

DESCRIPTION

TCA440 is a monolithic IC, especially developed for AM receivers up to 50MHz. It includes a RF stage with AGC, a balanced mixer, separate oscillator and an IF amplifier with AGC. Because of its low current consumption and of its internal stabilization the TCA440 is perfectly suited for battery operated portables, car and home radios.

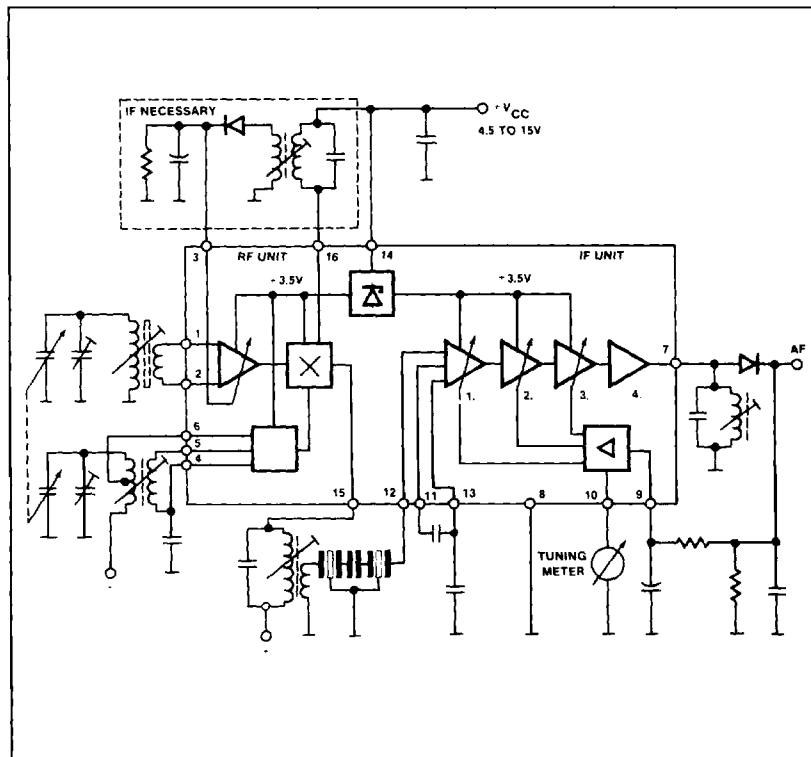
FEATURES

- **Balanced circuit**
- **Separately controllable prestage**
- **Multiplicative push-pull mixer with separate oscillator**
- **High signal handling capability even with 4.5V supply voltage**
- **100dB feedback control range in 5 stages**
- **Direct connection for tuning meter**
- **Minimum external components**

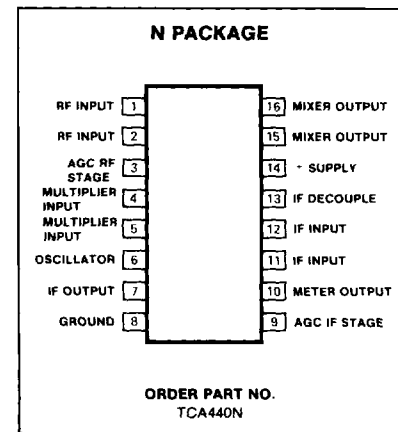
ABSOLUTE MAXIMUM RATINGS

| PARAMETER | RATING | UNIT |
|---|-------------|------|
| V _{CC} Supply voltage | 15 | V |
| T _{amb} Ambient temperature in operation | -15 to +80 | °C |
| T _s Storage temperature | -30 to +125 | °C |
| V _{CC} Range of operation | 4.5 to 15 | V |

BLOCK DIAGRAM



PIN CONFIGURATION



TUNING METER

Recommended instruments:

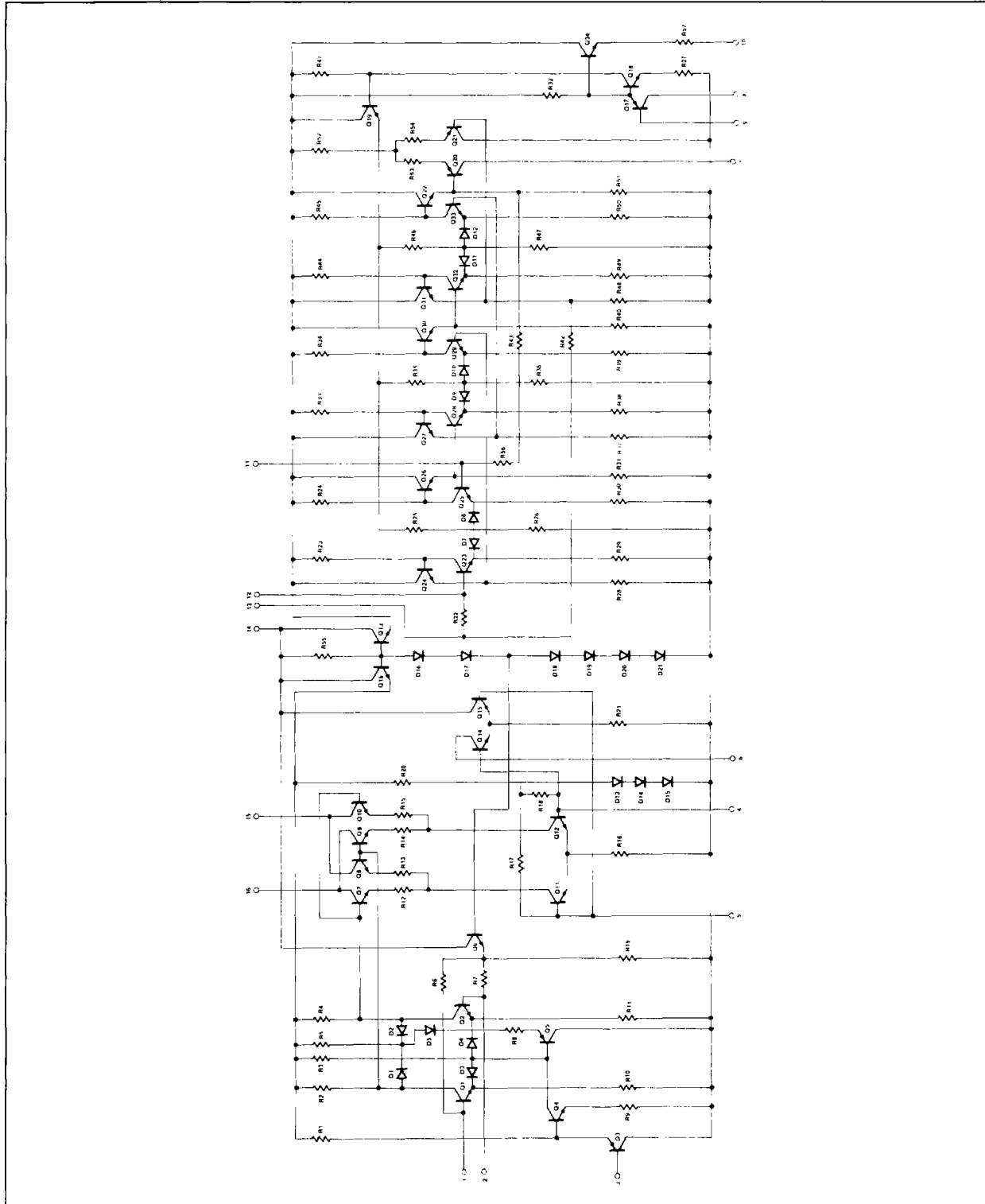
- or 500 μ A ($R_1 = 800k\Omega$)
- or 300 μ A ($R_1 = 1.5k\Omega$)

The IC offers at pin 10 a tuning meter voltage of 600 mV_{EMP} max. with a source impedance of approx. 400 Ω .

