



Broadcast Electronics

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FM-100C, FM-100E

100 WATT

FM Transmitter

Instruction Manual

597-1002
Rev B
December 28, 2011

FM-100, FM-100E. 100 WATT FM Transmitter

Instruction Manual

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RF PRODUCT TECHNICAL ASSISTANCE, REPAIR SERVICE, PARTS -

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RF TECHNICAL SERVICES -

Telephone: +1 (217) 224-9617

E-Mail: rfservice@bdcast.com

Fax: +1 (217) 224-6258

FACILITY CONTACTS -

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Web Site: www.bdcast.com

PARTS -

Telephone: +1 (217) 224-9617

E-Mail: parts@bdcast.com



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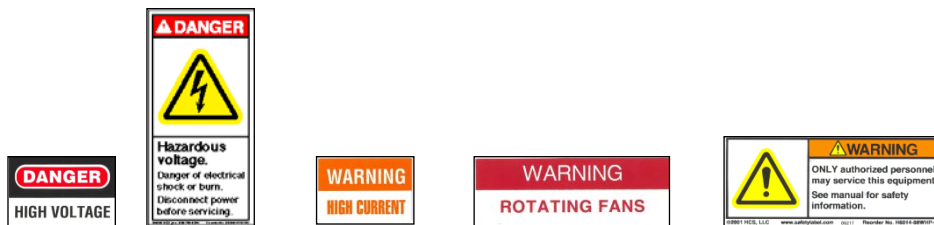




SAFETY PRECAUTIONS

PLEASE READ 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. 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.
- D. RF BURNS** Circuit boards with RF power transistors contain high RF potentials. Do not operate an RF power module with the cover removed.

HIGH VOLTAGE –

Many power circuits operate at voltages high enough to kill through electrocution. Personnel should always break the primary AC Power when accessing the inside of the transmitter.

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/cm² 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/cm² 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 leak proof. 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.

HOT SURFACES –

The power components in the transmitter are cooled by forced-air and natural convection. When handling any components of the transmitter after it has been in operation, caution must always be taken to ensure that the component is cool enough to handle without injury.



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1 Overview

Information presented by this section provides a general description of the FM-100C/E transmitter features and lists equipment specifications.

1.1 RELATED PUBLICATIONS.

The following list of publications provides data for equipment and options associated with the FM-100C/E transmitters.

PUBLICATION NUMBER	EQUIPMENT
597-0008-004	FC-30 SCA Generator
597-9900	LYNX FM Digital Stereo Generator

1.2 EQUIPMENT DESCRIPTION.

The FM-100C/E transmitter is available in several configurations. Refer to the following list for various transmitter models, spare parts kits, and options available.

MODEL	PART NO.	DESCRIPTION
FM-100C	909-1101-204	FM-100C Solid State transmitter, 117V ac, 50/60 Hz, 10 to 100 Watt FM transmitter with built-in low pass filter.
FM-100C	909-1101-304	FM-100C Solid State transmitter, 220V/240V ac, 50/60 Hz, 10 to 100 Watt FM transmitter with built-in low pass filter.
FX-100E	909-1101-309	FM-100C Solid State transmitter, 220V/240V ac, 50/60 Hz, 10 to 100 Watt FM transmitter with built-in low pass filter.
----	909-0131	Optional Master Synchronous FM Booster Circuit Board.
----	909-0132	Optional Slave Synchronous FM Booster Circuit Board.
----	979-0403	Recommended spare parts kit for the FM-100C/E transmitters. Includes selected switches and assemblies, etc. Does not include semiconductors.
----	979-0404	Recommended semiconductor kit for the FM-100C/E transmitters.
----	979-0405	100% semiconductor kit for the FM-100C/E transmitters.
----	959-0315	Optional FM Notch Filter.

1.3 FM-100C AND FM-100E MODELS.

The FM-100C and the FM-100E FM transmitters are nearly identical in construction and features (refer to Figure 1-1). However, the FM-100E meets stringent CE standards for locations requiring CE certification. Both units contain identical control, metering, and RF amplifier circuitry. The units both exhibit excellent performance specifications. However, FM-100E models are equipped with: 1) additional input/output and ac line filtering, 2) a 25-pin D- type remote interface connector, and 3) only a single rear-panel composite audio input receptacle (unbalanced).



1.4 PHYSICAL DESCRIPTION.

The FM-100C/E chassis is equipped with slide rails to allow easy access to all assemblies when the unit is extended from the rack. Removal and installation of assemblies within the transmitter is facilitated by the semimodular mechanical construction. Each assembly is firmly mounted to the main chassis and electrically connected to the main wiring harness with plugs and jacks. Front-panel test receptacles allow measurements of the composite signal without removing the top-cover. On FM-100C units, input and output connections are routed to a rear-panel terminal strip and several BNC connectors. On FM-100E units, input and output connections are routed to a rear-panel 25-pin D-Type connector and several BNC connectors.

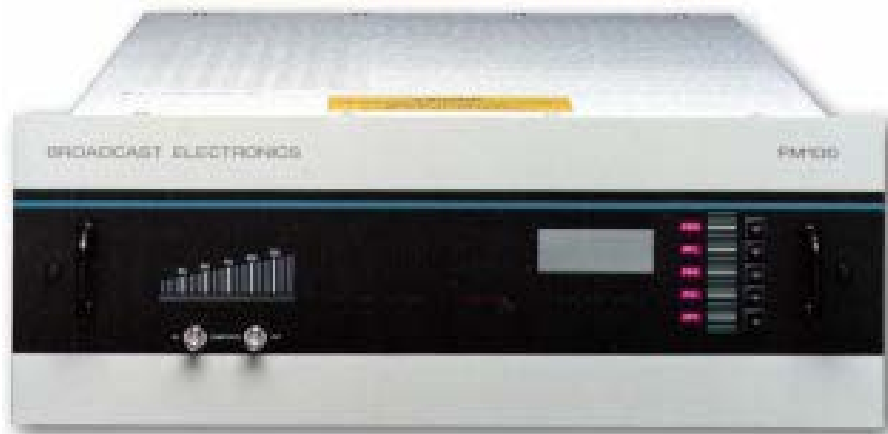


Figure 1-1. FM-100C/E TRANSMITTER

1.5 ELECTRICAL DESCRIPTION.

The Broadcast Electronics FM-100C/E transmitters are solid-state wideband FM units providing a continuously variable RF output from 10 to 100 watts into a 50 Ohm load at any frequency within the 87.5 to 108 MHz FM broadcast band in 10 kHz increments. The transmitter accepts multiple wideband composite inputs from a stereo generator or SCA generator in addition to a 600 Ohm balanced monaural input. Typical performance exhibits extremely low distortion with THD and IMD less than 0.015% and a typical signal-to-noise ratio of 85 dB. A dual primary power transformer and a voltage selector allows operation from a wide range of ac input potentials.

1.5.1 METERING.

Transmitter operating parameters are monitored by a front-panel digital LCD multimeter and an LED display. Multimeter functions are identified by large LED indicators which illuminate when a function switch is operated. The multimeter can also be operated as a high-impedance test meter for internal measurements. In addition, a color coded moving bar LED display is incorporated to indicate peak modulation percentage in increments of 5%.

1.5.2 STATUS DISPLAYS.

The FM-100C/E transmitters are designed with front-panel LEDs to indicate the status of three main transmitter operating potentials, three preset limits, and operating frequency stabilization. Additional LEDs are incorporated on the AFC/PLL circuit board assembly to indicate the status of operating potentials and monitor reference oscillator and modulated oscillator circuit conditions.



1.5.3 AUTOMATIC FREQUENCY CONTROL.

A temperature compensated reference oscillator and a dual-speed phase-locked-loop controlling the carrier frequency locks the frequency of the modulated oscillator to the precision reference frequency oscillator. This allows prompt on-frequency operation of the transmitter from a cold start. The transmitter will achieve frequency lock from a cold start in less than five seconds.

1.5.4 CONTROL CIRCUIT.

The control circuitry provides automatic control of RF output to maintain a preset power output. In addition, the control circuitry: 1) eliminates adjustments after the initial setup, and 2) protects the RF output circuitry from excessive temperatures, high VSWR conditions, over-voltage conditions, and short circuit conditions.

1.5.5 RF AMPLIFIER.

The RF amplifier is a broadbanded 10 to 100 watt amplifier covering the entire commercial FM broadcast band. Tuning of the amplifier is not required.

1.6 EQUIPMENT SPECIFICATIONS.

Refer to Table 1-1 for electrical specifications and Table 1-2 for physical and environmental specifications of the FM-100C/E transmitters .

Table 1-1. FM-100C/E Transmitter Specifications

PARAMETER	SPECIFICATIONS
AC INPUT POWER REQUIREMENTS FM-100C	97 to 133V AC or 194 to 266V AC, 50/60 Hz, 400W Maximum
FM-100E	194 to 266V AC, 50/60 Hz, 400W Maximum.
RF OUTPUT IMPEDANCE	50 Ohms.
POWER OUTPUT	10 Watts to 125 Watts, Continuously Variable. Type "N" Female Connector.
R.F. HARMONIC AND SPURIOUS SUPPRESSION (CONDUCTED)	Meets or exceeds all FCC, DOC, and CCIR standards.
FREQUENCY RANGE	87.5 MHz to 108 MHz Digitally Programmable in 10 kHz increments.
FREQUENCY STABILITY	± 300 Hz, $+32^{\circ}\text{F}$ to $+122^{\circ}\text{F}$ (0°C to $+50^{\circ}\text{C}$).
MODULATION TYPE	Direct FM at the Carrier Frequency.
MODULATION CAPABILITY	Greater than ± 350 kHz.
MODULATION INDICATION	Peak Reading, Color Coded, LED Display with Baseband Over-Modulation Indicator.
ASYNCHRONOUS AM SIGNAL-TO-NOISE RATIO	70 dB Below 100 Watt Reference Carrier with 100% Amplitude Modulation @ 400 Hz and 75 Microsecond Deemphasis (No FM Modulation Present).

SYNCHRONOUS AM SIGNAL-TO-NOISE RATIO	55 dB Below 100 Watt Reference Carrier with 100% Amplitude Modulation @ 400 Hz and 75 microsecond deemphasis (FM Modulation: ± 75 kHz @ 400 Hz @ 100 Watts Output Power).
MULTIMETER	5 Function LCD Plus Diagnostic Aid, $\pm 3\%$ Accurate.
TEST METERING	Internal High Input Impedance Multimeter with Probe for Internal DC Measurements.
FRONT PANEL TEST CONNECTIONS	Composite Input and Composite Output.
AUDIO/CONTROL CONNECTIONS FM-100C FM-100E	16 Terminal Barrier Strip and 5 BNC Connectors. 25-Pin D-Type Connector and 4 BNC Connectors.
VSWR	Rated Power into 1.5:1 Maximum Without Output Matching. Capable of Operating Into Higher VSWR with Automatic Power Reduction. Open and Short Circuit Protected At All Phase Angles.
PRE-EMPHASIS	FCC 75 uS, CCIR 50 uS, Dolby 25 uS, or Flat Response Selectable.
OVERALL EFFICIENCY	Greater than 25%.
WIDEBAND COMPOSITE OPERATION	
COMPOSITE INPUTS FM-100C	3 Total, Unbalanced (1) and Balanced (1) Plus Front Panel Test Provision (1) (BNC Connectors).
FM-100E	2 Total, Unbalanced (1) Plus Front Panel Test Provision (1) (BNC Connectors).
COMPOSITE INPUT IMPEDANCE	10 k Ohm or 50 Ohm, Nominal, Resistive, Selectable
COMPOSITE INPUT LEVEL	3.5V p-p Nominal, for ± 75 kHz Deviation.
COMPOSITE FM SIGNAL-TO-NOISE RATIO	90 dB Below ± 75 kHz Deviation @ 400 Hz. Measured within a 20 Hz to 200 kHz Bandwidth with 75 Microsecond Deemphasis.
COMPOSITE HARMONIC DISTORTION PLUS NOISE	0.005% or Less at 400 Hz.
COMPOSITE SMPTE INTER-MODULATION DISTORTION	0.005% or Less, 60 Hz/7 kHz 1:1 ratio.
COMPOSITE CCIF INTERMODULATION DISTORTION	0.05% or Less, 15 kHz/14 kHz; 1:1 Ratio.
COMPOSITE TRANSIENT IMD	0.01% or Less (Square Wave/Sine Wave.)



COMPOSITE AMPLITUDE RESPONSE	± 0.1 dB, 30 Hz to 53 kHz.
COMPOSITE PHASE RESPONSE	$\pm 0.25^\circ$ from Linear Phase 30 Hz to 53 kHz.
COMPOSITE GROUP DELAY VARIATION	± 125 Nanoseconds.
<i>SCA OPERATION</i>	
MODULATION TYPE	Direct FM.
SUBCARRIER FREQUENCY	67 kHz (39 to 95 kHz optional).
SUBCARRIER FREQUENCY STABILITY	$\pm 0.5\%$ (330 Hz @ 67 kHz), 0°C to $+50^\circ\text{C}$
SUBCARRIER HARMONIC CONTENT	Less than 0.3%.
SUBCARRIER ENVELOPE DECAY	Greater than 100 Milliseconds from 90% to 10% Subcarrier Level.
MODULATION CAPABILITY	$\pm 20\%$ of Subcarrier Frequency, Maximum.
INPUT IMPEDANCE AUDIO	600 Ohms, Balanced, Resistive.
DATA	75 Ohms, Unbalanced, Resistive, DC Coupled.
INPUT LEVEL AUDIO	Adjustable +10 dBm to -10 dBm for ± 6 kHz Deviation @ 400 Hz.
DATA	Adjustable 1.0 to 4.0 V p-p for ± 6 kHz Deviation (DC Coupled).
PREEMPHASIS: AUDIO	150 Microseconds (75 Microseconds with Internal Jumper).
DATA	No Preemphasis.
FREQUENCY RESPONSE: AUDIO	$\pm 0.5\%$ dB, 10 Hz to 10 kHz, Exclusive of Lowpass Filter.
DATA	± 0.5 dB, DC to 10 kHz.
LOW-PASS FILTER	Sixth Order, -3 dB at 4.3 kHz (Other Filters Available On Special Order). May be Bypassed.
TOTAL HARMONIC DISTORTION	Less than 0.5% Throughout Pass Band.
SMPTE INTERMODULATION DISTORTION	Less than 0.5% 60 Hz/7 kHz, 1:1 Ratio (Low-Pass and Pre-Emphasis Filter Bypassed).



CROSSTALK SCA TO STEREO	-60 dB or Better Below 100% Modulation Of Left Or Right. 75 Microsecond Deemphasis.
CROSSTALK STEREO TO SCA	-50 dB or Better Below ± 6 kHz Deviation of SCA Using 150 Microsecond Deemphasis and FS-30 Stereo Generator.
<i>STEREO OPERATION</i>	
AUDIO INPUT IMPEDANCE	600 Ohms Balanced, Resistive, Floating. Adaptable to Other Impedances.
AUDIO INPUT LEVEL	+10 dBm ± 1 dBm for 100% Modulation at 400 Hz.
AUDIO INPUT FILTERS	15 kHz Low-Pass Filters with Delay Equalization for Minimum Overshoot.
FREQUENCY RESPONSE	+0.5 dB, 30 to 15,000 Hz, 75 μ s Preemphasis (Flat, 25 μ s, or 50 μ s Preemphasis Selectable).
TOTAL HARMONIC DISTORTION	0.05% or Less @ 400 Hz.
SMPTE INTERMODULATION DISTORTION	0.05%, 60 Hz/7 kHz; 4:1 Ratio.
CCIF INTERMODULATION DISTORTION	0.05% or Less, 15 kHz/14 kHz; 1:1 Ratio.
TRANSIENT INTERMODULATION DISTORTION	0.1% (Square Wave/Sine Wave).
FM SIGNAL TO NOISE	80 dB or Greater Below Left or Right Channel, 100% Modulation @ 400 Hz, 75 μ s Deemphasis.
DYNAMIC STEREO SEPARATION	40 dB or Greater From 30 to 15,000 Hz (Normal Program Content).
LINEAR CROSSTALK (MAIN TO SUB/SUB TO MAIN DUE TO AMPLITUDE AND PHASE MATCHING OF LEFT AND RIGHT CHANNELS)	45 dB Below 100% Modulation, 30 to 15,000 Hz.
NON-LINEAR CROSSTALK (MAIN TO SUB/SUB TO MAIN DUE TO DISTORTION PRODUCTS).	70 dB Minimum Below 100% Modulation.
38 kHz SUPPRESSION	80 dB Minimum below 100% Modulation.
PILOT STABILITY	± 0.5 Hz, +32°F to +122°F (0°C to +50°C).
STEREOPHONIC SEPARATION	50 dB, 30 Hz to 15 kHz (Sinewave).



<i>MONAURAL OPERATION</i>	
AUDIO INPUT IMPEDANCE	600 Ohms Balanced, Resistive, Adaptable to Other Impedances, 60 dB Common Mode Suppression.
AUDIO INPUT LEVEL	+10 dBm Nominal for ± 75 kHz Deviation @ 400 Hz, Adaptable to Other Levels.
AUDIO FREQUENCY RESPONSE	± 0.5 dB, 30 Hz to 15 kHz, Selectable Flat, 25, 50 or 75 Microsecond Pre-emphasis.
HARMONIC DISTORTION PLUS NOISE	0.01% or Less at 400 Hz.
SMPTE INTERMODULATION DISTORTION	0.01% or Less, 60 Hz to 7 kHz, 4:1 Ratio.
CCIF INTERMODULATION DISTORTION	0.01% or Less, 15 kHz/14 kHz 1:1 Ratio.
TRANSIENT INTERMODULATION DISTORTION	0.01% or Less (Square Wave/Sine Wave).
FM SIGNAL-TO-NOISE RATION	90 dB Below ± 75 kHz Deviation @ 400 Hz Measured in a 20 Hz to 30 kHz Bandwidth with 75 Microsecond De-emphasis.
<i>REGULATORY</i>	
FM-100E ONLY	Meets CE Specifications.
<i>SAFETY</i>	
FM-100C/FM-100E	Meets IEC 215 Specifications.

Table 1-2. PHYSICAL AND ENVIRONMENTAL SPECIFICATIONS

PARAMETER	SPECIFICATION
<i>PHYSICAL</i>	
WEIGHT:	
PACKED	46 Pounds (20.9 kg).
UNPACKED	40 Pounds (18.1 kg).
DIMENSIONS:	
HEIGHT	7 Inches (17.78 cm).
WIDTH	19.00 Inches (48.3 cm).
DEPTH	19.00 Inches (48.3 cm).
<i>ENVIRONMENTAL</i>	
AMBIENT OPERATING TEMPERATURE	+32°F to +122°F (0°C to +50°C)
HUMIDITY	95% Maximum, Non-Condensing.
ALTITUDE	
50 Hz	0 to 7500 Feet (2286 m) Above Sea Level.
60 Hz	0 to 10,000 Feet (3048 m) Above Sea Level.



2 INSTALLATION

This section contains information required for installation and preliminary checkout of the Broadcast Electronics FM Transmitters.

2.1 UNPACKING.

The equipment becomes the property of the customer when the equipment is delivered to the carrier. Carefully unpack the transmitter. 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.

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

2.2 INSTALLATION.

Each transmitter is assembled, 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) Wiring, and 3) Transmitter Checkout.

2.2.1 PRELIMINARY INSTALLATION.

ENVIRONMENTAL CONSIDERATIONS. Table 1-2 provides physical and environmental conditions which should be considered prior to FM-100C/E Transmitter installation.



WARNING

ENSURE ALL TRANSMITTER POWER IS DEENERGIZED BEFORE PROCEEDING.

WARNING

AC LINE VOLTAGE PROGRAMMING. The FM-100C/E transmitters are programmed for the appropriate line voltage when shipped from the factory. The FM-100E can only operate from a 220V/240V ac supply. Therefore, ensure the line voltage selector is configured to 220V/240V.

For FM-100C models, the unit can be operated from a 110V or 220V ac supply. Check the ac line voltage programming as follows:

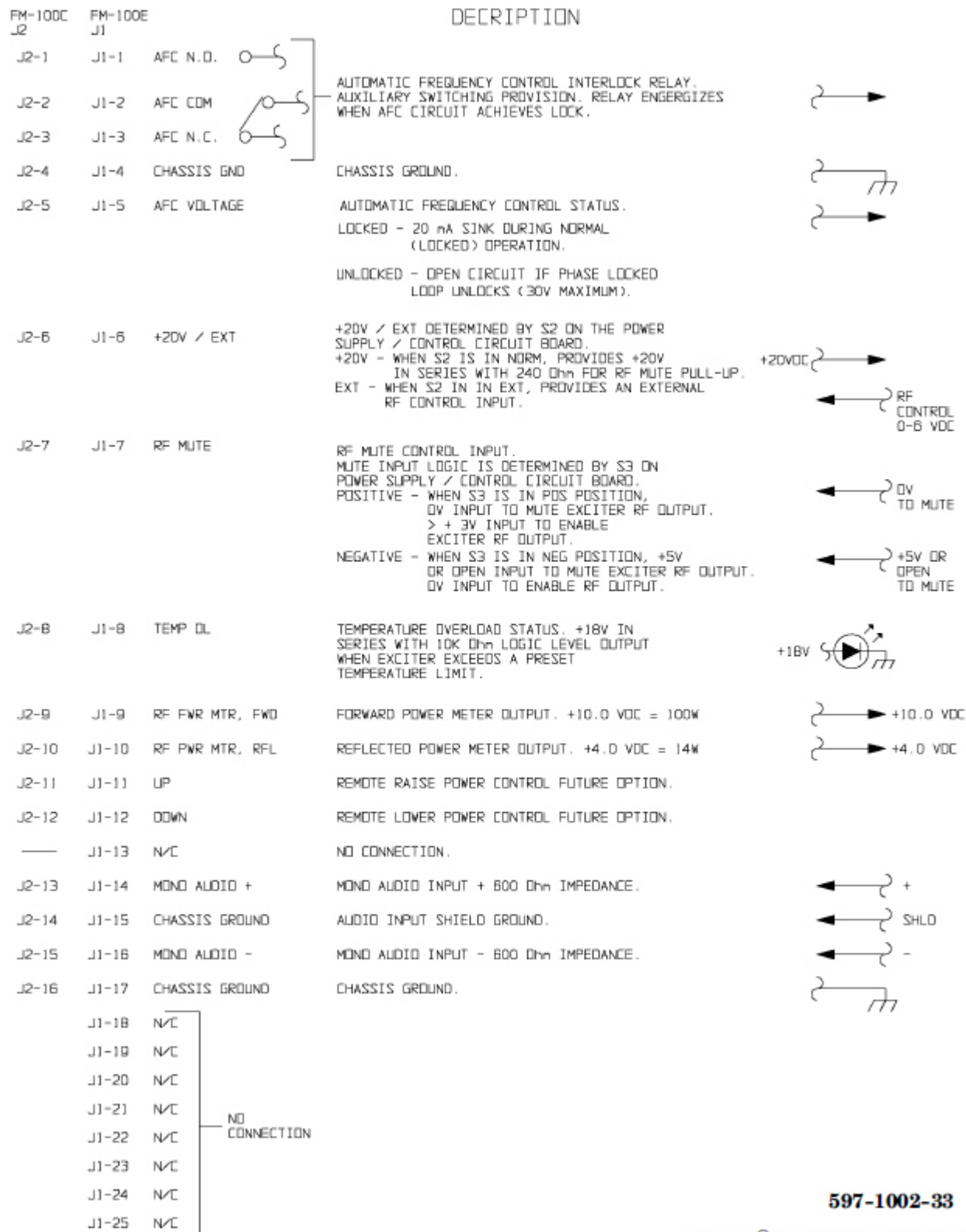
Place the transmitter on a work surface.

Remove any packing material from the outside of the transmitter.

Refer to Figure 2-1 and ensure the appropriate primary ac line voltage is visible on the AC LINE VOLTAGE SELECTOR circuit board (115/120V or 230/240V). The following text presents the ac line voltage programming:

LINE VOLTAGE	VOLTAGE SELECTOR PROGRAMMING
97-115V	100V
115-133V	120V
194-230V	220V
230-266V	240V





597-1002-33

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Figure 2-1. FM-100C/E REAR-PANEL CONNECTIONS (SHEET 2 OF 2)

If an alternate ac line voltage is required, remove the AC LINE VOLTAGE SELECTOR 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 receptacle.

Ensure the line fuse and spare fuse are both fast-blow types and rated at 8.0 amperes for the 97 to 133 volt range or 6.0 ampere for the 194 to 266 volt range.

PLACEMENT. The FM-100C/E transmitter may be installed in any convenient location in a 19 inch (48.3 cm) rack within reach of signal and power cables. The unit requires a 7 inch (17.78 cm) vertical space in a 19 inch rack. The transmitter should not be installed directly above or below heat generating equipment, otherwise no special requirements need be observed.

SLIDE-RAIL INSTALLATION AND TRANSMITTER MOUNTING. The transmitter is designed to be mounted in a rack using slide rails. To install the slide rails, proceed as follows:

- A. Locate the slide rail mounting brackets and the movable portion of each slide rail in the accessory kit.
- B. Refer to Figure 14-2, SECTION VII, DRAWINGS and secure the slide rail mounting brackets to the respective side of the rack cabinet with the hardware supplied.



CAUTION
CAUTION

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

- C. Secure the movable portion of the slide rail to the mounting brackets with the hardware supplied.
- D. After the slide rails are mounted, lift the transmitter onto the rails over the slide stops and onto the rails. Push the transmitter into the rack.

OPERATING FUNCTION PROGRAMMING. The FM-100C/E transmitters are equipped with several programmable operating functions. Refer to the following text and program the operating functions as desired.

Pull the transmitter forward until the slide rail stops are encountered.

Loosen the eight turn-lock fasteners on the top of the transmitter and remove the top cover.

Remove any packing material from the inside of the transmitter.

Refer to Figure 2-2 and ensure AUTO-PWR-MAN switch S1 and NORM-EXT switch S2 on the power supply/control circuit board assembly are operated to AUTO and to NORM respectively.

POS-MUTE-NEG switch S3 on the power supply/control circuit board is provided to select the RF mute input logic polarity (refer to Figure 2-2). S3 must be in the POS position when the transmitter is operated as a stand-alone unit. If the FM-100C/E is operated in association with another transmitter such as when the unit is used as exciter, S3 may be operated to positive or negative as determined by the transmitter mute control logic. Refer to the applicable transmitter manual and determine if positive or negative mute control is required. Switch S3 is factory operated to the POS position.

Refer to the final test data sheets shipped with the transmitter and ensure the 3 SYNTHESIZER FREQUENCY SELECTION switches on the AFC/PLL assembly are correctly positioned.

Refer to Figure 2-2 and remove the two shipping screws which secure the modulated oscillator assembly to the shock mounts.

Replace the top cover on the transmitter and secure the eight turn-lock fasteners on the top of the cover.

Refer to Figure 2-2 and check the programming of rear-panel/DAC power control header J22. Ensure J22 is programmed: 1) in position 1-2 if the transmitter is not equipped with the remote raise/lower power control option or 2) in position 2-3 if the transmitter is equipped with the remote raise/lower power control option.



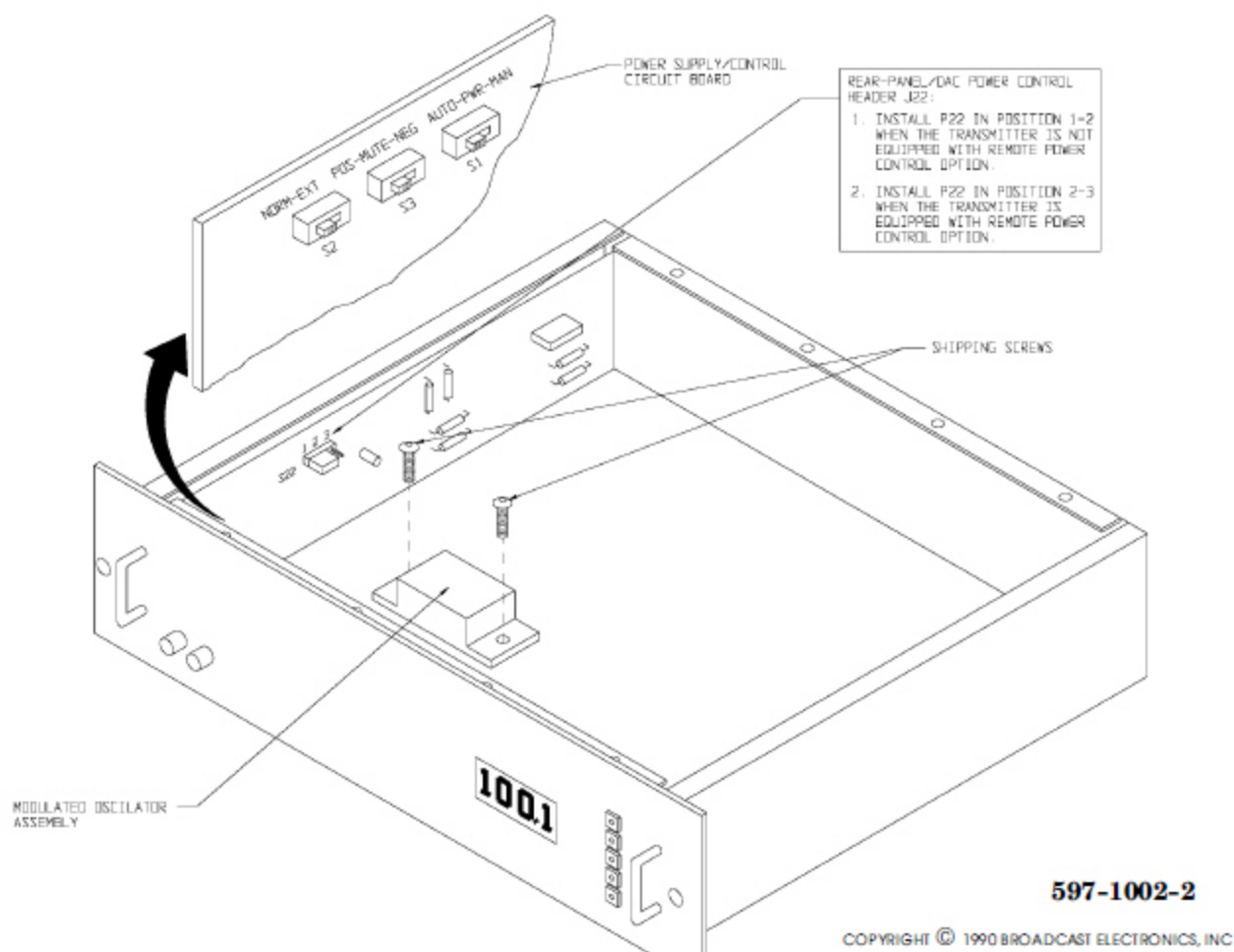


Figure 2-2. FM-100Q/E COMPONENT LOCATION DIAGRAM

GAIN SELECTION. The gain of the balanced monophonic audio processing circuit on the AFC/PLL circuit board can be programmed for input levels ranging from 0.0 dB to +10 dB. The transmitter is shipped from the factory for an input level of +10 dB. If an alternate level is required, refer to Figure 2-3 and connect the appropriate resistor between terminals E1 and E2 as determined by the following information:

INPUT LEVEL	RESISTOR VALUE
+10 dBm	OMIT
+8 dBm	39k Ohm
+4 dBm	10k Ohm
0.0 dBm	4.7k Ohm



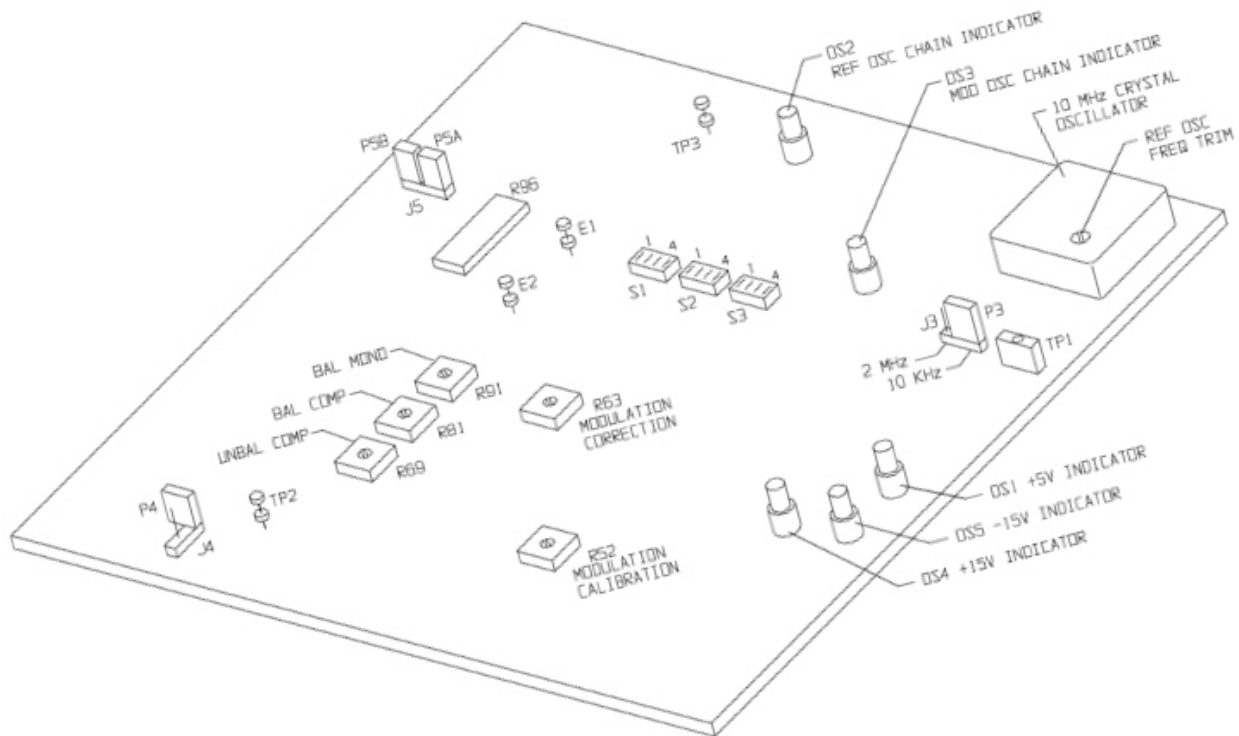
WARNING

WARNING

ENSURE ALL SYSTEM POWER IS DISCONNECTED BEFORE PROCEEDING.

2.3 WIRING.

RF OUTPUT. Refer to Figure 2-1 and connect a coaxial cable (located in the accessory kit) between the RF OUTPUT connector on the transmitter rear-panel and a 50 Ohm RF load capable of dissipating the output of the transmitter.



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597-1050-17

Figure 2-3. AFC/PLL CIRCUIT BOARD GAIN CONNECTIONS



WARNING

WARNING

ENSURE THE EXCITER CASE IS DISCONNECTED TO EARTH GROUND.

GROUND. Ensure a ground wire is connected from terminal TB1-4 on the transmitter rear-panel terminal board to earth ground. Connect the terminal to earth ground using 18 gauge wire.

REMOTE CONTROL. The FM-100C/E transmitters are designed for remote control operation (refer to Figure 2-1). The transmitter will interface with almost any remote control unit or panel. The following text presents a description of the remote control and indicator functions.

Automatic Frequency Control Relay. An Automatic-Frequency-Control relay is provided to control equipment connected external to the transmitter. When the FM-100C/E is used as an exciter in a transmitter system, the relay is used for the connection of an interlock to disable the transmitter RF power supply. When the FM-100C/E is operating as an independent unit, the relay can be used to control an external alarm. The relay contacts are rated at 125V @ .5 Amps and are located at J2-1, J2-2, and J2-3 on FM-100C units and J1-1, J1-2, and J1-3 on FM-100E units. When the AFC circuit is locked, the relay is closed. When the AFC circuit unlocks, the relay will open.



Automatic Frequency Control Indicator. The automatic frequency control indicator provides a signal to indicate when the transmitter AFC circuit is locked. The AFC indicator is located at J2-5 on FM-100C units and J1-5 on FM-100E units. The indicator will be open when the AFC circuit is unlocked.

+20 Or Ext. The +20/EXT terminal functions as a +20V supply or an analog RF control input port. When S2 on the power supply/control board is operated to NORM, the terminal operates as a +20V supply. When S2 is operated to EXT, the terminal operates as an analog RF control input port. The control range is from 0-6 V dc. If desired, control the transmitter RF output power by: 1) constructing a remote power control circuit to output a specific DC voltage to select a transmitter power level, 2) operating switch S2 to EXT, and 3) connecting the remote power supply circuit to J2-6 on FM-100C units and J1-6 on FM-100E units.

RF Mute. The FM-100C/E is equipped with an RF mute control input. Switch S3 on the power supply/control circuit board is provided to select the RF mute input logic polarity. When S3 is operated to POS, a +0V signal is required to mute the transmitter output. When S3 is operated to NEG, a greater than +5V signal is required to mute the transmitter output. To mute the transmitter, proceed as follows:

1. Refer to Figure 2-1 and remove the jumper between J2-6 and J2-7 on FM-100C units and J1-6 and J1-7 on FM-100E units.
2. Operate switch S3 on the power supply/control circuit board to POS.
3. Connect a normally closed switch between J2-6 and J2-7 on FM-100C units and J1-6 and J1-7 on FM-100E units.

Over-Temperature Indicator. Both the FM-100C and FM-100E are equipped with an over-temperature indicator. The indicator will output a HIGH (+18V dc) when the RF amplifier heat-sink temperature exceeds approximately 65°C. Refer to Figure 2-1 and connect the wiring to J2-8 on FM-100C units and J1-8 on FM-100E units.

Remote RF Power Metering. The FM-100C/E units are equipped with remote forward power and reflected power meter indications. The forward power meter indication will provide a 10.0 VDC signal to indicate a 100 watt forward power output. The reflected power meter indication will provide a 4.0 VDC signal to indicate a 14 watt reflected power output. Connect the remote metering to J2-9/J2-10 on FM-100C units and J1-9/J1-10 on FM-100E units.

Remote Power Control Option. A down remote power control option is provided at J2-12 on FM-100C units and J1-12 on FM-100E units. An up remote power control option is provided at J2-11 on FM-100C units and J1-11 on FM-100E units. The option will be available at a future date.

MONOPHONIC AUDIO CONNECTIONS. The FM-100C/E units are equipped with a balanced 600 ohm monophonic audio input (refer to Figure 2-1). The inputs are designed to accept a +10 dBm signal at 600 Ohms. Connect audio to the transmitter as follows:

AUDIO SIGNAL	FM-100C	FX-50E
+	J2-13	J1-14
SHIELD	J2-14	J1-15
-	J2-15	J1-16

CONNECTION OF COMPOSITE STEREO SIGNAL SOURCES. The FM-100C is equipped with one balanced and one unbalanced composite input on the rear-panel (COMPOSITE INPUT BAL and UNBAL). The FM-100E is equipped with a single unbalanced composite input (COMPOSITE INPUT UNBAL). These inputs are for the connection to a composite stereo source such as a stereo generator or composite STL receiver (refer to Figure 2-1). A front-panel COMPOSITE TEST IN connector functions in the same manner as the UNBAL composite input. A coaxial cable is provided in the accessory kit for the connections of a composite stereo or SCA signal to the transmitter.

Both the COMPOSITE INPUT UNBAL and BAL receptacles require a level of 3.5V p-p (1.24 VRMS) to modulate the carrier at ± 75 kHz. These jacks may be used entirely independent of each other and will accept frequencies of less than 1 Hz to 100 kHz. If these inputs are used, the output level on the composite source must be adjusted to obtain 100% peak modulation as indicated by the FM-100C Transmitter modulation display (145% range).

The BAL receptacle is ac coupled at the input and equipped with common mode rejection circuitry. Therefore, the BAL input must be used if ground loops and hum are present between the transmitter and composite source.

CONNECTION OF SCA SIGNAL SOURCES. SCA unbalanced input receptacles SUB-1, SUB-2, and SUB-3 are provided on the rear-panel of the FM-100C Transmitter. Each input is ac coupled and accepts frequencies from 40 kHz to 100 kHz. An input of 3.5V P-P (1.24 VRMS) will modulate the FM carrier 10% at ± 7.5 kHz. A coaxial cable is provided in the accessory kit for the connections of a composite stereo or SCA signal to the transmitter.

If the FM-100C transmitter is equipped with the FM synchronous booster system, rear-panel receptacle SUB-1 is used as the input/output connection for a reference frequency.

When using an SCA input, the output level of the source must be adjusted to obtain the desired peak modulation as indicated by the transmitter modulation display (14.5% range). Each input is also compatible with any SCA generator using a dc coupled input for the transmission of data.

SYNCHRONOUS FM BOOSTER OPTION. The transmitter can be equipped with a synchronous FM booster system option. The option consists of a: 1) master configuration and 2) slave configuration. The FM booster system configures a slave booster to be locked to the frequency of the master booster. Typically, the master/slave booster options are installed at the factory. If the synchronous FM booster option is to be installed in the field, installation and operating information is provided in the SYNCHRONOUS FM BOOSTER SYSTEM section of this manual. Refer to the SYNCHRONOUS FM BOOSTER SYSTEM section of this manual and perform the installation procedures as required.

2.4 TRANSMITTER CHECKOUT.

Before proceeding, check the following:

- A. Ensure all connections at terminal strips are secure.
- B. Ensure primary power is properly programmed.
- C. Ensure the chassis ground connection is secure.
- D. Ensure all signal inputs are secure.
- E. Ensure the RF output is properly connected.
- F. Ensure all external cabling is properly dressed and secured.



CAUTION

CAUTION

**THE PRIMARY AC POWER USED MUST BE THE SAME
AS DISPLAYED ON THE AC LINE VOLTAGE SELECTOR
CIRCUIT BOARD.**

Connect the transmitter to an appropriate power source with the power cord provided. The following events will occur.



- A. The fan will begin to operate.
- B. The +20V, -20V, and +5V status indicators will illuminate. After approximately 5 seconds, the LOCK status indicator will illuminate.
- C. The multimeter WATTS and FWD indicators will illuminate.
- D. The multimeter will indicate approximately 5 watts.

Depress the multimeter AFC switch.

- A. The multimeter VOLTS and AFC indicators will illuminate.
- B. The multimeter will indicate a potential within the range of +2.0 volts to +9.0 volts, dependent upon carrier frequency. Refer to the final test data sheets for the correct voltage indication.

Depress the multimeter PAV switch.

- A. The multimeter VOLTS and PAV indicators will illuminate.
- B. The multimeter will indicate a potential within the range of +3.0 volts to +5.0 volts (assuming an RF output power of 5 Watts).

Depress the multimeter PAI switch.

- A. The multimeter AMPS and PAI indicators will illuminate.
- B. The multimeter will indicate approximately 2.8 amperes (assuming an RF output power of 5 Watts).

Depress the multimeter FWD switch.

- A. Extend the transmitter forward on the slide rails to expose the R.F. POWER OUTPUT ADJ. control access hole in the left side of the top cover.
- B. Using an insulated adjustment tool, adjust the transmitter output power to the desired level.



WARNING

**DISCONNECT TRANSMITTER PRIMARY POWER
BEFORE PROCEEDING.**

WARNING

Disconnect ac primary power from the transmitter.

Disconnect the RF load and connect the transmitter output to the antenna.

3 OPERATION

This section identifies all controls and indicators associated with the FM-100C/E FM Transmitters and provides standard operating procedures.

3.1 CONTROLS AND INDICATORS.

Refer to Figure 3-1 for the location of all controls and indicators associated with normal operation of the FM-100C/E Transmitters. The function of each control or indicator is described in Table 3-1.

3.2 OPERATION.



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

3.2.1 TURN ON.

Primary power will be applied to the transmitter when the unit is connected to an appropriate power source. The following events will occur:

- A. The flushing fan will operate.
- B. The +20V, -20V, and +5V operating voltage status indicators will immediately illuminate.
- C. After a delay of approximately 5 seconds, the LOCK indicator will illuminate to indicate operating frequency stabilization.
- D. The multimeter will be operated to the forward power function and indicate a previously adjusted RF output level.

Observe the modulation indicator to ensure programming is applied to the transmitter.

Operate the multimeter forward switch to illuminate the FWD indicator and record the multimeter output power indication.

Operate the multimeter reflected switch to illuminate the RFL indicator and record the multimeter reflected power indication.

The forward and reflected power indications may be converted to a VSWR ratio using Table 3-2. To use the table, divide the multimeter reflected power indication by the multimeter forward power indication. Locate the quotient in the POWER RATIO column. The VSWR is listed across from the POWER RATIO entry.

3.2.2 MUTE.

For units operating as an independent transmitter with the installation of a mute switch, operate the switch to mute to disable the transmitter RF output power.



Table 3-1. FM-100C/E CONTROL AND INDICATORS

ITEM NO.	NOMENCLATURE	FUNCTION
1	RF Power Output Level Control	Adjusts transmitter RF output level. CW adjustment increases output level.
2	+20V Status Indicator	Illuminates to indicate the presence of the +20 volt operating potential.
3	-20V Status Indicator	Illuminates to indicate the presence of the -20 volt operating potential.
4	+5V Status Indicator	Illuminates to indicate the presence of the +5 volt operating potential.
5	LOCK Status Indicator	Illuminates to indicate the operating frequency is stabilized.
6	RF Status Indicator	Illuminates to indicate an RF amplifier malfunction.
7	VSWR Status Indicator	Illuminates to indicate reflected power exceeds 5.5 watts.
8	TEMP Status Indicator	Illuminates to indicate the RF amplifier heat-sink temperature exceeds a preset limit.
9	Multimeter LCD Display	Indicates units of voltage, power, or current as selected by the multimeter switches.
10	RFL Multimeter Indicator	Illuminates to indicate the reflected power multimeter function is selected.
11	FWD Multimeter Indicator	Illuminates to indicate the forward power multimeter function is selected.
12	Forward Multimeter Switch	Selects the forward power multimeter function when depressed.
13	Reflected Multimeter Switch	Selects the reflected power multimeter function when depressed.
14	PA Voltage Multimeter Switch	Selects the PA voltage multimeter function when depressed.
15	PA Current Multimeter Switch	Selects the PA current multimeter function when depressed.
16	Automatic Frequency Control Multimeter Switch	Selects the AFC voltage multimeter function when depressed.
17	AFC Multimeter Indicator	Illuminates to indicate the AFC multimeter function is selected.
18	PAI Multimeter Indicator	Illuminates to indicate the PA current multimeter function is selected.

19	PAV Multimeter Indicator	Illuminates to indicate the PA voltage multimeter function is selected.
20	Amps Multimeter Unit Indicator	Illuminates when the multimeter indicates units of current.
21	Volts Multimeter Unit Indicator	Illuminates when the multimeter indicates units of voltage.
22	Watts Multimeter Unit Indicator	Illuminates when the multimeter indicates units of power.
23	Modulation Indicator	Indicates peak composite baseband modulation level. Scale is calibrated for 100% at ± 75 kHz deviation.
24	X10 Scale Indicator	Illuminates when modulation display input level is multiplied by 10.

Table 3-2. POWER/VSWR CONVERSION

Reflected Power in Watts = POWER RATIO Forward Power in Watts	VSWR
0.000	1.0:1
0.002	1.1:1
0.008	1.2:1
0.017	1.3:1
0.028	1.4:1
0.040	1.5:1
0.053	1.6:1
0.074	1.75:1
0.111	2.0:1
0.183	2.5:1
0.250	3.0:1
0.360	4.0:1



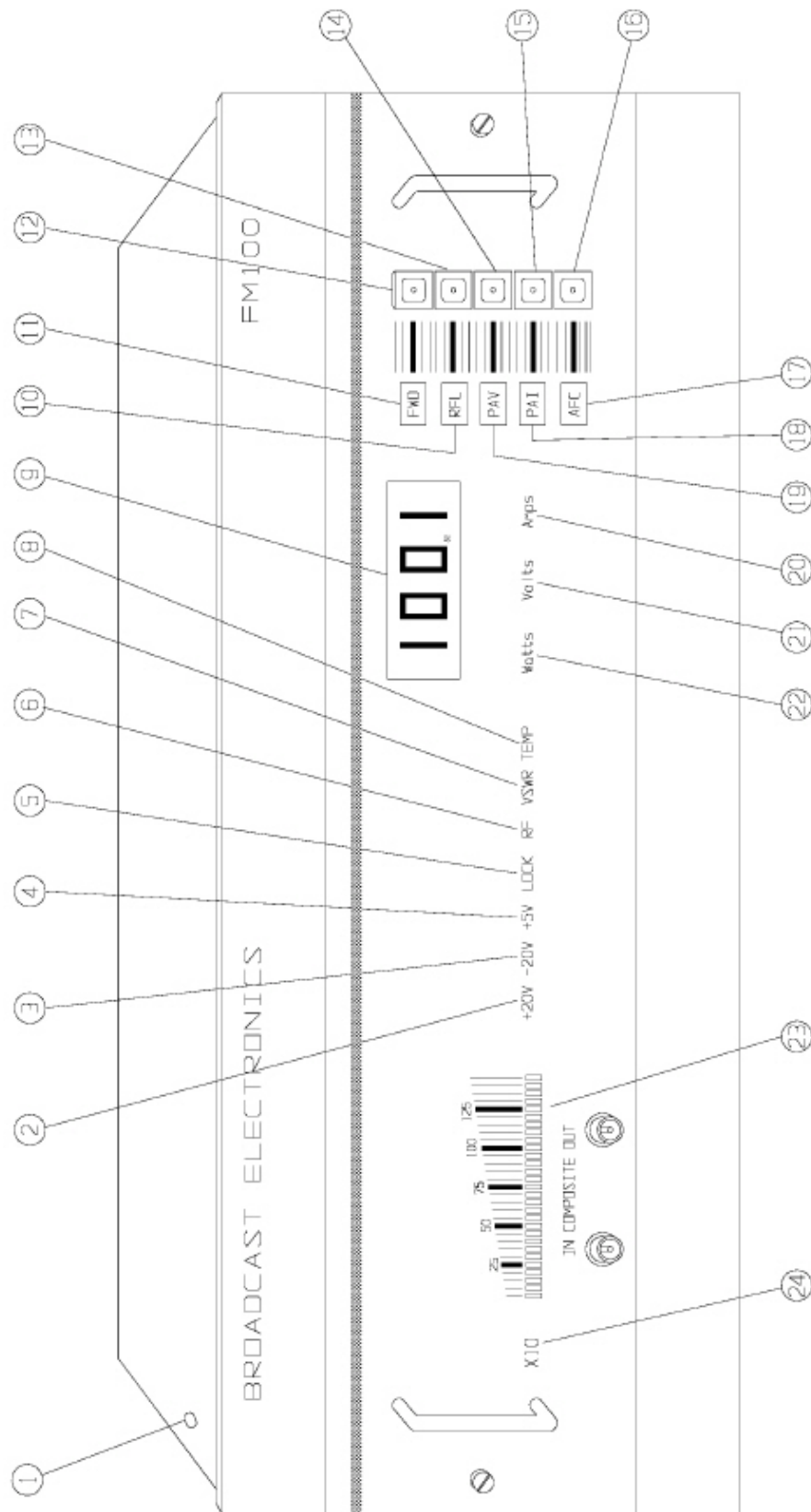


Figure 3-1. FM-100C/E CONTROLS AND INDICATORS

4 THEORY OF OPERATION

This section presents overall theory of operation for the FM-100C/E FM Transmitters.

For the purpose of explaining the FM-100C/E transmitter circuitry; the transmitter is divided into functional subassemblies in the following text. A detailed description of each subassembly is presented in Part II of this manual. A block diagram of the FM-100C/E FM Transmitter is presented in Figure 4-1.

4.1 FUNCTIONAL DESCRIPTION.

4.1.1 POWER SUPPLY/CONTROL CIRCUITS.

The power supply/control circuit board contains the transmitter power supply circuit and control circuitry. The proceeding text will describe the power supply circuitry followed by the control circuitry.

POWER SUPPLY CIRCUIT. Primary ac power to the transmitter is applied through a voltage selector and line filter module. This device provides overload protection for the entire ex citer and allows selection of a wide range of ac input potentials.

All dc circuitry in the transmitter with the exception of the main dc supply for the RF amplifier assembly operates from three pre-regulated potentials of +20 volts, -20 volts and +5 volts. All supplies are full-wave rectified, filtered, and electronically regulated to assure stable equipment operation.

The +20 volt, -20 volt, and +5 volt supplies are low-current circuits which are protected from over-voltage, over-current, reverse-voltage, and short-circuit conditions. These potentials are distributed throughout the transmitter to various subassemblies and re-regulated to lower voltages on each circuit board. Front-panel LEDs provide status indication of the +20 volt, -20 volt, and +5 volt operating potentials.

A modular switching power supply assembly +28 volt supply for application to the RF amplifier is regulated by the control circuitry in response to preset level controls and feedback loops. This supply contains over-voltage, over-current, reverse-voltage, short-circuit, and over-temperature circuitry to protect the transmitter sub-assemblies.

CONTROL CIRCUIT. The control circuitry regulates operation of the RF amplifier within preset limits dependent upon several parameters such as forward RF power output, reflected power, RF amplifier heat sink temperature, dc current, dc supply voltage, an external mute control potential, and an external RF power adjust potential. The control circuit assembly also contains amplifiers for the forward and reflected power directional couplers, over temperature circuitry, and the VSWR circuitry.

The control circuit compares the sum of the forward and reflected powers to a reference for automatic control of power output. If the reflected power becomes excessive, the power output will be reduced by the amount required to maintain safe operation of the RF output transistor. If excessive VSWR exists, a front-panel VSWR indicator will illuminate.

In addition, the control circuit monitors the total RF amplifier assembly heat sink temperature and limits RF output accordingly. This assures operation at safe transistor temperatures under the worst case conditions of high VSWR, high ambient temperatures, or failure of the cooling fan. If an over-temperature condition exists, a front-panel TEMP indicator will illuminate.

Automatic protection of the RF devices and the switching power supply assembly from excessive voltage is provided by an MOV. Short circuit protection is provided by foldback current limiting and a fuse. If an over-current condition exists, the front-panel RF indicator will illuminate.



4.1.2 REMOTE CONTROL/STATUS INTERFACING AND RFI FILTER NETWORK.

Remote control and status interfacing is accomplished by: 1) an interface circuit board on FM-100C models and 2) a 25-pin D-Type connector on the RFI filter circuit board for FM-100E models. The RFI filter circuit board prevents interference from signals of 500 kHz and above by filtering and bypassing the audio, control, and status input and output circuits. Transient protection for the signals is provided by transorbs. The front-panel COM POSITE TEST IN and COMPOSITE TEST OUT circuits are not routed through this circuit board.

4.1.3 METERING CIRCUIT.

Metering of important transmitter operating parameters is provided by a digital multimeter. Five steady-state parameters are selected by front-panel switches and displayed on a liquid crystal display (LCD). Additional circuitry on the metering circuit board converts the multimeter into a high-impedance test instrument for internal voltage measurements.

A digitally controlled moving-bar LED display constantly monitors the ac composite signal applied to the modulated oscillator. Indication of short transient peaks exceeding 100% modulation is provided by a one-shot multivibrator connected to the 100% digital display segment. Accuracy to 5% on signals from dc to a one-cycle burst of a 100 kHz tone is provided by a high-speed peak detector. An automatic scaling circuit provides expansion of the meter scale from 145% to 14.5% to measure SCA and pilot injection signal levels.

4.1.4 AFC/PLL CIRCUIT.

The AFC/PLL circuit synthesizes the transmitter carrier frequency and maintains the phase and frequency of the carrier. The transmitter frequency synthesizer and comparator circuit provides 2000 synthesized frequencies within the commercial FM broadcast band in 10 kHz increments.

Carrier sampled at the output of the modulated oscillator is returned to the AFC/PLL circuit as feedback. This feedback is divided and compared to a scaled-down reference frequency within a programmable frequency synthesizer and comparator logic circuit to develop a correction signal.

During normal operation, the AFC/PLL circuit constantly modifies the correction signal applied to the modulated oscillator to maintain the stability of the carrier. If the carrier is off frequency, the AFC/PLL circuit will mute the RF output and deenergize the AFC relay until the carrier is locked in phase and frequency to the reference oscillator. A dual-speed loop filter provides rapid stabilization of the carrier and allows modulation from 1 Hz to 100 kHz. When frequency stabilization is attained, a front-panel status indicator will illuminate.

As a secondary function, the assembly accepts all audio inputs, corrects the audio, and sums the corrected audio with AFC tuning bias which linearizes the modulation and adjusts the carrier frequency of the modulated oscillator.

4.1.5 MODULATED OSCILLATOR CIRCUIT.

The modulated oscillator circuit generates the final carrier frequency, frequency modulates the carrier, and amplifies the modulated RF carrier to a level sufficient to drive the RF amplifier. Additional circuitry interfaced with the AFC/PLL circuit maintains the RF carrier center frequency as part of a phase-locked-loop.

4.1.6 RF AMPLIFIER ASSEMBLY.

The RF amplifier assembly consists of three stages of amplification designed to increase the 1 milliwatt RF input signal from the modulated oscillator to an adjustable RF power level of 10 to 100 watts as required. A +28 volt dc supply for the RF amplifier assembly and the +20 volt regulator is provided by a modular switching power supply unit.

The first stage employs a broadband thick-film hybrid amplifier which provides an output of approximately one watt to the input of the driver stage. The driver provides 8 watts of RF power to the power amplifier which outputs an adjustable RF level of 10 to 100 watts.

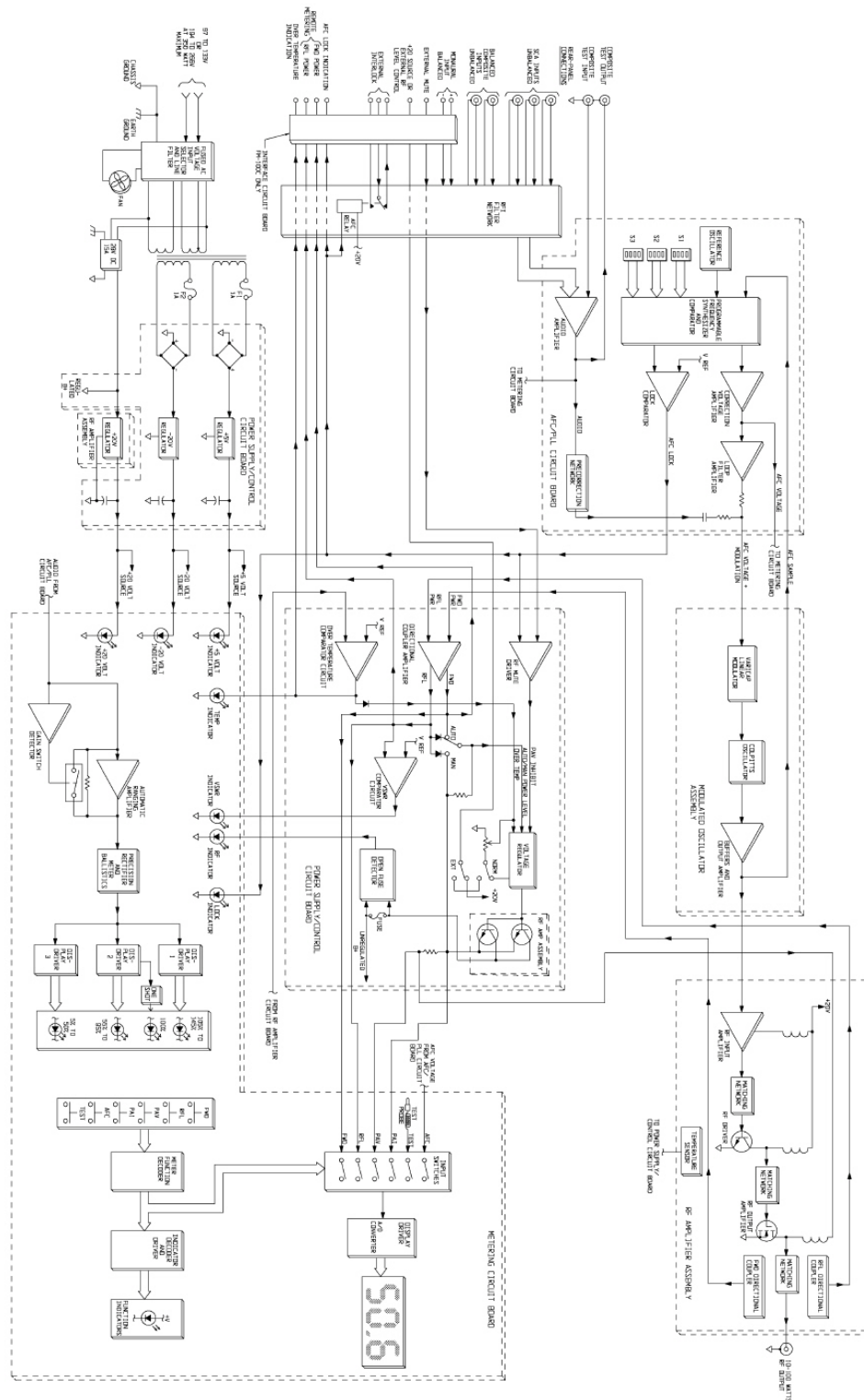


FIGURE 4-1. FM-100C/E OVERALL SIMPLIFIED SCHEMATIC

Figure 4-1. FM-100C/E OVERALL SIMPLIFIED SCHEMATIC

A microstrip directional coupler on the RF amplifier printed circuit board supplies information to the transmitter control circuitry to automatically maintain RF power output and provide protection during high VSWR operating conditions. A notch filter is provided between the RF amplifier circuit and the directional coupler circuit.

The RF amplifier transistor is mounted on a large heat sink positioned in the direct air flow from a cooling fan. Heat sink temperature is monitored by the control circuitry. If an over-temperature condition exists, the control circuit will automatically reduce RF power to maintain safe operation of the RF devices.

The broadband characteristic of the amplifier eliminates the necessity for adjustments at any frequency within the FM band, assures that the transmitter output is transparent to the signal generated by the modulated oscillator, and enhances amplifier stability under varying load conditions.

5 MAINTENANCE

This section provides general maintenance information, electrical adjustment procedures, and troubleshooting information for the FM-100C/E FM Transmitters.

5.1 SAFETY CONSIDERATIONS.



WARNING

THE TRANSMITTER CONTAINS GUARDS FOR HAZARDOUS VOLTAGES PRESENT AT THE AC LINE SELECTOR AND

WARNING

HIGH CURRENTS PRESENT AT THE POWER TRANSISTORS MOUNTED IN THE RF AMPLIFIER HEAT SINK ASSEMBLY.



WARNING

NEVER OPERATE THE TRANSMITTER WITHOUT THE GUARDS.

WARNING



WARNING

USE THE INSULATED TUNING TOOL PROVIDED FOR ANY ADJUSTMENTS AND DO NOT TOUCH ANY COMPONENT WITHIN THE TRANSMITTER WHEN POWER IS ENERGIZED.

WARNING

Low voltages are used throughout the transmitter circuitry; however, maintenance with power energized is always considered hazardous and caution should be observed. It is possible to receive minor RF burns from the high impedance points of the RF power amplifier with the transmitter top-panel removed.



WARNING

ENSURE ALL PRIMARY POWER IS DISCONNECTED FROM THE EXCITER BEFORE ATTEMPTING EQUIPMENT MAINTENANCE

WARNING

5.2 FIRST LEVEL MAINTENANCE.

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

Periodically, the transmitter chassis and fan filter should be cleaned of accumulated dust using a brush and vacuum cleaner. Check for overheated components, tighten loose hardware, and lubricate mechanical surfaces (such as the slide rails) as required. Check performance levels by utilizing the multimeter functions and status indicators provided.

5.3 SECOND LEVEL MAINTENANCE.

Second level maintenance consists of procedures required to restore the FM-100C/E to operation after a fault has occurred.

The maintenance philosophy of the transmitters consists of problem isolation to a specific assembly. Refer to the applicable section of this manual for detail troubleshooting information to isolate a problem to specific components. If desired, the entire assembly may be returned to Broadcast Electronics for repair or replacement.



5.3.1 ADJUSTMENTS.

Adjustment procedures for all controls on all circuit boards are provided by each applicable section of this manual.

5.4 TROUBLESHOOTING.

Most troubleshooting consists of visual checks. The various transmitter indicators (meters, LED's, and fuses) should be observed to isolate the malfunction to a specific area as listed below. Typical meter indications are presented in Table 5-1 and transmitter power demand requirements are listed in Table 5-2.

- A. Transmitter Input
- B. Power Supply Circuit
- C. Metering Circuit
- D. Modulated Oscillator Circuit
- E. AFC/PLL Circuit
- F. RF Amplifier
- G. Control Circuit
- H. Transmitter Output

DC VOLTMETER. The FM-100C/E transmitters are equipped with a high impedance voltmeter which can be employed to measure internal dc potentials. To convert the front-panel multimeter to a dc test instrument, refer to Figure 5-1 and the following procedure.

Procedure. To convert the multimeter to a test instrument, proceed as follows:

- A. Slide the transmitter forward and remove the top-cover.



WARNING

WARNING

DO NOT TOUCH ANY FEED THROUGH CAPACITORS OR COMPONENTS ON THE RF AMPLIFIER MODULE WITH POWER APPLIED.

- B. Operate the test switch/indicator on the metering circuit board assembly to illuminate the switch/indicator. All multimeter function indicators will extinguish and the LCD display will indicate zero volts.
- C. The test probe is mounted directly behind the metering circuit board inside the chassis. The test probe measures D.C. voltages.
- D. To restore normal operation of the meter, depress any front-panel multimeter function switch. Replace the top-cover.

Once the trouble is isolated, refer to the applicable section discussing the theory of operation and troubleshooting procedures for the respective assembly to assist in problem resolution. All internal components may be accessed through a removable top cover (refer to Figure 5-1).

Table 5-1. TYPICAL METER INDICATIONS

MULTIMETER SWITCH POSITION		MULTIMETER INDICATION		
TEST				
	+20 V	+19 to +21 V DC		
	- 20 V	- 19 to -21 V DC		
	+5 V	+4.8 to +5.2 V DC		
AFC		+2.0 to +9.0 V DC, dependent upon RF carrier frequency		
PAV	RF POWER	88.1 MHz	98.1 MHz	108.1 MHz
	10 Watts	+6.1 V DC	+6.4 V DC	+6.8 V DC
	25 Watts	+10.1 V DC	+10.4 V DC	+11.3 V DC
	50 Watts	+14.3 V DC	+15.0 V DC	+16.1 V DC
	75 Watts	+17.1 V DC	+18.1 V DC	+19.3 V DC
	100 Watts	+20.1 V DC	+20.9 V DC	+22.3 V DC
PAI	RF POWER	88.1 MHz	98.1 MHz	108.1 MHz
	10 Watts	2.89 Ampere	3.0 Ampere	3.11 Ampere
	25 Watts	4.03 Ampere	4.04 Ampere	4.01 Ampere
	50 Watts	5.25 Ampere	5.16 Ampere	5.02 Ampere
	75 Watts	6.09 Ampere	5.96 Ampere	5.72 Ampere
	100 Watts	6.98 Ampere	6.7 Ampere	6.38 Ampere
FWD		10 to 100 Watts		
RFL		Less than 2 Watts		



Table 5-2. AC POWER REQUIREMENTS

RF POWER OUTPUT MIDBAND 98.1 MHz	AC INPUT	POWER REQUIREMENTS
100 W	230 V AC	1.95 Ampere
75 W	230 V AC	1.8 Ampere
50 W	230 V AC	1.6 Ampere
25 W	230 V AC	1.4 Ampere
100 W	115 V AC	3.9 Ampere
75 W	115 V AC	3.6 Ampere
50 W	115 V AC	3.2 Ampere
25 W	115 V AC	2.8 Ampere



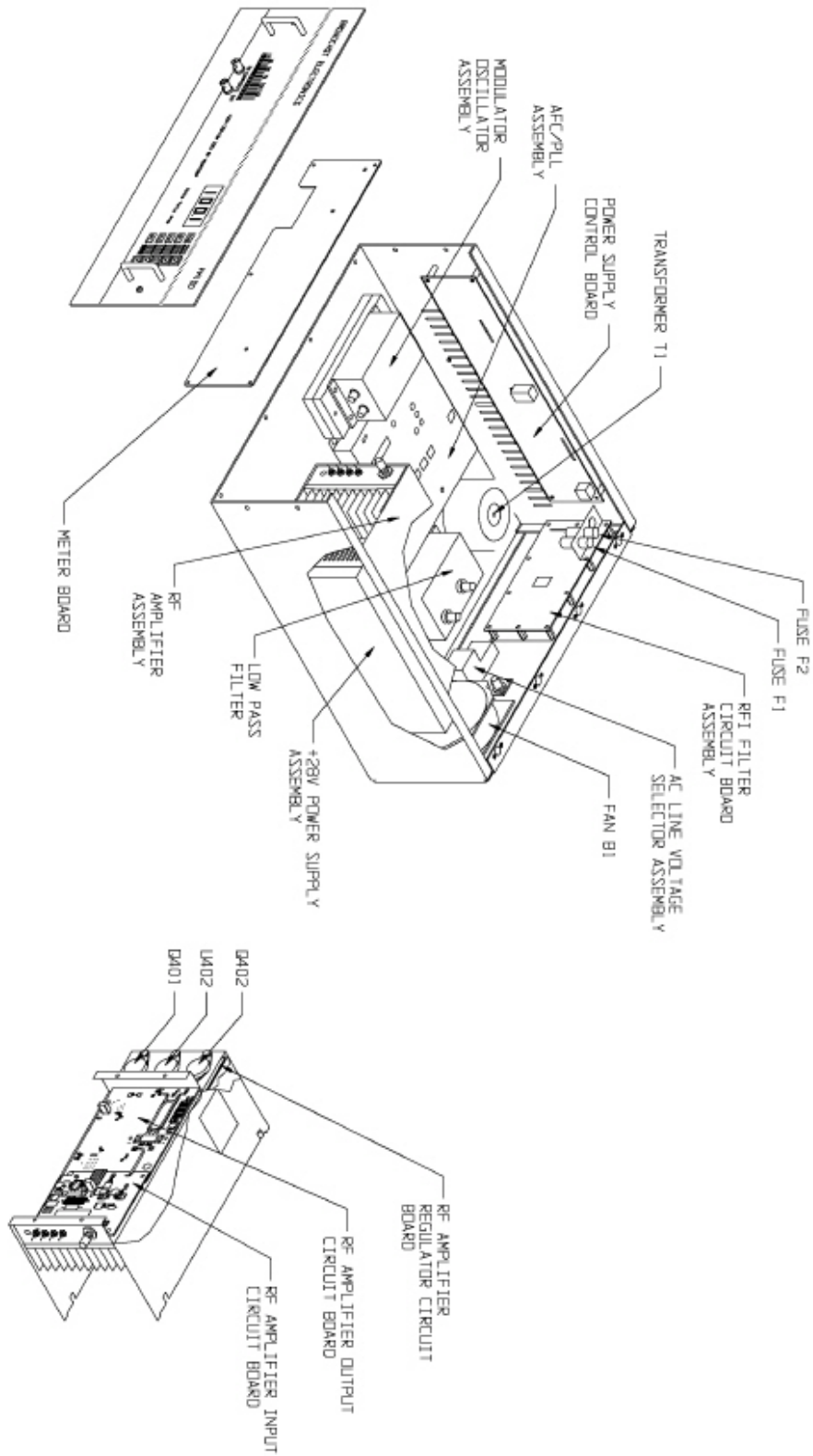


Figure 5-1. FM-100C/E ASSEMBLY

5.5 TRANSMITTER PREPARATION FOR SHIPMENT

If the transmitter is removed from service to be shipped to another location, ensure the following steps are accomplished prior to shipping:

- A. Secure the modulated oscillator assembly in place with two 6-32 X 3/4 inch (1.27 cm) screws in the tapped holes provided.
- B. Ensure the top-cover is secured to the transmitter.
- C. Pack the transmitter in a carton, allowing 2 inches (5.08 cm) minimum of packing material all around the transmitter.
- D. Provide adequate insurance coverage.

