

Video and Wide-band Amplifier

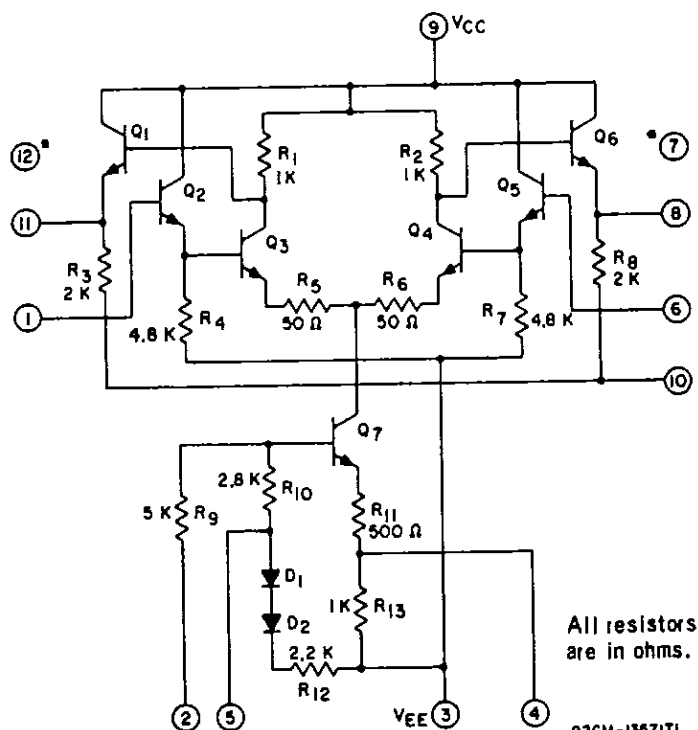
Features:

- Designed for use in video systems and communication equipment
- Balanced differential amplifier configuration with controlled constant-current source provides outstanding versatility
- Built-in temperature stability for operation from -55°C to $+125^{\circ}\text{C}$
- Emitter follower input & output
- Companion Application Note ICAN5038 "Application of the RCA-CA3001 Integrated-Circuit Video Amplifier", covers different operating modes, gain control, distortion, swing capability, 3 stage amplifier design, and a Schmitt trigger study.

- Push-pull input & output
- AGC range - 60 dB typ.
- Bandwidth - 29 MHz
- Input resistance - 150 k Ω typ.
- Output resistance - 45 Ω typ.
- Voltage gain - 19 dB typ.
- Input offset voltage - 1.5 mV typ.

Applications

- Schmitt trigger
- Mixer
- Modulator
- DC, IF & video amplifier



* Internal Connection - DO NOT USE

Fig. 1 — Schematic Diagram.

