Engineering and Testing for EMC and Safety Compliance

CERTIFICATION APPLICATION REPORT
FCC PART 15.231

Test Lab:	Applicant:
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FCC ID:	G8JSRP03	**GRANTEE FRN NUMBER:**	0007856438
PLAT FORM:	N/A	**RTL WORK ORDER NUMBER:**	2003077
MODEL(S):	TRACE Short Range Programmer	**RTL QUOTE NUMBER:**	QRTL03-823
DATE OF TEST REPORT:	July 1, 2003		

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 40.66-4070 MHz and above 70 MHz
Digital Interface Information	Digital Interface was found to be compliant
Receiver Information	Receiver was found to be compliant

I, 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: July 1, 2003

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 test report contains test data per FCC 15.231(a), (b) and (c) requirements for AMCO Automated Systems, Model: TRACE Short Range Programmer, FCC ID: G8JSRP03. Please note that the device as tested does not meet the current requirements of FCC 15.231(a) because data is being transmitted with a control signal. The device does meet the current requirements of FCC 15.231 in all other respects, and will meet the requirements of FCC 15.231 when the rule revisions recently adopted in Docket 01-278 take effect. AMCO is pursuing a waiver because of this issue.

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 1.5 seconds over a period of 30 minutes (corresponding to a best case duty cycle factor of –20 dB allowable). 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 TEST RESULT SUMMARY

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

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

2.4 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	TRACE SHORT RANGE PROGRAMMER	TX	G8JSRP03	N/A	15312
TRANSPONDER	AMCO AUTOMATED SYSTEMS	TRACE SHORT RANGE PROGRAMMER	RX	G8JSRP03	N/A	15313

2.5 CONFIGURATION OF TESTED SYSTEM

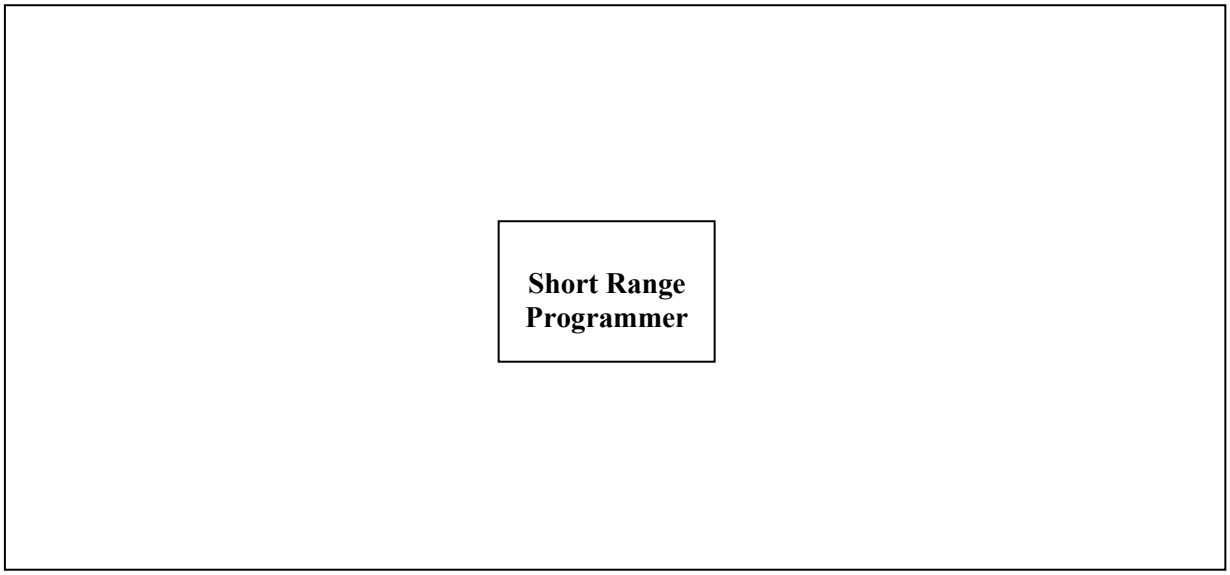


FIGURE 1: CONFIGURATION OF SYSTEM UNDER TEST

3 CONDUCTED EMISSIONS

3.1 TEST METHODOLOGY FOR CONDUCTED EMISSIONS MEASUREMENTS

The power line conducted emission measurements were performed in a Series 81 type shielded enclosure manufactured by Rayproof. The EUT was assembled on a wooden table 80 centimeters high. Power was fed to the EUT through a 50 ohm / 50 microhenry Line Impedance Stabilization Network (EUT LISN). The EUT LISN was fed power through an A.C. filter box on the outside of the shielded enclosure. The filter box and EUT LISN housing are bonded to the ground plane of the shielded enclosure. A second LISN, the peripheral LISN, provides isolation for the EUT test peripherals. This peripheral LISN was also fed A.C. power. A metal power outlet box, which is bonded to the ground plane and electrically connected to the peripheral LISN, powers the EUT host peripherals.

