INSTRUCTION MANUAL

FC-30
SCA GENERATOR

May, 1984

IM No. 597-0008

BROADCAST ELECTRONICS, INC.

on TCC

IMPORTANT INFORMATION

EQUIPMENT LOST OR DAMAGED IN TRANSIT

When delivering the equipment to you, the truck driver or carrier's agent will present a receipt for your signature. Do not sign it until you have (a) inspected the containers for visible signs of damage and (b) counted the containers and compared with the amount shown on the shipping papers. If a shortage or evidence of damage is noted, insist that notation to that effect be made on the shipping papers before you sign them.

Further, after receiving the equipment, unpack it and inspect thoroughly for concealed damage. If concealed damage is discovered, immediately notify the carrier, confirming the notification in writing, and secure an inspection report. This item should be unpacked and inspected for damage WITHIN 15 DAYS after receipt. Claims for loss or damage will not be honored without proper notification of inspection by the carrier.

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FOR TECHNICAL ASSISTANCE
Phone (217) 224-9600 Customer Service

WARRANTY ADJUSTMENT

Broadcast Electronics, Inc. warranty is included in the Terms and Conditions of Sale. In the event of a warranty claim, replacement or repair parts will be supplied F.O.B. factory. At the discretion of Broadcast Electronics, the customer may be required to return the defective part or equipment to Broadcast Electronics, Inc. F.O.B. Quincy, Illinois. Warranty replacements of defective merchandise will be billed to your account. This billing will be cleared by a credit issued upon return of the defective item.

RETURN, REPAIR AND EXCHANGES

Do not return any merchandise without our written approval and Return Authorization. We will provide special shipping instructions and a code number that will assure proper handling and prompt issuance of credit. Please furnish complete details as to circumstances and reasons when requesting return of merchandise. All returned merchandise must be sent freight prepaid and properly insured by the customer.

REPLACEMENT PARTS

Replacement and Warranty Parts may be ordered from the address below. Be sure to include equipment model and serial number and part description and part number.

Broadcast Electronics, Inc.
4100 N. 24th St., P.O. Box 3606
Quincy, Illinois 62305
Tel: (217) 224-9600
Telex: 25-0142
Cable: BROADCAST

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Broadcast Electronics, Inc. reserves the right to modify the design and specifications of the equipment in this manual without notice. Any modifications shall not adversely affect performance of the equipment so modified.

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SECTION I

1-1. EQUIPMENT DESCRIPTION.

1-2. The Broadcast Electronics Model FC-30 is a high-quality SCA generator suited for transmission of audio or dc coupled data on a multiplexed subcarrier (see Figure 1). Features of the FC-30 include an extremely stable oscillator providing very low FM noise and high modulation linearity. A controlled-decay subcarrier muting system eliminates receiver noise resulting from slow-to-act receiver squelch circuits; a fault common to many SCA generator designs.

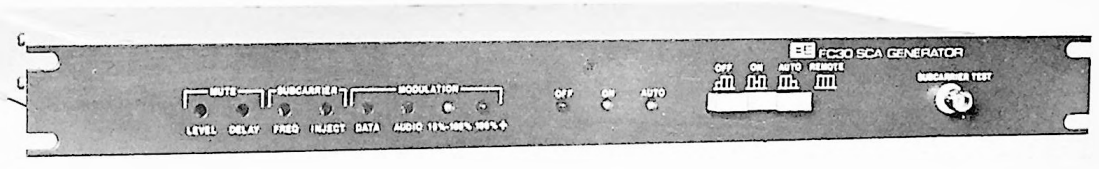

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FIGURE 1. FC-30 SCA GENERATOR

1-3. The FC-30 allows full remote control operation utilizing optically isolated inputs and outputs. All control inputs are configured to accept either positive or negative polarity control logic. A tapped dual-primary power transformer and a fused voltage selector/filter assembly allows operation from a wide range of ac input potentials.

1-4. The unit requires 1 3/4 inches (4.45 cm) of 19 inch (48.26 cm) vertical rack space for mounting. The FC-30 contains extensive RFI protection which allows mounting in the transmitter cabinet or in a separate enclosure. Input and output connections are made to a terminal strip and BNC connectors mounted to the SCA generator rear panel. A convenient subcarrier test connector along with all operating controls and indicators are located on the front panel. The SCA generator is available in one basic configuration as follows:

PART NO.	DESCRIPTION
909-0051	SCA Generator, 97 to 133V ac or 194 to 266V ac, Single Phase, 50/60 Hz with Accessory Kit consisting of: access cable, line cord, rack mounting hardware, and 1/16 Ampere fuse for 250 volt operation.

1-5. SPECIFICATIONS.

1-6. Refer to Table 1 for electrical and physical specifications relative to operation of the FC-30 SCA generator.

TABLE 1. ELECTRICAL AND PHYSICAL SPECIFICATIONS
(Sheet 1 of 2)

PARAMETER		SPECIFICATIONS
SUBCARRIER FREQUENCY		67 kHz (39 kHz to 95 kHz available on special order).
SUBCARRIER FREQUENCY STABILITY		±0.5% (335 Hz at 67 kHz), +32°F to +122°F (Ø°C to +50°C).
SUBCARRIER HARMONIC CONTENT		Less than 0.3%.
SUBCARRIER OUTPUT		Adjustable, 0.5V p-p to 4.0V p-p at 600 Ohms, Resistive, Unbalanced.
SUBCARRIER TEST OUTPUT		5.0V p-p at 10 k Ohms, Resistive.
SUBCARRIER ENVELOPE DECAY		Greater than 100 Milliseconds from 90% to 10% subcarrier level.
MODULATION CAPABILITY		±20% of Subcarrier Frequency, Maximum.
FM NOISE		Less than 72 dB (referenced at ±6 kHz deviation modulated at 400 Hz with 150 microsecond deemphasis).
INPUTS:	AUDIO	Adjustable from +10 dBm to -10 dBm for ±6 kHz deviation at 400 Hz, ac coupled, 600 Ohms, Resistive.
	DATA	Adjustable from 1.0V p-p to 4.0V p-p for ±6 kHz deviation, dc coupled. 10 k Ohm, Supplied with 75 Ohm Resistor Termination.
PREEMPHASIS:	AUDIO	150 Microseconds (75 microseconds with internal jumper).
	DATA	No preemphasis.
FREQUENCY RESPONSE:	AUDIO	±0.5% dB, 10 Hz to 10 kHz, exclusive of low-pass filter.
	DATA	±0.5 dB, dc to 10 kHz.
LOW-PASS FILTER		Sixth Order, -3 dB at 4.3 kHz (other filters available on special order). May be bypassed.
TOTAL HARMONIC DISTORTION		Less than 0.5% throughout pass band.
INTERMODULATION		Less than 0.5% 60 Hz to 7 kHz, 1:1 Ratio (low-pass and pre-emphasis filter bypassed).
CROSSTALK SCA TO STEREO		-60 dB or better. Below 100% modulation of left or right using 75 Microsecond deemphasis and FX-30 Exciter.

TABLE 1. ELECTRICAL AND PHYSICAL SPECIFICATIONS
(Sheet 2 of 2)

PARAMETER		SPECIFICATIONS
CROSSTALK STEREO TO SCA		-50 dB or better below ±6 kHz deviation of SCA using 150 Microseconds deemphasis, FX-30 Exciter and FC-30 Stereo Generator.
AUDIO MUTING LEVEL		Adjustable from 10 dB to 30 dB below program level.
AUDIO MUTING DELAY		Adjustable from 0.5 seconds to 10.0 seconds.
OPERATING TEMPERATURE RANGE		+32°F to +122°F (Ø°C to +50°C).
MAXIMUM ALTITUDE		Ø to 15,000 Feet (4572 m) above sea level.
HUMIDITY		95%, Non-condensing.
DIMENSIONS:	HEIGHT	1.75 inches (4.5 cm).
	WIDTH	19.0 inches (48.3 cm).
	DEPTH	9.0 inches (22.9 cm).
AC POWER REQUIREMENTS		97 to 133V ac or 194 to 266V ac, 50/60 Hz, 7 Watts.
WEIGHT:	UNPACKED	4.5 pounds (2 kg).

SECTION II

2-1. UNPACKING.

2-2. The equipment becomes the property of the customer when the equipment is delivered to the carrier. Carefully unpack the SCA generator. Perform a visual inspection to determine that no apparent damage has been incurred during shipment. All shipping materials should be retained until it is determined that the unit has not been damaged. Claims for damaged equipment must be promptly filed with the carrier or the carrier may not accept the claim.

2-3. The contents of the shipment should be as indicated on the packing lists. If the contents are incomplete, or if the unit is damaged electrically or mechanically, notify both the carrier and Broadcast Electronics, Inc.

2-4. ENVIRONMENTAL REQUIREMENTS.

2-5. Table 1 provides environmental conditions which must be considered prior to SCA generator installation.

2-6. INSTALLATION.

2-7. Each SCA generator is operated, tested, and inspected at the factory prior to shipment and is ready for installation when received. Installation is accomplished in three steps: 1) placement, 2) wiring, and 3) initial checkout.

2-8. PLACEMENT.

2-9. The SCA generator requires 1 3/4 inches (4.45 cm) of 19 inch (48.26 cm) rack space and may be mounted in any convenient location within reach of signal and power cables. The signal cables should be as short and direct as possible. The SCA generator should not be mounted directly above heat-generating equipment. It should also be noted that the more constant the ambient temperature in which the SCA generator operates, the greater the stability of the SCA generator oscillator. Otherwise no special requirements need be observed.

2-10. WIRING.

WARNING ENSURE AC POWER IS DISCONNECTED BEFORE PROCEEDING.

2-11. Set the SCA generator on a work surface.

2-12. Remove the top cover and assure the following connectors are correctly positioned:

A. REMOTE MODE CONTROL POLARITY SELECT. Plug P3 onto J3 if negative polarity control logic is to be used or J4 if positive polarity control logic is to be used (see Figure 2).

B. REMOTE MODE INDICATOR POLARITY SELECT. Plug P5 onto J5 if negative polarity output is desired or J6 if positive polarity output is desired (see Figure 2).

C. PREEMPHASIS SELECTION. P8 must be inserted onto J8 if 150 microsecond preemphasis is desired. If 75 microsecond preemphasis is desired, P8 must be positioned over one pin only of J8 so that the connection across J8 is opened.

D. DATA INPUT FILTER BYPASS SELECT. If the data input is to be used and no low-pass filter is desired, insert P9 onto J9, pins 2 and 3. If the low-pass filter in the data path is desired, insert P9 onto J9, pins 1 and 2.

E. AUDIO LOW-PASS FILTER CUT-OFF FREQUENCY SELECT. Typically the low-pass filter in the SCA generator is configured for a cut-off frequency of 4.3 kHz but may be changed if desired. Refer to the SCA generator circuit board schematic diagram for further information.

2-13. Replace the top cover.