FUNCTION

As pictured in the circuit diagram the TCA440 comprises two control loops independent of each other which control the RF stage and the IF stages. By AGCing the RF stage, excellent signal handling is obtained. A voltage of 2.6V_{pp} on the IC input can be handled with very low distortion. The push-pull mixer operates multiplicatively, thereby resulting in few harmonic mixing products and whistling points. The oscillator which is separated from the mixer is also apted excellently for short waves. From the AGC of the RF amplifier a voltage is derived for a tuning meter which can be connected directly to the meter. The symmetric composition of the circuit provides high stability against oscillation and, at the same time, an AGC range of more than 100dB. The bridge circuit of the mixer provides good isolation of the oscillator.

EQUIVALENT SCHEMATIC

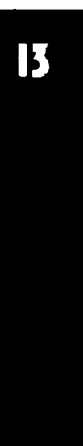


DC ELECTRICAL CHARACTERISTICS $V_{CC} = 9V$, $T_A = 25^\circ C$ unless otherwise specified.

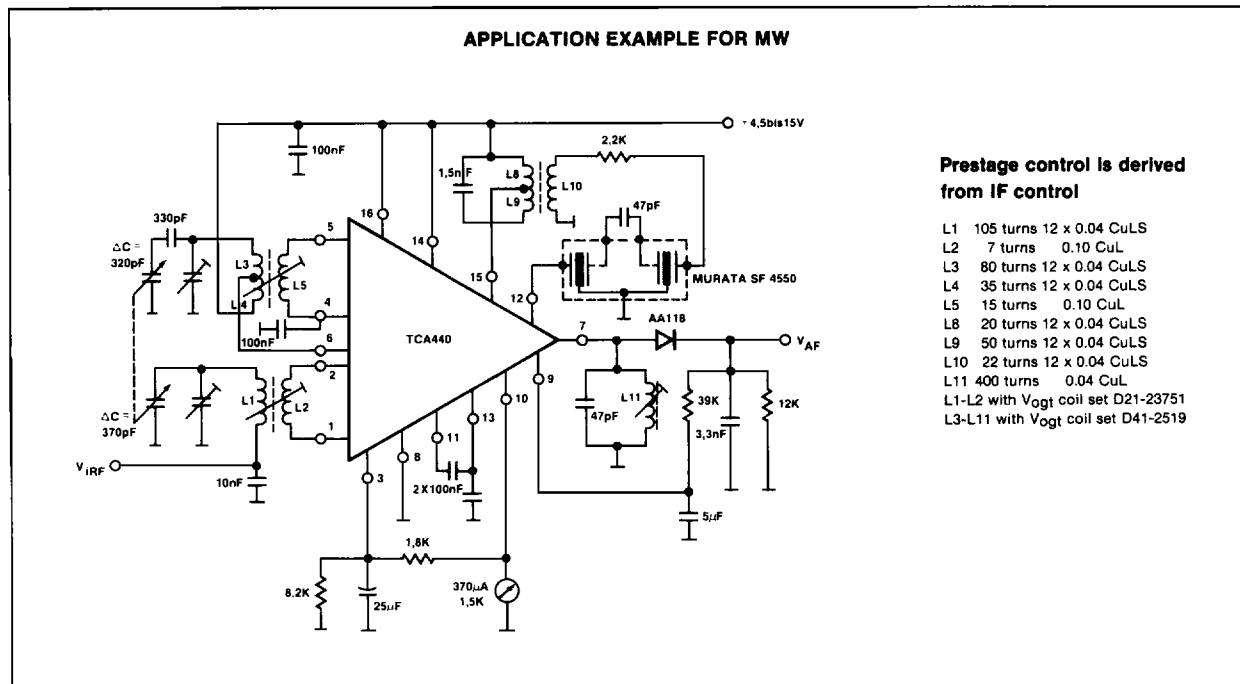
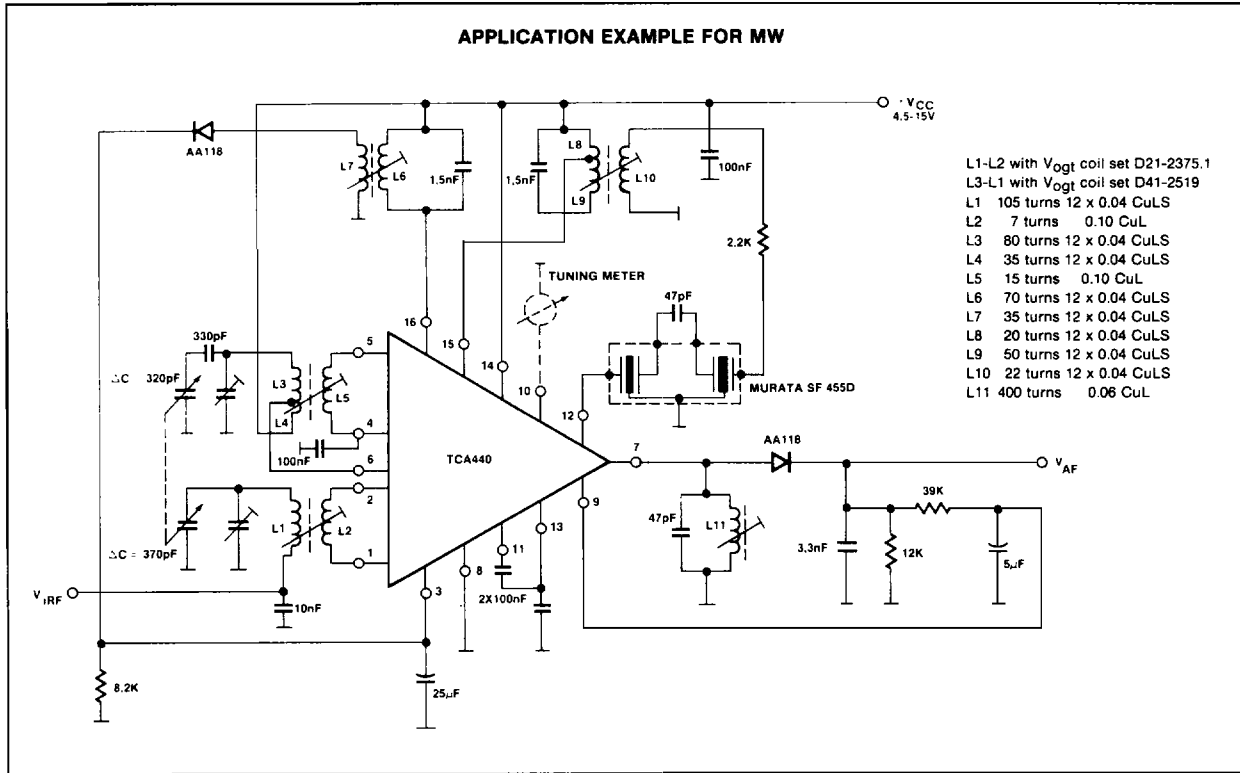
| PARAMETER | TEST CONDITIONS | TCA 440 | | | UNIT |
|--|-----------------|---------|------|-----|------|
| | | Min | Typ | Max | |
| I_{CC} Total current consumption at: | $V_{CC} = 4.5V$ | | 7 | | mA |
| | $V_{CC} = 9V$ | | 10.5 | | mA |
| | $V_{CC} = 15V$ | | 12 | | mA |

AC ELECTRICAL CHARACTERISTICS $V_{CC} = 9V$, $T_A = 25^\circ C$, $f_{IRF} = 600kHz$, $f_{mod} = 1kHz$ unless otherwise specified.

