2	-44.02	-43.2	-0.82	11.856
2437.900	7.30E-07	10.65	2	-44.02	-43.2	-0.82	11.825
2437.950	4.30E-07	10.83	2	-44.02	-43.2	-0.82	12.012
2438.000	3.22E-07	10.93	2	-43.52	-43.2	-0.32	12.61
2438.050	2.44E-07	11.02	2	-45.22	-43.2	-2.02	11.003
2438.100	1.10E-07	11.28	2	-44.02	-43.2	-0.82	12.459
2438.150	7.80E-07	10.62	2	-43.02	-43.2	0.18	12.801
2438.200	5.90E-07	10.72	2	-44.22	-43.2	-1.02	11.701
2438.250	3.30E-07	10.92	2	-44.12	-43.2	-0.92	12.002
2438.300	4.32E-07	10.83	2	-44.92	-43.2	-1.72	11.11
2438.350	3.36E-07	10.92	2	-44.02	-43.2	-0.82	12.096
2438.400	2.54E-07	11.01	2	-44.02	-43.2	-0.82	12.19
2438.450	5.49E-07	10.75	2	-44.02	-43.2	-0.82	11.927
2438.500	3.33E-07	10.92	2	-44.02	-43.2	-0.82	12.099
2438.550	3.00E-07	10.95	2	-44.02	-43.2	-0.82	12.134
2438.600	3.33E-07	10.92	2	-42.02	-43.2	1.18	14.099
2438.650	4.34E-07	10.83	2	-42.02	-43.2	1.18	14.008
2438.700	3.55E-07	10.9	2	-43.52	-43.2	-0.32	12.577
2438.750	4.86E-07	10.79	2	-43.52	-43.2	-0.32	12.469
2438.800	5.32E-07	10.76	2	-45.22	-43.2	-2.02	10.738
2438.850	6.70E-07	10.68	2	-44.02	-43.2	-0.82	11.856
2438.900	7.30E-07	10.65	2	-43.02	-43.2	0.18	12.825
2438.950	4.30E-07	10.83	2	-44.22	-43.2	-1.02	11.812
2439.000	3.22E-07	10.93	2	-44.12	-43.2	-0.92	12.01
2439.050	2.44E-07	11.02	2	-44.92	-43.2	-1.72	11.303
2439.100	1.10E-07	11.28	2	-45.02	-43.2	-1.82	11.459
2439.150	2.60E-07	11	2	-45.02	-43.2	-1.82	11.182
2439.200	4.00E-07	10.86	2	-45.02	-43.2	-1.82	11.037

Processing gain of a direct sequence spread spectrum, FCC CFR 47, Part 15.247 (e)

Measured Data:

Sig. Gen. Freq. [MHz]	Bit error rate (BER)	(S/N)o [dB]	L sys [dB]	Sig. Gen. Total Peak Power @ RX [dBm]	TX Total Peak Power @ RX [dBm]	Jammer to Signal Ratio Mj [dB]	Processing Gain (PG) [dB]
2439.250	5.50E-07	10.75	2	-44.02	-43.2	-0.82	11.926
2439.300	6.50E-07	10.69	2	-44.02	-43.2	-0.82	11.867
2439.350	6.30E-07	10.7	2	-44.02	-43.2	-0.82	11.878
2439.400	5.50E-07	10.75	2	-45.02	-43.2	-1.82	10.926
2439.450	3.33E-07	10.92	2	-45.02	-43.2	-1.82	11.099
2439.500	4.34E-07	10.83	2	-45.02	-43.2	-1.82	11.008
2439.550	7.50E-07	10.64	2	-45.02	-43.2	-1.82	10.815
2439.600	4.86E-07	10.79	2	-45.02	-43.2	-1.82	10.969
2439.650	5.32E-07	10.76	2	-45.02	-43.2	-1.82	10.938
2439.700	6.75E-07	10.67	2	-44.02	-43.2	-0.82	11.853
2439.750	6.70E-07	10.68	2	-43.02	-43.2	0.18	12.856
2439.800	5.60E-07	10.74	2	-44.02	-43.2	-0.82	11.92
2439.850	4.32E-07	10.83	2	-43.62	-43.2	-0.42	12.41
2439.900	2.40E-07	11.03	2	-43.62	-43.2	-0.42	12.609
2439.950	1.30E-07	11.23	2	-43.62	-43.2	-0.42	12.807
2440.000	6.60E-07	10.68	2	-43.42	-43.2	-0.22	12.461
2440.050	1.20E-07	11.25	2	-43.42	-43.2	-0.22	13.032
2440.100	4.60E-07	10.81	2	-43.42	-43.2	-0.22	12.588
2440.150	7.90E-07	10.62	2	-43.62	-43.2	-0.42	12.197
2440.200	8.90E-07	10.57	2	-44.22	-43.2	-1.02	11.553
2440.250	8.90E-07	10.57	2	-45.02	-43.2	-1.82	10.753
2440.300	1.88E-07	11.11	2	-45.52	-43.2	-2.32	10.789
2440.350	9.60E-08	11.32	2	-45.72	-43.2	-2.52	10.802
2440.400	4.95E-07	10.78	2	-45.32	-43.2	-2.12	10.663
2440.450	2.17E-07	11.06	2	-45.82	-43.2	-2.62	10.442
2440.500	5.34E-08	11.5	2	-45.82	-43.2	-2.62	10.88
2440.550	6.60E-07	10.68	2	-45.12	-43.2	-1.92	10.761
2440.600	3.11E-07	10.94	2	-45.32	-43.2	-2.12	10.822
2440.650	3.50E-07	10.9	2	-45.02	-43.2	-1.82	11.082
2440.700	3.56E-07	10.9	2	-45.02	-43.2	-1.82	11.076
2440.750	6.60E-07	10.68	2	-45.02	-43.2	-1.82	10.861
2440.800	6.30E-07	10.7	2	-44.72	-43.2	-1.52	11.178
2440.850	1.60E-07	11.16	2	-43.02	-43.2	0.18	13.341
2440.900	5.10E-07	10.77	2	-42.52	-43.2	0.68	13.452
2440.950	4.90E-08	11.53	2	-42.52	-43.2	0.68	14.205

Processing gain of a direct sequence spread spectrum, FCC CFR 47, Part 15.247 (e)

Measured Data:

Sig. Gen. Freq. [MHz]	Bit error rate (BER)	(S/N)o [dB]	L sys [dB]	Sig. Gen. Total Peak Power @ RX [dBm]	TX Total Peak Power @ RX [dBm]	Jammer to Signal Ratio Mj [dB]	Processing Gain (PG) [dB]
2441.000	6.35E-08	11.45	2	-42.02	-43.2	1.18	14.628
2441.050	4.30E-07	10.83	2	-42.02	-43.2	1.18	14.012
2441.100	3.50E-07	10.9	2	-43.52	-43.2	-0.32	12.582
2441.150	3.10E-07	10.94	2	-43.52	-43.2	-0.32	12.623
2441.200	2.50E-07	11.02	2	-45.22	-43.2	-2.02	10.995
2441.250	2.10E-07	11.07	2	-44.02	-43.2	-0.82	12.253
2441.300	3.00E-07	10.95	2	-43.02	-43.2	0.18	13.134
2441.350	4.30E-07	10.83	2	-44.22	-43.2	-1.02	11.812
2441.400	5.10E-07	10.77	2	-44.12	-43.2	-0.92	11.852
2441.450	4.20E-07	10.84	2	-44.92	-43.2	-1.72	11.12
2441.500	2.10E-07	11.07	2	-44.82	-43.2	-1.62	11.453
2441.550	3.58E-07	10.9	2	-44.52	-43.2	-1.32	11.575
2441.600	3.70E-07	10.88	2	-45.32	-43.2	-2.12	10.763
2441.650	4.00E-07	10.86	2	-45.02	-43.2	-1.82	11.037
2441.700	5.10E-07	10.77	2	-45.02	-43.2	-1.82	10.952
2441.750	2.10E-07	11.07	2	-45.12	-43.2	-1.92	11.153
2441.800	1.10E-07	11.28	2	-45.42	-43.2	-2.22	11.059
2441.850	2.30E-07	11.04	2	-45.32	-43.2	-2.12	10.923
2441.900	6.80E-07	10.67	2	-42.92	-43.2	0.28	12.951
2441.950	7.10E-07	10.66	2	-43.32	-43.2	-0.12	12.535
2442.000	5.50E-07	10.75	2	-44.32	-43.2	-1.12	11.626
2442.050	4.20E-07	10.84	2	-44.42	-43.2	-1.22	11.62
2442.100	3.86E-07	10.87	2	-44.72	-43.2	-1.52	11.349
2442.150	2.11E-07	11.07	2	-45.02	-43.2	-1.82	11.251
2442.200	5.10E-07	10.77	2	-44.32	-43.2	-1.12	11.652
2442.250	5.65E-07	10.74	2	-42.92	-43.2	0.28	13.016
2442.300	6.11E-07	10.71	2	-42.82	-43.2	0.38	13.089
2442.350	4.20E-07	10.84	2	-42.82	-43.2	0.38	13.22
2442.400	2.50E-07	11.02	2	-42.42	-43.2	0.78	13.795
2442.450	2.20E-07	11.06	2	-42.02	-43.2	1.18	14.237
2442.500	2.80E-07	10.98	2	-42.02	-43.2	1.18	14.157
2442.550	4.30E-07	10.83	2	-42.02	-43.2	1.18	14.012
2442.600	5.40E-07	10.75	2	-42.02	-43.2	1.18	13.932
2442.650	6.60E-07	10.68	2	-42.02	-43.2	1.18	13.861
2442.700	3.50E-07	10.9	2	-42.02	-43.2	1.18	14.082

Processing gain of a direct sequence spread spectrum, FCC CFR 47, Part 15.247 (e)

Measured Data:

Sig. Gen. Freq. [MHz]	Bit error rate (BER)	(S/N)o [dB]	L sys [dB]	Sig. Gen. Total Peak Power @ RX [dBm]	TX Total Peak Power @ RX [dBm]	Jammer to Signal Ratio Mj [dB]	Processing Gain (PG) [dB]
2442.750	3.99E-07	10.86	2	-42.02	-43.2	1.18	14.037
2442.800	3.50E-07	10.9	2	-42.02	-43.2	1.18	14.082
2442.850	4.35E-07	10.83	2	-42.02	-43.2	1.18	14.008
2442.900	4.79E-07	10.79	2	-42.02	-43.2	1.18	13.974
2442.950	5.35E-07	10.76	2	-42.02	-43.2	1.18	13.936
2443.000	3.80E-07	10.87	2	-42.02	-43.2	1.18	14.054
2443.050	1.50E-07	11.18	2	-42.02	-43.2	1.18	14.361
2443.100	3.48E-07	10.9	2	-42.02	-43.2	1.18	14.084
2443.150	5.68E-07	10.74	2	-42.02	-43.2	1.18	13.915
2443.200	5.00E-07	10.78	2	-42.02	-43.2	1.18	13.959
2443.250	5.50E-07	10.75	2	-42.02	-43.2	1.18	13.926
2443.300	5.00E-07	10.78	2	-42.02	-43.2	1.18	13.959
2443.350	6.30E-07	10.7	2	-41.02	-43.2	2.18	14.878
2443.400	6.11E-07	10.71	2	-43.02	-43.2	0.18	12.889
2443.450	5.50E-07	10.75	2	-41.02	-43.2	2.18	14.926
2443.500	4.30E-07	10.83	2	-42.02	-43.2	1.18	14.012
2443.550	3.30E-07	10.92	2	-43.02	-43.2	0.18	13.102
2443.600	4.55E-07	10.81	2	-43.02	-43.2	0.18	12.992
2443.650	3.54E-07	10.9	2	-43.02	-43.2	0.18	13.078
2443.700	2.63E-07	11	2	-43.02	-43.2	0.18	13.178
2443.750	6.89E-07	10.67	2	-42.02	-43.2	1.18	13.846
2443.800	4.30E-07	10.83	2	-43.02	-43.2	0.18	13.012
2443.850	5.30E-07	10.76	2	-43.02	-43.2	0.18	12.939
2443.900	5.90E-07	10.72	2	-43.02	-43.2	0.18	12.901
2443.950	2.10E-07	11.07	2	-43.02	-43.2	0.18	13.253
2444.000	7.50E-08	11.4	2	-43.32	-43.2	-0.12	13.278
2444.050	3.10E-07	10.94	2	-43.02	-43.2	0.18	13.123
2444.100	2.10E-07	11.07	2	-43.02	-43.2	0.18	13.253
2444.150	1.60E-07	11.16	2	-43.02	-43.2	0.18	13.341
2444.200	1.02E-07	11.3	2	-43.02	-43.2	0.18	13.483
2444.250	5.50E-07	10.75	2	-42.52	-43.2	0.68	13.426
2444.300	2.50E-07	11.02	2	-43.02	-43.2	0.18	13.195
2444.350	3.30E-07	10.92	2	-43.02	-43.2	0.18	13.102
2444.400	4.30E-07	10.83	2	-43.02	-43.2	0.18	13.012
2444.450	3.30E-07	10.92	2	-43.02	-43.2	0.18	13.102

Processing gain of a direct sequence spread spectrum, FCC CFR 47, Part 15.247 (e)

Measured Data:

Sig. Gen. Freq. [MHz]	Bit error rate (BER)	(S/N)o [dB]	L sys [dB]	Sig. Gen. Total Peak Power @ RX [dBm]	TX Total Peak Power @ RX [dBm]	Jammer to Signal Ratio Mj [dB]	Processing Gain (PG) [dB]
2444.500	4.10E-07	10.85	2	-43.02	-43.2	0.18	13.028
2444.550	4.40E-07	10.82	2	-43.02	-43.2	0.18	13.004
2444.600	5.10E-07	10.77	2	-43.02	-43.2	0.18	12.952
2444.650	3.30E-07	10.92	2	-43.02	-43.2	0.18	13.102
2444.700	3.22E-07	10.93	2	-43.02	-43.2	0.18	13.11
2444.750	2.44E-07	11.02	2	-43.02	-43.2	0.18	13.203
2444.800	6.70E-07	10.68	2	-43.02	-43.2	0.18	12.856
2444.850	7.30E-07	10.65	2	-43.02	-43.2	0.18	12.825
2444.900	4.30E-07	10.83	2	-43.02	-43.2	0.18	13.012
2444.950	3.22E-07	10.93	2	-43.02	-43.2	0.18	13.11
2445.000	2.44E-07	11.02	2	-43.02	-43.2	0.18	13.203
2445.050	1.10E-07	11.28	2	-43.02	-43.2	0.18	13.459
2445.100	5.00E-07	10.78	2	-43.02	-43.2	0.18	12.959
2445.150	5.50E-07	10.75	2	-43.02	-43.2	0.18	12.926
2445.200	6.00E-07	10.72	2	-43.02	-43.2	0.18	12.895
2445.250	6.30E-07	10.7	2	-43.02	-43.2	0.18	12.878
2445.300	6.11E-07	10.71	2	-42.02	-43.2	1.18	13.889
2445.350	5.50E-07	10.75	2	-43.02	-43.2	0.18	12.926
2445.400	4.30E-07	10.83	2	-43.02	-43.2	0.18	13.012
2445.450	3.30E-07	10.92	2	-43.02	-43.2	0.18	13.102
2445.500	4.80E-07	10.79	2	-42.02	-43.2	1.18	13.974
2445.550	3.40E-07	10.91	2	-43.02	-43.2	0.18	13.092
2445.600	3.08E-07	10.95	2	-43.02	-43.2	0.18	13.125
2445.650	5.20E-07	10.77	2	-43.02	-43.2	0.18	12.946
2445.700	7.20E-07	10.65	2	-42.02	-43.2	1.18	13.83
2445.750	5.20E-07	10.77	2	-43.02	-43.2	0.18	12.946
2445.800	1.20E-07	11.25	2	-44.02	-43.2	-0.82	12.432
2445.850	2.20E-07	11.06	2	-44.02	-43.2	-0.82	12.237
2445.900	9.30E-08	11.33	2	-44.02	-43.2	-0.82	12.512
2445.950	8.80E-08	11.35	2	-44.02	-43.2	-0.82	12.529
2446.000	3.30E-07	10.92	2	-43.02	-43.2	0.18	13.102
2446.050	4.10E-07	10.85	2	-43.02	-43.2	0.18	13.028
2446.100	5.10E-07	10.77	2	-43.02	-43.2	0.18	12.952
2446.150	3.06E-07	10.95	2	-43.02	-43.2	0.18	13.128
2446.200	2.87E-07	10.97	2	-43.02	-43.2	0.18	13.149

Processing gain of a direct sequence spread spectrum, FCC CFR 47,
Part 15.247 (e)

Measured Data:

Sig. Gen. Freq. [MHz]	Bit error rate (BER)	(S/N)o [dB]	L sys [dB]	Sig. Gen. Total Peak Power @ RX [dBm]	TX Total Peak Power @ RX [dBm]	Jammer to Signal Ratio Mj [dB]	Processing Gain (PG) [dB]
2446.250	6.20E-07	10.7	2	-43.02	-43.2	0.18	12.883
2446.300	4.30E-07	10.83	2	-43.02	-43.2	0.18	13.012
2446.350	3.40E-07	10.91	2	-43.02	-43.2	0.18	13.092
2446.400	2.90E-07	10.97	2	-43.02	-43.2	0.18	13.146
2446.450	2.05E-07	11.08	2	-43.02	-43.2	0.18	13.261
2446.500	2.78E-07	10.98	2	-43.02	-43.2	0.18	13.16
2446.550	3.30E-07	10.92	2	-43.02	-43.2	0.18	13.102
2446.600	2.10E-07	11.07	2	-43.02	-43.2	0.18	13.253
2446.650	1.87E-07	11.11	2	-43.02	-43.2	0.18	13.29
2446.700	2.25E-07	11.05	2	-43.02	-43.2	0.18	13.23
2446.750	1.60E-07	11.16	2	-43.02	-43.2	0.18	13.341
2446.800	9.80E-08	11.32	2	-42.52	-43.2	0.68	13.995
2446.850	1.08E-07	11.29	2	-43.02	-43.2	0.18	13.465
2446.900	2.50E-07	11.02	2	-43.02	-43.2	0.18	13.195
2446.950	2.70E-07	10.99	2	-43.02	-43.2	0.18	13.17
2447.000	8.90E-08	11.35	2	-42.72	-43.2	0.48	13.825
2447.050	3.40E-07	10.91	2	-43.02	-43.2	0.18	13.092
2447.100	3.60E-07	10.89	2	-43.02	-43.2	0.18	13.073
2447.150	4.30E-07	10.83	2	-43.02	-43.2	0.18	13.012
2447.200	5.20E-07	10.77	2	-43.02	-43.2	0.18	12.946
2447.250	5.30E-07	10.76	2	-43.02	-43.2	0.18	12.939
2447.300	3.20E-07	10.93	2	-43.02	-43.2	0.18	13.113
2447.350	3.50E-07	10.9	2	-43.02	-43.2	0.18	13.082
2447.400	3.90E-07	10.87	2	-43.02	-43.2	0.18	13.045
2447.450	2.50E-07	11.02	2	-43.02	-43.2	0.18	13.195
2447.500	2.06E-07	11.08	2	-43.02	-43.2	0.18	13.259
2447.550	3.70E-07	10.88	2	-43.02	-43.2	0.18	13.063
2447.600	2.89E-07	10.97	2	-43.02	-43.2	0.18	13.147
2447.650	2.99E-07	10.96	2	-43.02	-43.2	0.18	13.135
2447.700	8.30E-08	11.37	2	-42.52	-43.2	0.68	14.047
2447.750	2.00E-07	11.09	2	-43.02	-43.2	0.18	13.269
2447.800	1.50E-07	11.18	2	-43.02	-43.2	0.18	13.361
2447.850	2.00E-07	11.09	2	-43.02	-43.2	0.18	13.269
2447.900	9.90E-08	11.31	2	-42.02	-43.2	1.18	14.492
2447.950	1.02E-07	11.3	2	-43.02	-43.2	0.18	13.483

