



**ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT  
INTENTIONAL RADIATOR CERTIFICATION TO  
FCC PART 15 SUBPART C REQUIREMENT**

OF

**FCC ID: CAR1002429**

**ALT72 ASSISTIVE LISTENING TRANSMITTER**

**MODEL NO: 2429**

**S/N: 8E24290010**

**REPORT NO: 98E7385**

**MAY 27, 1998**

Prepared for

**R.L. DRAKE COMPANY  
230 INDUSTRIAL DRIVE  
FRANKLIN, OH 45005**

Prepared by

**COMPLIANCE ENGINEERING SERVICES, INC.  
1366 BORDEAUX DRIVE  
SUNNYVALE, CA 94089**



**FCC, VCCI, CISPR, CE, AUSTEL, NZ  
UL, CSA, TUV, BCIQ, DHHS, NVLAP**

**1366 BORDEAUX DRIVE, SUNNYVALE, CA 94089-1005**

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## 1. VERIFICATION OF COMPLIANCE

COMPANY NAME : R.L. DRAKE COMPANY  
 230 INDUSTRIAL DRIVE  
 FRANKLIN, OHIO 45005

CONTACT PERSON : MR. NEIL LE SAINT / SENIOR ENGINEER

TELEPHONE NO : (513) 746-4556

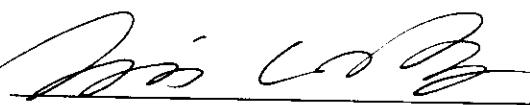
EUT DESCRIPTION : ALT72 ASSISTIVE LISTENING TRANSMITTER

MODEM NAME : 2429

DATE TESTED : MAY 27, 1998

LIMIT APPLY TO: FCC PART 15 SECTION 15.237	
TECHNICAL LIMITS	TEST RESULT
A band 200 KHz wide centered on the operating frequency	Confined
Field Strength within 200 KHz band @ 3 meter	Passed
Field Strength outside 200 KHz band @ 3 meter	Passed
LIMIT APPLY TO: FCC PART 15 SECTION 15.207	
AC Line Conducted Emission	Passed

The above equipment was tested by Compliance Engineering Services, Inc. for compliance with the requirements set forth in CFR 47 PART 15 SUBPART C. This said equipment in the configuration described in this report shows that maximum emission levels emanating from equipment are within the compliance requirements.

  
 MIKE C. I. KUO/ VICE PRESIDENT  
 COMPLIANCE ENGINEERING SERVICES, INC.

## 2. DESCRIPTION OF EQUIPMENT UNDER TEST (EUT)

CHASSIS TYPE	METAL
Central Frequency	72.1 - 72.9 MHz, 74.7 MHz, and 75.3 - 75.9 MHz
Frequency Generation	PLL Synthesis
Tuning Step Size	200 KHz
Modulation	FM, 180KF3E
power Source	AC adapter, Input:120VAC, Output:+12VDC
Antenna	1) 7" Flexible (Rubber Duckie) antenna 2) Magnetic-mount whip antenna w/reverse thread SMA connector (optional)
Associated Receiver	FCC ID:CAR1002110

EUT is a Wide-band FM listening System which operates in the 72 - 76 MHz Frequency band. Designed for hearing assistance in places of public access, the ALT72 is for those who need help overcoming background noise, reverberation, or distance from the sound source.

