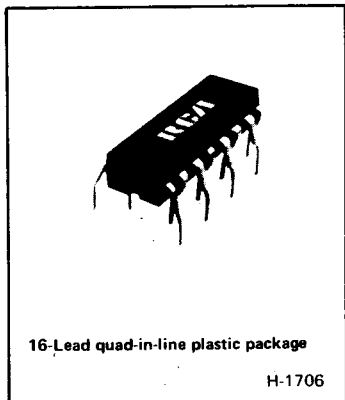


## CA3090AQ



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

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

- 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.

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  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$ .

\*Formerly Developmental Type No. TA6262G.

### MAXIMUM RATINGS, Absolute-Maximum Values at $T_A = 25^{\circ}\text{C}$ :

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

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

ELECTRICAL CHARACTERISTICS

CHARACTERISTIC	TERMINAL MEASURED AND SYMBOL	TEST CONDITIONS			LIMITS			UNITS
		Typ. Char. Curve Fig. No.	T <sub>A</sub> = 25°C V <sub>+</sub> = 12 V (unless specified otherwise)	Circuit Fig. No.	Min.	Typ.	Max.	
<b>Static Characteristics</b>								
Total Current (Terms. 9, 10, 11)	I <sub>total</sub>		Lamp OFF	3	—	22	27	mA
DC Voltage:								
Term. 1	V <sub>1</sub>			3	1.6	2.3	3.1	V
Term. 6 (Indicator Lamp OFF)	V <sub>6</sub>			3	—	2.1	3.6	V
Terms. 9 and 10	V <sub>9 &amp; 10</sub>			3	3.7	5.4	7.4	V
Term. 12 (Indicator Lamp OFF)	V <sub>12</sub>		V <sup>+</sup> = 16 V		12.7	—	—	V
Voltage Differential (Term. 2—Term. 1)	V <sub>2</sub> - V <sub>1</sub>			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 <sub>IN</sub> (at f = 19 kHz) = 18 mV	1	75	100	—	mA
<b>Dynamic Characteristics</b>								
Input Impedance	Z <sub>IN</sub>			7	—	50k	—	Ω
Channel Separation (L + R Reference)*				7	25	40	—	dB
Channel Balance (Monaural)				7	—	0.3	3	dB
Monaural Gain			V <sub>IN</sub> = 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 <sub>IN</sub> = 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 <sub>4</sub> )					—	—	<0.9	V
Stereo Enable Voltage (V <sub>4</sub> )					>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.

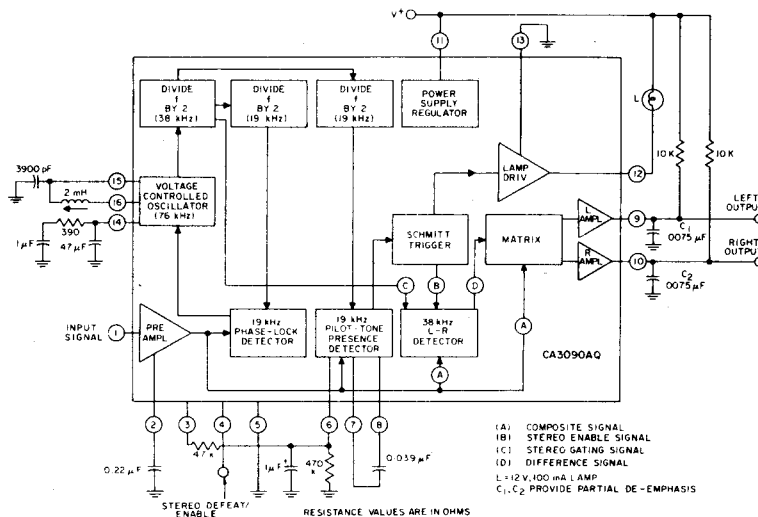


Fig. 1 — Functional block diagram of the CA3090AQ.

