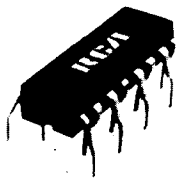
CA3090AQ



16-Lead quad-in-line plastic package

H-1706

Stereo Multiplex Decoder

For FM Stereo Multiplex Systems

FEATURES:

- *Requires the use of only one low-inductance tuning coil*
- *Automatic stereo switching*
- *Directly drives a stereo indicator lamp up to 100 mA*
- *Includes driver for stereo-lamp indicator*
- *Operates from a wide range of power supplies: 10 to 16 volts*
- *Requires only one adjustment for alignment*
- *Switching from monaural to stereo and stereo to monaural produces no audible thumps*
- *Low distortion: under 0.5%*
- *Separate dc input permits stereo defeat or enable*
- *High signal output: directly drives audio amplifiers*
- *Excellent SCA (storecast) rejection: 55 dB typ.*
- *High audio channel separation: 40 dB typ.*

RCA-CA3090AQ*, a monolithic silicon integrated circuit, is a stereo multiplex decoder intended for FM multiplex systems.

The CA3090AQ is the successor to the CA3090Q; it offers three major advantages over the CA3090Q as follows:

1. Can directly drive a stereo indicator lamp with a current drain of up to 100 mA.
2. Stereo Defeat/Enable control-voltage specifications.
3. Capable of operation with lower distortion.

This stereo multiplex decoder requires only one low-inductance tuning coil (requires only one adjustment for complete alignment), provides automatic stereo switching, energizes a stereo indicator lamp, and operates from a wide range of voltage supplies.

Figure 1 shows the block diagram for the CA3090AQ. The input signal from the detector is amplified by a low-distortion preamplifier and simultaneously applied to both the 19-kHz and 38-kHz synchronous detectors. A 76-kHz signal, generated by a local voltage-controlled oscillator (VCO), is counted down by two frequency dividers to a 38-kHz signal and to two 19-kHz signals in phase quadrature. The 19-kHz pilot-tone supplied by the FM detector is compared to the locally generated 19-kHz signal in a synchronous detector. The resultant signal controls the voltage controlled oscillator (VCO) so that it produces an output signal to phase-lock the stereo decoder with the pilot tone. A second synchronous detector compares the locally generated 19-kHz signal with the 19-kHz pilot tone. If the pilot tone exceeds an externally adjustable threshold voltage, a Schmitt trigger circuit is energized. The signal from the Schmitt trigger lights the stereo indicator, enables the 38-kHz synchronous detector, and automatically switches the CA3090AQ from monaural to stereo operation. The output signal from the 38-kHz detector and the composite signal from the preamplifier are applied to a matrixing circuit from which emerge the resultant left and right channel audio signals. These signals are applied to their respective left and right post amplifiers for amplification to a level sufficient to drive most audio amplifiers.

The CA3090AQ may be used without the stereo defeat/enable function (see Fig. 6) if a control voltage for this function is not readily available. In this case, Terminal 4 should be grounded.

The CA3090AQ utilizes the 16-lead quad-in-line plastic package and operates over the ambient temperature range of -40° C to +85° C.

*Formerly Developmental Type No. TA6262G.

MAXIMUM RATINGS, *Absolute-Maximum Values at T_A = 25° C:*

DC Supply Voltage	16 V
Current at Term. 12	100 mA
Input Signal Voltage (Composite)■	400 mV
Ambient Temperature Range:	
Operating	-40 to +85° C
Storage	-65 to +150° C
Lead Temperature (during soldering):	
At distance not less than 1/32" (0.79 mm) from case for 10 s max.	+265° C

■For stereo operation, a minimum input signal voltage (composite) of 40 mV is required.

