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Electromagnetic Emissions Test Report and Request for Class II Permissive Change pursuant to FCC Part 15, Subpart C Specifications for an Intentional Radiator on the Schlumberger Industries Model: Pocket Pro Reader

FCC ID:	F9CTALAHH11295
GRANTEE:	Schlumberger Industries 1600 Alabama Highway 229 Tallassee, AL 36078
TEST SITE:	Elliott Laboratories, Inc. 684 W. Maude Avenue Sunnyvale, CA 94086
REPORT DATE:	August 19, 1999
FINAL TEST DATE:	August 16 and August 19, 1999
AUTHORIZED SIGNATORY:	David W. Bare Principal Engineer

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SCOPE

An electromagnetic emissions test has been performed on the Schlumberger Industries - Water Division Transmitter model Pocket Pro Reader 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 as outlined in Elliott Laboratories test procedures.

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 Schlumberger Industries - Water Division model Pocket Pro Reader and therefore apply only to the tested sample. The sample was selected and prepared by Mohammed S. Ali of Schlumberger Industries.

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 subsequently manufactured.

STATEMENT OF COMPLIANCE

The tested sample of Schlumberger Industries - Water Division model Pocket Pro Reader 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 that 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 Schlumberger Industries - Water Division model Pocket Pro Reader. The actual test results are contained in an exhibit of this report.

LIMITS OF CONDUCTED INTERFERENCE VOLTAGE

Conducted testing was not performed, as the EUT is battery operated only.

LIMITS OF RADIATED INTERFERENCE FIELD STRENGTH

The EUT tested complied with the limits detailed in FCC Rules Part 15 Section 15.249 and 15.209 in the case of emissions outside the 902-928 MHz band.

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.

Frequency MHz	Level dBuV/m	Pol v/h	FCC Part 15.249 Limit	Margin	Detector Pk/QP/Avg	Azimuth degrees	Height meters	Comments
3656.200	50.1	H	54.0	-3.9	Avg	180	1.8	

MEASUREMENT UNCERTAINTIES

ISO Guide 25 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level and were calculated in accordance with NAMAS document NIS 81.

Measurement Type	Frequency Range (MHz)	Calculated Uncertainty (dB)
Conducted Emissions	0.15 to 30	± 2.4
Radiated Emissions	30 to 1000	± 3.2

EQUIPMENT UNDER TEST (EUT) DETAILS

GENERAL

The Schlumberger Industries - Water Division model Pocket Pro Reader is designed to transmit data. The sample was received on August 16, 1999 and tested on August 16 and August 19, 1999. The EUT consisted of the following component(s):

Manufacturer/Model/Description	Serial Number	FCC ID Number
Schlumberger Industries / Pocket Pro Reader	PRF000000	F9CTALAHH11295

INPUT POWER

The EUT operates on battery only.

PRINTED WIRING BOARDS

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

Manufacturer/Description	Assembly #	Rev.	Serial #	Frequencies (MHz)
Main	12011-400	A	PRF000000	19.6608
Radio	11970-001	G	-	914.0

ENCLOSURE

The EUT enclosure is primarily constructed of fabricated Plastic. It measures approximately 7 cm wide by 4 cm deep by 15 cm high.

EUT OPERATION

The EUT was set to transmit continuously during testing.

PROPOSED MODIFICATION DETAILS

GENERAL

This section details the modifications to the Schlumberger Industries model Pocket Pro Reader being proposed. All performance and construction deviations from the characteristics originally reported to the FCC are addressed

PRINTED WIRING BOARD LAYOUT

The radio printing wiring board was changed from that which was originally reported.

TEST SITE

GENERAL INFORMATION

Final test measurements were taken on August 16 and August 19, 1999 at the Elliott Laboratories Open Area Test Site #2 located at 684 West Maude Avenue, Sunnyvale, California. The test site contains 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. The test site contains separate areas for radiated and conducted emissions testing. 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, 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 measurements made with the receivers.

The Spectrum Monitor provides a visual display of the signal being measured. In addition, the controller or a personal computer runs 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.