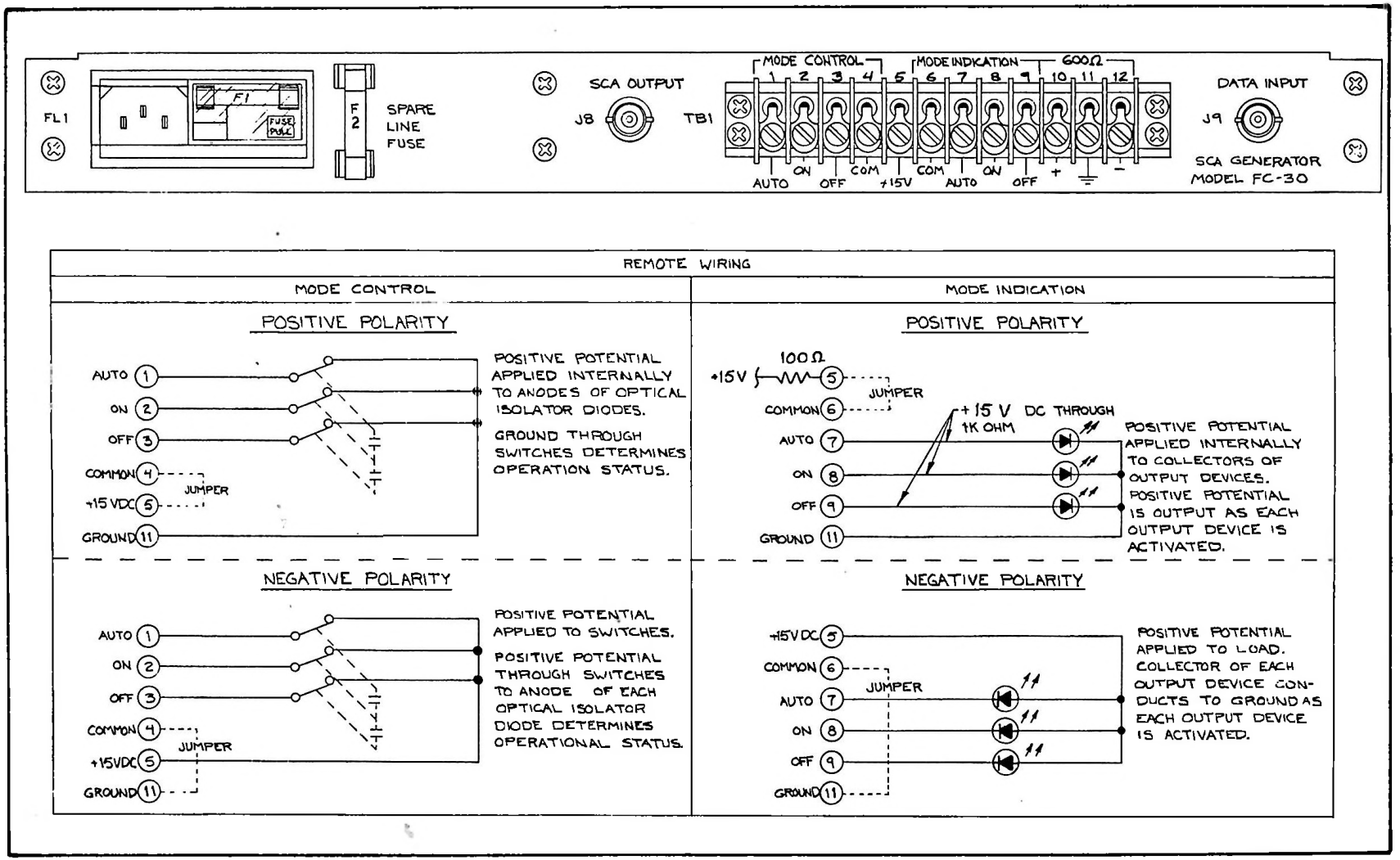

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FIGURE 2. SCA GENERATOR WIRING

2-14. Remove the fuse from the ac line voltage selector on the SCA generator rear panel.

2-15. Ensure the primary ac line voltage with which the SCA generator will be used is visible on the ac line voltage selector circuit board (100V, 115/120V, 220V, or 230/240V).

2-16. If the ac line voltage must be changed, remove the ac line voltage selector circuit board with a small pair of needle-nose pliers. Reinsert the circuit board so that the correct ac line voltage is visible when the circuit board is inserted into the receptacle.

2-17. Two fuses are shipped with the SCA generator. A 1/8 Ampere fuse is required for the 100/115 volt range and a 1/16 Ampere fuse is required for the 220/240 volt range. Both fuses must be slow-blow types.

2-18. Install the correct fuse for operation at the desired ac line voltage.

2-19. Mount the SCA generator in the rack.

2-20. Wire the audio inputs with 600 Ohm two-conductor shielded wire or the data input with 50 or 75 Ohm coaxial cable. To change input impedance of the data or audio inputs, refer to SCA Generator Block Diagram.

2-21. Wire the remote mode control inputs and the remote mode indicator outputs (see Figure 2).

2-22. INITIAL CHECKOUT.

2-23. Depress the front panel OFF switch.

2-24. Connect an ac power source to the unit. The OFF indicator will illuminate.

2-25. Depress the ON switch. The ON indicator will illuminate.

2-26. Connect a frequency counter to the SUBCARRIER TEST connector. Adjust the SUBCARRIER FREQ control to obtain the subcarrier frequency desired.

2-27. Adjust the SUBCARRIER INJECT control to obtain the level of SCA injection desired as indicated by the station modulation monitor (typically 8 to 10 percent). .

2-28. Apply programming to the SCA generator as follows:

(AUDIO) +10 dBm to -10 dBm @ 600 Ohms.
(DATA) 1.0V to 4.0V p-p.

2-29. Adjust the DATA or AUDIO MODULATION control (as applicable) to obtain the modulation level desired as indicated by the station modulation monitor. Normally, ±6 kHz deviation of the SCA is considered to be 100% modulation.

2-30. The 10%-100% MODULATION indicator will flash intermittently as the modulation level changes to provide a convenient indication of modulation activity. The SCA generator will normally be modulated 100% with an audio input in which case the 100%+ MODULATION indicator will flash intermittently as the modulation level peaks at 100% but will not remain illuminated unless the level exceeds 100%. The red 100% LED is factory calibrated to illuminate at a deviation of ±6 kHz.

2-31. The MUTE LEVEL and MUTE DELAY controls have an effect only when the AUTO switch is depressed and should be adjusted as desired:

A. The MUTE DELAY control adjusts the time delay between the end of the programming and when the carrier is muted. This delay is adjustable from one-half second to ten seconds (typically set for five seconds).

B. The MUTE LEVEL control adjusts circuitry which initiates a mute delay timing sequence whenever the audio input falls below a preset level. The MUTE LEVEL control is factory adjusted for 20 dB below 100% modulation with an audio input.

2-32. Depress the AUTO switch. The AUTO indicator will illuminate.

2-33. The unit is now ready for service.

SECTION III

3-1. OPERATION.

3-2. The following procedure assumes the SCA generator is completely installed and is free of any discrepancies.

3-3. Depress the OFF switch. The SCA generator will deenergize in a standby mode with no output. The OFF indicator will illuminate.

3-4. Apply programming to the SCA generator.

3-5. If continuous carrier output with no muting is desired, depress the ON switch. The ON indicator will illuminate and the SCA generator will be ready for service.

3-6. If it is desired that the carrier automatically mute with or without delay when programming is removed, depress the AUTO switch. The AUTO indicator will illuminate and the SCA generator will be ready for service.

3-7. The two mute adjustments have an effect only in the automatic mode of operation. The MUTE LEVEL control adjusts the level at which the carrier will mute and the MUTE DELAY control adjusts a variable delay associated with the muting circuit to compensate for slow-to-act receiver squelch circuits. These two controls should be adjusted for best operation by the user in each particular situation.

3-8. CONTROLS AND INDICATORS.

3-9. Refer to Figure 3 for the location of the controls and indicators associated with the SCA generator. The function of each control or indicator is described by Table 2.

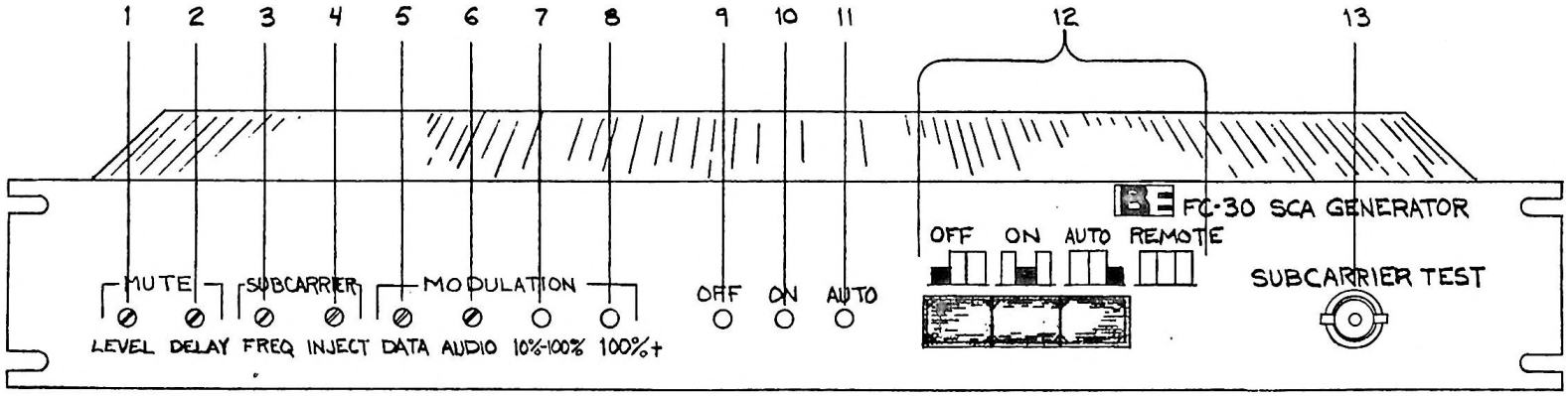

FIGURE 3. SCA GENERATOR CONTROLS AND INDICATORS.

TABLE 2. SCA GENERATOR CONTROLS AND INDICATORS
(Sheet 1 of 2)

INDEX NO.	NOMENCLATURE	FUNCTION
1	MUTE LEVEL Control (R67)	Presets an input signal threshold level below which the SCA generator output is muted. Operates only when the AUTO indicator is illuminated.
2	MUTE DELAY Control (R95)	Adjusts a timed delay of one-half to ten seconds initiated by the mute level circuitry which delays muting of the SCA carrier to allow the SCA receiver squelch circuitry time to react. Operates only when the AUTO indicator is illuminated.
3	SUBCARRIER FREQ Control (R89)	Adjusts the subcarrier output frequency.
4	SUBCARRIER INJECT Control (R91)	Adjusts the subcarrier output level.
5	DATA MODULATION Control (R13)	Adjusts the data signal input level.
6	AUDIO MODULATION Control (R35)	Adjusts the audio signal input level.
7	10%-100% MODULATION Indicator (DS5)	Illuminates to indicate the modulation level of the subcarrier is 10% or greater.
8	100%+ MODULATION Indicator (DS4)	Illuminates to indicate subcarrier modulation level is 100% or greater.
9	OFF Indicator (DS2)	Illuminates to indicate power is applied to the SCA generator and the unit is in standby with no output.
10	ON Indicator (DS3)	Illuminates to indicate the SCA generator carrier will not be muted when programming halts.
11	AUTO Indicator (DS1)	Illuminates to indicate the SCA generator carrier will be automatically muted when programming halts.

TABLE 2. SCA GENERATOR CONTROLS AND INDICATORS
(Sheet 2 of 2)

INDEX NO.	NOMENCLATURE	FUNCTION
12	SCA Generator ON/ OFF/AUTO/REMOTE Mode Switch (S1)	Provides local selection of the SCA generator operational modes. When all three switch sections are out, remote control is enabled. OFF switch (S1C): Configures equipment in standby mode with no output. ON switch (S1B): Configures equipment for operation in manual mode. Automatic muting inoperative. AUTO switch (S1A): Configures equipment for operation in automatic mode. Automatic muting operational.
13	SUBCARRIER TEST Receptacle (J10)	Provides a convenient front-panel SCA carrier test point. (5V p-p into 10 k)

SECTION IV

4-1. THEORY OF OPERATION.

4-2. Theory of operation for the SCA generator is presented by Figure 4.

SECTION V.

5-1. FIRST LEVEL MAINTENANCE.

WARNING DISCONNECT POWER PRIOR TO SERVICING.

5-2. Maintenance of the SCA generator falls into the category of good housekeeping and is limited to whatever cleaning may be necessary and checking the performance level of the unit.

A 75 OHM RESISTIVE INPUT TO DATA BUFFER U1A IS ESTABLISHED BY R2. R3A, B, C, AND D ARE CLOSELY SCALED TO MAXIMIZE NOISE IMMUNITY. R13 ALLOWS ADJUSTMENT OF THE DATA MODULATION LEVEL.