## 3. MARKETING USAGE PER FCC 15.3 REQUIREMENT

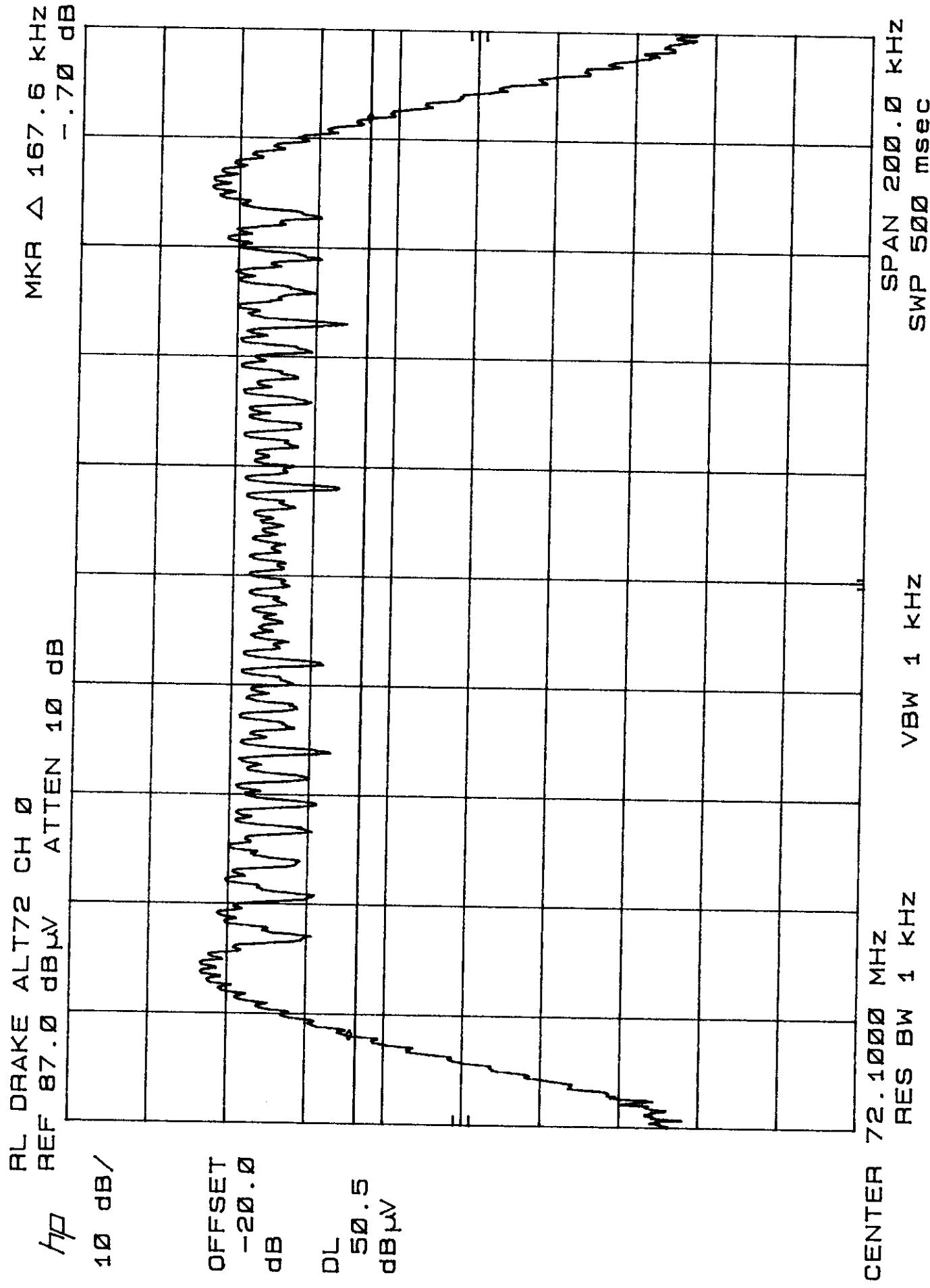
In reference to letter from Mr. Michael Brubaker, V.P. of R.L. Drake ,dated June 03,1997, addressed to Mr. George Tannahill in regarding to previous FCC certification application under FCC ID:CAR1002434. Statement made by R.L. Drake in reference to FCC 15.3 requirement as following "*This product will be marketed to public facilities who are now required to provide assisted listening to handicapped individuals with hearing impairments under the Americans with Disabilities Act (A.D.A.). This will be done , once the product receives your approval and may be offered for sale, through independent, professional sound systems contractors. These contractors are the same type of qualified technicians who supply public address, intercom, and similar systems to a variety of commercial customers....."*

## 4. TEST LOCATION

All emissions tests were performed at:

