INSTRUCTION MANUAL
MODEL SCG-6/SCD-2
SUBCARRIER SYSTEM

MOSELEY ASSOCIATES, INC
Santa Barbara Research Park
111 Castilian Drive
Goleta, California 93017

August 1968

INSTRUCTION MANUAL

MODEL SCG-6/SCD-2

SUBCARRIER SYSTEM

Introduction

The Moseley Associates, Inc. Model SCG-6 Subcarrier Generator and the Model SCD-2 Subcarrier Detector collectively form a Subcarrier System designed to provide the broadcaster with a means for adding additional communications-grade channels to an aural STL such as the Moseley Associates, Inc. Model PCL-303. Intended primarily to convey control tones from the studio to the transmitter site for remote control purposes, the SCG-6/SCD-2 Subcarrier System may be used for other purposes such as signaling, communications, or data transmission.

The SCG-6/SCD-2 Subcarrier System features simplicity and stability of operation, small size, all silicon semiconductors, and excellent access for test or adjustment purposes. Both the SCG-6 Subcarrier Generator and the SCD-2 Subcarrier Detector have their major electronic portions on plug-in printed circuit boards. Because of the high performance of the integrated circuit transistor arrays used, the SCG-6/SCD-2 Subcarrier System can, on special order, be placed on any frequency from 20 kHz upwards to 200 kHz.

Specifications

Model SCG-6 Subcarrier Generator

Input Impedance	Greater than 5 K ohms
Input Level	6 volts peak-to-peak nominal; remove internal strap for 0.5 volts peak-to-peak
Frequency Response	50 Hz to 7500 Hz ±2 db
Modulation Distortion	Less than 3% at 10% deviation
Noise Level	Better than 60 db below 10% deviation
Output Level	Adjustable up to 3 volts peak-to-peak into 2000 Ω or more load resistance
Minimum Load Resistance	2000 Ω
Maximum Load Capacitance	1000 picofarads
Center Frequency Stability	Less than 1% drift in 6 months; Less than 1% shift from 0°F to 140°F

Model SCD-2 Subcarrier Detector

Input Impedance	4700 ohms
Input Subcarrier Level	1.5 volts peak-to-peak normal; 0.5 volts peak-to-peak minimum
Frequency Range	25 kHz to 200 kHz as specified
Bandpass Filter Selectivity	±6% of subcarrier frequency at -6 db; ±20% of subcarrier frequency at -40 db
Frequency Response	±2 db, 50 Hz to 4000 Hz
Demodulator Distortion	Less than 3%
Noise Level	Better than 60 db below 10% deviation
Output Level	6 volts peak-to-peak nominal, no load
Output Load Impedance	600 Ω or greater
Output Impedance	50 Ω unbalanced

Each Unit

Power Requirements	117/240 VAC, 50-60 Hz, 10 watts
Operating Temperature Range	0°F to 140°F
Size	$3\frac{1}{2}$" x 19" x $7\frac{1}{2}$"
Weight	7 lbs
Domestic Shipping Weight	12 lbs.

Installation

The SCG-6 Subcarrier Generator may be placed at any location near the aural STL with which it is used It is usually placed in the same rack as the STL, but it may be placed closer to the source of modulation, such as a remote control system. The output cable on the SCG-6 should have less than 1000 picofarads of capacity. For this reason it is recommended that it be placed near the aural STL transmitter. There are no particular requirements as regards ventilation although placement immediately above heat-producing equipment is not recommended The unit should be securely mounted in the rack and the 3-connector power cable connected to a source of the appropriate voltage. The device is factory wired for 117 VAC but may be field converted to 240 volts if required

The input, normally from the remote control system, is a BNC connector appropriately labeled on the rear of the unit. The output, also a Type BNC connector, drives the aural STL multiplex input.

No adjustments should be made at this time on the SCG-6.

The SCD-2 Subcarrier Detector should be placed somewhere near the aural STL receiver from which the subcarrier is derived. The multiplex output of the STL receiver is connected to the input of the SCD-2; the output of the SCD-2, normally the control tones for the remote control system, is connected to the control input on the remote control system.

Placement in the rack, ventilation, and power requirements for the SCD-2 are identical to the SCG-6.

Principles of Operation

Discussing first the SCG-6 Subcarrier Generator, refer to the schematic for this unit, drawing number 91B 6272.