DATA INPUT 1.704V P-P

P6 RFI FILTER ASSEMBLY

AN INPUT IMPEDANCE OTHER THAN 600 OHMS MAY BE ESTABLISHED BY CHANGING R1 AND/OR R2.

A 600 OHM RESISTIVE INPUT TO AUDIO AMPLIFIER U1B/U1C IS ESTABLISHED BY R1. CAPACITORS C1/C2 PREVENT DC COUPLING AND RESISTORS R8/R9 PROVIDE SURGE PROTECTION FOR THE INPUT CIRCUIT.

AUDIO INPUT +10 TO -10dBm

75 US PREEMPHASIS IS PERMANENTLY WIRED. 150 US PREEMPHASIS MAY BE SELECTED BY CONNECTING J8/P8.

R3E, F, G, AND H ARE CLOSELY SCALED TO MAXIMIZE THE NOISE IMMUNITY OF AUDIO BUFFER U1D. R35 ALLOWS ADJUSTMENT OF THE AUDIO MODULATION LEVEL.

ADDITIONAL INPUT PROTECTION IS PROVIDED BY DIODES D7/D6 AND D5/D8. INPUT SIGNAL EXCURSIONS GREATER THAN ±15 VOLTS WILL BE SHORTED BY THE APPROPRIATE DIODE.

P8/J9 ALLOWS USE OR BYPASS OF THE LOW-PASS FILTER IN THE DATA PATH.

P8/J9 DATA INPUT FILTER BYPASS SELECT

U7D ACTS AS A SUMMING AMPLIFIER FOR THE AC COUPLED DATA OR THE DC COUPLED AUDIO WHEN EITHER SIGNAL IS ROUTED THROUGH THE LOW-PASS FILTER.

U10A PROVIDES GAIN EQUAL TO U9A/B/C/D WHEN THE LOW-PASS FILTER IS BYPASSED. U10A ALSO FUNCTIONS AS AN INVERTER WHEN THE LOW-PASS FILTER IS USED.

6TH ORDER LOW-PASS FILTER

AUDIO IS APPLIED TO U13 THROUGH R148 WHICH ADJUSTS DEVIATION. R89 ADJUSTS SUBCARRIER FREQUENCY, R80 ADJUSTS CANCELLATION OF ODD ORDER HARMONICS, AND R78 ADJUSTS CANCELLATION OF EVEN ORDER HARMONICS.

A SQUARE WAVE SIGNAL, REPRESENTATIVE OF THE SCA OUTPUT FREQUENCY IS AC COUPLED TO THE FRONT PANEL SUBCARRIER TEST CONNECTOR. R100 AND R101 PROVIDE PROTECTION FOR U13 IN CASE THE OUTPUT BECOMES SHORTED TO GROUND OR A SIGNAL IS FED BACK INTO THE SCA GENERATOR.

R91 ADJUSTS THE SCA SUBCARRIER OUTPUT LEVEL.

U16A, U16B, AND THE ASSOCIATED COMPONENTS FUNCTION AS AN 18 DB/OCTAVE LOW-PASS FILTER.

MODULATION CALIBRATION

SUBCARRIER FREQUENCY R89

MODULATOR SYMMETRY R80

MODULATOR BALANCE R78

SUBCARRIER INJECT R91

SUBCARRIER TEST J10 .5V AT 10K OHMS

P/O RFI FILTER ASSEMBLY

SCA OUTPUT J8 0.5 TO 4V P-P AT 600 OHMS

DUAL NAND GATES CONFIGURED AS BISTABLE FLIP-FLOPS RECEIVE AND STORE INPUT COMMANDS. THE CONTROL LOGIC OPERATES AS FOLLOWS:

	GATE							
MODE	U8A	U8B	U8C	U8D	U9A	U9B	U9C
AUTO	HIGH	LOW	HIGH	LOW	HIGH	LOW	LOW
ON	LOW	HIGH	HIGH	LOW	LOW	HIGH	LOW
OFF	DON'T CARE	DON'T CARE	LOW	HIGH	LOW	LOW	HIGH

AUDIO AMPLIFIED BY U10B IS APPLIED TO A PEAK DETECTOR. R95 ADJUSTS THE TIME CONSTANT OF R95/C35 TO DETERMINE THE LENGTH OF TIME THE SCA GENERATOR REMAINS IN THE MUTED CONDITION (1/2 TO 10 SECONDS).

AUDIO IS INPUT TO THE NON-INVERTING INPUT OF VOLTAGE FOLLOWER U10B. THE GAIN OF U10B IS ADJUSTED BY R67 WHICH DETERMINES THE LEVEL AT WHICH THE MUTE CIRCUIT WILL ACTIVATE.

THE OUTPUT OF U10C IS HIGH WHEN THE UNIT IS OPERATIONAL AND LOW WHEN THE UNIT IS MUTED. DIODES D34 AND D35 FUNCTION AS CLAMPERS TO LIMIT THE OUTPUT AMPLITUDE OF U10C.

PEAK DETECTOR

MUTE DELAY R95

MUTE LEVEL R67

WHEN THE SCA GENERATOR IS OPERATIONAL, THE LED IN LDR 1 IS ON WHICH OFFERS A LOW SERIES RESISTANCE TO THE SIGNAL AND THE LED IN LDR 2 IS OFF WHICH EXHIBITS A HIGH SHUNT RESISTANCE ACROSS THE SIGNAL OUTPUT. IN THE MUTED CONDITION, LDR 1 EXHIBITS A HIGH SERIES RESISTANCE AND LDR 2 OFFERS A LOW SHUNT RESISTANCE.

WHEN THE UNIT IS OPERATIONAL:
U10D OUTPUT WILL BE HIGH.
Q4 WILL BE ON.
Q5 WILL BE OFF.
WHEN THE UNIT IS MUTED:
U10D OUTPUT WILL BE LOW.
Q4 WILL BE OFF.
Q5 WILL BE ON.

STEERING DIODE D33 ENABLES MUTING IN THE AUTO MODE AND STEERING DIODE D35 DISABLES MUTING IN THE ON MODE.

POSITIVE OR NEGATIVE POLARITY REMOTE CONTROL LOGIC

OFF / OFF COMMON / ON / ON COMMON / AUTO / AUTO COMMON

POLARITY SELECTOR J3-NEGATIVE J4-POSITIVE

+15VDC PROVISION FOR REMOTE CONTROL

+15VDC

U9D ENABLES REMOTE CONTROL WHEN-EVER ALL THREE SWITCHES ARE OUT.

MODE SWITCHES ARE INTERLOCKED, ALL THREE MUST BE OUT TO ENABLE REMOTE CONTROL.

+14.3V SOURCE

THE CHARGE STORED IN C20 FUNCTIONS AS A POWER FAIL MEMORY TO RESTORE THE UNIT TO THE MODE IN WHICH IT WAS OPERATING AT POWER FAILURE. DIODES D19/D20/D21 ARE BLOCKING DIODES WHICH CONSERVE THE CHARGE IN C20.

A FUSED AC INPUT SELECTOR/RFI FILTER ASSEMBLY AND A SPECIALLY TAPPED TRANSFORMER PROVIDES RFI ISOLATION, OVERLOAD PROTECTION, AND PERMITS A WIDE RANGE OF AC INPUT POTENTIALS.

97 TO 133 VAC OR 194 TO 266 VAC SINGLE PHASE 50/60 HZ 6 WATTS

EARTH GROUND

POSITIVE AND NEGATIVE REGULATORS ENSURE STABLE VOLTAGE SOURCES. DIODES D18 AND D15 EACH PROTECTS ITS RESPECTIVE REGULATOR FROM A REVERSE POLARITY APPLIED TO THE REGULATOR OUTPUT. DIODES D14 AND D12 EACH PROTECTS ITS RESPECTIVE REGULATOR FROM A HIGHER THAN NORMAL POTENTIAL APPLIED TO THE REGULATOR OUTPUT.

+15V REGULATOR U5 ADJ

-15V REGULATOR U6 ADJ

+15V SOURCE

-15V SOURCE

WHEN A POSITIVE VOLTAGE IS APPLIED TO U14A, THE OUTPUT WILL DROP IN LEVEL, ALLOWING D29 TO CONDUCT FEEDBACK TO THE INVERTING INPUT THROUGH R85H. WHEN A NEGATIVE VOLTAGE IS APPLIED TO U14A, THE OUTPUT WILL INCREASE IN LEVEL, ALLOWING DIODE D28 TO CONDUCT FEEDBACK TO THE INVERTING INPUT THROUGH R85H.

A PEAK DETECTOR COMPRISING D36, R125, AND C43 CHARGES TO THE PEAK VALUE OF THE APPLIED WAVEFORM.

THE POSITIVE AND NEGATIVE WAVEFORMS ARE APPLIED TO U14D WHICH DIFFERENTIALLY AMPLIFIES THE TWO INPUTS RESULTING IN A FULL-WAVE RECTIFIED OUTPUT.

AUDIO ADJUSTED BY R70 IS APPLIED TO U14A CONFIGURED AS A FULL-WAVE RECTIFIER THROUGH USE OF TWO SEPARATE FEEDBACK LOOPS.

MODULATION DISPLAY CALIBRATION R70

THE POSITIVE-GOING WAVEFORM FROM U14A IS BUFFERED BY UNITY GAIN AMPLIFIER U14B AND THE NEGATIVE-GOING WAVEFORM IS BUFFERED BY UNITY GAIN AMPLIFIER U14C.

Q3 FUNCTIONS AS AN EMITTER-FOLLOWER WITHIN THE FEEDBACK LOOP OF U14D TO BOOST THE FULL-WAVE RECTIFIED CURRENT OUTPUT.

100% + MODULATION

10% - 100% MODULATION

WHEN THE VOLTAGE ON THE NON-INVERTING INPUT OF U17A REACHES 5 VOLTS, DS3 WILL ILLUMINATE TO SIGNAL EXCESSIVE MODULATION.

WHEN THE VOLTAGE ON THE NON-INVERTING INPUT OF U17B REACHES 0.5 VOLTS, DS5 WILL ILLUMINATE. BELOW THIS POINT, DS5 WILL GO OUT.

POLARITY SELECTOR J5-NEGATIVE J6-POSITIVE

P/O RFI FILTER ASSEMBLY

POSITIVE OR NEGATIVE POLARITY MODE INDICATION

+15VDC PROVISION FOR REMOTE CONTROL

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FIGURE 4. SCA GENERATOR BLOCK DIAGRAM

11/12

5-3. On a regular basis, clean the equipment of accumulated dust, check for overheated components, and tighten loose hardware as required. Ensure the input and output connections are secure.

5-4. SECOND LEVEL MAINTENANCE.

5-5. Second level maintenance consists of procedures required to restore the equipment to satisfactory operation after a fault has occurred.

5-6. The maintenance philosophy of the SCA generator consists of problem isolation to a specific assembly with subsequent troubleshooting as required to isolate specific defective components. If desired, an entire assembly may be returned to the factory for repair or exchange.

5-7. ADJUSTMENTS.

5-8. The following text provides adjustment procedures for all controls which are not described in Section II, Installation.

5-9. MODULATION DISPLAY. The modulation display calibration control (R70) will not normally require adjustment in the field unless the modulation or metering circuitry has been repaired. To adjust the modulation display calibration control (R70), proceed as follows:

5-10. Required Equipment. The following equipment is required for adjustment of the modulation display calibration control.

A. No. 1 Phillips Screwdriver, 4 inches (10.16 cm) long.

B. Miniature Flat-Tip Screwdriver, 3/16 inch (0.5 cm) tip.

C. Calibrated Single Trace Oscilloscope or Calibrated High Input Impedance Voltmeter.

D. Calibrated Audio Generator, 600 Ohm Output.

5-11. Procedure. To adjust the modulation display calibration control (R70) proceed as follows:

5-12. Remove the SCA generator from service and remove the top cover.

5-13. Adjust the audio generator to 400 Hz at approximately 2 volts RMS.

5-14. Connect the audio generator to the rear panel terminal strip audio input.

5-15. Depress the ON switch and operate the SCA generator.