ELECTRICAL CHARACTERISTICS

CHARACTERISTIC	TERMINAL MEASURED AND SYMBOL	TEST CONDITIONS: Typ. Char. Curve Fig. No.	TEST CONDITIONS: $T_A = 25^\circ C$, $V+ = 12$ V (unless specified otherwise)	TEST CONDITIONS: Circuit Fig. No.	LIMITS: Min.	LIMITS: Typ.	LIMITS: Max.	UNITS
Static Characteristics								
Total Current (Terms. 9, 10, 11)	I_{total}		Lamp OFF	3	–	22	27	mA
DC Voltage: Term. 1	V_1			3	1.6	2.3	3.1	V
Term. 6 (Indicator Lamp OFF)	V_6			3	–	2.1	3.6	V
Terms. 9 and 10	$V_{9\ \&\ 10}$			3	3.7	5.4	7.4	V
Term. 12 (Indicator Lamp OFF)	V_{12}		$V^+ = 16$ V		12.7	–	–	V
Voltage Differential (Term. 2–Term. 1)	$V_2 - V_1$			3	–	0	0.1	V
Current at Term. 12 (In actual use external circuit resistance (e.g. lamp should limit Term. 12 to the maximum rated value of 100 mA.)		4	V_{IN} (at f = 19 kHz) = 18 mV	1	75	100	–	mA
Dynamic Characteristics								
Input Impedance	Z_{IN}			7	–	50k	–	Ω
Channel Separation (L + R Reference)*				7	25	40	–	dB
Channel Balance (Monaural)				7	–	0.3	3	dB
Monaural Gain			V_{IN} = 180 mV		3	6	9	dB
Stereo/Monaural Gain Ratio*				7	–	±0.3	±3	dB
Indicator Lamp – Turn-ON Voltage		5	19-kHz pilot-tone @ Term. 1	7	–	4	–	mV
Capture Range (Deviation from 76-kHz center frequency)		7, 8	19-kHz pilot-tone voltage = 18 mV	7	±6.6	±10	–	%
Distortion (75-μs de-emphasis): 2nd Harmonic			V_{IN} = 240 mV	7	–	0.2	–	%
3rd, 4th, and 5th Harmonic				7	–	<0.1	–	%
19-kHz Rejection				7	–	35	–	dB
38-kHz Rejection				7	–	25	–	dB
SCA (storecast) Rejection				7	–	55	–	dB
Stereo Defeat Voltage (V_4)					–		<0.9	V
Stereo Enable Voltage (V_4)					>1.6		–	V

NOTE: For improved pilot sensitivity and overload characteristics, replace the .039 μF capacitor between Terminals 7 and 8 with a Series L-C Network (L = 4.7 mH, C = 0.015 μF). Under these conditions, Indicator Lamp Sensitivity: 'ON' = 3.3 mV , 'OFF' = 2.0 mV

* For stereo operation, test conditions require a composite stereo input signal (modulated at 1 kHz) including a 19-kHz (18 mV) pilot-tone signal.