The spectrum analyzer was connected to the A.C. line through an isolation transformer. The 50 ohm output of the EUT LISN was connected to the spectrum analyzer input through a high-pass filter. The filter is used to prevent overload of the spectrum analyzer from noise below 150 kHz. Conducted emission levels were measured on each current-carrying line with the spectrum analyzer operating in the CISPR quasi-peak mode (or peak mode if applicable). The analyzer's 6 dB bandwidth was set to 9 kHz. No video filter less than 10 times the resolution bandwidth was used. Average measurements are performed in linear mode using a 10 kHz resolution bandwidth, a 1 Hz video bandwidth, and by increasing the sweep time in order to obtain a calibrated measurement. The emission spectrum was scanned from 150 kHz to 30 MHz. The highest emission amplitudes relative to the appropriate limit were measured and have been recorded in this report.

3.2 CONDUCTED EMISSIONS TEST

The initial step in collecting conducted data is a spectrum analyzer peak scan of the measurement range. If the conducted emissions exceed the limit with the instrument set to the quasi-peak mode, then measurements are made in the average mode. If the quasi-peak measurement is at least 6dB higher than the amplitude in the average mode, the level measured in the quasi-peak mode may be reduced by 13dB before comparing it to the limit.

The conducted test was performed with the EUT exercise program loaded, and the emissions were scanned between 150 kHz to 30 MHz on the NEUTRAL SIDE and PHASE SIDE.

3.3 CONDUCTED EMISSIONS TEST DATA

TABLE 3-1: CONDUCTED EMISSIONS TEST (NEUTRAL SIDE)

Temperature: 68°F Humidity: 27%						
Emission Frequency (MHz)	**Test Detector**	**Analyzer Reading (dBuV)**	**Site Correction Factor (dB)**	**Emission Level (dBuV)**	**Limit (dBuV)**	**Margin (dBuV)**
0.151	Pk	41.0	2.0	43.0	65.9	-22.9
0.290	Pk	35.2	1.0	36.2	60.5	-24.3
0.396	Pk	31.9	0.8	32.7	57.9	-25.2
0.500	Pk	29.6	0.7	30.3	56.0	-25.7
0.970	Pk	25.6	0.7	26.3	56.0	-29.7
15.220	Pk	14.0	2.8	16.8	60.0	-43.2
28.580	Pk	14.0	3.6	17.6	60.0	-42.4

TABLE 3-2: CONDUCTED EMISSIONS TEST (PHASE SIDE)

Temperature: 68°F Humidity: 27%						
Emission Frequency (MHz)	**Test Detector**	**Analyzer Reading (dBuV)**	**Site Correction Factor (dB)**	**Emission Level (dBuV)**	**Limit (dBuV)**	**Margin (dBuV)**
0.151	Pk	40.4	2.0	42.4	65.9	-23.5
0.254	Pk	35.4	1.3	36.7	61.6	-24.9
0.324	Pk	32.2	0.9	33.1	59.6	-26.5
0.392	Pk	29.6	0.8	30.4	58.0	-27.6
0.500	Pk	23.9	0.7	24.6	56.0	-31.4
0.500	Pk	28.0	0.7	28.7	56.0	-27.3
14.930	Pk	14.7	2.6	17.3	60.0	-42.7
24.660	Pk	18.1	3.4	21.5	60.0	-38.5

[1]Pk = Peak; QP = Quasi-Peak; Av = Average

TEST PERSONNEL:

Daniel Baltzell		July 2, 2003
Test Technician/Engineer	Signature	Date Of Test

3.4 TEST EQUIPMENT USED FOR TESTING CONDUCTED EMISSIONS

TABLE 3-3: EQUIPMENT USED FOR TESTING CONDUCTED EMISSIONS

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
900897	Hewlett Packard	85650A	Spectrum Analyzer (10 kHz – 1.5 GHz)	N/A	11/09/03
900339	Hewlett Packard	N/A	Quasi-Peak Adapter	N/A	11/09/03
901084	AFJ	LS16	LISN	N/A	11/09/03