| PARAMETER | TEST CONDITIONS | TCA 440 | | | UNIT |
|--|--|---------|-------------------|-----|----------------|
| | | Min | Typ | Max | |
| ΔG_{RF} RF level deviation for ($m = 80\%$) | $\Delta V_{AF} = 6dB$ $\Delta V_{AF} = 10dB$ | | 65 80 | | dB dB |
| V_{AFeff} AF output voltage for V_{IRF} (symm. measured at 1-2) | $m = 80\%$ $V_{IRF} = 20\mu V$ $V_{IRF} = 1mV$ $V_{IRF} = 500mV$ | | 140 260 350 | | mV mV |
| | $m = 30\%$ $V_{IRF} = 20\mu V$ $V_{IRF} = 1mV$ $V_{IRF} = 500mV$ | | 50 100 130 | | mV |
| V_{IRF} Input sensitivity (measured at 60Ω , $f_{IRF} = 1MHz$, $m = 30\%/0\%$, $R_G = 540\Omega$) | At signal-to-noise distance | | | | |
| | $\frac{S + N}{N} = 6dB$ | | 1 | | μV |
| | $\frac{S + N}{N} = 26dB$ | | 7 | | μV |
| | $\frac{S + N}{N} = 58dB$ | | 1 | | mV |
| RF unit | | | | | |
| f_{IRF} Input frequency range | $f_{IF} = f_{OSC} = f_{IRF}$ | | 0 to 50 | | MHz |
| f_{IF} Output frequency | | | 460 | | kHz |
| ΔG_V Control range | | | 38 | | dB |
| V_{IRFpp} Input voltage | for 600kHz, $m = 80\%$, for Overdrive, $k_{AF} = 10\%$, Symmetrically measured at pins 1 & 2 (mean carrier value) | | 2.6 | | Vpp |
| V_{IRFeff} | | | .5 | | V |
| S_{IF} IF suppression between 1-2 to 15 | Asymmetrical coupling at: | | 20 | | dB |
| Z_i RF input impedance | G_{RFmax} | | 2/5 | | k Ω /pF |
| | G_{RFmin} | | 2.2/1.5 | | k Ω /pF |
| | Symmetrical coupling at: | | | | |
| | G_{RFmax} | | 4/5 | | k Ω /pF |
| | G_{RFmin} | | 4.5/1.5 | | k Ω /pF |
| Z_{gosc} Mixer output impedance | Pins 15 or 16 | | 250/4.5 | | k Ω /pF |
| IF unit | | | | | |
| f_{IF} Input frequency range | Mean carrier value at G_{min} for Overdrive ($k_{AF} = 10\%$), measured at Pin 12 (60Ω to ground, $f_{IF} = 460kHz$, $m = 80\%$, $f_{mod} = 1kHz$) | | 0 to 2 | | MHz |
| ΔG_V Control range at 460kHz | | | 62 | | dB |
| V_{IFeff} Input voltage | V_{IF} at 60Ω (Pin 12) $f_{mod} = 1kHz$ | | 200 | | mV |
| V_{AFeff} AF output voltage | $V_{IF} = 30\mu V$, $m = 80\%$ | | 50 | | mV |
| | $V_{IF} = 3mV$, $m = 80\%$ | | 200 | | mV |
| | $V_{IF} = 3mV$, $m = 30\%$ | | 70 | | mV |
| Z_i IF input impedance | Asymmetrical coupling | | 3/3 | | k Ω /pF |
| Z_g IF output impedance | Pin 7 | | 200/8 | | k Ω /pF |