5.6 TRANSMITTER FREQUENCY CHANGE.

If modification of the transmitter frequency is required, perform the following procedures in sequence as listed.

- A. FREQUENCY SELECTION procedure in the AFC/PLL section of this manual.
- B. MODULATION CALIBRATION procedure in the AFC/PLL section of this manual.
- C. MODULATION CORRECTION procedure in the AFC/PLL section of this manual.
- D. FWD CAL (R5) AND RFL CAL (R9) procedure in the POWER SUPPLY/CONTROL section of this manual.



WARNING

BERYLLIUM OXIDE CERAMICS (BeO) – AVOID BREATHING DUST OR FUMES.

WARNING



WARNING

PORTIONS OF THE WHITE CASE MATERIAL OF THE FM-100C/E TRANSMITTER RF AMPLIFIER TRANSISTORS ARE MADE OF BeO CERAMIC MATERIAL. 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. USE CARE IN REPLACING TRANSISTORS OF THIS TYPE.

WARNING

COMPONENT REPLACEMENT. The circuit boards used in the FM-100C/E transmitters 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 board.

On all circuit boards, the adhesion between the copper trace and the circuit 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.

To remove a soldered component from a circuit board, cut the leads from the body of the defective component while the device is still soldered to the board. Grip each component lead with long nose pliers. Touch the soldering iron to the lead at the solder connection on the circuit side of the board. 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 re-heating with a low wattage iron and removing the residual solder with a soldering vacuum tool.

Install the new component and apply solder from the circuit side of the board. If no damage has been incurred to the plated-through holes, soldering of the component side will not be required.



WARNING

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, INCLUDING CIGARETTES AND SOLDER IRONS.



WARNING

WARNING

OBSERVE THE MANUFACTURER'S CAUTIONARY INSTRUCTIONS.

After soldering, remove residual flux with a suitable solvent. Rubbing alcohol is highly diluted and is not effective.

The board should be checked to ensure the flux has been removed. Rosin flux is not normally corrosive; however, the flux will absorb enough moisture in time to become conductive and cause problems.

INTEGRATED CIRCUITS. Special care should be exercised with integrated circuits. Each integrated circuit must be installed by matching the integrated circuit notch with the notch on the socket. Do not attempt to remove an integrated circuit from a socket with your fingers. Use an integrated circuit puller to lightly pry the component from the socket.

6 POWER SUPPLY/CONTROL CIRCUIT

This section provides general information and specifications relative to the operation of the power supply/control circuit board.

6.1 DESCRIPTION.

The control circuitry on the power supply/control circuit board regulates the operation of the RF amplifier within preset limits depending on the forward power output, reflected power output, PA voltage and current, and RF amplifier assembly temperature. The circuit board is designed with over temperature, over voltage, and short circuit protection circuits, and a VSWR foldback circuit.

A conventional power transformer and rectifier circuit provide regulated -20V and +5V dc potentials. The -20V and +5V supplies are full-wave rectified, filtered, and electronically regulated to assure stable equipment operation. A modulator switching power supply unit provides a +28V dc potential for a regulated +20V dc supply and a PAV supply for the RF amplifier circuit. An unregulated PAV supply is also routed to the metering circuit board. The +20V dc supply regulator is located on the RF amplifier regulator circuit board assembly.

6.2 ELECTRICAL CHARACTERISTICS.

Refer to Table 6-1 for electrical characteristics relative to the power supply/control circuit board.

Table 6-1. POWER SUPPLY/CONTROL CIRCUIT ELECTRICAL CHARACTERISTICS

PARAMETER	SPECIFICATION
INPUTS	
AC POWER REQUIREMENTS	
FM-100C	97 to 133V AC or 194 to 266V AC, 50/60 Hz, 230W Maximum
FM-100E	194 to 266V AC, 50/60 Hz, 230W Maximum
RF MUTE FROM TRANSMITTER	
NEG POS LOGIC SWITCH POSITION	
POSITIVE	0V = RF mute +5V = RF enable
NEGATIVE	+5V or High Impedance = RF mute 0V = RF enable
EXTERNAL RF POWER CONTROL	Positive potential, varies with adjustment of PWR SET control R52. Nominally 0-6V DC with R52 fully CW for 10-100W.
OUTPUTS	
FWD POWER	+10V at 10 K Ohm for 100W RF
RFL POWER	Approximately +1.2V at 10K Ohm for 2W RF

TEMP OL DRIVE	+18V at 5 mA, Maximum
PA Voltage	Approximately +20.0V at 7.5 Amperes for 100W RF.

6.3 THEORY OF OPERATION

This section presents the theory of operation for the transmitter power supply/control circuit board.

6.3.1 FUNCTIONAL DESCRIPTION.

The power supply/control circuit board will be described as follows: 1) the control circuitry, and 2) the power supply circuitry.

6.3.2 CONTROL CIRCUITRY.

The control circuitry consists of five circuits. Figure 6-1 presents a simplified schematic of the control circuits on the power supply/control circuit board. Refer to Figure 6-1 as required for a description of the following circuits.

- A. RF Mute Circuit
- B. Forward/Reflected Amplifier Circuits
- C. Temperature Sense Circuit
- D. Open Fuse Detector Circuit
- E. Power Control Circuit

RF MUTE CIRCUIT. The RF mute circuit automatically inhibits transmitter RF output if the AFC circuit is unlocked or if the transmitter is not ready to accept RF drive. This circuit consists of logic input switch S3, inverters Q3 and Q4, RF mute driver U3B, and mute switch Q2.

With S3 in the positive logic input position, U3B will output a HIGH to the base of Q2 when a LOW from a transmitter is applied to the inverting input of U3B through Q3 and Q4. This HIGH biases Q2 ON which applies a LOW to voltage regulator U4 compensation input to disable the RF. A HIGH from the AFC circuit (unlocked condition) applied to U3B non-inverting input will also inhibit the RF.

FORWARD/REFLECTED AMPLIFIER CIRCUITS. The forward/reflected amplifier circuits provide information from the directional couplers to the power control circuit and the metering circuit board. The forward amplifier circuit consists of meter amplifier U1A, FWD CAL control R5, diode D1, and AUTO/MAN switch S1. The reflected amplifier circuit consists of meter amplifier U1B, RFL CAL control R9, diodes D1 and D2, and VSWR indicator driver U2A.

Forward Amplifier. Output from the forward power directional coupler is applied to the non-inverting input of U1A which operates as a voltage follower with the gain determined by potentiometer R5. The output of U1A is routed to: 1) the metering circuit board for display, 2) a rear-panel barrier strip for remote metering, 3) diode D1, and 4) the inverting input of voltage controller U4 through S1.

Reflected Amplifier. Output from the reflected power directional coupler is applied to the non-inverting input of U1B which operates as a voltage follower with the gain determined by potentiometer R9. The output of U1B is routed to: 1) diodes D1 and D2, 2) the metering circuit board for display, and 3) the rear-panel barrier strip for remote metering.

Output from U1B is also routed to the inverting input of voltage controller U4 through S1 and D1/D2, and the non-inverting input of U2A which operates as a comparator circuit. If the reflected power level at U2A non-inverting input exceeds the reference potential at the inverting input, U2A will output a HIGH to illuminate VSWR indicator DS7.



TEMPERATURE SENSE CIRCUIT. The temperature sense circuit provides automatic RF power reduction if the RF amplifier assembly temperature exceeds a preset level. This circuit consists of temperature sensor U401, TEMP CAL control R25, over temperature comparator U3A, TEMP TRIP control R27, diode D3, temperature indicator driver U2B, and TEMP indicator DS8.

The output of U401 on the RF amplifier regulator circuit board is calibrated by R25 and applied to the inverting input of U3A. As the temperature increases, the output level of U401 increases. If this potential exceeds a threshold level established by R27, the output of U3A will be reduced and applied to the non-inverting input of U4 through D3. U4 will reduce the RF power output to stabilize the temperature.

The output of U3A is also routed to the inverting input of U2B which operates as a comparator circuit. If this level decreases below the reference potential at U2B, U2B will output a HIGH to illuminate TEMP indicator DS8. This HIGH is also routed to the rear panel barrier strip.

OPEN FUSE DETECTOR CIRCUIT. This circuit provides a visual indication of an RF amplifier malfunction. If the PA transistor current is excessive, fuse F1 will open to bias transistor switch Q5 ON which outputs a HIGH to illuminate RF indicator DS6. In addition, Q5 applies a HIGH to mute switch Q2 to enable the mute circuit.

POWER CONTROL CIRCUIT. The power control circuit provides automatic power control, over voltage protection, and short circuit protection for the RF power transistor. This circuit consists of voltage controller U4, PWR SET control R52, NORM/EXT switch S2, diodes D5, D6, and D7, resistors R47, R48, and R62/R63, and pass transistors Q1 and Q2.

Pass Transistors. Parallel pass transistors Q401 and Q402 on the RF amplifier regulator circuit board operate as an emitter follower circuit. Voltage regulation is provided by a control voltage from U4. The regulated voltage at the emitter is routed to the PA transistor through meter resistors R62/R63. Zener diode D5 will limit the control voltage to 27 volts if voltage controller U4 fails.

Voltages sampled across meter resistors R62/R63 are routed to the metering circuit board for display. These potentials are also applied to the current limit (CL) and current sense (CS) inputs of U4 to automatically control the PA current.



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Power Set Control Operation. With NORM/EXT switch S2 in the normal position: 1) +20V is routed to the rear-panel barrier strip, and 2) PWR SET control R52 is connected between the VREF output and non-inverting input of U4. As R52 is adjusted, U4 output will increase or decrease the PA output power.

With the NORM/EXT switch in the external position, a reference voltage can be applied to PWR SET control R52 through the rear-panel external power level control connection to control power externally.

Automatic Power Control Operation. With AUTO/MAN switch S1 in the automatic position, the outputs of U1A and U1B are connected to the inverting input of regulator U4. Resistors R47 and R48 establish the gain for U4. The forward voltage sample from U1A will increase or decrease the output of controller U4 to maintain constant RF output power.

Proportional VSWR foldback is provided by diode D1. If the reflected voltage sample at U1B output exceeds the output of U1A, reflected power will be added to the forward power input of U4 through D1. U4 will reduce the RF output power until VSWR is normal.

With the AUTO/MAN switch in the manual position, only the reflected voltage sample at U1B is connected to the input of U4 through D2 to provide proportional VSWR foldback. In addition, resistor R47 is shunted to decrease the gain of U4.

6.3.3 POWER SUPPLY CIRCUITRY.

Figure 6-2 presents a simplified schematic of the power supply components on the power supply/control circuit board and transmitter chassis. Refer to Figure 6-2 as required for the following description of the transmitter power supply.

Primary power is applied to the FM-100C/E through an RFI filter and an IEC ac input receptacle. Power from the receptacle is routed to: 1) the flushing fan, 2) the primary of power transformer T1, and 3) a modular +28V dc switching power supply unit. Transformer T1 provides 9.5V and 0V ac potentials for application to a +5V regulator and a -20V dc regulator. The modular switching power supply unit provides a +28V dc potential for application to a +20V regulator and a PAV supply for the RF amplifier circuit. Fuses F1, F2, and F3 protect transformer T1 in the event of a short circuit in a secondary winding.

+5 VOLT SUPPLY. The 9.0 volt ac potential is routed to a full-wave rectifier and filter network and applied to voltage regulator U5. Resistors R75 and R76 adjust the output of U5 for a regulated +5 volt dc potential. The supply is applied to the AFC/PLL circuit board and metering circuit board.

-20 VOLT SUPPLY. The 22.5 volt ac potential is routed to a full-wave rectifier and filter network and applied to voltage regulator U6. Resistors R77 and R78 adjust the output of U6 for a regulated -20 volt dc potential. The supply is applied to the AFC/PLL circuit board and metering circuit board.

+20 VOLT SUPPLY. The +28V potential from the modular switching power supply unit is applied to: 1) +20V regulator U402 on the RF amplifier regulator circuit board and 2) the metering circuit board. U402 is a three terminal adjustable regulator containing internal thermal overload and short-circuit current limiting features. The output of the +20V supply is applied to the transmitter circuitry.

RF AMPLIFIER PAV SUPPLY. The +28V potential from the modular switching power supply unit is also applied to pass transistors Q401 and Q402 on the RF amplifier regulator circuit board. Q401/Q402 are controlled by the power control circuit on the power supply/ control circuit board. The output of Q401/Q402 provides the adjustable PAV supply for the RF amplifier.



Figure 6-2. POWER SUPPLY SIMPLIFIED SCHEMATIC DIAGRAM

6.4 MAINTENANCE

This section provides maintenance information, electrical adjustment procedures and troubleshooting information for the power supply/control circuit board.

6.4.1 ELECTRICAL ADJUSTMENTS.

REQUIRED EQUIPMENT. The following tools and equipment are required for electrical adjustment procedures.

- A. Insulated adjustment tool, shipped with the transmitter (P/N 407-0083).
- B. Non-inductive, 100 watt, 50 Ohm test load.
- C. Adapter, BNC jack-to-jack N plug, for test load (P/N 417-3288).
- D. Adapter, BNC jack-to-jack N plug, for test load (P/N 417-3841).
- E. Coaxial Accessory Cable, BNC connectors, shipped with transmitter (P/N 949-0017-2).
- F. Calibrated 50 Ohm in-line wattmeter.
- G. Digital voltmeter, Fluke 75 or equivalent.
- H. Temperature probe, Fluke 80T-150 or equivalent.

FWD CAL (R5) AND RFL CAL (R9). FWD CAL control R5 and RFL CAL control R9 on the power supply/control circuit board must be adjusted in proper sequence. Potentiometers R5 and R9 are adjusted as follows.

Procedure. To adjust controls R5 and R9, proceed as follows:

- A. Apply primary power and record the front-panel FWD meter indication



WARNING

**DISCONNECT TRANSMITTER PRIMARY POWER
BEFORE PROCEEDING.**

WARNING

- B. Disconnect the transmitter primary power.
- C. Connect a 100 watt, 50 Ohm test load and in-line wattmeter to the rear-panel RF OUTPUT receptacle.
- D. Remove the top-cover. Refer to Figure 6-3 and operate AUTO-PWR-MAN switch S1 to the MAN position.
- E. Apply primary power and operate the transmitter.

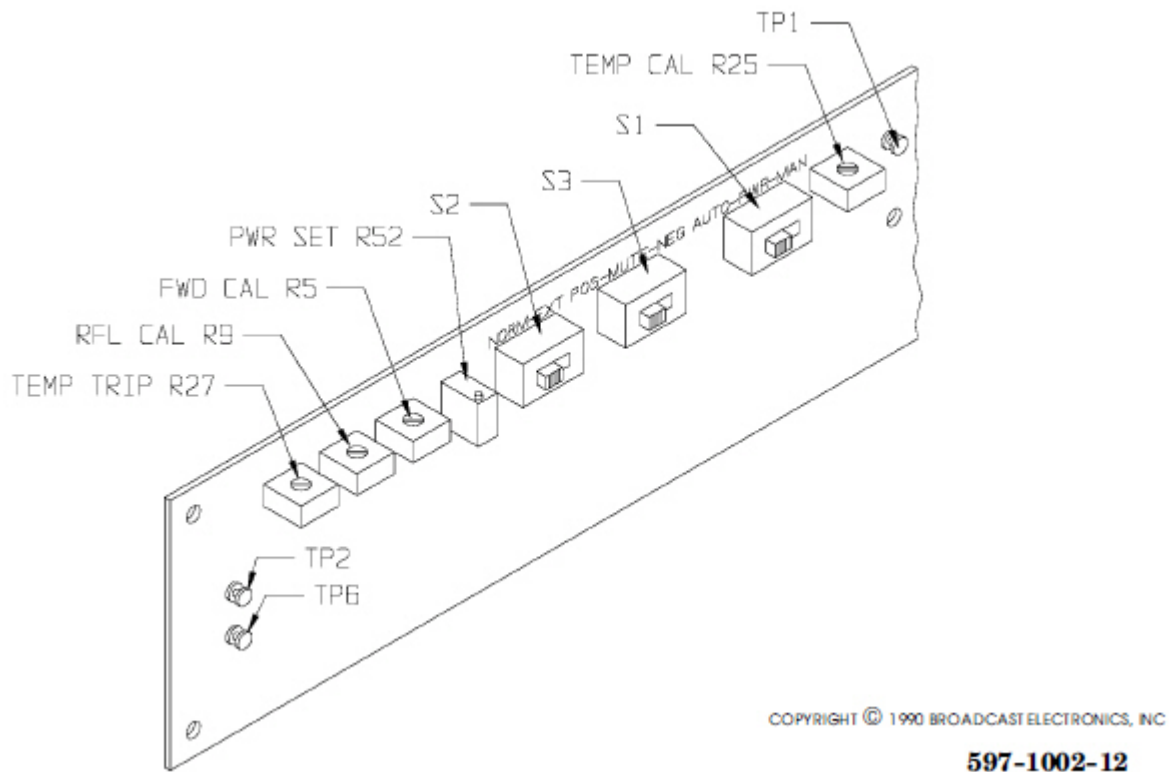


Figure 6-3. POWER SUPPLY/CONTROL CIRCUIT BOARD CONTROLS



WARNING

DONOT TOUCH ANY COMPONENT WITHIN THE TRANSMITTER WITH POWER APPLIED.

WARNING

- F. Refer to Figure 6-3 and adjust PWR SET control R52 for a 100 watt output power indication on the external meter.
- G. Refer to Figure 6-3 and adjust FWD CAL control R5 for 100 watts as indicated on the front-panel FWD meter.
- H. Remove the external wattmeter. Refer to Figure 6-4 and connect two 100 watt, 50 Ohm test loads (in parallel) to the RF OUTPUT receptacle as shown.
- I. Depress the FWD meter function switch and record the meter indication.



WARNING

DONOT TOUCH ANY COMPONENT WITHIN THE TRANSMITTER WITH POWER APPLIED.

WARNING

- J. Depress the RFL meter function switch. Refer to Figure 6-3 and adjust RFL CAL control R9 until the meter indicates 11% of the value recorded in step I.



K. Repeat steps I and J as required until the 11% rate is established. Connect the normal load to the transmitter and depress the front-panel FWD meter function switch.



WARNING

DONOT TOUCH ANY COMPONENT WITHIN THE TRANSMITTER WITH POWER APPLIED.

WARNING

M. Refer to Figure 6-3, adjust PWR SET control R52 until the meter indicates the value recorded in step A.

N. Disconnect the transmitter primary power.

O. Disconnect all test equipment and replace the top-cover.

TEMP CAL (R25). TEMP CAL control R25 on the power supply/control circuit board calibrates the output voltage of temperature sensor U401 on the RF amplifier regulator circuit board in relation to temperature. Potentiometer R25 is adjusted as follows.

Procedure. To adjust TEMP CAL control R25, proceed as follows:



WARNING

DISCONNECT TRANSMITTER PRIMARY POWER BEFORE PROCEEDING.

WARNING

A. Disconnect the primary power to the transmitter.

B. Remove the top-cover and attach a temperature probe to the RF amplifier heatsink assembly near U1.

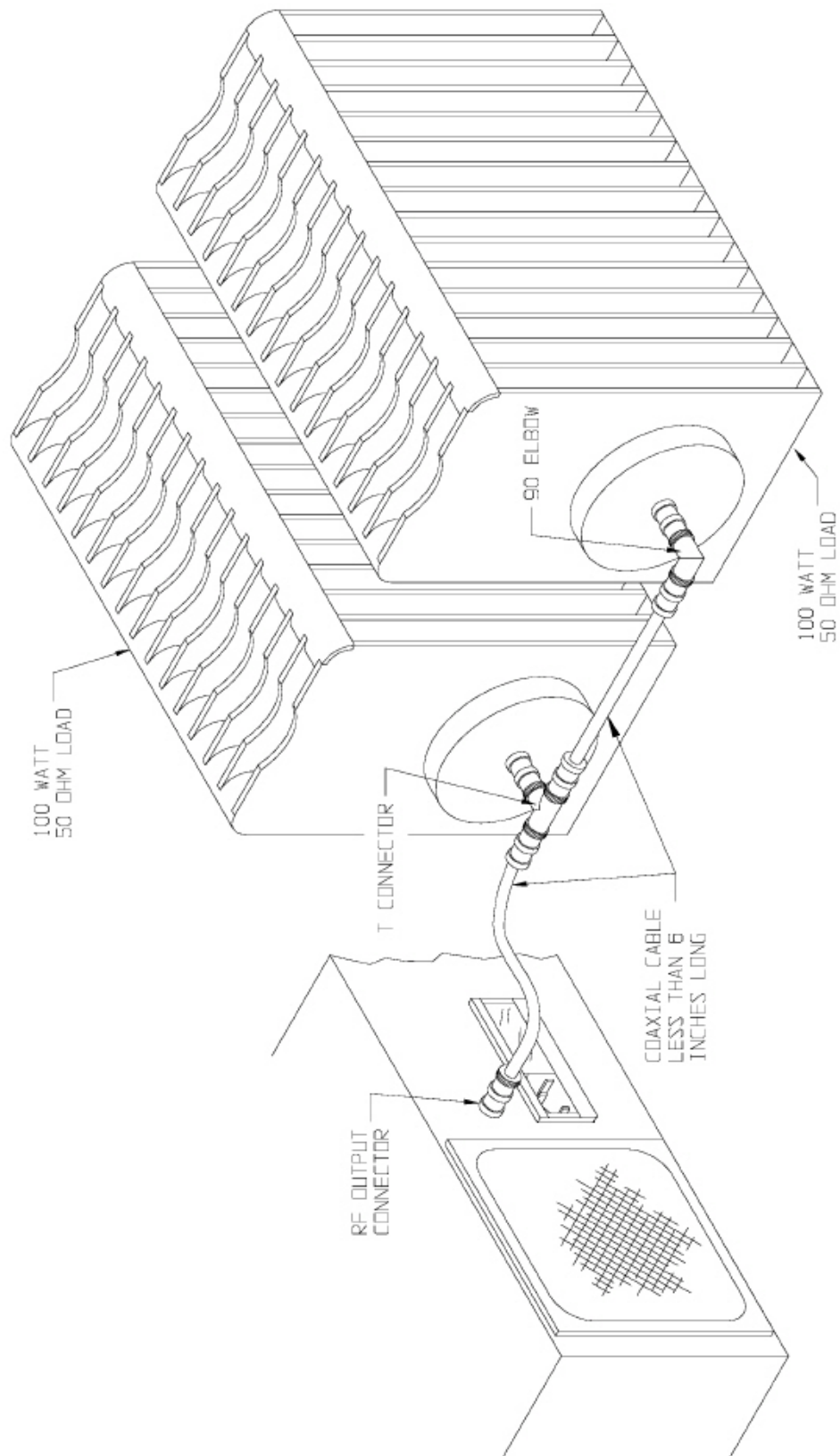
C. Connect the probe to a voltmeter and record the temperature indication (TI).

D. Using the following equation and information from step C, calculate and record the voltage (V).

$$V = \frac{TI + 273}{100}$$

E. Refer to Figure 6-3 and connect a voltmeter between TP1 and TP6 (ground).

F. Apply primary power to the transmitter.



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597-1050-63

Figure 6-4. PARALLEL LOAD CONNECTION

**WARNING**

DONOT TOUCH ANY COMPONENT WITHIN THE TRANSMITTER WITH POWER APPLIED.

WARNING

G. Refer to Figure 6-3, adjust TEMP CAL (R25) until the voltmeter indicates the value recorded in step D.

EXAMPLE: $\frac{25^{\circ}\text{C} + 273}{100} = \frac{298}{100} = 2.98\text{V}$

**WARNING**

DISCONNECT TRANSMITTER PRIMARY POWER BEFORE PROCEEDING.

WARNING

H. Disconnect the primary power to the transmitter.

I. Remove the test equipment and replace the top-cover.

TEMP TRIP (R27). TEMP TRIP control R27 on the power supply/control circuit board adjusts the threshold of the over temperature circuit. Potentiometer R27 is adjusted as follows.

Procedure. To adjust control R27, proceed as follows:

**WARNING**

DISCONNECT TRANSMITTER PRIMARY POWER BEFORE PROCEEDING.

WARNING

A. Disconnect the primary power to the transmitter.

B. Remove the top-cover. Refer to Figure 6-3 and connect a voltmeter between TP2 and TP6 (ground).

C. Apply primary power and operate the transmitter.

**WARNING**

DONOT TOUCH ANY COMPONENT WITHIN THE TRANSMITTER WITH POWER APPLIED.

WARNING

D. Refer to Figure 6-3 and adjust R27 until the voltmeter indicates +3.65V dc.

WARNING

DISCONNECT TRANSMITTER PRIMARY POWER BEFORE PROCEEDING.

WARNING

E. Disconnect the primary power to the transmitter.

F. Remove the test equipment and replace the top-cover.

6.4.2 TROUBLESHOOTING THE POWER SUPPLY/CONTROL BOARD CIRCUITRY.

The troubleshooting philosophy for the power supply/control circuit board consists of isolating a problem to a specific circuit. The problem may be further isolated by referencing the following information and Figure 6-5 which presents troubleshooting information.

**WARNING**

DISCONNECT PRIMARY POWER FROM THE TRANSMITTER BEFORE REMOVING ANY COMPONENTS.

WARNING**CAUTION**

INADVERTENT CONTACT BETWEEN ADJACENT COMPONENTS AND CIRCUIT TRACES MAY DAMAGE THE POWER SUPPLY/CONTROL BOARD.

CAUTION

After the problem is isolated and power is totally deenergized, refer to the schematic diagrams and the theory of operation to facilitate in problem resolution. The defective circuitry may be repaired locally or the circuit board may be returned to Broadcast Electronics. for repair or replacement.

6.5 REMOVAL AND INSTALLATION

This section provides removal and installation procedures for the power supply/control circuit board.

6.5.1 REMOVAL PROCEEDURE

REQUIRED EQUIPMENT. A number 2 Phillips screwdriver with a 4 inch (10.16 cm) shaft is required to remove the power supply/control circuit board from the transmitter chassis.

PROCEDURE. To remove the power supply/control circuit board, proceed as follows:

**WARNING**

ENSURE ALL SYSTEM POWER IS DISCONNECTED BEFORE PROCEEDING.

WARNING

- A. Disconnect the primary power to the transmitter.
- B. Remove the transmitter top-cover.
- C. Disconnect P10, P11, P12, P13, P20 and P21 from the circuit board.
- D. Disconnect P23 if the optional remote power control option is installed in the unit.
- E. Remove the screw near J11 securing the circuit board to the chassis.
- F. With slight pressure, pull the circuit board from the mounting stud at each corner.

6.5.2 INSTALLATION PROCEDURE.

To install the power supply/control circuit board after repairs have been completed, proceed as follows:

**WARNING**

ENSURE ALL SYSTEM POWER IS DISCONNECTED BEFORE PROCEEDING.

WARNING

- A. Disconnect the primary power to the transmitter.
- B. Follow the REMOVAL PROCEDURE in reverse order.

NOTES:

1. A 100W, 50 OHM TEST LOAD IS CONNECTED TO THE REAR PANEL RF OUTPUT CONNECTOR.
2. AUTOMAN SWITCH ON THE POWER SUPPLY/CONTROL CIRCUIT BOARD IS OPERATED TO THE AUTOMATIC POSITION.
3. PWR/SET CONTROL ON THE POWER SUPPLY/CONTROL CIRCUIT BOARD IS ADJUSTED FCW.
4. NRP/EXT SWITCH ON THE POWER SUPPLY/CONTROL CIRCUIT BOARD IS OPERATED TO NORM POSITION.
5. POS/MUTE/NEG SWITCH ON THE POWER SUPPLY/CONTROL CIRCUIT BOARD IS OPERATED TO THE POSITIVE POSITION.
6. A JUMPER IS CONNECTED BETWEEN TB-6 AND TB-7 ON THE REAR PANEL.
7. THE FORWARD AND REFLECTED INPUT POWER SAMPLES ARE DISCONNECTED FROM THE REAR PANEL.

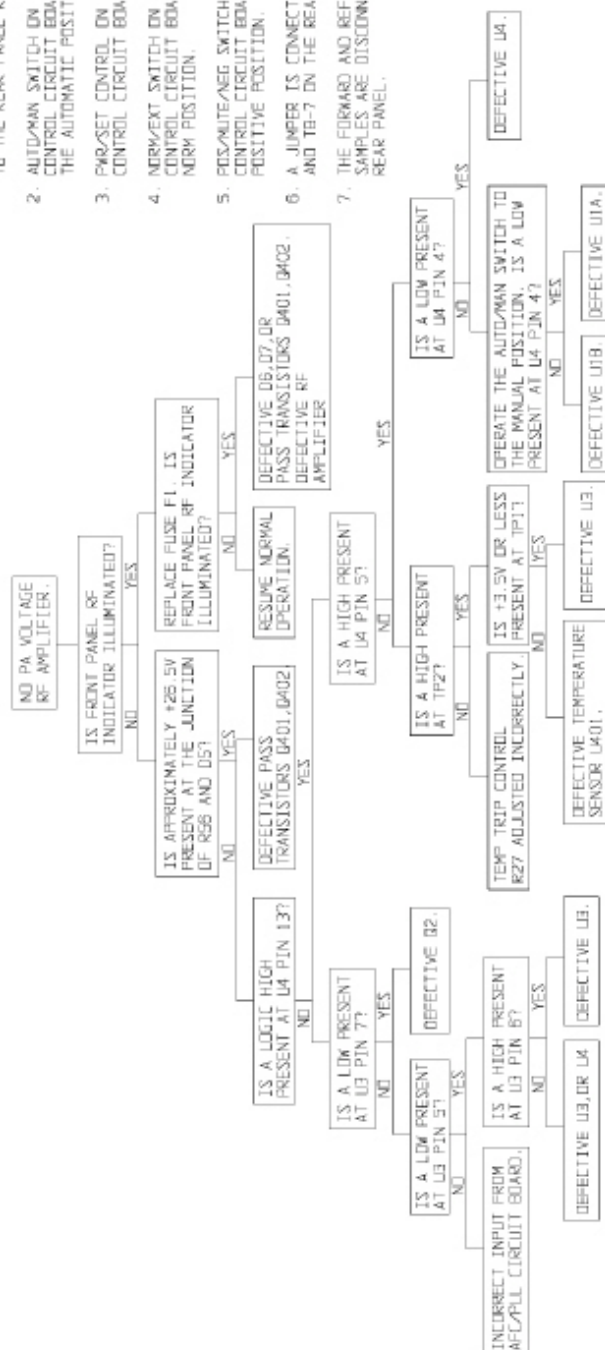


Figure 6-5. NO PA VOLTAGE TO THE RF AMPLIFIER

7 TRANSMITTER METERING CIRCUIT BOARD

This section provides general information and specifications relative to operation of the transmitter metering circuit board.

7.1 DESCRIPTION.

The metering circuit board is equipped with LED status indicators for the +5 volt, +20 volt, -20 volt, TEMP, VSWR, RF, and LOCK operating parameters. Modulation percentage from 5% to 145% is indicated by a color coded moving bar LED display with an automatic ranging amplifier to convert the meter full scale indication to 14.5%.

The metering circuit board also includes a multimeter circuit with an LCD display for measuring five steady-state operating parameters. In addition, the multimeter can be converted into a high-impedance dc voltmeter for troubleshooting purposes.

7.2 INTERNAL VOLTMETER CHARACTERISTICS.

The internal voltmeter input impedance is 1.5 Meg Ohms. The meter is capable of measuring dc potentials from 0 to ± 45 volts.

7.3 THEORY OF OPERATION

This section presents the theory of operation for the FM-100C/E metering circuit board.

7.3.1 FUNCTIONAL DESCRIPTION.

The metering circuit board contains four circuits. A simplified schematic diagram of the metering circuit board is presented in Figure 7-1. Refer to Figure 7-1 as required for a description of the following circuits.

- A. Status Indicator Circuits
- B. Multimeter Circuit
- C. Modulation Display Circuit
- D. Voltage Regulator Circuits

7.3.2 STATUS INDICATOR CIRCUITS.

The metering circuit board contains seven LEDs to provide transmitter status indications. DS2 through DS4 will illuminate to indicate the presence of +20V, -20V, and +5V primary operating potentials. DS5 through DS8 will illuminate to indicate frequency lock, RF amplifier malfunction, excessive VSWR, and excessive RF amplifier temperature.

7.3.3 MULTIMETER CIRCUIT.

The multimeter circuit and LCD display provides a visual indication of five transmitter steady state operating parameters. Meter function switches S1 through S6 are routed directly to the input of meter function encoder U9. When a function switch is depressed, a momentary HIGH is input to U9.

U9 will generate a three digit BCD code to the input of meter function latch U10 and a HIGH to one shot U8A. U8A outputs a momentary LOW to the clock input of U10 which latches the information and routes the BCD code to the input of meter function/input switch decoder U11.

U11 will decode the information and output logic HIGHs to operate the appropriate input switch(es) for the selected meter function. These HIGHs are also routed to indicator decoder U12 and the decimal point locator logic. U12 outputs a LOW to illuminate a function indicator and appropriate unit of measure indicator (Watts, Amps, or Volts).



FWD/RFL METER OPERATION. When the forward or reflected power meter function is selected, input switches U6A and U3A or U3B will operate and route a sample voltage to the input of amplifier U4A. This sample voltage is non-linear. However, U4A output is maintained linear by a resistor/diode linearization network in combination with feedback resistor R16.

The linear output of U4A is routed through input switch U6A to A/D converter/display driver U7. U7 converts the analog voltage to digital information by activating the appropriate display segment control lines to DS12. LCD meter display DS12 will indicate a value as numerical characters.

A/D converter/display driver U7 also routes information to a decimal point locator logic circuit consisting of U13B, U13C, and U13D. With information from U11 and U7, this circuit will position the decimal point within the displayed value.

Test point TP2 is employed to determine the condition of the LCD display. When +5 volts is applied to TP2, U7 will activate all segment control lines which illuminates all DS12 display segments.

Meter calibration control R56 is provided to adjust the multimeter for an accurate indication in the test meter mode of operation.

PAV METER OPERATION. When the PA voltage function is selected, input switch U6B will operate and route a sample voltage to the input of A/D converter/display driver U7.

PAI METER OPERATION. The PAI meter circuit utilizes two voltage-to-current converter circuits. The first consists of integrated circuit U5B, current amplifier Q2, resistors R6, R7, and meter shunt R62/R63 (located on the power/supply control circuit board).

When PA current flows, a voltage is developed across R62/R63 and routed to the input of U5B through R6. The output of U5B is routed to amplifier Q2 which applies feedback to the inverting input of U5B to maintain circuit stabilization. The amplified current through Q2 will develop a voltage across R7 in proportion to the collector current for application to a second converter.

The second converter consists of integrated circuit U5A, current amplifier Q3, resistors R8, R47, and input switch U6C. The operation of this circuit is similar to the previous circuit with the following exception. The voltage developed across Q3 collector resistor R47 is routed to the A/D converter/display driver through input switch U6C.

AFC METER OPERATION. When the AFC voltage meter function is selected, input switch U6D will operate and route a sample voltage to the input of A/D converter/display driver U7.

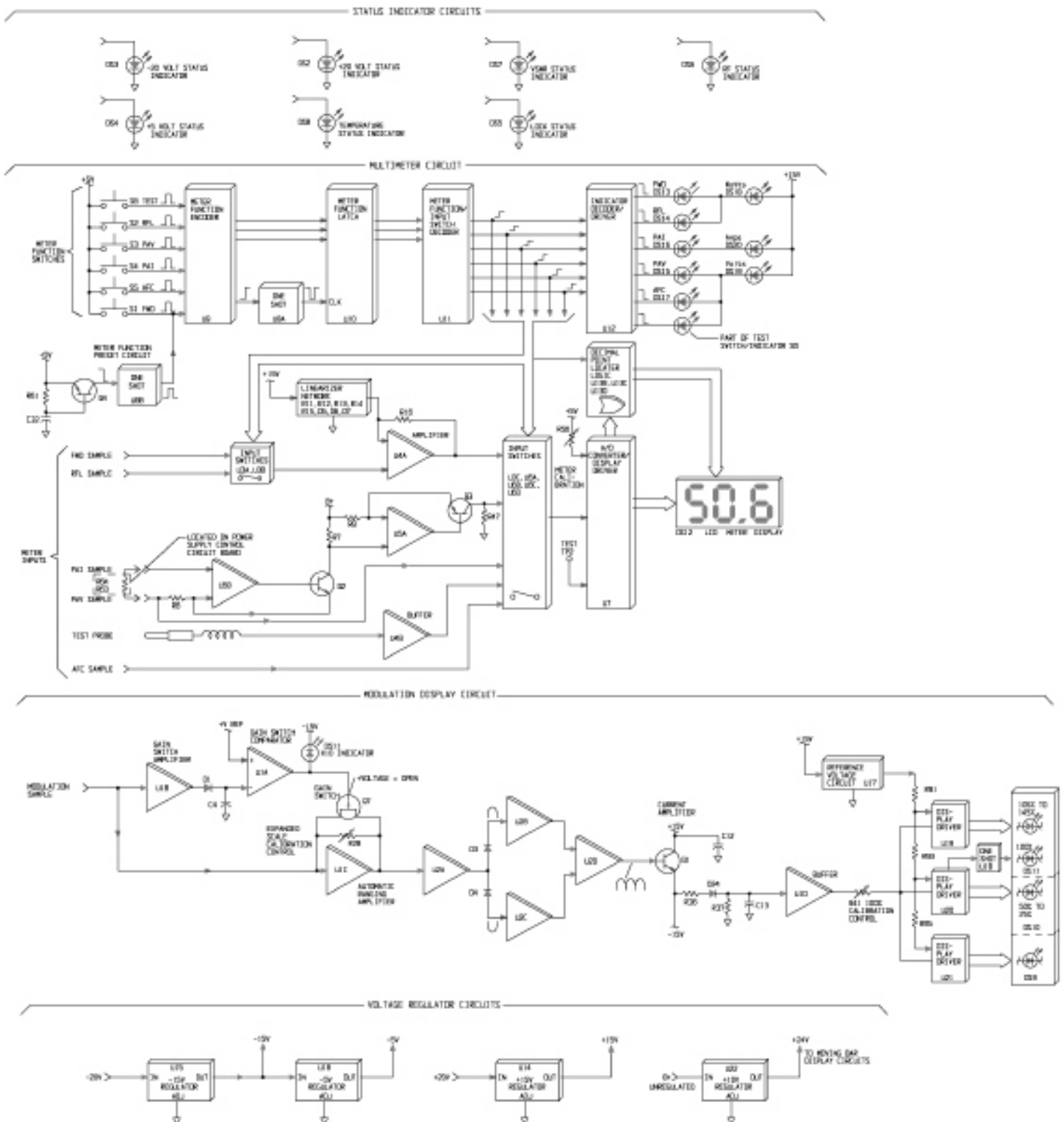
TEST METER OPERATION. When the test meter function is selected, input switch U3C will operate and route test probe potentials to the input of U7 through buffer U4B.

METER FUNCTION PRESET CIRCUIT. A meter function preset circuit consisting of resistor R61, capacitor C32, transistor switch Q4, and one shot U8B automatically selects the forward power meter function when transmitter primary power is applied. Q4 will output a LOW to U8B as C32 charges through R61. U8B outputs a momentary HIGH to forward power meter function switch S1 and the input of meter function encoder U9.

7.3.4 MODULATION DISPLAY CIRCUIT.

The modulation display circuit and moving bar LED display provides a visual indication of the modulation percentage. A sample of the audio signal is input to gain switch amplifier U1A and automatic ranging amplifier U1C. Gain switch Q7 is normally closed for high levels of audio signal.

With Q7 closed, U1C operates as an inverting unity gain amplifier. The output of U1C is applied to a precision rectifier and meter ballistics circuit. This circuit consists of integrated circuit U2, diodes D3 and D4, and transistor Q1 and associated components.



The positive excursions of the signal at the output of U2A are applied to buffer U2B through diode D3. The negative excursions are applied to buffer U2C through diode D4. The output of U2B and U2C are routed to U2D which differentially amplifies the full-wave rectified signal.

The output of U2D is applied to current amplifier Q1 which transfers the positive charge on capacitor C12 to C13 through resistor R36 and diode D24. The rate at which the charge is transferred is determined by R36. C13 discharges through R37 at a slower rate to provide the display with a gradual decay time and a rapid rise time.

The signal at capacitor C13 is routed to display drivers U19, U20, and U21 through buffer U1D and 100% calibration control R41. Each display driver contains a resistive ladder network and comparator circuits which sequentially activate output lines in direct proportion to the input voltage. Integrated circuit U17, resistors R91, R93, and R95 provide a reference voltage for the display drivers.

The output lines of the display drivers are connected to LED displays DS9, DS10, and DS11 which illuminate when the lines are activated. An output line from U20 is routed to one shot U18 which generates a one second pulse to illuminate the 100% LED.

AUTOMATIC RANGING CIRCUIT OPERATION. The automatic ranging circuit provides expanded scale meter indication for low level modulation signals. During low level signal conditions, the output of gain switch amplifier U1A insufficiently charges capacitor C4 through diode D1.

This minimal charge on C4 is applied to gain switch comparator U1B which outputs a positive voltage to bias gain switch Q7 OFF and illuminate indicator DS11. With Q7 OFF (open), expanded scale calibration control R28 operates as a feedback resistor for automatic ranging amplifier U1C. This converts the circuit into an inverting amplifier with a gain of 10.

7.3.5 VOLTAGE REGULATOR CIRCUITS.

The metering circuit board contains four voltage regulator circuits which convert the FM-100C/E primary operating voltages to potentials required for circuit board operation. All regulators are equipped with overload protection, thermal overload protection, and current limiting circuits.

Voltage regulator circuit U15 converts a -20 volt potential into a -15 volt source. This -15 volts is also applied to the input of regulator circuit U16 which provides a -5 volt potential. Voltage regulator circuit U14 converts a +20 volt potential into a +15 volt source. Finally, voltage regulator circuit U22 converts the +30 volt unregulated voltage (B+) to provide a +24 volt potential.

7.4 MAINTENANCE

This section provides maintenance information, electrical adjustment procedures and troubleshooting information for the metering circuit board assembly.

7.4.1 ELECTRICAL ADJUSTMENTS.

REQUIRED EQUIPMENT. The following tools and equipment are required for electrical adjustment procedures.

- A. Insulated adjustment tool, shipped with the transmitter (P/N 407-0083).
- B. Digital voltmeter, Fluke 75 or equivalent.
- C. Low distortion audio generator.
- D. Calibrated oscilloscope.

METER CALIBRATE CONTROL (R56). Potentiometer R56 on the metering circuit board adjusts the multimeter circuitry for an accurate indication in the test meter mode. To adjust R56, refer to Figure 7-2 as required and proceed as follows.

Procedure. To adjust meter calibration control R56, proceed as follows:

**WARNING**

**DISCONNECT TRANSMITTER PRIMARY POWER
BEFORE PROCEEDING.**

WARNING

- A. Disconnect the transmitter primary power.
- B. Remove the top-cover. Connect an external voltmeter and transmitter test probe to test point TP1 (+5V).
- C. Apply transmitter primary power and operate the test switch/indicator on the metering circuit board to illuminate the switch/indicator.

**WARNING**

**DONOT TOUCH ANY COMPONENT WITHIN THE
TRANSMITTER WITH POWER APPLIED.**

WARNING

- D. With an insulated adjustment tool, adjust R56 until the front-panel and external meter indications are equal.

**WARNING**

**DISCONNECT TRANSMITTER PRIMARY POWER
BEFORE PROCEEDING.**

WARNING

- E. Disconnect the power to the transmitter, remove the test equipment, replace the test probe in the clip provided, and replace the top-cover.

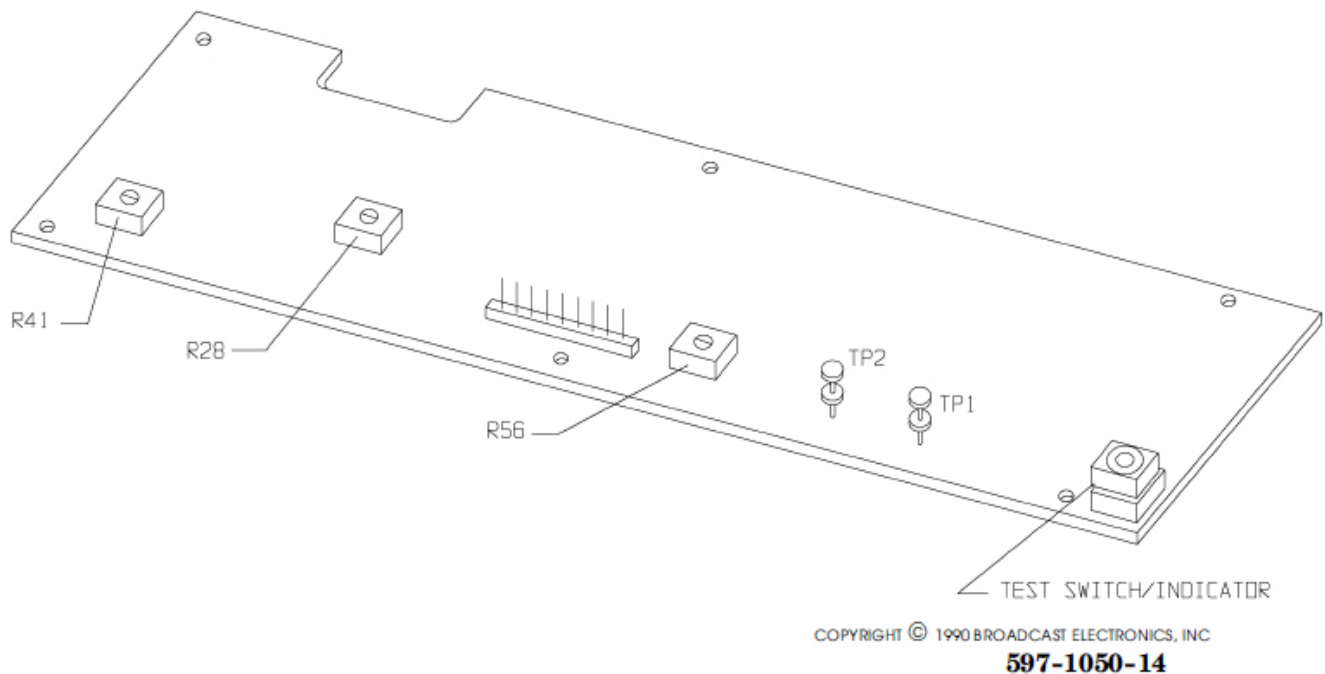


Figure 7-2. METERING CIRCUIT BOARD CONTROLS AND TEST POINTS

DISPLAY CALIBRATE (R41) AND X10 CALIBRATE (R28) CONTROLS. Display calibrate control R41 and X10 calibrate control R28 on the metering circuit board must be adjusted in proper sequence. R41 and R28 are adjusted as follows.

Procedure. To adjust R41 and R28, refer to Figure 7-2 as required and proceed as follows:

- A. Remove the top-cover and connect an audio generator to the front-panel COMPOSITE IN connector.
- B. Connect an oscilloscope to the front-panel COMPOSITE OUT connector.
- C. Adjust the audio generator for 400 Hz at 6 volts peak-to-peak (2.12V RMS) as indicated on the oscilloscope.



WARNING

DONOT TOUCH ANY COMPONENT WITHIN THE TRANSMITTER WITH POWER APPLIED.

WARNING

- D. With an insulated adjustment tool, adjust R41 fully counterclockwise, then clockwise until the 100% modulation indicator just illuminates.
- E. Adjust the audio generator for 0.6V peak-to-peak (0.212V RMS). The front-panel X10 indicator will illuminate.



WARNING

DONOT TOUCH ANY COMPONENT WITHIN THE TRANSMITTER WITH POWER APPLIED.

WARNING

- F. With an insulated adjustment tool, adjust R28 fully counterclockwise, then clockwise until the 100% modulation indicator just illuminates.
- G. Remove all test equipment and replace the top-cover.

7.4.2 TROUBLESHOOTING.

The troubleshooting philosophy for the metering circuit board consists of isolating a problem to a specific circuit. The problem may be further isolated by referencing the following information and Table 7-1 which presents troubleshooting information for the metering circuit board.



WARNING

DISCONNECT PRIMARY POWER FROM THE TRANSMITTER BEFORE REMOVING ANY COMPONENTS.

WARNING



CAUTION

INADVERTENT CONTACT BETWEEN ADJACENT COMPONENTS AND CIRCUIT TRACES MAY DAMAGE THE POWER SUPPLY/CONTROL BOARD.

CAUTION

After the problem is isolated and power is totally deenergized, refer to the schematic diagrams and the theory of operation to facilitate in problem resolution. The defective circuitry may be repaired locally or the circuit board may be returned to Broadcast Electronics for repair or replacement.

Table 7-1. METERING CIRCUIT BOARD TROUBLESHOOTING

SYMPTOM	DEFECT/REMEDY
NO MODULATION AND MULTIMETER DISPLAY	<ol style="list-style-type: none"> 1. Check the +15V regulator circuit U14. 2. Check the -15V regulator circuit U15. 3. Check the -5V regulator circuit U16.
NO MODULATION DISPLAY	<ol style="list-style-type: none"> 1. Check the +24V regulator circuit U22. 2. Check integrated circuit U1C. 3. Check integrated circuit U2 and associated components. 4. Check transistor Q1 and associated components.
NO 100% MODULATION INDICATOR	<ol style="list-style-type: none"> 1. Check integrated circuit U18. 2. Check transistors Q5 and Q6.
ENTIRE MODULATION DISPLAY IS ILLUMINATED	<ol style="list-style-type: none"> 1. Check +7.5V reference voltage circuit U17.
NO X10 METER INDICATOR	<ol style="list-style-type: none"> 1. Check X10 indicator DS1.
NO EXPANDED SCALE METER OPERATION	<ol style="list-style-type: none"> 1. Check FET switch Q7 and associated components.
NO X10 METER INDICATOR AND EXPANDED SCALE METER OPERATION	<ol style="list-style-type: none"> 1. Check integrated circuit U1A/U1B and associated components.
NO 5% TO 50% METER INDICATORS	<ol style="list-style-type: none"> 1. Check display DS10. 2. Check display driver U20.
NO MULTIMETER FUNCTION SWITCH OPERATION	<ol style="list-style-type: none"> 1. Check integrated circuit U8A. 2. Check integrated circuit U9. 3. Check integrated circuit U10. 4. Check integrated circuit U11.
NO PAV MULTIMETER FUNCTION	<ol style="list-style-type: none"> 1. Check PAV switch S3. 2. Check input switch U6B.
NO FWD POWER FUNCTION SELECTED WHEN PRIMARY POWER IS APPLIED	<ol style="list-style-type: none"> 1. Check integrated circuit U8B. 2. Check transistor Q4 and associated components.
NO MULTIMETER FUNCTION AND UNIT MEASURE INDICATORS	<ol style="list-style-type: none"> 1. Check integrated circuit U12.
NO FWD POWER METER INDICATION	<ol style="list-style-type: none"> 1. Check input switch U3A.
NO FWD AND RFL POWER METER INDICATION	<ol style="list-style-type: none"> 1. Check input switch U6A. 2. Check integrated circuit U4A and associated components.
NO LCD DISPLAY	<ol style="list-style-type: none"> 1. Check integrated circuit U7. 2. Check display DS12.



7.5 REMOVAL AND INSTALLATION

This section provides removal and installation procedures for the FM-100C/E metering circuit board assembly.

7.5.1 REMOVAL PROCEDURE.

REQUIRED EQUIPMENT. The following equipment is required to remove the metering circuit board assembly.

- A. Flat tip screwdriver, 4 inch (10.16 cm) shaft with 1/4 inch tip.
- B. Number 2 Phillips screwdriver, 4 inch (10.16 cm) shaft.
- C. Number 1 Phillips screwdriver, 4 inch (10.16 cm) shaft.

PROCEDURE. The removal of the metering circuit board assembly requires the transmitter be placed on a suitable work surface. To remove the metering circuit board assembly, refer to Figure 7-3 and proceed as follows:



WARNING

**DISCONNECT TRANSMITTER PRIMARY POWER
BEFORE PROCEEDING.**

WARNING

- A. Disconnect the primary power from the transmitter.
- B. Remove the FM-100C top-cover and disconnect P14 from the metering circuit board.
- C. Remove the two front-panel mounting screws on each side of the chassis.
- D. Remove the four front-panel mounting screws on the underside of the chassis and lower the front-panel.
- E. Remove the five screws securing the shield to the circuit board assembly.
- F. Remove the five stand-offs and one screw securing the circuit board assembly to the front-panel.
- G. Lift the circuit board assembly from the front-panel by applying light pressure on the multimeter function switches.

7.5.2 INSTALLATION PROCEDURE.

To install the metering circuit board assembly after repairs have been completed, proceed as follows:



WARNING

**DISCONNECT TRANSMITTER PRIMARY POWER
BEFORE PROCEEDING.**

WARNING

- A. Disconnect the primary power from the transmitter.
- B. Follow the REMOVAL PROCEDURE in reverse order.

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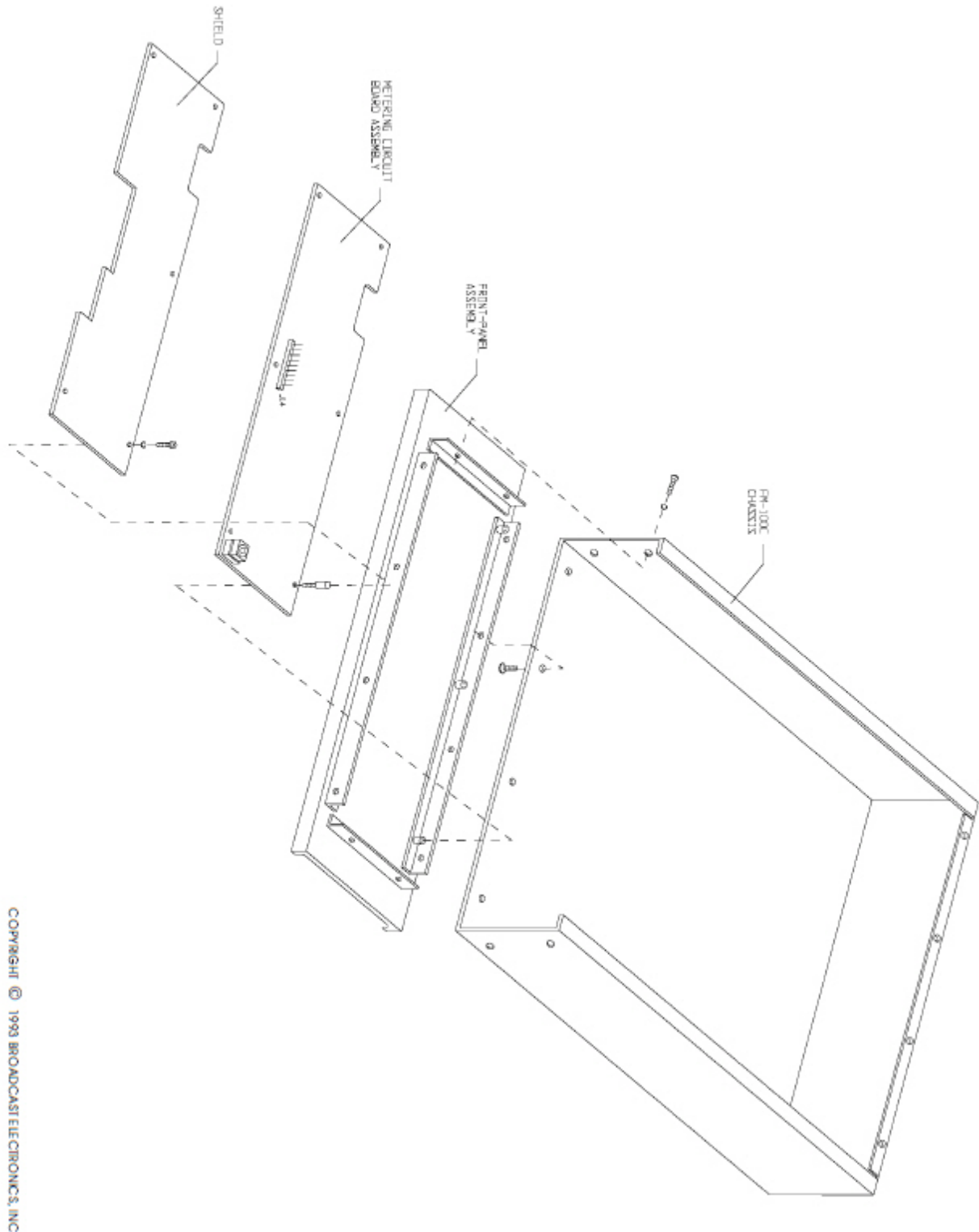


Figure 7-3. METERING CIRCUIT REMOVAL AND INSTALLATION DIAGRAM

8 Modulated Oscillator

This section provides general information and specifications relative to the operation of the modulated oscillator assembly.

8.1 DESCRIPTION.

The modulated oscillator assembly produces the carrier frequency, frequency modulates the carrier, and amplifies the modulated RF carrier to a level sufficient to drive the RF amplifier assembly. Additional circuitry is interfaced to the AFC/PLL circuit board which operates as a phase-locked loop to maintain the RF carrier center frequency.

8.2 ELECTRICAL CHARACTERISTICS.

Refer to Table 8-1 for electrical characteristics relative to the modulated oscillator assembly.

Table 8-1. ELECTRICAL CHARACTERISTICS

PARAMETER	SPECIFICATION
SIGNAL INPUTS	
MODULATION AND AFC VOLTAGE	35 m V p-p Nominal with 2.0V to 9.0V DC Dependent on the RF Center Frequency.
SIGNAL OUTPUTS	
RF	1 mW at 50 Ohms.
AFC SAMPLE	1 mW at 50 Ohms.

8.3 THEORY OF OPERATION

This section presents the theory of operation for the transmitter modulated oscillator assembly.

8.4 FUNCTIONAL DESCRIPTION.

MECHANICAL ASSEMBLY.

The modulated oscillator circuit board is enclosed in a cast aluminum housing which is secured to a heavy steel plate. Mechanical vibrations are reduced by a foam rubber pad between the steel plate and the chassis. The increased mass of the assembly also lowers the mechanical resonance below the frequency of vibrations from external sources.

In addition, a foam rubber pad attached to the inside top-cover restricts movement of circuit board components to reduce mechanically introduced noise modulation and increase the frequency stability of the oscillator.

ELECTRICAL DESCRIPTION.

Figure 8-1 presents a simplified schematic diagram of the modulated oscillator circuit board. Refer to Figure 8-1 as required for a description of the following circuits.

- A. Modulator/Oscillator
- B. Buffers and Output Amplifier
- C. Power Supply

MODULATOR/OSCILLATOR. The oscillator section is a modified Colpits configuration consisting of transistor Q2, inductors L3 and L2, capacitors C1 and C2, and varactor diodes D1 through D8. C2 provides positive feedback to sustain oscillation. Tuning is accomplished by the 2V to 9V (dependent upon the carrier frequency) potential applied to the varactor diodes from the AFC/PLL circuit board through L1/L6.

Varactor diodes D1 through D8 also operate as a linear FM modulator. The modulation voltage applied to the diodes through L1/L6 varies the capacitance across the oscillator tank circuit to provide direct FM modulation. Capacitor C3 prevents ground loops between the AFC/PLL circuit board ground and modulated oscillator assembly ground. The oscillator output amplitude is maintained at a constant level by limit diode D9/D10/D11.

BUFFERS AND OUTPUT AMPLIFIER. Three RF stages provide isolation between the oscillator and output load, harmonic suppression, and a low output impedance.

The modulated RF at Q2 is coupled to the base of buffer/amplifier Q3 through capacitor C8. The output of Q3 is applied to buffer/amplifier Q4 through C11. The output of Q4 is applied to the base of output amplifier Q5 through a low-pass filter consisting of C15, C16, and L5. The output of Q5 is routed through C18 to resistors R23 and R24 which establish a 50 Ohm output impedance.

Two identical signals are output from the modulated oscillator assembly. The signal at R24 provides drive to the RF amplifier and the signal at R23 provides a frequency sample to the AFC/PLL circuit board.



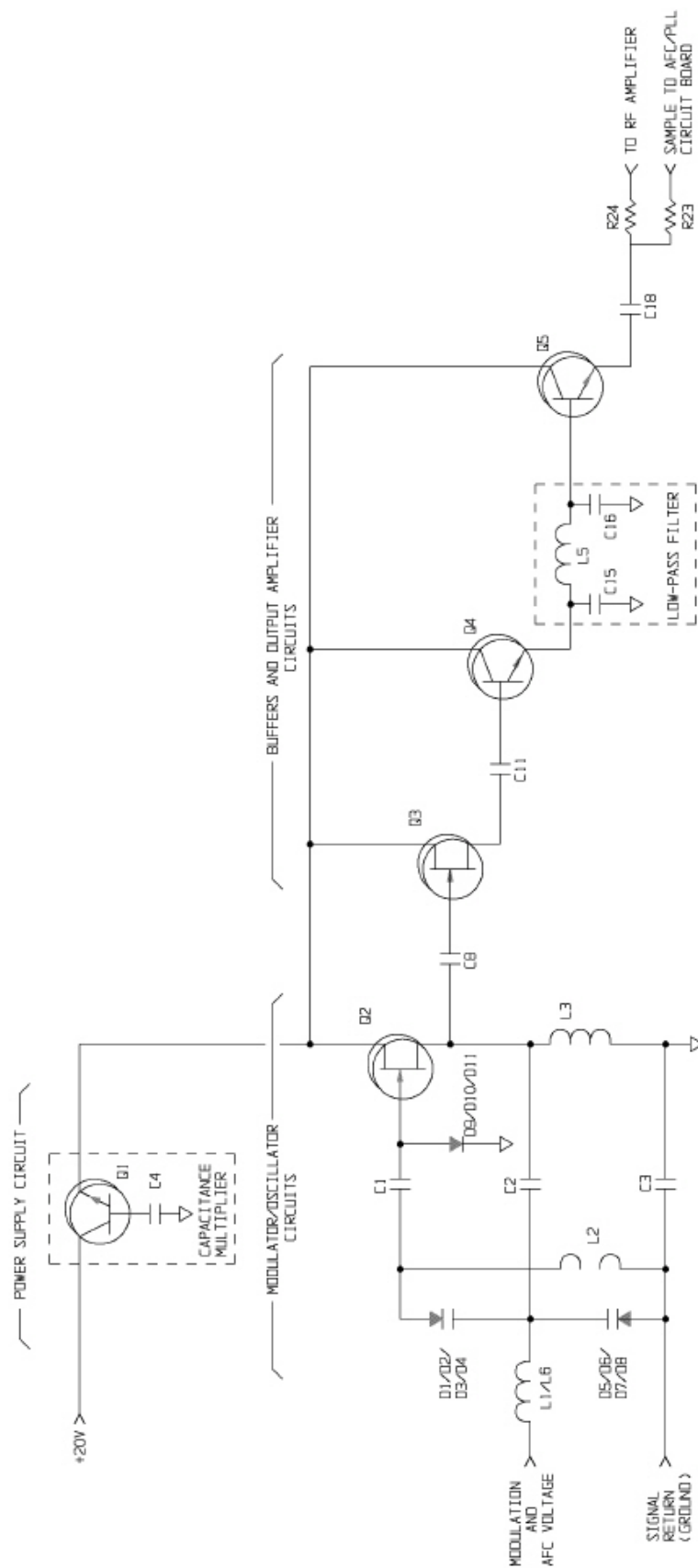


Figure 8-1. MODULATED OSCILLATOR SIMPLIFIED SCHEMATIC DIAGRAM

POWER SUPPLY. +20V dc is applied to the transistors on the modulated oscillator circuit board through transistor Q1. Q1 operates as a capacitance multiplier for dc filter capacitor C4.

8.5 MAINTENANCE

This section provides maintenance and troubleshooting information for the transmitter modulated oscillator assembly.

8.5.1 MAINTENANCE.

ELECTRICAL ADJUSTMENTS.

The modulated oscillator assembly contains no controls which require adjustment or calibration.

8.6 TROUBLESHOOTING.

Field servicing the modulated oscillator assembly is not recommended. Therefore, if difficulties are encountered and the modulated oscillator is suspected as faulty, return the assembly to Broadcast Electronics Inc. for repair or replacement.

8.7 REMOVAL AND INSTALLATION

This section provides removal and installation procedures for the modulated oscillator assembly.

8.7.1 REMOVAL AND INSTALLATION PROCEDURES.

REQUIRED EQUIPMENT. A number 2 Phillips screwdriver with a 4 inch (10.16 cm) shaft is required to remove the modulated oscillator assembly from the transmitter chassis.

PROCEDURE. To remove the modulated oscillator assembly, proceed as follows:



WARNING

**DISCONNECT TRANSMITTER PRIMARY POWER
BEFORE PROCEEDING.**

WARNING

- A. Disconnect the primary power to the transmitter.
- B. Remove the transmitter top-cover. Disconnect P8 from the AFC/PLL circuit board.
- C. Disconnect RF sample connector P6 and RF output connector P9 from the rear of the modulated oscillator assembly.
- D. Remove the four screws securing the modulated oscillator assembly to the steel mounting plate. Remove the ground straps.

8.7.2 INSTALLATION PROCEDURE.

To install the modulated oscillator assembly after repairs have been completed, proceed as follows:



WARNING

**DISCONNECT TRANSMITTER PRIMARY POWER
BEFORE PROCEEDING.**

WARNING

- A. Disconnect the primary power to the transmitter.
- B. Follow the REMOVAL PROCEDURE in reverse order.



9 AFC/PLL

This section provides general information and specifications relative to the operation of the automatic frequency control/phase-locked-loop (AFC/PLL) circuit board.

9.1 DESCRIPTION.

The AFC/PLL circuit board: 1) synthesizes and maintains the desired carrier frequency to a high degree of precision, and 2) processes the audio for modulation.

A sample of the modulated oscillator output frequency is compared to a precision reference frequency in a comparator circuit which generates a correction voltage. This correction voltage is applied to the modulated oscillator to maintain the stability of the carrier frequency. If the carrier is off frequency (as when power is applied), the AFC/PLL circuitry will mute the RF output until the carrier is locked in-phase with the reference frequency. A dual speed PLL filter ensures rapid stabilization of the carrier frequency.

In addition, the AFC/PLL circuit board accepts, sums, and precorrects audio input signals to provide a linear response when applied to the modulated oscillator.

