

TABLE OF CONTENTS LIST

APPLICANT: COLUMBIA TELECOMMUNICATIONS GROUP, INC.

FCC ID: GAFFRS-CS14

TEST REPORT:

PAGE	1.....COVER SHEET - GENERAL INFORMATION & TECHNICAL DESCR.
PAGE	2.....TECHNICAL DESCRIPTION CONTINUED & RF POWER OUTPUT
PAGE	3.....MODULATION CHARACTERISTICS AND OCCUPIED BANDWIDTH
PAGE	4.....METHOD OF MEASURING OCCUPIED BANDWIDTH
PAGE	5.....SPURIOUS EMISSIONS AT ANTENNA TERMINALS
PAGE	5.....FIELD STRENGTH OF SPURIOUS EMISSIONS
PAGE	6.....METHOD OF MEASURING RADIATED SPURIOUS EMISSIONS
PAGE	7.....FREQUENCY STABILITY
PAGE	8.....LIST OF TEST EQUIPMENT

EXHIBITS CONTAINING:

EXHIBIT	1.....FCC ID LABEL SAMPLE
EXHIBIT	2.....SKETCH OF FCC ID LABEL LOCATION
EXHIBIT	3A.....EXTERNAL PHOTO - FRONT VIEW
EXHIBIT	3B.....EXTERNAL PHOTO - REAR VIEW
EXHIBIT	3C-3D.....INTERNAL PHOTO - COMPONENT SIDE
EXHIBIT	3E.....INTERNAL PHOTO - SOLDER SIDE
EXHIBIT	3F.....INTERNAL PHOTO - COMPONENT SIDE - SMALL BOARD
EXHIBIT	3G.....INTERNAL PHOTO - SOLDER SIDE - SMALL BOARD
EXHIBIT	4.....TEST SET UP PHOTO
EXHIBIT	5.....BLOCK DIAGRAM
EXHIBIT	6A.....SCHEMATIC - MAIN
EXHIBIT	6B.....SCHEMATIC - RF
EXHIBIT	7.....USER'S MANUAL
EXHIBIT	8.....CIRCUIT DESCRIPTION
EXHIBIT	9.....TUNING PROCEDURE
EXHIBIT	10.....AUDIO FREQUENCY RESPONSE GRAPH
EXHIBIT	11A.....MODULATION LIMITING PLOT - 300 Hz
EXHIBIT	11B.....MODULATION LIMITING PLOT - 1000 Hz
EXHIBIT	11C.....MODULATION LIMITING PLOT - 3000 Hz
EXHIBIT	12.....AUDIO LOW PASS FILTER GRAPH
EXHIBIT	13.....OCCUPIED BANDWIDTH CW PLOT
EXHIBIT	14.....OCCUPIED BANDWIDTH PLOT - 2500 Hz TONE

APPLICANT: COLUMBIA TELECOMMUNICATIONS GROUP, INC.

FCC ID: GAFFRS-CS14

REPORT #: T:\CUS\C\COLUMBIA\487ZH0\487zh0rpt.doc

PAGE: TABLE OF CONTENTS

GENERAL INFORMATION REQUIRED
FOR TYPE ACCEPTANCE

duty 2.1033(c)(1)(2) COLUMBIA TELECOMMUNICATIONS GROUP, INC. will
manufacture the FCCID: GAFFRS-CS14 FAMILY RADIO SERVICES
14 CHANNEL TRANSCEIVER in quantity, for use under FCC
RULES PART 95. The UUT is a PTT Radio with a maximum
cycle of 50%.

COLUMBIA TELECOMMUNICATIONS GROUP, INC.
395 ATLANTIC AVENUE
EAST ROCKAWAY, NY 11518
USA

2.1033 (c) TECHNICAL DESCRIPTION

2.1033(c)(3) Instruction book. A draft copy of the instruction
manual is included as EXHIBIT 7.

