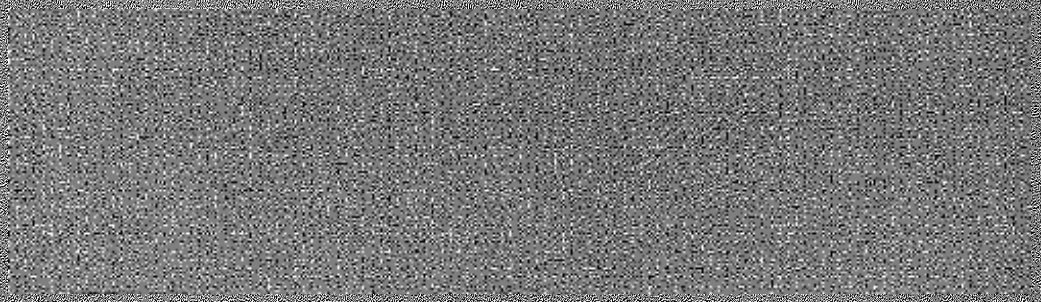
INSTRUCTION MANUAL



AX-10 AM STEREO EXCITER

April, 1992 IM No. 597-0095-004

BROADCAST ELECTRONICS, INC.

BE®

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.

TECHNICAL ASSISTANCE AND REPAIR SERVICE

Technical assistance is available from Broadcast Electronics by letter or prepaid telephone or telegram. Equipment requiring repair or overhaul should be sent by common carrier, prepaid, insured and well protected. Do not mail equipment. We can assume no liability for inbound damage, and necessary repairs become the obligation of the shipper. Prior arrangement is necessary. Contact Customer Service Department for a Return Authorization.

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
Fax: (217) 224-9607

PROPRIETARY NOTICE

MODIFICATIONS

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.

WARNING

OPERATING HAZARDS

READ THIS SHEET AND OBSERVE ALL SAFETY PRECAUTIONS

ALL PERSONS WHO WORK WITH OR ARE EXPOSED TO POWER TUBES, POWER TRANSISTORS, OR EQUIPMENT WHICH UTILIZES SUCH DEVICES MUST TAKE PRECAUTIONS TO PROTECT THEMSELVES AGAINST POSSIBLE SERIOUS BODILY INJURY. EXERCISE EXTREME CARE AROUND SUCH PRODUCTS. UNINFORMED OR CARELESS OPERATION OF THESE DEVICES CAN RESULT IN POOR PERFORMANCE, DAMAGE TO THE DEVICE OR PROPERTY, SERIOUS BODILY INJURY, AND POSSIBLY DEATH.

DANGEROUS HAZARDS EXIST IN THE OPERATION OF POWER TUBES AND POWER TRANSISTORS

The operation of power tubes and power transistors involves one or more of the following hazards, any one of which, in the absence of safe operating practices and precautions, could result in serious harm to personnel.

A. HIGH VOLTAGE - Normal operating voltages can be deadly. Additional information follows.

B. RF RADIATION - Exposure to RF radiation may cause serious bodily injury possibly resulting in blindness or death. Cardiac pacemakers may be affected. Additional information follows.

C. BERYLLIUM-OXIDE POISONING - Dust or fumes from BeO ceramics used as thermal links with conduction cooled power tubes and power transistors are highly toxic and can cause serious injury or death. Additional information follows.

D. HOT SURFACES - Surfaces of air-cooled radiators and other parts of tubes can reach temperatures of several hundred degrees centigrade and cause serious burns if touched. Additional information follows.

HIGH VOLTAGE

Many power tubes operate at voltages high enough to kill through electrocution. Personnel should always break the primary circuits of the power supply and discharge high voltage capacitors when direct access to the tube is required.

RADIO FREQUENCY RADIATION

Exposure of personnel to RF radiation should be minimized, personnel should not be permitted in the vicinity of open energized RF generating circuits, or RF transmission systems (waveguides, cables, connectors, etc.), or energized antennas. It is generally accepted that exposure to "high levels" of radiation can result in severe bodily injury including blindness. Cardiac pacemakers may be affected.

The effect of prolonged exposure to "low level" RF radiation continues to be a subject of investigation and controversy. It is generally agreed that prolonged exposure of personnel to RF radiation should be limited to an absolute minimum. It is also generally agreed that exposure should be reduced in working areas where personnel heat load is above normal. A 10 mW/cm^2 per one tenth hour average level has been adopted by several U.S. Government agencies including the Occupational Safety and Health Administration (OSHA) as the standard protection guide for employee work environments. An even stricter standard is recommended by the American National Standards Institute which recommends a 1.0 mW/cm^2 per one tenth hour average level exposure between 30 Hz and 300 mHz as the standard employee protection guide (ANSI C95.1-1982).

RF energy must be contained properly by shielding and transmission lines. All input and output RF connections, such as cables, flanges and gaskets must be RF leakproof. Never operate a power tube without a properly matched RF energy absorbing load attached. Never look into or expose any part of the body to an antenna or open RF generating tube or circuit or RF transmission system while energized. Monitor the tube and RF system for RF radiation leakage at regular intervals and after servicing.

DANGER--BERYLLIUM OXIDE CERAMICS (BeO) - AVOID BREATHING DUST OR FUMES

BeO ceramic material is used as a thermal link to carry heat from a tube or transistor to the heat sink. Do not perform any operation on any BeO ceramic which might produce dust or fumes, such as grinding, grit blasting, or acid cleaning. Beryllium oxide dust or fumes are highly toxic and breathing them can result in serious personal injury or death. BeO ceramics must be disposed of only in a manner prescribed by the device manufacturer.

HOT SURFACES

The anode portion of power tubes is often air-cooled or conduction-cooled. The air-cooled external surface normally operates at a high temperature (up to 200° to 300°C). Other portions of the tube may also reach high temperatures, especially the cathode insulator and the cathode/heater surfaces. All hot surfaces may remain hot for an extended time after the tube is shut off. To prevent serious burns, take care to prevent and avoid any bodily contact with these surfaces both during and for a reasonable cool-down period after tube operation.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF ILLUSTRATIONS

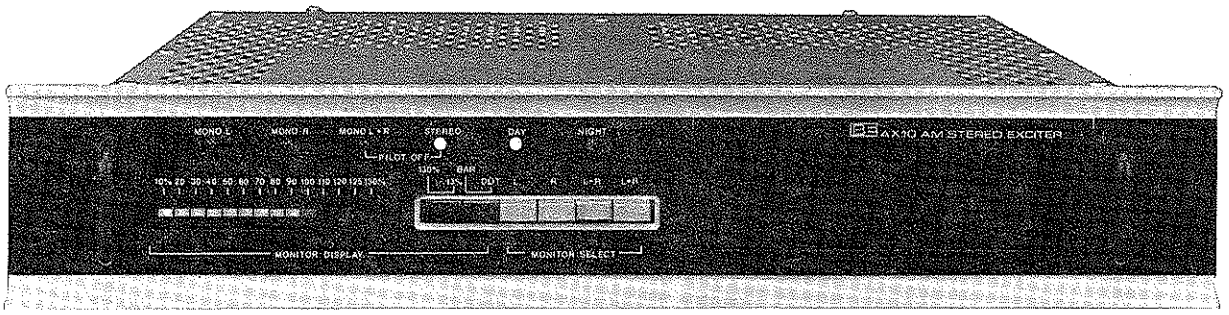
SECTION I
GENERAL INFORMATION

1–1. INTRODUCTION.

1–2. Information presented by this section provides a general description of the AX–10 AM Stereo Exciter features and lists equipment specifications.

1–3. EQUIPMENT DESCRIPTION.

1–4. The Broadcast Electronics AX–10 is a total solid–state C–QUAM AM Stereo Exciter providing a continuously variable RF output from 0.15 to 10 watts into a 50 Ohm load at any frequency within the 522 to 1710 kHz AM broadcast band (see Figure 1–1).



597–0095–1

FIGURE 1–1. AX–10 AM STEREO EXCITER

AX–10 AM STEREO EXCITER

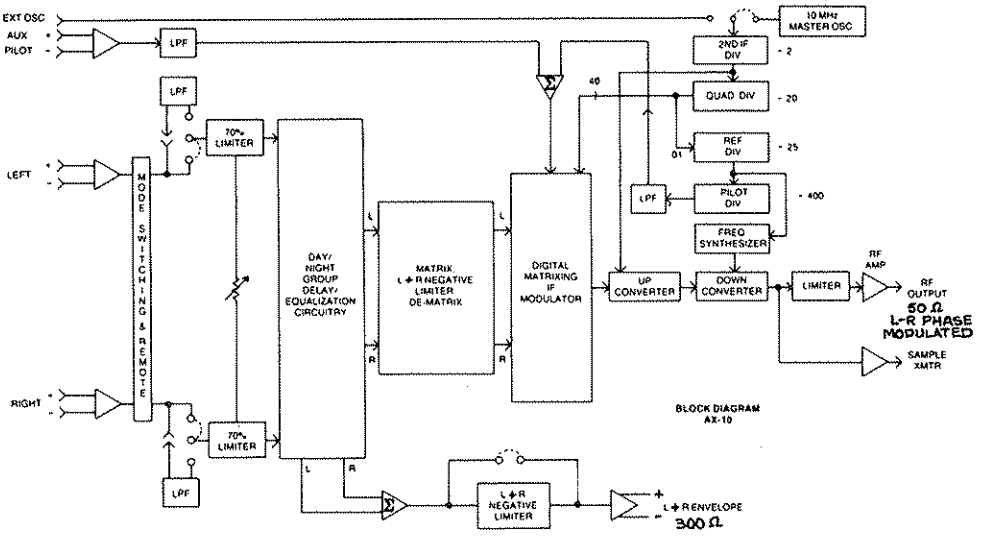
MODEL	PART NO.	DESCRIPTION
AX–10	907–0010–004	AM Stereo Exciter for C–QUAM system operation on a single specified frequency in the 522 kHz to 1620 kHz range. 19 inch (48.21 cm) rack mount, 117V 50/60 Hz.
AX–10	907–0100–304	AM Stereo Exciter for C–QUAM system operation on a single specified frequency in the 522 kHz to 1620 kHz range. 19 inch (48.21 cm) rack mount, 220V 50/60 Hz.
		ACCESSORY EQUIPMENT
AS–10	907–0100–004	C–QUAM AM Stereo Modulation Monitor

SPARE PARTS KITS

——	977–0001–004	Recommended Spare Parts Kit, AX–10 AM Stereo Exciter.
——	977–0002–004	Recommended Semi–Conductor Spare Parts Kit, AX–10 AM Stereo Exciter.
——	977–0003	100% Semi–Conductor Spare Parts Kit, AX–10 AM Stereo Exciter.

1–5. ELECTRICAL DESCRIPTION.

1–6. **THE C–QUAM SYSTEM.** The C–Quam AM stereo system is a mode of AM stereo transmission utilizing amplitude modulated monaural (L+R) information and an independently quadrature modulated stereo (L–R) information. The results produce a stereo transmission system compatible with mono receivers (see Figure 1–2).



597–0095–22

FIGURE 1–2. AX–10 BLOCK DIAGRAM

1–7. The multiplexing of the left and right stereo signals in an AM transmitter requires angular modulation of the RF carrier in addition to the normal amplitude modulation process. This is accomplished by quadrature modulation.

1–8. Quadrature modulation is a scheme by which two carriers differing in phase by 90 degrees, are modulated by a third signal. This type of modulation is used to produce the NTSC color TV signal which is used in the U.S.A.

1–9. The C–Quam AM stereo exciter has two outputs. The monaural L+R information is applied to the transmitter audio input and modulates the transmitter carrier wave with the sum of the left and right stereo program to provide compatibility with existing mono receivers.

1–10. The stereo L–R information is applied to a point in the transmitter RF chain, possibly the oscillator buffer, after the transmitter oscillator has been disabled. The left and right difference information is transmitted with the amplitude modulated L+R information as angular modulation.

1–11. **AUDIO INPUTS.** The transformerless left and right channel audio inputs accept balanced or unbalanced 600 Ohm signals. For day and night transmitter operation or changing antenna patterns, completely separate switch–selectable equalization adjustments are provided. These consist of individual group delay networks and low–frequency and high–frequency equalizers. Combinations of these may be pre–selected, combined, and inserted into either the L–R circuitry or the transmitter audio input path. The balanced 300 Ohm L+R output is available from 0 to +20 dBm (terminated into a 600 Ohm load) with independent level adjustments for both day and night transmitter operation.

1–12. **AUTOMATIC FREQUENCY CONTROL.** The carrier frequency is established by a synthesizer circuit containing a phase–locked–loop which locks the carrier frequency and phase to a 10 MHz temperature–compensated reference oscillator. Prompt on–frequency operation is assured as frequency lock from a cold start is achieved in typically less than two seconds. Use of a frequency synthesizer to establish the carrier frequency allows the frequency to be easily re–programmed. Additional provisions exist which allow locking the exciter to an external 10 MHz standard such as WWV to reduce co–channel interference.

1–13. The 25 Hz pilot tone which signals stereo operation is obtained through dividers from the 10 MHz reference. This signal may be used with a subsonic AM subcarrier generator to provide communications such as meter readings from the transmitter site to the studio.

1–14. **METERING.** Important exciter parameters such as left channel audio, right channel audio, L+R information, L–R information, and pilot injection metering are displayed by a color–coded, peak–reading moving dot/bar graph LED display. A 125% peak–hold detector allows monitoring of asymmetrical modulation. The metering functions are selected by push–switches located on the exciter front–panel.

1–15. **RF AMPLIFIER.** The RF amplifier outputs an adjustable 0.15 to 10 watt level at 50 Ohms. Tuning of the amplifier is not required. An optional interface unit allows interfacing the AX–10 with transmitters requiring asymmetrical duty cycle TTL–level inputs.

1–16. **PHYSICAL DESCRIPTION.**

1–17. The AX–10 chassis is mounted on slide rails to allow easy access to all assemblies when the unit is extended from the rack. Removal and installation of assemblies within the exciter is augmented by the semi–modular mechanical construction. Each assembly is firmly mounted to the main chassis and electrically connected to the main wiring harness with plugs and jacks. Connectors mounted on the exciter rear panel provide input and output connections.

1–18. EQUIPMENT SPECIFICATIONS.

1–19. Refer to Table 1–1 for electrical specifications and Table 1–2 for mechanical specifications for the AX–10 AM Stereo Exciter.

TABLE 1–1. ELECTRICAL CHARACTERISTICS

PARAMETER	SPECIFICATIONS
RF OUTPUT POWER (L–R)	0.15 to 10 Watts RMS into 50 Ohms, continuously variable.
RF OUTPUT IMPEDANCE (L–R)	50 Ohms, BNC connector.
SAMPLE TRANSMITTER OUTPUT	2V p–p, 50 Ohms, BNC Connector.
FREQUENCY RANGE	522 kHz to 1710 kHz.
FREQUENCY STABILITY	Assigned carrier frequency ±10 Hz.
L + R AUDIO OUTPUT	0 to +20 dBm with a 600 Ohm termination, adjustable.
L + R AUDIO OUTPUT IMPEDANCE	300 Ohms, balanced, transformerless.
AUDIO INPUT LEVEL	+10 dBm, ±1 dBm, balanced, transformerless. Other levels accommodated by internal resistor selection.
AUDIO INPUT IMPEDANCE	600 Ohms, balanced, resistive. Other values accommodated by internal resistor selection.
AUXILIARY PILOT INPUT LEVEL	0 dBm, 5 Hz to 100 Hz for 10% phase deviation.
AUXILIARY PILOT INPUT IMPEDANCE	600 Ohms, balanced, transformerless.
FREQUENCY RESPONSE	0 to –1 dB from 50 Hz to 15 kHz.
STEREO SEPARATION	35 dB, 50 Hz to 7.5 kHz; 25 dB, 7.5 kHz to 15 kHz.
SIGNAL–TO–NOISE RATIO	
Monophonic	–60 dB below 100% modulation @ 400 Hz.
Stereophonic	–55 dB below 100% modulation @ 400 Hz (Left Channel, Right Channel).
HARMONIC DISTORTION	
85% Modulation	L=R, Monaural, 0.25% Maximum, 50 Hz to 15 kHz.
50% Modulation	L, R, Single Channel, 0.5% Maximum, 50 Hz to 7.5 kHz.
POWER REQUIREMENTS	90 to 133 or 180 to 266 VAC, 50/60 Hz, 50 Watts Maximum.

TABLE 1–2. PHYSICAL CHARACTERISTICS

PARAMETER	SPECIFICATIONS
AMBIENT TEMPERATURE RANGE	+32°F to +122°F (0°C to +50°C). Usable to –4°F (–20°C).
MAXIMUM ALTITUDE	15,000 Feet above sea level (4572 m).
MAXIMUM HUMIDITY	95%, Non–condensing.
SIZE:	
WIDTH	19.00 Inches (48.3 cm).
DEPTH	19.00 Inches (48.3 cm).
HEIGHT	3.25 Inches (8.9 cm).
WEIGHT:	
UNPACKED	22 Pounds (9.98 kg).
PACKED	27 Pounds (12.25 kg).
CUBAGE:	
UNPACKED	0.73 Cubic Feet (0.02 m^3).
PACKED	4 Cubic Feet (0.11 m^3).

SECTION II
INSTALLATION

2–1. INTRODUCTION.

2–2. This section contains information required for installation and preliminary checkout of the Broadcast Electronics AX–10 AM Stereo Exciter.

2–3. UNPACKING.

2–4. The equipment becomes the property of the customer when the equipment is delivered to the carrier. Carefully unpack the exciter. 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.

2–5. 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.

2–6. ENVIRONMENTAL REQUIREMENTS.

2–7. Table 2–1 provides environmental conditions which must be considered prior to exciter installation.

TABLE 2–1. ENVIRONMENTAL REQUIREMENTS

SPECIFICATION	REQUIREMENT
TEMPERATURE	+32°F to +122°F (0°C to +50°C) Usable to –4°F (–20°C).
ALTITUDE	0 to 15,000 Feet (4572 m) Above Sea Level.
HUMIDITY	95% Maximum, Non–Condensing.
SIZE:	
HEIGHT	3.5 Inches (8.9 cm).
WIDTH	19.00 Inches (48.3 cm).
DEPTH	19.00 Inches (48.3 cm).
WEIGHT	22 Pounds (9.98 kg).

2–8. INSTALLATION.

2–9. Each exciter is wired, operated, tested, and inspected at the factory prior to shipment and is ready for installation when received. Prior to installation, this publication should be studied to obtain a thorough understanding of the operation, circuitry, nomenclature, and installation requirements. Installation is accomplished as follows: 1) Preliminary Installation, 2) Exciter RF Interfacing, 3) Transmitter IPM Check, 4) Exciter Audio Interfacing, 5) Exciter Audio Equalization, 6) Additional Rear–Panel Connections, 7) Exciter Proof of Performance, and 8) Installation Adjustments.

2–10. Table 2–2 lists the test equipment required to install the AX–10 AM Stereo Exciter. Refer to this table as required for the installation procedures.

TABLE 2–2. TEST EQUIPMENT

TEST EQUIPMENT	REQUIREMENTS
Calibrated Low Distortion Audio Generator	+20 dBm, 600 Ohm output (Potomac AG–51 or equivalent).
Audio Analyzer	Capable of indicating distortion levels of 0.1% (Potomac AA–51 or equivalent).
Calibrated Oscilloscope	10 MHz bandwidth, X–Y display of audio frequencies with no appreciable phase shift (Tektronix 7603 Oscilloscope Main Frame or equivalent).
Spectrum Analyzer	5 MHz bandwidth, 70 dB dynamic range (Tektronix 7603 Oscilloscope Main Frame and 7L5 Spectrum Analyzer Plug–in with L3 module or equivalent).
AM Stereo Modulation Monitor	Broadcast Electronics model AS–10 (BE P/N 907–0100) or equivalent (Motorola Model 1410, or Delta Model ASM–1).
Insulated Adjustment Tool (Shipped with the Exciter)	5 inch (12.7 cm) insulated adjustment tool with flat–tip (BE P/N 407–0186).
Flat–Tip Screwdriver	4 inch (10.2 cm) blade, 1/4 inch (0.6 cm) tip.
Test Load, Bird Model 8080	Non–inductive, 25 Watt, 50 Ohm (BE P/N 829–8080) or equivalent.
RG58 Coaxial Cable	Belden 8262 (BE P/N 622–0050) or equivalent.
Audio Cable, 2–Conductor with Shield	Belden 8451 (BE P/N 622–8451) or equivalent.
Connector, for Test Load	Type N jack (BE P/N 418–0031) or equivalent.
Phillips No. 2 Screwdriver	4 inches (10.2 cm) long.

2–11. PRELIMINARY INSTALLATION.

2–12. The AX–10 exciter may be mounted in any convenient location in a 19 inch (48.3 cm) rack within reach of signal and power cables. The exciter should not be mounted directly above heat generating equipment (i.e. power amplifier stage) or strong magnetic fields (i.e. power transformer). Also, 2 inches (5.1 cm) of rack space above and below the exciter is required for adequate cooling.

WARNING ***ENSURE ALL RACK POWER IS DEENERGIZED BEFORE ATTEMPTING EXCITER INSTALLATION.***

WARNING

2–13. Set the exciter on a work surface.

2–14. Remove any packing material from the outside of the exciter.

2–15. Remove the fuse from the 50/60 Hz AC LINE VOLTAGE SELECT device on the exciter rear panel.

2–16. Ensure the primary ac line voltage with which the exciter will be used is visible on the AC LINE VOLTAGE SELECT device circuit board (100V, 115/120V, 220V, or 230/240V). The following text presents AC Line voltage programming information.

LINE VOLTAGE	AC LINE VOLTAGE SELECT DEVICE PROGRAMMING
90–110V	100V
108–133V	120V
205–242V	220V
215–266V	240V

2–17. If the unit is to be operated from a 180V to 200Vac power source, the ac line voltage input device must be re–configured. To re–configure the ac line voltage input device, proceed as follows:

WARNING ***ENSURE ALL PRIMARY POWER IS DISCONNECTED.***

WARNING

1. Ensure all primary power is dosconnected.
2. Disconnect the blue wire from the ac line voltage input device Terminal D.
3. Heat shrink end of wire.
4. Connect the brown/white wire to the ac line voltage input device Terminal D.
5. Program the ac Line Voltage input device for 220V operation.

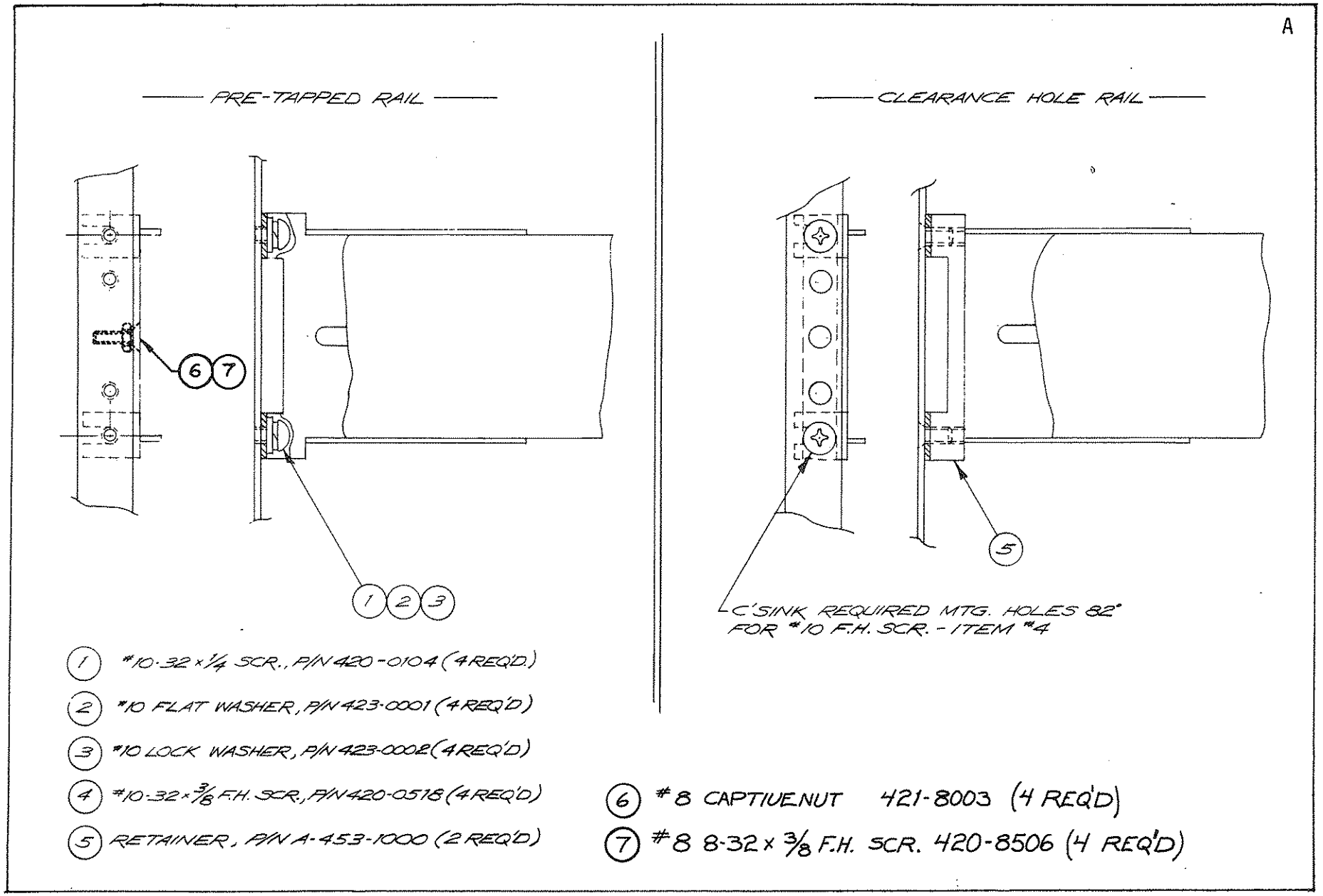
2–18. If the ac line voltage must be changed, remove the AC LINE VOLTAGE SELECT device circuit board with a small pair of needle nose pliers. Re–insert the circuit board so that the correct ac line voltage is visible when the circuit board is inserted into the recep–tacle.

2–19. Ensure the fuse and the spare fuse are both slow–blow types and rated at 1.0 ampere for the 90 to 120 volt range or 0.5 ampere for the 180 to 240 volt range.

2–20. If the exciter must be mounted in a rack, complete the following procedure.

A. Extend and remove the movable portion of each slide rail from the sides of the exciter.

B. Mount the front edge of each slide rail to the respective side of the rack cabinet with hardware supplied (see Figure 2–1).



597-0095-2

FIGURE 2–1. EXCITER FRONT RAIL MOUNTING APPLICATIONS

CAUTION ***ENSURE THE SLIDE RAILS ARE PARALLEL TO EACH OTHER AND LEVEL BEFORE DRILLING ANY HOLES TO MOUNT THE REAR OF THE SLIDE RAILS.***

CAUTION

C. Mount the rear of each slide rail to the rack cabinet. Hardware is supplied for this purpose.

D. Place the exciter on the slide rails.

2–21. Pull the exciter forward, out of the rack until the slide rail stops are encountered.

2–22. Loosen the turn–lock fasteners on the top of the exciter and remove the top cover.

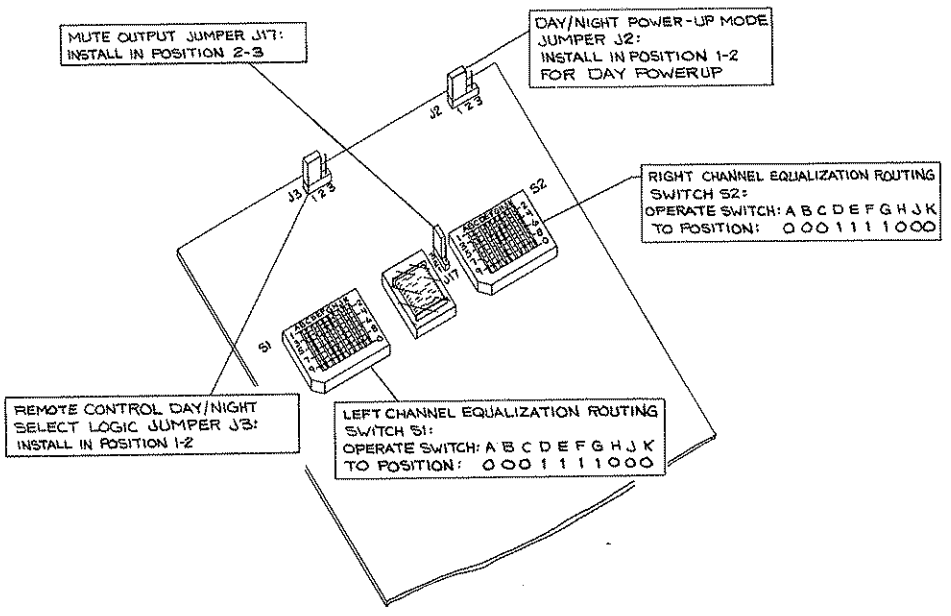
WARNING ***ENSURE ALL EXCITER POWER IS DISCONNECTED BEFORE PROCEEDING.***

WARNING

2–23. **CIRCUIT BOARD SWITCH AND JUMPER–PLUG PROGRAMMING CHECK.** All AX–10 exciter circuit boards are factory programmed during final test. To assure the circuit board switch and jumper–plugs have not become dislodged or changed during shipment, refer to Figures 2–2 through 2–5 and check the position of each circuit board switch and jumper–plug.

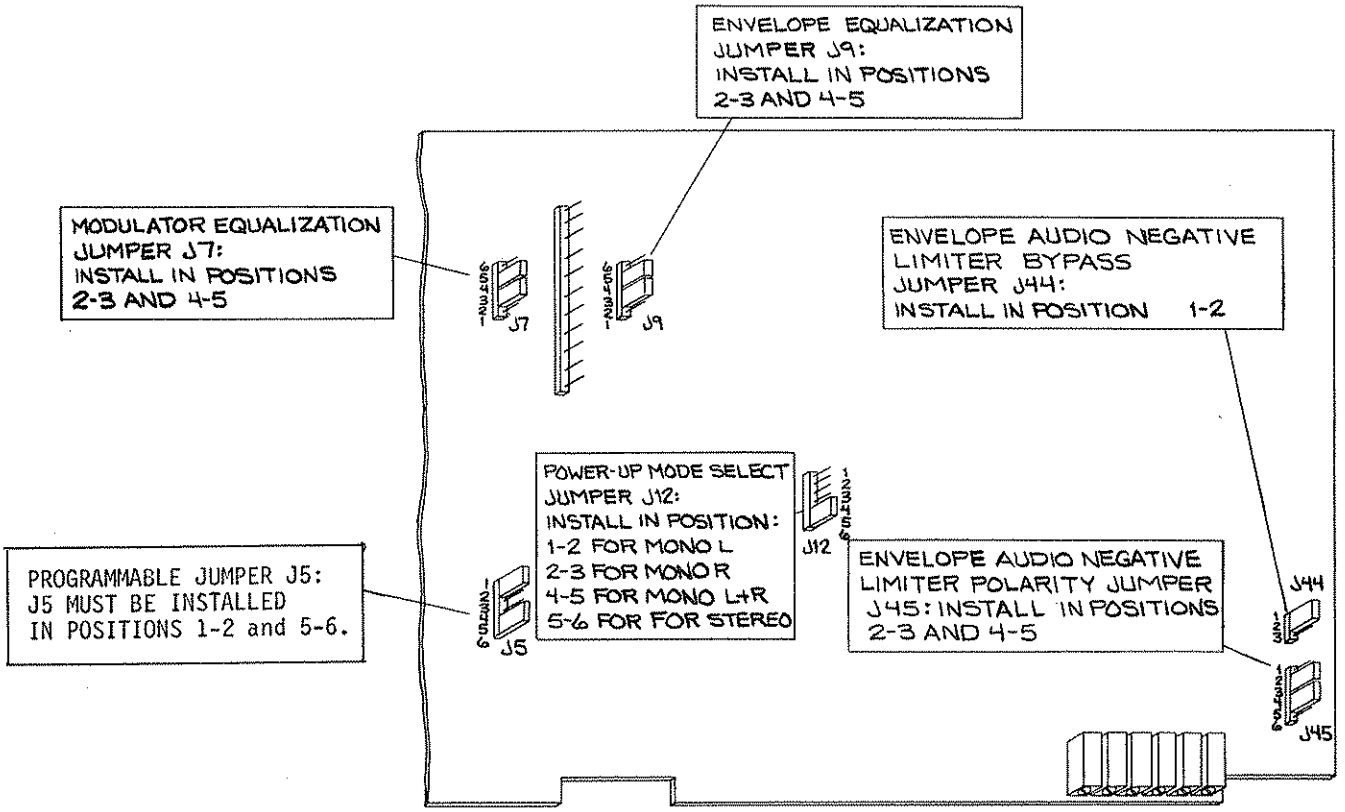
2–24. **EXCITER RF INTERFACING.**

2–25. **TRANSMITTER RF INPUT POINT.** The first step is to determine the appropriate point at which to apply drive to the transmitter RF circuitry. The AX–10 is designed with a 10 watt square–wave output which is adjustable from a TTL–level to 45V peak–to–peak for driving various types of RF circuitry. To select the transmitter RF input point, proceed as follows:



597–0095–3

FIGURE 2–2. DAY/NIGHT EQUALIZATION CIRCUIT BOARD SWITCH AND JUMPER–PLUG PROGRAMMING



597-0095-4

FIGURE 2–3. AUDIO CONTROL CIRCUIT BOARD JUMPER–PLUG PROGRAMMING

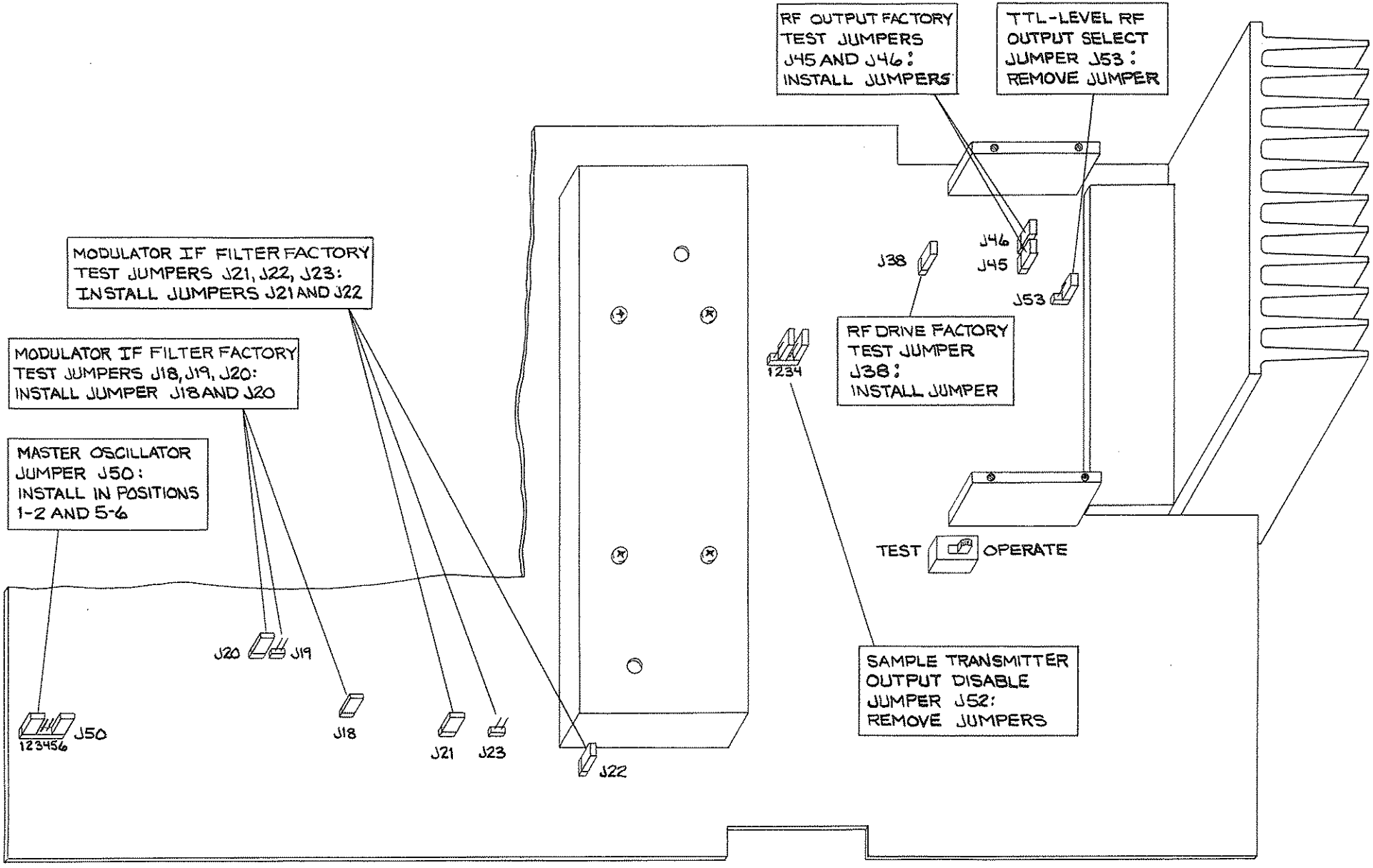
TRANSMITTER RF INPUT POINT

WARNING ***ENSURE ALL TRANSMITTER PRIMARY POWER IS DISCONNECTED BEFORE PROCEEDING.***

WARNING

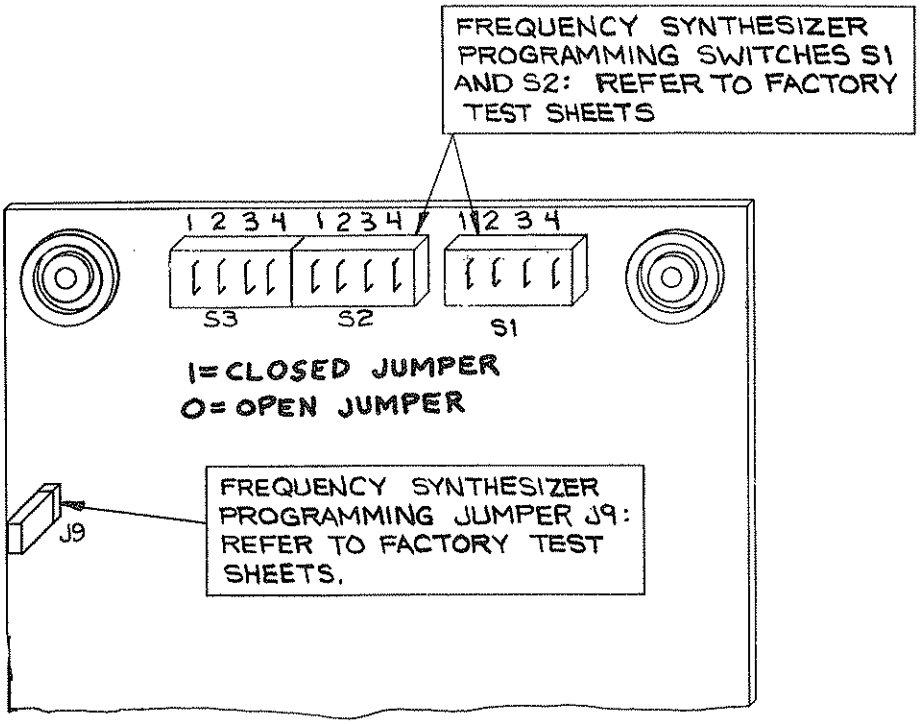
A. Examine the transmitter schematics for an RF input point. As a general rule, select the highest point in the transmitter RF chain which will require an input of less than 45V peak–to–peak. If the normal RF voltages are not indicated on the schematics, the voltages must be measured. Refer to the transmitter manual for recommended procedures and test equipment.

B. For AX–10 exciter installation purposes, the RF input points are divided into two categories: high–level and TTL–level. If the selected RF input point requires a high–level input, refer to the HIGH–LEVEL INPUT INSTALLATION in the following text. If the selected RF input point requires a TTL–level input, the input can be interfaced using the HIGH–LEVEL INPUT installation or the TTL–LEVEL INPUT installation. To drive a single TTL–level transmitter, it is recommended the HIGH –LEVEL INPUT installation be used. To drive one high–level transmitter and one TTL–LEVEL transmitter, use the HIGH–LEVEL INSTALLATION for the high–level transmitter and the TTL–LEVEL INSTALLATION for the TTL–level transmitter. For TTL–LEVEL installations, refer to the TTL–LEVEL INPUT INSTALLATION in the following text.



597-0095-5

FIGURE 2–4. MODULATOR CIRCUIT BOARD SWITCH AND JUMPER–PLUG PROGRAMMING



597–0095–6

FIGURE 2–5. FREQUENCY SYNTHESIZER CIRCUIT BOARD SWITCH PROGRAMMING

2–26. **HIGH–LEVEL INPUT INSTALLATION.** For transmitters requiring a high–level RF input, proceed as follows:

HIGH–LEVEL INPUT INSTALLATION

WARNING *DISCONNECT ALL TRANSMITTER PRIMARY POWER BEFORE PROCEEDING.*

WARNING

A. Disconnect all transmitter primary power.

B. Connect an oscilloscope to the selected RF input point.

C. Energize the transmitter primary ac input and operate the transmitter at the normal power output.

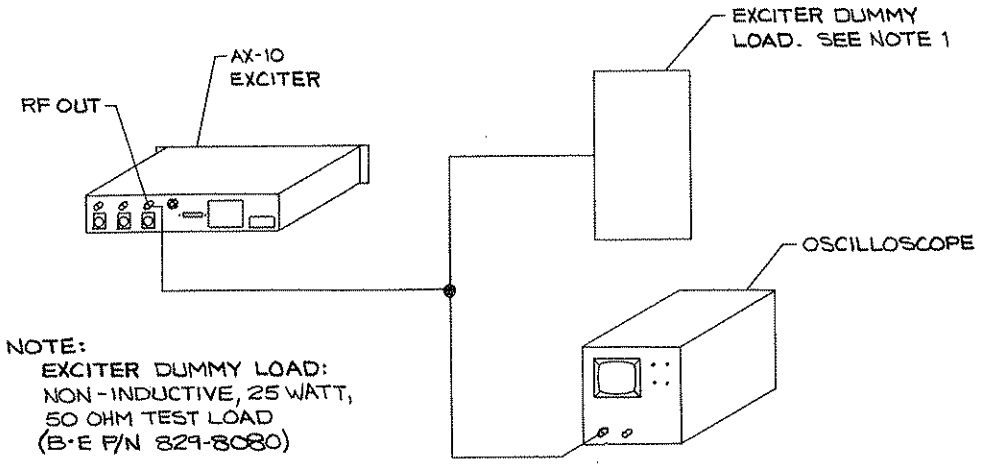
D. Measure and record the peak–to–peak voltage indication _____.

WARNING *ENSURE ALL EXCITER PRIMARY POWER IS DISCONNECTED BEFORE PROCEEDING.*

WARNING

E. Connect the exciter and the test equipment as shown in Figure 2–6.

F. Connect the exciter power cord to the appropriate power source.



597–0095–8

FIGURE 2–6. TEST EQUIPMENT CONNECTIONS, HIGH–LEVEL INPUT INSTALLATION

HIGH–LEVEL INPUT INSTALLATION (Cont'd)

G. Adjust RF output level control R130 and RF drive control R175 (refer to Figure 2–7) for the recorded RF input voltage level (refer to Step D) and to eliminate RF drive overshoot as shown by Figure 2–8.

WARNING ***DISCONNECT ALL EXCITER AND TRANSMITTER PRIMARY POWER BEFORE PROCEEDING.***

WARNING

H. Disconnect all exciter and transmitter primary power.

I. Disconnect the exciter from the dummy load and the oscilloscope.

J. Disable the transmitter crystal oscillator by disconnecting the power supply voltage.

K. Examine the transmitter schematics and determine the RF input point impedance. The AX–10 requires a 50 Ohm termination. If the selected RF input point does not provide a proper termination, install a resistance pad to establish a 50 Ohm load.

L. With RG58 coaxial cable, connect the exciter RF OUT jack to the transmitter RF input point.

M. If it is desired to null the second harmonic frequency with the adjustment of the symmetry control in the following steps, connect a transmitter output sample to the input of a spectrum analyzer.

CAUTION ***TO PREVENT DAMAGE TO THE TRANSMITTER RF CIRCUITRY, APPLY POWER TO THE EXCITER BEFORE***

CAUTION ***OPERATING THE TRANSMITTER.***

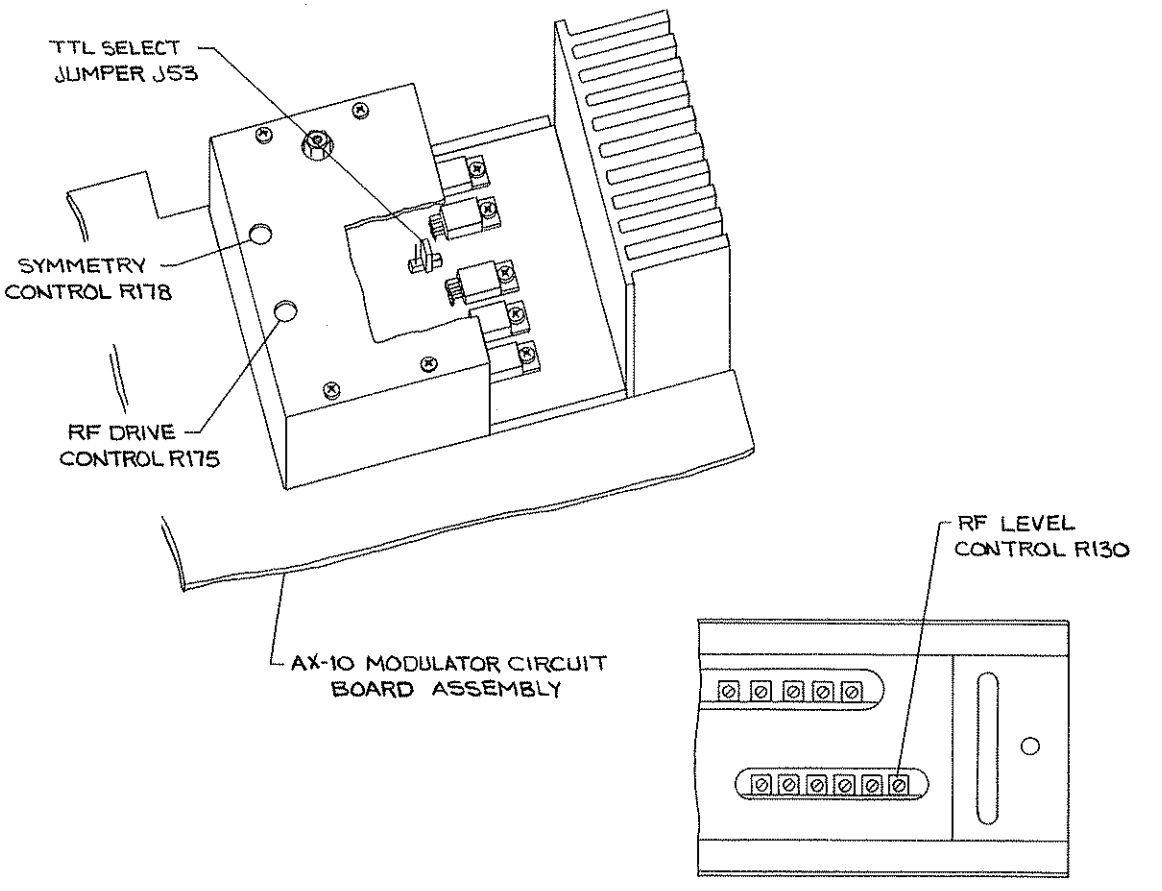
N. Apply primary power to the exciter.

O. Energize the transmitter primary ac input and operate the transmitter at the normal power output.

P. Adjust symmetry control R178 (refer to Figure 2–7) to:

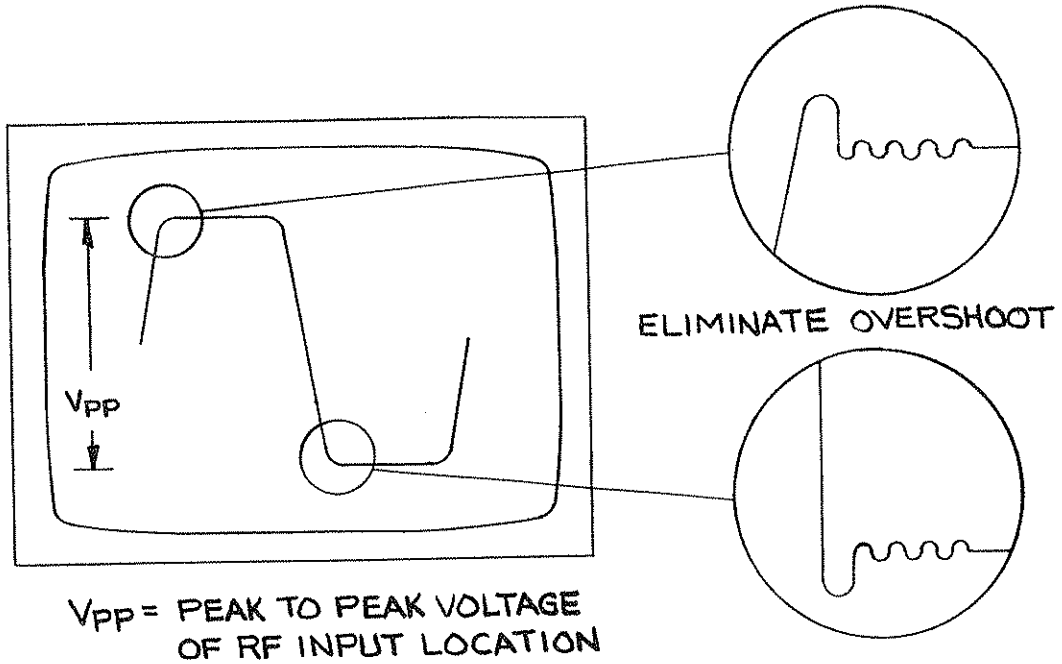
1. Obtain the best overall transmitter efficiency,
   or
2. Null the second harmonic frequency.

Q. Check all transmitter parameters for normal operating indications.



597–0095–9

FIGURE 2–7. RF OUTPUT ADJUSTMENTS



597-0095-10

FIGURE 2–8. EXCITER RF OUTPUT WAVE–FORM

2–27. **TTL–LEVEL INPUT INSTALLATION.** If TTL–level RF input is required, connect a 50 Ohm coaxial cable (RG–58/U) to the **TTL OUT** connector on the rear–panel of the AX–10 to the RF input point of the transmitter. The cable length must not exceed 30 feet and be terminated at the RF input point with a 50 Ohm 1 watt resistor.

2–28. **TRANSMITTER IPM CHECK.**

2–29. After connecting the exciter RF output to the transmitter, the next step is to determine the amount of transmitter IPM (incidental phase modulation). Transmitter IPM is inadvertent angular modulation of the AM carrier which may be generated by power supply hum or the PA stage. This inadvertent modulation must be minimized to broadcast a high quality AM stereo signal. Check the transmitter for power supply and PA circuit generated IPM as follows:

2–30. **POWER SUPPLY GENERATED IPM.** To check the transmitter for power supply generated IPM, proceed as follows:

POWER SUPPLY GENERATED IPM

WARNING *DISCONNECT ALL EXCITER AND TRANSMITTER PRIMARY POWER BEFORE PROCEEDING.*

WARNING

A. Disconnect all exciter and transmitter primary power.

B. Connect the test equipment to the transmitter as shown in Figure 2–9.

CAUTION *TO PREVENT DAMAGE TO THE TRANSMITTER RF CIRCUITRY, APPLY POWER TO THE EXCITER BEFORE OPERATING THE TRANSMITTER.*

CAUTION

C. Apply primary power to the exciter.

D. Energize the transmitter primary ac input and operate the transmitter at the normal power output.

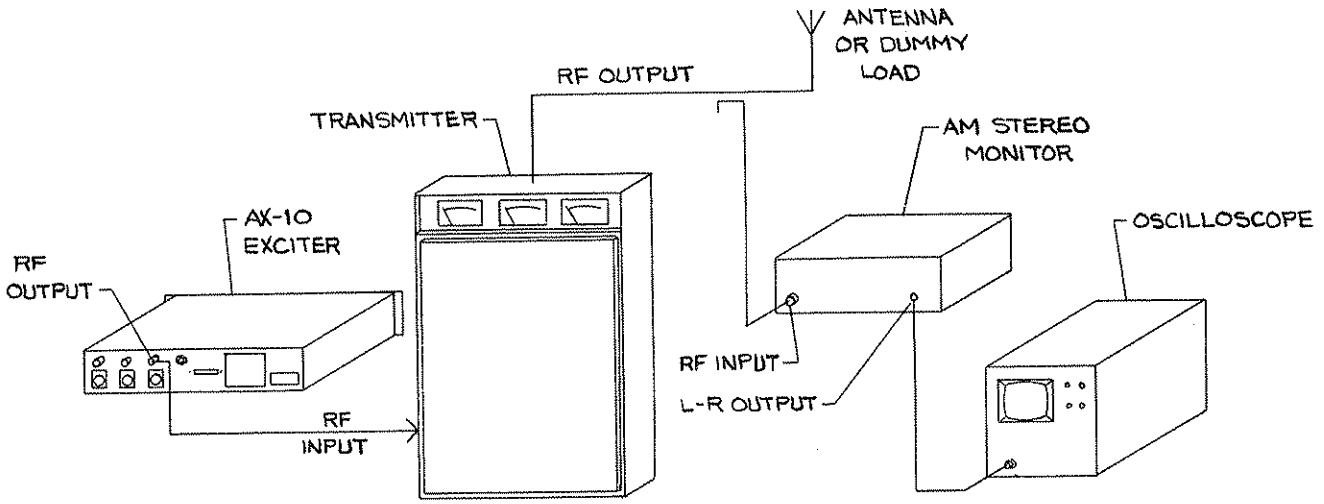
E. Operate the exciter to the stereo mode by depressing the **STEREO** switch (located behind the front–panel access door). The front–panel **STEREO** indicator will illuminate.

F. Disable the exciter pilot tone by operating the **PILOT OFF** switch (located behind the front–panel access door) to the in position. The front–panel **STEREO** and **MONO L+R** indicators will illuminate.

G. Adjust the AM stereo monitor for the correct RF input level and to indicate L–R information.

H. For acceptable power supply generated IPM, the monitor must indicate an L–R level of –35 dB to –40 dB. If the monitor indication is above the acceptable level, then reduction of the power supply generated IPM is required.

I. Check the oscilloscope for the type of IPM components displayed. If power supply components are detected, the components may be removed by installing power supply filters on the lower level RF circuitry.



597–0095–12

FIGURE 2–9. TEST EQUIPMENT CONNECTIONS, TRANSMITTER IPM

2–31. **PA CIRCUIT GENERATED IPM.** To check the transmitter for PA circuit generated IPM, proceed as follows:

PA CIRCUIT GENERATED IPM

WARNING *DISCONNECT ALL EXCITER AND TRANSMITTER PRIMARY POWER BEFORE PROCEEDING.*

WARNING

A. Disconnect all exciter and transmitter primary power.

B. With the exciter, transmitter, and the test equipment connected as shown in Figure 2–9, connect an audio generator to the transmitter audio input.

CAUTION *TO PREVENT DAMAGE TO THE TRANSMITTER RF CIRCUITRY, APPLY POWER TO THE EXCITER BEFORE OPERATING THE TRANSMITTER.*

CAUTION

C. Apply primary power to the exciter.

D. Energize the transmitter primary ac input and operate the transmitter at the normal power output.

E. Ensure the exciter is operated to the stereo mode and the pilot tone is off (the front–panel **STEREO** and **MONO L+R** indicators will be illuminated).

F. Operate the AM stereo monitor to indicate L+R information.

G. Operate the audio generator for a 1 kHz output at a level to produce 85% L+R modulation.

H. Operate the AM stereo monitor to indicate L–R information.

I. For acceptable PA circuit generated IPM, the monitor must indicate an L–R level of –35 dB to –40 dB. If the monitor indication is above the acceptable level, then reduction of the PA circuit generated IPM is required. The source of PA circuit generated IPM will vary greatly in different types of transmitters. One area that usually contributes to IPM is transmitter neutralization.

J. Refer to the transmitter manual as required to adjust the neutralization for an acceptable L–R level. If the proper L–R level cannot be obtained through neutralization, contact the transmitter manufacturer for other possible sources and solutions to reduce the PA circuit generated IPM.

2–32. **EXCITER AUDIO INTERFACING.**

2–33. **EXCITER AUDIO OUTPUT CONNECTION.** After reducing the transmitter IPM to an acceptable level, the next step is to connect the exciter audio output to the transmitter. To connect the exciter audio output to the transmitter, proceed as follows:

EXCITER AUDIO OUTPUT CONNECTION

WARNING ***DISCONNECT ALL EXCITER AND TRANSMITTER PRIMARY POWER BEFORE PROCEEDING.***

WARNING

A. Disconnect all exciter and transmitter primary power.

B. Construct an audio output cable by connecting one end of a 2–conductor shielded audio cable to the audio output female XLR connector (located in the exciter accessory parts kit) as follows:

1. The shield to terminal 1 (ground).
2. One conductor to terminal 2 (+).
3. One conductor to terminal 3 (–).

C. Using the audio output cable, connect the XLR connector to the exciter rear–panel ENVELOPE OUT jack and the opposite end to the transmitter audio input terminal strip as follows:

1. For a balanced transmitter audio input, connect:
   a. The high signal wire (from terminal 2) to the + terminal.
   b. The low signal wire (from terminal 3) to the – terminal.
   c. The shield to ground.
2. For an unbalanced transmitter audio input, connect:
   a. The high signal wire (from terminal 2) to the + terminal.
   b. The shield to ground.

D. Remove the covers from the audio input male XLR connectors (located in the exciter accessory parts kit) and attach the connectors to the exciter rear–panel LEFT IN and RIGHT IN jacks. The XLR connector terminal designations are as follows:

1. Terminal 1: Ground
2. Terminal 2: +
3. Terminal 3: –

E. Connect the test equipment to the exciter and transmitter as shown in Figure 2–10.

CAUTION ***TO PREVENT DAMAGE TO THE TRANSMITTER RF CIRCUITRY, APPLY POWER TO THE EXCITER BEFORE OPERATING THE TRANSMITTER.***

CAUTION

F. Apply primary power to the exciter.

G. Energize the transmitter primary ac input and operate the transmitter at the normal power output.

H. Ensure the exciter is operated to the day mode (the front–panel **DAY** indicator will be illuminated). If the exciter **NIGHT** indicator is illuminated, operate the exciter to the DAY mode by depressing the **DAY/NIGHT** switch (located behind the front–panel access door).

EXCITER AUDIO OUTPUT CONNECTION (Cont'd)

I. Ensure the exciter is operated to the stereo mode and the pilot tone is off (the front–panel **STEREO** and **MONO L+R** indicators will be illuminated).

J. Adjust the audio generator for a L=R 1kHz output at +10 dBm.

K. Operate the AM stereo monitor to indicate L+R information.

L. Adjust the exciter **DAY LEVEL** control (located behind the exciter front–panel access door) until the AM stereo monitor indicates 100% transmitter modulation.

M. Adjust the audio generator for a left channel 1 kHz output at +10 dBm.

N. Adjust the oscilloscope to the X–Y mode.

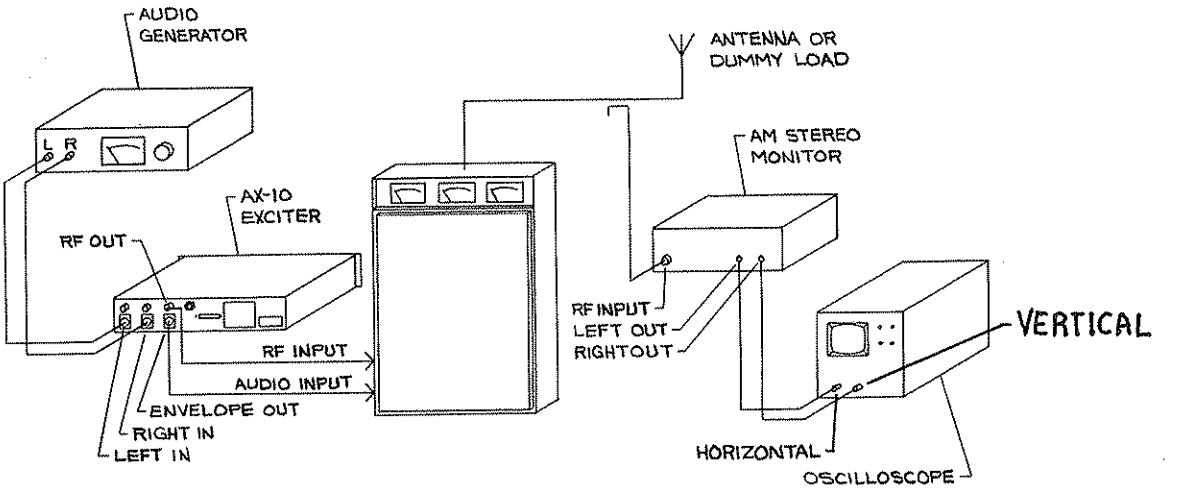
O. Observe and compare the lissajous pattern to Figure 2–11.