Integrated circuit IC-301 is a free-running multivibrator whose frequency is determined both by timing components (C-202 through C-205, R-209, and R-212) and by applied voltages

To determine the center frequency, the DC voltage applied to the timing circuit is variable. This is accomplished by changing the value of R-203, labeled FREQUENCY. To modulate the frequency of this multivibrator, an AC input from the MODULATION potentiometer is applied through blocking capacitor C-201.

The output of this oscillator is a square wave which may be viewed at the yellow test point. It is applied to a buffer, the output of which is available at the green test point. The square wave is then sinusoidalized with a low-pass filter, and the output of the filter is available at the blue test point. This sine wave is amplified and observable at the violet test point. The output buffer amplifier drives the output level control. The output of this amplifier appears at the grey test point.

The controls are set at the factory for remote control operation and should not be disturbed unless proven necessary. The MODULATION control determines the amount of modulation of the subcarrier by the control tone. The FREQUENCY control determines the center frequency of the generator. The OUTPUT control sets the level of the subcarrier going to the aural STL.

Refer now to the schematic for the SCD-2 Subcarrier Detector, drawing number 91C 6273.

The input (from the multiplex output of the aural STL) is applied to the bandpass filter. This filter has been sweep-aligned at the factory and should not be disturbed. The adjustments do not drift enough under any condition to affect performance, and nothing will be gained by attempting to realign the device in the field unless a sweep generator is available. The output of the filter is the selected subcarrier, its level being a normal 0.3 volts peak-to-peak as seen at the yellow test point. It is applied to the detector board.

The first stage on the board is integrated circuit IC-301, the first section being an emitter-follower buffer (output at the yellow test point) driving an amplifier (output of which is at the green test point). The output of this amplifier is applied to the

back-to-back silicon diode limiter using CR-301 and CR-302. The output of the limiter is applied to an amplifier and then an emitter follower.

This emitter follower is used as a buffer to drive the Schmitt trigger shaping circuit using the first two transistors in IC-302. The output of this circuit is available at the violet test point. The pulse-counting demodulator using the last two transistors in IC-302 demodulates the FM subcarrier.

The output of the pulse counter is applied to a buffer using the first transistor in IC-303. This buffer is viewable at the gray test point, and it drives a low-pass filter for subcarrier-ripple removal. This filter cuts off at about 10 kHz. The output from the filter is amplified, de-emphasized, and applied to the output buffer Q-301. The output of the system is observable at the white test point and appears at the BNC connector marked OUTPUT.

The power supplies in both units are identical. Each uses a 3-conductor plug and cable for primary power, a split-primary transformer, a plug-in bridge rectifier, and Zener diode regulation.

Adjustment

The SCG-6 and the SCD-2 should not have adjustments made on them unless it is shown that they are definitely at fault. An ordinary oscilloscope may be used for the following adjustments.

The OUTPUT level adjustment on the SCG-6 should be adjusted for a level of 1.5 volts peak-to-peak of subcarrier out of the Model PCL-303 STL receiver multiplex output

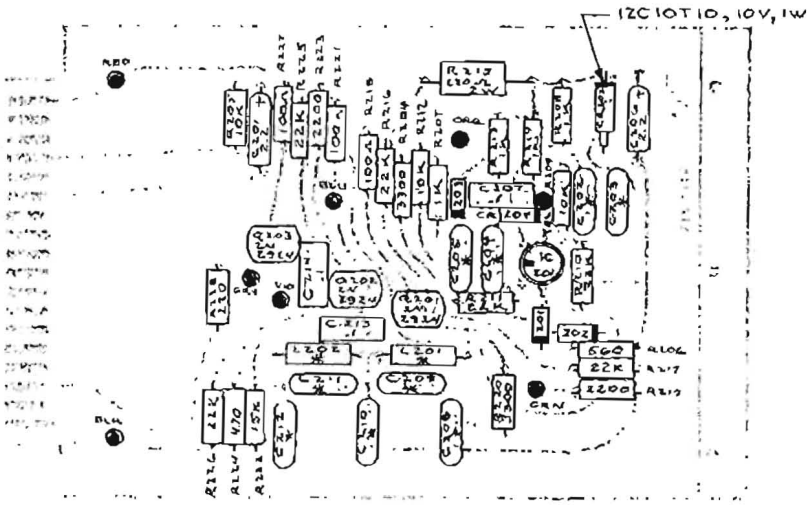
The FREQUENCY adjustment may be adjusted for maximum subcarrier signal at the detector board orange test point. This signal may appear to have amplitude modulation which is caused by the input bandpass filter selectivity.