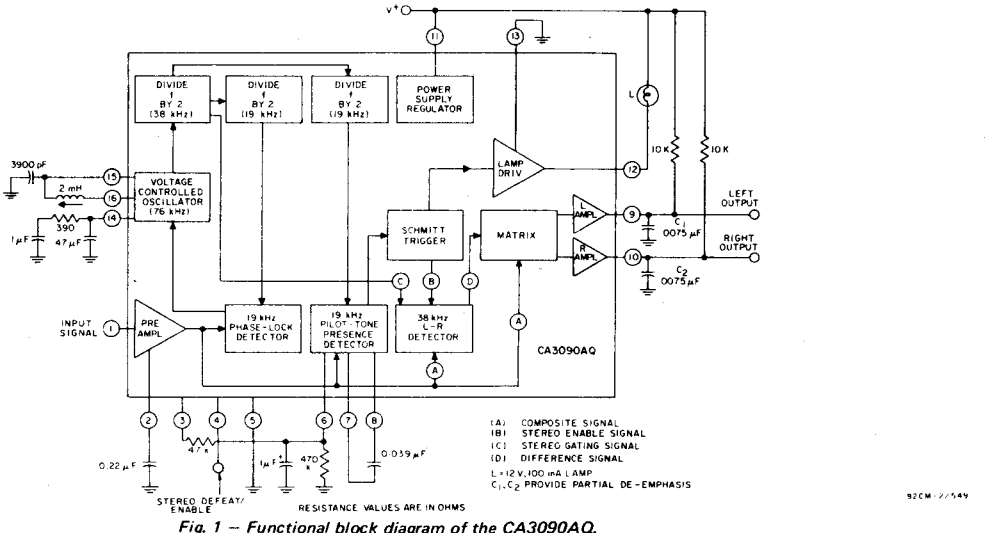


Fig. 1 – Functional block diagram of the CA3090AQ.

