

# Memorandum



To: FCC Equipment Authorization  
From: Johnson Data Telemetry  
Subject: Equipment Authorization Change

The supplied data is for a request for a Certificated Equipment Change according to Section 2.1043 of the Pike & Fischer Inc., CD ROM revision 9/28/98.

FCC Identifier of Certificated Equipment: NP42422430-001  
Granted: February 10, 1998

Description of changes: Adding a 16K0F3E to the Grant of Equipment Authorization to be used in a 25 KHz channel. (Authorized BW= 20 KHz).

Power Out: 1-5 Watts continuously variable

Frequency Range: 132-174 MHz

Rule Parts: 90.210

If further information is necessary please contact Mark Christensen at (507)835-6249.

Sincerely,

Allen Frederick

NAME OF TEST: Percentage Modulation Versus Input Voltage  
(25 kHz channel)

RULE PART NUMBER: 2.1047 (b)

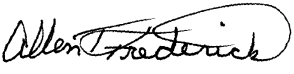
MINIMUM STANDARD: Shall not exceed 5.0 kHz deviation from 300 Hz to 3000 Hz

TEST RESULTS: Conforms to minimum standards

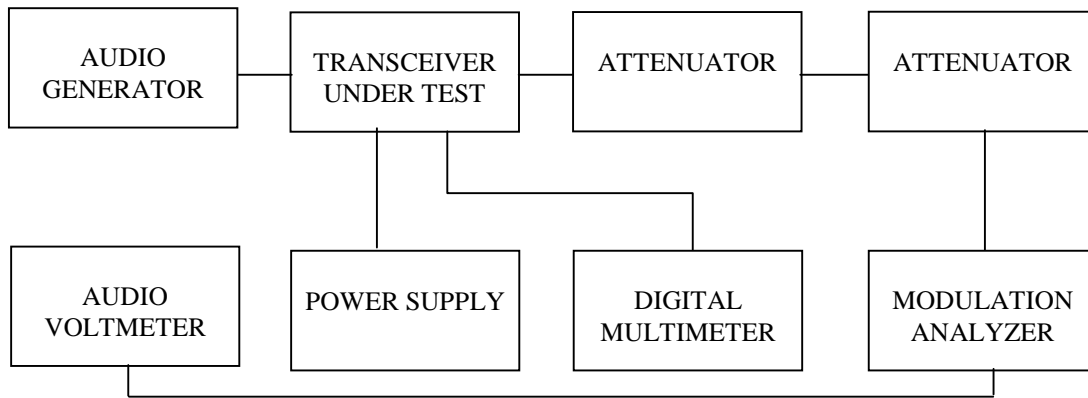
TEST CONDITIONS: Standard Test Conditions, 25 C

TEST PROCEDURE: TIA/EIA - 603, 2.2.3

TEST EQUIPMENT: Attenuator, BIRD Model / 9715 / 50-A-MFN-06 / 6 dB / 50 Watt  
Attenuator, BIRD Model / 9716 / 25-A-MFN-20 / 20 dB / 25 Watt  
DC Power Source, Model HP6284A  
Modulation Analyzer, Model HP8901A  
Power Supply, Model HP-6284A  
Audio Generator, Model HP8903A  
Audio Voltmeter, Model HP8903A

PERFORMED BY:  DATE: 11/3/98  
Allen Frederick

TEST SET-UP:



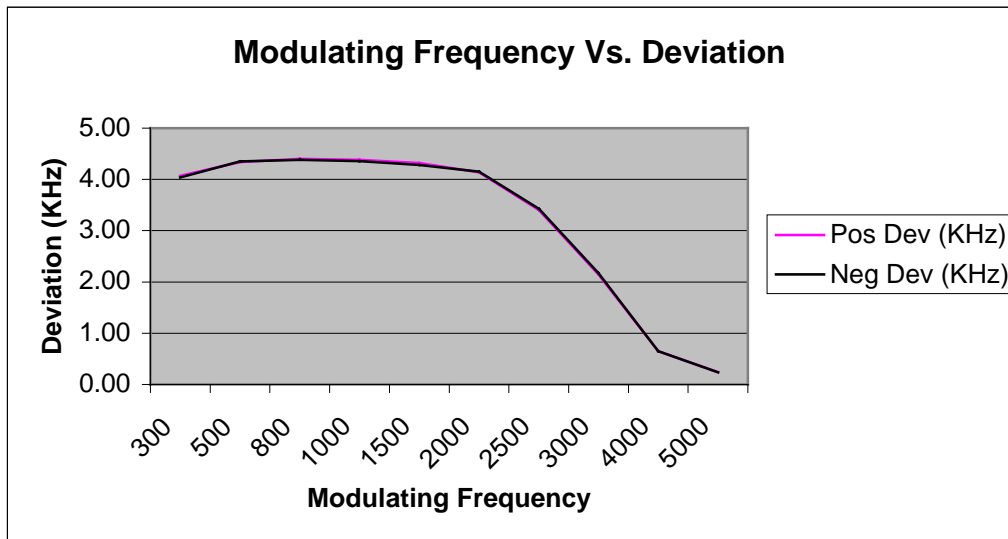
(Test data on next page)

NAME OF TEST:

Percentage Modulation Versus Input Voltage  
(25 kHz channel, Continued) For 16K0F3E