The MODULATION control may be adjusted until the above mentioned amplitude modulation is about 20% when the remote control tone is present

It is assumed that the remote control equipment is connected during these tests. If an audio oscillator is used to supply the modulating signal to the SCG-6, set its output level at 6 volts peak-to-peak at a frequency of 1000 Hz

The multiturn potentiometer on the SCD-2 may be adjusted for maximum output from the SCD-2 and then turned counterclockwise until the output level drops 1.5 db. The output level from the SCD-2 at this time should be between 4 volts and 6 volts peak-to-peak.

This completes any adjustment that is likely to be required in the field.



NOTES:

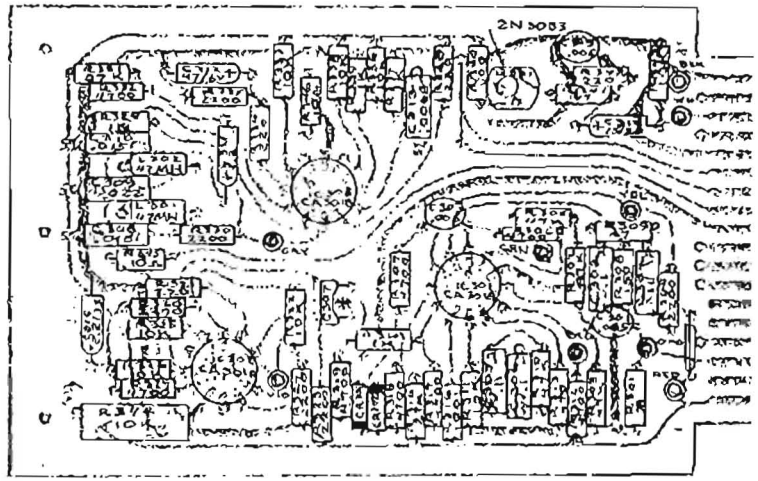
1. SCHEMATIC 91B6272
2. ⊣▭⊢ DENOTES IN4154
3. RESISTORS IN OHMS, ½W, 10%
   UNLESS SPECIFIED
4. CAPACITORS IN MICROFARADS
   UNLESS SPECIFIED
5. I.C. IS CA3028
6. TRIM & DRILL IS 51A5118
7. ◉ DENOTES TEST POINT JOHNSON # 105-850
8. ✳ DENOTES FREQUENCY-DEPENDENT
   COMPONENT.

REVISIONS

MOSELEY ASSOCIATES, INC.
SANTA BARBARA, CALIFORNIA

COMPONENT LAYOUT
SCG-6 SUBCARRIER GENRTR.

TOL FRACT	.X	XX	.000	XXX	ANG
DWN		11/6/68	SCALE	FULL	
CHK	T.K.V	11/68	20A2084		
ENG					



NOTES:

1. SCHEMATIC 91C 6273
2. TRIM + DRILL 51A5132
3. UNLESS SPECIFIED OTHERWISE.
   RESISTORS ARE OHMS, ½W, 10%
   CAPACITORS ARE MICROFARADS
4. * DENOTES SELECTED VALUE