5-16. Measure the voltage on terminal E5 (refer to the SCA generator circuit board schematic diagram) and adjust the audio generator to obtain an indication of 6.0 volts p-p (2.12 volts RMS).

5-17. Adjust the modulation display calibration control (R70) so the 100%+ MODULATION indicator just illuminates.

5-18. Remove the test equipment, replace the top cover, and return the SCA generator to service.

5-19. MODULATION. The modulation controls will not normally require adjustment in the field unless the modulation circuitry has been repaired. To adjust the modulation symmetry (R80), modulation balance (R141), and modulation calibration (R148) controls, proceed as follows:

5-20. Required Equipment. The following equipment is required for adjustment of the modulation symmetry (R80), modulation balance (R141), and modulation calibration (R148) controls:

A. No. 1 Phillips Screwdriver, 4 inches (10.16 cm) long.

B. Miniature Flat-Tip Screwdriver, 3/16 inch (0.5 cm) tip.

C. Tektronix 7000 Series Oscilloscope Main Frame with Model 7L5 Plug-in Spectrum Analyzer or Equivalent.

D. Calibrated Audio Generator, 600 Ohm Output.

E. Calibrated Single-Trace Oscilloscope or Calibrated High Input Impedance Voltmeter.

F. Carbon Resistor, 620 Ohm ±5%, 1/4W.

5-21. To adjust the modulation symmetry (R80), modulation balance (R141), and modulation calibration (R148) controls, proceed as follows:

5-22. Remove the SCA generator from service and remove the top cover.

5-23. Connect a 620 Ohm resistor across the SCA OUTPUT connector or adjust the input loading on the spectrum analyzer to 600 Ohms.

5-24. Depress the ON switch and operate the SCA generator with no signal input.

5-25. Measure the voltage across the resistor. The voltage must be less than 3.5 volts p-p (1.237 VRMS). If not, adjust the SUBCARRIER INJECT control (R91) as required.

5-26. Remove the resistor and test equipment from the SCA generator.

5-27. Adjust the spectrum analyzer input impedance selector to 600 Ohms.

5-28. Connect the spectrum analyzer input to the SCA OUTPUT connector.

5-29. Adjust the spectrum analyzer so that 67 kHz appears at the far left of the display. Adjust the horizontal sweep for 20 kHz per division with resolution of 300 Hz.

5-30. Adjust the spectrum analyzer to obtain full scale deflection of the 67 kHz subcarrier.

5-31. The following three carriers will be displayed: 67 kHz, 134 kHz, and 201 kHz. The levels of the 134 kHz and 201 kHz carriers will be below the level of the 67 kHz carrier.

5-32. Adjust the modulation balance control (R141) to minimize the second harmonic at 134 kHz. The control will null the second harmonic to approximately -60 dB.

5-33. Adjust the modulation symmetry control (R80) to minimize the third harmonic at 201 kHz. The control will null the third harmonic to approximately -65 dB.

5-34. Readjust the modulation balance control (R141) and the modulation symmetry control (R80) until no further improvement is noted.

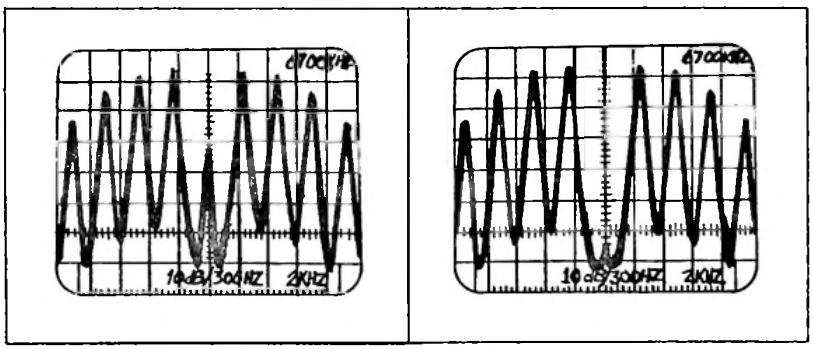
5-35. Adjust the audio generator frequency to 2.495 kHz ±0.5 Hz and connect the audio generator to SCA generator terminal strip terminals 10 (+) and 12 (-).

5-36. Adjust the audio generator output amplitude so that 2.120 VRMS ±0.01 VRMS is noted on test point TP-1 within the SCA generator.

5-37. Adjust the spectrum analyzer so that the 67 kHz subcarrier appears in the center of the display using a horizontal sweep of 2 kHz per division (see Figure 5A).

5-38. Adjust the modulation calibration control (R148) to minimize the subcarrier at 67 kHz. The control will null the subcarrier to approximately -65 dB below the two adjacent carriers (see Figure 5B). A carrier null of 45 dB or better is satisfactory.

5-39. Remove the test equipment, replace the top cover, and return the SCA generator to service.



A. CARRIER NOT NULLED B. CARRIER NULLED

597-0008-7

FIGURE 5. MODULATION CALIBRATION ADJUSTMENT

5-40. TROUBLESHOOTING.

5-41. Most troubleshooting consists of visual checks. To simplify troubleshooting, the various indicators should be used to isolate a malfunction to a specific area of the SCA generator. Table 5 is provided as a general guide to SCA generator malfunctions. Figure 5 provides pin-out-diagrams for all semiconductor devices except diodes.

5-42. Once the trouble is isolated, refer to the section of this manual providing theory of operation to assist in problem resolution. All internal components are accessible through a removable top cover.

5-43. COMPONENT REPLACEMENT.

5-44. The circuit board used in the SCA generator is a double-sided board with plated through-holes. Because of the plated through-holes, solder fills the holes by capillary action. These conditions require that defective components be removed carefully to avoid damage to the board.

5-45. On all circuit boards, the adhesive securing the copper track to the board melts at almost the same temperature as solder. A circuit board track can be destroyed by excessive heat or lateral movement during soldering. Use of a small iron with steady pressure is required for circuit board repairs.

5-46. To remove a component from a double-sided circuit board, cut the leads from the body of the defective component while the device is still soldered to the board.

5-47. Grip each component lead, one at a time, with long nose pliers. Turn the board over and touch the soldering iron to the lead at the solder connection. When the solder begins to melt, push the lead through the back side of the board and cut off the bent outer end of the lead. Each lead may now be heated independently and pulled out of each hole. The holes may be cleared of solder by carefully re-heating with a low wattage iron and removing the residual solder with a soldering vacuum tool.

5-48. Install the new component and apply solder from the bottom side of the board. If no damage has been done to the plated through-holes, soldering of the top side is not required.

WARNING MOST SOLVENTS WHICH WILL REMOVE ROSIN FLUX ARE VOLATILE AND TOXIC BY THEIR NATURE AND SHOULD

WARNING BE USED ONLY IN SMALL AMOUNTS IN A WELL VENTILATED AREA, AWAY FROM FLAME, INCLUDING

WARNING CIGARETTES AND A HOT SOLDERING IRON.

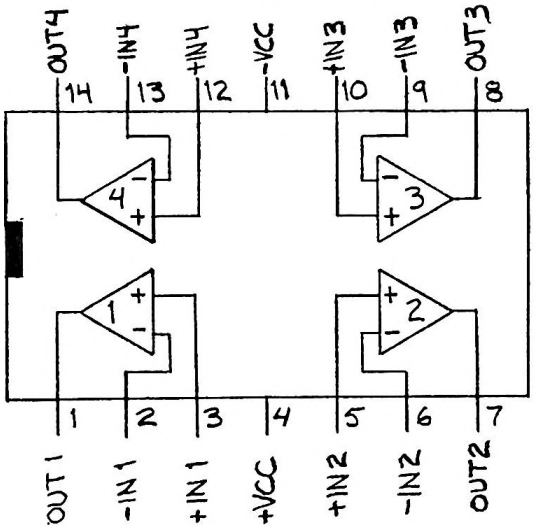
WARNING OBSERVE THE MANUFACTURER'S CAUTIONARY INSTRUCTIONS.

Table 3. SCA Generator Troubleshooting

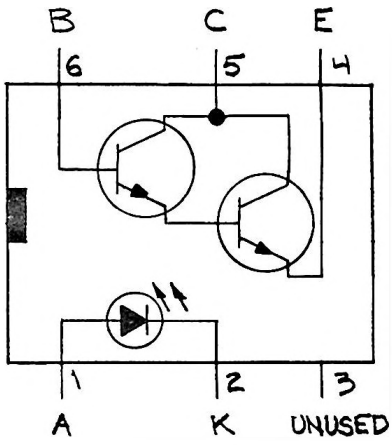
SYMPTOM	DEFECT/REMEDY
10%-100% AND 100%+ MODULATION INDICATORS INOPERATIVE	Check Waveforms to Isolate Defective U14, D28, D29, A3, D36, or Associated Component.
10%-100% OR 100%+ MODULATION INDICATOR FUNCTIONING INCORRECTLY	Defective U17A/D54 or U17B/D55, or Associated Component.
NO SCA OUTPUT	LDR1, Q4, Q5, U10, U13, U16, Power Supply, or Associated Component.
LOW SCA OUTPUT	D53, LDR1, Q4, Q5, U16, or Associated Component.
SUBCARRIER OFF FREQUENCY	U13 or Associated Component.
NO MODULATION	U1, U7, U10, or Associated Component.
NO LOCAL CONTROL	U8, U9, or Associated Component.

NOTE

TOP VIEW SHOWN UNLESS OTHERWISE NOTED

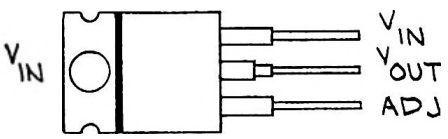


TL074 CN
DUAL JFET INPUT
QUAD OPERATIONAL AMPLIFIER



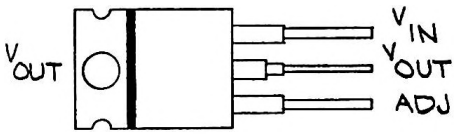
4N 33
OPTICAL ISOLATOR
LED/PHOTO TRANSISTOR TYPE

FRONT VIEW



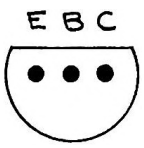
LM317T
POSITIVE VOLTAGE
REGULATOR

FRONT VIEW

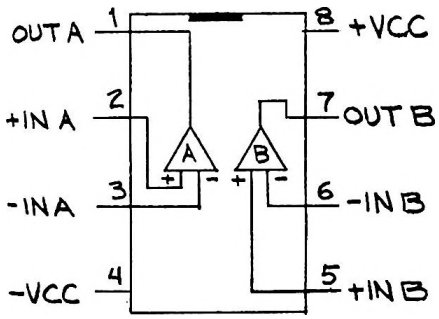


LM337T
NEGATIVE VOLTAGE
REGULATOR

BOTTOM VIEW



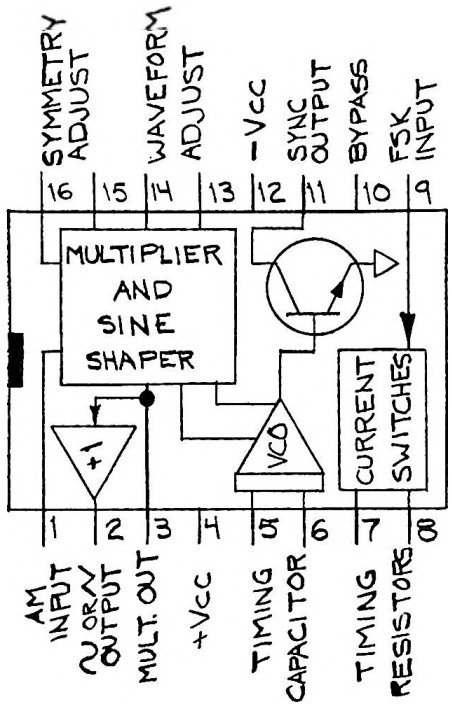
2N3904 NPN TRANSISTOR
2N3906 PNP TRANSISTOR