P. If the audio phase is incorrect, proceed as follows:

WARNING ***DISCONNECT ALL EXCITER AND TRANSMITTER PRIMARY POWER BEFORE PROCEEDING.***

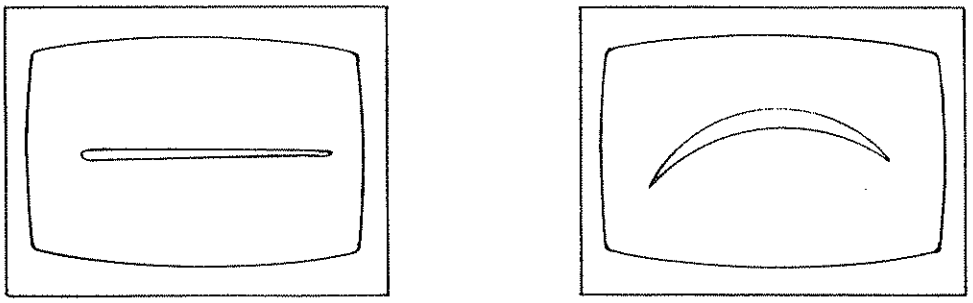
WARNING

1. Disconnect all exciter and transmitter primary power.
2. For a balanced transmitter audio input, reverse the + and – connections on the transmitter audio input terminal strip.
3. For an unbalanced transmitter audio input, disconnect the high signal wire from the + terminal and connect the low signal wire.



597–0095–13

FIGURE 2–10. TEST EQUIPMENT CONNECTIONS, EXCITER AUDIO OUTPUT CONNECTION



597–0095–14

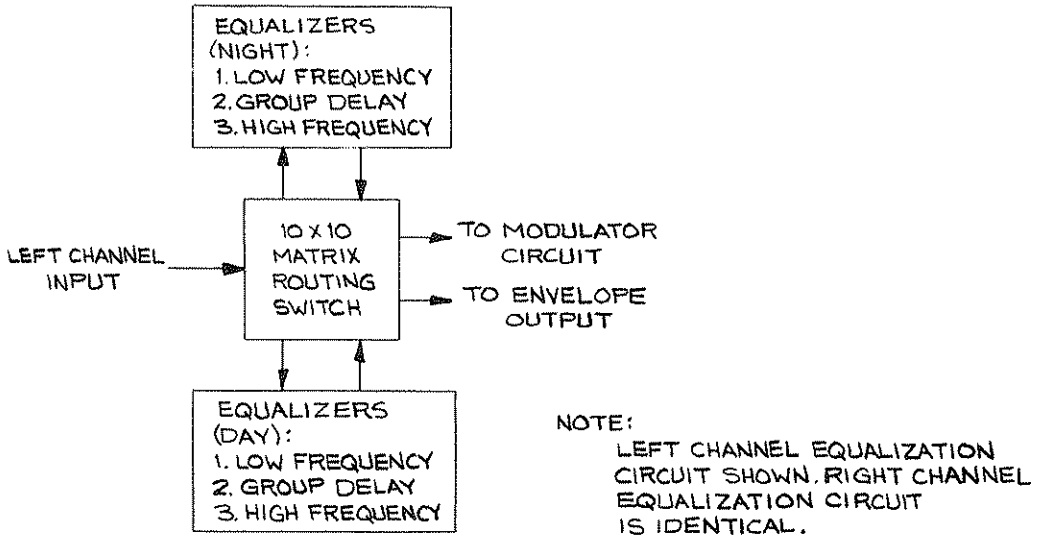
FIGURE 2–11. LISSAJOUS PATTERNS, AUDIO PHASING

2–34. **EXCITER AUDIO EQUALIZATION.**

2–35. After adjusting the exciter audio level, the next step is to adjust the exciter audio equalization to obtain the best stereo performance from the transmitter.

2–36. In all transmitters, the propagation time required for the audio signal to conduct through the transmitter is different from the propagation time required by the RF signal. To broadcast an AM stereo signal with the best separation, the audio and the RF signals must arrive at the modulator simultaneously. The AX–10 is designed with built–in equalization circuitry which controls the signal path delays to match the characteristics of the transmitter.

2–37. **EXCITER EQUALIZATION CIRCUIT.** The exciter equalization circuit consists of identical left and right channel circuits (refer to Figure 2–12). Each circuit is designed to route audio via a 10 X 10 matrix routing switch to identical day/night sub–circuits consisting of the following equalizers: 1) Low Frequency, 2) Group Delay, and 3) High Frequency. The equalizer outputs are returned to the matrix switch for routing to another equalizer, the modulator circuit, or to the envelope output as required. Controls in each equalizer provide the required response to match the transmitter characteristics.

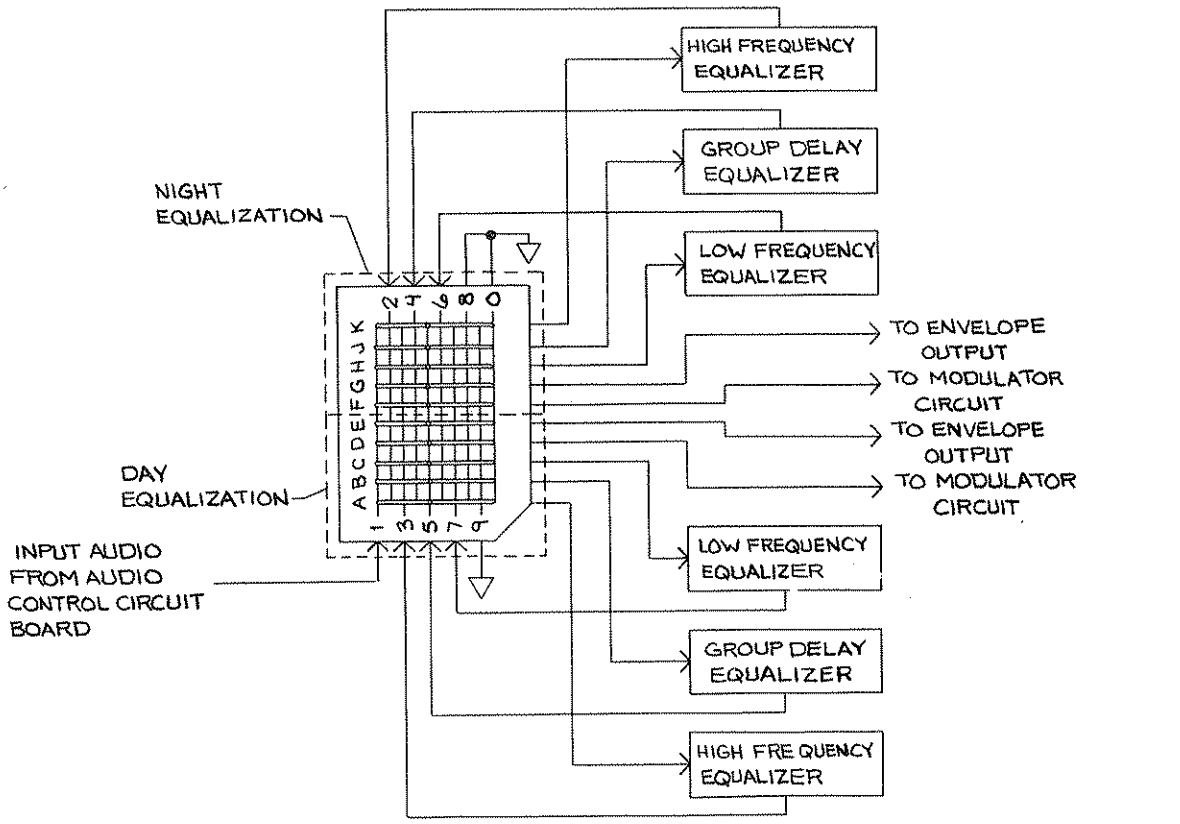


597-0095-15

FIGURE 2-12. EXCITER EQUALIZATION CIRCUIT

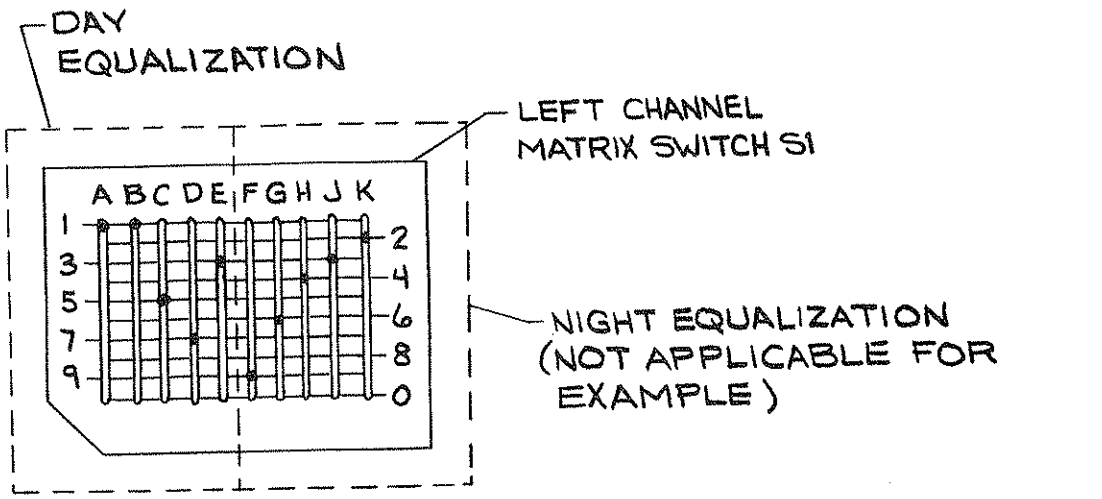
2-38. **Equalization Matrix Routing Switches.** The left and right channel equalization matrix routing switches are located on the day/night equalization circuit board (refer to Figure 2-2). Each matrix switch is divided into identical day/night functions (refer to Figure 2-13). All audio sources (input audio from the audio control circuit board and the equalizer outputs) enter the matrix switch through ports 1 through 7 (ports 0, 8, and 9 are grounded). All output destinations (equalizer inputs, modulator circuit, and envelope output) are selected by matrix slide-switches A through K. The following list and Figure 2-14 describe one typical left channel day routing selection with the correct matrix slide-switch positions.

Desired Audio Routing	Matrix Slide-Switch Positions
Input audio to high frequency equalizer.	S1A-1
Input audio to group delay equalizer.	S1B-1
Group delay equalizer output to low frequency equalizer.	S1C-5
High frequency equalizer output to envelope output.	S1E-3
Low frequency equalizer output to modulator circuit.	S1D-7



597–0095–16

FIGURE 2–13. EQUALIZATION MATRIX SWITCH ROUTING

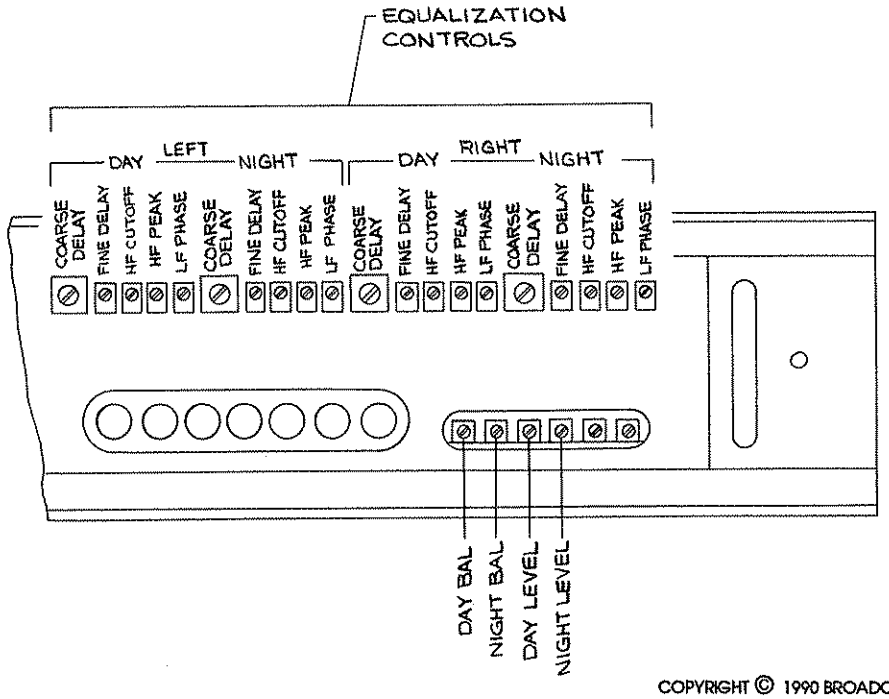


597–0095–17

FIGURE 2–14. MATRIX SLIDE–SWITCH POSITIONS

2–39. **Equalization Controls.** The equalization controls consist of identical left and right channel adjustments which are located behind the front–panel access door (refer to Figure 2–15). The left and right channel controls are further divided into identical day/night functions. Each day/night function contains five controls: 1) COARSE DELAY, 2) FINE DELAY, 3) HF CUTOFF, 4) HF PEAK, and 5) LF PHASE. The following list provides a general description of each control.

CONTROL	FUNCTION
COARSE DELAY	In the group delay equalizer, coarse adjusts the audio delay through a rotary switch divided into 4 microsecond increments.
FINE DELAY	In the group delay equalizer, fine adjusts the audio delay through a 0 to 6 microsecond adjustment.
HF CUTOFF	Controls the cutoff frequency in the high frequency equalizer.
HF PEAK	Controls the amplitude of the peaking at the cutoff frequency in the high frequency equalizer. The control provides a peaking range from –3 dB to +3 dB.
LF PHASE	In the low frequency equalizer, shifts the phase to compensate for transmitter variations (usually required by plate modulated transmitters only).



597–0095–18

FIGURE 2–15. EQUALIZATION CONTROLS

2–40. The **DAY/NIGHT LEVEL** and the **DAY/NIGHT BAL** controls operate with the equalization controls to provide comprehensive C–QUAM equalization. The controls interact to produce the proper ratios between the left/right channel mix and the overall level.

2–41. **EQUALIZATION LISSAJOUS PATTERNS.** The response of the exciter equalization circuit is observed through lissajous patterns. Figure 2–16 illustrates two types of lissajous patterns: 1) maximum separation patterns and 2) poor separation patterns with the associated diagnosis. Refer to the lissajous patterns as required for the equalization procedures in the following text.

2–42. **EQUALIZATION PROCEDURES.** The exciter audio equalization is divided into three procedures: 1) Group Delay, 2) Low Frequency Equalization, and 3) High Frequency Equalization. The equalization procedures interact, therefore do not remove or change the operation of the exciter, transmitter, or the test equipment between each procedure.

2–43. Each equalization procedure describes the adjustment of the left channel day controls. The adjustment of the right channel controls is identical. Perform the equalization procedures as follows:

2–44. **Test Equipment Connections.** Assure the exciter, transmitter, and the test equipment are properly connected and operated to the correct modes for the equalization procedures as follows:

WARNING ***DISCONNECT ALL EXCITER AND TRANSMITTER PRIMARY POWER BEFORE PROCEEDING.***

WARNING

A. Disconnect all exciter and transmitter primary power.

B. Ensure the test equipment is connected to the exciter and transmitter as shown by Figure 2–10.

CAUTION ***TO PREVENT DAMAGE TO THE TRANSMITTER RF CIRCUITRY, APPLY POWER TO THE EXCITER BEFORE OPERATING THE TRANSMITTER.***

CAUTION

C. Apply primary power to the exciter.

D. Energize the transmitter primary ac input and operate the transmitter to the normal power output.

E. Ensure the exciter is operated to the stereo mode and the pilot tone is off (the front–panel **STEREO** and **MONO L+R** indicators will be illuminated).

F. Ensure the exciter is operated to the DAY mode (the front–panel **DAY** indicator will be illuminated).

G. Ensure the exciter equalization controls are operated as follows:

1. The **COARSE DELAY** controls to the 0 position.
2. The **FINE DELAY, LF PHASE, HF CUTOFF,** and the **HF PEAK** controls are fully counterclockwise.

H. Adjust the AM stereo modulation monitor for separate left channel and right channel meter indications.

I. Ensure the oscilloscope is operated to the X–Y mode.

J. Disable the exciter single–channel–limiter by operating **SCL OFF** switch (located behind the front–panel access door) to the in position.

2–45. **Group Delay Procedure.** To adjust the exciter group delay, proceed as follows:

GROUP DELAY

CAUTION

CAUTION

OPERATION OF THE EXCITER WITH THE TOP–PANEL REMOVED IS ALWAYS CONSIDERED HAZARDOUS, THEREFORE CAUTION SHOULD BE OBSERVED. DO NOT TOUCH ANY COMPONENT WITHIN THE EXCITER WHEN POWER IS ENERGIZED.

A. Adjust the audio generator for a left channel 1 kHz output at +10 dBm.

B. Determine if the modulator audio path or the envelope audio path requires left channel group delay as follows:

1. Insert left channel group delay into the modulator audio path by operating the left channel matrix switch for the following day routing sequence:

   a. Left channel audio to envelope output.

   b. Left channel audio to group delay equalizer.

   c. Group delay equalizer output to modulator circuit.

2. Observe the lissajous pattern. Generally, the pattern will indicate incorrect phase and amplitude equalization (refer to Figure 2–16).

3. Adjust the LEFT channel **DAY COARSE DELAY** control clockwise and observe the elliptical lissajous pattern (the pattern will either expand or contract).

4. If the elliptical lissajous pattern contracts, left channel group delay is required in the modulator audio path, therefore proceed to step C. If the elliptical lissajous pattern expands, left channel group delay is required in the envelope audio path, therefore proceed to step D.

C. If left channel group delay is required in the modulator audio path, proceed as follows:

1. Ensure the left channel group delay is inserted into the modulator audio path as described by step B–1.

2. Correct phase equalization as follows:

   a. Adjust the LEFT channel **DAY COARSE DELAY** control clockwise for a straight–line lissajous pattern.

   b. Adjust the LEFT channel **DAY FINE DELAY** control for maximum separation as indicated by the AM stereo modulation monitor right channel meter.

D. If left channel group delay is required in the envelope audio path, proceed as follows:

1. Adjust the LEFT channel **DAY COARSE DELAY** control counterclockwise to the 0 position.

2. Insert left channel group delay into the envelope audio path by operating the left channel matrix switch for the day routing sequence:

a. Left channel audio to the modulator circuit.

b. Left channel audio to group delay equalizer.

c. Group delay equalizer output to the envelope output.

3. Repeat step C–2.

E. Refer to the left channel matrix switch as required to record the modulator audio path (example: Left Channel Audio ⇒ Group Delay ⇒ Modulator Circuit).

Left Channel Day _____

Right Channel Day _____

Left Channel Night _____

Right Channel Night _____

F. Refer to the left channel matrix switch as required to record the envelope audio path (example: Left Channel Audio ⇒ envelope Output).

Left Channel Day _____

Right Channel Day _____

Left Channel Night _____

Right Channel Night _____

G. Correct amplitude equalization by adjusting the front–panel **DAY LEVEL** control for maximum separation as indicated by the AM stereo modulation monitor right channel meter and the lissajous pattern.

H. Adjust the right channel group delay as follows:

1. Adjust the audio generator for a right channel 1 kHz output at +10 dBm.

2. Repeat steps B through F using the RIGHT channel **DAY** controls. Maximum right channel separation is indicated by the AM stereo modulation monitor left channel meter.

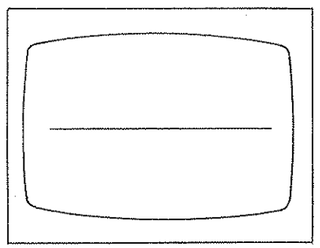
I. Adjust the ratio between the left and right channel mix and the overall level for maximum left channel into right channel and right channel into left channel separation as follows:

1. Adjust the front–panel **DAY BAL** control for maximum separation as indicated by the AM stereo modulation monitor left channel meter. Record the number of turns and the direction.

Day
1. _____.
2. _____.
3. _____.

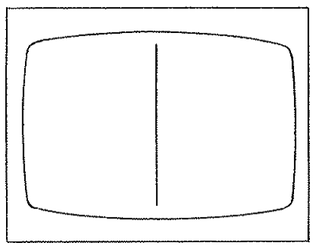
Night
1. _____.
2. _____.
3. _____.

2. Adjust the **DAY BAL** control one–half the recorded number of turns in the opposite direction.



LEFT CHANNEL

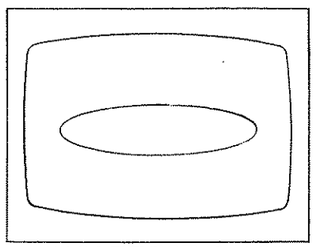
L+R
(MONOPHONIC)



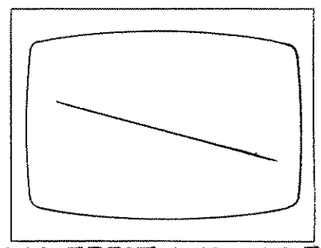
RIGHT CHANNEL

L-R
(STEREOPHONIC)

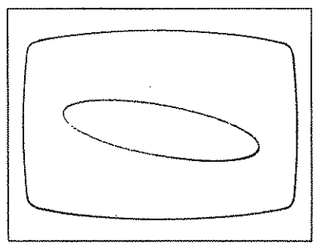
MAXIMUM SEPARATION LISSAJOUS PATTERNS



INCORRECT PHASE
EQUALIZATION

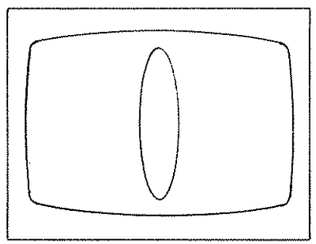


INCORRECT AMPLITUDE
EQUALIZATION

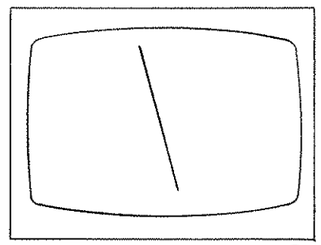


COMBINATION

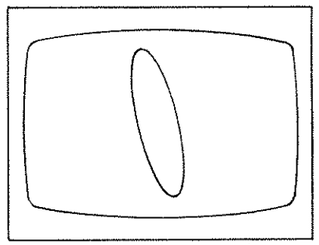
LEFT CHANNEL



INCORRECT PHASE
EQUALIZATION



INCORRECT AMPLITUDE
EQUALIZATION



COMBINATION

RIGHT CHANNEL

POOR SEPARATION LISSAJOUS PATTERNS

FIGURE 2-16.
EQUALIZATION LISSAJOUS PATTERNS

3. Adjust the audio generator for a left channel 1 kHz output at +10 dBm.
4. Adjust the **DAY LEVEL** control for maximum separation as indicated by the AM stereo modulation monitor right channel meter.
5. Adjust the audio generator for a right channel 1 kHz output at +10 dBm.
6. Repeat steps 1 through 5 as required until the monitor indicates maximum left channel into right channel and right channel into left channel separation.

2–46. **Low Frequency Equalization Procedure.** To adjust the low frequency equalization, proceed as follows:

LOW FREQUENCY EQUALIZATION

CAUTION

CAUTION

OPERATION OF THE EXCITER WITH THE TOP–PANEL REMOVED IS ALWAYS CONSIDERED HAZARDOUS, THEREFORE CAUTION SHOULD BE OBSERVED. DO NOT TOUCH ANY COMPONENT WITHIN THE EXCITER WHEN POWER IS ENERGIZED.

A. Adjust the audio generator for a left channel 50 Hz (or lowest modulating frequency accepted by the transmitter) output at +10 dBm.

B. Observe and compare the lissajous pattern to Figure 2–16.

C. If the lissajous pattern indicates:

1. Acceptable left channel separation, proceed to step I.
2. Incorrect amplitude equalization only, proceed to step I.
3. Incorrect phase equalization, proceed to step D.

D. Determine if the modulator audio path or the envelope audio path requires left channel low frequency equalization as follows:

1. Insert low frequency equalization into the modulator audio path by operating the left channel matrix switch for the following day routing sequence:
   a. Last audio source in the modulator audio path (refer to **Group Delay Procedure**, step E) to low frequency equalizer.
   b. Low frequency equalizer output to modulator circuit.
2. Adjust the LEFT channel **DAY LF PHASE** control clockwise and observe the elliptical lissajous pattern (the pattern will either expand or contract).
3. If the elliptical lissajous pattern contracts, left channel low frequency equalization is required in the modulator audio path, therefore proceed to step E. If the elliptical lissajous pattern expands, left channel low frequency equalization is required in the envelope audio path, therefore proceed to step F.

E. If left channel low frequency equalization is required in the modulator audio path, proceed as follows:

1. Ensure low frequency equalization is inserted into the modulator audio path as described by step D–1.
2. Correct phase equalization by adjusting the LEFT channel **DAY LF PHASE** control for a straight–line lissajous pattern.

F. If left channel low frequency equalization is required in the envelope audio path, proceed as follows:

1. Adjust the LEFT channel **DAY LF PHASE** control fully counterclockwise.
2. Return the left channel matrix switch to the position at the beginning of the procedure (refer to **Group Delay Procedure**, steps E and F).
3. Insert low frequency equalization into the envelope audio path by operating the left channel matrix switch for the following day routing sequence:
   a. Last audio source in the envelope audio path (refer to **Group Delay Procedure**, step F) to low frequency equalizer.
   b. Low frequency equalizer output to envelope output.
4. Repeat step E–2. If the elliptical lissajous pattern expands during the adjustment, excessive low frequency equalization is already present in the envelope audio path, therefore proceed as follows:
   a. Return the left channel matrix switch to the position at the beginning of the procedure (refer to **Group Delay Procedure**, steps E and F).
   b. Adjust the LEFT channel **DAY LF PHASE** control fully counterclockwise.
   c. Proceed to step I.

G. Refer to the left channel matrix switch as required to record the modulator audio path.

Left Channel Day _____

Right Channel Day _____

Left Channel Night _____

Right Channel Night _____

CAUTION ***OPERATION OF THE EXCITER WITH THE TOP–PANEL REMOVED IS ALWAYS CONSIDERED HAZARDOUS, THEREFORE CAUTION SHOULD BE OBSERVED. DO NOT TOUCH ANY COMPONENT WITHIN THE EXCITER WHEN POWER IS ENERGIZED.***

CAUTION

H. Refer to the left channel matrix switch as required to record the envelope audio path.

Left Channel Day _____

Right Channel Day _____

Left Channel Night _____

Right Channel Night _____

LOW FREQUENCY EQUALIZATION (Cont'd)

I. Adjust the right channel low frequency equalization as follows:

1. Adjust the audio generator for a right channel 50 Hz (or lowest modulating frequency accepted by the transmitter) output at +10 dBm.
2. Repeat steps B through H using the RIGHT channel **DAY** controls. Maximum right channel separation is indicated by the AM stereo modulation monitor left channel meter.

J. If the modulator and envelope audio paths did not require low frequency equalization, proceed to the **High Frequency Equalization Procedure** in the following text.

K. If the modulator audio path or envelope audio path required low frequency equalization, check the separation at 1 kHz as follows:

1. Adjust the audio generator for a left channel 1 kHz output at +10 dBm.
2. If the lissajous pattern indicates acceptable separation, proceed to step 4.
3. If the lissajous pattern indicates degraded separation, adjust the LEFT channel **DAY FINE DELAY** control until the lissajous pattern indicates maximum separation.
4. Check right channel separation at 1 kHz as follows:
   a. Adjust the audio generator for a right channel 1 kHz output at +10 dBm.
   b. Repeat steps 2 and 3.

2–47. **High Frequency Equalization Procedure.** To adjust the high frequency equalization, proceed as follows:

HIGH FREQUENCY EQUALIZATION

CAUTION

CAUTION

OPERATION OF THE EXCITER WITH THE TOP–PANEL REMOVED IS ALWAYS CONSIDERED HAZARDOUS, THEREFORE CAUTION SHOULD BE OBSERVED. DO NOT TOUCH ANY COMPONENT WITHIN THE EXCITER WHEN POWER IS ENERGIZED.

A. Adjust the audio generator for a left channel 5 kHz output at +10 dBm.

B. Determine if the modulator audio path or the envelope audio path requires left channel high frequency equalization as follows:

1. Insert high frequency equalization into the modulator audio path by operating the left channel matrix switch for the following day routing sequence:
   a. Last audio source in the modulator audio path (refer to **Low Frequency Equalization** Procedure, step G) to high frequency equalizer.
   b. High frequency equalizer output to modulator circuit.

2. Observe the lissajous pattern. Due to various transmitter characteristics, a variety of lissajous patterns will appear. Generally, the pattern will indicate distortion, and incorrect phase and amplitude equalization.
3. Adjust the LEFT channel **DAY HF CUTOFF** control for as close to a straight–line lissajous pattern as possible (disregard the deviation of the pattern from the hori zontal axis).
4. Adjust the audio generator for a left channel 1 kHz output at +10 dBm.
5. Adjust the LEFT channel **DAY FINE DELAY** control for maximum separation as indicated by the lissajous pattern. If maximum separation cannot be obtained, adjust the LEFT channel **DAY COARSE DELAY** as required.
6. Adjust the audio generator for a left channel 5 kHz output at +10 dBm.
7. Repeat steps 3 through 6 as required to observe if the lissajous pattern indicates improved separation at 1 kHz and 5 kHz (a straight–line lissajous pattern at 1 kHz and 5 kHz).
8. If the lissajous pattern indicates improved separation at 1 kHz and 5 kHz, left channel high frequency equalization is required in the modulator audio path, therefore proceed to step C. If the lissajous pattern indicates degraded separation at 1 kHz and 5 kHz, left channel high frequency equalization is required in the envelope audio path, therefore proceed to step D.

C. If left channel high frequency equalization is required in the modulator audio path, proceed as follows:

1. Ensure high frequency equalization is inserted into the modulator audio path as described by step B–1.
2. Correct phase and amplitude equalization as follows:
   a. Adjust the LEFT channel **DAY HF CUTOFF** control for a straight–line lissajous pattern.
   b. Adjust the LEFT channel **DAY HF PEAK** control clockwise until the el–liptical lissajous pattern begins to expand.
   c. Adjust the LEFT channel **DAY HF CUTOFF** control for a straight–line lissajous pattern.
   d. Adjust the audio generator for a left channel 1 kHz output at +10 dBm.
   e. Adjust the LEFT channel **DAY FINE DELAY** control for a straight–line lissajous pattern.
   f. Adjust the audio generator for a left channel 5 kHz output at +10 dBm.
   g. Repeat steps a through f as required for maximum separation at 1 kHz and 5 kHz as indicated by the lissajous pattern and the AM stereo modu–lation monitor right channel meter.

D. If high frequency equalization is required in the envelope audio path, proceed as follows:

1. Adjust the LEFT channel **DAY HF PEAK** and **HF CUTOFF** controls fully counterclockwise.

2. Return the left channel matrix switch to the position at the beginning of the procedure (refer to **Low Frequency Equalization Procedure**, steps G and H).
3. Return the LEFT channel **DAY FINE DELAY** (or **COARSE DELAY** control if adjusted in step B–5) control to the position at the beginning of the procedure as follows:
   a. Adjust the audio generator for a left channel 1 kHz output at +10 dBm.
   b. Adjust the LEFT channel **DAY FINE DELAY** (or **COARSE DELAY**) control for maximum separation as indicated by the lissajous pattern.
4. Insert the high frequency equalization into the envelope audio path by operating the left channel matrix switch for the following day routing sequence:
   a. Last audio source in the envelope audio path (refer to the **Low Frequency Equalization Procedure**, step H) to high frequency equalizer.
   b. High frequency equalizer output to the envelope output.
5. Correct phase and amplitude equalization as follows:
   a. Adjust the audio generator for a left channel 5 kHz output at +10 dBm.
   b. Perform steps C–2a through C–2g.

E. After obtaining maximum separation at 1 kHz and 5 kHz, check the separation at other selected high frequencies (frequencies above 1 kHz) as desired by performing the following:

1. Adjust the audio generator for a left channel +10 dBm output at the selected frequency.
2. Observe the lissajous pattern and the AM stereo modulation monitor right channel meter.
3. If the lissajous pattern and the monitor indicate acceptable separation, proceed to step 1.
4. If the lissajous pattern and the monitor indicate poor separation, the separation may be improved through the adjustments described in the following text. However, the separation at 1 kHz and 5 kHz may degrade. Use proper judgement in determining the compromises between frequencies.
   a. Adjust the LEFT channel **DAY HF CUTOFF** and **HF PEAK** controls for the desired separation as indicated by the lissajous pattern and the AM stereo modulation monitor right channel meter.
   b. Adjust the audio generator for a left channel 1 kHz output at +10 dBm.
   c. Adjust the LEFT channel **DAY FINE DELAY** control for the desired separation as indicated by the lissajous pattern and the AM stereo modulation monitor right channel meter.
   d. Adjust the audio generator for a left channel 5 kHz output at +10 dBm.
   e. Adjust the LEFT channel **DAY HF CUTOFF** and **HF PEAK** controls for the desired separation as indicated by the lissajous pattern and the AM stereo modulation monitor right channel meter.

f. Adjust the audio generator for a left channel +10 dBm output at the selected frequency.

g. Repeat steps a through f until a desired level of separation is obtained at each frequency.

F. Adjust the right channel high frequency equalization as follows:

1. Adjust the audio generator for a right channel 5 kHz output at +10 dBm.

2. Repeat steps B through E using the RIGHT channel **DAY** controls. Maximum right channel separation is indicated by the AM stereo modulation monitor left channel meter.

2–48. **Equalization Fine Adjustments.** Repeat each equalization procedure for fine adjustments. With the initial completion of the procedures, the audio path has been established, therefore do not repeat the steps associated with the audio routing.

2–49. **Night Equalization Procedure.** After performing the exciter equalization procedures using the day controls, repeat the procedures for a night configuration using the night controls if required.

2–50. **ADDITIONAL REAR–PANEL CONNECTIONS.**

2–51. **REMOTE CONTROL.** All exciter mode functions and indications are designed for remote operation through built–in remote control circuitry. The remote mode function circuitry is designed to interface with remote control units with momentary contact–to–ground outputs. The remote mode indication circuitry is designed to output +12V dc to indicate an enabled mode function.

CAUTION

DO NOT CONNECT ANY EXTERNAL VOLTAGES TO THE REMOTE MODE FUNCTIONS OR INDICATIONS.

CAUTION

NOTE

FOR REMOTE CONTROL OPERATION, ALL LOCAL MODE SWITCHES MUST BE OPERATED TO THE OUT POSITION.

NOTE

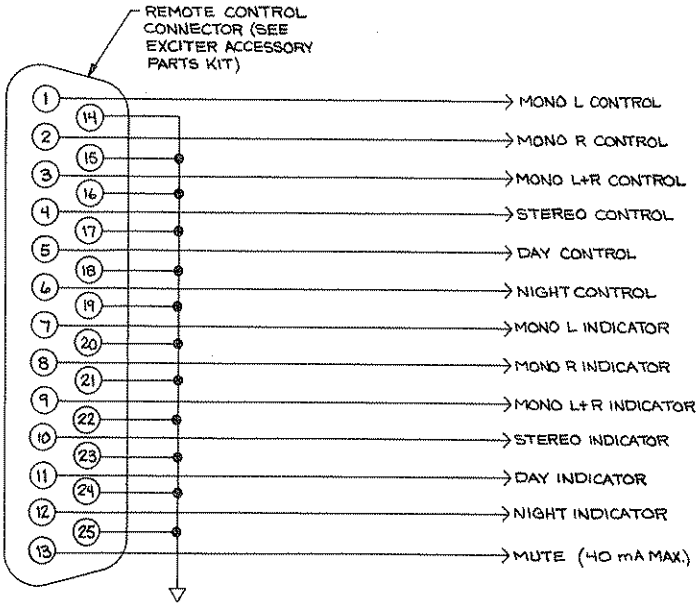
2–52. If remote control is desired, connect the remote control cable to the D–type connector (located in the exciter accessory parts kit) as shown by Figure 2–17. Then, attach the connector to the **REMOTE** jack on the exciter rear–panel. Enable remote control operation by operating all local mode switches (**MONO L, MONO R, MONO L+R,** and **STEREO**) to the out position.

2–53. **Remote Control Circuit Board Programming.** The remote day/night function requires circuit board programming. Refer to Figure 2–2 for pin designations and program the circuit board jumper on the day/night equalization circuit board as follows:

A. Remote Control Day/Night Select Jumper J3:

1. Install in position 1–2 for remote control units with pulse (momentary contact–to–ground) output logic.

2. Install in position 2–3 for remote control units with constant contact–to–ground output logic.



597–0095–20

FIGURE 2–17. REMOTE CONTROL CONNECTIONS

2–54. **TRANSMITTER MUTE CONTROL LINE.** A transmitter mute control line is provided to deenergize the transmitter if the exciter RF drive circuit fails or the carrier frequency becomes unlocked. The mute control line monitors the status of the exciter RF and PLL circuits and detects the loss of RF drive or carrier frequency. The mute control line is constructed with an open–collector optical isolator output driver which is designed for a maximum load of 40 mA.

CAUTION

CAUTION

FAILURE TO INSTALL THE MUTE CONTROL LINE MAY CAUSE SERIOUS DAMAGE TO THE TRANSMITTER RF CIRCUIT IF THE EXCITER RF DRIVE CIRCUIT FAILS OR THE CARRIER FREQUENCY BECOMES UNLOCKED.

2–55. The transmitter mute control line is located on pin 13 of the rear–panel **REMOTE** jack (refer to Figure 2–17). Connect the control line to a transmitter muting circuit (example: connect the mute control line through an external relay to the transmitter interlock string). A programmable jumper on the day/night equalization circuit board establishes a normally closed mute output or a normally open mute output. Refer to Figure 2–2 for pin designations and program the circuit board jumper as follows:

A. Mute Output Control Jumper J17:

1. Install in position 1–2 for a normally closed mute output.
2. Install in position 2–3 for a normally open mute output.

2–56. **AUXILIARY CONNECTIONS.** Connect a coaxial cable to the following auxiliary rear–panel connectors as required.

CONNECTOR	DESCRIPTION
AUX PILOT IN	Provides a connection for an external pilot tone or AM subcarrier generator.
10 MHz REF	Allows the exciter to be locked to an external 10 MHz standard such as WWV to reduce co–channel interference (requires reprogramming of jumper J50 on the modulator circuit board, refer to schematic 917–0055). Also, allows the connection of an external counter for the calibration of the internal oscillator.
SAMPLE XMTR	Outputs a simulated transmitter signal for closed–loop testing.

2–57. **EXCITER PROOF OF PERFORMANCE.**

2–58. The next step in the installation process is to perform an exciter proof of performance. Table 2–3 lists the FCC requirements for AM stereo operation.

TABLE 2–3. FCC AM STEREO SPECIFICATIONS

PARAMETER	MODULATION MODE L–R	LEFT	RIGHT	L+R	SPECIFICATION
HARMONIC and SPURIOUS RADIATION					
Modulation Level:					
95%	X			X	Note as required to prove the absence of harmonics and spurious radiations which may cause interference with other local radio services.
75%		X	X		
50%		X	X		

2–59. Figure 2–18 illustrates the test equipment connections for the exciter proof of performance. Using the information presented, perform a proof of performance. Record the information on the test sheet provided at the end of this section.

2–60. **INSTALLATION ADJUSTMENTS.**

2–61. The last step in the installation section is to perform the exciter installation adjustments. To perform the installation adjustments, proceed as follows.

2–62. **PILOT LEVEL.** To adjust pilot level control R219 (located behind the front–panel access door), proceed as follows:

PILOT LEVEL ADJUSTMENT

WARNING ***DISCONNECT ALL EXCITER AND TRANSMITTER PRIMARY POWER BEFORE PROCEEDING.***

WARNING

A. Disconnect all exciter and transmitter primary power.

B. Disconnect the audio generator and audio analyzer from the exciter proof of performance test equipment connections (refer to Figure 2–18).

CAUTION ***TO PREVENT DAMAGE TO THE TRANSMITTER RF CIRCUITRY, APPLY POWER TO THE EXCITER BEFORE OPERATING THE TRANSMITTER.***

CAUTION

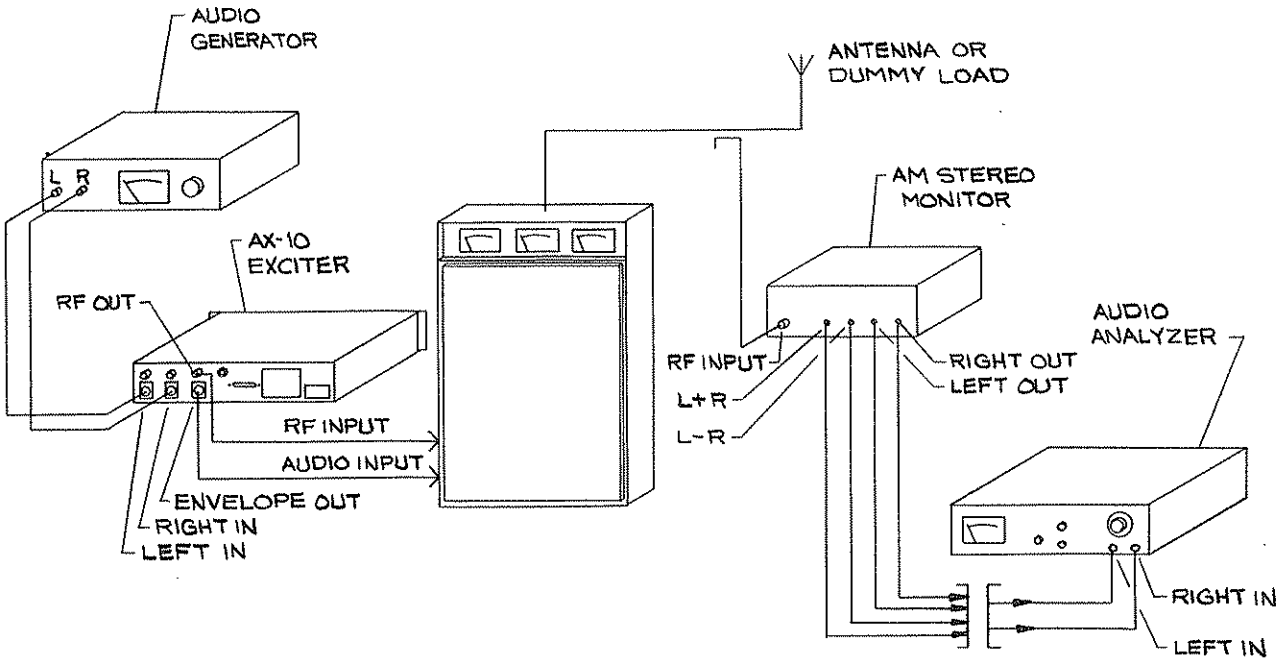
C. Apply primary power to the exciter.

D. Energize the transmitter primary ac input and operate the transmitter at the normal power output.

E. Operate the exciter to the stereo mode by depressing the **STEREO** switch and enable the pilot tone by operating the **PILOT OFF** switch to the out position. The **STEREO** indicator will illuminate.

F. Operate the AM stereo modulation monitor to indicate pilot information.

G. Adjust pilot level control R219 until the AM stereo monitor indicates 5.0%.



597–0095–21

FIGURE 2–18.
TEST EQUIPMENT CONNECTIONS, EXCITER PROOF OF PERFORMANCE

2–63. **ENVELOPE AUDIO NEGATIVE LIMIT ADJUST.** With AM stereo broadcasting, envelope audio negative limiting is required in either the audio processing, exciter, or transmitter to prevent excessive negative modulation and the resultant loss of stereo information. If envelope audio negative limiting is desired in the AX–10 exciter, proceed as follows.

ENVELOPE AUDIO NEGATIVE LIMIT ADJUSTMENT

WARNING ***DISCONNECT ALL EXCITER AND TRANSMITTER PRIMARY POWER BEFORE PROCEEDING.***

WARNING

A. Disconnect all exciter and transmitter primary power.

B. Remove the day/night equalization circuit board as follows:

1. Remove the five Phillip–head mounting screws.
2. Unplug connector J1 on the day/night equalization circuit boar.
3. Remove the day/night equalization circuit board.
4. Install modulator equalization jumper J7 and envelope equalization jumper J9 on the audio control circuit board in positions 1–2 and 5–6 (refer to Figure 2–3 for pin designations).

C. Install envelope audio negative limiter bypass jumper J44 on the audio control circuit board in position 2–3.

D. Adjust envelope audio negative limit control R227 on the audio control circuit board fully clockwise.

E. Connect the test equipment to the exciter and transmitter as shown by Figure 2–19.

CAUTION ***TO PREVENT DAMAGE TO THE TRANSMITTER RF CIRCUITRY, APPLY POWER TO THE EXCITER BEFORE OPERATING THE TRANSMITTER.***

CAUTION

F. Apply primary power to the exciter.

G. Energize the transmitter primary ac input and operate the transmitter at the normal power output.

H. Operate the exciter to the stereo mode by depressing the **STEREO** switch and enable the pilot tone by operating the **PILOT OFF** switch to the out position. The **STEREO** indicator will illuminate.

I. Adjust the audio generator for a L=R 1kHz output at +10 dBm.

J. Observe and compare the envelope pattern to Figure 2–20.

K. If the envelope pattern indicates:

1. Negative clipping, proceed to Step L.
2. Positive clipping, reverse the envelope audio limiter polarity as follows:

CAUTION *TO PREVENT DAMAGE TO THE EXCITER AND TRANSMITTER, DISCONNECT ALL EXCITER AND TRANSMITTER PRIMARY POWER BEFORE REPROGRAMMING THE CIRCUIT BOARD JUMPER IN THE FOLLOWING STEP.*

CAUTION

a. Disconnect all exciter and transmitter primary power.

b. Install envelope audio negative limiter polarity jumper J45 on the audio control circuit board in positions 1–2 and 5–6 (refer to Figure 2–3 for pin designations).

CAUTION *TO PREVENT DAMAGE TO THE TRANSMITTER RF CIRCUITRY, APPLY POWER TO THE EXCITER BEFORE OPERATING THE TRANSMITTER.*

CAUTION

c. Apply primary power to the exciter.

d. Energize the transmitter primary ac input and operate the transmitter at the normal power output.

L. Disconnect the transmitter sample from the oscilloscope and connect the sample to the AM stereo modulation monitor RF input.

M. Adjust the AM stereo modulation monitor to indicate –95% L+R modulation.

N. Adjust envelope audio negative limit control R227 until the AM stereo monitor indicates –95% L+R modulation.

WARNING *DISCONNECT ALL EXCITER AND TRANSMITTER PRIMARY POWER BEFORE PROCEEDING.*

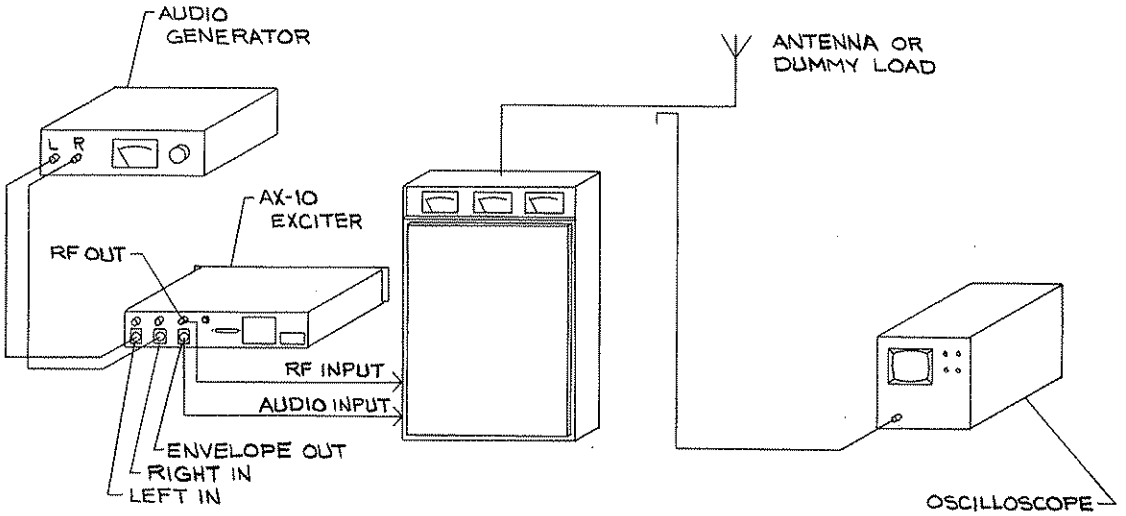
WARNING

O. Disconnect all exciter and transmitter primary power.

P. Return the modulator equalization jumper J7 and envelope equalization jumper J9 to positions 2–3 and 4–5 as shown in Figure 2–3.

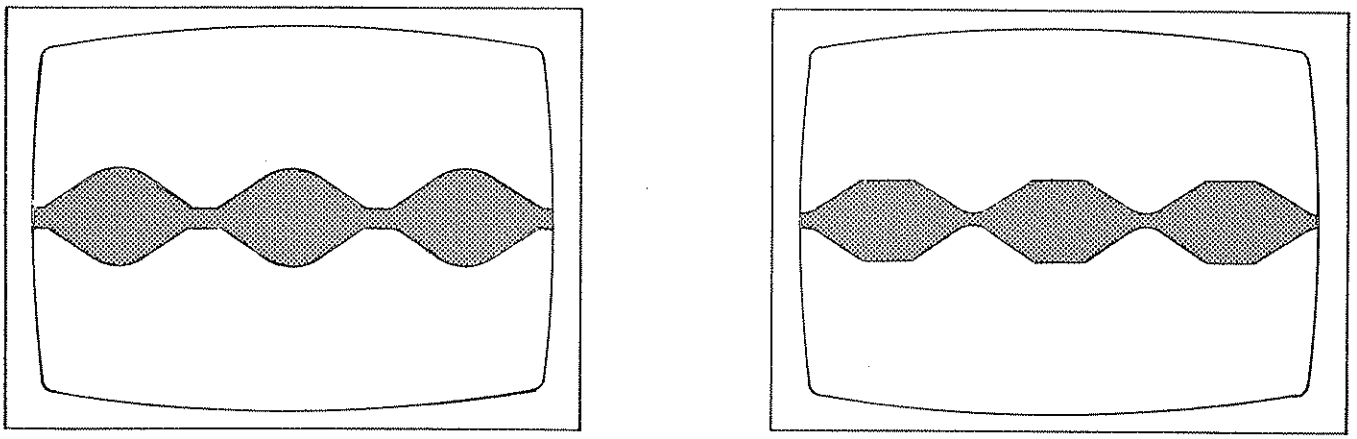
Q. Replace the day/night equalization circuit board.

R. Remove the test equipment and replace the exciter top–panel.



597-0095-23

FIGURE 2–19. TEST EQUIPMENT CONNECTIONS, ENVELOPE AUDIO NEGATIVE LIMIT ADJUSTMENT



NEGATIVE CLIPPING
CORRECT

POSITIVE CLIPPING
INCORRECT

597-0095-24

FIGURE 2–20. ENVELOPE CLIPPING PATTERNS

Station Call Letters / Location

_____

PROOF OF PERFORMANCE
AX–10 AM STEREO EXCITER INSTALLATION

DISTORTION / SEPARATION		AUDIO FREQUENCY 50	100	200	400	1K	2K	3K	5K	7.5K	10K	12.5K	15K
L+R (MONO)	95%												
L–R (STEREO)	95%												
L+R	75%												
L	75%												
R	75%												
L+R	50%												
L	50%												
R	50%												
L+R	25%												
L	25%												
R	25%												

RESPONSE													
	L+R 95%					0							
	L–R 95%					0							
	L+R 75%					0							
	L 75%					0							
	R 75%					0							
	L+R 50%					0							
	L 50%					0							
	R 50%					0							
	L+R 25%					0							
	L 25%					0							
	R 25%					0							
CROSSTALK L+R	L–R												
CROSSTALK L–R	L+R												

NOISE	L	R	L+R	L–R
IPM		TRANSMITTER LOAD ☐ DUMMY ☐ ANT	
CARRIER SHIFT		TRANSMITTER MAKE & MODEL_____	
PILOT FREQ., INS.		DATE_____	
OPERATING FREQUENCY		ENGINEER/ CONSULTANT:_____	

BROADCAST ELECTRONICS INC.
4100 N. 24th ST., P.O. BOX 3606, QUINCY, IL 62305 U.S.A.

OPTIONAL DISTORTION DISTORTION / SEPARATION

RP 1085 1M

SECTION III
OPERATION

3–1. INTRODUCTION.

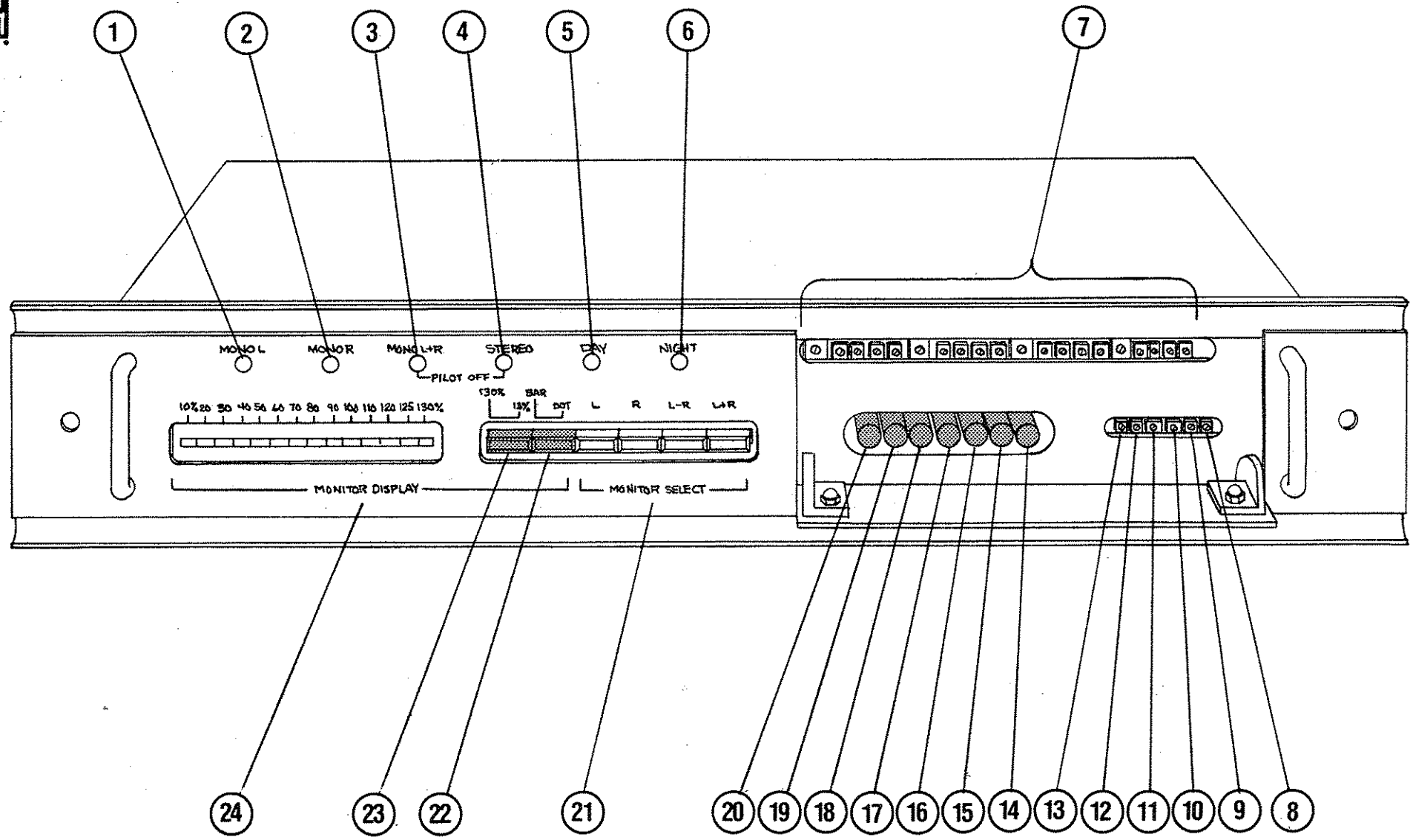
3–2. This section identifies all controls and indicators associated with the AX–10 Exciter and provides standard operating procedures.

3–3. CONTROLS AND INDICATORS.

3–4. Refer to Figure 3–1 for the location of all controls and indicators associated with the AX–10 Exciter. The function of each control or indicator is described by Table 3–1.

TABLE 3–1. CONTROLS AND INDICATORS
(Sheet 1 of 3)

INDEX NO.	NOMENCLATURE	FUNCTION
1	**MONO L** Indicator	When illuminated, indicates the exciter is processing a monaural signal comprising the left channel audio input only.
2	**MONO R** Indicator	When illuminated, indicates the exciter is processing a monaural signal comprising the right channel audio input only.
3	**MONO L+R** Indicator	When illuminated and the **STEREO** indicator is out, indicates the exciter processing a monaural signal comprising the algebraic sum of the left and right channel audio inputs.
		When illuminated and the **STEREO** indicator is illuminated, indicates the exciter is operating in the stereo mode with the pilot off.
4	**STEREO** Indicator	When illuminated and the **MONO L+R** indicator is out, indicates the exciter is processing a stereophonic signal.
		When illuminated and the **MONO L+R** indicator is illuminated, indicates the exciter is operating in the stereo mode with the pilot off.
5	**DAY** Indicator	When illuminated, indicates the exciter is processing a signal in the day mode.
6	**NIGHT** Indicator	When illuminated, indicates the exciter is processing a signal in the night mode.



597-0095-35

FIGURE 3–1. EXCITER CONTROLS AND INDICATORS

TABLE 3–1. CONTROLS AND INDICATORS
(Sheet 2 of 3)

INDEX NO.	NOMENCLATURE	FUNCTION
7	**LEFT DAY/NIGHT** and **RIGHT DAY/NIGHT** Equalization Controls	Adjusts the response of the exciter internal equalization circuit (if required, refer to EXCITER AUDIO EQUALIZATION in SECTION II for a detailed description of each control).
8	**RF** Control	Adjusts the exciter RF output level. The control is bypassed if the exciter is operated with a TTL–level RF output.
9	**PILOT** Control	Adjusts the exciter pilot level.
10	**NIGHT LEVEL** Control	Adjusts the exciter night envelope audio output level.
11	**DAY LEVEL** Control	Adjusts the exciter day envelope audio output level.
12	**NIGHT BAL** Control	Adjusts the night envelope audio mix of the left and right channels.
13	**DAY BAL** Control	Adjusts the day envelope audio mix of the left and right channels.
14	**DAY/NIGHT** Switch	Toggles the exciter between the day and night modes of operation.
15	**SCL** (Single–Channel–Limiter) **OFF** Switch	Controls the operation of the exciter internal single–channel–limiter.
16	**STEREO** Switch	Configures the exciter to process a stereophonic signal.
17	**MONO L+R** Switch	Configures the exciter to process a monaural signal comprising the algebraic sum of the left and right channel audio inputs.
18	**MONO R** Switch	Configures the exciter to process a monaural signal comprising the right channel audio input only.
19	**MONO L** Switch	Configures the exciter to process a monaural signal comprising the left channel audio input only.
20	**PILOT OFF** Switch	Allows the operator to disable the pilot signal in the stereo mode.
21	**MONITOR SELECT** Switches	Selects the parameter (L, R, L+R, L–R) displayed on the exciter MONITOR DISPLAY.
22	**MONITOR DISPLAY BAR/DOT** Switch	Selects between a moving dot or moving bar MONITOR DISPLAY for operator preference.

TABLE 3–1. CONTROLS AND INDICATORS
(Sheet 3 of 3)

INDEX NO.	NOMENCLATURE	FUNCTION
23	**MONITOR DISPLAY 130%/13%** Switch	When depressed, expands the MONITOR DISPLAY indication by 10 to allow SCA and pilot injection level adjustment.
24	MONITOR DISPLAY	Indicates the parameter selected by the **MONITOR SELECT** switches. The 100% indicator is factory calibrated to equal a +10 dBm audio input level. Each indicator illuminates at the level indicated.

3–5. **OPERATION.**

NOTE
NOTE

THE FOLLOWING PROCEDURE ASSUMES THAT THE EXCITER IS COMPLETELY INSTALLED AND IS FREE OF ANY DISCREPANCIES.

CAUTION
CAUTION

TO PREVENT DAMAGE TO THE TRANSMITTER RF CIRCUITRY, ALWAYS APPLY POWER TO THE EXCITER BEFORE OPERATING THE TRANSMITTER.

3–6. Apply primary power to the exciter.

3–7. Enable the exciter pilot tone by operating the **PILOT OFF** switch to the out position.

3–8. Enable the exciter single–channel–limiter by operating the **SCL OFF** switch to the out position.

NOTE
NOTE

THE PILOT TONE IS AUTOMATICALLY SWITCHED OFF WHEN THE EXCITER IS OPERATED TO ANY OF THE MONO MODES.

3–9. Select the desired mode of operation.