4 RADIATED EMISSIONS - §15.231

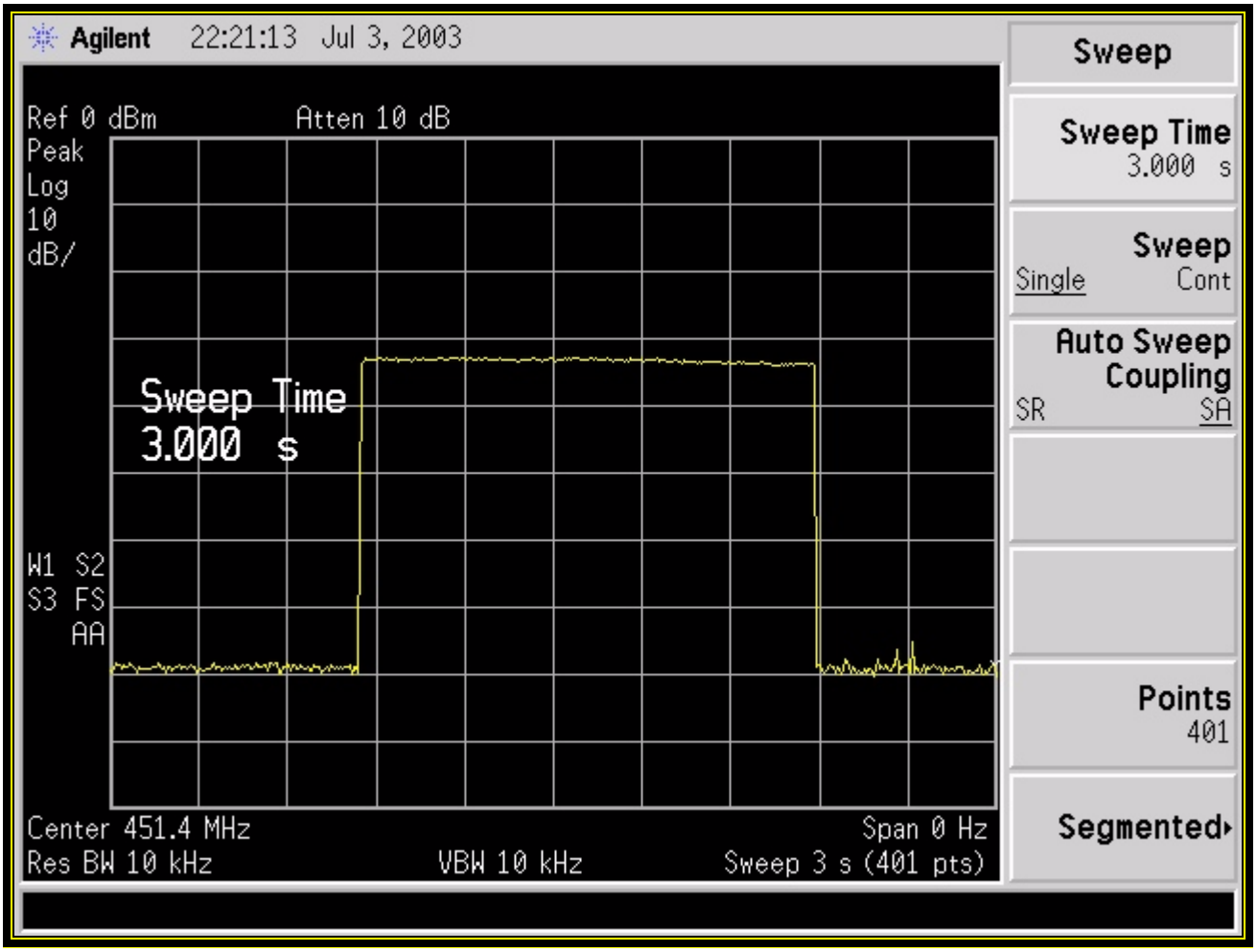
4.1 RADIATED EMISSION LIMITS TEST PROCEDURE

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.

4.2 DUTY CYCLE

The duty cycle correction factor is calculated by 20 log (1500/30 minutes), with 20 dB being the maximum allowable duty correction factor.