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. Above 1000 MHz, a horn antenna is used. 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 MHz up to the frequency required by the regulation specified on page 1. One or more of these is with the antenna polarized vertically while the one or more of these are 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 that 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 that have values close to the specification limit may also be measured with a tuned dipole antenna to determine compliance.

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 & 15.249

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
902 to 928	50,000	94.0
Above 960 & Harmonics	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#1

August 13, 1999

	Manufacturer/Description		Model	Asset #	Interval	Last Cal	Cal Due
☐	EMCO	Biconical Antenna, 30-300 MHz	3110B	363	12	4/19/99	4/19/2000
☐	EMCO	D. Ridge Horn Antenna, 1-18GHz	3115	487	12	3/24/99	3/24/2000
☒	EMCO	D. Ridge Horn Antenna, 1-18GHz	3115	786	12	1/15/99	1/15/2000
☐	EMCO	D. Ridge Horn Antenna, 1-18GHz	3115	868	12	9/22/98	9/22/99
☒	EMCO	Log Periodic Antenna, 0.3-1 GHz	3146A	364	12	6/25/99	6/25/2000
☐	Filtek	High Pass Filter	HP12/1000-5BA	955	12	4/17/99	4/17/2000
☐	Filtek	High Pass Filter	HP12/1000-5BA	956	12	4/17/99	4/17/2000
☐	Filtek	High Pass Filter	HP12/1000-5BA	957	12	4/17/99	4/17/2000
☐	Fischer Custom	LISN, Freq. 0.9 -30 MHz,16 Amp	FCC-LISN-50/2	1079	12	6/11/99	6/11/2000
☐	Hewlett Packard	EMC Receiver /Analyzer	8595EM	780	12	1/4/99	1/4/2000
☐	Hewlett Packard	EMC Recever /Analyzer	8595EM	787	12	11/23/98	11/23/99
☐	Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	263, (F303)	12	8/3/99	8/3/2000
☐	Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	785	12	11/25/98	11/25/99
☒	Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	870	12	11/12/98	11/12/99
☐	Hewlett Packard	Power Meter	432A	259, (F304)	12	2/17/99	2/17/2000
☒	Hewlett Packard	Spectrum Analyzer	8563E	284, (F194)	12	1/18/99	1/18/2000
☐	Hewlett Packard	Spectrum Analyzer, 9 KHz-6.5 GHz	8595E-041-103-	Metric, 885	12	5/11/99	5/11/2000
☐	Hewlett Packard	Thermistor Mount	478A	652	12	2/17/99	2/17/2000
☐	Inmet Corporation	20 dB Pad, DC-18 GHz, 50Ω	18N-20	859	12	8/27/98	8/27/99
☒	Narda West	EMI Filter 2.4 GHz, High Pass	60583 HPF-161	248	12	4/23/99	4/23/2000
☐	Narda West	EMI Filter 5.6 GHz, High Pass	60583 HXF370	247	12	4/29/99	4/29/2000
☐	Narda West	High Pass Filter	HPF 180	821	12	8/10/99	8/10/2000
☐	Rohde& Schwarz	Pulse Limiter	ESH3 Z2	811	12	7/10/99	7/10/2000
☐	Rohde & Schwarz	Test Receiver, 0.009-30 MHz	ESH3	274	12	5/27/99	5/27/2000
☐	Rohde &Schwarz	Test Receiver, 20-1300MHz	ESVP	213, (F196)	12	5/27/99	5/27/2000
☐	Solar Electronics	Support Equipment LISN,	8012-50-R-24-B	305, (F111)	12	3/26/99	3/26/2000

File Number: T33265

Date: 8-16-99

Engr: CC.

All calibration of equipment is traceable to a national standard of measurement such as NIST.