Compliance Consulting Services  
561F Monterey Road

PAGE NO: 2



MRK A 161.4 kHz  
.00 dB

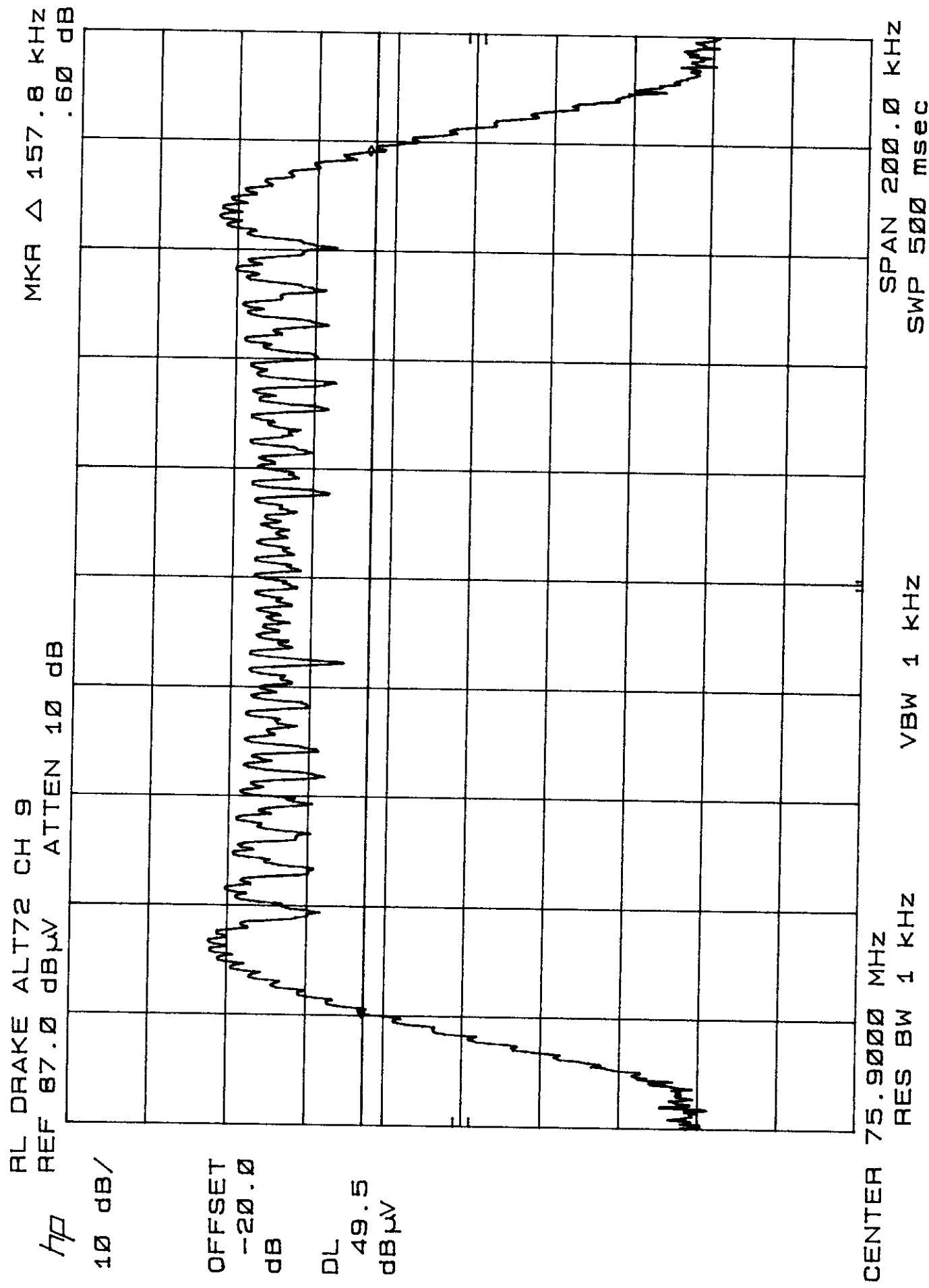
RL DRAKE ALT72 CH 5  
REF 87.0 dB  $\mu$ V ATTEN 10 dB

10 dB/  
hp

OFFSET  
-20.0 dB  
DL  
50.6 dB  $\mu$ V

CENTER 74.7000 MHz  
RES BW 1 kHz  
VBW 1 kHz

SPAN 200.0 kHz  
SWP 500 msec



Compliance Engineering Services Inc.