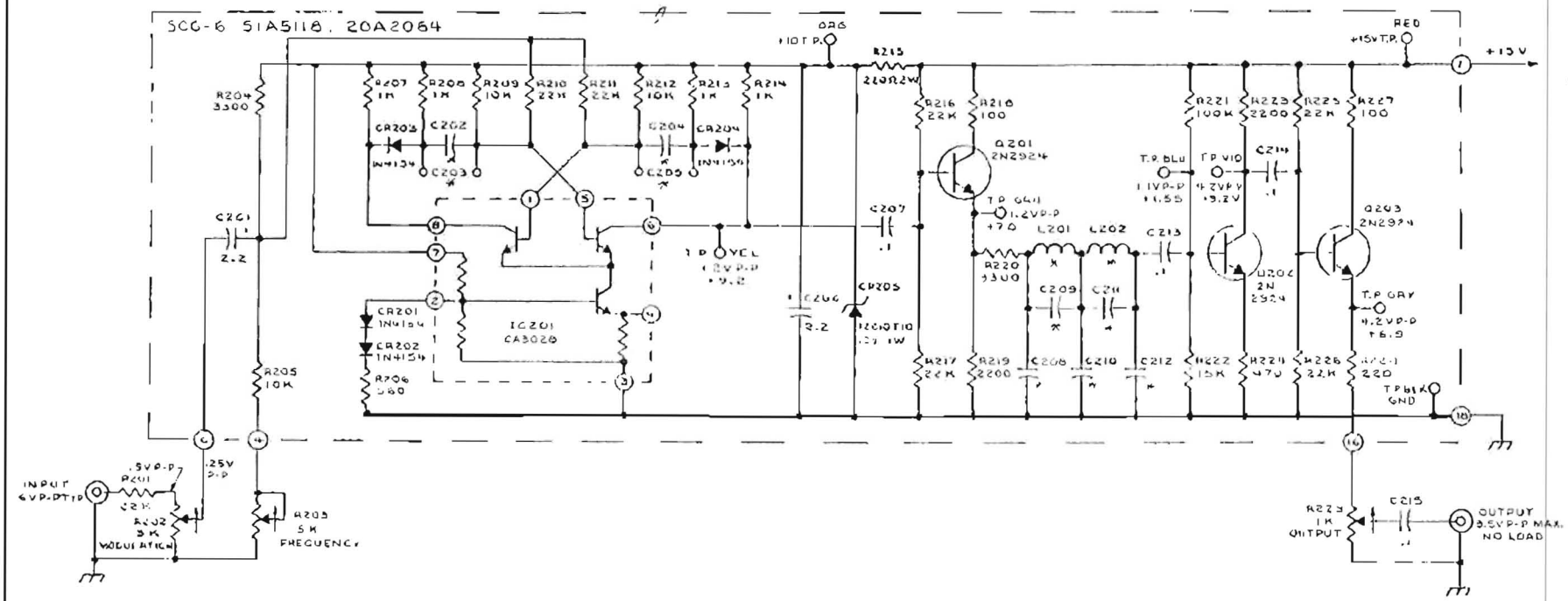
REVISIONS		DATE
B	ADD C316 & CHGS PER ECO 1198	9/68
A	COMPONENTS PER ECO 1183	

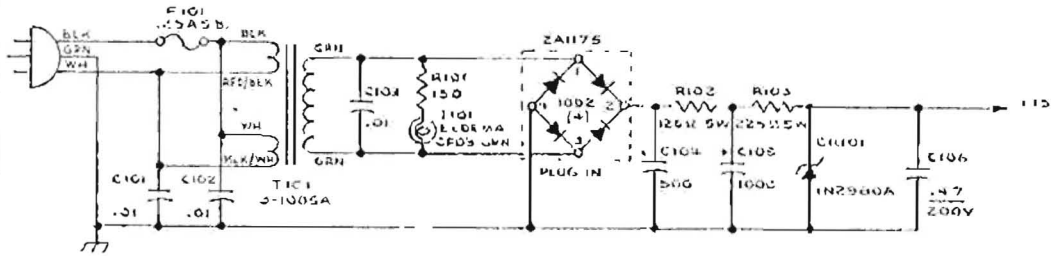
MOSELEY ASSOCIATES, INC.
SANTA BARBARA, CALIFORNIA

COMPONENT LAYOUT
DEMODULATOR SCD-2

TOL FRACT ± 1/32 XX ± 0.01 XXX ± .010

DWN		7/68	SCALE
CHK	FXY	8/68	20A2055 B
ENG			





185

135 KHZ

NOTES

1. UNLESS OTHERWISE SPECIFIED RESISTOR VALUES ARE IN OHMS, 1/2W, 10% CAPACITOR VALUES ARE IN MICROFARADS.
2. DENOTES FREQUENCY DEPENDENT COMPONENT