Test Equipment List - SVOATS#1

August 13, 1999

	Manufacturer/Description		Model	Asset #	Interval	Last Cal	Cal Due
☐	EMCO	Biconical Antenna, 30-300 MHz	3110B	363	12	4/19/99	4/19/2000
☐	EMCO	D. Ridge Horn Antenna, 1-18GHz	3115	487	12	3/24/99	3/24/2000
☐	EMCO	D. Ridge Horn Antenna, 1-18GHz	3115	786	12	1/15/99	1/15/2000
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☐	EMCO	Log Periodic Antenna, 0.3-1 GHz	3146A	364	12	6/25/99	6/25/2000
☒	Filtek	High Pass Filter	HP12/1000-5BA	955	12	4/17/99	4/17/2000
☐	Filtek	High Pass Filter	HP12/1000-5BA	956	12	4/17/99	4/17/2000
☐	Filtek	High Pass Filter	HP12/1000-5BA	957	12	4/17/99	4/17/2000
☐	Fischer Custom	LISN, Freq. 0.9 -30 MHz,16 Amp	FCC-LISN-50/2	1079	12	6/11/99	6/11/2000
☐	Hewlett Packard	EMC Receiver /Analyzer	8595EM	780	12	1/4/99	1/4/2000
☐	Hewlett Packard	EMC Recever /Analyzer	8595EM	787	12	11/23/98	11/23/99
☐	Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	263, (F303)	12	8/3/99	8/3/2000
☐	Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	785	12	11/25/98	11/25/99
☒	Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	870	12	11/12/98	11/12/99
☐	Hewlett Packard	Power Meter	432A	259, (F304)	12	2/17/99	2/17/2000
☒	Hewlett Packard	Spectrum Analyzer	8563E	284, (F194)	12	1/18/99	1/18/2000
☐	Hewlett Packard	Spectrum Analyzer, 9 KHz-6.5 GHz	8595E-041-103-	Metric, 885	12	5/11/99	5/11/2000
☐	Hewlett Packard	Thermistor Mount	478A	652	12	2/17/99	2/17/2000
☐	Inmet Corporation	20 dB Pad, DC-18 GHz, 50Ω	18N-20	859	12	8/27/98	8/27/99
☐	Narda West	EMI Filter 2.4 GHz, High Pass	60583 HPF-161	248	12	4/23/99	4/23/2000
☐	Narda West	EMI Filter 5.6 GHz, High Pass	60583 HXF370	247	12	4/29/99	4/29/2000
☐	Narda West	High Pass Filter	HPF 180	821	12	8/10/99	8/10/2000
☐	Rohde& Schwarz	Pulse Limiter	ESH3 Z2	811	12	7/10/99	7/10/2000
☐	Rohde & Schwarz	Test Receiver, 0.009-30 MHz	ESH3	274	12	5/27/99	5/27/2000
☐	Rohde &Schwarz	Test Receiver, 20-1300MHz	ESVP	213, (F196)	12	5/27/99	5/27/2000
☐	Solar Electronics	Support Equipment LISN,	8012-50-R-24-B	305, (F111)	12	3/26/99	3/26/2000

File Number: T33317

Date: 19-Aug-99

Engr: Paul Chapman

All calibration of equipment is traceable to a national standard of measurement such as NIST.

EXHIBIT 2:Test Data Log Sheets

ELECTROMAGNETIC EMISSIONS

TEST LOG SHEETS

AND

MEASUREMENT DATA

T33265 4 Pages
T33317 4 Pages

Elliott

EMC Test Log

Client:	Schlumberger	Date:	8/16/99	Test Engr:	Conrad Chu
Product:	Pocket Pro Reader	File:	T33265	Proj. Eng:	David Bare
Objective:	Final Qualification	Site:	SVOATS #1	Contact:	Mohammed S Ali
Spec:	FCC Part 15.249	Page:	1 of 3	Approved:	
Revision	1.0				

Ambient Conditions	
Temperature:	20 °C
Humidity:	60 % RH

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.

Test Summary

Run #1 - Radiated Emissions Measurement of Fundamental Frequency
(EUT tested in three orientations: upright, on side, and on back)

Results: FCC -13.0 dB QP @ 914.050 MHz Vertical

Run #2 - Radiated Emissions Measurement of Harmonics, EUT in upright orientation

PASS Results: FCC -3.9 dB AV @ 3656.200 MHz Horizontal

Equipment Under Test (EUT) General Description

The EUT is a Wireless transmitter operating at 914 MHz designed to read utility meters remotely. Normally, the EUT would be handheld during operation. The EUT was, therefore, placed in three, front, side, and back, orientations this position during emissions testing to simulate the end user environment

Equipment Under Test (EUT)

Manufacturer/Model/Description	Serial Number	FCC ID Number
Schlumberger / Pocket Pro Reader / Wireless Utility Meter Reader	None	F9CTALAHH11295

Power Supply and Line Filters

The EUT power was derived from an internal battery.