CHARACTERISTICS (See Page 2 for Definitions of Terms)	SYMBOLS	SPECIAL TEST CONDITIONS Terminals No.4 and No.5 Not Connected Unless Specified	TEST CIRCUITS	LIMITS					TYPICAL CHARAC- TERISTICS CURVES	
				TYPE CA3001						
				Fig.	Min.	Typ.	Max.	Units		Fig.
STATIC CHARACTERISTICS:										
Input Offset Voltage	V_{IO}		4	-	1.5	-	mV	2		
Input Offset Current	I_{IO}		5	-	1	10	μA	2		
Input Bias Current	I_I		5	-	16	36	μA	3		
Output Offset Voltage	V_{OO}	$R_S = 1\text{ k}\Omega$		-	54	300	mV	6		
Quiescent Operating Voltage	V_B OR V_{11}	TERMINALS								
		MODE	4	5						
		A	NC	NC		3.8	4.4	5	V	7
		B	NC	V_{EE}		-	4.8	-	V	7
		C	V_{EE}	NC		-	2.7	-	V	7
Device Dissipation	P_D	D	V_{EE}	V_{EE}		-	4	-	V	7
		A	NC	NC		60	78	120	mW	8
		B	NC	V_{EE}		-	71	-	mW	8
		C	V_{EE}	NC		-	110	-	mW	8
		D	V_{EE}	V_{EE}		-	86	-	mW	8
DYNAMIC CHARACTERISTICS:										
Differential Voltage Gain (Single-ended input and output)	A_{DIFF}	$f = 1.75\text{ MHz}$ $f = 20\text{ MHz}$		16	19	-	dB	9 A, 9 B		
Bandwidth at -3 dB Point	BW	$R_S = 60\Omega$		10	14	-	dB	9 B		
Maximum Output Voltage Swing	$V_{OUT(P-P)}$	$R_S = 60\Omega$ $f = 1.75\text{ MHz}$		16	29	-	MHz	NONE		
Noise Figure	NF	$f = 1.75\text{ MHz}$, $R_S = 1\text{ K}\Omega$	14	-	5	8	dB	10		
		$f = 11.7\text{ MHz}$, $R_S = 1\text{ K}\Omega$	14	-	7.7	-	dB	10		
Common-Mode Rejection Ratio	CMRR	$f = 1\text{ KHz}$	16	70	88	-	dB	12		
Input Impedance Components:										
Parallel Input Resistance	R_{IN}	$f = 1.75\text{ MHz}$		50	140	-	$\text{K}\Omega$	14		
Parallel Input Capacitance	C_{IN}	$f = 1.75\text{ MHz}$		-	3.4	7	pF	14		
Output Resistance	R_{OUT}	$f = 1.75\text{ MHz}$		-	45	70	Ω	NONE		
AGC Range (Maximum voltage gain to complete cutoff)	AGC	$f = 1.75\text{ MHz}$	19	55	60	-	dB	NONE		

TYPICAL STATIC CHARACTERISTICS

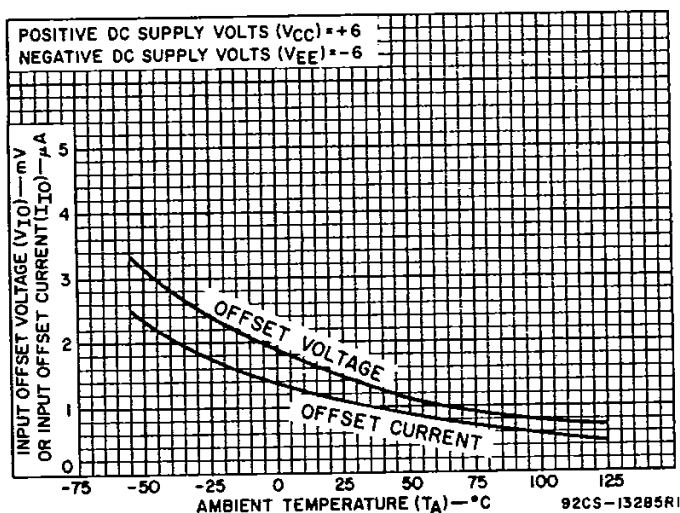


Fig.2 - Input offset voltage and current vs. temperature.

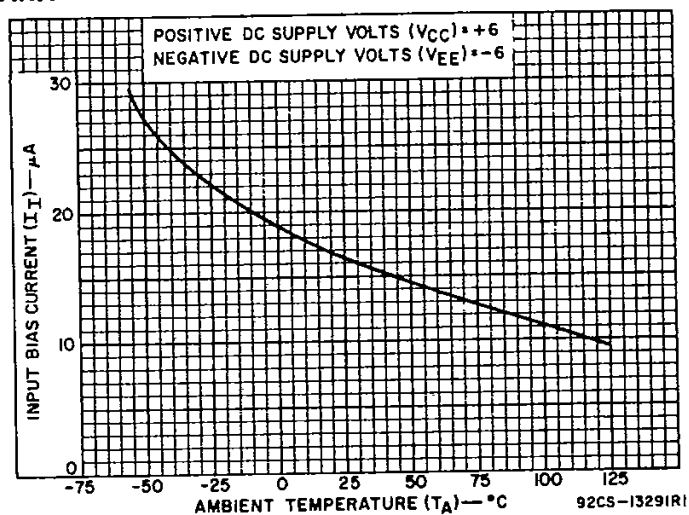


Fig.3 - Input bias current vs. temperature.