MOSELEY ASSOCIATES, INC.
SANTA BARBARA, CALIFORNIA

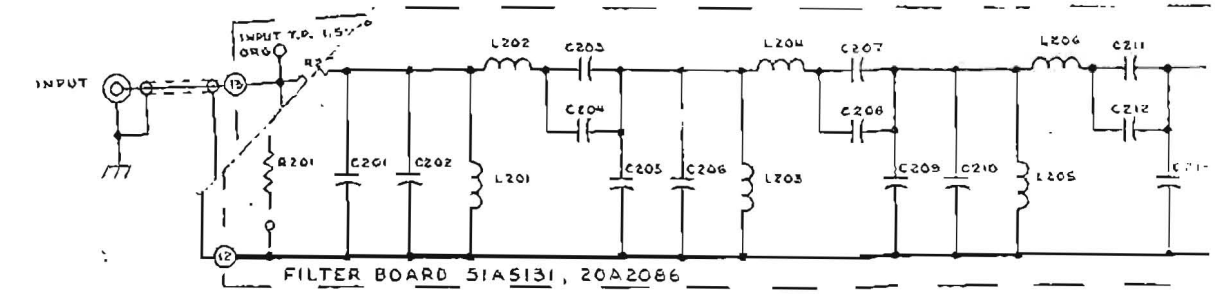
SCHEMATIC
SUBCARRIER GENERATOR SCG-6

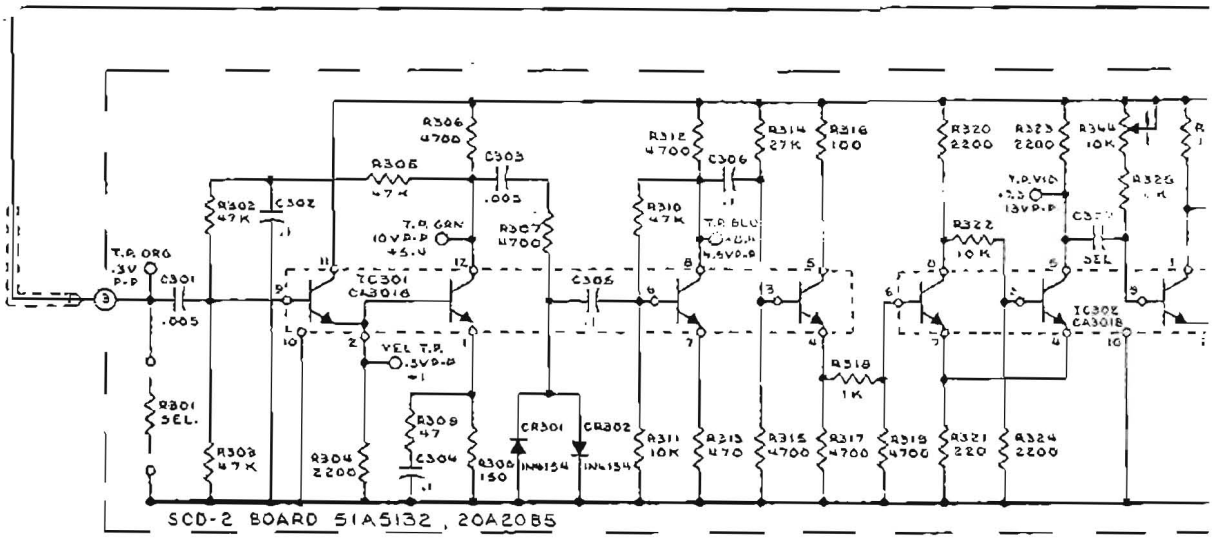
TOL FRACT ± 1/32, XX ± .030, XXX ± .010

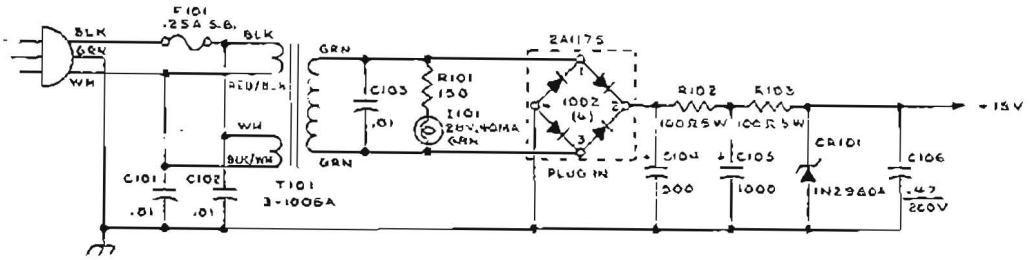
DWN	F.K.V	7/66	SCALE NONE
CHK			

DATE
REVISIONS

91B 6272

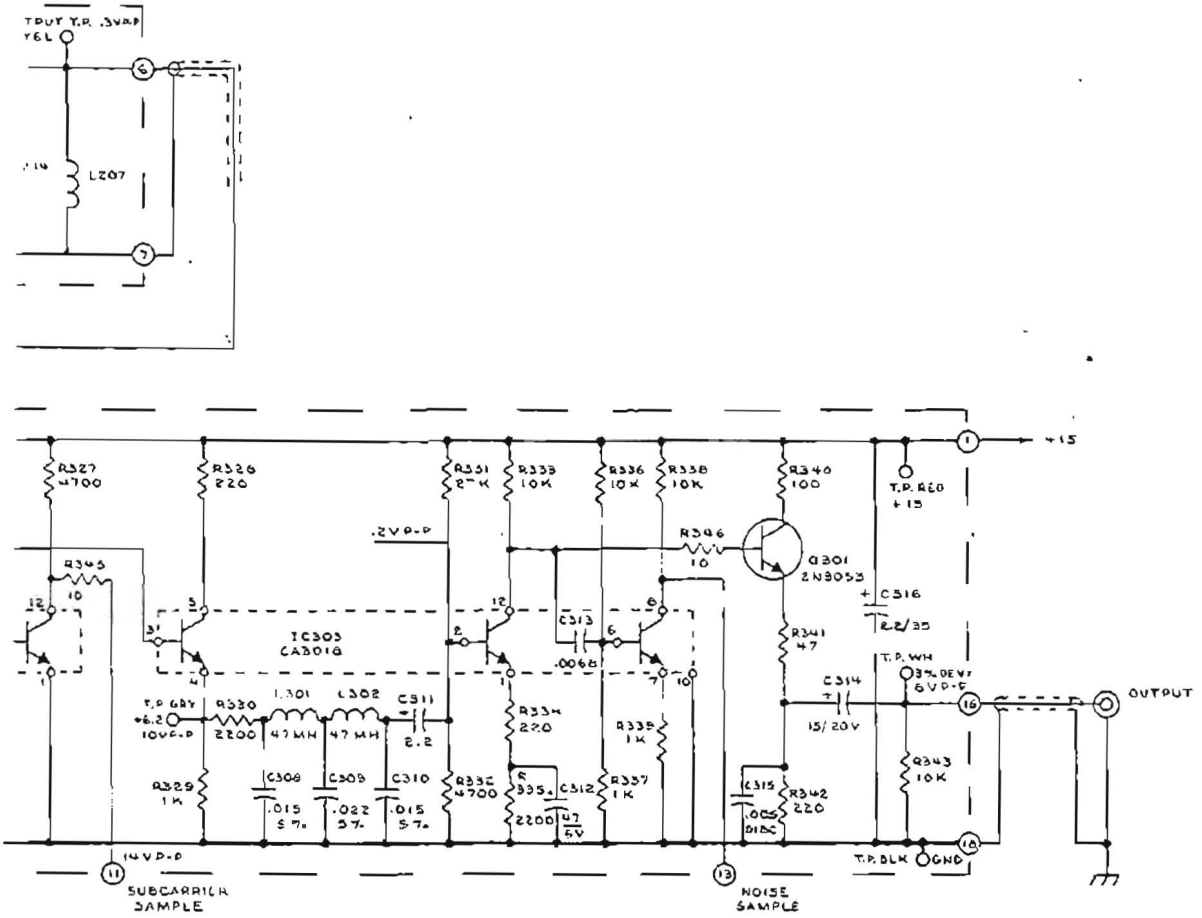






NOTES:

1. UNLESS OTHERWISE SPECIFIED RESISTOR VALUES ARE IN OHMS, 1/2 W, 10%. CAPACITOR VALUES ARE IN MICROFARADS.



REVISIONS	DATE	
B	ADDED R 103 WERE 1250, ADD C316, R351 WAS 150, R334 WAS 150, ECO 1256	5/68
A	COMPONENT VALUE CHANGES PER ECO 1051	4/68

MOSELEY ASSOCIATES, INC.
SANTA BARBARA, CALIFORNIA

SCHEMATIC
SUBCARRIER DEMODULATOR SCD-2

TOL FRACT ± .020	.XX ± .010	.XXX ± .010		
DWN	F X Y	7/68	SCALE: NONE	
CHK			91C6273	B
ENG	J.T.	7-68		