PLOT 4-1: DUTY CYCLE PLOT



4.3 RADIATED EMISSION LIMITS TEST DATA

The fundamental was measured at 71.9dBuV/m in peak mode at 100% duty cycle. The maximum -20 dB duty cycle correction factor was subtracted from the peak result, to a corrected reading of 51.9 dBuV/m compared to a peak limit of 71.9 dBuV/m per 15.35 and 15.231(a). The spurious and harmonics were corrected using the duty cycle factor and compared to the limit per 15.35 and 15.231(a)

TABLE 4-1: RADIATED EMISSIONS

Corrected with duty cycle and average limit applied

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)	Margin (dB)
451.378	Pk	V	185	1.0	83.3	-11.4	71.9	-20.0	51.9	81.4	-29.5

TABLE 4-2: RADIATED EMISSIONS 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)	Margin (dB)
902.756	Pk	V	180	1.0	40.5	-3.4	37.1	-20.0	17.1	61.4	-44.3
1354.137	Pk	H	0	1.0	42.8	2.3	45.1	-20.0	25.1	61.4	-36.3
1805.506	Pk	H	0	1.0	43.5	6.1	49.6	-20.0	29.6	61.4	-31.8

Note: No emissions were observed beyond the fourth harmonic.

TABLE 4-3: RADIATED EMISSIONS DIGITAL/RECEIVER

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)	Limit (dBuV/m)	Margin (dB)
155.161	Qp	H	0	1.0	34.0	-19.9	14.1	43.5	-29.4
225.678	Qp	H	0	1.8	32.5	-17.4	15.1	46.0	-30.9
403.585	Qp	V	90	1.3	55.4	-12.6	42.8	46.0	-3.2
465.484	Qp	H	0	1.0	33.6	-11.2	22.4	46.0	-23.6
536.011	Qp	H	0	1.0	33.8	-9.6	24.2	46.0	-21.8
807.169	Qp	V	160	1.2	48.2	-4.3	43.9	46.0	-2.1
846.334	Qp	H	0	1.0	33.4	-3.9	29.5	46.0	-16.5
1210.754	Av	V	0	1.0	37.7	-1.5	36.2	54.0	-17.8

PEAK: RES. =100 KHZ, VID= 100 KHZ FOR LESS THAN 1 GHZ; 1 MHZ/1MHZ RESOLUTION ABOVE 1 GHZ

TEST PERSONNEL:

Daniel Baltzell		July 1, 2003
Test Engineer	Signature	Date Of Test

4.4 TEST EQUIPMENT USED FOR TESTING RADIATED SPURIOUS EMISSIONS

TABLE 4-4: EQUIPMENT USED FOR TESTING RADIATED SPURIOUS EMISSIONS

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
900772	EMCO	3161-02	Horn Antenna (2 - 4 GHz)	9804-1044	3/15/04
900321	EMCO	3161-03	Horn Antenna (4.0 - 8.2 GHz)	9508-1020	4/10/04
900932	Hewlett Packard	8449B OPT H02	Preamplifier (1 - 26.5 GHz)	3008A00505	7/15/03
900724	Antenna Research Associates, Inc.	LPB-2520	LOG Periodic / Biconal Antenna (25 – 1000 MHz)	1037	3/27/04

5 MODULATED BANDWIDTH - §15.231(c)

The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz.

Limit = 451.38 MHz X 0.25% = 1.13 MHz

5.1 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 5-1.