A. MONO L
B. MONO R
C. MONO L+R
D. STEREO
E. DAY/NIGHT

3–10. Select the desired monitoring. The front–panel monitor controls have no effect on the exciter output or operation.

A. BAR/DOT
B. 130%/13%
C. L
D. R
E. L–R
F. L+R

3–11. **REMOTE OPERATION.**

3–12. If AX–10 remote operation is desired, configure all local mode switches (**MONO L, MONO R, MONO L+R,** and **STEREO**) to the out position. This will allow the exciter to be controlled from a remote location.

SECTION IV
THEORY OF OPERATION

4–1. INTRODUCTION.

4–2. This section presents theory of operation for the Broadcast Electronics AX–10 AM Stereo Exciter. A detailed block diagram of the AX–10 exciter is presented in Figure 4–1. Refer to the block diagram as required for the following discussion.

4–3. FUNCTIONAL DESCRIPTION.

4–4. AUDIO INPUTS.

4–5. The AX–10 exciter accepts either balanced or unbalanced left and right channel audio inputs. A 600 Ohm impedance is established for each channel through chassis–mounted resistors R5 (left channel) and R6 (right channel). Left and right channel instrumentation amplifiers (left channel: integrated circuits U1 and U4A, right channel: integrated circuits U2 and U5A) provide balanced–to–unbalanced signal conversion.

4–6. Protection for each instrumentation amplifier is provided by a diode network. Input signals in excess of 31.4V peak–to–peak are clipped through positive/negative biased diodes, preventing overload damage.

4–7. MODE SWITCHING AND INDICATIONS.

4–8. **LOCAL.** Local mode switching is accomplished with four interlocked sections (S7B through S7E) of a seven–section push–switch assembly. Stereo, mono L+R, mono L, and mono R modes of operation are selected through a LOW applied to the mode control logic (integrated circuits U30 through U34). The mode control logic decodes the LOW and outputs the appropriate control signals to the mode indicators (DS1 through DS4) and mode control relays K1 and K2. Relays K1 and K2 provide the required audio routing for each mode of operation.

4–9. **REMOTE.** All remote mode control commands and indications are routed through RFI filters on the remote interface circuit board. The RFI filters consist of RLC networks. Also, each remote mode control command and indication is optical coupled (integrated circuits U26 through U29 and U36 through U39) to/from the mode control logic to provide isolation from extraneous signals.

4–10. SINGLE–CHANNEL–LIMITER.

4–11. In all C–QUAM AM stereo receivers, distortion will be generated when the decoder circuit receives excessive levels of single–channel–generated L–R and L+R information. To prevent this distortion, the AX–10 is equipped with a single–channel–limiter (SCL) circuit which limits the single–channel–generated L–R information to 70%. The SCL consists of a single–channel detector circuit (integrated circuits U8 and U9), a 70% L–R detector circuit (integrated circuits U10 and U11A), a single–channel–limiter indicator (DS1), an on/off switch (S7F), and a limiting device (LDR1).

4–12. During normal operation, the SCL constantly monitors the left and right channels and L–R information. If the SCL detects: 1) only one channel, 2) the channel is generating above 70% L–R information, a bias voltage is applied to the single–channel–limiter indicator and light–dependent–resistor LDR1. With LDR1 biased, the single–channel signal is routed into both channels resulting in increased L+R information and a maximum of 70% L–R information. The on/off switch is provided to disable the SCL during initial alignment procedures.

4–13. **DAY/NIGHT EQUALIZATION CIRCUIT.**

4–14. A description of the day/night equalization circuit operation is provided in the installation section of this manual. To review the operation of the circuit, refer to EXCITER AUDIO EQUALIZATION in SECTION II, INSTALLATION as required.

4–15. **DAY/NIGHT CONTROL CIRCUIT.**

4–16. The day/night control circuit provides the required control circuitry for the day/night modes of operation. The circuit consists of a day/night select switch (S7G), control logic (integrated circuits U33 through U35), day and night indicators (DS5 and DS6), and two control relays (K1 on the day/night equalization circuit board and K3 on the audio control circuit board).

4–17. Selection of the day or night mode is accomplished through the front–panel day/night select switch. A LOW from the switch toggles the control logic circuit between day and night modes of operation. The control logic circuit illuminates the appropriate indicator and energizes/deenergizes day/night mode relays K1 and K3 as required. Remote commands and indications are RFI filtered and optical coupled to/from the control logic to provide isolation from extraneous signals.

4–18. **ENVELOPE DRIVER CIRCUIT.**

4–19. The envelope driver circuit generates the monaural L+R portion of the C–QUAM signal. The circuit consists of a resistor summing network (day envelope balance control R139 and night envelope balance control R208), an envelope negative limiter (integrated circuits U16B and U17A, diodes D46 and D47, and jumper J45), and an amplifier network (integrated circuits U17B and U40, day envelope level control R108, and night envelope level control R107).

4–20. Left and right channel envelope audio is summed through the day and night balance controls. Relay K3 routes either day or night envelope audio to the bypassable (jumper J44) envelope negative limiter.

4–21. The envelope negative limiter is designed with selectable polarity (jumper J45) due to the possibility of inverting circuitry in the transmitter. The limiter operates by comparing the input voltage to a reference at U16B. If the input voltage is above the reference, the positive or negative portion of the sine–wave is clipped through a corresponding diode. The clipped waveform is then buffered by U17A to lower the output impedance.

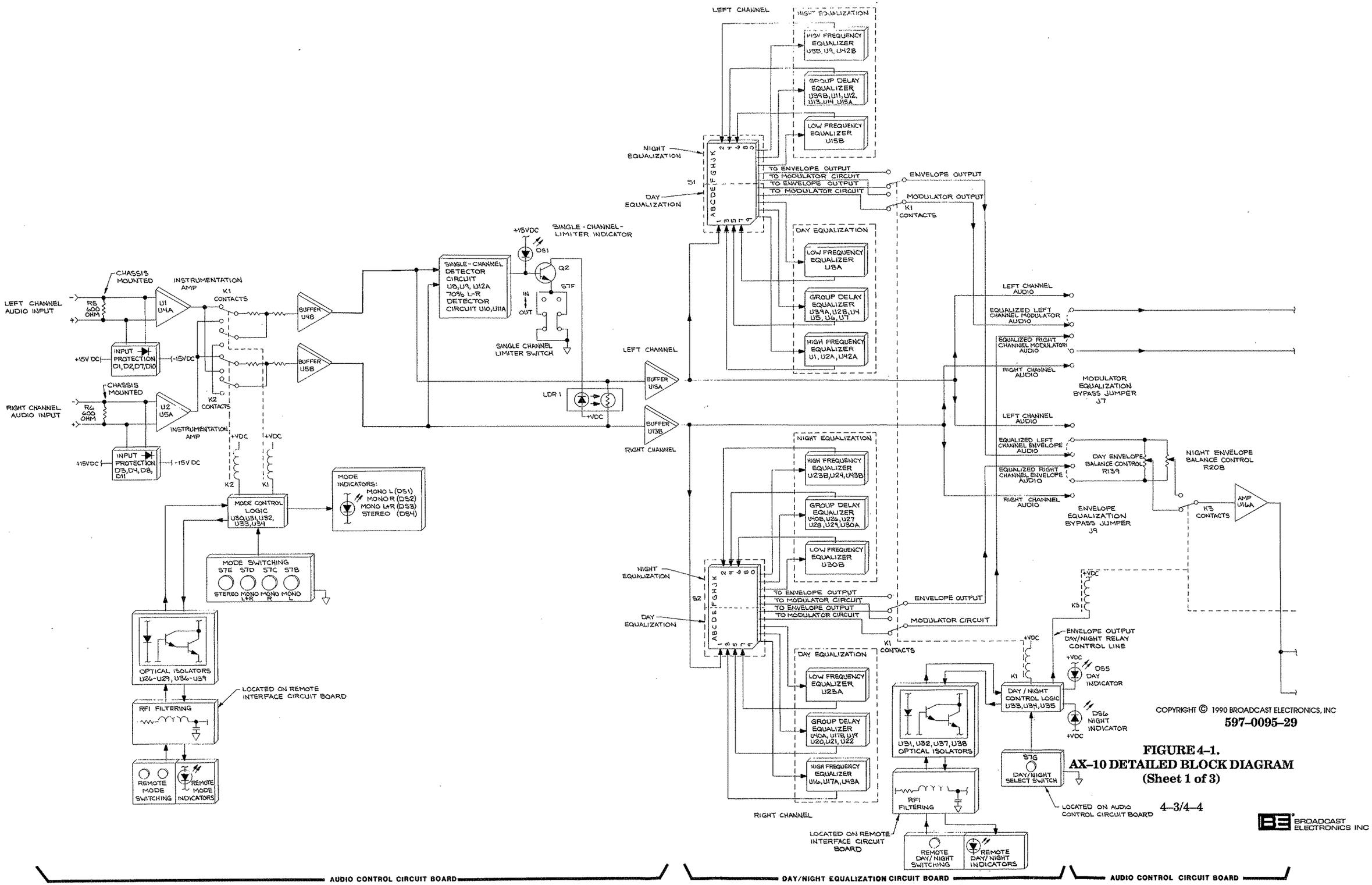
4–22. In the amplifier network, U17B establishes the output level through adjustable feedback from the day level control R108 and night level control R107. Amplifier U40 provides an active–balanced signal to the envelope output.

4–23. **L+R/L–R MATRIX/DEMATRIX CIRCUIT.**

4–24. Left and right channel modulator audio is matrixed into L+R and L–R information through integrated circuits U14 and U15 to provide samples for the metering circuit. Integrated circuit U8A functions as an L+R negative limiter to prevent the loss of carrier and resultant loss of RF drive to the transmitter. The L+R and L–R information is then dematrixed into separate left and right channel signals through integrated circuits U18B, U16B, and U19 for application to the modulator audio drivers.

4–25. **METERING CIRCUIT.**

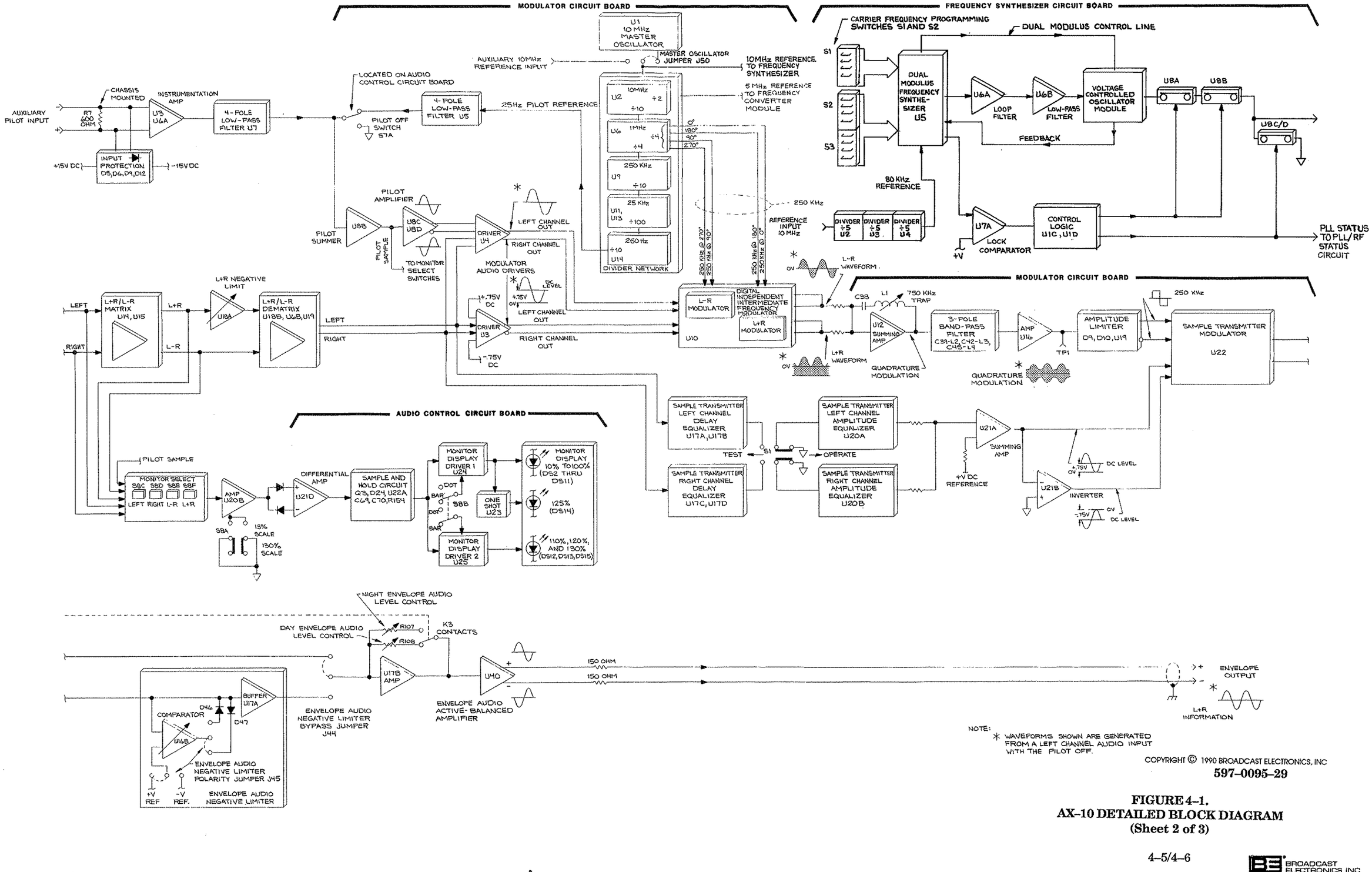
4–26. Metering of left channel audio, right channel audio, L+R information, and L–R information is provided by a digitally controlled color–coded peak–reading LED display. A display selector provides either a bar graph or a moving dot display of peak modulation levels from 10% to 130%. A 13%/130% switch allows expansion of the display to monitor pilot levels from 1% to 13%.



597-0095-29

FIGURE 4-1.
AX-10 DETAILED BLOCK DIAGRAM
(Sheet 1 of 3)

BROADCAST ELECTRONICS INC

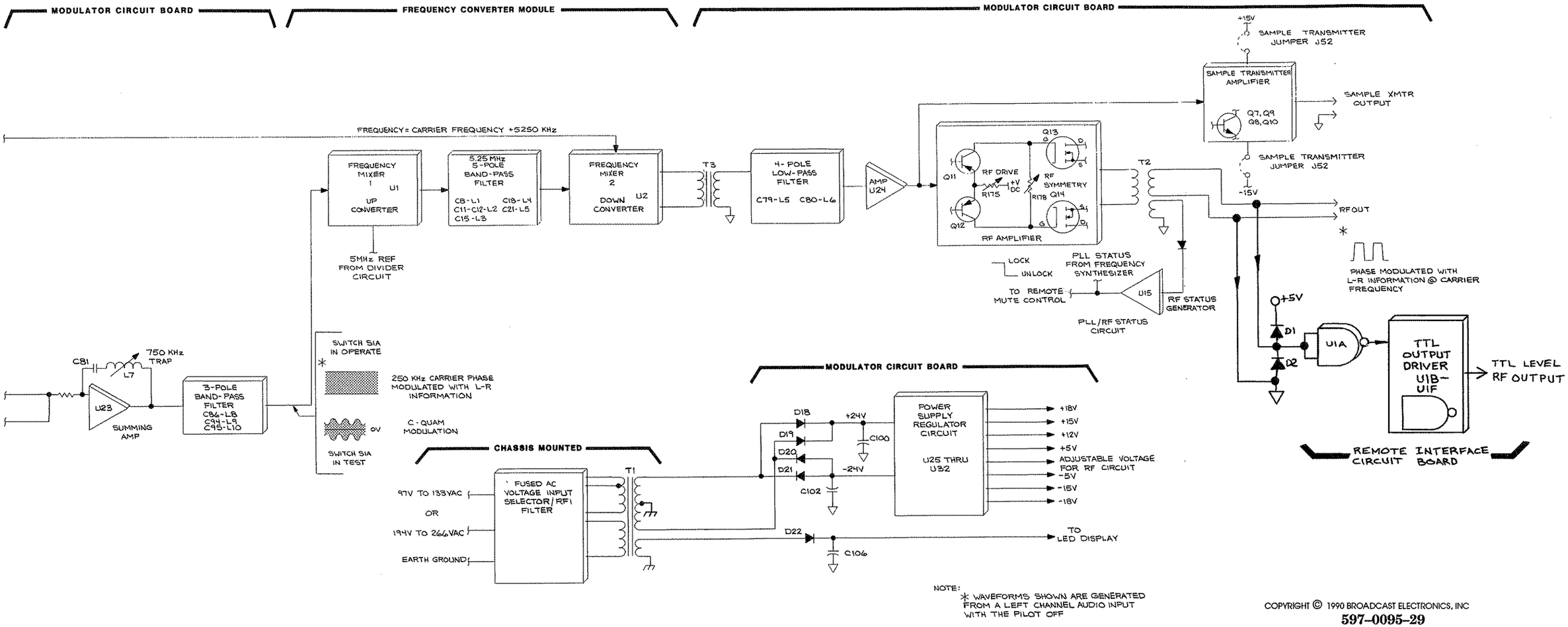


NOTE:
* WAVEFORMS SHOWN ARE GENERATED FROM A LEFT CHANNEL AUDIO INPUT WITH THE PILOT OFF.

597-0095-29

FIGURE 4-1.
AX-10 DETAILED BLOCK DIAGRAM
(Sheet 2 of 3)

BROADCAST ELECTRONICS INC



NOTE:
* WAVEFORMS SHOWN ARE GENERATED FROM A LEFT CHANNEL AUDIO INPUT WITH THE PILOT OFF

597-0095-29

FIGURE 4-1.
AX-10 DETAILED BLOCK DIAGRAM
(Sheet 3 of 3)

4–27. Meter selection is accomplished with four interlocked sections (S8C through S8F) of a six–section push–switch assembly. The selected parameter sample is applied to a scale expander comprised of amplifier U20B and switch S8A. The scale is expanded when switch S1A is closed, resulting in a gain of 10 from amplifier U20B.

4–28. Next, the sample is rectified into positive–going and negative–going half–cycle waveforms. Integrated circuit U21D differentially amplifies the waveforms to produce a full–wave rectified output to the sample and hold circuit.

4–29. The sample and hold circuit (transistor Q3, diode D24, integrated circuit U22A, capacitors C69 and C70, and resistor R154) provides the LED display with a fast rise time and relatively slow decay time. This allows accurate measurement of fast transient peaks.

4–30. The output of the sample and hold circuit is applied to monitor display drivers U24 and U25. A one–shot multivibrator (U23) allows the operator to easily identify short modulation peaks that exceed the 125% threshold. The bar/dot switch (S8B) determines the operational mode of the display.

4–31. MASTER OSCILLATOR AND DIVIDER NETWORK.

4–32. All AX–10 internal timing is provided by a 10 MHz temperature compensated crystal oscillator (U1). An auxiliary 10 MHz reference input connection is provided to lock the exciter to an external reference such as WWV to reduce co–channel interference. Selection of the references is provided by jumper J50.

4–33. The internal or external 10 MHz reference is applied to a digital divider network. The following list presents the divider network components and the corresponding outputs.

COMPONENT	OUTPUT
U12	5 MHz reference to the frequency converter module.
U6	Four 250 kHz references to the digital independent IF modulator. Each reference is 90 degrees out–of–phase.
U9	50 kHz reference to the frequency synthesizer circuit board.
U11,U13	250 Hz reference to the pilot tone divider.
U14	25 Hz pilot reference.

4–34. PILOT CIRCUIT.

4–35. The AX–10 is designed to operate with an internal–generated pilot tone or with an external pilot signal connected to the auxiliary pilot input. The auxiliary pilot connection may be used to connect subsonic subcarrier inputs to the exciter if desired.

4–36. The auxiliary pilot connection accepts either balanced or unbalanced inputs. A 600 Ohm impedance is established through chassis–mounted resistor R7. Inputs are applied to an instrumentation amplifier (integrated circuits U3 and U6A) which provides balanced–to–unbalanced signal conversion. Protection for the instrumentation amplifier is provided through a diode network which clips input waveforms in excess of 31.4V peak–to–peak. The instrumentation amplifier output is coupled to the internal pilot circuitry through a 4–pole low–pass filter (integrated circuit U7).

4–37. The exciter internal pilot tone is established from a divider–network–generated 25 Hz reference. The reference is applied through a 4–pole low–pass filter (integrated circuit U5) to front–panel on/off switch S7A. The internal and external pilot tones are summed into the amplifier section of the pilot circuit at U8B. Pilot amplifiers U8C/U8D provide inverted/non–inverted outputs to the modulator circuit.

4–38. **MODULATOR AND SAMPLE TRANSMITTER CIRCUITS.**

4–39. **GENERAL.** In a dual function design, the modulator and sample transmitter circuits provide the exciter with operate/test modes of operation. In the operate mode, the modulator circuit outputs a phase modulated carrier which is used to transmit the stereophonic L–R portion of the C–QUAM signal. In the test mode, the modulator circuit L–R information is combined with L+R information from the sample transmitter circuit to produce a C–QUAM test signal. The C–QUAM test signal provides a simulated transmitter output which is used for exciter closed–loop–testing.

4–40. **MODULATOR CIRCUIT.** The modulator circuit consists of an audio driver network (integrated circuits U3 and U4), a digital independent IF modulator and summing network (integrated circuits U10 and U12), an amplitude limiter (diodes D7 and D10, and integrated circuit U19), and a sample transmitter modulator and summing network (integrated circuits U22 and U23).

4–41. The audio driver network functions as a summing stage for the IF modulator. Driver U4 combines audio and pilot tone information to produce left and right channel inputs for an L–R modulator. Driver U3 combines audio and a DC reference voltage to produce left and right channel inputs for an L+R modulator.

4–42. Digital IF modulator U10 amplitude modulates four 250 kHz square–wave carriers (each carrier is 90 degrees out–of–phase) with the audio information in an independent channel configuration. The modulator outputs are summed through a resistor and amplifier (U12) network to produce a quadrature modulated (QUAM) signal. Third harmonic suppression is provided by an LC 750 kHz trap. The square–wave carrier QUAM signal is filtered into a sinusoidal form through a 3–pole bandpass filter. An amplifier stage (integrated circuit U16) provides a high–gain to prevent loss of carrier during the amplitude limiting process.

4–43. The amplitude limiter consists of a diode clipping network and high–speed comparator which amplitude limits the quadrature waveform. As a result of the limiting, two L–R angular modulated square–wave carriers (one is 180 degrees out–of–phase) are generated. With the audio portion of the sample transmitter circuit disabled (test/operate switch in operate), the carriers are modulated with dc voltages at sample transmitter modulator U22. The two carriers are summed through amplifier U23 to produce a single square–wave L–R angular modulated carrier at 250 kHz. The carrier is output to the frequency converter module through a second 750 kHz trap and 3–pole band–pass filter.

4–44. **SAMPLE TRANSMITTER CIRCUIT.** The sample transmitter circuit consists of identical left and right channel delay equalizers (left channel: U17A/B, right channel: U17C/D), identical left and right channel amplitude equalizers (left channel: U20A, right channel: U20B), a test/operate switch (S1), and a dc voltage summing and inverting network (integrated circuit U21).

4–45. The operate/test switch is used to determine the function of the sample transmitter circuit. In the operate position, audio is disabled which allows the modulator circuit to output only the L–R portion of the C–QUAM signal.

4–46. In the test position, left and right channel audio is routed through separate delay and amplitude equalizers to simulate an audio path through a transmitter. The equalized audio is summed to produce L+R information. A dc voltage summing and inverting network comprising integrated circuit U21 outputs inverted/non–inverted L+R waveforms with dc components to sample–transmitter modulator U22. At the modulator, the L+R waveforms amplitude modulate the L–R angular modulated 250 kHz carriers from the modulator circuit. The resultant components are summed through U23 to produce a C–QUAM test signal. The test signal is output to the frequency converter module through the 750 kHz trap and 3–pole band–pass filter.

4–47. **FREQUENCY SYNTHESIZER.**

4–48. The AX–10 frequency synthesizer is a phase–locked–loop, dual modulus circuit which generates and maintains the phase and frequency of the carrier to a high level of precision. The circuit is designed with the ability to synthesize: 1) 107 frequencies within the 535 kHz to 1605 kHz AM broadcast band in 10 kHz increments, or 2) 123 frequencies within the 522 kHz to 1620 kHz AM broadcast band in 9 kHz increments.

4–49. The frequency synthesizer circuit operates from Binary–Coded–Decimal (BCD) carrier frequency information entered through switches S1, S2, and S3. The carrier frequency information is directly applied to a data bus to program dual modulus frequency synthesizer U5.

4–50. Once programmed, frequency synthesizer U5 will output a series of square–wave pulses to loop filter U6A and low–pass filter U6B. U6A and U6B operate in conjunction to produce a stable dc control voltage for application to a voltage–controlled–oscillator (VCO) module. The control voltage is used by the VCO module to generate an IF output to the frequency converter module (frequency = carrier frequency + 5.25 MHz).

4–51. The VCO module contains a dual modulus divider which generates a 9 kHz or 10 kHz increment carrier output as determined by frequency synthesizer U5. Precision alignment of the VCO output is maintained by the phase–locked–loop design. Feedback samples from the VCO are monitored by a phase comparator circuit within U5. If the VCO frequency shifts from the normal operating state, the square–wave output of U5 will change to adjust the control voltage and maintain a stable VCO output.

4–52. The synthesizer phase loop is monitored for locked/unlocked conditions by a comparator circuit consisting of U7A and control logic U1C and U1D. When the synthesizer loop is locked, a positive voltage from the U5 phase lock circuit control line will produce a HIGH from comparator U7A. The HIGH will generate signals from control logic U1C/U1D which close U8A/U8B and open U8C/U8D. When the synthesizer loop becomes unlocked, a LOW from U5 will produce a LOW from U7A. The LOW will produce signals from the control logic to open U8A/U8B and close U8C/U8D, muting the exciter output.

4–53. **FREQUENCY CONVERTER MODULE.**

4–54. The frequency converter module utilizes a heterodyne technique to establish the exciter carrier frequency. The module consists of an up converter (integrated circuit U1), a 5.25 MHz band–pass filter (pole pairs C8–L1, C11–C12–L2, C15–L3, C18–L4, C21–L5), and a down converter (integrated circuit U2).

4–55. Up converter U1 adds the 250 kHz output from the modulator circuit with a 5 MHz reference from the divider network. The output of the up converter is applied through an LC 5.25 MHz 5–pole band–pass filter to down converter U2. U2 subtracts the frequency synthesizer input (frequency = carrier frequency + 5.25 MHz) from the band–pass filter input (5.25 MHz) to yield the carrier frequency. The carrier is coupled to a 4–pole low–pass filter and amplifier section (U24) through wideband RF transformer T3. The output of the amplifier section is applied to the sample transmitter and RF amplifiers.

4–56. **SAMPLE TRANSMITTER AMPLIFIER.**

4–57. The sample transmitter amplifier provides a transistor driven amplifier stage for the C–QUAM test signal. The transistors are configured as a complementary symmetry stage to provide a gain of 2 and a 50 Ohm output impedance. The amplifier is enabled through jumper J52.

4–58. **RF AMPLIFIER.**

4–59. The exciter RF amplifier consists of a transistor driven amplifier stage which is operated in a cutoff–to–saturated mode to produce a square–wave output. An RF drive control provides an adjustable RF output from TTL–levels to 45V peak–to–peak. A symmetry control provides adjustment of the output duty–cycle. The amplifier is shielded to prevent RF leakage into near–by circuitry.

4–60. **TTL OUTPUT DRIVER.**

4–61. An RF output sample from transformer T2 is applied to a TTL level output driver network consisting of: 1) diodes D1 and D2, and 2) NAND driver integrated circuit U1. The RF output sample is routed to diodes D1 and D2 which functions as limiter stage to produce a TTL level RF sample. The RF sample is inverted at U1A and applied to a NAND TTL driver network consisting of U1B through U1F. The network produces an adjustable TTL level output for driving a 50 Ohm coaxial cable terminated with a 50 Ohm load up to a maximum of 30 feet.

4–62. **PLL/RF MONITOR CIRCUIT.**

4–63. RF status and PLL status are monitored through a control line to provide remote muting. The output of RF status sensor U5 is summed with a PLL status signal from the frequency synthesizer. If RF output is lost or the synthesizer becomes unlocked, a LOW will be applied to the transmitter mute control line.

4–64. **POWER SUPPLY.**

4–65. AC power to the exciter is applied through an interlocked voltage selector and line filter. This device also provides overload protection and allows the selection of a wide range of ac input potentials.

4–66. A dual primary/secondary power transformer (T1) provides all operating voltages for the rectifier and regulator circuitry. A 37V supply is full–wave rectified and filtered into +24V and –24V dc supplies through diodes D18 through D21 and capacitors C100 and C102. A 7V supply is half–wave rectified and filtered into a +5V dc supply through diode D22 and capacitor C106 for the monitor LED display.

4–67. The +24V and –24V supplies are electronically regulated into various supplies through a power supply regulator circuit. The regulator circuitry contains full protection from over–voltage, over–current, reverse–voltage, and short–circuit conditions. The following list presents the regulator output potentials which are distributed throughout the exciter to the various circuit board assemblies.

1. +18V and –18V supplies
2. +15V and –15V supplies
3. +12V supply
4. +5V and –5V supplies
5. An adjustable voltage supply for the RF amplifier circuit.

SECTION V
MAINTENANCE

5–1. INTRODUCTION.

5–2. This section provides general maintenance information, electrical adjustment procedures, and troubleshooting information for the Broadcast Electronics AX–10 AM stereo exciter.

5–3. SAFETY CONSIDERATIONS.

5–4. Low voltages are used throughout the AX–10 circuit boards, however maintenance with power energized is always considered hazardous and caution should be observed. All high voltages have been shielded, however do not touch any component within the exciter chassis with the power energized. Good judgment, care, and common sense must be practiced to prevent accidents. The procedures contained in this section should be performed only by experienced and trained maintenance personnel.

5–5. FIRST LEVEL MAINTENANCE.

5–6. First level maintenance consists of precautionary procedures applied to the equipment to prevent future failures. The procedures are performed on a regular basis and the results recorded in a performance log.

WARNING *DISCONNECT ALL EXCITER PRIMARY POWER BEFORE ATTEMPTING ANY EQUIPMENT MAINTENANCE.*

WARNING

5–7. The exciter should be cleaned of accumulated dust using a brush and vacuum cleaner. Check the circuit boards for improperly seated semiconductors and components damaged by overheating. Check the exciter chassis for loose hardware and lubricate mechanical surfaces (exciter slide rails) as required.

5–8. SECOND LEVEL MAINTENANCE.

5–9. Second level maintenance consists of procedures required to restore the AX–10 exciter to operation after a fault has occurred. The following procedures are divided into electrical adjustments and troubleshooting.

5–10. The maintenance philosophy of the exciter consists of isolating a problem to a specific assembly with subsequent troubleshooting as required to isolate the defective components. The defective components may be repaired locally or the entire device may be returned to Broadcast Electronics, Inc. for repair or replacement.

5–11. ELECTRICAL ADJUSTMENTS.

WARNING *REMOVE ALL JEWELRY BEFORE PROCEEDING.*

WARNING

5–12. The following text provides adjustment procedures for all exciter controls with the exception of the following controls which are described in SECTION II, INSTALLATION.

A. **LEFT DAY/NIGHT** and **RIGHT DAY/NIGHT** Equalization Controls.

B. **DAY/NIGHT LEVEL** and **DAY/NIGHT BAL** Controls.

C. RF Level, RF Drive, and RF Symmetry Controls.

D. Pilot Level Control.

E. Envelope Audio Clip Level Control.

5–13. The adjustment procedures are presented in the following order.

A. Audio Adjustments.

B. Exciter Sample Transmitter Adjustments.

C. Frequency Synthesizer Adjustments.

D. Carrier Frequency Reprogramming.

E. Filter Adjustments.

5–14. **AUDIO ADJUSTMENTS.**

5–15. **DISPLAY CALIBRATE AND X10 CALIBRATE CONTROLS.** The display calibrate (R161) and X10 calibrate (R142) controls adjust the meter driver circuit to provide an accurate monitor display. To adjust the controls, proceed as follows.

5–16. **Required Equipment.** The following equipment is required to adjust the display and X10 calibrate controls.

A. Insulated Adjustment Tool (shipped with the exciter).

B. Flat–Tip Screwdriver, 4 inch (10.2 cm) blade, 1/4 inch (0.6 cm) tip.

C. Calibrated Low Distortion Audio Generator, +20 dBm, 600 Ohm output (Potomac AG–51 or equivalent).

D. Number 2 Phillips Screwdriver, 4 inch (10.2 cm) blade.

5–17. **Procedure.** To adjust the controls, proceed as follows:

CAUTION

CAUTION

MAINTENANCE WITH POWER ENERGIZED IS ALWAYS CONSIDERED HAZARDOUS, THEREFORE CAUTION SHOULD BE OBSERVED. DO NOT TOUCH ANY COMPONENT WITHIN THE EXCITER WHEN POWER IS ENERGIZED.

CAUTION

CAUTION

TO PREVENT DAMAGE TO TRANSMITTER RF CIRCUIT, DEENERGIZE THE TRANSMITTER WHEN DISABLING THE EXCITER FOR MAINTENANCE PROCEDURES.

5–18. Disconnect the transmitter and exciter primary power and remove the exciter top–panel.

5–19. Connect the audio generator to the exciter **LEFT IN** and **RIGHT IN** jacks.

5–20. Apply power to the exciter.

5–21. Adjust the audio generator for a L=R 100 Hz output at +10 dBm.

5–22. Operate the exciter to the stereo mode by depressing the **STEREO** switch.

WARNING: DISCONNECT PRIMARY POWER BEFORE PROCEEDING

5–23. Operate the exciter 13%/130%switch to 130% and depress the **L+R MONITOR SELECT** switch.

5–24. Refer to Figure 5–1 and adjust display calibrate control R161 fully counterclockwise, then clockwise until the 100% indicator begins to illuminate.

5–25. Adjust the audio generator for a L=R 100 Hz output at –10 dBm.

5–26. Operate the exciter 13%/130%switch to the 13%.

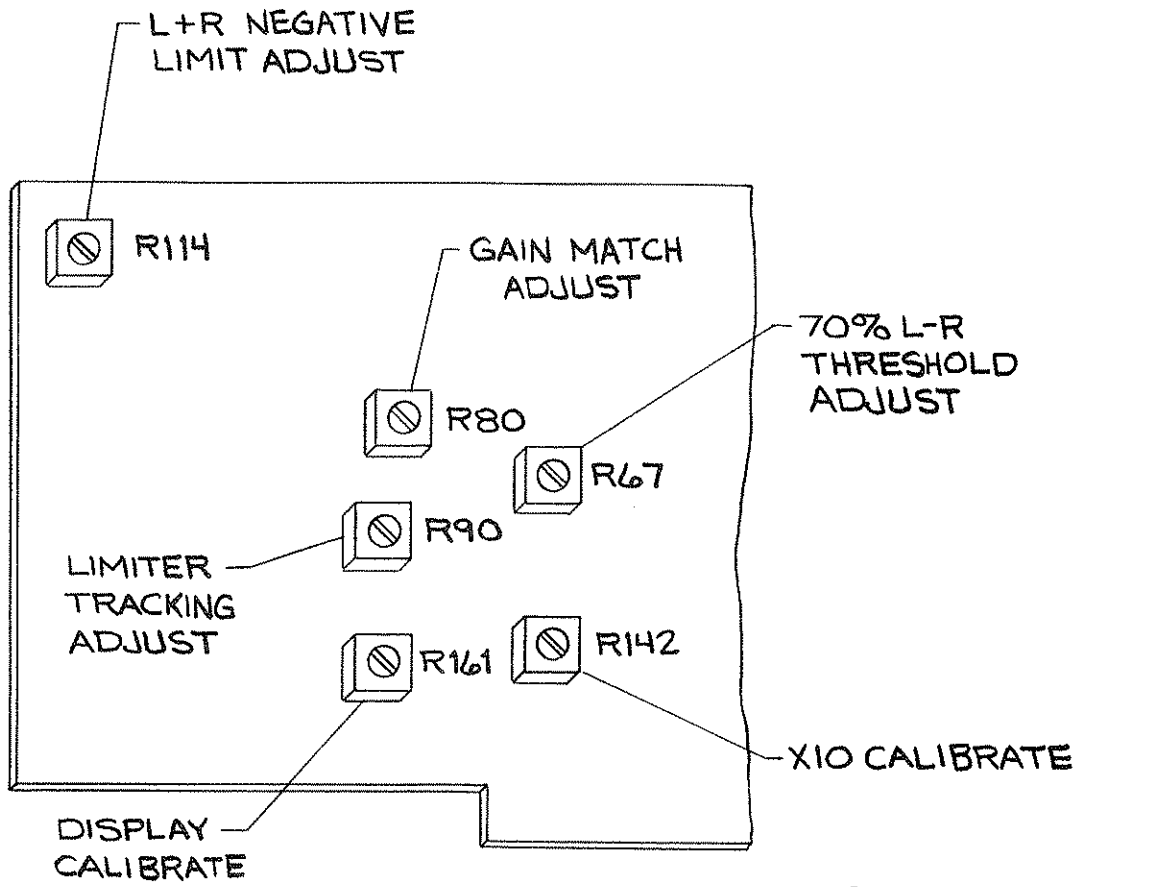
5–27. Refer to Figure 5–1 and adjust X10 calibrate control R142 fully counterclockwise, then clockwise until the 100% (10%) indicator begins to illuminate.

5–28. Adjust the audio generator for a L=R 100 Hz output at +10 dBm.

5–29. Operate the exciter 13%/130%switch to 130%.

5–30. Observe the monitor display.

5–31. If the 100% indicator on the monitor display is not illuminated, adjust display calibrate control R161 slightly until the 100% indicator begins to illuminate.



597–0095–25

FIGURE 5–1. AUDIO CONTROL CIRCUIT BOARD CONTROLS

5–32. Return the exciter to service as follows:

A. Disconnect the exciter primary power.

B. Remove the test equipment.

C. Replace the top–panel.

5–33. **GAIN MATCH CONTROL.** Gain match control R80 balances the left and right channel gain to prevent the generation of crosstalk in the modulator. To adjust the control, proceed as follows.

5–34. **Required Equipment.** The following equipment is required to adjust the gain match control.

A. Insulated Adjustment Tool (shipped with the exciter).

B. Flat–Tip Screwdriver, 4 inch (10.2 cm) blade, 1/4 inch (0.6 cm) tip.

C. Number 2 Phillips Screwdriver, 4 inch (10.2 cm) blade.

D. Calibrated Low Distortion Audio Generator, +20 dBm, 600 Ohm output (Potomac AG–51 or equivalent).

E. Spectrum Analyzer, 5 MHz bandwidth, 70 dB dynamic range (Tektronix 7603 Oscilloscope Main Frame and 7L5 Spectrum Analyzer Plug–in with L3 module or equivalent.

5–35. **Procedure.** To adjust the control, proceed as follows:

CAUTION

CAUTION

MAINTENANCE WITH POWER ENERGIZED IS ALWAYS CONSIDERED HAZARDOUS, THEREFORE CAUTION SHOULD BE OBSERVED. DO NOT TOUCH ANY COMPONENT WITHIN THE EXCITER WHEN POWER IS ENERGIZED.

CAUTION

CAUTION

TO PREVENT DAMAGE TO TRANSMITTER RF CIRCUIT, DEENERGIZE THE TRANSMITTER WHEN DISABLING THE EXCITER FOR MAINTENANCE PROCEDURES.

5–36. Disconnect the transmitter and exciter primary power and remove the exciter top–panel.

5–37. Connect the spectrum analyzer to pin 9 of integrated circuit U10 on the modulator circuit board.

5–38. Connect the audio generator to the exciter **LEFT IN** and **RIGHT IN** jacks.

5–39. Apply power to the exciter.

5–40. Operate the exciter to the stereo mode by depressing the **STEREO** switch.

5–41. Adjust the audio generator for a L=R 1 kHz output at +10 dBm.

5–42. Refer to Figure 5–1 and adjust gain match control R80 on the audio control circuit board to null the 1kHz sidebands.

5–43. Return the exciter to service as follows:

A. Disconnect the exciter primary power.

WARNING: DISCONNECT PRIMARY POWER BEFORE PROCEEDING

B. Remove the test equipment.

C. Replace the top–panel.

5–44. **70% L–R THRESHOLD CONTROL AND LIMITER TRACKING CONTROL.** The 70% L–R threshold control R67 and limiter tracking control R90 determine the level and amount of L–R limiting. To adjust the controls, proceed as follows.

5–45. **Required Equipment.** The following equipment is required to adjust the 70% L–R threshold control and the limiter tracking control.

A. Insulated Adjustment Tool (shipped with the exciter).

B. Flat–Tip Screwdriver, 4 inch (10.2 cm) blade, 1/4 inch (0.6 cm) tip.

C. Number 2 Phillips Screwdriver, 4 inch (10.2 cm) blade.

D. Calibrated Low Distortion Audio Generator, +20 dBm, 600 Ohm output (Potomac AG–51 or equivalent).

5–46. **Procedure.** To adjust the controls, proceed as follows:

CAUTION

CAUTION

MAINTENANCE WITH POWER ENERGIZED IS ALWAYS CONSIDERED HAZARDOUS, THEREFORE CAUTION SHOULD BE OBSERVED. DO NOT TOUCH ANY COMPONENT WITHIN THE EXCITER WHEN POWER IS ENERGIZED.

CAUTION

CAUTION

TO PREVENT DAMAGE TO TRANSMITTER RF CIRCUIT, DEENERGIZE THE TRANSMITTER WHEN DISABLING THE EXCITER FOR MAINTENANCE PROCEDURES.

NOTE

NOTE

PERFORM THE METER CALIBRATE AND GAIN MATCH ADJUSTMENT PROCEDURES BEFORE PROCEEDING.

5–47. Disconnect the transmitter and exciter primary power and remove the exciter top–panel.

5–48. Connect the audio generator to the exciter **LEFT IN** and **RIGHT IN** jacks.

5–49. Apply power to the exciter.

5–50. Operate the exciter to the stereo mode by depressing the **STEREO** switch.

5–51. Disable the exciter single–channel–limiter by operating the **SCL OFF** switch to the in position.

5–52. Operate the exciter **13%/130%**switch to 130% and depress the **L MONITOR SELECT** switch.

5–53. Adjust the audio generator for a left channel 1kHz output at a level to produce 100% left channel modulation as indicated by the exciter monitor.

5–54. Refer to Figure 5–1 and adjust 70% L–R threshold control R67 until LED DS1 on the audio control circuit board begins to illuminate.

5–55. Enable the exciter single–channel–limiter by operating the **SCL OFF** switch to the out position.

5–56. Depress the exciter L+R MONITOR SELECT switch.

5–57. Adjust the audio generator for a left channel 1kHz output at a level to produce 100% L+R modulation as indicated by the exciter monitor.

5–58. Depress the exciter L–R MONITOR SELECT switch.

5–59. Refer to Figure 5–1 and adjust limiter tracking control R90 until the exciter monitor 70% indicator begins to illuminate.

5–60. Return the exciter to service as follows:

A. Disconnect the exciter primary power.

B. Remove the test equipment.

C. Replace the top–panel.

5–61. **EXCITER SAMPLE TRANSMITTER ADJUSTMENTS.**

5–62. **GENERAL.** The following text describes adjustment procedures for all controls associated with the exciter sample transmitter. All of the procedures must be completed and performed in sequence to align the exciter sample transmitter. The procedures are presented as follows:

A. Preliminary Set–Up Procedure.

B. Carrier Match Control.

C. Left Channel and Right Channel Level Match Controls.

D. Left Channel and Right Channel Delay Match Controls.

E. L+R Negative Limiter Control.

F. Return to Service Procedure.

5–63. **REQUIRED EQUIPMENT.** The following equipment is required for the exciter sample transmitter adjustment procedures.

A. Insulated Adjustment Tool (shipped with the exciter).

B. Flat–Tip Screwdriver, 4 inch (10.2 cm) blade, 1/4 inch (0.6 cm) tip.

C. Number 2 Phillips Screwdriver, 4 inch (10.2 cm) blade.

D. Calibrated Low Distortion Audio Generator, +20 dBm, 600 Ohm output (Potomac AG–51 or equivalent).

E. Voltmeter (Simpson 260 or equivalent).

5–64. **PROCEDURE.** To adjust the exciter sample transmitter, proceed as follows.

5–65. **Preliminary Set–Up Procedure.** The following text describes a preliminary set–up procedure which is required for the sample transmitter adjustments. The preliminary procedure involves: 1) removal of the day/night equalization circuit board and LPF circuit board (if required), 2) enabling of the exciter sample transmitter output, and 3) test equipment connections. Perform the preliminary set–up procedure as follows:

CAUTION

CAUTION

TO PREVENT DAMAGE TO TRANSMITTER RF CIRCUIT, DEENERGIZE THE TRANSMITTER WHEN DISABLING THE EXCITER FOR MAINTENANCE PROCEDURES.

WARNING: DISCONNECT PRIMARY POWER BEFORE PROCEEDING

5–66. Disconnect the transmitter and exciter primary power and remove the exciter top–panel.

5–67. Remove the day/night equalization circuit board as follows:

A. Remove the 5 Phillips–head mounting screws.

CAUTION

CAUTION

TO PREVENT DAMAGE TO THE EXCITER, ENSURE ALL EXCITER PRIMARY POWER IS DISCONNECTED BEFORE REMOVING OR INSTALLING CIRCUIT BOARD CONNECTORS AND JUMPERS.

B. Unplug connector J1 on the day/night equalization circuit board.

C. Remove the day/night equalization circuit board.

D. Install modulator equalization jumper J7 and envelope equalization jumper J9 on the audio control circuit board in positions 1–2 and 5–6 (refer to Figure 2–3 for pin designations).

CAUTION

CAUTION

TO PREVENT DAMAGE TO THE TRANSMITTER, DISCONNECT THE EXCITER RF OUT CONNECTOR BEFORE ENABLING THE EXCITER SAMPLE TRANSMITTER OUTPUT.

5–68. Disconnect the exciter **RF OUT** connector.

5–69. Enable the exciter sample transmitter output as follows:

A. Operate the exciter Test/Operate switch on the modulator circuit board to Test.

CAUTION

CAUTION

TO PREVENT DAMAGE TO THE EXCITER, ENSURE ALL EXCITER PRIMARY POWER IS DISCONNECTED BEFORE REMOVING OR INSTALLING CIRCUIT BOARD CONNECTORS AND JUMPERS.

B. Install sample transmitter output jumper J52 on the modulator circuit board in positions 1–2 and 3–4 (refer to Figure 2–4 for pin designations).

C. With a coaxial test cable, connect the exciter **SAMPLE XMTR** jack to the AM stereo modulation monitor **RF** input jack.

5–70. Operate the exciter to the stereo mode by depressing the **STEREO** switch and disable the pilot tone by operating the **PILOT OFF** switch to the in position.

5–71. Connect the audio generator to the exciter **LEFT IN** and **RIGHT IN** jacks.

5–72. **Carrier Match Control.** Carrier match control R108 adjusts the sample transmitter to output the correct carrier level. To adjust the control, proceed as follows:

CAUTION

CAUTION

MAINTENANCE WITH POWER ENERGIZED IS ALWAYS CONSIDERED HAZARDOUS, THEREFORE CAUTION SHOULD BE OBSERVED. DO NOT TOUCH ANY COMPONENT WITHIN THE EXCITER WHEN POWER IS ENERGIZED.

CAUTION

CAUTION

WITH POWER ENERGIZED, INADVERTENT CONTACT BETWEEN ADJACENT COMPONENTS OR CIRCUIT BOARDS WITH TEST EQUIPMENT CAN CAUSE SERIOUS DAMAGE TO THE EXCITER.

NOTE ***DO NOT APPLY AUDIO TO THE EXCITER IN THE FOLLOWING PROCEDURE.***

NOTE

5–73. Apply power to the exciter.

5–74. With the voltmeter, measure and record the dc voltage indication at pin 1 of integrated circuit U3 on the modulator circuit board _____VDC.

5–75. Connect the voltmeter to pin 1 of integrated circuit U21 on the modulator circuit board.

5–76. Refer to Figure 5–2 and adjust carrier match control R108 for the recorded voltage indication.

5–77. **Left Channel and Right Channel Level Match Controls.** Left channel level match control R103 and right channel level match control R106 adjust the sample transmitter amplitude equalization. To adjust the controls, proceed as follows:

CAUTION ***MAINTENANCE WITH POWER ENERGIZED IS ALWAYS CONSIDERED HAZARDOUS, THEREFORE CAUTION SHOULD BE OBSERVED. DO NOT TOUCH ANY COMPONENT WITHIN THE EXCITER WHEN POWER IS ENERGIZED.***

CAUTION

5–78. Apply power to the exciter.

5–79. Adjust the audio generator for a left channel 1kHz output at +10 dBm.

5–80. Operate the AM stereo modulation monitor for separate left channel and right channel meter indications.

5–81. Refer to Figure 5–2 and adjust left channel level match control R103 for maximum separation as indicated by the AM stereo modulation monitor right channel meter.

5–82. Adjust the audio generator for a right channel 1kHz output at +10 dBm.

5–83. Refer to Figure 5–2 and adjust right channel level match control R106 for maximum separation as indicated by the AM stereo modulation monitor left channel meter.

5–84. **Left Channel and Right Channel Delay Match Controls.** Left channel delay match control R82 and right channel delay match control R83 adjust the sample transmitter phase equalization. To adjust the controls, proceed as follows:

CAUTION ***MAINTENANCE WITH POWER ENERGIZED IS ALWAYS CONSIDERED HAZARDOUS, THEREFORE CAUTION SHOULD BE OBSERVED. DO NOT TOUCH ANY COMPONENT WITHIN THE EXCITER WHEN POWER IS ENERGIZED.***

CAUTION

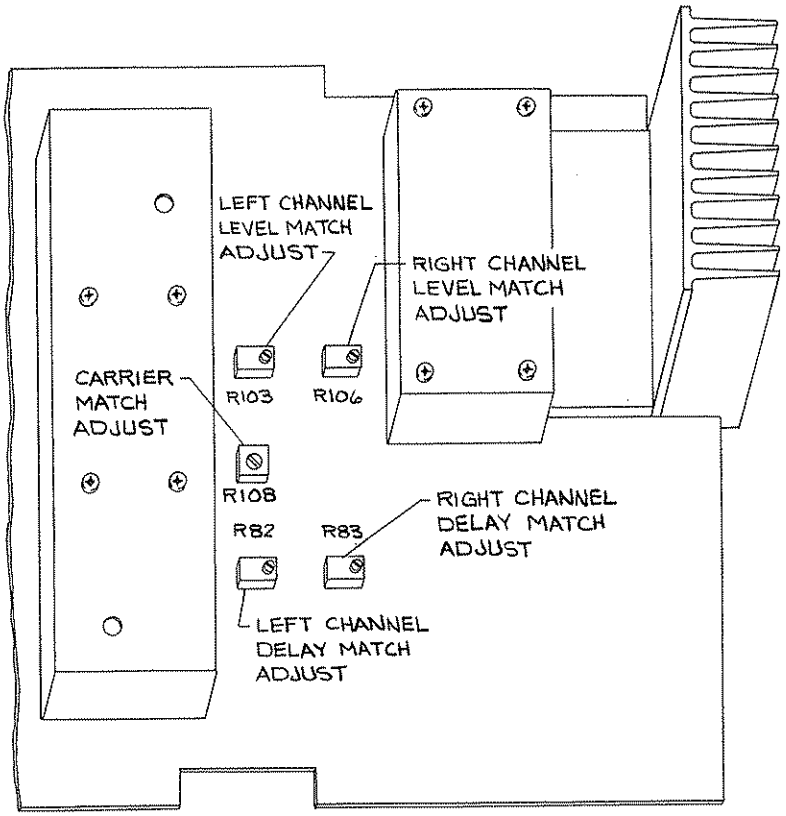
5–85. Apply power to the exciter.

5–86. Adjust the audio generator for a left channel 7.5 kHz output at +10 dBm.

5–87. Ensure the AM stereo modulation monitor is operated for separate left channel and right channel meter indications.

5–88. Refer to Figure 5–2 and adjust left channel delay match control R82 for maximum separation as indicated by the AM stereo modulation monitor right channel meter.

WARNING: DISCONNECT PRIMARY POWER BEFORE PROCEEDING



597-0095-26

FIGURE 5–2. MODULATOR CIRCUIT BOARD CONTROLS

5–89. Adjust the audio generator for a right channel 7.5 kHz output at +10 dBm.

5–90. Refer to Figure 5–2 and adjust right channel delay match control R83 for maximum separation as indicated by the AM stereo modulation monitor left channel meter.

5–91. **L+R Negative Limiter Control.** The L+R negative limiter control R114 limits the negative L+R information to prevent excessive modulation when summed with the pilot tone. To adjust the control, proceed as follows:

CAUTION

CAUTION

MAINTENANCE WITH POWER ENERGIZED IS ALWAYS CONSIDERED HAZARDOUS, THEREFORE CAUTION SHOULD BE OBSERVED. DO NOT TOUCH ANY COMPONENT WITHIN THE EXCITER WHEN POWER IS ENERGIZED.

5–92. Apply power to the exciter.

5–93. Adjust the AM stereo modulation monitor to indicate –95% L+R modulation.

5–94. Adjust the audio generator for a L=R 1kHz output at +10 dBm.

5–95. Refer to Figure 5–1 and adjust L+R negative limit control R114 until the AM stereo modulation monitor indicates –95% L+R modulation.

5–96. **Return To Service Procedure.** After completing all of the exciter sample transmitter adjustments, return the exciter to service as follows:

5–97. Disconnect all exciter primary power.

5–98. Remove all test equipment.

5–99. Reconnect the exciter **RF OUT** connector.

5–100. Disable the exciter sample transmitter output by reversing the procedure described in paragraph 5–69. Ensure sample transmitter output jumper J52 on the modulator circuit board is removed as shown in Figure 2–4.

5–101. Replace the day/night equalization circuit board by reversing the procedure described in paragraph 5–67. Ensure modulator equalization jumper J7 and envelope equalization jumper J9 are installed in positions 2–3 and 4–5 as shown in Figure 2–3.

5–102. Replace the exciter top–panel.

5–103. **FREQUENCY SYNTHESIZER ADJUSTMENTS.**

5–104. **REFERENCE SUPPRESSION.** Reference suppression control R11 nulls the 10 kHz sidebands in the carrier signal. Adjustment of the control will not be required unless replacement components are installed in the control voltage circuit or the complete frequency synthesizer circuit board is replaced. To adjust reference suppression control R11, proceed as follows.

5–105. **Required Equipment.** The following equipment is required to adjust reference suppression control R11.

A. Flat–Tip Screwdriver, 4 inch (10.2 cm) blade, 1/4 inch (0.6 cm) tip.

B. Insulated Adjustment Tool.

C. Spectrum Analyzer (Tektronics 7613 Oscilloscope Main–Frame and 7L5 Spectrum Analyzer with Module L3 or Equivalent).

5–106. **Procedure.** To adjust reference suppression control R11, proceed as follows:

CAUTION

CAUTION

TO PREVENT DAMAGE TO THE TRANSMITTER RF CIRCUIT, DEENERGIZE THE TRANSMITTER WHEN DISABLING THE EXCITER FOR MAINTENANCE PROCEDURES.

5–107. Disconnect the transmitter and exciter primary power and remove the exciter top–panel.

5–108. Unplug connector J1 on the day/night equalization circuit board and remove the day/night equalization circuit board from the chassis.

CAUTION

CAUTION

TO PREVENT DAMAGE TO THE TRANSMITTER, DISCONNECT THE EXCITER RF OUT CONNECTOR BEFORE ENABLING THE EXCITER SAMPLE TRANSMITTER OUTPUT.

5–109. Disconnect the cable from the exciter **RF OUT** connector.

5–110. Enable the exciter sample transmitter as follows:

A. Operate the exciter Test/Operate switch on the modulator circuit board to Test.

CAUTION

CAUTION

TO PREVENT DAMAGE TO THE EXCITER, ENSURE ALL EXCITER PRIMARY POWER IS DISCONNECTED BEFORE REMOVING OR INSTALLING CIRCUIT BOARD CONNECTORS AND JUMPERS.

B. Install sample transmitter jumper J52 on the modulator circuit board in positions 1–2 and 3–4 (refer to Figure 2–4 for pin designations).

5–111. Connect the spectrum analyzer to the exciter **SAMPLE XMTR** receptacle on the rear–panel. Adjust the spectrum analyzer for a center frequency equal to the exciter carrier frequency.

5–112. Apply power to the exciter.

5–113. Refer to Figure 5–3 and adjust reference suppression control R11 to null the 10 kHz sidebands.

5–114. Disconnect all exciter primary power.

5–115. Return the unit to service as follows:

A. Remove all test equipment.

B. Reconnect the cable to the exciter **RF OUT** receptacle.

C. Disable the exciter sample transmitter by reversing the procedure described in the preceding text. Ensure sample transmitter jumper J52 on the modulator circuit board is removed as shown in Figure 2–4.

D. Replace the day/night equalization circuit board and reconnect J1.

5–116. **CARRIER FREQUENCY REPROGRAMMING.**

5–117. **FREQUENCY SELECTION AND PROGRAMMING.** The exciter carrier frequency is established by a dual modulus frequency synthesizer on the synthesizer circuit board. The frequency synthesizer is programmed by one eight–segment DIP switch, one four–segment DIP switch, and a two–position programmable jumper. To reprogram the exciter carrier frequency, proceed as follows.

5–118. **Required Equipment.** The following equipment is required to change the exciter carrier frequency.

A. Insulated Adjustment Tool (shipped with the exciter).

B. Flat–Tip Screwdriver, 4 inch (10.2 cm) blade, 1/4 inch (0.6 cm) tip.

5–119. **Procedure.** To change the exciter carrier frequency, proceed as follows:

CAUTION

CAUTION

TO PREVENT DAMAGE TO THE EXCITER, DISCONNECT ALL PRIMARY POWER BEFORE PROCEEDING.

CAUTION

CAUTION

TO PREVENT DAMAGE TO TRANSMITTER RF CIRCUIT, DEENERGIZE THE TRANSMITTER WHEN DISABLING THE EXCITER FOR MAINTENANCE PROCEDURES.

5–120. Disconnect the transmitter and exciter primary power and remove the exciter top–panel.

5–121. Using needle–nose pliers, remove the three programmable headers from the frequency synthesizer circuit board and install three programmable DIP switches (located in the exciter accessory parts kit) in locations S1, S2, and S3 (refer to Figure 5–3).

5–122. Refer to Table 5–1 and select the DIP–switch programming for the desired carrier frequency. The frequency synthesizer programming is divided into two sections: 1) 10 kHz increment programming and 2) 9 kHz increment programming.

5–123. Refer to Figure 5–3 and program four–segment switch S1, S2, and S3 for the desired operating frequency.

5–124. Refer to Figure 5–3 and install frequency programming jumper J9 if the carrier frequency is less than 1300 kHz. If the carrier frequency is greater than 1300 kHz, remove frequency programming jumper J9.

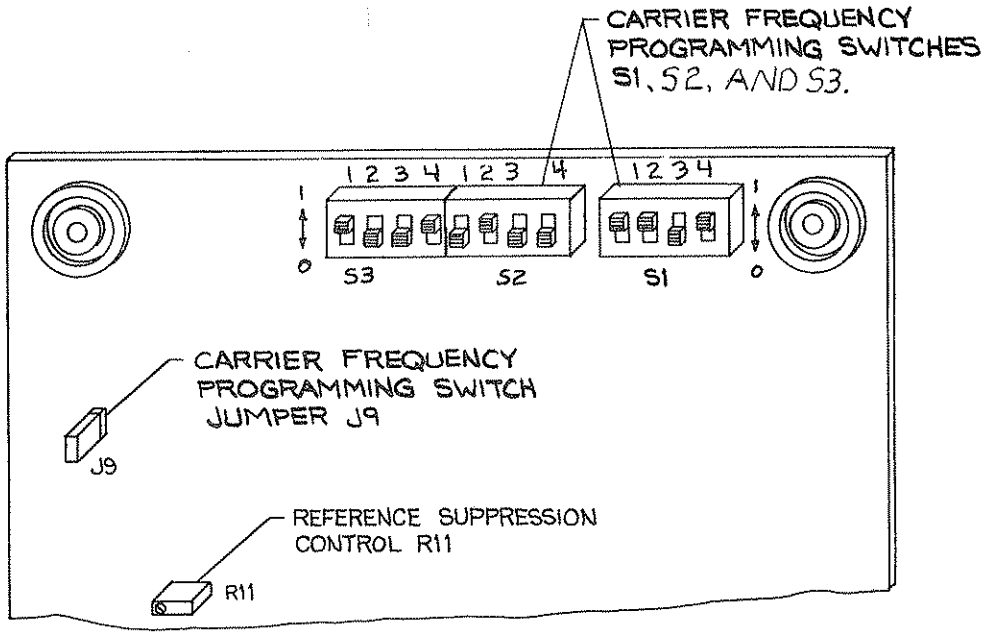
5–125. Replace the top–panel and return the exciter to service.