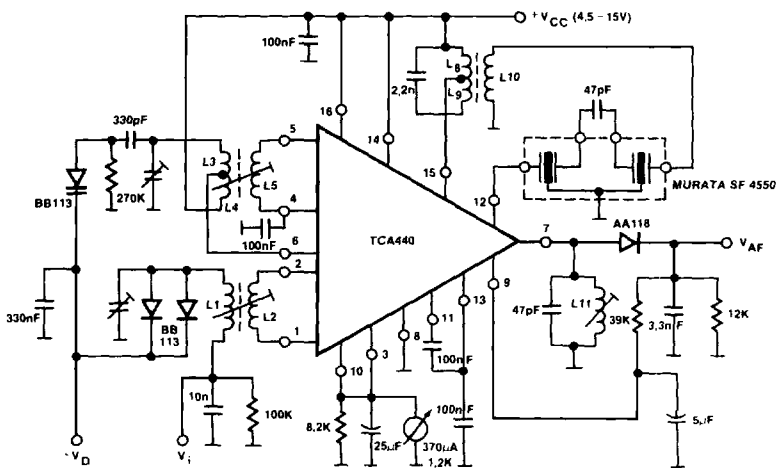


TYPICAL APPLICATIONS



TYPICAL APPLICATIONS (Cont'd)

APPLICATION EXAMPLE FOR AM USING VARICAP DIODES BB 113

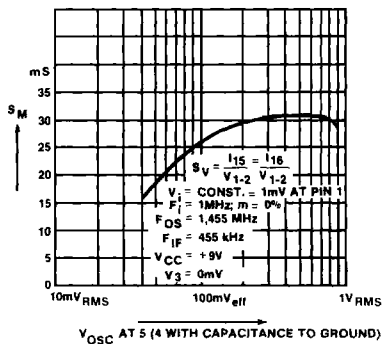


- L1 105 turns 12 x 0.04 CuLS
- L2 7 turns 0.10 CuL
- L3 80 turns 12 x 0.04 CuLS
- L4 35 turns 12 x 0.04 CuLS
- L5 15 turns 0.10 CuL
- L8 20 turns 12 x 0.04 CuLS
- L9 50 turns 12 x 0.04 CuLS
- L10 22 turns 12 x 0.04 CuLS
- L11 400 turns 0.06 CuL

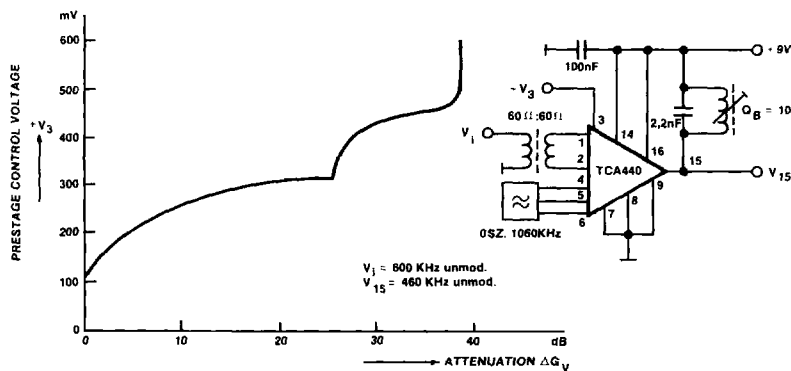
L1-L2 with Vogt coil set D21-23751
 L3-L11 with Vogt coil set D41-2519

