Engineering and Testing for EMC and Safety Compliance

CERTIFICATION APPLICATION REPORT FCC PART 15.231

Test Lab:	Applicant Information:
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FCC ID:	G8JVRT02	**GRANTEE FRN NUMBER:**	0007856438
PLAT FORM:	N/A	**RTL WORK ORDER NUMBER:**	2002199
MODEL(S):	Remote Water Meter Transponder (RWT)	**RTL QUOTE NUMBER:**	QRTL02-632
TEST REPORT DATE:	December 23, 2002		

American National Standard Institute:	ANSI/TIA/EIA603 and ANSI/TIA/EIA 603-1
FCC Classification:	Low Power Communication Device Transmitter
FCC Rule Part(s):	Part 15.231 Periodic operation in the band 40.66-40.70 MHz and above 70 MHz
Digital Interface Information	Digital Interface was found to be compliant
Receiver Information	Receiver was found to be compliant

We, the undersigned, hereby declare that the equipment tested and referenced in this report conforms to the identified standard(s) as described in this test report. No modifications were made to the equipment during testing in order to achieve compliance with these standards.

Furthermore, there was no deviation from, additions to, or exclusions from the FCC Part 2, FCC Part 15, ANSI/TIA/EIA 603, and ANSI/TIA/EIA 603-1.

Signature: _____ Date: December 23, 2002

Typed/Printed Name: Desmond A. Fraser Position: President

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1 GENERAL INFORMATION

1.1 SCOPE

FCC Rules Part 15.231: Periodic operation in the band 40.66-40.70 MHz and above 70 MHz.

1.2 TEST FACILITY

The open area test site and conducted measurement facility used to collect the radiated data is located at 360 Herndon Parkway, Suite 1400, Herndon, Virginia 20170. This site has been fully described in a report and approved by the Federal Communications Commission to perform AC line conducted and radiated emissions testing (ANSI C63.4 1992).

1.3 RELATED SUBMITTAL(S)/GRANT(S)

This is an original application for Certification for AMCO Automated Systems, Model: Remote Water Meter Transponder, FCC ID: G8JVRT02.

2 TEST INFORMATION

2.1 TEST JUSTIFICATION

The EUT was tested in all three orthogonal planes in order to determine worst-case emissions. Radiated emission measurements were made of the Fundamental and Spurious Emission levels.

2.2 EXERCISING THE EUT

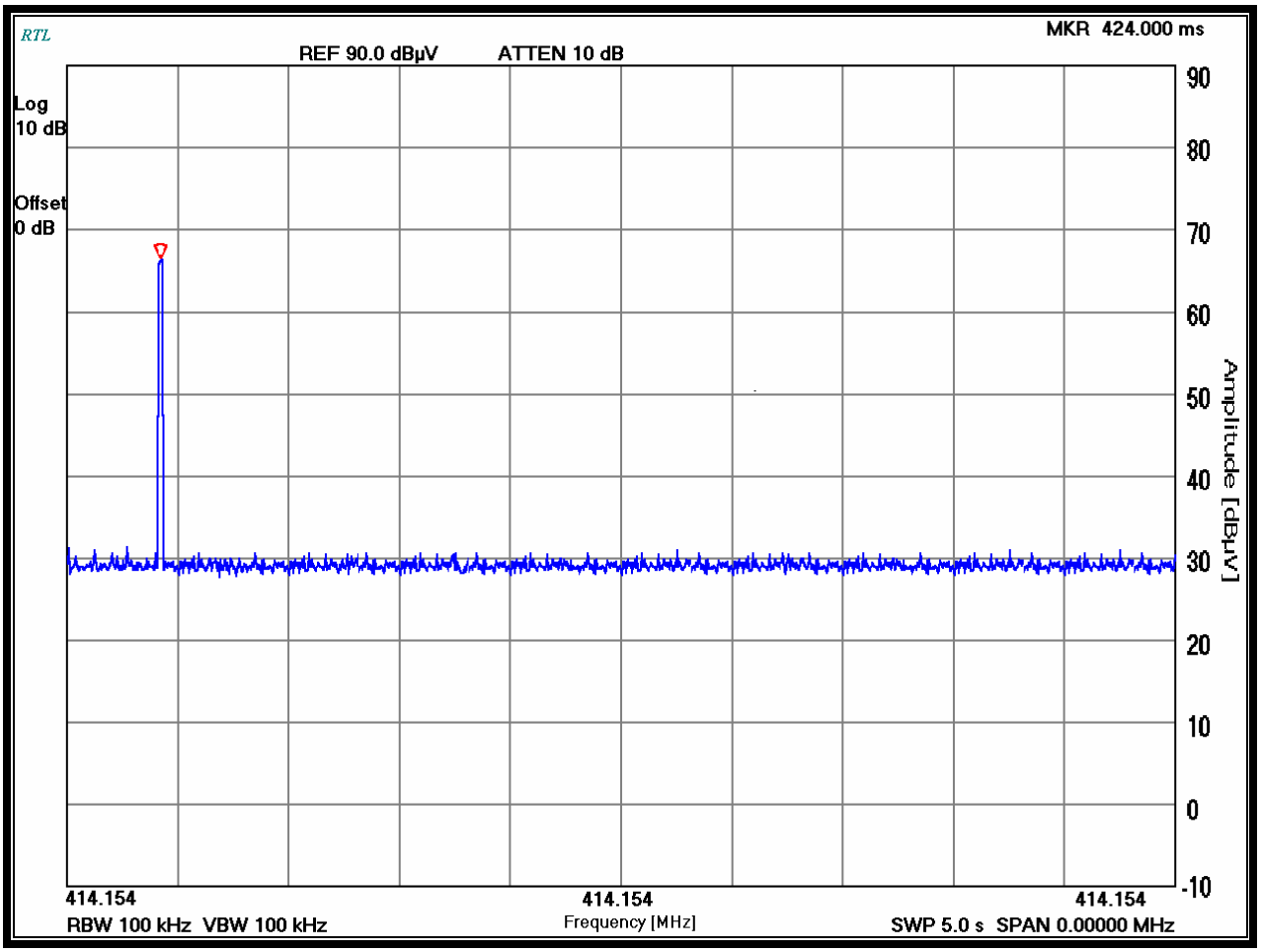
The unit was tested in its typical configurations with an on-time of 15 milliseconds over a period greater than 100 milliseconds (corresponding to a duty cycle factor of –16.5 dB). The unit was also tested in a continuous transmit mode during testing. The EUT was investigated and tested in three orthogonal axes. The worst-case configuration is listed in this report. The carrier was also checked to verify that information was being transmitted.

2.3 CONFORMITY WITH 15.231 (e)

In order to comply with the part 15.231(e), the unit must respect the following requirements for the silent period as shown in Plot 2-1.

- The device transmits only once per interrogation, and does not repeat a transmission for any interrogation. Devices are typically read once per month, but could be read as often as once per day.
- All transmissions are 15 msec. This time duration does not change, and is never greater than 15 msec.
- A transponder does not repeat packets at any time. It only sends one 15-msec packet reply for each interrogation.