5–126. **FILTER ADJUSTMENTS.**

5–127. Due to the complexity and difficulty of the procedure and the types of equipment required, all filters associated with the AX–10 exciter (IF filters and the frequency converter module filter) are not considered field adjustable. Therefore, it is suggested the defective filter be returned to Broadcast Electronics Inc. for adjustment or exchange. If return is not practical, contact the Broadcast Electronics Customer Service Department for a recommended procedure and list of required test equipment.

5–128. **TROUBLESHOOTING.**

5–129. Troubleshooting within the exciter is not considered hazardous due to the low voltages and currents involved. All high voltages used within the exciter have been shielded, however do not touch any component within the exciter when power is energized.



597–0095–28

FIGURE 5–3. FREQUENCY SYNTHESIZER CIRCUIT BOARD CONTROLS

WARNING: DISCONNECT PRIMARY POWER BEFORE PROCEEDING

TABLE 5–1. FREQUENCY SYNTHESIZER PROGRAMMING
(Sheet 1 of 2)

10 kHz INCREMENT PROGRAMMING

FREQUENCY	SWITCH S1 PROGRAMMING 1 2 3 4	SWITCH S3 PROGRAMMING 1 2 3 4	SWITCH S2 PROGRAMMING 1 2 3 4	FREQUENCY	SWITCH S1 PROGRAMMING 1 2 3 4	SWITCH S3 PROGRAMMING 1 2 3 4	SWITCH S2 PROGRAMMING 1 2 3 4
540 kHz	1 1 1 1	1 0 1 1	1 1 0 0	1160 kHz	1 1 1 1	0 1 1 1	1 1 1 0
550 kHz	1 1 1 1	1 0 1 1	1 0 1 1	1170 kHz	1 1 1 1	0 1 1 1	1 1 0 1
560 kHz	1 1 1 1	1 0 1 1	1 0 1 0	1180 kHz	1 1 1 1	0 1 1 1	1 1 0 0
570 kHz	1 1 1 1	1 0 1 1	1 0 0 1	1190 kHz	1 1 1 1	0 1 1 1	1 0 1 1
580 kHz	1 1 1 1	1 0 1 1	1 0 0 0	1200 kHz	1 1 1 1	0 1 1 1	1 0 1 0
590 kHz	1 1 1 1	1 0 1 1	0 1 1 1	1210 kHz	1 1 1 1	0 1 1 1	1 0 0 1
600 kHz	1 1 1 1	1 0 1 1	0 1 1 0	1220 kHz	1 1 1 1	0 1 1 1	1 0 0 0
610 kHz	1 1 1 1	1 0 1 1	0 1 0 1	1230 kHz	1 1 1 1	0 1 1 1	0 1 1 1
620 kHz	1 1 1 1	1 0 1 1	0 1 0 0	1240 kHz	1 1 1 1	0 1 1 1	0 1 1 0
630 kHz	1 1 1 1	1 0 1 1	0 0 1 1	1250 kHz	1 1 1 1	0 1 1 1	0 1 0 1
640 kHz	1 1 1 1	1 0 1 1	0 0 1 0	1260 kHz	1 1 1 1	0 1 1 1	0 1 0 0
650 kHz	1 1 1 1	1 0 1 1	0 0 0 1	1270 kHz	1 1 1 1	0 1 1 1	0 0 1 1
660 kHz	1 1 1 1	1 0 1 1	0 0 0 0	1280 kHz	1 1 1 1	0 1 1 1	0 0 1 0
670 kHz	1 1 1 1	1 0 1 0	1 1 1 1	1290 kHz	1 1 1 1	0 1 1 1	0 0 0 1
680 kHz	1 1 1 1	1 0 1 0	1 1 1 0	1300 kHz	1 1 1 1	0 1 1 1	0 0 0 0
690 kHz	1 1 1 1	1 0 1 0	1 1 0 1	1310 kHz	1 1 1 1	0 1 1 0	1 1 1 1
700 kHz	1 1 1 1	1 0 1 0	1 1 0 0	1320 kHz	1 1 1 1	0 1 1 0	1 1 1 0
710 kHz	1 1 1 1	1 0 1 0	1 0 1 1	1330 kHz	1 1 1 1	0 1 1 0	1 1 0 1
720 kHz	1 1 1 1	1 0 1 0	1 0 1 0	1340 kHz	1 1 1 1	0 1 1 0	1 1 0 0
730 kHz	1 1 1 1	1 0 1 0	1 0 0 1	1350 kHz	1 1 1 1	0 1 1 0	1 0 1 1
740 kHz	1 1 1 1	1 0 1 0	1 0 0 0	1360 kHz	1 1 1 1	0 1 1 0	1 0 1 0
750 kHz	1 1 1 1	1 0 1 0	0 1 1 1	1370 kHz	1 1 1 1	0 1 1 0	1 0 0 1
760 kHz	1 1 1 1	1 0 1 0	0 1 1 0	1380 kHz	1 1 1 1	0 1 1 0	1 0 0 0
770 kHz	1 1 1 1	1 0 1 0	0 1 0 1	1390 kHz	1 1 1 1	0 1 1 0	0 1 1 1
780 kHz	1 1 1 1	1 0 1 0	0 1 0 0	1400 kHz	1 1 1 1	0 1 1 0	0 1 1 0
790 kHz	1 1 1 1	1 0 1 0	0 0 1 1	1410 kHz	1 1 1 1	0 1 1 0	0 1 0 1
800 kHz	1 1 1 1	1 0 1 0	0 0 1 0	1420 kHz	1 1 1 1	0 1 1 0	0 1 0 0
810 kHz	1 1 1 1	1 0 1 0	0 0 0 1	1430 kHz	1 1 1 1	0 1 1 0	0 0 1 1
820 kHz	1 1 1 1	1 0 1 0	0 0 0 0	1440 kHz	1 1 1 1	0 1 1 0	0 0 1 0
830 kHz	1 1 1 1	1 0 0 1	1 1 1 1	1450 kHz	1 1 1 1	0 1 1 0	0 0 0 1
840 kHz	1 1 1 1	1 0 0 1	1 1 1 0	1460 kHz	1 1 1 1	0 1 1 0	0 0 0 0
850 kHz	1 1 1 1	1 0 0 1	1 1 0 1	1470 kHz	1 1 1 1	0 1 0 1	1 1 1 1
860 kHz	1 1 1 1	1 0 0 1	1 1 0 0	1480 kHz	1 1 1 1	0 1 0 1	1 1 1 0
870 kHz	1 1 1 1	1 0 0 1	1 0 1 1	1490 kHz	1 1 1 1	0 1 0 1	1 1 0 1
880 kHz	1 1 1 1	1 0 0 1	1 0 1 0	1500 kHz	1 1 1 1	0 1 0 1	1 1 0 0
890 kHz	1 1 1 1	1 0 0 1	1 0 0 1	1510 kHz	1 1 1 1	0 1 0 1	1 0 1 1
900 kHz	1 1 1 1	1 0 0 1	1 0 0 0	1520 kHz	1 1 1 1	0 1 0 1	1 0 1 0
910 kHz	1 1 1 1	1 0 0 1	0 1 1 1	1530 kHz	1 1 1 1	0 1 0 1	1 0 0 1
920 kHz	1 1 1 1	1 0 0 1	0 1 1 0	1540 kHz	1 1 1 1	0 1 0 1	1 0 0 0
930 kHz	1 1 1 1	1 0 0 1	0 1 0 1	1550 kHz	1 1 1 1	0 1 0 1	0 1 1 1
940 kHz	1 1 1 1	1 0 0 1	0 1 0 0	1560 kHz	1 1 1 1	0 1 0 1	0 1 1 0
950 kHz	1 1 1 1	1 0 0 1	0 0 1 1	1570 kHz	1 1 1 1	0 1 0 1	0 1 0 1
960 kHz	1 1 1 1	1 0 0 1	0 0 1 0	1580 kHz	1 1 1 1	0 1 0 1	0 1 0 0
970 kHz	1 1 1 1	1 0 0 1	0 0 0 1	1590 kHz	1 1 1 1	0 1 0 1	0 0 1 1
980 kHz	1 1 1 1	1 0 0 1	0 0 0 0	1600 kHz	1 1 1 1	0 1 0 1	0 0 1 0
990 kHz	1 1 1 1	1 0 0 0	1 1 1 1	1610 kHz	1 1 1 1	0 1 0 1	0 0 0 1
1000 kHz	1 1 1 1	1 0 0 0	1 1 1 0	1620 kHz	1 1 1 1	0 1 0 1	0 0 0 0
1010 kHz	1 1 1 1	1 0 0 0	1 1 0 1	1630 kHz	1 1 1 1	0 1 0 0	1 1 1 1
1020 kHz	1 1 1 1	1 0 0 0	1 1 0 0	1640 kHz	1 1 1 1	0 1 0 0	1 1 1 0
1030 kHz	1 1 1 1	1 0 0 0	1 0 1 1	1650 kHz	1 1 1 1	0 1 0 0	1 1 0 1
1040 kHz	1 1 1 1	1 0 0 0	1 0 1 0	1660 kHz	1 1 1 1	0 1 0 0	1 1 0 0
1050 kHz	1 1 1 1	1 0 0 0	1 0 0 1	1670 kHz	1 1 1 1	0 1 0 0	1 0 1 1
1060 kHz	1 1 1 1	1 0 0 0	1 0 0 0	1680 kHz	1 1 1 1	0 1 0 0	1 0 1 0
1070 kHz	1 1 1 1	1 0 0 0	0 1 1 1	1690 kHz	1 1 1 1	0 1 0 0	1 0 0 1
1080 kHz	1 1 1 1	1 0 0 0	0 1 1 0	1700 kHz	1 1 1 1	0 1 0 0	1 0 0 0
1090 kHz	1 1 1 1	1 0 0 0	0 1 0 1	1710 kHz	1 1 1 1	0 1 0 0	0 1 1 1
1100 kHz	1 1 1 1	1 0 0 0	0 1 0 0				
1110 kHz	1 1 1 1	1 0 0 0	0 0 1 1				
1120 kHz	1 1 1 1	1 0 0 0	0 0 1 0				
1130 kHz	1 1 1 1	1 0 0 0	0 0 0 1				
1140 kHz	1 1 1 1	1 0 0 0	0 0 0 0				
1150 kHz	1 1 1 1	0 1 1 1	1 1 1 1				

TABLE 5–1. FREQUENCY SYNTHESIZER PROGRAMMING
(Sheet 2 of 2)

9 kHz INCREMENT PROGRAMMING

FREQUENCY	SWITCH S1 PROGRAMMING 1 2 3 4	SWITCH S3 PROGRAMMING 1 2 3 4	SWITCH S2 PROGRAMMING 1 2 3 4	FREQUENCY	SWITCH S1 PROGRAMMING 1 2 3 4	SWITCH S3 PROGRAMMING 1 2 3 4	SWITCH S2 PROGRAMMING 1 2 3 4
522 kHz	1 1 0 1	1 0 1 1	1 1 1 0	1116 kHz	1 0 0 1	1 0 0 0	0 0 1 1
531 kHz	1 1 1 0	1 0 1 1	1 1 0 1	1125 kHz	1 0 1 0	1 0 0 0	0 0 1 0
540 kHz	1 1 1 1	1 0 1 1	1 1 0 0	1134 kHz	1 0 1 1	1 0 0 0	0 0 0 1
549 kHz	0 1 1 0	1 0 1 1	1 1 0 0	1143 kHz	1 1 0 0	1 0 0 0	0 0 0 0
558 kHz	0 1 1 1	1 0 1 1	1 0 1 1	1152 kHz	1 1 0 1	0 1 1 1	1 1 1 1
567 kHz	1 0 0 0	1 0 1 1	1 0 1 0	1161 kHz	1 1 1 0	0 1 1 1	1 1 1 0
576 kHz	1 0 0 1	1 0 1 1	1 0 0 1	1170 kHz	1 1 1 1	0 1 1 1	1 1 0 1
585 kHz	1 0 1 0	1 0 1 1	1 0 0 0	1179 kHz	0 1 1 0	0 1 1 1	1 1 0 1
594 kHz	1 0 1 1	1 0 1 1	0 1 1 1	1188 kHz	0 1 1 1	0 1 1 1	1 1 0 0
603 kHz	1 1 0 0	1 0 1 1	0 1 1 0	1197 kHz	1 0 0 0	0 1 1 1	1 0 1 1
612 kHz	1 1 0 1	1 0 1 1	0 1 0 1	1206 kHz	1 0 0 1	0 1 1 1	1 0 1 0
621 kHz	1 1 1 0	1 0 1 1	0 1 0 0	1215 kHz	1 0 1 0	0 1 1 1	1 0 0 1
630 kHz	1 1 1 1	1 0 1 1	0 0 1 1	1224 kHz	1 0 1 1	0 1 1 1	1 0 0 0
639 kHz	0 1 1 0	1 0 1 1	0 0 1 1	1233 kHz	1 1 0 0	0 1 1 1	0 1 1 1
648 kHz	0 1 1 1	1 0 1 1	0 0 1 0	1242 kHz	1 1 0 1	0 1 1 1	0 1 1 0
657 kHz	1 0 0 0	1 0 1 1	0 0 0 1	1251 kHz	1 1 1 0	0 1 1 1	0 1 0 1
666 kHz	1 0 0 1	1 0 1 1	0 0 0 0	1260 kHz	1 1 1 1	0 1 1 1	0 1 0 0
675 kHz	1 0 1 0	1 0 1 0	1 1 1 1	1269 kHz	0 1 1 0	0 1 1 1	0 1 0 0
684 kHz	1 0 1 1	1 0 1 0	1 1 1 0	1278 kHz	0 1 1 1	0 1 1 1	0 0 1 1
693 kHz	1 1 0 0	1 0 1 0	1 1 0 1	1287 kHz	1 0 0 0	0 1 1 1	0 0 1 0
702 kHz	1 1 0 1	1 0 1 0	1 1 0 0	1296 kHz	1 0 0 1	0 1 1 1	0 0 0 1
711 kHz	1 1 1 0	1 0 1 0	1 0 1 1	1305 kHz	1 0 1 0	0 1 1 1	0 0 0 0
720 kHz	1 1 1 1	1 0 1 0	1 0 1 0	1314 kHz	1 0 1 1	0 1 1 0	1 1 1 1
729 kHz	0 1 1 0	1 0 1 0	1 0 1 0	1323 kHz	1 1 0 0	0 1 1 0	1 1 1 0
738 kHz	0 1 1 1	1 0 1 0	1 0 0 1	1332 kHz	1 1 0 1	0 1 1 0	1 1 0 1
747 kHz	1 0 0 0	1 0 1 0	1 0 0 0	1341 kHz	1 1 1 0	0 1 1 0	1 1 0 0
756 kHz	1 0 0 1	1 0 1 0	0 1 1 1	1350 kHz	1 1 1 1	0 1 1 0	1 0 1 1
765 kHz	1 0 1 0	1 0 1 0	0 1 1 0	1359 kHz	0 1 1 0	0 1 1 0	1 0 1 1
774 kHz	1 0 1 1	1 0 1 0	0 1 0 1	1368 kHz	0 1 1 1	0 1 1 0	1 0 1 0
783 kHz	1 1 0 0	1 0 1 0	0 1 0 0	1377 kHz	1 0 0 0	0 1 1 0	1 0 0 1
792 kHz	1 1 0 1	1 0 1 0	0 0 1 1	1386 kHz	1 0 0 1	0 1 1 0	1 0 0 0
801 kHz	1 1 1 0	1 0 1 0	0 0 1 0	1395 kHz	1 0 1 0	0 1 1 0	0 1 1 1
810 kHz	1 1 1 1	1 0 1 0	0 0 0 1	1404 kHz	1 0 1 1	0 1 1 0	0 1 1 0
819 kHz	0 1 1 0	1 0 1 0	0 0 0 1	1413 kHz	1 1 0 0	0 1 1 0	0 1 0 1
828 kHz	0 1 1 1	1 0 1 0	0 0 0 0	1422 kHz	1 1 0 1	0 1 1 0	0 1 0 0
837 kHz	1 0 0 0	1 0 0 1	1 1 1 1	1431 kHz	1 1 1 0	0 1 1 0	0 0 1 1
846 kHz	1 0 0 1	1 0 0 1	1 1 1 0	1440 kHz	1 1 1 1	0 1 1 0	0 0 1 0
855 kHz	1 0 1 0	1 0 0 1	1 1 0 1	1449 kHz	0 1 1 0	0 1 1 0	0 0 1 0
864 kHz	1 0 1 1	1 0 0 1	1 1 0 0	1458 kHz	0 1 1 1	0 1 1 0	0 0 0 1
873 kHz	1 1 0 0	1 0 0 1	1 0 1 1	1467 kHz	1 0 0 0	0 1 1 0	0 0 0 0
882 kHz	1 1 0 1	1 0 0 1	1 0 1 0	1476 kHz	1 0 0 1	0 1 0 1	1 1 1 1
891 kHz	1 1 1 0	1 0 0 1	1 0 0 1	1485 kHz	1 0 1 0	0 1 0 1	1 1 1 0
900 kHz	1 1 1 1	1 0 0 1	1 0 0 0	1494 kHz	1 0 1 1	0 1 0 1	1 1 0 1
909 kHz	0 1 1 0	1 0 0 1	1 0 0 0	1503 kHz	1 1 0 0	0 1 0 1	1 1 0 0
918 kHz	0 1 1 1	1 0 0 1	0 1 1 1	1512 kHz	1 1 0 1	0 1 0 1	1 0 1 1
927 kHz	1 0 0 0	1 0 0 1	0 1 1 0	1521 kHz	1 1 1 0	0 1 0 1	1 0 1 0
936 kHz	1 0 0 1	1 0 0 1	0 1 0 1	1530 kHz	1 1 1 1	0 1 0 1	1 0 0 1
945 kHz	1 0 1 0	1 0 0 1	0 1 0 0	1539 kHz	0 1 1 0	0 1 0 1	1 0 0 1
954 kHz	1 0 1 1	1 0 0 1	0 0 1 1	1548 kHz	0 1 1 1	0 1 0 1	1 0 0 0
963 kHz	1 1 0 0	1 0 0 1	0 0 1 0	1557 kHz	1 0 0 0	0 1 0 1	0 1 1 1
972 kHz	1 1 0 1	1 0 0 1	0 0 0 1	1566 kHz	1 0 0 1	0 1 0 1	0 1 1 0
981 kHz	1 1 1 0	1 0 0 1	0 0 0 0	1575 kHz	1 0 1 0	0 1 0 1	0 1 0 1
990 kHz	1 1 1 1	1 0 0 0	1 1 1 1	1584 kHz	1 0 1 1	0 1 0 1	0 1 0 0
999 kHz	0 1 1 0	1 0 0 0	1 1 1 1	1593 kHz	1 1 0 0	0 1 0 1	0 0 1 1
1008 kHz	0 1 1 1	1 0 0 0	1 1 1 0	1602 kHz	1 1 0 1	0 1 0 1	0 0 1 0
1017 kHz	1 0 0 0	1 0 0 0	1 1 0 1	1611 kHz	1 1 1 0	0 1 0 1	0 0 0 1
1026 kHz	1 0 0 1	1 0 0 0	1 1 0 0	1620 kHz	1 1 1 1	0 1 0 1	0 0 0 0
1035 kHz	1 0 1 0	1 0 0 0	1 0 1 1	1629 kHz	0 1 1 0	0 1 0 1	0 0 0 0
1044 kHz	1 0 1 1	1 0 0 0	1 0 1 0	1638 kHz	0 1 1 1	0 1 0 0	1 1 1 1
1053 kHz	1 1 0 0	1 0 0 0	1 0 0 1	1647 kHz	1 0 0 0	0 1 0 0	1 1 1 0
1062 kHz	1 1 0 1	1 0 0 0	1 0 0 0	1656 kHz	1 0 0 1	0 1 0 0	1 1 0 1
1071 kHz	1 1 1 0	1 0 0 0	0 1 1 1	1665 kHz	1 0 1 0	0 1 0 0	1 1 0 0
1080 kHz	1 1 1 1	1 0 0 0	0 1 1 0	1674 kHz	1 0 1 1	0 1 0 0	1 0 1 1
1089 kHz	0 1 1 0	1 0 0 0	0 1 1 0	1683 kHz	1 1 0 0	0 1 0 0	1 0 1 0
1098 kHz	0 1 1 1	1 0 0 0	0 1 0 1	1692 kHz	1 1 0 1	0 1 0 0	1 0 0 1
1107 kHz	1 0 0 0	1 0 0 0	0 1 0 0	1701 kHz	1 1 1 0	0 1 0 0	1 0 0 0

WARNING: DISCONNECT PRIMARY POWER BEFORE PROCEEDING

5–130. The troubleshooting philosophy for the AX–10 exciter consists of isolating a problem to a specific circuit board. The problem may be isolated by referencing the following warnings and Table 5–2 which provides a general guide to AX–10 exciter troubleshooting.

TABLE 5–2. AX–10 EXCITER TROUBLESHOOTING

SYMPTOM	DEFECT/REMEDY
MONITOR DISPLAY INOPERATIVE– ALL INDICATORS ILLUMINATED	1. Refer to Figure 5–4.
MONITOR DISPLAY INOPERATIVE– ALL INDICATORS OUT	1. Locate defect in power supply. 2. Refer to Figure 5–4.
NO ENVELOPE OUTPUT – DAY AND NIGHT MODES	1. Check integrated circuits U40A/B, U17B, U17A and U16B (if envelope limiter is enabled), and U16A on the audio control circuit board.
NO ENVELOPE OUTPUT – DAY MODE	1. Check relay K3, resistors R139 and R103 on the audio control circuit board. 2. Check relay K1 on the day/night equalization circuit board.
NO ENVELOPE OUTPUT – NIGHT MODE	1. Check relay K3, resistors R208 and R102 on the audio control circuit board. 2. Check relay K1 on the day/night equalization circuit board.
NO RF OUTPUT	1. Refer to Figure 5–5.
NO SAMPLE TRANSMITTER OUTPUT	1. Ensure jumper J52 on the modulator circuit board is installed. 2. Check transistors Q7 through Q10 on the modulator circuit board. 3. Refer to Figure 5–5 and begin troubleshooting at transformer T3.
NO LOCAL MODE CONTROL	1. Check integrated circuits U30, U31, U32, U33, and U34 on the audio control circuit board.
NO REMOTE MODE CONTROL	1. Check optical isolators U26, U27, U28, and U29 on the audio control circuit board and U31 and U32 on the day/night equalization circuit board. 2. Check integrated circuits U30, U31, U32, U33, and U34 on the audio control circuit board.
NO REMOTE MODE INDICATIONS	1. Check optical isolators U36, U37, U38, and U39 on the audio control circuit board and U37, U38, and U41 on the day/night equalization circuit board.

WARNING: DISCONNECT PRIMARY POWER BEFORE PROCEEDING

WARNING

WARNING

REMOVE ALL JEWELRY BEFORE TROUBLESHOOTING.

WARNING

WARNING

DISCONNECT ALL EXCITER PRIMARY POWER BEFORE REPLACING ANY COMPONENTS.

CAUTION

CAUTION

INADVERTENT CONTACT BETWEEN ADJACENT COMPONENTS OR CIRCUIT BOARDS WITH TEST EQUIPMENT CAN CAUSE SERIOUS DAMAGE TO THE EXCITER.

CAUTION

CAUTION

WHEN REPLACING A COMPONENT MOUNTED ON A HEAT–SINK, ENSURE A THIN FILM OF A ZINC–BASED HEAT–SINK COMPOUND IS USED (BE P/N 700–0028) TO ASSURE GOOD HEAT DISSIPATION.

5–131. Once the trouble is isolated and power is totally deenergized, refer to the schematic diagrams and the theory of operation to assist in problem resolution. The defective component may be repaired locally or the entire device may be returned to Broadcast Electronics Inc. for repair or replacement.

WARNING

WARNING

DISCONNECT POWER BEFORE REMOVING OR REPLACING CIRCUIT BOARDS OR COMPONENTS.

5–132. **COMPONENT REPLACEMENT.** The circuit boards used in the AX–10 exciter are double–sided boards 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 circuit board.

5–133. On all circuit boards, the adhesion of the copper trace to the board fails at almost the same temperature as solder melts. A circuit board trace 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.

5–134. To remove a component other than the plug–in type from a circuit board, cut the leads from the body of the defective component while the device is still soldered to the board.

5–135. 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 clinched 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 reheating with a low wattage iron and removing the residual solder with a soldering vacuum tool.

5–136. 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 BE USED ONLY IN SMALL AMOUNTS IN A WELL VENTILATED AREA, AWAY FROM FLAME, CIGARETTES, OR HOT SOLDERING IRONS.*

WARNING

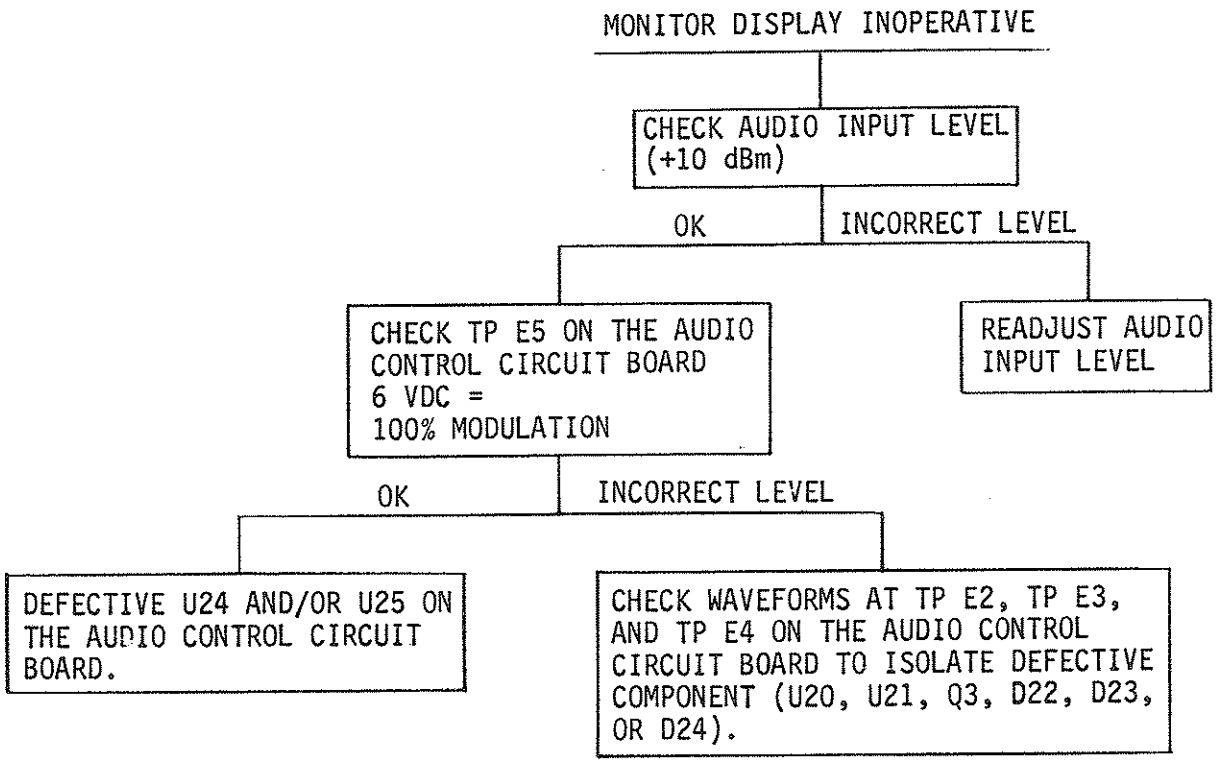
WARNING *OBSERVE THE MANUFACTURERS CAUTIONARY INSTRUCTIONS.*

WARNING

5–137. After soldering, remove residual flux with a cotton swab moistened with a suitable solvent. Rubbing alcohol is highly diluted and is not effective. Solvents are available from electronic supply houses which are useful.

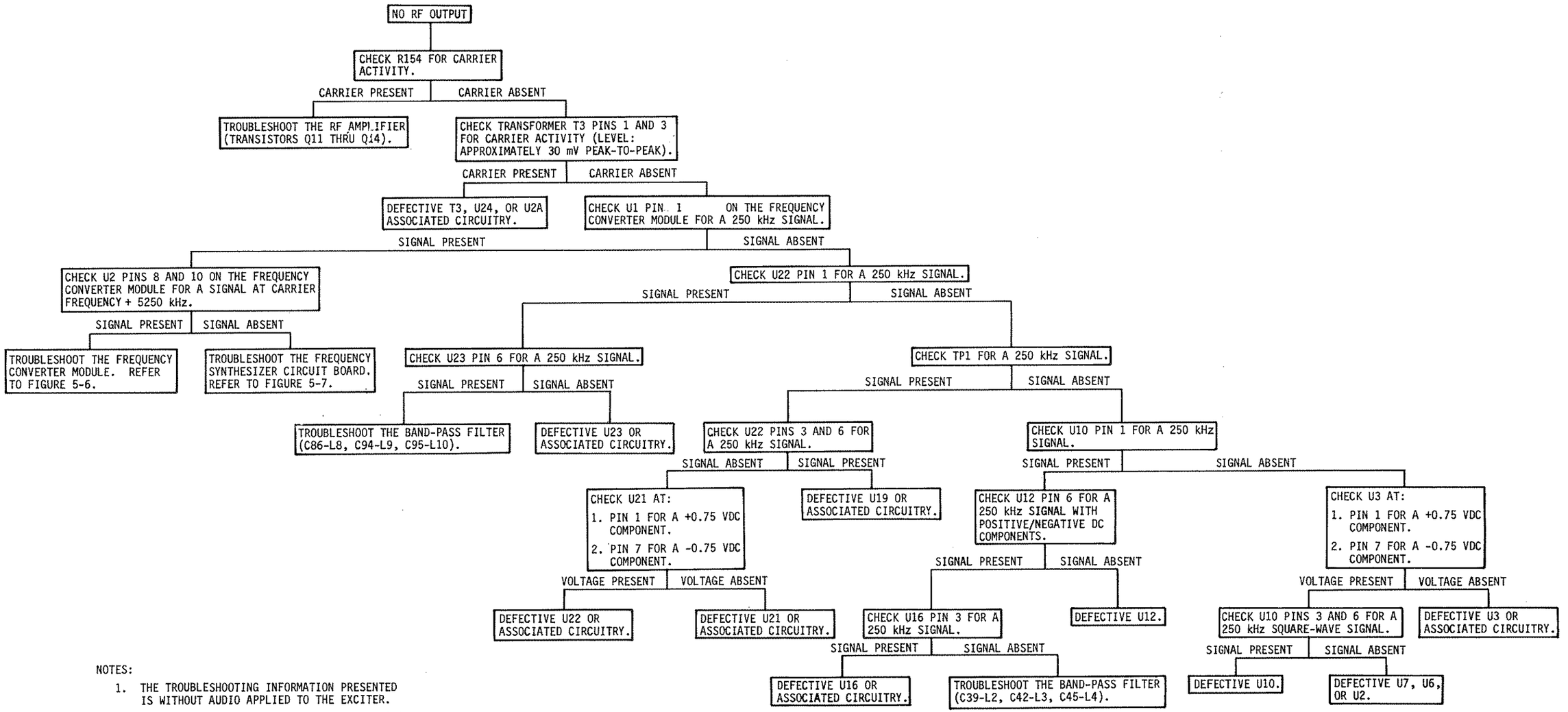
5–138. The board should be checked to ensure the flux has been removed and not just smeared about. Rosin flux is not normally corrosive, but it will absorb enough moisture in time to become conductive and cause problems.

5–139. **INTEGRATED CIRCUITS.** Extra care should be exercised with integrated circuits. Each integrated circuit must be oriented so that its notch matches the notch on the socket. Do not attempt to remove an integrated circuit with your fingers. Use an integrated circuit puller to lightly pry the circuit form its socket.



597-0095-27

FIGURE 5–4. MONITOR DISPLAY INOPERATIVE



NOTES:

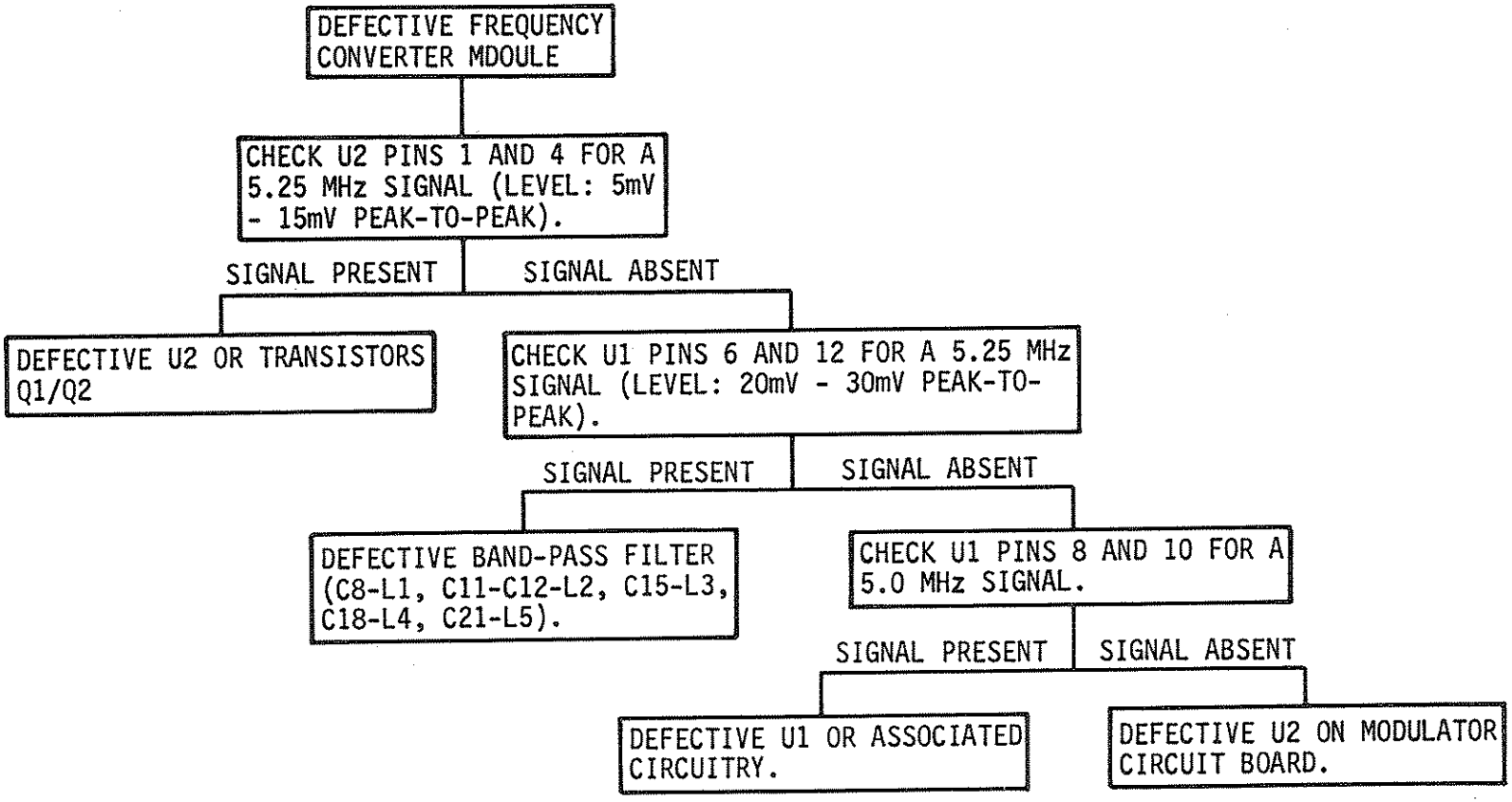
1. THE TROUBLESHOOTING INFORMATION PRESENTED IS WITHOUT AUDIO APPLIED TO THE EXCITER.
2. ALL COMPONENTS ARE LOCATED ON THE MODULATOR CIRCUIT BOARD UNLESS OTHERWISE SPECIFIED.
3. PERFORM ALL MEASUREMENTS WITH A CALIBRATED OSCILLOSCOPE UNLESS OTHERWISE SPECIFIED.

597-0095-30

FIGURE 5-5.
TROUBLESHOOTING TREE, NO RF OUTPUT

BROADCAST ELECTRONICS INC

WARNING: DISCONNECT PRIMARY POWER BEFORE PROCEEDING



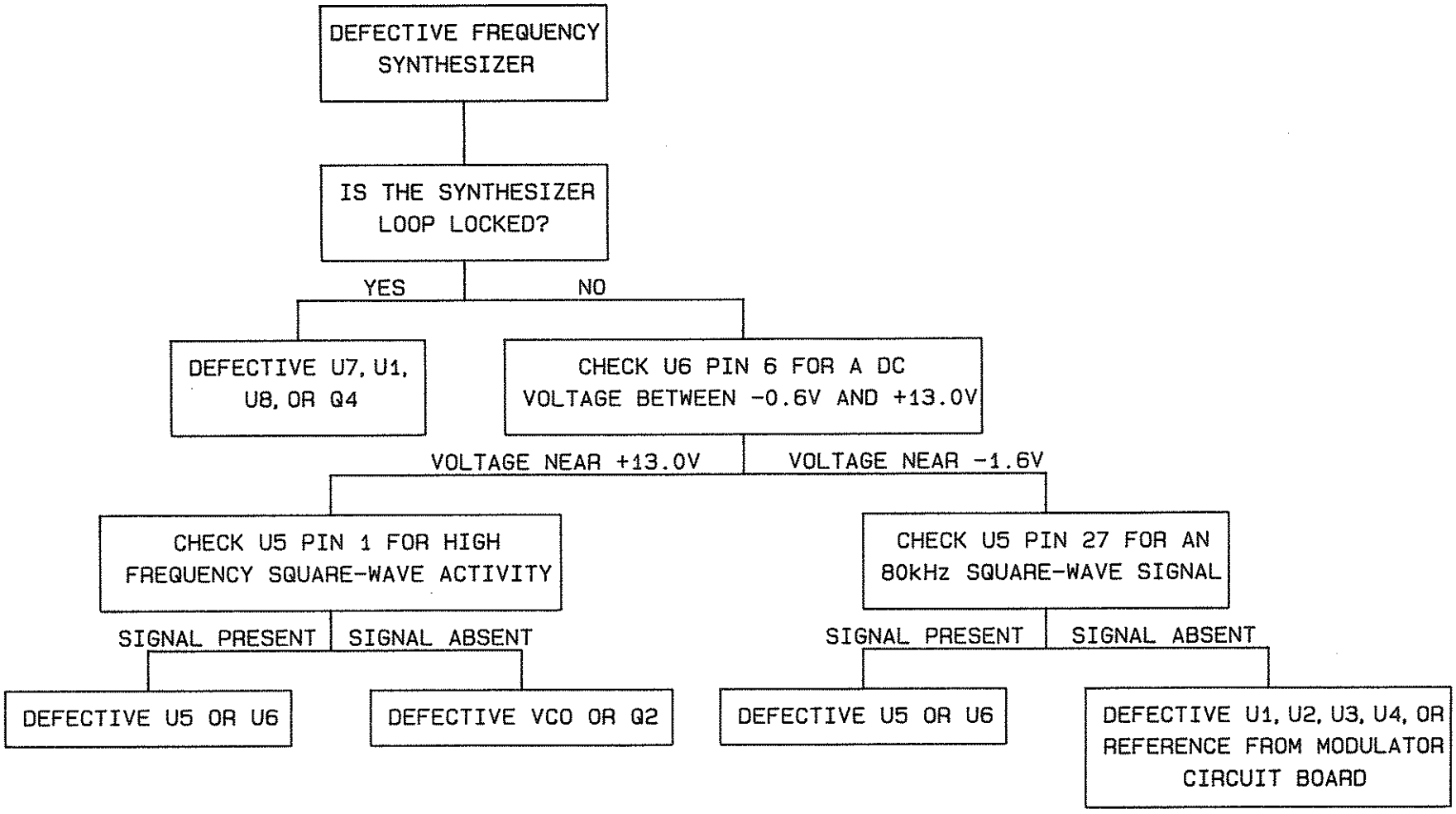
NOTES:

1. THE TROUBLESHOOTING INFORMATION PRESENTED IS WITHOUT AUDIO APPLIED TO THE EXCITER.

2. PERFORM ALL MEASUREMENTS WITH A CALIBRATED OSCILLOSCOPE UNLESS OTHERWISE SPECIFIED.

597-0095-31

FIGURE 5-6. TROUBLESHOOTING TREE, DEFECTIVE FREQUENCY CONVERTER MODULE



NOTES:

1. THE TROUBLESHOOTING INFORMATION PRESENTED IS WITHOUT AUDIO APPLIED TO THE EXCITER.
2. PERFORM ALL MEASUREMENTS WITH A CALIBRATED OSCILLOSCOPE UNLESS OTHERWISE SPECIFIED.

597-0095-32

FIGURE 5–7. TROUBLESHOOTING TREE, DEFECTIVE FREQUENCY SYNTHESIZER

SECTION VI
PARTS LIST

6–1. INTRODUCTION.

6–2. This section provides descriptions and part numbers of electrical components, assemblies, and selected mechanical parts required for maintenance of the Broadcast Electronics AX–10 AM Stereo Exciter. Each table entry in this section is indexed by reference designators appearing on the applicable schematic diagram.

6–3. Table 6–1 indexes all tables listing assemblies and sub–assemblies having replaceable parts, the table number listing the parts, and the page number of the applicable table.

TABLE 6–1. PARTS LIST INDEX

TABLE 6–2. AX–10 AM STEREO EXCITER ASSEMBLY – 907–0010–004/–304

REF. DES.	DESCRIPTION	PART NO.	QTY.
C1 THRU C12	Capacitor, Ceramic Feed–Thru, 1000 pF ±20%, 500V	008–1033	12
FL1	Fused Power Connector/Voltage Selector/EMI Filter, 120/240V	360–6504	1
L1 THRU L8	Ferrite Choke, 180 MHz, 2.5 Turns, Single Section	364–0002	8
J54	Receptacle, BNC (SAMPLE XMTR)	417–0016	1
J55	Receptacle, BNC, Insulated (10 MHz REF)	417–0048	1
J56	Receptacle, BNC, (RF OUT)	417–0016	1
J57,J58	Receptacle, Female, 3–Pin, XLR Type (LEFT IN, RIGHT OUT)	829–4214	2
J59	Receptacle, Male, 3–Pin, XLR Type (ENVELOPE OUT)	829–4213	1
J60	Jack, 3 Circuit, 1/4 inch Phone, Insulated (AUX PILOT IN)	417–0311	1
J62	Receptacle, BNC (TTL OUT)	417–0016	1
R1	Resistor, 47 Ohm ±3%, 5W, WW	130–4722	1
R2	Resistor, 1 Ohm ±1%, 7.5W, WW	130–1001	1
R3	Resistor, 47 Ohm ±3%, 5W, WW	130–4722	1
R4	Resistor, 3 Ohm ±5%, 5W, WW	130–3013	1
R5 THRU R7	Resistor, 604 Ohm ±1%, 1/4W	100–6031	3
T1	Power Transformer, 115/230V, 50/60 Hz, Dual 115V Primary: One winding tapped at 95V Dual Secondary: 36.74V CT @ 1.2A 3.94V @ 0.7A	376–0038	1
——	Frequency Synthesizer Circuit Board Assembly	917–0070	1
——	LED Circuit Board Assembly	917–0045	1
——	Day/Night Equalization Circuit Board Assembly	917–0052	1
——	Remote Interface Circuit Board Assembly	917–0073	1
——	Audio Control Circuit Board Assembly	917–0054	1
——	Modulator Circuit Board Assembly	917–0055	1
——	Wiring Harness Assembly	947–0151	1
——	Accessory Parts Kit	957–0001	1
——	Window for MONITOR DISPLAY	467–1001–1	1
——	Receptacle, Top Cover Retainer	420–0022	10
——	Stud, Top Cover Retainer, 0.46 inches long	420–0019	9
——	Stud, Top Cover Retainer, 0.42 inches long (in RFI Partition Panel)	420–0027	1
——	Stud Retainer, Top Cover Retainer	420–0021	10
——	Rack Retainer Latch (Front Panel)	420–0023	2
——	Clip, Fuse (for spare line fuse)	415–1001	2
——	Clip, Fuse (for adjustment tool)	415–1010	2
——	Adjustment Tool, extended and recessed flat blade	407–0186	1
——	Chassis Slide Rails, Pair	469–0413–002	1

Table 6–3. FREQUENCY SYNTHESIZER CIRCUIT BOARD ASSEMBLY – 917–0070
(Sheet 1 of 3)

REF. DES.	DESCRIPTION	PART NO.	QTY.
C1	Capacitor, Electrolytic, 100 uF, 25V	023–1085	1
C2,C3	Capacitor, Electrolytic, 22 uF, 50V	024–2274	2
C4 THRU C12	Capacitor, Monolythic, 0.1 uF, 50V	003–1054	9
C13	Capacitor, Electrolytic, 100 uF, 25V	023–1085	1
C14	Capacitor, Monolythic, 0.1 uF, 50V	003–1054	1
C15,C16	Capacitor, Electrolytic, 10 uF, 35V	023–1076	2
C17,C18	Capacitor, Mica, 680 pF, 300V	040–6824	2
C19,C20	Capacitor, Mylar, 0.1 uF, 100V	030–1053	2
C21	Capacitor, Mylar Film, 0.047 uF, 100V	030–4743	1

Table 6–3. FREQUENCY SYNTHESIZER CIRCUIT BOARD ASSEMBLY –917–0070 (Sheet 2 of 3)

REF. DES.	DESCRIPTION	PART NO.	QTY.
C22	Capacitor, Mylar Film, 0.022 uF, 100V	031–2243	1
C23,C24	Capacitor, Electrolytic, 10 uF, 35V	023–1076	2
C25	Capacitor, Monolythic, 0.1 uF, 50V	003–1054	1
C26	Capacitor, Mica, 560 pF ±5%, 500V	040–5623	1
C27	Capacitor, Mica, 680 pF ±5%, 300V	040–6824	1
C28 THRU C31	Capacitor, Monolythic, 0.1 uF, ±20%, 50V	003–1054	1
D1,D2	Diode, 1N4148, Silicon, 75V @ 0.3 Amperes	203–4148	2
DS1	Light Emitting Diode, HP–1200, Red, 1.6V @ 20 mA Maximum, T1 size	323–7344	1
J9	Receptacle, Header, 2–Pin In–line	417–4004	1
J44	Receptacle, Header, 8–Pin In–line	417–0080–001	1
L1	RF Choke, 1.5 uH ±10%, 580 mA Maximum, DC Resistance = 0.30 Ohms	360–0032	1
P9	Jumper, Programmable, 2–Pin	340–0004	1
Q1	Transistor, 2N3906, PNP, Silicon, TO–92 Case	210–3906	1
Q2	Transistor, MPS–A14, Silicon, NPN, Darlington, TO–92 Case	211–0014	1
Q3	Transistor, 2N3904, NPN, Silicon, TO–92 Case	211–3904	1
Q4	Transistor, FET, J310, RF, N–Channel, TO–92 Case	212–0310	1
R1	Resistor, 10 k Ohm ±5%, 1/4W	100–1053	1
R2	Resistor, 2.7 k Ohm ±5%, 1/4W	100–2743	1
R3	Resistor, 100 Ohm ±5%, 1/4W	100–1033	1
R4	Resistor, 1 k Ohm ±5%, 1/4W	100–1043	1
R5	Resistor, 27 k Ohm ±5%, 1/4W	100–2753	1
R6	Resistor, 1 k Ohm ±5%, 1/4W	100–1043	1
R7,R8	Resistor, 14.3 k Ohm ±1%, 1/4W	103–1435	2
R9,R10	Resistor, 40.2 k Ohm ±1%, 1/4W	103–4025	2
R11	Potentiometer, 10 k Ohm ±10%, 1/2W	177–1055	1
R12,R13	Resistor, 2 k Ohm ±5%, 1/4W	100–2043	2
R14	Resistor, 10 k ±5%, 1/4W	100–1053	1
R15,R16	Resistor, 10 Ohm ±5%, 1/4W	100–1023	2
R17	Resistor, 820 Ohm ±5%, 1/4W	100–8233	1
R18	Resistor, 10 k Ohm ±5%, 1/4W	100–1053	1
R19	Resistor, 2.7 k Ohm ±5%, 1/4W	100–2743	1
R20	Resistor, 4.7 k Ohm ±5%, 1/4W	100–4743	1
R21	Resistor, 27 k Ohm ±5%, 1/4W	100–2753	1
R22	Resistor, 10 k Ohm ±5%, 1/4W	100–1053	1
R23	Resistor, 1.5 k Ohm ±5%, 1/4W	100–1543	1
R24	Resistor, 20 k Ohm ±5%, 1/4W	100–2053	1
R25	Resistor, 39 Ohm ±5%, 1/4W	100–3923	1
R26	Resistor, 100 Ohm ±5%, 1/4W	100–1033	1
R27	Resistor, 470 Ohm ±5%, 1/4W	100–4733	1
R28	Resistor, 470 k Ohm ±5%, 1/4W	100–4763	1
R29	Resistor, 1 k Ohm ±5%, 1/4W	100–1043	1
R30	Resistor, 2 k Ohm ±5%, 1/4W	100–2223	1
S1 THRU S3	Header, Programmable, 8–Pin DIP	340–0006	3
U1	Integrated Circuit, SN74LS132N, Quad 2–Input NAND Schmitt Trigger, 14–Pin DIP	228–2132	1
U2 THRU U4	Integrated Circuit, SN74LS90N, Negative edge–triggered, Divide–by–10 Counter, 14–Pin DIP	228–0290	3

Table 6–3. FREQUENCY SYNTHESIZER CIRCUIT BOARD ASSEMBLY –917–0070
(Sheet 3 of 3)

REF. DES.	DESCRIPTION	PART NO.	QTY.
U5	Integrated Circuit, MC145152P, 4–Bit Data–Bus–Input PLL Frequency Synthesizer, Dual Modulus, 14–Pin DIP	220–5152	1
U6	Integrated Circuit, OP–227GY, Dual Operational Amplifier, 14–Pin DIP	220–0227	1
U7	Integrated Circuit, LM358N, Dual Operational Amplifier, 8–Pin DIP	221–0358	1
U8	Integrated Circuit, CD4066BE, CMOS, Quad Bilateral Switch, 14–Pin DIP	225–0004	1
XS1 THRU XS3	Socket, 8–Pin DIP	417–0804	3
XU1 THRU XU4	Socket, 14–Pin DIP	417–1404	4
XU5	Socket, 28–Pin DIP	417–2804	1
XU6	Socket, 14–Pin DIP	417–1404	1
XU7	Socket, 8–Pin DIP	417–0804	1
XU8	Socket, 14–Pin DIP	417–1404	1
——	Receptacle, Single Pin	417–0071–001	8
——	VCO Module Circuit Board Assembly	917–0061	1
——	Blank Circuit Board	517–0070	1

TABLE 6–4. 60 MHz VCO CIRCUIT BOARD ASSEMBLY –917–0061
(Sheet 1 of 2)

REF. DES.	DESCRIPTION	PART NO.	QTY.
C1,C2	Capacitor, Mica, 270 pF ±5%, 300V	041–2722	2
C3,C4	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003–1054	2
C5	Capacitor, Mica, 68 pF ±5%, 500V	040–6813	1
C6	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003–1054	1
C7	Capacitor, Mica, 68 pF ±5%, 500V	040–6813	1
C8 THRU C15	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003–1054	8
D1,D2	Diode, MV209, Voltage Variable Capacitance, 26 pF to 32 pF range, 30V dc Maximum Reverse Voltage	205–0109	2
D3 THRU D6	Diode, HP5082–2800, High Voltage, Schottky Barrier Type, 70V, 15 mA	201–2800	4
L1	RF Choke, 0.33 uH, B.E. Manufactured	NPN	1
L2,L3	RF Choke, 3.3 uH ±10%, 0.85 Ohms dc Resistance, 380 mA Maximum	360–3300	2
P1 THRU P8	Plug, Male, Single Pin	417–0119	8
Q1,Q2	Field Effect Transistor, J3100, RF, N–Channel, TO–92 Case	212–0310	2
Q3	Transistor, 2N5109, RF, NPN, TO–92 Case	211–5109	1
R1	Resistor, 1 k Ohm ±5%, 1/4W	100–1043	1
R2	Resistor, 100 k Ohm ±5%, 1/4W	100–1063	1
R3	Resistor, 1 k Ohm ±5%, 1/4W	100–1043	1
R4	Resistor, 240 Ohm ±5%, 1/4W	100–2433	1
R5	Resistor, 100 k Ohm ±5%, 1/4W	100–1063	1
R6	Resistor, 100 Ohm ±5%, 1/4W	100–1033	1
R7	Resistor, 470 Ohm ±5%, 1/4W	100–4733	1
R8	Resistor, 12 k Ohm ±5%, 1/4W	100–1253	1
R9	Resistor, 7.5 k Ohm ±5%, 1/4W	100–7543	1
R10	Resistor, 56 Ohm ±5%, 1/4W	100–5623	1

TABLE 6–4. 60 MHz VCO CIRCUIT BOARD ASSEMBLY –917–0061
(Sheet 2 of 2)

REF. DES.	DESCRIPTION	PART NO.	QTY.
R11	Resistor, 200 Ohm ±5%, 1/4W	100–2033	1
R12	Resistor, 100 Ohm ±5%, 1/4W	100–1033	1
R13	Resistor, 39 k Ohm ±5%, 1/4W	100–3953	1
R14	Resistor, 560 Ohm ±5%, 1/4W	100–5633	1
R15,R16	Resistor, 10 Ohm ±5%, 1/4W	100–1023	2
U1	Integrated Circuit, 11C90, ECL Divide–by–Ten Counter, 16–Pin DIP	228–1190	1
U2	Integrated Circuit, SP8660C, ECL Divide–by–Ten Counter, 8–Pin DIP	220–8660	1
——	Blank Circuit Board	517–0061	1

TABLE 6–5. LED CIRCUIT BOARD ASSEMBLY – 917–0045

REF. DES.	DESCRIPTION	PART NO.	QTY.
DS1 THRU DS3	**MONO L**, **MONO R**, and **MONO L+R** Indicators, LED, Red, 521–9212, 1.7V @ 50 mA Maximum	323–9217	3
DS4	**STEREO** Indicator, LED, Green, 521–9175, 2.3V @ 40 mA Maximum	323–9224	1
DS5	**DAY** and **NIGHT** Indicators, LED, Yellow, 521–9176, 2.3V @ 40 mA Maximum	323–9225	1
——	Blank Circuit Board	517–0045	1

TABLE 6–6. DAY/NIGHT EQUALIZATION CIRCUIT BOARD ASSEMBLY – 917–0052
(Sheet 1 of 9)

REF. DES.	DESCRIPTION	PART NO.	QTY.
C1,C2	Capacitor, Ceramic, 0.001 uF ±10%, 200V	030–1033	2
C3	Capacitor, Mica, 5000 pF ±5%, 500V	040–5033	1
C4,C5	Capacitor, Ceramic, 0.001 uF ±10%, 200V	030–1033	2
C6	Capacitor, Mica, 5000 pF ±5%, 500V	040–5033	1
C7,C8	Capacitor, Mylar, 0.01 uF ±10%, 100V	031–1043	2
C9 THRU C12	Capacitor, Mica, 1000 pF ±1%, 100V	041–1031	4
C13 THRU C20	Capacitor, Electrolytic, 10 uF, 35V	023–1076	8
C21	Capacitor, Mylar, 0.01 uF ±10%, 100V	031–1043	1
C22	Capacitor, Mica, 5000 pF ±5%, 500V	040–5033	1
C23	Capacitor, Mylar, 0.22 uF ±10%, 100V	030–2253	1
C24	Capacitor, Mylar, 0.01 uF ±10%, 100V	031–1043	1
C25	Capacitor, Mica, 5000 pF ±5%, 500V	040–5033	1
C26	Capacitor, Mylar, 0.22 uF ±10%, 100V	030–2253	1
C27	Capacitor, Mica, 1000 pF ±1%, 100V	041–1031	1
C28,C29	Capacitor, Electrolytic, 10 uF, 35V	023–1076	2
C30	Capacitor, Mylar, 0.01 uF, 100V	031–1043	1
C31	Capacitor, Mica, 1000 pF ±1%, 100V	041–1031	1
C32,C33	Capacitor, Electrolytic, 10 uF, 35V	023–1076	2

TABLE 6–6. DAY/NIGHT EQUALIZATION CIRCUIT BOARD ASSEMBLY – 917–0052
(Sheet 2 of 9)

REF. DES.	DESCRIPTION	PART NO.	QTY.
C34	Capacitor, Mica, 1000 pF ±1%, 100V	041–1031	1
C35,C36	Capacitor, Electrolytic, 10 uF, 35V	023–1076	2
C37	Capacitor, Mylar, 0.01 uF ±10%, 100V	031–1043	1
C38	Capacitor, Mica, 1000 pF ±1%, 100V	041–1031	1
C39 THRU C42	Capacitor, Electrolytic, 10 uF, 35V	023–1076	4
C43 THRU C46	Capacitor, Mica, 1000 pF ±1%, 100V	041–1031	4
C47	Capacitor, Electrolytic, 10 uF, 35V	023–1076	1
C48	Capacitor, Mylar, 0.01 uF ±10%, 100V	031–1043	1
C49	Capacitor, Electrolytic, 10 uF, 35V	023–1076	1
C50	Capacitor, Mylar, 0.01 uF ±10%, 100V	031–1043	1
C51,C52	Capacitor, Mica, 270 pF ±5%, 300V	041–2722	2
C53 THRU C62	Capacitor, Electrolytic, 10 uF, 35V	023–1076	10
C63,C64	Capacitor, Mica, 1000 pF ±1%, 100V	041–1031	2
C65,C66	Capacitor, Electrolytic, 10 uF, 35V	023–1076	2
C67,C68	Capacitor, Ceramic, 0.001 uF ±10%, 200V	030–1033	2
C69	Capacitor, Mica, 5000 pF ±5%, 500V	040–5033	1
C70,C71	Capacitor, Ceramic, 0.001 uF ±10%, 200V	030–1033	1
C72	Capacitor, Mica, 5000 pF ±5%, 500V	040–5033	1
C73,C74	Capacitor, Mylar, 0.01 uF ±10%, 100V	031–1043	2
C75 THRU C78	Capacitor, Mica, 1000 pF ±1%, 100V	041–1031	4
C79 THRU C86	Capacitor, Electrolytic, 10 uF, 35V	023–1076	8
C87	Capacitor, Mylar, 0.01 uF ±10%, 100V	031–1043	1
C88	Capacitor, Mica, 5000 pF ±5%, 500V	040–5033	1
C89	Capacitor, Mylar, 0.22 uF ±10%, 100V	030–2253	1
C90	Capacitor, Mylar, 0.01 uF ±10%, 100V	031–1043	1
C91	Capacitor, Mica, 5000 pF ±5%, 500V	040–5033	1
C92	Capacitor, Mylar, 0.22 uF ±10%, 100V	030–2253	1
C93	Capacitor, Mica, 1000 pF ±1%, 100V	041–1031	1
C94,C95	Capacitor, Electrolytic, 10 uF, 35V	023–1076	2
C96	Capacitor, Mylar, 0.01 uF ±10%, 100V	031–1043	1
C97	Capacitor, Mica, 1000 pF ±1%, 100V	041–1031	1
C98,C99	Capacitor, Electrolytic, 10 uF, 35V	023–1076	2
C100	Capacitor, Mica, 1000 pF ±1%, 100V	041–1031	1
C101,C102	Capacitor, Electrolytic, 10 uF, 35V	023–1076	2
C103	Capacitor, Mylar, 0.01 uF ±10%, 100V	031–1043	1
C104	Capacitor, Mica, 1000 pF ±1%, 100V	041–1031	1
C105 THRU C108	Capacitor, Electrolytic, 10 uF, 35V	023–1076	4
C109 THRU C112	Capacitor, Mica, 1000 pF ±1%, 100V	041–1031	4
C113	Capacitor, Electrolytic, 10 uF, 35V	023–1076	1
C114	Capacitor, Mylar, 0.01 uF ±10%, 100V	031–1043	1
C115	Capacitor, Electrolytic, 10 uF, 35V	023–1076	1
C116	Capacitor, Mylar, 0.01 uF ±10%, 100V	031–1043	1
C117,C118	Capacitor, Mica, 270 pF ±5%, 300V	041–2722	2

TABLE 6–6. DAY/NIGHT EQUALIZATION CIRCUIT BOARD ASSEMBLY – 917–0052
(Sheet 3 of 9)