9.2 ELECTRICAL CHARACTERISTICS.

Refer to Table 9-1 for electrical characteristics relative to the AFC/PLL circuit board.

Table 9-1. AFC/PLL ELECTRICAL CHARACTERISTICS

PARAMETER	SPECIFICATIONS
INPUTS:	
RF SAMPLE	1 mW at 50 Ohms.
BALANCED AUDIO	+10 dBm at 600 Ohm for 100% Modulation.
COMPOSITE AUDIO	3.5V p-p (1.24V RMS) for 100% Modulation.
SCA AUDIO	3.5V p-p (1.24V RMS) for 10% Injection.
OUTPUTS:	
MODULATION	35 mV p-p, Nominal for +/- 75 kHz Deviation.
AFC	+2.0V DC to +9.0V DC, Dependent Upon RF Center Frequency.
AFC (Metering)	+2.0V DC to 9.0V DC, Dependent Upon RF Center Frequency.
AFC INTERLOCK	Open Collector Output.
EXTERNAL LOCK INDICATOR	Open Collector Output.
COMPOSITE AUDIO (Metering)	6.0V p-p at 1 k Ohm.
COMPOSITE TEST	6.0V p-p at 1 k Ohm.

9.3 THEORY OF OPERATION

This section presents the theory of operation for the transmitter AFC/PLL circuit board.

9.4 FUNCTIONAL DESCRIPTION.

The AFC/PLL circuit board contains nine circuits. Figure 9-1 presents a simplified schematic of the AFC/PLL circuit board. Refer to Figure 9-1 as required for a description of the following circuits.

- A. Reference Divider Circuit
- B. Reference Oscillator Activity Monitor
- C. RF Sample Divider Circuit
- D. Comparator Circuit
- E. Loop Filter Control Circuit
- F. VCO Activity Monitor
- G. Audio Processing Circuits
- H. Pre-modulation Control Circuit
- I. Voltage Regulator Circuits

9.4.1 REFERENCE DIVIDER CIRCUIT.

This divider circuit provides an accurate and stable reference frequency for input to a comparator circuit. A 10 MHz signal from crystal oscillator Y1 is input to divide-by-five counter U1B to produce 2 MHz. These two frequencies are available at TP1 through programmable jumper J3.

The 2 MHz signal from U1B is input to divide-by-two counter U1A to produce 1 MHz. Logic circuits U2, U3, and U4A further divide the 1 MHz signal by 250 to provide 4 kHz to one shot U5. The 4 kHz signal at the QA output of U5 is applied to programmable frequency synthesizer and comparator U9.

9.4.2 REFERENCE OSCILLATOR ACTIVITY MONITOR.

This circuit provides a visual indication of the reference divider circuit output. When the 4 kHz signal is present, the QB output of U5 will go HIGH which biases LED driver transistor Q1 ON to illuminate indicator DS2.

9.4.3 RF SAMPLE DIVIDER CIRCUIT.

This divider circuit provides an RF sample frequency for input to the comparator circuit. An RF sample from the modulated oscillator is input to transformer T1 to reduce ground loop interference. The output of T1 is coupled to a low-pass filter consisting of capacitors C15, C16, and inductor L3 which eliminates any harmonics.

The sinusoidal output signal from the low-pass filter is applied to the input of counter U8. U8 will divide the sample frequency by 20 and output a digital signal to U9.

9.4.4 COMPARATOR CIRCUIT.

This circuit compares the signals from both the reference divider and RF sample divider circuits and generates an error signal when a difference exists. Logic circuit U9 is a programmable frequency synthesizer and comparator which will internally divide the 4 kHz signal at the OSC input to provide a frequency of 500 Hz.

When binary switches S1, S2, and S3 are preset for the appropriate carrier frequency, U9 will divide the RF sample signal at the F input to provide 500 Hz at the FV output which is applied to one shot U12. If an error exists, output FV will vary above or below 500 Hz. This signal and the 500 Hz from the reference division are internally compared for phase and frequency variations.



When the carrier frequency and reference frequency are equal and in phase, the PD output of U9 will be steady state at approximately +2.5 volts. If the carrier leads or is greater than the reference frequency, the output will pulse LOW. If the carrier lags or is less than the reference frequency, the output will pulse HIGH. These output pulses will vary in width directly in proportion to the degree of phase error. The pulses are applied to U11B.

Normally, the LD output of U9 will be a logic HIGH for a locked condition. If an unlocked condition exists, the output will pulse LOW. This output is applied to the D input of lock/ unlock sensor U4B. With the signal from the FV output of U9, the QA output of one shot U12 will provide a clock pulse to U4B which leads or lags the signal at the D input depending on the phase error direction.

9.4.5 LOOP FILTER CONTROL CIRCUIT.

The loop filter control circuit increases/decreases the voltage controlled oscillator (VCO) center frequency to maintain accuracy. U10B biases integrator/amplifier U11B at 2.5V to provide a voltage gain of 11 for any differential voltage within the range of the bias. The output of U11B is applied to the metering circuit board for display.

ACTIVE FILTER. The output of U11B is also applied to an active third-order 5 Hz low-pass filter consisting of capacitors C29 through C31, resistors R25 through R27, and loop filter buffer U11A. The filter removes the reference frequency component to provide a dc automatic frequency control (AFC) voltage to the modulated oscillator through resistor R31.

LOCK DRIVER. The output of lock/unlock sensor U4B normally applies a HIGH through resistor R39 to lock driver U13A for a locked-loop condition. U13A is activated by a slow charge/rapid discharge circuit consisting of resistors R39, R40, diode D2, and capacitor C42.

As long as the output of U4B is HIGH, the potential on C42 will maintain U13A output HIGH. This HIGH will: 1) illuminate front-panel LOCK indicator DS5, 2) bias transistor switch Q3/Q4 ON to remove the RF inhibit from the rear-panel terminal strip, and 3) enable the AFC relay.

If an unlock condition exists, the output of U4B will go LOW which rapidly discharges C42 through D2 and R40 and applies a LOW to U13A. When this occurs, the output of U13A will go LOW to extinguish the lock indicator, disable the AFC relay, inhibit the RF, and activate a dual rate loop driver.

DUAL RATE LOOP DRIVER. The LOW output from U13A is routed to a dual rate control network consisting of R42, R43, C44, and D3. This circuit is identical in operation to the slow charge/rapid discharge circuit previously described. The circuit forces the output of U13B HIGH which enables light dependent resistors LDR1, LDR2, and LDR3 in the active filter circuit to increase loop lock response.

LOOP LOCK RESPONSE. Increased loop lock response is accomplished by LDR1, LDR2, and LDR3. When enabled during an unlocked condition, LDR1 will shunt the 5 Hz lowpass filter and route the output from U11B directly to U11A. LDR2 will shunt resistor R31 to rapidly charge capacitor C35 through resistor R34. Modulation coupling capacitor C37 will be rapidly charged through LDR3.

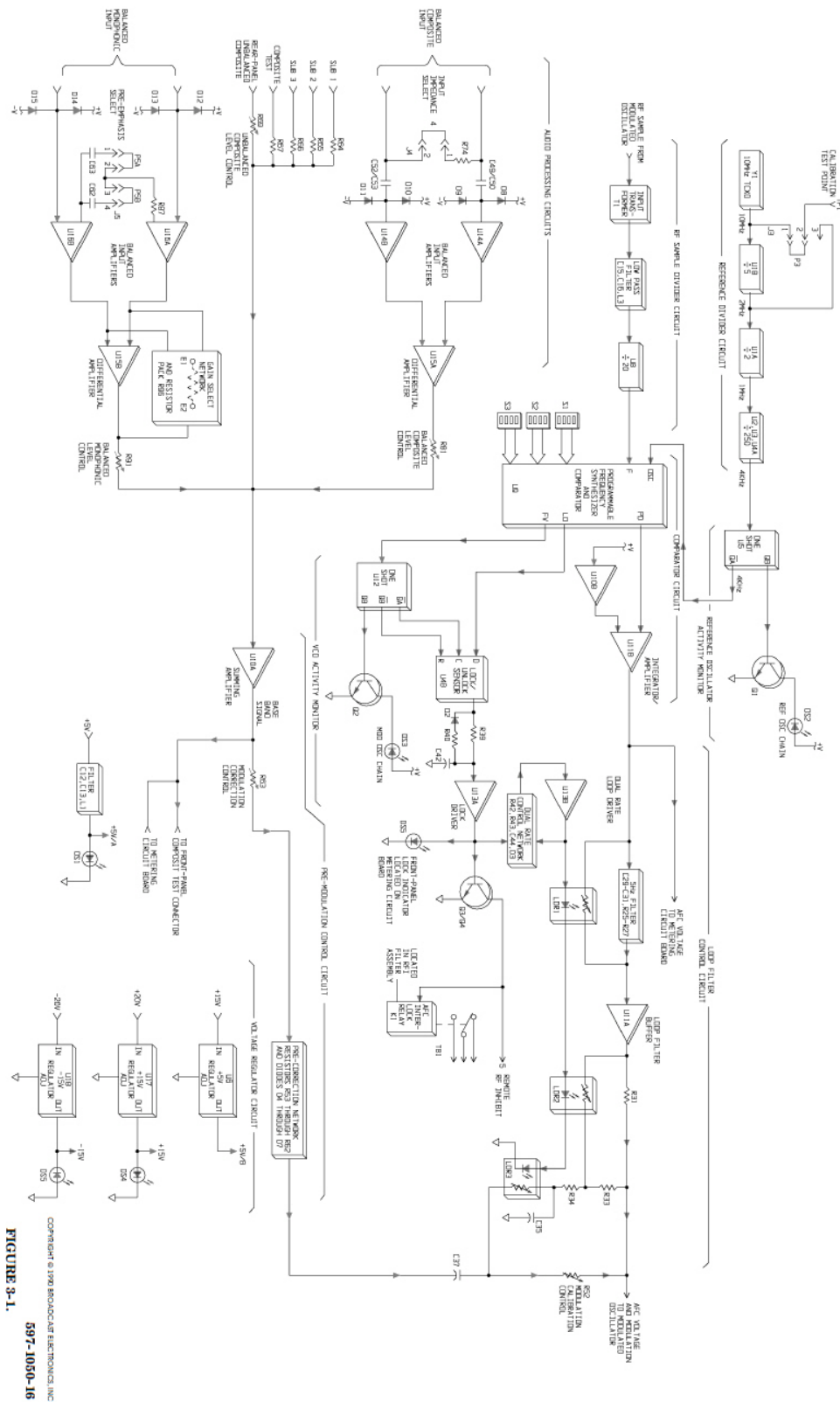


Figure 9-1. AFC/PLL CIRCUIT BOARD SIMPLIFIED SCHEMATIC

LOCK UP. When the operating frequency and phase output of the modulated oscillator are sufficiently adjusted by the AFC control voltage, the output of U4B will return HIGH which changes the output state of U13A and U13B. The duration between the unlock and lock conditions is less than 5 seconds.

9.4.6 VCO ACTIVITY MONITOR.

This circuit indirectly provides a visual indication of output from the RF sample divider circuit via the FV output of U9. When the 500 Hz signal is present, the QB output of U12 will go HIGH which biases LED driver transistor Q2 ON to illuminate indicator DS3. If any component within the RF sample divider circuit or modulated oscillator circuit fails, indicator DS3 will extinguish and the QB output of U12 will issue a reset pulse to U4B which inhibits the RF.

9.4.7 AUDIO PROCESSING CIRCUITS.

BALANCED INPUTS. A balanced composite audio input circuit and a balanced mono phonic audio input circuit are provided by the FM-100C transmitter. Audio for the composite circuit is input through a rear-panel BNC connector. Audio for the monophonic circuit is input through rear-panel barrier strip TB1.

Composite Circuit. When programmable jumper J4 is installed, resistor R74 is connected across the input circuit to convert the impedance from 10 k Ohms to 50 Ohms. Audio from the rear-panel is ac coupled to balanced input amplifiers U14A and U14B through capacitors C49/C50 and C52/C53.

The outputs of U14A and U14B are routed to differential amplifier U15A. The output of U15A is routed to summing amplifier U10A through balanced composite level control R81.

Monophonic Circuit. Audio from the rear-panel is ac coupled through capacitors in the RFI assembly to balanced input amplifiers U16A and U16B. Pre-emphasis is selected by programmable jumpers J5A and J5B which connect capacitor(s) C62 and/or C63 into the circuit through resistor R37.

The outputs of U16A and U16B are routed to differential amplifier U15B. The voltage gain for U15B is selected by a gain select network consisting of resistor pack R96 and a resistor connected between tie points E1 and E2. The output of U15B is routed to summing amplifier U10A through balanced monophonic level control R91.

UNBALANCED INPUTS. Subcarrier audio from rear-panel connectors SUB1, SUB2, and SUB3 and audio from front-panel composite test connector are input to U10A through summing resistors R64 through R67. Audio from the rear-panel unbalanced composite connector is also input to U10A through unbalanced composite level control R69.

9.4.8 PREMODULATION CONTROL CIRCUIT.

Audio signals from the balanced and unbalanced input circuits are summed at the input of summing amplifier U10A. The output of U10A is routed to the front-panel composite test connector, the metering circuit board, and a precorrection network through modulation correction control R63.

The audio precorrection network consisting of resistors R53 through R62 and diodes D4 through D7 adjusts the base band signal to compensate for varactor non-linearity in the modulated oscillator. The output of this network is routed to the modulated oscillator through coupling capacitor C37 and modulation calibration control R52.

9.4.9 VOLTAGE REGULATOR CIRCUITS.

The AFC/PLL circuit board contains three voltage regulator circuits. +15 volts is applied to regulator circuit U6 to provide a +5 V/B operating potential at the output. +20 volts is applied to regulator circuit U17 to provide an output potential of +15V to the circuit board and indicator DS4. -20 volts is applied to regulator circuit U18 to provide an output potential of -15V to the circuit board and indicator DS5.

In addition, +5 volts is applied to a filter circuit consisting of capacitors C12, C13, and inductor L1. The output illuminates indicator DS1 and provides a +5V/A operating potential.

9.5 MAINTENANCE

This section provides maintenance information, electrical adjustment procedures, and troubleshooting information for the transmitter AFC/PLL circuit board.

9.6 ELECTRICAL ADJUSTMENTS.

Figure 9-2 presents the AFC/PLL circuit board controls and indicators with the cover removed. The following electrical adjustment procedures do not require the cover to be removed.

REQUIRED EQUIPMENT. The following tools and equipment are required for electrical adjustment procedures.

- A. Insulated adjustment tool, shipped with the transmitter (P/N 407-0038).
- B. Digital voltmeter, Fluke 75 or equivalent.
- C. Low distortion audio generator and distortion analyzer, Sound Technology 1710A or equivalent.
- D. Calibrated oscilloscope.
- E. High linearity FM demodulator, Belar FMM-2 or equivalent.
- F. 20 dB power attenuator, Bird 8343-200 or equivalent.
- G. Calibrated frequency counter, HP-5315B or equivalent.

9.6.1 BAL MONO (R91).

The BAL MONO level control on the AFC/PLL circuit board adjusts the output level of the balanced monophonic amplifier circuit. BAL MONO control R91 is adjusted as follows.

Procedure. To adjust BAL MONO control R91, refer to Figure 9-2 as required and proceed as follows:



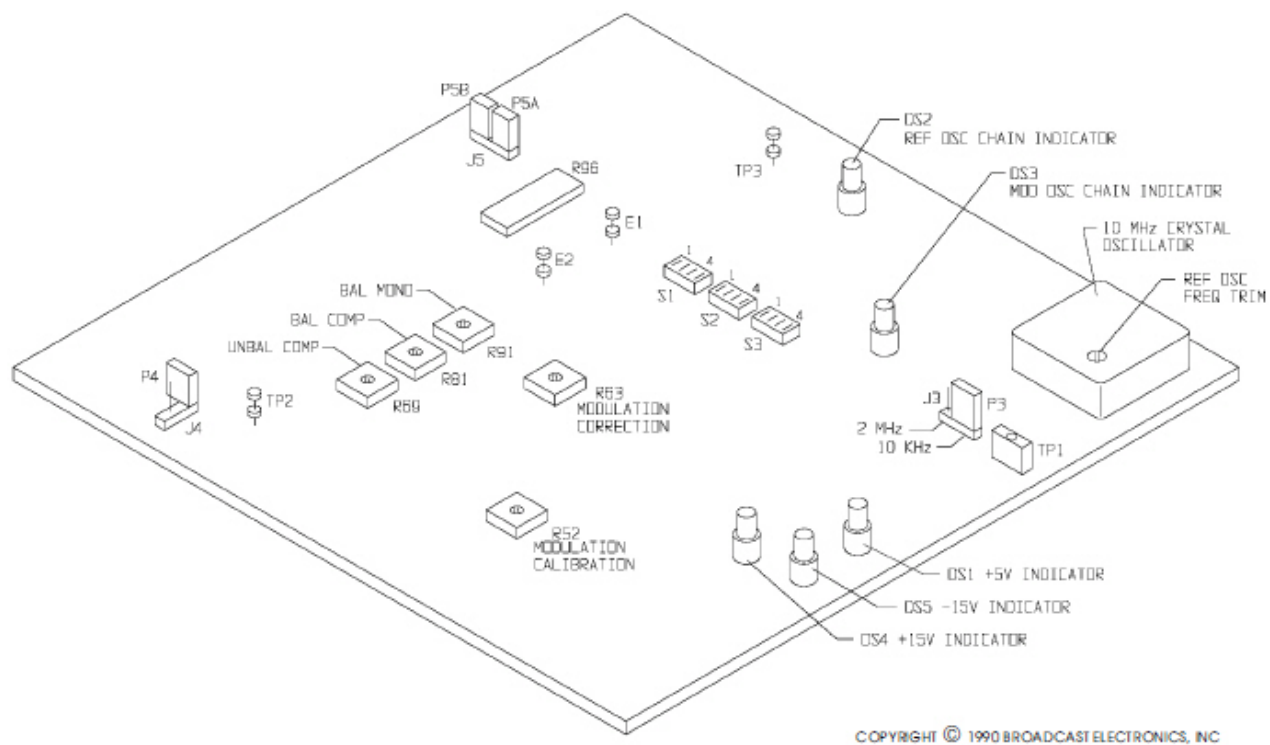
WARNING

**DISCONNECT TRANSMITTER PRIMARY POWER
BEFORE PROCEEDING.**

WARNING

- A. Disconnect the transmitter primary power.
- B. Remove the top-cover and connect an audio generator to the AUDIO INPUT terminals on rear-panel barrier strip.
- C. Connect a digital voltmeter to the front-panel COMPOSITE OUT receptacle.





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Figure 9-2. AFC/PLL CIRCUIT BOARD CONTROLS AND INDICATORS



WARNING

**DISCONNECT TRANSMITTER PRIMARY POWER
BEFORE PROCEEDING.**

WARNING

- D. Apply primary power and operate the transmitter.
- E. Adjust the audio generator for 400 Hz at +10 dBm (2.45V RMS) output.
- F. With an insulated adjustment tool, adjust R91 until the voltmeter indicates 2.12V RMS.
- G. Disconnect the primary power, remove all test equipment, and replace the top-cover.

9.6.2 BAL COMP (R81).

The BAL COMP level control on the AFC/PLL circuit board adjusts the output level of the balanced composite amplifier circuit. BAL COMP control R81 is adjusted as follows.

Procedure. To adjust BAL COMP control R81, refer to Figure 9-2 as required and proceed as follows:



WARNING

**DISCONNECT TRANSMITTER PRIMARY POWER
BEFORE PROCEEDING.**

WARNING

- A. Disconnect the transmitter primary power.
- B. Remove the top-cover and connect an audio generator to the rear-panel BAL COMPOSITE INPUT receptacle.
- C. Connect a digital voltmeter to the front-panel COMPOSITE OUT receptacle.

**WARNING**

DONOT TOUCH ANY COMPONENT WITHIN THE TRANSMITTER WITH POWER APPLIED.

WARNING

- D. Apply primary power and operate the transmitter.
- E. Adjust the audio generator for 400 Hz at 1.24V RMS output.
- F. With an insulated adjustment tool, adjust R81 until the voltmeter indicates 2.12V RMS.
- G. Disconnect the primary power, remove all test equipment, and replace the top-cover.

9.6.3 UNBAL COMP (R69).

The UNBAL COMP level control on the AFC/PLL circuit board adjusts the output level of the unbalanced composite amplifier circuit. UNBAL COMP control R69 is adjusted as follows.

Procedure. To adjust UNBAL COMP control R69, refer to Figure 9-2 as required and proceed as follows:

**WARNING**

DISCONNECT TRANSMITTER PRIMARY POWER BEFORE PROCEEDING.

WARNING

- A. Disconnect the transmitter primary power.
- B. Remove the top-cover and connect an audio generator to the rear-panel UNBAL COMPOSITE INPUT receptacle.
- C. Connect a digital voltmeter to the front-panel COMPOSITE OUT receptacle.

**WARNING**

DONOT TOUCH ANY COMPONENT WITHIN THE TRANSMITTER WITH POWER APPLIED.

WARNING

- D. Apply primary power and operate the transmitter.
- E. Adjust the audio generator for 400 Hz at 1.24V RMS output.
- F. With an insulated adjustment tool, adjust R69 until the voltmeter indicates 2.12V RMS.
- G. Disconnect the primary power, remove all test equipment, and replace the topcover.

9.6.4 MODULATION CORRECTION (R63).

The MODULATION CORRECTION control on the AFC/PLL circuit board corrects the audio signal prior to application to the modulated oscillator assembly. MODULATION CORRECTION control R63 is adjusted as follows.

Procedure. To adjust MODULATION CORRECTION control R63, refer to Figure 9-2 as required and proceed as follows:



**WARNING**

**DISCONNECT TRANSMITTER PRIMARY POWER
BEFORE PROCEEDING.**

WARNING

- A. Disconnect the transmitter primary power.
- B. Remove the top-cover and connect an audio generator to the front-panel COMPOSITE IN receptacle. Connect a digital voltmeter to the front-panel COMPOSITE OUT receptacle.
- C. Connect an FM demodulator to the transmitter RF OUTPUT receptacle through a 20 dB attenuator and a distortion analyzer to the output of the demodulator.

**WARNING**

**DONOT TOUCH ANY COMPONENT WITHIN THE
TRANSMITTER WITH POWER APPLIED.**

WARNING

- D. Apply primary power and operate the transmitter.
- E. Adjust the audio generator for 400 Hz at 2.12V RMS output as indicated on the voltmeter.
- F. With an insulated adjustment tool, adjust R63 for minimum THD as indicated on the distortion analyzer.
- G. Disconnect the primary power, remove all test equipment, and replace the topcover.

9.6.5 MODULATION CALIBRATION (R52).

The MODULATION CALIBRATION control on the AFC/PLL circuit board adjusts the transmitter percentage of modulation. MODULATION CALIBRATION control R52 is adjusted as follows.

Procedure. To adjust MODULATION CALIBRATION control R52, refer to Figure 9-2 as required and proceed as follows:

- A. Perform the BAL MONO (R91), BAL COMP (R81), and the UNBAL COMP (R69) adjustment procedures.

**WARNING**

**DISCONNECT TRANSMITTER PRIMARY POWER
BEFORE PROCEEDING.**

WARNING

- B. Disconnect the transmitter primary power.
- C. Remove the top-cover and connect an audio generator to the front-panel COMPOSITE IN receptacle. Connect a digital voltmeter to the front-panel COMPOSITE OUT receptacle.
- D. Connect an FM demodulator to the transmitter RF OUTPUT receptacle through a 20 dB attenuator.

**WARNING**

**DONOT TOUCH ANY COMPONENT WITHIN THE
TRANSMITTER WITH POWER APPLIED.**

WARNING

- E. Apply primary power and operate the transmitter.
- F. Adjust the audio generator for 400 Hz at 2.12V RMS output as indicated on the voltmeter.
- G. With an insulated adjustment tool, adjust R52 for 100% modulation as indicated on the modulation monitor.

H. Disconnect the primary power, remove all test equipment, and replace the topcover.

9.6.6 REF OSC FREQ TRIM.

The REF OSC FREQ TRIM control on the AFC/PLL circuit board adjusts the reference frequency. The REF OSC FREQ TRIM control is adjusted as follows.

Procedure. To adjust the REF OSC FREQ TRIM control, refer to Figure 9-2 as required and proceed as follows:



WARNING

**DISCONNECT TRANSMITTER PRIMARY POWER
BEFORE PROCEEDING.**

WARNING

A. Disconnect the transmitter primary power.

B. Remove the transmitter top-cover and connect a frequency counter to TP1 on the AFC/ PLL circuit board.



WARNING

**DONOT TOUCH ANY COMPONENT WITHIN THE
TRANSMITTER WITH POWER APPLIED.**

WARNING

C. Apply primary power and operate the transmitter.

D. With an insulated adjustment tool, adjust the REF OSC FREQ TRIM control until the frequency counter indicates $10 \text{ MHz} \pm 5 \text{ Hz}$ or $2 \text{ MHz} \pm 1 \text{ Hz}$ depending on programmable jumper J3.

E. Disconnect the primary power, remove all test equipment, and replace the topcover.

9.6.7 FREQUENCY SELECTION.

The transmitter carrier frequency is established by programmable frequency synthesizer switches S1, S2, and S3 on the AFC/PLL circuit board assembly (refer to Figure 9-3). The position of each switch corresponds to a weighted binary number (refer to Table 9-2).

Table 9-2 lists standard carrier frequencies and corresponding switch binary codes for domestic and European operation. A "1" in the code represents a switch in the ON position and a "0" represents a switch in the OFF position. S1, S2, and S3 are programmed as follows.

Procedure. To change the transmitter carrier frequency, proceed as follows.



WARNING

**DISCONNECT TRANSMITTER PRIMARY POWER
BEFORE PROCEEDING.**

WARNING

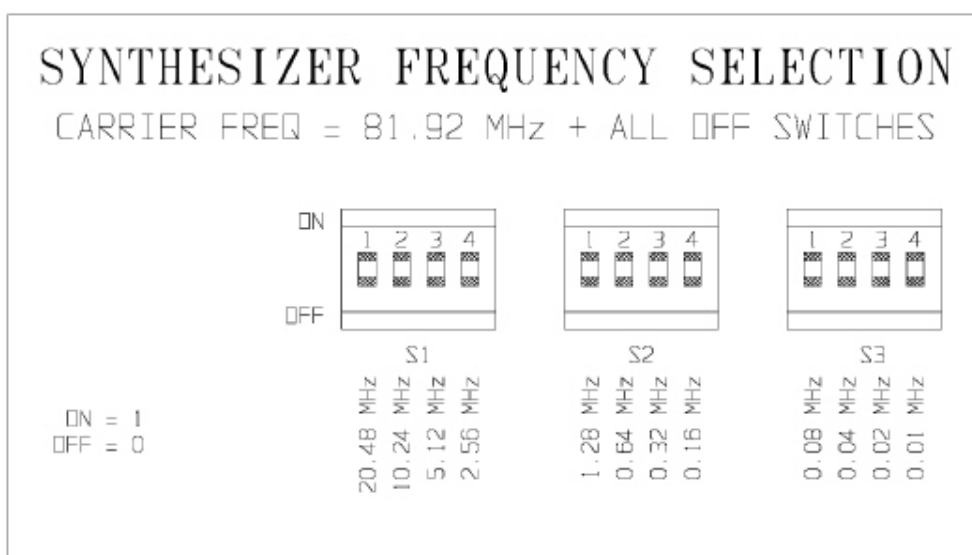
A. Disconnect the transmitter primary power.

B. Remove the transmitter top-cover. Refer to Table 9-2 and select the desired frequency and corresponding binary code.

C. Refer to Figure 9-3 and program four-segment switches S1, S2, and S3 for the desired frequency.

D. Replace the top-cover and return the transmitter to service.





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Figure 9-3. FREQUENCY SELECTION

9.6.8 PRE-EMPHASIS SELECTION.

Programmable jumpers P5A and P5B on the AFC/PLL circuit board establish the transmitter pre-emphasis. The transmitter is normally shipped with 75 microsecond pre-emphasis. If required, an alternate pre-emphasis can be selected as follows.

Procedure. To select an alternate pre-emphasis, refer to Figure 9-2 as required and proceed as follows:



WARNING

**DISCONNECT TRANSMITTER PRIMARY POWER
BEFORE PROCEEDING.**

WARNING

- A. Disconnect the transmitter primary power.
- B. Remove the transmitter top-panel.
- C. Refer to the following information and program P5A and P5B as required.

PRE EMPHASIS	P5A	P5B
75 us	Install	Install
50 us	Remove	Install
25 us	Install	Remove

- D. Replace the transmitter top-panel.

DOMESTIC												EUROPEAN												
FREQUENCY				SWITCH				FREQUENCY				SWITCH				FREQUENCY				SWITCH				
IN	S1	S2	S3	IN	S1	S2	S3	IN	S1	S2	S3	IN	S1	S2	S3	IN	S1	S2	S3	IN	S1	S2	S3	
MHz	1	2	3	4	MHz	1	2	3	4	MHz	1	2	3	4	MHz	1	2	3	4	MHz	1	2	3	4
87.1	0	0	1	0	98.1	0	0	0	0	87.2	1	0	0	1	98.2	0	0	0	0	87.3	0	0	1	0
87.3	0	0	1	0	98.3	0	0	0	0	87.4	1	0	0	0	98.4	1	0	0	0	87.5	1	0	0	0
87.5	0	0	1	0	98.5	0	0	0	0	87.6	1	0	0	0	98.6	1	0	0	0	87.7	1	0	0	0
87.7	0	0	1	0	98.7	0	0	0	0	87.8	1	0	0	0	98.8	1	0	0	0	87.9	1	0	0	0
88.1	0	0	1	0	98.9	0	0	0	0	88.2	1	0	0	0	98.9	1	0	0	0	88.3	1	0	0	0
88.3	0	0	1	0	99.0	0	0	0	0	88.4	1	0	0	0	99.0	1	0	0	0	88.5	1	0	0	0
88.5	0	0	1	0	99.2	0	0	0	0	88.6	1	0	0	0	99.2	1	0	0	0	88.7	1	0	0	0
88.7	0	0	1	0	99.5	0	0	0	0	88.8	1	0	0	0	99.5	1	0	0	0	88.9	1	0	0	0
89.1	0	0	1	0	99.7	0	0	0	0	89.2	1	0	0	0	99.7	1	0	0	0	89.3	1	0	0	0
89.3	0	0	1	0	100.1	0	0	0	0	89.4	1	0	0	0	100.1	1	0	0	0	89.5	1	0	0	0
89.5	0	0	1	0	100.3	0	0	0	0	89.6	1	0	0	0	100.3	1	0	0	0	89.7	1	0	0	0
89.7	0	0	1	0	100.7	0	0	0	0	89.8	1	0	0	0	100.7	1	0	0	0	89.9	1	0	0	0
89.9	0	0	1	0	100.9	0	0	0	0	90.2	1	0	0	0	100.9	1	0	0	0	90.3	1	0	0	0
90.1	0	0	1	0	100.9	0	0	0	0	90.4	1	0	0	0	101.1	1	0	0	0	90.5	1	0	0	0
90.3	0	0	1	0	101.3	0	0	0	0	90.6	1	0	0	0	101.3	1	0	0	0	90.7	1	0	0	0
90.5	0	0	1	0	101.5	0	0	0	0	90.8	1	0	0	0	101.5	1	0	0	0	90.9	1	0	0	0
90.7	0	0	1	0	101.7	0	0	0	0	91.0	1	0	0	0	101.7	1	0	0	0	91.1	1	0	0	0
91.1	0	0	1	0	101.9	0	0	0	0	91.2	1	0	0	0	101.9	1	0	0	0	91.3	1	0	0	0
91.3	0	0	1	0	102.1	0	0	0	0	91.4	1	0	0	0	102.1	1	0	0	0	91.5	1	0	0	0
91.5	0	0	1	0	102.3	0	0	0	0	91.6	1	0	0	0	102.3	1	0	0	0	91.7	1	0	0	0
91.7	0	0	1	0	102.5	0	0	0	0	91.8	1	0	0	0	102.5	1	0	0	0	91.9	1	0	0	0
91.9	0	0	1	0	102.9	0	0	0	0	92.1	1	0	0	0	102.9	1	0	0	0	92.2	1	0	0	0
92.1	0	0	1	0	103.1	0	0	0	0	92.4	1	0	0	0	103.1	1	0	0	0	92.5	1	0	0	0
92.3	0	0	1	0	103.3	0	0	0	0	92.6	1	0	0	0	103.3	1	0	0	0	92.7	1	0	0	0
92.5	0	0	1	0	103.5	0	0	0	0	92.8	1	0	0	0	103.5	1	0	0	0	92.9	1	0	0	0
92.7	0	0	1	0	103.7	0	0	0	0	93.1	1	0	0	0	103.7	1	0	0	0	93.2	1	0	0	0
92.9	0	0	1	0	103.9	0	0	0	0	93.4	1	0	0	0	103.9	1	0	0	0	93.5	1	0	0	0
93.1	0	0	1	0	104.1	0	0	0	0	93.6	1	0	0	0	104.1	1	0	0	0	93.7	1	0	0	0
93.3	0	0	1	0	104.3	0	0	0	0	93.8	1	0	0	0	104.3	1	0	0	0	93.9	1	0	0	0
93.5	0	0	1	0	104.5	0	0	0	0	94.0	1	0	0	0	104.5	1	0	0	0	94.1	1	0	0	0
93.7	0	0	1	0	104.7	0	0	0	0	94.2	1	0	0	0	104.7	1	0	0	0	94.3	1	0	0	0
93.9	0	0	1	0	104.9	0	0	0	0	94.4	1	0	0	0	104.9	1	0	0	0	94.5	1	0	0	0
94.1	0	0	1	0	105.1	0	0	0	0	94.6	1	0	0	0	105.1	1	0	0	0	94.7	1	0	0	0
94.3	0	0	1	0	105.3	0	0	0	0	94.8	1	0	0	0	105.3	1	0	0	0	94.9	1	0	0	0
94.5	0	0	1	0	105.5	0	0	0	0	94.9	1	0	0	0	105.5	1	0	0	0	95.1	1	0	0	0
94.7	0	0	1	0	105.7	0	0	0	0	95.2	1	0	0	0	105.7	1	0	0	0	95.3	1	0	0	0
94.9	0	0	1	0	105.9	0	0	0	0	95.4	1	0	0	0	105.9	1	0	0	0	95.5	1	0	0	0
95.1	0	0	1	0	106.1	0	0	0	0	95.6	1	0	0	0	106.1	1	0	0	0	95.7	1	0	0	0
95.3	0	0	1	0	106.3	0	0	0	0	95.8	1	0	0	0	106.3	1	0	0	0	95.9	1	0	0	0
95.5	0	0	1	0	106.5	0	0	0	0	96.1	1	0	0	0	106.5	1	0	0	0	96.2	1	0	0	0
95.7	0	0	1	0	106.7	0	0	0	0	96.3	1	0	0	0	106.7	1	0	0	0	96.4	1	0	0	0
95.9	0	0	1	0	106.9	0	0	0	0	96.5	1	0	0	0	106.9	1	0	0	0	96.7	1	0	0	0
96.1	0	0	1	0	107.1	0	0	0	0	96.8	1	0	0	0	107.1	1	0	0	0	96.9	1	0	0	0
96.3	0	0	1	0	107.3	0	0	0	0	97.1	1	0	0	0	107.3	1	0	0	0	97.2	1	0	0	0
96.5	0	0	1	0	107.5	0	0	0	0	97.4	1	0	0	0	107.5	1	0	0	0	97.5	1	0	0	0
96.7	0	0	1	0	107.7	0	0	0	0	97.6	1	0	0	0	107.7	1	0	0	0	97.7	1	0	0	0
96.9	0	0	1	0	107.9	0	0	0	0	97.8	1	0	0	0	107.9	1	0	0	0	97.9	1	0	0	0
97.1	0	0	1	0	108.1	0	0	0	0	98.0	1	0	0	0	108.1	1	0	0	0	98.1	1	0	0	0
97.3	0	0	1	0	108.3	0	0	0	0	98.2	1	0	0	0	108.3	1	0	0	0	98.3	1	0	0	0
97.5	0	0	1	0	108.5	0	0	0	0	98.4	1	0	0	0	108.5	1	0	0	0	98.5	1	0	0	0
97.7	0	0	1	0	108.7	0	0	0	0	98.6	1	0	0	0	108.7	1	0	0	0	98.7	1	0	0	0
97.9	0	0	1	0	108.9	0	0	0	0	98.8	1	0	0	0	108.9	1	0	0	0	98.9	1	0	0	0

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Table 9-2. FREQUENCY SYNTHESIZER PROGRAMMING



9.7 TROUBLESHOOTING.

The troubleshooting philosophy for the AFC/PLL circuit board consists of isolating a problem to a specific circuit. The problem may be further isolated by referencing the following information and Figure 9-4 and Figure 9-5 which present troubleshooting information.



WARNING

DISCONNECT PRIMARY POWER FROM THE TRANSMITTER BEFORE REMOVING ANY COMPONENTS.

WARNING



CAUTION

INADVERTENT CONTACT BETWEEN ADJACENT

CAUTION

COMPONENTS AND CIRCUIT TRACES MAY DAMAGE THE AFC/PLL BOARD.

After the problem is isolated and power is totally deenergized, refer to the schematic diagrams and the theory of operation to assist in problem resolution. The defective circuitry may be repaired locally or the circuit board may be returned to Broadcast Electronics for repair or replacement.

9.8 REMOVAL AND INSTALLATION

This section provides removal and installation procedures for the AFC/PLL circuit board assembly.

9.8.1 REMOVAL PROCEDURE.

REQUIRED EQUIPMENT. A number 2 Phillips screwdriver with a 4 inch (10.16 cm) shaft is required to remove the AFC/PLL circuit board assembly from the transmitter chassis.

PROCEDURE. The removal of the AFC/PLL circuit board assembly requires the unit be placed on a suitable work surface. To remove the circuit board, proceed as follows:



WARNING

DISCONNECT TRANSMITTER PRIMARY POWER BEFORE PROCEEDING.

WARNING

- A. Disconnect the primary power to the transmitter.
- B. Remove the transmitter top-cover. Disconnect J1, J2, and J8 from the AFC/PLL circuit board.
- C. Disconnect RF sample BNC connector P6 from the output of the modulated oscillator assembly.
- D. Remove the four screws securing the AFC/PLL cover to the circuit board. Remove the cover and the ground straps.
- E. Remove the four screws securing the AFC/PLL circuit board to the transmitter chassis and remove the circuit board.

9.8.2 INSTALLATION PROCEDURE.

To install the AFC/PLL circuit board assembly after repairs have been completed, proceed as follows:

**WARNING**

**DISCONNECT TRANSMITTER PRIMARY POWER
BEFORE PROCEEDING.**

WARNING

- A. Disconnect the primary power to the transmitter.
- B. Follow the REMOVAL PROCEDURE in reverse order.



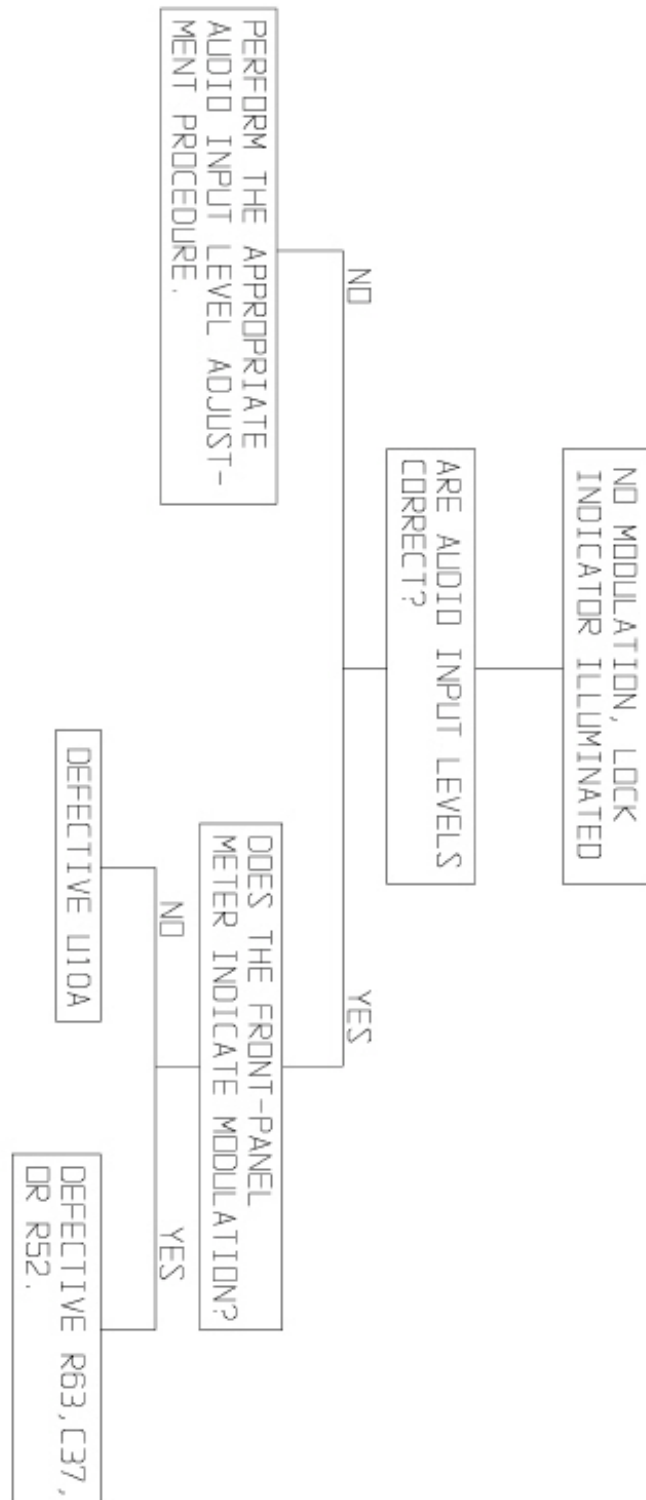


Figure 9-5. NO MODULATION, LOCK INDICATOR ILLUMINATED.

10 RF Amplifier

This section provides general information and specifications relative to the operation of the RF amplifier assembly.

10.1 DESCRIPTION.

The RF amplifier assembly is equipped with three stages of amplification to increase the low level RF input signal from the modulated oscillator to an adjustable level of 10 to 100 watts. Directional coupler sensing lines on the circuit board provide both forward and reflected power outputs for monitoring and control of amplifier operation. DC power for the RF amplifier assembly and the +20 volt regulator is provided by a modular switching power supply assembly.

10.2 ELECTRICAL SPECIFICATIONS.

Refer to Table 10-1 for electrical specifications of the RF amplifier assembly.

Table 10-1. RF Amplifier Electrical Specifications

PARAMETER	SPECIFICATIONS
SIGNAL LEVELS:	
RF AMPLIFIER	
INPUT	1 mW dBm at 50 Ohms.
OUTPUT	10 to 100 Watts RF at 50 Ohms (adjustable).
DIRECTIONAL COUPLER OUTPUT	
FORWARD	5.7V DC at 100 Watts RF output.
REFLECTED	Less than 1V DC at 50 Watts RF Output at 50 Ohms.

10.3 THEORY OF OPERATION

This section presents the theory of operation for the transmitter RF amplifier assembly.

10.3.1 RF AMPLIFIER ASSEMBLY DESCRIPTION.

The RF amplifier assembly consists of: 1) an RF amplifier regulator circuit board, 2) an RF amplifier input circuit board, and 3) an RF amplifier output circuit board. All wiring to and from the assembly is routed through plugs and jacks to facilitate maintenance. An exhaust fan is installed on the transmitter rear-panel to maintain proper operating temperature.

The RF amplifier assembly is equipped with a three-stage FM broadband amplifier with a maximum output power of 100 watts. Output levels from 10 to 100 watts are attained by adjusting the power transistor supply voltage. Due to the broadband characteristics, tuning of the amplifier is not required.

In addition, the RF amplifier assembly contains forward and reflected power directional couplers and an input mute circuit. The directional coupler outputs and operating potentials are routed from the circuit board through the chassis with feed-through capacitors to prevent RF interference.

A simplified schematic diagram of the RF amplifier circuit board is presented in Figure 10-1. Refer to Figure 10-1 as required for a description of the following circuit boards:

- A. RF amplifier circuit.
- B. Directional coupler circuits.
- C. Input mute circuit.

A simplified schematic diagram of the RF amplifier circuit board is presented in Figure 10-1. Refer to Figure 10-1 as required for a description of the following circuits.

10.3.2 RF AMPLIFIER INPUT CIRCUIT BOARD.

The RF amplifier input circuit board consists of an input amplifier, a driver amplifier, and associated components. An impedance matching network is designed to provide maximum broadband frequency stabilization.

INPUT AMPLIFIER. The input amplifier consists of thick-film hybrid amplifier U1, and re-sistor pad R6 and R7. A 1 milliwatt RF input signal from the modulated oscillator is input to U1. This stage provides approximately 1 watt of output power across R6 and R7 to the following stage.

Input amplifier U1 operates from a dc potential of +20 volts which is routed through input mute transistor Q3. Inductor L1 and capacitors C7 and C8 provide power supply isolation.

DRIVER AMPLIFIER. The driver amplifier consists of transistor Q1, an impedance matching network, resistor R8, and inductor L3. The matching network converts the 50 Ohm output of U1 to the low input impedance required by Q1. This stage provides approximately 8 watts of output power to the following stage. L3 provides a dc return path for Q1. R8 en-sures stable amplifier operation. Capacitors C43/C18 and microstrip inductor SL3 match the output impedance of Q1 to the input impedance of the next amplifier stage.

Driver amplifier Q1 operates from a dc potential of +20 volts. Inductors L4 and L5, and capacitors C15, C16, and C17 provide power supply isolation. Potentiometer R11 esta-blishes the bias for the power transistor on the RF amplifier output circuit board.

INPUT MUTE CIRCUIT. The input mute circuit consists of transistors Q2 and Q3. During normal operation, +20 volts is routed to input amplifier U1 through Q3. When the trans-mitter is muted, the final PAV supply is terminated. The loss of this potential will bias Q2 OFF and disable Q3 which terminates the +20 volts to U1.

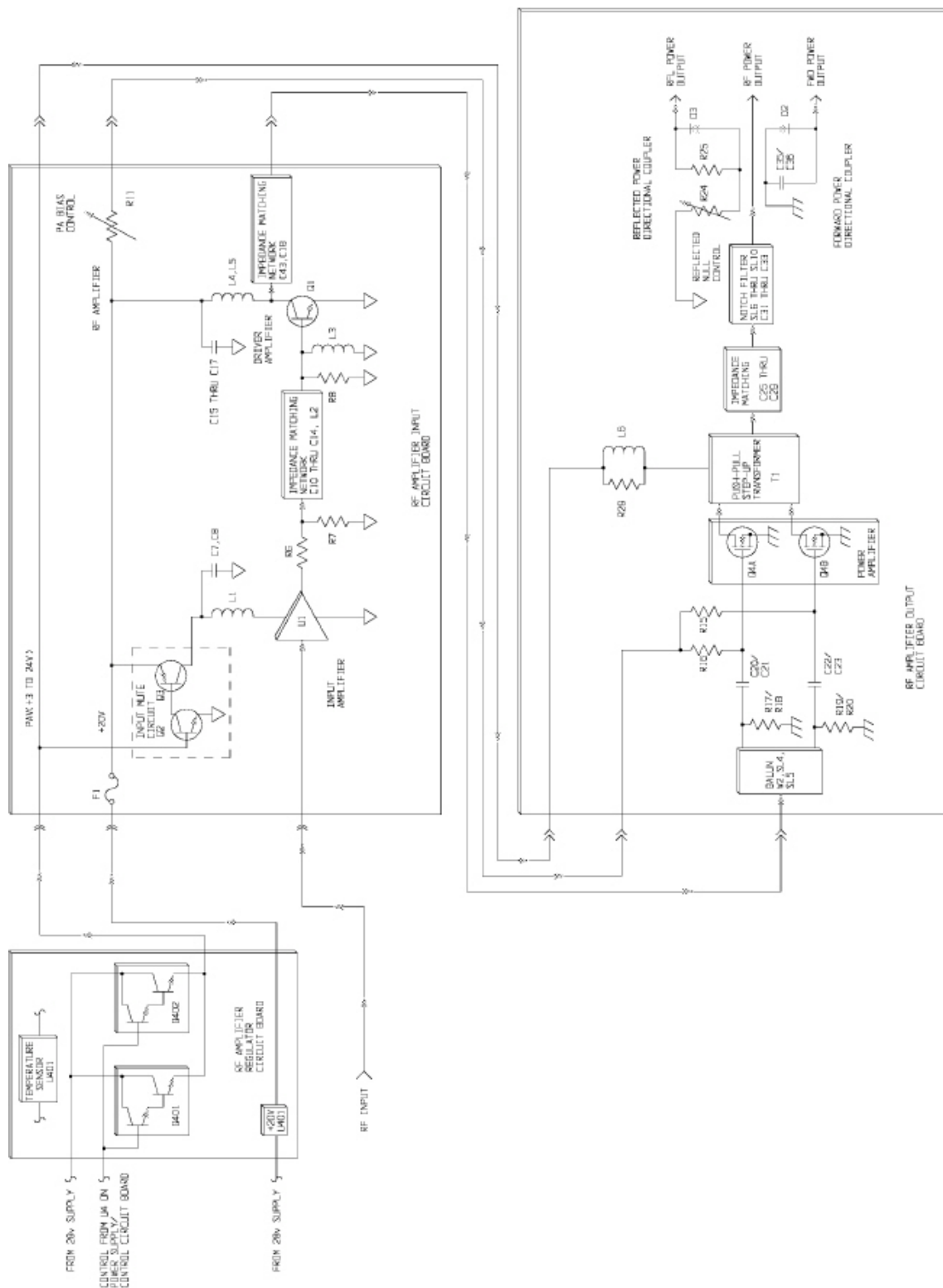
10.3.3 RF AMPLIFIER OUTPUT CIRCUIT BOARD.

The RF amplifier output circuit board consists of balun W2, power transistor Q4, step-up transformer T1, an impedance matching circuit, a low-pass filter, and a directional coupler circuit. Balun W2 is designed to convert the unbalanced output of transistor Q1 on the RF amplifier input circuit board to a balanced signal to drive power transistor Q4. The output of W2 is applied through termination and stabilization components R17 through R20 and RF coupling capacitors C20 through C23 to power transistor Q4.

Power transistor Q4 is the primary amplifier device. The device is designed to output 100 watts of RF power. Q4 operates from an adjustable dc potential of +3 to +24 volts. The adjustable potential is preset by circuitry on the power supply/control circuit board and is automatically maintained by feedback from the forward power directional coupler. Induc-tors L6 and capacitor C30 provide power supply isolation.

The output of Q4 is applied to push-pull step-up transformer T1. Transformer T1: 1) pro-vides dc blocking, 2) converts the balanced output of Q4 to an unbalanced signal, and 3) provides a 50 Ohm output. The 50 Ohm output is routed to a notch filter consisting of ca-pacitors C31 through C33 and microstrip inductors SL6 through SL10. Capacitors C25 through C29 provide impedance matching. The output of the notch filter is applied to the directional coupler circuit.





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Figure 10-1. RF AMPLIFIER SIMPLIFIED SCHEMATIC

10.3.4 DIRECTIONAL COUPLER CIRCUITS.

The directional couplers provide two dc signals obtained by rectifying a sample of the RF output signal. Due to the polarity of the samples, one signal will represent the forward output signal and the other will represent the re-lected.

FORWARD DIRECTIONAL COUPLER. The forward voltage sample is obtained from a microstrip inductor on the circuit board near the output line. This signal is rectified and filtered by diode D2 and capacitors C35 and C36.

REFLECTED DIRECTIONAL COUPLER. The reflected voltage sample is obtained from a microstrip inductor on the circuit board near the output line. This signal is rectified and filtered by diode D3 and capacitors C39 and C40. The directivity of the circuit is adjusted by null control R24.

10.3.5 RF AMPLIFIER REGULATOR CIRCUIT BOARD.

The RF amplifier regulator circuit board consists of two series pass voltage transistors, a heatsink temperature sensor, and a +20 volt regulator. Series pass transistors Q401 and Q402 provide the PAV supply voltage for the RF amplifier circuit. The pass transistors are controlled by the power control circuit on the power supply/control circuit board. The voltage is adjusted from +3 volts to +24 volts to provide a variable RF power output from 10 watts to 100 watts. Heatsink temperature sensor U401 is designed to monitor the RF amplifier assembly heatsink temperature. Three-terminal adjustable regulator U402 provides +20 volt supply for application to the FM-100C circuitry.

10.3.6 MODULAR POWER SUPPLY ASSEMBLY DESCRIPTION.

The FM-100C/E is equipped with a modular switching power supply assembly. The power supply provides a +28 volt supply for application to the: 1) RF amplifier assembly and 2) the +20 volt regulator. The supply is: 1) not manufactured by Broadcast Electronics and 2) contains proprietary information. Therefore, no electrical description can be provided.

10.4 MAINTENANCE

This section provides maintenance information, electrical adjustment procedures, and troubleshooting information for the RF amplifier assembly.

10.4.1 ELECTRICAL ADJUSTMENTS.

Although the following controls are not located on the RF amplifier assembly, the controls effect the operation of the RF amplifier. The adjustment procedure for each control is presented in the power supply/control circuit board section of this manual.

- A. TEMP TRIP (R27)
- B. TEMP CAL (R25)
- C. FWD CAL (R5)
- D. RFL CAL (R9)

REQUIRED EQUIPMENT. The following tools and equipment are required for electrical adjustment procedures.

- A. Insulated adjustment tool, shipped with the transmitter (P/N 407-0038).
- B. Non-inductive, 100 watt, 50 Ohm test load.
- C. Adapter, BNC jack to type N plug for test load (P/N 417-3288).
- D. Adapter, type N jack-to-jack for test load (P/N 417-3841).
- E. Coaxial accessory cable, BNC connectors, shipped with transmitter (P/N 947-0017-2).



10.4.2 RFL NULL (R24).

The RFL NULL control on the RF amplifier output circuit board adjusts the directivity of the reflected power directional coupler. Potentiometer R24 is adjusted as follows.

Procedure. To adjust reflected power null control R24, proceed as follows:



WARNING

DISCONNECT TRANSMITTER PRIMARY POWER BEFORE PROCEEDING.

WARNING

- A. Disconnect the transmitter primary power.
- B. Remove the transmitter top-cover and the access hole plug at the top and rear of the RF amplifier assembly (refer to Figure 10-2).
- C. Connect a 100 watt non-inductive test load to the transmitter rear-panel RF OUTPUT receptacle.
- D. Apply primary power and operate the transmitter for 100 watts as indicated on the front panel meter.
- E. Depress the front-panel RFL meter function switch.



WARNING

MAINTENANCE WITH POWER APPLIED IS ALWAYS CONSIDERED HAZARDOUS AND THEREFORE CAUTION SHOULD BE OBSERVED. DO NOT TOUCH ANY COMPONENTS WITHIN THE TRANSMITTER WHEN POWER IS APPLIED.

WARNING



WARNING

USE AN INSULATED TOOL FOR ADJUSTMENT.

WARNING

- F. Refer to Figure 10-2 and adjust R24 for minimum reflected power as indicated on the front-panel meter.



WARNING

DISCONNECT THE PRIMARY POWER TO THE TRANSMITTER BEFORE PROCEEDING.

WARNING

- G. Disconnect the transmitter primary power.
- H. Remove all test equipment and replace the access hole plug and transmitter top-cover.

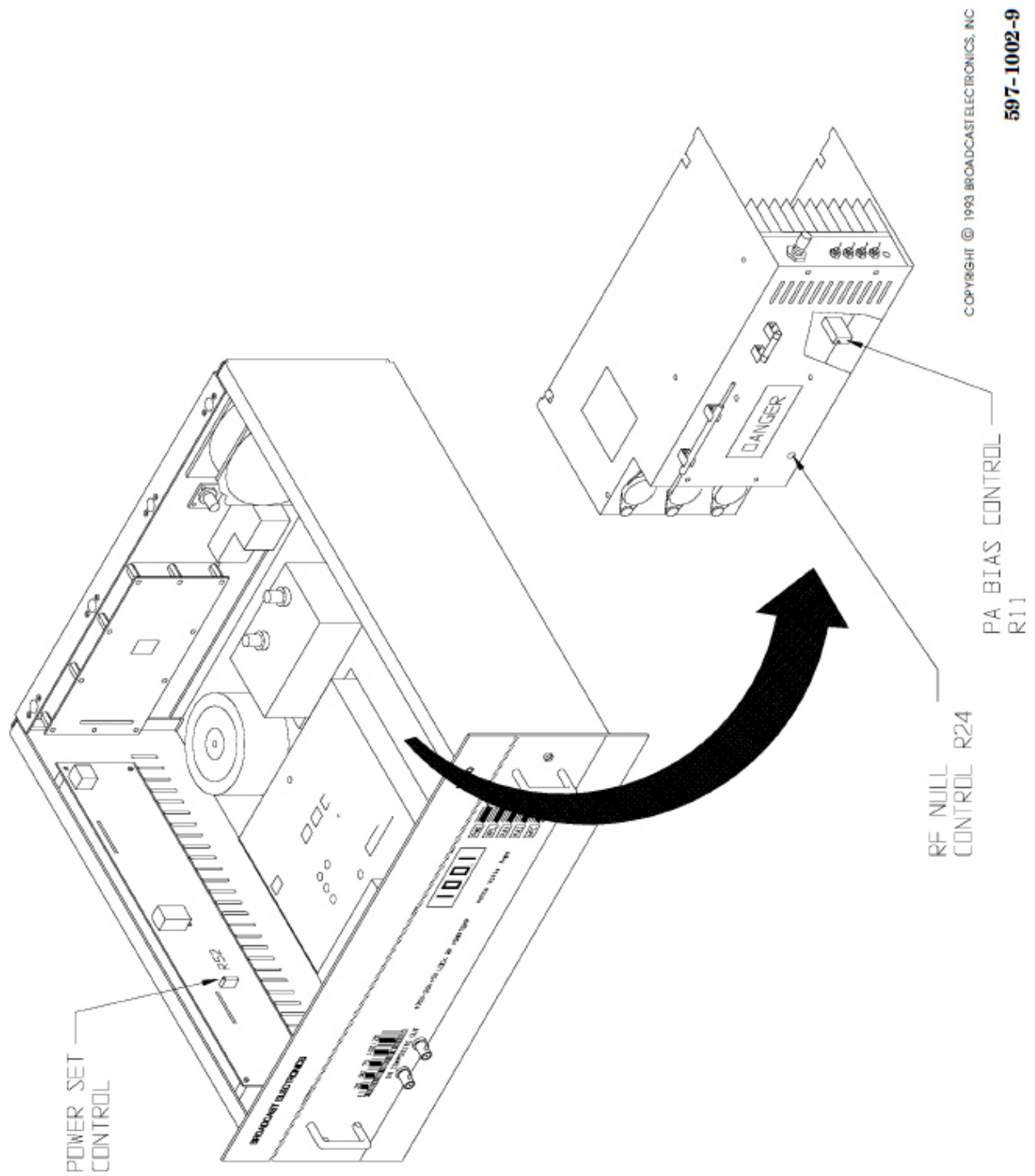


Figure 10-2. RF AMPLIFIER CIRCUIT BOARD CONTROLS.

10.4.3 PA BIAS (R11).

PA BIAS control R11 on the RF amplifier circuit board adjusts the PA quiescent current. Potentiometer R11 is adjusted as follows.

Procedure. To adjust PA bias control R11, proceed as follows:



WARNING

DISCONNECT THE PRIMARY POWER TO THE TRANSMITTER BEFORE PROCEEDING.

WARNING

- A. Apply primary power to the transmitter and record the forward power meter indication.
- B. Disconnect the transmitter primary power.
- C. Refer to the REMOVAL PROCEDURE in SECTION II, REMOVAL AND INSTALLATION and remove the RF amplifier assembly from the transmitter chassis.
- D. Refer to Figure 10-2 and remove the screws securing the RF amplifier assembly to the mounting bracket/shield.
- E. Refer to Figure 10-2 and reinstall the RF amplifier assembly in the chassis as shown.
- F. Refer to Figure 10-2 and connect J15 to P15 of the RF amplifier assembly power/ control cable.
- G. Refer to Figure 10-2 and connect P18 to J18 on the rear of the RF amplifier assembly.
- H. Connect a 100 watt non-inductive test load to the transmitter rear-panel RF OUTPUT receptacle.



WARNING

MAINTENANCE WITH POWER APPLIED IS ALWAYS CONSIDERED HAZARDOUS AND THEREFORE CAUTION SHOULD BE OBSERVED. DO NOT TOUCH ANY COMPONENTS WITHIN THE TRANSMITTER WHEN POWER IS APPLIED.

WARNING



WARNING

USE AN INSULATED TOOL FOR ADJUSTMENT.

WARNING

- I. Ensure P17 is disconnected from the RF amplifier.
- J. Refer to Figure 10-2 and adjust PWR SET control R52 on the power supply/control circuit board fully counter clockwise.
- K. Operate AUTO-PWR-MAN switch on the power supply/control circuit board to AUTO.
- L. Apply power to the unit.
- M. Depress front-panel PAI meter function switch.
- N. Refer to Figure 10-2 and adjust R11 for 500 milliamps (0.50A) as indicated on the front-panel meter.
- O. Refer to Figure 10-2 and connect P17 to the RF amplifier.
- P. Refer to Figure 10-2, adjust PWR SET control R52 until the meter indicates the value recorded in step A.

**WARNING**

DISCONNECT THE PRIMARY POWER TO THE TRANSMITTER BEFORE PROCEEDING.

WARNING

- Q. Disconnect primary power to the transmitter.
- R. Operate the AUTO-PWR-MAN switch to MAN.
- S. Remove all test equipment and replace the RF amplifier assembly mounting bracket/shield.
- T. Refer to the INSTALLATION PROCEDURE in SECTION II, REMOVAL AND INSTALLATION and install the RF amplifier assembly in the transmitter chassis.

10.5 TROUBLESHOOTING.

The troubleshooting philosophy for the RF amplifier assembly consists of isolating a problem to a specific circuit. The problem may be further isolated by referencing the following information and Figure 10-3 which presents troubleshooting information for the RF amplifier assembly.

**WARNING**

DISCONNECT PRIMARY POWER FROM THE TRANSMITTER BEFORE REMOVING ANY COMPONENTS.

WARNING**CAUTION****CAUTION**

INADVERTENT CONTACT BETWEEN ADJACENT COMPONENTS AND CIRCUIT TRACES MAY DAMAGE THE AFC/PLL BOARD.

After the problem is isolated and power is totally deenergized, refer to the schematic diagrams and the theory of operation to facilitate in problem resolution. The defective circuitry may be repaired locally or the circuit board may be returned to Broadcast Electronics for repair or replacement.

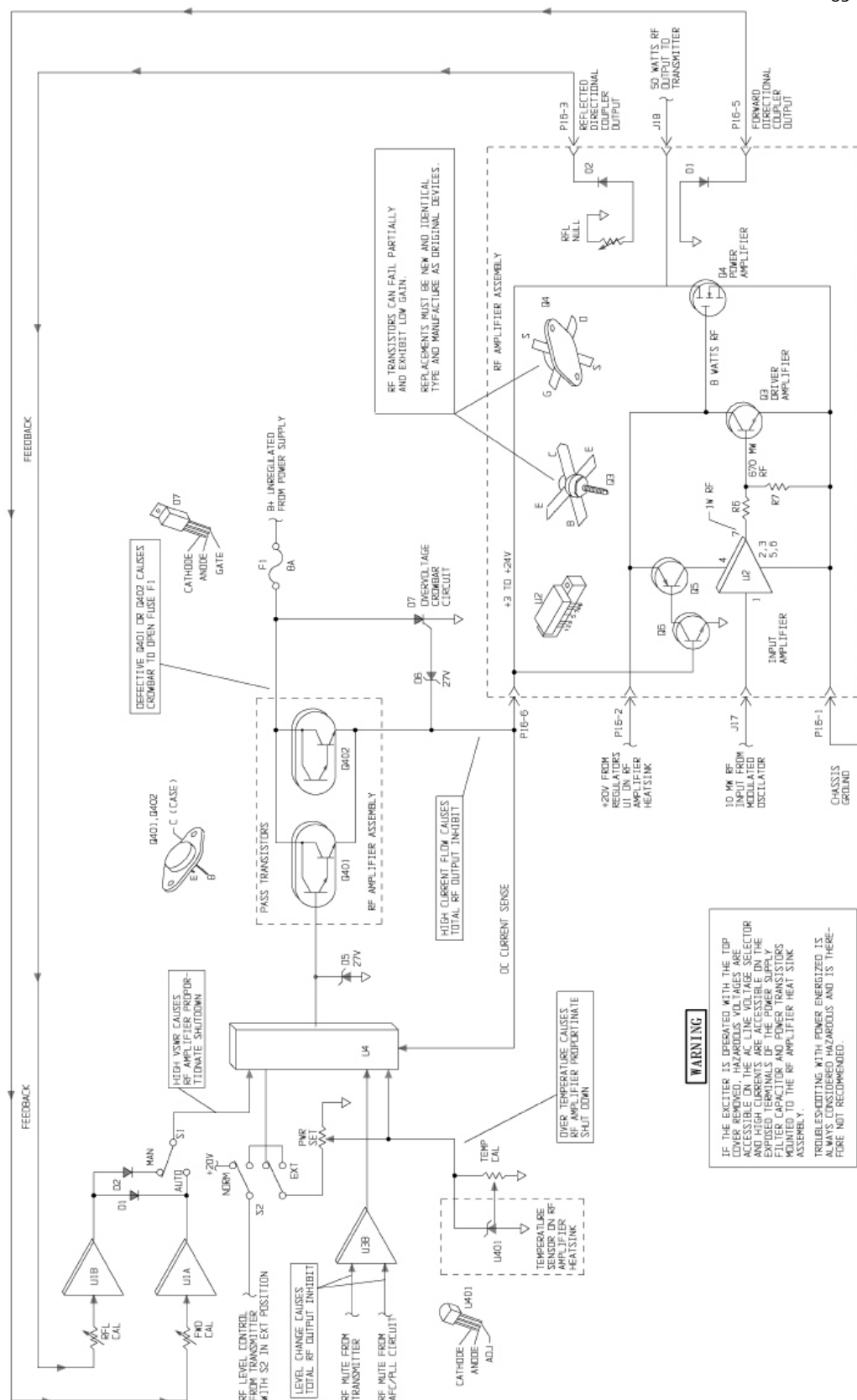


Figure 10-3. RF AMPLIFIER TROUBLESHOOTING INFORMATION.

10.6 RF AMPLIFIER REMOVAL AND INSTALLATION

This section provides removal and installation procedures for the RF amplifier assembly.

10.6.1 REMOVAL PROCEDURE.

REQUIRED EQUIPMENT. A number 2 Phillips screwdriver with a 4 inch (10.16 cm) shaft is required to remove the RF amplifier assembly from the transmitter chassis.

RF AMPLIFIER REMOVAL PROCEDURE. The removal of the RF amplifier assembly requires the transmitter be placed on a suitable work surface. To remove the RF amplifier assembly, proceed as follows:



WARNING

**DISCONNECT TRANSMITTER PRIMARY POWER
BEFORE PROCEEDING.**

WARNING

- A. Disconnect the primary power from the transmitter.
- B. Remove the transmitter top-cover and disconnect J15 from P15 of the RF amplifier power/control cable.
- C. Disconnect 4-Pin connector J21 from P21 on the power supply/control circuit board.
- D. Disconnect 4-Pin connector J25 from P25 located near the rear-panel.
- E. Disconnect BNC connector P18 from J18 on the rear of the RF amplifier assembly.
- F. Disconnect BNC connector P17 from J17 on the front of the RF amplifier assembly.
- G. Remove the four screws from the side of the chassis which secure the RF amplifier assembly to the unit.
- F. Remove the RF amplifier assembly from the transmitter chassis.

10.6.2 RF AMPLIFIER INSTALLATION PROCEDURE.

To install the RF amplifier assembly after repairs have been completed, proceed as follows:



WARNING

**DISCONNECT TRANSMITTER PRIMARY POWER
BEFORE PROCEEDING.**

WARNING

- A. Disconnect the primary power from the transmitter.
- B. Follow the REMOVAL PROCEDURE in reverse order.

10.7 POWER SUPPLY REMOVAL PROCEDURE.

10.7.1 REMOVAL PROCEDURE.

The power supply is located in the RF amplifier assembly. Removal of the RF amplifier assembly is required to replace the power supply. To remove the power supply, refer to Figure 10-4 and proceed as follows:

Remove the RF amplifier assembly as follows:



**WARNING**

**DISCONNECT TRANSMITTER PRIMARY POWER
BEFORE PROCEEDING.**

WARNING

- A. Disconnect the primary power from the transmitter.
 - B. Refer to the preceding text and perform the RF AMPLIFIER REMOVAL PROCEDURE to remove the RF amplifier assembly from the transmitter chassis.
- Remove the power supply as follows:
- A. Remove the three screws which secure the power supply to the RF amplifier assembly. Discard the three mounting screws.
 - B. Remove the power supply unit from the RF amplifier assembly.