2.1033(c) (4) Type of Emission: 10K0F3E
95.629

Bn = 2M + 2DK
M = 3000
D = 2.0K
Bn = 2(3.0)+2(2.0) = 10.0K

Authorized Bandwidth 12.5KHz

2.1033(c)(5) Frequency Range: 1. 462.5625 8. 467.5625
95.627 2. 462.5875 9. 467.5875
3. 462.6125 10. 467.6125
4. 462.6375 11. 467.6375
5. 462.6625 12. 467.6625
6. 462.6875 13. 467.6875
7. 462.7125 14. 467.7125 MHz

2.1033(c)(6)(7) Power Output shall not exceed 0.500Watts effective
95.637 radiated power. There can be no provisions for
95.647 increasing the power or varing the power. The Maximum
Output Power Rating: 400 milliWatts
effective radiated power.

95.645 The antenna is an intergral part to the unit, it cannot
be removed without rendering the unit inoperative. In
order to remove the antenna the case must unscrewed,
then the PCB assemblies must be removed then the
antenna can be removed.

2.1033(c)(8) DC Voltages and Current into Final Amplifier:
FINAL AMPLIFIER ONLY
Vce = 4.5 Volts DC Ice = 0.12A.
Pin = 0.54 Watts

2.1033(c)(9) Tune-up procedure. The tune-up procedure is included
9.

PAGE #: 1

2.1033(c)(10) Complete Circuit Diagrams: The circuit diagram is included as EXHIBIT 6A-6B of this report. The block diagrams are included as EXHIBIT 5 of this report.

2.1033(c)(11) A photograph or a drawing of the equipment identification label is included as exhibit No. 1.

2.1033(c)(12) Photographs(8"X10") of the equipment of sufficient clarity to reveal equipment construction and layout, including meters, labels for controls, including any view under shields - See EXHIBIT 3A-3G.

2.1033(c)(13) Digital modulation is not allowed.

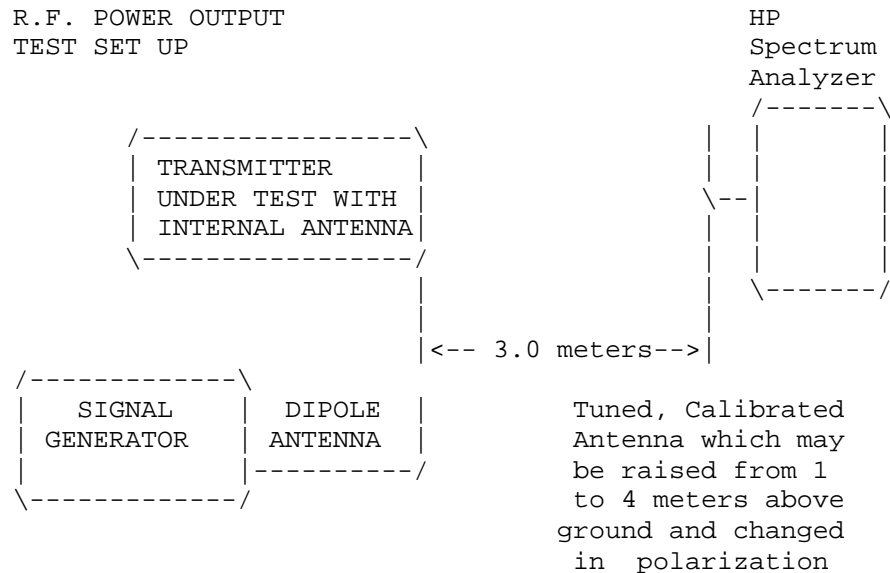
2.1033(c)(14) The data required by 2.1046 through 2.1057 is submitted below.

2.1046(a) RF power output.

95.637 RF power is measured by measuring the radiated power at 3 meters and then replacing the transmitter with a signal generator to determine the effective radiated power. The ERP shall not exceed 0.500 Watts.

