
Project Number: 03001-10

Prepared for:

PGI INTERNATIONAL

16101 Valen Drive.
Houston, TX 77041

By

Professional Testing (EMI), Inc.
1601 FM 1460, Suite B
Round Rock, Texas 78664

June 2002

CERTIFICATION
Electromagnetic Interference
Test Report

PGI INTERNATIONAL
Remote Shut-Off Device

Table of Contents

Title Page.....	1
Table of Contents.....	2
Certificate of Compliance	3
1.0 EUT Description	4
1.1 EUT Operation.....	4
2.0 Electromagnetic Emissions Testing	4
2.1 TEST PROCEDURE.....	5
2.2 TEST CRITERIA.....	5
2.3 TEST RESULTS	5
3.0 Occupied Bandwidth Measurements.....	5
3.1 TEST PROCEDURE.....	6
3.2 TEST CRITERIA.....	6
3.3 TEST RESULTS	6
4.0 Antenna Requirement.....	6
4.1 EVALUATION PROCEDURE	6
4.2 EVALUATION CRITERIA	7
4.3 EVALUATION RESULTS	7
4.4 TRANSMIT DURATION	7
5.0 Modifications to Equipment	7
6.0 List of Test Equipment	7

Figures

Figure 1: Radiated Emissions Test Setup.....	8
--	---

Appendices

Appendix A: Fundamental Emissions Test Data.....	9
Appendix B: Spurious Emissions Test Data	11
Appendix C: Occupied Bandwidth Test Data	14

THIS REPORT IS
TESTING (EMI),



Certificate of Compliance

Applicant: PGI International
 Applicant's Address: 16101 Valen Drive
 Houston, TX 77041
 Model: Remote Shut-Off Device
 Serial Number:
 Project Number: 03001-10

I, Jeffrey A. Lenk, for Professional Testing (EMI), Inc., being familiar with the FCC rules and test procedures have reviewed the test setup, measured data and this report. I believe them to be true and accurate.

The **PGI International Remote Shut-Off Device** was tested to and found to be in compliance with FCC Part 15 Subpart C for an Intentional Radiator.

The highest emissions generated by the above equipment are listed below:

	<u>Frequency (MHz)</u>	<u>Level (dBμV/m)</u>	<u>Limit (dBμV/m)</u>	<u>Margin (dB)</u>
Fundamental	433.9	77.9	80.8	-2.9
Spurious Harmonics	1302	66.1	70.4	-4.3

Jeffrey A. Lenk
President

1.0 EUT Description

The Equipment Under Test (EUT) is the **PGI International Remote Shut-Off Device**. The **Remote Shut-Off Device** is a miniature RF module that provides a cost effective high performance FM radio data link, at 433.92 MHz or 315 MHz. There are no adjustable components and ensures very reliable operation over time. The EUT operates at 433 MHz and is designed for compliance with 47 CFR 15.231 of the FCC rules. Specific test requirements for this device include the following:

47 CFR 15.231	Fundamental Transmit Power
47 CFR 15.231 & 15.205	Spurious Radiated Power
47 CFR 15.231 & 2.1049	Occupied Bandwidth (2.989 used as Procedural Reference)
47 CFR 15.203	Antenna Requirement

The system tested consisted of the following:

<u>Manufacturer & Model</u>	<u>Serial #</u>	<u>FCC ID #</u>	<u>Description</u>
PGI International, Remote Shut-Off Device	1026-ASY-02	QHL-RSDT-1	RSD Transmitter

1.1 EUT Operation

The **Remote Shut-Off Device** was held by one technician and operated by pressing a key to transmit a signal while a second technician measured and logged the transmitted signal. This procedure was performed through out the tests. Setup and operational modes cover worst-case configuration and operational modes for the device. The frequency of the transmitting signal is 433 MHz.

2.0 Electromagnetic Emissions Testing

Professional Testing (EMI), Inc. (PTI), follows the guidelines of NIST for all uncertainty calculations, estimates and expressions thereof for EMC testing.

Radiated emission measurements were made of the Fundamental and Spurious Emission levels for the **Remote Shut-Off Device**. Measurements of the occupied bandwidth were also made for the equipment.

