

APPENDIX 7

CIRCUITS AND DEVICES TO STABILIZE FREQUENCY

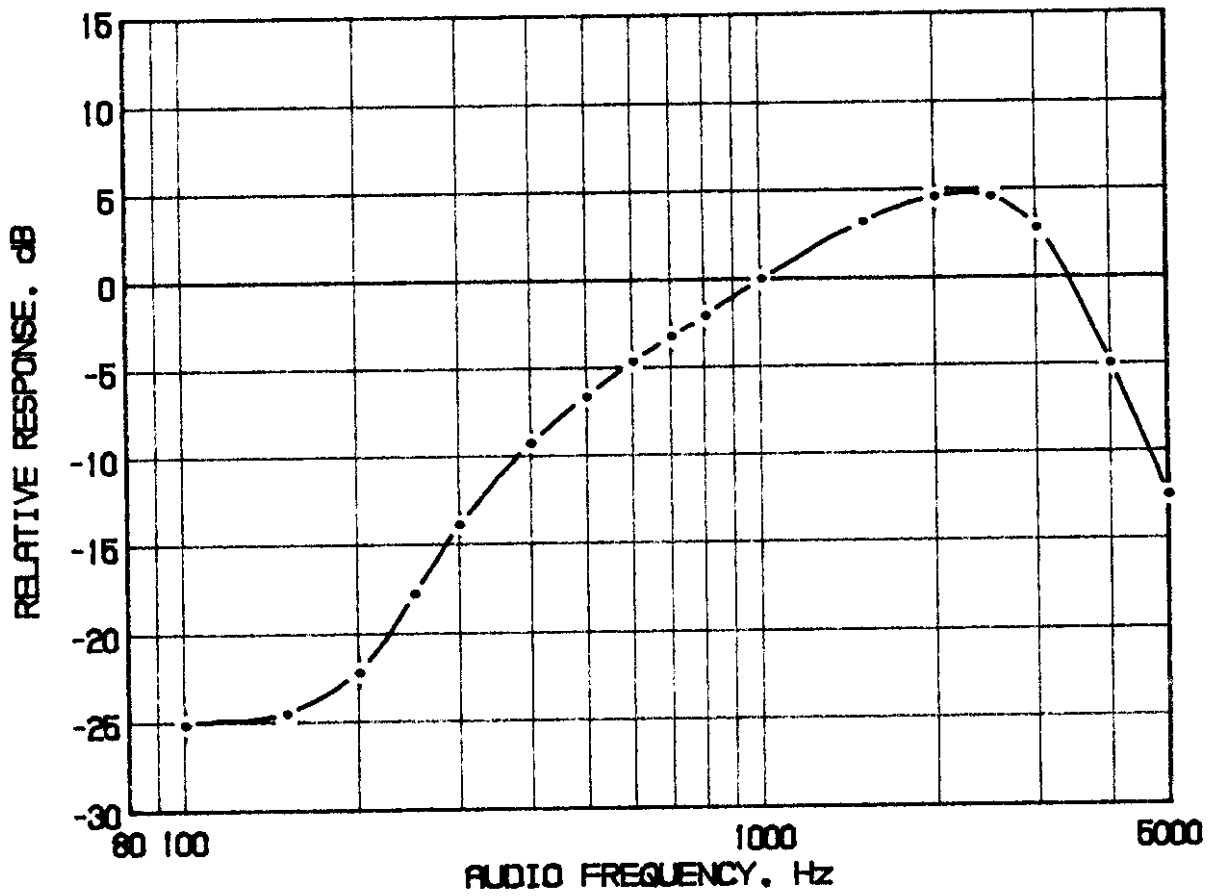
SYNTHESIZER

A phase locked loop (PLL) circuit establishes and stabilizes operating frequency.

The data for producing necessary frequencies is established by the CPU on the digital board.

The frequency stability of the Tx/Rx is maintained by the TCXO, which generates a stable frequency of 12.8 MHz.