PLOT 2-1: TIMING REQUIREMENT



TEST PERSONNEL:

Franck Schuppius		11/21/2002
Test Engineer	Signature	Date Of Test

2.4 TEST RESULT SUMMARY

TABLE 2-1: TEST RESULT SUMMARY WITH FCC RULES AND REGULATIONS

STANDARD	TEST
FCC 15.231 (e)	Fundamental Transmit Power
FCC 15.231 (e) & 15.205	Spurious Radiated Power
FCC 15.109	Unintentional Radiated Emissions
FCC 15.231 (e) & 2.1049	Occupied Bandwidth
FCC 15.203	Antenna Requirement

2.5 TEST SYSTEM DETAILS

The FCC Identifiers for all equipment, plus descriptions of all cables used in the tested system are:

TABLE 2-2: EQUIPMENT UNDER TEST (EUT)

PART	MANUFACTURER	MODEL	SERIAL NUMBER	FCC ID	CABLE DESCRIPTION	RTL BAR CODE
TRANSPONDER	AMCO AUTOMATED SYSTEMS	REMOTE WATER METER TRANSPONDER (RWT)	52870G045	G8JVRT02	N/A	14897

2.6 CONFIGURATION OF TESTED SYSTEM

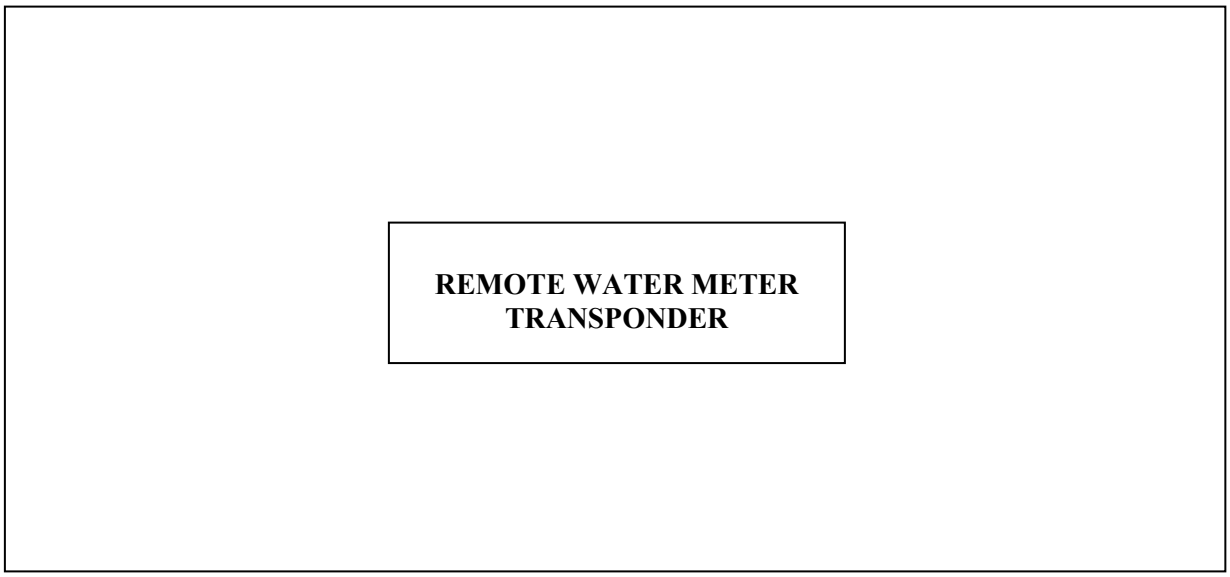


FIGURE 1: WORST CASE CONFIGURATION OF SYSTEM UNDER TEST

3 RADIATED EMISSION - §15.231

3.1 RADIATED EMISSION LIMITS TEST PROCEDURE

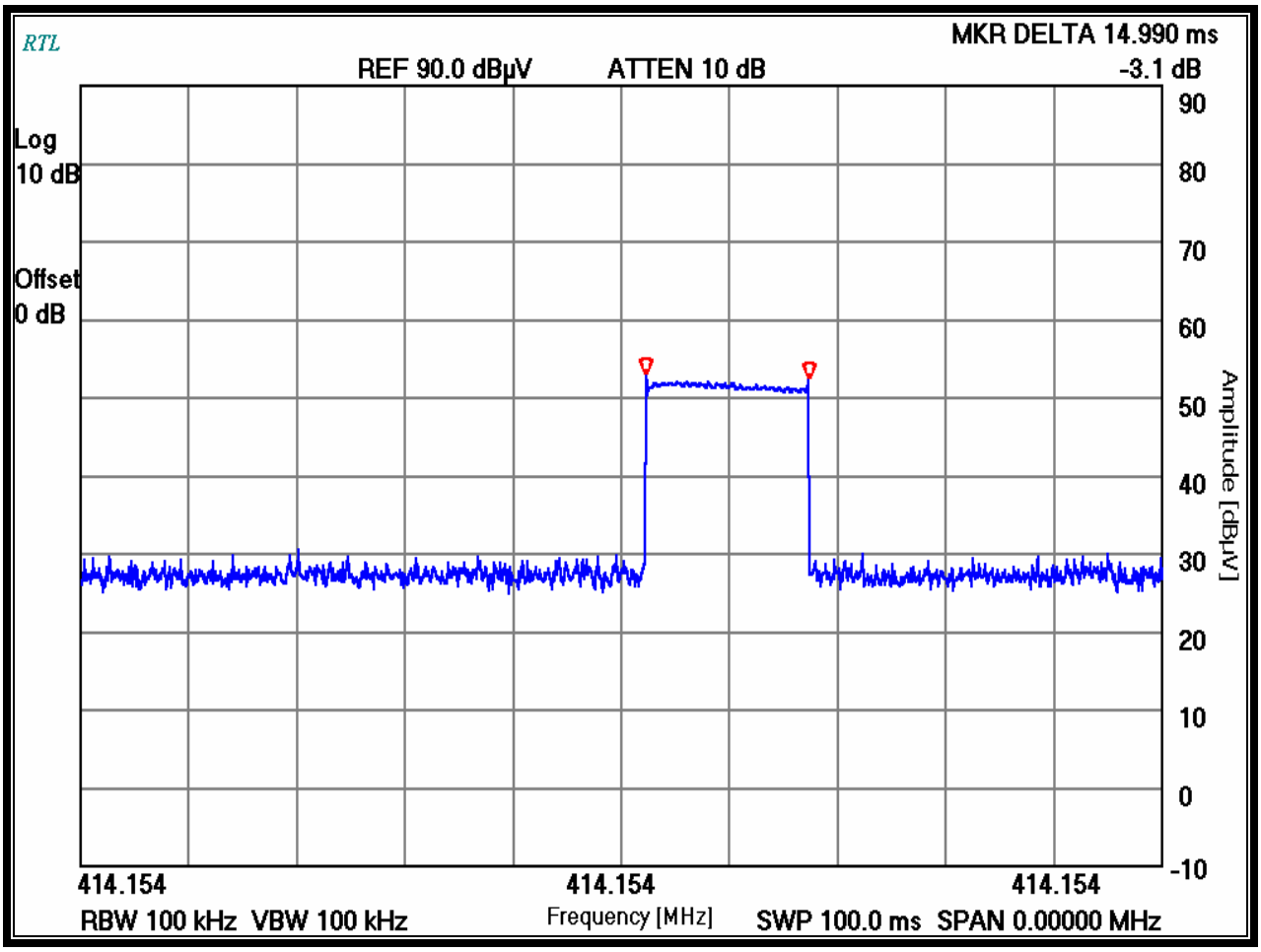
The EUT was placed on a non-conductive table 0.8 meters above the ground plane. The table was centered on a motorized turntable, which allows 360-degree rotation. For measurements of the fundamental signal and spurious/ harmonics, a measurement antenna was positioned at a distance of 3 meters as measured from the closest point of the EUT.