ABSOLUTE-MAXIMUM VOLTAGE AND CURRENT LIMITS at $T_A = 25^\circ\text{C}$

Indicated voltage or current limits for each terminal can be applied under the specified conditions for other terminals.
All Voltages are with respect to ground (common terminal of Positive and Negative DC Supplies).

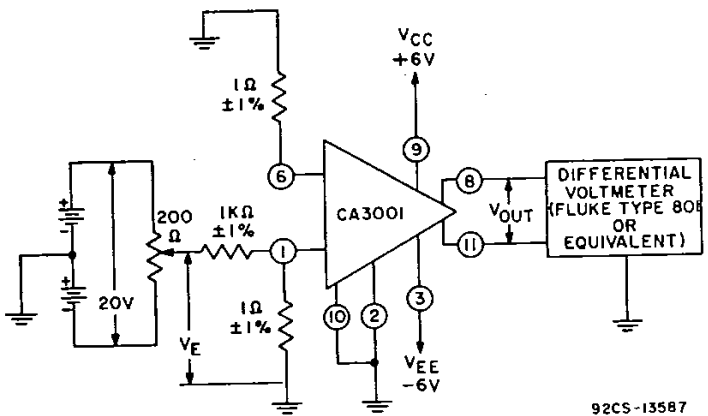
TERMINAL	VOLTAGE OR CURRENT LIMITS		CONDITIONS	
	NEGATIVE	POSITIVE	TERMINAL	VOLTAGE
1	-2.5	+2.5	2, 6 3, 10 9	0 -6 +6
2	-8.5	0	1, 6 3, 10 9	0 -8.5 +6
3	-10	0	1, 2, 6 9 10	0 +6 -6
4	-8.5	0	1, 2, 6 9 10	0 +6 -6
5	-6	0	1, 2, 6 3, 10 9	0 -6 +6
6	-2.5	+2.5	1, 2 3, 10 9	0 -6 +6
7	INTERNAL CONNECTION DO NOT USE			

TERMINAL	VOLTAGE OR CURRENT LIMITS		CONDITIONS	
	NEGATIVE	POSITIVE	TERMINAL	VOLTAGE
8	25 mA		1, 2, 6, 10 3 9	0 -6 +6
			200- Ω RESISTOR CONNECTED BETWEEN TERMINALS No.8 & No.10	
9	0	+10	1, 2, 6, 10 3	0 -6
10	-10	0	1, 2, 6 3 9	0 -6 +6
11	25 mA		1, 2, 6, 10 3 9	0 -6 +6
			200- Ω RESISTOR CONNECTED BETWEEN TERMINALS No.10&No.11	
12	INTERNAL CONNECTION DO NOT USE			
CASE	INTERNALLY CONNECTED TO TERMINAL No.3 (SUBSTRATE) DO NOT GROUND			

OPERATING TEMPERATURE RANGE	-55 $^\circ\text{C}$ to +125 $^\circ\text{C}$
STORAGE TEMPERATURE RANGE	-65 $^\circ\text{C}$ to +150 $^\circ\text{C}$
LEAD TEMPERATURE (During Soldering):	
At distance 1/16 \pm 1/32 inch (1.59 \pm 0.79mm)	
from case for 10 seconds max.	+265 $^\circ\text{C}$
MAXIMUM SINGLE-ENDED INPUT-SIGNAL VOLTAGE	\pm 4 V
MAXIMUM COMMON-MODE INPUT-SIGNAL VOLTAGE	\pm 2.5 V
MAXIMUM DEVICE DISSIPATION:	
-55 to 85 $^\circ\text{C}$	450 mW
Above 85 $^\circ\text{C}$	Derate linearly 5 mW/ $^\circ\text{C}$