MEASURED POWER OUTPUT = 400 milliWatts ERP

R.F. POWER OUTPUT
TEST SET UP



Equipment placed 1 meter above ground on a rotatable platform.

APPLICANT: COLUMBIA TELECOMMUNICATIONS GROUP, INC.

FCC ID: GAFFRS-CS14

REPORT #: T:\CUS\C\COLUMBIA\487ZH0\487zh0rpt.doc

2.1047(a)(b) Modulation characteristics:

AUDIO FREQUENCY RESPONSE

The audio frequency response was measured in accordance with TIA/EIA Specification 603. The audio frequency response curve is shown on the next page. The audio signal was fed into a dummy microphone circuit and into the microphone connector. The input required to produce 30 percent modulation level was measured. See Exhibit 10.

2.1047(b) Audio input versus modulation

The audio input level needed for a particular percentage of modulation was measured in accordance with TIA/EIA Specification 603. The audio input curves versus modulation are on the following pages. Curves are provided for audio input frequencies of 300, 1000, and 3000 Hz. See Exhibit 11A-11C.

95.635(b) Post Limiter Filter The filter must be between the modulation limiter and the modulated stage. At any frequency between 3 & 20KHz the filter must have an attenuation of $60\log(f/3)$ greater than the attenuation at 1KHz. See Exhibit 12.

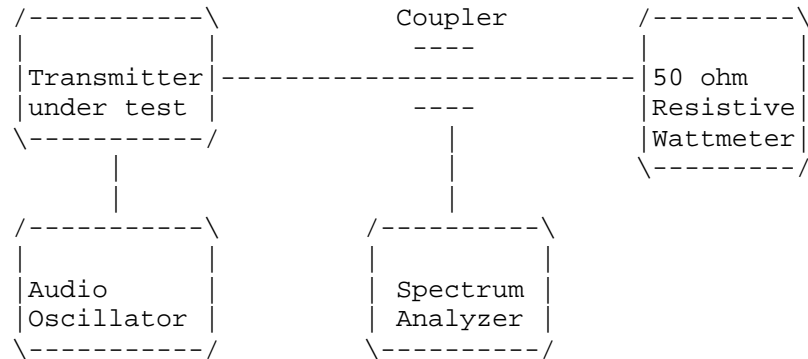
2.989(c) EMISSION BANDWIDTH:
95.633(b)(1)(3)(7)

Data in the plots shows that the sidebands from greater than 50% to 100% of the authorized bandwidth must be attenuated by at least 25dB and from 100 to 250% the sidebands must be attenuated by at least 35dB. Beyond 250% the sidebands must be attenuated by at least $43 + \log_{10}(TP)$. The transmitter was modulated with 2500 Hz, adjusted for 50% modulation plus 16 dB. The spectrum analyzer was set with the unmodulated carrier at the top of the screen. The test procedure diagram and occupied bandwidth PLOTS follow.

Radiotelephone transmitter with modulation limiter.

Test procedure diagram

OCCUPIED BANDWIDTH MEASUREMENT



2.1051 Not Applicable, no antenna terminal allowed.

2.1053 UNWANTED_RADIATION:
95.635(b)(7)

REQUIREMENTS: Emissions must be attenuated by at least the following below the output of the transmitter.

$$43 + 10\log(TP) = 43 + 10\log(0.5) = 40.00\text{dB}$$

TEST DATA:

EMISSION FREQ. MHz	METER READING @ 3m dBuV	COAX LOSS dB	ACF dB	FIELD STRNGTH dBuV/m	ATT. dBuV/m	MARGIN dB	ANT.
462.60	100.90	1.60	18.44	120.94	0.00	0.00	V
925.20	49.50	2.90	24.10	76.50	44.44	4.44	V
1387.80	47.10	1.00	25.55	73.65	47.29	7.29	V
1850.40	36.80	1.01	27.40	65.21	55.73	15.73	V
2313.00	45.00	1.08	28.78	74.86	46.08	6.08	V
2775.60	28.80	1.15	29.94	59.89	61.05	21.05	V
3238.20	25.90	1.22	31.10	58.21	62.73	22.73	H
3700.80	39.10	1.29	32.25	72.64	48.30	8.30	V
4163.40	34.60	1.35	33.18	69.14	51.80	11.80	H
4626.00	29.00	1.42	33.70	64.13	56.81	16.81	V