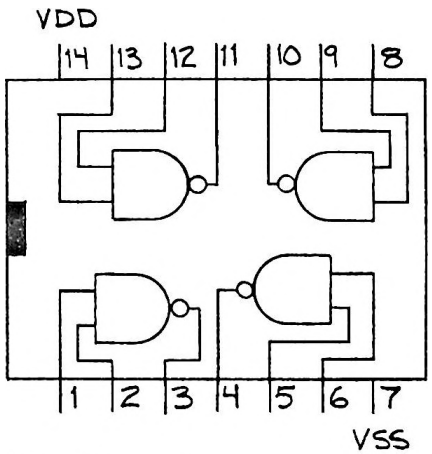
TL072 CP, TL092 CP
JFET INPUT
DUAL OPERATIONAL AMPLIFIER

597-0008-6A

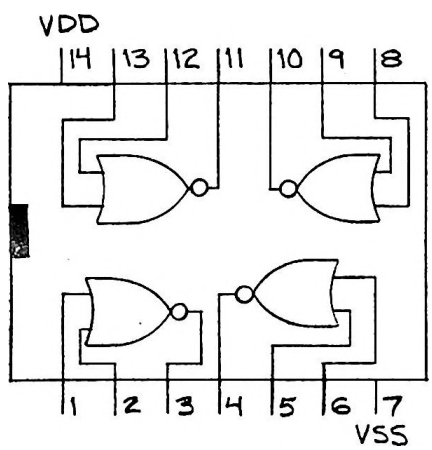
FIGURE 6. SEMICONDUCTOR TERMINAL DESIGNATION DIAGRAMS
(Sheet 1 of 2)



XR 2206 CP
FUNCTION GENERATOR

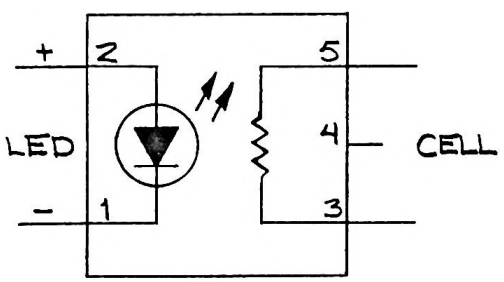


MC14011 UB
CMOS QUAD 2 INPUT NAND GATE



MC14001 UB
CMOS QUAD 2 INPUT NOR GATE

VTL5C2
OPTICAL ISOLATOR
LED/LDR TYPE



597-0008-6B

FIGURE 6. SEMICONDUCTOR TERMINAL DESIGNATION DIAGRAMS
(Sheet 2 of 2)

5-49. After soldering, remove flux with a cotton swab moistened with a suitable solvent. Rubbing alcohol is highly diluted and is not effective. Solvents are available in electronic supply houses which are useful.

5-50. The board should be checked to ensure the flux has been removed and not just smeared about. Rosin flux is not normally corrosive, but rosin will absorb enough moisture in time to become conductive and cause problems.

5-51. PARTS LISTS AND DRAWINGS.

5-52. The following parts lists and drawings are presented as aids to maintenance:

PARTS LISTS

TABLE	TITLE	NUMBER
4	FC-30 SCA Generator	909-0051
5	Access Cable Assembly	947-0020
6	Accessory Kit	959-0051
7	SCA Generator Circuit Board Assembly	914-0044

DRAWINGS

TITLE	NUMBER
SCA Generator Assembly Diagram	597-0008-5
SCA Generator Interconnect Schematic Diagram	C909-0053
SCA Generator Circuit Board Schematic Diagram	D909-0111

Table 4. FC-30 SCA Generator - 909-0051

REF. DES.	DESCRIPTION	PART NO.	QTY.
C50	Capacitor Assembly, Feed-Thru, 100 pF:		
	Kapton Dielectric	409-1817	2
	Nylon Insulator	423-6007	1
C51 THRU C62	Capacitor, Ceramic, Feed-Thru, 100 pF ±20%, 500V	008-1033	12
C63	Capacitor Assembly, Feed-Thru, 100 pF:		
	Kapton Dielectric	409-1817	2
	Nylon Insulator	423-6007	1
C64	Capacitor, Ceramic, Feed-Thru, 100 pF ±20%, 500V	008-1033	1
DS1	Indicator, LED, Yellow, 521-9176, 2.3V @ 30 mA Maximum (AUTO Indicator)	323-9225	1
DS2	Indicator, LED, Red, 521-9212, 1.7V @ 50 mA Maximum (OFF Indicator)	323-9217	1
DS3	Indicator, LED, Green, 521-9175, 2.3V @ 40 mA Maximum (ON Indicator)	323-9224	1
DS4	Indicator, LED, Red, 521-9212, 1.7V @ 50 mA Maximum (100%+ MODULATION Indicator)	323-9217	1
DS5	Indicator, LED, Green, 521-9175, 2.3V @ 40 mA Maximum (10% - 100% MODULATION Indicator)	323-9224	1
F1,F2	Fuse, MDL, 1/8 Ampere, 250V, Slow-Blow (for 120 Volt Operation)	334-0051	2
FL1	Filter, Modified, Fuse/Line 120/240V	360-6504	1
J8 THRU J10	Insulated BNC Connector	417-0048	3
L1 THRU L9	Choke, Ferrite, 180 MHz, 2.5 Turns, Single Section	364-0002	9
P1	Connector, 6-Pin	417-0601	1
P2	Connector, 2-Pin	417-0499	1
P3,P5	Connector, 6-Pin	417-0601	2
P7	Connector, 8-Pin	417-0046	1
P8,P9	Programmable Jumper	340-0004	2
----	Pins for P1, P2, P3, P5, and P7, Crimp Type	417-8766	25
T1	Transformer, Power, 50/60 Hz Primary: Dual 115V Primary, One Winding tapped at 100V Secondary: Dual 19V @ 0.09 Amperes	376-9852	1
TB1	Barrier Strip, 12 Terminal	412-0012	1
----	Switch Cap, Gray	343-6402	3
----	Accessory Kit	959-0051	1
----	SCA Generator Circuit Board Assembly	917-0044	1

Table 5. Access Cable Assembly - 947-0020

REF. DES.	DESCRIPTION	PART NO.	QTY.
P1,P2	BNC Connector for RG/58U	417-0205	2

Table 6. Accessory Kit - 959-0051

REF. DES.	DESCRIPTION	PART NO.	QTY.
----	Access Cable Assembly	947-0020	1
----	Fuse, MDL, 1/16 Ampere, 250V, Slow-Blow (240 Volt Operation)	334-0052	1
----	Line Cord	682-0001	1

Table 7. SCA Generator Circuit Board Assembly - 917-0044 (Sheet 1 of 6)

REF. DES.	DESCRIPTION	PART NO.	QTY.
C1,C2	Capacitor, Polystyrene, 0.47 uF, 100V	038-4753	2
C3,C4	Capacitor, Electrolytic, 1000 uF, 50V	014-1094	2
C5,C6	Capacitor, Polystyrene, 7500 pF, 50V	037-7540	2
C7 THRU C10	Capacitor, Electrolytic, 10 uF, 25V	023-1076	4
C11	Capacitor, Polystyrene, 7500 pF, 50V	037-7540	1
C12,C13	Capacitor, Electrolytic, 100 uF, 25V	023-1084	2
C14	Capacitor, Polystyrene, 7500 pF, 50V	037-7540	1
C15	Capacitor, Mylar Film, 0.1 uF, 100V	030-1053	1
C16	Capacitor, Polystyrene, 7500 pF, 50V	037-7540	1
C17	Capacitor, Electrolytic, 10 uF, 25V	023-1076	1
C18	Capacitor, Polystyrene, 7500 pF, 50V	037-7540	1
C19	Capacitor, Mylar Film, 0.1 uF, 100V	030-1053	1
C20	Capacitor, Electrolytic, 100 uF, 20V, Tantalum	063-1083	1
C21	Capacitor, Electrolytic, 10 uF, 25V	023-1076	1
C22,C23	Capacitor, Polystyrene, 7500 pF, 50V	037-7540	2
C24	Capacitor, Mylar Film, 0.1 uF, 100V	030-1053	1
C25	Capacitor, Electrolytic, 10 uF, 25V	023-1076	1
C26	Capacitor, Electrolytic, 100 uF, 25V	023-1084	1
C27	Capacitor, Mylar Film, 0.1 uF, 100V	030-1053	1
C28	Capacitor, Electrolytic, 10 uF, 25V	023-1076	1
C29	Capacitor, Mylar Film, 0.1 uF, 100V	030-1053	1
C30	Capacitor, Electrolytic, 10 uF, 25V	023-1076	1
C31	Capacitor, Mica, 500 pF ±1%, 500V	042-5021	1
C32	Capacitor, Ceramic Disc, 5 pF, 500V, NPO	001-5004	1
C33	Capacitor, Electrolytic, 10 uF, 25V	023-1076	1
C34	Capacitor, Mylar Film, 0.1 uF, 100V	030-1053	1
C35	Capacitor, Electrolytic, 10 uF, 25V	023-1076	1
C36	Capacitor, Mylar Film, 0.1 uF, 100V	030-1053	1
C37	Capacitor, Ceramic Disc, 5 pF, 500V, NPO	001-5004	1
C38 THRU C40	Capacitor, Electrolytic, 10 uF, 25V	023-1076	3
C41	Capacitor, Electrolytic, 100 uF, 25V	023-1084	1
C42	Capacitor, Mica, 0.001 uF, 500V	041-1032	1
C43	Capacitor, Mylar Film, 0.022 uF, 200V	031-2243	1

Table 7. SCA Generator Circuit Board Assembly - 917-0044 (Sheet 2 of 6)

REF. DES.	DESCRIPTION	PART NO.	QTY.
C44	Capacitor, Mylar Film, 0.047 uF, 100V	030-4743	1
C45	Capacitor, Mica, 100 pF, 500V	040-1022	1
C46	Capacitor, Electrolytic, 10 uF, 25V	023-1076	1
C47	Capacitor, Mica, 100 pF, 500V	040-1022	1
C48	Capacitor, Electrolytic, 10 uF, 25V	023-1076	1
C49	Capacitor, Mylar Film, 0.1 uF, 100V	030-1053	1
C65	Capacitor, Electrolytic, 10 uF, 16V, Non-Polarized	023-1075	1
D1 THRU D4	Diode, 1N4005, Silicon, 600V, 1 Ampere	203-4005	4
D5 THRU D8	Diode, 1N4148, Silicon, 75V @ 0.3A, Fast Switching	203-4148	4
D9 THRU D12	Diode, 1N4005, Silicon, 600V, 1 Ampere	203-4005	4
D13	Diode, 1N4148, Silicon, 75V @ 0.3A, Fast Switching	203-4148	1
D14,D15	Diode, 1N4005, Silicon, 600V, 1 Ampere	203-4005	2
D16,D17	Diode, 1N4148, Silicon, 75V @ 0.3A, Fast Switching	203-4148	2
D18	Diode, 1N4005, Silicon, 600V, 1 Ampere	203-4005	1
D19 THRU D21	Diode, 1N4148, Silicon, 75V @ 0.3A, Fast Switching	203-4148	3
D22	Diode, 1N4005, Silicon, 600V, 1 Ampere	203-4005	1
D23,D26	Diode, 1N4148, Silicon, 75V @ 0.3A, Fast Switching	203-4148	2
D28 THRU D30	Diode, HP5082-2800, High Voltage Schottky Barrier Type, 70V, 15 mA	201-2800	3
D31 THRU D35	Diode, 1N4148, Silicon, 75V @ 0.3A, Fast Switching	203-4148	5
D36	Diode, HP5082-2800, High Voltage Schottky Barrier Type, 70V, 15 mA	201-2800	1
D37 THRU D39	Diode, 1N4148, Silicon, 75V @ 0.3A, Fast Switching	203-4148	3
J1	Connector, Header, 6-Pin	417-0006-1	1
J2	Connector, Header, 2-Pin	417-4004	1
J3 THRU J6	Connector, Header, 6-Pin	417-0006-1	4
J7	Connector, Header, 8-Pin	417-0080	1
J8	Connector, Header, 2-Pin	417-4004	1
J9	Connector, Header, 3-Pin	417-0003	1
LDR1,LDR2	Optical Isolator, LDR/LED Type, VTL5C2 On Resistance: 500 Ohms Off Resistance: 1 Meg Ohm Cell Voltage: 200V Maximum Cell Current: 10 to 40 mA	323-7345	2
Q1 THRU Q4	Transistor, 2N3904, Silicon, NPN, TO-92 Case	211-3904	4
Q5	Transistor, 2N3906, Silicon, PNP, TO-92 Case	210-3906	1
R1	Resistor, 620 Ohm ±5%, 1/4W	100-6233	1
R2	Resistor, 75 Ohm ±5%, 1/4W	100-7523	1