Measurements of the maximum emission levels for the fundamental and the spurious/harmonic emissions of the **Remote Shut-Off Device** were made at the Professional Testing "Open Field" Site 3, located in Round Rock, Texas to determine the radio noise radiated from the EUT. A "Description of Measurement Facilities" has been submitted to the FCC and approved pursuant to Section 2.948 of CFR 47 of the FCC rules.

Tests of the fundamental and spurious harmonics for the device were performed to determine the worst-case polarization of the devices. The fundamental and spurious emissions of the device were measured with the antennas of the devices vertical and horizontal to the ground plane.

2.1 Test Procedure

The EUT was held .8 meter above the ground plane and 3 meters in front of the measurement antenna. The EUT stops transmitting within 5 seconds even if the button is being held down. The EUT while being held and re-keyed was also rotated in each orthogonal plane while a second technician scanned the measurement antenna to capture the highest signal.

For spurious/harmonic measurements above 1GHz, the EUT was held 1 meter in front of the measurement antenna. It was rotated in all three axis while being re-keyed. The analyzer was placed in peak hold while using a 10kHz VBW to get the peak of the average detected signal. No azimuth information is given in the tabular data for this reason. A drawing showing the test setup is given as Figure 1.

2.2 Test Criteria

The table below shows FCC Part 15.231 radiated limits for a non-periodic intentional radiator operating in the 260-470 MHz band. In addition to these requirements, the EUT must meet the restricted emission band requirements of §15.205. For this frequency range, the intentional radiated emission limits of §15.231 for 433.896 MHz radiator is higher than the restricted band limits of §15.205. FCC Part 15.231 allows the higher limit (Whichever limit permits a higher field strength) between 15.231 and 15.209 to be used for spurious emissions. The 15.231 limits were higher for this frequency and will therefore be used. The limit of §15.205 was used for the spurious emission test. The spurious measurements of the harmonic were performed to the 10th harmonic of the fundamental. The reference distance for each limit is also shown in this table.

<u>Signal Type</u>	<u>Test Distance (Meters)</u>	<u>Field Strength</u>	
		<u>(μV/m)</u>	<u>(dBμV/m)</u>
Fundamental (433.896MHz)	3	10,965	80.8
Harmonics (3 rd and above)	1	3298.7	70.4
Restricted band	1	1496	63.5

2.3 Test Results

The radiated test data for the fundamental is included in Appendix A. Quasi-Peak detector has been used during the test. The radiated emission test data for the harmonics is included in Appendix B. The emissions were maximized at each frequency and the highest emissions identified were measured using peak detection. The radiated emissions generated by the **Remote Shut-Off Device** are below the FCC Part 15.231 maximum emission criteria.

3.0 Occupied Bandwidth Measurements

Measurements of the occupied bandwidth for the fundamental signals of the of the FCC Part 15.231 were made at the Professional Testing's Round Rock, Texas laboratory. All measurements were made in a controlled indoor environment in a configuration, which did not present measurement distortion or ambient interference.

3.1 Test Procedure

The EUT was placed on a non-conductive table 0.8 meters above the floor. The table was rotated to an angle, which presented the highest signal level. The occupied bandwidth was also measured on the device. Peak detection was used for all tests. The occupied bandwidth was based on a 26 dB criteria (26 dB down either side of the emission from the nominal center of the emission). A drawing showing the test setup is given as Figure 1.

3.2 Test Criteria

According to FCC Part 15.231, the bandwidth of the emission shall not be wider than 0.25 % of the center frequency for the devices operating above 70 MHz and below 900 MHz. The limit is 1.085 MHz for the transmitter working at 433.896 MHz.

Measurement of the occupied bandwidth was performed to verify that the emission bandwidth from the EUT did not exceed 1.085 MHz.

3.3 Test Results

The occupied bandwidth test data is included in Appendix C. The measured occupied bandwidth for the fundamental frequency (433.896 MHz) was 107 kHz. This figure is typical for the **Remote Shut-Off Device**.

The intended center frequency for the EUT was centered at 433.896 MHz. The center frequency is within the allowed band. The fundamental signal generated by the **Remote Shut-Off Device** is within the band allowed under FCC Part 15.231 emission band criteria.

4.0 Antenna Requirement

An analysis of the **Remote Shut-Off Device** was performed to determine compliance with Section 15.203 of the Rules. This section requires specific handling and control of antennas used for devices subject to regulations under the Intentional Radiator portions of Part 15.