$V_D = 8.5V - f_c = 800kHz$
 $V_D = 30V - f_c = 1620kHz$

CONVERSION CONDUCTANCE vs OSCILLATOR VOLTAGE



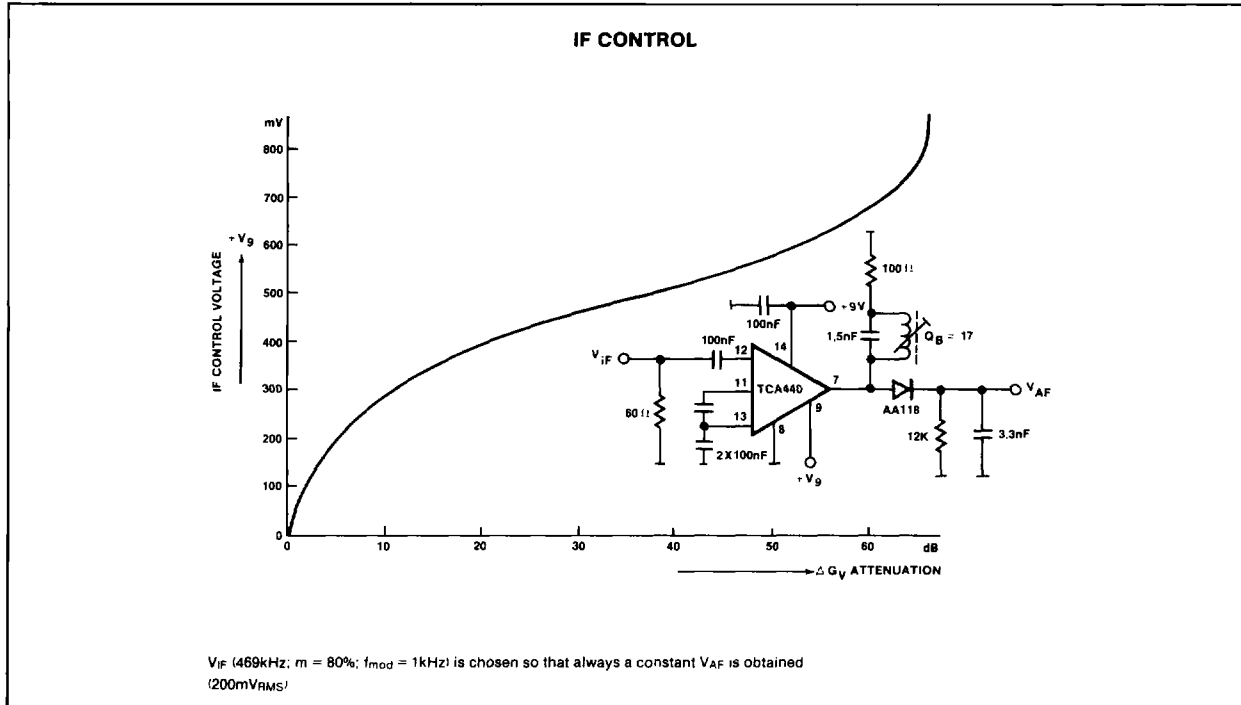
RF STAGE CONTROL



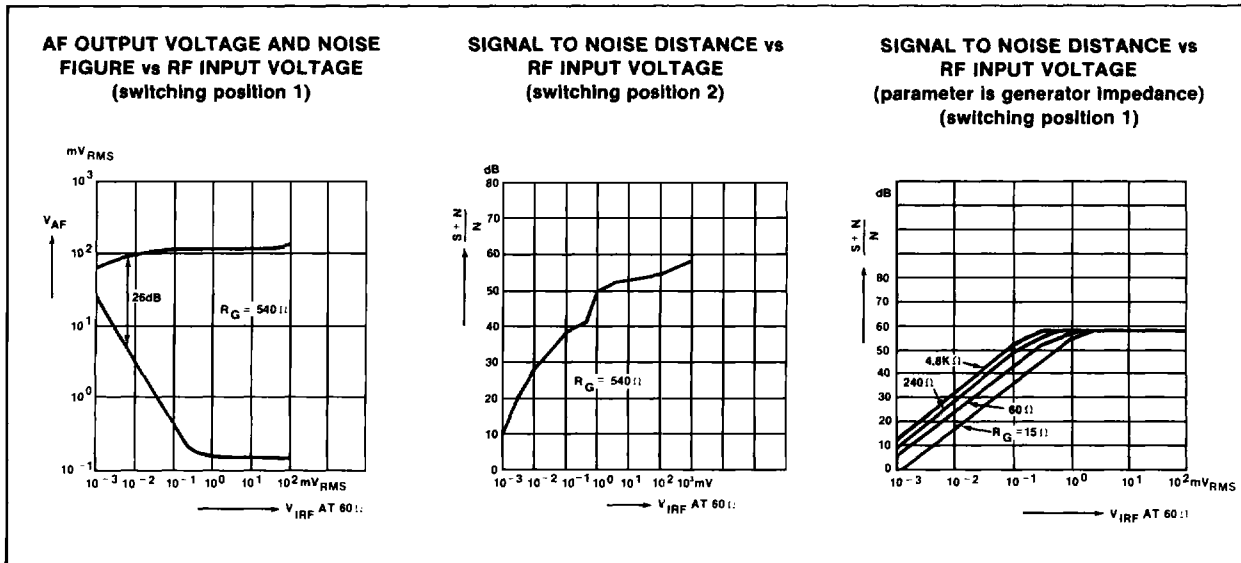
The input is not power matched and can be driven with a higher resistance. V_1 is chosen so that a constant V_{15} is obtained (50mV_{pp}).