Table 7. SCA Generator Circuit Board Assembly - 917-0044 (Sheet 3 of 6)

REF. DES.	DESCRIPTION	PART NO.	QTY.
R3 (A THRU H)	Resistor Network, 5 k Ohm ±1%, 1/4W, 16-Pin DIP	226-0500	1
R5,R6	Resistor, 1 Meg Ohm ±5%, 1/4W	100-1073	2
R8,R9	Resistor, 10 k Ohm ±5%, 1/4W	100-1053	2
R10	Resistor, 100 Ohm ±5%, 1/2W	110-1033	1
R12	Resistor, 680 Ohm ±5%, 1/4W	100-6833	1
R13	Potentiometer, 5 k Ohm ±10%, 1W, 10 Turn	179-5043	1
R14	Resistor, 330 Ohm ±5%, 1/4W	100-3333	1
R15	Resistor, 680 Ohm ±5%, 1/4W	100-6833	1
R16	Resistor, 1.33 k Ohm ±1%, 1/4W	103-1331	1
R17	Resistor, 10 Ohm ±5%, 1/4W	100-1023	1
R18,R19	Resistor, 4.99 k Ohm ±1%, 1/4W	100-5041	2
R20	Resistor, 10 Ohm ±5%, 1/4W	100-1023	1
R21 THRU R23	Resistor, 1 Meg Ohm ±5%, 1/4W	100-1073	3
R24	Resistor, 1.33 k Ohm ±1%, 1/4W	103-1331	1
R25	Resistor, 4.99 k Ohm ±1%, 1/4W	100-5041	1
R28	Resistor, 121 Ohm ±1%, 1/4W	100-1231	1
R29	Resistor, 4.99 k Ohm ±1%, 1/4W	100-5041	1
R31	Resistor, 100 k Ohm ±5%, 1/4W	100-1063	1
R33	Resistor, 121 Ohm ±1%, 1/4W	100-1231	1
R34	Resistor, 6.8 k Ohm ±5%, 1/4W	100-6843	1
R35	Potentiometer, 5 k Ohm ±10%, 1W, 10 Turn	179-5043	1
R36	Resistor, 330 Ohm ±5%, 1/4W	100-3333	1
R37	Resistor, 1 Meg Ohm ±5%, 1/4W	100-1073	1
R38	Resistor, 20 k Ohm ±5%, 1/4W	100-2053	1
R39	Resistor, 100 Ohm ±5%, 1/4W	100-1033	1
R40	Resistor, 20 k Ohm ±5%, 1/4W	100-2053	1
R41	Resistor, 4.99 k Ohm ±1%, 1/4W	100-5041	1
R42	Resistor, 10 k Ohm ±5%, 1/4W	100-1053	1
R43	Resistor, 39 k Ohm ±5%, 1/4W	100-8243	1
R44 THRU R46	Resistor, 1 Meg Ohm ±5%, 1/4W	100-1073	3
R47	Resistor, 4.99 k Ohm ±1%, 1/4W	100-5041	1
R48	Resistor, 56 k Ohm ±5%, 1/4W	100-5653	1
R49	Resistor, 10 Ohm ±5%, 1/4W	100-1023	1
R50	Resistor, 47 k Ohm ±5%, 1/4W	100-4753	1
R51	Resistor, 27 k Ohm ±5%, 1/4W	100-2753	1
R52	Resistor, 1 Meg Ohm ±5%, 1/4W	100-1073	1
R53	Resistor, 1 k Ohm ±5%, 1/4W	100-1043	1
R54	Resistor, 10 Ohm ±5%, 1/4W	100-1023	1
R55	Resistor, 4.99 k Ohm ±1%, 1/4W	100-5041	1
R56	Resistor, 1 k Ohm ±5%, 1/4W	100-1043	1
R57	Resistor, 10 k Ohm ±5%, 1/4W	100-1053	1
R58	Resistor, 4.99 k Ohm ±1%, 1/4W	100-5041	1
R59	Resistor, 15 k Ohm ±5%, 1/4W	100-1553	1
R60	Resistor, 47 k Ohm ±5%, 1/4W	100-4753	1

Table 7. SCA Generator Circuit Board Assembly - 917-0044 (Sheet 4 of 6)

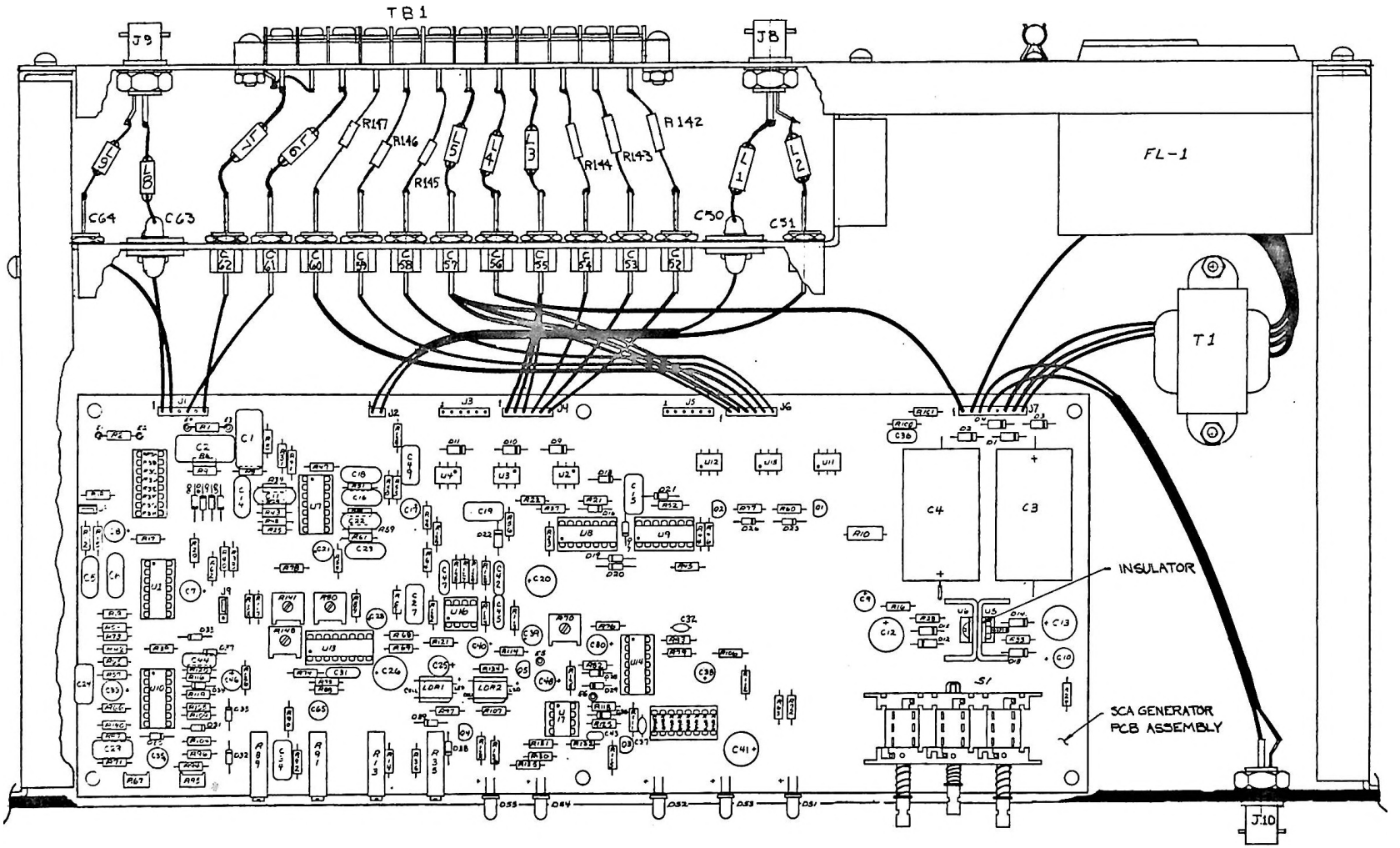
REF. DES.	DESCRIPTION	PART NO.	QTY.
R61	Resistor, 22 k Ohm ±5%, 1/4W	100-2253	1
R62	Resistor, 10 k Ohm ±5%, 1/4W	100-1053	1
R63	Resistor, 1.2 k Ohm ±5%, 1/4W	100-1243	1
R64	Resistor, 100 Ohm ±5%, 1/4W	100-1033	1
R65	Resistor, 10 k Ohm ±5%, 1/4W	100-1053	1
R66	Resistor, 1 Meg Ohm ±5%, 1/4W	100-1073	1
R67	Potentiometer, 1 Meg Ohm ±10%, 1/2W	178-1074	1
R68,R69	Resistor, 5.1 k Ohm ±5%, 1/4W	100-5143	2
R70	Potentiometer, 2 k Ohm ±10%, 1/2W	177-2044	1
R71	Resistor, 4.7 k Ohm ±5%, 1/4W	100-4743	1
R72	Resistor, 1.2 k Ohm ±5%, 1/4W	100-1243	1
R73	Resistor, 10 Ohm ±5%, 1/4W	100-1023	1
R74	Resistor, 10 k Ohm ±5%, 1/4W	100-1053	1
R75	Resistor, 287 k Ohm ±1%, 1/4W Film	103-2861	1
R76	Resistor, 9.1 k Ohm ±5%, 1/4W	100-9143	1
R77	Resistor, 47 k Ohm ±5%, 1/4W	100-4753	1
R78	Resistor, 4.7 k Ohm ±5%, 1/4W	100-4743	1
R79	Resistor, 5.1 k Ohm ±5%, 1/4W	100-5143	1
R80	Potentiometer, 100 Ohm ±10%, 1/2W	177-1034	1
R81	Resistor, 10 k Ohm ±5%, 1/4W	100-1053	1
R82	Resistor, 10 Ohm ±5%, 1/4W	100-1023	1
R83	Resistor, 100 k Ohm ±5%, 1/4W	100-1063	1
R84	Resistor, 150 Ohm ±5%, 1/4W	100-1533	1
R85 (A THRU H)	Resistor Network, 10 k Ohm ±1%, 1/4W, 16-Pin DIP	226-1055	1
R87	Resistor, 100 Ohm ±5%, 1/4W	100-1033	1
R88	Resistor, 27.4 k Ohm ±1%, 1/4W	103-2751	1
R89	Potentiometer, 5 k Ohm ±10%, 1W, 10 Turn	179-5043	1
R90	Resistor, 470 Ohm ±5%, 1/4W	100-4733	1
R91	Potentiometer, 5 k Ohm ±10%, 1W, 10 Turn	179-5043	1
R92	Resistor, 470 Ohm ±5%, 1/4W	100-4733	1
R94	Resistor, 10 k Ohm ±5%, 1/4W	100-1053	1
R95	Potentiometer, 1 Meg Ohm ±10%, 1/2W	178-1074	1
R96	Resistor, 10 k Ohm ±5%, 1/4W	100-1053	1
R97	Resistor, 820 Ohm ±5%, 1/4W	100-8233	1
R100	Resistor, 1 Meg Ohm ±5%, 1/4W	100-1073	1
R101	Resistor, 10 k Ohm ±5%, 1/4W	100-1053	1
R104	Resistor, 27 k Ohm ±5%, 1/4W	100-2753	1
R105	Resistor, 4.7 k Ohm ±5%, 1/4W	100-4743	1
R106	Resistor, 10 Ohm ±5%, 1/4W	100-1023	1
R107	Resistor, 1 k Ohm ±5%, 1/4W	100-1043	1
R108,R109	Resistor, 10 k Ohm ±5%, 1/4W	100-1053	2
R111 THRU R114	Resistor, 10 Ohm ±5%, 1/4W	100-1023	4
R115	Resistor, 5.1 k Ohm ±5%, 1/4W	100-5143	1
R116	Resistor, 220 k Ohm ±5%, 1/4W	100-2263	1
R117	Resistor, 10 k Ohm ±5%, 1/4W	100-1053	1
R118	Resistor, 10 Ohm ±5%, 1/4W	100-1023	1