Printed Wiring Boards in EUT

The manufacturer provided the following information:

Manufacturer/Description	Assembly #	Rev.	Serial Number	Crystals (MHz)
Main	12011-400	A	-	19.6608
Radio	11970-001	G	-	914.0

Subassemblies in EUT

The manufacturer provided the following information:

Manufacturer/Description	Assembly Number	Rev.	Serial Number
None			

EUT Enclosure(s)

The EUT enclosure is primarily constructed of plastic. It measures approximately 7 cm wide by 5 cm deep by 16 cm high.

EMI Suppression Devices (filters, gaskets, etc.)

The manufacturer provided the following information:

Description	Manufacturer	Part Number
None		

Modifications

No modifications were made to the EUT in order to comply with the requirements.

Client:	Schlumberger	Date:	8/16/99	Test Engr:	Conrad Chu
Product:	Pocket Pro Reader	File:	T33265	Proj. Eng:	David Bare
Objective:	Final Qualification	Site:	SVOATS #1	Contact:	Mohammed S Ali
Spec:	FCC Part 15.249	Page:	3 of 3	Approved:	
Revision	1.0				

Local Support Equipment

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

Remote Support Equipment

Manufacturer/Model/Description	Serial Number	FCC ID Number
None		

Interface Cabling

Cable Description	Length (m)	From Unit/Port	To Unit/Port
None			

Test Software

The small black plug was removed from the rear on the EUT to activate the internal test software that continuously transmitted during the test.

General Test Conditions

During radiated testing, the EUT was powered by an internal battery. The EUT was located on the turntable for radiated testing.

Test Data Tables

See attached data

Emissions Test Data

Client:	Schlumberger	Date:	08/16/1999	Test Engr:	Conrad Chu
Product:	Pocket Pro Reader	File:	T33265	Proj. Engr:	David Bare
Objective	Final Qualification	Site:	SVOATS #1	Contact:	Mohammed S Ali
Spec:	FCC Part 15.249	Distance:	10 m	Approved:	

Ambient Conditions
Temperature: 20 °C
Humidity: 60 % RH

TEST NOTES:
Per instructions, the small black plug was removed from the rear of the EUT.

Run #1: Measurement of Fundamental Frequency, 914.050 MHz
EUT tested upright, on side, on back (three orientations)
Measurements taken at 3-meter test distance, QP detector with 120 kHz measurement bandwidth

Frequency	Level	Pol	FCC	FCC	Detector	Azimuth	Height	Comments
MHz	dBuV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
914.050	81.0	v	94.0	-13.0	QP	186	1.1	EUT in upright position
914.050	76.6	h	95.0	-18.4	QP	61	2.1	EUT in upright position
914.050	74.2	v	96.0	-21.8	QP	178	1.1	EUT on its side
914.050	79.6	h	97.0	-17.4	QP	288	1.1	EUT on its side
914.050	77.3	v	98.0	-20.7	QP	146	1.0	EUT on its back
914.050	81.4	h	99.0	-17.6	QP	146	1.0	EUT on its back

Emissions Test Data

Client:	Schlumberger	Date:	08/16/1999	Test Engr:	Conrad Chu
Product:	Pocket Pro Reader	File:	T33265	Proj. Engr:	David Bare
Objective	Final Qualification	Site:	SVOATS #1	Contact:	Mohammed S Ali
Spec:	FCC Part 15.249	Distance:	10 m	Approved:	

Run #2: Measurement of Harmonics (Up to Tenth Harmonic)