Processing gain of a direct sequence spread spectrum, FCC CFR 47, Part 15.247 (e)

Measured Data:

Sig. Gen. Freq. [MHz]	Bit error rate (BER)	(S/N)o [dB]	L sys [dB]	Sig. Gen. Total Peak Power @ RX [dBm]	TX Total Peak Power @ RX [dBm]	Jammer to Signal Ratio Mj [dB]	Processing Gain (PG) [dB]
2448.000	6.80E-07	10.67	2	-43.02	-43.2	0.18	12.851
2448.050	5.30E-07	10.76	2	-43.02	-43.2	0.18	12.939
2448.100	3.50E-07	10.9	2	-43.02	-43.2	0.18	13.082
2448.150	4.30E-07	10.83	2	-43.02	-43.2	0.18	13.012
2448.200	5.20E-07	10.77	2	-43.02	-43.2	0.18	12.946
2448.250	6.30E-07	10.7	2	-43.02	-43.2	0.18	12.878
2448.300	4.30E-07	10.83	2	-43.02	-43.2	0.18	13.012
2448.350	3.40E-07	10.91	2	-43.02	-43.2	0.18	13.092
2448.400	3.60E-07	10.89	2	-42.72	-43.2	0.48	13.373
2448.450	4.30E-07	10.83	2	-43.02	-43.2	0.18	13.012
2448.500	5.20E-07	10.77	2	-43.02	-43.2	0.18	12.946
2448.550	5.30E-07	10.76	2	-43.02	-43.2	0.18	12.939
2448.600	3.20E-07	10.93	2	-43.02	-43.2	0.18	13.113
2448.650	3.50E-07	10.9	2	-43.02	-43.2	0.18	13.082
2448.700	3.90E-07	10.87	2	-43.02	-43.2	0.18	13.045
2448.750	2.50E-07	11.02	2	-43.02	-43.2	0.18	13.195
2448.800	2.06E-07	11.08	2	-43.02	-43.2	0.18	13.259
2448.850	3.60E-07	10.89	2	-43.02	-43.2	0.18	13.073
2448.900	4.30E-07	10.83	2	-43.02	-43.2	0.18	13.012
2448.950	5.30E-07	10.76	2	-43.02	-43.2	0.18	12.939
2449.000	6.80E-07	10.67	2	-43.22	-43.2	-0.02	12.651
2449.050	5.30E-07	10.76	2	-43.22	-43.2	-0.02	12.739
2449.100	3.50E-07	10.9	2	-43.22	-43.2	-0.02	12.882
2449.150	4.30E-07	10.83	2	-43.22	-43.2	-0.02	12.812
2449.200	5.20E-07	10.77	2	-43.32	-43.2	-0.12	12.646
2449.250	3.40E-07	10.91	2	-43.32	-43.2	-0.12	12.792
2449.300	3.60E-07	10.89	2	-43.32	-43.2	-0.12	12.773
2449.350	4.30E-07	10.83	2	-43.02	-43.2	0.18	13.012
2449.400	5.20E-07	10.77	2	-43.02	-43.2	0.18	12.946
2449.450	5.30E-07	10.76	2	-43.02	-43.2	0.18	12.939
2449.500	3.20E-07	10.93	2	-43.02	-43.2	0.18	13.113
2449.550	3.50E-07	10.9	2	-43.02	-43.2	0.18	13.082
2449.600	3.90E-07	10.87	2	-43.02	-43.2	0.18	13.045
2449.650	2.50E-07	11.02	2	-43.02	-43.2	0.18	13.195
2449.700	2.06E-07	11.08	2	-43.02	-43.2	0.18	13.259

Processing gain of a direct sequence spread spectrum, FCC CFR 47, Part 15.247 (e)

Measured Data:

Sig. Gen. Freq. [MHz]	Bit error rate (BER)	(S/N)o [dB]	L sys [dB]	Sig. Gen. Total Peak Power @ RX [dBm]	TX Total Peak Power @ RX [dBm]	Jammer to Signal Ratio Mj [dB]	Processing Gain (PG) [dB]
2449.750	5.00E-07	10.78	2	-43.02	-43.2	0.18	12.959
2449.800	5.50E-07	10.75	2	-43.02	-43.2	0.18	12.926
2449.850	4.30E-07	10.83	2	-43.02	-43.2	0.18	13.012
2449.900	1.25E-07	11.24	2	-43.02	-43.2	0.18	13.419
2449.950	3.20E-07	10.93	2	-43.02	-43.2	0.18	13.113
2450.000	3.30E-07	10.92	2	-43.02	-43.2	0.18	13.102
2450.050	5.00E-07	10.78	2	-43.02	-43.2	0.18	12.959
2450.100	5.50E-07	10.75	2	-43.02	-43.2	0.18	12.926
2450.150	4.30E-07	10.83	2	-43.02	-43.2	0.18	13.012
2450.200	6.30E-07	10.7	2	-43.02	-43.2	0.18	12.878
2450.250	3.22E-07	10.93	2	-43.02	-43.2	0.18	13.11
2450.300	2.44E-07	11.02	2	-43.02	-43.2	0.18	13.203
2450.350	6.70E-07	10.68	2	-43.02	-43.2	0.18	12.856
2450.400	7.30E-07	10.65	2	-43.02	-43.2	0.18	12.825
2450.450	4.30E-07	10.83	2	-43.02	-43.2	0.18	13.012
2450.500	3.22E-07	10.93	2	-43.02	-43.2	0.18	13.11
2450.550	3.40E-07	10.91	2	-43.02	-43.2	0.18	13.092
2450.600	3.60E-07	10.89	2	-43.02	-43.2	0.18	13.073
2450.650	4.30E-07	10.83	2	-43.02	-43.2	0.18	13.012
2450.700	5.20E-07	10.77	2	-43.02	-43.2	0.18	12.946
2450.750	5.30E-07	10.76	2	-43.02	-43.2	0.18	12.939
2450.800	3.20E-07	10.93	2	-43.02	-43.2	0.18	13.113
2450.850	3.50E-07	10.9	2	-43.02	-43.2	0.18	13.082
2450.900	3.90E-07	10.87	2	-43.02	-43.2	0.18	13.045
2450.950	2.50E-07	11.02	2	-43.02	-43.2	0.18	13.195
2451.000	2.06E-07	11.08	2	-43.02	-43.2	0.18	13.259
2451.050	3.30E-07	10.92	2	-43.02	-43.2	0.18	13.102
2451.100	3.70E-07	10.88	2	-43.02	-43.2	0.18	13.063
2451.150	4.30E-07	10.83	2	-43.02	-43.2	0.18	13.012
2451.200	3.10E-07	10.94	2	-43.02	-43.2	0.18	13.123
2451.250	2.70E-07	10.99	2	-43.02	-43.2	0.18	13.17
2451.300	2.20E-07	11.06	2	-43.02	-43.2	0.18	13.237
2451.350	4.30E-07	10.83	2	-43.02	-43.2	0.18	13.012
2451.400	3.30E-07	10.92	2	-43.02	-43.2	0.18	13.102
2451.450	2.55E-07	11.01	2	-43.02	-43.2	0.18	13.189

Processing gain of a direct sequence spread spectrum, FCC CFR 47, Part 15.247 (e)

Measured Data:

Sig. Gen. Freq. [MHz]	Bit error rate (BER)	(S/N)o [dB]	L sys [dB]	Sig. Gen. Total Peak Power @ RX [dBm]	TX Total Peak Power @ RX [dBm]	Jammer to Signal Ratio Mj [dB]	Processing Gain (PG) [dB]
2451.500	4.83E-07	10.79	2	-43.02	-43.2	0.18	12.971
2451.550	3.30E-07	10.92	2	-43.02	-43.2	0.18	13.102
2451.600	5.60E-07	10.74	2	-43.02	-43.2	0.18	12.92
2451.650	4.80E-07	10.79	2	-43.02	-43.2	0.18	12.974
2451.700	5.60E-07	10.74	2	-43.02	-43.2	0.18	12.92
2451.750	5.50E-07	10.75	2	-43.02	-43.2	0.18	12.926
2451.800	5.40E-07	10.75	2	-43.02	-43.2	0.18	12.932
2451.850	5.10E-07	10.77	2	-43.02	-43.2	0.18	12.952
2451.900	3.90E-07	10.87	2	-43.02	-43.2	0.18	13.045
2451.950	4.30E-07	10.83	2	-43.02	-43.2	0.18	13.012
2452.000	4.80E-07	10.79	2	-43.02	-43.2	0.18	12.974
2452.050	5.10E-07	10.77	2	-43.02	-43.2	0.18	12.952
2452.100	5.50E-07	10.75	2	-43.02	-43.2	0.18	12.926
2452.150	5.75E-07	10.73	2	-43.02	-43.2	0.18	12.91
2452.200	6.30E-07	10.7	2	-43.02	-43.2	0.18	12.878
2452.250	3.80E-07	10.87	2	-43.02	-43.2	0.18	13.054
2452.300	1.50E-07	11.18	2	-43.02	-43.2	0.18	13.361
2452.350	3.40E-07	10.91	2	-43.02	-43.2	0.18	13.092
2452.400	5.60E-07	10.74	2	-43.02	-43.2	0.18	12.92
2452.450	5.00E-07	10.78	2	-43.02	-43.2	0.18	12.959
2452.500	5.50E-07	10.75	2	-43.02	-43.2	0.18	12.926
2452.550	6.00E-07	10.72	2	-43.02	-43.2	0.18	12.895
2452.600	6.30E-07	10.7	2	-43.02	-43.2	0.18	12.878
2452.650	6.10E-07	10.71	2	-43.02	-43.2	0.18	12.889
2452.700	3.20E-07	10.93	2	-42.02	-43.2	1.18	14.113
2452.750	2.40E-07	11.03	2	-42.02	-43.2	1.18	14.209
2452.800	3.20E-07	10.93	2	-42.02	-43.2	1.18	14.113
2452.850	2.44E-07	11.02	2	-42.02	-43.2	1.18	14.203
2452.900	6.70E-07	10.68	2	-42.02	-43.2	1.18	13.856
2452.950	7.30E-07	10.65	2	-42.02	-43.2	1.18	13.825
2453.000	4.30E-07	10.83	2	-42.02	-43.2	1.18	14.012
2453.050	3.22E-07	10.93	2	-42.02	-43.2	1.18	14.11
2453.100	2.40E-07	11.03	2	-42.02	-43.2	1.18	14.209
2453.150	1.10E-07	11.28	2	-42.02	-43.2	1.18	14.459
2453.200	3.30E-07	10.92	2	-42.02	-43.2	1.18	14.102

Processing gain of a direct sequence spread spectrum, FCC CFR 47, Part 15.247 (e)

Measured Data:

Sig. Gen. Freq. [MHz]	Bit error rate (BER)	(S/N)o [dB]	L sys [dB]	Sig. Gen. Total Peak Power @ RX [dBm]	TX Total Peak Power @ RX [dBm]	Jammer to Signal Ratio Mj [dB]	Processing Gain (PG) [dB]
2453.250	5.45E-07	10.75	2	-42.02	-43.2	1.18	13.929
2453.300	4.63E-07	10.81	2	-42.02	-43.2	1.18	13.986
2453.350	5.50E-07	10.75	2	-42.02	-43.2	1.18	13.926
2453.400	5.80E-07	10.73	2	-42.02	-43.2	1.18	13.907
2453.450	5.30E-07	10.76	2	-42.02	-43.2	1.18	13.939
2453.500	3.50E-07	10.9	2	-42.02	-43.2	1.18	14.082
2453.550	4.30E-07	10.83	2	-42.02	-43.2	1.18	14.012
2453.600	5.20E-07	10.77	2	-42.02	-43.2	1.18	13.946
2453.650	6.30E-07	10.7	2	-42.02	-43.2	1.18	13.878
2453.700	3.40E-07	10.91	2	-42.02	-43.2	1.18	14.092
2453.750	3.60E-07	10.89	2	-42.02	-43.2	1.18	14.073
2453.800	4.30E-07	10.83	2	-42.02	-43.2	1.18	14.012
2453.850	5.20E-07	10.77	2	-42.02	-43.2	1.18	13.946
2453.900	5.30E-07	10.76	2	-42.02	-43.2	1.18	13.939
2453.950	3.20E-07	10.93	2	-42.02	-43.2	1.18	14.113
2454.000	3.50E-07	10.9	2	-42.02	-43.2	1.18	14.082
2454.050	3.90E-07	10.87	2	-42.02	-43.2	1.18	14.045
2454.100	2.50E-07	11.02	2	-42.02	-43.2	1.18	14.195
2454.150	2.06E-07	11.08	2	-42.02	-43.2	1.18	14.259
2454.200	4.40E-07	10.82	2	-42.02	-43.2	1.18	14.004
2454.250	3.89E-07	10.87	2	-42.02	-43.2	1.18	14.046
2454.300	4.33E-07	10.83	2	-42.02	-43.2	1.18	14.009
2454.350	2.99E-07	10.96	2	-42.02	-43.2	1.18	14.135
2454.400	3.80E-07	10.87	2	-42.02	-43.2	1.18	14.054
2454.450	1.50E-07	11.18	2	-42.02	-43.2	1.18	14.361
2454.500	3.48E-07	10.9	2	-42.02	-43.2	1.18	14.084
2454.550	5.68E-07	10.74	2	-42.02	-43.2	1.18	13.915
2454.600	5.00E-07	10.78	2	-42.02	-43.2	1.18	13.959
2454.650	5.50E-07	10.75	2	-42.02	-43.2	1.18	13.926
2454.700	6.00E-07	10.72	2	-42.02	-43.2	1.18	13.895
2454.750	5.50E-07	10.75	2	-42.02	-43.2	1.18	13.926
2454.800	5.40E-07	10.75	2	-42.02	-43.2	1.18	13.932
2454.850	5.10E-07	10.77	2	-42.02	-43.2	1.18	13.952
2454.900	4.30E-07	10.83	2	-42.02	-43.2	1.18	14.012
2454.950	3.30E-07	10.92	2	-42.02	-43.2	1.18	14.102

Processing gain of a direct sequence spread spectrum, FCC CFR 47, Part 15.247 (e)

Measured Data:

Sig. Gen. Freq. [MHz]	Bit error rate (BER)	(S/N)o [dB]	L sys [dB]	Sig. Gen. Total Peak Power @ RX [dBm]	TX Total Peak Power @ RX [dBm]	Jammer to Signal Ratio Mj [dB]	Processing Gain (PG) [dB]
2455.000	3.30E-07	10.92	2	-42.02	-43.2	1.18	14.102
2455.050	4.30E-07	10.83	2	-42.02	-43.2	1.18	14.012
2455.100	2.85E-07	10.97	2	-42.02	-43.2	1.18	14.152
2455.150	2.43E-07	11.03	2	-42.02	-43.2	1.18	14.205
2455.200	3.30E-07	10.92	2	-42.02	-43.2	1.18	14.102
2455.250	5.50E-07	10.75	2	-42.32	-43.2	0.88	13.626
2455.300	6.10E-07	10.71	2	-42.32	-43.2	0.88	13.589
2455.350	7.10E-07	10.66	2	-42.32	-43.2	0.88	13.535
2455.400	4.30E-07	10.83	2	-42.02	-43.2	1.18	14.012
2455.450	5.50E-07	10.75	2	-42.02	-43.2	1.18	13.926
2455.500	5.30E-07	10.76	2	-42.02	-43.2	1.18	13.939
2455.550	3.50E-07	10.9	2	-42.72	-43.2	0.48	13.382
2455.600	4.30E-07	10.83	2	-42.72	-43.2	0.48	13.312
2455.650	5.20E-07	10.77	2	-42.72	-43.2	0.48	13.246
2455.700	6.30E-07	10.7	2	-42.72	-43.2	0.48	13.178
2455.750	4.40E-07	10.82	2	-42.72	-43.2	0.48	13.304
2455.800	3.60E-07	10.89	2	-42.72	-43.2	0.48	13.373
2455.850	4.30E-07	10.83	2	-42.72	-43.2	0.48	13.312
2455.900	5.20E-07	10.77	2	-43.02	-43.2	0.18	12.946
2455.950	5.30E-07	10.76	2	-42.02	-43.2	1.18	13.939
2456.000	3.20E-07	10.93	2	-42.02	-43.2	1.18	14.113
2456.050	3.50E-07	10.9	2	-42.02	-43.2	1.18	14.082
2456.100	3.90E-07	10.87	2	-43.02	-43.2	0.18	13.045
2456.150	2.50E-07	11.02	2	-43.02	-43.2	0.18	13.195
2456.200	2.06E-07	11.08	2	-42.02	-43.2	1.18	14.259
2456.250	5.10E-07	10.77	2	-43.02	-43.2	0.18	12.952
2456.300	5.30E-07	10.76	2	-43.02	-43.2	0.18	12.939
2456.350	2.60E-07	11	2	-42.52	-43.2	0.68	13.682
2456.400	3.50E-07	10.9	2	-42.52	-43.2	0.68	13.582
2456.450	4.00E-07	10.86	2	-42.52	-43.2	0.68	13.537
2456.500	3.60E-07	10.89	2	-42.52	-43.2	0.68	13.573
2456.550	4.00E-07	10.86	2	-42.02	-43.2	1.18	14.037
2456.600	3.87E-07	10.87	2	-42.02	-43.2	1.18	14.048
2456.650	3.90E-07	10.87	2	-42.02	-43.2	1.18	14.045
2456.700	4.30E-08	11.56	2	-42.02	-43.2	1.18	14.744

Processing gain of a direct sequence spread spectrum, FCC CFR 47, Part 15.247 (e)

Measured Data:

Sig. Gen. Freq. [MHz]	Bit error rate (BER)	(S/N)o [dB]	L sys [dB]	Sig. Gen. Total Peak Power @ RX [dBm]	TX Total Peak Power @ RX [dBm]	Jammer to Signal Ratio Mj [dB]	Processing Gain (PG) [dB]
2456.750	3.50E-07	10.9	2	-42.02	-43.2	1.18	14.082
2456.800	6.10E-07	10.71	2	-42.02	-43.2	1.18	13.889
2456.850	3.50E-07	10.9	2	-42.02	-43.2	1.18	14.082
2456.900	4.20E-07	10.84	2	-42.02	-43.2	1.18	14.02
2456.950	6.40E-07	10.69	2	-43.02	-43.2	0.18	12.872
2457.000	4.43E-07	10.82	2	-42.52	-43.2	0.68	13.501
2457.050	4.23E-07	10.84	2	-42.52	-43.2	0.68	13.517
2457.100	5.50E-07	10.75	2	-42.02	-43.2	1.18	13.926
2457.150	5.40E-07	10.75	2	-43.02	-43.2	0.18	12.932
2457.200	5.10E-07	10.77	2	-43.02	-43.2	0.18	12.952
2457.250	3.50E-07	10.9	2	-42.02	-43.2	1.18	14.082
2457.300	4.00E-07	10.86	2	-43.02	-43.2	0.18	13.037
2457.350	3.60E-07	10.89	2	-43.02	-43.2	0.18	13.073
2457.400	4.00E-07	10.86	2	-42.52	-43.2	0.68	13.537
2457.450	4.50E-07	10.82	2	-42.52	-43.2	0.68	13.496
2457.500	4.60E-07	10.81	2	-42.02	-43.2	1.18	13.988
2457.550	5.10E-07	10.77	2	-42.02	-43.2	1.18	13.952
2457.600	5.50E-07	10.75	2	-42.02	-43.2	1.18	13.926
2457.650	5.40E-07	10.75	2	-42.02	-43.2	1.18	13.932
2457.700	5.10E-07	10.77	2	-42.02	-43.2	1.18	13.952
2457.750	6.90E-07	10.67	2	-41.62	-43.2	1.58	14.245
2457.800	7.00E-07	10.66	2	-41.62	-43.2	1.58	14.24
2457.850	8.10E-07	10.61	2	-41.52	-43.2	1.68	14.287
2457.900	6.80E-07	10.67	2	-41.52	-43.2	1.68	14.351
2457.950	5.30E-07	10.76	2	-41.02	-43.2	2.18	14.939
2458.000	3.50E-07	10.9	2	-41.02	-43.2	2.18	15.082
2458.050	4.30E-07	10.83	2	-41.02	-43.2	2.18	15.012
2458.100	5.20E-07	10.77	2	-41.52	-43.2	1.68	14.446
2458.150	6.30E-07	10.7	2	-41.02	-43.2	2.18	14.878
2458.200	4.30E-07	10.83	2	-41.02	-43.2	2.18	15.012
2458.250	4.60E-07	10.81	2	-41.02	-43.2	2.18	14.988
2458.300	4.00E-07	10.86	2	-41.02	-43.2	2.18	15.037
2458.350	3.97E-07	10.86	2	-41.02	-43.2	2.18	15.039
2458.400	6.50E-07	10.69	2	-40.02	-43.2	3.18	15.867
2458.450	6.80E-07	10.67	2	-40.02	-43.2	3.18	15.851

Processing gain of a direct sequence spread spectrum, FCC CFR 47, Part 15.247 (e)

Measured Data:

Sig. Gen. Freq. [MHz]	Bit error rate (BER)	(S/N)o [dB]	L sys [dB]	Sig. Gen. Total Peak Power @ RX [dBm]	TX Total Peak Power @ RX [dBm]	Jammer to Signal Ratio Mj [dB]	Processing Gain (PG) [dB]
2458.500	4.95E-07	10.78	2	-39.02	-43.2	4.18	16.963
2458.550	3.11E-07	10.94	2	-39.02	-43.2	4.18	17.122
2458.600	5.10E-07	10.77	2	-39.02	-43.2	4.18	16.952
2458.650	6.35E-07	10.7	2	-39.02	-43.2	4.18	16.875
2458.700	5.29E-07	10.76	2	-39.52	-43.2	3.68	16.44
2458.750	5.60E-07	10.74	2	-39.52	-43.2	3.68	16.42
2458.800	6.30E-07	10.7	2	-39.02	-43.2	4.18	16.878
2458.850	4.10E-07	10.85	2	-39.02	-43.2	4.18	17.028
2458.900	4.80E-07	10.79	2	-39.02	-43.2	4.18	16.974
2458.950	3.30E-07	10.92	2	-39.02	-43.2	4.18	17.102
2459.000	5.56E-07	10.74	2	-39.02	-43.2	4.18	16.922
2459.050	4.70E-07	10.8	2	-39.02	-43.2	4.18	16.981
2459.100	4.80E-07	10.79	2	-39.02	-43.2	4.18	16.974
2459.150	4.20E-07	10.84	2	-39.02	-43.2	4.18	17.02
2459.200	4.00E-07	10.86	2	-38.52	-43.2	4.68	17.537
2459.250	3.48E-07	10.9	2	-38.02	-43.2	5.18	18.084
2459.300	2.20E-07	11.06	2	-38.02	-43.2	5.18	18.237
2459.350	3.80E-07	10.87	2	-38.02	-43.2	5.18	18.054
2459.400	1.50E-07	11.18	2	-39.02	-43.2	4.18	17.361
2459.450	3.48E-07	10.9	2	-39.02	-43.2	4.18	17.084
2459.500	5.68E-07	10.74	2	-39.02	-43.2	4.18	16.915
2459.550	5.00E-07	10.78	2	-38.02	-43.2	5.18	17.959
2459.600	5.50E-07	10.75	2	-38.02	-43.2	5.18	17.926
2459.650	6.00E-07	10.72	2	-37.02	-43.2	6.18	18.895
2459.700	6.30E-07	10.7	2	-38.02	-43.2	5.18	17.878
2459.750	6.11E-07	10.71	2	-38.02	-43.2	5.18	17.889
2459.800	5.50E-07	10.75	2	-37.02	-43.2	6.18	18.926
2459.850	4.30E-07	10.83	2	-36.52	-43.2	6.68	19.512
2459.900	3.30E-07	10.92	2	-36.02	-43.2	7.18	20.102
2459.950	2.10E-07	11.07	2	-35.02	-43.2	8.18	21.253
2460.000	1.30E-07	11.23	2	-34.02	-43.2	9.18	22.407
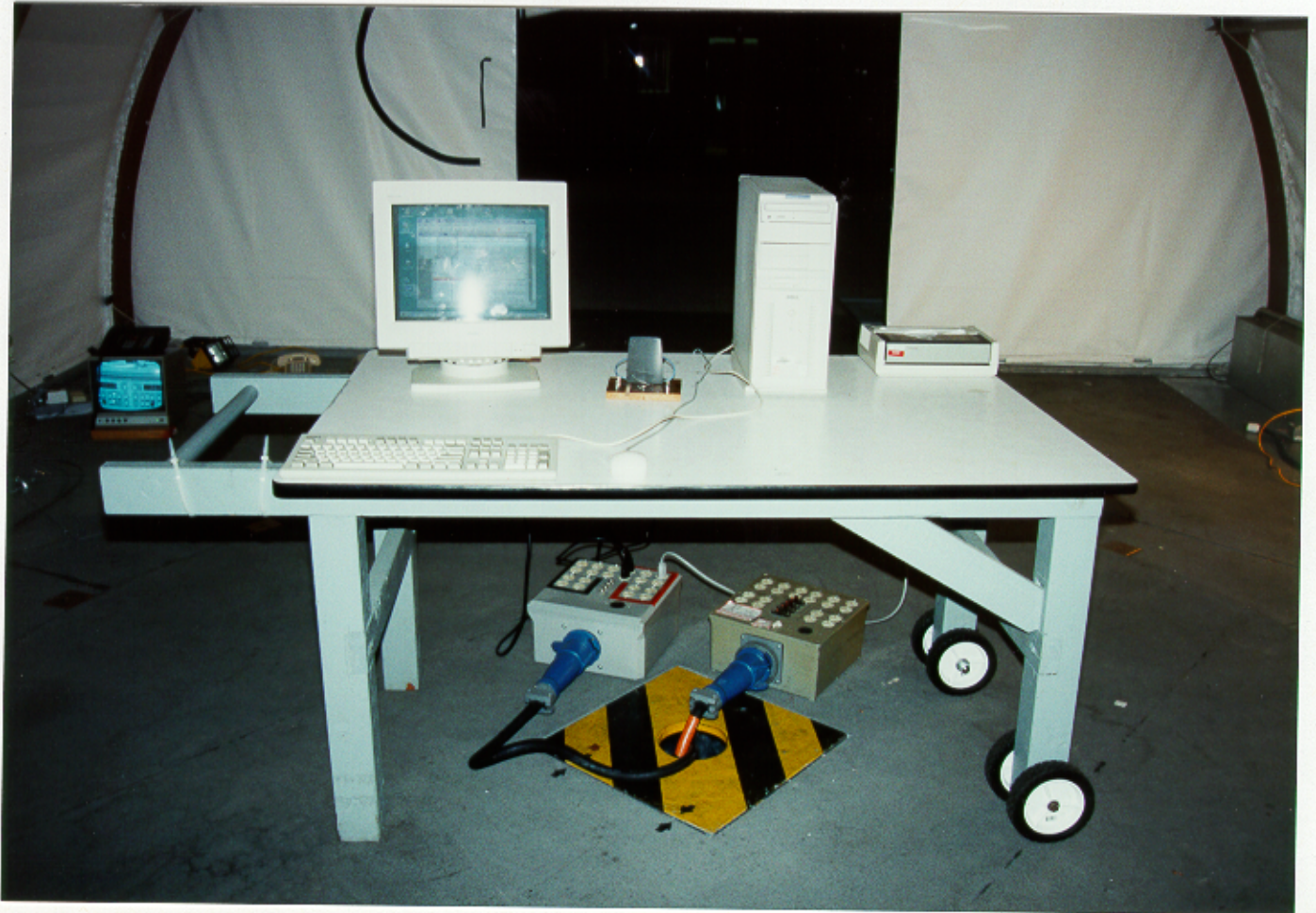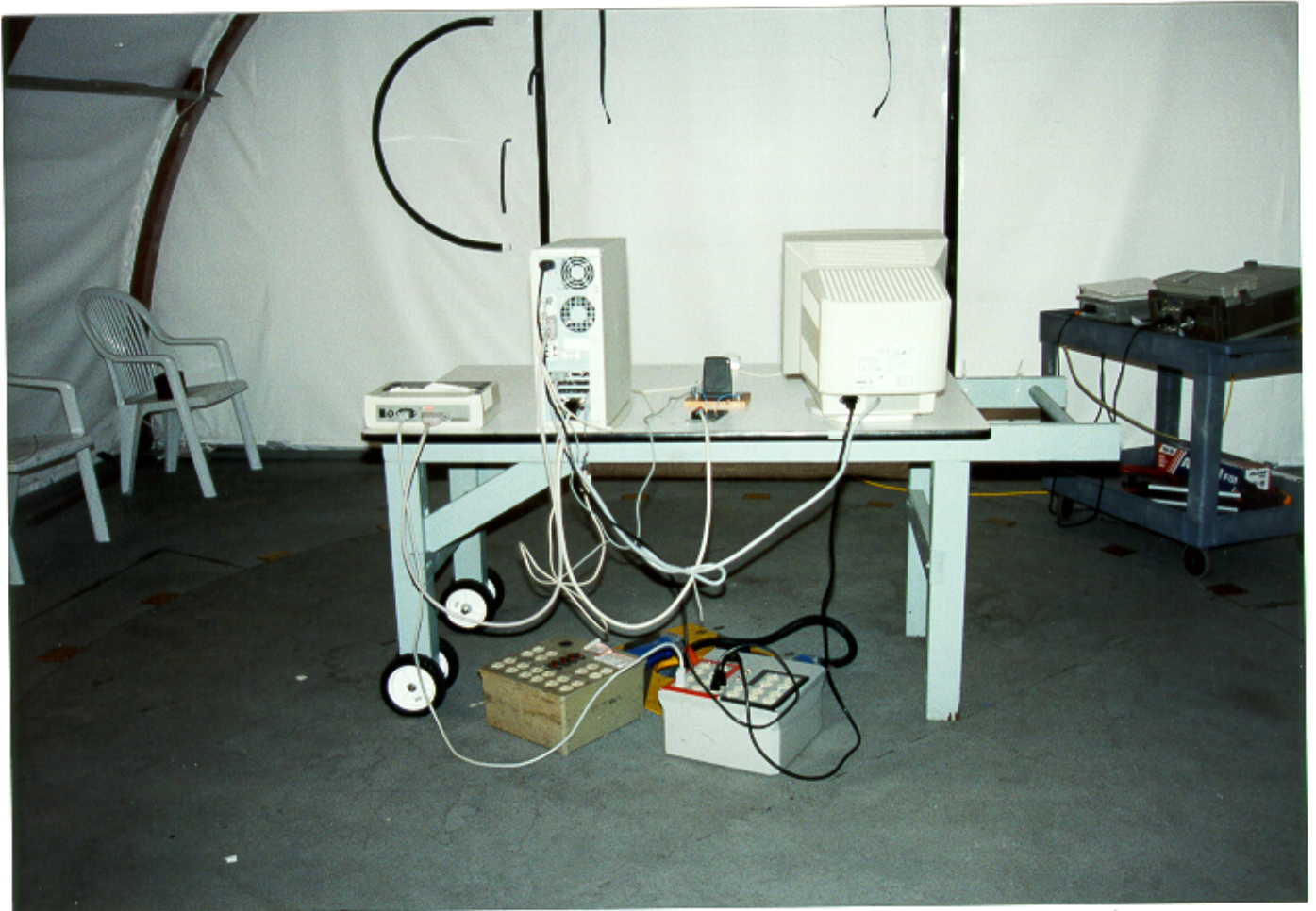
EXHIBIT 4: Proposed FCC ID Label & Label Location

This device complies with Part 15 of the FCC rules.
Operation is subject to the following two conditions:
(1) This device may not cause harmful interference, and
(2) This device must accept any interference received,
including interference that may cause undesired operation.

FCC ID N9P5W1-2450

S/N

P/N 200-0110-000

M/N

LABEL
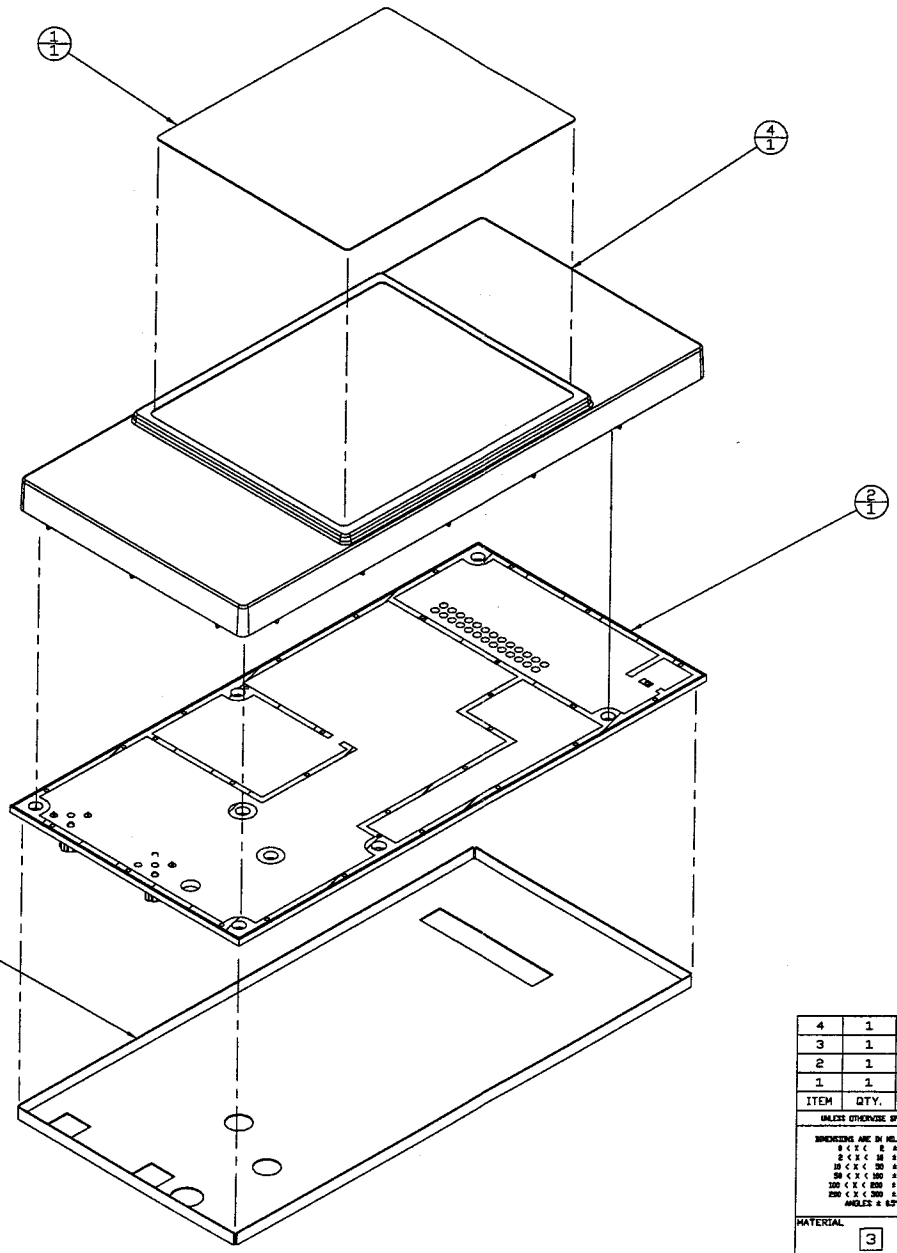
Label location

LABEL LOCATION

4	1	B13-0100-000	HEATSINK/EMI SHIELD, PCBA, RADIO	ALUMINUM 390.0
3	1	800-0113-000	SHIELD, ANALOG, BACKSIDE, EMI, PCB, RADIO	CRS
2	1	200-0119-000	PCBA, RADIO	
1	1	109-0103-000	LABEL, PRODUCT, SET TOP ENCLOSURE	
ITEM	QTY.	PART NUMBER	DESCRIPTION	MATERIAL

SHAREWAVE, INC.