POWER SUPPLY INSTALLATION PROCEDURE - NEW REPLACEMENT ASSEMBLY

To install a new replacement power supply assembly and the RF amplifier assembly in the transmitter, refer to Figure 10-4 and proceed as follows:

**WARNING**

**DISCONNECT TRANSMITTER PRIMARY POWER
BEFORE PROCEEDING.**

WARNING

- A. Ensure all primary power is disconnected before proceeding.
- B. Insert the new power supply in the power supply location.
- C. Secure the power supply in the assembly using the No. 6 screws, flat washers, and split lock washers as shown.
- D. Re-Install the RF amplifier assembly by performing the RF AMPLIFIER REMOVAL PROCEDURE procedure in reverse order. Route the cable connected to P21 between the power supply and the transmitter chassis as shown. Ensure the P21 and P25 cables are routed under the fan on the rear panel.

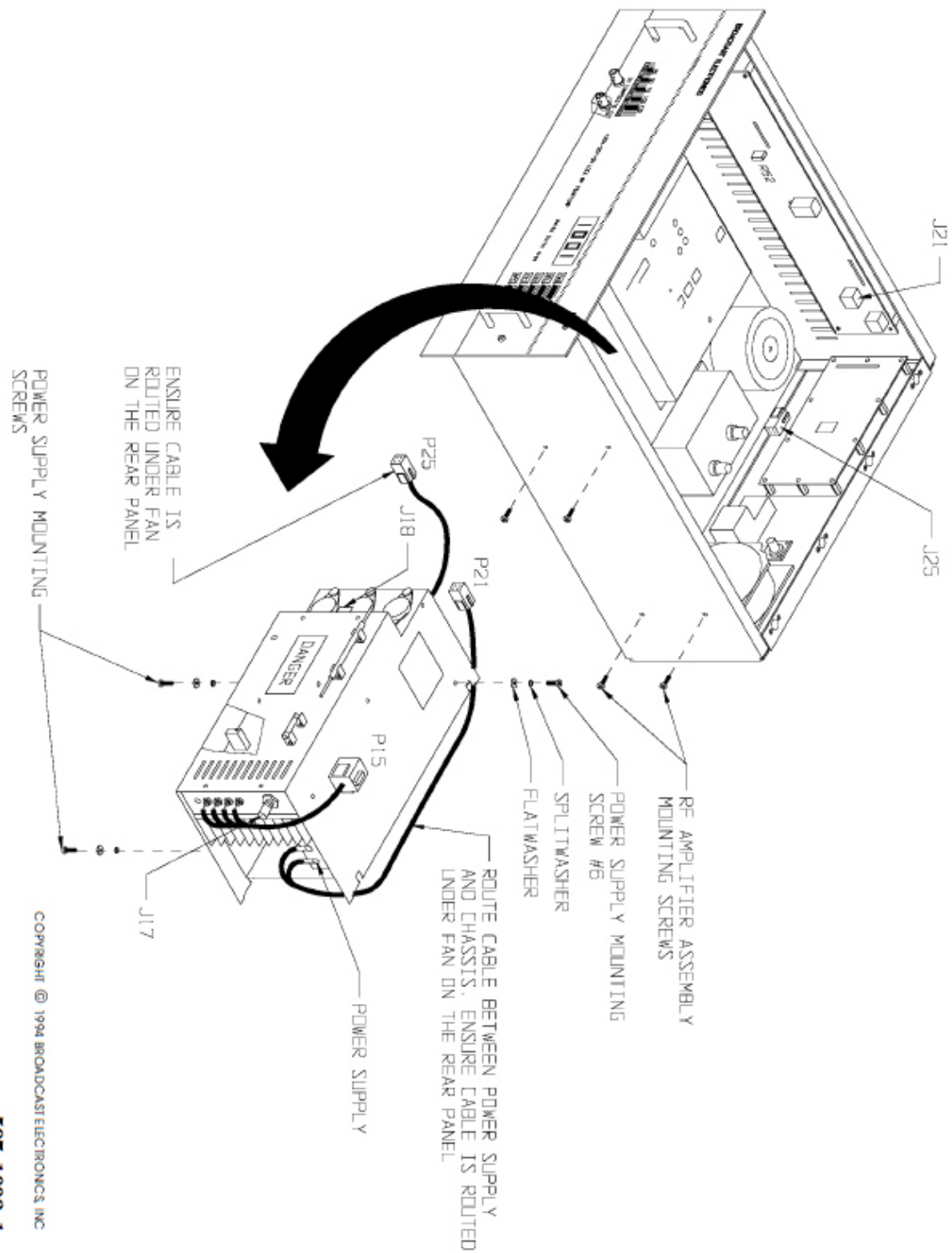


Figure 10-4. POWER SUPPLY INSTALLATION.

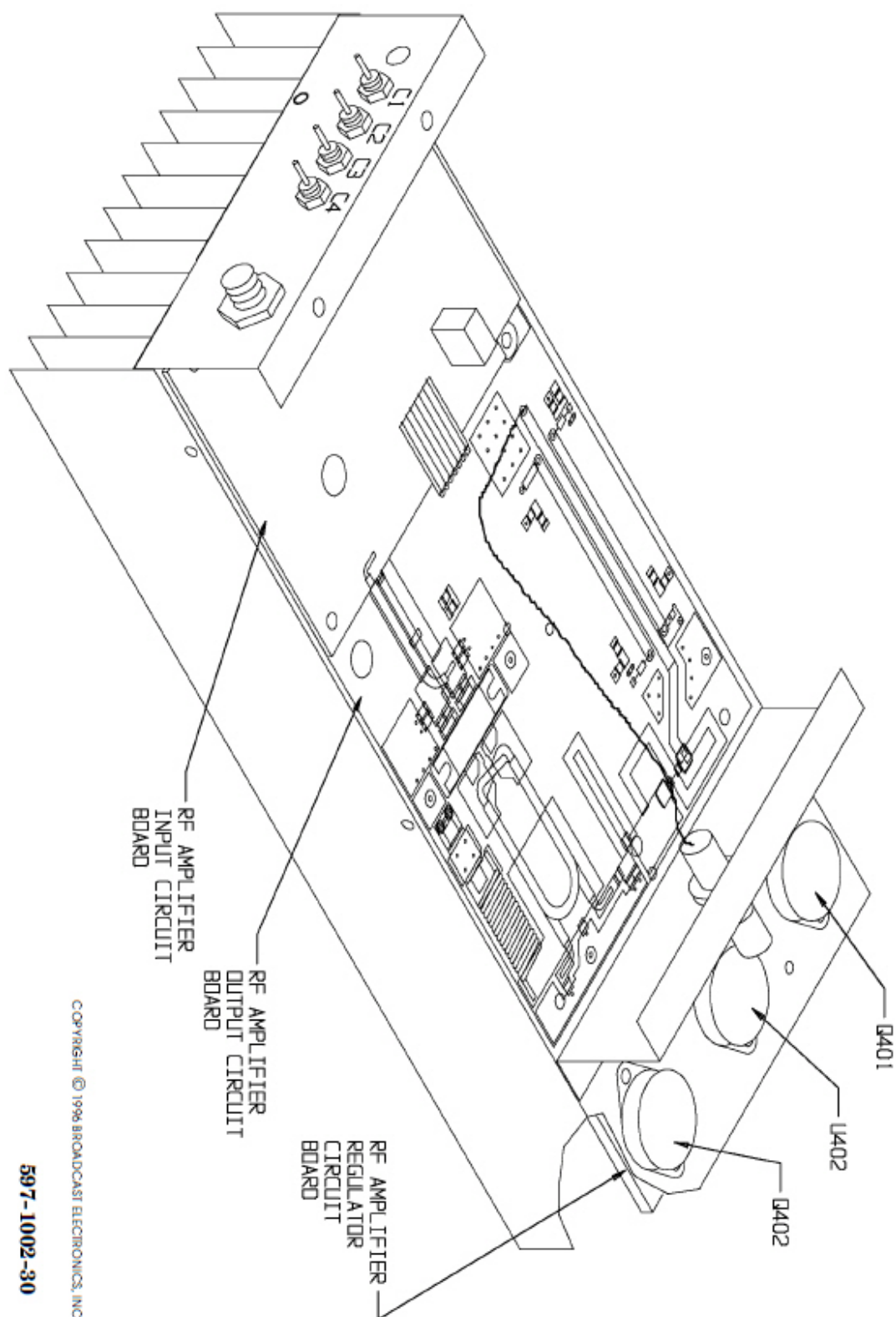


Figure 10-5. RF AMPLIFIER ASSEMBLY

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11 Synchronous FM Booster

This section provides general information and specifications relative to operation of the optional synchronous FM booster system.

11.1 SYSTEM DESCRIPTION.

The synchronous FM booster system is designed to provide precise and reliable frequency locking of one or more slave FM-100C/E transmitters to a master FM-100C/E transmitter. The system features a plug-in circuit board installed in the master transmitter which generates a reference signal. This signal is transmitted to a similar circuit board installed in the slave transmitter at the booster site to synchronize a 10 MHz voltage controlled crystal oscillator (VCXO).

If transmission of the reference signal is interrupted or lost, a clamping circuit on the slave circuit board will operate to stabilize the 10 MHz VCXO. The slave transmitter will continue to operate reliably and well within the assigned frequency range.

11.2 SYSTEM CONFIGURATIONS.

The optional synchronous FM booster circuit boards may be ordered in the following configurations:

MODEL NO.	PART NUMBER	DESCRIPTION
FM-100C/E	909-0131	Master synchronous FM booster circuit board for the FM-100C/E transmitter, factory installed.
FM-100C/E	909-0132	Slave synchronous FM booster circuit board for the FM-100C/E transmitter, factory installed.

11.3 ELECTRICAL SPECIFICATIONS.

Refer to Table 11-1 for synchronous FM booster system electrical specifications.

Table 11-1. SYNCHRONOUS FM BOOSTER SYSTEM SPECIFICATIONS

PARAMETER	SPECIFICATION
POWER REQUIREMENTS	-20V and +5V supplied by the FM-100C transmitter Power Supply/Control Circuit Board.
REFERENCE FREQUENCIES	
STANDARD	125 kHz, ± 0.375 Hz, 0° to 50°C, for STL Subcarrier.
ALTERNATES	100 kHz for Omega International Synchronous Repeater Systems or 90.909 kHz for Composite Subcarrier.
REFERENCE SIGNALS	
INPUT	
LEVEL	500mV to 5V p-p.
IMPEDANCE	100k Ohms, Resistive.



OUTPUT	
LEVEL	-10 to 0 dBm, with 600 Ohm load, Unbalanced, Resistive.
IMPEDANCE	600 Ohms, Resistive.
FREQUENCY STABILITY:	
MASTER	Carrier Frequency ± 300 HZ, 0° TO 50°C.
SLAVE	Carrier Frequency ± 300 Hz When Locked to Master. Carrier Frequency ± 1000 Hz When Unlocked from Master, 0° to 50°C.

11.4 INSTALLATION

This section contains information required for installation of the Broadcast Electronics synchronous FM booster system.

This procedure is specifically for field installation kits. To install the master or slave circuit board, refer to the following information and sheet 2 of assembly drawing 909-0131, as required.



WARNING

DISCONNECT THE PRIMARY POWER TO THE TRANSMITTER BEFORE PROCEEDING.

WARNING

- A. Disconnect the primary power to the transmitter.
- B. Remove the transmitter top-cover. Disconnect J1, J2, and J8 from the AFC/PLL assembly.
- C. Remove the four screws securing the AFC/PLL assembly cover to the circuit board. Remove the cover and ground strap.
- D. Secure two card guides to the AFC/PLL assembly cover using the hardware provided.
- E. Install two ribbon cable press clips on the side of the AFC/PLL assembly cover.
- F. Remove and discard integrated circuit U1 from the AFC/PLL circuit board.
- G. Align pin 1 of the ribbon cable connector with pin 1 of socket XU1 and insert into the socket.
- H. Install the AFC/PLL assembly cover and ground strap with the hardware provided.
- I. Install the booster circuit board into J1 on the AFC/PLL assembly.
- J. Route the ribbon cable through the two press clips and connect to J10 on the booster circuit board.
- K. Connect P1 to J1 on the booster circuit board.
- L. Connect P8 to J8, and P2 to J2 on the AFC/PLL assembly.

A partially assembled three conductor cable with 5 position connector P12 will interconnect between the power supply/control circuit board and the booster circuit board. The termination of wires 81, 82, and 83 of this cable assembly is as follows.

- A. Remove P13 from J13 on the power supply/control circuit board.
- B. Insert wire NO. 81 into P13 pin 6.
- C. Insert wire NO. 82 into P13 pin 12.
- D. Insert wire NO. 83 into P13 pin 3.
- M. Connect P13 to J13 on the power supply/control circuit board.
- N. Connect P12 to J12 on the booster circuit board. Replace the transmitter top-cover.

11.5 INSTALLATION ADJUSTMENTS.

11.5.1 OUTPUT LEVEL ADJUSTMENT (R26).

Potentiometer R26 on the slave circuit board is adjusted fully clockwise. R26 on the master circuit board adjusts the output level from -10 to 0 dBm. To adjust R26 on the master circuit board, proceed as follows.



WARNING

DISCONNECT THE PRIMARY POWER TO THE TRANSMITTER BEFORE PROCEEDING.

WARNING

Disconnect the transmitter primary power.

Remove the top-cover and connect a 600 Ohm load and oscilloscope to the FM-100C rear panel SUB-1 connector.

Apply primary power to the transmitter.



WARNING

DO NOT TOUCH ANY COMPONENT WITHIN THE TRANSMITTER WITH POWER APPLIED.

WARNING

Refer to Figure 11-3, and adjust R26 for the level required by the transmission equipment.

Remove the test equipment and replace the top-cover.

11.6 THEORY OF OPERATION

This section presents the theory of operation for the Broadcast Electronics optional synchronous FM booster system.

11.6.1 FUNCTIONAL DESCRIPTION.

The synchronous FM booster system consists of: 1) a master circuit board which generates a reference frequency, and 2) a slave circuit board which locks to the reference frequency.

The master and slave circuit boards are plug-in modules which interface with the AFC/ PLL circuit board in the FM-100C transmitter.

11.6.2 SLAVE CIRCUIT BOARD.

Figure 11-1 presents a simplified schematic of the slave synchronous FM booster circuit board. Refer to Figure 11-1 as required for the following functional description.

A reference frequency is routed to input amplifier U7 from the transmitter rear-panel SUB-1 connector through programmable jumpers J3 and J4. After amplification, the output of U7 is input to a band-pass filter to remove any low frequency components. The output of the band-pass filter is applied to amplifier U8 through level control R26.

The sinusoidal output of U8 is applied to U1 which will convert the signal to a square wave for application to phase comparator U2. When this signal and a signal from one shot U6B are compared, a correction voltage is generated and applied to a reference filter network.



The reference filter network consisting of U3A and U3B removes the reference frequency component from the signal to provide a dc correction voltage to 10 MHz voltage controlled crystal oscillator Y1. The output of Y1 varies in response to the correction voltage and is applied to divide-by-ten counter U4 through programmable jumper J5.

The output of U4 provides a 1 MHz signal to the AFC/PLL circuit board and to programmable counter U5. Depending on the position of programmable jumper J11, U5 will divide 1 MHz by 8, 10, or 11. The output of U5 is applied to phase comparator U2 through one shot U6B which operates as a pulse stretcher. Duty cycle control R20 adjusts the width of the pulse.

PROTECTION CIRCUITRY. Resistors R34 and R35 operate as a voltage divider network. If phase comparator U2 fails, a clamping voltage of approximately +1.7 volts will be applied to U3A through diode D2 to maintain the output range of the VCXO within acceptable limits.

If loss of reference frequency occurs, the output pulse of phase comparator U2 will exhibit a 50% duty cycle. This will generate +2.5 volts to maintain the output frequency of the VCXO at a constant 10 MHz.

11.6.3 MASTER CIRCUIT BOARD.

Figure 11-2 presents a simplified schematic of the master synchronous FM booster circuit board. Refer to Figure 11-2 as required for the following functional description.

The 10 MHz reference frequency from the AFC/PLL circuit board is applied to divide-by ten counter U4 through programmable jumper J5. The output of U4 provides a 1 MHz signal to programmable counter U5 and the AFC/PLL circuit board. Depending on the position of programmable jumper J11, U5 will divide the 1 MHz signal to provide a frequency of 125 kHz, 100 kHz, or 90.909 kHz to U6B. One shot U6B and potentiometer R20 operate as a pulse stretcher to provide an output pulse with a 50% duty cycle. This pulse is applied to input amplifier U7 through programmable jumper J4. Finally, the output of U7 is applied to amplifier U8 through a band pass filter and level control R26.

The function of the band-pass filter is to remove harmonics and convert the signal to a sinewave. The reference frequency at the output of U8 is available for application to RF communications equipment for transmission to a booster site.



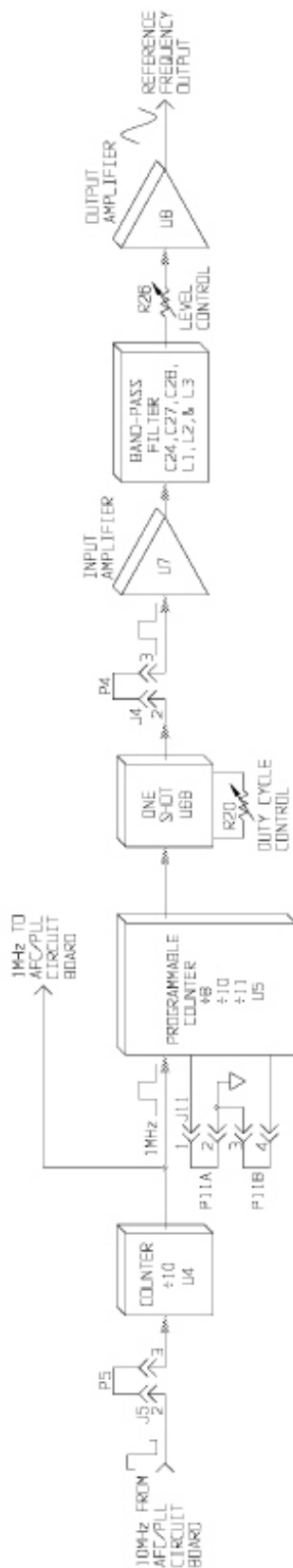


Figure 11-2. MASTER FM BOOSTER SIMPLIFIED SCHEMATIC.

11.7 MAINTENANCE

This section provides maintenance information, electrical adjustment procedures, and troubleshooting information for the synchronous FM booster circuit boards.

REQUIRED EQUIPMENT. The following tools and equipment are required for electrical adjustment procedures.

- A. Insulated adjustment tool, shipped with the transmitter (P/N 407-0083).
- B. Calibrated oscilloscope.
- C. Frequency counter.

11.7.1 DUTY CYCLE ADJUSTMENT (R20).

Potentiometer R20 on the slave or master circuit board adjusts the duty cycle of the reference signal. Control R20 is adjusted as follows.

Procedure. To adjust duty cycle control R20, proceed as follows:



WARNING

DISCONNECT THE PRIMARY POWER TO THE TRANSMITTER BEFORE PROCEEDING.

WARNING

- A. Disconnect the transmitter primary power.
- B. Remove the transmitter top-cover. Refer to Figure 11-3 and connect an oscilloscope between TP2 and ground.
- C. Apply primary power to the transmitter.



WARNING

DO NOT TOUCH ANY COMPONENT WITHIN THE TRANSMITTER WITH POWER APPLIED.

WARNING

- D. Refer to Figure 11-3 and adjust R20 for a 50% duty cycle as indicated on the oscilloscope.



WARNING

DISCONNECT THE PRIMARY POWER TO THE TRANSMITTER BEFORE PROCEEDING.

WARNING

- E. Disconnect the transmitter primary power.
- F. Remove the test equipment and replace the top-cover.

11.7.2 LOW PASS FILTER (L1, L2, L3).

Inductors L1, L2, and L3 on the slave or master circuit board adjust the sensitivity of the low-pass filter network. Inductors L1, L2, and L3 are adjusted as follows.

Procedure. To adjust L1, L2, and L3, proceed as follows:

- A. Perform steps A through E of the DUTY CYCLE ADJUSTMENT procedure.
- B. Refer to Figure 11-3 and operate programmable jumpers J3 and J4 to position 2-3.
- C. Refer to Figure 11-3 and adjust output level control R26 to midrange position.



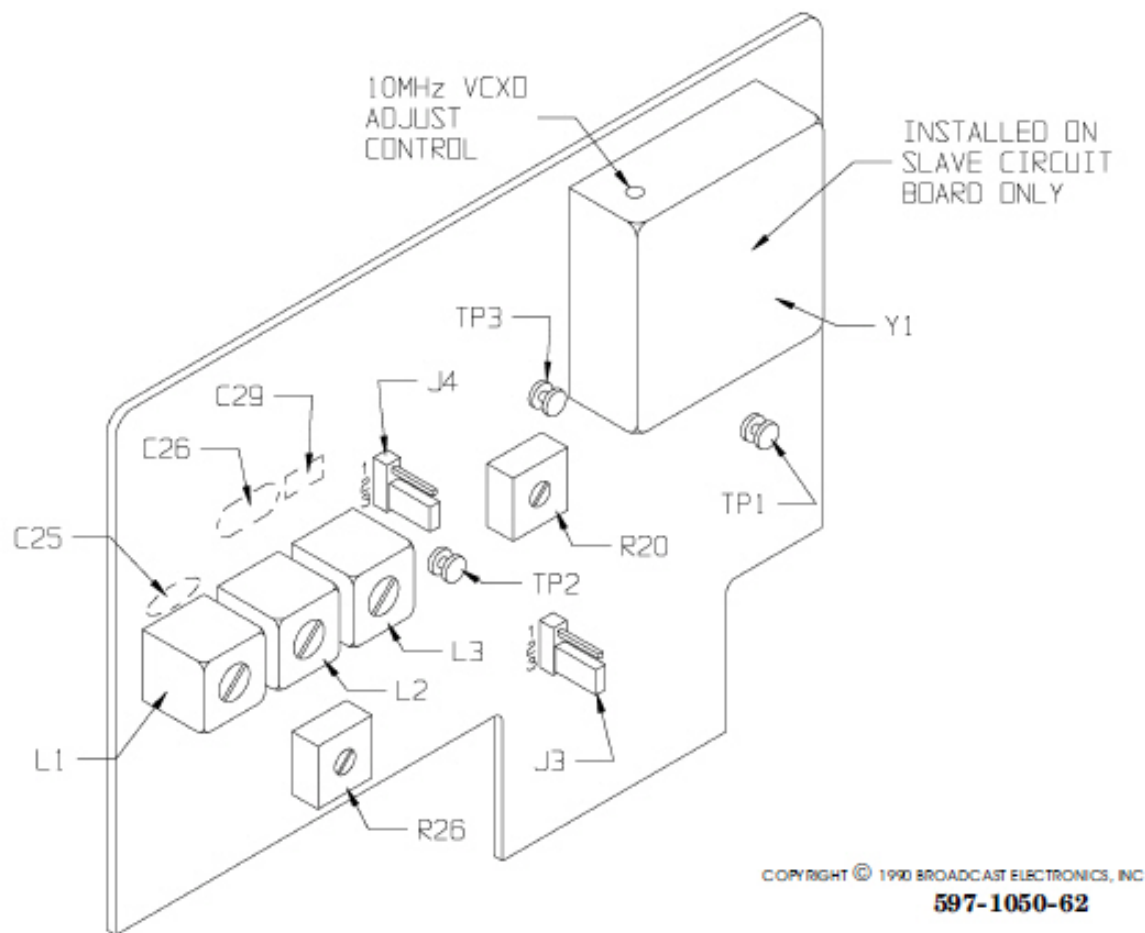


Figure 11-3. SLAVE/MASTER CIRCUIT BOARD CONTROLS

D. Refer to Figure 11-3 and connect an oscilloscope to transmitter rear-panel SUB-1 receptacle.

E. Apply primary power to the transmitter.



WARNING

DO NOT TOUCH ANY COMPONENT WITHIN THE TRANSMITTER WITH POWER APPLIED.

WARNING

F. Refer to Figure 11-3 and adjust L1, L2, and L3 for a maximum indication on the oscilloscope. Repeat if necessary.



WARNING

DO NOT TOUCH ANY COMPONENT WITHIN THE TRANSMITTER WITH POWER APPLIED.

WARNING

G. Disconnect the transmitter primary power.

H. If the unit under test is a slave circuit board, adjust R26 fully clockwise. If the unit under test is a master, refer to the OUTPUT LEVEL ADJUSTMENT procedure.

I. Remove the test equipment, restore programmable jumpers J3 and J4 to the original position, and replace the top-cover.

11.7.3 VCXO ADJUSTMENT.

Due to frequency drift of crystals with age, it is recommended the VCXO frequency on the slave circuit board be periodically checked and adjusted if required. The VCXO frequency is adjusted as follows.

Procedure. To adjust the VCXO, proceed as follows:

A. Perform the DUTY CYCLE ADJUSTMENT procedure.



WARNING

DISCONNECT THE PRIMARY POWER TO THE TRANSMITTER BEFORE PROCEEDING.

WARNING

B. Disconnect the transmitter primary power.

C. Remove the top-cover. Refer to Figure 11-3 and connect a frequency counter between TP1 and ground.

D. Remove the reference input from the rear-panel SUB-1 input connector.

E. Apply primary power to the transmitter.



WARNING

DO NOT TOUCH ANY COMPONENT WITHIN THE TRANSMITTER WITH POWER APPLIED.

WARNING

F. Refer to Figure 11-3 and adjust the 10 MHz VCXO adjust control for 10 MHz \pm 5 Hz as indicated on the frequency counter.



WARNING

DISCONNECT THE PRIMARY POWER TO THE TRANSMITTER BEFORE PROCEEDING.

WARNING

G. Disconnect the transmitter primary power.

H. Remove the test equipment, replace the top-cover, and connect the reference input to the rear-panel SUB-1 receptacle.

11.7.4 REFERENCE FREQUENCY SELECTION.

The removal or installation of capacitors C25, C26, and C29 selects alternate reference frequencies. If an alternate frequency is desired, refer to Figure 11-3 and the following information and install the required combination of capacitors.



REFERENCE FREQUENCY	C25	C26	C29
125 kHz	Removed	Removed	Removed
100 kHz	Installed	Installed	Removed
90.909 kHz	Installed	Installed	Installed

12 FM-100C CANADA VERSION

This section presents information for the FM-100C Canada version. The Canada version consists of a standard FM-100C with the following additions: 1) a rear-panel on/off switch, 2) a front-panel RF sample receptacle, and 3) a fan mute circuit. Standard installation, operation, and maintenance information for an FM-100C transmitter is presented in this instruction manual.

12.1 ADDITIONS TO STANDARD FM-100C

12.1.1 REAR-PANEL AC ON/OFF SWITCH.

The FM-100C is equipped with a rear-panel ac on/off switch. Operate the switch to ON to enable the FM-100C. Operate the switch to OFF to disable the FM-100C.

12.1.2 FRONT-PANEL RF SAMPLE RECEPTACLE.

The FM-100C is equipped with a front-panel RF sample receptacle. The receptacle provides a -20 dBm sample in a 50 Ohm load at 10 watts for monitoring operations.

12.1.3 FAN MUTE.

The FM-100C is equipped with a solid-state relay to disable the fan when the transmitter RF output is muted.

12.2 DRAWINGS.

The overall schematic presents the electrical changes associated with the FM-100C modifications. Refer to the overall FM-100C schematic diagram 909-0101-204/-304/-306 for the Canada version of the FM-100C transmitter.



13 BE Part Numbers

This section provides parts lists for the FM-100C/E Transmitter. The parts lists provide descriptions and part numbers of electrical components, assemblies, and selected mechanical parts required for maintenance. Each parts list entry in this section is indexed by reference designators appearing on the applicable schematic diagrams.

This bill of material uses an indented structure to show relationships of parts into sub assemblies. Example; all BOM LEVEL 2 parts are contained in the BOM LEVEL 1 part immediately above it.

13.1 FM-100E, EXCITER, 220V

BOM LEVEL	PART NO.	DESCRIPTION	QTY	REF. DES.
0	909-0101-509	FM-100E,EXCITER,220V,CE,NICKEL GRAY		
..1	140-0036	VARISTOR,V275LA20A	2	
..1	330-0600	FUSE,6A,250V,3AG,FAST ACTING	2	
..1	334-0100	FUSE,1A MDL SLO BLO 250V	2	
..1	360-0003	FERRITE BEAD,.291 DIA	2	
..1	360-6504	FUSE,LINE FILTER MOD,120/240V	1	
..1	370-4390	XFMR,TOROID 115/230,50/60HZ (NOTE!)	1	
..1	380-4600	FAN,4 1/2	1	
..1	380-5502	FILTER,FAN	1	
..1	380-6307	FINGER GUARD,FAN,4.125 CENTERS	1	
..1	400-0024	SHOCK MT,MODULATED OSC FX50	1	
..1	402-0000	TY-RAP	7	
..1	402-0008	MTG DEVICE,FOR #6SCR,TIE CBL	2	
..1	415-1010	FUSE CLIP,LITTLEFUSE,101002	2	
..1	415-1011	FUSE CLIP,LITTLEFUSE,105002	1	
..1	415-2012	FUSEHOLDER,PANEL MOUNT, 10A	2	
..1	417-0016	CONN,BNC,RF,UG1094A/U,AMPHENOL	2	
..1	417-0053	SKT,CONN 641294-1 AMP	6	
..1	418-0240	PLUG,FEM,4PIN	1	
..1	420-0817	ASSY,FEMALE SCREWLOCK 205817-1	1	
..1	420-4105	SCREW,4-40X.312,S.S. PH	6	



BOM LEVEL	PART NO.	DESCRIPTION	QTY	REF. DES.
..1	420-4110	SCREW,4-40X.625,S.S. PH	8	
..1	420-6104	SCREW,6-32X.250,S.S. PH	8	
..1	420-6105	SCREW,6-32X.312,S.S. PH	6	
..1	420-6106	SCREW,6-32X.375,S.S. PH	22	
..1	420-6108	SCREW,6-32X.500,S.S. PH	5	
..1	420-6112	SCREW,6-32X.750,S.S. PH	2	
..1	420-8006	SCREW,8-32X.375,S.S. PH FLH UC	6	
..1	420-8106	SCREW,8-32X.375,S.S. PHH	4	
..1	420-8107	SCREW,8-32X.437,S.S. PHH	12	
..1	420-8624	SCREW,8-32X1.500,S.S. SL HD	1	
..1	421-1102	RIV,BLD,DOMED 3/32	2	
..1	421-1113	RIV,CLOSED-END .125 X .316L	2	
..1	421-4008	4-40 KEP NUT	16	
..1	421-6001	6-32 S.S. HEX THIN NUT	2	
..1	421-6008	6-32 KEP NUT	10	
..1	421-8028	NUT,JAM,1/2-28 UNEF-2B	4	
..1	422-6106	SCREW,SEMS 6-32 X 3/8 PAN PH. ST."	8	
..1	423-3004	5/16 LOCK INT TOOTH THIN	2	
..1	423-6002	#6 LOCK SPLIT	32	
..1	423-6011	#6 FLAT .310 X .160 X .030	1	
..1	423-8001	#8 FLAT .375 X .170 X .025	1	
..1	423-8002	#8 LOCK SPLIT	17	
..1	423-9002	WASH,INT TOOTH,1/2	4	
..1	441-0131	STOFF,ALUM 1/4HEX 5/16M/FEM632	6	
..1	441-8217	STOFF,ALUM 1/4HEX X 5/8 6-32	5	
..1	450-1700	PLUG,HOLE,1/2 NYL BLACK 2643	1	
..1	465-0090-101	ANGLE,UPPER FRT PNL,CE EXCITER	1	
..1	465-0091-100	ANGLE,LOWER FRT PNL,FX50	1	



BOM LEVEL	PART NO.	DESCRIPTION	QTY	REF. DES.
..1	466-0093	ANGLE,FRONT PANEL MOUNT,FX50	2	
..1	467-0178	BOOT,INSULATING FOR 360-6504	1	
..1	467-1003	OVERLAY,FX50	1	
..1	469-0365	FINGER STOCK,1S197520A	32	
..1	469-0365-1	STRIP,RFI SHIELD	2	
....2	469-0365	FINGER STOCK,1S197520A	2.75	
..1	469-0366-1	STRIP,RFI SHIELD 1.25	4	
....2	469-0366	FINGER STOCK (NOTE!!!!)	1.25	
..1	469-0366-2	STRIP,RFI SHIELD 4.25	6	
....2	469-0366	FINGER STOCK (NOTE!!!!)	4.25	
..1	471-0360	COVER,AFC/PLL PCB FX50	1	
....2	471-0360-009	COVER,AFC/PLL PCB UNSCREENED	1	
..1	471-0584-100	COVER,TOP,FM250C/E	1	
..1	471-0795	SHIELD,FRONT PANEL PCB,FX-50	1	
....2	471-0795-009	SHLD,FRT PNL PCB,FX-50,UNSCRND	1	
..1	471-0954-300	PANEL,STATUS,FM100C,HD COLOR	1	
....2	471-0954-309	PANEL,STATUS,FM100C/FM250C,HD COLOR,UNSCREENED	1	
..1	471-0955-100	PANEL,REAR,FM100C/E,SCREENED	1	
..1	471-0956-100	CHASSIS,FM100C/E	1	
..1	471-0965	GUARD, AFC/PLL, FM100C	1	
..1	471-0966	SHIELD, AFC/PLL, FM100C	1	
..1	471-5289-002	BRACKET,FUSE HOLDER,FM100,SCREENED	1	
....2	471-5289	BRACKET,FUSE HOLDER,FX50,FM100,FM250,UNSCREENED	1	
..1	474-0300	PLATE,MODULATED OSC FX50	1	
..1	486-0004	HANDLE 1 3/4	2	
..1	486-0014	FERRULE,BLK,FOR .25 DIA HANDLE	4	
..1	488-0010	LATCH,LO-PROFILE 27-10-501-50	2	



BOM LEVEL	PART NO.	DESCRIPTION	QTY	REF. DES.
..1	540-0013-100	PWR SPLY,+28VDC,95-252VAC, WITH FAN	1	
..1	591-0001	PLATE,FCC ID	1	
..1	594-0095	LABEL,1EC LINE RCPT 700-0152	1	
..1	594-0250	LABEL,CAUTION,TOP COVER,FM EXC	1	
..1	601-1802	WIRE,AWG18,19/30 RED (*NOTE)	0.25	
..1	611-0060	TUB, HT SHK, 1/16	0.125	
..1	611-1250	TUB,HT SHK,1/8	1	
..1	611-2500	TUB,HT SHK,1/4	0.5	
..1	700-0145	FILM,2 DOUBLE ADHESIVE #467	0.003	
..1	919-0104	ASSY PCB,AFC/PLL	1	
....2	000-3302	CAP,CER,DISC,3.3PF,1000V	1	C59
....2	001-5004	CAP,CER,DISC,5PF,500V,NPO	4	C15, C16, C56, C57
....2	003-1054	CAP,CER,MNLY,.1uF,50V,20%	24	C1, C3, C5, C6, C7, C8, C10, C12, C13, C21, C24, C27, C32, C33, C39, C43, C51, C55, C58, C60, C61, C64, C66, C41
....2	020-4793	CAP,LYTIC,4700UF,16V,LOW LEAK	1	C35
....2	023-1076	CAP,LYTIC,10uF,50V,STDUP	5	C42, C68, C70, C72, C73
....2	023-1084	CAP,LYTIC,100MFD,35V,STDUP,RAD	11	C4, C15, C22, C23, C25, C49, C50, C52, C53, C69, C71
....2	024-1064	CAP,LYTIC,1UF,50V,RAD	1	C29
....2	024-3364	CAP,LYTIC,3.3UF,50V,NP	1	C30
....2	024-3374	CAP,LYTIC,33UF,35V,STDUP	1	C37
....2	024-4764	CAP,LYTIC,4.7UF,50V,20%,STDUP	1	C28
....2	030-1053	CAP,MYLAR FILM,.1uF,100V,RAD	1	C31
....2	030-2253	CAP,MYLAR FILM,.22UF,100V,RAD	4	C34, C38, C48, C54
....2	031-1043	CAP,MYLAR FILM,.01UF,100V,RAD	3	C9, C11, C40
....2	031-2243	CAP,MYLAR FILM,.022UF,200V,RAD	1	C26



BOM LEVEL	PART NO.	DESCRIPTION	QTY	REF. DES.
....2	038-4753	CAP,PYST, .47UF,100V	1	C44
....2	040-2422	CAP,MICA,240PF	3	C45, C46, C47
....2	042-2531	CAP,MICA,2500PF,500V,1%	1	C62
....2	042-3312	CAP,MICA,33PF,500V,5%	2	C65, C67
....2	042-3922	CAP,MICA,390PF,100V,5%	6	C2, C17, C18, C19, C20, C36
....2	042-5031	CAP,MICA,5000PF,500V,1%	1	C63
....2	100-1031	RES,100 OHM,1/4W,1%,METAL	1	R22
....2	100-1041	RES,1K OHM,1/4W,1%	7	R10, R42, R40, R44, R23, R84, R85
....2	100-1051	RES,10K OHM,1/4W,1%	15	R6, R13, R37, R15, R16, R24, R46, R47, R48, R95, R75, R76, R50, R103, R67,
....2	100-1111	RES,118 OHM,1/4W,1%	1	R32
....2	100-1231	RES,121 OHM,1/4W,1%	3	R21, R97, R99
....2	100-1551	RES,15K OHM,1/4W,1%	4	R25, R26, R27, R51
....2	100-1731	RES,174 OHM,1/4W,1%	1	R59
....2	100-2723	RES,27 OHM,1/4W,5%	1	R34
....2	100-3031	RES,301 OHM,1/4W,1%	1	R57
....2	100-3951	RES,39.2K OHM,1/4W,1%	1	R9
....2	100-4773	RES,4.7MEG OHM,1/4W,5%	1	R43
....2	100-5041	RES,4.99K OHM,1/4W,1%	4	R29, R30, R88, R90
....2	100-5663	RES,560K OHM,1/4W,5%	1	R19
....2	103-1007	RES,1 MEG OHM,1/4W,1%,METAL	8	R71, R72, R79, R77, R86, R89, R70, R78
....2	103-1021	RES,10 OHM,1/4W,1%,METAL	1	R1
....2	103-1062	RES,100K OHM,1/4W,1%,METAL	5	R17, R18, R64, R65, R66
....2	103-1215	RES,12.1K OHM,1/4W,1%,METAL	1	R11
....2	103-1331	RES,1.33K OHM,1/4W,1%,METAL	2	R98, R100

BOM LEVEL	PART NO.	DESCRIPTION	QTY	REF. DES.
....2	103-1375	RES,13.7K OHM,1/4W,1%,METAL	1	R101
....2	103-1504	RES,1.5K OHM,1/4W,1%,METAL	1	R28,
....2	103-1745	RES,17.4K OHM,1/4W,1%,METAL	1	R82
....2	103-1825	RES,18.2K OHM,1/4W,1%,METAL	1	R92
....2	103-2213	RES,221 OHM,1/4W,1%,METAL	1	R33
....2	103-2673	RES,267 OHM,1/4W,1%,METAL	5	R7, R14, R38, R93, R94
....2	103-3014	RES,3.01K OHM,1/4W,1%,METAL	1	R83
....2	103-3323	RES,332 OHM,1/4W,1%,METAL	2	R2, R8
....2	103-3324	RES,3.32K OHM,1/4W,1%,METAL	2	R4, R5
....2	103-3631	RES,365 OHM,1/4W,1%,METAL	1	R20
....2	103-3836	RES,383K OHM,,1/4W,1%,METAL	1	R39
....2	103-4361	RES,432K OHM,1/4W,1%,METAL	1	R53
....2	103-4753	RES,475 OHM,1/4W,1%,METAL	2	R45, R61
....2	103-4755	RES,47.5K OHM,1/4W,1%,METAL	1	R31
....2	103-4951	RES,49.9K OHM,1/4W,1%,METAL	2	R36, R12
....2	103-5112	RES,51.1 OHM,1/4W,1%,METAL	2	R3, R74
....2	103-5113	RES,511 OHM,1/4W,1%,METAL	1	R49
....2	103-5624	RES,5.62K OHM,1/4W,1%,METAL	1	R41
....2	103-6193	RES,619 OHM,1/4W,1%,METAL	1	R87
....2	103-6194	RES,6.19K OHM,1/4W,1%,METAL	2	R54, R62
....2	103-6346	RES,634K OHM,1/4W,1%,METAL	1	R60
....2	103-7326	RES,732K OHM,1/4W,1%,METAL	1	R58
....2	103-7503	RES,750 OHM,1/4W,1%,METAL	1	R55
....2	103-7541	RES,7.50K OHM,1/4W,1%,METAL	2	R68, R80
....2	103-8255	RES,82.5K OHM,1/4W,1%,METAL	1	R35
....2	103-8256	RES,825K OHM,1/4W,1%,METAL	1	R56
....2	175-1034	RES,TRMR,1K,VERT ADJ	1	R63



BOM LEVEL	PART NO.	DESCRIPTION	QTY	REF. DES.
....2	177-5044	RES,TRMR,5K,VERT ADJ	3	R69, R81, R91
....2	177-5054	RES,TRMR,50K,VERT ADJ	1	R52
....2	200-0009	DIODE,ZENER,1N 4739A	2	D17, D19
....2	203-4005	DIODE,1N4005	2	D16, D18
....2	203-4148	DIODE,1N4148	7	D1, D2, D3, D4, D5, D6, D7,
....2	211-3904	TSTR,2N3904	4	Q1, Q2, Q3, Q4
....2	220-0317	VR,LM317LZ TO92	1	U6
....2	220-4040	IC,MC14040B 12-BIT BINARY	1	U2
....2	220-5151	IC,MC145151 SYNTHESIZER	1	U9
....2	220-8658	IC,SP8658 PRESCALER,DIVIDE/20	1	U8
....2	221-0072	AMP,OP,BIFET TLO72CP	1	U11
....2	221-0358	AMP,DUAL OP,LM358	1	U13
....2	221-5532-001	IC,NE-5532AN	4	U10, U14, U15, U16
....2	226-0392	RES NETWORK, 10K	2	R73, R96
....2	227-0317	VR,LM317T,LM317KC	1	U17
....2	227-0337	VOLTAGE REGULATOR,3 TERM, NEG	1	U18
....2	228-0290	IC, 74LS90N (N)	1	U1
....2	228-4013	IC,MC14013B	1	U4
....2	228-4073	IC,MC14073B	1	U3
....2	228-4538	IC,MC14538B NATL SEMICONDUCTOR	2	U5, U12
....2	323-7345	LDR,LED TYPE,VACTEC VTL 5C2	3	LDR1, LDR2, LDR3
....2	323-9224	IND,LED,GRN,521-9270	5	DS1, DS2, DS3, DS4, DS5
....2	340-0002	SW,4 POS,SPST,8-PIN DIP	3	S1, S2, S3
....2	340-0004	SW,JUMPER PROGRAMMABLE	5	P3, P4, P5A, P5B, P10
....2	360-2200	CHOKE,RF 2.2UH 550MA	2	L1, L2
....2	364-0047	COIL, MOLDED .47UH	1	L3

BOM LEVEL	PART NO.	DESCRIPTION	QTY	REF. DES.
....2	370-0002	XMFR,RF,MCL,T4-1 (NOTE)	1	T1
....2	390-0001	OSC,XTAL PC MT TCXO 10MHZ	1	Y1
....2	402-0000	TY-RAP	2	
....2	407-0074	SPR,LED .25 ODX.147 1D X.22L	5	
....2	413-1597	TERM,TURRET,2 SHLDR,.219,GOLD FLASH	5	
....2	417-0003	CONN,HEADER 3 PIN	3	J3,J4, J10
....2	417-0004	JACK,TEST,RIGHT ANGLE PC MT	1	TP1
....2	417-0200	CONN,HEADER 20 PIN	2	J5, J8, J2, J1,
....2	417-0804	SOCKET,8-PIN DIP,BURNDY	6	XU10, XU11, XU13, XU14, XU15, XU16
....2	417-1404	SOCKET,14-PIN DIP	3	XU1, XU3, XU4
....2	417-1604	SKT,16-PIN,DIP	5	XU2, XU5, XU12, XR73, XR96
....2	417-2804	SOCKET,IC 28-PIN,DIP,HI RELIABILITY	1	XU9
....2	420-6104	SCREW,6-32X.250,S.S. PH	2	
....2	423-6002	#6 LOCK SPLIT	2	
....2	426-6000	PEM NUT,#6-32 KFS2-632	6	
....2	519-0104	PCB,BLANK,AFC/PLL (scan)	1	
....2	700-0148	TAPE,JOINING 3/4	0.001	
....2	949-1050-001	ASSY, CABLE, AFC-PLL (SBCM)	1	
.....3	402-0051	TY-RAP, W/FLAG	1	
.....3	418-0034	PLUG,BNC DUAL CRIMP 1-227079-6	1	
.....3	621-1359	CBL,COAX,RG316/U,50 OHM	1.25	
.....3	690-0023	TUB,PVC105/7 BLK,ALPHA	1.25	
..1	919-0107-001	ASSY,PCB,P.S./CNTL,FM100C	1	
....2	001-1014	CAP,CER,DISC,10pF,1KV,10%,NPO	2	C3, C4,
....2	003-1054	CAP,CER,MNLY,.1uF,50V,20%	9	C5, C6, C7, C16, C25, C28, C30, C33, C37,
....2	014-1084	CAP,LYTIC,100UF,50V,INS	1	C15,



BOM LEVEL	PART NO.	DESCRIPTION	QTY	REF. DES.
....2	014-1094	CAP,LYTIC,1000UF,50V,INS	2	C24, C29,
....2	023-1076	CAP,LYTIC,10uF,50V,STDUP	1	C17,
....2	023-1084	CAP,LYTIC,100MFD,35V,STDUP,RAD	7	C26, C27, C31, C32, C35, C36, C38
....2	024-1064	CAP,LYTIC,1UF,50V,RAD	1	C11
....2	024-2274	CAP,LYTIC,22UF,100V,STDUP	1	C34,
....2	030-1033	CAP,CER MOLDED,.001UF,200V,10%	2	C12, C20,
....2	031-1043	CAP,MYLAR FILM,.01UF,100V,RAD	2	C8, C10,
....2	040-5013	CAP,MICA,50PF,500V,5%	1	C13
....2	042-3922	CAP,MICA,390PF,100V,5%	5	C1, C2, C14, C18, C19,
....2	100-1013	RES,1 OHM,1/4W,5%	1	R64
....2	100-1041	RES,1K OHM,1/4W,1%	6	R6, R61, R37, R12, R50, R59,
....2	100-1051	RES,10K OHM,1/4W,1%	10	R4, R8, R30, R28, R32, R33, R42, R43, R55, R65,
....2	100-1231	RES,121 OHM,1/4W,1%	2	R76, R78
....2	100-1551	RES,15K OHM,1/4W,1%	2	R24, R22,
....2	100-1841	RES,1.82K OHM,1/4W,1%	6	R77, R79, R1, R2, R36, R11,
....2	103-1007	RES,1 MEG OHM,1/4W,1%,METAL	5	R21, R34, R44, R45, R87,
....2	103-1021	RES,10 OHM,1/4W,1%,METAL	2	R60, R51,
....2	103-1025	RES,10.2K OHM,1/4W,1%,METAL	1	R15
....2	103-1062	RES,100K OHM,1/4W,1%,METAL	5	R3, R7, R23, R47, R41,
....2	103-1261	RES,121K OHM,1/4W,1%,METAL	2	R82, R86,
....2	103-1331	RES,1.33K OHM,1/4W,1%,METAL	1	R14
....2	103-1504	RES,1.5K OHM,1/4W,1%,METAL	1	R10,
....2	103-1561	RES,150K OHM,1/4W,1%,METAL	1	R31,
....2	103-2212	RES,22.1 OHM,1/4W,1%,METAL	1	R54,



BOM LEVEL	PART NO.	DESCRIPTION	QTY	REF. DES.
....2	103-2241	RES,2.21K OHM,1/4W,1%,METAL	1	R39
....2	103-3324	RES,3.32K OHM,1/4W,1%,METAL	1	R29
....2	103-3325	RES,33.2K OHM,1/4W,1%,METAL	3	R35, R40, R48,
....2	103-3631	RES,365 OHM,1/4W,1%,METAL	1	R75
....2	103-3924	RES,3.92K OHM,1/4W,1%,METAL	2	R17, R19
....2	103-4755	RES,47.5K OHM,1/4W,1%,METAL	8	R38, R85, R80, R81, R83, R84, R26, R57,
....2	103-5141	RES,5.11K OHM,1/4W,1%,METAL	2	R13, R49,
....2	103-6194	RES,6.19K OHM,1/4W,1%,METAL	2	R16, R18
....2	103-6346	RES,634K OHM,1/4W,1%,METAL	1	R46
....2	103-6813	RES,681 OHM,1/4W,1%,METAL	1	R53
....2	103-6814	RES,6.81K OHM,1/4W,1%,METAL	1	R20
....2	110-1023	RES,10 OHM,1/2W,5% NOTE	1	R56
....2	130-1000	RES,.1 OHM,5W,1%,WW	4	R70, R71, R62, R63
....2	140-0018	VARISTOR,V477A1 47V GE	1	MOV1
....2	178-1054	RES,TRMR,10K,HORZ ADJ	1	R25
....2	178-2044	RES,TRMR,2K,HORZ ADJ	2	R5, R27
....2	178-5044	RES,TRMR,5K,HORZ ADJ	1	R9
....2	178-5046	RES,TRMR,5K,1/2W,MT	1	R52
....2	200-0015	DIODE,ZENER,15V,1W,1N4744A	1	D27
....2	201-4728	DIODE,ZENER,1N4728	2	D29, D30,
....2	202-0502	RECT,3A,200V,IN5402	1	D18
....2	203-4005	DIODE,1N4005	15	D13, D14, D16, D17, D19, D20, D12, D15, D21, D22, D23, D24, D25, D26, D32,
....2	203-4148	DIODE,1N4148	8	D1, D2, D3, D4, D8, D11, D28, D31,
....2	210-3906	2N3906 PNP 40V 2A .35W 250MHZ	2	Q3, Q5,
....2	211-3904	TSTR,2N3904	2	Q4, Q2,



BOM LEVEL	PART NO.	DESCRIPTION	QTY	REF. DES.
....2	221-0358	AMP,DUAL OP,LM358	3	U1, U2, U3
....2	227-0317	VR,LM317T,LM317KC	1	U5
....2	227-0337	VOLTAGE REGULATOR,3 TERM, NEG	1	U6
....2	227-0723	IC,VR,UA723	1	U4
....2	330-1500	FUSE,3AG 15A 32V	1	F1
....2	340-0004	SW,JUMPER PROGRAMMABLE	1	P22
....2	345-0863	SW,SLD,DPDT,SWCFT C56206L2	3	S1, S2, S3
....2	407-0141	COVER,FUSE,STD 840836 RICHCO	1	
....2	413-0025	TERM,TURRET,2 SHLDR,,360,GOLD FLASH	8	E1, E2, E3, E4, E5, E6, E7, E8,
....2	413-0106	TERM,TEST POINT,OVAL,RED	8	TP1, TP2, TP3, TP4, TP5, TP6, TP7, TP8
....2	415-2068	CLIP,FUSE,15AMP,LITTLEFUSE,102071	2	XF1, XF2
....2	417-0003	CONN,HEADER 3 PIN	1	J22
....2	417-0169	CONN 15 PIN 640503-1 AMP	1	J11
....2	417-0200	CONN,HEADER 20 PIN	2	J12, J13, J23
....2	417-0700	CONN,PCB MT,2PIN	1	J20
....2	417-0804	SOCKET,8-PIN DIP,BURNDY	3	XU1, XU2, XU3
....2	417-1404	SOCKET,14-PIN DIP	1	XU4
....2	418-0255	CONN,MALE,4PIN	1	J21
....2	418-0900	CONN,9 PIN 640501-5 AMP	1	J10
....2	420-6105	SCREW,6-32X.312,S.S. PH	2	
....2	423-6002	#6 LOCK SPLIT	2	
....2	426-6000	PEM NUT,#6-32 KFS2-632	2	
....2	455-0075	HEATSINK,TO-220 PKG,,.85 TALL	2	
....2	519-0107-001	PCB,MACH,P.S./CNTL,FM-100C (scan)	1	
..1	919-0108-001	ASSY,PCB,METERING, FM100C	1	
....2	001-5004	CAP,CER,DISC,5PF,500V,NPO	2	C8, C11

BOM LEVEL	PART NO.	DESCRIPTION	QTY	REF. DES.
....2	003-1054	CAP,CER,MNLY,.1uF,50V,20%	35	C2, C3, C4, C9, C10, C15, C17, C18, C19, C21, C22, C24, C27, C28, C30, C31, C34, C35, C36, C37, C38, C39, C40, C41, C42, C43, C44, C45, C50, C52, C54, C56, C57, C61, C63,
....2	020-1085	CAP,LYTIC,100UF,50V,STDUP,NP	1	C1
....2	023-1076	CAP,LYTIC,10uF,50V,STDUP	9	C12, C32, C33, C51, C53, C55, C58, C60, C62,
....2	023-1084	CAP,LYTIC,100MFD,35V,STDUP,RAD	4	C46, C47, C48, C49
....2	024-2274	CAP,LYTIC,22UF,100V,STDUP	1	C59
....2	030-1053	CAP,MYLAR FILM,.1uF,100V,RAD	1	C29
....2	031-1043	CAP,MYLAR FILM,.01UF,100V,RAD	1	C13
....2	040-5013	CAP,MICA,50PF,500V,5%	1	C26
....2	042-3312	CAP,MICA,33PF,500V,5%	1	C14
....2	042-3922	CAP,MICA,390PF,100V,5%	6	C6, C7, C16, C20, C23, C25
....2	100-1041	RES,1K OHM,1/4W,1%	13	R18, R20, R98, R99, R100, R101, R102, R103, R104, R105, R106, R107, R13
....2	100-1051	RES,10K OHM,1/4W,1%	13	R23, R19, R29, R38, R42, R52, R60, R66, R67, R68, R69, R70, R71
....2	100-1083	RES,10MEG OHM,1/4W,5%	1	R26
....2	100-1111	RES,118 OHM,1/4W,1%	1	R110
....2	100-1231	RES,121 OHM,1/4W,1%	5	R78, R80, R82, R88, R108
....2	100-1873	RES,1.8MEG OHM,1/4W,5%	1	R59
....2	100-2041	RES,2K OHM,1/4W,1%	1	R40
....2	100-2283	RES,22MEG OHM,1/4W,5%	2	R21, R37,



BOM LEVEL	PART NO.	DESCRIPTION	QTY	REF. DES.
....2	100-3051	RES,30.1K OHM,1/4W,1%	1	R55
....2	100-6031	RES,604 OHM,1/4W,1%	1	R89,
....2	103-1007	RES,1 MEG OHM,1/4W,1%,METAL	3	R9, R39, R54,
....2	103-1021	RES,10 OHM,1/4W,1%,METAL	3	R33, R34, R36,
....2	103-1062	RES,100K OHM,1/4W,1%,METAL	8	R5, R31, R53, R64, R65, R87, R97, R111,
....2	103-1214	RES,1.21K OHM,1/4W,1%,METAL	3	R90, R92, R94,
....2	103-1274	RES,1.27K OHM,1/4W,1%,METAL	1	R11
....2	103-1331	RES,1.33K OHM,1/4W,1%,METAL	2	R79, R81
....2	103-1504	RES,1.5K OHM,1/4W,1%,METAL	1	R25
....2	103-1695	RES,16.9K OHM,1/4W,1%,METAL	1	R48
....2	103-1826	RES,182K OHM,1/4W,1%,METAL	1	R58
....2	103-2003	RES,200 OHM,1/4W,1%,METAL	2	R75, R76
....2	103-2051	RES,20K OHM,1/4W,1%,METAL	1	R12
....2	103-2264	RES,2.26K OHM,1/4W,1%,METAL	1	R109
....2	103-2341	RES,2.32K OHM,1/4W,1%,METAL	1	R16
....2	103-2495	RES,24.9K OHM,1/4W,1%,METAL	1	R14
....2	103-2673	RES,267 OHM,1/4W,1%,METAL	1	R63
....2	103-2675	RES,26.7K OHM,1/4W,1%,METAL	3	R22, R84, R86
....2	103-2751	RES,27.4K OHM,1/4W,1%,METAL	1	R45
....2	103-3014	RES,3.01K OHM,1/4W,1%,METAL	1	R47
....2	103-3061	RES,301K OHM,1/4W,1%,METAL	1	R24
....2	103-3631	RES,365 OHM,1/4W,1%,METAL	1	R83
....2	103-4441	RES,4.42K OHM,1/4W,1%,METAL	1	R3
....2	103-4755	RES,47.5K OHM,1/4W,1%,METAL	5	R57, R61, R62, R85, R96
....2	103-4993	RES,499 OHM,1/4W,1%,METAL	7	R6, R91, R93, R95, R7, R8, R4,
....2	103-4996	RES,499K OHM,1/4W,1%,METAL	1	R10

BOM LEVEL	PART NO.	DESCRIPTION	QTY	REF. DES.
....2	103-5112	RES,51.1 OHM,1/4W,1%,METAL	2	R77, R112
....2	103-5113	RES,511 OHM,1/4W,1%,METAL	1	R15
....2	103-5141	RES,5.11K OHM,1/4W,1%,METAL	1	R35
....2	103-5764	RES,5.76K OHM,1/4W,1%,METAL	1	R1
....2	103-6193	RES,619 OHM,1/4W,1%,METAL	3	R72, R73, R74,
....2	103-8254	RES,8.25K OHM,1/4W,1%,METAL	1	R30
....2	103-8255	RES,82.5K OHM,1/4W,1%,METAL	1	R27
....2	103-8453	RES,845 OHM,1/4W,1%,METAL	6	R44, R46, R49, R51, R2, R43
....2	103-8454	RES,8.45K OHM,1/4W,1%,METAL	1	R50
....2	103-9314	RES,9.31K OHM,1/4W,1%,METAL	1	R17
....2	177-1054	RES,TRMR,10K,VERT ADJ	1	R56
....2	177-2044	RES,TRMR,2K,VERT ADJ	1	R41
....2	177-2054	RES,TRMR,20K,VERT ADJ	1	R28
....2	200-4733	DIODE,ZENER,1N4733A, 5%	1	D14
....2	200-4742	DIODE,ZENER,1N4742A	2	D18, D19
....2	200-5363	DIODE,ZENER,IN5363 30V SW	1	D25
....2	201-2800	DIODE,HOT CARRIER	6	D3, D4, D24, D5, D6, D7,
....2	203-4005	DIODE,1N4005	3	D20, D21, D23
....2	203-4148	DIODE,1N4148	12	D1, D2, D8, D9, D10, D11, D12, D13, D15, D16, D17, D22
....2	210-0271	TSTR,FET J271	1	Q7
....2	210-3906	2N3906 PNP 40V 2A .35W 250MHZ	3	Q3, Q4, Q5
....2	211-3904	TSTR,2N3904	3	Q1, Q2, Q6
....2	220-0317	VR,LM317LZ TO92	1	U17
....2	220-7136	A/D,3-1/2 DIGIT LCD,ICL7136CPL	1	U7
....2	221-0074	AMP,OP,BIFET TLO74CW	2	U1, U2
....2	221-4227	AMP,DUAL OP	2	U4, U5



BOM LEVEL	PART NO.	DESCRIPTION	QTY	REF. DES.
....2	225-0004	IC,CD4066BE	2	U3, U6
....2	226-0392	RES NETWORK, 10K	1	R32
....2	226-2004	MC1416,ULN2004 7-DRLNGTNS DP16	1	U12
....2	227-0317	VR,LM317T,LM317KC	2	U14, U22
....2	227-0337	VOLTAGE REGULATOR,3 TERM, NEG	2	U15, U16
....2	228-4028	IC,MC14028B	1	U11
....2	228-4071	IC,MC14070 QUAD EXCLUSIVE OR	1	U13
....2	228-4076	IC,MC14076 QUAD REGISTER	1	U10
....2	228-4532	IC,MC14532B 8-BIT PRIOR ENCOD	1	U9
....2	228-4538	IC,MC14538B NATL SEMICONDUCTOR	1	U8
....2	229-0555	IC,TIMER,NE555N	1	U18
....2	229-3914	DRIVER,DOT/BAR DISPLAY LM3914N	3	U19, U20, U21
....2	320-0016	LED,GRN PANEL INDICATOR	7	DS2, DS3, DS4, DS5, DS18, DS19, DS20,
....2	320-0017	LED,RED MV57173 I OR H	9	DS1, DS6, DS7, DS8, DS13, DS14, DS15, DS16, DS17,
....2	320-0021	DISP,LCD,4-DIGIT,0.7	1	DS12
....2	320-4164	LED ARRAY,GRN,10 BAR	2	DS9, DS10
....2	320-7164	LED ARRAY RED MV57164 INTEN G OR H	1	DS11
....2	340-0107	KEYSWITCH,SI20601H1 SECME (NOTE)	6	S1, S2, S3, S4, S5, S6,
....2	402-0000	TY-RAP	1	
....2	413-1597	TERM,TURRET,2 SHLDR,,219,GOLD FLASH	7	E1, TP1, TP2, TP3, TP4, TP5, TP6
....2	417-0172	SKT, 20 PIN SINGLE ROW,SAMTEC	2	
....2	417-0200	CONN,HEADER 20 PIN	1	J14
....2	417-0804	SOCKET,8-PIN DIP,BURNDY	3	XU4, XU5, XU18
....2	417-1404	SOCKET,14-PIN DIP	5	XU1, XU2, XU3, XU6, XU13

BOM LEVEL	PART NO.	DESCRIPTION	QTY	REF. DES.
....2	417-1604	SKT,16-PIN,DIP	6	XU8, XU9, XU10, XU11, XU12, XR32
....2	417-1804	SOCKET,18-PIN,DIP,HIGH RELIABILITY	3	XU19, XU20, XU21
....2	417-4005	SOCKET,40-PIN,DIP,HIGH RELIABILITY	1	XU7
....2	420-6104	SCREW,6-32X.250,S.S. PH	4	
....2	423-6002	#6 LOCK SPLIT	4	
....2	426-6000	PEM NUT,#6-32 KFS2-632	4	
....2	449-0006	TEST CLIP,COILED	1	
....2	519-0108	PCB,BLANK,METERING (scan)	1	
..1	919-0445-309	ASSY,PCB,RFI FILTER,CE	1	
....2	417-0039-VLX	CONN,BNC,PCB,VERT MOUNT,VALOX BODY	-1	REMOVE J305
....2	417-2502-FER	RCPT,25 PIN D,FEMALE,FERITE FILTER	-1	REMOVE J1
....2	417-2502-FIL	RCP, 25 PIN D, FEMALE, PI FILTER	1	J1
....2	420-4105	SCREW,4-40X.312,S.S. PH	2	
....2	423-4002	#4 LOCK S.S. SPLIT	2	
....2	441-4000	STOFF,4-40 X .50L,3/16 HEX ALUM	2	
....2	919-0445	ASSY,PCB,RFI FILTER (SBCM)	1	
.....3	002-1034	CAP,CER,DISC,.001UF,1000V	3	C301, C302, C303
.....3	003-1054	CAP,CER,MNLY,.1uF,50V,20%	8	C304, C305, C306, C307, C308, C309, C310, C311
.....3	031-2033	CAP,MYLAR FILM,.0022uF,100V,10%	2	C312, C313,
.....3	038-4750	CAP,POLY,.47MFD,50V,10% OR BETTER	2	C324, C325
.....3	040-1022	CAP,MICA,100PF,500V,RAD	10	C314, C316, C318, C320, C322, C326, C327, C328, C329, C330
.....3	047-1035	CAP,FIL,EMI SUPPR,1000pF,3-PIN	3	FL312, FL313, FL319
.....3	100-1041	RES,1K OHM,1/4W,1%	3	R302, R306, R307,
.....3	100-1051	RES,10K OHM,1/4W,1%	1	R303,
.....3	100-6031	RES,604 OHM,1/4W,1%	1	R308,



BOM LEVEL	PART NO.	DESCRIPTION	QTY	REF. DES.
.....3	103-5112	RES,51.1 OHM,1/4W,1%,METAL	2	R310, R311
.....3	103-8254	RES,8.25K OHM,1/4W,1%,METAL	2	R304, R305,
.....3	130-2423	RES,240 OHM,2W,5%	2	R301, R309,
.....3	201-0012	ZENER VOLTAGE SUPPRESSOR,+/-12V	12	D310, D311, D312, D313, D314, D315, D316, D317, D318, D319, D320, D321
.....3	201-0027	ZENER VOLTAGE SUPPRESSOR,+/-27V	4	D302, D303, D304, D305
.....3	201-0040	ZENER VOLTAGE SUPPRESSOR,+/-18V	4	D306, D307, D308, D309
.....3	203-4005	DIODE,1N4005	1	D301,
.....3	270-0065	REL,SPDT,12VDC,DIP	1	K301,
.....3	340-0004	SW,JUMPER PROGRAMMABLE	2	P308, P309
.....3	364-4662	INDU,1.0MH	2	L303, L305,
.....3	411-0001	FILTER,EMI 10,000PF 3PIN	21	FL301, FL302, FL303, FL304, FL305, FL306, FL307, FL308, FL309, FL310, FL311, FB312, FB313, FL314, FL315, FL316, FL319, FL320, FL321, FL322, FL323
.....3	417-0003	CONN,HEADER 3 PIN	2	J308, J309
.....3	417-0039-VLX	CONN,BNC,PCB,VERT MOUNT,VALOX BODY	5	J305, J301, J302, J303, J304
.....3	417-0200	CONN,HEADER 20 PIN	1	J307,
.....3	417-1276	CONN,PCB,12 PIN	1	J306
.....3	417-2502-FER	RCPT,25 PIN D,FEMALE,FERITE FILTER	1	J1
.....3	420-6105	SCREW,6-32X.312,S.S. PH	10	
.....3	423-6002	#6 LOCK SPLIT	20	
.....3	426-6000	PEM NUT,#6-32 KFS2-632	10	
.....3	441-0184	STOFF,6-32,MALE-FEMALE,3/8	10	



BOM LEVEL	PART NO.	DESCRIPTION	QTY	REF. DES.
.....3	519-0445-001	PCB,MACH,RFI FILTER	1	
.....4	519-0445	PCB,MACH,RFI FILTER BREAKAWAY	0.5	
.....3	519-0445-002	PCB,MACH,RFI FILTER SHIELD	1	
.....4	519-0445	PCB,MACH,RFI FILTER BREAKAWAY	0.5	
..1	949-0147-002	ASSY,HRNS,FM-100E (SBCM)	1	
....2	402-0000	TY-RAP	40	
....2	410-0065	LUG,TERM #6 RING CRIMP #22 AWG	4	
....2	410-1488	LUG,TERM #6 SPADE #10-12	2	
....2	410-1489	LUG,TERM #6 SPADE #16-22	3	
....2	410-1493	LUG,TERM #6 RECT 12-10 329697	1	
....2	417-0036	PIN CONN,AMP,350967-1	7	
....2	417-0053	SKT,CONN 641294-1 AMP	54	
....2	417-0059	CONN,9 PIN 1-640521-0 AMP	1	P10
....2	417-0076	JACK,N PANEL FOR RG-142B/U	1	J19
....2	417-0095	CONN,BNC RG/U142 31-326 AMPH	3	P18, P201, P202
....2	417-0122	HSNG,20 POS MOD IV 3-87499-7	2	P14, P307
....2	417-0123	HSNG,16 POS MOD IV 2-87499-9	1	P1
....2	417-0148	HSNG,10 POS MOD 1V 1-87499-7	1	P2
....2	417-0176	CONN,20 PIN FEM,AMP 1-350245-9	1	P15
....2	417-0224	KEYING PLUG MOD IV 87077 AMP	3	
....2	417-1401	HOUSING,SKT,14PIN,AMP MOD IV	2	P12, P13
....2	417-2379	CONN,155OC HOUSING,AMP,MR	1	P11
....2	417-8766	CONTACT,CRIMP,MOD-IV 87809-1	61	
....2	418-0034	PLUG,BNC DUAL CRIMP 1-227079-6	2	P9, P17
....2	418-0233	HSNG,CONN, 4P,1-640509-AMP	2	P25
....2	418-0240	PLUG,FEM,4PIN	2	J25, P21
....2	418-0701	CONN,HOUSING,2 PIN	1	P20
....2	418-1271	CONN,HOUSING,12PIN	1	P306