# Linear Integrated Circuits

## CA3090AQ

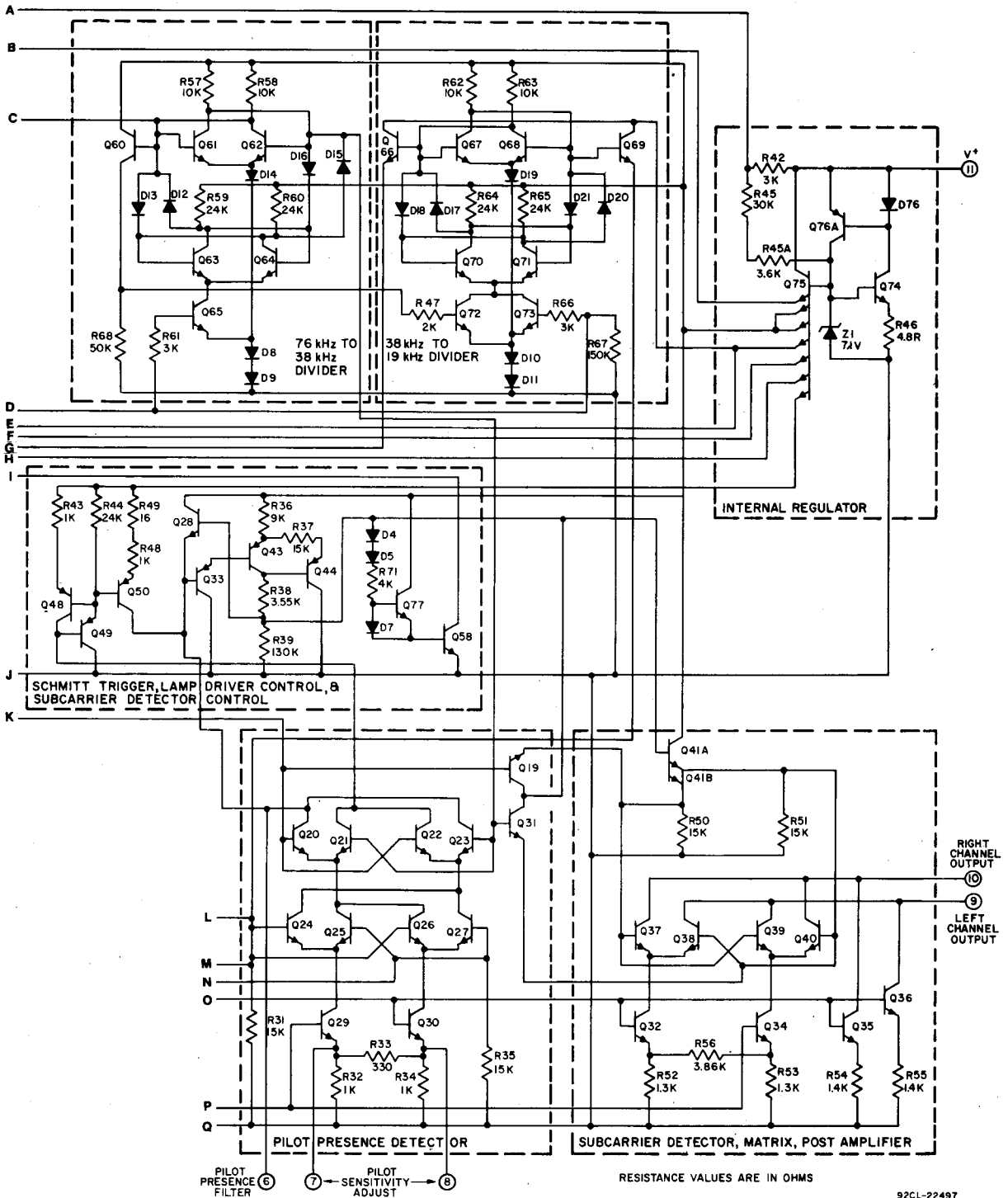


Fig. 2 - Schematic diagram of the CA3090AQ (cont'd from previous page).