5175 HILLSDALE CIRCLE, EL DORADO HILLS, CA 95762 (916) 939-9460

ASSY, PCBA, SHIELDED, RADIO

	SIGNATURES	DATE
DRAWN	FUNCTION	
CHECKED		
ENGR	C. DAVIS	
MFG ENGR		
ISSUED		
NEXT ASSY:		

MATERIAL 3

DWG NAME: FLC_SHIELD_RADIO
DWG INV: FLC_SHIELD_RADIO_ASSY

SCALE 2.000

SIZE D | DRAWING NUMBER 200-0103-000 | REV B

SHEET 1 OF 1

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN MILLIMETERS

THIRD ANGLE PROJECTION

EXHIBIT 5:Detailed Photographs of ShareWave Model PowerWave 2.4GHz Radio Construction

6 Pages
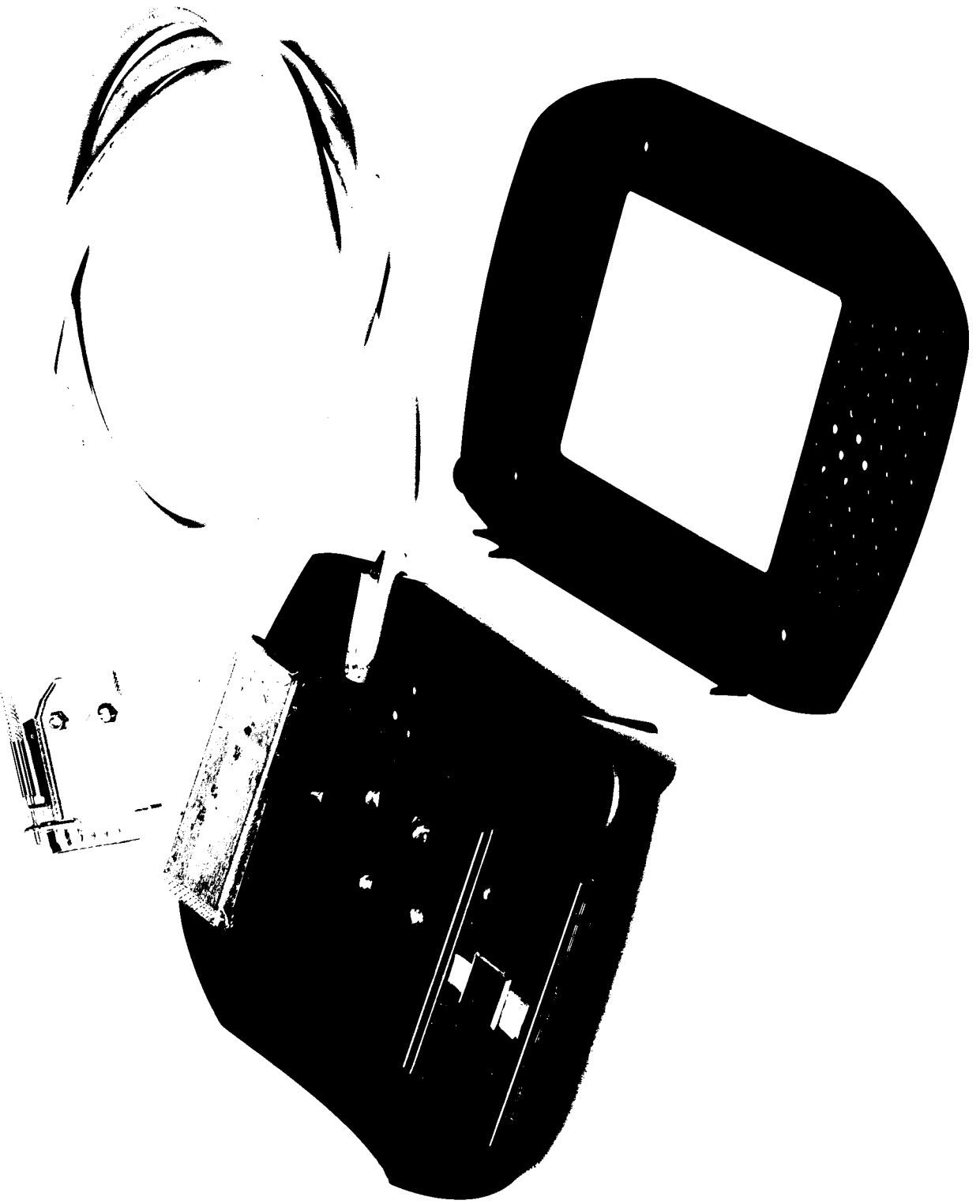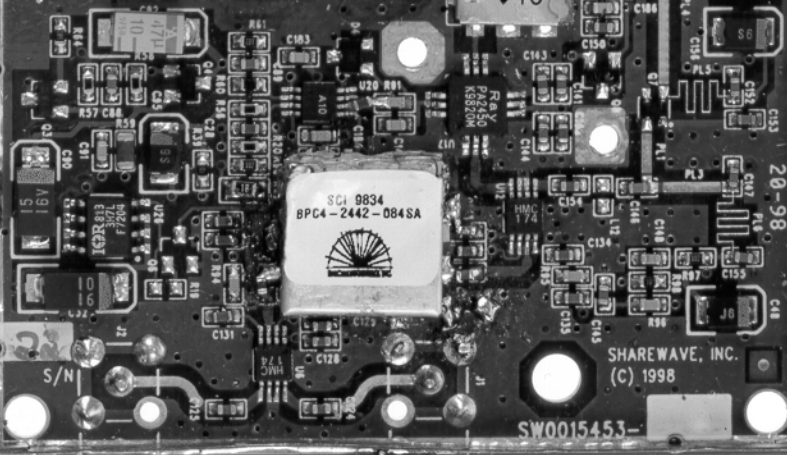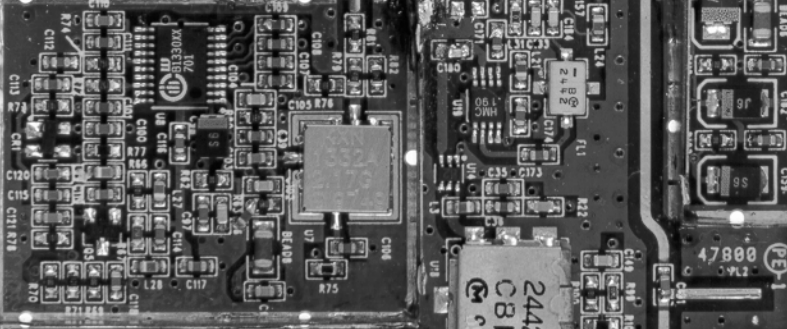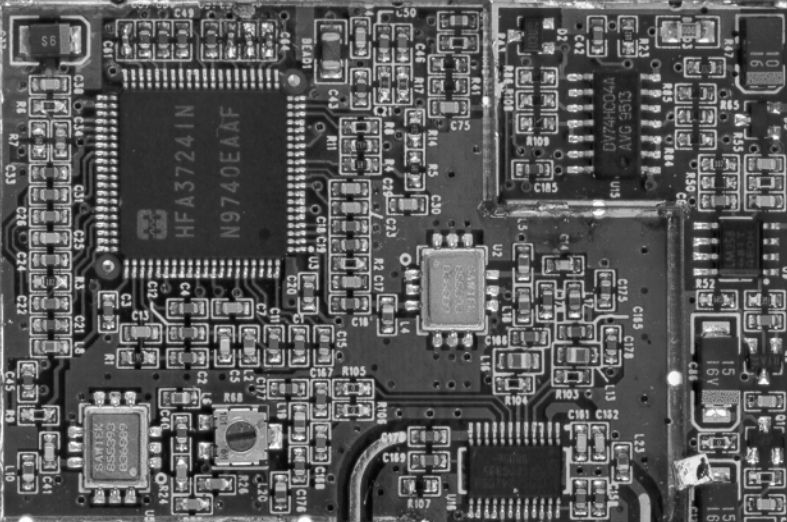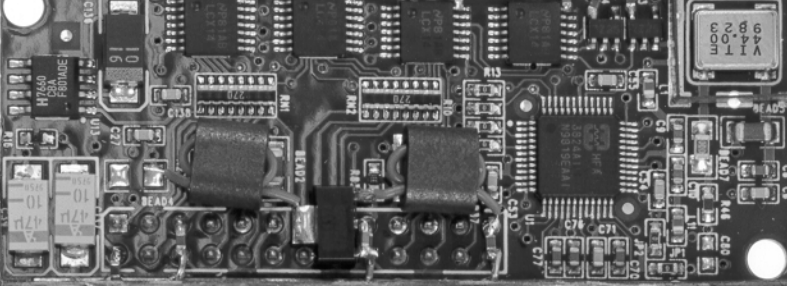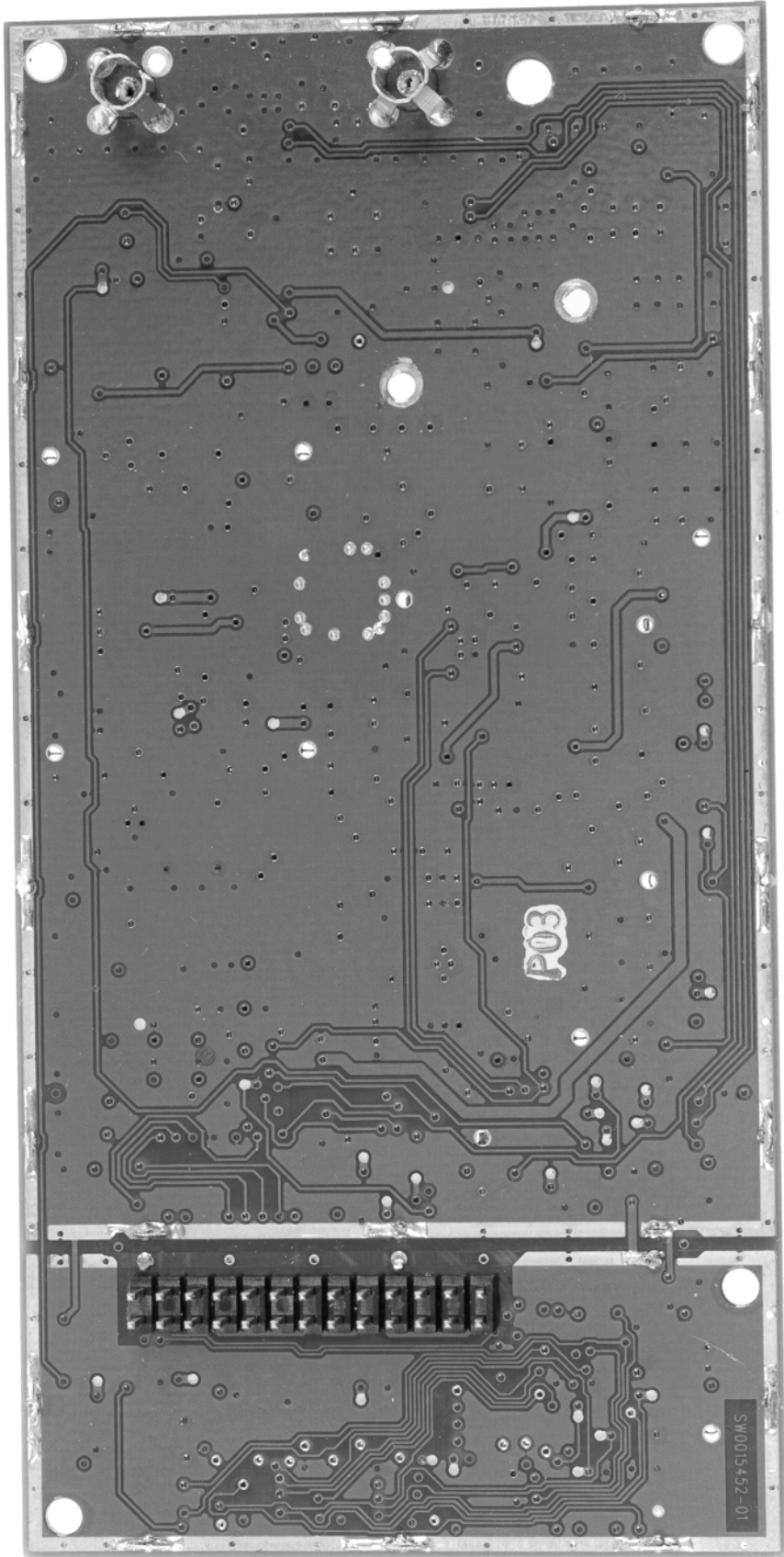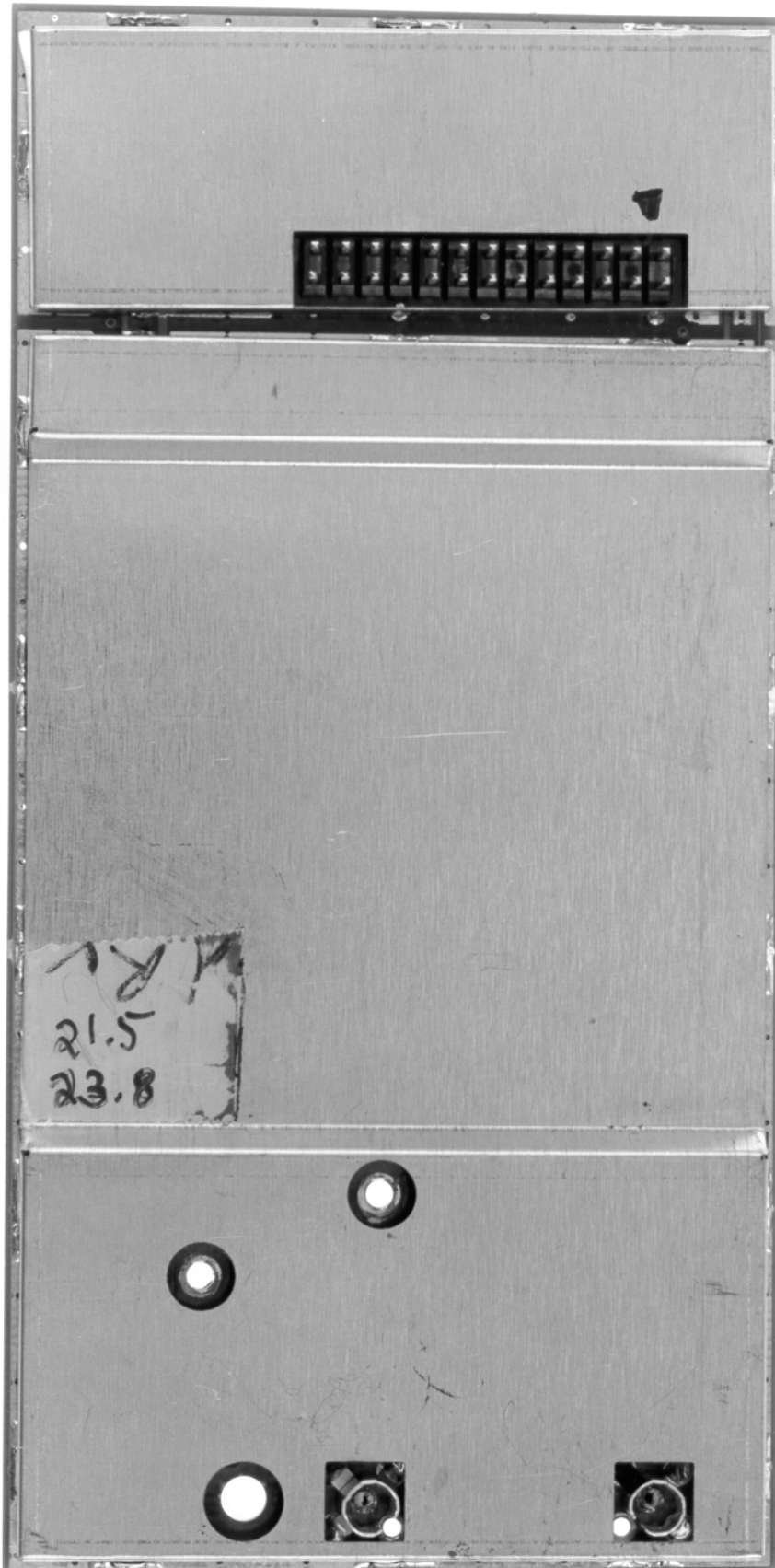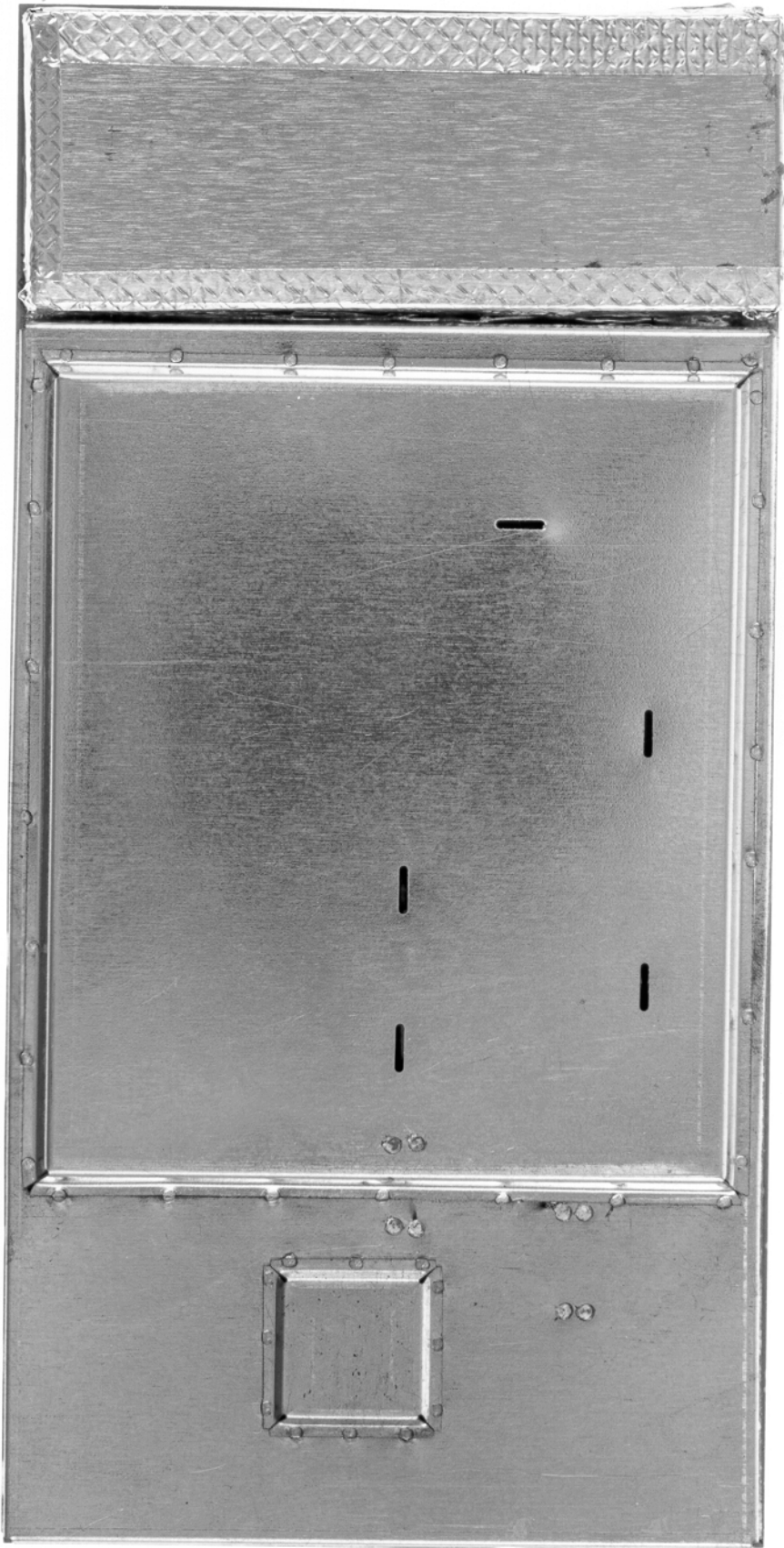
EXHIBIT 6:Operator's Manual for ShareWave Model PowerWave 2.4GHz Radio

52 Pages

SharePC™

Wireless TV System

■ How to install and use your **SharePC** Wireless TV System

*** DRAFT ***

*** DRAFT ***

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Using SharePC

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Technical support

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FCC and UL information

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Contacting {OEM}

Appendix F   51
Specifications

Chapter 1
Welcome

Congratulations on your purchase of the *SharePC® Wireless TV System*, and welcome to a wonderful new world of home computing enjoyment and flexibility. Your SharePC Wireless TV System is easy to operate and will give your family many years of reliable service.