4.1 Evaluation Procedure

The structure and application of the **Remote Shut-Off Device** were analyzed with respect to the rules. The antenna for this unit is an external antenna, which is soldered onto the main board and is not accessible by the user. An auxiliary antenna port is not present.

4.2 Evaluation Criteria

Section 15.203 of the rules states that the subject device must meet at least one of the following criteria:

- (a) Antenna be permanently attached to the unit.
- (b) Antenna must use a unique type of connector to attach to the EUT.
- (c) Unit must be professionally installed. Installer shall be responsible for verifying that the correct antenna is employed with the unit.

4.3 Evaluation Results

The **Remote Shut-Off Device** meets the criteria of this rule by virtue of having an external antenna permanently attached to the unit. The EUT is therefore compliant with §15.203.

4.4 Transmit Duration

The **Remote Shut-Off Device** is designed to meet the 5 second transmit duration of section 15.231 (a) (1). The transmit duration was verified during the testing program.

5.0 Modifications to Equipment

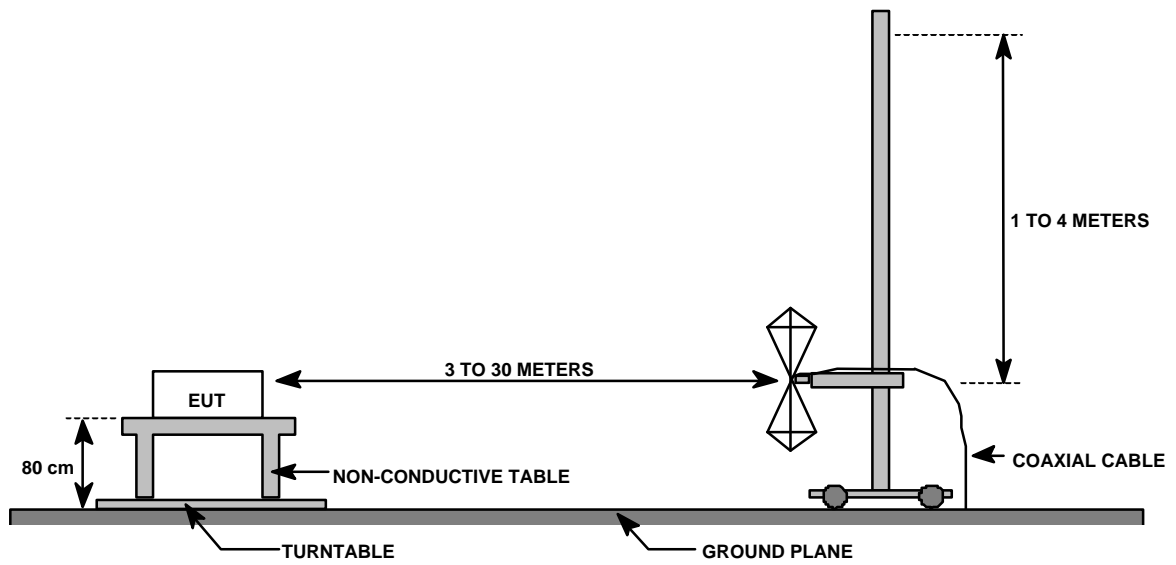
There were no modifications made on the **Remote Shut-Off Device** during the performance of the test program in order to meet the FCC criteria.

6.0 List of Test Equipment

A list of the test equipment utilized to perform the testing is given below. The date of calibration is given for each.

Electromagnetic Emissions Test Equipment

<u>Device</u>	<u>Description</u>	<u>Calibration Due</u>
HP 8568B	Spectrum Analyzer	November 2002
HP 85650A	Quasi Peak Adapter	November 2002
HP 8566B	Spectrum Analyzer	November 2002
HP 8447D	Preamplifier	October 2002
MITEQ	30 GHz Preamplifier	January 2003
EMCO 3146	Log Antenna	November 2002
EMCO 3115	Microwave Antenna	July 2002
MITEQ	20 GHz Preamplifier	January 2003