BOM LEVEL	PART NO.	DESCRIPTION	QTY	REF. DES.
....2	601-1800	WIRE,AWG18 19/30 BLK	51.6	
....2	601-1800-054	WIRE,AWG 18,STRANDED,GREEN/YELLOW	1.677	
....2	601-2200	WIRE,AWG22,7/30,PVC INS,BLK	0.934	
....2	601-2209	WIRE,AWG22,7/30 WHT	85.5	
....2	621-0001	CBL,COAX TEFLON RG 142B/U BELD	1.5	
....2	621-1359	CBL,COAX,RG316/U,50 OHM	4.83	
....2	622-8451	WIRE,BELD 8451,SHIELD,1PR	14.66	
....2	693-0002	SLVG,1/4 EXPANDO FR BLACK"	3.791	
..1	959-0203	ASSY MODL,MODLTD. OSC. (SBCM)	1	
....2	008-1020	CAP,FEEDTHRU,100PF 20% 250V	1	C21
....2	008-1033	CAP,FEEDTHRU,1000PF,20%,500V	2	C19, C20
....2	040-6223	CAP,MICA,620PF,300V,5%	1	C23
....2	360-0003	FERRITE BEAD,.291 DIA	3	
....2	364-0002	CHOKE,VK200-20/4B FERROXCUBE	1	L7
....2	402-0000	TY-RAP	5	
....2	402-0006	MT,ADH BACKED,FOR CBL TIES	1	
....2	402-0008	MTG DEVICE,FOR #6SCR,TIE CBL	1	
....2	410-1419	LUG,SOLDER 7/8	1	
....2	417-0016	CONN,BNC,RF,UG1094A/U,AMPHENOL	2	J6, J9
....2	420-4404	SCREW,4-40X.250,S.S. SHCS	7	
....2	420-4504	SCREW,4-40X.250,S.S. PH	1	
....2	420-4506	SCREW,4-40X.375,BR FLH SC	4	
....2	423-4004	#4 LOCK EXT TOOTH	7	
....2	470-0328	BRKT,BNC,MOD OSC	1	
....2	479-6443-003	BOX,MOD.,MODULATED OSC FX50	1	
....2	601-0022	WIRE,AWG22,BUSS	0.166	
....2	611-2500	TUB,HT SHK,1/4	0.083	
....2	693-0220	TUB,TEFLON,TW,AWG22 NTL	0.249	

BOM LEVEL	PART NO.	DESCRIPTION	QTY	REF. DES.
....2	919-0106	ASSY PCB,MODLTD.OSC FX-50	1	
.....3	000-3302	CAP,CER,DISC,3.3PF,1000V	1	C16
.....3	001-5004	CAP,CER,DISC,5PF,500V,NPO	1	C15
.....3	009-4723	CAP,CER CHIP,470PF,200V,5%	2	C3, C22
.....3	023-1076	CAP,LYTIC,10uF,50V,STDUP	1	C6
.....3	023-1084	CAP,LYTIC,100MFD,35V,STDUP,RAD	2	C4, C7
.....3	040-1213	CAP,MICA,12PF,500V,5%	1	C2
.....3	042-3312	CAP,MICA,33PF,500V,5%	2	C1, C8
.....3	042-3922	CAP,MICA,390PF,100V,5%	9	C5, C9, C10, C11, C12, C13, C14, C17, C18
.....3	100-1031	RES,100 OHM,1/4W,1%,METAL	2	R12, R6
.....3	100-1041	RES,1K OHM,1/4W,1%	3	R7, R13, R14
.....3	100-1111	RES,118 OHM,1/4W,1%	1	R22
.....3	100-4561	RES,453K OHM,1/4W,1%	1	R10
.....3	103-1007	RES,1 MEG OHM,1/4W,1%,METAL	1	R9
.....3	103-1021	RES,10 OHM,1/4W,1%,METAL	4	R1, R11, R15, R20
.....3	103-1062	RES,100K OHM,1/4W,1%,METAL	1	R5
.....3	103-2213	RES,221 OHM,1/4W,1%,METAL	5	R4, R17, R18, R19, R21
.....3	103-2673	RES,267 OHM,1/4W,1%,METAL	1	R8
.....3	103-2744	RES,2.74K OHM,1/4W,1%,METAL	1	R16
.....3	103-3324	RES,3.32K OHM,1/4W,1%,METAL	1	R3
.....3	103-5112	RES,51.1 OHM,1/4W,1%,METAL	2	R23, R24
.....3	201-2800	DIODE,HOT CARRIER	3	D9, D10, D11
.....3	203-4005	DIODE,1N4005	1	D12
.....3	205-0109	DIODE,VARI-CAP TUNING	6	D2, D3, D4, D6, D7, D8
.....3	205-3201	DIODE,VARACTOR,KV3201 2-11PF	2	D1, D5
.....3	211-0006	MPS-A06 NPN 80V .5A .3W 100MHZ	1	Q1



BOM LEVEL	PART NO.	DESCRIPTION	QTY	REF. DES.
.....3	211-5109	TSTR,RF 2N5109 NPN	2	Q4, Q5
.....3	212-0310	TSTR,FET N CHAN RF J3100	2	Q2, Q3
.....3	360-3300	CHOKE,RF,3.3UH,380MA,9230-32	3	L1, L3, L6
.....3	364-0047	COIL, MOLDED .47UH	2	L4, L5
.....3	370-0106	COIL, MOD OSC., L2	1	L2
.....4	555-0106	LABOR, 370-0106	1	
.....4	610-0026	SMALL TRANS LINE	0.708	
.....3	409-0012	PAD,TSTR 520-021 BIVAR TO-5	2	
.....3	413-1597	TERM,TURRET,2 SHLDR,,219,GOLD FLASH	6	E1, E2, E3, E4, E5, E6
.....3	440-0018	STOFF,ANTI ROT 7/32 RND X 1/4	4	
.....3	519-0106	PCB,BLANK,MODLTD.OSC. (scan)	1	
....2	949-1050	ASSY, CABLE, MOD OSC. (SBCM)	1	
.....3	402-0051	TY-RAP, W/FLAG	1	
.....3	417-0165	HSNG,5POS MOD IV S.ROW 87499-9	1	
.....3	417-0224	KEYING PLUG MOD IV 87077 AMP	1	
.....3	417-8766	CONTACT,CRIMP,MOD-IV 87809-1	4	
.....3	611-1250	TUB,HT SHK,1/8	2	
.....3	621-1359	CBL,COAX,RG316/U,50 OHM	2	
..1	959-0410	ASSY,LOW PASS FILTER,FM-100C	1	
....2	420-4104	SCREW,4-40X.250,S.S. PH	8	
....2	423-4002	#4 LOCK S.S. SPLIT	1	
....2	479-6443	POMONA ELECTRONICS BOX,2906	1	
....2	919-0411-002	ASSY, PCB, LPF, FM100C	1	
.....3	000-3302	CAP,CER,DISC,3.3PF,1000V	1	C202,
.....3	009-1513	CAP,CER CHIP,15PF,500V,5%	2	C208, C210
.....3	009-2713	CAP,CER CHIP,27PF,500V,5%	1	C204
.....3	046-0007	CAP,MICA,RF,7PF	2	C206, C201,



BOM LEVEL	PART NO.	DESCRIPTION	QTY	REF. DES.
.....3	096-0010	CAP,TRMR,CER,2-8PF,350V,LUG MNT,NPO	5	C203, C205, C209, C211, C213,
.....3	360-0145	COIL,L1,FM-1C LPF (SBCM)	1	L204
.....4	640-1200	WIRE,12GA,MAGNET	0.035	
.....3	360-0147	COIL,3.5 TURNS,LPF,FM100C (SBCM)	1	L203
.....4	601-0111	12 AWGBUSS .080 FLOOR STOCK FT	0.45	
.....3	360-0148	COIL,4.5 TURNS,LPF,FM100C (SBCM)	2	L201, L202
.....4	601-0111	12 AWGBUSS .080 FLOOR STOCK FT	0.51	
.....3	417-0259	CONN, BNC PCB MOUNT	2	J201, J202
.....3	519-0411-002	PCB,MACH LPF FM100C	1	
.....4	519-0411	PCB,MACH,FM-100C 0.09 BREAKAWAY"	0.26	
..1	959-0411	ASSY,RF AMP,FM-100C	1	
....2	008-1033	CAP,FEEDTHRU,1000PF,20%,500V	4	C1, C2, C3, C4
....2	009-4723	CAP,CER CHIP,470PF,200V,5%	4	C20, C21, C22, C23
....2	130-3333	RES,330 OHM,2W,5%	1	R1
....2	210-0151	TSTR,RF PWR MOSFET,MRF-151G	1	Q4
....2	213-6198	TSTR,RF PWR,2N6198	1	Q1
....2	219-3000	TSTR, DARLINGTON, SI, NPN	2	Q401, Q402
....2	227-0339	VR,LM338K,5AMP ADJUSTABLE	1	U402
....2	229-2830	AMP,RF,HYBRID,MHW5342A	1	U1
....2	330-1500	FUSE,3AG 15A 32V	1	
....2	360-0003	FERRITE BEAD,.291 DIA	15	Z1, Z2, Z3, Z4, Z5, Z6, Z7, Z8, Z9, Z10, Z11, Z12, Z13, Z14, Z15,
....2	370-0050	XFMR,RF AMP OUTPUT,FM-1C	1	T1
....2	370-0721	INPUT TRANSFORMER	1	W2
....2	402-0835	CLAMP,CBL,3/8	1	
....2	407-0186	TOOL,ADJ 8 T000/5 SPECTROL	1	
....2	407-3000	COVER,TSTR	3	



BOM LEVEL	PART NO.	DESCRIPTION	QTY	REF. DES.
....2	415-1010	FUSE CLIP,LITTLEFUSE,101002	4	
....2	417-0017	RECP,BNC,BULKHEAD,UG-492A/U	1	J17
....2	418-0010	INSULATOR,MICA,TSTR,TO-3PKG	3	
....2	420-0305	SCREW,4-40X.375,BR PH SC	2	
....2	420-0504	SCREW,6-32X.375,BR PH SC	6	
....2	420-0509	SCREW,10-32X.500,BR SL PAN HD	1	
....2	420-4105	SCREW,4-40X.312,S.S. PH	4	
....2	420-6106	SCREW,6-32X.375,S.S. PH	15	
....2	420-6110	SCREW,6-32X.625,S.S. PH	6	
....2	420-6112	SCREW,6-32X.750,S.S. PH	2	
....2	420-8104	SCREW,8-32X.250,S.S. PHH	2	
....2	421-0801	#10-32 BR HEX NUT	1	
....2	421-6908	SHEET EDGE CONNECTOR 6-32	4	
....2	421-8002	8-32 HEX NUT, BRASS	1	
....2	423-0005	#10 LOCK SPLIT (BRONZE)	1	
....2	423-1012	#4 LOCK INT TOOTH (BRONZE)	2	
....2	423-6002	#6 LOCK SPLIT	24	
....2	423-6004	#6 LOCK SPLIT (BRONZE)	6	
....2	423-6011	#6 FLAT .310 X .160 X .030	1	
....2	423-8002	#8 LOCK SPLIT	2	
....2	423-8005	#8 LOCK SPLIT	1	
....2	441-0184	STOFF,6-32,MALE-FEMALE,3/8	1	
....2	450-0651	PLUG,HOLE,5/16	1	
....2	455-0049-002	HEATSINK,RF AMP,FM100C	1	
.....3	455-0049-001	HEATSINK,RF AMP,FX50	1	
.....3	555-0049-002	COST,LABOR 455-0049-002	1	
....2	471-0957	COVER,RF AMP,FM100C,SCREENED	1	
.....3	471-0957-009	COVER,RF AMP,FM100C, UNSCREENED	1	



BOM LEVEL	PART NO.	DESCRIPTION	QTY	REF. DES.
....2	474-0301	PLATE,FRT,RF AMP PCB COVER	1	
....2	474-0302	PLATE,BACK,RF AMP PCB COVER	1	
....2	594-0019	LABEL,DANGER HV 1X 1.5	1	
....2	594-0500	LABEL,DANGER	1	
....2	919-0410-001	ASSY,PCB,RF AMP INPUT,FM-100C	1	
.....3	003-1523	CAP,MONO CER,.0015uF,100V,5%	2	C44, C45,
.....3	009-1032	CAP,CER CHIP,1000PF,100V,5%	1	C34
.....3	024-3374	CAP,LYTIC,33UF,35V,STDUP	2	C16, C42
.....3	038-4753	CAP,PYST,.47UF,100V	1	C17
.....3	040-6813	CAP,MICA,68PF,500V,5%	1	C9
.....3	042-2000	CAP,MICA,200PF,350V,10%	2	C10, C11
.....3	042-3922	CAP,MICA,390PF,100V,5%	6	C5, C6, C7, C8, C15, C24
.....3	046-0003	CAP,MICA,RF,80PF,350V,10%	3	C13, C14, C43
.....3	046-0005	CAP,MICA,150PF,350V,10%	1	C12
.....3	046-0022	CAP,MICA,RF,22PF	1	C18
.....3	100-1051	RES,10K OHM,1/4W,1%	1	R4
.....3	100-1231	RES,121 OHM,1/4W,1%	1	R27
.....3	100-2041	RES,2K OHM,1/4W,1%	1	R5
.....3	103-1021	RES,10 OHM,1/4W,1%,METAL	1	R28
.....3	103-2212	RES,22.1 OHM,1/4W,1%,METAL	1	R8
.....3	103-2945	RES,29.4K OHM,1/4W,1%,METAL	3	R10, R12, R13
.....3	103-4324	RES,4.32K OHM,1/4W,1%,METAL	1	R2
.....3	103-4755	RES,47.5K OHM,1/4W,1%,METAL	1	R3
.....3	103-5112	RES,51.1 OHM,1/4W,1%,METAL	1	R7
.....3	103-6985	RES,69.8K OHM,1/4W,1%,METAL	1	R14
.....3	110-3623	RES,36 OHM,1/2W,5%	1	R6
.....3	130-2223	RES,22 OHM,2W,5%	1	R9



BOM LEVEL	PART NO.	DESCRIPTION	QTY	REF. DES.
.....3	177-1055	RES,TRMR,10K,10 TURN TOP ADJ	1	R11
.....3	201-2800	DIODE,HOT CARRIER	1	D1
.....3	211-3904	TSTR,2N3904	1	Q2
.....3	218-0032	TSTR,TIP32A,2N6125	1	Q3
.....3	330-0200	FUSE,3AG,2 AMP	1	F1
.....3	364-0002	CHOKE,VK200-20/4B FERROXCUBE	2	L1, L4
.....3	364-0010	CHOKE,MOLDED RF 10UHY 10%	1	L3
.....3	364-0051	COIL,MOLDED .051UH	1	L2
.....3	410-0025	TERM,MALE DISCONNECT PC .25TAB	1	E101
.....3	415-2068	CLIP,FUSE,15AMP,LITTLEFUSE,102071	2	
.....3	417-0677	CONN,PCB MT,6PIN MALE	1	J16
.....3	417-5022	SKT,LEAD .020 D,SAMTEC SEP-266	1	XU1
.....3	519-0426	PCB,MACH,RF AMP INPUT, FM-100C	1	
.....3	640-1800	WIRE AWG 18 EN MAGNET	0.031	L5
....2	919-0410-004	ASSY,PCB,REGULATOR,FM-100C (SBCM)	1	
.....3	030-1053	CAP,MYLAR FILM,.1uF,100V,RAD	4	C404, C405, C406, C407,
.....3	042-3922	CAP,MICA,390PF,100V,5%	3	C401, C402, C403,
.....3	100-1231	RES,121 OHM,1/4W,1%	1	R401
.....3	229-0335	IC,LM335,TEMPERATURE SENSOR	1	U401
.....3	360-0001	FERRITE BEADS,F-R 2643000301	13	FB401, FB402, FB403, FB404, FB405, FB406, FB407, FB408, FB409, FB410, FB411, FB412, FB413,
.....3	417-0169	CONN 15 PIN 640503-1 AMP	1	J401
.....3	417-0299	SOCKET,TO-3,PCB MT	3	XU402, XQ401, XQ402
.....3	519-0410-004	PCB,MACH,REGULATOR,FM-100C	1	
.....3	601-0022	WIRE,AWG22,BUSS	0.8	



BOM LEVEL	PART NO.	DESCRIPTION	QTY	REF. DES.
....2	919-0411-001	ASSY,PCB,RF AMP OUTPUT,FM-100C	1	
.....3	003-4712	CAP,CER,47PF,50V,5%	2	C35, C39,
.....3	009-1013	CAP,CER CHIP,10PF,500V,5%	2	C28, C29,
.....3	009-1032	CAP,CER CHIP,1000PF,100V,5%	4	C19, C36, C37, C40,
.....3	009-1033	CAP,CER CHIP,1000PF,500V,5%	1	C27
.....3	009-2023	CAP,CER CHIP,200PF,300V,5%	2	C25, C26
.....3	009-3613	CAP,CER CHIP,36PF,500V,5%	1	C31
.....3	046-0022	CAP,MICA,RF,22PF	1	C33
.....3	046-0045	CAP,MICA,RF,45PF	1	C32
.....3	046-1030	CAP,METAL FEED,1000PF,350V,10%	1	C30
.....3	101-2243	RES,CHIP,2.2K OHM,1/4W,5%	5	R15, R16, R22, R23, R26,
.....3	103-7152	RES,71.5 OHM,1/4W,1%,METAL	1	R21
.....3	111-2223	RES,CHIP,22 OHM,1W,5%	5	R17, R18, R19, R20, R25,
.....3	130-1023	RES,10 OHM,2W,5%	1	R29
.....3	177-1035	RES,TRMR,100 OHM,25T TOP 3299W	1	R24
.....3	201-2800	DIODE,HOT CARRIER	2	D2, D3
.....3	360-0146	CHOKE,RF AMP DECOUPLING,FM-1C	1	L6
.....4	640-1400	WIRE,14GA,MAGNET	0.04	
.....3	410-0025	TERM,MALE DISCONNECT PC .25TAB	1	E102
.....3	519-0411-001	PCB, MACH,RF AMP OUTPUT, FM-100C	1	
.....4	519-0411	PCB,MACH,FM-100C 0.09 BREAKAWAY"	0.74	
.....3	600-0008	FLEXSTRIP, 7 COND 1	1	P24
....2	949-0411	ASSY,HRNS,RF AMP,FM-100C (SBCM)	1	
.....3	402-0000	TY-RAP	8	
.....3	410-0051	LUG,TERM,14-16GA,FEMSPADE	2	
.....3	410-0060	LUG,TERM,#10 RING CRIMP 10-12G	1	
.....3	410-1553	LUG,TERM #10 RING CRIMP 16-22	1	



BOM LEVEL	PART NO.	DESCRIPTION	QTY	REF. DES.
.....3	417-0036	PIN CONN,AMP,350967-1	19	
.....3	417-0053	SKT,CONN 641294-1 AMP	19	
.....3	417-0106	JACK,BNC BULKHEAD	1	J18
.....3	417-0175	CONN, HOUSING, 20 PIN	1	J15
.....3	417-2379	CONN,155OC HOUSING,AMP,MR	1	P401
.....3	418-0034	PLUG,BNC DUAL CRIMP 1-227079-6	1	W1
.....3	418-0670	HOUSING,CONN,6PIN FEM	1	P16
.....3	601-1604	WIRE,AWG16, 19/29 YEL	0.75	
.....3	601-1800	WIRE,AWG18 19/30 BLK	20	
.....3	601-2209	WIRE,AWG22,7/30 WHT	20	
.....3	621-0001	CBL,COAX TEFLON RG 142B/U BELD	0.5	J18
.....3	621-1359	CBL,COAX,RG316/U,50 OHM	0.5	W1
.....3	693-0002	SLVG,1/4 EXPANDO FR BLACK"	1	
..1	969-0007-100	KIT, HARDWARE RACK FM-100C/250C	1	
....2	402-0001	TY-RAP,T+B TY24M,1-1/4 DIA	4	
....2	420-0108	SCREW,10-32X.500,S.S. PHH	4	
....2	420-0508	SCREW,10-32X.500,S.S. FLH	8	
....2	420-8110	SCREW,8-32X.625,S.S. PHH	4	
....2	421-0102	10-32 KEP NUT	8	
....2	423-0001	WASHER,FLAT,#10 SST,.438 X .203 X .065	8	
....2	459-0138	RETAINER,SLIDE BRKT	2	
....2	469-0415	SLIDE, EXCITER CHASSIS	1	
....2	470-0238	BRKT,MTG,APC+IPA,FM1.5A	4	
....2	701-0005	ANTISTATIC ZIPLOC BAG 4X6 4MIL	1	
..1	979-0402-309	KIT, ACCESSORY PARTS, FM-100E	1	
....2	682-0003	CORD,PWR EUROPEAN RIGHT ANGLE, 6'	1	
....2	701-0001	ENVELOPE,COIN 2-1/2 X 4-1/4	1	
....2	701-0019	ANTISTATIC ZIPLOC BAG 13X18 4M	1	



BOM LEVEL	PART NO.	DESCRIPTION	QTY	REF. DES.
....2	947-0020	ASSY,CBL BNC ACCESS (SBCM)	2	
.....3	417-0094	CONN,BNC RG/U58 31-320 AMPH	2	
.....3	622-0050	CBL,SH,50 OHM,RG-58/CU	2.5	
....2	979-9985	KIT,BIND+MAN,FM-100C	1	
.....3	597-1002	INSTRUCTION MANUAL, FM 100C/FM 100E FM EXCITER/TRANSMITTER	1	
.....3	598-0010-001	BINDER,1 IN, BLUE,W CD POCKET	1	

13.2 FM-100C, 100W XMTR, 220V

BOM LEVEL	PART NO.	DESCRIPTION	QTY	REF. DES.
0	909-1101-504	FM-100C,100W XMTR,220V 50/60Hz,NICKEL GRAY		
..1	330-0600	FUSE,6A,250V,3AG,FAST ACTING	2	
..1	330-0800	FUSE,8A,250V,3AG,FAST ACTING	-2	
..1	682-0001	CORD LINE,3 COND,DETACH 7.5FT	-1	
..1	682-0003	CORD,PWR EUROPEAN RIGHT ANGLE, 6'	1	
..1	909-1101-404	FM-100C,100W XMTR,117V 50/60 HZ,NICKEL GRAY	1	
....2	140-0036	VARISTOR,V275LA20A	2	
....2	330-0800	FUSE,8A,250V,3AG,FAST ACTING	1	
....2	334-0100	FUSE,1A MDL SLO BLO 250V	2	
....2	360-0003	FERRITE BEAD,.291 DIA	2	
....2	360-6504	FUSE,LINE FILTER MOD,120/240V	1	
....2	370-4390	XFMR,TOROID 115/230,50/60HZ (NOTE!)	1	
....2	380-4600	FAN,4 1/2	1	
....2	380-5502	FILTER,FAN	1	
....2	380-6307	FINGER GUARD,FAN,4.125 CENTERS	1	
....2	400-0024	SHOCK MT,MODULATED OSC FX50	1	



BOM LEVEL	PART NO.	DESCRIPTION	QTY	REF. DES.
....2	402-0000	TY-RAP	11	
....2	402-0006	MT,ADH BACKED,FOR CBL TIES	2	
....2	402-0008	MTG DEVICE,FOR #6SCR,TIE CBL	2	
....2	402-0051	TY-RAP, W/FLAG	1	
....2	415-1010	FUSE CLIP,LITTLEFUSE,101002	2	
....2	415-1011	FUSE CLIP,LITTLEFUSE,105002	1	
....2	415-2012	FUSEHOLDER,PANEL MOUNT, 10A	2	
....2	417-0016	CONN,BNC,RF,UG1094A/U,AMPHENOL	2	
....2	417-0053	SKT,CONN 641294-1 AMP	8	
....2	418-0240	PLUG,FEM,4PIN	1	
....2	420-0817	ASSY,FEMALE SCREWLOCK 205817-1	1	
....2	420-4020	SCREW,M.4X12,LENGTH S.S. PAN SL HD	4	
....2	420-4105	SCREW,4-40X.312,S.S. PH	6	
....2	420-4110	SCREW,4-40X.625,S.S. PH	4	
....2	420-6104	SCREW,6-32X.250,S.S. PH	8	
....2	420-6105	SCREW,6-32X.312,S.S. PH	6	
....2	420-6106	SCREW,6-32X.375,S.S. PH	14	
....2	420-6108	SCREW,6-32X.500,S.S. PH	4	
....2	420-6112	SCREW,6-32X.750,S.S. PH	2	
....2	420-8006	SCREW,8-32X.375,S.S. PH FLH UC	4	
....2	420-8107	SCREW,8-32X.437,S.S. PHH	12	
....2	420-8624	SCREW,8-32X1.500,S.S. SL HD	1	
....2	421-1102	RIV,BLD,DOMED 3/32	2	
....2	421-1113	RIV,CLOSED-END .125 X .316L	2	
....2	421-4008	4-40 KEP NUT	12	
....2	421-6001	6-32 S.S. HEX THIN NUT	2	
....2	421-6008	6-32 KEP NUT	10	
....2	421-8028	NUT,JAM,1/2-28 UNEF-2B	5	

BOM LEVEL	PART NO.	DESCRIPTION	QTY	REF. DES.
....2	422-6106	SCREW,SEMS 6-32 X 3/8 PAN PH. ST."	12	
....2	422-6107	SCREW,SEMS 6-32 X 7/16 PAN PH.ST."	1	
....2	423-3004	5/16 LOCK INT TOOTH THIN	2	
....2	423-6002	#6 LOCK SPLIT	23	
....2	423-6011	#6 FLAT .310 X .160 X .030	1	
....2	423-8001	#8 FLAT .375 X .170 X .025	1	
....2	423-8002	#8 LOCK SPLIT	17	
....2	423-9002	WASH,INT TOOTH,1/2	5	
....2	441-0131	STOFF,ALUM 1/4HEX 5/16M/FEM632	6	
....2	441-8217	STOFF,ALUM 1/4HEX X 5/8 6-32	5	
....2	465-0090-101	ANGLE,UPPER FRT PNL,CE EXCITER	1	
....2	465-0091-100	ANGLE,LOWER FRT PNL,FX50	1	
....2	466-0093	ANGLE,FRONT PANEL MOUNT,FX50	2	
....2	467-0178	BOOT,INSULATING FOR 360-6504	1	
....2	467-1003	OVERLAY,FX50	1	
....2	469-0365	FINGER STOCK,1S197520A	32	
....2	469-0365-1	STRIP,RFI SHIELD	2	
.....3	469-0365	FINGER STOCK,1S197520A	2.75	
....2	469-0366-1	STRIP,RFI SHIELD 1.25	4	
.....3	469-0366	FINGER STOCK (NOTE!!!!!!)	1.25	
....2	469-0366-2	STRIP,RFI SHIELD 4.25	6	
.....3	469-0366	FINGER STOCK (NOTE!!!!!!)	4.25	
....2	471-0360	COVER,AFC/PLL PCB FX50	1	
.....3	471-0360-009	COVER,AFC/PLL PCB UNSCREENED	1	
....2	471-0584-100	COVER,TOP,FM250C/E	1	
....2	471-0795	SHIELD,FRONT PANEL PCB,FX-50	1	
.....3	471-0795-009	SHLD,FRT PNL PCB,FX-50,UNSCRND	1	
....2	471-0954-300	PANEL,STATUS,FM100C,HD COLOR	1	



BOM LEVEL	PART NO.	DESCRIPTION	QTY	REF. DES.
.....3	471-0954-309	PANEL,STATUS,FM100C/FM250C,HD COLOR,UNSCREENED	1	
....2	471-0955-100	PANEL,REAR,FM100C/E,SCREENED	1	
....2	471-0956-100	CHASSIS,FM100C/E	1	
....2	471-0965	GUARD, AFC/PLL, FM100C	1	
....2	471-0966	SHIELD, AFC/PLL, FM100C	1	
....2	471-5289-002	BRACKET,FUSE HOLDER,FM100,SCREENED	1	
.....3	471-5289	BRACKET,FUSE HOLDER,FX50,FM100,FM250,UNSCREENED	1	
....2	474-0300	PLATE,MODULATED OSC FX50	1	
....2	486-0004	HANDLE 1 3/4	2	
....2	486-0014	FERRULE,BLK,FOR .25 DIA HANDLE	4	
....2	488-0010	LATCH,LO-PROFILE 27-10-501-50	2	
....2	540-0013-100	PWR SPLY,+28VDC,95-252VAC, WITH FAN	1	
....2	591-0001	PLATE,FCC ID	1	
....2	594-0095	LABEL,1EC LINE RCPT 700-0152	1	
....2	594-0250	LABEL,CAUTION,TOP COVER,FM EXC	1	
....2	601-1802	WIRE,AWG18,19/30 RED (*NOTE)	0.25	
....2	611-0060	TUB, HT SHK, 1/16	0.125	
....2	611-1250	TUB,HT SHK,1/8	1	
....2	611-2500	TUB,HT SHK,1/4	0.5	
....2	690-1200	TUB,BLK,PVC 105C,1/2	0.25	
....2	700-0145	FILM,2 DOUBLE ADHESIVE #467	0.003	
....2	919-0104	ASSY PCB,AFC/PLL	1	
.....3	000-3302	CAP,CER,DISC,3.3PF,1000V	1	C59
.....3	001-5004	CAP,CER,DISC,5PF,500V,NPO	4	C15, C16, C56, C57

BOM LEVEL	PART NO.	DESCRIPTION	QTY	REF. DES.
.....3	003-1054	CAP,CER,MNLY,.1uF,50V,20%	24	C1, C3, C5, C6, C7, C8, C10, C12, C13, C21, C24, C27, C32, C33, C39, C43, C51, C55, C58, C60, C61, C64, C66, C41
.....3	020-4793	CAP,LYTIC,4700UF,16V,LOW LEAK	1	C35
.....3	023-1076	CAP,LYTIC,10uF,50V,STDUP	5	C42, C68, C70, C72, C73
.....3	023-1084	CAP,LYTIC,100MFD,35V,STDUP,RAD	11	C4, C15, C22, C23, C25, C49, C50, C52, C53, C69, C71
.....3	024-1064	CAP,LYTIC,1UF,50V,RAD	1	C29
.....3	024-3364	CAP,LYTIC,3.3UF,50V,NP	1	C30
.....3	024-3374	CAP,LYTIC,33UF,35V,STDUP	1	C37
.....3	024-4764	CAP,LYTIC,4.7UF,50V,20%,STDUP	1	C28
.....3	030-1053	CAP,MYLAR FILM,.1uF,100V,RAD	1	C31
.....3	030-2253	CAP,MYLAR FILM,.22UF,100V,RAD	4	C34, C38, C48, C54
.....3	031-1043	CAP,MYLAR FILM,.01UF,100V,RAD	3	C9, C11, C40
.....3	031-2243	CAP,MYLAR FILM,.022UF,200V,RAD	1	C26
.....3	038-4753	CAP,PYST,.47UF,100V	1	C44
.....3	040-2422	CAP,MICA,240PF	3	C45, C46, C47
.....3	042-2531	CAP,MICA,2500PF,500V,1%	1	C62
.....3	042-3312	CAP,MICA,33PF,500V,5%	2	C65, C67
.....3	042-3922	CAP,MICA,390PF,100V,5%	6	C2, C17, C18, C19, C20, C36
.....3	042-5031	CAP,MICA,5000PF,500V,1%	1	C63
.....3	100-1031	RES,100 OHM,1/4W,1%,METAL	1	R22
.....3	100-1041	RES,1K OHM,1/4W,1%	7	R10, R42, R40, R44, R23, R84, R85
.....3	100-1051	RES,10K OHM,1/4W,1%	15	R6, R13, R37, R15, R16, R24, R46, R47, R48, R95, R75, R76, R50, R103, R67,



BOM LEVEL	PART NO.	DESCRIPTION	QTY	REF. DES.
.....3	100-1111	RES,118 OHM,1/4W,1%	1	R32
.....3	100-1231	RES,121 OHM,1/4W,1%	3	R21, R97, R99
.....3	100-1551	RES,15K OHM,1/4W,1%	4	R25, R26, R27, R51
.....3	100-1731	RES,174 OHM,1/4W,1%	1	R59
.....3	100-2723	RES,27 OHM,1/4W,5%	1	R34
.....3	100-3031	RES,301 OHM,1/4W,1%	1	R57
.....3	100-3951	RES,39.2K OHM,1/4W,1%	1	R9
.....3	100-4773	RES,4.7MEG OHM,1/4W,5%	1	R43
.....3	100-5041	RES,4.99K OHM,1/4W,1%	4	R29, R30, R88, R90
.....3	100-5663	RES,560K OHM,1/4W,5%	1	R19
.....3	103-1007	RES,1 MEG OHM,1/4W,1%,METAL	8	R71, R72, R79, R77, R86, R89, R70, R78
.....3	103-1021	RES,10 OHM,1/4W,1%,METAL	1	R1
.....3	103-1062	RES,100K OHM,1/4W,1%,METAL	5	R17, R18, R64, R65, R66
.....3	103-1215	RES,12.1K OHM,1/4W,1%,METAL	1	R11
.....3	103-1331	RES,1.33K OHM,1/4W,1%,METAL	2	R98, R100
.....3	103-1375	RES,13.7K OHM,1/4W,1%,METAL	1	R101
.....3	103-1504	RES,1.5K OHM,1/4W,1%,METAL	1	R28,
.....3	103-1745	RES,17.4K OHM,1/4W,1%,METAL	1	R82
.....3	103-1825	RES,18.2K OHM,1/4W,1%,METAL	1	R92
.....3	103-2213	RES,221 OHM,1/4W,1%,METAL	1	R33
.....3	103-2673	RES,267 OHM,1/4W,1%,METAL	5	R7, R14, R38, R93, R94
.....3	103-3014	RES,3.01K OHM,1/4W,1%,METAL	1	R83
.....3	103-3323	RES,332 OHM,1/4W,1%,METAL	2	R2, R8
.....3	103-3324	RES,3.32K OHM,1/4W,1%,METAL	2	R4, R5
.....3	103-3631	RES,365 OHM,1/4W,1%,METAL	1	R20
.....3	103-3836	RES,383K OHM,,1/4W,1%,METAL	1	R39

BOM LEVEL	PART NO.	DESCRIPTION	QTY	REF. DES.
.....3	103-4361	RES,432K OHM,1/4W,1%,METAL	1	R53
.....3	103-4753	RES,475 OHM,1/4W,1%,METAL	2	R45, R61
.....3	103-4755	RES,47.5K OHM,1/4W,1%,METAL	1	R31
.....3	103-4951	RES,49.9K OHM,1/4W,1%,METAL	2	R36, R12
.....3	103-5112	RES,51.1 OHM,1/4W,1%,METAL	2	R3, R74
.....3	103-5113	RES,511 OHM,1/4W,1%,METAL	1	R49
.....3	103-5624	RES,5.62K OHM,1/4W,1%,METAL	1	R41
.....3	103-6193	RES,619 OHM,1/4W,1%,METAL	1	R87
.....3	103-6194	RES,6.19K OHM,1/4W,1%,METAL	2	R54, R62
.....3	103-6346	RES,634K OHM,1/4W,1%,METAL	1	R60
.....3	103-7326	RES,732K OHM,1/4W,1%,METAL	1	R58
.....3	103-7503	RES,750 OHM,1/4W,1%,METAL	1	R55
.....3	103-7541	RES,7.50K OHM,1/4W,1%,METAL	2	R68, R80
.....3	103-8255	RES,82.5K OHM,1/4W,1%,METAL	1	R35
.....3	103-8256	RES,825K OHM,1/4W,1%,METAL	1	R56
.....3	175-1034	RES,TRMR,1K,VERT ADJ	1	R63
.....3	177-5044	RES,TRMR,5K,VERT ADJ	3	R69, R81, R91
.....3	177-5054	RES,TRMR,50K,VERT ADJ	1	R52
.....3	200-0009	DIODE,ZENER,1N 4739A	2	D17, D19
.....3	203-4005	DIODE,1N4005	2	D16, D18
.....3	203-4148	DIODE,1N4148	7	D1, D2, D3, D4, D5, D6, D7,
.....3	211-3904	TSTR,2N3904	4	Q1, Q2, Q3, Q4
.....3	220-0317	VR,LM317LZ TO92	1	U6
.....3	220-4040	IC,MC14040B 12-BIT BINARY	1	U2
.....3	220-5151	IC,MC145151 SYNTHESIZER	1	U9
.....3	220-8658	IC,SP8658 PRESCALER,DIVIDE/20	1	U8
.....3	221-0072	AMP,OP,BIFET TLO72CP	1	U11



BOM LEVEL	PART NO.	DESCRIPTION	QTY	REF. DES.
.....3	221-0358	AMP,DUAL OP,LM358	1	U13
.....3	221-5532-001	IC,NE-5532AN	4	U10, U14, U15, U16
.....3	226-0392	RES NETWORK, 10K	2	R73, R96
.....3	227-0317	VR,LM317T,LM317KC	1	U17
.....3	227-0337	VOLTAGE REGULATOR,3 TERM, NEG	1	U18
.....3	228-0290	IC, 74LS90N (N)	1	U1
.....3	228-4013	IC,MC14013B	1	U4
.....3	228-4073	IC,MC14073B	1	U3
.....3	228-4538	IC,MC14538B NATL SEMICONDUCTOR	2	U5, U12
.....3	323-7345	LDR,LED TYPE,VACTEC VTL 5C2	3	LDR1, LDR2, LDR3
.....3	323-9224	IND,LED,GRN,521-9270	5	DS1, DS2, DS3, DS4, DS5
.....3	340-0002	SW,4 POS,SPST,8-PIN DIP	3	S1, S2, S3
.....3	340-0004	SW,JUMPER PROGRAMMABLE	5	P3, P4, P5A, P5B, P10
.....3	360-2200	CHOKE,RF 2.2UH 550MA	2	L1, L2
.....3	364-0047	COIL, MOLDED .47UH	1	L3
.....3	370-0002	XMFR,RF,MCL,T4-1 (NOTE)	1	T1
.....3	390-0001	OSC,XTAL PC MT TCXO 10MHZ	1	Y1
.....3	402-0000	TY-RAP	2	
.....3	407-0074	SPR,LED .25 ODX.147 1D X.22L	5	
.....3	413-1597	TERM,TURRET,2 SHLDR,.219,GOLD FLASH	5	
.....3	417-0003	CONN,HEADER 3 PIN	3	J3,J4, J10
.....3	417-0004	JACK,TEST,RIGHT ANGLE PC MT	1	TP1
.....3	417-0200	CONN,HEADER 20 PIN	2	J5, J8, J2, J1,
.....3	417-0804	SOCKET,8-PIN DIP,BURNDY	6	XU10, XU11, XU13, XU14, XU15, XU16
.....3	417-1404	SOCKET,14-PIN DIP	3	XU1, XU3, XU4
.....3	417-1604	SKT,16-PIN,DIP	5	XU2, XU5, XU12, XR73, XR96

BOM LEVEL	PART NO.	DESCRIPTION	QTY	REF. DES.
.....3	417-2804	SOCKET,IC 28-PIN,DIP,HI RELIABILITY	1	XU9
.....3	420-6104	SCREW,6-32X.250,S.S. PH	2	
.....3	423-6002	#6 LOCK SPLIT	2	
.....3	426-6000	PEM NUT,#6-32 KFS2-632	6	
.....3	519-0104	PCB,BLANK,AFC/PLL (scan)	1	
.....3	700-0148	TAPE,JOINING 3/4	0.001	
.....3	949-1050-001	ASSY, CABLE, AFC-PLL (SBCM)	1	
.....4	402-0051	TY-RAP, W/FLAG	1	
.....4	418-0034	PLUG,BNC DUAL CRIMP 1-227079-6	1	
.....4	621-1359	CBL,COAX,RG316/U,50 OHM	1.25	
.....4	690-0023	TUB,PVC105/7 BLK,ALPHA	1.25	
....2	919-0107-001	ASSY,PCB,P.S./CNTL,FM100C	1	
.....3	001-1014	CAP,CER,DISC,10pF,1KV,10%,NPO	2	C3, C4,
.....3	003-1054	CAP,CER,MNLY,.1uF,50V,20%	9	C5, C6, C7, C16, C25, C28, C30, C33, C37,
.....3	014-1084	CAP,LYTIC,100UF,50V,INS	1	C15,
.....3	014-1094	CAP,LYTIC,1000UF,50V,INS	2	C24, C29,
.....3	023-1076	CAP,LYTIC,10uF,50V,STDUP	1	C17,
.....3	023-1084	CAP,LYTIC,100MFD,35V,STDUP,RAD	7	C26, C27, C31, C32, C35, C36, C38
.....3	024-1064	CAP,LYTIC,1UF,50V,RAD	1	C11
.....3	024-2274	CAP,LYTIC,22UF,100V,STDUP	1	C34,
.....3	030-1033	CAP,CER MOLDED,.001UF,200V,10%	2	C12, C20,
.....3	031-1043	CAP,MYLAR FILM,.01UF,100V,RAD	2	C8, C10,
.....3	040-5013	CAP,MICA,50PF,500V,5%	1	C13
.....3	042-3922	CAP,MICA,390PF,100V,5%	5	C1, C2, C14, C18, C19,
.....3	100-1013	RES,1 OHM,1/4W,5%	1	R64
.....3	100-1041	RES,1K OHM,1/4W,1%	6	R6, R61, R37, R12,



BOM LEVEL	PART NO.	DESCRIPTION	QTY	REF. DES.
				R50, R59,
.....3	100-1051	RES,10K OHM,1/4W,1%	10	R4, R8, R30, R28, R32, R33, R42, R43, R55, R65,
.....3	100-1231	RES,121 OHM,1/4W,1%	2	R76, R78
.....3	100-1551	RES,15K OHM,1/4W,1%	2	R24, R22,
.....3	100-1841	RES,1.82K OHM,1/4W,1%	6	R77, R79, R1, R2, R36, R11,
.....3	103-1007	RES,1 MEG OHM,1/4W,1%,METAL	5	R21, R34, R44, R45, R87,
.....3	103-1021	RES,10 OHM,1/4W,1%,METAL	2	R60, R51,
.....3	103-1025	RES,10.2K OHM,1/4W,1%,METAL	1	R15
.....3	103-1062	RES,100K OHM,1/4W,1%,METAL	5	R3, R7, R23, R47, R41,
.....3	103-1261	RES,121K OHM,1/4W,1%,METAL	2	R82, R86,
.....3	103-1331	RES,1.33K OHM,1/4W,1%,METAL	1	R14
.....3	103-1504	RES,1.5K OHM,1/4W,1%,METAL	1	R10,
.....3	103-1561	RES,150K OHM,1/4W,1%,METAL	1	R31,
.....3	103-2212	RES,22.1 OHM,1/4W,1%,METAL	1	R54,
.....3	103-2241	RES,2.21K OHM,1/4W,1%,METAL	1	R39
.....3	103-3324	RES,3.32K OHM,1/4W,1%,METAL	1	R29
.....3	103-3325	RES,33.2K OHM,1/4W,1%,METAL	3	R35, R40, R48,
.....3	103-3631	RES,365 OHM,1/4W,1%,METAL	1	R75
.....3	103-3924	RES,3.92K OHM,1/4W,1%,METAL	2	R17, R19
.....3	103-4755	RES,47.5K OHM,1/4W,1%,METAL	8	R38, R85, R80, R81, R83, R84, R26, R57,
.....3	103-5141	RES,5.11K OHM,1/4W,1%,METAL	2	R13, R49,
.....3	103-6194	RES,6.19K OHM,1/4W,1%,METAL	2	R16, R18
.....3	103-6346	RES,634K OHM,1/4W,1%,METAL	1	R46
.....3	103-6813	RES,681 OHM,1/4W,1%,METAL	1	R53
.....3	103-6814	RES,6.81K OHM,1/4W,1%,METAL	1	R20



BOM LEVEL	PART NO.	DESCRIPTION	QTY	REF. DES.
.....3	110-1023	RES,10 OHM,1/2W,5% NOTE	1	R56
.....3	130-1000	RES,.1 OHM,5W,1%,WW	4	R70, R71, R62, R63
.....3	140-0018	VARISTOR,V477A1 47V GE	1	MOV1
.....3	178-1054	RES,TRMR,10K,HORZ ADJ	1	R25
.....3	178-2044	RES,TRMR,2K,HORZ ADJ	2	R5, R27
.....3	178-5044	RES,TRMR,5K,HORZ ADJ	1	R9
.....3	178-5046	RES,TRMR,5K,1/2W,MT	1	R52
.....3	200-0015	DIODE,ZENER,15V,1W,1N4744A	1	D27
.....3	201-4728	DIODE,ZENER,1N4728	2	D29, D30,
.....3	202-0502	RECT,3A,200V,IN5402	1	D18
.....3	203-4005	DIODE,1N4005	15	D13, D14, D16, D17, D19, D20, D12, D15, D21, D22, D23, D24, D25, D26, D32,
.....3	203-4148	DIODE,1N4148	8	D1, D2, D3, D4, D8, D11, D28, D31,
.....3	210-3906	2N3906 PNP 40V 2A .35W 250MHZ	2	Q3, Q5,
.....3	211-3904	TSTR,2N3904	2	Q4, Q2,
.....3	221-0358	AMP,DUAL OP,LM358	3	U1, U2, U3
.....3	227-0317	VR,LM317T,LM317KC	1	U5
.....3	227-0337	VOLTAGE REGULATOR,3 TERM, NEG	1	U6
.....3	227-0723	IC,VR,UA723	1	U4
.....3	330-1500	FUSE,3AG 15A 32V	1	F1
.....3	340-0004	SW,JUMPER PROGRAMMABLE	1	P22
.....3	345-0863	SW,SLD,DPDT,SWCFT C56206L2	3	S1, S2, S3
.....3	407-0141	COVER,FUSE,STD 840836 RICHCO	1	
.....3	413-0025	TERM,TURRET,2 SHLDR,.360,GOLD FLASH	8	E1, E2, E3, E4, E5, E6, E7, E8,
.....3	413-0106	TERM,TEST POINT,OVAL,RED	8	TP1, TP2, TP3, TP4, TP5, TP6, TP7, TP8
.....3	415-2068	CLIP,FUSE,15AMP,LITTLEFUSE,102071	2	XF1, XF2



BOM LEVEL	PART NO.	DESCRIPTION	QTY	REF. DES.
.....3	417-0003	CONN,HEADER 3 PIN	1	J22
.....3	417-0169	CONN 15 PIN 640503-1 AMP	1	J11
.....3	417-0200	CONN,HEADER 20 PIN	2	J12, J13, J23
.....3	417-0700	CONN,PCB MT,2PIN	1	J20
.....3	417-0804	SOCKET,8-PIN DIP,BURNDY	3	XU1, XU2, XU3
.....3	417-1404	SOCKET,14-PIN DIP	1	XU4
.....3	418-0255	CONN,MALE,4PIN	1	J21
.....3	418-0900	CONN,9 PIN 640501-5 AMP	1	J10
.....3	420-6105	SCREW,6-32X.312,S.S. PH	2	
.....3	423-6002	#6 LOCK SPLIT	2	
.....3	426-6000	PEM NUT,#6-32 KFS2-632	2	
.....3	455-0075	HEATSINK,TO-220 PKG,.85 TALL	2	
.....3	519-0107-001	PCB,MACH,P.S./CNTL,FM-100C (scan)	1	
....2	919-0108-001	ASSY,PCB,METERING, FM100C	1	
.....3	001-5004	CAP,CER,DISC,5PF,500V,NPO	2	C8, C11
.....3	003-1054	CAP,CER,MNLY,.1uF,50V,20%	35	C2, C3, C4, C9, C10, C15, C17, C18, C19, C21, C22, C24, C27, C28, C30, C31, C34, C35, C36, C37, C38, C39, C40, C41, C42, C43, C44, C45, C50, C52, C54, C56, C57, C61, C63,
.....3	020-1085	CAP,LYTIC,100UF,50V,STDUP,NP	1	C1
.....3	023-1076	CAP,LYTIC,10uF,50V,STDUP	9	C12, C32, C33, C51, C53, C55, C58, C60, C62,
.....3	023-1084	CAP,LYTIC,100MFD,35V,STDUP,RAD	4	C46, C47, C48, C49
.....3	024-2274	CAP,LYTIC,22UF,100V,STDUP	1	C59
.....3	030-1053	CAP,MYLAR FILM,.1uF,100V,RAD	1	C29
.....3	031-1043	CAP,MYLAR FILM,.01UF,100V,RAD	1	C13

BOM LEVEL	PART NO.	DESCRIPTION	QTY	REF. DES.
.....3	040-5013	CAP,MICA,50PF,500V,5%	1	C26
.....3	042-3312	CAP,MICA,33PF,500V,5%	1	C14
.....3	042-3922	CAP,MICA,390PF,100V,5%	6	C6, C7, C16, C20, C23, C25
.....3	100-1041	RES,1K OHM,1/4W,1%	13	R18, R20, R98, R99, R100, R101, R102, R103, R104, R105, R106, R107, R13
.....3	100-1051	RES,10K OHM,1/4W,1%	13	R23, R19, R29, R38, R42, R52, R60, R66, R67, R68, R69, R70, R71
.....3	100-1083	RES,10MEG OHM,1/4W,5%	1	R26
.....3	100-1111	RES,118 OHM,1/4W,1%	1	R110
.....3	100-1231	RES,121 OHM,1/4W,1%	5	R78, R80, R82, R88, R108
.....3	100-1873	RES,1.8MEG OHM,1/4W,5%	1	R59
.....3	100-2041	RES,2K OHM,1/4W,1%	1	R40
.....3	100-2283	RES,22MEG OHM,1/4W,5%	2	R21, R37,
.....3	100-3051	RES,30.1K OHM,1/4W,1%	1	R55
.....3	100-6031	RES,604 OHM,1/4W,1%	1	R89,
.....3	103-1007	RES,1 MEG OHM,1/4W,1%,METAL	3	R9, R39, R54,
.....3	103-1021	RES,10 OHM,1/4W,1%,METAL	3	R33, R34, R36,
.....3	103-1062	RES,100K OHM,1/4W,1%,METAL	8	R5, R31, R53, R64, R65, R87, R97, R111,
.....3	103-1214	RES,1.21K OHM,1/4W,1%,METAL	3	R90, R92, R94,
.....3	103-1274	RES,1.27K OHM,1/4W,1%,METAL	1	R11
.....3	103-1331	RES,1.33K OHM,1/4W,1%,METAL	2	R79, R81
.....3	103-1504	RES,1.5K OHM,1/4W,1%,METAL	1	R25
.....3	103-1695	RES,16.9K OHM,1/4W,1%,METAL	1	R48
.....3	103-1826	RES,182K OHM,1/4W,1%,METAL	1	R58



BOM LEVEL	PART NO.	DESCRIPTION	QTY	REF. DES.
.....3	103-2003	RES,200 OHM,1/4W,1%,METAL	2	R75, R76
.....3	103-2051	RES,20K OHM,1/4W,1%,METAL	1	R12
.....3	103-2264	RES,2.26K OHM,1/4W,1%,METAL	1	R109
.....3	103-2341	RES,2.32K OHM,1/4W,1%,METAL	1	R16
.....3	103-2495	RES,24.9K OHM,1/4W,1%,METAL	1	R14
.....3	103-2673	RES,267 OHM,1/4W,1%,METAL	1	R63
.....3	103-2675	RES,26.7K OHM,1/4W,1%,METAL	3	R22, R84, R86
.....3	103-2751	RES,27.4K OHM,1/4W,1%,METAL	1	R45
.....3	103-3014	RES,3.01K OHM,1/4W,1%,METAL	1	R47
.....3	103-3061	RES,301K OHM,1/4W,1%,METAL	1	R24
.....3	103-3631	RES,365 OHM,1/4W,1%,METAL	1	R83
.....3	103-4441	RES,4.42K OHM,1/4W,1%,METAL	1	R3
.....3	103-4755	RES,47.5K OHM,1/4W,1%,METAL	5	R57, R61, R62, R85, R96
.....3	103-4993	RES,499 OHM,1/4W,1%,METAL	7	R6, R91, R93, R95, R7, R8, R4,
.....3	103-4996	RES,499K OHM,1/4W,1%,METAL	1	R10
.....3	103-5112	RES,51.1 OHM,1/4W,1%,METAL	2	R77, R112
.....3	103-5113	RES,511 OHM,1/4W,1%,METAL	1	R15
.....3	103-5141	RES,5.11K OHM,1/4W,1%,METAL	1	R35
.....3	103-5764	RES,5.76K OHM,1/4W,1%,METAL	1	R1
.....3	103-6193	RES,619 OHM,1/4W,1%,METAL	3	R72, R73, R74,
.....3	103-8254	RES,8.25K OHM,1/4W,1%,METAL	1	R30
.....3	103-8255	RES,82.5K OHM,1/4W,1%,METAL	1	R27
.....3	103-8453	RES,845 OHM,1/4W,1%,METAL	6	R44, R46, R49, R51, R2, R43
.....3	103-8454	RES,8.45K OHM,1/4W,1%,METAL	1	R50
.....3	103-9314	RES,9.31K OHM,1/4W,1%,METAL	1	R17
.....3	177-1054	RES,TRMR,10K,VERT ADJ	1	R56

BOM LEVEL	PART NO.	DESCRIPTION	QTY	REF. DES.
.....3	177-2044	RES,TRMR,2K,VERT ADJ	1	R41
.....3	177-2054	RES,TRMR,20K,VERT ADJ	1	R28
.....3	200-4733	DIODE,ZENER,1N4733A, 5%	1	D14
.....3	200-4742	DIODE,ZENER,1N4742A	2	D18, D19
.....3	200-5363	DIODE,ZENER,IN5363 30V SW	1	D25
.....3	201-2800	DIODE,HOT CARRIER	6	D3, D4, D24, D5, D6, D7,
.....3	203-4005	DIODE,1N4005	3	D20, D21, D23
.....3	203-4148	DIODE,1N4148	12	D1, D2, D8, D9, D10, D11, D12, D13, D15, D16, D17, D22
.....3	210-0271	TSTR,FET J271	1	Q7
.....3	210-3906	2N3906 PNP 40V 2A .35W 250MHZ	3	Q3, Q4, Q5
.....3	211-3904	TSTR,2N3904	3	Q1, Q2, Q6
.....3	220-0317	VR,LM317LZ TO92	1	U17
.....3	220-7136	A/D,3-1/2 DIGIT LCD,ICL7136CPL	1	U7
.....3	221-0074	AMP,OP,BIFET TLO74CW	2	U1, U2
.....3	221-4227	AMP,DUAL OP	2	U4, U5
.....3	225-0004	IC,CD4066BE	2	U3, U6
.....3	226-0392	RES NETWORK, 10K	1	R32
.....3	226-2004	MC1416,ULN2004 7-DRLNGTNS DP16	1	U12
.....3	227-0317	VR,LM317T,LM317KC	2	U14, U22
.....3	227-0337	VOLTAGE REGULATOR,3 TERM, NEG	2	U15, U16
.....3	228-4028	IC,MC14028B	1	U11
.....3	228-4071	IC,MC14070 QUAD EXCLUSIVE OR	1	U13
.....3	228-4076	IC,MC14076 QUAD REGISTER	1	U10
.....3	228-4532	IC,MC14532B 8-BIT PRIOR ENCOD	1	U9
.....3	228-4538	IC,MC14538B NATL SEMICONDUCTOR	1	U8
.....3	229-0555	IC,TIMER,NE555N	1	U18



BOM LEVEL	PART NO.	DESCRIPTION	QTY	REF. DES.
.....3	229-3914	DRIVER,DOT/BAR DISPLAY LM3914N	3	U19, U20, U21
.....3	320-0016	LED,GRN PANEL INDICATOR	7	DS2, DS3, DS4, DS5, DS18, DS19, DS20,
.....3	320-0017	LED,RED MV57173 I OR H	9	DS1, DS6, DS7, DS8, DS13, DS14, DS15, DS16, DS17,
.....3	320-0021	DISP,LCD,4-DIGIT,0.7	1	DS12
.....3	320-4164	LED ARRAY,GRN,10 BAR	2	DS9, DS10
.....3	320-7164	LED ARRAY RED MV57164 INTEN G OR H	1	DS11
.....3	340-0107	KEYSWITCH,SI20601H1 SECME (NOTE)	6	S1, S2, S3, S4, S5, S6,
.....3	402-0000	TY-RAP	1	
.....3	413-1597	TERM,TURRET,2 SHLDR,,219,GOLD FLASH	7	E1, TP1, TP2, TP3, TP4, TP5, TP6
.....3	417-0172	SKT, 20 PIN SINGLE ROW,SAMTEC	2	
.....3	417-0200	CONN,HEADER 20 PIN	1	J14
.....3	417-0804	SOCKET,8-PIN DIP,BURNDY	3	XU4, XU5, XU18
.....3	417-1404	SOCKET,14-PIN DIP	5	XU1, XU2, XU3, XU6, XU13
.....3	417-1604	SKT,16-PIN,DIP	6	XU8, XU9, XU10, XU11, XU12, XR32
.....3	417-1804	SOCKET,18-PIN,DIP,HIGH RELIABILITY	3	XU19, XU20, XU21
.....3	417-4005	SOCKET,40-PIN,DIP,HIGH RELIABILITY	1	XU7
.....3	420-6104	SCREW,6-32X.250,S.S. PH	4	
.....3	423-6002	#6 LOCK SPLIT	4	
.....3	426-6000	PEM NUT,#6-32 KFS2-632	4	
.....3	449-0006	TEST CLIP,COILED	1	
.....3	519-0108	PCB,BLANK,METERING (scan)	1	
....2	919-0190	ASSY,PCB,FM EXITER INTERFACE	1	
.....3	103-5141	RES,5.11K OHM,1/4W,1%,METAL	1	R1

BOM LEVEL	PART NO.	DESCRIPTION	QTY	REF. DES.
.....3	340-0004	SW,JUMPER PROGRAMMABLE	1	P3Replaced 417-0309 on 06/21/2007 12:49:19
.....3	412-1600	BARR STP,16 POS,BEAU	1	J2
.....3	417-0003	CONN,HEADER 3 PIN	1	J3
.....3	417-2503	RCPT,25 PIN D, MALE	1	J1
.....3	519-0190	PCB,MACH,FM EXCITER INTERFACE	1	
....2	919-0445	ASSY,PCB,RFI FILTER (SBCM)	1	
.....3	002-1034	CAP,CER,DISC,.001UF,1000V	3	C301, C302, C303
.....3	003-1054	CAP,CER,MNLY,.1uF,50V,20%	8	C304, C305, C306, C307, C308, C309, C310, C311
.....3	031-2033	CAP,MYLAR FILM,.0022uF,100V,10%	2	C312, C313,
.....3	038-4750	CAP,POLY,.47MFD,50V,10% OR BETTER	2	C324, C325
.....3	040-1022	CAP,MICA,100PF,500V,RAD	10	C314, C316, C318, C320, C322, C326, C327, C328, C329, C330
.....3	047-1035	CAP,FIL,EMI SUPPR,1000pF,3-PIN	3	FL312, FL313, FL319
.....3	100-1041	RES,1K OHM,1/4W,1%	3	R302, R306, R307,
.....3	100-1051	RES,10K OHM,1/4W,1%	1	R303,
.....3	100-6031	RES,604 OHM,1/4W,1%	1	R308,
.....3	103-5112	RES,51.1 OHM,1/4W,1%,METAL	2	R310, R311
.....3	103-8254	RES,8.25K OHM,1/4W,1%,METAL	2	R304, R305,
.....3	130-2423	RES,240 OHM,2W,5%	2	R301, R309,
.....3	201-0012	ZENER VOLTAGE SUPPRESSOR,+/-12V	12	D310, D311, D312, D313, D314, D315, D316, D317, D318, D319, D320, D321
.....3	201-0027	ZENER VOLTAGE SUPPRESSOR,+/-27V	4	D302, D303, D304, D305
.....3	201-0040	ZENER VOLTAGE SUPPRESSOR,+/-18V	4	D306, D307, D308, D309



BOM LEVEL	PART NO.	DESCRIPTION	QTY	REF. DES.
.....3	203-4005	DIODE,1N4005	1	D301,
.....3	270-0065	REL,SPDT,12VDC,DIP	1	K301,
.....3	340-0004	SW,JUMPER PROGRAMMABLE	2	P308, P309
.....3	364-4662	INDU,1.0MH	2	L303, L305,
.....3	411-0001	FILTER,EMI 10,000PF 3PIN	21	FL301, FL302, FL303, FL304, FL305, FL306, FL307, FL308, FL309, FL310, FL311, FB312, FB313, FL314, FL315, FL316, FL319, FL320, FL321, FL322, FL323
.....3	417-0003	CONN,HEADER 3 PIN	2	J308, J309
.....3	417-0039-VLX	CONN,BNC,PCB,VERT MOUNT,VALOX BODY	5	J305, J301, J302, J303, J304
.....3	417-0200	CONN,HEADER 20 PIN	1	J307,
.....3	417-1276	CONN,PCB,12 PIN	1	J306
.....3	417-2502-FER	RCPT,25 PIN D,FEMALE,FERITE FILTER	1	J1
.....3	420-6105	SCREW,6-32X.312,S.S. PH	10	
.....3	423-6002	#6 LOCK SPLIT	20	
.....3	426-6000	PEM NUT,#6-32 KFS2-632	10	
.....3	441-0184	STOFF,6-32,MALE-FEMALE,3/8	10	
.....3	519-0445-001	PCB,MACH,RFI FILTER	1	
.....4	519-0445	PCB,MACH,RFI FILTER BREAKAWAY	0.5	
.....3	519-0445-002	PCB,MACH,RFI FILTER SHIELD	1	
.....4	519-0445	PCB,MACH,RFI FILTER BREAKAWAY	0.5	
....2	949-0147-002	ASSY,HRNS,FM-100E (SBCM)	1	
.....3	402-0000	TY-RAP	40	
.....3	410-0065	LUG,TERM #6 RING CRIMP #22 AWG	4	
.....3	410-1488	LUG,TERM #6 SPADE #10-12	2	

BOM LEVEL	PART NO.	DESCRIPTION	QTY	REF. DES.
.....3	410-1489	LUG,TERM #6 SPADE #16-22	3	
.....3	410-1493	LUG,TERM #6 RECT 12-10 329697	1	
.....3	417-0036	PIN CONN,AMP,350967-1	7	
.....3	417-0053	SKT,CONN 641294-1 AMP	54	
.....3	417-0059	CONN,9 PIN 1-640521-0 AMP	1	P10
.....3	417-0076	JACK,N PANEL FOR RG-142B/U	1	J19
.....3	417-0095	CONN,BNC RG/U142 31-326 AMPH	3	P18, P201, P202
.....3	417-0122	HSNG,20 POS MOD IV 3-87499-7	2	P14, P307
.....3	417-0123	HSNG,16 POS MOD IV 2-87499-9	1	P1
.....3	417-0148	HSNG,10 POS MOD 1V 1-87499-7	1	P2
.....3	417-0176	CONN,20 PIN FEM,AMP 1-350245-9	1	P15
.....3	417-0224	KEYING PLUG MOD IV 87077 AMP	3	
.....3	417-1401	HOUSING,SKT,14PIN,AMP MOD IV	2	P12, P13
.....3	417-2379	CONN,155OC HOUSING,AMP,MR	1	P11
.....3	417-8766	CONTACT,CRIMP,MOD-IV 87809-1	61	
.....3	418-0034	PLUG,BNC DUAL CRIMP 1-227079-6	2	P9, P17
.....3	418-0233	HSNG,CONN, 4P,1-640509-AMP	2	P25
.....3	418-0240	PLUG,FEM,4PIN	2	J25, P21
.....3	418-0701	CONN,HOUSING,2 PIN	1	P20
.....3	418-1271	CONN,HOUSING,12PIN	1	P306
.....3	601-1800	WIRE,AWG18 19/30 BLK	51.6	
.....3	601-1800-054	WIRE,AWG 18,STRANDED,GREEN/YELLOW	1.677	
.....3	601-2200	WIRE,AWG22,7/30,PVC INS,BLK	0.934	
.....3	601-2209	WIRE,AWG22,7/30 WHT	85.5	
.....3	621-0001	CBL,COAX TEFLON RG 142B/U BELD	1.5	
.....3	621-1359	CBL,COAX,RG316/U,50 OHM	4.83	
.....3	622-8451	WIRE,BELD 8451,SHIELD,1PR	14.66	
.....3	693-0002	SLVG,1/4 EXPANDO FR BLACK"	3.791	



BOM LEVEL	PART NO.	DESCRIPTION	QTY	REF. DES.
....2	959-0203	ASSY MODL,MODLTD. OSC. (SBCM)	1	
.....3	008-1020	CAP,FEEDTHRU,100PF 20% 250V	1	C21
.....3	008-1033	CAP,FEEDTHRU,1000PF,20%,500V	2	C19, C20
.....3	040-6223	CAP,MICA,620PF,300V,5%	1	C23
.....3	360-0003	FERRITE BEAD,.291 DIA	3	
.....3	364-0002	CHOKE,VK200-20/4B FERROXCUBE	1	L7
.....3	402-0000	TY-RAP	5	
.....3	402-0006	MT,ADH BACKED,FOR CBL TIES	1	
.....3	402-0008	MTG DEVICE,FOR #6SCR,TIE CBL	1	
.....3	410-1419	LUG,SOLDER 7/8	1	
.....3	417-0016	CONN,BNC,RF,UG1094A/U,AMPHENOL	2	J6, J9
.....3	420-4404	SCREW,4-40X.250,S.S. SHCS	7	
.....3	420-4504	SCREW,4-40X.250,S.S. PH	1	
.....3	420-4506	SCREW,4-40X.375,BR FLH SC	4	
.....3	423-4004	#4 LOCK EXT TOOTH	7	
.....3	470-0328	BRKT,BNC,MOD OSC	1	
.....3	479-6443-003	BOX,MOD.,MODULATED OSC FX50	1	
.....3	601-0022	WIRE,AWG22,BUSS	0.166	
.....3	611-2500	TUB,HT SHK,1/4	0.083	
.....3	693-0220	TUB,TEFLON,TW,AWG22 NTL	0.249	
.....3	919-0106	ASSY PCB,MODLTD.OSC FX-50	1	
.....4	000-3302	CAP,CER,DISC,3.3PF,1000V	1	C16
.....4	001-5004	CAP,CER,DISC,5PF,500V,NPO	1	C15
.....4	009-4723	CAP,CER CHIP,470PF,200V,5%	2	C3, C22
.....4	023-1076	CAP,LYTIC,10uF,50V,STDUP	1	C6
.....4	023-1084	CAP,LYTIC,100MFD,35V,STDUP,RAD	2	C4, C7
.....4	040-1213	CAP,MICA,12PF,500V,5%	1	C2
.....4	042-3312	CAP,MICA,33PF,500V,5%	2	C1, C8



BOM LEVEL	PART NO.	DESCRIPTION	QTY	REF. DES.
.....4	042-3922	CAP,MICA,390PF,100V,5%	9	C5, C9, C10, C11, C12, C13, C14, C17, C18
.....4	100-1031	RES,100 OHM,1/4W,1%,METAL	2	R12, R6
.....4	100-1041	RES,1K OHM,1/4W,1%	3	R7, R13, R14
.....4	100-1111	RES,118 OHM,1/4W,1%	1	R22
.....4	100-4561	RES,453K OHM,1/4W,1%	1	R10
.....4	103-1007	RES,1 MEG OHM,1/4W,1%,METAL	1	R9
.....4	103-1021	RES,10 OHM,1/4W,1%,METAL	4	R1, R11, R15, R20
.....4	103-1062	RES,100K OHM,1/4W,1%,METAL	1	R5
.....4	103-2213	RES,221 OHM,1/4W,1%,METAL	5	R4, R17, R18, R19, R21
.....4	103-2673	RES,267 OHM,1/4W,1%,METAL	1	R8
.....4	103-2744	RES,2.74K OHM,1/4W,1%,METAL	1	R16
.....4	103-3324	RES,3.32K OHM,1/4W,1%,METAL	1	R3
.....4	103-5112	RES,51.1 OHM,1/4W,1%,METAL	2	R23, R24
.....4	201-2800	DIODE,HOT CARRIER	3	D9, D10, D11
.....4	203-4005	DIODE,1N4005	1	D12
.....4	205-0109	DIODE,VARI-CAP TUNING	6	D2, D3, D4, D6, D7, D8
.....4	205-3201	DIODE,VARACTOR,KV3201 2-11PF	2	D1, D5
.....4	211-0006	MPS-A06 NPN 80V .5A .3W 100MHZ	1	Q1
.....4	211-5109	TSTR,RF 2N5109 NPN	2	Q4, Q5
.....4	212-0310	TSTR,FET N CHAN RF J3100	2	Q2, Q3
.....4	360-3300	CHOKE,RF,3.3UH,380MA,9230-32	3	L1, L3, L6
.....4	364-0047	COIL, MOLDED .47UH	2	L4, L5
.....4	370-0106	COIL, MOD OSC., L2	1	L2
.....5	555-0106	LABOR, 370-0106	1	
.....5	610-0026	SMALL TRANS LINE	0.708	
.....4	409-0012	PAD,TSTR 520-021 BIVAR TO-5	2	