TYPICAL STATIC CHARACTERISTICS AND TEST CIRCUITS

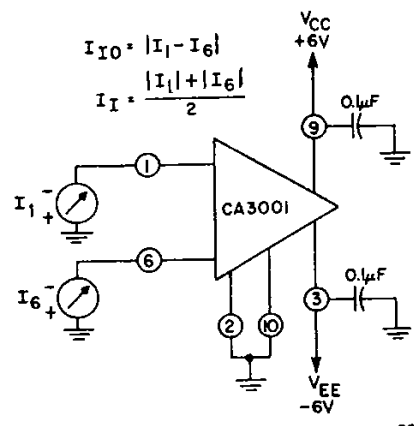
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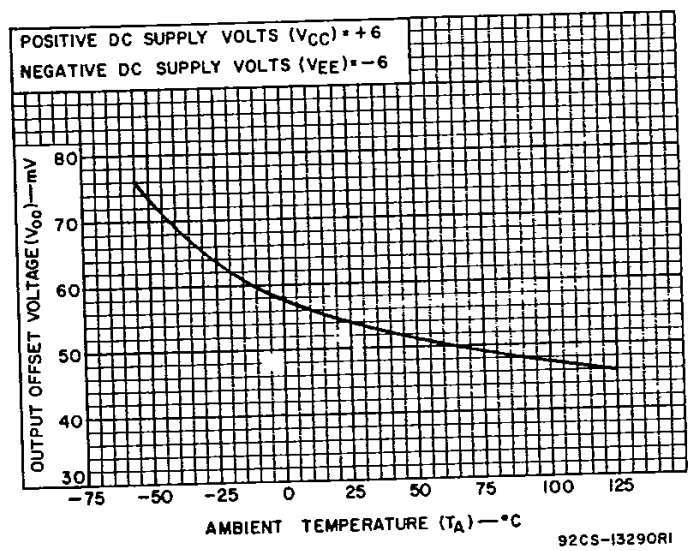
1. Adjust V_E for $V_{OUT}(DC) = 0 \pm 0.1 V$
2. Measure V_E and record input offset voltage (V_{IO}) in mV as $V_{IO} = \frac{V_E}{1000}$

Fig. 4 - Input offset voltage test circuit.



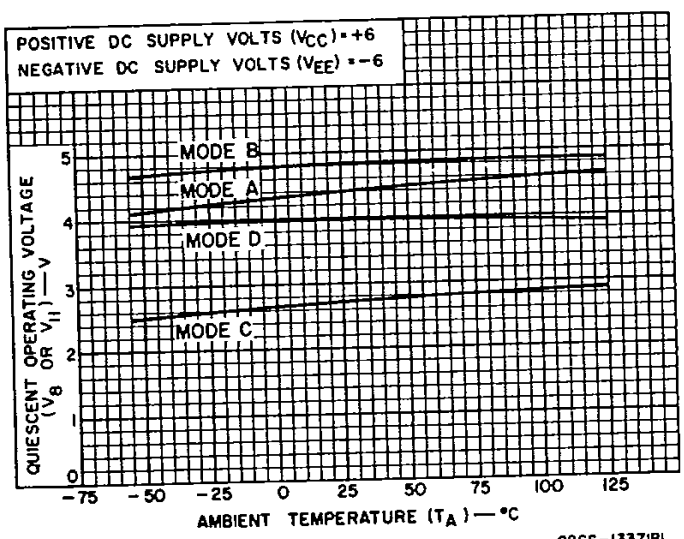
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Fig. 5 - Input offset current and input bias current test circuit.