The SharePC Wireless TV System provides *wireless* access to your home PC's computing power from a remote television without the expense and clutter of a second computer, monitor, or cables. Through the miracle of the SharePC wireless, *Digital Spread Spectrum* (DSS) technology, you can now share the power of your computer throughout your home using a standard TV.

Now your family can share one computer from two locations *at the same time*. No more hassles about who gets to use the computer. You'll appreciate the convenience of being able to run business applications or surf the Internet while your kids do their homework. And just imagine your entire family enjoying big-screen computer games and entertainment in the comfort of your living room instead of crowding around a small computer screen in your office or den.

You may already have a remote TV location in mind, such as the family room, den, master bedroom, or home theater, where your family will most likely use

the SharePC Wireless TV System. SharePC is a perfect addition to a home theater environment because of its superb graphics and sound capabilities.

Customized user desktops

The SharePC Wireless TV System allows each member of your family to access the power of your PC through a choice of customized *user desktops*, which display only on your television.

TV Desktop is designed for users who may prefer its familiar look and feel.

ShareCenter (the default desktop) is specially designed for family members who may prefer a simplified user interface. It's also ideal for limiting access to sensitive files, settings, or applications on your computer.

ShareCenter allows family member to access files and applications on your computer through a customized set of *activities* and *categories*.

*** DRAFT ***

An activity (also known as a *shortcut*) is simply a link to a program or file. Whenever you click a ShareCenter activity, you automatically start the program or open a file just as you would on any computer. Because are shortcuts, they can be safely renamed or deleted without affecting the actual program or file.
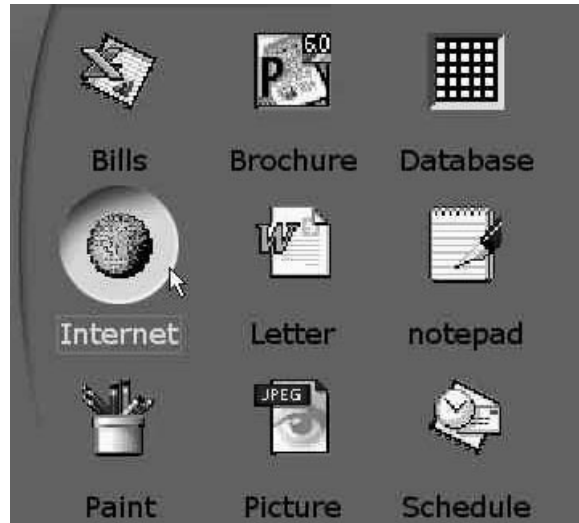
Related activities can be grouped together into customizable categories. Each category can be given a unique picture icon and name, such as *Work, Sports, Games,* or *Shopping*.

For instance, you may want a category named *Work* where you place activities linked to your spreadsheets and word processor. You may want another category named *Games* where you place activities linked to your favorite computer games.

To start a game, you would first click the *Games* category. You would then click an activity to start the desired game. The game launches in the background on your home computer and is displayed on your television. ShareCenter activities and categories display only on your television, not at the computer. Another family member can use the computer at the same time to run other applications.
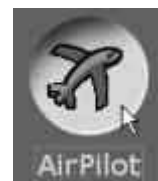
For your convenience, several ShareCenter activities and categories come pre-installed with the SharePC Wireless TV System.

Internet-ready features

*** DRAFT ***

The World Wide Web is one click away when using the SharePC Wireless TV System. The system is Internet ready, and comes complete with its own unique *ShareCenter Browser*. Using a single modem and telephone line connected to your PC, the ShareCenter Browser allows two users to access the Internet *at the same time*!
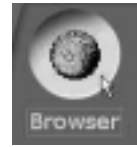
How to use this manual

This manual covers the installation and operation of your new SharePC Wireless TV System. For best performance from your new system, please read all of the instructions carefully. They were especially designed to help you correctly install your system as quickly as possible.

This symbol tells you to stop and read the directions carefully, then proceed with caution before completing an installation step.

This symbol warns you of possible electrical problems or dangers. Risk of bodily injury or damage to your equipment is possible. Please use extra caution.

If an installation step is confusing or doesn't match your particular situation, this symbol tells you where to look for more information.

This symbol marks valuable installation tips to save you time and confusion.

This symbol tells you that you have successfully completed an important installation section and are ready to move on to the next section.

Chapter 2
Before you begin

We know you're eager to get started. But before you begin, please take a moment to read through this section and check the contents of your SharePC Wireless TV System. The SharePC Wireless TV System contains some parts that must be installed at your PC and some that must be installed at your television.

Before you unpack the SharePC box, move it to the location of your home PC. This is where you'll begin your installation and test the system. Once these steps are completed, you'll then finish your installation at your television. This will save you from running back and forth between the two locations.

Your SharePC Wireless TV System contains the following parts. If any of these items are missing, please contact the dealer who sold you the system.

TV Terminal

Wireless Keyboard

PC Antenna

PCI Card

Installation Manual

Software Bundle

Installation Software

Quick Start Guide

A/V Cable

S-video Cable

3 – AAA Batteries

Power Supply

You will also need a screwdriver (not included).

System requirements

To install SharePC, your computer must have:

- at least a 133 MHz Pentium™ or equivalent processor

- at least 32 MB of RAM

- at least 100 MB of available hard disk space

- an empty PCI bus expansion slot

- a CD ROM or DVD drive

For best operation, your SharePC Wireless TV System needs the latest version of the Windows operating systems, either Windows 95, or Windows 98.

That's it! You're now ready to install your SharePC Wireless TV System. Proceed to the next chapter; Install the PC components.

Chapter 3

Install the PC components

Open your computer

If your computer is on, please shut down Windows. Turn off your computer and unplug it from the electrical outlet.

To avoid risk of electric shock, your computer and all other devices connected to it should be turned off and unplugged from electrical outlets.

If you need to unplug additional cables to work on your computer (printer, monitor, keyboard, mouse, etc.), do so now.

To help you reconnect your equipment, you can use tape to label all of the cables and connectors or make a drawing of their connections before you unplug them.

Remove your computer's cover screws and then remove the cover.
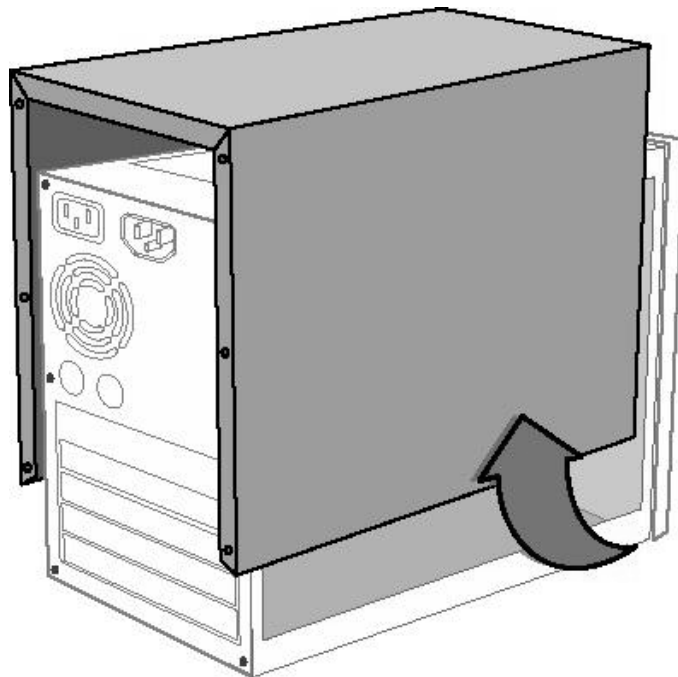
Your computer may look different than the one shown, but the steps to remove the cover should be similar. Consult your computer manufacturer's user manual if you need more instructions.

Your computer's main circuit board should have a group of computer expansion slots located near the back panel of the computer. Many computers have two or more kinds of slots. Locate an empty *PCI expansion slot*. PCI expansion slots are usually smaller, white plastic slots. The slot's opening should be the same length as the gold contact edge of your SharePC PCI card.

Rear panel bracket

PCI expansion slot

Expansion slot cover
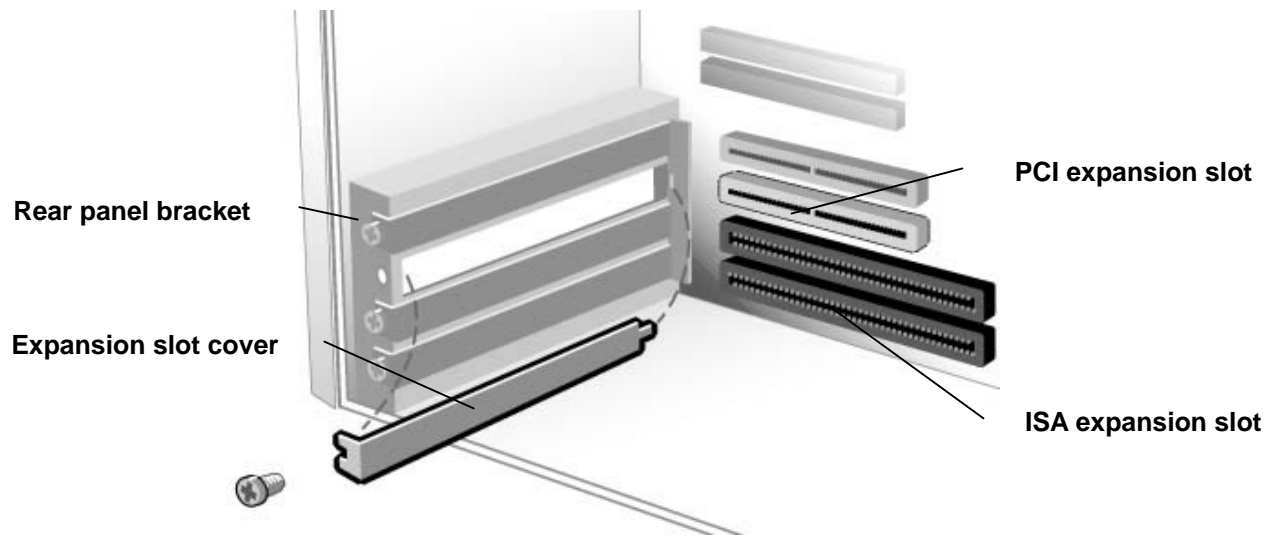
ISA expansion slot

If other PCI cards fill all PCI expansion slots, you will need to remove one of these other cards to install the SharePC card. Contact your computer dealer or technician for more information.

Each expansion slot sits directly behind a rear panel bracket containing removable expansion slot covers (thin metal strips that prevent dust from entering the computer). Locate the slot cover you wish to remove. The slot cover is usually secured to the rear panel bracket by a screw. Remove the screw and the slot cover. Save the screw. You'll need it to secure the PCI card.

Some slot covers are attached to the computer frame by a small metal tab. Bend the slot cover back and forth to break the tab and remove the slot cover.

*** DRAFT ***

Install the SharePC card

Your SharePC PCI card contains delicate electronic circuits that can be damaged or destroyed by static electricity on your hands, clothing, or work area. Before removing the SharePC card from its protective electrostatic bag, touch one hand to the metal frame of your computer to discharge any static electricity. Carefully handle the card by the edges to avoid touching the gold contact strip or board circuitry.

Remove the SharePC PCI card from its protective electrostatic bag.

Holding the card by its plastic edges, align the card's contact strip with the PCI expansion slot. There is a small alignment notch in the contact strip that should line up with a matching ridge in the expansion slot. Insert the card with a gentle rocking motion until it is completely seated in the slot. If you feel resistance, the card may not be lined up with the slot. Remove the card and try again.
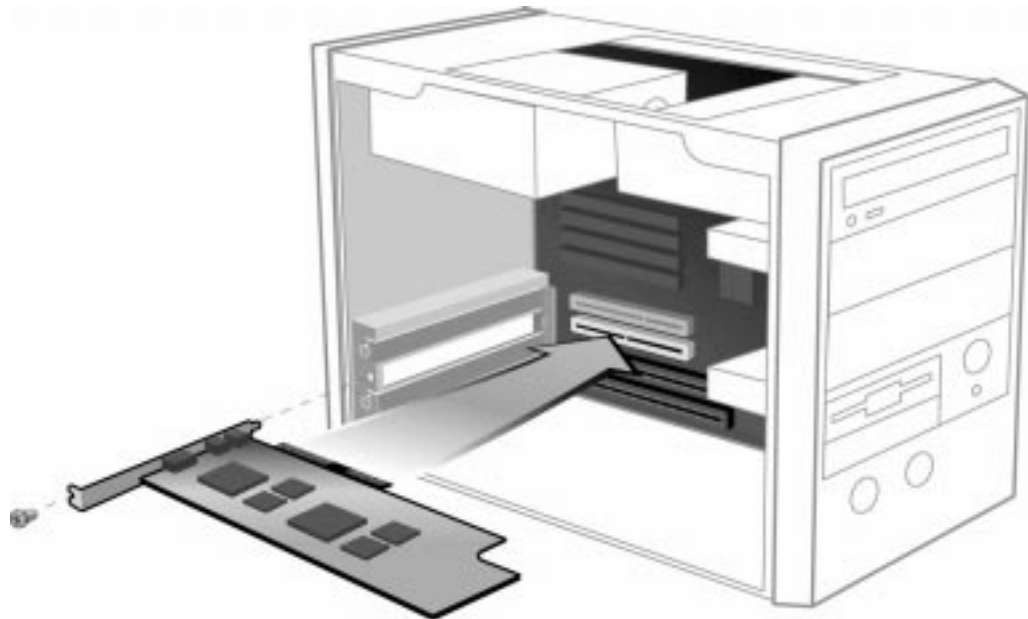
Do not *apply excessive force when inserting the PCI card as it may damage the card and the main board.*

Secure the card to the slot bracket with the bracket screw you removed earlier. Replace the computer cover and the cover screws.

Connect the PC Antenna

Remove the PC Antenna from its protective bag. Place it upright on a shelf or other flat surface. The top of the PC Antenna contains a flip-up antenna panel. Lift up on the front edge of the antenna panel and rotate it to an upright position.

PC Antenna

PCI card connector
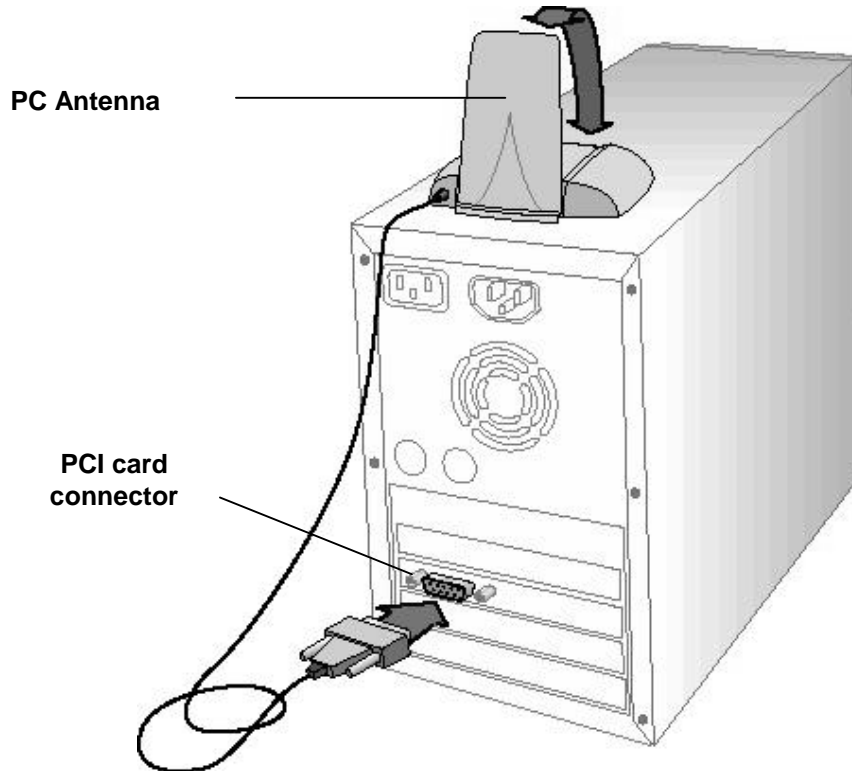
For best reception, locate the PC Antenna as high as possible and within four feet of your computer. Do not locate your PC Antenna where there is excessive vibration, heat, or moisture. The PC Antenna has an attached, 54-inch connector cable. Connect this cable to the SharePC PCI card connector.

Reconnect all power cords and equipment cables, and turn on the computer.

Congratulations! You have installed the PCI card and the PC Antenna. Now it's time to install the SharePC software and test your SharePC Wireless TV System.

Install the SharePC software

Once Windows starts, a dialog box should indicate that Windows has detected new hardware. You are prompted to locate the SharePC driver files. Insert your SharePC installation software CD ROM into your computer's CD-ROM or DVD drive. Click **Next** to continue. When you see this screen, click **Finish.**

If you see the screen below instead of the previous screen, click the **Back** button.

When you see the **Insert Disk** screen, click **OK** to continue. In the **Copy files from:** box, type **D:\setup.exe**, where "**D**" is the drive letter of your CD ROM or DVD drive (Depending on your computer, you may need to type the letter "**E**" or "**F**." to access the CD ROM drive). Click **OK**. You will see several screens as the driver files are installed. Once the software installation is complete, you will

see a screen telling you that the SharePC driver has been installed and that you must now restart your computer. Click **OK**.

After the computer restarts, eject the SharePC installation software CD ROM and re insert it to start your computer's auto run feature. The installer will now check your system for adequate resources and install the SharePC system software. Follow the on-screen directions to complete the software installation.