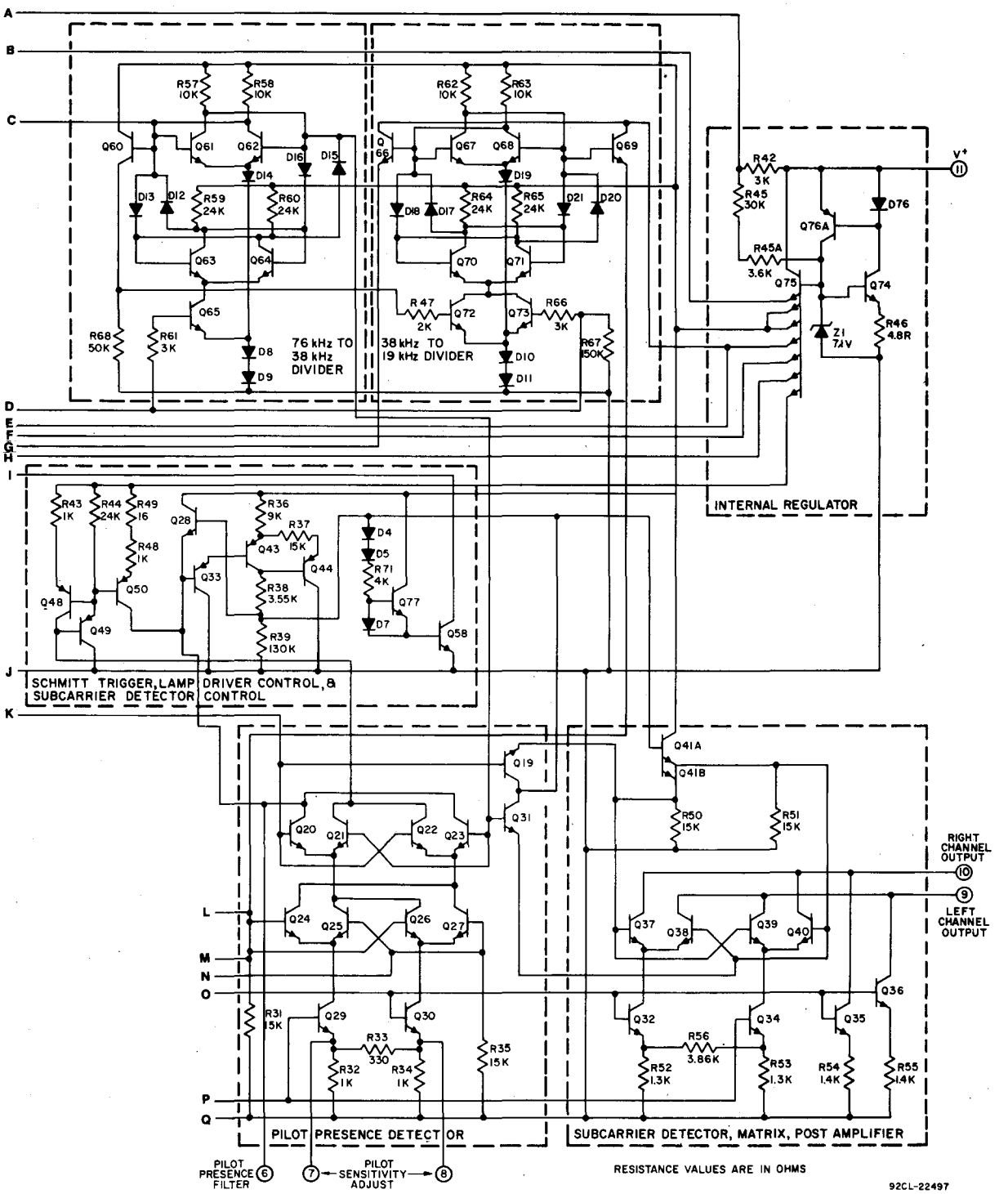


Fig. 2 - Schematic diagram of the CA3090AQ (cont'd from previous page).