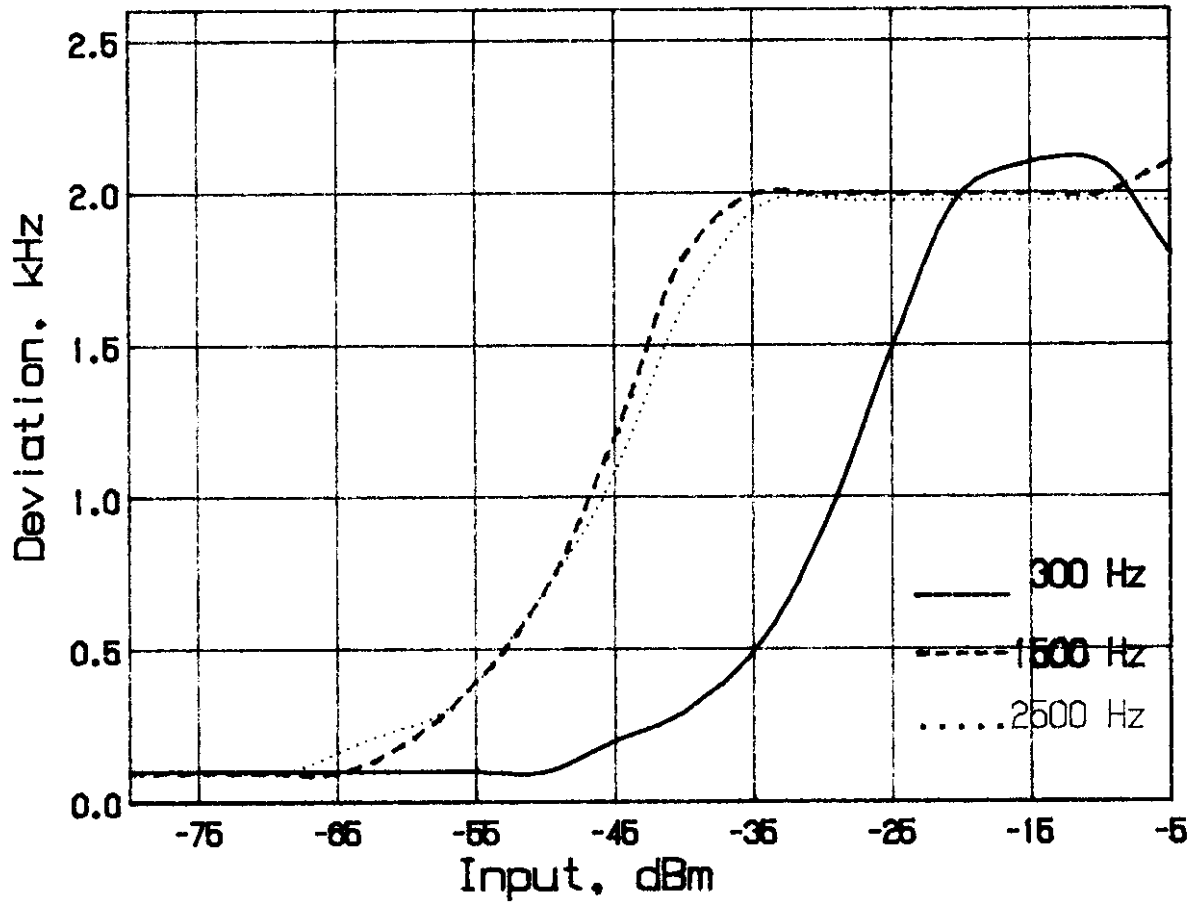
FIGURE 1
MODULATION FREQUENCY RESPONSE



MODULATION FREQUENCY RESPONSE
FCC ID: OKMCONNECT3

FIGURE 1

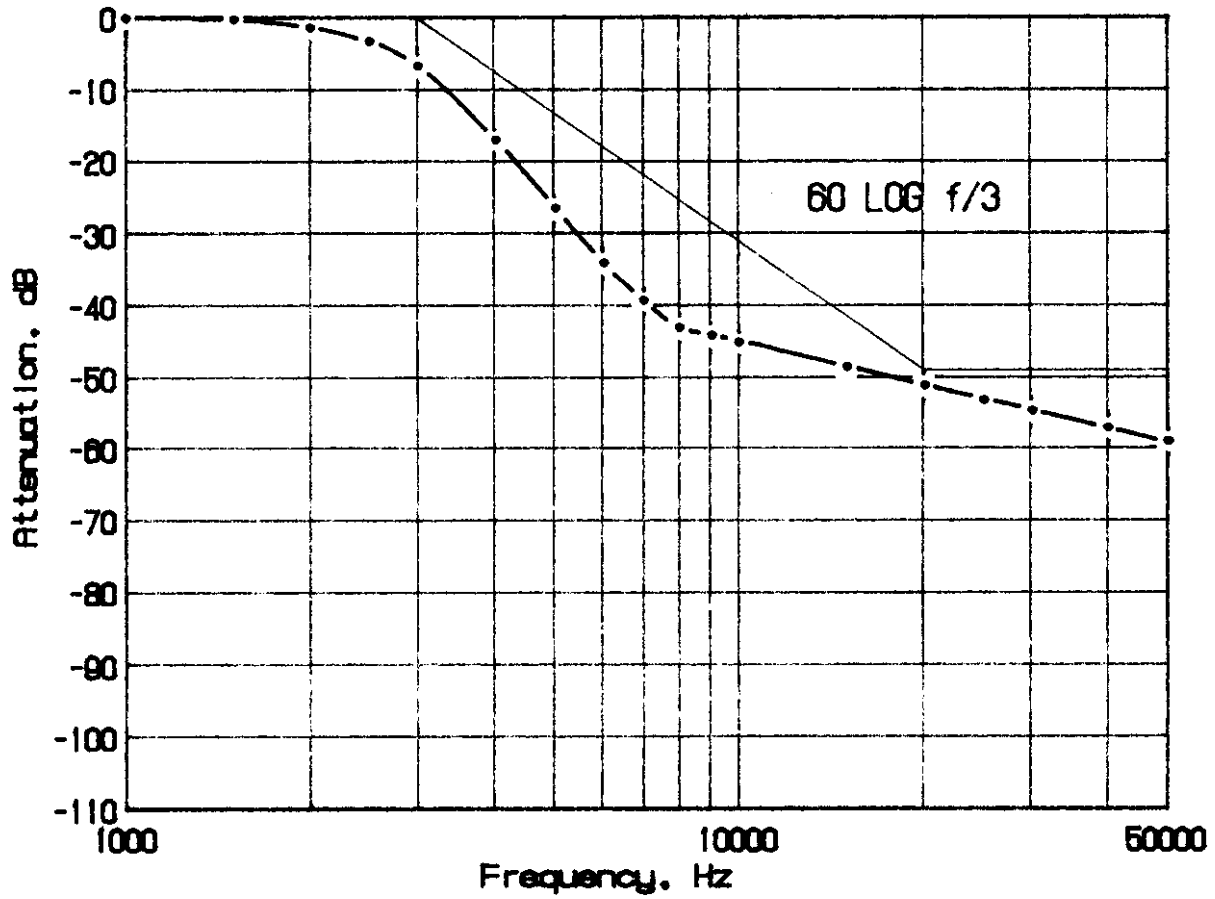
FIGURE 2
AUDIO LIMITER CHARACTERISTICS



AUDIO LIMITER CHARACTERISTICS
FCC ID: OKMCONNECT3

FIGURE 2

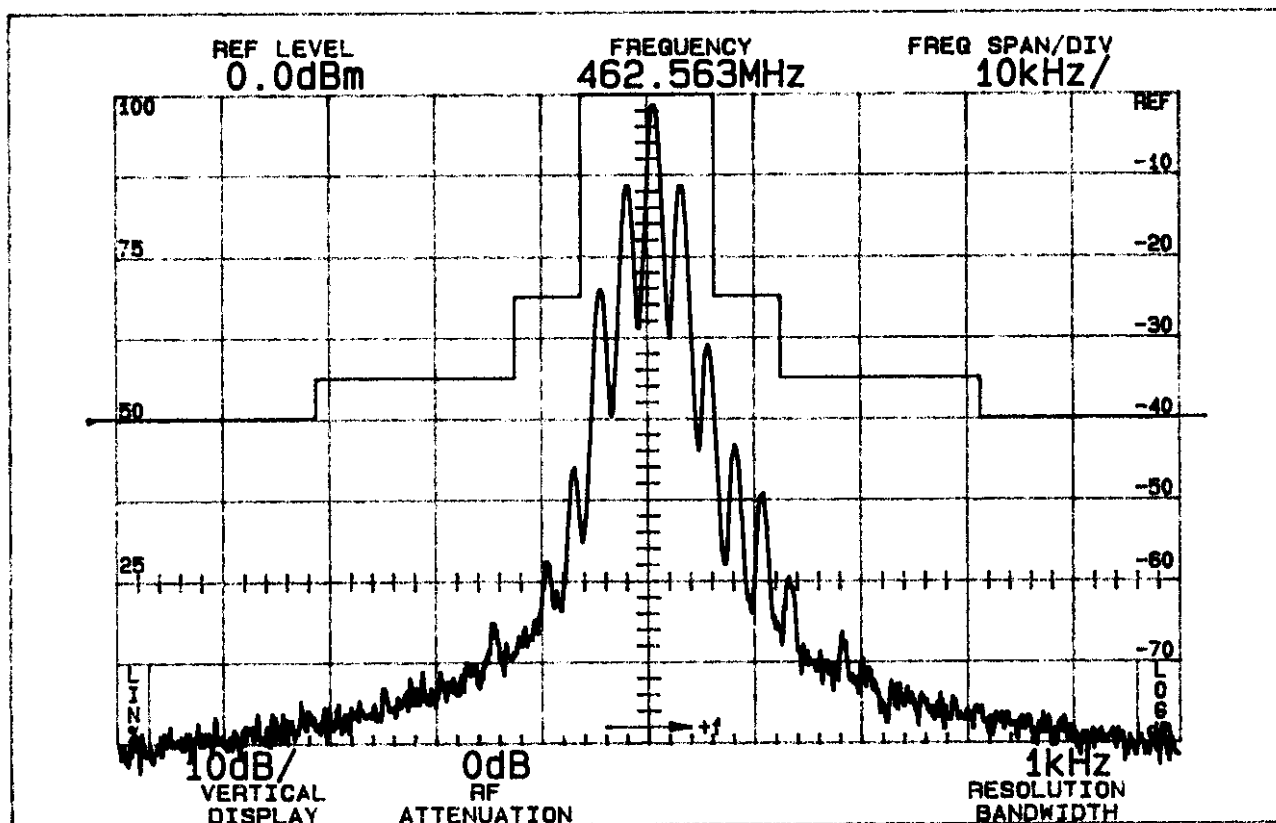
FIGURE 3
AUDIO LOW PASS FILTER RESPONSE



AUDIO LOW PASS FILTER
RESPONSE
FCC ID: OKMCONNECT3

FIGURE 3

FIGURE 4
OCCUPIED BANDWIDTH



ATTENUATION IN dB BELOW
MEAN OUTPUT POWER
Required

On any frequency more than 50%
up to and including 100% of the
authorized bandwidth, 12.5 kHz
(6.25-12.5 kHz)

25

On any frequency more than 100%,
up to and including 250% of the
authorized bandwidth (12.5-31.25
kHz)

35

On any frequency removed from
the assigned frequency by more
than 250% of the authorized
bandwidth (over 31.25 kHz)