3.2 DUTY CYCLE

The duty cycle correction factor is calculated by 20 log (15/100), with 20 dB being the maximum allowable duty correction factor.

The duration of each transmission was found to be not greater than one second and the silent period between transmissions was found to be at least 30 times the duration of the transmission, but in no case less than 10 seconds.

PLOT 3-1: DUTY CYCLE PLOT



TEST PERSONNEL:

Franck Schuppius		11/21/2002
Test Engineer	Signature	Date Of Test

3.3 RADIATED EMISSION LIMITS TEST DATA

The fundamental was measured at 78.9 dBuV/m in peak mode at 100% duty cycle. The 16 dB duty cycle correction factor was subtracted from the peak result to a corrected reading of 62.9 dBuV/m compared to the average limit of 72.2 dBuV/m per 15.35 and 15.231(e). The spurious and harmonics were corrected using the duty cycle factor and compared to the limit per 15.35, 15.209 and 15.231(e).

TABLE 3-1: RADIATED EMISSIONS

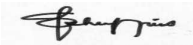
Emission Frequency (MHz)	Test Detector	Antenna Polarity (H/V)	Turntable Azimuth (deg)	Antenna Height (m)	Analyzer Reading (dBuV)	Site Correction Factor (dB/m)	Emission Level (dBuV/m)	Duty factor (dB)	Corrected Level (dBuV/m)	Limit (dBuV/m)
415.585	Pk	V	90	1.0	90.4	-11.5	78.9	-16	62.9	72.2

TABLE 3-2: RADIATED EMISSIONS SPURS/HARMONICS

Emission Frequency (MHz)	Test Detector	Antenna Polarity (H/V)	Turntable Azimuth (deg)	Antenna Height (m)	Analyzer Reading (dBuV)	Site Correction Factor (dB/m)	Emission Level (dBuV/m)	Duty factor (dB)	Corrected Level (dBuV/m)	Limit (dBuV/m)
830.670	Pk	V	0	1.0	56.6	-5.4	51.2	-16	35.2	52.2
1243.140	Pk	V	145	1.0	45.3	-1.0	44.3	-16	28.3	54.0
1660.840	Pk	V	145	1.0	60.6	3.2	63.8	-16	47.8	54.0
2077.440	Pk	V	145	1.0	40.2	11.0	52.2	-16	36.2	54.0

PEAK: RES. =100 KHZ, VID= 100 KHZ, AV: RES. =100 KHZ, VID= 10HZ

TEST PERSONNEL:

Franck Schuppius		11/24/2002
Test Engineer	Signature	Date Of Test

3.4 TEST EQUIPMENT USED FOR TESTING

TABLE 3-3: RADIATED SPURIOUS EMISSIONS TEST EQUIPMENT

RTL ASSET #	MANUFACTURER	MODEL	PART TYPE	SERIAL NUMBER
900772	EMCO	3161-02	Horn Antenna (2-4 GHz)	900772
900321	EMCO	3161-03	Horn Antenna (4-8,2 GHz)	9508-1020
900723	Miteq	NA	AMP (100MHz-26 GHz	NA
900791	Schaffner-Chase	CBL6112	Antenna (25 MHz - 2 GHz)	2099

4 MODULATED BANDWIDTH - §15.231(c)

4.1 MODULATED BANDWIDTH TEST PROCEDURE

The minimum 20 dB bandwidth per FCC 15.231(c) was performed as radiated testing with the resolution bandwidth set at 10 kHz, and the video bandwidth set at 100 kHz. The minimum 20 dB modulated bandwidth is listed in Table 4-2.

4.2 TEST EQUIPMENT USED FOR TESTING

TABLE 4-1: TEST EQUIPMENT USED FOR TESTING (MODULATED BANDWIDTH)

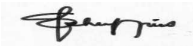
RTL ASSET #	MANUFACTURER	MODEL	PART TYPE	SERIAL NUMBER
900931	Hewlett Packard	8566B	Spectrum Analyzer (100 Hz – 22 GHz)	3138A07771

4.3 MODULATED BANDWIDTH TEST DATA

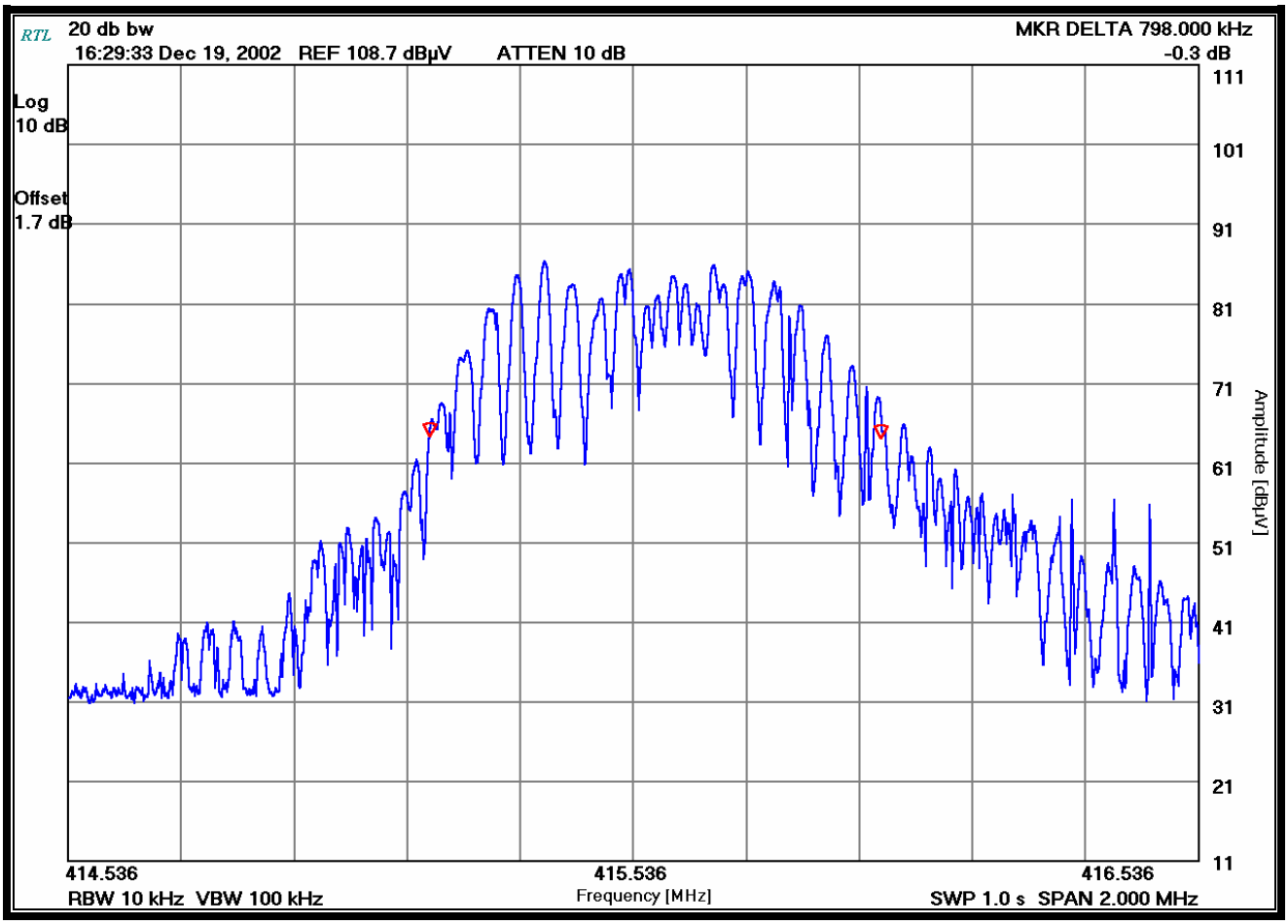
TABLE 4-2: MINIMUM 20 DB MODULATED BANDWIDTH