Once the system software has been installed, you will be asked to register your new system on line. Please have your **Net ID** and **Client ID** numbers ready. These numbers are printed on the bottom of the SharePC TV Terminal and on the registration card that came with your SharePC system.

Once the registration is completed, you will be asked to restart your computer. Click **OK**.

You did it! The SharePC software has been correctly installed. Now it's time to test the rest of your system components before completing your installation.

Test the TV Terminal

Remove the TV Terminal from its protective bag. Place the TV Terminal across the room from your computer. The top of the TV Terminal contains a flip-up antenna panel. Lift up on the front edge of the antenna panel and rotate it to an upright position. Locate the TV Terminal power supply and plug the power cable into the connector on the back of the TV Terminal. Plug the TV Terminal power supply into a nearby wall outlet.
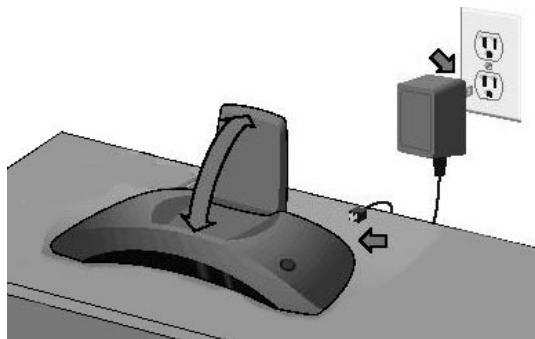
Use only the power supply that comes with your SharePC Wireless TV System. Using another power supply may damage your equipment and void the warranty.

*** DRAFT ***

On the front of the TV Terminal, you will three red, yellow and green signal strength lights. The green light should be lit. If the red or yellow light is lit, you may need to relocate the TV Terminal, host unit or both. If no lights are lit, recheck the power supply and be sure it is plugged into a live outlet.

Your PC should now detect a signal from the TV Terminal and display the following screen:

Click **OK**. If you do not see the above screen, try pressing the reset button on the top of the TV Terminal.

Test the Wireless Keyboard

Remove the SharePC Wireless Keyboard from the protective bag. Turn the keyboard over and insert the three "AAA" batteries. Be sure to observe the correct polarity as indicated by the + symbol on each battery.
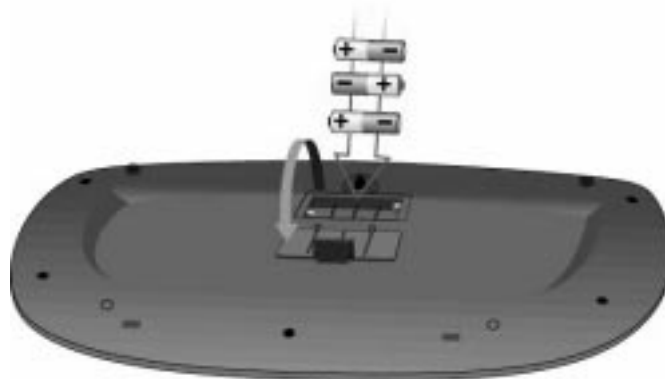
When you are finished inserting the batteries, close the battery cover.

*** DRAFT ***

With the wireless keyboard now upright and facing you, point the front of the keyboard at the TV Terminal.
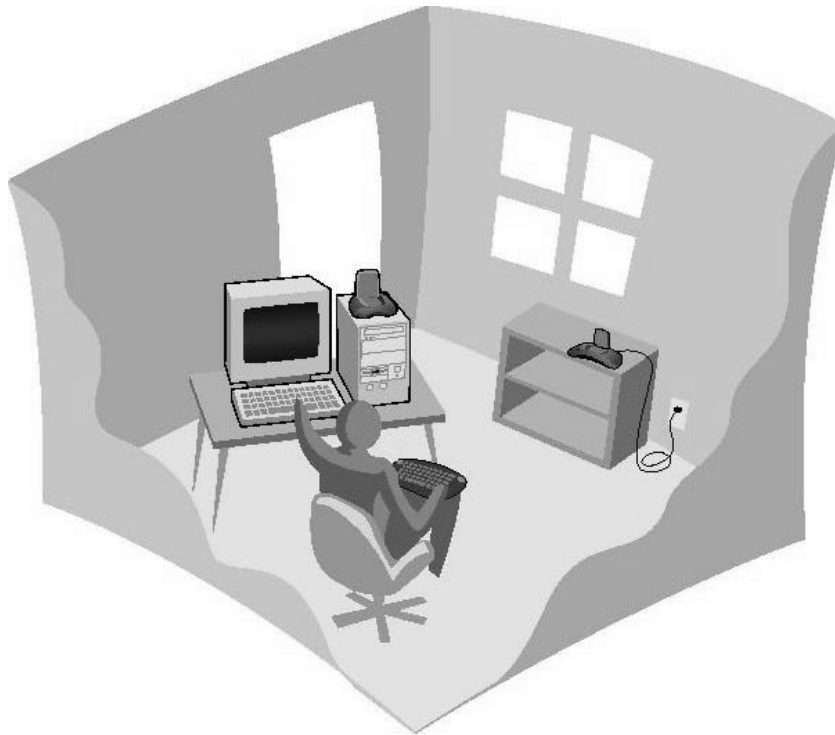
Press any key. You should see the following screen on your computer display.

Click **OK.**

Congratulations! Your SharePC Wireless Keyboard, PC Antenna, and TV Terminal communications system is working correctly.

Chapter 4
Connect the TV Terminal

Unplug the TV Terminal power supply from the wall socket and TV Terminal. Leave your computer on with the **Welcome to SharePC** window active. Move the TV Terminal, power supply, wireless keyboard, audio and video cables, Quick Start Guide, and user Manual to your television.

Turn off your TV, VCR, or home theater equipment before proceeding.

Place the SharePC TV Terminal on the television, VCR, or other level surface. Make sure the TV Terminal antenna is raised into its full, upright position. For best performance, locate the TV Terminal as high as possible and within six feet of your VCR or television. Do not locate your TV Terminal where there is excessive vibration, heat, or moisture.

Locate the TV Terminal power supply and connect it to the TV Terminal. Plug the TV Terminal power supply into a nearby wall outlet. The green signal strength light on the TV Terminal should be lit.

The following example depicts the most common method of connecting the SharePC TV Terminal to a standard television with stereo audio and video

inputs. Connect the SharePC audio and video cable as shown. The yellow, red, and white connectors on the ends of the audio and video cable will guide you.
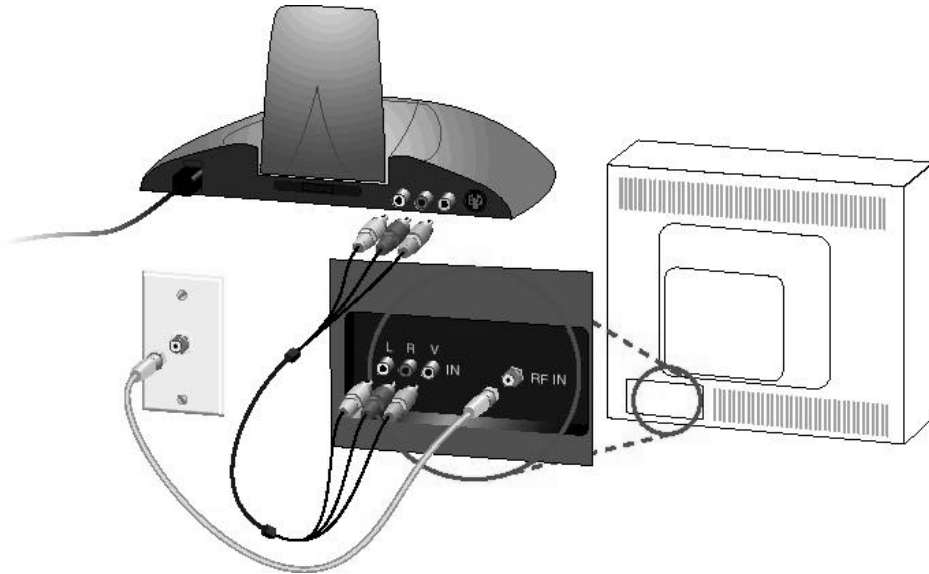
Because of its excellent audio capabilities, you may want to connect the TV Terminal's right and left audio output (the red and white connectors) to your stereo or home theater system instead of to your television.

Your installation may be different than the one shown above. Additional wiring diagrams can be found in Appendix A in this manual. Also, consult your owner's manuals for your television and VCR for additional wiring instructions.

Turn on the television (and home theater system or stereo if connected). Select the proper input on the TV to select the TV Terminal. For most installations, you will set your TV's input selector to **Video** or **Aux.** input. Consult the owner's manual that came with your TV for more information.

You should now see the **Welcome to SharePC** screen on your television indicating that the TV Terminal has been detected and is functioning correctly.
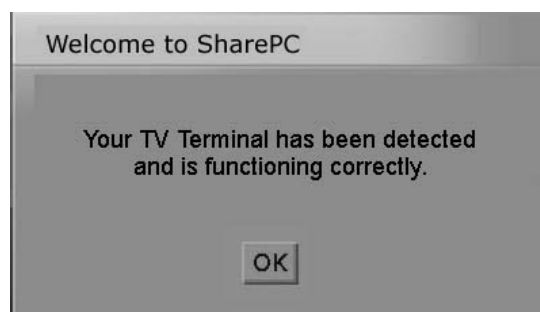
*** DRAFT ***

Click **OK**.

With the keyboard now upright and facing you, point the front of the keyboard at the TV Terminal and press any key. You should now see the **Welcome to SharePC** screen on your television indicating that the SharePC Wireless Keyboard has been detected and is functioning correctly.

Welcome to SharePC

Your SharePC Wireless Keyboard
has been detected and is
functioning correctly.

OK
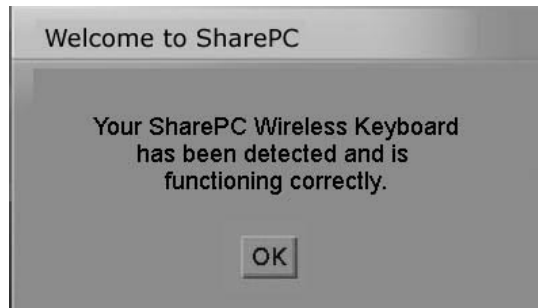
Click **OK**.

Congratulations! Your SharePC Wireless TV System is installed and working correctly. Now it's time to learn about the operation of your new equipment!

<div align="right">Chapter 5</div>

The SharePC Wireless Keyboard

Before you start using your system, please take a moment and become familiar with the operation and care of your infrared SharePC Wireless Keyboard.

Layout and operation

The layout and operation of your SharePC Wireless Keyboard is practically the same as your home computer's keyboard, with some special additions:

Game console buttons

Mouse/joystick selector switch

Left mouse button

Right mouse button

Joystick pointing device

SharePC/Fn function key
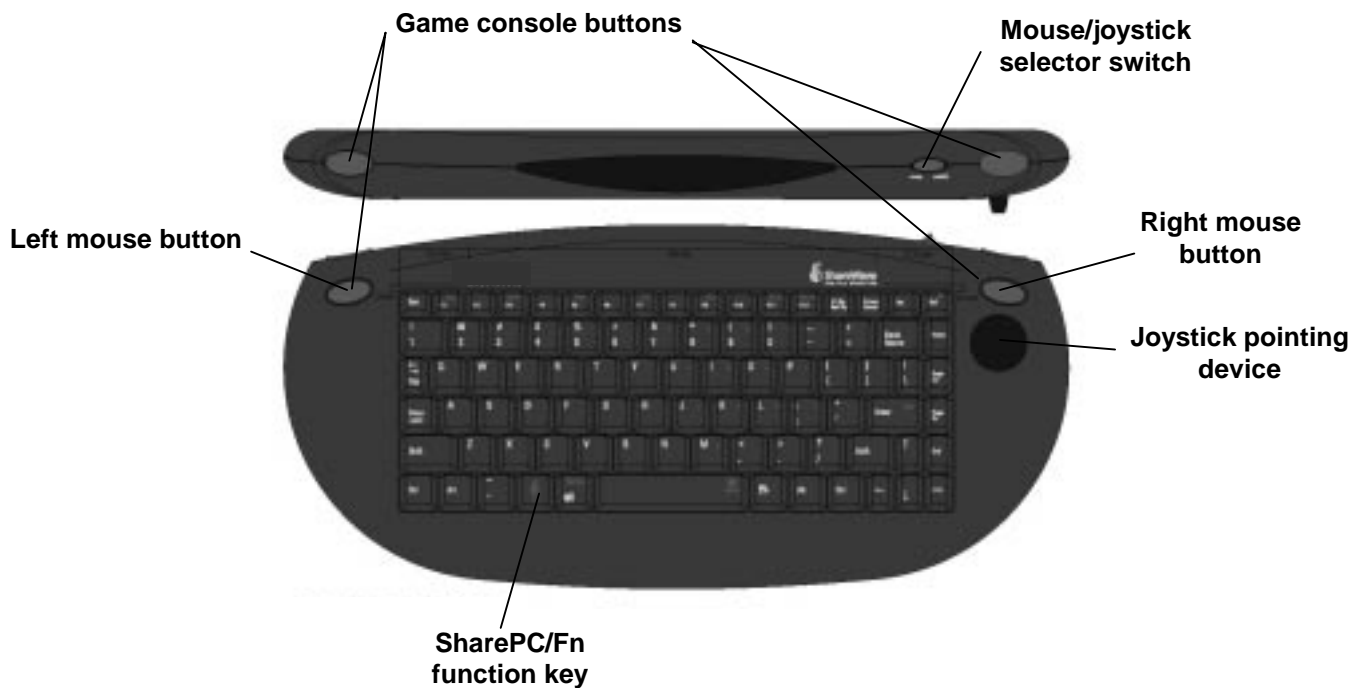
The joystick pointing device

To make the keyboard easy to use with your television, a small joystick pointing device in the upper right-hand corner of the keyboard has replaced the normal computer mouse. With a little practice you can use the joystick as you would a regular mouse. To click objects or to select items, press the large blue button located on the upper left corner of the keyboard, next to the **Esc** key.The small

selector switch on the right front edge of the keyboard is used to control the function of the joystick pointing device. For normal use, the switch should be set to **Mouse**. The switch should be set to **Joystick** for use with certain games that are compatible with the SharePC joystick pointing device.

Game console buttons

In addition to the two blue buttons used with the mouse, there are two more blue buttons located at the upper left- and right-hand edges of the keyboard. Together with the SharePC joystick pointing device, these four buttons can be used to control certain games that support them.

SharePC Keyboard Functions

In addition to standard computer keys, the SharePC keyboard has a special SharePC function key, marked "**Fn**" and located to the left of the space bar. When pressed by itself, the **Fn** key shows or hides the TV Desktop *task bar*. When pressed in conjunction with other keys, the **Fn** key also activates a number of ShareCenter and TV Desktop menu functions:

Fn + Space Bar - Displays the **Open activities** menu and switches between open activities (similar to Alt + Tab on a regular PC)

Fn + Windows key - Displays the TV Desktop start menu or ShareCenter main menu

Fn + **F1** - Activates the ShareCenter Help system

Fn + **F3** - Starts the default Web Browser and loads the user's home page (requires Internet access)

Fn + **F5** - Closes all open applications and displays the **user Log-in** screen

Fn + **F7** - Activates the auto-run feature of a CD-ROM disk in your main or default CD ROM or DVD drive

Fn + **F9** - Activates the auto-run feature of a CD-ROM disk in a second CD ROM or DVD drive (if any)

Fn + **Del** - Shuts down SharePC and switches the SharePC Wireless TV System to a soft power-down mode (pressing any key on the wireless keyboard will then restore the system to power on)

Keyboard shortcut keys

Most ShareCenter menu functions can be selected by using either the on-screen cursor or by using special *keyboard shortcut keys*. Keyboard shortcuts are activated by pressing the **Alt** key while pressing a letter key corresponding to an underlined letter in a menu or button name. For instance, to correct a mistake click the **U**ndo button with your mouse or press **Alt** + **U** on the keyboard.

Keyboard care

Change your batteries every few months or whenever the keyboard seems sluggish or stops working. Use only fresh, size AAA alkaline batteries. Do not leave old or discharged batteries in the keyboard as they may leak and damage your keyboard. Dispose of old batteries correctly by recycling.

Avoid spilling liquids or food into the keyboard. This may damage the keyboard and void the warranty. Do not twist or drop the keyboard. Serious damage to the keyboard may result. Do not allow the keyboard to become wet or dirty. Find a safe place to store the keyboard when not in use. Avoid leaving it on the floor, a couch, or a chair. Clean your keyboard occasionally by using a small amount of mild, non-abrasive liquid detergent on a lightly damp (not wet) soft cloth. Apply the detergent to the cloth, not directly to the keyboard.

Now that you know how to use and care for your keyboard, you're ready to set up your ShareCenter and TV Desktop user accounts!

Chapter 6

Setting up user accounts

Setting up your super user account

Before you can set up regular user accounts, you must first set up a super user account. As a super user, you can then set up individual user accounts and control the type of features and access each user has. For instance, you may want to prevent some family members from accessing the Internet or certain files on your computer.

When SharePC launches for the first time, you will be prompted to create a super user name and password.

Enter your password. Your password can contain up to eight characters using any combination of letters and numbers. Re-enter your password.

Your password should be something easy to remember but not so easy that others can guess it. Be sure to write down your password and keep it in a safe place.

Click **OK**. This will launch ShareCenter.

Setting up regular user accounts

You can create customized user accounts for each member of your family who uses the SharePC Wireless TV System. Each user account can be given a unique name, picture icon, and password. You can also select the ShareCenter or TV desktop for each user and limit access to sensitive files, programs, or even the Internet.

From ShareCenter, select **User Menu**. This will display the **User Menu** screen:
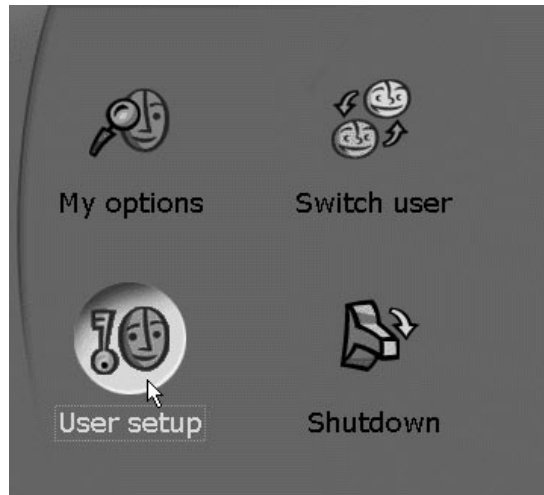
Click **User setup**. This will display the **Super user menu** screen:

*** DRAFT ***

Enter your **super user password**.