$$43 + 10 \log P = 40$$

$$(P = 0.5)$$

OCCUPIED BANDWIDTH
FCC ID: OKMCONNECT3

FIGURE 4

D. MODULATION CHARACTERISTICS (Continued)

The plots are within FCC limits. The horizontal scale (frequency) is 10 kHz per division and the vertical scale (amplitude) is a logarithmic presentation equal to 10 dB per division.

**E. SPURIOUS EMISSIONS AT THE ANTENNA TERMINALS
(Paragraph 2.991 of the Rules)**

The Connect 3 has a permanently attached antenna. There is no connector for an external antenna. Therefore, no antenna terminal conducted measurements were made.

F. DESCRIPTION OF RADIATED SPURIOUS MEASUREMENT FACILITIES

A description of the Hyak Laboratories' radiation test facility is a matter of record with the FCC. The facility was accepted for radiation measurements from 25 to 1000 MHz on October 1, 1976 and is currently listed as an accepted site.

G. FIELD STRENGTH MEASUREMENTS OF SPURIOUS RADIATION

Field intensity measurements of radiated spurious emissions from the Connect 3 were made with a Tektronix 494P spectrum analyzer using Singer DM-105 for the measurements to 1 GHz, and EMCO 3115 horn to 4.8 GHz.

The transmitter was located in an open field 3 meters from the test antenna. Supply voltage was a power supply with a terminal voltage under load of 4.5 Vdc.

The transmitter and test antennae were arranged to maximize pickup. Both vertical and horizontal test antenna polarization were employed.

The measurement system was capable of detecting signals 100 dB or more below the reference level. Measurements were made from the lowest frequency generated within the unit (12 MHz), to 10 times operating frequency. Data after application of antenna factors and line loss corrections are shown in Table 3.