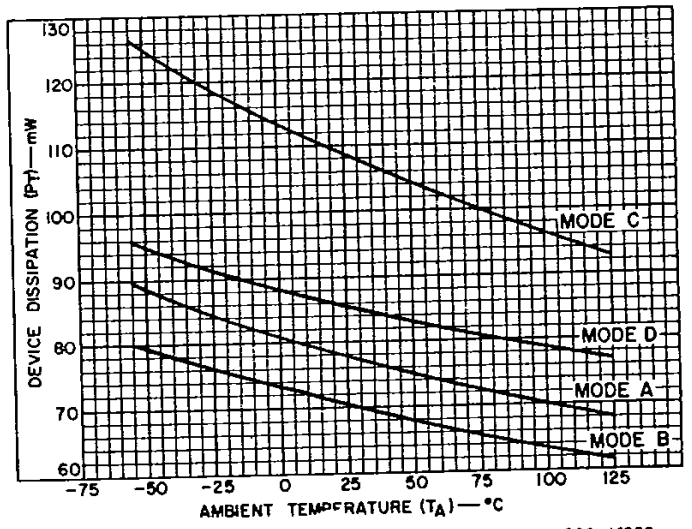
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Fig. 6 - Output offset voltage vs. temperature.



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Fig. 7 - Quiescent operating voltage vs. temperature.



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Fig. 8 - Device dissipation vs. temperature.

TYPICAL DYNAMIC CHARACTERISTICS

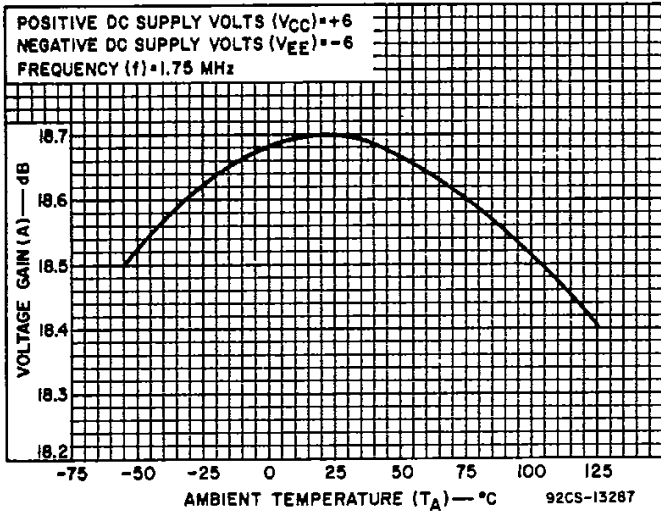


Fig.9 a - Differential voltage gain vs. temperature.

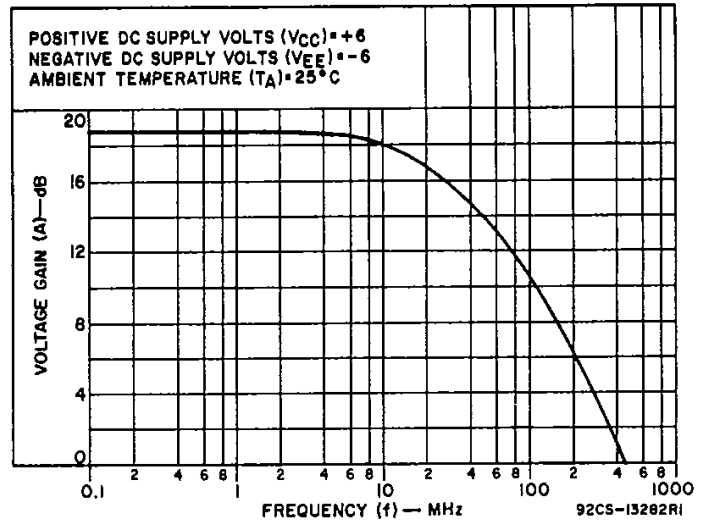


Fig.9 b - Differential voltage gain vs. frequency.