EUT tested in upright position only

Measurements taken at 3-meter test distance per FCC requirements

A +1.0 dB reference level offset was used to correct for input filter loss

Filter #248 (<1dB loss from 1.92 - 18 GHz) used above 1.92 GHz

Filter #956 (<1dB loss below 1.0 GHz) used from 1.0 - 2.0 GHz

Frequency	Level	Pol	FCC B	FCC B	Detector	Azimuth	Height	Comments
MHz	dBuV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
3656.200	50.1	h	54.0	-3.9	Avg	180	1.8	
3656.200	49.2	v	54.0	-4.8	Avg	57	1.5	
5484.300	47.0	h	54.0	-7.0	Avg	280	1.6	
6398.400	45.2	h	54.0	-8.8	Avg	337	1.6	
4570.300	43.9	h	54.0	-10.1	Avg	326	1.7	
6398.400	43.8	v	54.0	-10.2	Avg	355	1.0	
7312.400	43.7	v	54.0	-10.3	Avg	40	1.1	
8226.500	41.8	v	54.0	-12.2	Avg	77	1.2	
4570.300	41.6	v	54.0	-12.4	Avg	82	1.2	
5484.300	40.6	v	54.0	-13.4	Avg	53	1.4	
2742.100	37.0	h	54.0	-17.0	Avg	260	1.6	
1828.100	35.6	h	54.0	-18.4	Avg	172	2.7	
1828.100	33.7	v	54.0	-20.3	Avg	268	1.1	
3656.200	53.2	h	74.0	-20.8	Pk	180	1.8	
3656.200	52.9	v	74.0	-21.1	Pk	57	1.5	
8226.500	51.5	v	74.0	-22.5	Pk	77	1.2	
5484.300	51.5	h	74.0	-22.5	Pk	280	1.6	
7312.400	51.1	v	74.0	-22.9	Pk	40	1.1	
6398.400	50.9	h	74.0	-23.1	Pk	337	1.6	
6398.400	50.3	v	74.0	-23.7	Pk	355	1.0	
4570.300	48.9	h	74.0	-25.1	Pk	326	1.7	
5484.300	48.3	v	74.0	-25.7	Pk	53	1.4	
4570.300	47.4	v	74.0	-26.6	Pk	82	1.2	
2742.100	44.9	h	74.0	-29.1	Pk	260	1.6	
1828.100	43.9	h	74.0	-30.1	Pk	172	2.7	
1828.100	41.6	v	74.0	-32.4	Pk	268	1.1	

Elliott

EMC Test Log

Client:	Schlumberger	Date:	8/19/99	Test Engr:	Paul / Chris
Product:	Pocket Pro Reader	File:	T33317	Proj. Eng:	David Bare
Objective:	Final Qualification	Site:	SVOATS #1	Contact:	Mohammed S Ali
Spec:	FCC Part 15.249	Page:	1 of 3	Approved:	
Revision	1.1				

Ambient Conditions	
Temperature:	21.7 °C
Humidity:	56 % RH

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.

Test Summary

Run #1 - Radiated Emissions Measurement of Harmonics
(EUT tested on side)

Results: FCC 15.249 -6.4 dB Pk* @ 4570.300 MHz Horizontal
* Pk reading, average limit

Run #2 - Radiated Emissions Measurement of Harmonics
(EUT tested on back)

PASS Results: FCC 15.249 -7.7 dB AV @ 3656.200 MHz Horizontal

Equipment Under Test (EUT) General Description

The EUT is a Wireless transmitter operating at 914 MHz designed to read utility meters remotely. Normally, the EUT would be handheld during operation. The EUT was, therefore, placed in three, front, side, and back, orientations this position during emissions testing to simulate the end user environment

Equipment Under Test (EUT)

Manufacturer/Model/Description	Serial Number	FCC ID Number
Schlumberger / Pocket Pro Reader / Wireless Utility Meter Reader	None	F9CTALAHH11295

Client:	Schlumberger	Date:	8/19/99	Test Engr:	Paul / Chris
Product:	Pocket Pro Reader	File:	T33317	Proj. Eng:	David Bare
Objective:	Final Qualification	Site:	SVOATS #1	Contact:	Mohammed S Ali
Spec:	FCC Part 15.249	Page:	2 of 3	Approved:	
Revision	1.1				

Power Supply and Line Filters

The EUT power was derived from an internal battery.