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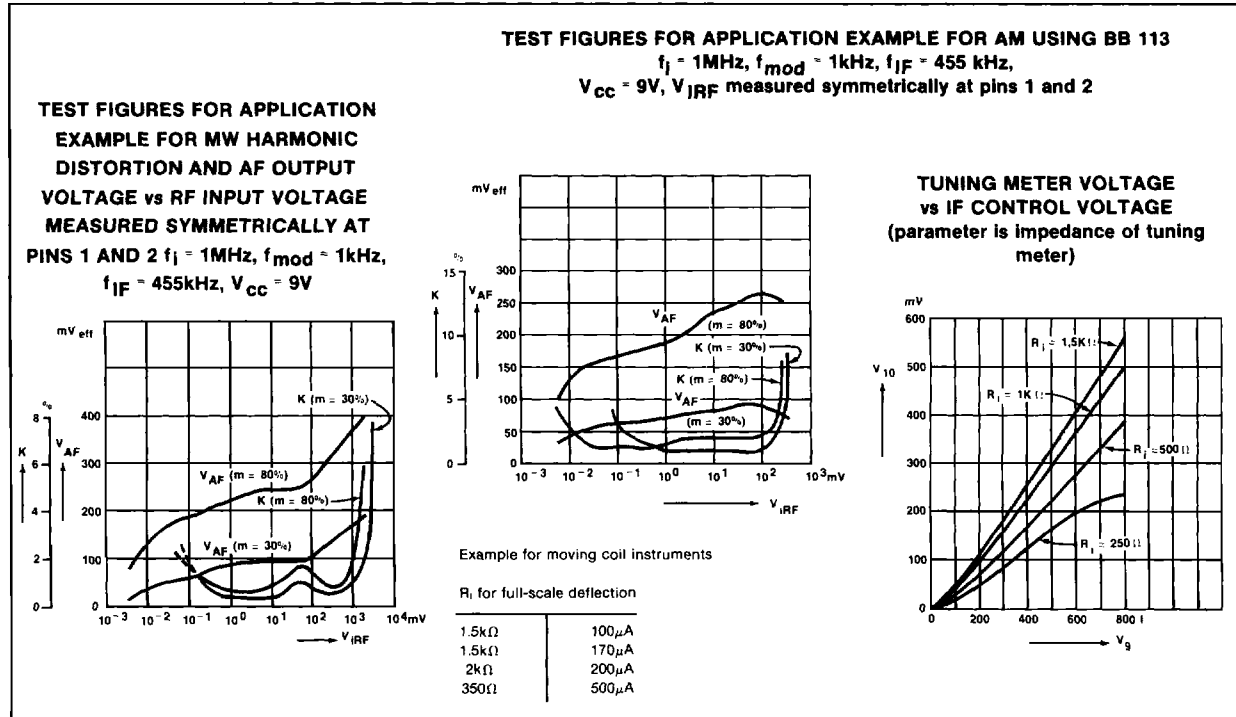
TYPICAL APPLICATIONS (Cont'd)



TYPICAL PERFORMANCE CHARACTERISTICS



TYPICAL PERFORMANCE CHARACTERISTICS (Cont'd)



TEST CIRCUITS