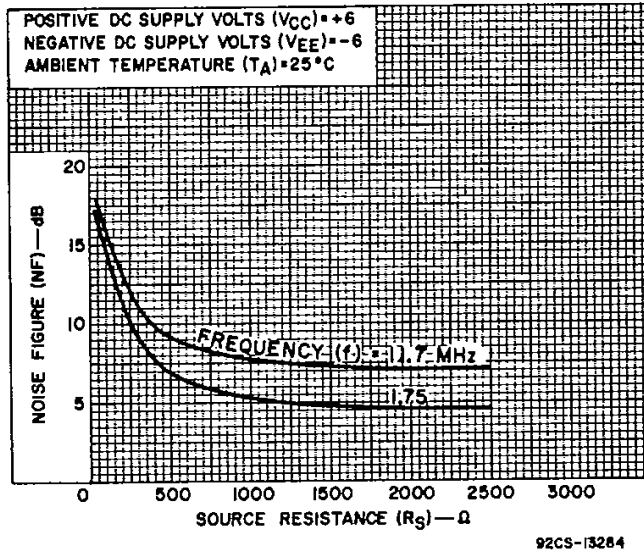
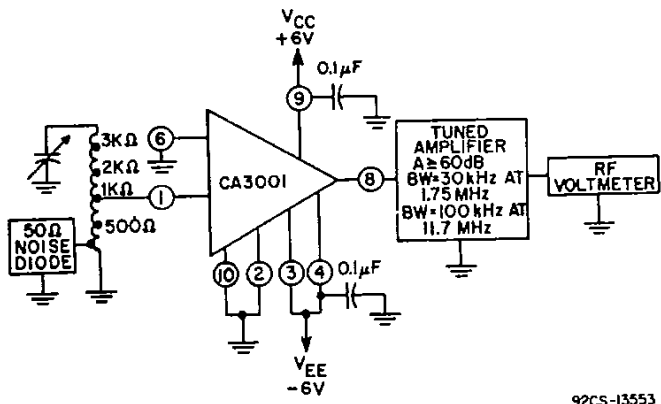


Fig.10 - Noise figure vs. source resistance and frequency.

TYPICAL DYNAMIC CHARACTERISTICS AND TEST CIRCUITS

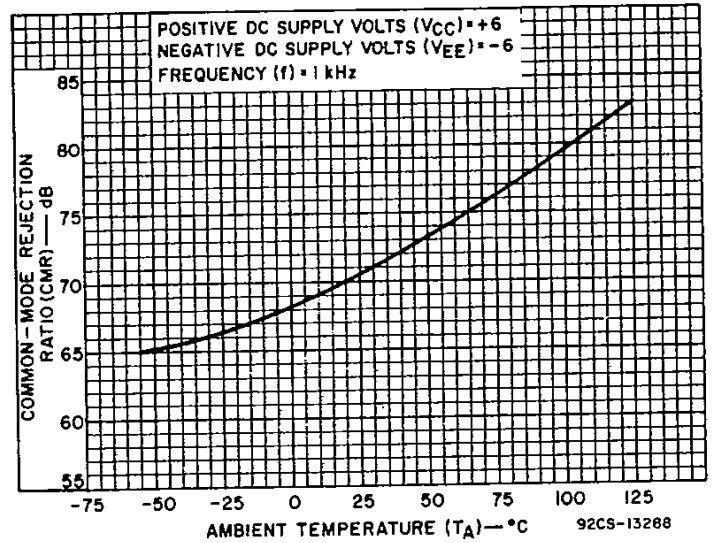
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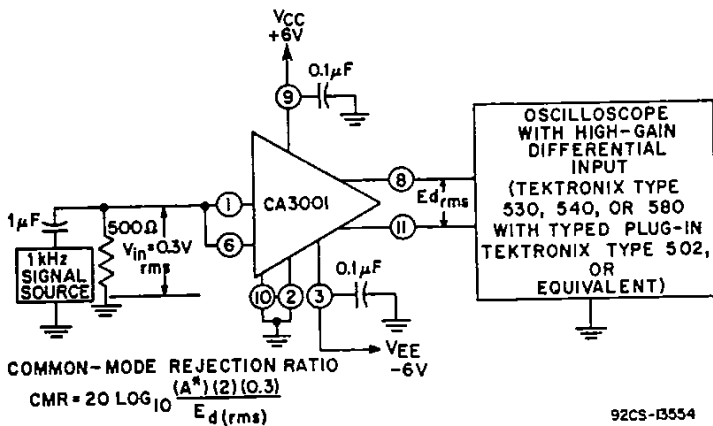
* Separate tuned input circuits are used for 1.75 MHz and 11.7 MHz. Source-resistance matching taps adjusted with circuit tuned to resonance and with 50-ohm resistor connected to simulate noise diode.