MARGIN = (Field strength of Fund - 40dB) - FS OF EMISSION

METHOD OF MEASUREMENT: The procedure used was C63.4-1992 for intentional radiators. The spectrum was scanned from 30 to at least the tenth harmonic of the fundamental using a HP model 8566B spectrum analyzer, and an appropriate antenna - see the equipment list. Measurements were made at the open field test site of TIMCO ENGINEERING INC. located at 849 N.W. State Road 45, Newberry, FL 32669.

APPLICANT: COLUMBIA TELECOMMUNICATIONS GROUP, INC.
FCC ID: GAFFRS-CS14
REPORT #: T:\CUS\C\COLUMBIA\487ZH0\487zh0rpt.doc

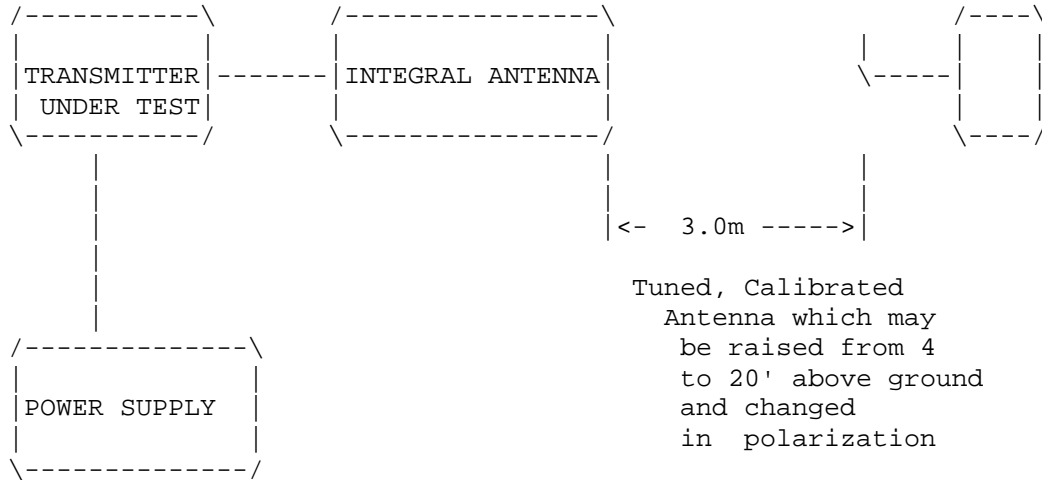
2.1053

UNWANTED_RADIATION:

95.631(b)(8)(9)

Method of Measuring Radiated Spurious Emissions

Hewlett Packard
Spectrum
Analyzer
HP8566B



Equipment placed 4' above ground
on a rotatable platform.

APPLICANT: COLUMBIA TELECOMMUNICATIONS GROUP, INC.
FCC ID: GAFFRS-CS14
REPORT #: T:\CUS\C\COLUMBIA\487ZH0\487zh0rpt.doc

2.1055

Frequency stability:

Temperature and voltage tests were performed to verify that the frequency remains within the 0.00025%, 2.5 ppm specification limit. The test was conducted as follows: The transmitter was placed in the temperature chamber at 25 degrees C and allowed to stabilize for one hour. The transmitter was keyed ON for one minute during which four frequency readings were recorded at 15 second intervals. The worse case number was taken for temperature plotting. The assigned channel frequency was considered to be the reference frequency. The temperature was then reduced to -30 degrees C after which the transmitter was again allowed to stabilize for one hour. The transmitter was keyed ON for one minute, and again frequency readings were noted at 15 second intervals. The worst case number was recorded for temperature plotting. This procedure was repeated in 10 degree increments up to + 50 degrees C.