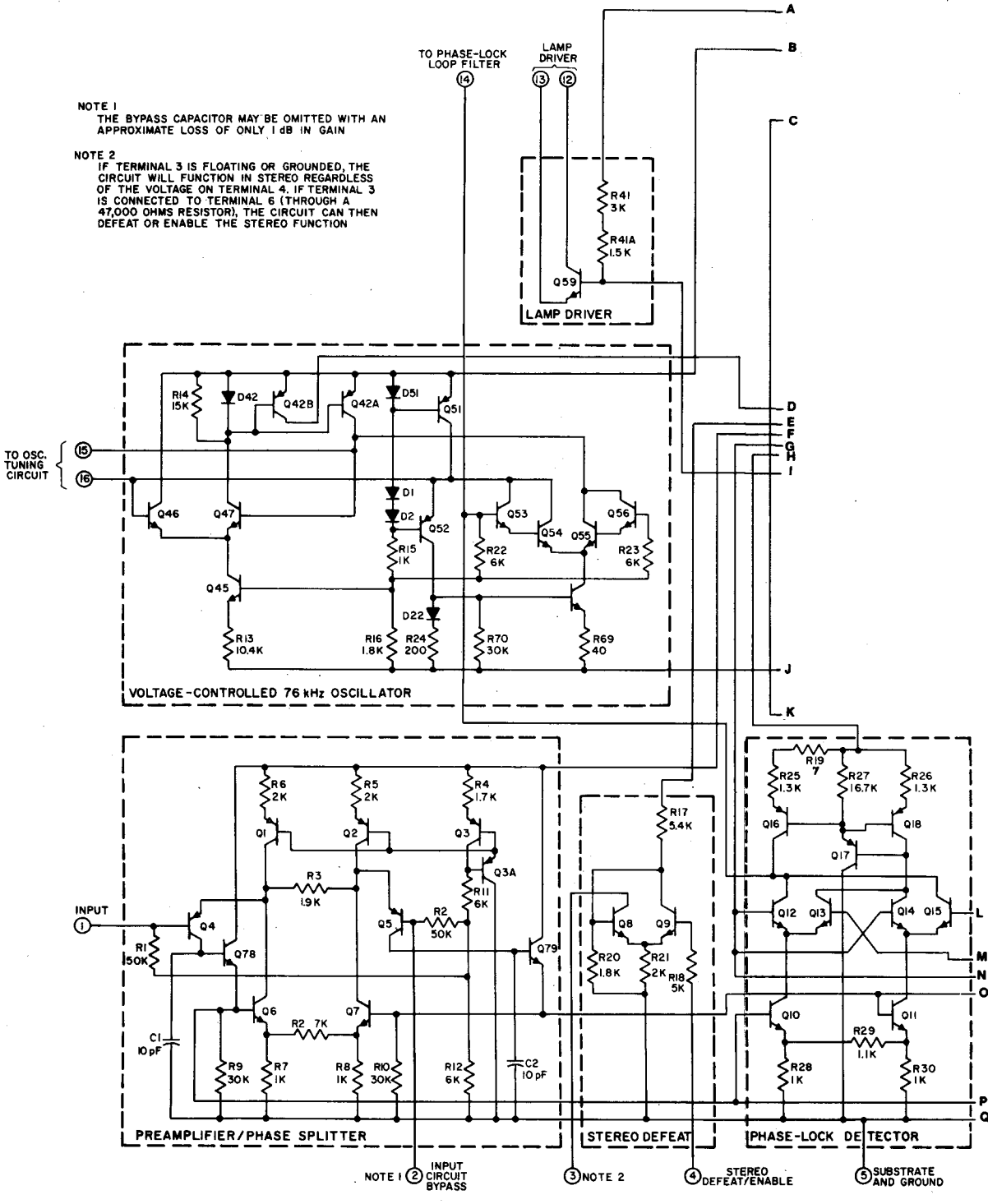


Fig. 2 - Schematic diagram of the CA3090AQ (cont'd on next page).

CA3090AQ

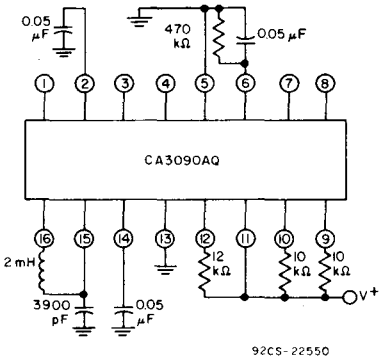


Fig. 3 – Test circuit for DC characteristics.

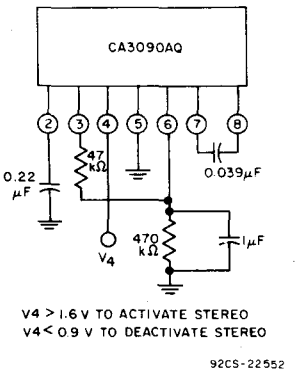


Fig. 5 – Test circuit for use with stereo defeat/enable.

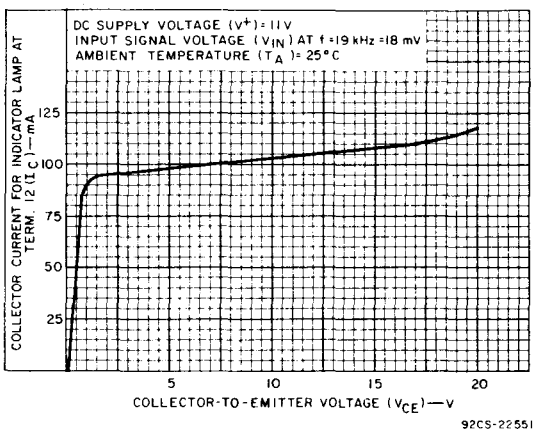


Fig. 4 – Indicator lamp characteristics (I_C vs. V_{CE}).

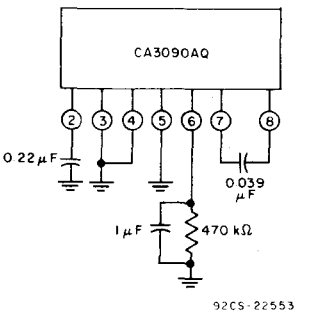


Fig. 6 – Test circuit for use without stereo defeat/enable.