Fig. 11 - Noise figure test circuit.



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Fig. 12 - Common-mode rejection ratio vs. temperature.

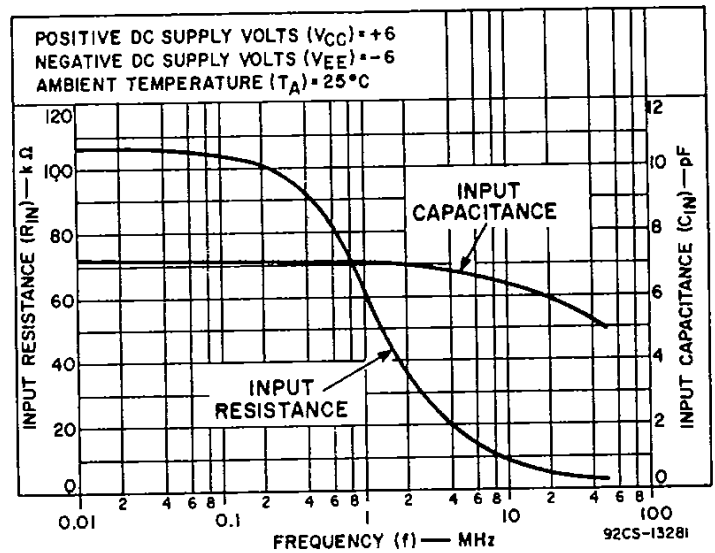


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COMMON-MODE REJECTION RATIO
 $CMR = 20 \log_{10} \frac{(A^*)(2)(0.3)}{E_d(rms)}$

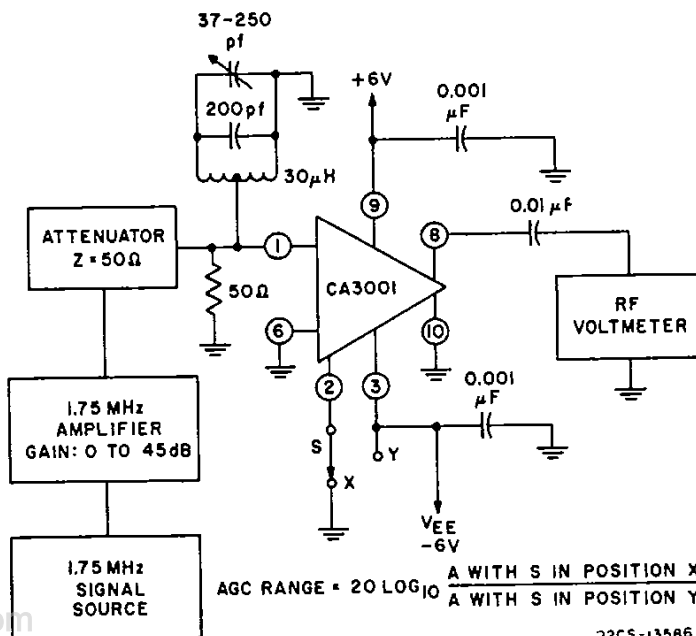
* A = SINGLE-ENDED VOLTAGE GAIN

Fig. 13 - Common-mode rejection ratio test circuit.



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Fig. 14 - Input impedance components vs. frequency.



AGC RANGE = $20 \log_{10} \frac{A \text{ WITH S IN POSITION X}}{A \text{ WITH S IN POSITION Y}}$

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Fig. 15 - AGC range test circuit.