FREQUENCY (MHz)	20 dB BANDWIDTH (kHz)
415.5	798.00

TEST PERSONNEL:

Franck Schuppius		12/19/2002
Test Technician/Engineer	Signature	Date Of Test

PLOT 4-1: MODULATED BANDWIDTH



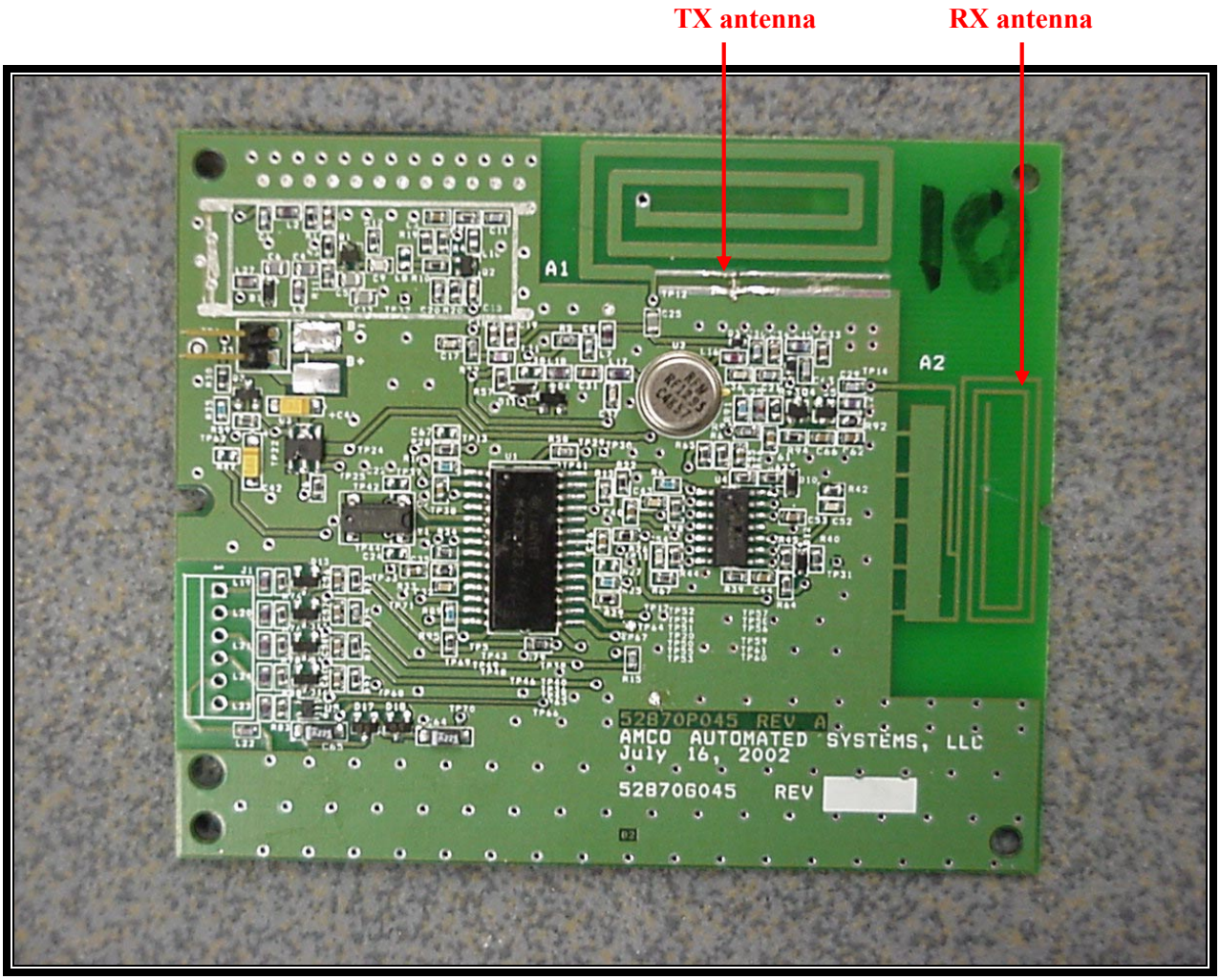
TEST PERSONNEL:

Franck Schuppius		12/19/2002
Test Technician/Engineer	Signature	Date Of Test

5 CONCLUSION

The data in this measurement report shows that the AMCO Automated Systems, Model: Remote Water Meter Transponder, FCC ID: G8JVRT02, complies with all the requirements of Part 15.231 of the FCC Rules.

APPENDIX A: ANTENNA SPECIFICATIONS



PHOTOGRAPH 1: ANTENNA LOCATION

APPENDIX B: AGENCY AUTHORIZATION LETTER

Please see the following page.

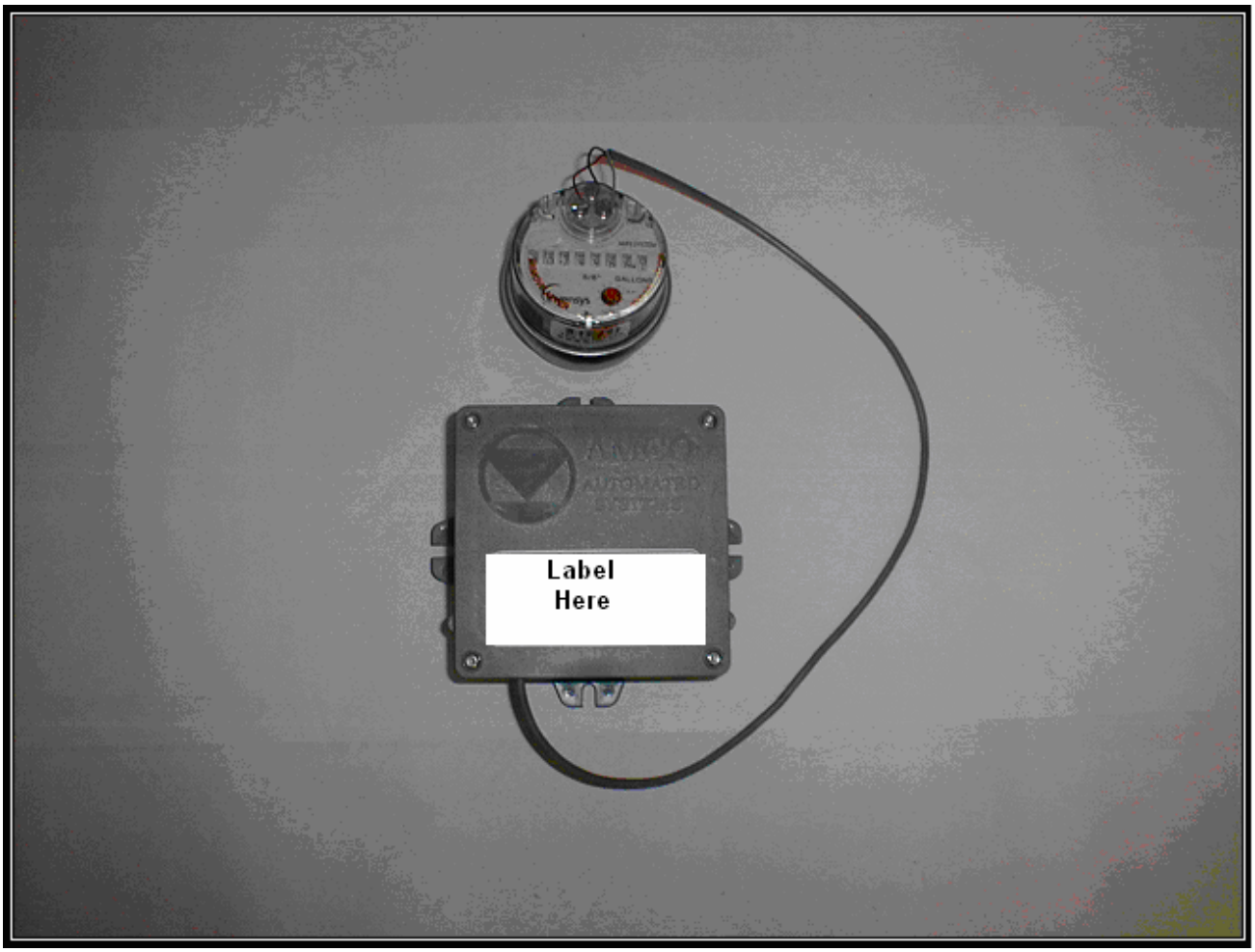
APPENDIX C: CONFIDENTIALITY REQUEST LETTER