DEVIATION LIMITING WITH INPUT VOLTAGE  
20 dB ABOVE 60% RATED DEVIATION AT 1000 Hz

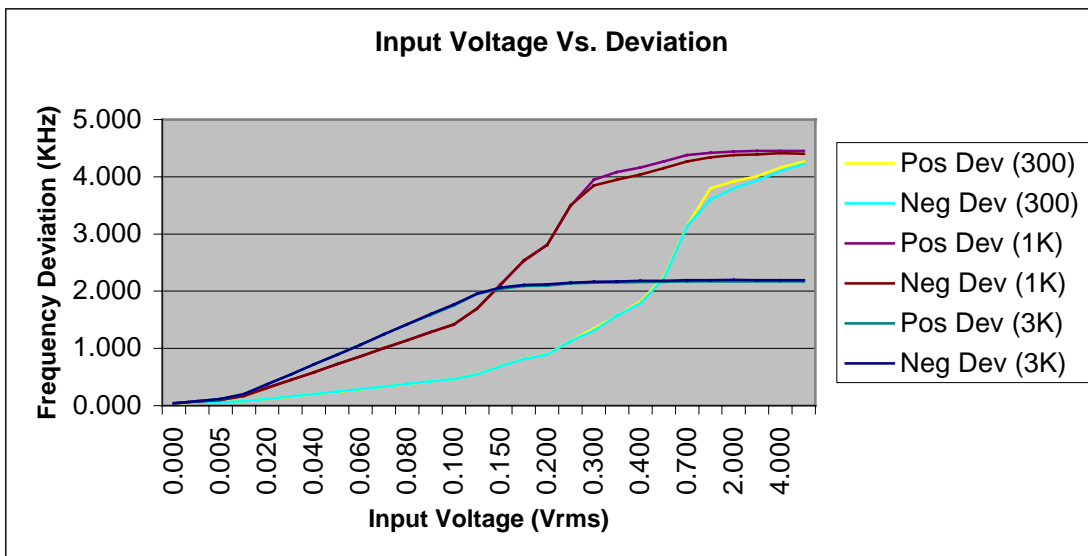
Freq	Pos Dev (KHz)	Neg Dev (KHz)
300	4.07	4.04
500	4.34	4.35
800	4.40	4.38
1000	4.38	4.36
1500	4.32	4.28
2000	4.14	4.15
2500	3.40	3.43
3000	2.15	2.18
4000	0.65	0.65
5000	0.24	0.24



NAME OF TEST:

Percentage Modulation Versus Input Voltage  
(25 kHz channel, Continued) For 16K0F3E

Modulating Voltage (Vrms)	Modulating Freq 300 Hz		Modulating Freq 1000 Hz		Modulating Freq 3000 Hz	
	Pos Dev (300) (KHz)	Neg Dev (300) (KHz)	Pos Dev (1K) (KHz)	Neg Dev (1K) (KHz)	Pos Dev (3K) (KHz)	Neg Dev (3K) (KHz)
0.000	0.038	0.050	0.037	0.042	0.037	0.038
0.003	0.049	0.050	0.073	0.072	0.078	0.080
0.005	0.054	0.055	0.102	0.099	0.114	0.120
0.010	0.076	0.079	0.171	0.166	0.202	0.201
0.020	0.118	0.119	0.319	0.307	0.374	0.376
0.030	0.156	0.161	0.445	0.446	0.545	0.545
0.040	0.202	0.202	0.582	0.583	0.720	0.722
0.050	0.238	0.245	0.729	0.727	0.894	0.890
0.060	0.284	0.290	0.860	0.863	1.070	1.060
0.070	0.332	0.332	0.999	1.004	1.242	1.250
0.080	0.375	0.380	1.140	1.143	1.420	1.420
0.090	0.426	0.423	1.284	1.280	1.585	1.600
0.100	0.465	0.464	1.414	1.420	1.752	1.770
0.120	0.552	0.550	1.700	1.697	1.950	1.960
0.150	0.690	0.689	2.120	2.110	2.040	2.064
0.180	0.823	0.819	2.530	2.537	2.089	2.110
0.200	0.900	0.894	2.810	2.811	2.100	2.120
0.250	1.134	1.130	3.490	3.500	2.135	2.150
0.300	1.348	1.315	3.950	3.850	2.149	2.167
0.350	1.570	1.570	4.080	3.950	2.152	2.170
0.400	1.820	1.790	4.160	4.040	2.160	2.180
0.500	2.250	2.220	4.270	4.150	2.167	2.180
0.700	3.150	3.140	4.380	4.270	2.170	2.190
1.000	3.800	3.600	4.420	4.340	2.170	2.190
2.000	3.920	3.800	4.440	4.380	2.170	2.200
3.000	4.010	3.940	4.450	4.390	2.170	2.190
4.000	4.160	4.100	4.450	4.410	2.170	2.190
5.000	4.270	4.220	4.450	4.400	2.170	2.190



NAME OF TEST: Transmitter Occupied Bandwidth  
In Support of Emission Designator **16K0F3E**

RULE PART NUMBER: 2.201, 2.202, 2.1049 (c)(1), 90.209 (b)(5), 90.210 (b)

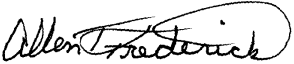
MINIMUM STANDARD: Mask B  
Sidebands and Spurious [Rule 90.210 (b), P = 4 Watts]  
Authorized Bandwidth = 20 kHz [Rule 90.209(b) (5)]  
From Fo to 50% of Authorized BW Removed from Fo, down 0 dB.  
From 50% to 100% removed, at least 25 dB.  
From 100% to 250% removed, at least 35 dB.  
Greater than 250% remove, at least  $43 + 10\log_{10}(P)$  dB.

Fo to 10 kHz Attenuation = 0 dB  
10 kHz to 20 kHz, Attenuation = 25 dB minimum  
20 kHz to 50 kHz, Attenuation = 35 dB minimum  
> 50 kHz, Attenuation = 49 dB minimum (4 watts)  
> 50 kHz, Attenuation = 43 dB minimum (1 watt)