REF. DES.	DESCRIPTION	PART NO.	QTY.
C119 THRU C128	Capacitor, Electrolytic, 10 uF, 35V	023–1076	10
C129,C130	Capacitor, Mica, 1000 pF ±1%, 100V	041–1031	2
C131	Capacitor, Electrolytic, 100 uF, 25V	023–1084	1
C132	Capacitor, Electrolytic, 47 uF, 16V	013–4750	1
C133	Capacitor, Electrolytic, 100 uF, 25V	023–1084	1
C134,C135	Capacitor, Mylar, 0.01 uF ±10%, 100V	031–1043	2
C136,C137	Capacitor, Electrolytic, 10 uF, 35V	023–1076	2
C138,C139	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003–1054	2
C140,C141	Capacitor, Mylar, 0.01 uF ±10%, 100V	031–1043	2
C142,C143	Capacitor, Electrolytic, 100 uF, 25V	023–1084	2
C144,C145	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003–1054	2
C146,C147	Capacitor, Mylar, 0.01 uF ±10%, 100V	031–1043	2
C148 THRU C151	Capacitor, Electrolytic, 10 uF, 35V	023–1076	4
C152,C153	Capacitor, Mylar, 0.022 uF, 200V	031–2243	2
C154 THRU C157	Capacitor, Mica, 100 pF ±5%, 500V	040–1022	4
D1 THRU D8	Diode, 1N4005, Silicon, 600V @ 1 Ampere	203–4005	8
D9 THRU D11, D13 THRU D16	Diode, 1N4148, Silicon, 75V @ 0.3 Amperes	203–4148	7
D17	Diode, 1N4750A, Zener, 27V ±10%, 1 Watt	200–0027	1
J1	Receptacle, Male, Right Angle, 20–Pin In–Line	417–0214	1
J2,J3,J17	Receptacle, Male, 3–Pin In–Line	417–0003	3
K1	Relay, Circuit Board Mount Coil: 12V DC, 330 Ohms ±10% Contact: 4PDT, 2A @ 30V dc or 0.5A @ 125V ac	270–0047	1
L1	RF Choke, 10 mH ±10%, 6.3 Ohms DC Resistance, 220 mA Maximum	364–0670	1
LDR1 THRU LDR8	Optical Isolator, VTL5C2, LDR/LED Type On Resistance: 500 Ohms Off Resistance: 1 Meg Ohm Cell Voltage: 200V Maximum Cell Current: 10 to 40 mA	323–7345	8
P2,P3,P17	Jumper, Programmable	340–0004	3
Q1 THRU Q5	Transistor, 2N3906, PNP, Silicon, TO–92 Case	210–3906	5
R1	Resistor, 768 Ohm ±1%, 1/4W	103–7683	1
R2	Resistor, 4.53 k Ohm ±1%, 1/4W	103–4534	1
R3	Resistor, 1 k Ohm ±1%, 1/4W	103–1041	1
R4	Resistor, 768 Ohm ±1%, 1/4W	103–7683	1
R5	Resistor, 4.53 k Ohm ±1%, 1/4W	103–4534	1
R6	Resistor, 1 k Ohm ±1%, 1/4W	103–1041	1
R7	Resistor, 21 k Ohm ±1%, 1/4W	103–2105	1
R8	Resistor, 768 Ohm ±1%, 1/4W	103–7683	1
R9	Resistor, 1 k Ohm ±1%, 1/4W	103–1041	1
R10	Resistor, 768 Ohm ±1%, 1/4W	103–7683	1
R11	Resistor, 21 k Ohm ±1%, 1/4W	103–2105	1
R12	Resistor, 1 k Ohm ±1%, 1/4W	103–1041	1
R13	Resistor, 8.66 k Ohm ±1%, 1/4W	100–8641	1
R14	Resistor, 1 k Ohm ±1%, 1/4W	103–1041	1
R15	Resistor, 8.66 k Ohm ±1%, 1/4W	100–8641	1
R16	Resistor, 1 k Ohm ±1%, 1/4W	103–1041	1

TABLE 6–6. DAY/NIGHT EQUALIZATION CIRCUIT BOARD ASSEMBLY – 917–0052
(Sheet 4 of 9)

REF. DES.	DESCRIPTION	PART NO.	QTY.
R17	Resistor, 20 k Ohm ±5%, 1/4W	100–2053	1
R18	Potentiometer, 50 k Ohm ±10%, 3/4W	179–5050	1
R19	Resistor, 20 k Ohm ±5%, 1/4W	100–2053	1
R20	Potentiometer, 50 k Ohm ±10%, 3/4W	179–5050	1
R21	Resistor, 1 k Ohm ±5%, 1/4W	100–1043	1
R22	Resistor, 23.7 k Ohm ±1%, 1/4W	103–2375	1
R23	Resistor, 4.75 k Ohm ±1%, 1/4W	103–4741	1
R24	Resistor, 10 k Ohm ±1%, 1/4W	100–1051	1
R25,R26	Resistor, 10 Ohm ±5%, 1/4W	100–1023	2
R27	Resistor, 1 k Ohm ±5%, 1/4W	100–1043	1
R28	Resistor, 23.7 k Ohm ±1%, 1/4W	103–2375	1
R29	Resistor, 4.75 k Ohm ±1%, 1/4W	103–4741	1
R30	Resistor, 10 k Ohm ±1%, 1/4W	100–1051	1
R31	Resistor, 768 Ohm ±1%, 1/4W	103–7683	1
R32,R33	Resistor, 10 Ohm ±5%, 1/4W	100–1023	2
R34	Resistor, 768 Ohm ±1%, 1/4W	103–7683	1
R35 THRU R38	Resistor, 10 Ohm ±5%, 1/4W	100–1023	4
R39	Resistor, 499 Ohm ±1%, 1/4W	103–4993	1
R40	Resistor, 10 k Ohm ±1%, 1/4W	100–1051	1
R41	Potentiometer, 500 k Ohm ±10%, 1 1/4W	178–5065	1
R42	Resistor, 499 Ohm ±1%, 1/4W	103–4993	1
R43	Resistor, 10 k Ohm ±1%, 1/4W	100–1051	1
R44	Potentiometer, 500 k Ohm ±10%, 1 1/4W	178–5065	1
R45	Resistor, 20 k Ohm ±5%, 1/4W	100–2053	1
R46,R47	Resistor, 10 k Ohm ±1%, 1/4W	100–1051	2
R48	Resistor, 698 Ohm ±1%, 1/4W	103–6983	1
R49	Resistor, 499 Ohm ±1%, 1/4W	103–4993	1
R50	Resistor, 10 k Ohm ±1%, 1/4W	100–1051	1
R51	Resistor, 6.8 k Ohm ±5%, 1/4W	100–6843	1
R52	Resistor, 20 k Ohm ±5%, 1/4W	100–2053	1
R53,R54	Resistor, 10 k Ohm ±1%, 1/4W	100–1051	2
R55	Resistor, 698 Ohm ±1%, 1/4W	103–6983	1
R56	Resistor, 499 Ohm ±1%, 1/4W	103–4993	1
R57	Resistor, 10 k Ohm ±1%, 1/4W	100–1051	1
R58	Resistor, 6.8 k Ohm ±5%, 1/4W	100–6843	1
R59	Resistor, 1 k Ohm ±5%, 1/4W	100–1043	1
R60,R61	Resistor, 10 Ohm ±5%, 1/4W	100–1023	2
R62	Resistor, 499 Ohm ±1%, 1/4W	103–4993	1
R63,R64	Resistor, 10 Ohm ±5%, 1/4W	100–1023	2
R65	Resistor, 1 k Ohm ±5%, 1/4W	100–1043	1
R66,R67	Resistor, 10 Ohm ±5%, 1/4W	100–1023	2
R68	Resistor, 499 Ohm ±1%, 1/4W	103–4993	1
R69 THRU R72	Resistor, 10 Ohm ±5%, 1/4W	100–1023	4
R73,R74	Resistor, 2.26 k Ohm ±1%, 1/4W	103–2264	2
R75	Resistor, 510 k Ohm ±5%, 1/4W	100–5163	1

TABLE 6–6. DAY/NIGHT EQUALIZATION CIRCUIT BOARD ASSEMBLY – 917–0052
(Sheet 5 of 9)

REF. DES.	DESCRIPTION	PART NO.	QTY.
R76	Potentiometer, 10 k Ohm ±10%, 1 1/4W	179–1053	1
R77	Resistor, 510 k Ohm ±5%, 1/4W	100–5163	1
R78	Potentiometer, 10 k Ohm ±10%, 1 1/4W	179–1053	1
R79	Resistor, 4.32 k Ohm ±1%, 1/4W	103–4324	1
R80	Resistor, 100 Ohm ±5%, 1/4W	100–1033	1
R81	Resistor, 4.32 k Ohm ±1%, 1/4W	103–4324	1
R82	Resistor, 100 Ohm ±5%, 1/4W	100–1033	1
R83	Resistor, 56 Ohm ±5%, 1/2W	110–5623	1
R84	Resistor, 4.75 k Ohm ±1%, 1/4W	103–4741	1
R85,R86	Resistor, 10 k Ohm ±1%, 1/4W	100–1051	2
R87	Resistor, 56 Ohm ±5%, 1/2W	110–5623	1
R88	Resistor, 4.75 k Ohm ±1%, 1/4W	103–4741	1
R89,R90	Resistor, 10 k Ohm ±1%, 1/4W	100–1051	2
R91	Resistor, 470 Ohm ±5%, 1/4W	100–4733	1
R92,R93	Resistor, 10 Ohm ±5%, 1/4W	100–1023	2
R94	Resistor, 10 k Ohm ±1%, 1/4W	100–1051	1
R95	Resistor, 470 Ohm ±5%, 1/4W	100–4733	1
R96,R97	Resistor, 10 Ohm ±5%, 1/4W	100–1023	2
R98	Resistor, 10 k Ohm ±1%, 1/4W	100–1051	1
R99	Resistor, 150 Ohm ±5%, 1/4W	100–1533	1
R100	Potentiometer, 500 Ohm ±10%, 1 1/4W	178–5001	1
R101	Resistor, 10 k Ohm ±1%, 1/4W	100–1051	1
R102,R103	Resistor, 10 Ohm ±5%, 1/4W	100–1023	2
R104	Resistor, 150 Ohm ±5%, 1/4W	100–1533	1
R105	Potentiometer, 500 Ohm ±10%, 1 1/4W	178–5001	1
R106	Resistor, 10 k Ohm ±1%, 1/4W	100–1051	1
R107,R108	Resistor, 10 Ohm ±5%, 1/4W	100–1023	2
R109 THRU R112	Resistor, 10 k Ohm ±1%, 1/4W	100–1051	4
R113	Resistor, 768 Ohm ±1%, 1/4W	103–7683	1
R114	Resistor, 4.53 k Ohm ±1%, 1/4W	103–4534	1
R115	Resistor, 1 k Ohm ±1%, 1/4W	103–1041	1
R116	Resistor, 768 Ohm ±1%, 1/4W	103–7683	1
R117	Resistor, 4.53 k Ohm ±1%, 1/4W	103–4534	1
R118	Resistor, 1 k Ohm ±1%, 1/4W	103–1041	1
R119	Resistor, 21 k Ohm ±1%, 1/4W	103–2105	1
R120	Resistor, 768 Ohm ±1%, 1/4W	103–7683	1
R121	Resistor, 1 k Ohm ±1%, 1/4W	103–1041	1
R122	Resistor, 768 Ohm ±1%, 1/4W	103–7683	1
R123	Resistor, 21 k Ohm ±1%, 1/4W	103–2105	1
R124	Resistor, 1 k Ohm ±1%, 1/4W	103–1041	1
R125	Resistor, 8.66 k Ohm ±1%, 1/4W	100–8641	1
R126	Resistor, 1 k Ohm ±1%, 1/4W	103–1041	1
R127	Resistor, 8.66 k Ohm ±1%, 1/4W	100–8641	1
R128	Resistor, 1 k Ohm ±1%, 1/4W	103–1041	1
R129	Resistor, 20 k Ohm ±5%, 1/4W	100–2053	1
R130	Potentiometer, 50 k Ohm ±10%, 3/4W	179–5050	1

TABLE 6–6. DAY/NIGHT EQUALIZATION CIRCUIT BOARD ASSEMBLY – 917–0052
(Sheet 6 of 9)

REF. DES.	DESCRIPTION	PART NO.	QTY.
R131	Resistor, 20 k Ohm ±5%, 1/4W	100–2053	1
R132	Potentiometer, 50 k Ohm ±10%, 3/4W	179–5050	1
R133	Resistor, 1 k Ohm ±5%, 1/4W	100–1043	1
R134	Resistor, 23.7 k Ohm ±1%, 1/4W	103–2375	1
R135	Resistor, 4.75 k Ohm ±1%, 1/4W	103–4741	1
R136	Resistor, 10 k Ohm ±1%, 1/4W	100–1051	1
R137,R138	Resistor, 10 Ohm ±5%, 1/4W	100–1023	2
R139	Resistor, 1 k Ohm ±5%, 1/4W	100–1043	1
R140	Resistor, 23.7 k Ohm ±1%, 1/4W	103–2375	1
R141	Resistor, 4.75 k Ohm ±1%, 1/4W	103–4741	1
R142	Resistor, 10 k Ohm ±1%, 1/4W	100–1051	1
R143	Resistor, 768 Ohm ±1%, 1/4W	103–7683	1
R144,R145	Resistor, 10 Ohm ±5%, 1/4W	100–1023	2
R146	Resistor, 768 Ohm ±1%, 1/4W	103–7683	1
R147 THRU R150	Resistor, 10 Ohm ±5%, 1/4W	100–1023	4
R151	Resistor, 499 Ohm ±1%, 1/4W	103–4993	1
R152	Resistor, 10 k Ohm ±1%, 1/4W	100–1051	1
R153	Potentiometer, 500 k Ohm ±10%, 1 1/4W	178–5065	1
R154	Resistor, 499 Ohm ±1%, 1/4W	103–4993	1
R155	Resistor, 10 k Ohm ±1%, 1/4W	100–1051	1
R156	Potentiometer, 500 k Ohm ±10%, 1 1/4W	178–5065	1
R157	Resistor, 20 k Ohm ±5%, 1/4W	100–2053	1
R158,R159	Resistor, 10 k Ohm ±1%, 1/4W	100–1051	2
R160	Resistor, 698 Ohm ±1%, 1/4W	103–6983	1
R161	Resistor, 499 Ohm ±1%, 1/4W	103–4993	1
R162	Resistor, 10 k Ohm ±1%, 1/4W	100–1051	1
R163	Resistor, 6.8 k Ohm ±5%, 1/4W	100–6843	1
R164	Resistor, 20 k Ohm ±5%, 1/4W	100–2053	1
R165,R166	Resistor, 10 k Ohm ±1%, 1/4W	100–1051	2
R167	Resistor, 698 Ohm ±1%, 1/4W	103–6983	1
R168	Resistor, 499 Ohm ±1%, 1/4W	103–4993	1
R169	Resistor, 10 k Ohm ±1%, 1/4W	100–1051	1
R170	Resistor, 6.8 k Ohm ±5%, 1/4W	100–6843	1
R171	Resistor, 1 k Ohm ±5%, 1/4W	100–1043	1
R172,R173	Resistor, 10 Ohm ±5%, 1/4W	100–1023	2
R174	Resistor, 499 Ohm ±1%, 1/4W	103–4993	1
R175,R176	Resistor, 10 Ohm ±5%, 1/4W	100–1023	2
R177	Resistor, 1 k Ohm ±5%, 1/4W	100–1043	1
R178,R179	Resistor, 10 Ohm ±5%, 1/4W	100–1023	2
R180	Resistor, 499 Ohm ±1%, 1/4W	103–4993	1
R181 THRU R184	Resistor, 10 Ohm ±5%, 1/4W	100–1023	4
R185,R186	Resistor, 2.26 k Ohm ±1%, 1/4W	103–2264	2
R187	Resistor, 510 k Ohm ±5%, 1/4W	100–5163	1
R188	Potentiometer, 10 k Ohm ±10%, 1 1/4W	179–1053	1
R189	Resistor, 510 k Ohm ±5%, 1/4W	100–5163	1

TABLE 6–6. DAY/NIGHT EQUALIZATION CIRCUIT BOARD ASSEMBLY – 917–0052
(Sheet 7 of 9)

REF. DES.	DESCRIPTION	PART NO.	QTY.
R190	Potentiometer, 10 k Ohm ±10%, 1 1/4W	179–1053	1
R191	Resistor, 4.32 k Ohm ±1%, 1/4W	103–4324	1
R192	Resistor, 100 Ohm ±5%, 1/4W	100–1033	1
R193	Resistor, 4.32 k Ohm ±1%, 1/4W	103–4324	1
R194	Resistor, 100 Ohm ±5%, 1/4W	100–1033	1
R195	Resistor, 56 Ohm ±5%, 1/2W	110–5623	1
R196	Resistor, 4.75 k Ohm ±1%, 1/4W	103–4741	1
R197,R198	Resistor, 10 k Ohm ±1%, 1/4W	100–1051	2
R199	Resistor, 56 Ohm ±5%, 1/2W	110–5623	1
R200	Resistor, 4.75 k Ohm ±1%, 1/4W	103–4741	1
R201,R202	Resistor, 10 k Ohm ±1%, 1/4W	100–1051	2
R203	Resistor, 470 Ohm ±5%, 1/4W	100–4733	1
R204,R205	Resistor, 10 Ohm ±5%, 1/4W	100–1023	2
R206	Resistor, 10 k Ohm ±1%, 1/4W	100–1051	1
R207	Resistor, 470 Ohm ±5%, 1/4W	100–4733	1
R208,R209	Resistor, 10 Ohm ±5%, 1/4W	100–1023	2
R210	Resistor, 10 k Ohm ±1%, 1/4W	100–1051	1
R211	Resistor, 150 Ohm ±5%, 1/4W	100–1533	1
R212	Potentiometer, 500 Ohm ±10%, 1 1/4W	178–5001	1
R213	Resistor, 10 k Ohm ±1%, 1/4W	100–1051	1
R214,R215	Resistor, 10 Ohm ±5%, 1/4W	100–1023	2
R216	Resistor, 150 Ohm ±5%, 1/4W	100–1533	1
R217	Potentiometer, 500 Ohm ±10%, 1 1/4W	178–5001	1
R218	Resistor, 10 k Ohm ±1%, 1/4W	100–1051	1
R219,R220	Resistor, 10 Ohm ±5%, 1/4W	100–1023	2
R221 THRU R224	Resistor, 10 k Ohm ±1%, 1/4W	100–1051	4
R225 THRU R228	Resistor, 3.48 k Ohm ±1%, 1/4W	103–3484	4
R229,R230	Resistor, 47 k Ohm ±5%, 1/4W	100–4753	2
R231	Resistor, 1 k Ohm ±5%, 1/4W	100–1043	1
R232,R233	Resistor, 100 k Ohm ±5%, 1/4W	100–1063	2
R234 THRU R238	Resistor, 10 k Ohm ±5%, 1/4W	100–1053	5
R239,R240	Resistor, 470 Ohm ±5%, 1/4W	100–4733	2
R241 THRU R244	Resistor, 10 k Ohm ±1%, 1/4W	100–1051	4
R245 THRU R249	Resistor, 470 k Ohm ±5%, 1/4W	100–4763	5
R250,R251	Resistor, 10 Ohm ±5%, 1/4W	100–1023	2
R252 THRU R257	Resistor, 470 k Ohm ±5%, 1/4W	100–4763	6
R258,R259	Resistor, 10 Ohm ±5%, 1/4W	100–1023	2
R260	Resistor, 470 k Ohm ±5%, 1/4W	100–4763	1
R262	Resistor, 10 k Ohm ±5%, 1/4W	100–1053	1
R263,R264	Resistor, 1 Meg Ohm ±5%, 1/4W	100–1073	2
R265	Resistor, 10 k Ohm ±5%, 1/4W	100–1053	1
R266,R267	Resistor, 220 Ohm ±5%, 1/2W	110–2233	2

TABLE 6–6. DAY/NIGHT EQUALIZATION CIRCUIT BOARD ASSEMBLY – 917–0052
(Sheet 8 of 9)

REF. DES.	DESCRIPTION	PART NO.	QTY.
R268	Resistor, 10 k Ohm ±5%, 1/4W	100–1053	1
R269	Resistor, 910 Ohm ±5%, 1/4W	100–9133	1
R270 THRU R277	Resistor, 10 k Ohm ±1%, 1/4W	100–1051	8
R278 THRU R281	Resistor, 10 Ohm ±5%, 1/4W	100–1023	4
R282	Resistor, 10 k Ohm ±5%, 1/4W	100–1053	1
R283	Resistor, 2 k Ohm ±5%, 1/4W	100–2043	1
S1,S2	Slide Switch Matrix, Miniature, 10 Ten–pole, Single–throw Switches, 0.5A @ 28V dc Maximum	340–0053	2
S3 THRU S6	Mechanically Pre–programmed Rotary Hexidecimal Switch with Complement, 1A @ 120 VRMS Maximum	340–0052	4
U1,U2	Integrated Circuit, TL072CP, Dual JFET–Input Operational Amplifier, 8–Pin DIP	221–0072	2
U3	Integrated Circuit, LM317LZ, Adjustable Positive Voltage Regulator, 1.2 to 37V @ 0.1 Ampere, TO–92 Case	220–0317	1
U4 THRU U9	Integrated Circuit, TLO72CP, Dual JFET–Input Operational Amplifier, 8–Pin DIP	221–0072	6
U10	Integrated Circuit, LM317LZ, Adjustable Positive Voltage Regulator, 1.2 to 37V @ 0.1 Ampere, TO–92 Case	220–0317	1
U11 THRU U17	Integrated Circuit, TLO72CP, Dual JFET–Input Operational Amplifier, 8–Pin DIP	221–0072	7
U18	Integrated Circuit, LM317LZ, Adjustable Positive Voltage Regulator, 1.2 to 37V @ 0.1 Ampere, TO–92 Case	220–0317	1
U19 THRU U24	Integrated Circuit, TLO72CP, Dual JFET–Input Operational Amplifier, 8–Pin DIP	221–0072	6
U25	Integrated Circuit, LM317LZ, Adjustable Positive Voltage Regulator, 1.2 to 37V @ 0.1 Ampere, TO–92 Case	220–0317	1
U26 THRU U30	Integrated Circuit, TLO72CP, Dual JFET–Input Operational Amplifier, 8–Pin DIP	221–0072	5
U31,U32	Optical Isolator, 4N33, NPN Phototransistor/Infared Light Emitting Diode Type, 2500V Isolation, 6–Pin DIP	229–0033	2
U33	Integrated Circuit, MC14011BCP, Quad 2–Input NAND, CMOS, 14–Pin DIP	228–4011	1
U34	Integrated Circuit, MC14538B, Dual Retriggerable, Resettable Resettable Monostable Multivibrator, CMOS, 16–Pin DIP	228–4538	1
U35	Integrated Circuit, MC14013BCP, Dual Type D Flip–Flop, CMOS, 14–Pin DIP	228–4013	1
U36	Integrated Circuit, MC1416P, 7 NPN Darlington Driver Pack, 16–Pin DIP	226–2004	1
U37,U38	Optical Isolator, 4N33, NPN Phototransistor/Infared Light Emitting Diode Type, 2500V Isolation, 6–Pin DIP	229–0033	2
U39,U40	Integrated Circuit, LF353N, Dual JFET–Input Operational Amplifier, 8–Pin DIP	221–0353	2
U41	Optical Isolator, 4N33, NPN Phototransistor/Infared Light Emitting Diode Type, 2500V Isolation, 6–Pin DIP	229–0033	1
U42,U43	Integrated Circuit, TLO72CP, Dual JFET–Input Operational Amplifier, 8–Pin DIP	221–0072	2
XU1,XU2, XU4 THRU XU9, XU11 THRU XU17, XU19 THRU XU24, XU26 THRU XU30	Socket, 8–Pin DIP	417–0804	26
XU31,XU32	Socket, 6–Pin DIP	417–0600	2
XU33	Socket, 14–Pin DIP	417–1404	1

TABLE 6–6. DAY/NIGHT EQUALIZATION CIRCUIT BOARD ASSEMBLY – 917–0052
(Sheet 9 of 9)

REF. DES.	DESCRIPTION	PART NO.	QTY.
XU34	Socket, 16–Pin DIP	417–1604	1
XU35	Socket, 14–Pin DIP	417–1404	1
XU36	Socket, 16–Pin DIP	417–1604	1
XU37,XU38	Socket, 6–Pin DIP	417–0600	2
XU39,XU40	Socket, 8–Pin DIP	417–0804	2
XU41	Socket, 6–Pin DIP	417–0600	1
XU42,XU43	Socket, 8–Pin DIP	417–0804	2

TABLE 6–7. REMOTE INTERFACE CIRCUIT BOARD ASSEMBLY – 917–0073

REF. DES.	DESCRIPTION	PART NO.	QTY.
C1 THRU C15	Capacitor, Ceramic, Monolythic, 0.1 uF ±20%, 50V	003–1054	15
C16	Capacitor, Electrolytic, 10 uF, 50V	023–1076	1
C17	Capacitor, Ceramic, Monolythic, 0.1 uF ±20%, 50V	003–1054	1
D1,D2	Diode, 1N4148, Silicon, 75V @ 0.3 Amperes	203–4148	2
J42	Receptacle, Male, Dual In–Line 13–Pin	417–2600	1
J43	Receptacle, 25–Pin	417–2500	1
J61	Connector, Header, 4–Pin In–line	417–0200	1
L1 THRU L12	Ferrite Bead	360–0001	12
L13	Molded Inductor, 47 mH ±10%, Resistance = 2.41 Ohms, 0.37A @ 700V Maximum	360–0012	1
R1 THRU R6	Resistor, 470 Ohm ±5%, 1/4W	100–4733	6
R7 THRU R12	Resistor, 100 Ohm ±5%, 1/4W	100–1033	6
R13,R14	Resistor, 1 k Ohm ±5%, 1/4W	100–1043	2
R15	Resistor, 4.7 k Ohm ±5%, 1/4W	100–4743	1
U1	Integrated Circuit, 74HC804, Hex 2–Input NAND Drivers, 20–Pin DIP	220–0804	1
XU1	Socket, 20–Pin DIP	417–2004	1
——	Blank Circuit Board	517–0073	1

TABLE 6–8. AUDIO CONTROL CIRCUIT BOARD ASSEMBLY – 917–0054
(Sheet 1 of 8)

REF. DES.	DESCRIPTION	PART NO.	QTY.
C1 THRU C4	Capacitor, Electrolytic, 3.3 uF, 50V, Non–Polarized	024–3364	4
C5 THRU C7	Capacitor, Electrolytic, 10 uF, 35V	023–1076	3
C8,C9	Capacitor, Ceramic, 5 pF ±5%, 500V, NPO	001–5004	2
C10,C11	Capacitor, Electrolytic, 10 uF, 35V	023–1076	2
C12,C13	Capacitor, Ceramic, 5 pF ±5%, 500V, NPO	001–5004	2
C14,C15	Capacitor, Electrolytic, 10 uF, 35V	023–1076	2
C16,C17	Capacitor, Ceramic, 5 pF ±5%, 500V, NPO	001–5004	2
C18 THRU C24	Capacitor, Electrolytic, 10 uF, 35V	023–1076	7
C25	Capacitor, Mylar, 0.1 uF ±10%, 100V	030–1053	1
C26	Capacitor, Mylar, 0.022 uF ±10%, 100V	031–2243	1
C27	Capacitor, Electrolytic, 10 uF, 35V	023–1076	1

TABLE 6–8. AUDIO CONTROL CIRCUIT BOARD ASSEMBLY – 917–0054
(Sheet 2 of 8)

REF. DES.	DESCRIPTION	PART NO.	QTY.
C28	Capacitor, Mylar, 0.1 uF ±10%, 100V	030–1053	1
C29	Capacitor, Polyester, 0.0022 uF ±10%, 100V	031–2033	1
C30 THRU C40	Capacitor, Electrolytic, 10 uF, 35V	023–1076	11
C41 THRU C43	Capacitor, Mylar, 0.1 uF ±10%, 100V	030–1053	3
C44,C45	Capacitor, Electrolytic, 100 uF, 50V	020–1085	2
C46 THRU C59	Capacitor, Electrolytic, 10 uF, 35V	023–1076	13
C60	Capacitor, Electrolytic, 3.3 uF, 50V, Non–Polarized	024–3364	1
C62	Capacitor, Mica, 33 pF ±5%, 500V	042–3312	1
C63	Capacitor, Electrolytic, 10 uF, 35V	023–1076	1
C65,C66	Capacitor, Ceramic, 5 pF ±5%, 500V, NPO	001–5004	2
C67,C68	Capacitor, Electrolytic, 10 uF, 35V	023–1076	2
C69	Capacitor, Electrolytic, 100 uF, 25V	023–1084	1
C70	Capacitor, Mylar, 0.022 uF ±10%, 100V	031–2243	1
C71	Capacitor, Electrolytic, 10 uF, 35V	023–1076	1
C72	Capacitor, Mica, 33 pF ±5%, 500V	042–3312	1
C73	Capacitor, Electrolytic, 10 uF, 35V	023–1076	1
C74,C75	Capacitor, Electrolytic, 4.7 uF, 35V, Low–Leakage	024–4753	2
C76	Capacitor, Mylar, 0.1 uF ±10%, 100V	030–1053	1
C77	Capacitor, Electrolytic, 10 uF, 35V	023–1076	1
C78 THRU C81	Capacitor, Electrolytic, 4.7 uF, 35V, Low–Leakage	024–4753	4
C82	Capacitor, Electrolytic, 100 uF, 25V	023–1084	1
C83 THRU C86	Capacitor, Mylar, 0.1 uF ±10%, 100V	030–1053	4
C87	Capacitor, Electrolytic, 100 uF, 25V	023–1084	1
C88 THRU C91	Capacitor, Mylar, 0.022 uF ±10%, 100V	031–2243	4
C92	Capacitor, Mylar, 0.1 uF ±10% 100V	030–1053	1
C93 THRU C96	Capacitor, Mylar, 0.01 uF ±10%, 100V	031–1043	4
C97	Capacitor, Mylar, 0.1 uF ±10%, 100V	030–1053	1
C98 THRU C101	Capacitor, Mylar, 0.01 uF 10%, 100V	031–1043	4
C102,C103	Capacitor, Electrolytic, 100 uF, 25V	023–1084	2
C104	Capacitor, Electrolytic, 1 uF, 50V	024–1064	1
C105	Capacitor, Mica, 100 pF ±5%, 500V	042–1022	1
D1 THRU D21	Diode, 1N4148, Silicon, 75V @ 0.3 Amperes	203–4148	21
D22 THRU D24	Diode, HP5082–2800, High Voltage Schottky Barrier Type, 70V @ 15 mA	201–2800	3
D25 THRU D27	Diode, 1N4148, Silicon, 75V @ 0.3 Amperes	203–4148	3
D28	Diode, Zener, 1N4733A, 5.1V ±5%, 1W	200–4733	1
D29 THRU D44, D46 THRU D50	Diode, 1N4148, Silicon, 75V @ 0.3 Amperes	203–4148	21
DS1	LED, Red, 521–9212, 1.7V @ 50 mA Maximum	323–9217	1
DS2 THRU DS10	MONITOR DISPLAY LEDs, Green, MV54124, 3V @ 20 mA Maximum	323–2124	9
DS11 THRU DS13	MONITOR DISPLAY LEDs, Yellow, MV53124, 3V @ 20 mA Maximum	323–3124	3
DS14,DS15	MONITOR DISPLAY LEDs, Red, MV57124, 3V @ 20 mA Maximum	323–7124	2

TABLE 6–8. AUDIO CONTROL CIRCUIT BOARD ASSEMBLY – 917–0054
(Sheet 3 of 8)

REF. DES.	DESCRIPTION	PART NO.	QTY.
J4	Receptacle, Male, 8–Pin In–Line	417–0080	1
J5	Receptacle, Male, 6–Pin In–Line	417–0006–1	1
J6	Receptacle, Male, 20–Pin In–Line	417–0200	1
J7	Receptacle, Male, 6–Pin In–Line	417–0006–1	1
J8	Receptacle, Male, 14–Pin In–Line	417–0140	1
J9	Receptacle, Male, 6–Pin In–Line	417–0006–1	1
J10	Receptacle, Male, 13–Pin Dual In–Line	417–2600	1
J11	Receptacle, Male, 8–Pin In–Line	417–0080	1
J12	Receptacle, Male, 6–Pin In–Line	417–0006–1	1
J13	Receptacle, Male, 8–Pin In–Line	417–0080	1
J44	Receptacle, Male, 3–Pin In–Line	417–0003	1
J45	Receptacle, Male, 6–Pin In–Line	417–0006–1	1
K1 THRU K3	Relay, Printed Circuit Board Mount Coil: 12 VDC, 250 Ohm dc Resistance Contacts: DPDT, 125V ac @ 0.5A or 30V dc @ 2A Maximum	270–0048	3
L3	RF Choke, 10 mH ±10%, 220 mA Maximum, 6.3 Ohms DC Resistance	364–0670	1
LDR1	Optical Isolator, VTL5C2, LDR/LED Type On Resistance: 500 Ohms Off Resistance: 1 Meg Ohm Cell Voltage: 200V Maximum Cell Current: 10 t0 40 mA	323–7345	1
P5A,P5B, P7A,P7B, P9A,P9B, P12,P44, P45A,P45B	Jumper Programmable	340–0004	10
Q1 THRU Q4	Transistor, 2N3904, NPN, Silicon, TO–92 Case	211–3904	4
Q5 THRU Q11	Transistor, 2N3906, PNP, Silicon, TO–92 Case	210–3906	7
Q12	Field Effect Transistor, J271, P–Channel Junction, TO–92 Case	210–0271	1
R1 THRU R6	Resistor, 453 k Ohm ±1%, 1/4W	100–4561	6
R7 THRU R9	Resistor Network, 10–10 k Ohm 0.5% Resistors, 0.7W Total Dissipation, 16–Pin DIP	226–0392	3
R12	Resistor, 681 Ohm ±1%, 1/4W	103–6813	1
R15 THRU R26	Resistor, 10 Ohm ±5%, 1/4W	100–1023	12
R27	Resistor, 31.6 k Ohm ±1%, 1/4W	100–3151	1
R28	Resistor, 57.6 k Ohm ±1%, 1/4W	103–5765	1
R29 THRU R32	Resistor, 4.99 k Ohm ±1%, 1/4W	100–5041	4
R33	Resistor, 31.6 k Ohm ±1%, 1/4W	100–3151	1
R34	Resistor, 10 Ohm ±5%, 1/4W	100–1023	1
R35,R36	Resistor, 10 k Ohm ±1%, 1/4W	100–1051	2
R37	Resistor, 86.6 k Ohm ±1%, 1/4W	103–8665	1
R38	Resistor, 100 k Ohm ±1%, 1/4W	103–1062	1
R39	Resistor, 86.6 k Ohm ±1%, 1/4W	103–8665	1
R40	Resistor, 10 Ohm ±5%, 1/4W	100–1023	1
R41 THRU R47	Resistor, 10 k Ohm ±5%, 1/4W	100–1053	7
R48	Resistor, 10 Ohm ±5%, 1/4W	100–1023	1
R49	Resistor, 10 k Ohm ±5%, 1/4W	100–1053	1
R50	Resistor, 10 Ohm ±5%, 1/4W	100–1023	1
R51	Resistor, 10 k Ohm ±5%, 1/4W	100–1053	1
R52	Resistor, 10 Ohm ±5%, 1/4W	100–1023	1

TABLE 6–8. AUDIO CONTROL CIRCUIT BOARD ASSEMBLY – 917–0054
(Sheet 4 of 8)

REF. DES.	DESCRIPTION	PART NO.	QTY.
R53 THRU R56	Resistor, 10 k Ohm ±5%, 1/4W	100–1053	4
R57,R58	Resistor, 100 k Ohm ±5%, 1/4W	100–1063	2
R59	Resistor, 10 Ohm ±5%, 1/4W	100–1023	1
R60	Resistor, 10 k Ohm ±5%, 1/4W	100–1053	1
R61	Resistor, 33 Ohm ±5%, 1/4W	100–3323	1
R62	Resistor, 10 k Ohm ±5%, 1/4W	100–1053	1
R63	Resistor, 33 Ohm ±5%, 1/4W	100–3323	1
R64,R65	Resistor, 10 Ohm ±5%, 1/4W	100–1023	2
R66	Resistor, 100 k Ohm ±5%, 1/4W	100–1063	1
R67	Potentiometer, 100 k Ohm ±10%, 1/2W	177–1064	1
R68	Resistor, 10 k Ohm ±5%, 1/4W	100–1053	1
R69,R70	Resistor, 1.2 k Ohm ±5%, 1/4W	100–1243	2
R71	Resistor, 10 k Ohm ±5%, 1/4W	100–1053	1
R72,R73	Resistor, 10 Ohm ±5%, 1/4W	100–1023	2
R74	Resistor, 1.2 k Ohm ±5%, 1/4W	100–1243	1
R75	Resistor, 10 k Ohm ±5%, 1/4W	100–1053	1
R76 THRU R79	Resistor, 499 Ohm ±1%, 1/4W	103–4993	4
R80	Potentiometer, 50 Ohm ±10%, 1/2W	177–5020	1
R81	Resistor, 10 k Ohm ±5%, 1/4W	100–1053	1
R82	Resistor, 15 k Ohm ±5%, 1/4W	100–1553	1
R83,R84	Resistor, 10 Ohm ±5%, 1/4W	100–1023	2
R85	Resistor, 15 k Ohm ±5%, 1/4W	100–1553	1
R86	Resistor, 750 Ohm ±5%, 1/4W	100–7533	1
R87	Resistor, 976 Ohm ±1%, 1/4W	103–9763	1
R88	Resistor, 1 k Ohm ±1%, 1/4W	103–1041	1
R89	Resistor, 82 Ohm ±5%, 1/4W	100–8223	1
R90	Potentiometer, 1 k Ohm ±10%, 1/2W	175–1034	1
R91,R92	Resistor Network, 10–10 k Ohm ±0.5% Resistors, 0.7W Total Dissipation, 16–Pin DIP	226–0392	2
R93	Resistor, 3.3 k Ohm ±5%, 1/4W	100–3343	1
R94 THRU R96	Resistor, 10 Ohm ±5%, 1/4W	100–1023	3
R97	Resistor Network, 10–10 k Ohm ±0.5% Resistors, 0.7W Total Dissipation, 16–Pin DIP	226–0392	1
R98	Resistor, 4.3 k Ohm ±5%, 1/4W	100–4343	1
R99	Resistor, 3.3 k Ohm ±5%, 1/4W	100–3343	1
R100	Resistor, 3 k Ohm ±5%, 1/4W	100–3043	1
R101	Resistor, 68 k Ohm ±5%, 1/4W	100–6853	1
R102,R103	Resistor, 560 Ohm ±5%, 1/4W	100–5633	2
R104 THRU R106	Resistor, 10 Ohm ±5%, 1/4W	100–1023	3
R107,R108	Potentiometer, 10 k Ohm ±10%, 1 1/4W	179–1053	2
R109	Resistor, 1 k Ohm ±5%, 1/4W	100–1043	1
R110	Resistor, 15 k Ohm ±5%, 1/4W	100–1553	1
R111	Resistor Network, 10–10 k Ohm ±0.5% Resistors, 0.7W Total Dissipation, 16–Pin DIP	226–0392	1

TABLE 6–8. AUDIO CONTROL CIRCUIT BOARD ASSEMBLY – 917–0054
(Sheet 5 of 8)

REF. DES.	DESCRIPTION	PART NO.	QTY.
R112	Resistor, 5.1 k Ohm ±5%, 1/4W	100–5143	1
R113	Resistor, 47 k Ohm ±5%, 1/4W	100–4753	1
R114	Potentiometer, 1 k Ohm ±10%, 1/2W	175–1034	1
R115,R116	Resistor, 10 Ohm ±5%, 1/4W	100–1023	2
R117	Resistor, 3.9 k Ohm ±5%, 1/4W	100–3943	1
R118	Resistor, 470 k Ohm ±5%, 1/4W	100–4763	1
R119	Resistor, 10 Ohm ±5%, 1/4W	100–1023	1
R120,R121	Resistor, 150 Ohm ±5%, 1/4W	100–1533	2
R122	Resistor, 10 Ohm ±5%, 1/4W	100–1023	1
R123	Resistor, 1 k Ohm ±5%, 1/4W	100–1043	1
R124	Resistor, 820 Ohm ±5%, 1/4W	100–8233	1
R125	Resistor, 10 Ohm ±5%, 1/4W	100–1023	1
R126	Resistor, 820 Ohm ±5%, 1/4W	100–8233	1
R127,R128	Resistor, 1.07 k Ohm ±1%, 1/4W	103–1074	2
R129	Resistor, 10 Ohm ±5%, 1/4W	100–1023	1
R130	Potentiometer, 10 k Ohm ±10%, 1 1/4W	179–1053	1
R131,R132	Resistor, 28 k Ohm ±1%, 1/4W	103–2805	2
R133	Resistor, 14 k Ohm ±1%, 1/4W	103–1405	1
R134	Resistor, 1.47 k Ohm ±1%, 1/4W	103–1474	1
R135	Resistor, 14 k Ohm ±1%, 1/4W	103–1405	1
R136	Resistor, 82 k Ohm ±5%, 1/4W	100–8253	1
R137	Resistor, 10 Ohm ±5%, 1/4W	100–1023	1
R138	Resistor, 14 k Ohm ±1%, 1/4W	103–1405	1
R139	Potentiometer, 2 k Ohm ±10%, 1 1/4W	179–2043	1
R140	Resistor, 470 k Ohm ±5%, 1/4W	100–4763	1
R141	Resistor, 820 Ohm ±5%, 1/4W	100–8233	1
R142	Potentiometer, 500 Ohm ±10%, 1/2W	177–5032	1
R143	Resistor, 10 k Ohm ±5%, 1/4W	100–1053	1
R144	Resistor, 10 Ohm ±5%, 1/4W	100–1023	1
R145	Resistor, 9.1 k Ohm ±5%, 1/4W	100–9143	1
R146	Resistor, 3.3 k Ohm ±5%, 1/4W	100–3343	1
R147	Resistor, 100 k Ohm ±5%, 1/4W	100–1063	1
R148	Resistor Network, 10–10 k Ohm ±0.5% Resistors, 0.7W Total Dissipation, 16–Pin DIP	226–0392	1
R149 THRU R152	Resistor, 10 Ohm ±5%, 1/4W	100–1023	4
R153	Resistor, 5.1 k Ohm ±5%, 1/4W	100–5143	1
R154	Resistor, 10 Ohm ±5%, 1/4W	100–1023	1
R155	Resistor, 10 Meg Ohm ±5%, 1/4W	100–1083	1
R156	Resistor, 1 Meg Ohm ±5%, 1/4W	100–1073	1
R157	Resistor, 10 k Ohm ±5%, 1/4W	100–1053	1
R158,R159	Resistor, 10 Ohm ±5%, 1/4W	100–1023	2
R160	Resistor, 620 Ohm ±5%, 1/4W	100–6233	1
R161	Potentiometer, 2 k Ohm ±10%, 1/2W	177–2044	1
R162	Resistor, 10 k Ohm ±5%, 1/4W	100–1053	1
R163	Resistor, 390 Ohm ±5%, 1/2W	110–3933	1
R164	Resistor, 180 k Ohm ±5%, 1/4W	100–1863	1

TABLE 6–8. AUDIO CONTROL CIRCUIT BOARD ASSEMBLY – 917–0054
(Sheet 6 of 8)

REF. DES.	DESCRIPTION	PART NO.	QTY.
R165	Resistor, 1 k Ohm ±5%, 1/4W	100–1043	1
R166	Resistor, 100 Ohm ±5%, 1/4W	100–1033	1
R167	Resistor, 8.06 k Ohm ±1%, 1/4W	103–8064	1
R168	Resistor, 6.34 k Ohm ±1%, 1/4W	103–6344	1
R169	Resistor, 1 k Ohm ±5%, 1/4W	100–1043	1
R170	Resistor, 1 Meg Ohm ±5%, 1/4W	100–1073	1
R171,R172	Resistor, 10 k Ohm ±5%, 1/4W	100–1053	2
R173 THRU R180	Resistor, 62 Ohm ±5%, 1/4W	100–6223	8
R181	Resistor, 10 k Ohm ±5%, 1/4W	100–1053	1
R182 THRU R186	Resistor, 62 Ohm ±5%, 1/4W	100–6223	5
R187	Resistor, 10 k Ohm ±5%, 1/4W	100–1053	1
R188	Resistor, 10 Ohm ±5%, 1/4W	100–1023	1
R189	Resistor, 4.42 k Ohm ±1%, 1/4W	103–4441	1
R190	Resistor, 330 Ohm ±5%, 1/4W	100–3333	1
R191	Resistor, 10 Ohm ±5%, 1/4W	100–1023	1
R192	Resistor, 1.82 k Ohm ±1%, 1/4W	100–1841	1
R193	Resistor, 301 Ohm ±1%, 1/4W	100–3031	1
R194	Resistor, 1.82 k Ohm ±1%, 1/4W	100–1841	1
R195	Resistor, 1 k Ohm ±5%, 1/4W	100–1043	1
R196 THRU R207	Resistor, 10 k Ohm ±5%, 1/4W	100–1053	12
R208	Potentiometer, 2 k Ohm ±10%, 1 1/4W	179–2043	1
R209 THRU P212	Resistor, 10 k Ohm ±5%, 1/4W	100–1053	4
R213 THRU R216	Resistor, 470 Ohm ±5%, 1/4W	100–4733	4
R217,R218	Resistor, 10 k Ohm ±5%, 1/4W	100–1053	2
R219	Potentiometer, 100 Ohm ±10%, 1 1/4W	178–1032	1
R220 THRU R223	Resistor, 220 Ohm ±5%, 1/2W	110–2233	4
R224	Resistor, 9.1 k Ohm ±5%, 1/4W	100–9143	1
R225	Resistor, 1 k Ohm ±5%, 1/4W	100–1043	1
R226	Resistor, 47 k Ohm ±5%, 1/4W	100–4753	1
R227	Potentiometer, 1 k Ohm ±10%, 1/2W	175–1034	1
R228	Resistor, 470 k Ohm ±5%, 1/4W	100–4763	1
R229	Resistor, 10 Ohm ±5%, 1/4W	100–1023	1
R230	Resistor, 5.1 k Ohm ±5%, 1/4W	100–5143	1
R231	Resistor, 10 Ohm ±5%, 1/4W	100–1023	1
R232	Resistor, 1 k Ohm ±5%, 1/4W	100–1043	1
R233	Resistor, 1.3 k Ohm ±5%, 1/4W	100–1343	1
R234	Resistor, 100 k Ohm ±5%, 1/4W	100–1063	1
R235	Resistor, 1 k Ohm ±5%, 1/4W	100–1043	1
R236	Resistor, 10 k Ohm ±5%, 1/4W	100–1053	1
S7	7 Section DPDT Push Switch Assembly with Black Switch Caps, Positions 2 thru 5 Interlocked, Resistive Load: 1A @ 28V dc or 0.45A @ 115V ac (Mode Switches)	343–0049	1

TABLE 6–8. AUDIO CONTROL CIRCUIT BOARD ASSEMBLY – 917–0054
(Sheet 7 of 8)

REF. DES.	DESCRIPTION	PART NO.	QTY.
S8	6 Section Push Switch Assembly, 2PDT per Station, Positions 3 thru 6 Interlocked, Positions 1 and 2 – Black Button, Positions 3 thru 6 – Cream Button, 1A @ 28V dc or 0.45A @ 115V ac Maximum Resistive Load (**MONITOR DISPLAY** and **MONITOR SELECT** Switches)	340–0055	1
U1 THRU U11	Integrated Circuit, TLO72CP, Dual JFET–Input Operational Amplifier, 8–Pin DIP	221–0072	11
U12	Integrated Circuit, MC14011BCP, Quad 2–Input, NAND, CMOS, 14–Pin DIP	228–4011	1
U13	Integrated Circuit, NE5532AP, Dual Low Noise Operational Amplifier, 8–Pin DIP	221–5532–001	1
U14	Integrated Circuit, TLO72CP, Dual JFET–Input Operational Amplifier, 8–Pin DIP	221–0072	1
U15	Integrated Circuit, NE5532AP, Dual Low Noise Operational Amplifier, 8–Pin DIP	221–5532–001	1
U16 THRU U18	Integrated Circuit, TLO72CP, Dual JFET–Input Operational Amplifier, 8–Pin DIP	221–0072	3
U19	Integrated Circuit, NE5532AP, Dual Low Noise Operational Amplifier, 8–Pin DIP	221–5532–001	1
U20	Integrated Circuit, TLO72CP, Dual JFET–Input Operational Amplifier, 8–Pin DIP	221–0072	1
U21	Integrated Circuit, TLO74CN, Quad JFET–Input Operational Amplifier, 14–Pin DIP	221–0074	1
U22	Integrated Circuit, TLO72CP, Dual JFET–Input Operational Amplifier, 8–Pin DIP	221–0072	1
U23	Integrated Circuit, NE555V, Timer, 8–Pin DIP	229–0555	1
U24,U25	Integrated Circuit, LM3914N, Dot/Bar Display Driver, 18–Pin DIP	229–3914	2
U26 THRU U29	Optical Isolator, 4N33, NPN Phototransistor/Infared Light Emitting Diode Type, 2500V Isolation, 6–Pin DIP	229–0033	4
U30	Integrated Circuit, CD4012BCN, Dual 4–Input, NAND, 14–Pin DIP	228–4012	1
U31	Integrated Circuit, MC14011BCP, Quad 2–Input, NAND, CMOS, 14–Pin DIP	228–4011	1
U32	Integrated Circuit, CD4012BCN, Dual 4–Input, NAND, 14–Pin DIP	228–4012	1
U33	Integrated Circuit, MC14011BCP, Quad 2–Input, NAND, CMOS, 14–Pin DIP	228–4011	1
U34	Integrated Circuit, CD4019AE, Quad AND/OR Select Gate, 16–Pin DIP	228–4019	1
U35	Integrated Circuit, MC1416P, 7 NPN Darlington Driver Pack, 16–Pin DIP	226–2004	1
U36 THRU U39	Integrated Circuit, 4N33, NPN Phototransistor/Infared Light Emitting Diode Type, 2500V Isolation, 6–Pin DIP	229–0033	4
U40	Integrated Circuit, NE5532AP, Dual Low Noise Operational Amplifier, 8–Pin DIP	221–5532–001	1
XR7 THRU XR9, XR91, XR92, XR97, XR111,XR148	Socket, 16–Pin DIP	417–1604	8
XU1 THRU XU11	Socket, 8–Pin DIP	417–0804	11
XU12	Socket, 14–Pin DIP	417–1404	1
XU13 THRU XU20	Socket, 8–Pin DIP	417–0804	8
XU21	Socket, 14–Pin DIP	417–1404	1
XU22,XU23	Socket, 8–Pin DIP	417–0804	2
XU24,XU25	Socket, 18–Pin DIP	417–1804	2
XU26 THRU XU29	Socket, 6–Pin DIP	417–0600	4

TABLE 6–8. AUDIO CONTROL CIRCUIT BOARD ASSEMBLY – 917–0054
(Sheet 8 of 8)

REF. DES.	DESCRIPTION	PART NO.	QTY.
XU30 THRU XU33	Socket, 14–Pin DIP	417–1404	4
XU34,XU35	Socket, 16–Pin DIP	417–1604	2
XU36 THRU XU39	Socket, 6–Pin DIP	417–0600	4
XU40	Socket, 8–Pin DIP	417–0804	1
——	Blank Circuit Board	517–0054	1

TABLE 6–9. MODULATOR CIRCUIT BOARD ASSEMBLY – 917–0055
(Sheet 1 of 8)

REF. DES.	DESCRIPTION	PART NO.	QTY.
C1	Capacitor, Electrolytic, 10 uF, 25V, Non–Polarized	023–1075	1
C2	Capacitor, Electrolytic, 100 uF, 25V	023–1084	1
C3	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003–1054	1
C4	Capacitor, Polyester, 0.47 uF ±10%, 100V	038–4753	1
C5	Capacitor, Electrolytic, 4.7 uF, 35V, Low–Leakage	024–4753	1
C6	Capacitor, Mica, 1000 pF ±1%, 100V	041–1031	1
C7	Capacitor, Electrolytic, 4.7 uF, 35V, Low–Leakage	024–4753	1
C8	Capacitor, Mylar, 0.047 uF ±10%, 100V	030–4743	1
C9 THRU C14	Capacitor, Electrolytic, 10 uF, 35V	023–1076	6
C15	Capacitor, Polyester, 0.47 uF ±10%, 100V	038–4753	1
C16	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003–1054	1
C17,C18	Capacitor, Electrolytic, 100 uF, 50V	020–1085	2
C19 THRU C21	Capacitor, Mylar, 0.01 uF ±10%, 100V	031–1043	3
C22	Capacitor, Monolythic Ceramic, 0.0015 uF ±5%, 100V	003–1523	1
C23 THRU C26	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003–1054	4
C27,C28	Capacitor, Electrolytic, 10 uF, 35V	023–1076	2
C29	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003–1054	1
C32	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003–1054	1
C33	Capacitor, Mica, 150 pF ±5%, 500V	040–1522	1
C34	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003–1054	1
C35,C36	Capacitor, Electrolytic, 10 uF, 35V	023–1076	2
C37,C38	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003–1054	2
C39	Capacitor, Mica, 820 pF ±5%, 300V	042–8222	1
C40,C41	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003–1054	2
C42	Capacitor, Mica, 1800 pF ±5%, 500V	040–1833	1
C43,C44	Capacitor, Electrolytic, 10 uF, 35V	023–1076	2
C45	Capacitor, Mica, 180 pF ±5%, 500V	042–1822	1
C46 THRU C48	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003–1054	3
C49,C50	Capacitor, Mica, 5000 pF ±1%, 500V	042–5031	2
C51	Capacitor, Mylar, 0.01 uF ±10%, 100V	031–1043	1
C52	Capacitor, Mica, 1000 pF ±1%, 100V	041–1031	1
C53	Capacitor, Mylar, 0.01 uF ±10%, 100V	031–1043	1
C54	Capacitor, Mica, 1000 pF ±1%, 100V	041–1031	1

TABLE 6–9. MODULATOR CIRCUIT BOARD ASSEMBLY – 917–0055
(Sheet 2 of 8)

REF. DES.	DESCRIPTION	PART NO.	QTY.
C55	Capacitor, Electrolytic, 10 uF, 35V	023–1076	1
C56	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003–1054	1
C57 THRU C60	Capacitor, Electrolytic, 10 uF, 35V	023–1076	4
C61,C62	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003–1054	2
C63	Capacitor, Electrolytic, 4.7 uF, 35V, Low–Leakage	024–4753	1
C64	Capacitor, Electrolytic, 47 uF, 16V	013–4750	1
C65	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003–1054	1
C66	Capacitor, Electrolytic, 10 uF, 35V	023–1076	1
C67,C68	Capacitor, Mica, 150 pF ±5%, 500V	040–1522	2
C69	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003–1054	1
C70,C71	Capacitor, Electrolytic, 10 uF, 35V	023–1076	2
C72	Capacitor, Electrolytic, 47 uF, 16V	013–4750	1
C73,C74	Capacitor, Electrolytic, 10 uF, 35V	023–1076	2
C75,C76	Capacitor, Mylar, 0.01 uF ±10%, 100V	031–1043	2
C77	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003–1054	1
C79	Capacitor, Mica, 500 pF ±1%, 500V	042–5021	1
C80	Capacitor, Mica, 220 pF ±5%, 500V	040–2223	1
C81	Capacitor, Mica, 150 pF ±5%, 500V	040–1522	1
C82,C83	Capacitor, Electrolytic, 10 uF, 35V	023–1076	2
C84	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003–1054	1
C85	Capacitor, Mica, 390 pF ±5%, 100V	042–3922	1
C86	Capacitor, Mica, 820 pF ±5%, 300V	042–8222	1
C87	Capacitor, Electrolytic, 22 uF, 50V	024–2274	1
C88	Capacitor, Mica, 0.1 uF ±10%, 100V	030–1053	1
C89	Capacitor, Electrolytic, 22 uF, 50V	024–2274	1
C90	Capacitor, Electrolytic, 10 uF, 35V	023–1076	1
C91	Capacitor, Mylar, 0.01 uF ±10%, 100V	031–1043	1
C92	Capacitor, Electrolytic, 10 uF, 35V	023–1076	1
C93	Capacitor, Mylar, 0.01 uF ±10%, 100V	031–1043	1
C94	Capacitor, Mica, 1800 pF ±5%, 500V	040–1833	1
C95	Capacitor, Mica, 150 pF ±5%, 500V	042–1822	1
C96	Capacitor, Electrolytic, 10 uF, 35V	023–1076	1
C97 THRU C99	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003–1054	3
C100	Capacitor, Electrolytic, 4700 uF, 35V	014–4795	1
C101	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003–1054	1
C102	Capacitor, Electrolytic, 4700 uF, 35V	014–4795	1
C103,C104	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003–1054	2
C105	Capacitor, Electrolytic, 10 uF, 35V	023–1076	1
C106	Capacitor, Electrolytic, 10,000 uF, 6.3V	011–8000	1
C107	Capacitor, Electrolytic, 10 uF, 35V	023–1076	1
C108	Capacitor, Electrolytic, 100 uF, 25V	023–1084	1
C109	Capacitor, Electrolytic, 10 uF, 35V	023–1076	1
C110	Capacitor, Electrolytic, 100 uF, 25V	023–1084	1
C111	Capacitor, Electrolytic, 10 uF, 35V	023–1076	1
C112	Capacitor, Electrolytic, 100 uF, 25V	023–1084	1
C113	Capacitor, Electrolytic, 10 uF, 35V	023–1076	1
C114	Capacitor, Electrolytic, 100 uF, 25V	023–1084	1
C115,C116	Capacitor, Electrolytic, 3.3 uF, 50V, Non–Polarized	024–3364	2
C117	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003–1054	1

TABLE 6-9. MODULATOR CIRCUIT BOARD ASSEMBLY - 917-0055
(Sheet 3 of 8)

REF. DES.	DESCRIPTION	PART NO.	QTY.
C118	Capacitor, Electrolytic, 10 uF, 35V	023-1076	1
C119	Capacitor, Electrolytic, 100 uF, 25V	023-1084	1
C120	Capacitor, Electrolytic, 10 uF, 35V	023-1076	1
C121	Capacitor, Electrolytic, 100 uF, 25V	023-1084	1
C122	Capacitor, Electrolytic, 10 uF, 35V	023-1076	1
C123	Capacitor, Electrolytic, 100 uF, 25V	023-1084	1
C124 THRU C128	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	5
C129	Capacitor, Mylar, 0.01 uF ±10%, 100V	031-1043	1
C130 THRU C135	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	6
C136,C137	Capacitor, Mylar, 0.01 uF ±10%, 100V	031-1043	2
C138	Capacitor, Electrolytic, 10 uF, 35V	023-1076	1
C141 THRU C143	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	3
C144	Capacitor, Electrolytic, 4.7 uF, 35V, Low-Leakage	024-4753	1
C145 THRU C148	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	4
D1 THRU D8	Diode, 1N4148, Silicon, 75V @ 0.3 Amperes	203-4148	8
D9,D10	Diode, HP5082-2800, High Voltage Schottky Barrier Type, 70V @ 15 mA	201-2800	2
D11	Diode, 1N4005, Silicon, 600V @ 1 Ampere	203-4005	1
D12 THRU D15	Diode, 1N4148, Silicon, 75V @ 0.3 Amperes	203-4148	4
D16,D17	Diode, 1N4737, Zener, 7.5V ±10%, 1W	200-4737	2
D18 THRU D21	Diode, MR502, Silicon, 200V @ 3 Amperes	202-0502	4
D22 THRU D38	Diode, 1N4005, Silicon, 600V @ 1 Ampere	203-4005	17
D39,D40	Diode, 1N4761A, Zener, 75V ±5%, 1W	200-4761	2
D41	Diode, 1N4148, Silicon, 75V @ 0.3 Amperes	203-4148	1
J15	Receptacle, Male, 16-Pin In-Line	417-0045	1
J16	Receptacle, Male, 8-Pin In-Line	417-0080	1
J18 THRU J23	Receptacle, Male, 2-Pin	417-4004	6
J24 THRU J36	Receptacle, Female, Single pin	417-0071-001	13
J37,J38	Receptacle, Male, 2-Pin	417-4004	2
J39	Receptacle, 12-Pin	417-1276	1
J45,J46	Receptacle, Male, 2-Pin	417-4004	2
J50	Receptacle, Male, 6-Pin In-Line	417-0006-1	1
J51	Receptacle, Male, 2-Pin	417-4004	1
J52	Receptacle, Male, 4-Pin In-Line	417-0070	1
J53	Receptacle, Male, 2-Pin	417-4004	1
L1	Shielded Adjustable Coil, 147-430 uH, 121 mA Maximum, 16.32 Ohms DC Resistance	360-0035	1
L2	Shielded Adjustable Coil, 422-1100 uH, 92 mA Maximum, 27.84 Ohms DC Resistance	360-0038	1
L3	Shielded Adjustable Coil, 147-430 uH, 121 mA Maximum, 16.32 Ohms DC Resistance	360-0035	1
L4	Shielded Adjustable Coil, 1050-3740 uH, 76 mA Maximum, 41.06 Ohms DC Resistance	360-0037	1
L5	Coil, Toroid, 10 uH ±10%, 22 Turns of No. 26 Enameled Copper Wire on B.E. No. 360-0023 Form	360-0051	1
—	Ferrite Toroid for L5, OD= 0.375 IN, ID= 0.188 IN, W= 0.125 IN	360-0023	—

TABLE 6–9. MODULATOR CIRCUIT BOARD ASSEMBLY – 917–0055
(Sheet 4 of 8)