Please see the following page.

APPENDIX D: PRODUCT DESCRIPTION

Please see the following pages.

APPENDIX E: LABEL AND LABEL LOCATION



PHOTOGRAPH 2: LOCATION OF LABEL ON DEVICE

Please refer to the following page for the label sample.

APPENDIX F: SCHEMATICS

Please see the following page.

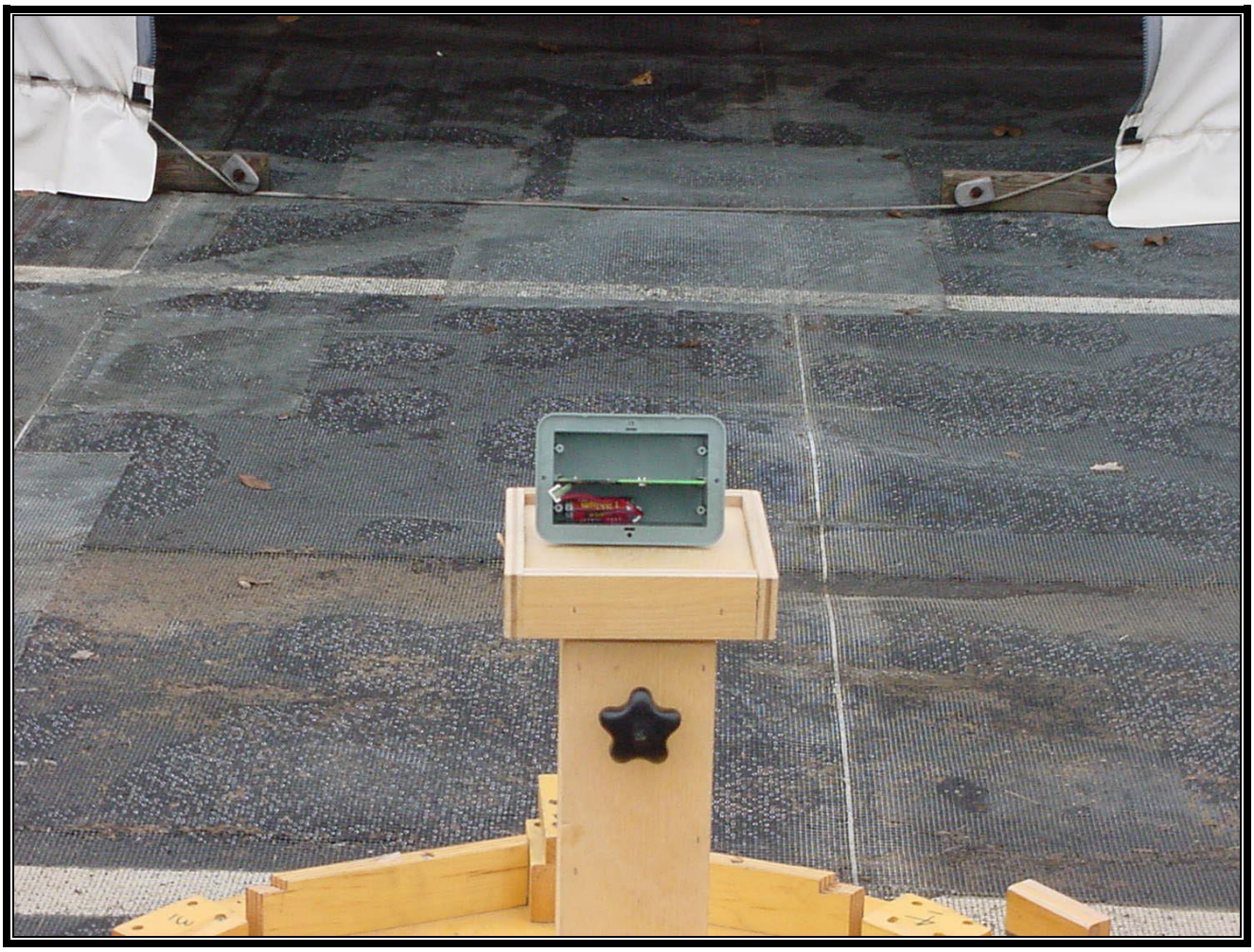
APPENDIX G: BLOCK DIAGRAM

Please see the following page.