BOM LEVEL	PART NO.	DESCRIPTION	QTY	REF. DES.
.....4	413-1597	TERM,TURRET,2 SHLDR,,219,GOLD FLASH	6	E1, E2, E3, E4, E5, E6
.....4	440-0018	STOFF,ANTI ROT 7/32 RND X 1/4	4	
.....4	519-0106	PCB,BLANK,MODLTD.OSC. (scan)	1	
.....3	949-1050	ASSY, CABLE, MOD OSC. (SBCM)	1	
.....4	402-0051	TY-RAP, W/FLAG	1	
.....4	417-0165	HSNG,5POS MOD IV S.ROW 87499-9	1	
.....4	417-0224	KEYING PLUG MOD IV 87077 AMP	1	
.....4	417-8766	CONTACT,CRIMP,MOD-IV 87809-1	4	
.....4	611-1250	TUB,HT SHK,1/8	2	
.....4	621-1359	CBL,COAX,RG316/U,50 OHM	2	
....2	959-0410	ASSY,LOW PASS FILTER,FM-100C	1	
.....3	420-4104	SCREW,4-40X.250,S.S. PH	8	
.....3	423-4002	#4 LOCK S.S. SPLIT	1	
.....3	479-6443	POMONA ELECTRONICS BOX,2906	1	
.....3	919-0411-002	ASSY, PCB, LPF, FM100C	1	
.....4	000-3302	CAP,CER,DISC,3.3PF,1000V	1	C202,
.....4	009-1513	CAP,CER CHIP,15PF,500V,5%	2	C208, C210
.....4	009-2713	CAP,CER CHIP,27PF,500V,5%	1	C204
.....4	046-0007	CAP,MICA,RF,7PF	2	C206, C201,
.....4	096-0010	CAP,TRMR,CER,2-8PF,350V,LUG MNT,NPO	5	C203, C205, C209, C211, C213,
.....4	360-0145	COIL,L1,FM-1C LPF (SBCM)	1	L204
.....5	640-1200	WIRE,12GA,MAGNET	0.035	
.....4	360-0147	COIL,3.5 TURNS,LPF,FM100C (SBCM)	1	L203
.....5	601-0111	12 AWGBUSS .080 FLOOR STOCK FT	0.45	
.....4	360-0148	COIL,4.5 TURNS,LPF,FM100C (SBCM)	2	L201, L202
.....5	601-0111	12 AWGBUSS .080 FLOOR STOCK FT	0.51	
.....4	417-0259	CONN, BNC PCB MOUNT	2	J201, J202



BOM LEVEL	PART NO.	DESCRIPTION	QTY	REF. DES.
.....4	519-0411-002	PCB,MACH LPF FM100C	1	
.....5	519-0411	PCB,MACH,FM-100C 0.09 BREAKAWAY"	0.26	
....2	959-0411	ASSY,RF AMP,FM-100C	1	
.....3	008-1033	CAP,FEEDTHRU,1000PF,20%,500V	4	C1, C2, C3, C4
.....3	009-4723	CAP,CER CHIP,470PF,200V,5%	4	C20, C21, C22, C23
.....3	130-3333	RES,330 OHM,2W,5%	1	R1
.....3	210-0151	TSTR,RF PWR MOSFET,MRF-151G	1	Q4
.....3	213-6198	TSTR,RF PWR,2N6198	1	Q1
.....3	219-3000	TSTR, DARLINGTON, SI, NPN	2	Q401, Q402
.....3	227-0339	VR,LM338K,5AMP ADJUSTABLE	1	U402
.....3	229-2830	AMP,RF,HYBRID,MHW5342A	1	U1
.....3	330-1500	FUSE,3AG 15A 32V	1	
.....3	360-0003	FERRITE BEAD,.291 DIA	15	Z1, Z2, Z3, Z4, Z5, Z6, Z7, Z8, Z9, Z10, Z11, Z12, Z13, Z14, Z15,
.....3	370-0050	XFMR,RF AMP OUTPUT,FM-1C	1	T1
.....3	370-0721	INPUT TRANSFORMER	1	W2
.....3	402-0835	CLAMP,CBL,3/8	1	
.....3	407-0186	TOOL,ADJ 8 T000/5 SPECTROL	1	
.....3	407-3000	COVER,TSTR	3	
.....3	415-1010	FUSE CLIP,LITTLEFUSE,101002	4	
.....3	417-0017	RECP,BNC,BULKHEAD,UG-492A/U	1	J17
.....3	418-0010	INSULATOR,MICA,TSTR,TO-3PKG	3	
.....3	420-0305	SCREW,4-40X.375,BR PH SC	2	
.....3	420-0504	SCREW,6-32X.375,BR PH SC	6	
.....3	420-0509	SCREW,10-32X.500,BR SL PAN HD	1	
.....3	420-4105	SCREW,4-40X.312,S.S. PH	4	
.....3	420-6106	SCREW,6-32X.375,S.S. PH	15	



BOM LEVEL	PART NO.	DESCRIPTION	QTY	REF. DES.
.....3	420-6110	SCREW,6-32X.625,S.S. PH	6	
.....3	420-6112	SCREW,6-32X.750,S.S. PH	2	
.....3	420-8104	SCREW,8-32X.250,S.S. PHH	2	
.....3	421-0801	#10-32 BR HEX NUT	1	
.....3	421-6908	SHEET EDGE CONNECTOR 6-32	4	
.....3	421-8002	8-32 HEX NUT, BRASS	1	
.....3	423-0005	#10 LOCK SPLIT (BRONZE)	1	
.....3	423-1012	#4 LOCK INT TOOTH (BRONZE)	2	
.....3	423-6002	#6 LOCK SPLIT	24	
.....3	423-6004	#6 LOCK SPLIT (BRONZE)	6	
.....3	423-6011	#6 FLAT .310 X .160 X .030	1	
.....3	423-8002	#8 LOCK SPLIT	2	
.....3	423-8005	#8 LOCK SPLIT	1	
.....3	441-0184	STOFF,6-32,MALE-FEMALE,3/8	1	
.....3	450-0651	PLUG,HOLE,5/16	1	
.....3	455-0049-002	HEATSINK,RF AMP,FM100C	1	
.....4	455-0049-001	HEATSINK,RF AMP,FX50	1	
.....4	555-0049-002	COST,LABOR 455-0049-002	1	
.....3	471-0957	COVER,RF AMP,FM100C,SCREENED	1	
.....4	471-0957-009	COVER,RF AMP,FM100C, UNSCREENED	1	
.....3	474-0301	PLATE,FRT,RF AMP PCB COVER	1	
.....3	474-0302	PLATE,BACK,RF AMP PCB COVER	1	
.....3	594-0019	LABEL,DANGER HV 1X 1.5	1	
.....3	594-0500	LABEL,DANGER	1	
.....3	919-0410-001	ASSY,PCB,RF AMP INPUT,FM-100C	1	
.....4	003-1523	CAP,MONO CER, .0015uF,100V,5%	2	C44, C45,
.....4	009-1032	CAP,CER CHIP,1000PF,100V,5%	1	C34
.....4	024-3374	CAP,LYTIC,33UF,35V,STDUP	2	C16, C42

BOM LEVEL	PART NO.	DESCRIPTION	QTY	REF. DES.
.....4	038-4753	CAP,PYST,.47UF,100V	1	C17
.....4	040-6813	CAP,MICA,68PF,500V,5%	1	C9
.....4	042-2000	CAP,MICA,200PF,350V,10%	2	C10, C11
.....4	042-3922	CAP,MICA,390PF,100V,5%	6	C5, C6, C7, C8, C15, C24
.....4	046-0003	CAP,MICA,RF,80PF,350V,10%	3	C13, C14, C43
.....4	046-0005	CAP,MICA,150PF,350V,10%	1	C12
.....4	046-0022	CAP,MICA,RF,22PF	1	C18
.....4	100-1051	RES,10K OHM,1/4W,1%	1	R4
.....4	100-1231	RES,121 OHM,1/4W,1%	1	R27
.....4	100-2041	RES,2K OHM,1/4W,1%	1	R5
.....4	103-1021	RES,10 OHM,1/4W,1%,METAL	1	R28
.....4	103-2212	RES,22.1 OHM,1/4W,1%,METAL	1	R8
.....4	103-2945	RES,29.4K OHM,1/4W,1%,METAL	3	R10, R12, R13
.....4	103-4324	RES,4.32K OHM,1/4W,1%,METAL	1	R2
.....4	103-4755	RES,47.5K OHM,1/4W,1%,METAL	1	R3
.....4	103-5112	RES,51.1 OHM,1/4W,1%,METAL	1	R7
.....4	103-6985	RES,69.8K OHM,1/4W,1%,METAL	1	R14
.....4	110-3623	RES,36 OHM,1/2W,5%	1	R6
.....4	130-2223	RES,22 OHM,2W,5%	1	R9
.....4	177-1055	RES,TRMR,10K,10 TURN TOP ADJ	1	R11
.....4	201-2800	DIODE,HOT CARRIER	1	D1
.....4	211-3904	TSTR,2N3904	1	Q2
.....4	218-0032	TSTR,TIP32A,2N6125	1	Q3
.....4	330-0200	FUSE,3AG,2 AMP	1	F1
.....4	364-0002	CHOKE,VK200-20/4B FERROXCUBE	2	L1, L4
.....4	364-0010	CHOKE,MOLDED RF 10UHY 10%	1	L3
.....4	364-0051	COIL,MOLDED .051UH	1	L2



BOM LEVEL	PART NO.	DESCRIPTION	QTY	REF. DES.
.....4	410-0025	TERM,MALE DISCONNECT PC .25TAB	1	E101
.....4	415-2068	CLIP,FUSE,15AMP,LITTLEFUSE,102071	2	
.....4	417-0677	CONN,PCB MT,6PIN MALE	1	J16
.....4	417-5022	SKT,LEAD .020 D,SAMTEC SEP-266	1	XU1
.....4	519-0426	PCB,MACH,RF AMP INPUT, FM-100C	1	
.....4	640-1800	WIRE AWG 18 EN MAGNET	0.031	L5
.....3	919-0410-004	ASSY,PCB,REGULATOR,FM-100C (SBCM)	1	
.....4	030-1053	CAP,MYLAR FILM,.1uF,100V,RAD	4	C404, C405, C406, C407,
.....4	042-3922	CAP,MICA,390PF,100V,5%	3	C401, C402, C403,
.....4	100-1231	RES,121 OHM,1/4W,1%	1	R401
.....4	229-0335	IC,LM335,TEMPERATURE SENSOR	1	U401
.....4	360-0001	FERRITE BEADS,F-R 2643000301	13	FB401, FB402, FB403, FB404, FB405, FB406, FB407, FB408, FB409, FB410, FB411, FB412, FB413,
.....4	417-0169	CONN 15 PIN 640503-1 AMP	1	J401
.....4	417-0299	SOCKET,TO-3,PCB MT	3	XU402, XQ401, XQ402
.....4	519-0410-004	PCB,MACH,REGULATOR,FM-100C	1	
.....4	601-0022	WIRE,AWG22,BUSS	0.8	
.....3	919-0411-001	ASSY,PCB,RF AMP OUTPUT,FM-100C	1	
.....4	003-4712	CAP,CER,47PF,50V,5%	2	C35, C39,
.....4	009-1013	CAP,CER CHIP,10PF,500V,5%	2	C28, C29,
.....4	009-1032	CAP,CER CHIP,1000PF,100V,5%	4	C19, C36, C37, C40,
.....4	009-1033	CAP,CER CHIP,1000PF,500V,5%	1	C27
.....4	009-2023	CAP,CER CHIP,200PF,300V,5%	2	C25, C26
.....4	009-3613	CAP,CER CHIP,36PF,500V,5%	1	C31
.....4	046-0022	CAP,MICA,RF,22PF	1	C33



BOM LEVEL	PART NO.	DESCRIPTION	QTY	REF. DES.
.....4	046-0045	CAP,MICA,RF,45PF	1	C32
.....4	046-1030	CAP,METAL FEED,1000PF,350V,10%	1	C30
.....4	101-2243	RES,CHIP,2.2K OHM,1/4W,5%	5	R15, R16, R22, R23, R26,
.....4	103-7152	RES,71.5 OHM,1/4W,1%,METAL	1	R21
.....4	111-2223	RES,CHIP,22 OHM,1W,5%	5	R17, R18, R19, R20, R25,
.....4	130-1023	RES,10 OHM,2W,5%	1	R29
.....4	177-1035	RES,TRMR,100 OHM,25T TOP 3299W	1	R24
.....4	201-2800	DIODE,HOT CARRIER	2	D2, D3
.....4	360-0146	CHOKE,RF AMP DECOUPLING,FM-1C	1	L6
.....5	640-1400	WIRE,14GA,MAGNET	0.04	
.....4	410-0025	TERM,MALE DISCONNECT PC .25TAB	1	E102
.....4	519-0411-001	PCB, MACH,RF AMP OUTPUT, FM-100C	1	
.....5	519-0411	PCB,MACH,FM-100C 0.09 BREAKAWAY"	0.74	
.....4	600-0008	FLEXSTRIP, 7 COND 1	1	P24
.....3	949-0411	ASSY,HRNS,RF AMP,FM-100C (SBCM)	1	
.....4	402-0000	TY-RAP	8	
.....4	410-0051	LUG,TERM,14-16GA,FEMSPADE	2	
.....4	410-0060	LUG,TERM,#10 RING CRIMP 10-12G	1	
.....4	410-1553	LUG,TERM #10 RING CRIMP 16-22	1	
.....4	417-0036	PIN CONN,AMP,350967-1	19	
.....4	417-0053	SKT,CONN 641294-1 AMP	19	
.....4	417-0106	JACK,BNC BULKHEAD	1	J18
.....4	417-0175	CONN, HOUSING, 20 PIN	1	J15
.....4	417-2379	CONN,155OC HOUSING,AMP,MR	1	P401
.....4	418-0034	PLUG,BNC DUAL CRIMP 1-227079-6	1	W1
.....4	418-0670	HOUSING,CONN,6PIN FEM	1	P16
.....4	601-1604	WIRE,AWG16, 19/29 YEL	0.75	



BOM LEVEL	PART NO.	DESCRIPTION	QTY	REF. DES.
.....4	601-1800	WIRE,AWG18 19/30 BLK	20	
.....4	601-2209	WIRE,AWG22,7/30 WHT	20	
.....4	621-0001	CBL,COAX TEFLON RG 142B/U BELD	0.5	J18
.....4	621-1359	CBL,COAX,RG316/U,50 OHM	0.5	W1
.....4	693-0002	SLVG,1/4 EXPANDO FR BLACK"	1	
....2	969-0007-100	KIT, HARDWARE RACK FM-100C/250C	1	
.....3	402-0001	TY-RAP,T+B TY24M,1-1/4 DIA	4	
.....3	420-0108	SCREW,10-32X.500,S.S. PHH	4	
.....3	420-0508	SCREW,10-32X.500,S.S. FLH	8	
.....3	420-8110	SCREW,8-32X.625,S.S. PHH	4	
.....3	421-0102	10-32 KEP NUT	8	
.....3	423-0001	WASHER,FLAT,#10 SST,.438 X .203 X .065	8	
.....3	459-0138	RETAINER,SLIDE BRKT	2	
.....3	469-0415	SLIDE, EXCITER CHASSIS	1	
.....3	470-0238	BRKT,MTG,APC+IPA,FM1.5A	4	
.....3	701-0005	ANTISTATIC ZIPLOC BAG 4X6 4MIL	1	
....2	979-0402	KIT,ACCESSORY PARTS,FM-100C	1	
.....3	330-0800	FUSE,8A,250V,3AG,FAST ACTING	1	
.....3	334-0100	FUSE,1A MDL SLO BLO 250V	2	
.....3	682-0001	CORD LINE,3 COND,DETACH 7.5FT	1	
.....3	701-0001	ENVELOPE,COIN 2-1/2 X 4-1/4	3	
.....3	701-0019	ANTISTATIC ZIPLOC BAG 13X18 4M	1	
.....3	947-0020	ASSY,CBL BNC ACCESS (SBCM)	2	
.....4	417-0094	CONN,BNC RG/U58 31-320 AMPH	2	
.....4	622-0050	CBL,SH,50 OHM,RG-58/CU	2.5	
.....3	979-9985	KIT,BIND+MAN,FM-100C	1	
.....4	597-1002	INSTRUCTION MANUAL, FM 100C/FM 100E FM EXCITER/TRANSMITTER	1	

BOM LEVEL	PART NO.	DESCRIPTION	QTY	REF. DES.
.....4	598-0010-001	BINDER,1 IN, BLUE,W CD POCKET	1	

13.3 FM-100C, 100W XMTR, CANADA

BOM LEVEL	PART NO.	DESCRIPTION	QTY	REF. DES.
0	909-1101-306	FM-100C, 100W XMTR, CANADA, 117V 50/60 HZ		
..1	110-1043	RES,1K OHM,1/2W,5%	1	
..1	270-0061	REL,SOLID STATE,CRYDOM S228C	1	
..1	348-0115	SW,TGL SPST 20 AMP	1	
..1	410-0067	LUG,FEM DISCONNECT 22-18 .230W	4	
..1	410-1552	LUG,TERM #8 RING CRIMP 16-22	2	
..1	417-0017	RECP,BNC,BULKHEAD,UG-492A/U	1	
..1	417-0224	KEYING PLUG MOD IV 87077 AMP	1	
..1	417-0259	CONN, BNC PCB MOUNT	1	
..1	417-0601	HOUSING,SKT,6PIN,AMP MOD IV	1	
..1	417-8766	CONTACT,CRIMP,MOD-IV 87809-1	2	
..1	418-0034	PLUG,BNC DUAL CRIMP 1-227079-6	2	
..1	420-4105	SCREW,4-40X.312,S.S. PH	2	
..1	421-4008	4-40 KEP NUT	2	
..1	471-0954	PANEL,STATUS,FM100C,SCREENED	-1	
....2	471-0954-009	PANEL,STATUS,FM100C, UNSCREENED	1	
..1	471-0954-003	PANEL,STATUS,FM100C,CANADA	1	
....2	471-0954-109	PANEL,STATUS,FM100C,CBC,UNSCREENED	1	
..1	591-0001	PLATE,FCC ID	-1	
..1	592-0035	PLATE,ID,CANADA	1	
..1	597-1002-001	INSTRUCTION MANUAL, FM 100C FM EXCITER (CANADA)	1	
..1	601-1800	WIRE,AWG18 19/30 BLK	1.5	



BOM LEVEL	PART NO.	DESCRIPTION	QTY	REF. DES.
..1	601-2209	WIRE,AWG22,7/30 WHT	4	
..1	621-1359	CBL,COAX,RG316/U,50 OHM	2	
..1	909-1101-204	FM-100C, 100W XMTR, 117V 50/60 HZ	1	
....2	140-0036	VARISTOR,V275LA20A	2	
....2	330-0800	FUSE,8A,250V,3AG,FAST ACTING	1	F1
....2	334-0100	FUSE,1A MDL SLO BLO 250V	2	
....2	360-0003	FERRITE BEAD,.291 DIA	2	
....2	360-6504	FUSE,LINE FILTER MOD,120/240V	1	
....2	370-4390	XFMR,TOROID 115/230,50/60HZ (NOTE!)	1	
....2	380-4600	FAN,4 1/2	1	
....2	380-5502	FILTER,FAN	1	
....2	380-6307	FINGER GUARD,FAN,4.125 CENTERS	1	
....2	400-0024	SHOCK MT,MODULATED OSC FX50	1	
....2	402-0000	TY-RAP	11	
....2	402-0006	MT,ADH BACKED,FOR CBL TIES	2	
....2	402-0008	MTG DEVICE,FOR #6SCR,TIE CBL	2	
....2	402-0051	TY-RAP, W/FLAG	1	
....2	415-1010	FUSE CLIP,LITTLEFUSE,101002	2	
....2	415-1011	FUSE CLIP,LITTLEFUSE,105002	1	
....2	415-2012	FUSEHOLDER,PANEL MOUNT, 10A	2	
....2	417-0016	CONN,BNC,RF,UG1094A/U,AMPHENOL	2	
....2	417-0053	SKT,CONN 641294-1 AMP	8	
....2	418-0240	PLUG,FEM,4PIN	1	
....2	420-0817	ASSY,FEMALE SCREWLOCK 205817-1	1	
....2	420-4020	SCREW,M.4X12,LENGTH S.S. PAN SL HD	4	
....2	420-4105	SCREW,4-40X.312,S.S. PH	6	
....2	420-4110	SCREW,4-40X.625,S.S. PH	4	
....2	420-6104	SCREW,6-32X.250,S.S. PH	8	



BOM LEVEL	PART NO.	DESCRIPTION	QTY	REF. DES.
....2	420-6105	SCREW,6-32X.312,S.S. PH	6	
....2	420-6106	SCREW,6-32X.375,S.S. PH	14	
....2	420-6108	SCREW,6-32X.500,S.S. PH	4	
....2	420-6112	SCREW,6-32X.750,S.S. PH	2	
....2	420-8006	SCREW,8-32X.375,S.S. PH FLH UC	4	
....2	420-8107	SCREW,8-32X.437,S.S. PHH	12	
....2	420-8624	SCREW,8-32X1.500,S.S. SL HD	1	
....2	421-1102	RIV,BLD,DOMED 3/32	2	
....2	421-1113	RIV,CLOSED-END .125 X .316L	2	
....2	421-4008	4-40 KEP NUT	12	
....2	421-6001	6-32 S.S. HEX THIN NUT	2	
....2	421-6008	6-32 KEP NUT	10	
....2	421-8028	NUT,JAM,1/2-28 UNEF-2B	5	
....2	422-6106	SCREW,SEMS 6-32 X 3/8 PAN PH. ST."	12	
....2	422-6107	SCREW,SEMS 6-32 X 7/16 PAN PH.ST."	1	
....2	423-3004	5/16 LOCK INT TOOTH THIN	2	
....2	423-6002	#6 LOCK SPLIT	23	
....2	423-6011	#6 FLAT .310 X .160 X .030	1	
....2	423-8001	#8 FLAT .375 X .170 X .025	1	
....2	423-8002	#8 LOCK SPLIT	17	
....2	423-9002	WASH,INT TOOTH,1/2	5	
....2	441-0131	STOFF,ALUM 1/4HEX 5/16M/FEM632	6	
....2	441-8217	STOFF,ALUM 1/4HEX X 5/8 6-32	5	
....2	465-0090-101	ANGLE,UPPER FRT PNL,CE EXCITER	1	
....2	465-0091-100	ANGLE,LOWER FRT PNL,FX50	1	
....2	466-0093	ANGLE,FRONT PANEL MOUNT,FX50	2	
....2	467-0178	BOOT,INSULATING FOR 360-6504	1	
....2	467-1003	OVERLAY,FX50	1	



BOM LEVEL	PART NO.	DESCRIPTION	QTY	REF. DES.
....2	469-0365	FINGER STOCK,1S197520A	32	
....2	469-0365-1	STRIP,RFI SHIELD	2	
.....3	469-0365	FINGER STOCK,1S197520A	2.75	
....2	469-0366-1	STRIP,RFI SHIELD 1.25	4	
.....3	469-0366	FINGER STOCK (NOTE!!!!)	1.25	
....2	469-0366-2	STRIP,RFI SHIELD 4.25	6	
.....3	469-0366	FINGER STOCK (NOTE!!!!)	4.25	
....2	471-0360	COVER,AFC/PLL PCB FX50	1	
.....3	471-0360-009	COVER,AFC/PLL PCB UNSCREENED	1	
....2	471-0584-100	COVER, TOP, FM250C/E	1	
....2	471-0795	SHIELD,FRONT PANEL PCB,FX-50	1	
.....3	471-0795-009	SHLD,FRT PNL PCB,FX-50,UNSCRND	1	
....2	471-0954	PANEL,STATUS,FM100C,SCREENED	1	
.....3	471-0954-009	PANEL,STATUS,FM100C, UNSCREENED	1	
....2	471-0955-100	PANEL,REAR,FM100C/E,SCREENED	1	
....2	471-0956-100	CHASSIS,FM100C/E	1	
....2	471-0965	GUARD, AFC/PLL, FM100C	1	
....2	471-0966	SHIELD, AFC/PLL, FM100C	1	
....2	471-5289-002	BRACKET,FUSE HOLDER,FM100,SCREENED	1	
.....3	471-5289	BRACKET,FUSE HOLDER,FX50,FM100,FM250,UNSCREENED	1	
....2	474-0300	PLATE,MODULATED OSC FX50	1	
....2	486-0004	HANDLE 1 3/4	2	
....2	486-0014	FERRULE,BLK,FOR .25 DIA HANDLE	4	
....2	488-0010	LATCH,LO-PROFILE 27-10-501-50	2	
....2	540-0013-100	PWR SPLY,+28VDC,95-252VAC, WITH FAN	1	
....2	591-0001	PLATE,FCC ID	1	
....2	594-0095	LABEL,1EC LINE RCPT 700-0152	1	



BOM LEVEL	PART NO.	DESCRIPTION	QTY	REF. DES.
....2	594-0250	LABEL,CAUTION,TOP COVER,FM EXC	1	
....2	601-1802	WIRE,AWG18,19/30 RED (*NOTE)	0.25	
....2	611-0060	TUB, HT SHK, 1/16	0.125	
....2	611-1250	TUB,HT SHK,1/8	1	
....2	611-2500	TUB,HT SHK,1/4	0.5	
....2	690-1200	TUB,BLK,PVC 105C,1/2	0.25	
....2	700-0145	FILM,2 DOUBLE ADHESIVE #467	0.003	
....2	919-0104	ASSY PCB,AFC/PLL	1	
.....3	000-3302	CAP,CER,DISC,3.3PF,1000V	1	C59
.....3	001-5004	CAP,CER,DISC,5PF,500V,NPO	4	C15, C16, C56, C57
.....3	003-1054	CAP,CER,MNLY,.1uF,50V,20%	24	C1, C3, C5, C6, C7, C8, C10, C12, C13, C21, C24, C27, C32, C33, C39, C43, C51, C55, C58, C60, C61, C64, C66, C41
.....3	020-4793	CAP,LYTIC,4700UF,16V,LOW LEAK	1	C35
.....3	023-1076	CAP,LYTIC,10uF,50V,STDUP	5	C42, C68, C70, C72, C73
.....3	023-1084	CAP,LYTIC,100MFD,35V,STDUP,RAD	11	C4, C15, C22, C23, C25, C49, C50, C52, C53, C69, C71
.....3	024-1064	CAP,LYTIC,1UF,50V,RAD	1	C29
.....3	024-3364	CAP,LYTIC,3.3UF,50V,NP	1	C30
.....3	024-3374	CAP,LYTIC,33UF,35V,STDUP	1	C37
.....3	024-4764	CAP,LYTIC,4.7UF,50V,20%,STDUP	1	C28
.....3	030-1053	CAP,MYLAR FILM,.1uF,100V,RAD	1	C31
.....3	030-2253	CAP,MYLAR FILM,.22UF,100V,RAD	4	C34, C38, C48, C54
.....3	031-1043	CAP,MYLAR FILM,.01UF,100V,RAD	3	C9, C11, C40
.....3	031-2243	CAP,MYLAR FILM,.022UF,200V,RAD	1	C26
.....3	038-4753	CAP,PYST,.47UF,100V	1	C44
.....3	040-2422	CAP,MICA,240PF	3	C45, C46, C47



BOM LEVEL	PART NO.	DESCRIPTION	QTY	REF. DES.
.....3	042-2531	CAP,MICA,2500PF,500V,1%	1	C62
.....3	042-3312	CAP,MICA,33PF,500V,5%	2	C65, C67
.....3	042-3922	CAP,MICA,390PF,100V,5%	6	C2, C17, C18, C19, C20, C36
.....3	042-5031	CAP,MICA,5000PF,500V,1%	1	C63
.....3	100-1031	RES,100 OHM,1/4W,1%,METAL	1	R22
.....3	100-1041	RES,1K OHM,1/4W,1%	7	R10, R42, R40, R44, R23, R84, R85
.....3	100-1051	RES,10K OHM,1/4W,1%	15	R6, R13, R37, R15, R16, R24, R46, R47, R48, R95, R75, R76, R50, R103, R67,
.....3	100-1111	RES,118 OHM,1/4W,1%	1	R32
.....3	100-1231	RES,121 OHM,1/4W,1%	3	R21, R97, R99
.....3	100-1551	RES,15K OHM,1/4W,1%	4	R25, R26, R27, R51
.....3	100-1731	RES,174 OHM,1/4W,1%	1	R59
.....3	100-2723	RES,27 OHM,1/4W,5%	1	R34
.....3	100-3031	RES,301 OHM,1/4W,1%	1	R57
.....3	100-3951	RES,39.2K OHM,1/4W,1%	1	R9
.....3	100-4773	RES,4.7MEG OHM,1/4W,5%	1	R43
.....3	100-5041	RES,4.99K OHM,1/4W,1%	4	R29, R30, R88, R90
.....3	100-5663	RES,560K OHM,1/4W,5%	1	R19
.....3	103-1007	RES,1 MEG OHM,1/4W,1%,METAL	8	R71, R72, R79, R77, R86, R89, R70, R78
.....3	103-1021	RES,10 OHM,1/4W,1%,METAL	1	R1
.....3	103-1062	RES,100K OHM,1/4W,1%,METAL	5	R17, R18, R64, R65, R66
.....3	103-1215	RES,12.1K OHM,1/4W,1%,METAL	1	R11
.....3	103-1331	RES,1.33K OHM,1/4W,1%,METAL	2	R98, R100
.....3	103-1375	RES,13.7K OHM,1/4W,1%,METAL	1	R101
.....3	103-1504	RES,1.5K OHM,1/4W,1%,METAL	1	R28,

BOM LEVEL	PART NO.	DESCRIPTION	QTY	REF. DES.
.....3	103-1745	RES,17.4K OHM,1/4W,1%,METAL	1	R82
.....3	103-1825	RES,18.2K OHM,1/4W,1%,METAL	1	R92
.....3	103-2213	RES,221 OHM,1/4W,1%,METAL	1	R33
.....3	103-2673	RES,267 OHM,1/4W,1%,METAL	5	R7, R14, R38, R93, R94
.....3	103-3014	RES,3.01K OHM,1/4W,1%,METAL	1	R83
.....3	103-3323	RES,332 OHM,1/4W,1%,METAL	2	R2, R8
.....3	103-3324	RES,3.32K OHM,1/4W,1%,METAL	2	R4, R5
.....3	103-3631	RES,365 OHM,1/4W,1%,METAL	1	R20
.....3	103-3836	RES,383K OHM,,1/4W,1%,METAL	1	R39
.....3	103-4361	RES,432K OHM,1/4W,1%,METAL	1	R53
.....3	103-4753	RES,475 OHM,1/4W,1%,METAL	2	R45, R61
.....3	103-4755	RES,47.5K OHM,1/4W,1%,METAL	1	R31
.....3	103-4951	RES,49.9K OHM,1/4W,1%,METAL	2	R36, R12
.....3	103-5112	RES,51.1 OHM,1/4W,1%,METAL	2	R3, R74
.....3	103-5113	RES,511 OHM,1/4W,1%,METAL	1	R49
.....3	103-5624	RES,5.62K OHM,1/4W,1%,METAL	1	R41
.....3	103-6193	RES,619 OHM,1/4W,1%,METAL	1	R87
.....3	103-6194	RES,6.19K OHM,1/4W,1%,METAL	2	R54, R62
.....3	103-6346	RES,634K OHM,1/4W,1%,METAL	1	R60
.....3	103-7326	RES,732K OHM,1/4W,1%,METAL	1	R58
.....3	103-7503	RES,750 OHM,1/4W,1%,METAL	1	R55
.....3	103-7541	RES,7.50K OHM,1/4W,1%,METAL	2	R68, R80
.....3	103-8255	RES,82.5K OHM,1/4W,1%,METAL	1	R35
.....3	103-8256	RES,825K OHM,1/4W,1%,METAL	1	R56
.....3	175-1034	RES,TRMR,1K,VERT ADJ	1	R63
.....3	177-5044	RES,TRMR,5K,VERT ADJ	3	R69, R81, R91
.....3	177-5054	RES,TRMR,50K,VERT ADJ	1	R52



BOM LEVEL	PART NO.	DESCRIPTION	QTY	REF. DES.
.....3	200-0009	DIODE,ZENER,1N 4739A	2	D17, D19
.....3	203-4005	DIODE,1N4005	2	D16, D18
.....3	203-4148	DIODE,1N4148	7	D1, D2, D3, D4, D5, D6, D7,
.....3	211-3904	TSTR,2N3904	4	Q1, Q2, Q3, Q4
.....3	220-0317	VR,LM317LZ TO92	1	U6
.....3	220-4040	IC,MC14040B 12-BIT BINARY	1	U2
.....3	220-5151	IC,MC145151 SYNTHESIZER	1	U9
.....3	220-8658	IC,SP8658 PRESCALER,DIVIDE/20	1	U8
.....3	221-0072	AMP,OP,BIFET TLO72CP	1	U11
.....3	221-0358	AMP,DUAL OP,LM358	1	U13
.....3	221-5532-001	IC,NE-5532AN	4	U10, U14, U15, U16
.....3	226-0392	RES NETWORK, 10K	2	R73, R96
.....3	227-0317	VR,LM317T,LM317KC	1	U17
.....3	227-0337	VOLTAGE REGULATOR,3 TERM, NEG	1	U18
.....3	228-0290	IC, 74LS90N (N)	1	U1
.....3	228-4013	IC,MC14013B	1	U4
.....3	228-4073	IC,MC14073B	1	U3
.....3	228-4538	IC,MC14538B NATL SEMICONDUCTOR	2	U5, U12
.....3	323-7345	LDR,LED TYPE,VACTEC VTL 5C2	3	LDR1, LDR2, LDR3
.....3	323-9224	IND,LED,GRN,521-9270	5	DS1, DS2, DS3, DS4, DS5
.....3	340-0002	SW,4 POS,SPST,8-PIN DIP	3	S1, S2, S3
.....3	340-0004	SW,JUMPER PROGRAMMABLE	5	P3, P4, P5A, P5B, P10
.....3	360-2200	CHOKE,RF 2.2UH 550MA	2	L1, L2
.....3	364-0047	COIL, MOLDED .47UH	1	L3
.....3	370-0002	XMFR,RF,MCL,T4-1 (NOTE)	1	T1
.....3	390-0001	OSC,XTAL PC MT TCXO 10MHZ	1	Y1

BOM LEVEL	PART NO.	DESCRIPTION	QTY	REF. DES.
.....3	402-0000	TY-RAP	2	
.....3	407-0074	SPR,LED .25 ODX.147 1D X.22L	5	
.....3	413-1597	TERM,TURRET,2 SHLDR,.219,GOLD FLASH	5	
.....3	417-0003	CONN,HEADER 3 PIN	3	J3,J4, J10
.....3	417-0004	JACK,TEST,RIGHT ANGLE PC MT	1	TP1
.....3	417-0200	CONN,HEADER 20 PIN	2	J5, J8, J2, J1,
.....3	417-0804	SOCKET,8-PIN DIP,BURNDY	6	XU10, XU11, XU13, XU14, XU15, XU16
.....3	417-1404	SOCKET,14-PIN DIP	3	XU1, XU3, XU4
.....3	417-1604	SKT,16-PIN,DIP	5	XU2, XU5, XU12, XR73, XR96
.....3	417-2804	SOCKET,IC 28-PIN,DIP,HI RELIABILITY	1	XU9
.....3	420-6104	SCREW,6-32X.250,S.S. PH	2	
.....3	423-6002	#6 LOCK SPLIT	2	
.....3	426-6000	PEM NUT,#6-32 KFS2-632	6	
.....3	519-0104	PCB,BLANK,AFC/PLL (scan)	1	
.....3	700-0148	TAPE,JOINING 3/4	0.001	
.....3	949-1050-001	ASSY, CABLE, AFC-PLL (SBCM)	1	
.....4	402-0051	TY-RAP, W/FLAG	1	
.....4	418-0034	PLUG,BNC DUAL CRIMP 1-227079-6	1	
.....4	621-1359	CBL,COAX,RG316/U,50 OHM	1.25	
.....4	690-0023	TUB,PVC105/7 BLK,ALPHA	1.25	
....2	919-0107-001	ASSY,PCB,P.S./CNTL,FM100C	1	
.....3	001-1014	CAP,CER,DISC,10pF,1KV,10%,NPO	2	C3, C4,
.....3	003-1054	CAP,CER,MNLY,.1uF,50V,20%	9	C5, C6, C7, C16, C25, C28, C30, C33, C37,
.....3	014-1084	CAP,LYTIC,100UF,50V,INS	1	C15,
.....3	014-1094	CAP,LYTIC,1000UF,50V,INS	2	C24, C29,
.....3	023-1076	CAP,LYTIC,10uF,50V,STDUP	1	C17,



BOM LEVEL	PART NO.	DESCRIPTION	QTY	REF. DES.
.....3	023-1084	CAP,LYTIC,100MFD,35V,STDUP,RAD	7	C26, C27, C31, C32, C35, C36, C38
.....3	024-1064	CAP,LYTIC,1UF,50V,RAD	1	C11
.....3	024-2274	CAP,LYTIC,22UF,100V,STDUP	1	C34,
.....3	030-1033	CAP,CER MOLDED,.001UF,200V,10%	2	C12, C20,
.....3	031-1043	CAP,MYLAR FILM,.01UF,100V,RAD	2	C8, C10,
.....3	040-5013	CAP,MICA,50PF,500V,5%	1	C13
.....3	042-3922	CAP,MICA,390PF,100V,5%	5	C1, C2, C14, C18, C19,
.....3	100-1013	RES,1 OHM,1/4W,5%	1	R64
.....3	100-1041	RES,1K OHM,1/4W,1%	6	R6, R61, R37, R12, R50, R59,
.....3	100-1051	RES,10K OHM,1/4W,1%	10	R4, R8, R30, R28, R32, R33, R42, R43, R55, R65,
.....3	100-1231	RES,121 OHM,1/4W,1%	2	R76, R78
.....3	100-1551	RES,15K OHM,1/4W,1%	2	R24, R22,
.....3	100-1841	RES,1.82K OHM,1/4W,1%	6	R77, R79, R1, R2, R36, R11,
.....3	103-1007	RES,1 MEG OHM,1/4W,1%,METAL	5	R21, R34, R44, R45, R87,
.....3	103-1021	RES,10 OHM,1/4W,1%,METAL	2	R60, R51,
.....3	103-1025	RES,10.2K OHM,1/4W,1%,METAL	1	R15
.....3	103-1062	RES,100K OHM,1/4W,1%,METAL	5	R3, R7, R23, R47, R41,
.....3	103-1261	RES,121K OHM,1/4W,1%,METAL	2	R82, R86,
.....3	103-1331	RES,1.33K OHM,1/4W,1%,METAL	1	R14
.....3	103-1504	RES,1.5K OHM,1/4W,1%,METAL	1	R10,
.....3	103-1561	RES,150K OHM,1/4W,1%,METAL	1	R31,
.....3	103-2212	RES,22.1 OHM,1/4W,1%,METAL	1	R54,
.....3	103-2241	RES,2.21K OHM,1/4W,1%,METAL	1	R39
.....3	103-3324	RES,3.32K OHM,1/4W,1%,METAL	1	R29



BOM LEVEL	PART NO.	DESCRIPTION	QTY	REF. DES.
.....3	103-3325	RES,33.2K OHM,1/4W,1%,METAL	3	R35, R40, R48,
.....3	103-3631	RES,365 OHM,1/4W,1%,METAL	1	R75
.....3	103-3924	RES,3.92K OHM,1/4W,1%,METAL	2	R17, R19
.....3	103-4755	RES,47.5K OHM,1/4W,1%,METAL	8	R38, R85, R80, R81, R83, R84, R26, R57,
.....3	103-5141	RES,5.11K OHM,1/4W,1%,METAL	2	R13, R49,
.....3	103-6194	RES,6.19K OHM,1/4W,1%,METAL	2	R16, R18
.....3	103-6346	RES,634K OHM,1/4W,1%,METAL	1	R46
.....3	103-6813	RES,681 OHM,1/4W,1%,METAL	1	R53
.....3	103-6814	RES,6.81K OHM,1/4W,1%,METAL	1	R20
.....3	110-1023	RES,10 OHM,1/2W,5% NOTE	1	R56
.....3	130-1000	RES,.1 OHM,5W,1%,WW	4	R70, R71, R62, R63
.....3	140-0018	VARISTOR,V477A1 47V GE	1	MOV1
.....3	178-1054	RES,TRMR,10K,HORZ ADJ	1	R25
.....3	178-2044	RES,TRMR,2K,HORZ ADJ	2	R5, R27
.....3	178-5044	RES,TRMR,5K,HORZ ADJ	1	R9
.....3	178-5046	RES,TRMR,5K,1/2W,MT	1	R52
.....3	200-0015	DIODE,ZENER,15V,1W,1N4744A	1	D27
.....3	201-4728	DIODE,ZENER,1N4728	2	D29, D30,
.....3	202-0502	RECT,3A,200V,IN5402	1	D18
.....3	203-4005	DIODE,1N4005	15	D13, D14, D16, D17, D19, D20, D12, D15, D21, D22, D23, D24, D25, D26, D32,
.....3	203-4148	DIODE,1N4148	8	D1, D2, D3, D4, D8, D11, D28, D31,
.....3	210-3906	2N3906 PNP 40V 2A .35W 250MHZ	2	Q3, Q5,
.....3	211-3904	TSTR,2N3904	2	Q4, Q2,
.....3	221-0358	AMP,DUAL OP,LM358	3	U1, U2, U3
.....3	227-0317	VR,LM317T,LM317KC	1	U5



BOM LEVEL	PART NO.	DESCRIPTION	QTY	REF. DES.
.....3	227-0337	VOLTAGE REGULATOR,3 TERM, NEG	1	U6
.....3	227-0723	IC,VR,UA723	1	U4
.....3	330-1500	FUSE,3AG 15A 32V	1	F1
.....3	340-0004	SW,JUMPER PROGRAMMABLE	1	P22
.....3	345-0863	SW,SLD,DPDT,SWCFT C56206L2	3	S1, S2, S3
.....3	407-0141	COVER,FUSE,STD 840836 RICHCO	1	
.....3	413-0025	TERM,TURRET,2 SHLDR,.360,GOLD FLASH	8	E1, E2, E3, E4, E5, E6, E7, E8,
.....3	413-0106	TERM,TEST POINT,OVAL,RED	8	TP1, TP2, TP3, TP4, TP5, TP6, TP7, TP8
.....3	415-2068	CLIP,FUSE,15AMP,LITTLEFUSE,102071	2	XF1, XF2
.....3	417-0003	CONN,HEADER 3 PIN	1	J22
.....3	417-0169	CONN 15 PIN 640503-1 AMP	1	J11
.....3	417-0200	CONN,HEADER 20 PIN	2	J12, J13, J23
.....3	417-0700	CONN,PCB MT,2PIN	1	J20
.....3	417-0804	SOCKET,8-PIN DIP,BURNDY	3	XU1, XU2, XU3
.....3	417-1404	SOCKET,14-PIN DIP	1	XU4
.....3	418-0255	CONN,MALE,4PIN	1	J21
.....3	418-0900	CONN,9 PIN 640501-5 AMP	1	J10
.....3	420-6105	SCREW,6-32X.312,S.S. PH	2	
.....3	423-6002	#6 LOCK SPLIT	2	
.....3	426-6000	PEM NUT,#6-32 KFS2-632	2	
.....3	455-0075	HEATSINK,TO-220 PKG, .85 TALL	2	
.....3	519-0107-001	PCB,MACH,P.S./CNTL,FM-100C (scan)	1	
....2	919-0108-001	ASSY,PCB,METERING, FM100C	1	
.....3	001-5004	CAP,CER,DISC,5PF,500V,NPO	2	C8, C11

BOM LEVEL	PART NO.	DESCRIPTION	QTY	REF. DES.
.....3	003-1054	CAP,CER,MNLY,.1uF,50V,20%	35	C2, C3, C4, C9, C10, C15, C17, C18, C19, C21, C22, C24, C27, C28, C30, C31, C34, C35, C36, C37, C38, C39, C40, C41, C42, C43, C44, C45, C50, C52, C54, C56, C57, C61, C63,
.....3	020-1085	CAP,LYTIC,100UF,50V,STDUP,NP	1	C1
.....3	023-1076	CAP,LYTIC,10uF,50V,STDUP	9	C12, C32, C33, C51, C53, C55, C58, C60, C62,
.....3	023-1084	CAP,LYTIC,100MFD,35V,STDUP,RAD	4	C46, C47, C48, C49
.....3	024-2274	CAP,LYTIC,22UF,100V,STDUP	1	C59
.....3	030-1053	CAP,MYLAR FILM,.1uF,100V,RAD	1	C29
.....3	031-1043	CAP,MYLAR FILM,.01UF,100V,RAD	1	C13
.....3	040-5013	CAP,MICA,50PF,500V,5%	1	C26
.....3	042-3312	CAP,MICA,33PF,500V,5%	1	C14
.....3	042-3922	CAP,MICA,390PF,100V,5%	6	C6, C7, C16, C20, C23, C25
.....3	100-1041	RES,1K OHM,1/4W,1%	13	R18, R20, R98, R99, R100, R101, R102, R103, R104, R105, R106, R107, R13
.....3	100-1051	RES,10K OHM,1/4W,1%	13	R23, R19, R29, R38, R42, R52, R60, R66, R67, R68, R69, R70, R71
.....3	100-1083	RES,10MEG OHM,1/4W,5%	1	R26
.....3	100-1111	RES,118 OHM,1/4W,1%	1	R110
.....3	100-1231	RES,121 OHM,1/4W,1%	5	R78, R80, R82, R88, R108
.....3	100-1873	RES,1.8MEG OHM,1/4W,5%	1	R59
.....3	100-2041	RES,2K OHM,1/4W,1%	1	R40
.....3	100-2283	RES,22MEG OHM,1/4W,5%	2	R21, R37,



BOM LEVEL	PART NO.	DESCRIPTION	QTY	REF. DES.
.....3	100-3051	RES,30.1K OHM,1/4W,1%	1	R55
.....3	100-6031	RES,604 OHM,1/4W,1%	1	R89,
.....3	103-1007	RES,1 MEG OHM,1/4W,1%,METAL	3	R9, R39, R54,
.....3	103-1021	RES,10 OHM,1/4W,1%,METAL	3	R33, R34, R36,
.....3	103-1062	RES,100K OHM,1/4W,1%,METAL	8	R5, R31, R53, R64, R65, R87, R97, R111,
.....3	103-1214	RES,1.21K OHM,1/4W,1%,METAL	3	R90, R92, R94,
.....3	103-1274	RES,1.27K OHM,1/4W,1%,METAL	1	R11
.....3	103-1331	RES,1.33K OHM,1/4W,1%,METAL	2	R79, R81
.....3	103-1504	RES,1.5K OHM,1/4W,1%,METAL	1	R25
.....3	103-1695	RES,16.9K OHM,1/4W,1%,METAL	1	R48
.....3	103-1826	RES,182K OHM,1/4W,1%,METAL	1	R58
.....3	103-2003	RES,200 OHM,1/4W,1%,METAL	2	R75, R76
.....3	103-2051	RES,20K OHM,1/4W,1%,METAL	1	R12
.....3	103-2264	RES,2.26K OHM,1/4W,1%,METAL	1	R109
.....3	103-2341	RES,2.32K OHM,1/4W,1%,METAL	1	R16
.....3	103-2495	RES,24.9K OHM,1/4W,1%,METAL	1	R14
.....3	103-2673	RES,267 OHM,1/4W,1%,METAL	1	R63
.....3	103-2675	RES,26.7K OHM,1/4W,1%,METAL	3	R22, R84, R86
.....3	103-2751	RES,27.4K OHM,1/4W,1%,METAL	1	R45
.....3	103-3014	RES,3.01K OHM,1/4W,1%,METAL	1	R47
.....3	103-3061	RES,301K OHM,1/4W,1%,METAL	1	R24
.....3	103-3631	RES,365 OHM,1/4W,1%,METAL	1	R83
.....3	103-4441	RES,4.42K OHM,1/4W,1%,METAL	1	R3
.....3	103-4755	RES,47.5K OHM,1/4W,1%,METAL	5	R57, R61, R62, R85, R96
.....3	103-4993	RES,499 OHM,1/4W,1%,METAL	7	R6, R91, R93, R95, R7, R8, R4,
.....3	103-4996	RES,499K OHM,1/4W,1%,METAL	1	R10

BOM LEVEL	PART NO.	DESCRIPTION	QTY	REF. DES.
.....3	103-5112	RES,51.1 OHM,1/4W,1%,METAL	2	R77, R112
.....3	103-5113	RES,511 OHM,1/4W,1%,METAL	1	R15
.....3	103-5141	RES,5.11K OHM,1/4W,1%,METAL	1	R35
.....3	103-5764	RES,5.76K OHM,1/4W,1%,METAL	1	R1
.....3	103-6193	RES,619 OHM,1/4W,1%,METAL	3	R72, R73, R74,
.....3	103-8254	RES,8.25K OHM,1/4W,1%,METAL	1	R30
.....3	103-8255	RES,82.5K OHM,1/4W,1%,METAL	1	R27
.....3	103-8453	RES,845 OHM,1/4W,1%,METAL	6	R44, R46, R49, R51, R2, R43
.....3	103-8454	RES,8.45K OHM,1/4W,1%,METAL	1	R50
.....3	103-9314	RES,9.31K OHM,1/4W,1%,METAL	1	R17
.....3	177-1054	RES,TRMR,10K,VERT ADJ	1	R56
.....3	177-2044	RES,TRMR,2K,VERT ADJ	1	R41
.....3	177-2054	RES,TRMR,20K,VERT ADJ	1	R28
.....3	200-4733	DIODE,ZENER,1N4733A, 5%	1	D14
.....3	200-4742	DIODE,ZENER,1N4742A	2	D18, D19
.....3	200-5363	DIODE,ZENER,IN5363 30V SW	1	D25
.....3	201-2800	DIODE,HOT CARRIER	6	D3, D4, D24, D5, D6, D7,
.....3	203-4005	DIODE,1N4005	3	D20, D21, D23
.....3	203-4148	DIODE,1N4148	12	D1, D2, D8, D9, D10, D11, D12, D13, D15, D16, D17, D22
.....3	210-0271	TSTR,FET J271	1	Q7
.....3	210-3906	2N3906 PNP 40V 2A .35W 250MHZ	3	Q3, Q4, Q5
.....3	211-3904	TSTR,2N3904	3	Q1, Q2, Q6
.....3	220-0317	VR,LM317LZ TO92	1	U17
.....3	220-7136	A/D,3-1/2 DIGIT LCD,ICL7136CPL	1	U7
.....3	221-0074	AMP,OP,BIFET TLO74CW	2	U1, U2
.....3	221-4227	AMP,DUAL OP	2	U4, U5



BOM LEVEL	PART NO.	DESCRIPTION	QTY	REF. DES.
.....3	225-0004	IC,CD4066BE	2	U3, U6
.....3	226-0392	RES NETWORK, 10K	1	R32
.....3	226-2004	MC1416,ULN2004 7-DRLNGTNS DP16	1	U12
.....3	227-0317	VR,LM317T,LM317KC	2	U14, U22
.....3	227-0337	VOLTAGE REGULATOR,3 TERM, NEG	2	U15, U16
.....3	228-4028	IC,MC14028B	1	U11
.....3	228-4071	IC,MC14070 QUAD EXCLUSIVE OR	1	U13
.....3	228-4076	IC,MC14076 QUAD REGISTER	1	U10
.....3	228-4532	IC,MC14532B 8-BIT PRIOR ENCOD	1	U9
.....3	228-4538	IC,MC14538B NATL SEMICONDUCTOR	1	U8
.....3	229-0555	IC,TIMER,NE555N	1	U18
.....3	229-3914	DRIVER,DOT/BAR DISPLAY LM3914N	3	U19, U20, U21
.....3	320-0016	LED,GRN PANEL INDICATOR	7	DS2, DS3, DS4, DS5, DS18, DS19, DS20,
.....3	320-0017	LED,RED MV57173 I OR H	9	DS1, DS6, DS7, DS8, DS13, DS14, DS15, DS16, DS17,
.....3	320-0021	DISP,LCD,4-DIGIT,0.7	1	DS12
.....3	320-4164	LED ARRAY,GRN,10 BAR	2	DS9, DS10
.....3	320-7164	LED ARRAY RED MV57164 INTEN G OR H	1	DS11
.....3	340-0107	KEYSWITCH,SI20601H1 SECME (NOTE)	6	S1, S2, S3, S4, S5, S6,
.....3	402-0000	TY-RAP	1	
.....3	413-1597	TERM,TURRET,2 SHLDR,.219,GOLD FLASH	7	E1, TP1, TP2, TP3, TP4, TP5, TP6
.....3	417-0172	SKT, 20 PIN SINGLE ROW,SAMTEC	2	
.....3	417-0200	CONN,HEADER 20 PIN	1	J14
.....3	417-0804	SOCKET,8-PIN DIP,BURNDY	3	XU4, XU5, XU18
.....3	417-1404	SOCKET,14-PIN DIP	5	XU1, XU2, XU3, XU6, XU13

BOM LEVEL	PART NO.	DESCRIPTION	QTY	REF. DES.
.....3	417-1604	SKT,16-PIN,DIP	6	XU8, XU9, XU10, XU11, XU12, XR32
.....3	417-1804	SOCKET,18-PIN,DIP,HIGH RELIABILITY	3	XU19, XU20, XU21
.....3	417-4005	SOCKET,40-PIN,DIP,HIGH RELIABILITY	1	XU7
.....3	420-6104	SCREW,6-32X.250,S.S. PH	4	
.....3	423-6002	#6 LOCK SPLIT	4	
.....3	426-6000	PEM NUT,#6-32 KFS2-632	4	
.....3	449-0006	TEST CLIP,COILED	1	
.....3	519-0108	PCB,BLANK,METERING (scan)	1	
....2	919-0190	ASSY,PCB,FM EXITER INTERFACE	1	
.....3	103-5141	RES,5.11K OHM,1/4W,1%,METAL	1	R1
.....3	340-0004	SW,JUMPER PROGRAMMABLE	1	P3Replaced 417-0309 on 06/21/2007 12:49:19
.....3	412-1600	BARR STP,16 POS,BEAU	1	J2
.....3	417-0003	CONN,HEADER 3 PIN	1	J3
.....3	417-2503	RCPT,25 PIN D, MALE	1	J1
.....3	519-0190	PCB,MACH,FM EXCITER INTERFACE	1	
....2	919-0445	ASSY,PCB,RFI FILTER (SBCM)	1	
.....3	002-1034	CAP,CER,DISC,.001UF,1000V	3	C301, C302, C303
.....3	003-1054	CAP,CER,MNLY,.1uF,50V,20%	8	C304, C305, C306, C307, C308, C309, C310, C311
.....3	031-2033	CAP,MYLAR FILM,.0022uF,100V,10%	2	C312, C313,
.....3	038-4750	CAP,POLY,.47MFD,50V,10% OR BETTER	2	C324, C325
.....3	040-1022	CAP,MICA,100PF,500V,RAD	10	C314, C316, C318, C320, C322, C326, C327, C328, C329, C330
.....3	047-1035	CAP,FIL,EMI SUPPR,1000pF,3-PIN	3	FL312, FL313, FL319
.....3	100-1041	RES,1K OHM,1/4W,1%	3	R302, R306, R307,
.....3	100-1051	RES,10K OHM,1/4W,1%	1	R303,



BOM LEVEL	PART NO.	DESCRIPTION	QTY	REF. DES.
.....3	100-6031	RES,604 OHM,1/4W,1%	1	R308,
.....3	103-5112	RES,51.1 OHM,1/4W,1%,METAL	2	R310, R311
.....3	103-8254	RES,8.25K OHM,1/4W,1%,METAL	2	R304, R305,
.....3	130-2423	RES,240 OHM,2W,5%	2	R301, R309,
.....3	201-0012	ZENER VOLTAGE SUPPRESSOR,+/-12V	12	D310, D311, D312, D313, D314, D315, D316, D317, D318, D319, D320, D321
.....3	201-0027	ZENER VOLTAGE SUPPRESSOR,+/-27V	4	D302, D303, D304, D305
.....3	201-0040	ZENER VOLTAGE SUPPRESSOR,+/-18V	4	D306, D307, D308, D309
.....3	203-4005	DIODE,1N4005	1	D301,
.....3	270-0065	REL,SPDT,12VDC,DIP	1	K301,
.....3	340-0004	SW,JUMPER PROGRAMMABLE	2	P308, P309
.....3	364-4662	INDU,1.0MH	2	L303, L305,
.....3	411-0001	FILTER,EMI 10,000PF 3PIN	21	FL301, FL302, FL303, FL304, FL305, FL306, FL307, FL308, FL309, FL310, FL311, FB312, FB313, FL314, FL315, FL316, FL319, FL320, FL321, FL322, FL323
.....3	417-0003	CONN,HEADER 3 PIN	2	J308, J309
.....3	417-0039-VLX	CONN,BNC,PCB,VERT MOUNT,VALOX BODY	5	J305, J301, J302, J303, J304
.....3	417-0200	CONN,HEADER 20 PIN	1	J307,
.....3	417-1276	CONN,PCB,12 PIN	1	J306
.....3	417-2502-FER	RCPT,25 PIN D,FEMALE,FERITE FILTER	1	J1
.....3	420-6105	SCREW,6-32X.312,S.S. PH	10	
.....3	423-6002	#6 LOCK SPLIT	20	
.....3	426-6000	PEM NUT,#6-32 KFS2-632	10	

BOM LEVEL	PART NO.	DESCRIPTION	QTY	REF. DES.
.....3	441-0184	STOFF,6-32,MALE-FEMALE,3/8	10	
.....3	519-0445-001	PCB,MACH,RFI FILTER	1	
.....4	519-0445	PCB,MACH,RFI FILTER BREAKAWAY	0.5	
.....3	519-0445-002	PCB,MACH,RFI FILTER SHIELD	1	
.....4	519-0445	PCB,MACH,RFI FILTER BREAKAWAY	0.5	
....2	949-0147-002	ASSY,HRNS,FM-100E (SBCM)	1	
.....3	402-0000	TY-RAP	40	
.....3	410-0065	LUG,TERM #6 RING CRIMP #22 AWG	4	
.....3	410-1488	LUG,TERM #6 SPADE #10-12	2	
.....3	410-1489	LUG,TERM #6 SPADE #16-22	3	
.....3	410-1493	LUG,TERM #6 RECT 12-10 329697	1	
.....3	417-0036	PIN CONN,AMP,350967-1	7	
.....3	417-0053	SKT,CONN 641294-1 AMP	54	
.....3	417-0059	CONN,9 PIN 1-640521-0 AMP	1	P10
.....3	417-0076	JACK,N PANEL FOR RG-142B/U	1	J19
.....3	417-0095	CONN,BNC RG/U142 31-326 AMPH	3	P18, P201, P202
.....3	417-0122	HSNG,20 POS MOD IV 3-87499-7	2	P14, P307
.....3	417-0123	HSNG,16 POS MOD IV 2-87499-9	1	P1
.....3	417-0148	HSNG,10 POS MOD 1V 1-87499-7	1	P2
.....3	417-0176	CONN,20 PIN FEM,AMP 1-350245-9	1	P15
.....3	417-0224	KEYING PLUG MOD IV 87077 AMP	3	
.....3	417-1401	HOUSING,SKT,14PIN,AMP MOD IV	2	P12, P13
.....3	417-2379	CONN,155OC HOUSING,AMP,MR	1	P11
.....3	417-8766	CONTACT,CRIMP,MOD-IV 87809-1	61	
.....3	418-0034	PLUG,BNC DUAL CRIMP 1-227079-6	2	P9, P17
.....3	418-0233	HSNG,CONN, 4P,1-640509-AMP	2	P25
.....3	418-0240	PLUG,FEM,4PIN	2	J25, P21
.....3	418-0701	CONN,HOUSING,2 PIN	1	P20



BOM LEVEL	PART NO.	DESCRIPTION	QTY	REF. DES.
.....3	418-1271	CONN,HOUSING,12PIN	1	P306
.....3	601-1800	WIRE,AWG18 19/30 BLK	51.6	
.....3	601-1800-054	WIRE,AWG 18,STRANDED,GREEN/YELLOW	1.677	
.....3	601-2200	WIRE,AWG22,7/30,PVC INS,BLK	0.934	
.....3	601-2209	WIRE,AWG22,7/30 WHT	85.5	
.....3	621-0001	CBL,COAX TEFLON RG 142B/U BELD	1.5	
.....3	621-1359	CBL,COAX,RG316/U,50 OHM	4.83	
.....3	622-8451	WIRE,BELD 8451,SHIELD,1PR	14.66	
.....3	693-0002	SLVG,1/4 EXPANDO FR BLACK"	3.791	
....2	959-0203	ASSY MODL,MODLTD. OSC. (SBCM)	1	
.....3	008-1020	CAP,FEEDTHRU,100PF 20% 250V	1	C21
.....3	008-1033	CAP,FEEDTHRU,1000PF,20%,500V	2	C19, C20
.....3	040-6223	CAP,MICA,620PF,300V,5%	1	C23
.....3	360-0003	FERRITE BEAD,.291 DIA	3	
.....3	364-0002	CHOKE,VK200-20/4B FERROXCUBE	1	L7
.....3	402-0000	TY-RAP	5	
.....3	402-0006	MT,ADH BACKED,FOR CBL TIES	1	
.....3	402-0008	MTG DEVICE,FOR #6SCR,TIE CBL	1	
.....3	410-1419	LUG,SOLDER 7/8	1	
.....3	417-0016	CONN,BNC,RF,UG1094A/U,AMPHENOL	2	J6, J9
.....3	420-4404	SCREW,4-40X.250,S.S. SHCS	7	
.....3	420-4504	SCREW,4-40X.250,S.S. PH	1	
.....3	420-4506	SCREW,4-40X.375,BR FLH SC	4	
.....3	423-4004	#4 LOCK EXT TOOTH	7	
.....3	470-0328	BRKT,BNC,MOD OSC	1	
.....3	479-6443-003	BOX,MOD.,MODULATED OSC FX50	1	
.....3	601-0022	WIRE,AWG22,BUSS	0.166	
.....3	611-2500	TUB,HT SHK,1/4	0.083	

BOM LEVEL	PART NO.	DESCRIPTION	QTY	REF. DES.
.....3	693-0220	TUB,TEFLON,TW,AWG22 NTL	0.249	
.....3	919-0106	ASSY PCB,MODLTD.OSC FX-50	1	
.....4	000-3302	CAP,CER,DISC,3.3PF,1000V	1	C16
.....4	001-5004	CAP,CER,DISC,5PF,500V,NPO	1	C15
.....4	009-4723	CAP,CER CHIP,470PF,200V,5%	2	C3, C22
.....4	023-1076	CAP,LYTIC,10uF,50V,STDUP	1	C6
.....4	023-1084	CAP,LYTIC,100MFD,35V,STDUP,RAD	2	C4, C7
.....4	040-1213	CAP,MICA,12PF,500V,5%	1	C2
.....4	042-3312	CAP,MICA,33PF,500V,5%	2	C1, C8
.....4	042-3922	CAP,MICA,390PF,100V,5%	9	C5, C9, C10, C11, C12, C13, C14, C17, C18
.....4	100-1031	RES,100 OHM,1/4W,1%,METAL	2	R12, R6
.....4	100-1041	RES,1K OHM,1/4W,1%	3	R7, R13, R14
.....4	100-1111	RES,118 OHM,1/4W,1%	1	R22
.....4	100-4561	RES,453K OHM,1/4W,1%	1	R10
.....4	103-1007	RES,1 MEG OHM,1/4W,1%,METAL	1	R9
.....4	103-1021	RES,10 OHM,1/4W,1%,METAL	4	R1, R11, R15, R20
.....4	103-1062	RES,100K OHM,1/4W,1%,METAL	1	R5
.....4	103-2213	RES,221 OHM,1/4W,1%,METAL	5	R4, R17, R18, R19, R21
.....4	103-2673	RES,267 OHM,1/4W,1%,METAL	1	R8
.....4	103-2744	RES,2.74K OHM,1/4W,1%,METAL	1	R16
.....4	103-3324	RES,3.32K OHM,1/4W,1%,METAL	1	R3
.....4	103-5112	RES,51.1 OHM,1/4W,1%,METAL	2	R23, R24
.....4	201-2800	DIODE,HOT CARRIER	3	D9, D10, D11
.....4	203-4005	DIODE,1N4005	1	D12
.....4	205-0109	DIODE,VARI-CAP TUNING	6	D2, D3, D4, D6, D7, D8
.....4	205-3201	DIODE,VARACTOR,KV3201 2-11PF	2	D1, D5



BOM LEVEL	PART NO.	DESCRIPTION	QTY	REF. DES.
.....4	211-0006	MPS-A06 NPN 80V .5A .3W 100MHZ	1	Q1
.....4	211-5109	TSTR,RF 2N5109 NPN	2	Q4, Q5
.....4	212-0310	TSTR,FET N CHAN RF J3100	2	Q2, Q3
.....4	360-3300	CHOKE,RF,3.3UH,380MA,9230-32	3	L1, L3, L6
.....4	364-0047	COIL, MOLDED .47UH	2	L4, L5
.....4	370-0106	COIL, MOD OSC., L2	1	L2
.....5	555-0106	LABOR, 370-0106	1	
.....5	610-0026	SMALL TRANS LINE	0.708	
.....4	409-0012	PAD,TSTR 520-021 BIVAR TO-5	2	
.....4	413-1597	TERM,TURRET,2 SHLDR,.219,GOLD FLASH	6	E1, E2, E3, E4, E5, E6
.....4	440-0018	STOFF,ANTI ROT 7/32 RND X 1/4	4	
.....4	519-0106	PCB,BLANK,MODLTD.OSC. (scan)	1	
.....3	949-1050	ASSY, CABLE, MOD OSC. (SBCM)	1	
.....4	402-0051	TY-RAP, W/FLAG	1	
.....4	417-0165	HSNG,5POS MOD IV S.ROW 87499-9	1	
.....4	417-0224	KEYING PLUG MOD IV 87077 AMP	1	
.....4	417-8766	CONTACT,CRIMP,MOD-IV 87809-1	4	
.....4	611-1250	TUB,HT SHK,1/8	2	
.....4	621-1359	CBL,COAX,RG316/U,50 OHM	2	
....2	959-0410	ASSY,LOW PASS FILTER,FM-100C	1	
.....3	420-4104	SCREW,4-40X.250,S.S. PH	8	
.....3	423-4002	#4 LOCK S.S. SPLIT	1	
.....3	479-6443	POMONA ELECTRONICS BOX,2906	1	
.....3	919-0411-002	ASSY, PCB, LPF, FM100C	1	
.....4	000-3302	CAP,CER,DISC,3.3PF,1000V	1	C202,
.....4	009-1513	CAP,CER CHIP,15PF,500V,5%	2	C208, C210
.....4	009-2713	CAP,CER CHIP,27PF,500V,5%	1	C204



BOM LEVEL	PART NO.	DESCRIPTION	QTY	REF. DES.
.....4	046-0007	CAP,MICA,RF,7PF	2	C206, C201,
.....4	096-0010	CAP,TRMR,CER,2-8PF,350V,LUG MNT,NPO	5	C203, C205, C209, C211, C213,
.....4	360-0145	COIL,L1,FM-1C LPF (SBCM)	1	L204
.....5	640-1200	WIRE,12GA,MAGNET	0.035	
.....4	360-0147	COIL,3.5 TURNS,LPF,FM100C (SBCM)	1	L203
.....5	601-0111	12 AWGBUSS .080 FLOOR STOCK FT	0.45	
.....4	360-0148	COIL,4.5 TURNS,LPF,FM100C (SBCM)	2	L201, L202
.....5	601-0111	12 AWGBUSS .080 FLOOR STOCK FT	0.51	
.....4	417-0259	CONN, BNC PCB MOUNT	2	J201, J202
.....4	519-0411-002	PCB,MACH LPF FM100C	1	
.....5	519-0411	PCB,MACH,FM-100C 0.09 BREAKAWAY"	0.26	
....2	959-0411	ASSY,RF AMP,FM-100C	1	
.....3	008-1033	CAP,FEEDTHRU,1000PF,20%,500V	4	C1, C2, C3, C4
.....3	009-4723	CAP,CER CHIP,470PF,200V,5%	4	C20, C21, C22, C23
.....3	130-3333	RES,330 OHM,2W,5%	1	R1
.....3	210-0151	TSTR,RF PWR MOSFET,MRF-151G	1	Q4
.....3	213-6198	TSTR,RF PWR,2N6198	1	Q1
.....3	219-3000	TSTR, DARLINGTON, SI, NPN	2	Q401, Q402
.....3	227-0339	VR,LM338K,5AMP ADJUSTABLE	1	U402
.....3	229-2830	AMP,RF,HYBRID,MHW5342A	1	U1
.....3	330-1500	FUSE,3AG 15A 32V	1	
.....3	360-0003	FERRITE BEAD,.291 DIA	15	Z1, Z2, Z3, Z4, Z5, Z6, Z7, Z8, Z9, Z10, Z11, Z12, Z13, Z14, Z15,
.....3	370-0050	XFMR,RF AMP OUTPUT,FM-1C	1	T1
.....3	370-0721	INPUT TRANSFORMER	1	W2
.....3	402-0835	CLAMP,CBL,3/8	1	
.....3	407-0186	TOOL,ADJ 8 T000/5 SPECTROL	1	