5.2 MODULATED BANDWIDTH TEST DATA

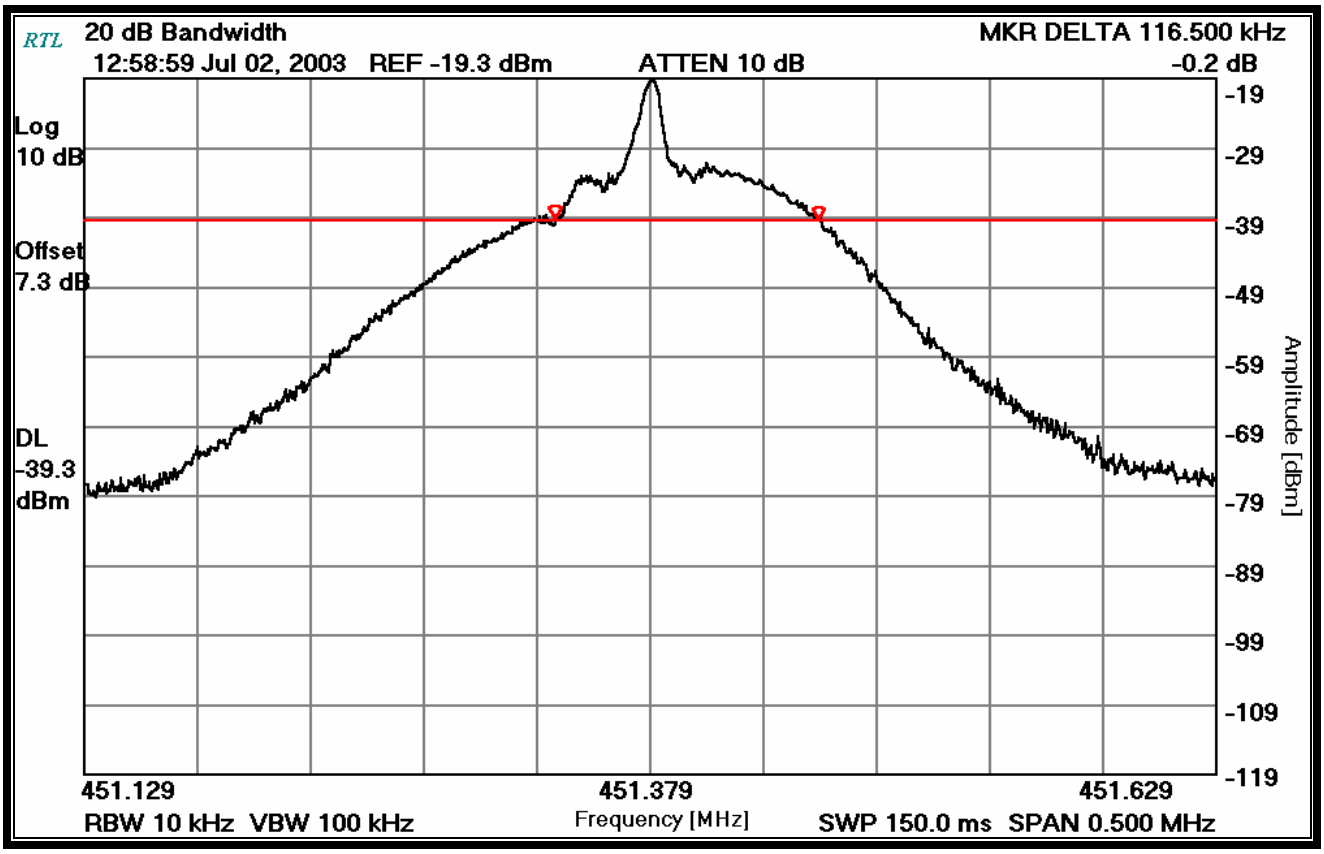
TABLE 5-1: MINIMUM 20 DB MODULATED BANDWIDTH

Frequency (MHz)	20 dB Bandwidth (kHz)	Limit (kHz)
451.38	116.5	1130

TEST PERSONNEL:

Daniel Baltzell		July 2, 2003
Test Technician/Engineer	Signature	Date Of Test

PLOT 5-1: MODULATED BANDWIDTH



TEST PERSONNEL:

Daniel Baltzell		July 2, 2003
Test Technician/Engineer	Signature	Date Of Test

5.3 TEST EQUIPMENT USED FOR TESTING MODULATED BANDWIDTH

TABLE 5-2: EQUIPMENT USED FOR TESTING MODULATED BANDWIDTH

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
900970	Hewlett Packard	85662A	Spectrum Analyzer Display	2542A11239	4/17/04
900968	Hewlett Packard	8567A	Spectrum Analyzer (10 kHz - 1.5 GHz)	2602A00160	4/17/04

6 CONCLUSION

This test report contains test data per FCC 15.231(a), (b) and (c) requirements for AMCO Automated Systems Model: TRACE Short Range Programmer, FCC ID: G8JSRP03. Please note that the device as tested does not meet the current requirements of FCC 15.231(a) because data is being transmitted with a control signal. The device does meet the current requirements of FCC 15.231 in all other respects, and will meet the requirements of FCC 15.231 when the rule revisions recently adopted in Docket 01-278 take effect. AMCO is pursuing a waiver because of this issue.