Readings were also taken at plus and minus 15% of the battery voltage of 4.5 VDC.

MEASUREMENT DATA:

Assigned Frequency (Ref. Frequency): 462.687 500

<u>TEMPERATURE_C</u>	<u>FREQUENCY_MHz</u>	<u>PPM</u>
REFERENCE_____	462.662 500	00.00
-20_____	462.661 394	-2.39
-10_____	462.663 048	+1.19
0_____	462.663 623	+2.43
+10_____	462.663 592	+2.66
+20_____	462.663 139	+1.38
+30_____	462.662 471	-0.06
+40_____	462.662 537	+0.08
+50_____	462.662 311	-0.41
BATT. End-Point 5.1V/dc	462.662 414	-0.19
BATT. End-Point 6.9V/dc	462.662 341	-0.34

RESULTS OF MEASUREMENTS: The maximum frequency variation over the temperature range was -2.39 to +2.66ppm. The maximum frequency variation with voltage was -0.34 ppm.

REPORT #: T:\CUS\C\COLUMBIA\487ZH0\487zh0rpt.doc
PAGE #: 7

APPLICANT: COLUMBIA TELECOMMUNICATIONS GROUP, INC.

FCC ID: GAFFRS-CS14

TEST EQUIPMENT LIST

1. X Spectrum Analyzer: HP 8566B-Opt 462, S/N 3138A07786, w/
preselector HP 85685A, S/N 3221A01400, Quasi-Peak Adapter
HP 85650A, S/N 3303A01690 & Preamplifier HP 8449B-OPT H02,
S/N 3008A00372 Cal. 10/17/99
2. X Biconnical Antenna: Eaton Model 94455-1, S/N 1057
3. Biconnical Antenna: Electro-Metrics Model BIA-25, S/N 1171
4. X Log-Periodic Antenna: Electro-Metrics Model EM-6950, S/N 632
5. Log-Periodic Antenna: Electro-Metrics Model LPA-30, S/N 409
6. Double-Ridged Horn Antenna: Electro-Metrics Model RGA-180,
1-18 GHz, S/N 2319
7. 18-26.3GHz Systron Donner Standard Gain Horn #DBE-520-20
8. Horn 40-60GHz: ATM Part #19-443-6R
9. Line Impedance Stabilization Network: Electro-Metrics Model
ANS-25/2, S/N 2604 Cal. 2/9/00
10. Temperature Chamber: Tenney Engineering Model TTRC, S/N 11717-7
11. Frequency Counter: HP Model 5385A, S/N 3242A07460 Cal 10/6/99
12. Peak Power Meter: HP Model 8900C, S/N 2131A00545
13. X Open Area Test Site #1-3meters Cal. 12/22/99
14. Signal Generator: HP 8640B, S/N 2308A21464 Cal. 9/23/99
15. Signal Generator: HP 8614A, S/N 2015A07428
16. Passive Loop Antenna: EMCO Model 6512, 9KHz to 30MHz, S/N
9706-1211 Cal. 6/10/00
17. Dipole Antenna Kit: Electro-Metrics Model TDA-30/1-4, S/N 153
Cal. 11/24/99
18. AC Voltmeter: HP Model 400FL, S/N 2213A14499 Cal. 9/21/99
19. Digital Multimeter: Fluke Model 8012A, S/N 4810047 Cal 9/21/99
20. Digital Multimeter: Fluke Model 77, S/N 43850817 Cal 9/21/99
21. Oscilloscope: Tektronix Model 2230, S/N 300572 Cal 9/23/99

APPLICANT: COLUMBIA TELECOMMUNICATIONS GROUP, INC.
FCC ID: GAFFRS-CS14

REPORT #: T:\CUS\C\COLUMBIA\487ZH0\487zh0rpt.doc
PAGE #: 8