Table 7. SCA Generator Circuit Board Assembly - 917-0044 (Sheet 5 of 6)

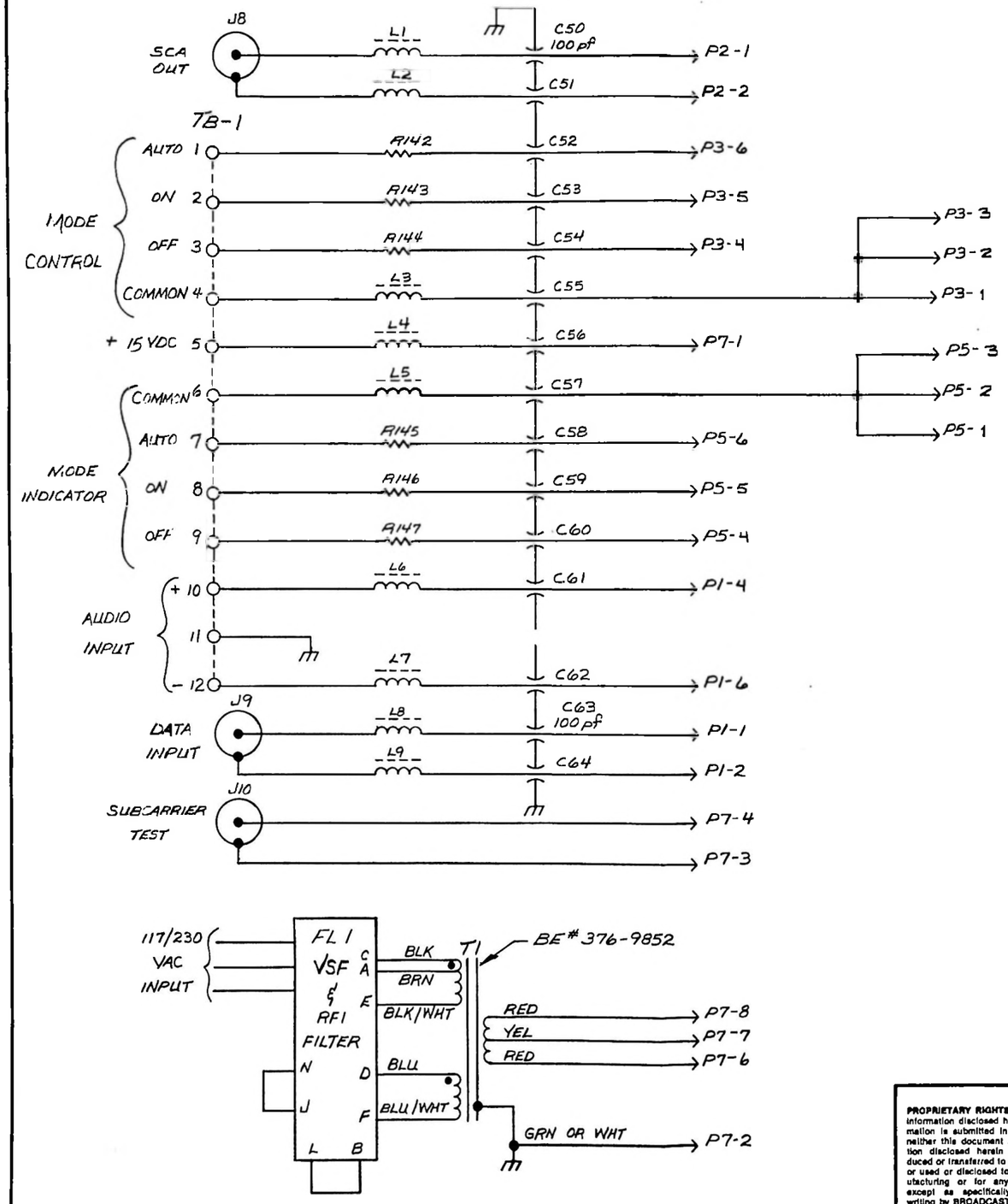
REF. DES.	DESCRIPTION	PART NO.	QTY.
R119	Resistor, 220 k Ohm ±5%, 1/4W	100-2263	1
R120	Resistor, 10 k Ohm ±5%, 1/4W	100-1053	1
R121	Resistor, 33 k Ohm ±5%, 1/4W	100-3353	1
R122	Resistor, 10 k Ohm ±5%, 1/4W	100-1053	1
R123	Resistor, 1.33 k Ohm ±1%, 1/4W	103-1331	1
R124	Resistor, 13 k Ohm ±5%, 1/4W	100-1353	1
R125	Resistor, 10 Meg Ohm ±5%, 1/4W	100-1083	1
R126	Resistor, 10 Ohm ±5%, 1/4W	100-1023	1
R127	Resistor, 27 k Ohm ±5%, 1/4W	100-2753	1
R128	Resistor, 47 k Ohm ±5%, 1/4W	100-4753	1
R129	Resistor, 13 k Ohm ±5%, 1/4W	100-1353	1
R130	Resistor, 20 k Ohm ±1%, 1/4W	103-2051	1
R131	Resistor, 9.09 k Ohm ±1%, 1/4W	103-9041	1
R132	Resistor, 1 k Ohm ±1%, 1/4W	103-1041	1
R133	Resistor, 10 Ohm ±5%, 1/4W	100-1023	1
R134	Resistor, 47 k Ohm ±5%, 1/4W	100-4753	1
R135,R136	Resistor, 1 k Ohm ±5%, 1/4W	100-1043	2
R137	Resistor, 620 Ohm ±5%, 1/4W	100-6233	1
R138	Resistor, 27 k Ohm ±5%, 1/4W	100-2753	1
R139	Resistor, 10 k Ohm ±5%, 1/4W	100-1053	1
R140	Resistor, 1 Meg Ohm ±5%, 1/4W	100-1073	1
R141,R148	Potentiometer, 20 k Ohm ±10%, 1/2W	177-2054	2
S1	Ganged, 3 Station, Interlocked Push Switch, DPDT, 25W Maximum, 0.5 Ampere @ 50V ac or dc, Resistive Load or 0.125 Ampere at 110/120V ac, Resistive Load (OFF/ON/AUTO/REMOTE Switch)	343-1202	1
U1	Integrated Circuit, TL074CN, Quad P-Channel JFET Input Operational Amplifier, 14-Pin DIP	221-0074	1
U2 THRU U4	Integrated Circuit, 4N33, Optical Isolator, Infared LED-Photo NPN Darlington Transistor Coupled Pair, 1500V Isolation, Response: 30 kHz Maximum, Current: 50 mA Maximum, 6-Pin DIP	229-0033	3
U5	Integrated Circuit, LM317T, Adjustable Positive Voltage Regulator, 1.2V to 37V, 1.5 Ampere, TO-220 Case	227-0317	1
U6	Integrated Circuit, LM337T, Adjustable Negative Voltage Regulator, 1.2V to 37V, 1.5 Ampere, TO-220 Case	227-0337	1
U7	Integrated Circuit, TL074CN, Quad P-Channel JFET Input Operational Amplifier, 14-Pin DIP	221-0074	1
U8	Integrated Circuit, MC14011, CMOS, Quad 2 Input NAND Gate, 14-Pin DIP	228-4011	1
U9	Integrated Circuit, MC14001, CMOS, Quad 2 Input NOR Gate, 14-Pin DIP	228-4001	1
U10	Integrated Circuit, TL074CN, Quad P-Channel JFET Input Operational Amplifier, 14-Pin DIP	221-0074	1

Table 7. SCA Generator Circuit Board Assembly - 917-0044
(Sheet 6 of 6)

REF. DES.	DESCRIPTION	PART NO.	QTY.
U11,U12	Integrated Circuit, 4N33, Optical Isolator, Infared LED-Photo NPN Darlington Transistor Coupled Pair, 1500V Isolation, Response: 30 kHz Maximum, Current: 50 mA Maximum, 6-Pin DIP	229-0033	2
U13	Integrated Circuit, XR2206CP, Function Generator, 0.01 Hz to 1 MHz, 16-Pin DIP	229-2206	1
U14	Integrated Circuit, TL074CN, Quad P-Channel JFET Input Operational Amplifier, 14-Pin DIP	221-0074	1
U15	Integrated Circuit, 4N33, Optical Isolator, Infared LED-Photo NPN Darlington Transistor Coupled Pair, 1500V Isolation, Response: 30 kHz Maximum, Current: 50 mA Maximum, 6-Pin DIP	229-0033	1
U16	Integrated Circuit, TL072CP, Dual P-Channel JFET Input Operational Amplifier, 8-Pin DIP	221-0072	1
U17	Integrated Circuit, TL092, Dual N-Channel JFET Input Operational Amplifier, 8-Pin DIP	221-0092	1
XR3,XR85	Socket, 16-Pin DIP	417-1604	2
XU1,XU7 THRU XU10	Socket, 14-Pin DIP	417-1404	5
XU13	Socket, 16-Pin DIP	417-1604	1
XU14	Socket, 14-Pin DIP	417-1404	1
XU16,XU17	Socket, 8-Pin DIP	417-0804	2
----	Heatsink, TO-220 Case, Low Profile	455-7805	2
----	Screw, 4-40 X 3/8, Nylon	420-4996	1
----	Transistor Mounting Insulator, TO-220 Case	409-7403	1
----	Nut, 4-40, Nylon	421-4901	1
----	Blank Circuit Board	517-0044	1



597-0008-5
FC-30 ASSEMBLY DRAWING



REVISIONS			
REV.	DESCRIPTION	DATE	APPROVED
A	PER ECN 3356	4-8-82	MRK
B	PER ECN 4957	JAN 2-21-83	JMK

NOTES:

1.) ALL FEEDTHRU CAPACITORS 1000pf U.O.S.,
2.) ALL RESISTORS 1K ¶ 1/2W U.O.S.,
3.) ALL CHOKES FERROXCUBE V200-20/4B U.O.S.
4.) LAST COMPONENTS USED: C64, FL1, J10, L9, P7, R147, T1, TB1
5.) COMPONENTS NOT USED ON SCHEMATIC: C1-C49, J1-J7, P4, P6, R1-R141

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TOLERANCE UNLESS OTHERWISE SPECIFIED
DECIMAL 2 PL=.01 3PL=.005
FRACTIONAL ±1/64
ANGULAR ± 1°
SHARP EDGES TO BEND RADII
FILLET RADII