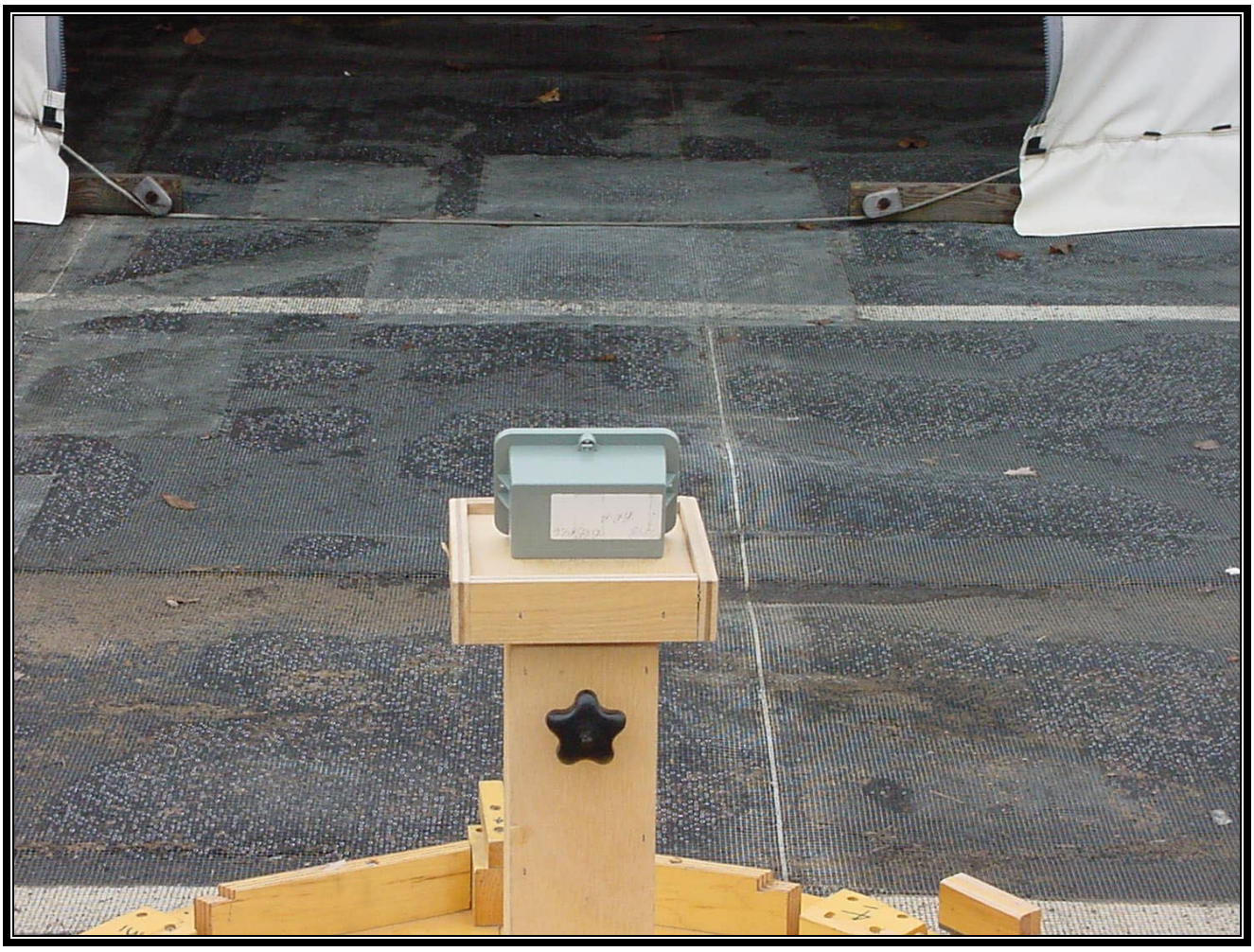
APPENDIX H: MANUAL

Please see the following pages.