Printed Wiring Boards in EUT

The manufacturer provided the following information:

Manufacturer/Description	Assembly #	Rev.	Serial Number	Crystals (MHz)
Main	12011-400	A	-	19.6608
Radio	11970-001	G	-	914.0

Subassemblies in EUT

The manufacturer provided the following information:

Manufacturer/Description	Assembly Number	Rev.	Serial Number
None			

EUT Enclosure(s)

The EUT enclosure is primarily constructed of plastic. It measures approximately 7 cm wide by 5 cm deep by 16 cm high.

EMI Suppression Devices (filters, gaskets, etc.)

The manufacturer provided the following information:

Description	Manufacturer	Part Number
None		

Modifications

No modifications were made to the EUT in order to comply with the requirements.

Client:	Schlumberger	Date:	8/19/99	Test Engr:	Paul / Chris
Product:	Pocket Pro Reader	File:	T33317	Proj. Eng:	David Bare
Objective:	Final Qualification	Site:	SVOATS #1	Contact:	Mohammed S Ali
Spec:	FCC Part 15.249	Page:	3 of 3	Approved:	
Revision	1.1				

Local Support Equipment

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

Remote Support Equipment

Manufacturer/Model/Description	Serial Number	FCC ID Number
None		

Interface Cabling

Cable Description	Length (m)	From Unit/Port	To Unit/Port
None			

Test Software

The small black plug was removed from the rear on the EUT to activate the internal test software that continuously transmitted during the test.

General Test Conditions

During radiated testing, the EUT was powered by an internal battery. The EUT was located on the turntable for radiated testing.

Test Data Tables

See attached data

Emissions Test Data

Client:	Schlumberger	Date:	08/19/1999	Test Engr:	Paul / Chris
Product:	Pocket Pro Reader	File:	T33317	Proj. Engr:	David Bare
Objective	Final Qualification	Site:	SVOATS #1	Contact:	Mohammed S Ali
Spec:	FCC Part 15.249	Distance:	3 m	Approved:	

Ambient Conditions
Temperature: 21.7 °C
Humidity: 56 % RH

TEST NOTES:
Per instructions, the small black plug was removed from the rear of the EUT.

Run #1: Measurement of Harmonics (up to Tenth Harmonic). Sorted by margin
EUT on its side
Measurements taken at 3-meter test distance per FCC requirements
Filter #955 (<1dB loss above 1.0 GHz)

Frequency	Level	Pol	FCC B	FCC B	Detector	Azimuth	Height	Comments
MHz	dBuV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
4570.300	47.6	h	54.0	-6.4	Pk	266	1.4	pk reading, avg. limit
6398.400	44.8	h	54.0	-9.2	Avg	100	1.4	
4570.300	43.3	v	54.0	-10.7	Avg	307	1.2	
5484.300	43.0	v	54.0	-11.0	Avg	293	1.2	
5484.300	42.7	h	54.0	-11.3	Avg	215	1.4	
2742.100	42.4	v	54.0	-11.6	Pk	43	1.3	pk reading, avg. limit
3656.200	42.4	v	54.0	-11.6	Avg	131	1.3	
7312.400	42.2	v	54.0	-11.8	Avg	322	1.3	
1828.100	41.6	h	54.0	-12.4	Pk	297	1.5	pk reading, avg. limit
3656.200	41.0	h	54.0	-13.0	Avg	316	1.5	
7312.400	40.7	h	54.0	-13.3	Avg	50	1.5	
2742.100	40.6	h	54.0	-13.4	Pk	297	1.4	pk reading, avg. limit
6398.400	40.0	v	54.0	-14.0	Avg	5	1.2	
8226.500	39.5	h	54.0	-14.5	Avg	28	1.2	
8226.500	39.2	v	54.0	-14.8	Avg	60	1.1	
1828.100	37.1	v	54.0	-16.9	Avg	43	1.5	
6398.400	51.5	h	74.0	-22.5	Pk	100	1.4	
7312.400	51.1	h	74.0	-22.9	Pk	50	1.5	
3656.200	51.0	h	74.0	-23.0	Pk	316	1.5	
3656.200	50.7	v	74.0	-23.3	Pk	131	1.3	
5484.300	50.5	v	74.0	-23.5	Pk	293	1.2	
7312.400	50.4	v	74.0	-23.6	Pk	322	1.3	
8226.500	50.2	h	74.0	-23.8	Pk	28	1.2	
6398.400	50.0	v	74.0	-24.0	Pk	5	1.2	
8226.500	49.5	v	74.0	-24.5	Pk	60	1.1	
4570.300	49.4	v	74.0	-24.6	Pk	307	1.2	
5484.300	49.4	h	74.0	-24.6	Pk	215	1.4	
1828.100	44.5	v	74.0	-29.5	Pk	43	1.5	