BOM LEVEL	PART NO.	DESCRIPTION	QTY	REF. DES.
.....3	407-3000	COVER,TSTR	3	
.....3	415-1010	FUSE CLIP,LITTLEFUSE,101002	4	
.....3	417-0017	RECP,BNC,BULKHEAD,UG-492A/U	1	J17
.....3	418-0010	INSULATOR,MICA,TSTR,TO-3PKG	3	
.....3	420-0305	SCREW,4-40X.375,BR PH SC	2	
.....3	420-0504	SCREW,6-32X.375,BR PH SC	6	
.....3	420-0509	SCREW,10-32X.500,BR SL PAN HD	1	
.....3	420-4105	SCREW,4-40X.312,S.S. PH	4	
.....3	420-6106	SCREW,6-32X.375,S.S. PH	15	
.....3	420-6110	SCREW,6-32X.625,S.S. PH	6	
.....3	420-6112	SCREW,6-32X.750,S.S. PH	2	
.....3	420-8104	SCREW,8-32X.250,S.S. PHH	2	
.....3	421-0801	#10-32 BR HEX NUT	1	
.....3	421-6908	SHEET EDGE CONNECTOR 6-32	4	
.....3	421-8002	8-32 HEX NUT, BRASS	1	
.....3	423-0005	#10 LOCK SPLIT (BRONZE)	1	
.....3	423-1012	#4 LOCK INT TOOTH (BRONZE)	2	
.....3	423-6002	#6 LOCK SPLIT	24	
.....3	423-6004	#6 LOCK SPLIT (BRONZE)	6	
.....3	423-6011	#6 FLAT .310 X .160 X .030	1	
.....3	423-8002	#8 LOCK SPLIT	2	
.....3	423-8005	#8 LOCK SPLIT	1	
.....3	441-0184	STOFF,6-32,MALE-FEMALE,3/8	1	
.....3	450-0651	PLUG,HOLE,5/16	1	
.....3	455-0049-002	HEATSINK,RF AMP,FM100C	1	
.....4	455-0049-001	HEATSINK,RF AMP,FX50	1	
.....4	555-0049-002	COST,LABOR 455-0049-002	1	
.....3	471-0957	COVER,RF AMP,FM100C,SCREENED	1	

BOM LEVEL	PART NO.	DESCRIPTION	QTY	REF. DES.
.....4	471-0957-009	COVER,RF AMP,FM100C, UNSCREENED	1	
.....3	474-0301	PLATE,FRT,RF AMP PCB COVER	1	
.....3	474-0302	PLATE,BACK,RF AMP PCB COVER	1	
.....3	594-0019	LABEL,DANGER HV 1X 1.5	1	
.....3	594-0500	LABEL,DANGER	1	
.....3	919-0410-001	ASSY,PCB,RF AMP INPUT,FM-100C	1	
.....4	003-1523	CAP,MONO CER,,0015uF,100V,5%	2	C44, C45,
.....4	009-1032	CAP,CER CHIP,1000PF,100V,5%	1	C34
.....4	024-3374	CAP,LYTIC,33UF,35V,STDUP	2	C16, C42
.....4	038-4753	CAP,PYST,,47UF,100V	1	C17
.....4	040-6813	CAP,MICA,68PF,500V,5%	1	C9
.....4	042-2000	CAP,MICA,200PF,350V,10%	2	C10, C11
.....4	042-3922	CAP,MICA,390PF,100V,5%	6	C5, C6, C7, C8, C15, C24
.....4	046-0003	CAP,MICA,RF,80PF,350V,10%	3	C13, C14, C43
.....4	046-0005	CAP,MICA,150PF,350V,10%	1	C12
.....4	046-0022	CAP,MICA,RF,22PF	1	C18
.....4	100-1051	RES,10K OHM,1/4W,1%	1	R4
.....4	100-1231	RES,121 OHM,1/4W,1%	1	R27
.....4	100-2041	RES,2K OHM,1/4W,1%	1	R5
.....4	103-1021	RES,10 OHM,1/4W,1%,METAL	1	R28
.....4	103-2212	RES,22.1 OHM,1/4W,1%,METAL	1	R8
.....4	103-2945	RES,29.4K OHM,1/4W,1%,METAL	3	R10, R12, R13
.....4	103-4324	RES,4.32K OHM,1/4W,1%,METAL	1	R2
.....4	103-4755	RES,47.5K OHM,1/4W,1%,METAL	1	R3
.....4	103-5112	RES,51.1 OHM,1/4W,1%,METAL	1	R7
.....4	103-6985	RES,69.8K OHM,1/4W,1%,METAL	1	R14
.....4	110-3623	RES,36 OHM,1/2W,5%	1	R6



BOM LEVEL	PART NO.	DESCRIPTION	QTY	REF. DES.
.....4	130-2223	RES,22 OHM,2W,5%	1	R9
.....4	177-1055	RES,TRMR,10K,10 TURN TOP ADJ	1	R11
.....4	201-2800	DIODE,HOT CARRIER	1	D1
.....4	211-3904	TSTR,2N3904	1	Q2
.....4	218-0032	TSTR,TIP32A,2N6125	1	Q3
.....4	330-0200	FUSE,3AG,2 AMP	1	F1
.....4	364-0002	CHOKE,VK200-20/4B FERROXCUBE	2	L1, L4
.....4	364-0010	CHOKE,MOLDED RF 10UHY 10%	1	L3
.....4	364-0051	COIL,MOLDED .051UH	1	L2
.....4	410-0025	TERM,MALE DISCONNECT PC .25TAB	1	E101
.....4	415-2068	CLIP,FUSE,15AMP,LITTLEFUSE,102071	2	
.....4	417-0677	CONN,PCB MT,6PIN MALE	1	J16
.....4	417-5022	SKT,LEAD .020 D,SAMTEC SEP-266	1	XU1
.....4	519-0426	PCB,MACH,RF AMP INPUT, FM-100C	1	
.....4	640-1800	WIRE AWG 18 EN MAGNET	0.031	L5
.....3	919-0410-004	ASSY,PCB,REGULATOR,FM-100C (SBCM)	1	
.....4	030-1053	CAP,MYLAR FILM,.1uF,100V,RAD	4	C404, C405, C406, C407,
.....4	042-3922	CAP,MICA,390PF,100V,5%	3	C401, C402, C403,
.....4	100-1231	RES,121 OHM,1/4W,1%	1	R401
.....4	229-0335	IC,LM335,TEMPERATURE SENSOR	1	U401
.....4	360-0001	FERRITE BEADS,F-R 2643000301	13	FB401, FB402, FB403, FB404, FB405, FB406, FB407, FB408, FB409, FB410, FB411, FB412, FB413,
.....4	417-0169	CONN 15 PIN 640503-1 AMP	1	J401
.....4	417-0299	SOCKET,TO-3,PCB MT	3	XU402, XQ401, XQ402
.....4	519-0410-004	PCB,MACH,REGULATOR,FM-100C	1	

BOM LEVEL	PART NO.	DESCRIPTION	QTY	REF. DES.
.....4	601-0022	WIRE,AWG22,BUSS	0.8	
.....3	919-0411-001	ASSY,PCB,RF AMP OUTPUT,FM-100C	1	
.....4	003-4712	CAP,CER,47PF,50V,5%	2	C35, C39,
.....4	009-1013	CAP,CER CHIP,10PF,500V,5%	2	C28, C29,
.....4	009-1032	CAP,CER CHIP,1000PF,100V,5%	4	C19, C36, C37, C40,
.....4	009-1033	CAP,CER CHIP,1000PF,500V,5%	1	C27
.....4	009-2023	CAP,CER CHIP,200PF,300V,5%	2	C25, C26
.....4	009-3613	CAP,CER CHIP,36PF,500V,5%	1	C31
.....4	046-0022	CAP,MICA,RF,22PF	1	C33
.....4	046-0045	CAP,MICA,RF,45PF	1	C32
.....4	046-1030	CAP,METAL FEED,1000PF,350V,10%	1	C30
.....4	101-2243	RES,CHIP,2.2K OHM,1/4W,5%	5	R15, R16, R22, R23, R26,
.....4	103-7152	RES,71.5 OHM,1/4W,1%,METAL	1	R21
.....4	111-2223	RES,CHIP,22 OHM,1W,5%	5	R17, R18, R19, R20, R25,
.....4	130-1023	RES,10 OHM,2W,5%	1	R29
.....4	177-1035	RES,TRMR,100 OHM,25T TOP 3299W	1	R24
.....4	201-2800	DIODE,HOT CARRIER	2	D2, D3
.....4	360-0146	CHOKE,RF AMP DECOUPLING,FM-1C	1	L6
.....5	640-1400	WIRE,14GA,MAGNET	0.04	
.....4	410-0025	TERM,MALE DISCONNECT PC .25TAB	1	E102
.....4	519-0411-001	PCB, MACH,RF AMP OUTPUT, FM-100C	1	
.....5	519-0411	PCB,MACH,FM-100C 0.09 BREAKAWAY"	0.74	
.....4	600-0008	FLEXSTRIP, 7 COND 1	1	P24
.....3	949-0411	ASSY,HRNS,RF AMP,FM-100C (SBCM)	1	
.....4	402-0000	TY-RAP	8	
.....4	410-0051	LUG,TERM,14-16GA,FEMSPADE	2	
.....4	410-0060	LUG,TERM,#10 RING CRIMP 10-12G	1	



BOM LEVEL	PART NO.	DESCRIPTION	QTY	REF. DES.
.....4	410-1553	LUG,TERM #10 RING CRIMP 16-22	1	
.....4	417-0036	PIN CONN,AMP,350967-1	19	
.....4	417-0053	SKT,CONN 641294-1 AMP	19	
.....4	417-0106	JACK,BNC BULKHEAD	1	J18
.....4	417-0175	CONN, HOUSING, 20 PIN	1	J15
.....4	417-2379	CONN,155OC HOUSING,AMP,MR	1	P401
.....4	418-0034	PLUG,BNC DUAL CRIMP 1-227079-6	1	W1
.....4	418-0670	HOUSING,CONN,6PIN FEM	1	P16
.....4	601-1604	WIRE,AWG16, 19/29 YEL	0.75	
.....4	601-1800	WIRE,AWG18 19/30 BLK	20	
.....4	601-2209	WIRE,AWG22,7/30 WHT	20	
.....4	621-0001	CBL,COAX TEFLON RG 142B/U BELD	0.5	J18
.....4	621-1359	CBL,COAX,RG316/U,50 OHM	0.5	W1
.....4	693-0002	SLVG,1/4 EXPANDO FR BLACK"	1	
....2	969-0007-100	KIT, HARDWARE RACK FM-100C/250C	1	
.....3	402-0001	TY-RAP,T+B TY24M,1-1/4 DIA	4	
.....3	420-0108	SCREW,10-32X.500,S.S. PHH	4	
.....3	420-0508	SCREW,10-32X.500,S.S. FLH	8	
.....3	420-8110	SCREW,8-32X.625,S.S. PHH	4	
.....3	421-0102	10-32 KEP NUT	8	
.....3	423-0001	WASHER,FLAT,#10 SST,.438 X .203 X .065	8	
.....3	459-0138	RETAINER,SLIDE BRKT	2	
.....3	469-0415	SLIDE, EXCITER CHASSIS	1	
.....3	470-0238	BRKT,MTG,APC+IPA,FM1.5A	4	
.....3	701-0005	ANTISTATIC ZIPLOC BAG 4X6 4MIL	1	
....2	979-0402	KIT,ACCESSORY PARTS,FM-100C	1	
.....3	330-0800	FUSE,8A,250V,3AG,FAST ACTING	1	
.....3	334-0100	FUSE,1A MDL SLO BLO 250V	2	



BOM LEVEL	PART NO.	DESCRIPTION	QTY	REF. DES.
.....3	682-0001	CORD LINE,3 COND,DETACH 7.5FT	1	
.....3	701-0001	ENVELOPE,COIN 2-1/2 X 4-1/4	3	
.....3	701-0019	ANTISTATIC ZIPLOC BAG 13X18 4M	1	
.....3	947-0020	ASSY,CBL BNC ACCESS (SBCM)	2	
.....4	417-0094	CONN,BNC RG/U58 31-320 AMPH	2	
.....4	622-0050	CBL,SH,50 OHM,RG-58/CU	2.5	
.....3	979-9985	KIT,BIND+MAN,FM-100C	1	
.....4	597-1002	INSTRUCTION MANUAL, FM 100C/FM 100E FM EXCITER/TRANSMITTER	1	
.....4	598-0010-001	BINDER,1 IN, BLUE,W CD POCKET	1	

14 RF Technical Services Contact Information

RF Technical Services -

Telephone: **(217) 224-9617**

E-Mail: rfservice@bdcast.com

Fax: **(217) 224-6528**

web: www.bdcast.com

15 Drawings

The following pages present the FM-100C/E Transmitter drawings.



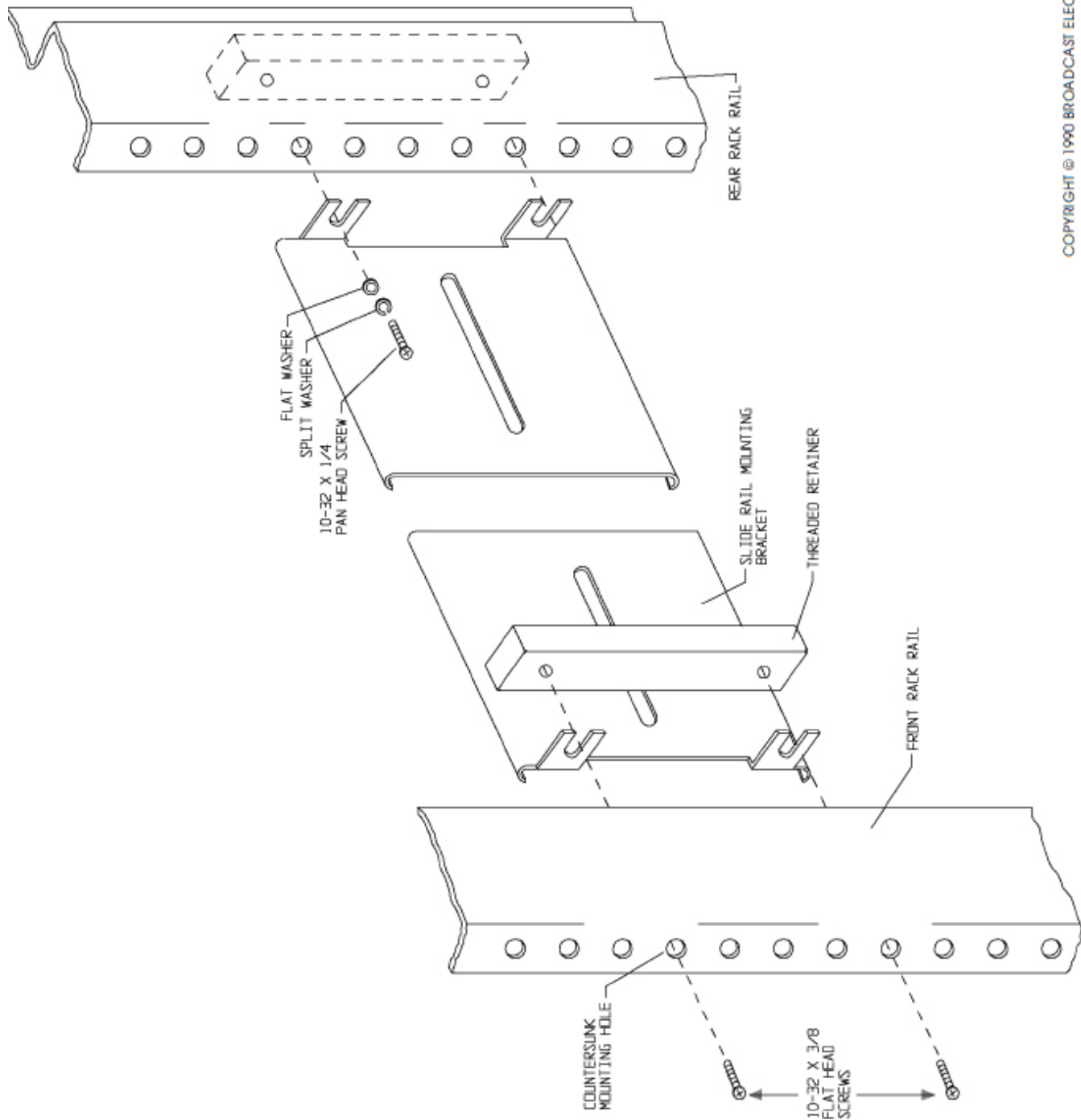
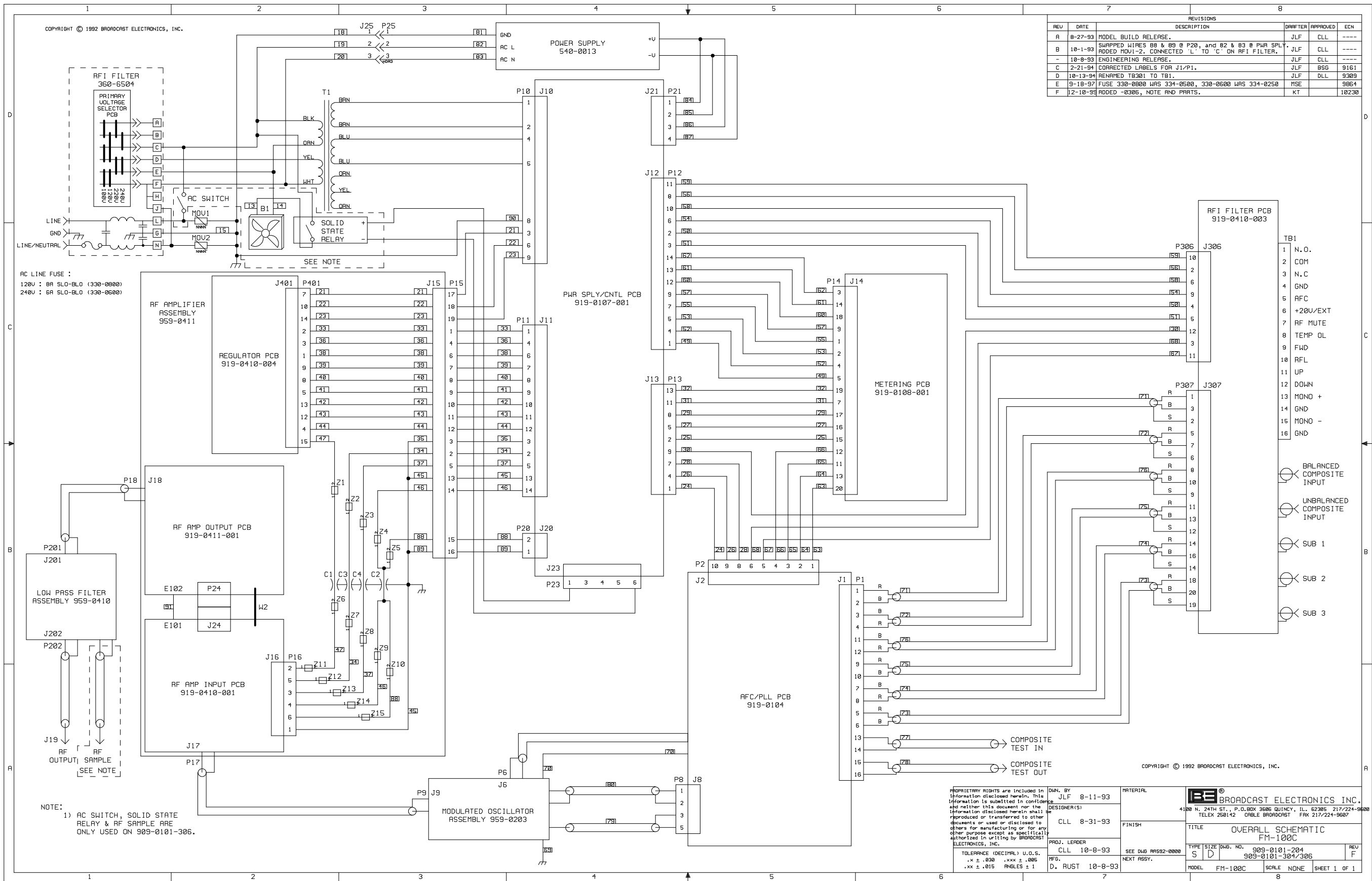
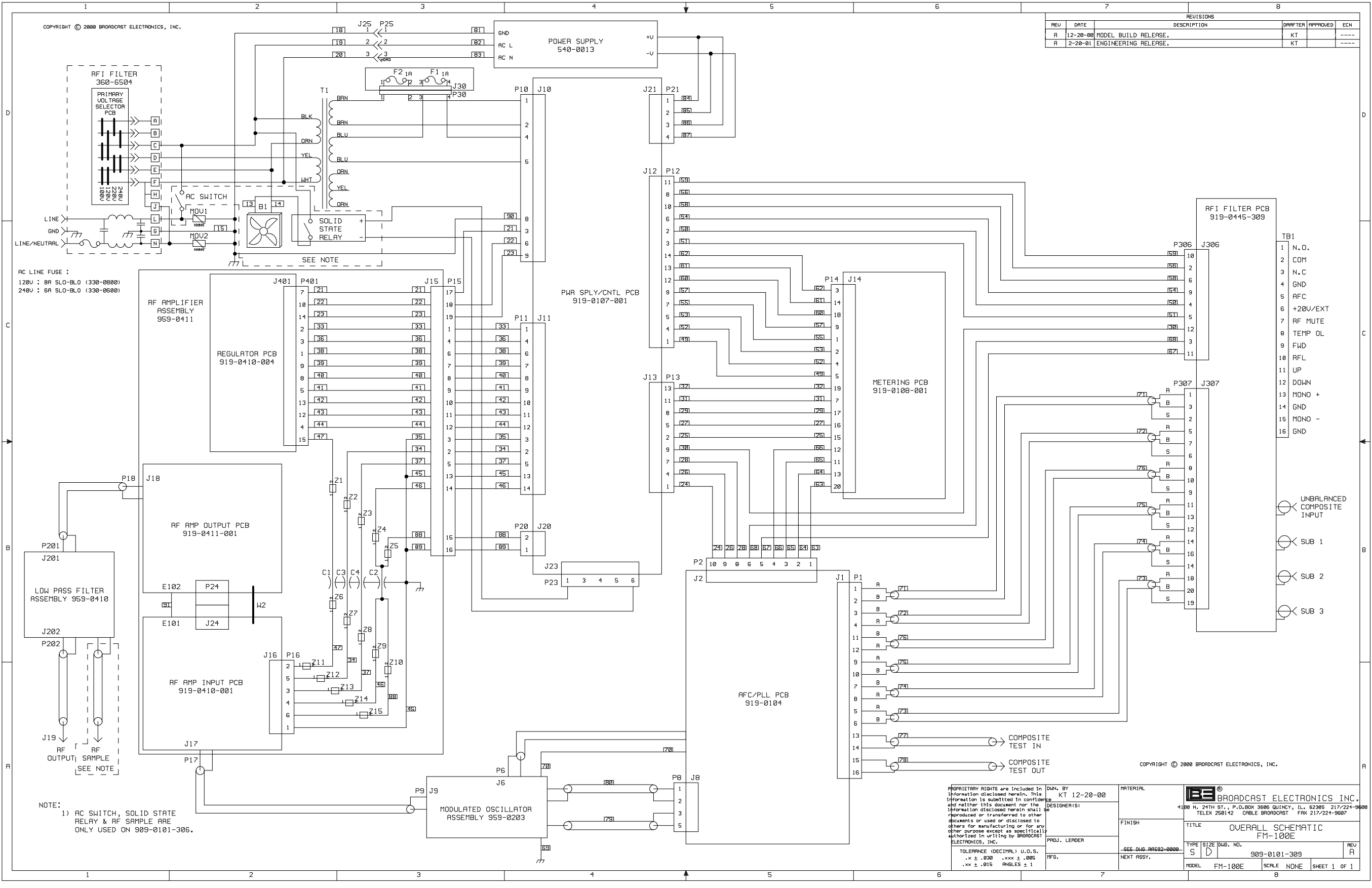


Figure 14-1. TRANSMITTER FRONT RAIL MOUNTING APPLICATIONS







REVISIONS				
REV	DATE	DESCRIPTION	DRAWN	APPROVED
A	12-20-00	MODEL BUILD RELEASE.	KT	----
A	2-20-01	ENGINEERING RELEASE.	KT	----

- TB1
- 1 N.O.
 - 2 COM
 - 3 N.C
 - 4 GND
 - 5 AFC
 - 6 +20V/EXT
 - 7 RF MUTE
 - 8 TEMP OL
 - 9 FWD
 - 10 RFL
 - 11 UP
 - 12 DOWN
 - 13 MONO +
 - 14 GND
 - 15 MONO -
 - 16 GND
- UNBALANCED COMPOSITE INPUT
- SUB 1
- SUB 2
- SUB 3

NOTE:
1) AC SWITCH, SOLID STATE RELAY & RF SAMPLE ARE ONLY USED ON 909-0101-306.

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

DWN. BY
KT 12-20-00

DESIGNER(S)
BY

PROJ. LEADER

RF6.

MATERIAL

FINISH

SEE Dwg. RA692-0000.

NEXT ASSY.

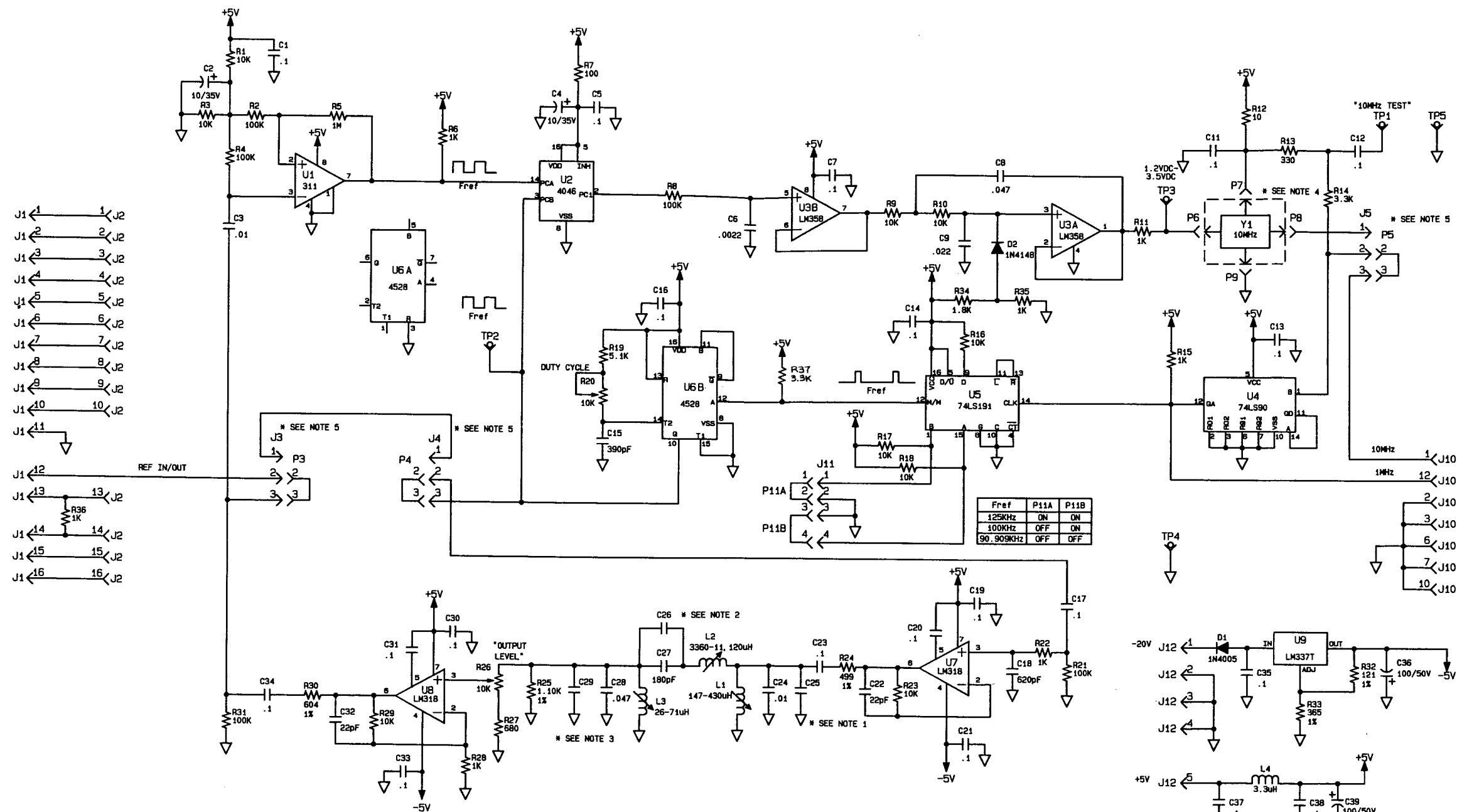
BROADCAST ELECTRONICS, INC.
4130 N. 24TH ST., P.O. BOX 3606 QUINCY, IL 62305 217/224-9600
TELEX 250142 CABLE BROADCAST FAX 217/224-9607

TITLE
**OVERALL SCHEMATIC
FM-100E**

TYPE SIZE Dwg. NO.
S D 909-0101-309

MODEL FM-100E SCALE NONE SHEET 1 OF 1

REV
A



NOTES:

- FOR Fref=100KHz OR 90.909KHz, ADD C25 .005uF. B.E. P/N 000-5034
- FOR Fref=100KHz, ADD C26 82pF. B.E. P/N 042-8212
FOR Fref=90.909KHz, ADD C26 240pF. B.E. P/N 040-2422
- FOR Fref=90.909KHz, ADD C29 .022uF. B.E. P/N 031-2243
- Y1 NOT INSTALLED WHEN UNIT IS CONFIGURED AS "MASTER".
- CONFIGURE P3, P4, P5: 1-2 FOR "SLAVE", 2-3 FOR "MASTER".
- ALL RESISTORS IN OHMS, 1/4W, 5%; ALL CAPACITORS IN MICROFARADS, UNLESS OTHERWISE SPECIFIED.
- LAST COMPONENTS USED: R37, C39, D2, U9, L4, TP4, J12, P9.
- SEE PCB ASSEMBLY AC909-0131
- COMPONENTS NOT USED: C10

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DWN BY KLS 7-25-88 CHKD MH 10-12-88 ME PROJ. ENGR. E. Schmitt 10-12-88 MFG. 10-12-88	SEE B/M 909-0131 FINISH NEXT ASSY	BROADCAST ELECTRONICS, INC. 4100 N. 24TH ST., P.O. BOX 3808, GLENVIEW, IL 60035 217/834-9900 TELE 235142 CABLE BROADCAST FAX 217/824-2907	
TITLE PCB SCHEMATIC- FX-50 BOOSTER OPTION BD.		TYPE SIZE DWG. NO. REV S D 909-0131 A	
MODEL FX-50		SCALE NTS	SHEET 1 OF 1

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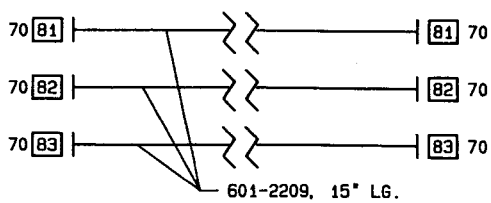
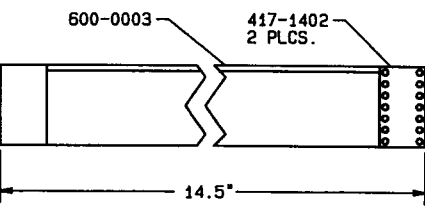
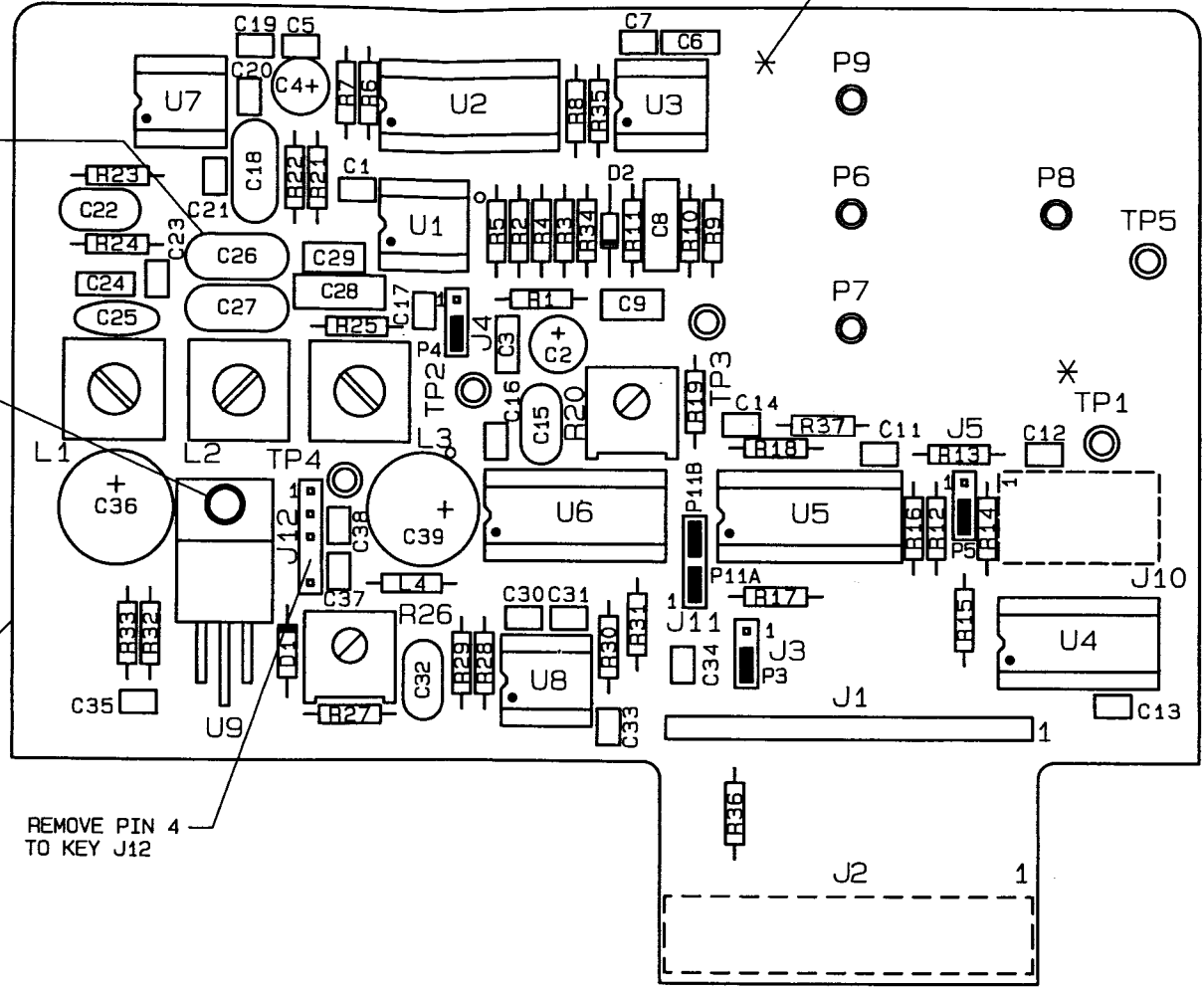
C25, C26, C29 NOT
NORMALLY INSTALLED
SEE SD909-0131 NOTES 1-3

423-6002
420-6104
426-6000

517-0072

REMOVE PIN 4
TO KEY J12

SEE NOTE 3



PIN NO.	WIRE NO.
1	81
2	82
3	OPEN
4	KEY
5	83

*KEYING PLUG P/N 417-0224

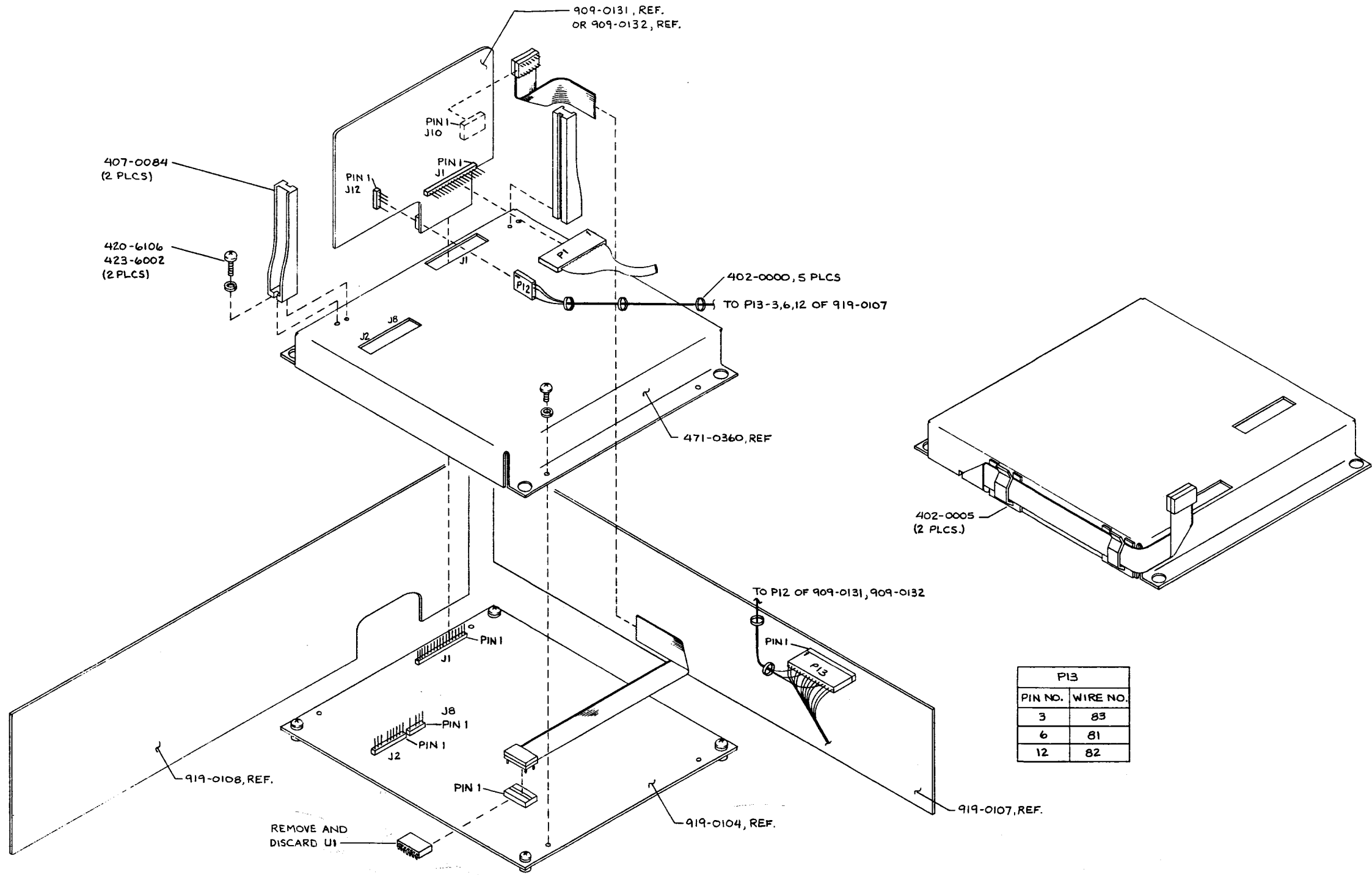
NOTES:

1. SEE SCHEMATIC SD909-0131
2. LAST COMPONENT USED: R37, C39, D2, U9, L4, TP5, J12, P9.
3. INSTALL Y1 P/N 390-0023 ON VERSION 909-0132 AND SOLDER WHERE INDICATED BY *. CUT LEADS TO 0.3".
4. COMPONENTS NOT USED: C10
5. FOR FREF=100KHz OR 90.909KHz, ADD C25 .005uF BE P/N 000-5034.
6. FOR FREF=100KHz, ADD C26 82pF BE P/N 042-8212.
7. FOR FREF=90.909KHz, ADD C26 240pF BE P/N 040-2422.
8. FOR FREF=90.909KHz, ADD C29 .022uF BE P/N 031-2243.

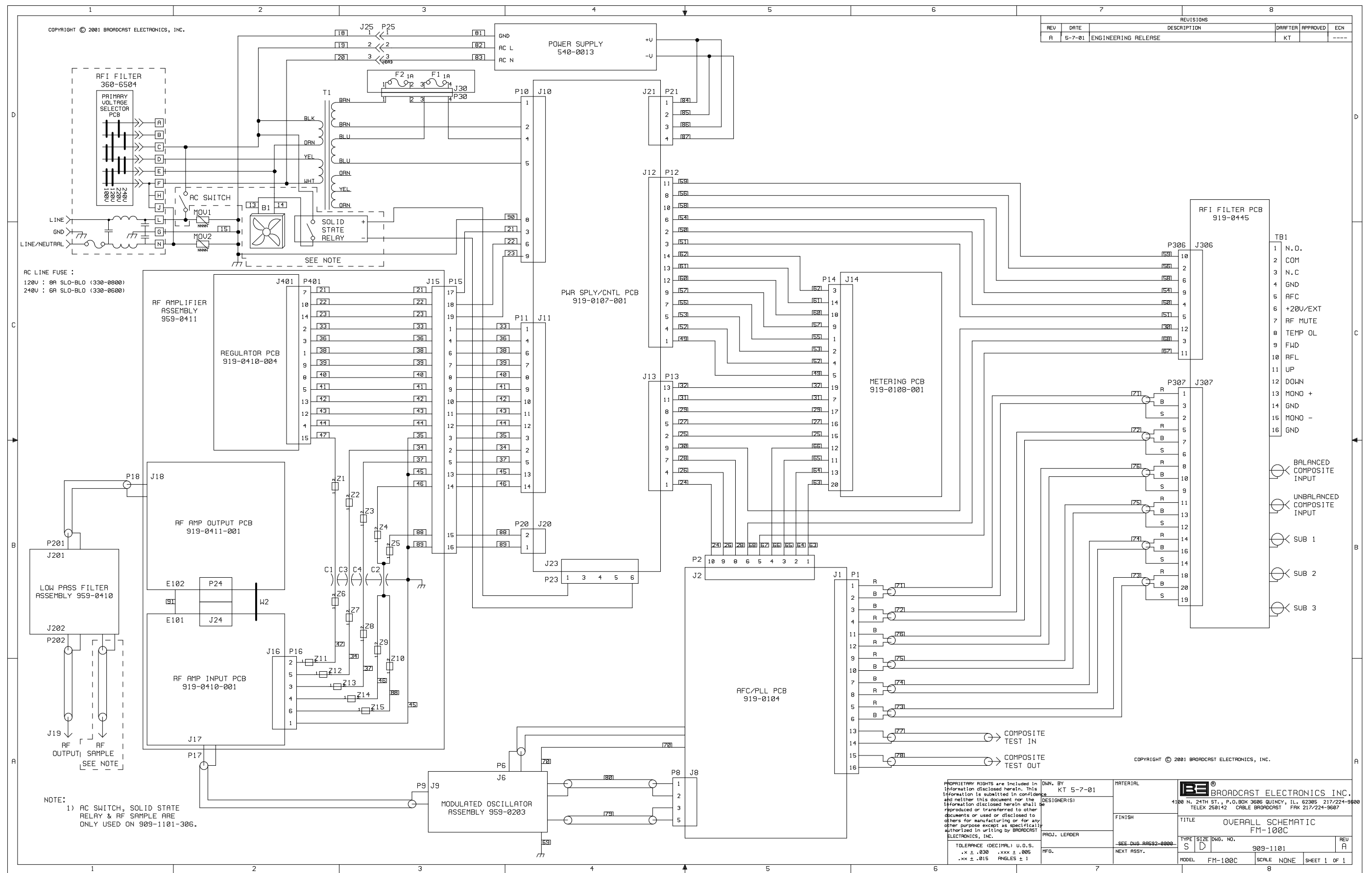
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TOLERANCE DECIMAL U.O.S. .X ± .030 .XXX ± .005 .XX ± .015 ANGLES ± 9°	CHKD MH 10-12-88	FINISH
	ME 10-12-88	NEXT ASSY
	PROJ. ENGR. S. A. 10-12-88	
	MFG 10-12-88	

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- FX-50 BOOSTER OPTION BD.			
TYPE A	SIZE C	DWG. NO. 909-0131	REV D
MODEL FX-50	SCALE 2/1	SHEET 1 OF 2	

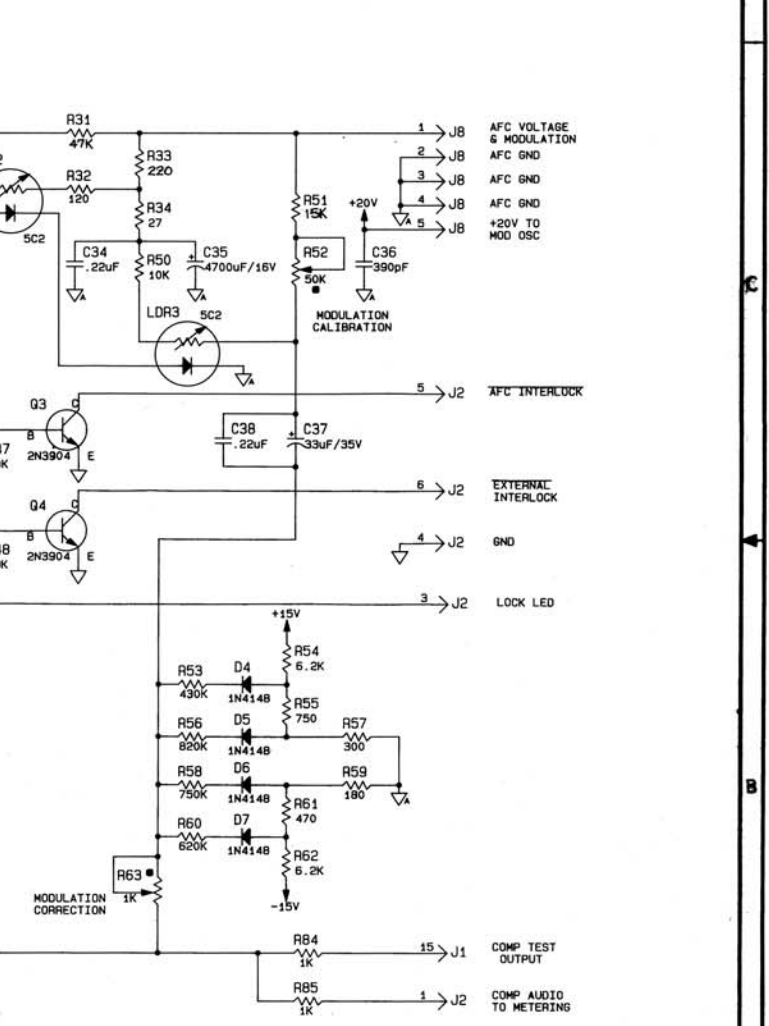


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	CHKD MH 10-12-88	FINISH			
	ME 10-12-88	PROJ. ENGR. E. H. H. 10-12-88	SEE DWG RA592-0000	TITLE PCB ASSEMBLY FX-50 BOOSTER OPTION ASSY.	
	TOLERANCE (DECIMAL) U.S. .x ± .030 .xxx ± .005 .xx ± .015 ANGLES ± 1°	MFG 10-13-88	NEXT ASSY.	TYPE A C	SIZE DWG. NO. 909-0131
			MODEL FX-50	SCALE .5=1	SHEET 2 OF 2



REVISIONS			DATE	DESCRIPTION	BY	CHK	ECN
A	7-17-87	PROTOTYPE RELEASE	W/CHGS	JAH	EJA	—	—
B	4-28-88	ENGINEERING RELEASE	W/CHGS	JAH	EJA	—	—
C	4-18-89	CHG. R51 FROM 47K TO 33K PER ECN		KLS	EJA	7783	
D	5-22-89	CHG. R31 FROM 47K TO 100K PER ECN		KLS	EJA	7836	
E	7-25-89	CHG. RESISTOR VALUES: R25, R26, R27, R33, R51		JAH	EJA	7828, 7840	
F	5-15-90	CHG. VALUE OF R35 TO 82K		JAH	EJA	8289	
G	6-26-95	DELETED DB-D15		MH	—	9363	
H	1-24-01	ADD J10, PID R101		—	—	—	11371

REV	DATE	DESCRIPTION	BY	CHK	ECN
H	1-24-01	ADD J10, PID R101	—	—	11371

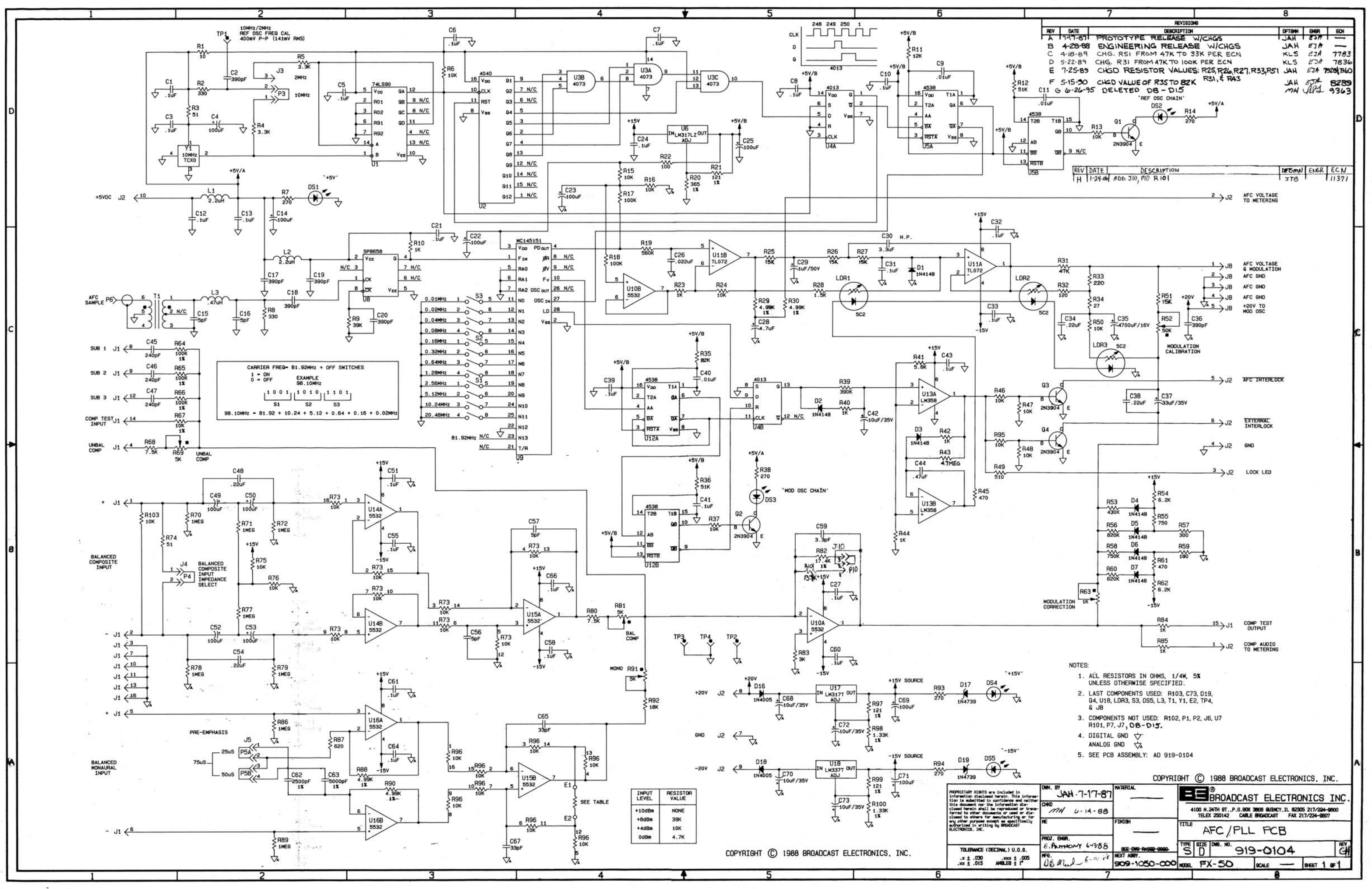


- NOTES:
1. ALL RESISTORS IN OHMS, 1/4W, 5% UNLESS OTHERWISE SPECIFIED.
 2. LAST COMPONENTS USED: R103, C73, D19, Q4, U18, LDR3, S3, DS5, L3, T1, Y1, E2, TP4, 6 JB
 3. COMPONENTS NOT USED: R102, P1, P2, J6, U7, R101, P7, J7, DB-D15.
 4. DIGITAL GND ANALOG GND
 5. SEE PCB ASSEMBLY: AD 919-0104

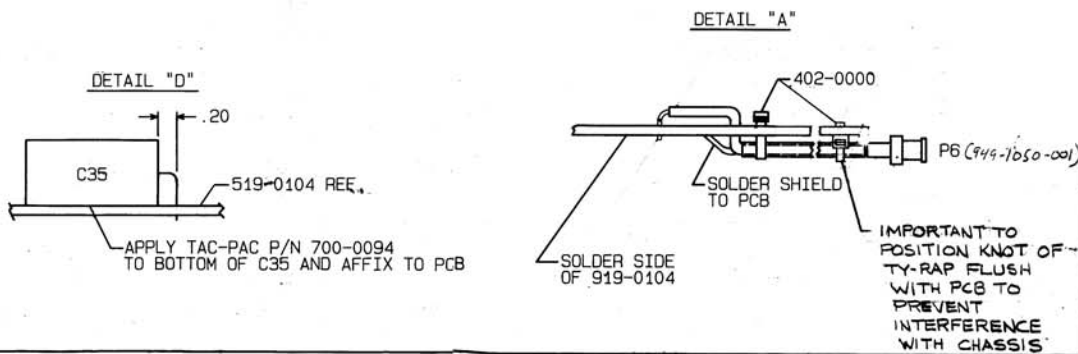
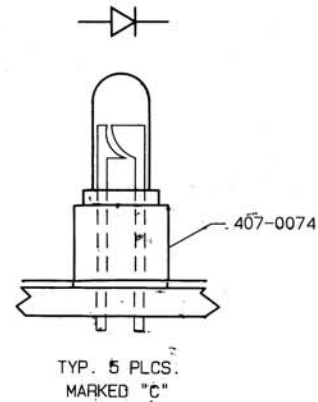
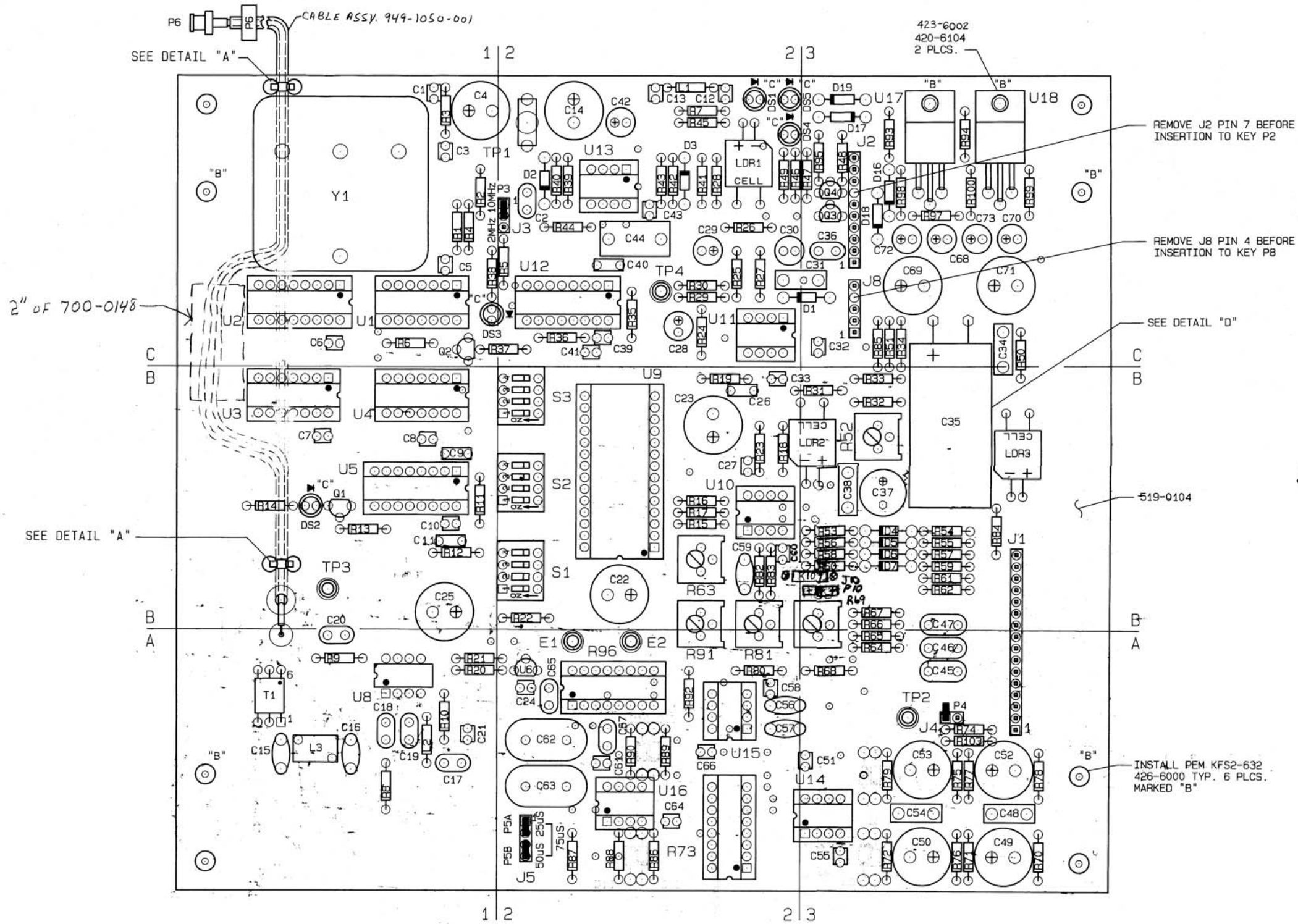
OWN. BY JAH 7-17-87		MATERIAL	
CHKD MH 4-14-88		FINISH	
REV. ENR. E. J. JAHONY 6-3-88		SEE ENR. 909-0000	
TOLERANCE (DECIMAL) U.O.B. .X ± .030 .XK ± .015		NEXT ASMT. 909-1050-000	
TITLE AFC/PLL PCB		TYPE SIZE DWS. NO. S1D 919-0104	
REV CH		MODEL FX-50	
SCALE		SHEET 1 OF 1	

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INPUT LEVEL	RESISTOR VALUE
+10dBm	NONE
+8dBm	39K
+6dBm	10K
0dBm	4.7K



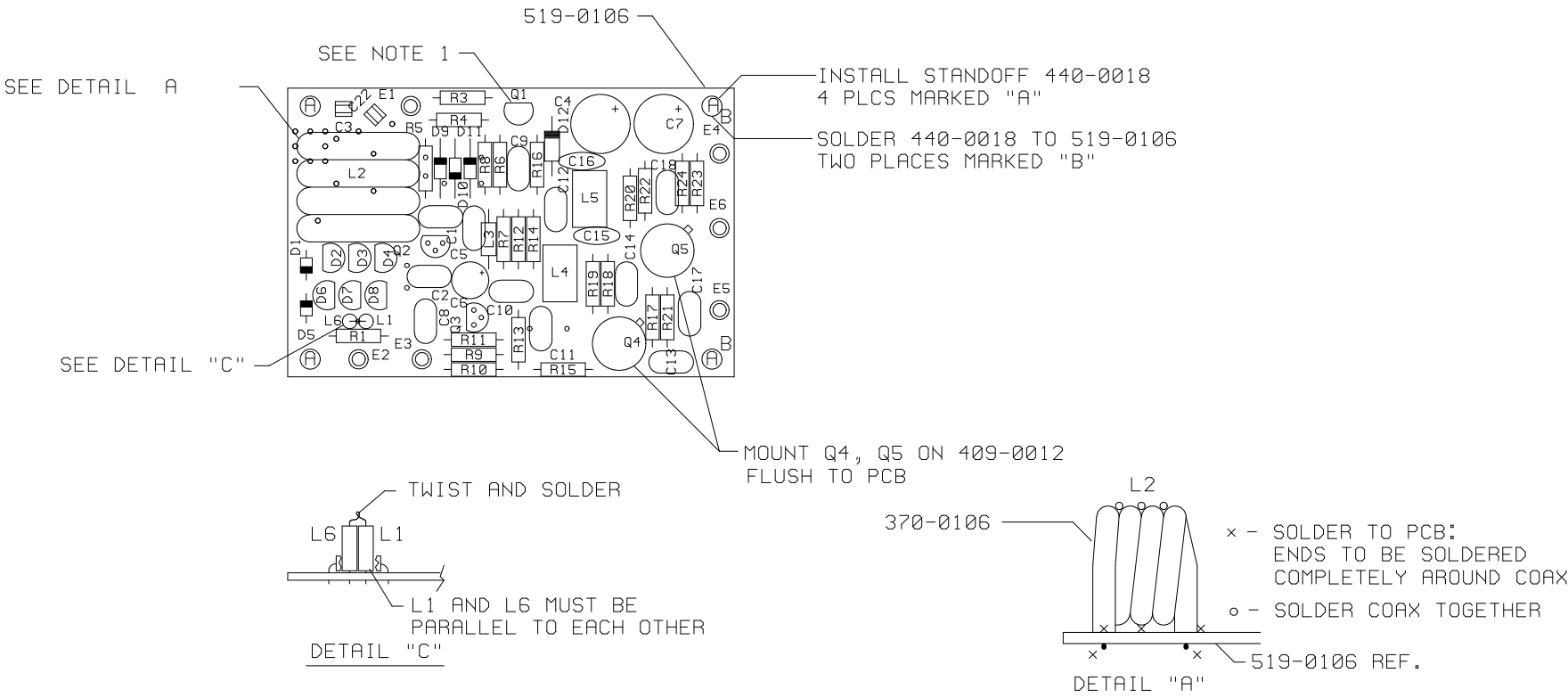
REVISIONS						
REV	DATE	DESCRIPTION	DFTM	ENGR	ECN	
A	8-18-87	PROTOTYPE RELEASE W/CHGS.	KLS	EJA		
B	4-13-88	ENGINEERING RELEASE W/CHGS.	KLS	EJA		
C	4-18-89	UPDATE REV. PER R31 VALUE CHG.	KLS	EJA	7783	
D	5-22-89	UPDATE REV. PER R31 VALUE CHG.	KLS	EJA	7836	
E	7-25-89	CHGD VALUE OF RESISTORS: R25, R26, R27, R33, R51, R31, & R43	JAH	EJA	7884	7960
F	5-15-90	CHGD VALUE OF R35 TO 82K	JAH	EJA	8285	
G	2-14-92	CHGD DETAIL A	JAH	EJA	8496	
H	8-24-93	CABLE IN DETAIL A WAS 9" LG.	JLF	EJA	9029	
J	6/20/95	DELETED DB-D15	JLF	EJA	9363	
K	3-14-97	C4, C14, C22, C23, C25, C49, C50, C52, C53 C69, C71	MSE	EJA	9783	
L	2-3-99	ADDED 2" OF 700-0148 & MOVED COR1 AWAY FROM R31, R35, R37	JLF	EJA	10084	
M	10-3-00	CHANGED DETAIL "A" TO CALL OUT 949-1050-001	KT	EJA	10362	
N	1-25-06	ADD P10, J18, R101	JTB	EJA	11371	



- NOTES:
1. LAST COMPONENT USED: R103, C73, C4, L3, S3, D19, DS3, LDR3, U18, J8, TP4, T1, Y1, E2.
 2. COMPONENTS NOT USED: U7, P1, P2, J6, P7, J7, R101, R102.
 3. SEE SCHEMATIC SD919-0104


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TOLERANCE DECIMAL U.S.S.				KLS		SEE B/M		4100 N. 24TH ST. QUINCY, IL. 62305 217/224-9600	
.X ± .030 .XXX ± .005				CHKD		919-0104		TELEX 250142 CABLE "BROADCAST"	
.XX ± .015 ANGLES ± 90°				DATE		FINISH		TITLE PCB ASSEMBLY-AFC/PLL	
				6-14-88				TYPE SIZE DWG. NO.	
				E. J. THOMAS				A D 919-0104	
				MFG		NEXT ASSY		MODEL FX-50	
				6-14-88		909-1050-000		SCALE 2/1	
								SHEET 1 OF 1	

REVISIONS					
REV	DATE	DESCRIPTION	DFTSMN	ENGR	ECN
A	11-3-99	ENGINEERING RELEASE	MH	DDL	10223
B	1-3-00	ADDED STANDOFF NOTE	KT	DDL	10246
C	8-23-02	REMOVED 370-0106 PART DETAIL FROM DRAWING	KT	DDL	10767

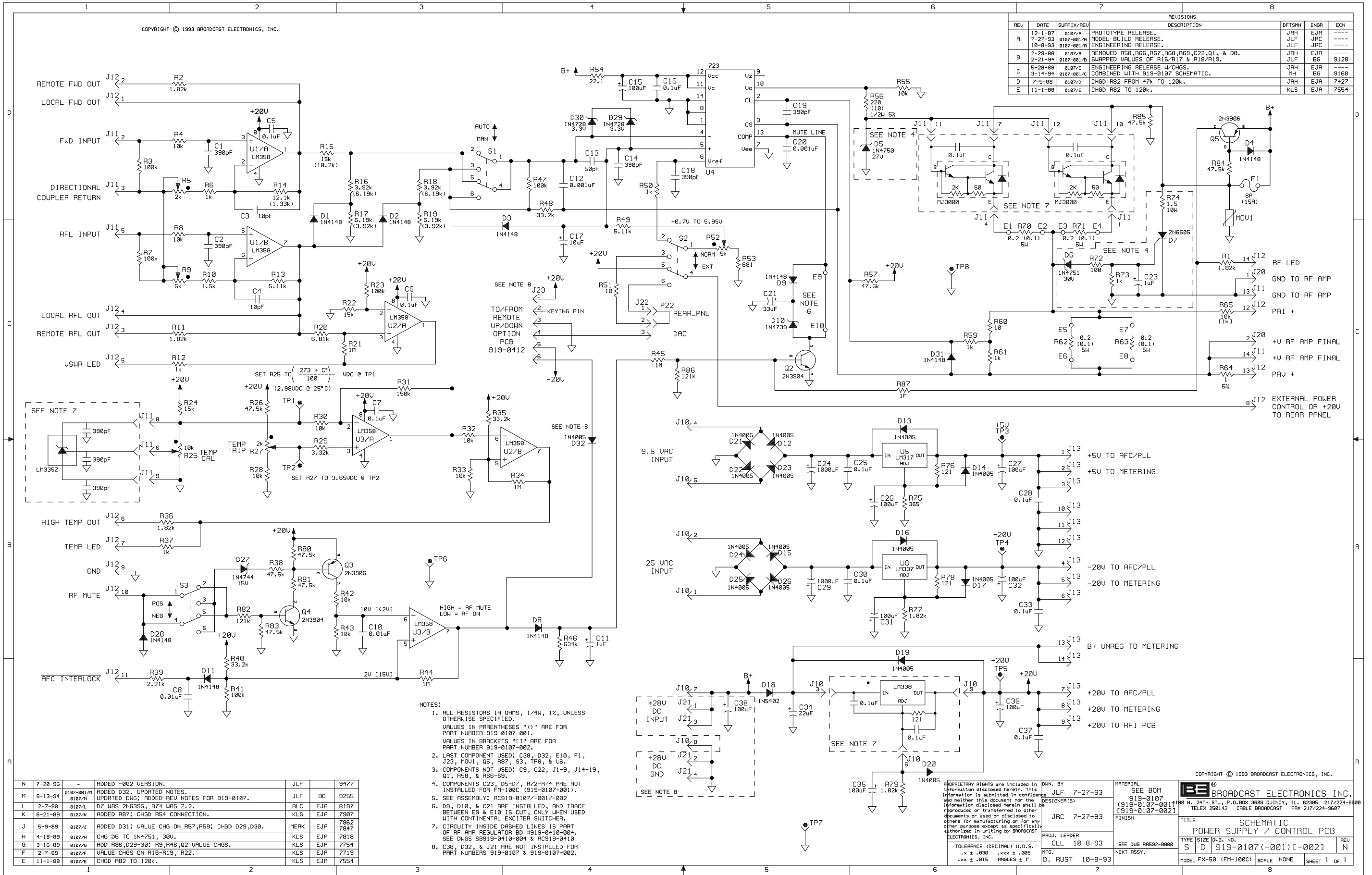


NOTES:

- STANDOFFS ON LEADS ON Q1-Q3,D2-D4 AND D6-D8 SHOULD BE PUSHED DOWN AGAINST PCB.
- SEE SCHEMATIC AC959-0203

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	M. HAYDEN		SEE B/M 919-0106					
	CHKD							
	ME		FINISH		TITLE PCB ASSEMBLY MODULATED OSCILLATOR BD			
	PROJ. ENGR.		-SEE DWG RA592-0000		TYPE A	SIZE B	DWG No. 919-0106	REV C
TOLERANCE (DECIMAL) U.O.S. .X ± .030 .XXX ± .005 .XX ± .015 ANGLES + 1°	MFG.		NEXT ASSY. 959-0203		MODEL FX-50/FM-100C		SCALE 1=1	SHEET 1 OF 1

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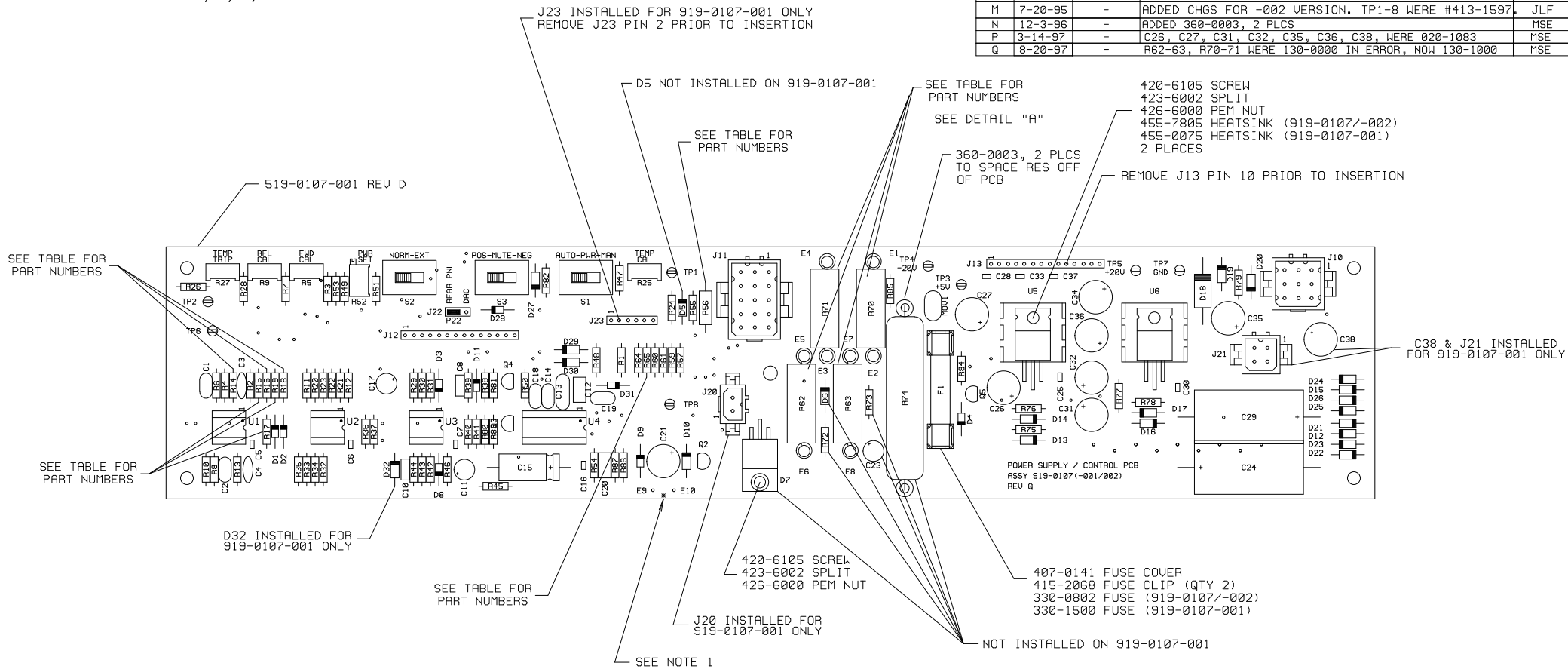


SIDE VIEW TOP VIEW

INSTALL (2) TURRETS #413-0025 AND SOLDER INTO PLACE TOP & BOTTOM. MOUNT RESISTOR TO TURRETS AS SHOWN. RESISTOR LEADS SHOULD BE AS SHORT AND STRAIGHT AS POSSIBLE WITHOUT BENDING TURRETS.