Adding users

Click **Add user**. This will display the **Add new users** screen:

Type in the new user's name. Set access privileges for each new user by clicking the check boxes under **Access privileges**. **Can Personalize ShareCenter** allows users to add or change their own categories and activities. **Can use Desktop** allows users to access the SharePC TV Desktop. **Can use Internet** allows users to access the Internet through either the default ShareCenter browser or other web browser.

To set up other options for a new user, click **User options**. The **User's options** screen displays:
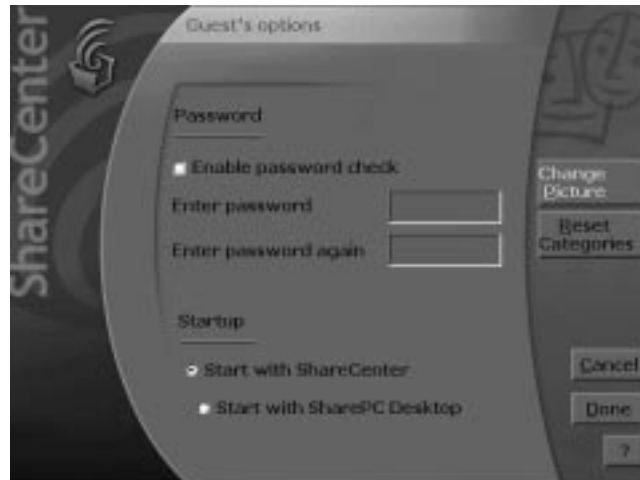
Set access privileges for new users by clicking the appropriate check boxes. **Enable password check** requires users to enter their password each time they log on to the SharePC TV Desktop or ShareCenter. **Startup** sets the default startup screen for each user as either ShareCenter or the SharePC TV Desktop.

Changing the user picture icon

To change the picture icon for a user, click **Change Picture**. The **Picture for user** menu displays. Click an icon to select the desired picture.

When you are finished, click **Done**.

Setting user categories

Each new user automatically begins with a default set of nine preselected categories. If you wish to change these categories, you can copy any set of

custom categories already created for other users by clicking the **Copy categories from** drop-down menu.

Personalizing categories

To set up specific categories for new users, click **Personalize Categories.**

Adding categories

To add new categories, you must first delete one or more of the nine default categories. To delete a category, select the category and click **<u>Delete</u>**. When you're finished, click **<u>Done</u>**.

In the **Personalize Categories** menu, click the **ADD** tab.

In the **Select a category to add** menu, click the categories you wish to add. When you are finished adding new categories, click **Done**.

You cannot rename, delete, or change the CD DVD Category. It is a permanent feature of the ShareCenter main menu.

The **Category status** box on the right side of the menu shows the total number of categories. When a category is added, each dot changes from blue to yellow. When all nine dots in the box are yellow, you cannot add any more categories.

Renaming categories

Select the category to rename. The category name will be highlighted in the **Change Name To** box. Type a new name.

*If you rename a category by mistake, click **Undo** and the original category name will be restored.*

Changing category picture icons

Select a category to change. Click **Change Picture**.

Click to select a new picture icon (you can click the ▲ and ▼ scroll arrows to see additional choices). Click **OK**.

Deleting categories

To delete a category, select the category you wish to delete. Click **Delete**. If you delete a category by mistake, click **Undo** and the category will be restored.

Resetting Categories

To reset categories to the default set of pre-installed categories, click **Reset Categories**. Click **Done**.

Adding activities

From the ShareCenter main menu, select a category. The activities for that category will be displayed. Click **Personalize Activities.** Click the **ADD** tab.

In the **Folder:** drop-down selection box, navigate to the location of the application or file you wish to add as an activity.
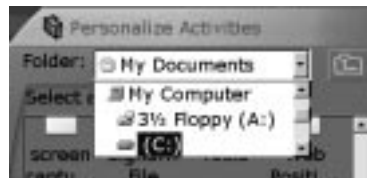
If you need to back up one folder level, you can click the folder button near the upper right corner.
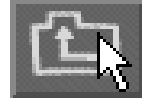
The drop-down **Type:** *selection box, at the bottom of the menu allows you to choose the type of files to display in the Add menu. For example, choosing* **Type: Interne***t displays only Web-related files, such as HTML, GIF, and JPEG, and hides all others. This may make it easier to find the file you want.*
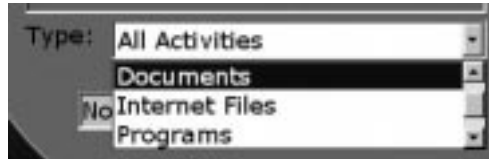
To add an activity, simply click the desired application or file (you can click the up and down scroll arrows along the right side of the menu to see additional choices). Repeat this process for as many applications as you like for each category.

When you are finished adding new activities, click **Done**.

Changing activities

Renaming or deleting activities

From the ShareCenter main menu, select a category. Click **Personalize activities.** From the **Personalize Activities** menu, click the **CHANGE** tab.

Renaming activities

Click the activity you wish to rename. The name of the activity is automatically highlighted in the **Change name to** box. Type a new name. If you rename an activity by mistake, click **Undo** and the original activity name will be restored. When you are finished renaming activities, click **Done.**

Deleting activities

Click the activity you wish to delete. Click **Delete**. If you delete an activity by mistake, click **Undo** and the activity will be restored. Repeat this process for as many activities as you like. When you are finished deleting activities, click **Done.**

Changing user options

Once you have set up user accounts, you can change user options whenever needed.

From ShareCenter, select **User Menu**. Click **User setup**. Enter your **super user password**. Click **Change user s**:
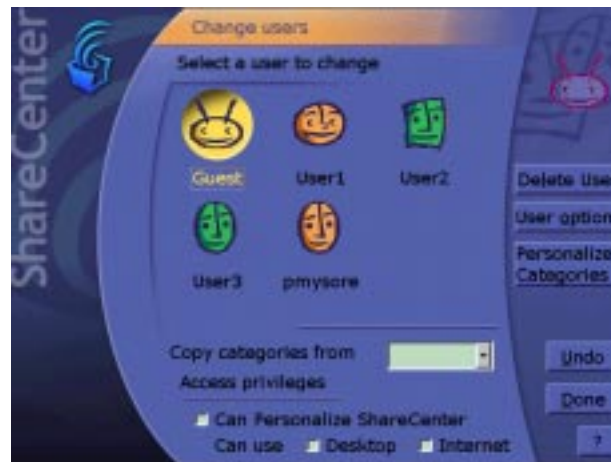
Select a user and change any desired options. When you are finished making your changes, click **Done**.

Changing global options

From ShareCenter, select **User Menu**. Click **User setup**. Enter your **super user password**. Click **Global options**:
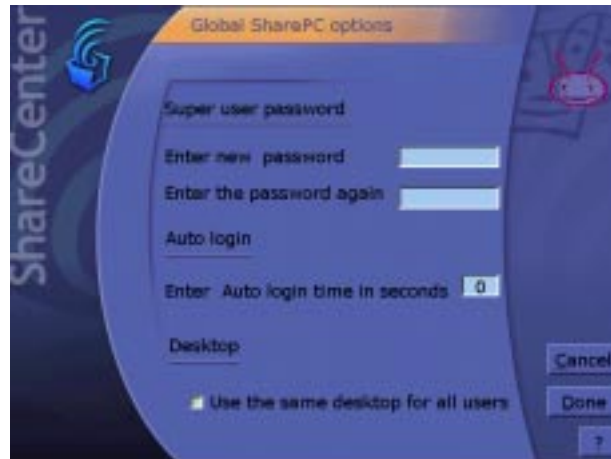
Changing your password

To change your user password, enter your new password. Re-enter your new password to confirm.

Setting the auto log-in time

Whenever the log-in menu is displayed at startup, a user must make a selection before the **Auto log-in** time expires. Otherwise, the user is automatically logged in as a restricted ShareCenter user. Enter the desired log-in time in seconds, using any value from 0 to 120.

Setting the default desktop

You can specify that all users will start with the ShareCenter main menu by checking the box next to **Use the same desktop for all users**.

When you are finished making your changes, click **Done.**

Chapter 7
Using SharePC

Starting your ShareCenter session

Whenever SharePC starts, you will see the names of all of the current user accounts displayed on the **Log-in to SharePC** screen.

Select your user account name. Type in your password (if required). Click **OK**.

Launching activities

From the ShareCenter main menu, select the desired category. The activities for that category will be displayed. Click the desired activity. The activity will launch and the ShareCenter main menu will shrink to a task bar along the bottom or right side of the screen (You can press **Fn** on the wireless keyboard to hide or show the task bar).
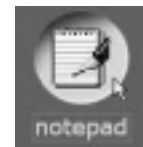
Launching a CD ROM or DVD disk

Insert a CD ROM or DVD disk into your CD ROM or DVD drive. On the ShareCenter main menu, click the **CD DVD** category. In the **CD DVD** activity list, click the desired program icon to launch the application. If you have no disk in the CD ROM or DVD drive, the **CD DVD** activity menu will be empty.

You may also press **Fn** + **F7** on the SharePC wireless keyboard to start the auto-run feature of your CD ROM or DVD disk (if available).

If you have more than one CD ROM or DVD drive, each drive will display an icon in the **CD DVD** activity menu.

Launching the ShareCenter browser

From ShareCenter, select the **Internet** category. Click the ShareCenter browser icon. You can also launch the ShareCenter browser by pressing **Fn** + **F3** on the SharePC wireless keyboard. This starts the default Web Browser and loads your default home page (requires Internet access).
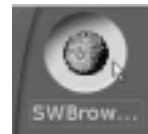
Returning to ShareCenter

Click the ShareCenter icon in the lower-left corner of the ShareCenter task bar at the bottom of the screen. The ShareCenter main menu will reappear. From here you can launch additional activities.

Switching between open activities

Just as with a regular computer, you can have two or more activities open at the same time. To switch between open activities, click the **switch** button near the lower left-hand corner of the ShareCenter task bar. You may also press the **Fn** + **space bar** keys on your wireless keyboard to switch between open activities.

Switching between ShareCenter and TV desktop

To switch from ShareCenter to the TV desktop, click the **TV desktop** button in the lower left-hand corner of the ShareCenter task bar.

To switch from the TV desktop to ShareCenter, click the ShareWave "magic box" icon in the lower right corner of the TV desktop task bar.

Ending your SharePC session

From the ShareCenter main menu, click **User Menu.** Click **Shutdown.** You will be asked if you would like to close any open applications. To save your work you should first close and running applications. When you are ready to end your SharePC session, click **OK.**

Switching users

From the ShareCenter main menu, click **User Menu**. Click **Switch user**. You will be asked if you would like to close any open applications. Click **OK**. At the **Log in to SharePC** screen, select your user name. Enter your password (if required). Click **OK.**
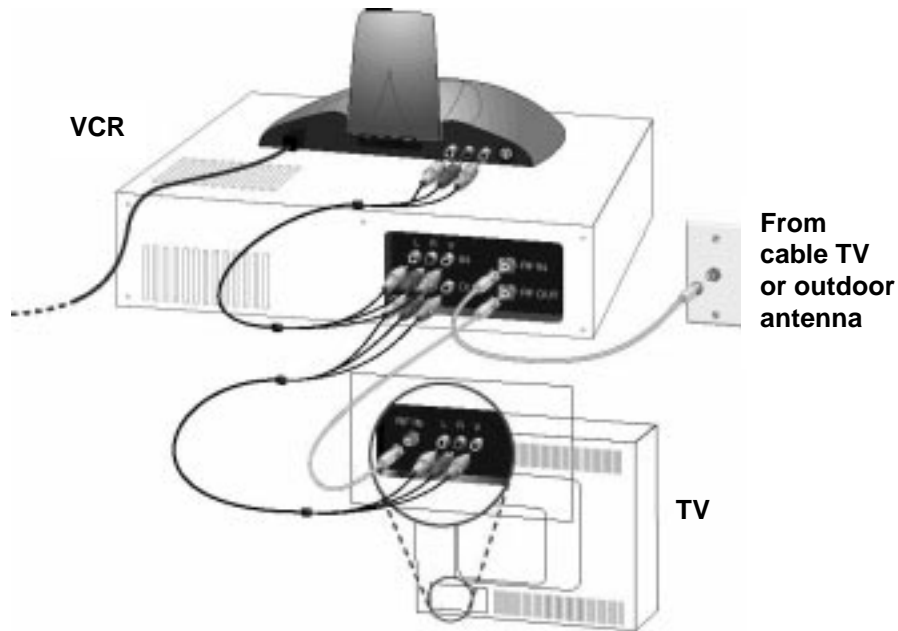
Accessing the SharePC on-line help system

For additional help with using your system, click the icon in the lower right hand corner of any ShareCenter screen at any time to access the on-line help system. You may also press the **Fn** + **F1** keys on your keyboard.
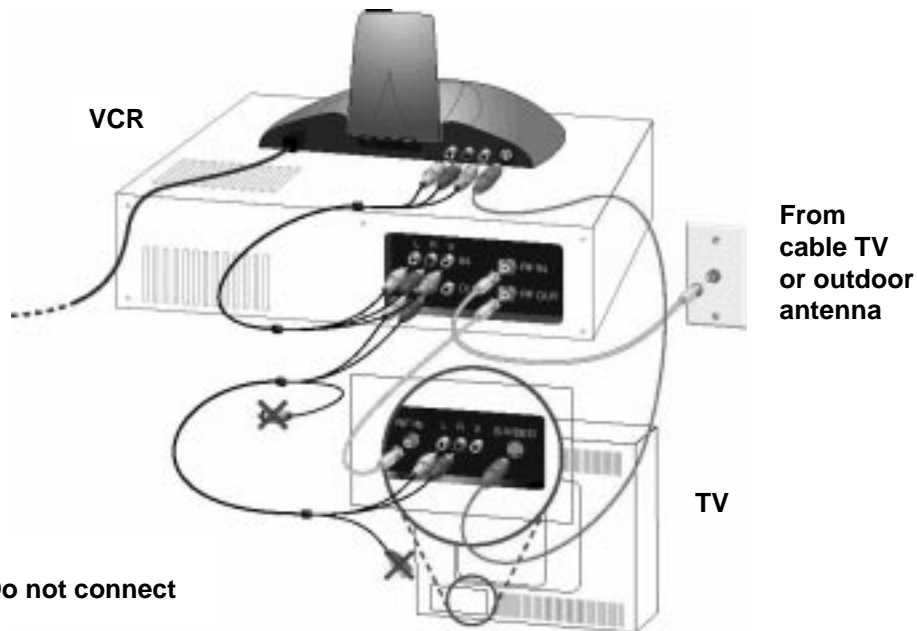
Appendix A
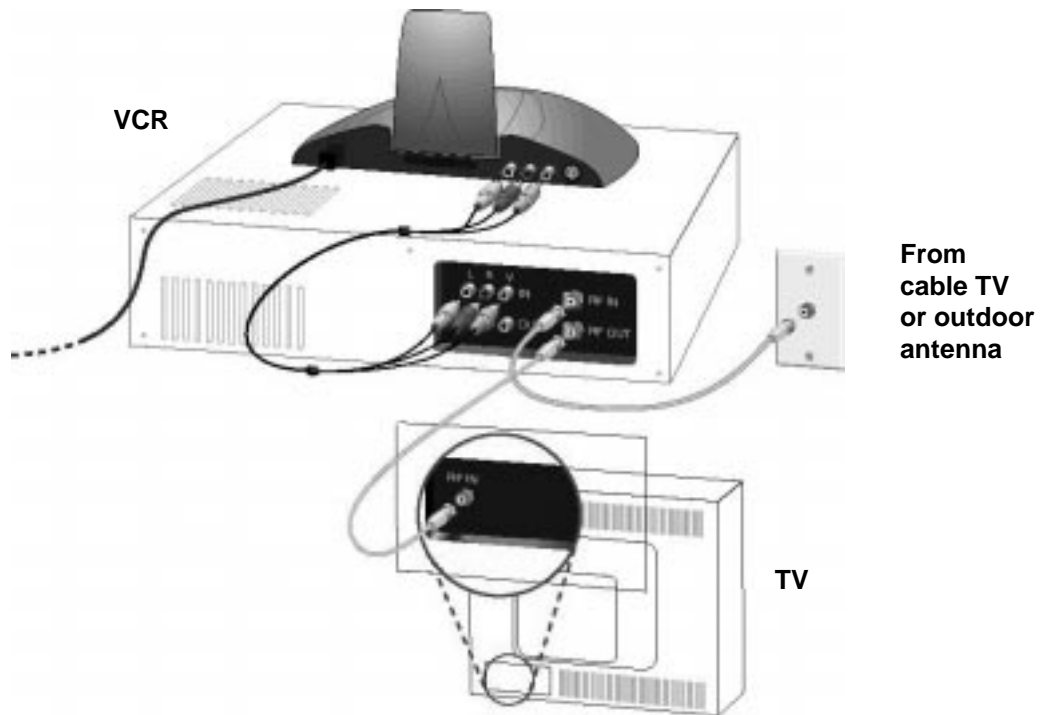
Additional Wiring Diagrams

Stereo television and stereo VCR

VCR

From cable TV or outdoor antenna

TV

Stereo VCR and television with S-video input

VCR

From cable TV or outdoor antenna

TV

✕ = Do not connect

*** DRAFT ***

Standard television with stereo VCR

VCR

From
cable TV
or outdoor
antenna

TV

Monaural TV and/or VCR

VCR

From
cable TV
or outdoor
antenna

TV

✗ = Do not connect

Appendix A - Additional Wiring Diagrams
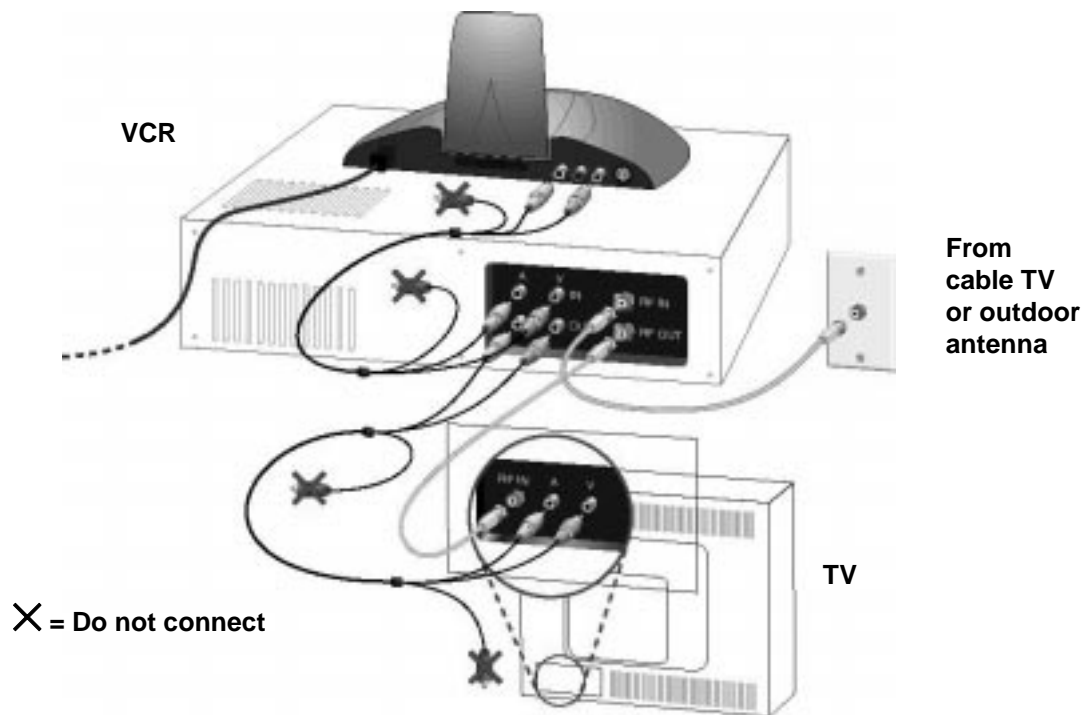
*** DRAFT ***