Emissions Test Data

Client:	Schlumberger	Date:	08/19/1999	Test Engr:	Paul / Chris
Product:	Pocket Pro Reader	File:	T33317	Proj. Engr:	David Bare
Objective	Final Qualification	Site:	SVOATS #1	Contact:	Mohammed S Ali
Spec:	FCC Part 15.249	Distance:	3 m	Approved:	

Run #2: Measurement of Harmonics (up to Tenth Harmonic). Sorted by margin

EUT on its back .

Measurements taken at 3-meter test distance per FCC requirements

Filter #955 (<1dB loss above 1.0 GHz)

Frequency	Level	Pol	FCC B	FCC B	Detector	Azimuth	Height	Comments
MHz	dBuV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
3656.200	46.3	h	54.0	-7.7	Avg	81	1.4	
5484.300	46.3	v	54.0	-7.7	Avg	298	1.4	
1828.100	44.5	v	54.0	-9.5	Pk	183	1.6	pk reading, avg. limit
3656.200	44.1	v	54.0	-9.9	Avg	74	1.4	
1828.100	43.0	h	54.0	-11.0	Pk	183	1.6	pk reading, avg. limit
2742.100	42.7	v	54.0	-11.3	Pk	282	1.4	pk reading, avg. limit
6398.400	41.8	v	54.0	-12.2	Avg	271	2.0	
7312.400	41.6	h	54.0	-12.4	Avg	8	1.5	
9140.500	41.1	v	54.0	-12.9	Avg	251	1.6	
9140.500	40.9	h	54.0	-13.1	Avg	146	1.5	
2742.100	40.6	h	54.0	-13.4	Pk	153	1.4	pk reading, avg. limit
4570.300	40.0	v	54.0	-14.0	Avg	358	1.4	
7312.400	39.9	v	54.0	-14.1	Avg	299	1.4	
8226.500	39.9	v	54.0	-14.1	Avg	303	1.3	
5484.300	39.6	h	54.0	-14.4	Avg	49	1.5	
8226.500	39.1	h	54.0	-14.9	Avg	-	-	forgot to take azimuth and height
4570.300	38.9	h	54.0	-15.1	Avg	18	1.4	
6398.400	37.1	h	54.0	-16.9	Avg	17	1.6	
5484.300	52.7	v	74.0	-21.3	Pk	298	1.4	
9140.500	52.1	v	74.0	-21.9	Pk	251	1.6	
3656.200	51.2	h	74.0	-22.8	Pk	81	1.4	
9140.500	51.2	h	74.0	-22.8	Pk	146	1.5	
3656.200	51.1	v	74.0	-22.9	Pk	74	1.4	
7312.400	50.3	v	74.0	-23.7	Pk	299	1.4	
8226.500	49.8	h	74.0	-24.2	Pk	-	-	forgot to take azimuth and height
6398.400	49.7	v	74.0	-24.3	Pk	271	2.0	
6398.400	49.2	h	74.0	-24.8	Pk	17	1.6	
7312.400	49.1	h	74.0	-24.9	Pk	8	1.5	
4570.300	48.9	h	74.0	-25.1	Pk	18	1.4	
8226.500	48.7	v	74.0	-25.3	Pk	303	1.3	
5484.300	48.4	h	74.0	-25.6	Pk	49	1.5	
4570.300	48.2	v	74.0	-25.8	Pk	358	1.4	