REF. DES.	DESCRIPTION	PART NO.	QTY.
L6	Coil, Toroid, 22 uH ±10%, 34 Turns of No. 30 Enameled Copper Wire on B.E. No. 360–0023 Form	360–0049	1
——	Ferrite Toroid for L6, OD= 0.375 IN, ID= 0.188 IN, W= 0.125 IN	360–0023	——
L7	Shielded Adjustable Coil, 147–430 uH, 121 mA Maximum, 16.32 Ohms DC Resistance	360–0035	1
L8	Shielded Adjustable Coil, 422–1100 uH, 92 mA Maximum, 27.84 Ohms DC Resistance	360–0038	1
L9	Shielded Adjustable Coil, 147–430 uH, 121 mA Maximum, 16.32 Ohms DC Resistance	360–0035	1
L10	Shielded Adjustable Coil, 1050–3740 uH, 76 mA Maximum, 41.06 Ohms DC Resistance	360–0037	1
L11,L12	RF Choke, 500 uH ±20%, 2A Maximum, 0.55 Ohms DC Resistance	360–0048	2
L13,L14	RF Choke, 910 uH ±5%, 79 mA Maximum, 15.8 Ohms DC Resistance	360–0047	2
P18,P20,P21, P22,P38,P45, P46,P53,P50A, P50B,P52A, P52B	Programmable Jumper	340–0004	12
Q1 THRU Q7	Transistor, 2N3904, Silicon, NPN, TO–92 Case	211–3904	7
Q8	Transistor, 2N3906, Silicon, PNP, TO–92 Case	210–3906	1
Q9	Transistor, MPS–U55, Silicon, PNP, Motorola Case 152–02	210–0155	1
Q10	Transistor, MPS–U05, Silicon, NPN, Motorola Case 152–02	211–0005	1
Q11,Q12	Transistor, 2N3906, Silicon, PNP, TO–92 Case	210–3906	2
Q13,Q14	Field Effect Transistor, VN88AD, Metal–Oxide/Silicon, N–Channel Enhancement Type, TO–220–AB Case	210–0088	2
R1	Resistor, 10 Ohm ±5%, 1/4W	100–1023	1
R2	Resistor, 4.7 k Ohm ±5%, 1/4W	100–4743	1
R3	Resistor, 33 Ohm ±5%, 1/4W	100–3323	1
R4	Resistor, 102 k Ohm ±1%, 1/4W	103–1026	1
R5	Resistor, 2.2 k Ohm ±5%, 1/4W	100–2243	1
R6	Resistor, 105 k Ohm ±1%, 1/4W	103–1056	1
R7	Resistor, 1.18 k Ohm ±1%, 1/4W	103–1184	1
R8	Resistor, 294 k Ohm ±1%, 1/4W	103–2946	1
R9	Resistor, 121 Ohm ±1%, 1/4W	100–1231	1
R10	Resistor, 6650 Ohm ±1%, 1/4W	103–6641	1
R11,R12	Resistor, 1 k Ohm ±1%, 1/4W	103–1041	2
R13	Resistor, 7.32 k Ohm ±1%, 1/4W	103–7324	1
R14	Resistor, 392 Ohm ±1%, 1/4W	103–3923	1
R15,R16	Resistor, 10 k Ohm ±1%, 1/4W	100–1051	2
R17,R18	Resistor, 10 Ohm ±5%, 1/4W	100–1023	2
R19	Resistor, 1 k Ohm ±1%, 1/4W	103–1041	1
R20	Resistor, 10 Ohm ±5%, 1/4W	100–1023	1
R21	Resistor, 2 k Ohm ±1%, 1/4W	100–2041	1
R22	Resistor, 10 Ohm ±5%, 1/4W	100–1023	1
R23	Resistor, 10 k Ohm ±1%, 1/4W	100–1051	1
R24	Resistor, 10 Ohm ±5%, 1/4W	100–1023	1
R25	Resistor, 10 k Ohm ±1%, 1/4W	100–1051	1
R26	Resistor, 10 Ohm ±5%, 1/4W	100–1023	1
R27,R28	Resistor, 221 k Ohm ±1%, 1/4W	103–2216	2
R29	Resistor, 56 Ohm ±5%, 1/4W	100–5623	1

TABLE 6–9. MODULATOR CIRCUIT BOARD ASSEMBLY – 917–0055
(Sheet 5 of 8)

REF. DES.	DESCRIPTION	PART NO.	QTY.
R30	Resistor, 270 Ohm ±5%, 1/4W	100–2733	1
R31 THRU R34	Resistor, 100 Ohm ±1%, 1/4W	100–1031	4
R35	Resistor, 294 k Ohm ±1%, 1/4W	103–2946	1
R36	Resistor, 10 Ohm ±5%, 1/4W	100–1023	1
R37	Resistor, 100 k Ohm ±5%, 1/4W	100–1063	1
R38,R39	Resistor, 10 Ohm ±5%, 1/4W	100–1023	2
R40	Resistor, 2.2 k Ohm ±5%, 1/4W	100–2243	1
R41	Resistor, 22 Ohm ±5%, 1/4W	100–2223	1
R42 THRU R44	Resistor, 10 k Ohm ±5%, 1/4W	100–1053	3
R45	Resistor, 2.2 k Ohm ±5%, 1/4W	100–2243	1
R46	Resistor, 22 Ohm ±5%, 1/4W	100–2223	1
R47,R48	Resistor, 1 k Ohm ±1%, 1/4W	103–1041	2
R49,R50	Resistor, 5.62 k Ohm ±1%, 1/4W	103–5624	2
R51	Resistor, 10 k Ohm ±5%, 1/4W	100–1053	1
R52	Resistor, 1 k Ohm ±1%, 1/4W	103–1041	1
R53	Resistor, 2 k Ohm ±1%, 1/4W	100–2041	1
R54	Resistor, 2.2 k Ohm ±5%, 1/4W	100–2243	1
R55	Resistor, 22 Ohm ±5%, 1/4W	100–2223	1
R56,R57	Resistor, 10 Ohm ±5%, 1/4W	100–1023	2
R58	Resistor, 2.2 k Ohm ±5%, 1/4W	100–2243	1
R59	Resistor, 22 Ohm ±5%, 1/4W	100–2223	1
R60	Resistor, 750 Ohm ±1%, 1/4W	103–7503	1
R61	Resistor, 1.8 k Ohm ±5%, 1/4W	100–1843	1
R62	Resistor, 100 k Ohm ±5%, 1/4W	100–1063	1
R63	Resistor, 1 Meg Ohm ±5%, 1/4W	100–1073	1
R64,R65	Resistor, 10 Ohm ±5%, 1/4W	100–1023	2
R66	Resistor, 1 k Ohm ±1%, 1/4W	103–1041	1
R67	Resistor, 51 Ohm ±5%, 1/4W	100–5123	1
R68 THRU R73	Resistor, 365 Ohm ±1%, 1/4W	103–3631	6
R74	Resistor, 1 k Ohm ±5%, 1/4W	100–1043	1
R75	Resistor, 12 k Ohm ±5%, 1/4W	100–1253	1
R76 THRU R79	Resistor, 10 Ohm ±5%, 1/4W	100–1023	4
R80	Resistor, 100 Ohm ±5%, 1/4W	100–1033	1
R81	Resistor, 1 k Ohm ±5%, 1/4W	100–1043	1
R82,R83	Potentiometer, 10 k Ohm ±10%, 1/2W	177–1055	2
R84	Resistor, 1.54 k Ohm ±1%, 1/4W	103–1544	1
R85	Resistor, 510 k Ohm ±5%, 1/4W	100–5163	1
R86	Resistor, 100 Ohm ±5%, 1/4W	100–1033	1
R87	Resistor, 10 k Ohm ±1%, 1/4W	100–1051	1
R88	Resistor, 510 k Ohm ±5%, 1/4W	100–5163	1
R89	Resistor, 100 Ohm ±5%, 1/4W	100–1033	1
R90 THRU R92	Resistor, 10 k Ohm ±1%, 1/4W	100–1051	3
R93	Resistor, 51 Ohm ±5%, 1/4W	100–5123	1

TABLE 6–9. MODULATOR CIRCUIT BOARD ASSEMBLY – 917–0055
(Sheet 6 of 8)

REF. DES.	DESCRIPTION	PART NO.	QTY.
R94	Resistor, 221 Ohm ±1%, 1/4W	103–2213	1
R95,R96	Resistor, 10 k Ohm ±1%, 1/4W	100–1051	2
R97	Resistor, 2.2 k Ohm ±5%, 1/4W	100–2243	1
R98	Resistor, 22 Ohm ±5%, 1/4W	100–2223	1
R99	Resistor, 2.2 k Ohm ±5%, 1/4W	100–2243	1
R100	Resistor, 22 Ohm ±5%, 1/4W	100–2223	1
R101	Resistor, 20 k Ohm ±5%, 1/4W	100–2053	1
R102	Resistor, 18 k Ohm ±5%, 1/4W	100–1853	1
R103	Potentiometer, 5 k Ohm ±10%, 1/2W	178–5045	1
R104	Resistor, 20 k Ohm ±5%, 1/4W	100–2053	1
R105	Resistor, 10 Ohm ±5%, 1/4W	100–1023	1
R106	Potentiometer, 5 k Ohm ±10%, 1/2W	178–5045	1
R107	Resistor, 4.7 k Ohm ±5%, 1/4W	100–4743	1
R108	Potentiometer, 100 Ohm ±10%, 1/2W	177–1034	1
R109	Resistor, 200 Ohm ±5%, 1/4W	100–2033	1
R110	Resistor, 18 k Ohm ±5%, 1/4W	100–1853	1
R111	Resistor Network, 8–10 k Ohm ±0.5% Resistors, 0.7W Total Dissipation, 16–Pin DIP	226–0392	1
R112	Resistor, 10 Ohm ±5%, 1/4W	100–1023	1
R113,R114	Resistor, 2.2 k Ohm ±5%, 1/4W	100–2243	2
R118	Resistor, 10 Ohm ±5%, 1/4W	100–1023	1
R119	Resistor, 100 Ohm ±1%, 1/4W	100–1031	1
R121	Resistor, 10 Ohm ±5%, 1/4W	100–1023	1
R126	Resistor, 100 Ohm ±1%, 1/4W	100–1031	1
R127	Resistor, 51 Ohm ±5%, 1/4W	100–5123	1
R128	Resistor, 5.6 k Ohm ±5%, 1/4W	100–5643	1
R129	Resistor, 15 k Ohm ±5%, 1/4W	100–1553	1
R130,R131	Resistor, 10 Ohm ±5%, 1/4W	100–1023	2
R132	Resistor, 750 Ohm ±1%, 1/4W	103–7503	1
R133	Resistor, 47 k Ohm ±5%, 1/4W	100–4753	1
R134,R135	Resistor, 5.1 k Ohm ±5%, 1/4W	100–5143	2
R136	Resistor, 47 k Ohm ±5%, 1/4W	100–4753	1
R137	Resistor, 470 Ohm ±5%, 1/4W	100–4733	1
R138,R139	Resistor, 27 Ohm ±5%, 1/4W	100–2723	2
R140	Resistor, 470 Ohm ±5%, 1/4W	100–4733	1
R141,R142	Resistor, 120 Ohm ±5%, 1/4W	100–1233	2
R143	Resistor, 10 Ohm ±5%, 1/4W	100–1023	1
R144,R145	Resistor, 82 Ohm ±5%, 1/4W	100–8223	2
R146	Resistor, 10 Ohm ±5%, 1/4W	100–1023	1
R147	Resistor, 174 Ohm ±1%, 1/4W	100–1731	1
R148	Resistor, 2.7 k Ohm ±5%, 1/4W	100–2743	1
R149	Resistor, 1 k Ohm ±5%, 1/4W	100–1043	1
R150	Resistor, 470 Ohm ±5%, 1/4W	100–4733	1
R151,R152	Resistor, 330 Ohm ±5%, 1/4W	100–3333	2
R153	Resistor, 1.3 k Ohm ±5%, 1/4W	100–1343	1
R154	Resistor, 100 Ohm ±5%, 1/4W	100–1033	1
R155	Resistor, 1.62 k Ohm ±1%, 1/4W	103–1624	1

TABLE 6–9. MODULATOR CIRCUIT BOARD ASSEMBLY – 917–0055
(Sheet 7 of 8)

REF. DES.	DESCRIPTION	PART NO.	QTY.
R156	Resistor, 1.33 k Ohm ±1%, 1/4W	103–1331	1
R157	Resistor, 1.05 k Ohm ±1%, 1/4W	103–1054	1
R158	Resistor, 365 Ohm ±1%, 1/4W	103–3631	1
R159	Resistor, 18 k Ohm ±5%, 1/4W	100–1853	1
R160	Resistor, 390 Ohm ±5%, 1/4W	100–3933	1
R161	Resistor, 365 Ohm ±1%, 1/4W	103–3631	1
R162	Resistor, 1.33 k Ohm ±1%, 1/4W	103–1331	1
R163	Resistor, 1.62 k Ohm ±1%, 1/4W	103–1624	1
R164	Resistor, 100 Ohm ±5%, 1/4W	100–1033	1
R165	Resistor, 470 Ohm ±5%, 1/4W	100–4733	1
R166 THRU R169	Resistor, 121 Ohm ±1%, 1/4W	100–1231	4
R170	Resistor, 240 Ohm ±5%, 1/4W	100–2433	1
R171 THRU R173	Resistor, 121 Ohm ±1%, 1/4W	100–1231	3
R174	Resistor, 330 Ohm ±5%, 1/4W	100–3333	1
R175	Potentiometer, 5 k Ohm ±10%, 1/2W	178–5045	1
R176	Resistor, 7.5 Meg Ohm ±5%, 1/4W	100–7573	1
R177	Resistor, 100 Ohm ±5%, 1/4W	100–1033	1
R178	Potentiometer, 1 k Ohm ±10%, 1/2W	177–1044	1
R179	Resistor, 100 Ohm ±5%, 1/4W	100–1033	1
R180	Resistor, 7.5 Meg Ohm ±5%, 1/4W	100–7573	1
R181	Resistor, 500 k Ohm ±10%, 1/2W	179–5065	1
R182,R183	Resistor, 22 Ohm ±5%, 1/4W	100–2223	2
R184	Resistor, 500 k Ohm ±10%, 1/2W	179–5065	1
R185,R186	Resistor, 110 k Ohm ±5%, 1/4W	100–1163	2
R187,R188	Resistor, 10 k Ohm ±5%, 1/4W	100–1053	2
R189	Resistor, 270 Ohm ±5%, 1/4W	100–2733	1
S1	Switch, Slide, DPDT, Circuit Board Mount, 0.5A, 115V ac or dc	345–0863	1
T1	Wideband RF Transformer, 0.01 to 100 MHz, Impedance Ratio 2.5:1 Primary Impedance= 50 Ohms Secondary Impedance= 125 Ohms, Center–Tapped	370–0018	1
T2	RF Output Transformer PRIMARY: 32 turns of No. 26 AWG Enameled Copper Wire, center tapped SECONDARY 1: 12 turns of No. 26 AWG Enameled Copper wire SECONDARY 2: 10 turns of No. 32 AWG Enameled Copper wire All Secondaries wound in listed sequence in same direction on the following: Bobbin 375–0001 1 Ferrite Core Half 360–0044 2	370–0021	1
T3	Wideband RF Transformer, 0.7 to 200 MHz PRIMARY: Impedance= 50 Ohms Maximum Current= 0.1A Maximum Power= 0.5W SECONDARY: Impedance= 100 Ohms, Center–Tapped	370–0016	1
U1	Oscillator, Crystal, TCXO, 10 MHz ±3 PPM, 05C to 505C, Input: ±5 VDC, Output: TTL Compatible	390–0001	1
U2	Integrated Circuit, SN7490N, Divide–By–Ten Counter, 14–Pin DIP	228–7490	1
U3 THRU U5	Integrated Circuit, LF353N, Dual JFET–Input Operational Amplifier, 8–Pin DIP	221–0353	3

TABLE 6–9. MODULATOR CIRCUIT BOARD ASSEMBLY – 917–0055
(Sheet 8 of 8)

REF. DES.	DESCRIPTION	PART NO.	QTY.
U6	Integrated Circuit, SN74LS74AN, Dual D–Type Flip–Flop, 14–Pin DIP	228–0074	1
U7	Integrated Circuit, SN7407N, Open Collector Hex Buffer, 14–Pin DIP	228–7407	1
U8	Integrated Circuit, TLO74CN, Dual JFET–Input Operational Amplifier, 8–Pin DIP	221–0074	1
U9	Integrated Circuit, DM74LS90N, Divide–By–Ten Counter, 14–Pin DIP	228–0290	1
U10	Integrated Circuit, SD5000N, N–Channel Enhancement Mode DMOS FET Analog Switch Array, 16–Pin DIP	226–5000	1
U11	Integrated Circuit, DM74LS90N, Divide–By–Ten Counter, 14–Pin DIP	228–0290	1
U12	Integrated Circuit, LM318P, Operational Amplifier, 8–Pin DIP	221–0318	1
U13,U14	Integrated Circuit, DM74LS90N, Divide–By–Ten Counter, 14–Pin DIP	228–0290	2
U15	Integrated Circuit, TL311P, JFET–Input Differential Comparator, 8–Pin DIP	220–0311	1
U16	Integrated Circuit, LM318P, Operational Amplifier, 8–Pin DIP	221–0318	1
U17	Integrated Circuit, TLO74CN, Dual JFET–Input Operational Amplifier, 8–Pin DIP	221–0074	1
U18	Integrated Circuit, LM337L, Adjustable Negative Voltage Regulator, 1.2 to 37V, 0.5A Maximum, TO–92 Case	220–0337	1
U19	Integrated Circuit, AM686DC, Voltage Comparator, 16–Pin DIP	220–0686	1
U20,U21	Integrated Circuit, LF353, Dual JFET–Input Operational Amplifier, 8–Pin DIP	221–0353	2
U22	Integrated Circuit, SD5000N, N–Channel Enhancement Mode DMOS FET Analog Switch Array, 16–Pin DIP	226–5000	1
U23	Integrated Circuit, LM318P, Operational Amplifier, 8–Pin DIP	221–0318	1
U24	Integrated Circuit, NE5539N, UHF Operational Amplifier, 14–Pin DIP	220–5539	1
U25 THRU U29	Integrated Circuit, LM317T, Adjustable Positive Voltage Regulator, 1.2V to 37V, 1.5 Ampere, TO–220 Case	227–0317	5
U30 THRU U32	Integrated Circuit, LM337T, Adjustable Negative Voltage Regulator, 1.2V to 37V, 1.5 Ampere, TO–220 Case	227–0337	3
XR111	Socket, 16–Pin DIP	417–1604	1
XU2	Socket, 14–Pin DIP	417–1404	1
XU3 THRU XU5	Socket, 8–Pin DIP	417–0804	3
XU6 THRU XU9	Socket, 14–Pin DIP	417–1404	4
XU10	Socket, 16–Pin DIP	417–1604	1
XU11	Socket, 14–Pin DIP	417–1404	1
XU12	Socket, 8–Pin DIP	417–0804	1
XU13,XU14	Socket, 14–Pin DIP	417–1404	2
XU15,XU16	Socket, 8–Pin DIP	417–0804	2
XU17	Socket, 14–Pin DIP	417–1404	1
XU19	Socket, 16–Pin DIP	417–1604	1
XU20,XU21	Socket, 8–Pin DIP	417–0804	2
XU22	Socket, 16–Pin DIP	417–1604	1
XU23	Socket, 8–Pin DIP	417–0804	1
XU24	Socket, 14–Pin DIP	417–1404	1
——	Insulator, Heatsink Mount, Left Side	407–0081	1
——	Insulator, Heatsink Mount, Right Side	407–0081–001	1
——	Shoulder Washer, Insulator, No. 4	407–0132	10
——	Insulator, TO–220 Transistor	409–7403	10
——	Frequency Converter Circuit Board Assembly	917–0056	1
——	Blank Circuit Board	517–0055	1

TABLE 6–10. FREQUENCY CONVERTER CIRCUIT BOARD ASSEMBLY – 917–0056
(Sheet 1 of 2)

REF. DES.	DESCRIPTION	PART NO.	QTY.
C1 THRU C3	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003–1054	3
C4	Capacitor, Electrolytic, 10 uF, 35V	023–1076	1
C5	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003–1054	1
C6	Capacitor, Electrolytic, 10 uF, 35V	023–1076	1
C7	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003–1054	1
C8	Capacitor, Mica, 620 pF ±5%, 300V	040–6223	1
C9,C10	Capacitor, Mica, 68 pF ±5%, 500V	040–6813	2
C11	Capacitor, Mica, 330 pF ±5%, 500V	042–3322	1
C12	Capacitor, Mica, 250 pF ±5%, 500V	042–2522	1
C13,C14	Capacitor, Mica, 39 pF ±5%, 500V	042–3912	2
C15	Capacitor, Mica, 620 pF ±5%, 300V	040–6223	1
C16,C17	Capacitor, Mica, 24 pF ±5%, 500V	040–2413	2
C18	Capacitor, Mica, 620 pF ±5%, 300V	040–6223	1
C19,C20	Capacitor, Mica, 47 pF ±5%, 500V	040–4713	2
C21	Capacitor, Mica, 620 pF ±5%, 300V	040–6223	1
C22 THRU C24	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003–1054	3
C25	Capacitor, Electrolytic, 10 uF, 35V	023–1076	1
C26,C27	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003–1054	2
C28	Capacitor, Electrolytic, 10 uF, 35V	023–1076	1
C29 THRU C32	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	023–1054	4
J24 THRU J36	Receptacle Single Pin, Male	417–0119	13
L1 THRU L5	Coil, Adjustable, 1.5 uH ±10%, Working Voltage: 300V DC DC Resistance: 0.1 Ohm	360–0052	5
L6,L7	RF Choke, 910 uH ±5%, 15.8 Ohms DC Resistance, 79 mA Maximum	360–0047	2
Q1,Q2	Transistor, 2N3904, NPN, Silicon, TO–92 Case	211–3904	2
R1	Resistor, 680 k Ohm ±5%, 1/4W	100–6863	1
R2	Potentiometer, 10 k Ohm ±10%, 1/2W	177–1055	1
R3 THRU R6	Resistor, 1 k Ohm ±5%, 1/4W	100–1043	4
R7	Resistor, 10 Ohm ±5%, 1/4W	100–1023	1
R8	Resistor, 470 Ohm ±5%, 1/4W	100–4733	1
R9	Resistor, 6.8 k Ohm ±5%, 1/4W	100–6843	1
R10	Resistor, 620 Ohm ±5%, 1/4W	100–6233	1
R11	Resistor, 10 Ohm ±5%, 1/4W	100–1023	1
R12	Resistor, 620 Ohm ±5%, 1/4W	100–6233	1
R13	Resistor, 680 k Ohm ±5%, 1/4W	100–6863	1
R14	Resistor, 5.1 k Ohm ±5%, 1/4W	100–5143	1
R15,R16	Resistor, 510 Ohm ±5%, 1/4W	100–5133	2
R17,R18	Resistor, 1 k Ohm ±5%, 1/4W	100–1043	2
R19	Resistor, 10 Ohm ±5%, 1/4W	100–1023	1
R20	Resistor, 1.5 k Ohm ±5%, 1/4W	100–1543	1
R21	Resistor, 18 k Ohm ±5%, 1/4W	100–1853	1
R22	Resistor, 10 Ohm ±5%, 1/4W	100–1023	1
R23,R24	Resistor, 3.3 k Ohm ±5%, 1/4W	100–3343	2
R25,R26	Resistor, 150 Ohm ±5%, 1/4W	100–1533	2
R27	Resistor, 5.1 k Ohm ±5%, 1/4W	100–5143	1

TABLE 6–10. FREQUENCY CONVERTER CIRCUIT BOARD ASSEMBLY – 917–0056
(Sheet 2 of 2)

REF. DES.	DESCRIPTION	PART NO.	QTY.
T1,T2	Wideband RF Transformer, 0.7 to 200 MHz PRIMARY: Impedance: 50 Ohms Maximum Current: 0.1A Maximum Power: 0.5W SECONDARY: Impedance: 100 Ohms, Center–tapped	370–0016	2
U1,U2	Integrated Circuit, Balanced Modulator/Demodulator, MC1596L, 14–Pin DIP	220–1596	2
XU1,XU2	Socket, 14–Pin DIP	417–1404	2
——	Blank Circuit Board	517–0056	1

TABLE 6–11. WIRING HARNESS ASSEMBLY – 947–0151

REF. DES.	DESCRIPTION	PART NO.	QTY.
P1,P6	Plug, Housing, 20 Contact	417–0122	2
P8	Plug, Housing, 14 Contact	417–1401	1
P10	Plug, Ribbon Cable, Dual 13 Contact	418–2600	1
P11,P13	Plug, Housing, 8 Contact	417–0046	2
P15	Plug, Housing, 16 Contact	417–0123	1
P16	Plug, Housing, 8 Contact	417–0046	1
P37	Plug, Housing, 2 Contact	417–0499	1
P39	Plug, Housing, 12 Contact	418–1271	1
P42	Plug, Ribbon Cable, Dual 13 Contact	418–2600	1
P44	Plug, Housing, 8 Contact	417–0046	1
P51	Plug, Housing, 2 Contact	417–0499	1
P61	Connector Housing, 4–Pin In–Line	417–0138	1
——	Pins for P39	417–0053	12
——	Pins for P1,P6,P8,P11,P13,P15,P16,P44	417–8766	103

TABLE 6–12. ACCESSORY PARTS KIT – 957–0001

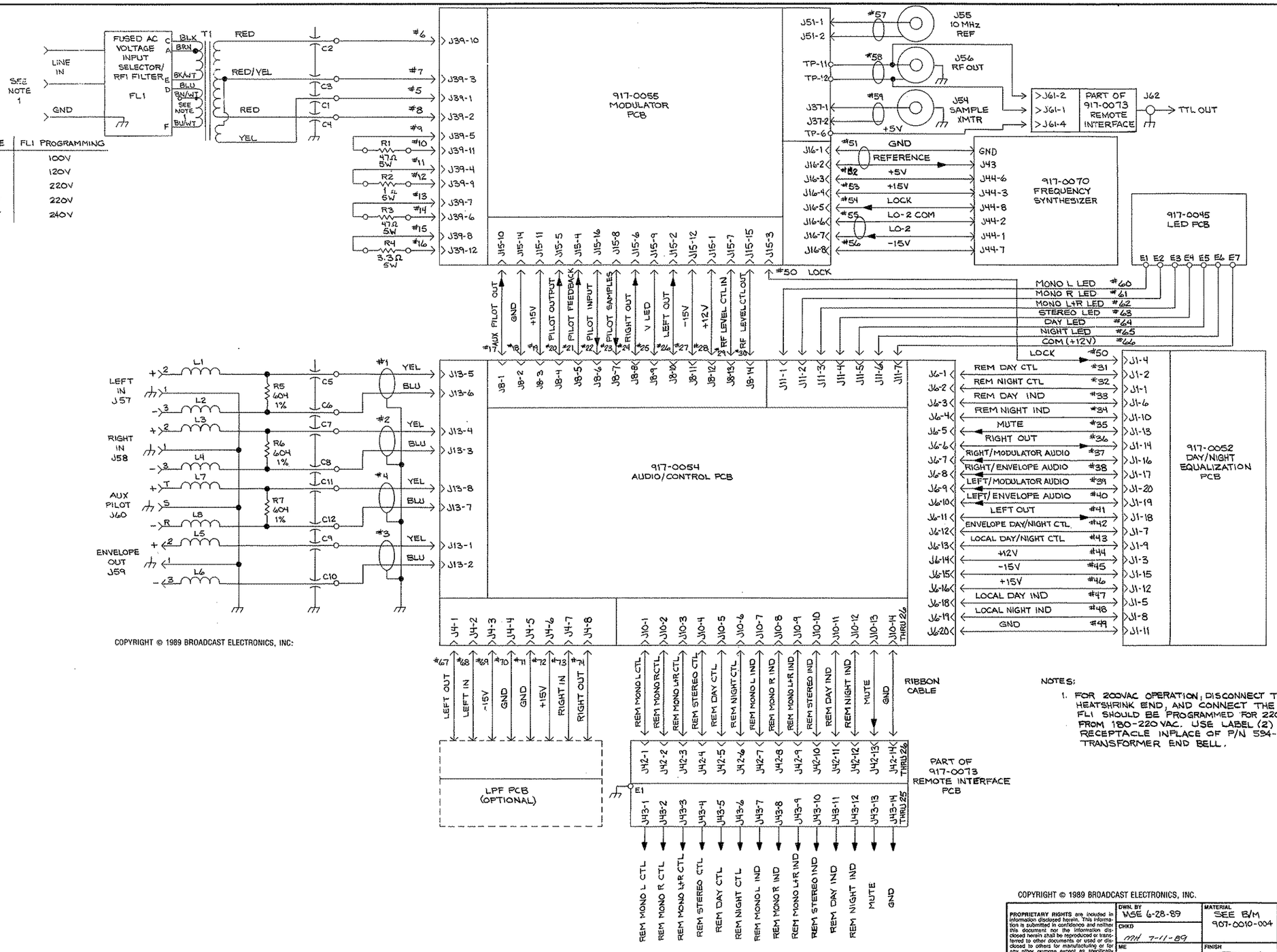
REF. DES.	DESCRIPTION	PART NO.	QTY.
P43	Plug, 25–Pin (for REMOTE Receptacle)	418–3219	1
P57,P58	Plug, Male, 3–Pin, XLR Type (for LEFT IN, RIGHT IN Receptacles)	829–4217	2
P59	Plug, Female, 3–Pin, XLR Type (for ENVELOPE OUT Receptacle)	829–4216	1
S1,S2,S3	Switch, SPST, 4–Position, 8–Pin DIP	340–0002	3
——	Hood for P43	418–3223	1
	For 117V 50/60 Hz		
F1,SPARE	Fuse, AGC, 1A, 250V, Slow–Blow	334–0100	2
——	AC Line Cord, N.E.M.A. 3–Wire Plug	682–0001	1
	For 220V 50/60 Hz		
F1,SPARE	Fuse, AGC, 1/2A, 250V, Slow–Blow	334–0050	2
——	AC Line Cord, CEE 7/7 3–Wire European Plug	682–0003	1

SECTION VII
DRAWINGS

7–1. INTRODUCTION.

7–2. This section provides assembly drawings, wiring diagrams, and schematic diagrams as listed below for the Broadcast Electronics AX–10 AM Stereo Exciter.

FIGURE	TITLE	NUMBER
7–1	SCHEMATIC DIAGRAM, AX–10 OVERALL	SD907–0010–004
7–2	ASSEMBLY DIAGRAM, AX–10 OVERALL	597–0095–53
7–3	SCHEMATIC DIAGRAM, DAY/NIGHT EQUALIZATION CIRCUIT BOARD	SD917–0052
7–4	ASSEMBLY DIAGRAM, DAY/NIGHT EQUALIZATION CIRCUIT BOARD	AD917–0052
7–5	COMPONENT LOCATOR, DAY/NIGHT EQUALIZATION CIRCUIT BOARD	597–0095–50
7–6	SCHEMATIC DIAGRAM, AUDIO CONTROL CIRCUIT BOARD	SD917–0054
7–7	ASSEMBLY DIAGRAM, AUDIO CONTROL CIRCUIT BOARD	AD917–0054
7–8	COMPONENT LOCATOR, AUDIO CONTROL CIRCUIT BOARD	597–0095–51
7–9	SCHEMATIC DIAGRAM, REMOTE INTERFACE CIRCUIT BOARD	SC917–0073
7–10	ASSEMBLY DIAGRAM, REMOTE INTERFACE CIRCUIT BOARD	AC917–0073
7–11	SCHEMATIC DIAGRAM, MODULATOR CIRCUIT BOARD	SD917–0055
7–12	ASSEMBLY DIAGRAM, MODULATOR CIRCUIT BOARD	AD917–0055
7–13	COMPONENT LOCATOR, MODULATOR CIRCUIT BOARD	597–0095–52
7–14	SCHEMATIC DIAGRAM, FREQUENCY CONVERTER MODULE	SC917–0056
7–15	ASSEMBLY DIAGRAM, FREQUENCY CONVERTER MODULE	AC917–0056
7–16	SCHEMATIC DIAGRAM, FREQUENCY SYNTHESIZER	SD917–0070
7–17	ASSEMBLY DIAGRAM, FREQUENCY SYNTHESIZER	AD917–0070
7–18	SCHEMATIC DIAGRAM, 60 MHz VCO MODULE	SC917–0061
7–19	ASSEMBLY DIAGRAM, 60 MHz VCO MODULE	AC917–0061



LINE VOLTAGE	FL1 PROGRAMMING
90-110V	100V
108-133V	120V
180-220V	220V
205-242V	220V
215-266V	240V

NOTES:

1. FOR 200VAC OPERATION, DISCONNECT THE BLUE WIRE FROM FL1-D, HEATSHRINK END, AND CONNECT THE BRN/WHT WIRE TO FL1-D. FL1 SHOULD BE PROGRAMMED FOR 220V, BUT WILL NOW OPERATE FROM 180-220 VAC. USE LABEL (2) P/N 594-0200, ONE OVER IEC RECEPTACLE INPLACE OF P/N 594-0099, ONE MOUNTED ON TRANSFORMER END BELL.

TOLERANCE (DECIMAL) U.O.S.
.x ± .030 .xxx ± .005
.xx ± .015 ANGLES ± 1°

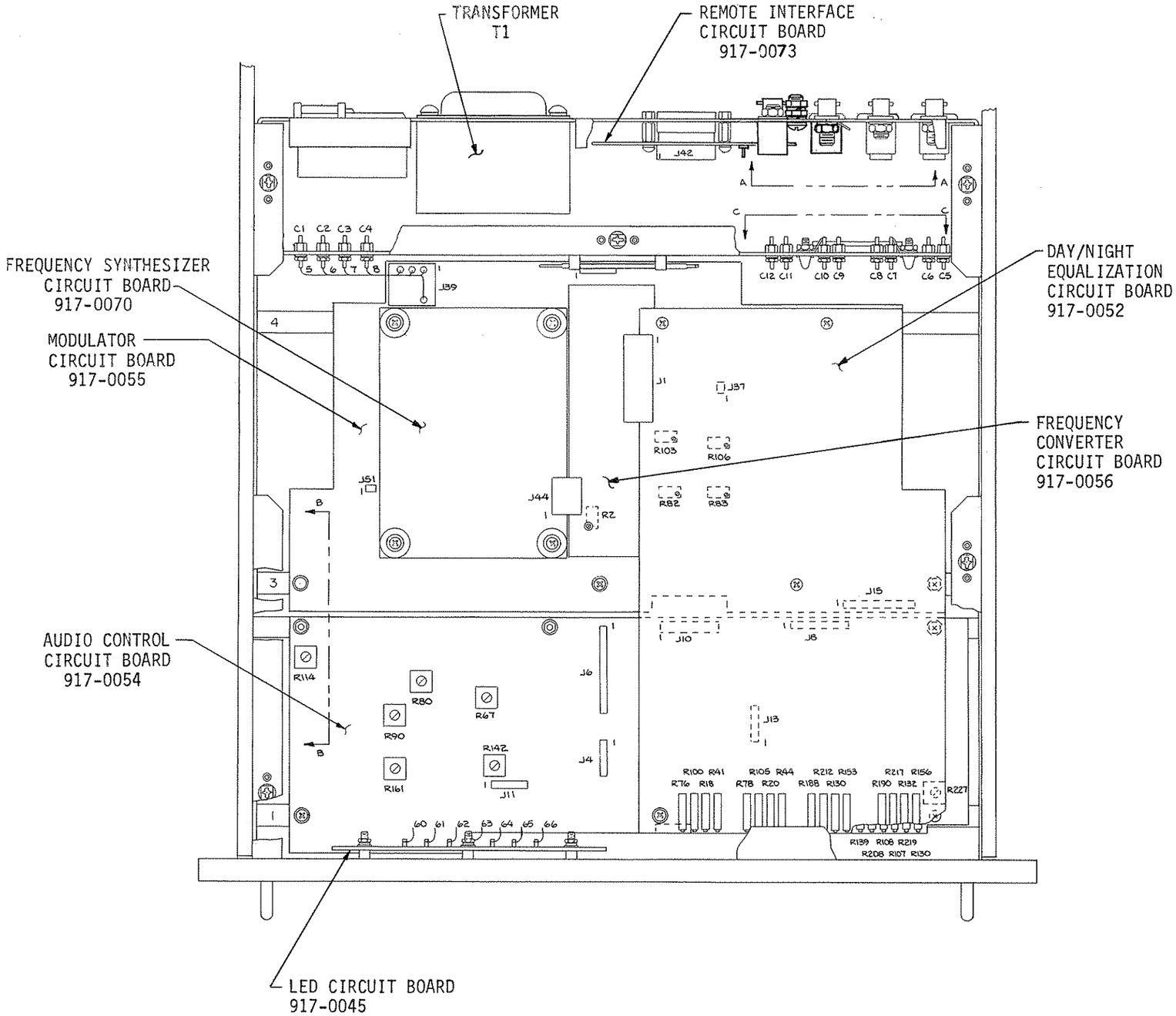
DWN. BY WSE 6-28-89
CHKD MH 7-11-89
ME
PROJ. ENGR. 6-28-89
MFG. 6-28-89
MATERIAL SEE B/M 907-0010-004
FINISH
NEXT ASSY.

BROADCAST ELECTRONICS INC.
4100 N. 24TH ST., P.O.BOX 3606 QUINCY, IL 62305 217/224-9600
TELEX 250142 CABLE BROADCAST

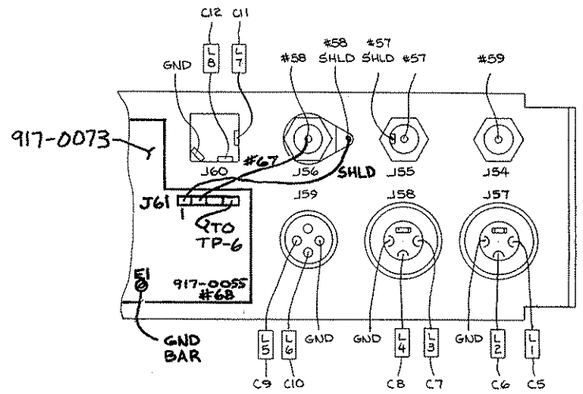
TITLE SCHEMATIC, AX-10 OVERALL

TYPE S | SIZE D | DWG. NO. 907-0010-004 | REV B

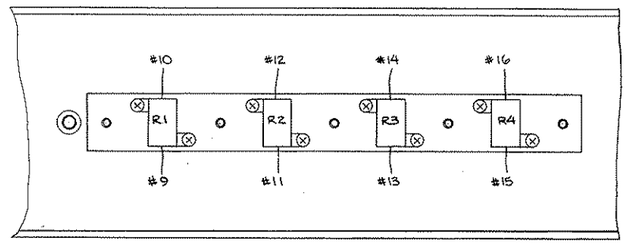
MODEL AX-10 | SCALE — | SHEET 1 OF 1



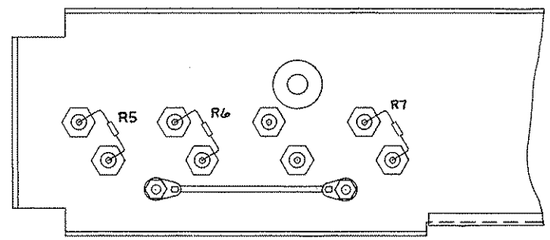
DETAIL A-A



DETAIL B-B

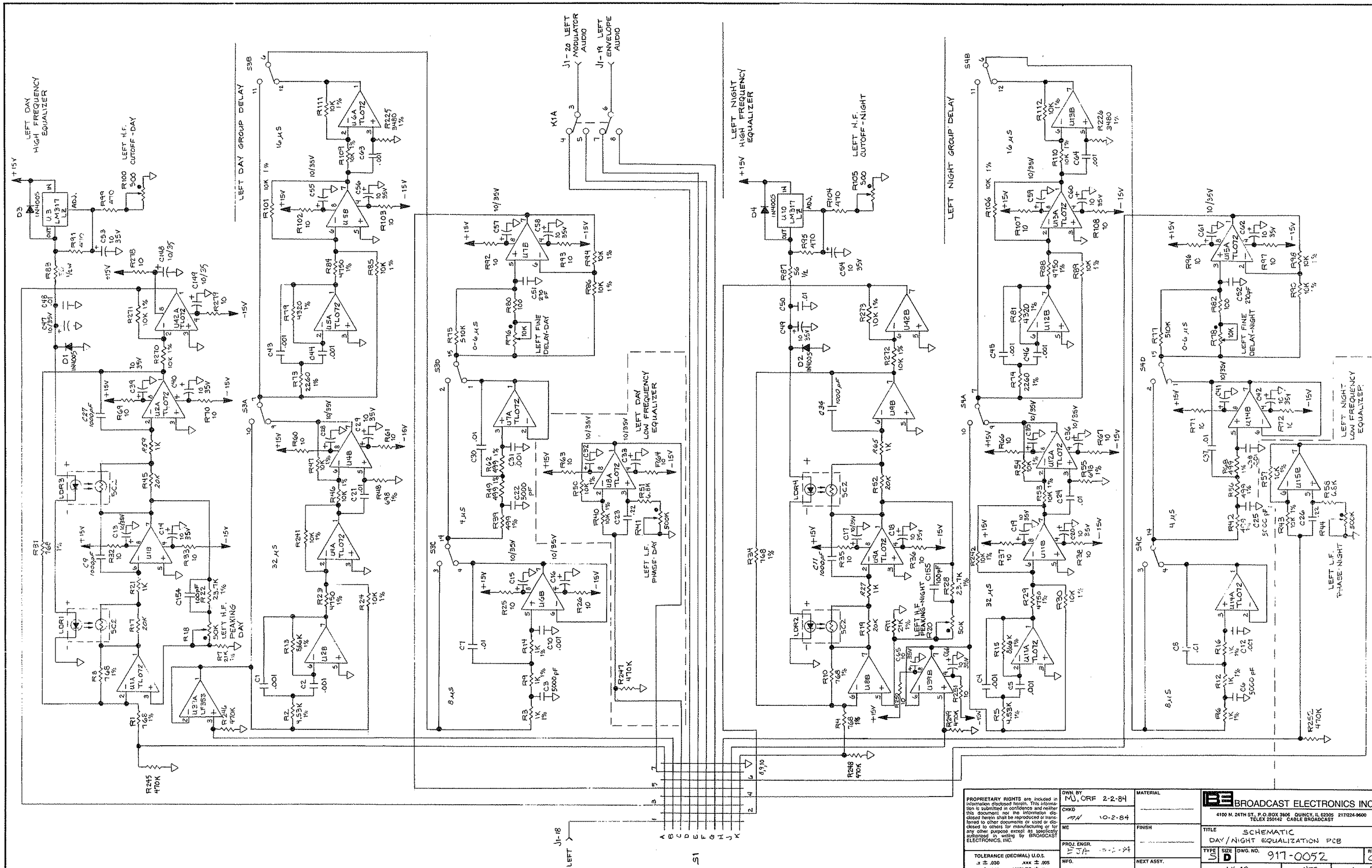


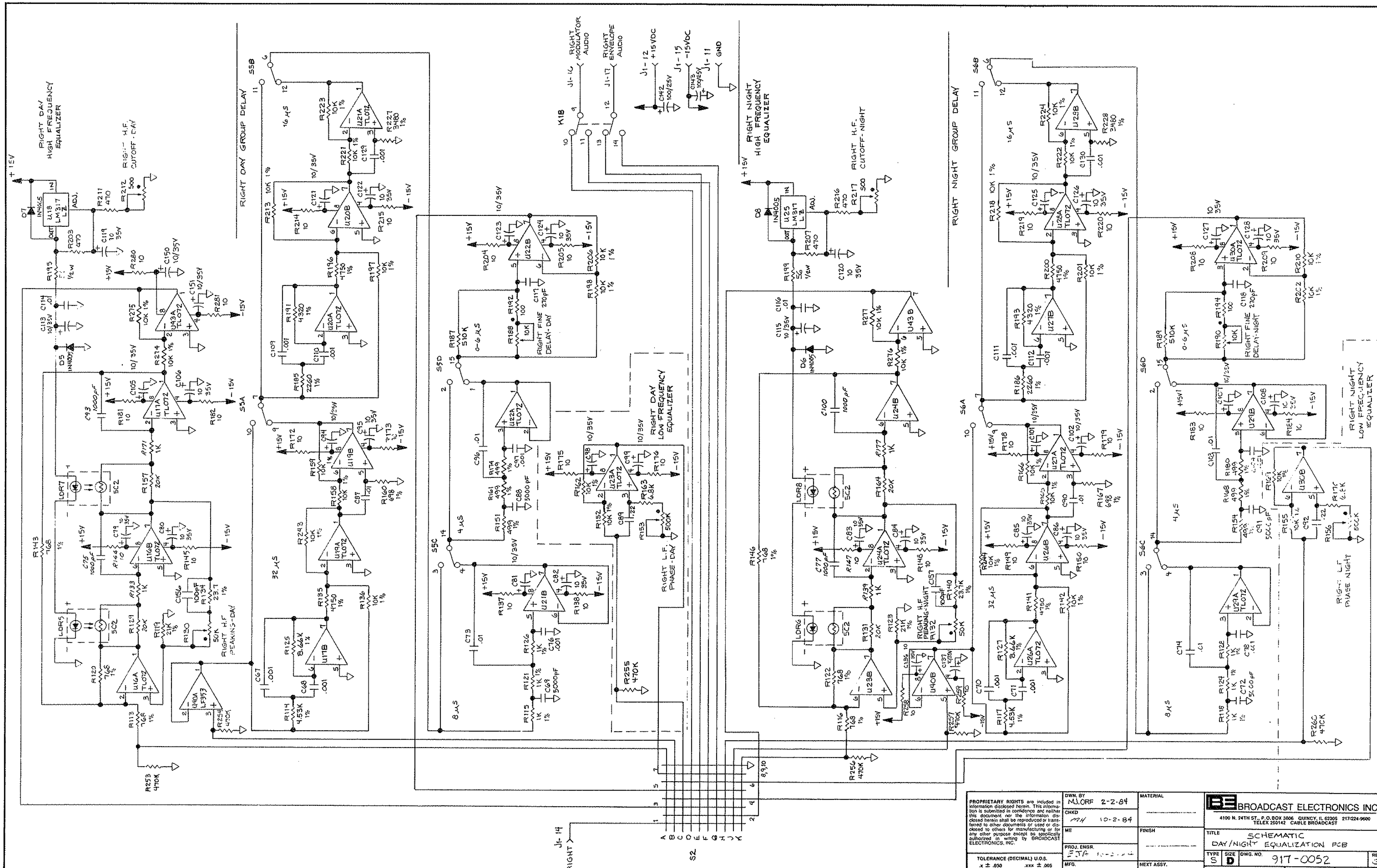
DETAIL C-C



597-0095-53

FIGURE 7-2.
ASSEMBLY DIAGRAM, AX-10 OVERALL


LEFT DAY HIGH FREQUENCY EQUALIZER
LEFT H.F. CUTOFF-DAY
LEFT DAY GROUP DELAY
J1-20 LEFT MODULATOR AUDIO
J1-19 LEFT ENVELOPE AUDIO
K1A
LEFT NIGHT HIGH FREQUENCY EQUALIZER
LEFT H.F. CUTOFF-NIGHT
LEFT NIGHT GROUP DELAY
LEFT FINE DELAY-DAY
LEFT DAY LOW FREQUENCY EQUALIZER
LEFT L.F. PHASE-DAY
LEFT H.F. PEAKING DAY
LEFT FINE DELAY-NIGHT
LEFT NIGHT LOW FREQUENCY EQUALIZER
LEFT L.F. PHASE-NIGHT
LEFT H.F. PEAKING-NIGHT
J1-18 LEFT
S1
PROPRIETARY RIGHTS are included in information disclosed herein. This information is submitted in confidence and neither this document nor the information disclosed herein shall be reproduced or transferred to other documents or used or disclosed to others for manufacturing or for any other purpose except as specifically authorized in writing by BROADCAST ELECTRONICS, INC.
TOLERANCE (DECIMAL) U.O.S.
.x ± .030 .xxx ± .005
.xx ± .015 ANGLES ± 1°
DWN. BY MJ, ORF 2-2-84
CHKD MH 10-2-84
ME
PROJ. ENGR. EJA
MFG.
MATERIAL
FINISH
NEXT ASSY.
BE BROADCAST ELECTRONICS INC.
4100 N. 24TH ST., P.O. BOX 3606 QUINCY, IL 62305 217/224-9600
TELEX 250142 CABLE BROADCAST
TITLE SCHEMATIC
DAY / NIGHT EQUALIZATION PCB
TYPE S
SIZE D
DWG. NO. 917-0052
REV G
MODEL AX-10
SCALE NTS
SHEET 1 OF 3



PROPRIETARY RIGHTS are included in information disclosed herein. This information is submitted in confidence and neither this document nor the information disclosed herein shall be reproduced or transferred to other documents or used or disclosed to others for manufacturing or for any other purpose except as specifically authorized in writing by BROADCAST ELECTRONICS, INC.

TOLERANCE (DECIMAL) U.O.S.
.x ± .030 .xxx ± .005
.xx ± .015 ANGLES ± 1°

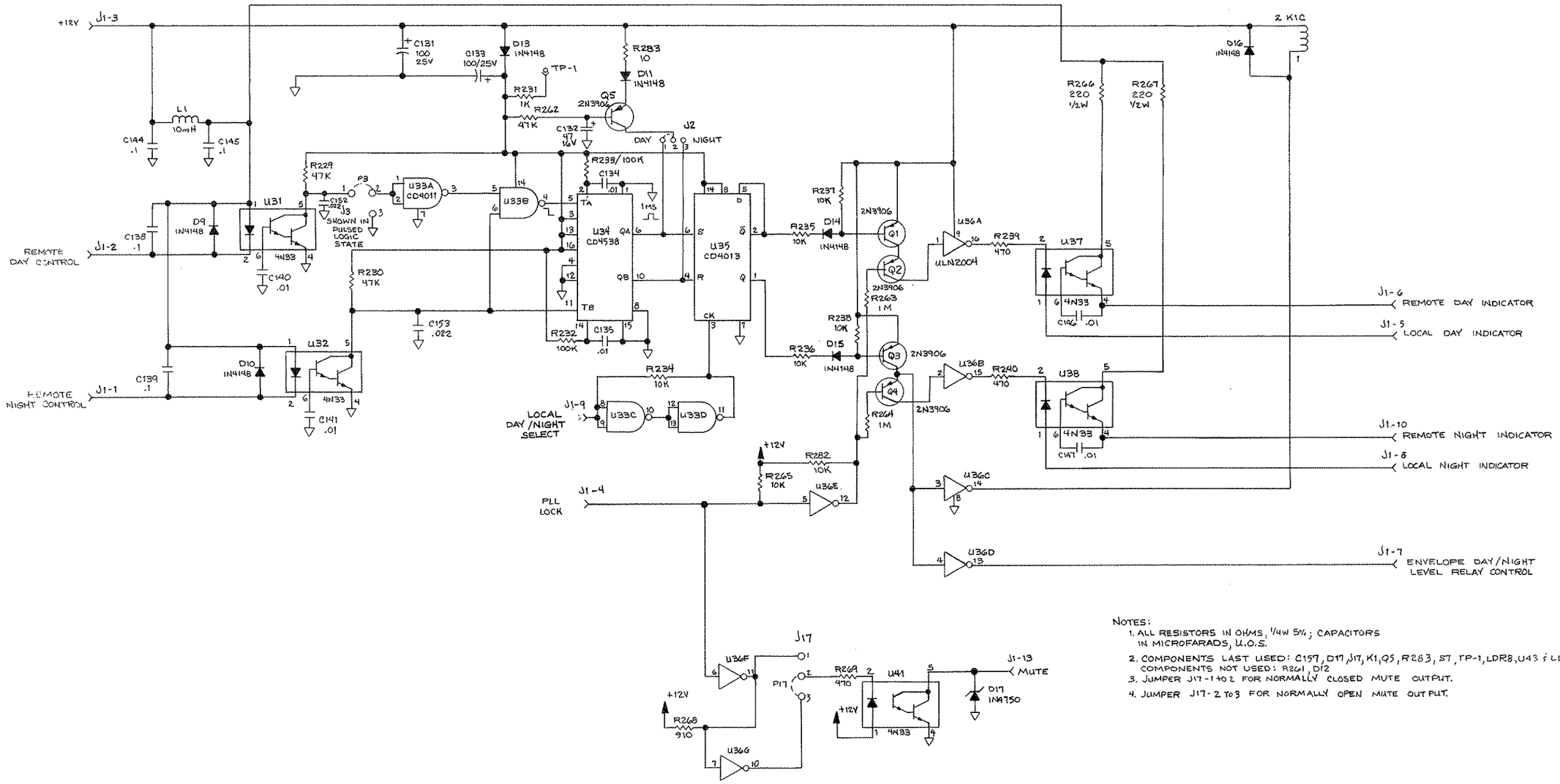
DWN. BY	MJ.ORF 2-2-84
CHKD	MH 10-2-84
ME	
PROJ. ENGR.	EJA [illegible]
MFG.	
MATERIAL	
FINISH	
NEXT ASSY.	

BE BROADCAST ELECTRONICS INC.
4100 N. 24TH ST., P.O. BOX 3606 QUINCY, IL 62305 217/224-9600
TELEX 250142 CABLE BROADCAST

TITLE SCHEMATIC
DAY/NIGHT EQUALIZATION PCB

TYPE	SIZE	DWG. NO.	REV
S	D	917-0052	G

MODEL AX-10 SCALE NTS SHEET 2 OF 3



NOTES:

1. ALL RESISTORS IN OHMS, 1/4W 5%; CAPACITORS IN MICROFARADS, U.O.S.
2. COMPONENTS LAST USED: C157, D17, J17, K1, Q5, R283, S7, TP-1, LDR8, U43 & L1.
   COMPONENTS NOT USED: R261, D12
3. JUMPER J17-1 TO 2 FOR NORMALLY CLOSED MUTE OUTPUT.
4. JUMPER J17-2 TO 3 FOR NORMALLY OPEN MUTE OUTPUT.

TOLERANCE (DECIMAL) U.O.S.
.x ± .030 .xxx ± .005
.xx ± .015 ANGLES ± 1°

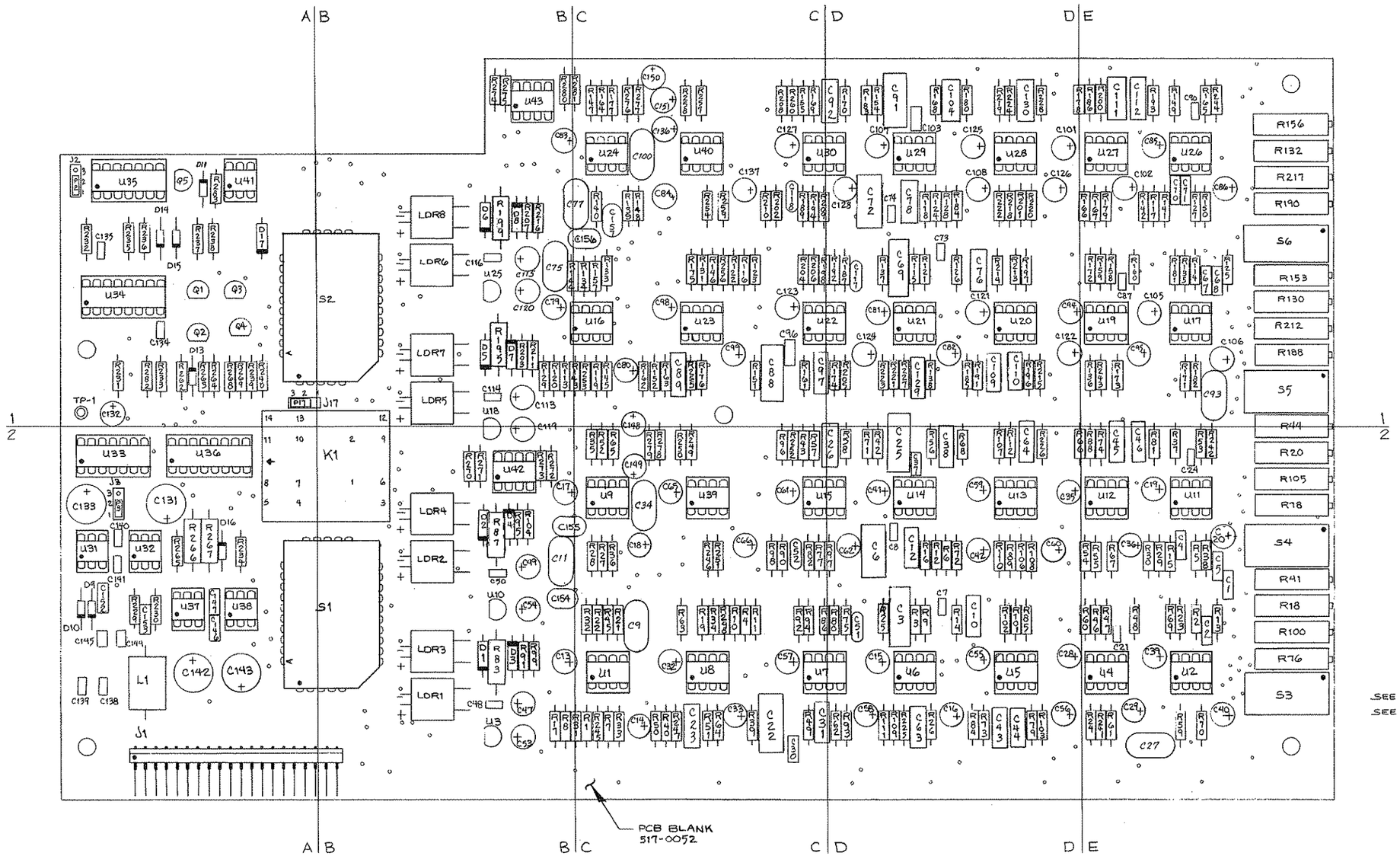
DWN. BY	MJ. ORF 2-3-84
CHKD	MH 10-2-84
ME	
PROJ. ENGR.	EJL 10-2-84
MFG.	
MATERIAL	
FINISH	
NEXT ASSY.	

BROADCAST ELECTRONICS INC.
4100 N. 24TH ST., P.O. BOX 3606 QUINCY, IL 62305 217/224-9600
TELEX 250142 CABLE BROADCAST

TITLE SCHEMATIC
DAY/NIGHT EQUALIZATION PCB

TYPE S | SIZE D | DWG. NO. 917-0052 | REV G

MODEL AX-10 | SCALE NTS | SHEET 3 OF 3



SEE SCHEMATIC # SD917-0052
SEE B/M # 917-0052

TOLERANCE (DECIMAL) U.O.S.
.x ± .030 .xxx ± .005
.xx ± .015 ANGLES ± 1°

DWN. BY	M. ORF 3-9-84	MATERIAL
CHKD	10-2-84	
ME		FINISH
PROJ. ENGR.	EJA 10-2-84	
MFG.		NEXT ASSY.