APPENDIX I: TEST PHOTOGRAPHS

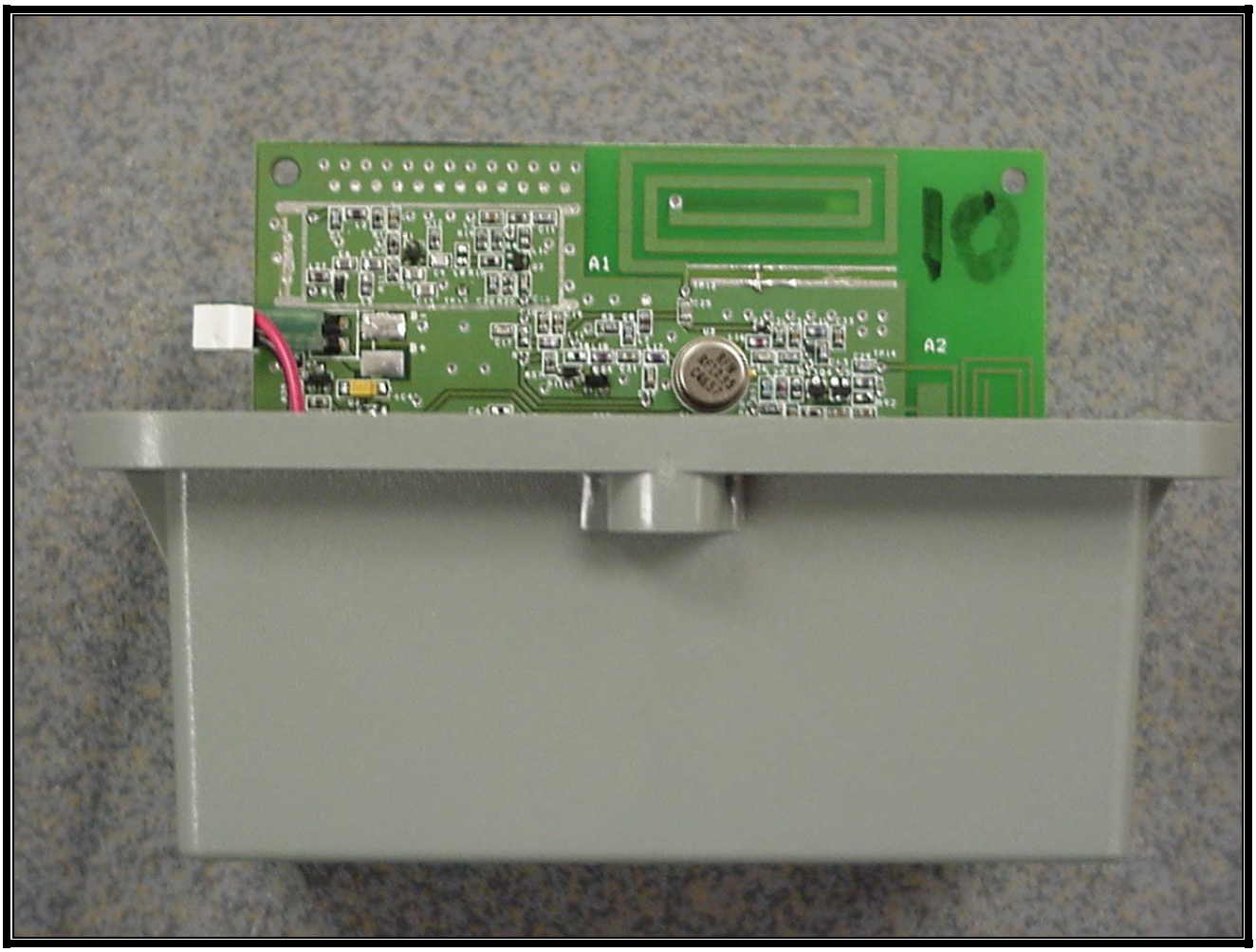


PHOTOGRAPH 3: **RADIATED EMISSION FRONT VIEW, WORST CASE CONFIGURATION**

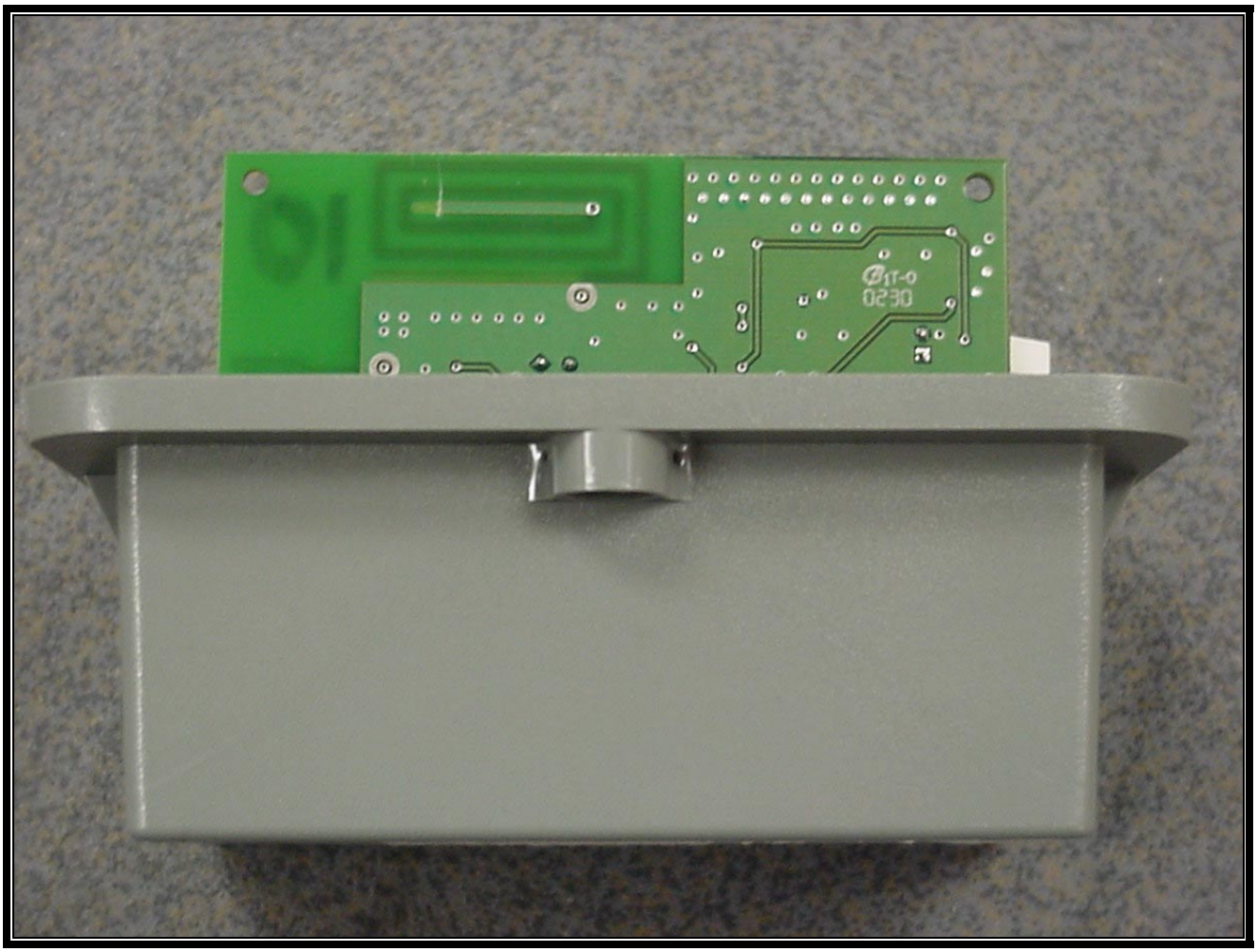


PHOTOGRAPH 4: RADIATED EMISSION REAR VIEW, WORST CASE CONFIGURATION

APPENDIX J: EXTERNAL PHOTOGRAPHS

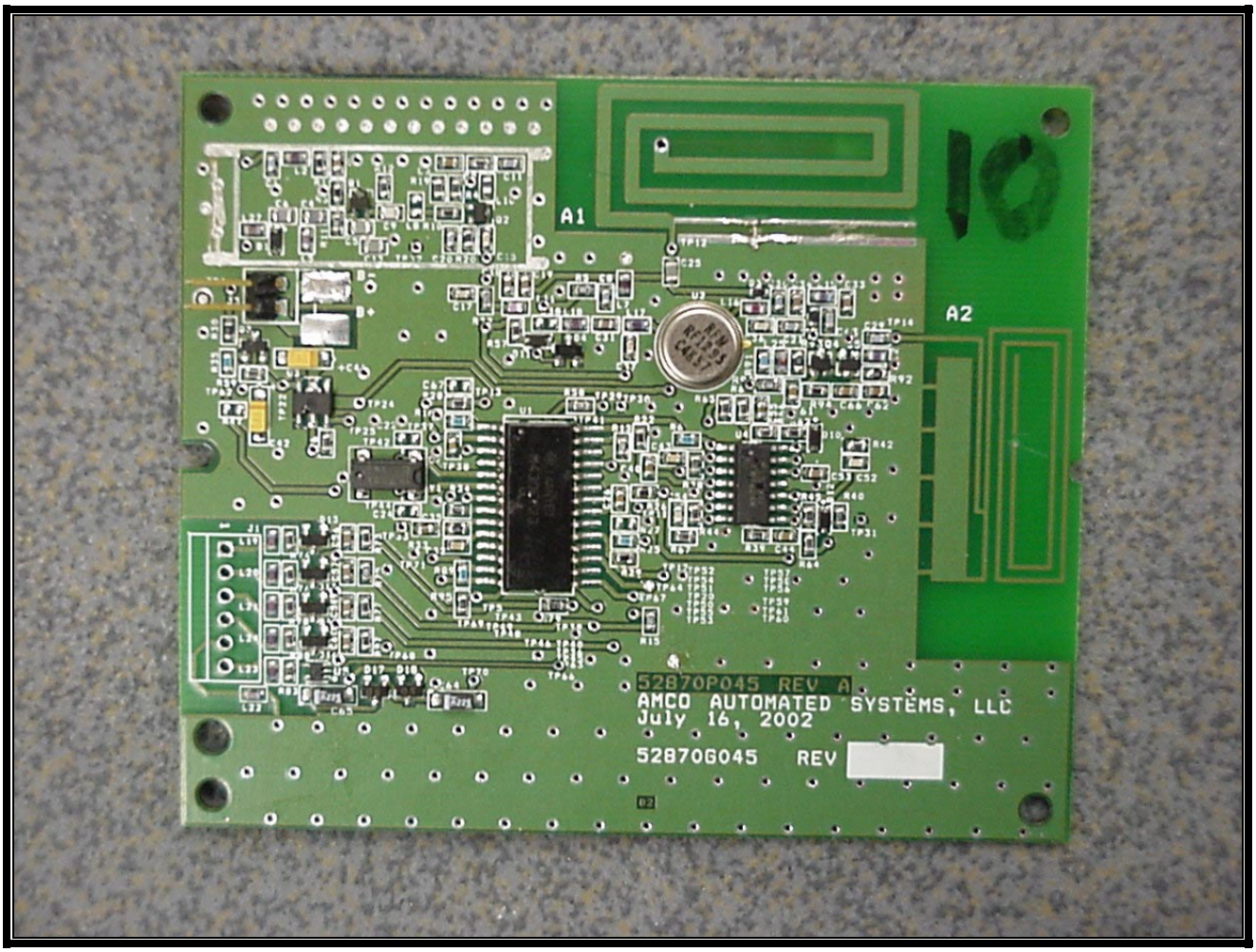