MATERIAL

DRAWN BY ORF DATE 7-6-81
CHECKED BY DATE
PROJECT ENGR. DATE 7-08-81
APPROVED BY 7-8-81

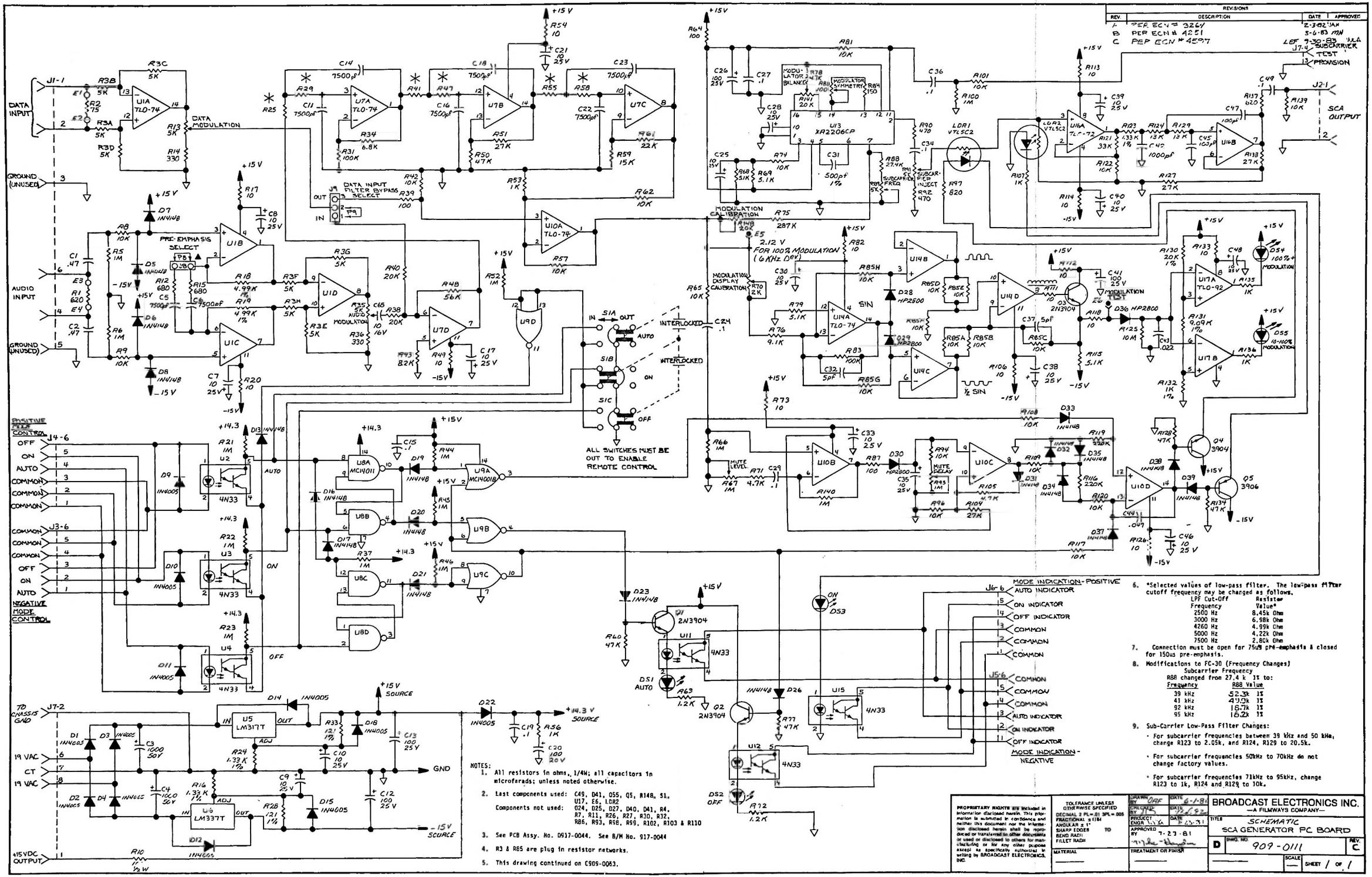
TREATMENT OR FINISH

BROADCAST ELECTRONICS INC.
—A FILMWAYS COMPANY—

TITLE SCHEMATIC
SCA GEN INTERCONNECT

C DWG. NO. 909-0053 REV. B

FC30 SCALE — SHEET 1 OF 1



REV.	DESCRIPTION	DATE	APPROVED
A	PER ECN # 3267	2-3-82	JAH
B	PER ECN # 4251	5-6-83	MN
C	PER ECN # 4597	7-30-84	LEF

NOTES:

1. All resistors in ohms, 1/4W; all capacitors in microfarads; unless noted otherwise.
2. Last components used: C49, D41, D55, Q5, R148, S1, U17, E6, LDR2
   Components not used: D24, D25, D27, D40, D41, R4, R7, R11, R26, R27, R30, R32, R86, R93, R98, R99, R102, R103 & R110
3. See PCB Assy. No. 0917-0044. See B/M No. 917-0044
4. R3 & R85 are plug in resistor networks.
5. This drawing continued on C909-0063.
6. *Selected values of low-pass filter. The low-pass filter cutoff frequency may be changed as follows.

LPF Cut-Off Frequency	Resistor Value*
2500 Hz	8.45k Ohm
3000 Hz	6.98k Ohm
4260 Hz	4.99k Ohm
5000 Hz	4.22k Ohm
7500 Hz	2.80k Ohm

7. Connection must be open for 75uS pre-emphasis & closed for 150us pre-emphasis.
8. Modifications to FC-30 (Frequency Changes)
   Subcarrier Frequency
   R88 changed from 27.4 k 1% to:

Frequency	R88 Value
39 kHz	52.3k 1%
41 kHz	49.9k 1%
92 kHz	16.7k 1%
95 kHz	16.2k 1%

9. Sub-Carrier Low-Pass Filter Changes:
   - For subcarrier frequencies between 39 kHz and 50 kHz, change R123 to 2.05k, and R124, R129 to 20.5k.
   - For subcarrier frequencies 50kHz to 70kHz do not change factory values.
   - For subcarrier frequencies 71kHz to 95kHz, change R123 to 1k, R124 and R129 to 10k.

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TOLERANCE UNLESS OTHERWISE SPECIFIED
DECIMAL ± PL = .01 3PL = .005
FRACTIONAL ± 1/64
ANGULAR ± 1°
SHARP EDGES TO BEND RADII
FILLET RADII
MATERIAL

DRAWN BY	DAF	DATE 6-1-81
CHECKED BY	JL	DATE 6-2-81
PRODUCT ENGR	[illegible]	DATE 6-25-81
APPROVED BY	7-23-81	

TREATMENT OR FINISH

BROADCAST ELECTRONICS INC.
—A FILMWAYS COMPANY—

TITLE: SCHEMATIC SCA GENERATOR PC BOARD

SIZE	DWG. NO.	REV.
D	909-0111	C

SCALE — SHEET 1 OF 1

PRODUCT WARRANTY

LIMITED ONE YEAR

While this warranty gives you specific legal rights, which terminate one (1) year (6 months on turntable motors) from the date of shipment, you may also have other rights which vary from state to state.

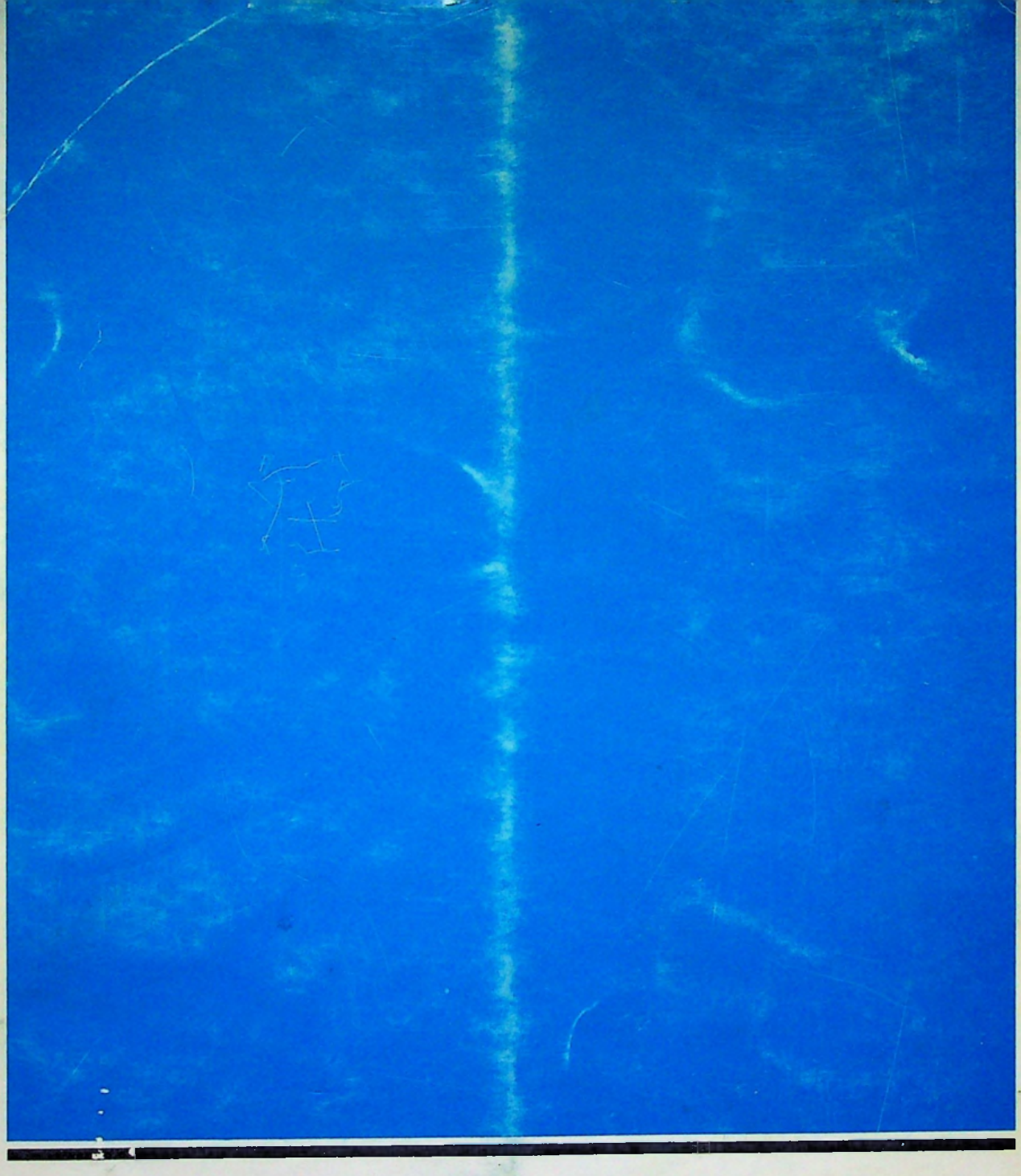
Broadcast Electronics, Inc. ("BE"), 4100 North 24th Street, P. O. Box 3606, Quincy, Illinois 62305, hereby warrants cartridge machines, consoles, transmitters and other new Equipment manufactured by BE against any defects in material or workmanship at the time of delivery thereof, that develop under normal use within a period of one (1) year (6 months for turntable motors) from the date of shipment. Other manufacturers' Equipment, if any, shall carry only such manufacturers' standard warranty. This warranty extends to the original user and any subsequent purchaser during the warranty period. BE's sole responsibility with respect to any Equipment or parts not conforming to this warranty is to replace such equipment or parts upon the return thereof F.O.B. BE's factory or authorized repair depot within the period aforesaid.

In the event of replacement pursuant to the foregoing warranty, only the unexpired portion of the warranty from the time of the original purchase will remain in effect for any such replacement. However, the warranty period will be extended for the length of time that the original user is without the services of the Equipment due to its being serviced pursuant to this warranty. The terms of the foregoing warranty shall be null and void if the Equipment has been altered or repaired without specific written authorization of BE, or if Equipment is operated under environmental conditions or circumstances other than those specifically described in BE's product literature or instruction manual which accompany the Equipment purchased. BE shall not be liable for any expense of any nature whatsoever incurred by the original user without prior written consent of BE.

BE shall not be liable to the original user for any and all incidental or consequential damages for breach of either expressed or implied warranties. However, some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you. All express and implied warranties shall terminate at the conclusion of the period set forth herein.

Except as set forth herein, and except as to title, there are no warranties, or any affirmations of fact or promises by BE, with reference to the Equipment, or to merchantability, fitness for a particular application, signal coverage, infringement, or otherwise, which extend beyond the description of the Equipment in BE's product literature or instruction manual which accompany the Equipment. Any card which is enclosed with the Equipment will be used by BE for survey purposes only.

BROADCAST ELECTRONICS, INC.
4100 North 24th Street, P. O. Box 3606, Quincy, Illinois 62305



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