BROADCAST ELECTRONICS INC.
4100 N. 24TH ST., P.O. BOX 3505 QUINCY, IL 62305 217/224-9600
TELEX 250142 CABLE BROADCAST

TITLE ASSEMBLY DAUGHTER EXPANSION PCB

TYPE	SIZE	DWG. NO.	REV
A	D	917-0052	H

MODEL AM | SCALE 2:1 | SHEET 1 OF 1

REF	ZONE	REF	ZONE	REF	ZONE	REF	ZONE	REF	ZONE
C1	E2	C50	B2	C99	C1	C148	C1–C2	R2	E2
C2	E2	C51	D2	C100	C1	C149	C2	R3	D2
C3	D2	C52	C2	C101	D1	C150	C1	R4	C2
C4	E2	C53	B2	C102	E1	C151	C1	R5	E2
C5	E2	C54	B2	C103	D1	C152	A2	R6	D2
C6	D2	C55	D2	C104	D1	C153	A2	R7	C2
C7	D2	C56	D2	C105	E1	C154	B2–C2	R8	B2
C8	D2	C57	C2	C106	E1	C155	B2–C2	R9	D2
C9	C2	C58	D2	C107	D1	C156	B1–C1	R10	C2
C10	D2	C59	D2	C108	D1	C157	C1	R11	C2
C11	B2	C60	D2	C109	D1	D1	B2	R12	D2
C12	D2	C61	C2	C110	D1	D2	B2	R13	E2
C13	B2	C62	D2	C111	E1	D3	B2	R14	D2
C14	C2	C63	D2	C112	E1	D4	B2	R15	E2
C15	D2	C64	D1–D2	C113	B1	D5	B1	R16	D2
C16	D2	C65	C2	C114	B1	D6	B1	R17	B2
C17	B2	C66	C2	C115	B1	D7	B1	R18	E2
C18	C2	C67	E1	C116	B1	D8	B1	R19	C2
C19	E2	C68	E1	C117	D1	D9	A2	R20	E2
C20	E2	C69	D1	C118	C1	D10	A2	R21	C2
C21	E2	C70	E1	C119	B1–B2	D11	A1	R22	C2
C22	C2	C71	E1	C120	B1	D13	A1	R23	E2
C23	C2	C72	D1	C121	D1	D14	A1	R24	E2
C24	E2	C73	D1	C122	D1	D15	A1	R25	D2
C25	D1–D2	C74	D1	C123	C1	D16	A2	R26	D2
C26	D2	C75	B1	C124	D1	D17	A1	R27	C2
C27	E2	C76	D1	C125	D1	J1	A2–B2	R28	C2
C28	D2	C77	B1–C1	C126	D1	J2	A1	R29	E2
C29	E2	C78	D1	C127	C1	J3	A2	R30	E2
C30	C2	C79	B1	C128	D1	J17	A1	R31	C2
C31	C2	C80	C1	C129	D1	K1	A2–B2	R32	C2
C32	C2	C81	D1	C130	D1	L1	A2	R33	C2
C33	C2	C82	D1	C131	A2	LDR1	B2	R34	C2
C34	C2	C83	B1	C132	A1	LDR2	B2	R35	C2
C35	D2	C84	C1	C133	A2	LDR3	B2	R36	C2
C36	E2	C85	E1	C134	A1	LDR4	B2	R37	E2
C37	D2	C86	E1	C135	A1	LDR5	B1	R38	E2
C38	D2	C87	E1	C136	C1	LDR6	B1	R39	C2
C39	E2	C88	C1	C137	C1	LDR7	B1	R40	C2
C40	E2	C89	C1	C138	A2	LDR8	B1	R41	E2
C41	D2	C90	E1	C139	A2	P2	A1	R42	D2
C42	D2	C91	D1	C140	A2	P3	A2	R43	C2
C43	D2	C92	C1–D1	C141	A2	P17	A1	R44	E1–E2
C44	D2	C93	E1	C142	A2	Q1	A1	R45	C2
C45	E1–E2	C94	D1	C143	A2	Q2	A1	R46	E2
C46	E1–E2	C95	E1	C144	A2	Q3	A1	R47	E2
C47	B2	C96	C1	C145	A2	Q4	A1	R48	E2
C48	B2	C97	C1	C146	A2	Q5	A1	R49	C2
C49	B2	C98	C1	C147	A2	R1	C2	R50	C2

597–0095–50

FIGURE 7–5. COMPONENT LOCATOR, DAY/NIGHT EQUALIZATION CIRCUIT BOARD (Sheet 1 of 3)

REF	ZONE	REF	ZONE	REF	ZONE	REF	ZONE	REF	ZONE
R51	C2	R100	E2	R149	E1	R198	C1	R247	C2
R52	C2	R101	D2	R150	E1	R199	B1	R248	C2
R53	E2	R102	D2	R151	C1	R200	E1	R249	C2
R54	E2	R103	D2	R152	C1	R201	D1	R250	C2
R55	E2	R104	B2	R153	E1	R202	C1	R251	C2
R56	D2	R105	E2	R154	D1	R203	B1	R252	C2
R57	C2	R106	D2	R155	C1	R204	C1	R253	C1
R58	D2	R107	D2	R156	E1	R205	D1	R254	C1
R59	E2	R108	D2	R157	C1	R206	C1	R255	C1
R60	E2	R109	D2	R158	E1	R207	B1	R256	C1
R61	E2	R110	D2	R159	E1	R208	C1	R257	C1
R62	D2	R111	D2	R160	E1	R209	C1	R258	C1
R63	C2	R112	D2	R161	C1	R210	C1	R259	C1
R64	C2	R113	B1	R162	C1	R211	B1	R260	C1
R65	C2	R114	E1	R163	C1	R212	E1	R262	A1
R66	D2–E2	R115	D1	R164	C1	R213	D1	R263	A1
R67	E2	R116	C1	R165	E1	R214	D1	R264	A1
R68	D2	R117	E1	R166	E1	R215	D1	R265	A2
R69	E2	R118	D1	R167	E1	R216	B1	R266	A2
R70	E2	R119	C1	R168	D1	R217	E1	R267	A2
R71	D2	R120	B1	R169	C1	R218	D1	R268	A1
R72	D2	R121	D1	R170	D1	R219	D1	R269	A1
R73	D2	R122	C1	R171	E1	R220	D1	R270	B2
R74	E2	R123	C1	R172	E1	R221	D1	R271	B2
R75	D2	R124	D1	R173	E1	R222	D1	R272	B2
R76	E2	R125	E1	R174	D1	R223	D1	R273	B2
R77	C2	R126	D1	R175	C1	R224	D1	R274	B1
R78	E2	R127	E1	R176	C1	R225	D2	R275	B1
R79	D2	R128	D1	R177	C1	R226	D2	R276	C1
R80	D2	R129	B1	R178	D1–E1	R227	D1	R277	C1
R81	E2	R130	E1	R179	E1	R228	D1	R278	C2
R82	C2	R131	C1	R180	D1	R229	A2	R279	C2
R83	B2	R132	E1	R181	E1	R230	A2	R280	B1
R84	D2	R133	C1	R182	E1	R231	A1	R281	B1–C1
R85	D2	R134	C1	R183	D1	R232	A1	R282	A1
R86	C2	R135	E1	R184	D1	R233	A1	R283	A1
R87	B2	R136	E1	R185	D1	R234	A2	S1	A2–B2
R88	E2	R137	D1	R186	E1	R235	A1	S2	A1–B1
R89	D2	R138	D1	R187	D1	R236	A1	S3	E2
R90	C2	R139	C1	R188	E1	R237	A1	S4	E2
R91	B2	R140	C1	R189	C1	R238	A1	S5	E1
R92	C2	R141	E1	R190	E1	R239	A1	S6	E1
R93	D2	R142	E1	R191	D1	R240	A1	TP1	A1
R94	C2	R143	B1–C1	R192	D1	R241	E2	U1	C2
R95	B2	R144	C1	R193	E1	R242	E2	U2	E2
R96	C2	R145	C1	R194	C1	R243	E1	U3	B2
R97	D2	R146	C1	R195	B1	R244	E1	U4	E2
R98	C2	R147	C1	R196	D1	R245	C2	U5	D2
R99	B2	R148	C1	R197	D1	R246	C2	U6	D2

597–0095–50

FIGURE 7–5. COMPONENT LOCATOR, DAY/NIGHT EQUALIZATION CIRCUIT BOARD
(Sheet 2 of 3)

REF	ZONE	REF	ZONE	REF	ZONE	REF	ZONE	REF	ZONE
U7	C2–D2								
U8	C2								
U9	C2								
U10	B2								
U11	E2								
U12	E2								
U13	D2								
U14	D2								
U15	C2–D2								
U16	C1								
U17	E1								
U18	B1–B2								
U19	E1								
U20	D1								
U21	D1								
U22	C1–D1								
U23	C1								
U24	C1								
U25	B1								
U26	E1								
U27	E1								
U28	D1								
U29	D1								
U30	C1–D1								
U31	A2								
U32	A2								
U33	A2								
U34	A1								
U35	A1								
U36	A2								
U37	A2								
U38	A2								
U39	C2								
U40	C1								
U41	A1								
U42	B2								
U43	B1								

597–0095–50

FIGURE 7–5. COMPONENT LOCATOR, DAY/NIGHT EQUALIZATION CIRCUIT BOARD (Sheet 3 of 3)

LEFT INPUT 2.45 VRMS NOM.

RIGHT INPUT

AUX PILOT

LPF BYPASS SEE NOTES 5 & 6 THIS SHEET

J4 INTERCONNECT TO AUDIO LPF ASSY XXX-XXXX

GAIN MATCH

LIMITER TRACKING

DS1 SCL ENABLED

S7F SINGLE CHANNEL LIMITER (SCL) OFF

J6-6 RIGHT OUTPUT TO EQ PCB

J6-2 RIGHT

J6-4 LEFT

J6-11 LEFT OUTPUT TO EQ PCB

J6-16 +15V

J6-15 -15V

J6-20 GND

J8-1 AUX PILOT OUT

J8-2 GND

J8-3 +15V SOURCE

J8-11 -15V SOURCE

LDR1 5C2

90% L-R THRESHOLD

NOTES: (APPLY TO ALL PAGES)

1. ALL RESISTORS IN OHMS, 1/8 W, 5% ; ALL CAPACITORS IN MICROFARADS UNLESS OTHERWISE SPECIFIED.
2. (#) - DENOTES CONTINUING CIRCUITRY CONNECTIONS ON APPLICABLE DWG SHEETS.
3. * - DENOTES DELETED COMPONENTS ON APPLICABLE ASSEMBLIES.
4. ● (DOT) DENOTES TRIMPOT WIPER LOCATION FOR FULL CLOCKWISE ROTATION.
5. JUMPER J5-1 AND J5-2, J5-5 AND J5-6 TO BYPASS LPF.
6. JUMPER J5-2 AND J5-3, J5-4 AND J5-5 TO ENABLE LPF.
7. LAST COMPONENTS USED; C105, D50, DS15, E9, J45, K3, L3, Q12, R236, S8, U40, LDR1.
8. COMPONENTS NOT USED: J1-13, J14-J43, S1-S6, D45, C58, C61, C64, L1 & L2.
9. SEE PCB ASSEMBLY #AB917-0054 ; #AB917-0053 ; #AB917-0045

TOLERANCE (DECIMAL) U.O.S. .x ± .030 .xxx ± .005 .xx ± .015 ANGLES ± 1°

DWN. BY MERKEL 2-29-84
CHKD MH 10-4-84
ME
PROJ. ENGR. EJA 10-4-84
MFG.

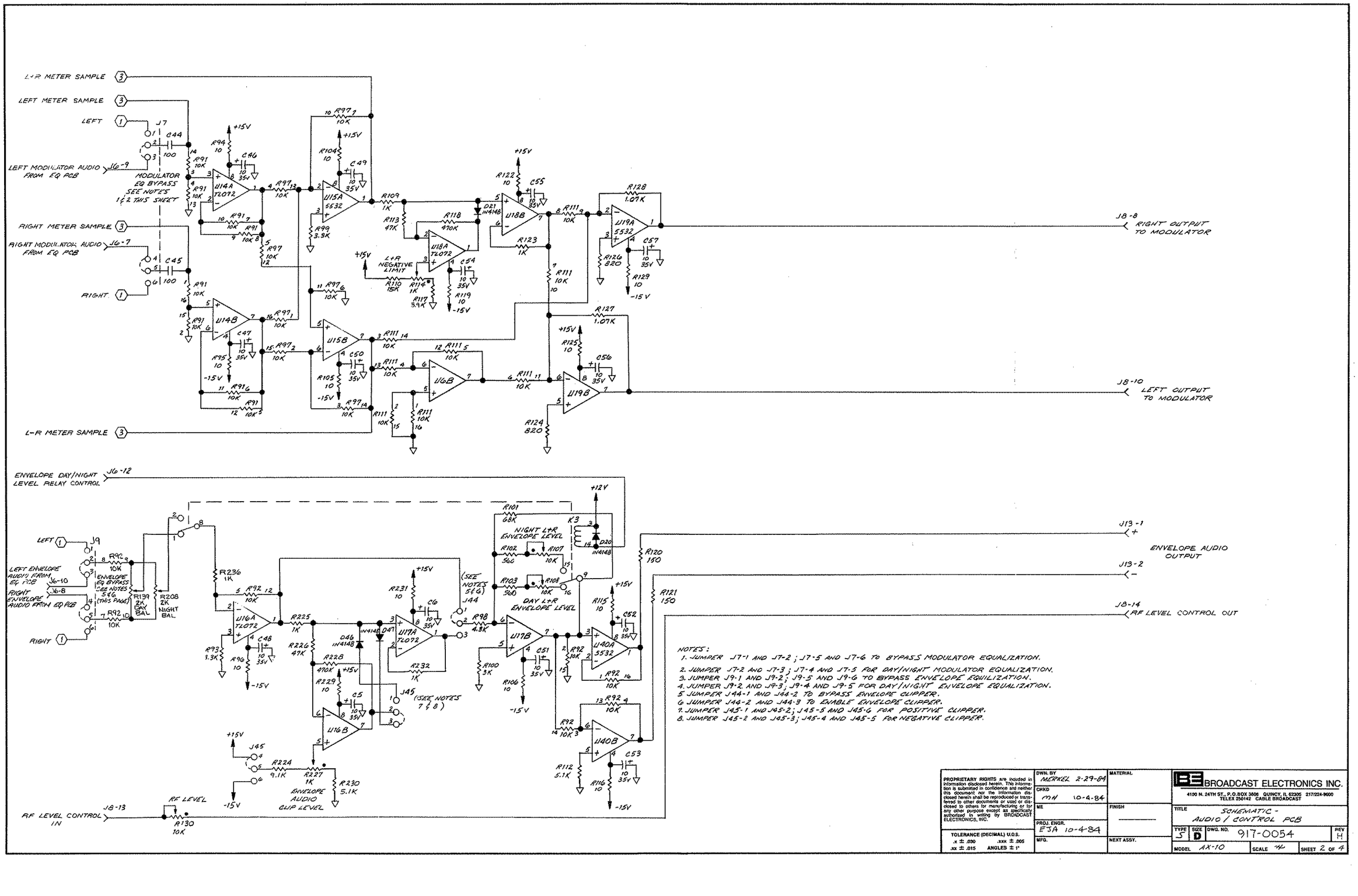
MATERIAL
FINISH
NEXT ASSY.

BROADCAST ELECTRONICS INC.
4100 N. 24TH ST., P.O.BOX 3606 QUINCY, IL 62305 217/224-9600
TELEX 250142 CABLE BROADCAST

TITLE STONEMATIC AUDIO / CONTROL PCB

TYPE S SIZE D DWG. NO. 917-0054 REV H

MODEL AX-10 SCALE — SHEET 1 OF 4



NOTES:
1. JUMPER J7-1 AND J7-2; J7-5 AND J7-6 TO BYPASS MODULATOR EQUALIZATION.
2. JUMPER J7-2 AND J7-3; J7-4 AND J7-5 FOR DAY/NIGHT MODULATOR EQUALIZATION.
3. JUMPER J9-1 AND J9-2; J9-5 AND J9-6 TO BYPASS ENVELOPE EQUILIZATION.
4. JUMPER J9-2 AND J9-3; J9-4 AND J9-5 FOR DAY/NIGHT ENVELOPE EQUALIZATION.
5. JUMPER J44-1 AND J44-2 TO BYPASS ENVELOPE CLIPPER.
6. JUMPER J44-2 AND J44-3 TO ENABLE ENVELOPE CLIPPER.
7. JUMPER J45-1 AND J45-2; J45-5 AND J45-6 FOR POSITIVE CLIPPER.
8. JUMPER J45-2 AND J45-3; J45-4 AND J45-5 FOR NEGATIVE CLIPPER.

TOLERANCE (DECIMAL) U.O.S.
.x ± .030 .xxx ± .005
.xx ± .015 ANGLES ± 1°

DWN. BY MERKEL 2-29-84
CHKD MH 10-4-84
ME
PROJ. ENGR. FJA 10-4-84
MFG.

MATERIAL
FINISH
NEXT ASSY.

BROADCAST ELECTRONICS INC.
4100 N. 24TH ST., P.O. BOX 3606 QUINCY, IL 62305 217/224-9600
TELEX 250142 CABLE BROADCAST

TITLE SCHEMATIC - AUDIO / CONTROL PCB

TYPE 5 SIZE D DWG. NO. 917-0054 REV H

MODEL AX-10 SCALE NONE SHEET 2 OF 4

MONITOR SELECT SWITCHES (INTERLOCKED, OUT POS)

LEFT — SBC — R131 28.0K 1%
RIGHT — SBD — R132 28.0K 1%
L-R — SBE — R133 14.0K 1%
PILOT SAMPLE — J8-7 — SBE — R134 147K 1%
L+R — SBF — R135 14.0K 1%

C105 100pF
R138 14.0K 1%
R137 10
C59 12 35V
U20A TL072
R136 82K
C60 3.3MF
R140 470K
R141 820
U20B
C62 33pF
C63 10 35V
R144 10
-15V
X10 CAL
R142 500
SBA EXPAND
R143 10K
R145 9.1K
R146 3.3K
R147 100K
C65 5pF
U21A LF347
R148 10K
D22 HP2800
D23 HP2800
U21B
U21C
U21D
C66 5pF
C67 10 35V
C68 10 35V
R149 10
R150 10
R151 10
R152 10
C69 100 25V
Q3 2N3904
R153 5.1K
R154 10
D24 HP2800
C70 .022
R155 10M
R156 1M
U22A TL072
C73 10 35V
R157 10K
R158 10
C71 10 35V
C72 33pF
R159 10
R160 620
R161 2K DISPLAY CAL
R162 10K
E5 6 VDC
R165 1K
R167 8.06K
R168 6.34K
U22B
R170 1M
R171 10K
D25 IN4148
Q4 2N3904
D26 IN9143
R172 10K
D27 IN4148
D28 IN5933 5.1V
R163 390 ½W
R164 180K
C74 4.7 35V
C75 4.7 35V
C76 .1
U23 LM555
R166 100
R169 1K 1%
C77 10 35V
C78 4.7 35V
C79 4.7 35V
C80 4.7 35V
R188 10
R189 4.42K 1%
R190 330
R191 10
R192 1.82K 1%
R193 301 1%
R194 1.82K 1%
DOT
BAR
SBB
J8-9 +3.5 TO +5.5V VLED
DS2 10 — DS3 20 — DS4 30 — DS5 40 — DS6 50 — DS7 60 — DS8 70 — DS9 80 — DS10 90 — DS11 100
DS12 110 — DS13 120 — DS14 — DS15 135 130%
R173 62 — R174 62 — R175 62 — R176 62 — R177 62 — R178 62 — R179 62 — R180 62 — R181 10K — R182 62 — R183 62 — R184 62 — R185 62 — R186 62
U24 LM3914
U25 LM3914

1 2 3 4 — 6.93V
1 2 3 4 — 3.4V
1 2 3 4 — 3.4V
1 2 3 4 — 6.8V
E1 E2 E3 E4

PROPRIETARY RIGHTS are included in information disclosed herein. This information is submitted in confidence and neither this document nor the information disclosed herein shall be reproduced or transferred to other documents or used or disclosed to others for manufacturing or for any other purpose except as specifically authorized in writing by BROADCAST ELECTRONICS, INC.

TOLERANCE (DECIMAL) U.O.S. .x ± .030 .xxx ± .005 .xx ± .015 ANGLES ± 1°

DWN. BY MERRELL 2-29-84
CHKD MH 10-4-84
ME
PROJ. ENGR. EJA 10-4-84
MFG.
MATERIAL
FINISH
NEXT ASSY.

BROADCAST ELECTRONICS INC.
4100 N. 24TH ST., P.O.BOX 3606 QUINCY, IL 62305 217/224-9600
TELEX 250142 CABLE BROADCAST

TITLE SCHEMATIC - AUDIO / CONTROL PCB
TYPE 5 SIZE D DWG. NO. 917-0054 REV H
MODEL AX-10 SCALE NONE SHEET 3 OF 4

J8-12 +12V
C82 100 25V
C87 100 35V
D35 IN4148
C81 4.7 35V
R195 1K
E6 +11.4V
J12
MONO L
MONO R
MONO L+R
STEREO
P12
D29 IN4148
D30 IN4148
POWER-UP MODE SELECT
(P12 SHOWN INSTALLED FOR POWER-UP IN STEREO MODE)
C88 .022
C89 .022
C90 .022
C91 .022
L3 10mH
C92 .1
C97 .1
PART OF PCB ASSY 917-0053
REMOTE STEREO CONTROL
J43 R4 470 L4
C4 .1
J42 P42 P10 J10
D31 IN4148
C83 .1
U26 4N33
C93 .01
REMOTE MONO L+R CONTROL
R3 470 L3
C3 .1
D32 IN4148
C84 .1
U27 4N33
C94 .01
REMOTE MONO R CONTROL
R2 470 L2
C2 .1
D33 IN4148
C85 .1
U28 4N33
C95 .01
REMOTE MONO L CONTROL
R1 470 L1
C1 .1
D34 IN4148
C86 .1
U29 4N33
C96 .01
U30A 4012
U30B
U31A 4011
U31D
U31B
U31C
U32A 4012
U32B
U33A 4011
U33B
U33C
U33D
U34 4019
R196 10K
R197 10K
R198 10K
R199 10K
S7E STEREO
S7D MONO L+R
S7C MONO R
S7B MONO L
MODE SELECT SWITCHES (INTERLOCKED, OUT POS.)
+12V SOURCE
R204 10K
R200 10K
D36 IN4148
Q5 2N3906
U35A ULN2004
R213 470
R211 10K
Q9 2N3906
R212 10K
Q10 2N3906
D49 IN4148
D43 IN4148
D50 IN4148
D44 IN4148
U35E
U35F
K2
K1
R218 10K
R217 10K
Q11 2N3906
S7A
PILOT OFF
R233 1.3K
C104 1.0
R234 100K
U271
Q12
R235 10K
R212 100
PILOT LEVEL
R209 10K
D41 IN4148
R210 10K
D42 IN4148
R201 10K
D37 IN4148
R202 10K
D38 IN4148
R203 10K
D39 IN4148
R205 10K
Q6 2N3906
R206 10K
Q7 2N3906
R207 10K
Q8 2N3906
D40 IN4148
R214 470
R215 470
R216 470
U35B
U35C
U35D
S7G
NC
J6-13 LOCAL DAY/NIGHT SELECT
R220 220 1/2W
U36 4N33
C98 .01
R221 220 1/2W
U37 4N33
C99 .01
R222 220 1/2W
U38 4N33
C100 .01
R223 220 1/2W
U39 4N33
C101 .01
PART OF PCB ASSY 917-0053
J6 J10 P10 P42 J13 47uH J43
MUTE
R11 100
REMOTE DAY INDICATOR
R12 100
REMOTE NIGHT INDICATOR
J11 P11
DS6 NIGHT
DS5 DAY
DS4 STEREO
DS3 MONO L+R
DS2 MONO R
DS1 MONO L
PCB ASSY 917-0045
LOCAL NIGHT INDICATOR
LOCAL DAY INDICATOR
J8-6 PILOT INPUT
J8-5 PILOT FEEDBACK
J8-4 PILOT OUTPUT
PART OF PCB ASSY 917-0053
J42 J49
GND
L10 R10 100
REMOTE STEREO INDICATOR
L9 R9 100
REMOTE MONO L+R INDICATOR
L8 R8 100
REMOTE MONO R INDICATOR
+12V
J6-14 +12V
L7 R7 100
REMOTE MONO L INDICATOR
J6-1
L5 R5 470
REMOTE DAY CONTROL
J6-2
L6 R6 470
REMOTE NIGHT CONTROL

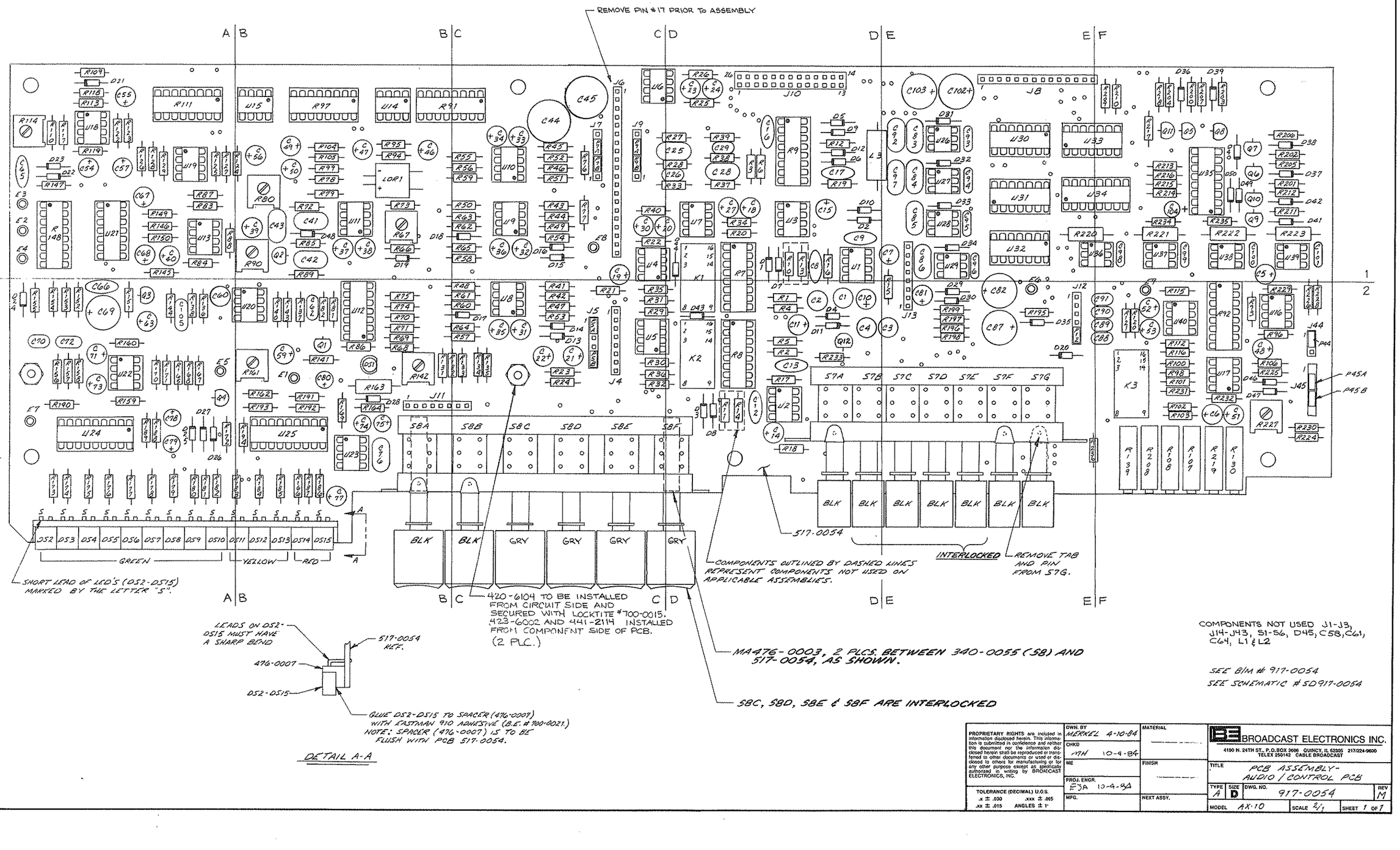
PROPRIETARY RIGHTS are included in information disclosed herein. This information is submitted in confidence and neither this document nor the information disclosed herein shall be reproduced or transferred to other documents or used or disclosed to others for manufacturing or for any other purpose except as specifically authorized in writing by BROADCAST ELECTRONICS, INC.

TOLERANCE (DECIMAL) U.O.S.
.x ± .030 .xxx ± .005
.xx ± .015 ANGLES ± 1°

DWN. BY MERKEL 2-29-84
CHKD MPH 10-4-84
ME
PROJ. ENGR. ESA 10-9-84
MFG.
MATERIAL
FINISH
NEXT ASSY.

BROADCAST ELECTRONICS INC.
4100 N. 24TH ST., P.O.BOX 3606 QUINCY, IL 62305 217/224-9600
TELEX 250142 CABLE BROADCAST

TITLE SCHEMATIC - AUDIO / CONTROL PCB
TYPE 5 SIZE D DWG. NO. 917-0054 REV H
MODEL AX-10 SCALE NONE SHEET 4 OF 4



COMPONENTS NOT USED J1-J3, J14-J43, S1-S6, D45, C58, C61, C64, L1 & L2

SEE B/M # 917-0054

SEE SCHEMATIC # SD917-0054

TOLERANCE (DECIMAL) U.O.S.
.x ± .030 .xxx ± .005
.xx ± .015 ANGLES ± 1°

DWN. BY MERKEL 4-10-84
CHKD MH 10-9-84
ME
PROJ. ENGR. EJA 10-9-84
MFG.
MATERIAL
FINISH
NEXT ASSY.

BROADCAST ELECTRONICS INC.
4100 N. 24TH ST., P.O.BOX 3606 QUINCY, IL 62305 217/224-9600
TELEX 250142 CABLE BROADCAST

TITLE PCB ASSEMBLY- AUDIO / CONTROL PCB

TYPE A | SIZE D | DWG. NO. 917-0054 | REV M

MODEL AX-10 | SCALE 2/1 | SHEET 1 OF 1

REF	ZONE	REF	ZONE	REF	ZONE	REF	ZONE	REF	ZONE
C1	D2	C50	B1	C102	E1	D47	F2	P7A	C1
C2	D2	C51	F2	C103	E1	D48	B1	P7B	C1
C3	E2	C52	F2	C104	F1	D49	F1	P9A	C1
C4	D2	C53	F2	C105	A2	D50	F1	P9B	C1
C5	F1	C54	A1	D1	D1	DS1	B2	P12	E2
C6	F2	C55	A1	D2	D1	DS2	A2	P44	F2
C7	E1	C56	B1	D3	D2	DS3	A2	P45A	F2
C8	D1	C57	A1	D4	D2	DS4	A2	P45B	F2
C9	D1	C59	B2	D5	D1	DS5	A2	Q1	B2
C10	D2	C60	A2	D6	D1	DS6	A2	Q2	B1
C11	D2	C62	B2	D7	D1	DS7	A2	Q3	A2
C12	D2	C63	A2	D8	D2	DS8	A2	Q4	A2
C13	D2	C65	A1	D9	D1	DS9	A2	Q5	F1
C14	D2	C66	A2	D10	D1	DS10	A2	Q6	F1
C15	D1	C67	A1	D11	D2	DS11	A2–B2	Q7	F1
C16	D1	C68	A1	D12	D1	DS12	B2	Q8	F1
C17	D1	C69	A2	D13	C2	DS13	B2	Q9	F1
C18	D1	C70	A2	D14	C2	DS14	B2	Q10	F1
C19	C1–C2	C71	A2	D15	C1	DS15	B2	Q11	F1
C20	C1–D1	C72	A2	D16	C1	E1	B2	Q12	D2
C21	C2	C73	A2	D17	C2	E2	A1	R1	D2
C22	C2	C74	B2	D18	C1	E3	A1	R2	D2
C23	D1	C75	B2	D19	B1	E4	A1	R3	D1
C24	D1	C76	B2	D20	E2	E5	A2	R4	D2
C25	C1–D1	C77	B2	D21	A1	E6	E2	R5	D2
C26	D1	C78	A2	D22	A1	E7	A2	R6	D1
C27	D1	C79	A2	D23	A1	E8	C1	R7	D1–D2
C28	D1	C80	B2	D24	A2	E9	F2	R8	D2
C29	D1	C81	E2	D25	A2	J4	C2	R9	D1
C30	C1	C82	E2	D26	A2	J5	C2	R10	D1
C31	C2	C83	E1	D27	A2	J6	C1	R11	D2
C32	C1	C84	E1	D28	B2	J7	C1	R12	D1
C33	C1	C85	E1	D29	E2	J8	E1	R13	D1
C34	C1	C86	E1	D30	E2	J9	C1	R14	D2
C35	C2	C87	E2	D31	E1	J10	D1	R15	E2
C36	C1	C88	F2	D32	E1	J11	B2–C2	R16	D1
C37	B1	C89	F2	D33	E1	J12	E2	R17	D2
C38	B1	C90	F2	D34	E1	J13	E1–E2	R18	D2
C39	B1	C91	F2	D35	E2	J44	F2	R19	D1
C40	A1	C92	E1	D36	F1	J45	F2	R20	D1
C41	B1	C93	E1	D37	F1	K1	D1–D2	R21	C2
C42	B1	C94	E1	D38	F1	K2	D2	R22	C1
C43	B1	C95	E1	D39	F1	K3	F2	R23	C2
C44	C1	C96	E1	D40	F1	L3	D1–E1	R24	C2
C45	C1	C97	E1	D41	F1	LDR1	B1	R25	D1
C46	B1	C98	F1	D42	F1	P5A	C2	R26	D1
C47	B1	C99	F1	D43	D2	P5B	C2	R27	D1
C48	F2	C100	F1	D44	D1	P7A	C1	R28	D1
C49	B1	C101	F1	D46	F2	P7B	C1	R29	C2

597–0095–51

FIGURE 7–8. COMPONENT LOCATOR, AUDIO CONTROL CIRCUIT BOARD (Sheet 1 of 3)

REF	ZONE	REF	ZONE	REF	ZONE	REF	ZONE	REF	ZONE
R30	C2	R79	B1	R128	A1	R177	A2	R226	F2
R31	C2	R80	B1	R129	A1	R178	A2	R227	F2
R32	C2	R81	B2	R130	F2	R179	A2	R228	F2
R33	D1	R82	B2	R131	B2	R180	A2	R229	F2
R34	D1	R83	A1	R132	B2–C2	R181	A2	R230	F2
R35	C2	R84	A1	R133	C2	R182	A2	R231	F2
R36	C2	R85	B1	R134	C2	R183	A2–B2	R232	F2
R37	D1	R86	B2	R135	C2	R184	B2	R233	D2
R38	D1	R87	A1	R136	A2	R185	B2	R234	F1
R39	D1	R88	A1	R137	B2	R186	B2	R235	F1
R40	C1	R89	B1	R138	A2	R187	B2	R236	E2–F2
R41	C2	R90	B1	R139	F2	R188	A2	S7A	D2
R42	C2	R91	B1–C1	R140	B2	R189	A2	S7B	D2–E2
R43	C1	R92	F2	R141	B2	R190	A2	S7C	E2
R44	C1	R93	F2	R142	B2	R191	B2	S7D	E2
R45	C1	R94	B1	R143	B2	R192	B2	S7E	E2
R46	C1	R95	B1	R144	A2	R193	B2	S7F	E2
R47	C2	R96	F2	R145	A1	R194	B2	S7G	E2
R48	C2	R97	B1	R146	A1	R195	E2	S8A	B2
R49	C1	R98	F2	R147	A1	R196	E2	S8B	B2–C2
R50	C1	R99	B1	R148	A1	R197	E2	S8C	C2
R51	C1	R100	F2	R149	A1	R198	E2	S8D	C2
R52	C1	R101	F2	R150	A1	R199	E2	S8E	C2
R53	C2	R102	F2	R151	A2	R200	F1	S8F	C2–D2
R54	C1	R103	F2	R152	A2	R201	F1	U1	D1
R55	C1	R104	B1	R153	A2	R202	F1	U2	D2
R56	C1	R105	B1	R154	A2	R203	F1	U3	D1
R57	C2	R106	F2	R155	A2	R204	F1	U4	C1
R58	C1	R107	F2	R156	A2	R205	F1	U5	C2
R59	C1	R108	F2	R157	A2	R206	F1	U6	C1
R60	C2	R109	A1	R158	A2	R207	F1	U7	D1
R61	C2	R110	A1	R159	A2	R208	F2	U8	C2
R62	C1	R111	A1	R160	A2	R209	F1	U9	C1
R63	C1	R112	F2	R161	B2	R210	F1	U10	C1
R64	C2	R113	A1	R162	B2	R211	F1	U11	B1
R65	C1	R114	A1	R163	B2	R212	F1	U12	B2
R66	B1	R115	F2	R164	B2	R213	F1	U13	A1
R67	B1	R116	F2	R165	A2	R214	F1	U14	B1
R68	B2	R117	A1	R166	B2	R215	F1	U15	B1
R69	B2	R118	A1	R167	A2	R216	F1	U16	F2
R70	B2	R119	A1	R168	A2	R217	F1	U17	F2
R71	B2	R120	F2	R169	B2	R218	F1	U18	A1
R72	B1	R121	F2	R170	A2	R219	F2	U19	A1
R73	B1	R122	A1	R171	A2	R220	E1–F1	U20	B2
R74	B2	R123	A1	R172	A2	R221	F1	U21	A1
R75	B2	R124	A1–B1	R173	A2	R222	F1	U22	A2
R76	C1	R125	A1	R174	A2	R223	F1	U23	B2
R77	C1	R126	A1	R175	A2	R224	F2	U24	A2
R78	B1	R127	A1	R176	A2	R225	F2	U25	B2

597-0095-51

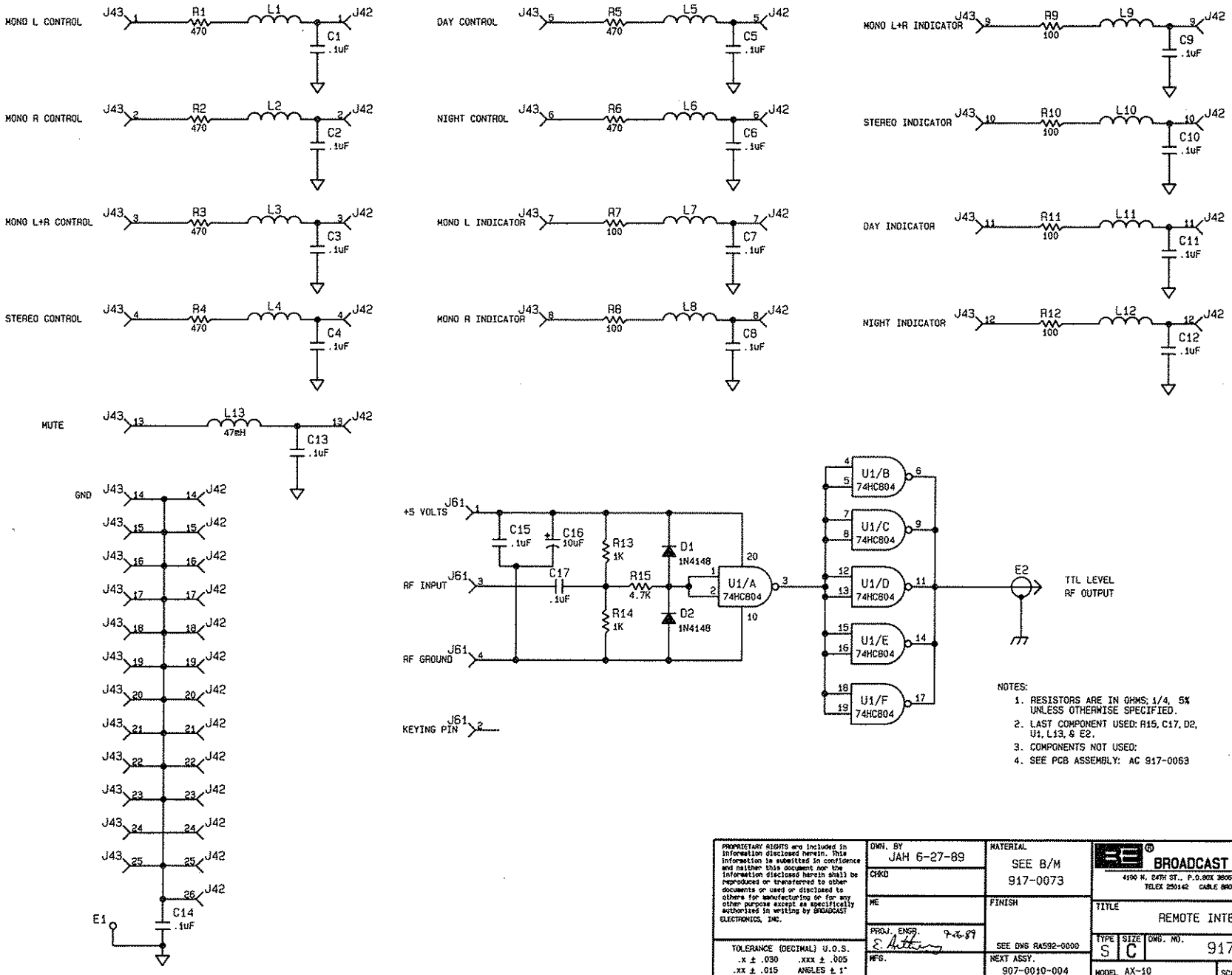
FIGURE 7–8. COMPONENT LOCATOR, AUDIO CONTROL CIRCUIT BOARD (Sheet 2 of 3)

REF	ZONE	REF	ZONE	REF	ZONE	REF	ZONE	REF	ZONE
U26	E1								
U27	E1								
U28	E1								
U29	E1								
U30	E1								
U31	E1								
U32	E1								
U33	E1–F1								
U34	E1–F1								
U35	F1								
U36	E1–F1								
U37	F1								
U38	F1								
U39	F1								
U40	F2								

597-0095-51

FIGURE 7–8. COMPONENT LOCATOR, AUDIO CONTROL CIRCUIT BOARD
(Sheet 3 of 3)

REVISIONS					
REV	DATE	DESCRIPTION	DFTSMN	ENGR	ECN
A	6-28-89	ENGINEERING RELEASE	JAH	[illegible]	—



NOTES:

1. RESISTORS ARE IN OHMS; 1/4, 5% UNLESS OTHERWISE SPECIFIED.
2. LAST COMPONENT USED: R15, C17, D2, U1, L13, & E2.
3. COMPONENTS NOT USED:
4. SEE PCB ASSEMBLY: AC 917-0063

TOLERANCE (DECIMAL) U.O.S.
.x ± .030 .xxx ± .005
.xx ± .015 ANGLES ± 1°

DWN. BY JAH 6-27-89
CHKD
ME
PROJ. ENGR. 7-6-89
MFG.

MATERIAL SEE B/M 917-0073
FINISH
SEE DWG RA592-0000
NEXT ASSY. 907-0010-004

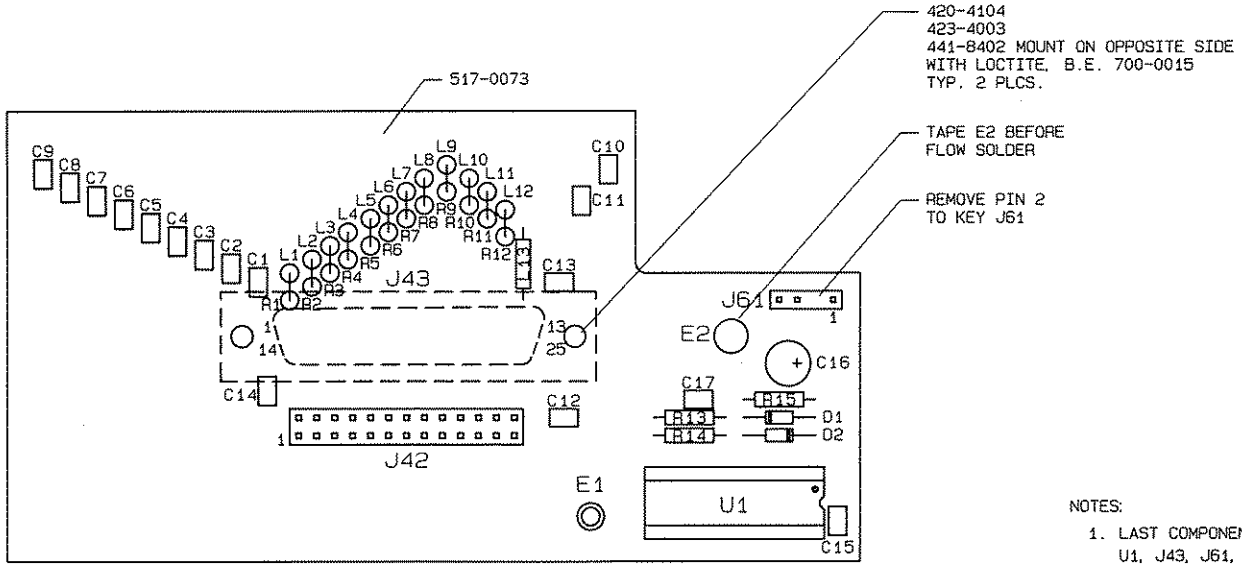
BROADCAST ELECTRONICS INC.
4100 N. 24TH ST., P.O.BOX 3606 QUINCY, IL. 62305 217/224-9600
TELEX 250142 CABLE BROADCAST FAX 217/224-9607

TITLE REMOTE INTERFACE PCB

TYPE S | SIZE C | DWG. NO. 917-0073 | REV A

MODEL AX-10 | SCALE NONE | SHEET 1 OF 1

REVISIONS					
REV	DATE	DESCRIPTION	DFTSMN	ENGR	ECN
A	7-10-89	ENGINEERING RELEASE	KLS	[illegible]	—



NOTES:

1. LAST COMPONENT USED: R15, C17, D2, U1, J43, J61, E2, L13.
2. SEE SCHEMATIC: SC917-0073

TOLERANCE DECIMAL U.O.S.
.X ± .030 .XXX ± .005
.XX ± .015 ANGLES ± 1°

DWN BY KLS 6-7-89
CHKD 7-10-89
ME
PROJ. ENGR. 7-10-89
MFG

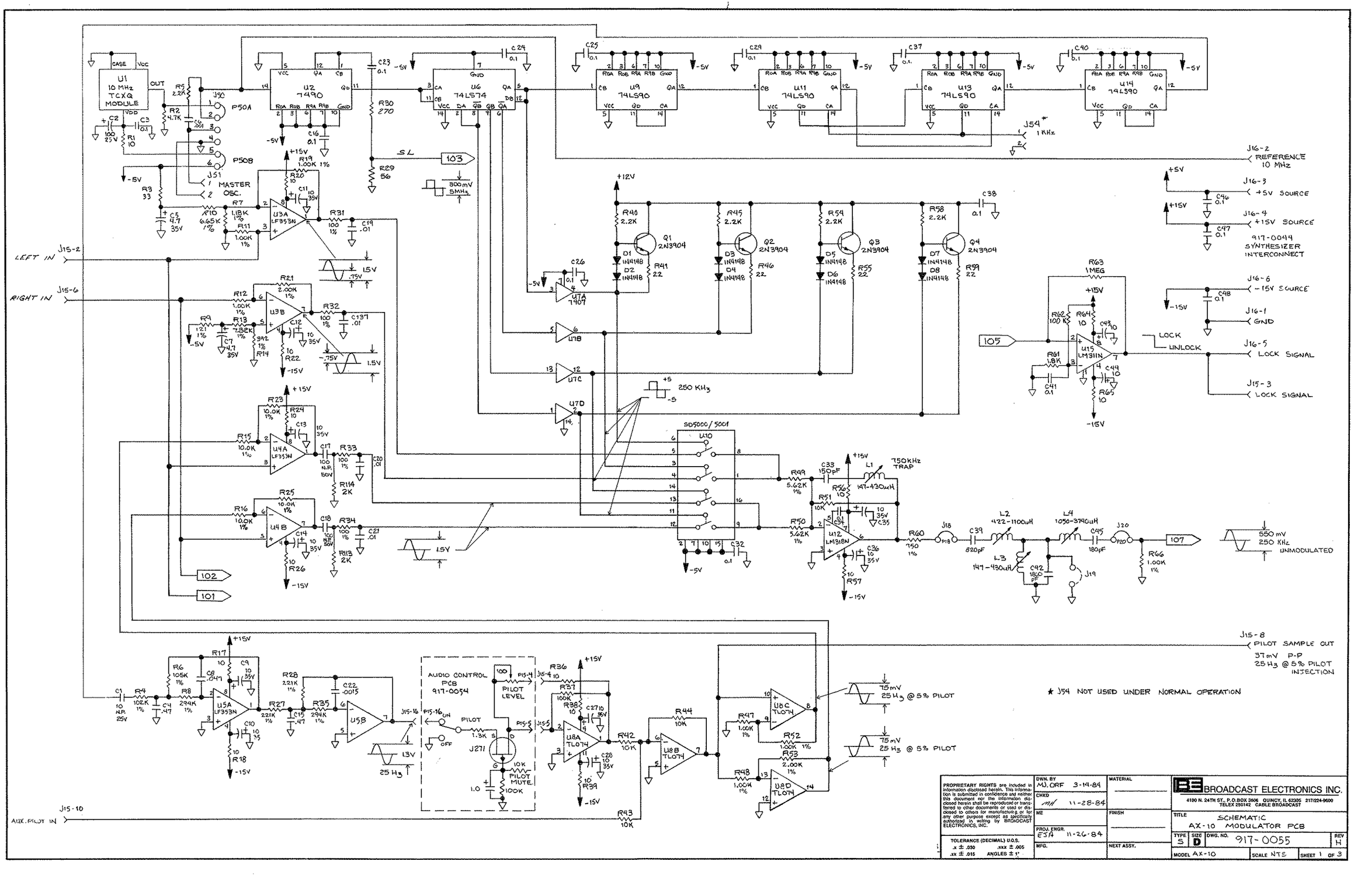
MATERIAL SEE B/M 917-0073
FINISH
NEXT ASSY

BROADCAST ELECTRONICS INC.
4100 N.24TH ST., P.O.BOX 3606 QUINCY, IL 62305 217/224-9600
TELEX 250142 CABLE BROADCAST FAX 217/224-9607

TITLE PCB ASSEMBLY- REMOTE INTERFACE BD.

TYPE	SIZE	DWG.NO.	REV
A	C	917-0073	A

MODEL AX-10 SCALE 2/1 SHEET 1 OF 1



PROPRIETARY RIGHTS are included in information disclosed herein. This information is submitted in confidence and neither this document nor the information disclosed herein shall be reproduced or transferred to other documents or used or disclosed to others for manufacturing, or for any other purpose except as specifically authorized in writing by BROADCAST ELECTRONICS, INC.

TOLERANCE (DECIMAL) U.O.S. .x ± .030 .xxx ± .005 .xx ± .015 ANGLES ± 1°

DWN. BY M.J.ORF 3-19-84
CHKD 11-28-84
ME
PROJ. ENGR. ESA 11-26-84
MFG.

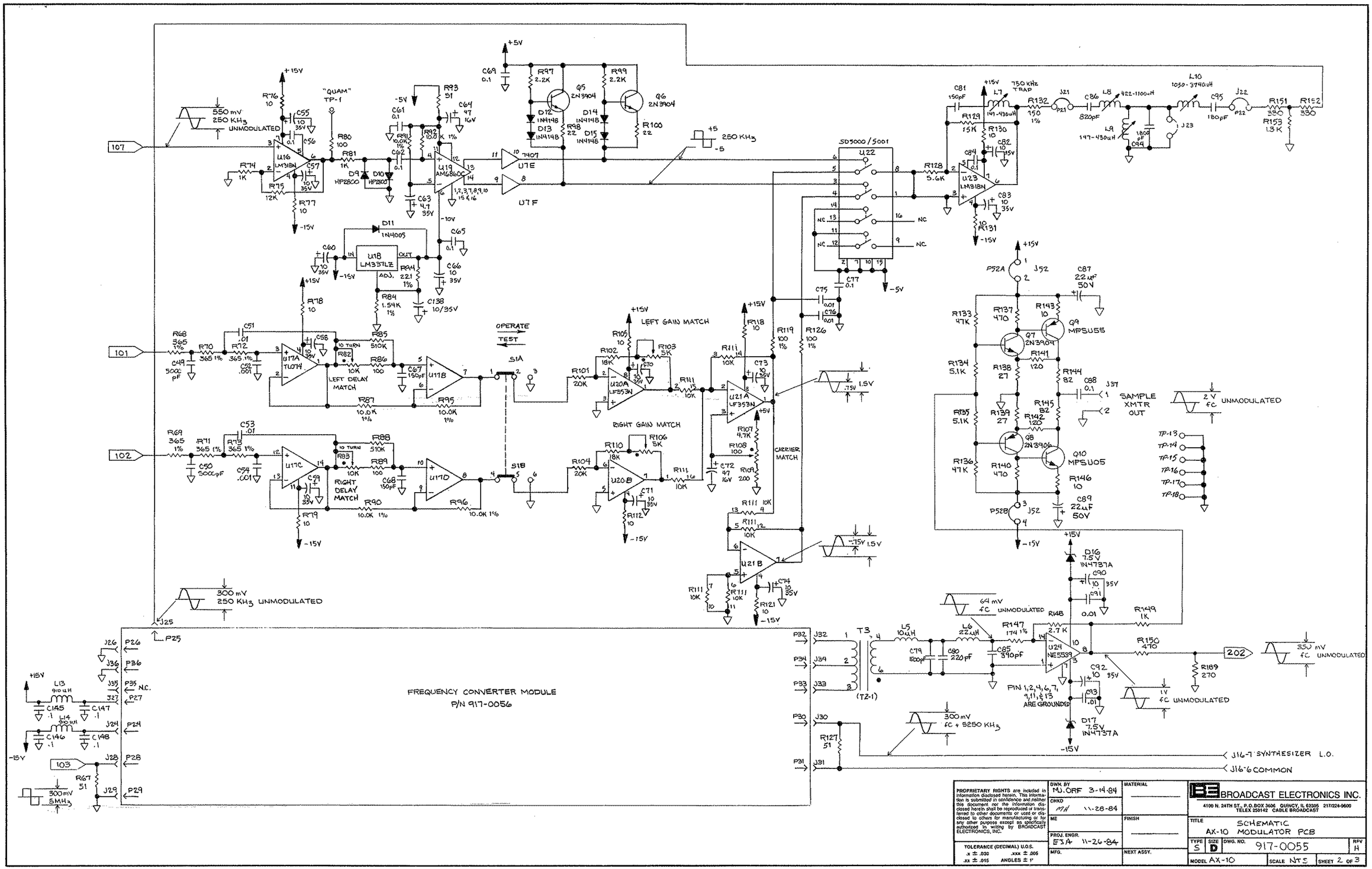
MATERIAL
FINISH
NEXT ASSY.

BROADCAST ELECTRONICS INC.
4100 N. 24TH ST., P.O. BOX 3606 QUINCY, IL 62305 217/224-9600
TELEX 250142 CABLE BROADCAST

TITLE SCHEMATIC AX-10 MODULATOR PCB

TYPE S SIZE D DWG. NO. 917-0055 REV H

MODEL AX-10 SCALE NTS SHEET 1 OF 3



PROPRIETARY RIGHTS are included in information disclosed herein. This information is submitted in confidence and neither this document nor the information disclosed herein shall be reproduced or transferred to other documents or used or disclosed to others for manufacturing or for any other purpose except as specifically authorized in writing by BROADCAST ELECTRONICS, INC.

TOLERANCE (DECIMAL) U.O.S.
.x ± .030 .xxx ± .005
.xx ± .015 ANGLES ± 1°

DWN. BY MJ. ORF 3-14-84
CHKD MM 11-26-84
ME
PROJ. ENGR. EJA 11-26-84
MFG.

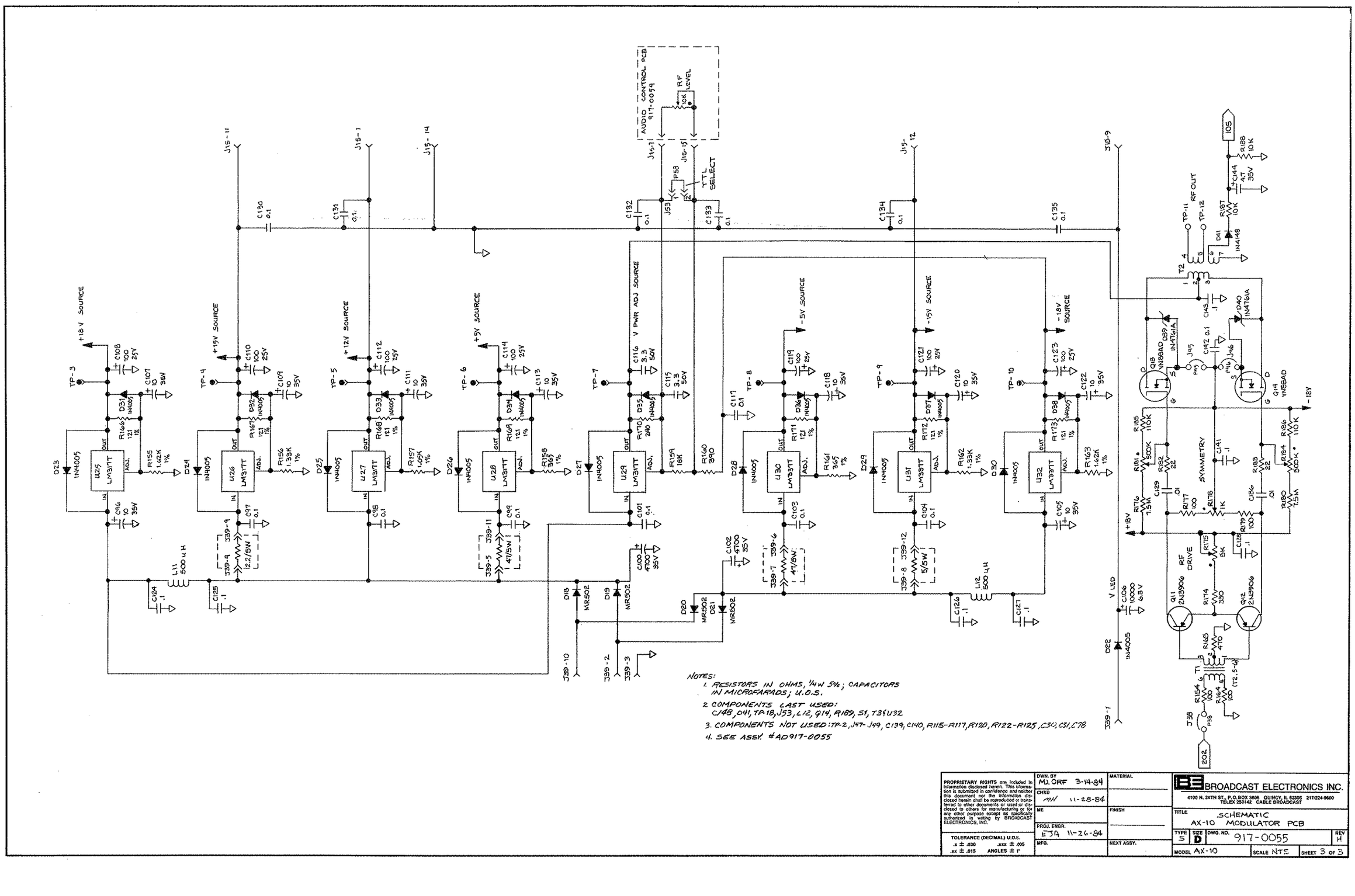
MATERIAL
FINISH
NEXT ASSY.

BROADCAST ELECTRONICS INC.
4100 N. 24TH ST., P.O. BOX 3606 QUINCY, IL 62305 217/224-9600
TELEX 250142 CABLE BROADCAST

TITLE SCHEMATIC
AX-10 MODULATOR PCB

TYPE S SIZE D DWG. NO. 917-0055 REV H

MODEL AX-10 SCALE NTS SHEET 2 OF 3



TOLERANCE (DECIMAL) U.O.S.
.x ± .030 .xxx ± .005
.xx ± .015 ANGLES ± 1°

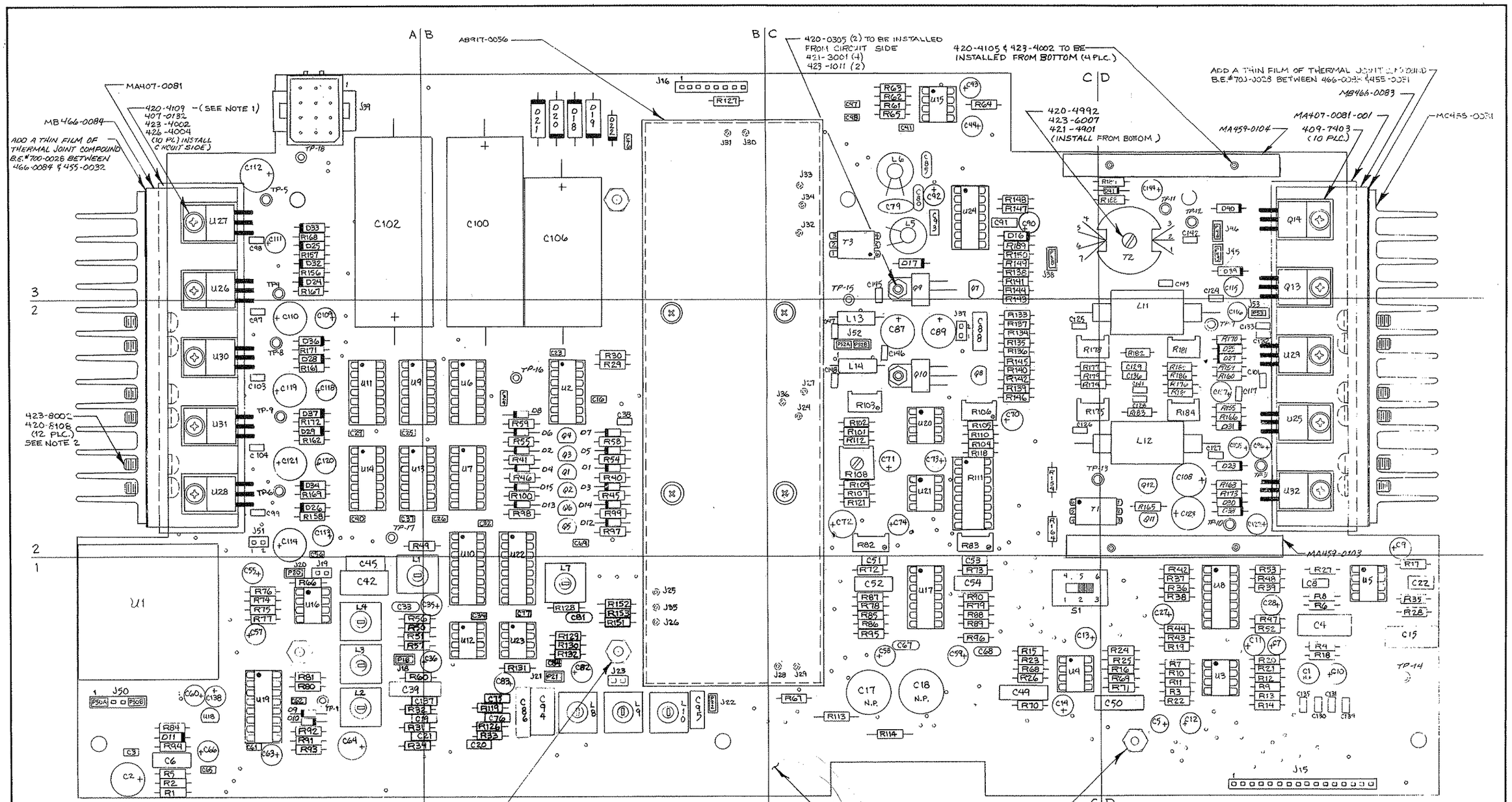
DWN. BY	MJ. ORF 3-14-84	MATERIAL
CHKD	MH 11-28-84	
ME		FINISH
PROJ. ENGR.	EJA 11-26-84	
MFG.		NEXT ASSY.