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CA3090AQ

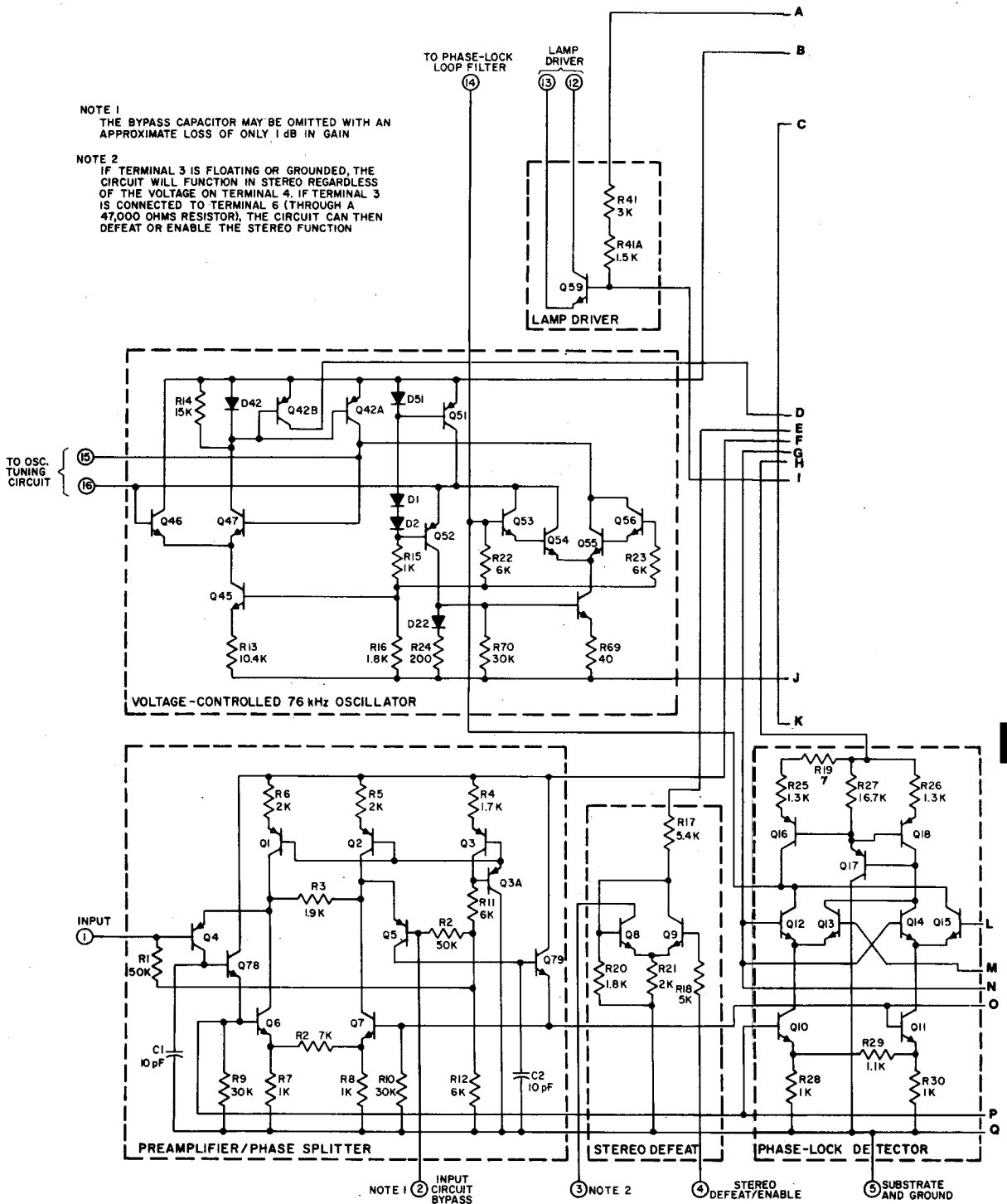
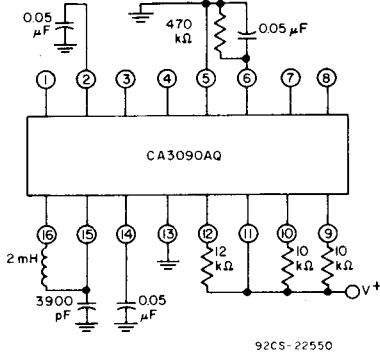


Fig. 2 - Schematic diagram of the CA3090AQ (cont'd on next page).

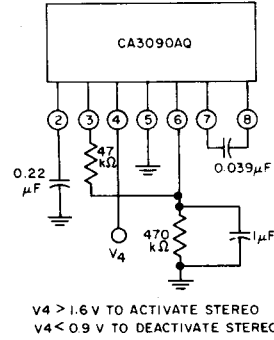
# Linear Integrated Circuits

## CA3090AQ



92CS-22550

Fig. 3 - Test circuit for DC characteristics.