Standard television without audio and video inputs or VCR

From cable TV or outdoor antenna

RF modulator (not included)

Antenna switch (not included)
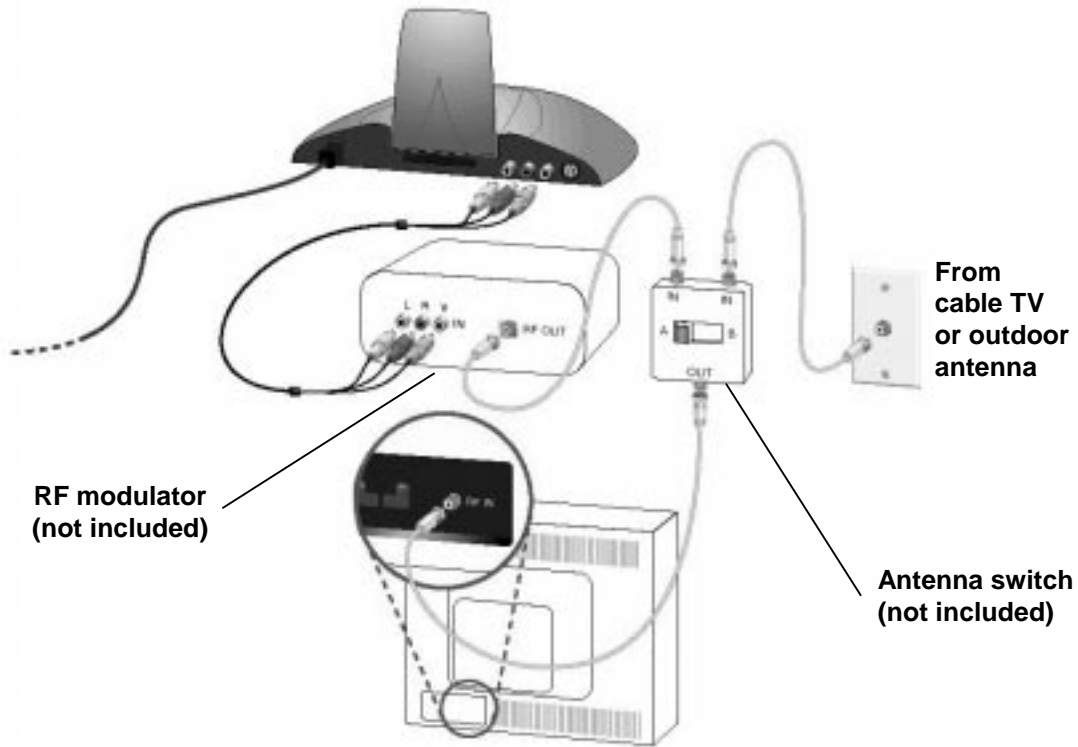
Appendix B
Troubleshooting

The computer does not detect my SharePC PCI card.

1. Click the Windows **Start** button. Select **Sh<u>u</u>t Down**. In the **Shut down Windows** dialog box, click the button next to **<u>S</u>hut down**. Click **Yes**. When it's safe to turn off your computer, turn it off and wait 10 seconds. Turn on the computer. Your computer may now detect your SharePC card. If you see the dialog box on your computer monitor indicating that Windows has detected new hardware, repeat the SharePC software installation instructions found in Chapter 3.

2. If your computer still does not detect your SharePC PCI card, click the Windows **Start** button. Point to **Settings**. Click **Control Panel**. Double-click the **System** icon. Click the **Device Manager** tab in the "System Properties" screen to display a list of devices attached to the computer. The list may include "Other Devices" or "Unknown Devices." Double-click **Other Devices** or **Unknown Devices** for a description of the device. If the description matches the SharePC card, click the Remove button. Click **OK** when Windows asks if you wish to remove the device. Restart the computer and repeat the SharePC software installation instructions.

3. If the PCI card is still not detected, turn off the computer. Check your PCI card installation to make sure the card is fully seated in the slot. Turn on your computer. If the card is still not detected, repeat the installation procedures at the start of this manual and try installing the PCI card in a different PCI slot.

The PCI card is detected but I get an error message saying there is a conflict.

1. You may not have enough system resources available for the PCI card. Click the Windows **Start** button, point to **Settings**, and then click **Control Panel**. Double-click the **System** icon. Under **System Properties**, click the **Device Manager** tab. Double-click **Computer.** Under **Computer Properties**, select **Interrupt <u>r</u>equest (IRQ)** at the top of the screen. If IRQ settings 3, 4, 5, 7, 9, 10, 11, and 12 are being used by your system, you need to free one of these IRQs for the SharePC card. You will need to move a device from one of these IRQ numbers to a different (usually higher) IRQ number. For more information on how to change

the IRQ for the device you want to move, read the user manual that came with the device or contact the device manufacturer.

I've connected my television but I don't see the Welcome to SharePC message

1. Check your connections and input selectors on your TV, VCR, video switcher, or home theater system.

2. Check to ensure that all equipment is plugged in and powered up.

3. Check to ensure that the PC is turned on.

4. Check the indicator lights on the left front of the TV Terminal. The green light should be lit indicating that the TV Terminal and PC Antenna are communicating with each other. If the red or yellow light is lit, there may be a poor connection or interference problem.

5. Press the reset button on the right-hand side of the top of the TV Terminal.

I can see the ShareCenter main menu but nothing happens when I press the keyboard commands.

1. The TV Terminal or the PC Antenna may not be plugged in. Check all connections. The Set-top power supply should be plugged into a live wall socket. Some wall sockets are controlled by a wall switch that may need to be turned on.

2. Check the batteries to be sure they are installed correctly

3. The keyboard batteries may be dead. Replace all of them with a fresh set (3) of size AAA alkaline batteries. Properly dispose of old batteries by recycling.

4. Aim the keyboard directly at the infrared sensor on the front of the TV Terminal. Be sure there are no obstructions between the keyboard and TV Terminal. The keyboard's infrared signals cannot pass around corners or through walls.

5. Press the reset button on the right-hand top panel of the TV Terminal.

6. The Host and TV Terminals may be having trouble communicating with each other. Some buildings may contain metal or other obstructions in the walls, floors, or ceilings, which may affect reception.

7. Check the indicator lights on the left front of the TV Terminal. The green light should be lit indicating that the TV Terminal and PC Antenna are communicating with each other. If the red or yellow light is lit, there may be a poor connection or interference problem.

8. Check the flip up antennas on the tops of the Host and TV Terminals to make sure they are in their full, upright positions. Try turning or moving the Host and/or TV Terminal to a different position to improve reception. Generally, the units will respond better at higher positions, but try lower positions as well. You may need to locate the TV Terminal farther from the television for the best possible reception. This may require the purchase of longer audio and video cables. The audio and video cables from the TV Terminal cannot exceed 25 feet. Consult your dealer for more information. Longer cable installations may require an audio and video amplifier. The PC Antenna cannot be extended beyond the reach of its 54-inch cable.

9. There may be interference from other electrical devices in your house. Try turning off appliances, cordless telephones, motors, florescent lights, and air conditioning equipment one by one to see if the problem disappears.

10. The SharePC system may be frozen. At the computer, try pressing **Ctrl+Alt+Del** to display the task list. Highlight the Share PC program in the task list and click **<u>End Task</u>**.If nothing works on your computer, you may need to restart the computer. The SharePC system will launch automatically whenever you restart.

There is no picture on my television. The television screen is black.

1. The television may be turned off.

2. The TV Terminal may not be plugged in. Refer to the wiring diagram and check all connections.

3. The connections between the TV Terminal and TV or VCR video input may be loose or incorrect.

4. The computer may be turned off.

5. Depending on your equipment and installation, the television input selector may be incorrectly set to the wrong input. Try switching it to Video 1 or Video 2 or S-video, if available. If the TV Terminal is connected to the VCR, the TV may need to be switched to "Antenna" or "Cable" and tuned to channels 3 or 4 to receive the correct signal from the VCR.

6. Press the reset button on the right-hand top panel of the TV Terminal.

There is no picture on my television. The television screen is snowy.

1. The TV Terminal may not be plugged in. Check all connections.

2. The TV may be tuned to the wrong channel. Tune the TV to channels 3 or 4 to receive the correct signal from the VCR.

3. Depending upon your equipment and installation, the television's input selector may be incorrectly switched to "Antenna" or "Cable." If the video output from the TV Terminal or VCR is connected to the TV's video input, the TV input selector may need to be switched to Video 1, Video 2, Aux., or S-video, to receive the correct signal from the TV Terminal or VCR.

4. If you have an external antenna selector switch for your television, it may be set for the wrong input. If the TV terminal is connected to your VCR, you may need to set the antenna selector switch to "VCR."

5. The computer may be turned off.

There is a picture on my television but it's a TV program or movie.

1. The Video or S-video input on the TV, VCR, or both is not selected. Depending upon your installation, try switching the VCR and/or TV input selector to "Video" or "S-video." Consult your VCR and TV operations manuals for more information on this function.

2. Your VCR may be playing a tape. Eject the tape.

I can start multimedia programs and games on my television but there is no sound.

1. The television volume control may be turned down or muted.

2. Depending upon your installation, you may need to turn on your stereo or home theater sound equipment, select the correct input, and turn up the volume control.

3. The VCR or TV may be incorrectly switched to the wrong audio input. Consult the VCR and TV operations manuals for more information on this function.

4. Check the audio left and right connections between the TV Terminal and VCR, TV or stereo system to verify they are correctly connected.

*** DRAFT ***

I get an error message when I try to create an activity for one of my files.

1. The file may not be a valid activity format. Activities can only be created for applications, documents, Internet URLs, and executable files (files whose names end with ".exe").

I want to create an activity for one of my files but I can't see the file.

1. The file may not be a valid activity format. Activities can only be created for applications, documents, Internet URLs, and executable files (files whose names end with ".exe").

2. Your file may not be displayed correctly. Select **All Files** in the Add activities dialog box.

The cursor on the television screen doesn't move correctly.

1. The keyboard selector switch is switched to the **Joystick** setting. Switch it to the **Mouse** setting.

*** DRAFT ***

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Appendix C

Technical support

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If you are having problems with your SharePC Wireless TV System:

♦ Review the installation and troubleshooting sections of this manual.

♦ Contact your SharePC Wireless TV System dealer. They may be able to provide immediate assistance.

♦ Contact a qualified computer technician. They can provide expert advice and troubleshooting.

If your dealer or technician can't help you, contact the {OEM} customer service department. Have your SharePC serial number and the version of your SharePC software ready.

On-line technical support

The World Wide Web	http://www.{OEM}.com
CompuServe	GO {OEM}
America On-line	Keyword is **{OEM}**
Internet FTP	ftp.{OEM}.com.
Email	techsupport@{OEM}.com

Telephone technical support

For regular technical support calls, dial {OEM}. Hours are Monday through Friday, from 8 a.m. to 7 p.m. PST.

Appendix D
FCC and UL information

Manufacturer's Declaration of Conformity

{OEM} declares that the product *SharePC Wireless TV System* conforms to the FCC's specifications:

Part 15; Subpart B Class B: Operation is subject to the following two conditions: (1) this device may not cause harmful electromagnetic interference, and (2) this device must accept any interference received including interference that may cause undesired operations.

UL listing

This information technology equipment is UL-Listed for use with UL-Listed personal computers that have installation instructions detailing user installation of card cage accessories.

FCC notice

Radio and television interference

This equipment generates and uses radio frequency energy and if not installed and used correctly, in strict accordance with the manufacturer's instructions, may cause interference to radio and television reception. The SharePC product has been tested and found to comply with the limits for a Class B computing device in accordance with the specifications in Part 15 of the FCC rules, which are designed to provide reasonable protection against such interference in a residential installation.

However, there is no guarantee that interference will not occur in a particular installation. If this device does cause interference to radio or television reception, which you can determine by monitoring reception when the SharePC

*** DRAFT ***

Wireless TV System is installed and when it is removed from the computer, try to correct the problem with one or more of the following measures:

♦ Re-orient the receiving antenna (for televisions with antenna reception only) or cable input device

♦ Relocate the computer with respect to the receiver

♦ Relocate the computer and/or the receiver so that they are on separate branch circuits

If necessary, consult your dealer or an experienced radio/television technician for assistance. A booklet prepared by the Federal Communications Commission may provide additional information:

How to Identify and Resolve Radio-TV Interference Problems
Stock No. 004-000-0345-4
U.S. Government Printing Office
Washington, DC 20402

In accordance with Part 15 of the FCC rules, the user is cautioned that any changes or modifications to the equipment described in this manual that are not expressly approved by ShareWave could void the user's authority to operate the equipment.

For your own protection, make sure that the electrical ground connections of the power supply, telephone lines, and internal metallic water pipe system, if present, are connected together. This precaution may be particularly important in rural areas.

*CAUTION: Do **NOT** attempt to make such connections yourself. Instead, contact an electric inspection authority or electrician, as appropriate.*

Appendix E
Contacting {OEM}

Telephone

In the United States   {OEM}

Outside the United States   {OEM}

Web site

www.{OEM}.com

E-mail

info@{OEM}.com

Mail

{OEM}

Appendix F
Specifications

General

Radio transmission format	Digital spread-spectrum (DSS)
Radio standard	Compliant with ShareWave Digital Wireless Ver. 1.0
Frequency	2.4 GHz unlicensed ISM
Modulation	Direct-sequence, spread-spectrum FM
Data transfer rate (maximum)	4 Mbps
RF range (maximum)	45 m (150')
Output power	200 mW
Receiver sensitivity	88 dbm

System Requirements (minimum)

Platform	PC only, Windows 95 or Windows 98
CPU	133 MHz Pentium processor or equivalent
RAM	32 MB
Hard disk space	100 MB (0.1 GB)
CD ROM or CD DVD player	1 required
PCI card expansion slot	1 available required

Environmental

Temperature	PC Antenna: 10 ~ 40 °C (50 ~ 105 °F)
	TV Terminal: 10 ~ 35 °C (50 ~ 98 °F)
Humidity	10 ~ 85% relative humidity, non-condensing
Safety standards	UL Approved
EMC	FCC part 15 subpart B class B, CSA C108.8 class B

Keyboard

Keyboard functions	Universal 57-key condensed, with integrated pointer and 4 game control keys
Joystick functions	Full function, 4-button, dual mode I-point joystick.
Infrared protocol	TWIRP Compatible.
Power requirements	DC 4.5 V (3-AAA batteries)
Dimensions (w × h × d)	385 mm × 181 mm × 30 mm (15.2" × 1.2" × 7.1")
Weight	0.72 kg (1.6 lbs.), without batteries

*** DRAFT ***

PC Antenna

Power requirements (through PCI bus)	DC 5.0 V, 320 mA
Interface	D-Sub 26-pin
Dimensions (w × h × d)	155 mm × 39mm × 125 mm (6.1" × 1.5" × 4.9")
Weight	0.25 kg (0.6 lbs.)

TV Terminal

Composite video output, impedance, connector	1 V pp negative sync (NTSC), 75Ω, female RCA phono jack
S-video output, impedance, connector	Luminance / chrominance, 75Ω, 4 pin female mini-DIN jack
Video compression	NAMI™ compression
Video frame rate support	VGA quality, color and aspect enhanced.
Output display resolution	525 lines (NTSC)
Audio output, impedance, connector	2 V pp, 5K ohm load min., female RCA phono jack, stereo
Dimensions (w × h × d)	290 mm × 53 mm × 127 mm (11.4" × 2.1" × 5.0")
Weight	0.68 kg (1.5 lbs.)
Power requirements	DC 5.8 V (negative ground) @ 1.5A, standby, DC 4.2 V @ 2.5 A

AC Adapter

Power requirements	AC 100-130 V, 60 Hz
Output	DC 5.8 V @ 1.5A; DC 4.2 V @ 2.5 A

PCI Card

Main-board interface	32/64 bit PCI expansion slot

EXHIBIT 7:ShareWave Model PowerWave 2.4GHz Radio SAR Summary

2 Pages

CERTIFICATION REPORT

Subject: **Specific Absorption Rate (SAR) Experimental Analysis**

Product: **ShareWave Power Wave 2.4G Radio**

Client: ShareWave, Inc.

Address: 5175 Hillsdale Circle
El Dorado Hills
CA   95762

Project #   SHWB-PowerWave-3094

Prepared by: APREL Laboratories
51 Spectrum
Nepean, Ontario
K2R 1E6

Submitted By   _Paul G Cardinal_   Date: _16 Oct 98_
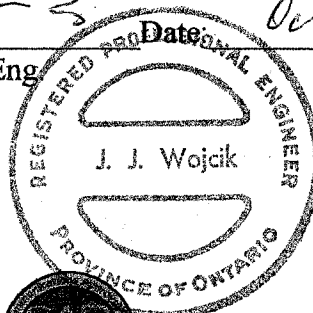Dr. Paul G. Cardinal
Director, Laboratories

Approved By   _____   Date: _Oct 16/98_
Dr. Jacek J. Wojcik, P.Eng.

FCC ID: NZL-
Applicant: ShareWave, Inc.
Equipment: Digital Radio
Model: Power Wave 2.4G Radio
Standard: FCC 96-326, Guidelines for Evaluating the Environmental Effects of Radio-
               Frequency Radiation

ENGINEERING SUMMARY

This report contains the results of the engineering evaluation performed on a ShareWave, Inc.
Model Power Wave 2.4 G digital radio. The measurements were carried out in accordance
with FCC 96-326. The desktop unit was evaluated for its maximum power level of 19.3 dBm
(85 mW).

The Power Wave was tested at high, middle and low frequencies, with the maximum SAR
coinciding with the peak performance RF output power on channel 1 (low, 2425 MHz). Test
data and graphs are presented in this report.

Based on the test results, it is certified that the product meets the requirements as set forth in
the above specification, for an uncontrolled RF exposure environment.

Page 2 of 23
51 Spectrum Way
Nepean, Ontario K2R 1E6

Report No.3094
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