Project No. : 98E7385  
Report No. : 980527C1  
Date : 05/27/1998  
Time : 09:18  
Test Engr : PETE K

>> 3 M RADIATED EMISSION DATA <<

Company : RL DRAKE  
Equipment Under Test : ALT72 ASSISTIVE LISTENING TRANSMITTER  
Test Configuration : EUT ONLY/ EUT AND EXTERNAL ANTENNA  
Type of Test : FCC CLASS B  
Mode of Operation : TX

Freq.	dBuV	PreAmp	Ant	Cable	dBuV/m	Limit	Margin	Pol	Hgt(m)	Az
CH 0										
Biconical 1214 ; Pre-pamp = 8447D-P5 2944A06550:										
72.10 111.90 -27.86 5.37 1.11 90.51 98.00 -7.49 V 1.0 0										
144.20 60.70 -27.60 15.99 1.56 50.64 63.50 -12.86 V 1.0 0										
LP 9107-3163 ; Pre-pamp = 8447D-P5 2944A06550:										
216.30	42.50	-27.18	11.73	1.95	28.99	63.50	-34.51	V	1.0	0
288.40	39.10	-26.93	14.58	2.26	29.01	63.50	-34.49	V	1.0	0
360.50	41.90	-27.27	15.68	2.52	32.83	63.50	-30.67	V	1.0	0
432.60	34.90	-27.73	16.40	2.76	26.33	63.50	-37.17	V	1.0	0
504.70	41.60	-28.20	17.55	2.99	33.93	63.50	-29.57	V	1.0	0
576.80	43.10	-28.33	18.11	3.22	36.10	63.50	-27.40	V	1.0	0
648.90	35.10	-28.32	19.24	3.42	29.44	63.50	-34.06	V	1.0	0
721.00	35.50	-28.23	20.36	3.58	31.20	63.50	-32.30	V	1.0	0
CH 5										
Biconical 1214 ; Pre-pamp = 8447D-P5 2944A06550:										
74.70	105.70	-27.86	6.25	1.12	85.21	98.00	-12.79	V	1.0	0
149.40	54.80	-27.57	16.86	1.59	45.67	63.50	-17.83	V	1.0	0
LP 9107-3163 ; Pre-pamp = 8447D-P5 2944A06550:										
224.10	42.40	-27.14	11.77	1.98	29.01	63.50	-34.49	V	1.0	0
298.80	38.20	-26.91	15.31	2.30	28.90	63.50	-34.60	V	1.0	0
373.50	41.30	-27.35	15.74	2.57	32.26	63.50	-31.24	V	1.0	0
448.20	34.30	-27.84	16.66	2.81	25.93	63.50	-37.57	V	1.0	0
522.90	42.60	-28.23	17.69	3.05	35.10	63.50	-28.40	V	1.0	0
597.60	44.90	-28.37	18.27	3.29	38.10	63.50	-25.40	V	1.0	0
672.30	33.80	-28.29	19.69	3.47	28.68	63.50	-34.82	V	1.0	0
747.00	36.10	-28.20	20.53	3.62	32.04	63.50	-31.46	V	1.0	0
CH 9										
Biconical 1214 ; Pre-pamp = 8447D-P5 2944A06550:										
75.90	106.90	-27.87	6.66	1.13	86.82	98.00	-11.18	V	1.0	0
151.80	52.50	-27.56	17.05	1.60	43.59	63.50	-19.91	V	1.0	0
LP 9107-3163 ; Pre-pamp = 8447D-P5 2944A06550:										
227.70	42.50	-27.12	11.80	1.99	29.17	63.50	-34.33	V	1.0	0
303.60	36.10	-26.93	15.41	2.32	26.90	63.50	-36.60	V	1.0	0
379.50	44.30	-27.39	15.77	2.59	35.27	63.50	-28.23	V	1.0	0
455.40	33.90	-27.89	16.78	2.83	25.62	63.50	-37.88	V	1.0	0
531.30	44.10	-28.25	17.75	3.07	36.68	63.50	-26.82	V	1.0	0

607.20	41.70	-28.36	18.43	3.32	35.08	63.50	-28.42	V	1.0	0
683.10	38.40	-28.28	19.90	3.50	33.52	63.50	-29.98	V	1.0	0
759.00	39.50	-28.19	20.60	3.64	35.55	63.50	-27.95	V	1.0	0

#### EXTERNAL ANTENNA BELOW

CH 0

Biconical 1214 ; Pre-pamp = 8447D-P5 2944A06550:

72.10	118.30	-27.86	5.37	1.11	96.91	108.00	-11.09	V	1.0	0
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AVG