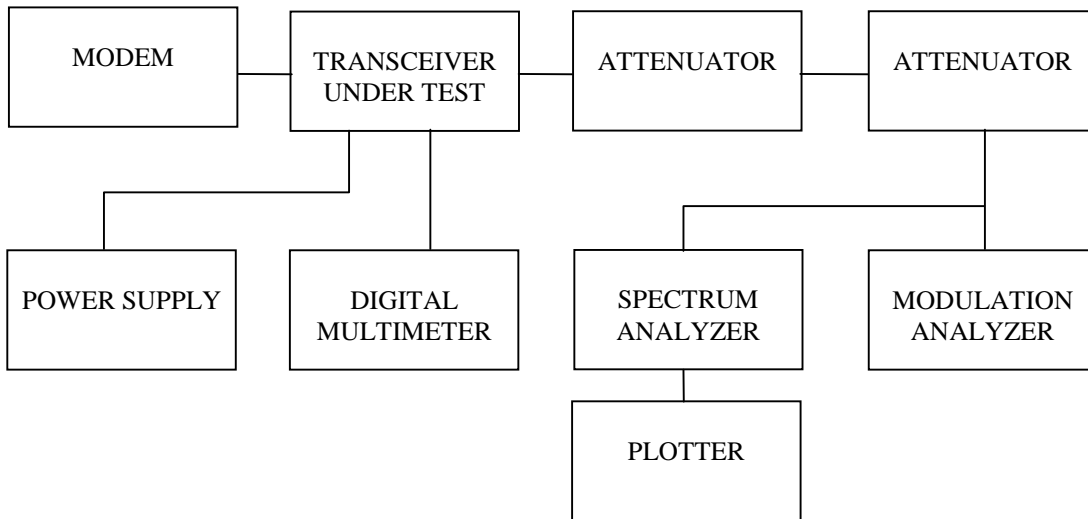
TEST RESULTS: Meets minimum standard (see data on the following pages)

TEST CONDITIONS: Standard Test Conditions, 25 C

TEST EQUIPMENT: Attenuator, BIRD Model / 9715 / 50-A-MFN-06 / 6 dB / 50 Watt  
Attenuator, BIRD Model / 9716 / 25-A-MFN-20 / 20 dB / 25 Watt  
Digital Voltmeter, Fluke Model 8012A  
DC Power Source, Model HP6284A  
Modulation Analyzer, Model HP8901A  
Spectrum Analyzer, Model HP8563

PERFORMED BY:  DATE: 11/3/98  
Allen Frederick

TEST SET-UP:



NAME OF TEST: Transmitter Occupied Bandwidth (continued)  
In Support of Emission Designator **16K0F3E**

MODULATION SOURCE DESCRIPTION:

HP-8903A was used to provide modulation at 2.5 KHz. The audio signal was applied to the audio input of the Transceiver.

NECESSARY BANDWIDTH (B<sub>n</sub>) CALCULATION

$$B_n = 2M + 2DK$$

M= 2500 Hz. This is the highest modulating frequency widely recognized by the industry for voice.

D = 5000 Hz. This is the maximum deviation.

$$K = 1.0$$

$$B_n = 2(2500) + 2(5000)(1.0) = 16,000 \text{ Hz.}$$

The corresponding emission designator prefix for necessary bandwidth = **16K0**.

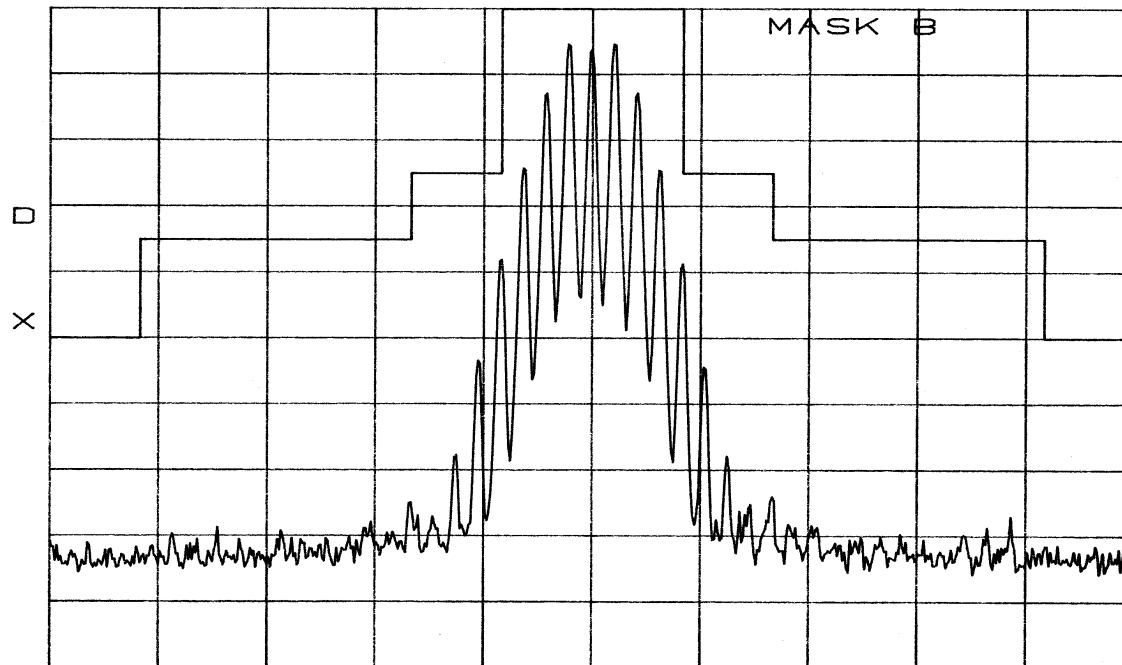
TEST DATA: Refer to the following graphs:

GRAPH: 16K0F3E  
SPECTRUM FOR EMISSION 16K0F3E  
OUTPUT POWER: 1 WATT  
FM = 2.5 KHz Tone  
PEAK DEVIATION < 5.0 KHz

\*ATTEN 20dB

RL -7.4dBm

10dB/



MASK B

D

X

CENTER 150.0000MHz

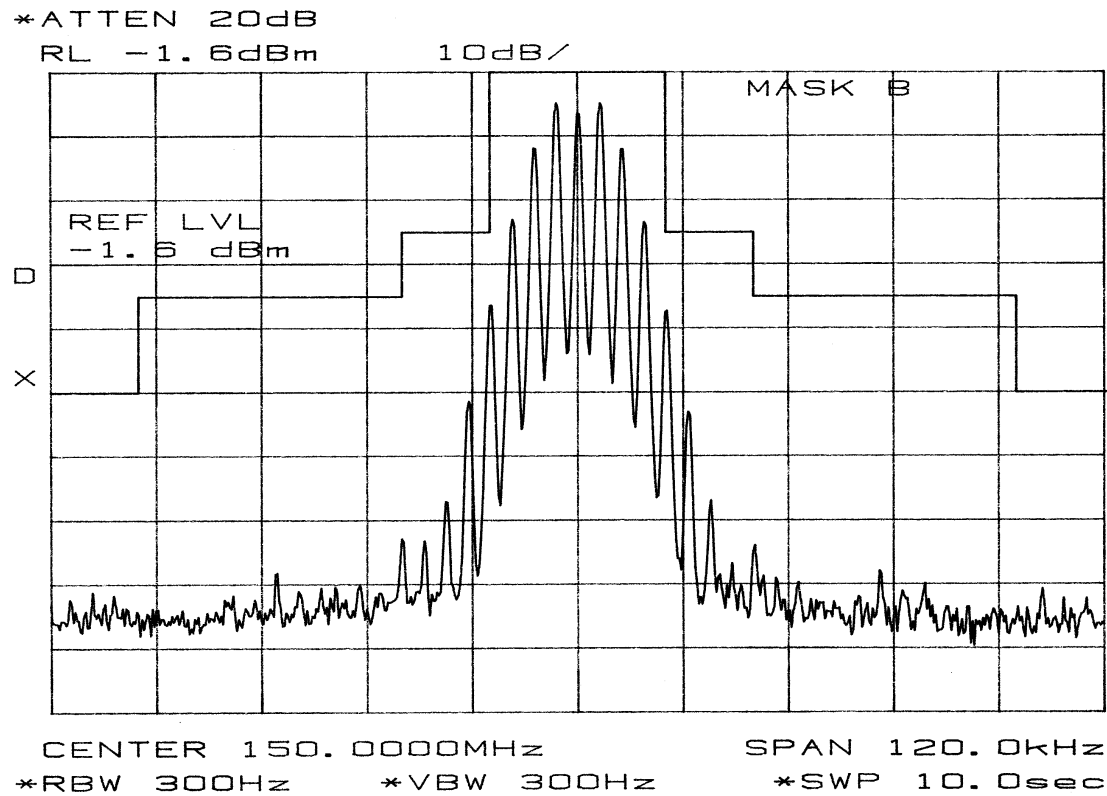
SPAN 120.0kHz

\*RBW 300Hz

\*VBW 300Hz

\*SWP 10.0sec

GRAPH: 16K0F3E  
SPECTRUM FOR EMISSION 16K0F3E  
OUTPUT POWER: 5 WATT  
FM = 2.5 KHz Tone  
PEAK DEVIATION < 5.0 KHz





NAME OF TEST: Transient Frequency Behavior

RULE PART NUMBER: 90.214

TEST CONDITIONS: The transient test was performed with the transmitter transmitting just a carrier tone. Also supplied is a transient test which was conducted with the transmitter modulated with a 1KHz tone at 3 KHz deviation .

MINIMUM STANDARD: **25 kHz channel** (used worst case numbers from 132 to 174 MHz)

TIME INTERVAL	MAX FREQ DIFFERENCE (kHz)	MAX FREQ DIFFERENCE (kHz)	TIME (ms)
	12.5KHz CH	25 kHz CH	
T1	+/- 12.5	+/- 25	10
T2	+/- 6.25	+/- 12.5	25
T3	+/- 12.5	+/- 25	10

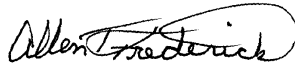
TEST RESULTS: Meets minimum standards, see data on following pages

TEST CONDITIONS: RF Power Level = 5 Watts, 1 Watt  
Standard Test Conditions, 25 C

TEST PROCEDURE: TIA/EIA - 603, 2.2.19

TEST EQUIPMENT: Attenuator, BIRD Model / 9716 / 25-A-MFN-20 / 20 dB / 25 Watt  
Digital Voltmeter, Fluke Model 8012A  
DC Power Source, Model HP6284A  
Modulation Analyzer, Model HP8901A  
RF Detector (Spectrum Analyzer), Model HP8563E  
Plotter, Model HP2671G  
Reference Generator, Fluke Model 6071A  
Power Meter, Model HP436A  
Power Combiner, Model MCL ZFSC-4-1  
Oscilloscope, Model HP54503A  
Directional Coupler, Model HP778D

PERFORMED BY:



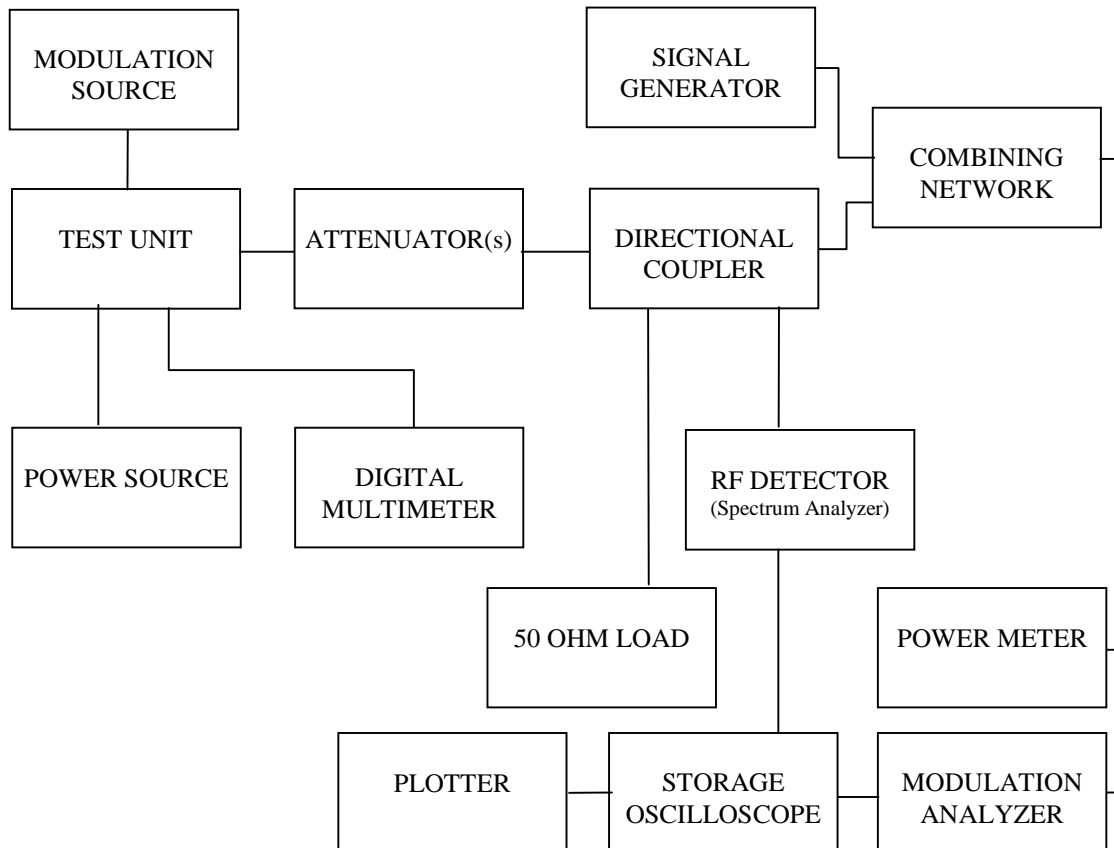
Allen Frederick

Date: 11/06/98

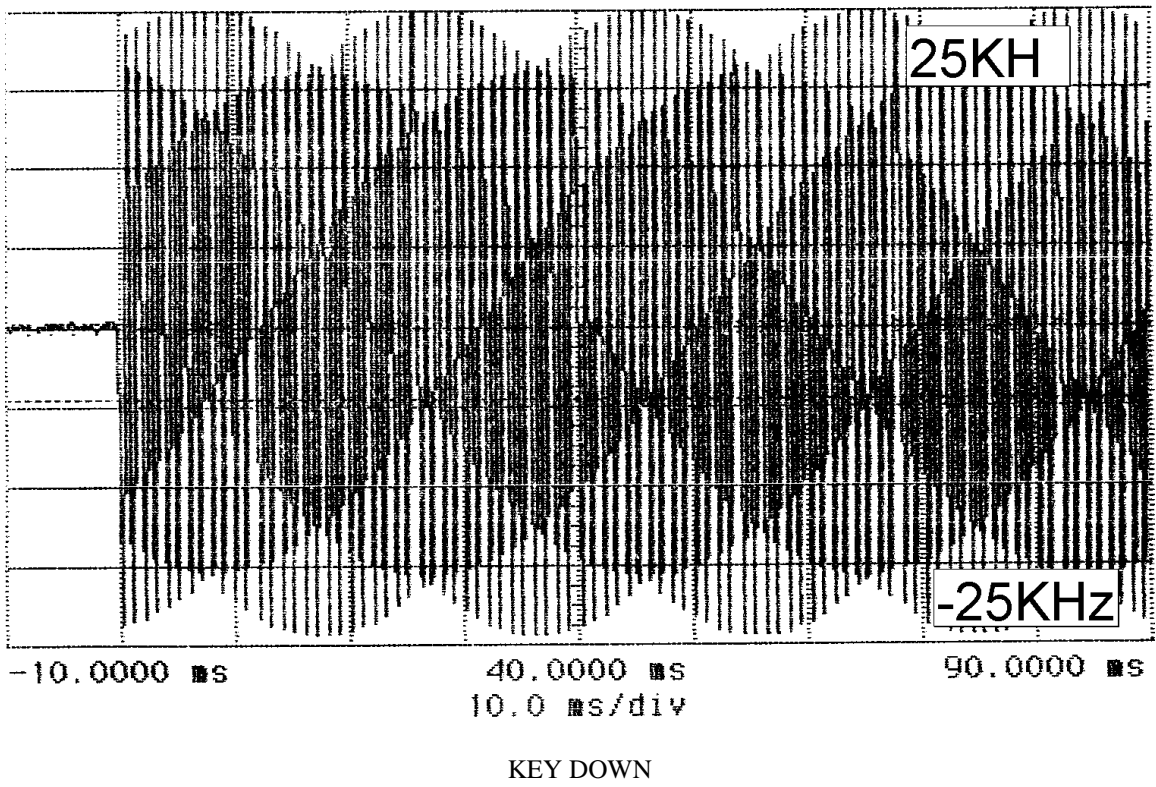
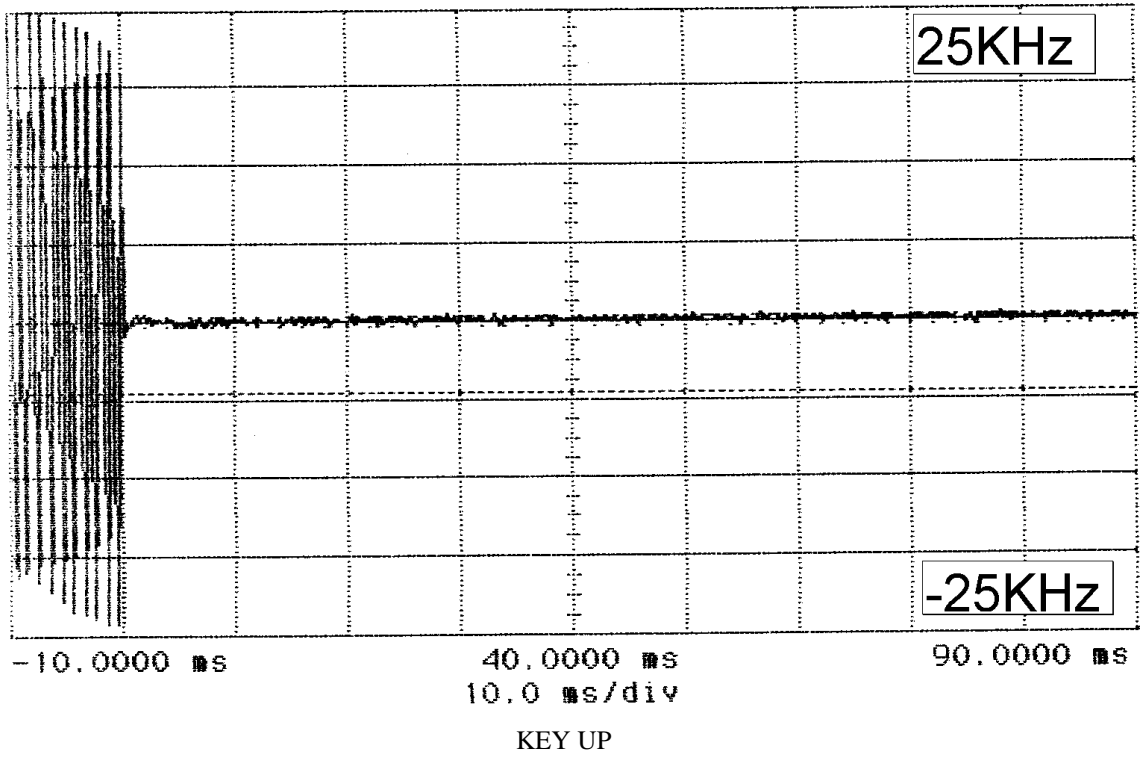
NAME OF TEST:

Transient Frequency Behavior (Continued)

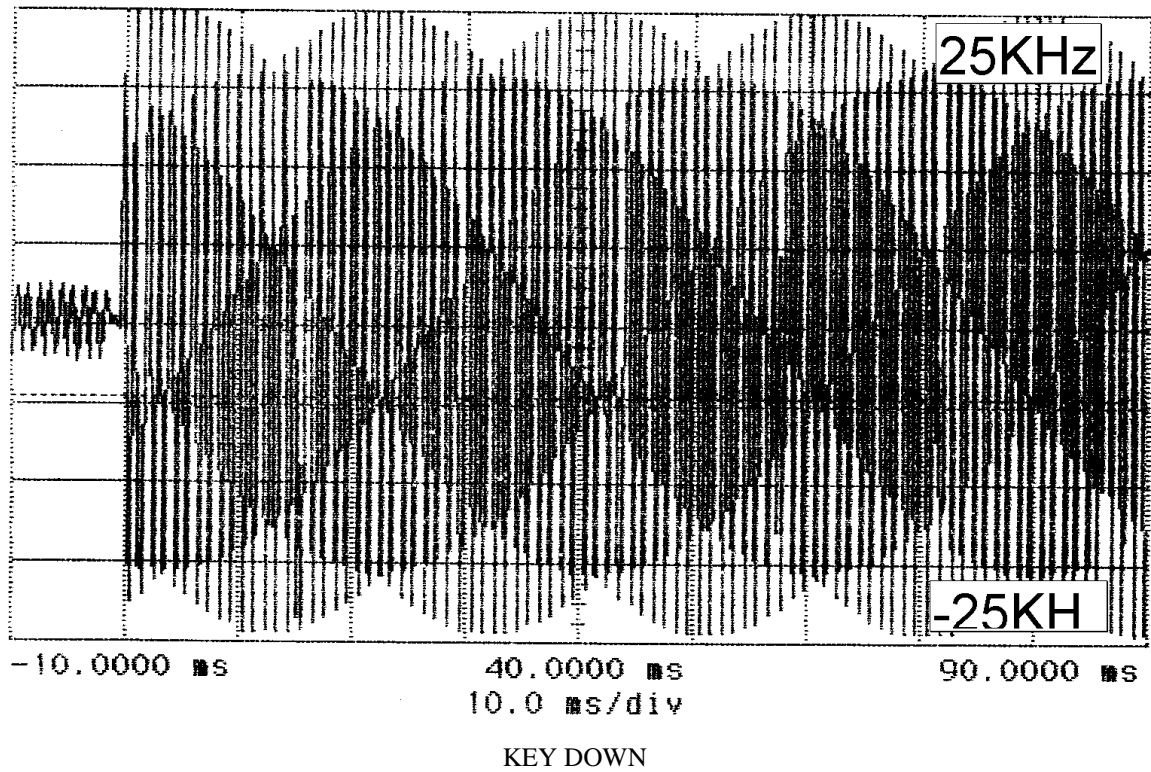
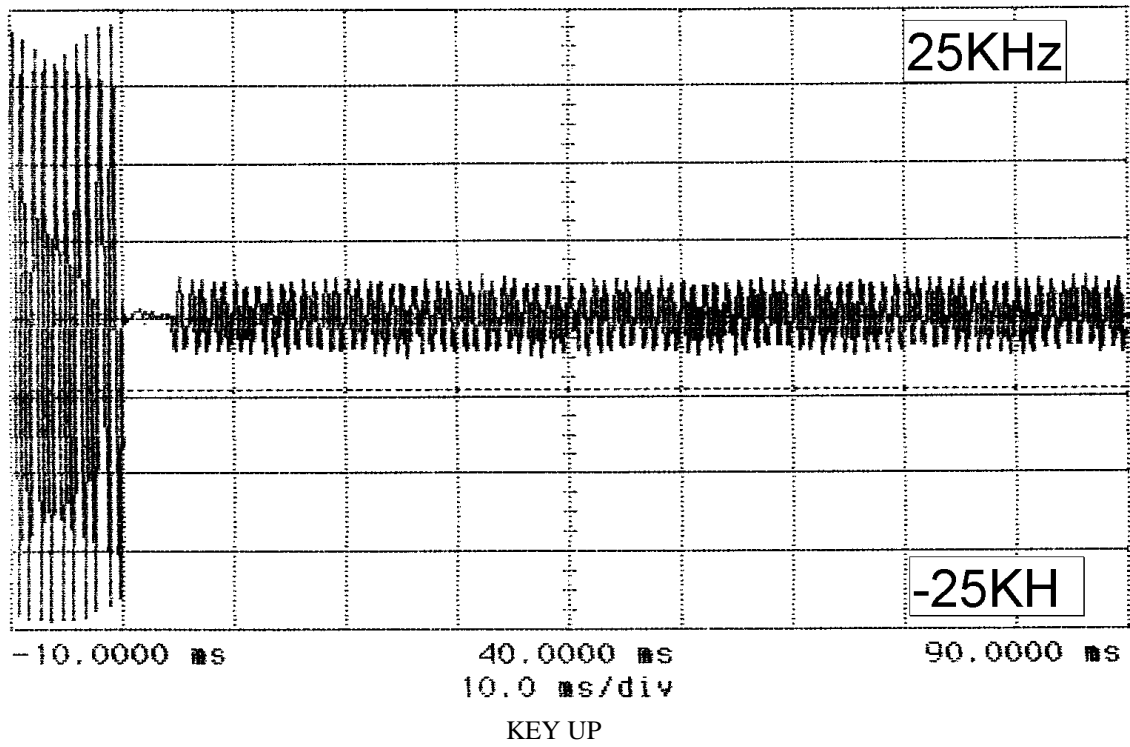
TEST SET-UP:



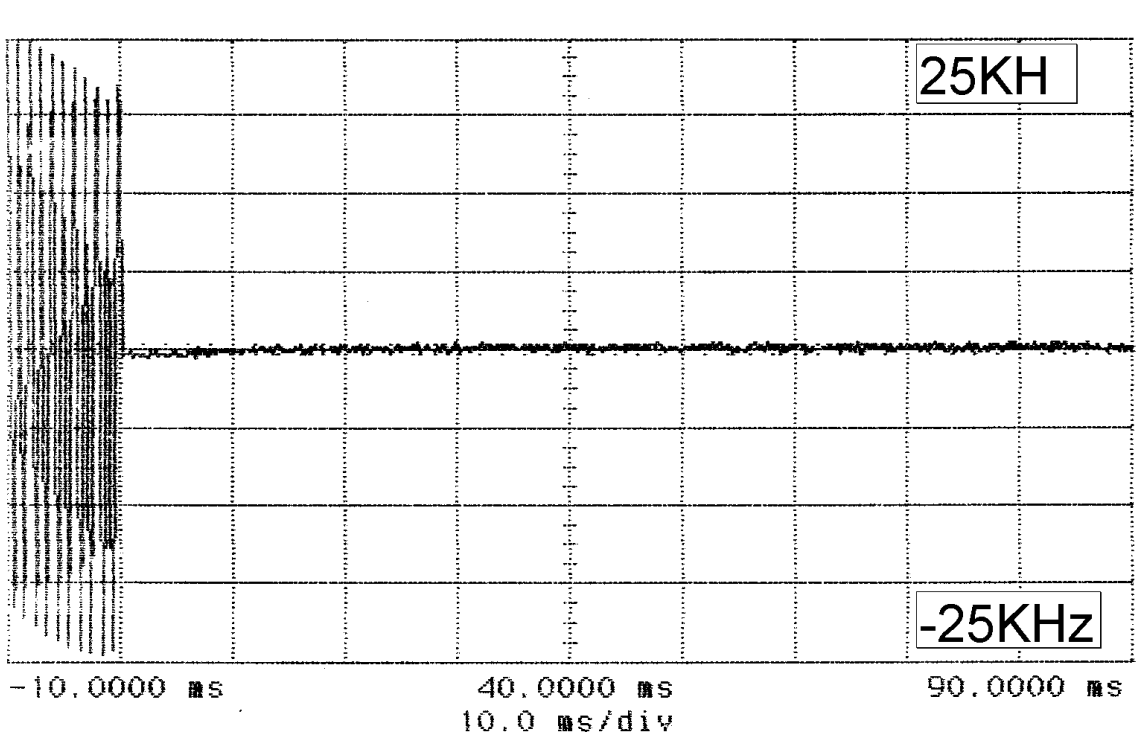
TRANSIENT FREQUENCY RESPONSE  
5 Watts, Unmodulated Carrier



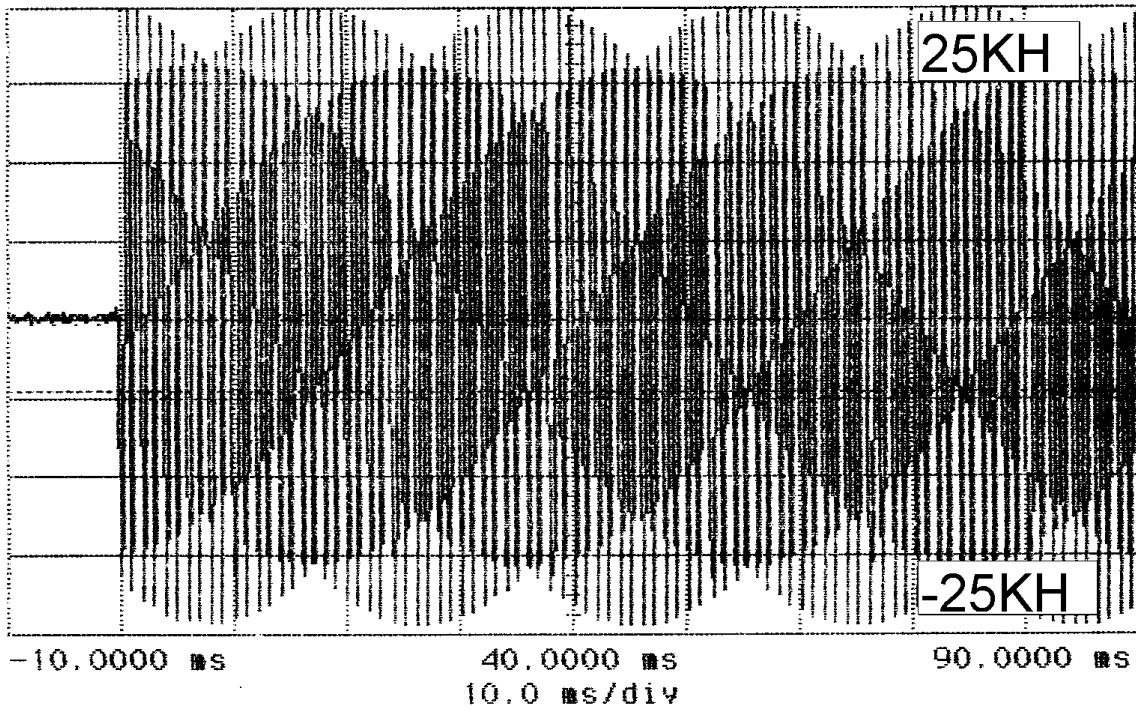
TRANSIENT FREQUENCY RESPONSE  
5 Watts, 3 KHz Deviation, 1KHz Tone