92CS-22552

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

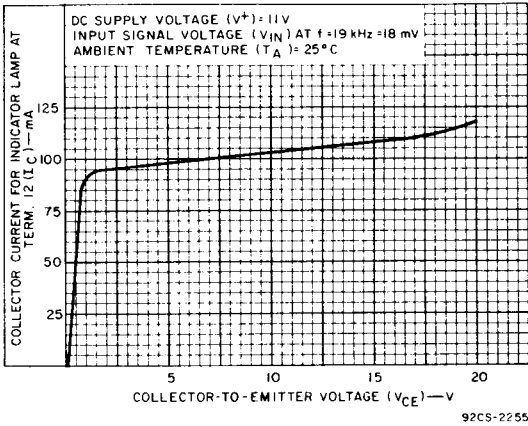
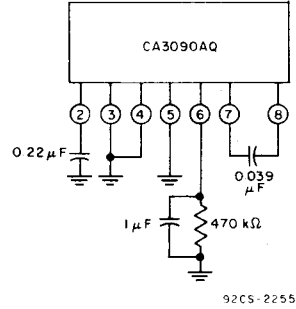
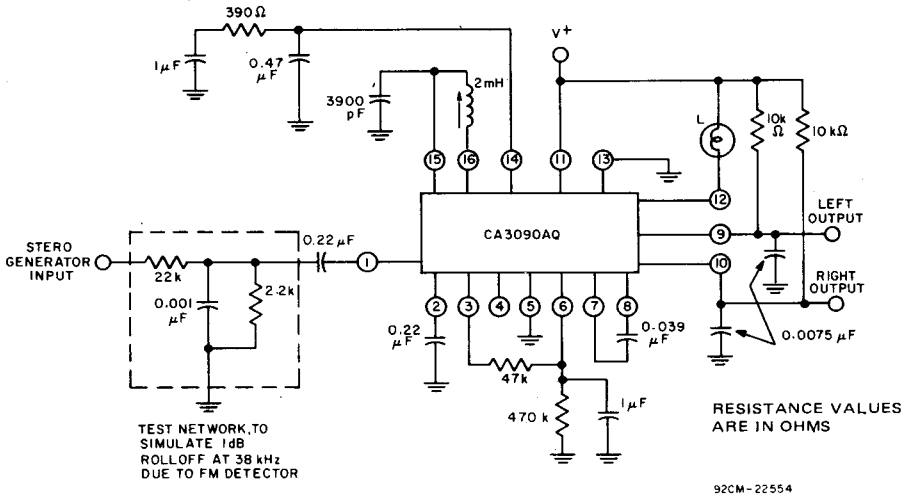


Fig. 4 - Indicator lamp characteristics ( $I_C$  vs.  $V_{CE}$ ).



92CS-22553

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



92CM-22554

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

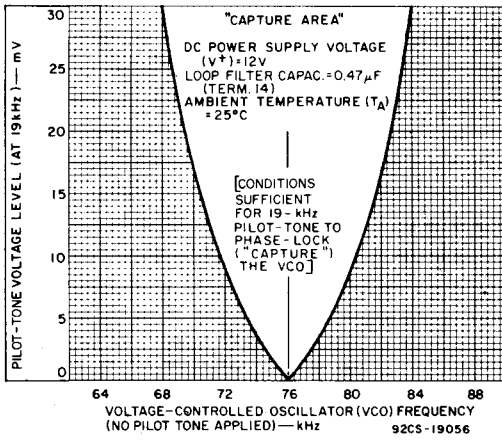


Fig. 8 — Pilot-tone voltage level vs. VCO frequency with no pilot-tone applied.

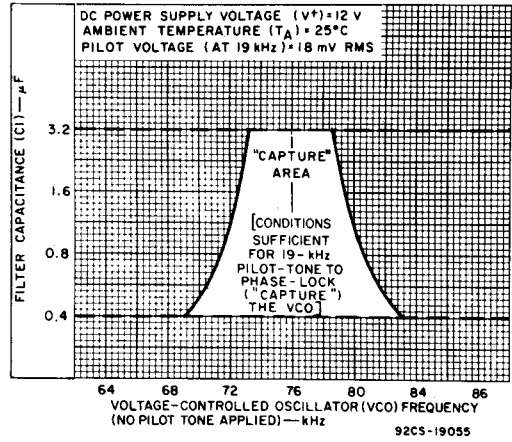
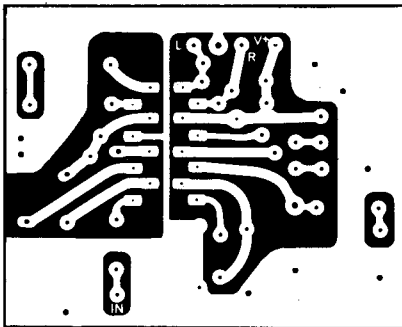
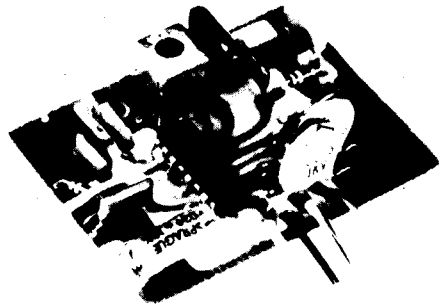


Fig. 9 — Filter capacitance vs. VCO frequency with no pilot-tone applied.



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.