72.10	117.20	-27.86	5.37	1.11	95.81	98.00	-2.19	V	1.0	0
144.20	73.10	-27.60	15.99	1.56	63.04	83.50	-20.46	V	1.0	0

AVG

144.20	72.50	-27.60	15.99	1.56	62.44	63.50	-1.06	V	1.0	0
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LP 9107-3163 ; Pre-pamp = 8447D-P5 2944A06550:

216.30	43.70	-27.18	11.73	1.95	30.19	63.50	-33.31	V	1.0	0
288.40	40.40	-26.93	14.58	2.26	30.31	63.50	-33.19	V	1.0	0
360.50	45.40	-27.27	15.68	2.52	36.33	63.50	-27.17	V	1.0	0
432.60	36.40	-27.73	16.40	2.76	27.83	63.50	-35.67	V	1.0	0
504.70	39.20	-28.20	17.55	2.99	31.53	63.50	-31.97	V	1.0	0
576.80	45.70	-28.33	18.11	3.22	38.70	63.50	-24.80	V	1.0	0
648.90	34.70	-28.32	19.24	3.42	29.04	63.50	-34.46	V	1.0	0
721.00	36.30	-28.23	20.36	3.58	32.00	63.50	-31.50	V	1.0	0

Biconical 1214 ; Pre-pamp = 8447D-P5 2944A06550:

74.70	117.60	-27.86	6.25	1.12	97.11	108.00	-10.89	V	1.0	0
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AVG

74.70	116.50	-27.86	6.25	1.12	96.01	98.00	-1.99	V	1.0	0
149.40	72.50	-27.57	16.86	1.59	63.37	83.50	-20.13	V	1.0	0

AVG:

149.40	70.60	-27.57	16.86	1.59	61.48	63.50	-2.02	V	1.0	0
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LP 9107-3163 ; Pre-pamp = 8447D-P5 2944A06550:

224.10	53.90	-27.14	11.77	1.98	40.51	63.50	-22.99	V	1.0	0
298.80	38.30	-26.91	15.31	2.30	29.00	63.50	-34.50	V	1.0	0
373.50	44.20	-27.35	15.74	2.57	35.16	63.50	-28.34	V	1.0	0
448.20	37.90	-27.84	16.66	2.81	29.53	63.50	-33.97	V	1.0	0
522.90	40.10	-28.23	17.69	3.05	32.60	63.50	-30.90	V	1.0	0
597.60	45.20	-28.37	18.27	3.29	38.40	63.50	-25.10	V	1.0	0
672.30	34.00	-28.29	19.69	3.47	28.88	63.50	-34.62	V	1.0	0
747.00	38.30	-28.20	20.53	3.62	34.24	63.50	-29.26	V	1.0	0

CH 9

Biconical 1214 ; Pre-pamp = 8447D-P5 2944A06550:

75.90	118.00	-27.87	6.66	1.13	97.93	108.00	-10.07	V	1.0	0
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AVG

75.90	116.90	-27.87	6.66	1.13	96.83	98.00	-1.17	V	1.0	0
151.80	71.00	-27.56	17.05	1.60	62.09	83.50	-21.41	V	1.0	0

AVG

151.70	69.80	-27.56	17.05	1.60	60.89	63.50	-2.61	V	1.0	0
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LP 9107-3163 ; Pre-pamp = 8447D-P5 2944A06550:

227.70	48.50	-27.12	11.80	1.99	35.17	63.50	-28.33	V	1.0	0
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303.60	38.10	-26.93	15.41	2.32	28.90	63.50	-34.60	V	1.0	0
379.50	45.70	-27.39	15.77	2.59	36.67	63.50	-26.83	V	1.0	0
455.40	35.50	-27.89	16.78	2.83	27.22	63.50	-36.28	V	1.0	0
531.30	43.20	-28.25	17.75	3.07	35.78	63.50	-27.72	V	1.0	0
607.20	43.50	-28.36	18.43	3.32	36.88	63.50	-26.62	V	1.0	0
683.10	40.30	-28.28	19.90	3.50	35.42	63.50	-28.08	V	1.0	0
759.00	41.60	-28.19	20.60	3.64	37.65	63.50	-25.85	V	1.0	0

Total # of data 66

V. c2.2

**Test Procedure**

The EUT operates on DC power only. The DC is supplied by a AC to DC converter.

1. The EUT was placed on a wooden table 40 cm from a vertical ground plane and approximately 80 cm above the horizontal ground plane on the floor
2. Line conducted data was recorded for both NEUTRAL and HOT lines.