PHOTOGRAPH 5: FRONT VIEW OF TRANSPONDER

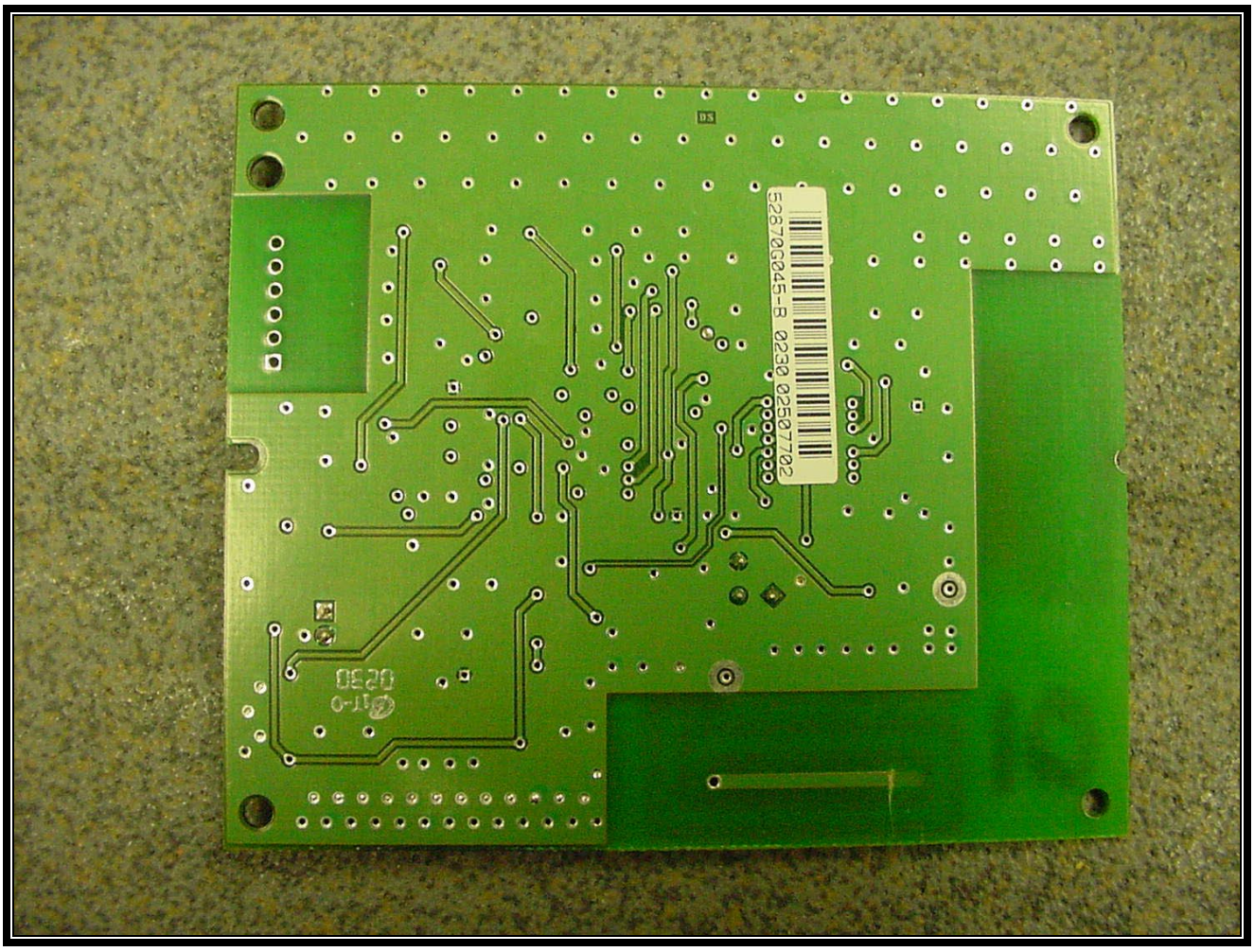


PHOTOGRAPH 6: REAR VIEW OF TRANSPONDER

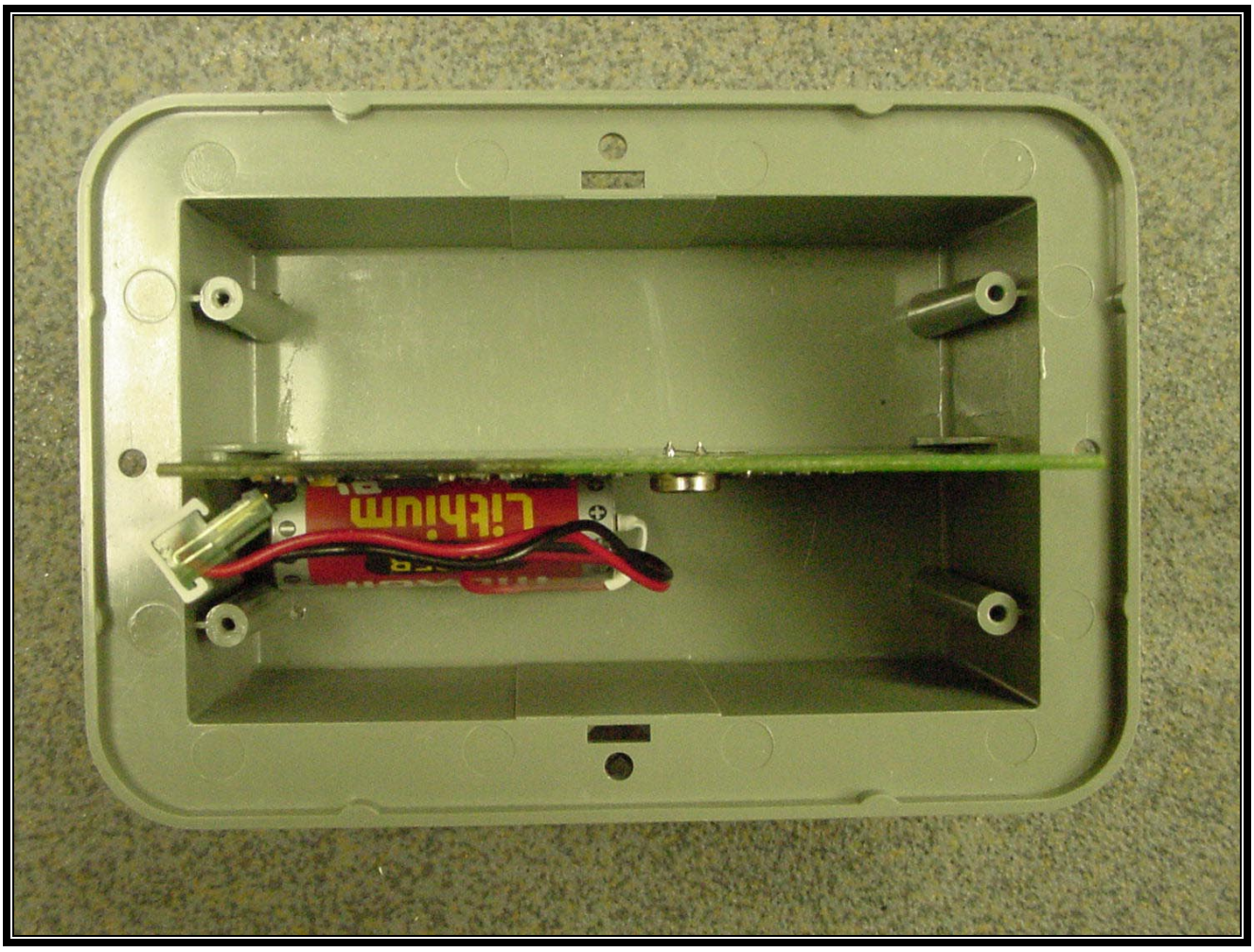
APPENDIX K: INTERNAL PHOTOGRAPHS



PHOTOGRAPH 7: FRONT VIEW OF PCB



PHOTOGRAPH 8: BACK VIEW OF PCB



PHOTOGRAPH 9: INSIDE VIEW