BROADCAST ELECTRONICS INC.
4100 N. 24TH ST., P.O. BOX 3606 QUINCY, IL 62305 217/224-9600
TELEX 250142 CABLE BROADCAST

TITLE SCHEMATIC
AX-10 MODULATOR PCB

TYPE	SIZE	DWG. NO.	REV
S	D	917-0055	H

MODEL AX-10 SCALE NTS SHEET 3 OF 3



NOTE
1. TORQUE SPEC FOR 10 #4 SCREWS = 5 ± 1 IN.-lb.
2. TORQUE SPEC FOR 12 #8 SCREWS = 20 ± 2 IN.-lb.
3. SEE SCHEMATIC # SD917-0055 (3 SHTS.)

REV	DATE	DESCRIPTION	DFTSMN	ENGR
H	12-4-87	REMOVED C30, C31, C78 ADDED R113 R114	JAH	ETA 7134
G	10-27-87	CHGD. 441-0072 TO 441-8585 ECN 7086	HERK	EJA
F	9-3-86	ADDED C30, C31, C78 ECN 6362	KLS	EJA
E	6-12-85	REMOVED C30, C31, C13 ECN 5818	NSE	EJA

TOLERANCE (DECIMAL) U.O.S.
.x ± .030 .xxx ± .005
.xx ± .015 ANGLES ± 1°

DWN. BY	MJO 8-7-84
CHKD	MH 11-28-84
ME	
PROJ. ENGR.	EJA 11-26-84
MFG.	
MATERIAL	
FINISH	
NEXT ASSY.	

BROADCAST ELECTRONICS INC.
4100 N. 24TH ST., P.O. BOX 3806 QUINCY, IL 62305 217/224-9600
TELEX 250142 CABLE BROADCAST

TITLE: PCB ASSEMBLY AX-10 MODULATOR PCB

TYPE	SIZE	DWG. NO.	REV
A	D	917-0055	H

MODEL AX-10 SCALE 2/1 SHEET 1 OF 1

REF	ZONE	REF	ZONE	REF	ZONE	REF	ZONE	REF	ZONE
C1	D1	C50	D1	C99	A2	D2	B2	J25	B1
C2	A1	C51	C1	C100	B3	D3	B2	J26	B1
C3	A1	C52	C1	C101	D2	D4	B2	J27	C2
C4	D1	C53	C1	C102	A3	D5	B2	J28	C1
C5	D1	C54	C1	C103	A2	D6	B2	J29	C1
C6	A1	C55	A1	C104	A2	D7	B2	J30	B3
C7	D1	C56	A2	C105	D2	D8	B2	J31	B3
C8	D1	C57	A1	C106	B3	D9	A1	J32	C3
C9	D2	C58	C1	C107	D2	D10	A1	J33	C3
C10	D1	C59	C1	C108	D2	D11	A1	J34	C3
C11	D1	C60	A1	C109	A2	D12	B2	J35	B1
C12	D1	C61	A1	C110	A2	D13	B2	J36	C2
C13	C1	C62	A1	C111	A3	D14	B2	J37	C2
C14	C1	C63	A1	C112	A3	D15	B2	J38	C3
C15	D1	C64	A1	C113	A2	D16	C3	J39	A3
C16	B2	C65	A1	C114	A2	D17	C3	J45	D3
C17	C1	C66	A1	C115	D3	D18	B3	J46	D3
C18	C1	C67	C1	C116	D2	D19	B3	J50	A1
C19	A1–B1	C68	C1	C117	D2	D20	B3	J51	A2
C20	B1	C69	B2	C118	A2	D21	B3	J52	C2
C21	A1–B1	C70	C2	C119	A2	D22	B3	J53	D2
C22	D1	C71	C2	C120	A2	D23	D2	L1	A1–B1
C23	B2	C72	C2	C121	A2	D24	A3	L2	A1
C24	B2	C73	C2	C122	D2	D25	A3	L3	A1
C25	A2	C74	C2	C123	D2	D26	A2	L4	A1
C26	B2	C75	B1	C124	D3	D27	D2	L5	C3
C27	D1	C76	B1	C125	C2	D28	A2	L6	C3
C28	D1	C77	B1	C126	C2	D29	A2	L7	B1
C29	A2	———	—	C127	D2	D30	D2	L8	B1
———	—	C79	C3	C128	D2	D31	D2	L9	B1
———	—	C80	C3	C129	D2	D32	A3	L10	B1
C32	B2	C81	B1	C130	D1	D33	A3	L11	D2–D3
C33	A1	C82	B1	C131	D1	D34	A2	L12	D2
C34	B1	C83	B1	C132	D2	D35	D2	L13	C2
C35	B1	C84	B1	C133	D2	D36	A2	L14	C2
C36	B1	C85	C3	C134	D1	D37	A2	P18	A1
C37	A2	C86	B1	C135	D1	D38	D2	P20	A1
C38	B2	C87	C2	C136	D2	D39	D3	P21	B1
C39	A1–B1	C88	C2	C137	A1–B1	D40	D3	P22	B1
C40	A2	C89	C2	C138	A1	D41	D3	P38	C3
C41	C3	C90	C3	C141	D2	J15	D1	P45	D3
C42	A1	C91	C3	C142	D3	J16	B3	P46	D3
C43	C3	C92	C3	C143	D3	J18	A1	P50A	A1
C44	C3	C93	C3	C144	D3	J19	A1	P50B	A1
C45	A1	C94	B1	C145	C3	J20	A1	P52A	C2
C46	B3	C95	B1	C146	C2	J21	B1	P52B	C2
C47	C3	C96	D2	C147	C2	J22	B1	P53	D2
C48	C3	C97	A2	C148	C2	J23	B1	Q1	B2
C49	C1	C98	A3	D1	B2	J24	C2	Q2	B2

597–0095–52

FIGURE 7–12. COMPONENT LOCATOR, MODULATOR CIRCUIT BOARD (Sheet 1 of 3)

REF	ZONE	REF	ZONE	REF	ZONE	REF	ZONE	REF	ZONE
Q3	B2	R38	D1	R87	C1	R144	C3	T3	C3
Q4	B2	R39	D1	R88	C1	R145	C2	TP1	A1
Q5	B2	R40	B2	R89	C1	R146	C2	TP3	D2
Q6	B2	R41	B2	R90	C1	R147	C3	TP4	A3
Q7	C2	R42	D1	R91	A1	R148	C3	TP5	A3
Q8	C2	R43	D1	R92	A1	R149	C3	TP6	A2
Q9	C3	R44	D1	R93	A1	R150	C3	TP7	D2
Q10	C2	R45	B2	R94	A1	R151	B1	TP8	A2
Q11	D2	R46	B2	R95	C1	R152	B1	TP9	A2
Q12	D2	R47	D1	R96	C1	R153	B1	TP10	D2
Q13	D3	R48	D1	R97	B2	R154	C2	TP11	D3
Q14	D3	R49	A2–B2	R98	B2	R155	D2	TP12	D3
R1	A1	R50	A1–B1	R99	B2	R156	A3	TP13	C2–D2
R2	A1	R51	A1–B1	R100	B2	R157	A3	TP14	D1
R3	D1	R52	D1	R101	C2	R158	A2	TP15	C3
R4	D1	R53	D1	R102	C2	R159	D2	TP16	B2
R5	A1	R54	B2	R103	C2	R160	D2	TP17	A2
R6	D1	R55	B2	R104	C2	R161	A2	TP18	A3
R7	D1	R56	A1–B1	R105	C2	R162	A2	U1	A1
R8	D1	R57	A1–B1	R106	C2	R163	D2	U2	B2
R9	D1	R58	B2	R107	C2	R164	C2	U3	D1
R10	D1	R59	B2	R108	C2	R165	D2	U4	C1
R11	D1	R60	A1–B1	R109	C2	R166	D2	U5	D1
R12	D1	R61	C3	R110	C2	R167	A3	U6	B2
R13	D1	R62	C3	R111	C2	R168	A3	U7	B2
R14	D1	R63	C3	R112	C2	R169	A2	U8	D1
R15	C1	R64	C3	R113	C1	R170	D2	U9	A2–B2
R16	D1	R65	C3	R114	C1	R171	A2	U10	B1–B2
R17	D1	R66	A1	R118	C2	R172	A2	U11	A2
R18	D1	R67	C1	R119	B1	R173	D2	U12	B1
R19	D1	R68	C1	R121	C2	R174	C2–D2	U13	A2–B2
R20	D1	R69	D1	R126	B1	R175	C2–D2	U14	A2
R21	D1	R70	C1	R127	B3	R176	D2	U15	C3
R22	D1	R71	D1	R128	B1	R177	C2–D2	U16	A1
R23	C1	R72	C1	R129	B1	R178	C2–D2	U17	C1
R24	D1	R73	C1	R130	B1	R179	C2–D2	U18	A1
R25	D1	R74	A1	R131	B1	R180	D2	U19	A1
R26	C1	R75	A1	R132	B1	R181	D2	U20	C2
R27	D1	R76	A1	R133	C2	R182	D2	U21	C2
R28	D1	R77	A1	R134	C2	R183	D2	U22	B1–B2
R29	B2	R78	C1	R135	C2	R184	D2	U23	B1
R30	B2	R79	C1	R136	C2	R185	D2	U24	C3
R31	A1–B1	R80	A1	R137	C2	R186	D2	U25	D2
R32	A1–B1	R81	A1	C138	C2	R187	D3	U26	A3
R33	B1	R82	C2	C139	C2	R188	D3	U27	A3
R34	A1–B1	R83	C2	R140	C2	R189	C3	U28	A2
R35	D1	R84	A1	R141	C3	S1	C1–D1	U29	D2
R36	D1	R85	C1	R142	C2	T1	C2–D2	U30	A2
R37	D1	R86	C1	R143	C3	T2	D3	U31	A2

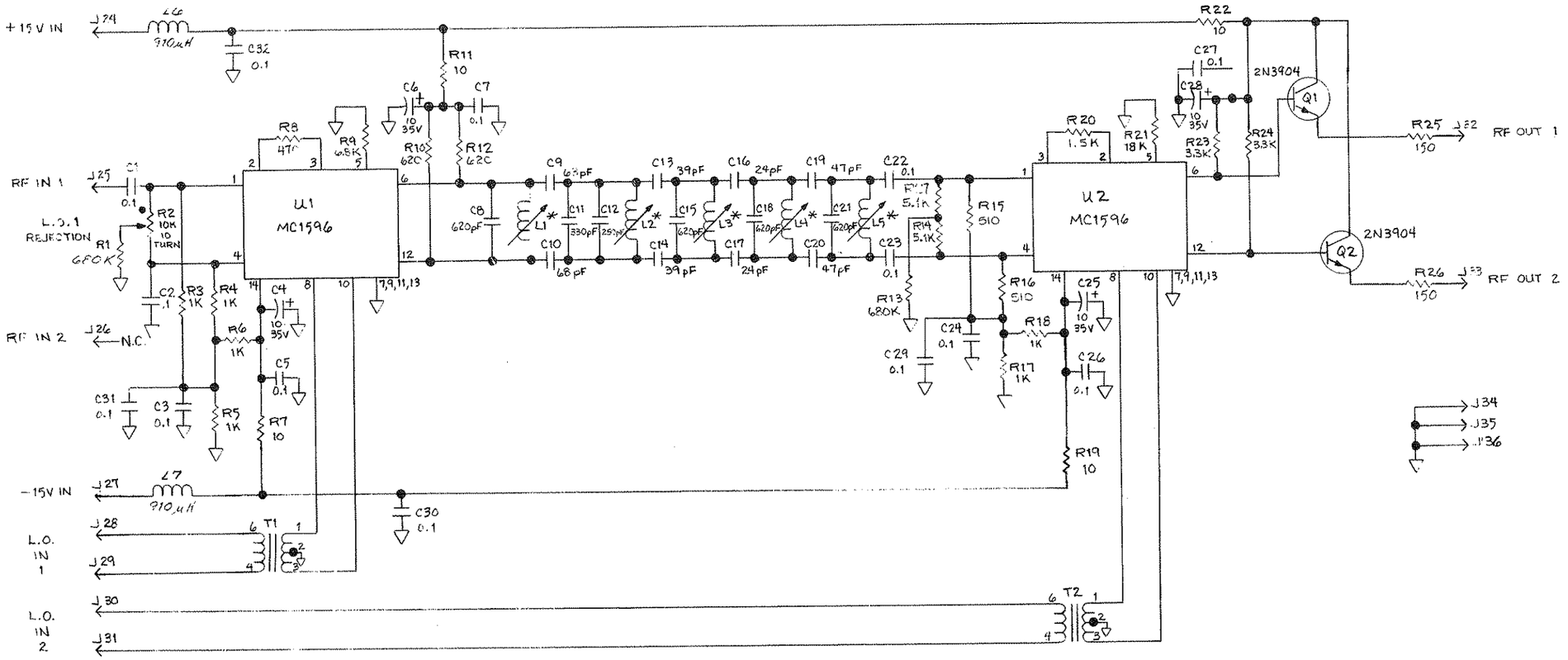
597-0095-52

FIGURE 7–12. COMPONENT LOCATOR, MODULATOR CIRCUIT BOARD
(Sheet 2 of 3)

REF	ZONE	REF	ZONE	REF	ZONE	REF	ZONE	REF	ZONE
U32	D2								

597–0095–52

FIGURE 7–12. COMPONENT LOCATOR, MODULATOR CIRCUIT BOARD (Sheet 3 of 3)



NOTE:

1. ALL RESISTORS IN OHMS 1/4W, 5%; CAPACITORS IN MICROFARADS; U.O.S..
2. * DENOTES 1.50 uH, ADJUSTABLE ±10%.
3. COMPONENTS LAST USED:
   C32, U2, L7, Q2, R26, T2 & P24 - P36
4. SEE B/M # 917-0056
   SEE ASSEMBLY # AC917-0056

TOLERANCE (DECIMAL) U.O.S.
.x ± .030 .xxx ± .005
.xx ± .015 ANGLES ± 1°

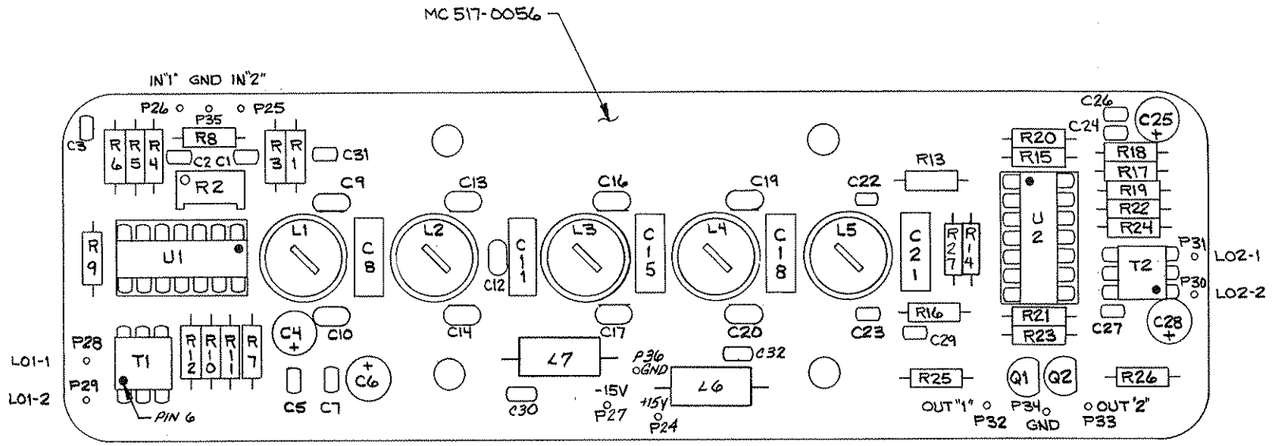
DWN. BY	MJ. ORF 5-15-84
CHKD	MH 11-1-84
ME	
PROJ. ENGR.	EJA 11-1-84
MFG.	
MATERIAL	
FINISH	
NEXT ASSY.	

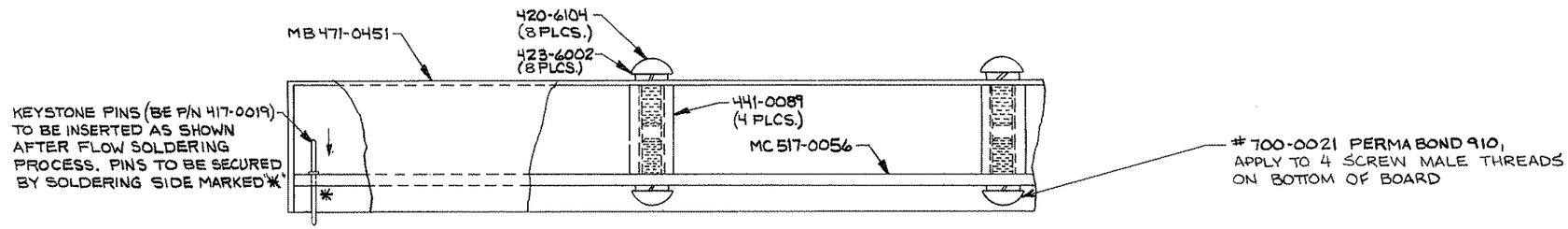
BROADCAST ELECTRONICS INC.
4100 N. 24TH ST., P.O. BOX 3606 QUINCY, IL 62305 217/224-9600
TELEX 250142 CABLE BROADCAST

TITLE SCHEMATIC
FREQUENCY CONVERTER MODULE

TYPE	SIZE	DWG. NO.	REV
S	C	917-0056	L

MODEL AX-10 SCALE NTS SHEET 1 OF 1





SEE SCHEMATIC # SC917-0056
SEE BIM # 917-0054

TOLERANCE (DECIMAL) U.O.S.
.x ± .030 .xxx ± .005
.xx ± .015 ANGLES ± 1°

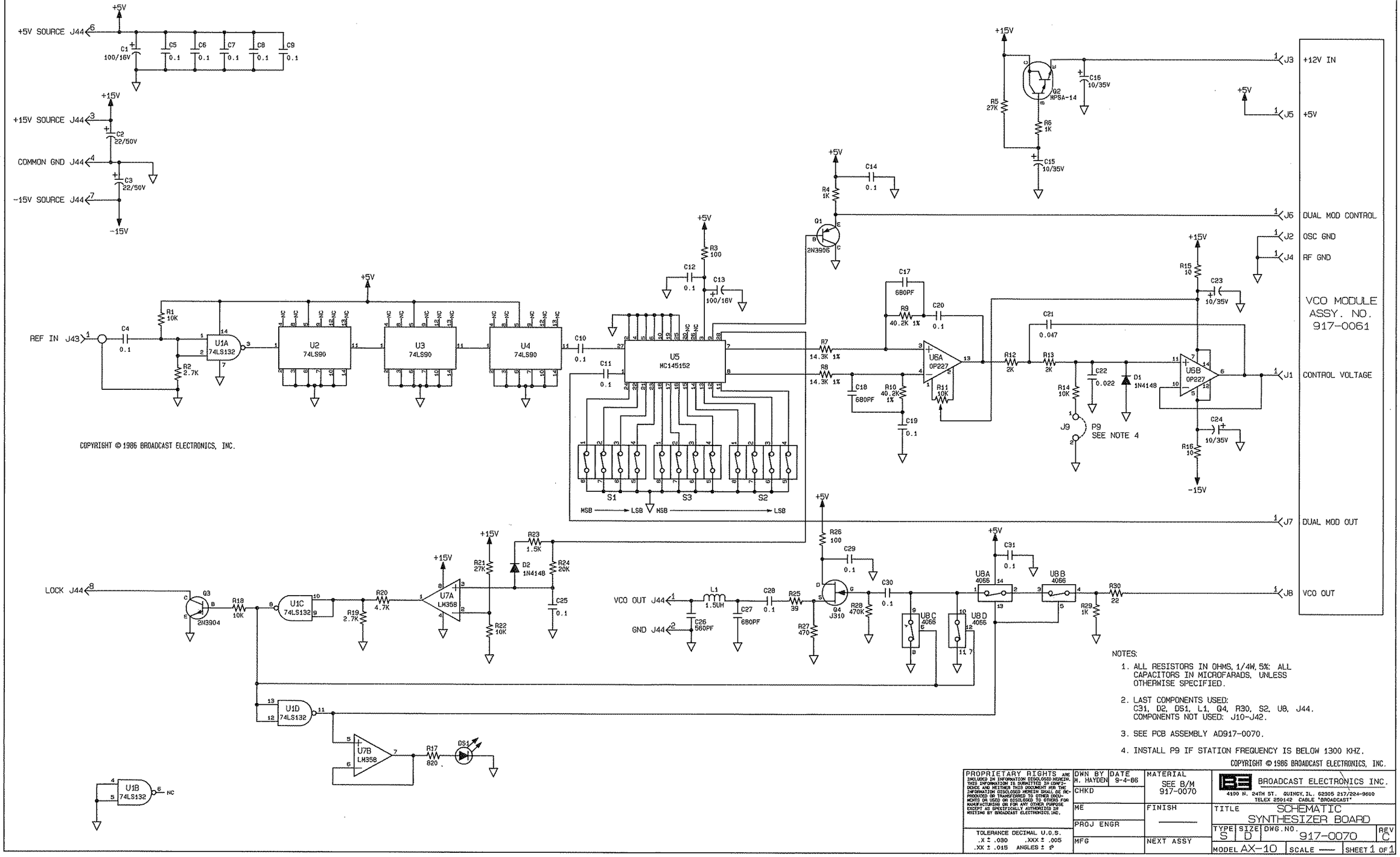
DWN. BY JAH 8-17-84
CHKD MH 11-1-84
ME
PROJ. ENGR. EJA 11-1-84
MFG.

MATERIAL
FINISH
NEXT ASSY.

BROADCAST ELECTRONICS INC.
4100 N. 24TH ST., P.O. BOX 3606 QUINCY, IL 62305 217/224-9600
TELEX 250142 CABLE BROADCAST

TITLE PCB ASSEMBLY
FREQUENCY CONVERTER MODULE

TYPE A | SIZE C | DWG. NO. 917-0056 | REV J
MODEL AX-10 | SCALE 2/1 | SHEET 1 OF 1



NOTES:

1. ALL RESISTORS IN OHMS, 1/4W, 5%: ALL CAPACITORS IN MICROFARADS, UNLESS OTHERWISE SPECIFIED.
2. LAST COMPONENTS USED: C31, D2, DS1, L1, Q4, R30, S2, U8, J44. COMPONENTS NOT USED: J10-J42.
3. SEE PCB ASSEMBLY AD917-0070.
4. INSTALL P9 IF STATION FREQUENCY IS BELOW 1300 KHZ.

TOLERANCE DECIMAL U.O.S.
.X ± .030 .XXX ± .005
.XX ± .015 ANGLES ± 2°

DWN BY M. HAYDEN	DATE 9-4-86	MATERIAL SEE B/M 917-0070
CHKD		
ME		FINISH ———
PROJ ENGR		
MFG		NEXT ASSY

BROADCAST ELECTRONICS INC.
4100 N. 24TH ST. QUINCY, IL. 62305 217/224-9600
TELEX 250142 CABLE "BROADCAST"

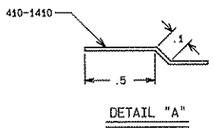
TITLE SCHEMATIC SYNTHESIZER BOARD

TYPE	SIZE	DWG. NO.	REV
S	D	917-0070	C

MODEL AX-10 | SCALE —— | SHEET 1 OF 1

NOTES:

1. SEE SCHEMATIC NO. SD917-0070.
2. INSTALL P9 IF STATION FREQUENCY IS BELOW 1300 KHZ.
3. * - INDICATES WHERE 917-0061 IS TO BE SOLDERED TO 471-0557, 2 PLACES.



DETAIL "A"

TOLERANCE DECIMAL U.O.S.
.X ± .030 .XXX ± .005
.XX ± .015 ANGLES ± 1°

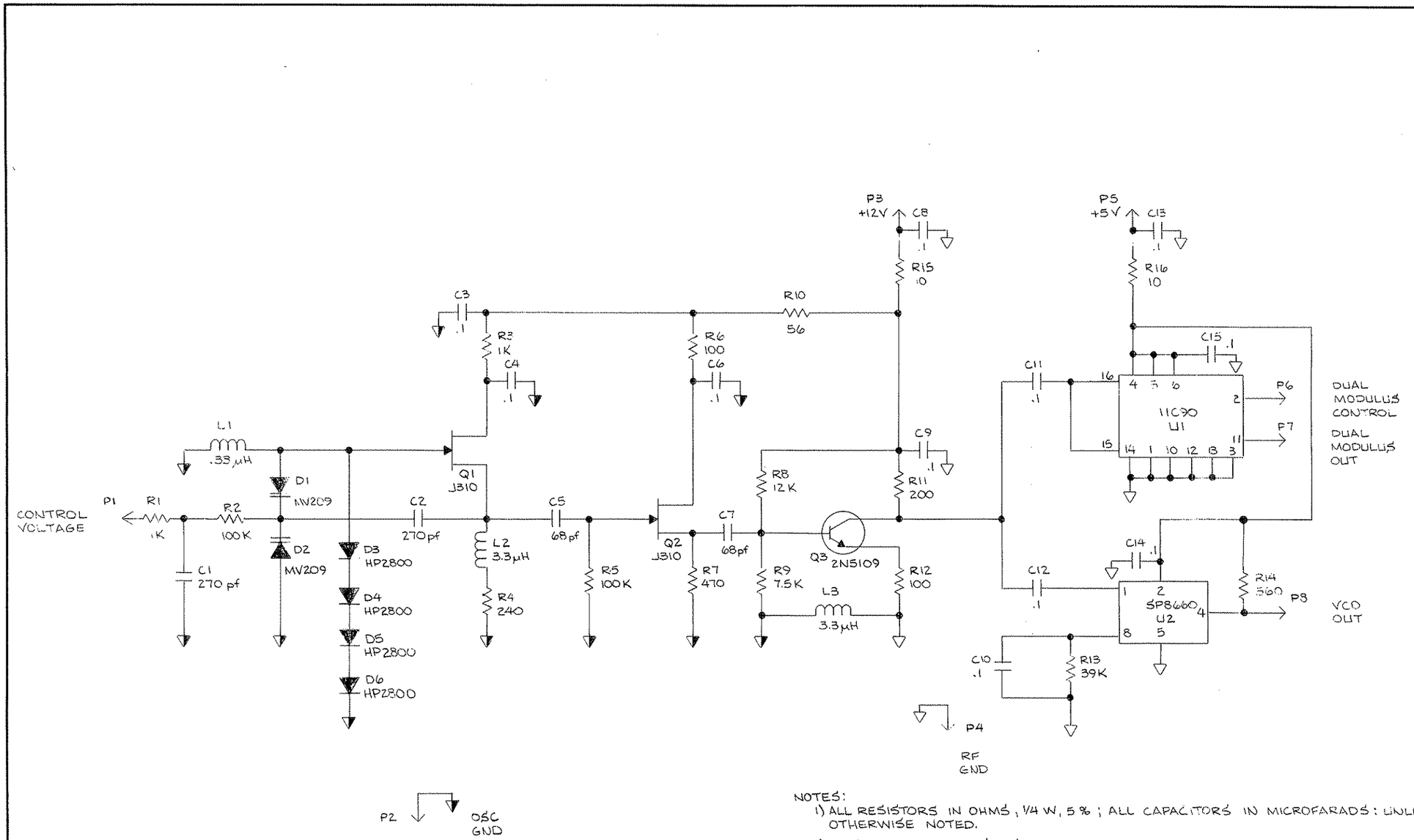
DWN BY M. HAYDEN	DATE 6-29-86	MATERIAL SEE B/M 917-0070
CHKD		
ME		FINISH
PROJ ENGR		
MFG		NEXT ASSY

BROADCAST ELECTRONICS INC.
4100 N. 24TH ST. QUINCY, IL. 62305 217/224-9600
TELEX 250142 CABLE "BROADCAST"

TITLE PCB ASSEMBLY
SYNTHESIZER BOARD

TYPE	SIZE	DWG.NO.	REV
A	D	917-0070	C

MODEL AX-10 | SCALE 2/1 | SHEET 1 OF 1



NOTES:

1) ALL RESISTORS IN OHMS, 1/4 W, 5%; ALL CAPACITORS IN MICROFARADS: UNLESS OTHERWISE NOTED.
2) LAST COMPONENTS USED: R10, C15, Q3, L3, U2, D6
3) SEE PCB ASSY. AC 917-0061

TOLERANCE (DECIMAL) U.O.S.
.x ± .030 .xxx ± .005
.xx ± .015 ANGLES ± 1°

DWN. BY	MSE 5-29-85
CHKD	MH 8-12-85
ME	
PROJ. ENGR.	EJH
MFG.	
MATERIAL	SEE B/M 917-0061
FINISH	
NEXT ASSY.	

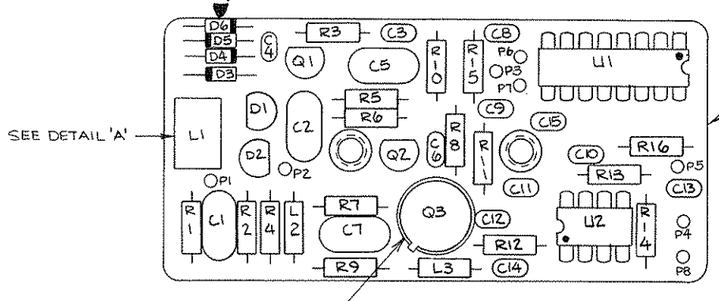
BROADCAST ELECTRONICS INC.
4100 N. 24TH ST., P.O.BOX 3606 QUINCY, IL 62305 217/224-9600
TELEX 250142 CABLE BROADCAST

TITLE: SCHEMATIC, VCO BD.

TYPE	SIZE	DWG. NO.	REV
5	C	917-0061	D

MODEL AX-10 SCALE ~ SHEET 1 OF 1

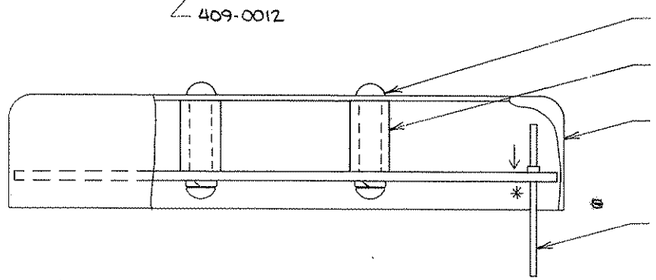
SOLDER PCB TO 471-0526-001 HERE
AFTER POTTING COMPOUND HAS BEEN ADDED.

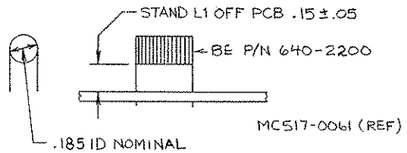


SEE DETAIL 'A'

MC 517-0061

409-0012





DETAIL 'A'

AFTER FLOW SOLDER AND ASSEMBLY OF L1, USE LOCKTITE #601 (BE #700-0079) TO SECURE 420-4104 AND 441-4003 TO COVER. INSTALL PCB TO COVER WITH 423-4002 AND 420-4104, 2 PLCS. SEND TO PCB TEST.
FOLLOWING PCB TEST, REMOVE COVER, INVERT, AND FILL WITH SLYGARD #184 (BE #700-0027) TO WITHIN .01 OF END OF STANDOFF. REMOUNT PCB TO COVER.
HEAT COMPLETE ASSEMBLY AT 150°F FOR 2 HOURS.

TOLERANCE (DECIMAL) U.O.S.
.x ± .030 .xxx ± .005
.xx ± .015 ANGLES ± 1°

DWN. BY MSE 5-28-85
CHKD MH 8-12-85
ME 8-5-85
PROJ. ENGR. EJH 8-5-85
MFG.

MATERIAL SEE B/M 917-0061
FINISH
NEXT ASSY.

BROADCAST ELECTRONICS INC.
4100 N. 24TH ST., P.O.BOX 3606 QUINCY, IL 62305 217/224-9600
TELEX 250142 CABLE BROADCAST

TITLE PCB ASSY, VCO BOARD

TYPE A | SIZE C | DWG. NO. 917-0061 | REV E
MODEL AX-10 | SCALE 2/1 | SHEET 1 OF 1

APPENDIX A
MANUFACTURERS DATA

A–1. INTRODUCTION.

A–2. This appendix lists technical data applicable to the operation and maintenance of the AX–10 AM stereo exciter. Information contained in this section is listed in the following order:

1. Data Sheet, Semi Processes Inc. N–Channel Enhancement–Mode Quad D–MOS FET Analog Switch Arrays, SD5000.
2. Data Sheet, Advanced Micro Devices Voltage Comparator, AM686.
3. Data Sheet, Signetics UHF Operational Amplifier, NE5539N.

SD5000, SD5001, SD5002

N-CHANNEL ENHANCEMENT-MODE QUAD D-MOS FET ANALOG SWITCH ARRAYS

ABSOLUTE MAXIMUM RATINGS (T_A = +25°C unless otherwise noted)

PARAMETER	SD5000	SD5001	SD5002	UNITS
V_{DS}	+20	+10	+15	Vdc
V_{SD}	+20	+10	+15	Vdc
V_{DB}	+25	+15	+22.5	Vdc
V_{SB}	+25	+15	+22.5	Vdc
V_{GS}	−25	−15	−22.5	Vdc
	+30	+25	+30	Vdc
V_{GB}	−0.3	−0.3	−0.3	Vdc
	+30	+25	+30	Vdc
V_{GD}	−25	−15	−22.5	Vdc
	+30	+25	+30	Vdc

I_D Continuous Drain Current 50mA

P_D Total Package Power Dissipation (at or below T_A = +25°C) 640mW

Linear Derating Factor ..... 10.67mW/°C

P_D Single Device Power Dissipation (at or below T_A = +25°C) 300mW

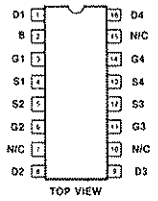
T_j Operating Junction Temperature Range ..... −55 to +85°C

T_S Storage Temperature Range .. −55 to +150°C

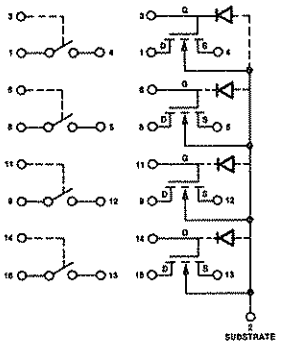
ORDERING INFORMATION

Sorted Chips in Carriers	XSD5000	XSD5001	XSD5002
Plastic DIP Package	SD5000N	SD5001N	SD5002N

PIN CONFIGURATION

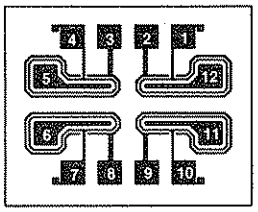


SCHEMATIC DIAGRAM



Note: Pin numbers correspond to Package Pin-out

CHIP CONFIGURATION

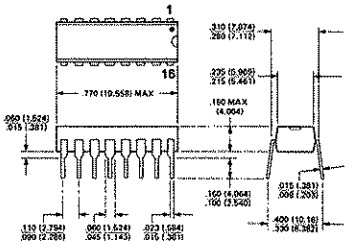


PAD NO.	PAD FUNCTION	PAD NO.	PAD FUNCTION
1	Gate No. 1	7	Gate No. 3
2	Source No. 1	8	Source No. 3
3	Source No. 2	9	Source No. 4
4	Gate No. 2	10	Gate No. 4
5	Drain No. 2	11	Drain No. 4
6	Drain No. 3	12	Drain No. 1

Dimensions: .040 x .032 x .010 Inches

PACKAGE DIMENSIONS

Plastic "N" Package



All dimensions in inches and (millimeters)

ELECTRICAL CHARACTERISTICS (T_A = +25°C unless otherwise noted)

#		PARAMETER	SD5000 MIN	SD5000 TYP	SD5000 MAX	SD5001 MIN	SD5001 TYP	SD5001 MAX	SD5002 MIN	SD5002 TYP	SD5002 MAX	UNIT	TEST CONDITIONS
1	STATIC	BV_{DS} Drain-Source Breakdown Voltage	20	25		10	25		15	25		V	I_D = 10nA, $V_{GS} = V_{BS}$ = −5V
2	STATIC	BV_{SD} Source-Drain Breakdown Voltage	20			10			15			V	I_S = 10nA, $V_{GD} = V_{BD}$ = −5V
3	STATIC	BV_{DB} Drain-Substrate Breakdown Voltage	25			15			22.5			V	I_D = 10nA, V_{GB} = 0, Source Open
4	STATIC	BV_{SB} Source-Substrate Breakdown Voltage	25			15			22.5			V	I_S = 10μA, V_{GB} = 0, Drain Open
5	STATIC	$I_{D(off)}$ Drain-Source Off Current						10				nA	V_{DS} = 10V; $V_{GS} = V_{BS}$ = −5V
6	STATIC	$I_{D(off)}$ Drain-Source Off Current									10	nA	V_{DS} = 15V; $V_{GS} = V_{BS}$ = −5V
7	STATIC	$I_{D(off)}$ Drain-Source Off Current			10							nA	V_{DS} = 20V; $V_{GS} = V_{BS}$ = −5V
8	STATIC	$I_{S(off)}$ Source-Drain OFF Current						10				nA	V_{SD} = 10V; $V_{GD} = V_{BD}$ = −5V
9	STATIC	$I_{S(off)}$ Source-Drain OFF Current									10	nA	V_{SD} = 15V; $V_{GD} = V_{BD}$ = −5V
10	STATIC	$I_{S(off)}$ Source-Drain OFF Current			10							nA	V_{SD} = 20V; $V_{GD} = V_{BD}$ = −5V
11	STATIC	I_{GBS} Gate-Body Leakage Current					1.0					μA	V_{GB} = 25V; $V_{DB} = V_{SB}$ = 0
12	STATIC	I_{GBS} Gate-Body Leakage Current			1.0						1.0	μA	V_{GB} = 30V; $V_{DB} = V_{SB}$ = 0
13	STATIC	$V_{GS(th)}$ Gate Threshold Voltage	0.1	1.0	2.0	0.1	1.0	2.0	0.1	1.0	2.0	V	$V_{DS} = V_{GS}$, I_D = 1μA, V_{SB} = 0
14	STATIC	$r_{DS(on)}$ Drain-Source ON Resistance		50	70		50	70		50	70	ohms	V_{GS} = 5V; I_D = 1mA, V_{SB} = 0
15	STATIC	$r_{DS(on)}$ Drain-Source ON Resistance		30			30			30		ohms	V_{GS} = 10V; I_D = 1mA, V_{SB} = 0
16	STATIC	$r_{DS(on)}$ Drain-Source ON Resistance		23			23			23		ohms	V_{GS} = 15V; I_D = 1mA, V_{SB} = 0
17	STATIC	$r_{DS(on)}$ Drain-Source ON Resistance		19			19			19		ohms	V_{GS} = 20V; I_D = 1mA, V_{SB} = 0
18	STATIC	r_{DSM} ON Resistance Match		1.0	5.0		1.0	5.0		1.0	5.0	ohms	V_{GS} = 5V; I_D = 1mA, V_{SB} = 0
19	DYNAMIC	g_{fs} Common-Source Forward Transcond.	10	12		10	12		10	12		mmhos	V_{DS} = 10V, I_D = 20mA, f = 1KHz, VSB = 0
20	DYNAMIC	$C_{(gs + gd + gb)}$ Gate Node Capacitance		2.4	3.5		2.4	3.5		2.4	3.5	pF	V_{DS} = 10V, $V_{GS} = V_{BS}$ = −15V, f = 1MHz
21	DYNAMIC	$C_{(gs + db)}$ Drain Node Capacitance		1.3	1.5		1.3	1.5		1.3	1.5	pF	V_{DS} = 10V, $V_{GS} = V_{BS}$ = −15V, f = 1MHz
22	DYNAMIC	$C_{(gs + gd)}$ Source Node Capacitance		3.5	4.0		3.5	4.0		3.5	4.0	pF	$V_{GS} = V_{BS}$ = −15V, f = 1MHz
23	DYNAMIC	$C_{(dg)}$ Reverse Transfer Capacitance		0.3	0.5		0.3	0.5		0.3	0.5	pF	$V_{GS} = V_{BS}$ = −15V, f = 1MHz
24	DYNAMIC	C_T Cross Talk		−107			−107			−107		dB	

Am686
Voltage Comparator

Distinctive Characteristics

- 12ns MAXIMUM PROPAGATION DELAY AT 5mV OVERDRIVE
- Complementary Schottky TTL outputs
- Fanout of 5
- 100% reliability assurance testing in compliance with MIL-STD-883
- Electrically and optically inspected dice for assemblers of hybrid products.
- Available in metal can and hermetic dual-in-line packages.

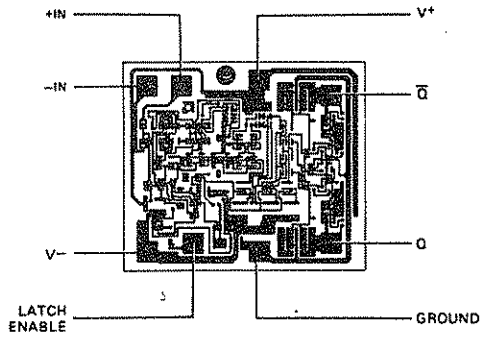
2

FUNCTIONAL DESCRIPTION

The Am686 is a fast voltage comparator manufactured with an advanced bipolar NPN, Schottky diode high-frequency process that makes possible very short propagation delays without sacrificing the excellent matching characteristics hitherto associated only with slow, high-performance linear IC's. The circuit has differential analog inputs and complementary logic outputs compatible with Schottky TTL. The output current capability is adequate for driving 5 standard Schottky inputs. The low input offset and high resolution make this comparator especially suitable for high-speed precision analog-to-digital processing.

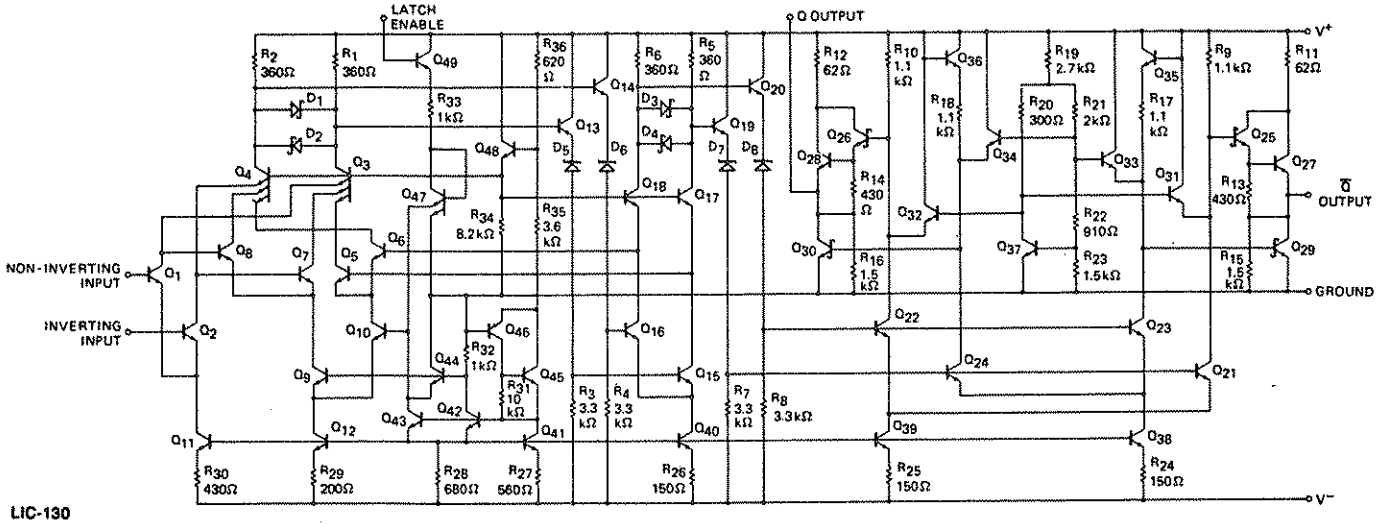
A latch function is provided to allow the comparator to be used in a sample-hold mode. If the Latch Enable input is LOW, the comparator functions normally. When the Latch Enable is driven HIGH, the comparator outputs are locked in their existing logical states. If the latch function is not used, the Latch Enable may be left open or connected to ground.

Metallization and Pad Layout



46 X 53 Mils

CIRCUIT DIAGRAM



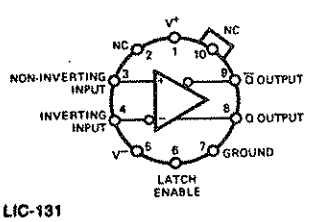
LIC-130

ORDERING INFORMATION

Part Number	Package Type	Temperature Range	Order Number
Am686	Metal Can	0°C to 70°C	Am686HC
	DIP	0°C to 70°C	Am686DC
Am686	Metal Can	−55°C to +125°C	Am686HM
	DIP	−55°C to +125°C	Am686DM
Am686	Dice	0°C to 70°C	Am686XC
	Dice	−55°C to +125°C	Am686XM

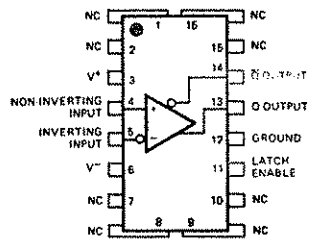
CONNECTION DIAGRAMS
Top Views

Metal Can



LIC-131

Dual-In-Line



Note 1: On metal package, pin 5 is connected to case. On DIP, pin 6 is connected to case.

LIC-132

MAXIMUM RATINGS (Above which the useful life may be impaired)

Positive Supply Voltage	+7V
Negative Supply Voltage	−7V
Input Voltage	±4V
Differential Input Voltage	±6V
Power Dissipation (Note 2)	600mW
Lead Temperature (Soldering, 60 sec.)	300°C
Storage Temperature Range	−65°C to +150°C

Operating Temperature Range	
Am686-C	0°C to +70°C
Am686-M	−55°C to +125°C
Operating Supply Voltage Range	
Am686-C	V^+ = +5.0V ±5%, V^- = −6.0V ±5%
Am686-M	V^+ = +5.0V ±10%, V^- = −6.0V ±10%
Minimum Operating Voltage (V^+ to V^-)	9.7V

ELECTRICAL CHARACTERISTICS OVER THE OPERATING TEMPERATURE RANGES (Unless Otherwise Specified)

DC Characteristics

Symbol	Parameter	Conditions (Note 3)	Am686-C	Am686-M	Units
V_{OS}	Input Offset Voltage	$R_S \leq 100\Omega$, $T_A = 25°C$ $R_S \leq 100\Omega$	3.0 3.5	2.0 3.0	mV MAX. mV MAX.
$\Delta V_{OS}/\Delta T$	Average Temperature Coefficient of Input Offset Voltage	$R_S \leq 100\Omega$	10	10	µV/°C MAX.
I_{OS}	Input Offset Current	$25°C \leq T_A \leq T_A$ (max.) $T_A = T_A$ (min.)	1.0 1.3	1.0 1.6	µA MAX. µA MAX.
I_B	Input Bias Current	$25°C \leq T_A \leq T_A$ (max.) $T_A = T_A$ (min.)	10 13	10 16	µA MAX. µA MAX.
V_{CM}	Input Voltage Range		+2.7, −3.3	+2.7, −3.3	V MIN.
CMRR	Common Mode Rejection Ratio	$R_S \leq 100\Omega$, $-3.3V \leq V_{CM} \leq +2.7V$	80	80	dB MIN.
SVRR	Supply Voltage Rejection Ratio	$R_S \leq 100\Omega$	70	70	dB MIN.
V_{OH}	Output HIGH voltage	$I_L = -1.0mA$, $V_S = V_S$ (min.)	2.7	2.5	V MIN.
V_{OL}	Output LOW Voltage	$I_L = 10mA$, $V_S = V_S$ (max.)	0.5	0.5	V MAX.
I^+	Positive Supply Current		42	40	mA MAX.
I^-	Negative Supply Current		34	32	mA MAX.
P_{DISS}	Power Dissipation		415	400	mW MAX.

Switching Characteristics (V^+ = +5.0V, V^- = −6.0V, V_{in} = 100mV, V_{od} = 5.0mV, C_L = 15pF) (Note 4)

t_{pd+}	Propagation Delay, Input to Output HIGH	T_A (min.) $\leq T_A \leq 25°C$ $T_A = T_A$ (max.)	12 15	12 15	ns MAX. ns MAX.
t_{pd-}	Propagation Delay, Input to Output LOW	T_A (min.) $\leq T_A \leq 25°C$ $T_A = T_A$ (max.)	12 15	12 15	ns MAX. ns MAX.
Δt_{pd}	Difference in Propagation Delay between Outputs	$T_A = 25°C$	2.0	2.0	ns MAX.

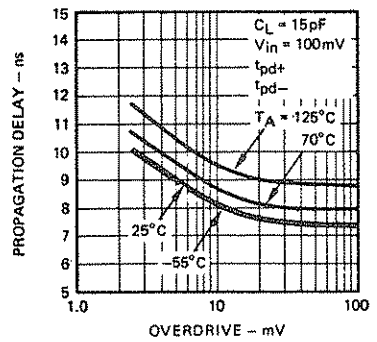
Notes: 2. For the metal can package, derate at 6.8mW/°C for operation at ambient temperatures above +95°C; for the dual-in-line package, derate at 9mW/°C for operation at ambient temperatures above 115°C.

3. Unless otherwise specified, V^+ = +5.0V, V^- = −6.0V and the Latch Enable input is at V_{OL}. The switching characteristics are for a 100mV input step with 5.0mV overdrive.

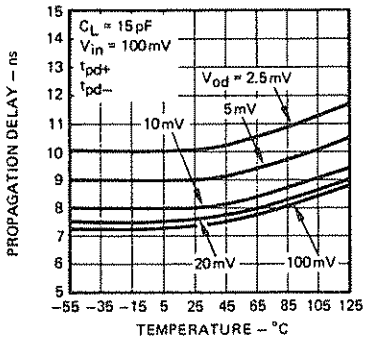
4. The outputs of the Am686 are unstable when biased into their linear range. In order to prevent oscillation, the rate-of-change of the input signal as it passes through the threshold of the comparator must be at least 1V/µs. For slower input signals, a small amount of external positive feedback may be applied around the comparator to give a few millivolts of hysteresis.

PERFORMANCE CURVES

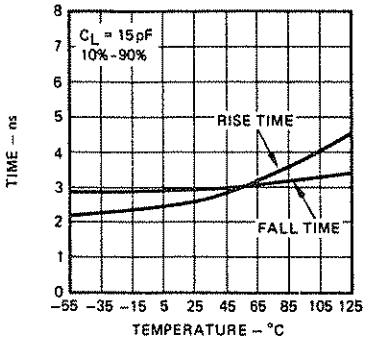
Propagation Delays as a Function of Input Overdrive



Propagation Delays as a Function of Temperature



Output Rise and Fall Times as a Function of Temperature



LIC-133

ULTRA HIGH FREQUENCY OPERATIONAL AMPLIFIER — SE/NE5539

DESCRIPTION

The Signetics SE/NE5539 is a very wide bandwidth, high slew rate, monolithic operational amplifier for use in video amplifiers, RF amplifiers, and extremely high slew rate amplifiers.

Emitter follower inputs provide a true differential high input impedance device. Proper external compensation will allow design operation over a wide range of closed loop gains, both inverting and non-inverting, to meet specific design requirements.

FEATURES

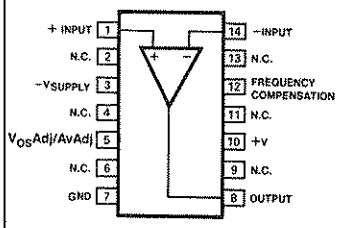
- **Gain bandwidth product: 1.2GHz at 17dB**
- **Slew rate: 600/Vμsec**
- **Full power response: 48MHz**
- **A_{VOL}: 52dB typical**
- **350MHz unity gain**

APPLICATIONS

- **Fast pulse amplifiers**
- **RF oscillators**
- **Fast sample and hold**
- **High gain video amplifiers (BW > 20MHz)**

PIN CONFIGURATION

D,F,N PACKAGE



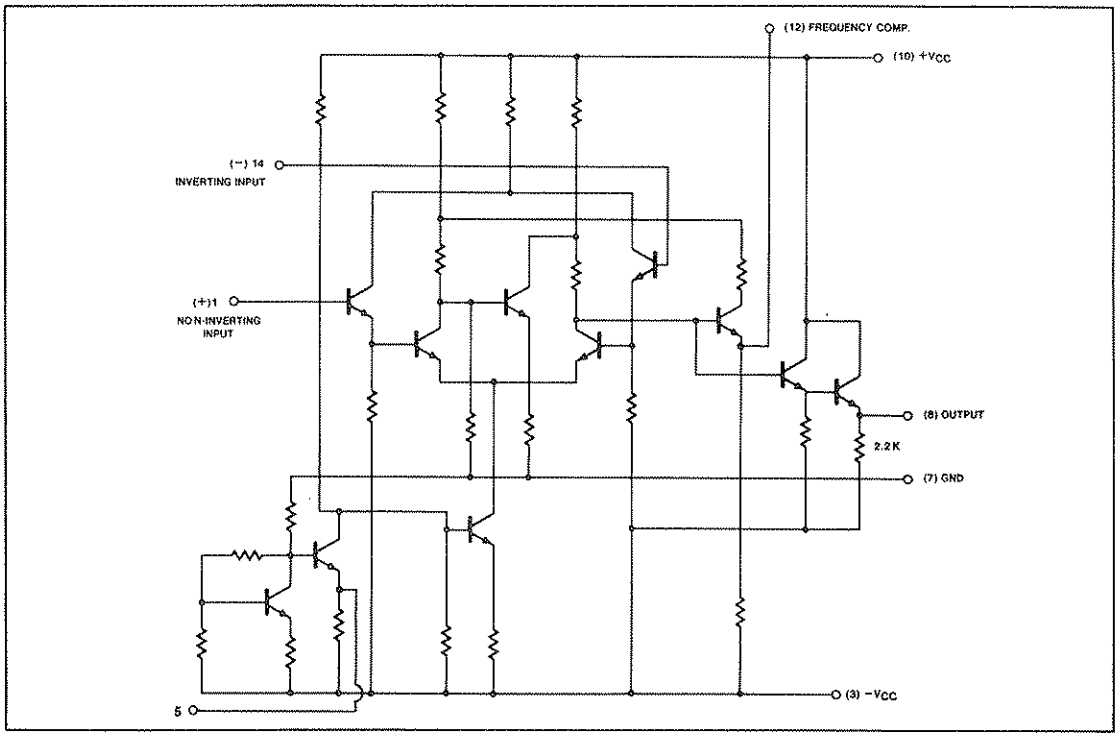
TOP VIEW

ORDER NUMBERS
SE/NE5539F SE/NE5539N
NE5539D

ABSOLUTE MAXIMUM RATINGS

	PARAMETER	RATING	UNIT
V_{CC}	Supply voltage	±12	V
P_D	Internal power dissipation	550	mW
T_{STG}	Storage temperature range	−65 to +150	°C
T_J	Max junction temperature	150	°C
T_A	Operating temperature range		
	NE	0 to 70	°C
	SE	−55 to +125	°C
	Lead temperature	300	°C

EQUIVALENT CIRCUIT



ULTRA HIGH FREQUENCY OPERATIONAL AMPLIFIER — SE/NE5539

DC ELECTRICAL CHARACTERISTICS

$V_{CC} = \pm 8V$, $T_A = 25°C$ unless otherwise specified

PARAMETER	TEST CONDITIONS		SE5539 Min	SE5539 Typ	SE5539 Max	NE5539 Min	NE5539 Typ	NE5539 Max	UNIT
V_{OS} Input offset voltage	$V_O = 0V$, $R_S = 100\Omega$	Over temp		2	5				mV
		$T_A = 25°C$		2	3		2.5	5	
$\Delta V_{OS}/\Delta T$				5			5		$\mu V/°C$
I_{OS} Input offset current		Over temp		.1	3				μA
		$T_A = 25°C$		.1	1			2	
$\Delta I_{OS}/\Delta T$				.5			.5		nA/°C
I_B Input bias current		Over temp		6	25				μA
		$T_A = 25°C$		5	13		5	20	
$\Delta I_B/\Delta T$				10			10		nA/°C
CMRR Common mode rejection ratio	$F = 1kHz$, $R_S = 100\Omega$, $V_{CM} \pm 1.7V$		70	80		70	80		dB
		Over temp	70	80					dB
R_{IN} Input impedance				100			100		kΩ
R_{OUT} Output impedance				10			10		Ω
V_{OUT} Output voltage swing	$R_L = 150\Omega$ to GND and 470Ω to $-V_{CC}$	+Swing				+2.3	+2.7		V
		−Swing				−1.7	−2.2		
V_{OUT} Output voltage swing	$R_L = 2k\Omega$ to GND, Over temp	+Swing	+2.3	+3.0					V
		−Swing	−1.5	−2.1					
	$R_L = 2k\Omega$ to GND, $T_A = 25°C$	+Swing	+2.5	+3.1					V
		−Swing	−2.0	−2.7					
$I_{CC}+$ Positive supply current	$V_O = 0$, $R_1 = \infty$	Over temp		14	18				mA
		$T_A = 25°C$		14	17		14	18	
$I_{CC}-$ Negative supply current	$V_O = 0$, $R_1 = \infty$	Over temp		11	15				mA
		$T_A = 25°C$		11	14		11	15	
PSRR Power supply rejection ratio	$\Delta V_{CC} = \pm 1V$	Over temp		300	1000				$\mu V/V$
		$T_A = 25°C$					200	1000	
A_{VOL} Large signal voltage gain	$V_O = +2.3V, -1.7V$, $R_L = 150\Omega$ to GND, 470Ω to $-V_{CC}$					47	52	57	dB
A_{VOL} Large signal voltage gain	$V_O = +2.3V, -1.7V$, $R_L = 2K$ to GND								dB
		$T_A = 25°C$				47	52	57	
A_{VOL} Large signal voltage gain	$V_O = +2.5V, -2.0V$, $R_L = 2k\Omega$ to GND	Over temp	46		60				dB
		$T_A = 25°C$	48	53	58				

NOTE

1. Differential input voltage should not exceed 0.25 volts to prevent excessive input bias current and common mode voltage 2.5 volts. These voltage limits may be exceeded if current limit is 10mA.

6

PRODUCT WARRANTY

LIMITED TWO YEAR

While this warranty gives Purchaser specific legal rights, which terminate two (2) years (one year on turntable, cartridge and blower motors) from the date of shipment, Purchaser may also have other rights which vary state to state.

Broadcast Electronics, Inc. ("Seller") hereby warrants cartridge machines, consoles, and other new Equipment manufactured by Seller against any defects in material or workmanship at the time of delivery thereof, that develop under normal use within a period of two (2) years (one year for turntable, cartridge and blower motors) from the date of shipment, as such term is defined herein. Other manufacturer's and suppliers' Equipment and services, if any, including electronic tubes, solid state devices, transmission line, antennas, towers, related equipment and installation and erection services, shall carry only such manufacturer's or suppliers' standard warranty. This warranty extends to the original user and any subsequent purchaser during the warranty period. Seller'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. Seller'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 Purchaser 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 Seller, or if Equipment is operated under environmental conditions or circumstances other than those specifically described in Seller's product literature or instruction manual which accompany the Equipment. Seller shall not be liable for any expense of any nature whatsoever incurred by the original user without prior written consent of Seller.

Seller shall not be liable to Purchaser 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 Purchaser. All express and implied warranties shall terminate at the conclusion of the period set forth herein. Any card which is enclosed with the equipment will be used by Seller for survey purposes only.

If the Equipment is described as used, it is sold as is and where is. If the contract covers equipment not owned by Seller at this date, it is sold subject to Seller's acquisition of possession and title.

EXCEPT AS SET FORTH HEREIN, AND EXCEPT AS TO TITLE, THERE ARE NO WARRANTIES, OR ANY AFFIRMATIONS OF FACT OR PROMISES BY SELLER, 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 ON THE FACE HEREOF.

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