**Test Results**

Refer to attached graph.

COMPLIANCE ENGINEERING SERVICES INC.  
RFI VOLTAGE

27. May 98 18:19

EUT: ALT72 ASSISTIVE LISTENING TRANSMITTER  
Manuf: R L DRAKE CO  
Op Cond: TX  
Operator: PETE KREBILL  
Test Spec: FCC B  
Comment: LINE: HOT (RED), NEUTRAL (BLUE)  
120VAC 60HZ

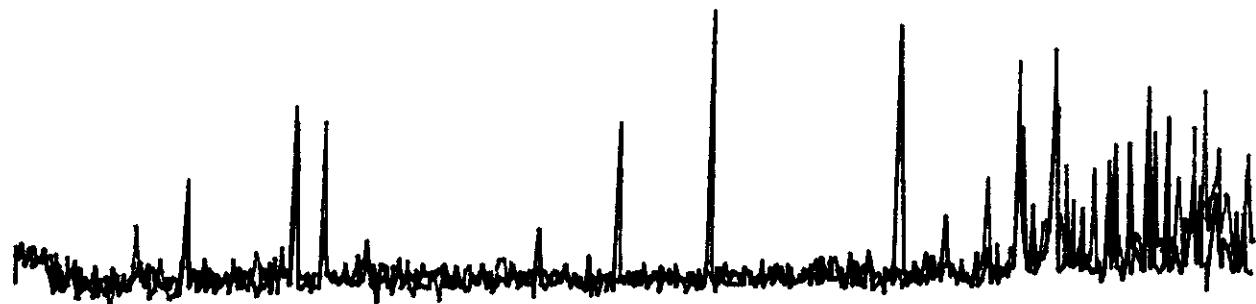
Scan Settings (2 Ranges)

Frequencies				Receiver Settings					
Start	Stop	Step	IF BN	Detector	M-Time	Atten	Preamp	OpRge	
450k	500k	500Hz	10k	PK	100ms	AUTO	LN OFF	80dB	
500k	30M	5k	10k	PK	20ms	AUTO	LN OFF	80dB	

Final Measurement: x GP

	Transducer No.	Start	Stop	Name
Meas Time:	1	8k	30M	FISCHER
Subranges:	25			
Acc Margin:	6dB			

FCC\_B



ALT72 Assistive Listening Transmitter  
THEORY OF OPERATION

May, 1998

Audio is fed into either high impedance input (J1 or J2) and passes through a low pass filter into the front panel level control, R10. From R10 the filtered audio is applied to a fixed gain amplifier stage (U6) and to a variable gain controlled amplifier (also within U6). The variable gain stage is controlled by a gain cell in U5. The setting of the front panel LIMITING/COMPRESSION switch, SW2, determines from which stage the audio is taken. If the limiter is bypassed, the fixed gain stage is selected. If the limiter is activated, the variable gain stage is selected. Following the selected routing through SW2, the audio is applied to stage U4 for a 75 uSec pre-emphasis and buffering prior to full wave rectification by U3 and accompanying diode bridge, CR2, CR3. Increasing levels of the resultant DC voltage from the rectifier triggers the gain cell in U5 to reduce the gain of the variable gain stage prior to the pre-emphasis stage. The gain is reduced for audio levels that attempt to exceed 1 Vp-p at the output of the pre-emphasis stage. With switch SW2 in the Compression + Limiting position, the compressor within the gain cell of U5 will also increase the gain of the variable gain stage during low level audio passages. In this compression + limiting mode, the gain cell in U5 has total control of the variable gain stage, being able to increase its gain to perform compression, or decrease its gain to perform limiting. The amplifier stage composed of U2 turns LED CR4 on whenever the limiter is triggered. The output of the pre-emphasis stage, U4, also supplies audio through the deviation control, R39, to another section of U4 which forms a summing junction for the audio and the tuning line of the 72-76 MHz VCO, thus modulating the VCO within a phase locked loop. The bandwidth of the phase locked loop is sufficiently low to prevent the loop from counteracting the applied audio. The loop is phase locked to a 7.2 MHz crystal reference oscillator. The Q4 stage amplifies the 72 - 76 MHz signal prior to applying it to the PLL divider. The modulated 72 - 76 MHz signal is amplified by stages composed of Q6 and Q7, lowpass filtered, and sent to the antenna.