FIGURE 1: Radiated Emissions Test Setup

Appendix A

Radiated Emissions Data Sheets

Fundamental Radiated Data Sheet**PGI International
Remote Shut-Off Device**

SERIAL #: 1026-ASY-02
 DATE: June 7, 2002
 PROJECT #: 03001-10

MEASUREMENT DISTANCE (m): 3
 DETECTOR FUNCTION: Quasi-Peak

$$\text{Corrected Level} = \text{Recorded Level} - \text{Amplifier Gain} + \text{Antenna Factor} + \text{Cable Loss}$$

Antenna Horizontal

Freq. (MHz)	EUT Dir (Deg.)	Antenna Elevation (Meters)	Recorded Level (dBuV)	Amplifier Gain (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Corrected Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
433.8		1.5	74.3	27.3	17.3	9.6	73.8	80.8	-7.0

Antenna Vertical

Freq. (MHz)	EUT Dir (Deg.)	Antenna Elevation (Meters)	Recorded Level (dBuV)	Amplifier Gain (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Corrected Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
433.9		1	78.4	27.3	17.3	9.6	77.9	80.8	-2.9

TEST ENGINEER: Chris Carpenter

Appendix B

Spurious Radiated Emissions Data Sheets

Spurious Radiated Data Sheet**PGI International
Remote Shut-Off Device**

SERIAL #: 1026-ASY-02

DATE: June 7, 2002

PROJECT #: 03001-10

MEASUREMENT DISTANCE (m): 1

ANTENNA POLARIZATION:
Horizontal

DETECTOR FUNCTION: Peak

$$\text{Corrected Level} = \text{Recorded Level} - \text{Amplifier Gain} + \text{Antenna Factor} + \text{Cable Loss}$$

Freq. (MHz)	EUT Dir (Deg.)	Antenna Elevation (Meters)	Recorded Level (dBuV)	Amplifier Gain (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Corrected Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
1214.4		1	45.5	20.8	25.8	2.0	52.5	63.5	-11.0
1215.9		1	48.2	20.8	25.8	2.0	55.2	63.5	-8.3
1302.0		1	57.3	20.8	25.6	2.0	64.2	70.4	-6.2
1736.0		1	57.7	21.7	26.2	2.3	64.6	70.4	-5.8
2170.0		1	33.4	22.3	27.2	2.6	41.0	70.4	-29.4
2604.0		1	46.9	21.8	26.9	3.0	55.0	70.4	-15.4
3038.0		1	35.7	21.8	28.0	3.2	45.1	70.4	-25.3
3471.0		1	37.1	22.8	29.0	3.5	46.8	70.4	-23.6
3906.0		1	32.3	22.3	29.9	3.8	43.7	70.4	-26.7

TEST ENGINEER: Chris Carpenter

Spurious Radiated Data Sheet**PGI International
Remote Shut-Off Device**

SERIAL #: 1026-ASY-02
 DATE: June 7, 2002
 PROJECT #: 03001-10

MEASUREMENT DISTANCE (m): 1
 ANTENNA POLARIZATION: Vertical
 DETECTOR FUNCTION: Peak

$$\text{Corrected Level} = \text{Recorded Level} - \text{Amplifier Gain} + \text{Antenna Factor} + \text{Cable Loss}$$

Freq. (MHz)	EUT Dir (Deg.)	Antenna Elevation (Meters)	Recorded Level (dBuV)	Amplifier Gain (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Corrected Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
1216.9		1	37.5	20.8	25.8	2.0	44.5	63.5	-19.0
1302.0		1	59.3	20.8	25.6	2.0	66.1	70.4	-4.3
1736.0		1	53.7	21.7	26.2	2.3	60.6	70.4	-9.8
2170.0		1	33.2	22.3	27.2	2.6	40.8	70.4	-29.6
2604.0		1	40.7	21.8	26.9	3.0	48.8	70.4	-21.6
3038.0		1	38.1	21.8	28.0	3.2	47.5	70.4	-22.9
3471.0		1	37.5	22.8	29.0	3.5	47.2	70.4	-23.2
3906.0		1	33.5	22.3	29.9	3.8	44.9	70.4	-25.5
4339.0		1	32.5	22.1	30.2	4.0	44.7	70.4	-25.7