TABLE 3
 TRANSMITTER CABINET RADIATED SPURIOUS
 462.5625 MHz, 4.5 Vdc, .481 watts

<u>Spurious Frequency MHz</u>	<u>Radiated Field uV/m @ 3M</u>	<u>dB Below Carrier Reference¹</u>
467.563	1621810.1	0.0
935.125	11985.0	42.6
1403.688	3247.9	54.0
1870.250	4540.0	51.1
2337.813	9633.4	44.5
2806.275	9659.9	44.5
3272.938	8170.8	46.0
3740.500	3367.4	53.7
4208.063	1681.3	59.7
4675.625	572.7	69.0

Required: 43+10 Log(P) = 40

¹Worst-case polarization, H-Horizontal, V-Vertical.

*Reference data only, more than 20 dB below FCC limit.

All other spurious from 12 MHz to the tenth harmonic were 20 dB or more below FCC limit.

Power:

$$\begin{aligned}
 P &= (F.1.x3)^2/49.2 \\
 &= (1.6218x3)^2/49.2 \\
 &= 0.481 \text{ W}
 \end{aligned}$$

H. FREQUENCY STABILITY
 (Paragraph 2.995(a)(2))

Measurement of frequency stability versus temperature was made at temperatures from -20°C to +50°C. At each temperature, the unit was exposed to test chamber ambient a minimum of 60 minutes after indicated chamber temperature ambient had stabilized to within ±2° of the desired test temperature. Following the 1 hour soak at each temperature, the unit was turned on, keyed and frequency measured within 2 minutes. Test temperature was sequenced in the order shown in Table 4, starting with -20°C.

A Thermotron S1.2 temperature chamber was used. Temperature was monitored with a Keithley 871 digital thermometer. The transmitter output stage was terminated in a dummy load. Primary supply was 4.5 volts. Frequency was measured with a HP 5385A frequency counter connected to the transmitter through a power attenuator. Measurements were made at 462.5625 MHz. No transient keying effects were observed.

TABLE 4

FREQUENCY STABILITY AS A FUNCTION OF TEMPERATURE

462.5625 MHz, 4.5 Vdc, .481 W

<u>Temperature, °C</u>	<u>Output Frequency, MHz</u>	<u>p.p.m.</u>
-19.3	467.563442	2.0
- 9.3	467.562925	0.9
0.4	467.562834	0.7
10.4	467.562735	0.5
20.2	467.562404	-0.2
30.2	467.562010	-1.0
40.4	467.561817	-1.5
49.9	467.562174	-0.7
Maximum frequency error:	467.563442	
	<u>467.562500</u>	
	+ .000942 MHz	

FCC Rule 95.627(b) specifies .00025% (2.5 p.p.m.) or a maximum of ± 0.001169 MHz, which corresponds to:

High Limit	467.563669 MHz
Low Limit	467.561331 MHz

I. FREQUENCY STABILITY AS A FUNCTION OF SUPPLY VOLTAGE
 (Paragraph 2.995(d)(2) of the Rules)

Oscillator frequency as a function of power supply voltage was measured with a HP 5385A frequency counter as supply voltage provided by an HP 6264B variable dc power supply was varied from $\pm 15\%$ above the nominal 4.5 volt rating to below the battery end point. A Fluke 197 digital voltmeter was used to measure supply voltage at transmitter primary input terminals. Measurements were made at 20°C ambient.

TABLE 5

FREQUENCY STABILITY AS A FUNCTION OF SUPPLY VOLTAGE

462.5625 MHz, 4.5 Vdc Nominal; .481W

<u>Supply Voltage</u>		<u>Output Frequency, MHz</u>	<u>p.p.m.</u>
5.17	115%	467.562396	-0.2
4.95	110%	467.562395	-0.2
4.73	105%	467.562397	-0.2
4.50	100%	467.562404	-0.2
4.28	95%	467.562411	-0.2
4.05	90%	467.562415	-0.2
3.83	85%	467.562419	-0.2
3.60	80%	467.562420	-0.2
Maximum frequency error:		467.562395	
		<u>467.562500</u>	
		- .000105 MHz	

FCC Rule 95.627(b) specifies .00025% (2.5 p.p.m) or a maximum of \pm 0.001169 MHz, corresponding to:

High Limit	467.563669 MHz
Low Limit	467.561331 MHz

*Battery end point.