EXHIBIT 3: Radiated Emissions Test Configuration Photograph

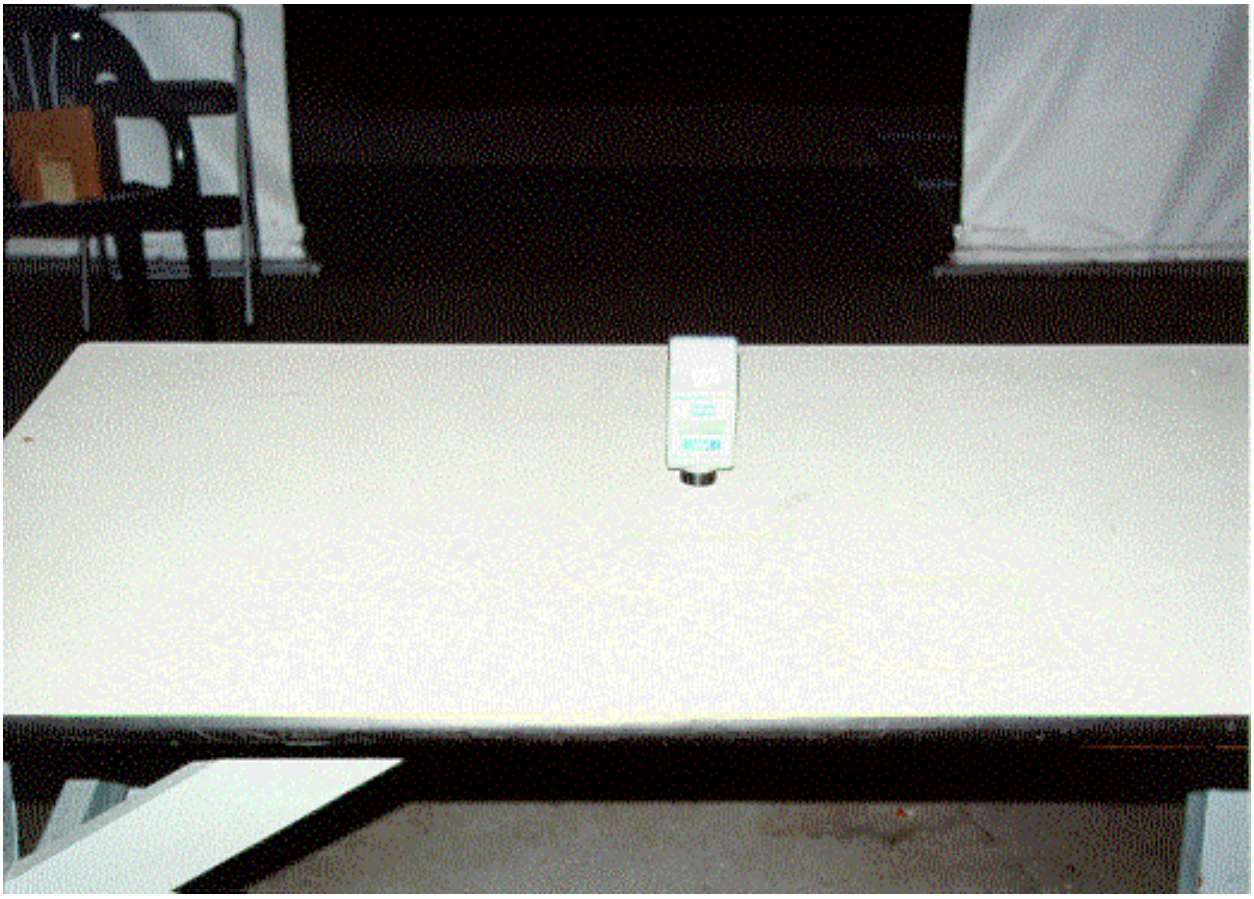

EXHIBIT 4:Detailed Photographs of Schlumberger Model Pocket Pro Reader Modified Construction

2 Pages

EXHIBIT 5: Modified Schematic Diagrams for Schlumberger Industries Model Pocket Pro Reader

1 Page