TEST ENGINEER: Chris Carpenter

Appendix C

Occupied Bandwidth Data Sheets

Occupied Bandwidth Datasheet**PGI International
Remote Shut-Off Device**

SERIAL #: 1026-ASY-02

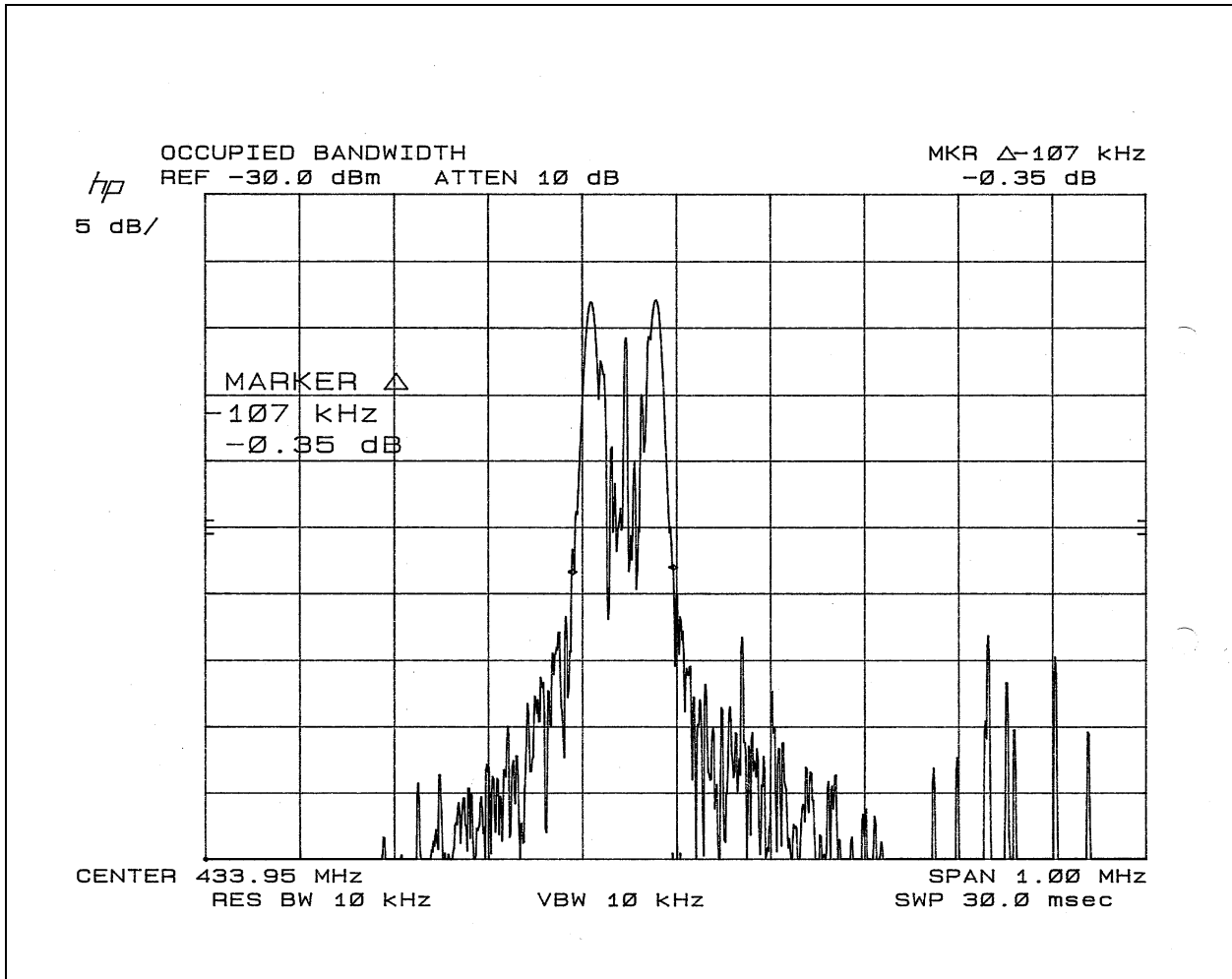
DATE: June 7, 2002

PROJECT #: 03001-10

MEASUREMENT DISTANCE (m): 1.0

ANTENNA POLARIZATION:
Horizontal

DETECTOR FUNCTION: Peak

**TEST ENGINEER: Chris Carpenter**