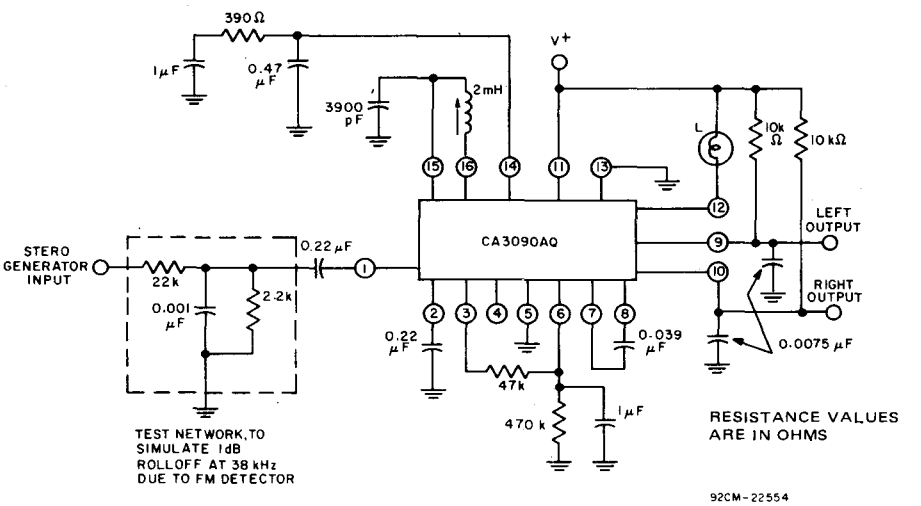


Fig. 7 – Test circuit for measurement of dynamic characteristics.

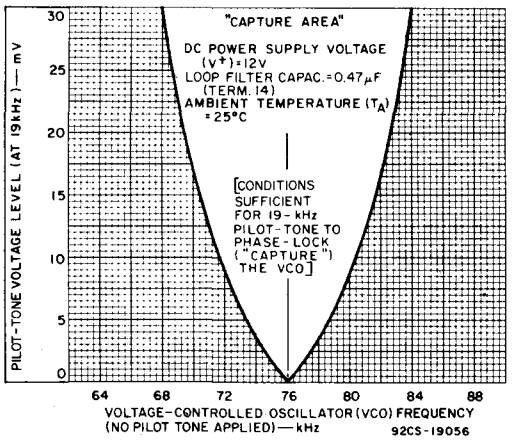


Fig. 8 – Pilot-tone voltage level vs. VCO frequency with no pilot-tone applied.

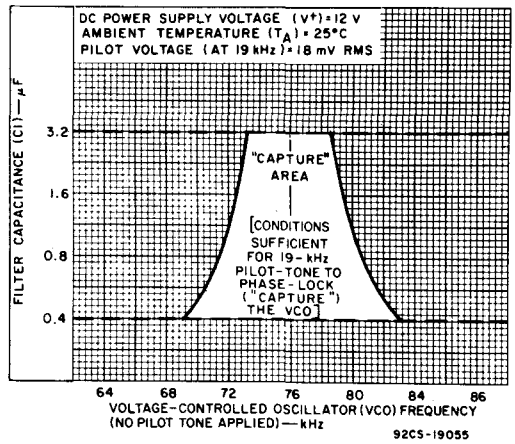
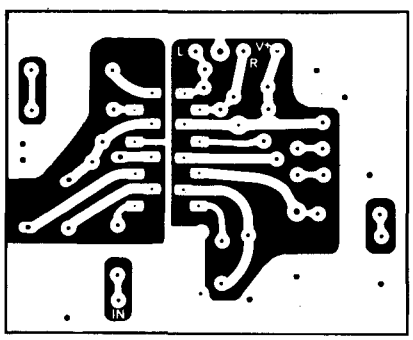
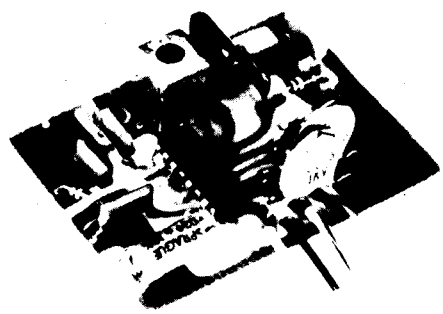


Fig. 9 – Filter capacitance vs. VCO frequency with no pilot-tone applied.



A—Foil side.



B—Component side.

Fig. 10 – Photographs of the CA3090AQ and outboard components mounted on a 2 X 2½-inch printed-circuit board to constitute a complete stereo multiplex decoder.