TRANSIENT FREQUENCY BEHAVIOR  
1 Watt, Unmodulated Carrier

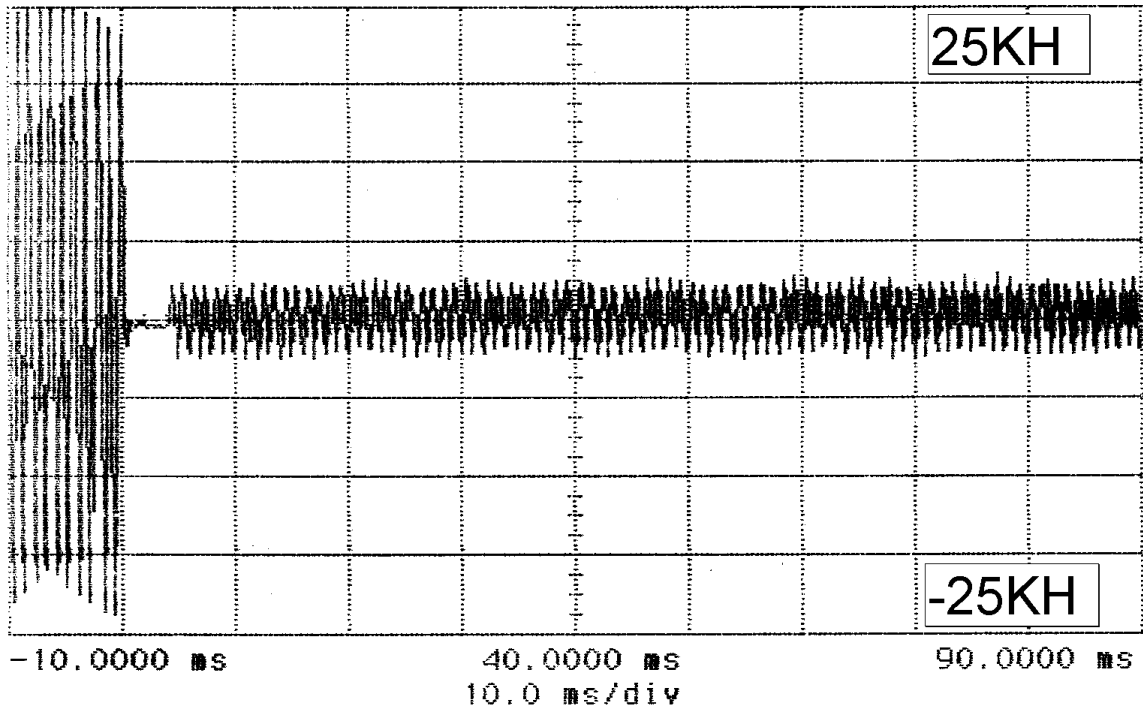


KEY UP

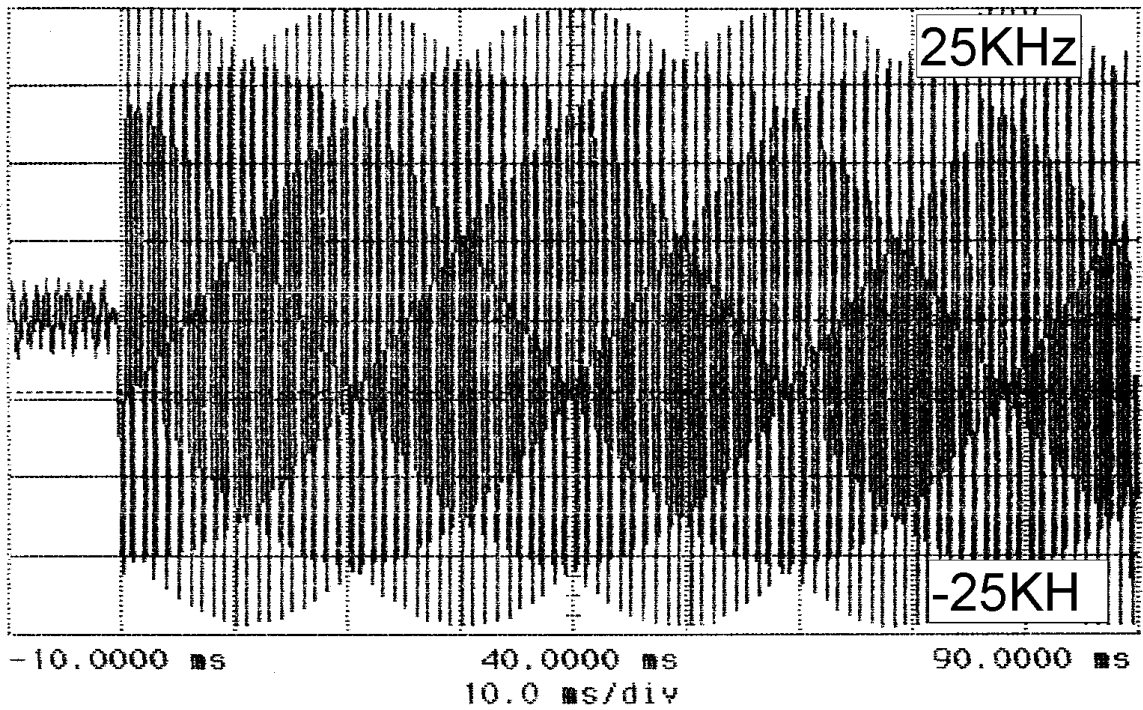


KEY DOWN

TRANSIENT FREQUENCY RESPONSE  
1 Watts, 3 KHz Deviation, 1KHz Tone



KEY UP



KEY DOWN