4 PLCS (R62,63,70,71)

REVISIONS						
REV	DATE	SUFFIX/REV	DESCRIPTION	DRAFTER	APPROVED	ECN
A	1-8-88 7-27-93	0107/A 0107-001/A	PROTOTYPE RELEASE W/CHGS. MODEL BUILD RELEASE.	KLS JLF	EJA JRC	---- ----
B	2-10-88 10-8-93	0107/B 0107-001/B	DELETED R66-R69,R58,D8,C22,Q1 ENGINEERING RELEASE W/CHGS.	KLS JLF	EJA JRC	---- 9085
C	6-13-88 2-21-94	0107/C 0107-001/C	ENGINEERING RELEASE W/CHGS. SHAPPED VALUES OF R16/R17 & R18/R19.	KLS JLF	EJA BG	---- 9128
D	2-8-89	0107/D	R16-R19,R22 VALUE CHGD.	KLS	EJA	7719
E	3-15-89	0107/E	ADDED R86,D29,D30; R9,Q2,R46 VALUE CHGS.	KLS	EJA	7754
F	4-18-89	0107/F	UPDATE REV. PER D6 VALUE CHG.	KLS	EJA	7818
G	5-9-89	0107/G	ADDED D31, VALUE CHG. ON R57,R59,CHGD. D29,D30	MERK	EJA	7847 7862
H	6-21-89	0107/H	ADDED R87	KLS	EJA	7907
J	2-7-90	0107/J	D7 WAS 2N6395, R74 WAS 2.2	ALC	EJA	8197
K	3-14-94	0107/K 0107-001/K	COMBINE 919-0107 BD WITH 919-0107-001 TO USE THE SAME BLANK BOARD (S19-0107-001).	MH	BG	9168
L	9-15-94	-	ADD D32 ON -001. CHGD FOOTPRINT OF MOV1. UPDATED	NOTES	BG	9255
M	7-20-95	-	ADDED CHGS FOR -002 VERSION. TP1-8 WERE #413-1597.	JLF	DLL	9477
N	12-3-96	-	ADDED 360-0003, 2 PLCS	MSE	DLL	9654
P	3-14-97	-	C26, C27, C31, C32, C35, C36, C38, WERE 020-1083	MSE	DLL	9783
Q	8-20-97	-	R62-63, R70-71 WERE 130-0000 IN ERROR, NOW 130-1000	MSE		9846



1. D9, D10, & C21 ARE INSTALLED, AND TRACE MARKED "*" IS TO BE CUT, ONLY WHEN USED WITH CONTINENTAL EXCITER SWITCHER.
2. LAST COMPONENTS USED: C38, D32, E10, F1, J13 MOU1, Q5, R87, S3, TP8, & U6.
3. COMPONENTS NOT USED: C9, C22, J1-9, J14-19, Q1, R58, & R66-69.
4. SEE SCHEMATIC: SD919-0107/-001/-002

	919-0107	919-0107-001	919-0107-002
R14	103-1215	103-1331	103-1215
R15	100-1551	103-1025	100-1551
R16 & R18	103-3924	103-6194	103-3924
R17 & R19	103-6194	103-3924	103-6194
R56	110-2233	110-1023	110-2233
R65	100-1051	100-1051	100-1013
R62-63,R70-71	132-2003	130-1000	132-2003

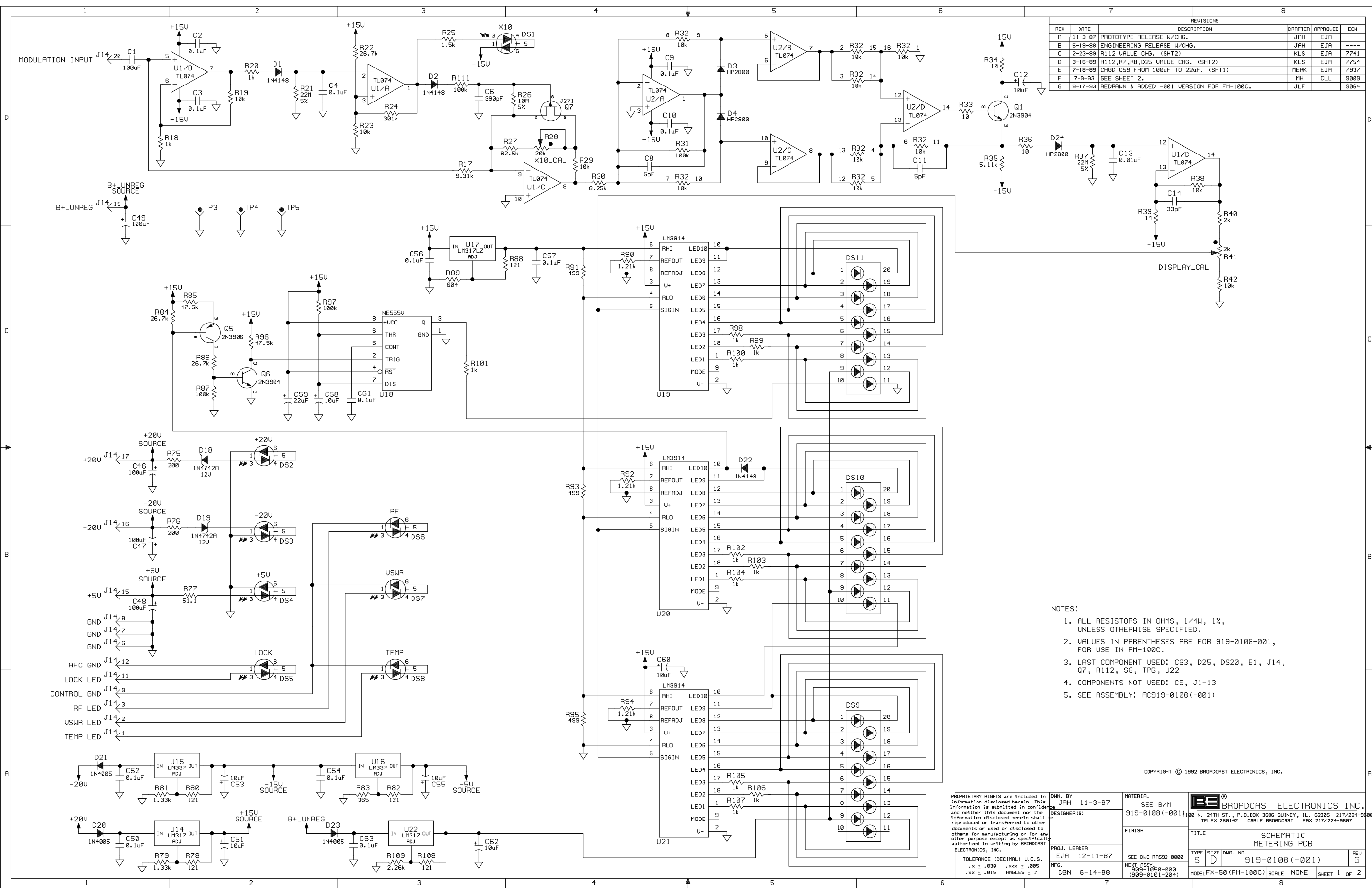
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D. RUST	10-8-9
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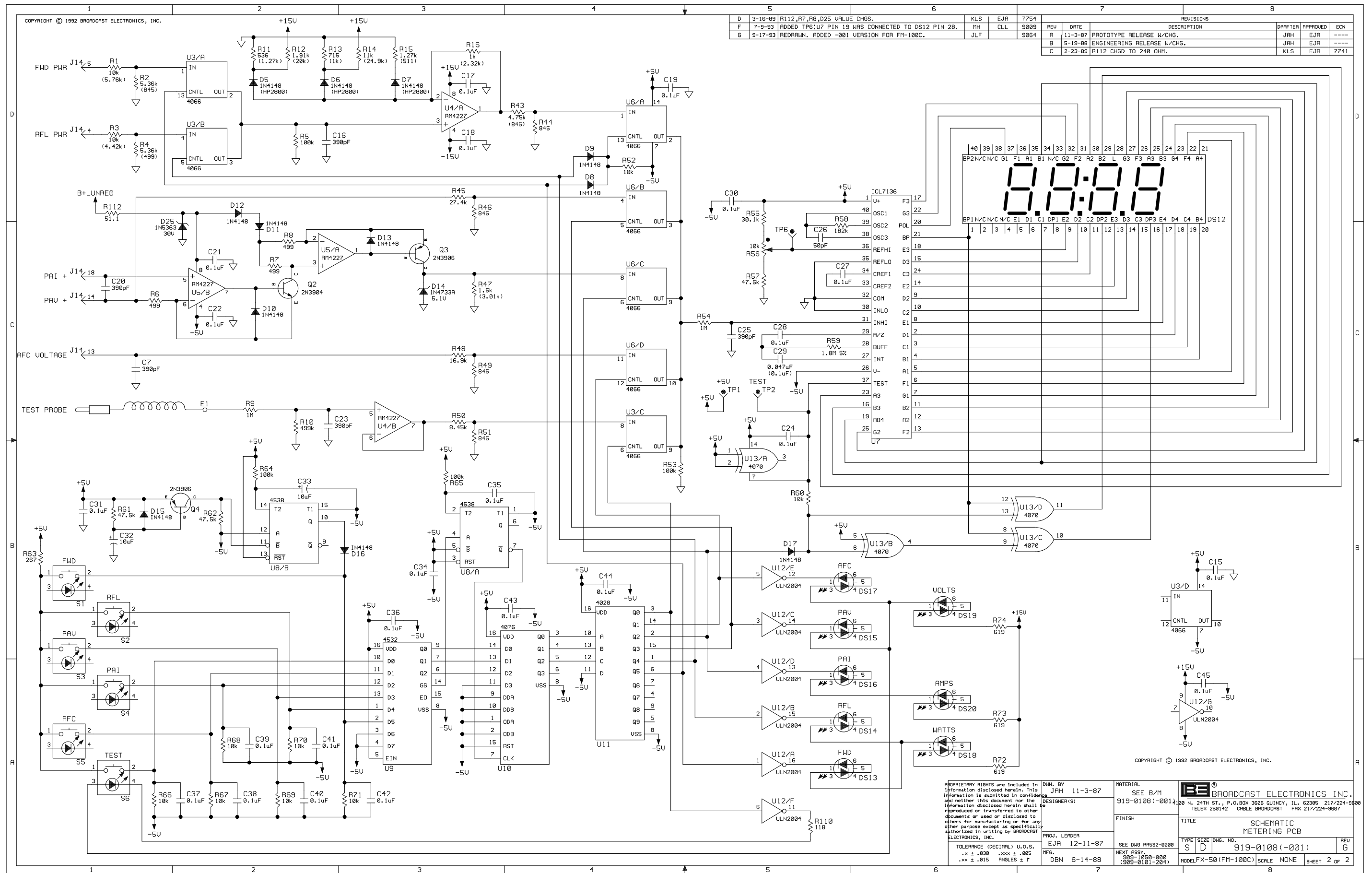
MODEL FX-50/

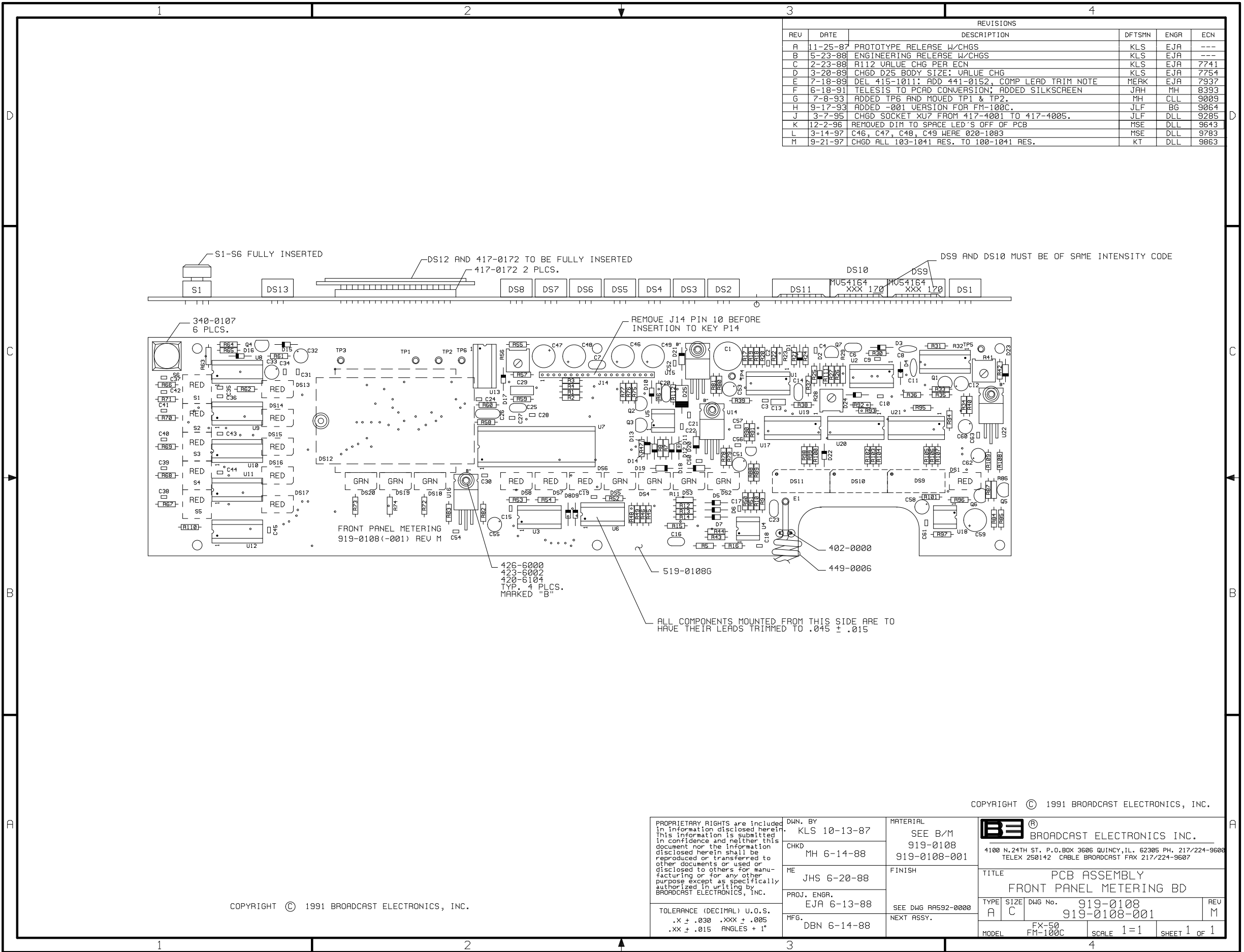
FM-100C	SCALE 1:1	SHEET 1 OF 1
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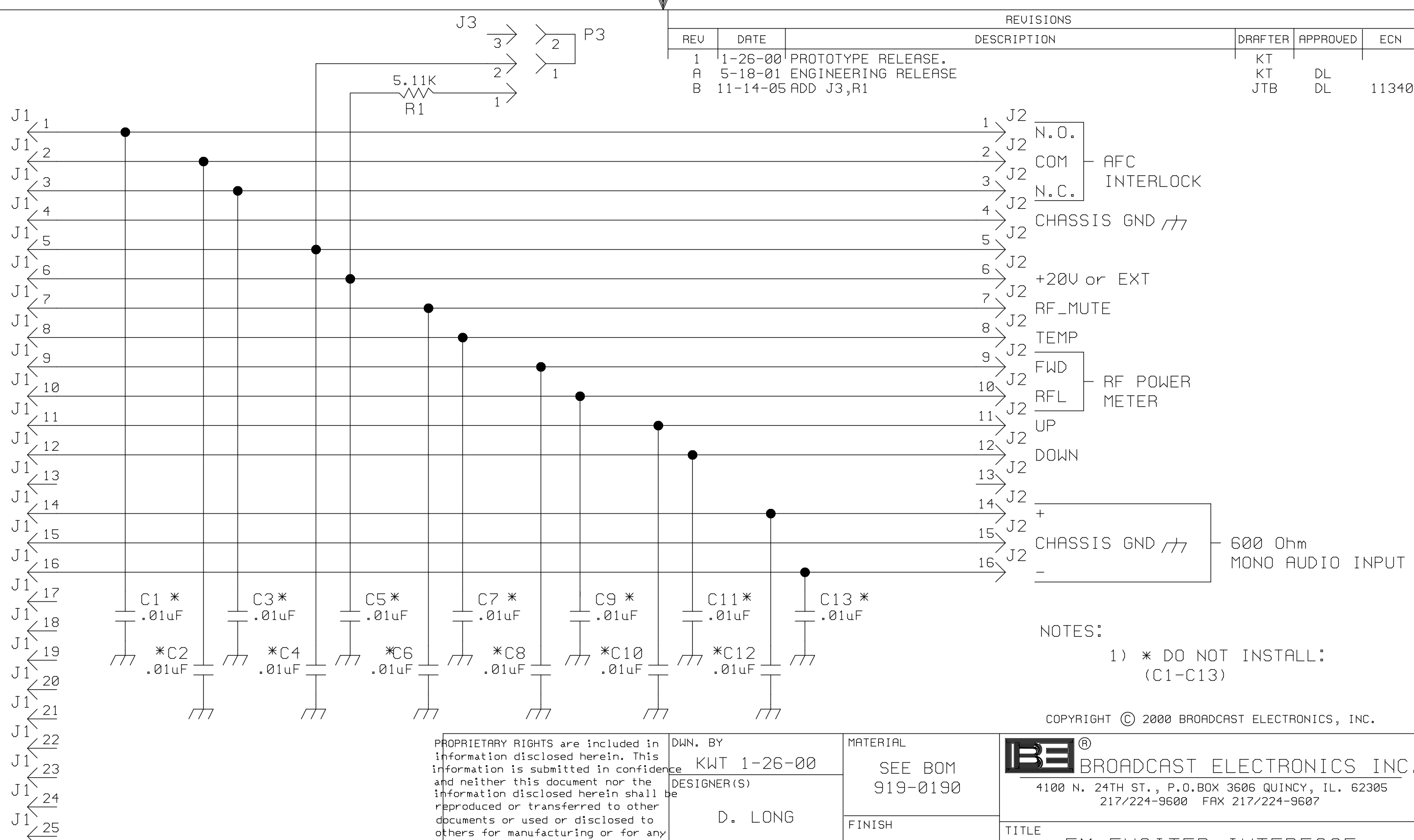


- NOTES:
- 1. ALL RESISTORS IN OHMS, 1/4W, 1%, UNLESS OTHERWISE SPECIFIED.
 - 2. VALUES IN PARENTHESES ARE FOR 919-0108-001, FOR USE IN FM-100C.
 - 3. LAST COMPONENT USED: C63, D25, DS20, E1, J14, Q7, R112, S6, TP6, U22
 - 4. COMPONENTS NOT USED: C5, J1-13
 - 5. SEE ASSEMBLY: AC919-0108(-001)

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BROADCAST ELECTRONICS, INC. 100 N. 24TH ST., P.O. BOX 3606 QUINCY, IL. 62305		TELEX 258142 CABLE BROADCAST		FAX 217/224-9607		TITLE SCHEMATIC METERING PCB		TYPE S	SIZE D	DWG. NO. 919-0108(-001)
REV A		DATE 11-3-87	DESCRIPTION PROTOTYPE RELEASE W/CHG.	DRAWN JAH	APPROVED EJA	ECN				
REV B		DATE 5-19-88	DESCRIPTION ENGINEERING RELEASE W/CHG.	DRAWN JAH	APPROVED EJA	ECN				
REV C		DATE 2-23-89	DESCRIPTION R112 VALUE CHG. (SHT2)	DRAWN KLS	APPROVED EJA	ECN 7741				
REV D		DATE 3-16-89	DESCRIPTION R112, R7, R8, D25 VALUE CHG. (SHT2)	DRAWN KLS	APPROVED EJA	ECN 7754				
REV E		DATE 7-18-89	DESCRIPTION CHG C59 FROM 100uF TO 22uF. (SHT1)	DRAWN MARK	APPROVED EJA	ECN 7937				
REV F		DATE 7-9-93	DESCRIPTION SEE SHEET 2.	DRAWN MH	APPROVED CLL	ECN 9809				
REV G		DATE 9-17-93	DESCRIPTION REDRAWN & ADDED -001 VERSION FOR FM-100C.	DRAWN JLF	APPROVED	ECN 9864				








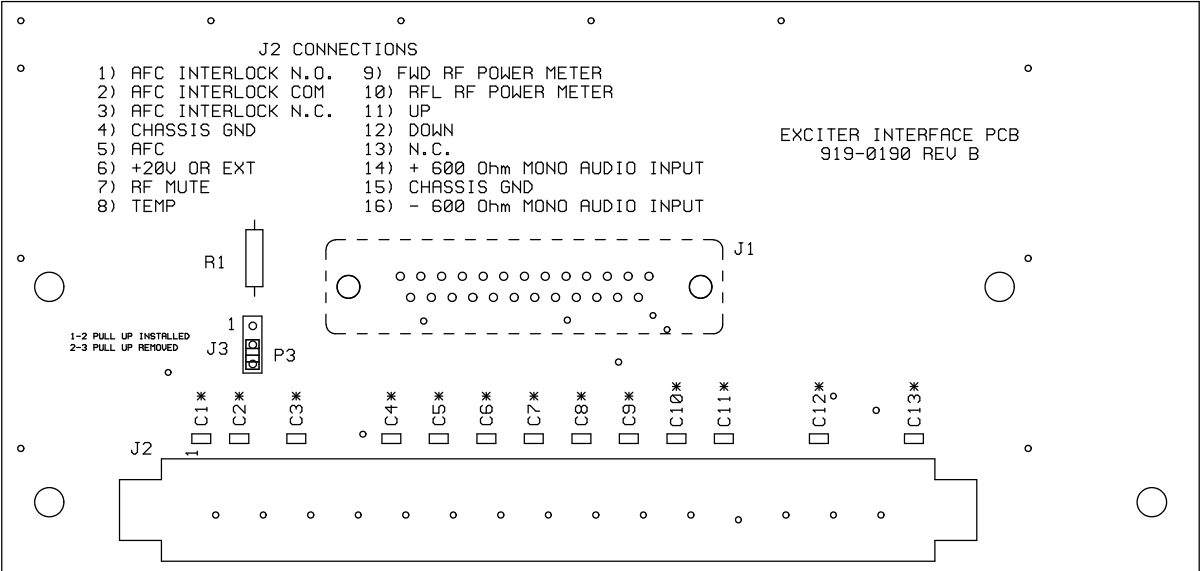
REVISIONS					DRAFTER	APPROVED	ECN
REV	DATE	DESCRIPTION					
1	1-26-00	PROTOTYPE RELEASE.			KT		
A	5-18-01	ENGINEERING RELEASE			KT	DL	
B	11-14-05	ADD J3,R1			JTB	DL	11340

NOTES:
1) * DO NOT INSTALL:
(C1-C13)

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	DESIGNER(S) D. LONG					
	PROJ. LEADER	FINISH NEXT ASSY.	TITLE FM EXCITER INTERFACE			
	MFG.					
TOLERANCE (DECIMAL) U.O.S. .x ± .030 .xxx ± .005 .xx ± .015 ANGLES ± 1°		TYPE S		SIZE B		DWG. NO. 919-0190
						REV B
MODEL EXCITERS			SCALE NONE		SHEET 1 OF 1	

REVISIONS					
REV	DATE	DESCRIPTION	DRAFTER	APPROVED	ECN
1	3-17-00	PROTOTYPE RELEASE.	KT		-----
2	9-6-00	MOVED C12 & C13	KT		-----
3	10-5-00	CHANGED BOARD OUTLINE	KT		-----
A	5-18-01	ENGINEERING RELEASE	KT	DL	-----
B	11-11-05	ADD J3,R1	JTB	DL	11340

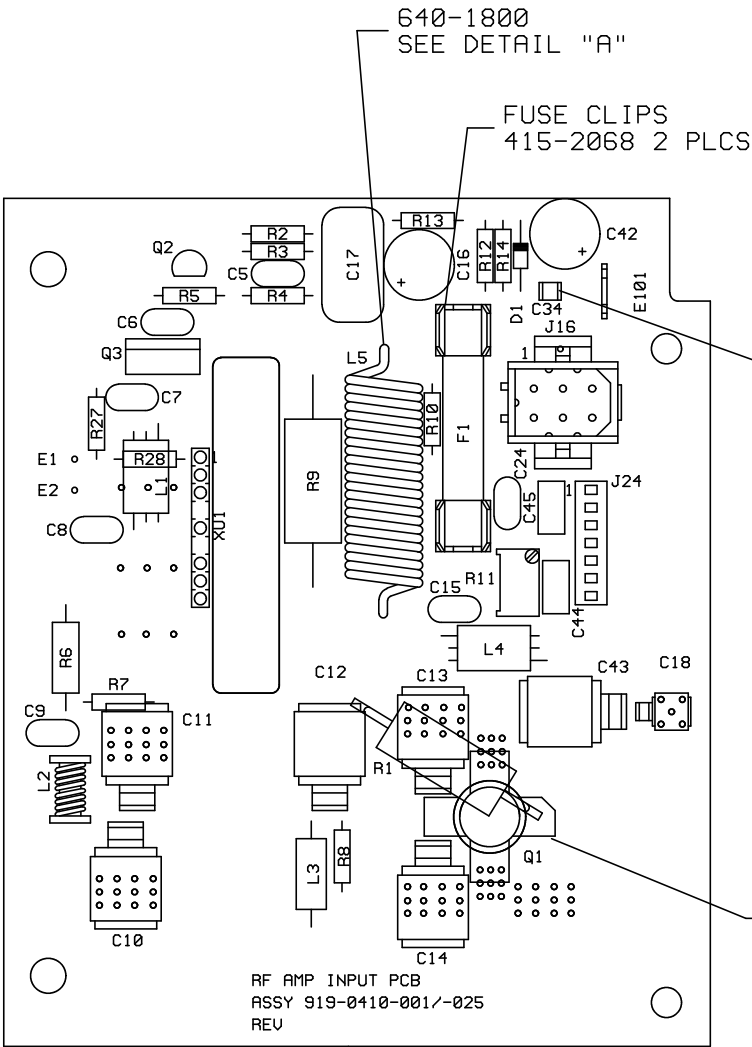


NOTES:

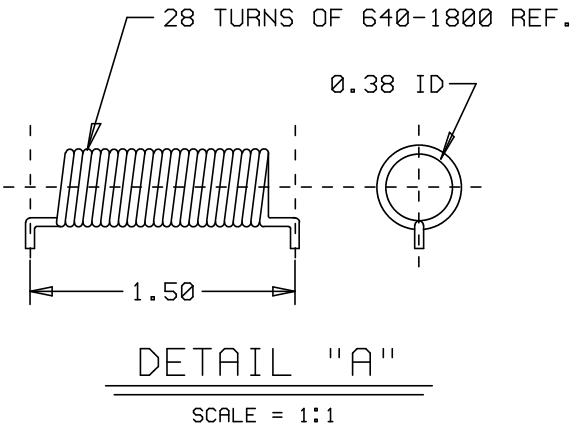
- 1) * DO NOT INSTALL (C1-C13)
- 2) P3 POS 1-2 FOR S-SERIES
P3 POS 2-3 FOR C & T SERIES

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	DESIGNER(S) D. LONG					
	PROJ. LEADER	FINISH	TITLE EXCITER INTERFACE PCB			
	MFG.	NEXT ASSY.	TYPE A	SIZE B	DWG No. 919-0190	REV B
TOLERANCE (DECIMAL) U.O.S. .X ± .030 .XXX ± .005 .XX ± .015 ANGLES + 1°			MODEL NNNN		SCALE 1/1	SHEET 1 OF 1



REVISIONS					
REV	DATE	DESCRIPTION	DRAFTER	APPROVED	ECN
C	8-2-93	MODEL BUILD RELEASE.	JLF	CLL	----
D	10-5-93	INCREASED PAD CLEARANCES TO GND PLANE.	JLF	CLL	9085
-	10-8-93	ENGINEERING RELEASE.	JLF	CLL	----
E	10-10-94	DEL -001 BD FROM 519-0410 BRKWDY. CREATED 519-0426.	JLF	BSG	9295
F	10-20-95	ADDED TABLE;ADDED ASSY. 919-0410-025 TO DRAWING, CHGD. Q3 TO TIP32(218-0032)	MERK	CLL	9538
G	6-3-98	MOVED XU1 TO THE LEFT .008, MOVED THE CUTOUT TO THE RIGHT .022.	MSE	DLL	9986
H	11-23-98	ADDED SOLDER MASK TO COMPONENT SIDE	MSE		10015



- NOTES:
1. COMPONENTS Q1 & R1 ARE INSTALLED DURING RF AMP (959-0411/959-0415) FINAL ASSEMBLY, AND ARE SHOWN HERE FOR REFERENCE ONLY.

SEE NOTE 1

519-0426 REV D

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REF. DES.	ASSEMBLY 919-0410-001	ASSEMBLY 919-0410-025
R2	103-4324 (4.32K,1%)	100-1051 (10K,1%)
R12	103-2945 (29.4K,1%)	100-2041 (2K,1%)
R13	103-2945 (29.4K,1%)	N/A
R14	103-6985 (69.8K,1%)	103-1021 (10,1%)
D1	201-2800 (HP2800)	N/A
C34	009-1032 (1000pF)	N/A

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

DWN. BY
JLF 7-13-93

DESIGNER(S)
CLL 8-4-93

PROJ. LEADER
CLL 10-8-93

MFG.
D. RUST 10-8-93

MATERIAL
SEE BOM
919-0410-001
919-0410-025

FINISH

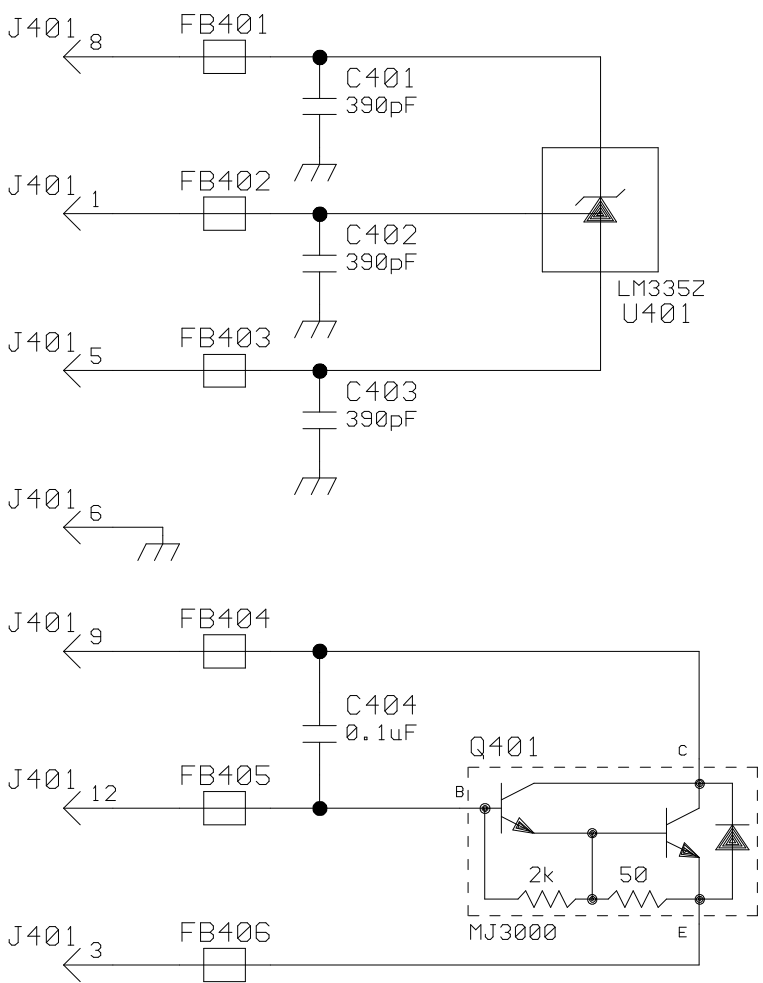
NEXT ASSY.
959-0415
959-0411

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

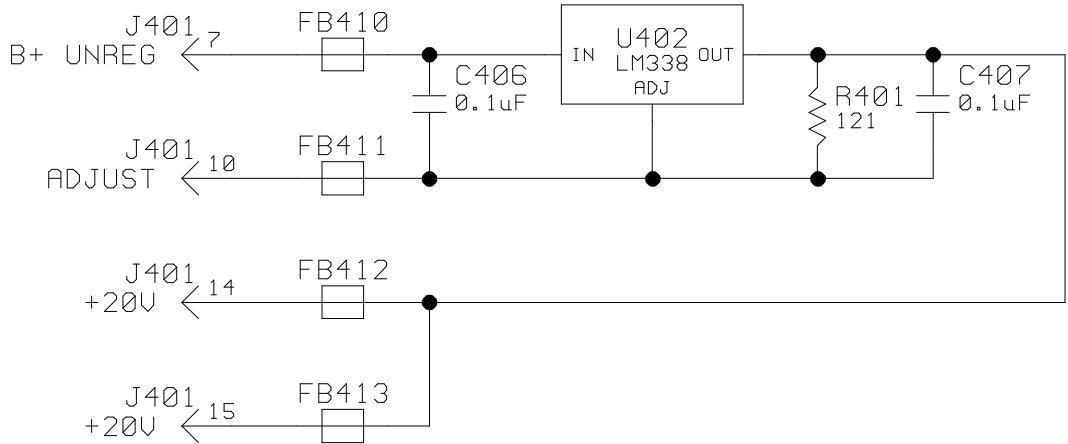
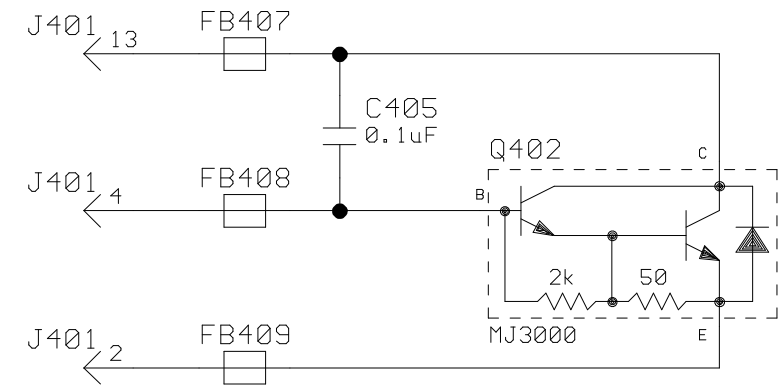
TITLE
PCB ASSEMBLY
RF AMP INPUT BD

TYPE	SIZE	DWG No.	REV
A	B	919-0410-001/-025	H

MODEL	FM-100C/FM-250C	SCALE	1:1	SHEET	1 OF 1
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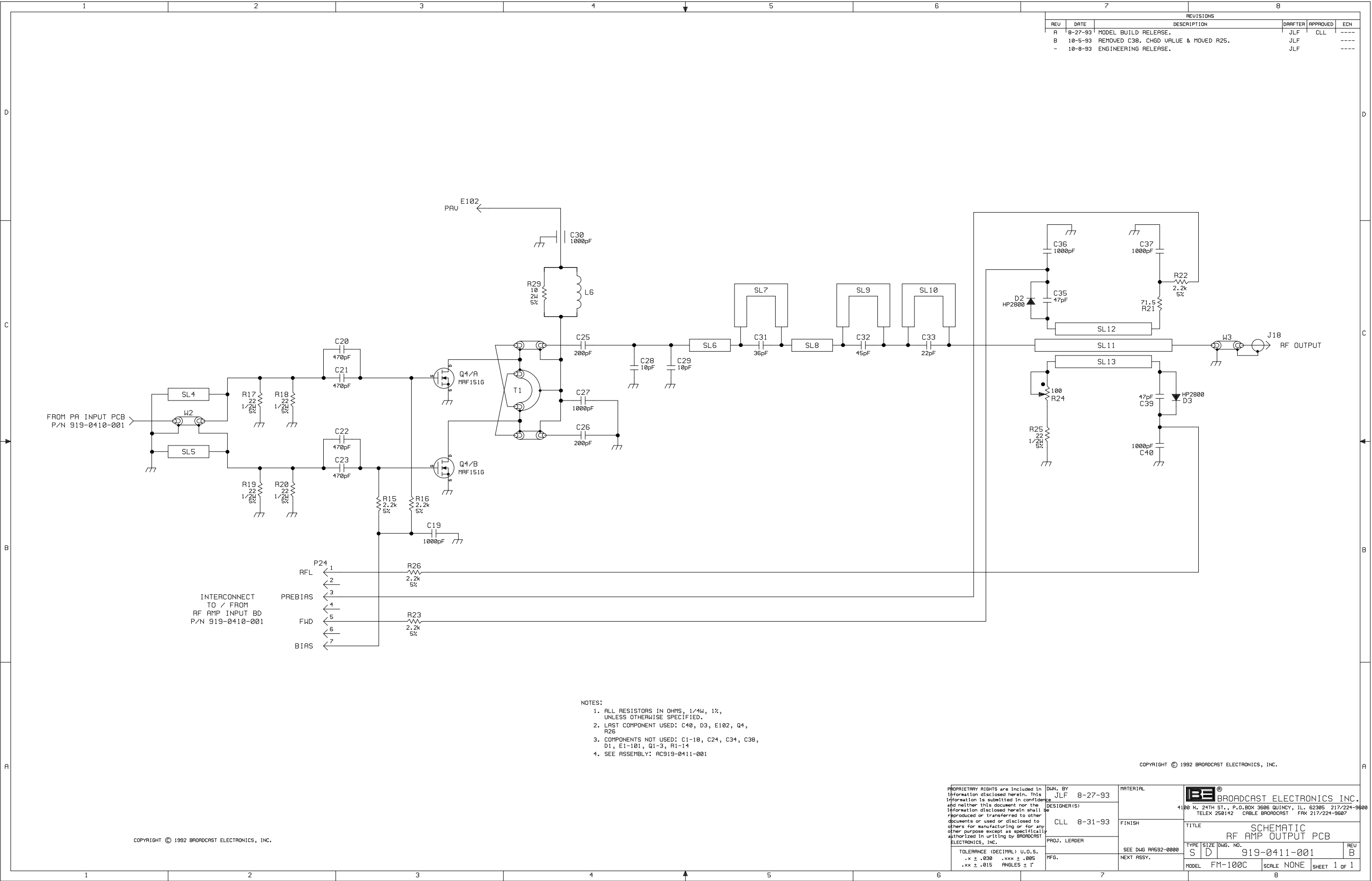
REVISIONS					
REV	DATE	DESCRIPTION	DRAFTER	APPROVED	ECN
A	3-29-93	PROTOTYPE RELEASE.	JLF		----
-	8-2-93	MODEL BUILD RELEASE.	JLF	CLL	----
-	10-8-93	ENGINEERING RELEASE.	JLF		----



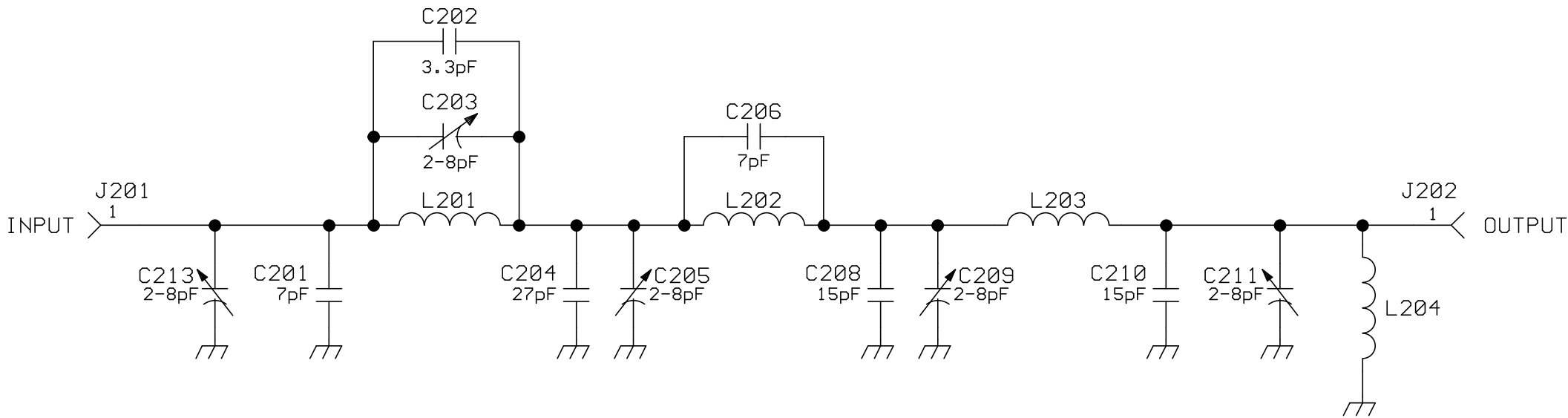
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- NOTES:
1. ALL REFERENCE DESIGNATORS START AT 401.
 1. ALL RESISTORS IN OHMS; 1/4W, 1% UNLESS OTHERWISE SPECIFIED.
 2. LAST COMPONENT USED: C407, FB413, J401, Q402, R401, U402
 3. COMPONENTS NOT USED:
 4. SEE ASSEMBLY: AC919-0410-004

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	DESIGNER(S) CLL 8/4/93				
	PROJ. LEADER	FINISH	TITLE SCHEMATIC RF AMP REGULATOR PCB		
	MFG.	SEE DWG RA592-0000 NEXT ASSY.	TYPE S	SIZE B	DWG. NO. 919-0410-004
TOLERANCE (DECIMAL) U.O.S. .x ± .030 .xxx ± .005 .xx ± .015 ANGLES ± 1°		MODEL FM-100C		SCALE NONE	SHEET 1 OF 1




REVISIONS					
REV	DATE	DESCRIPTION	DRAFTER	APPROVED	ECN
A	6-17-93	PROTOTYPE RELEASE.	MH		----
B	7-30-93	MODEL BUILD RELEASE W/CHGS.	JLF	CLL	----
C	10-8-93	C201 WAS 10pF. ADDED C202. ENGINEERING RELEASE.	JLF		----



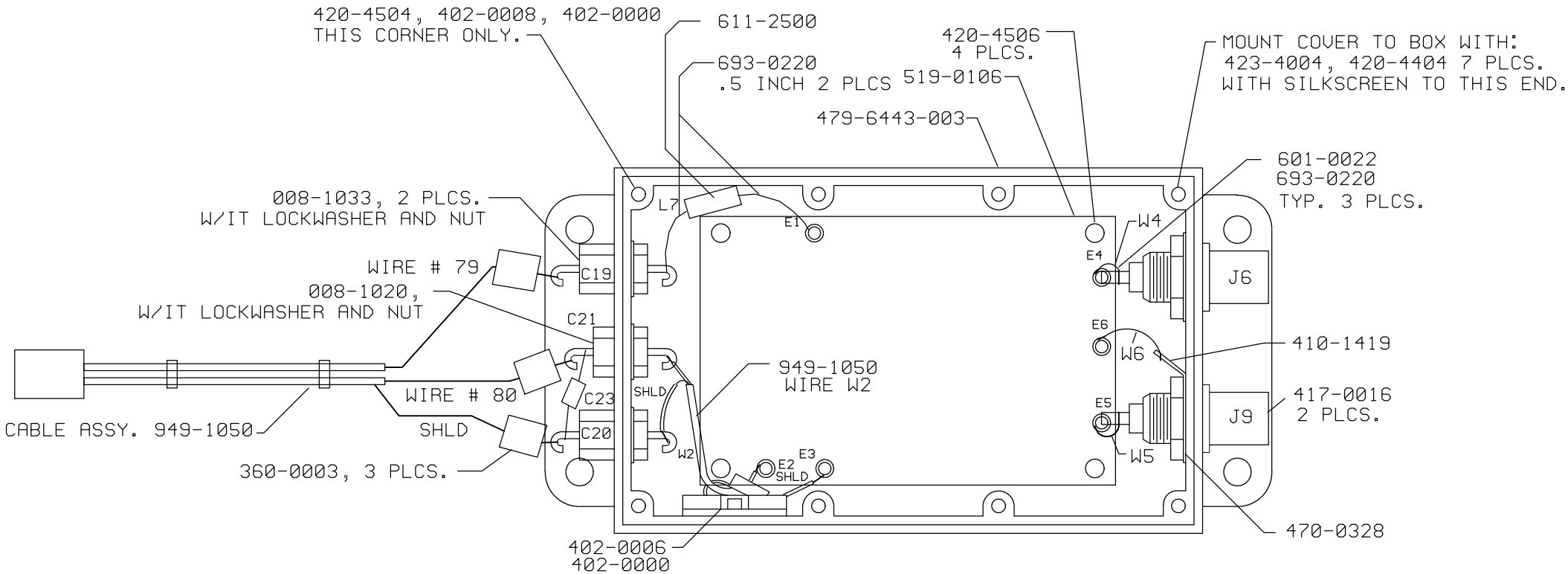
- NOTES:
1. ALL REFERENCE DESIGNATORS START AT 201.
 2. LAST COMPONENT USED: C213, J202, L204
 3. COMPONENTS NOT USED: C207, C212
 4. SEE ASSEMBLY: AC919-0411-002

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	DESIGNER(S)	M. HAYDEN		
		CLL 8/4/93	TITLE SCHEMATIC LOW PASS FILTER	
	PROJ. LEADER			
TOLERANCE (DECIMAL) U.O.S. .x ± .030 .xxx ± .005 .xx ± .015 ANGLES ± 1°		MFG.	SEE DWG RA592-0000	TYPE SIZE DWG. NO. REV S B 919-0411-002 C
			NEXT ASSY.	MODEL FM-100C SCALE NONE SHEET 1 OF 1

1. ALL RESISTORS IN OHMS, 1/4W, 5%; ALL CAPACITORS IN MICROFARADS, UNLESS OTHERWISE SPECIFIED.
2. LAST COMPONENTS USED: R24, C22, D12, Q5, L7, E6, W6.
3. SEE PCB ASSEMBLY 959-0203
4. COMPONENTS NOT USED: W3, R2, W1


K	4-6-90	ADDED C22,L7; REMOVED W1,REMOVED "*" NEAR C3	ELP	EJA	8240	REVISIONS					
L	5-21-91	ADDED 470-0328	JAH	JHS	8527	REV	DATE	DESCRIPTION	DFTSMN	ENGR	ECN
M	1-30-92	TELESIS TO PCAD CONVER MOVED PINS OF Q1 IN LINE	JAH	EJA	8582	U	12-1-99	SEPERATED 919-0106 ASSEMBLY FROM THIS ONE.	KT	DL	10223
N	3-14-94	LENGTH OF 621-1359 (2 PLCS) WAS 8"	MH	BG	9168	U	1-3-00	CHGD NOTES.	KT	DL	10246
P	10-27-94	ADDED 360-0003, 3 PLCS.	MH	JRC	9254	W	10-3-00	ADDED 949-1050 NOTES	KT	DL	10362
R	10-30-95	CHGD Q1 FROM 211-0005(MPS-U95) TO 211-0006(MPS-A06)	MERK		9561	Y	8-16-01	ADDED C23	KT		10457
S	12-3-96	12" LG WAS 10" LG, ADD 420-4504, 402-0008, 402-0000.	MSE	DL	9685	Z	6-7-10	ADD 611-2500(HEATSHRINK NOTE)	JTB		11773
T	3-26-97	MOVED 420-4504, 423-0008, 402-0000 TO OPP CORNER	MSE	DL	9774						



WIRING OF P8 417-0165	
PIN NO.	WIRE NO.
1	80
2	80 SHLD
3	79 SHLD
4	KEY
5	79

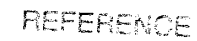
NOTES:

- WIRES W4,W5, AND W6 TO BE CUT AS SHORT AS POSSIBLE.
- CUT LEADS ON L7 AS SHORT AS POSSIBLE

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	CHKD MH 6-14-88					
	ME JHS 6-20-88	FINISH SEE DWG RA592-0000		TITLE PCB ASSEMBLY MODULATED OSCILLATOR BD		
	PROJ. ENGR. EJA 6-13-88			TYPE A	SIZE B	DWG No. 959-0203
	MFG. DBN 6-14-88	NEXT ASSY. 909-1050-000		MODEL FX-50/FM-100C		SCALE 1=1
TOLERANCE (DECIMAL) U.O.S. .X ± .030 .XXX ± .005 .XX ± .015 ANGLES + 1°						

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4700




OCT 30 1998

ONLY

POWER ONE
PROPRIETARY INFORMATION
NOT FOR REPRODUCTION WITHOUT
WRITTEN CONSENT

FEB 17 1993

ORIGINAL

ITEM	QTY REQD	PART NO. IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION		POWER ONE STD P/N
PARTS LIST					
MATERIAL		APPROVALS		DATE	 CAMARILLO, CALIF. 93012 (805)987-8741 D.C. POWER SUPPLIES
		DRAWN EVA MCKEEVER		5-7-91	
		CHECKED <i>B. G. PHE</i>		11/27/91	
		ENG. APPD. <i>Am 18</i>		1-27-93	
		APPROVED <i>Am 18</i>		11/27/91	
FINISH		MFG. APPD. <i>Am 18</i>		01/22/93	TITLE SCHEMATIC, EMI
		This drawing and specifications, herein, are the property of POWER-ONE INC. and shall not be reproduced or copied or used in whole or in part as the basis for the manufacture or sale of items without written permission.			
DO NOT SCALE DRAWING		SIZE		CODE IDENT NO.	DRAWING NO.
		C 54407			61026
		SCALE		COMPUTER/GEN/DWG	SHEET 1 OF 1

NOTES: UNLESS OTHERWISE SPECIFIED

REVISIONS				
ECO	LTR	DESCRIPTION	DATE	APPROVED
N/A	A	PRODUCTION RELEASE	1/27/93	P.H.F.
3423	B	INC. E.C.O.	4/12/93	STK
4124	C	INC E.C.O.	3/27/94	JCU
4619	D	ADD RTV AT E3 AND 4	8/4/94	LIYA
5787	E	REMOVE DETAIL A	9-10-95	B.G.

REFERENCE

OCT 30 1998

ONLY

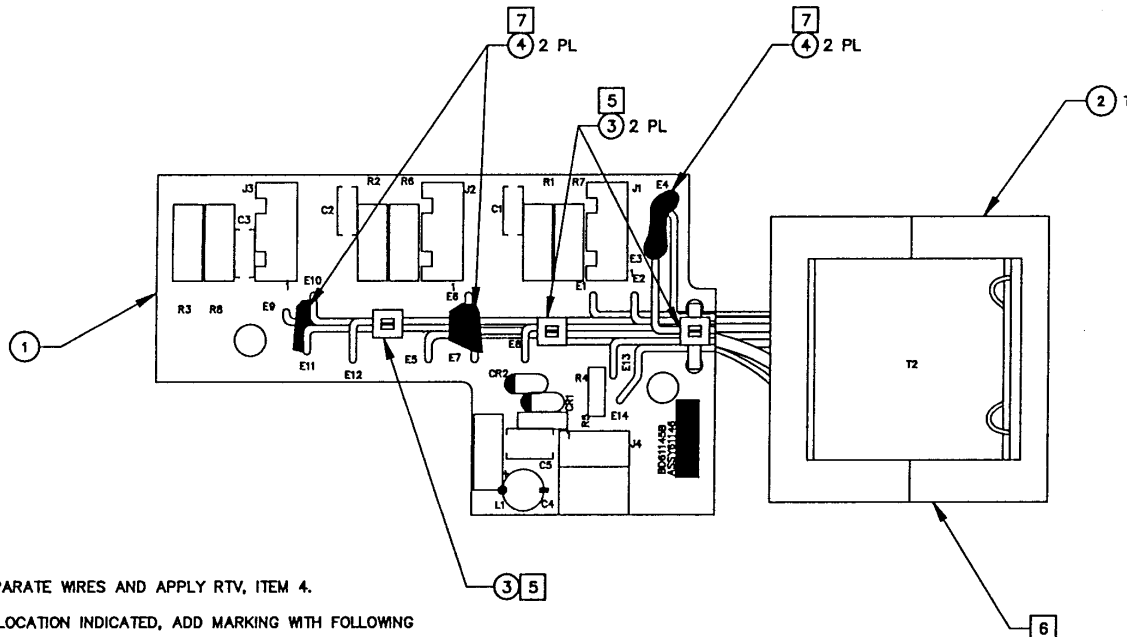
TABLE 1 4

P.C.B. DESIG	LEAD DESIG
E1	1
E2	2
E3	3
E4	4
E5	5
E6	6
E7	7
E8	8
E9	9
E10	10
E11	11
E12	12
E13	13
E14	14

FILED

SEP 1995


SEE SEPARATE PARTS LIST



7. SEPARATE WIRES AND APPLY RTV, ITEM 4.
6. IN LOCATION INDICATED, ADD MARKING WITH FOLLOWING INFORMATION:
 - PROCESS STAMPS
 - "ASSEMBLED IN MEXICO"
 - DATE STAMP
 - P.O. NO.
5. SECURE TRANSFORMER LEADS 1 THRU 14 TO P.W.B. WITH CABLE TIE, ITEM 3, 3 PLACES AS SHOWN.
4. TERMINATE TRANSFORMER LEADS 1 THRU 14 AT TERMINATION POINTS E1-14, AS SHOWN PER TABLE 1 USING FIXTURE #62412.

3. FOR HARDWARE SEE DWG NO. 61170.
2. FOR SCHEMATIC SEE DWG NO. 61146.
1. ALL ASSEMBLIES PER POWER-ONE WORKMANSHIP STANDARDS MANUAL, DOC. NO. 53857.

NOTES: UNLESS OTHERWISE SPECIFIED

		APPROVALS		DATE	 CAMARILLO, CALIF. 93012 (805)987-8741	TITLE TRANSFORMER/PWB FINAL ASSEMBLY	
		DRAWN	S. TAMBURRINO	1/4/93			
		CHECKED	B. GEHRKE	1/27/93			
		ENG. APPD.	S. KUNG	1/27/93			
		APPROVED	P. BOECK	1/27/93			
		MFG. APPD.		D. MATOS	1/28/93	SIZE CODE IDENT NO. DRAWING NO. REV. A 54407 62328 E	
		This drawing and specifications, herein, are the property of POWER-ONE INC. and shall not be reproduced or copied or used in whole or in part on the basis for the manufacture or sale of items without written permission.					
MATERIAL							
FINISH							
62296							
61956							
61955							
61954 NRG							
NEXT ASSY USED ON							
APPLICATION		DO NOT SCALE DRAWING					

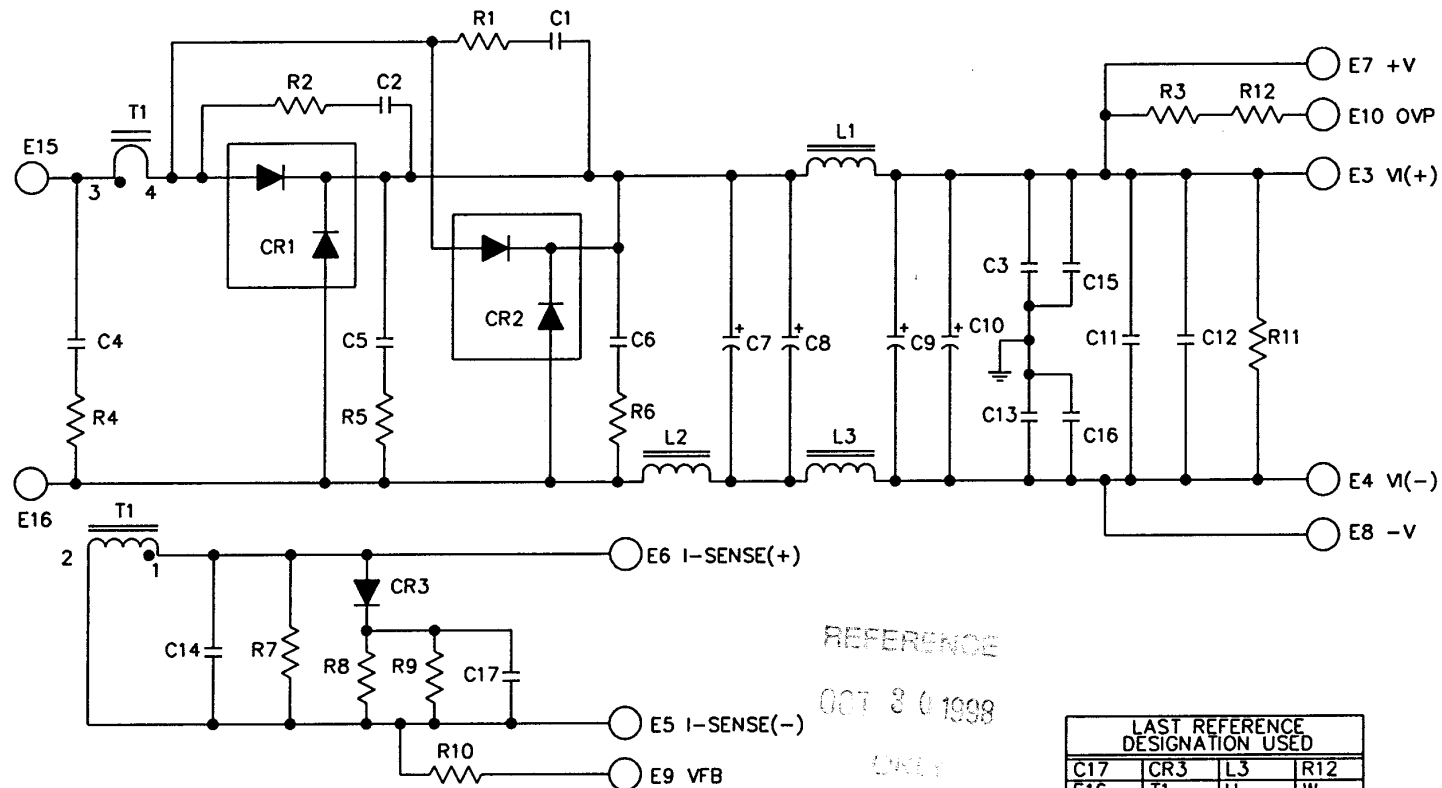
DO NOT SCALE DRAWING

SCALE 2:1

COMPUTER/GEN/DWG

SHEET 1 OF 1

REVISIONS			
ECO	LTR	DESCRIPTION	DATE
N/A	A	PRODUCTION RELEASE	3/9/94
4632	B	ADD C17	8-11-94




REFERENCE
007 8 0 1998
ONLY

LAST REFERENCE DESIGNATION USED			
C17	CR3	L3	R12
E16	T1	U	W
F			
REF DESIGNATION NOT USED			
E1,E2,E11-14			

1. FOR PARTS LIST DASH NUMBER SEE APPROPRIATE MODEL MDL.

NOTES: UNLESS OTHERWISE SPECIFIED

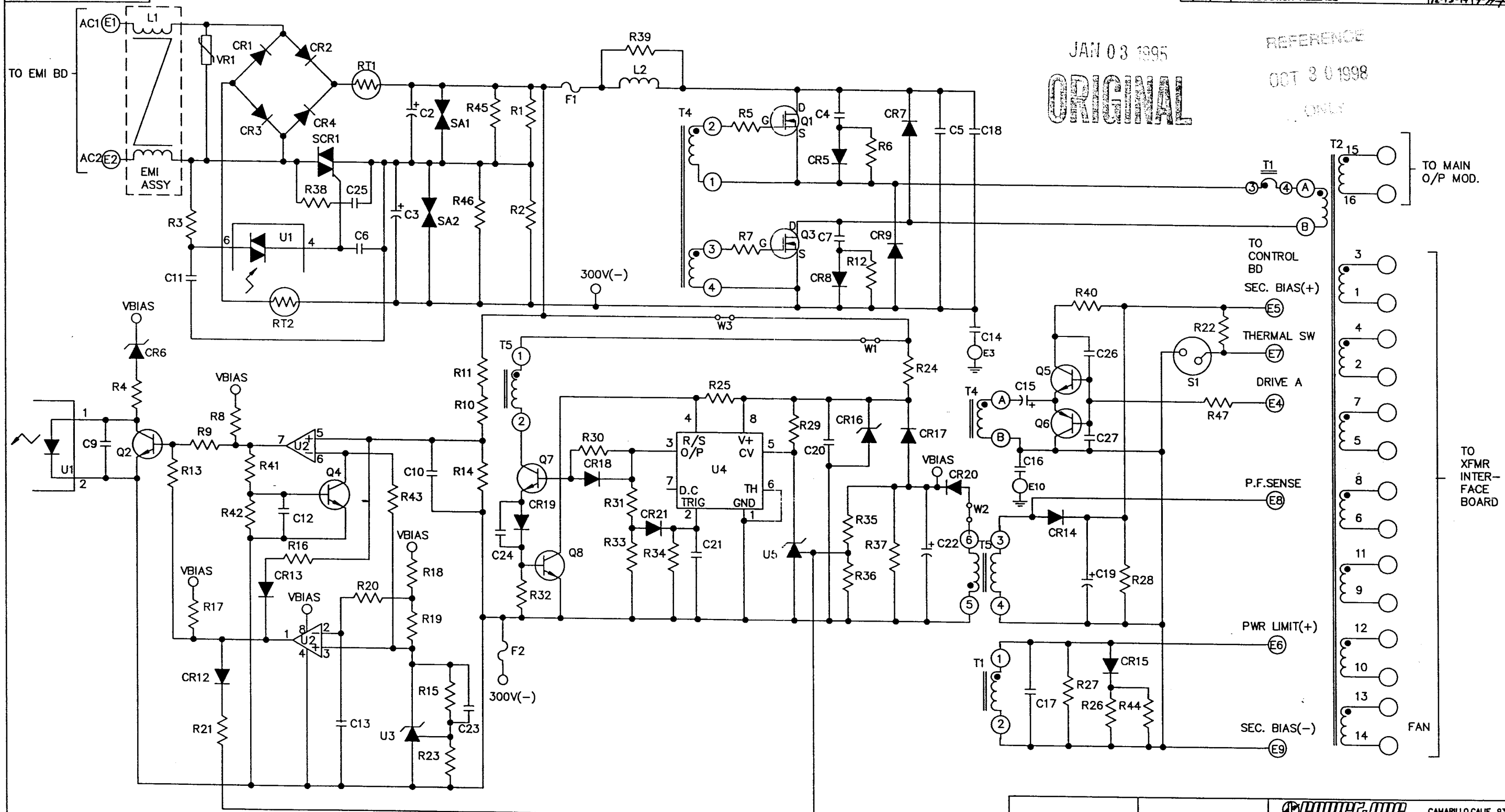
		APPROVALS		DATE	 CAMARILLO, CALIF. 93012 (805)987-8741	
		DRAWN		E. McKEEVER	2/19/93	
		CHECKED		B. GEMKE	3/9/94	
		ENG. APPD.		S. KUMBLE	3/9/94	
		APPROVED		P. BOECK	3/9/94	
		MFG. APPD.		D. MATOS	3/9/94	
		This drawing and specifications, herein, are the property of POWER-ONE INC. and shall not be reproduced or copied or used in whole or in part as the basis for the manufacture or sale of items without written permission.				
		MATERIAL				
		FINISH				
		NEXT ASSY		NRG		
		USED ON				
APPLICATION		DO NOT SCALE DRAWING		TITLE SCHEMATIC, 24-48V MOD		
		SIZE		CODE IDENT. NO.	DRAWING NO.	REV.
		A		54407	62517	B
		SCALE		COMPUTER/GEN/DWG SHEET 1 OF 1		

REVISIONS				
ECO	LTR	DESCRIPTION	DATE	APPROV
N/A	A	PRODUCTION RELEASE	17-5-90	241

JAN 03 1995

ORIGINAL

REFERENCE
OCT 30 1998
ONLY



1. FOR PARTS LIST DASH NUMBER SEE APPROPRIATE MODEL MDL.

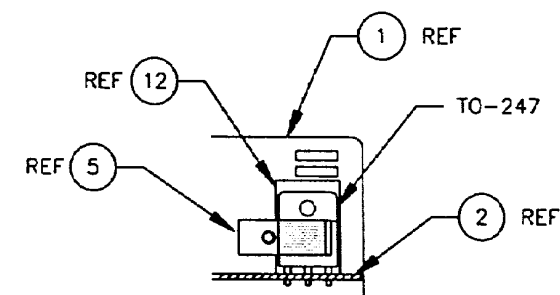
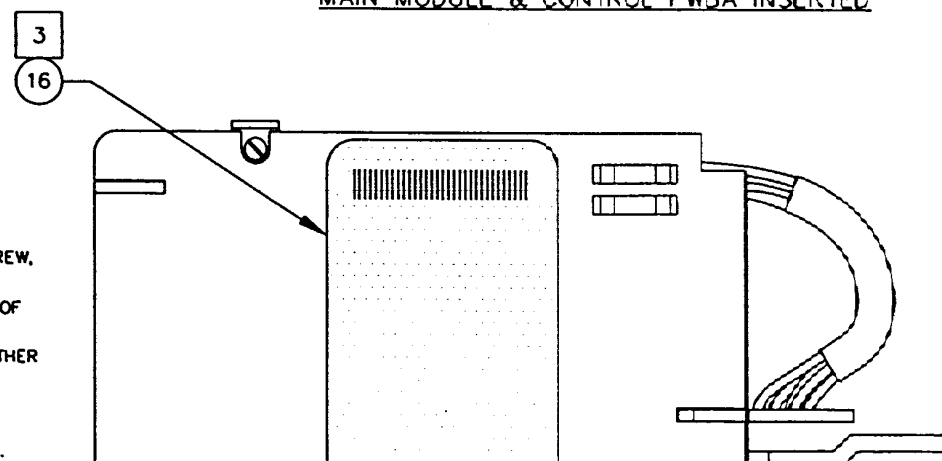
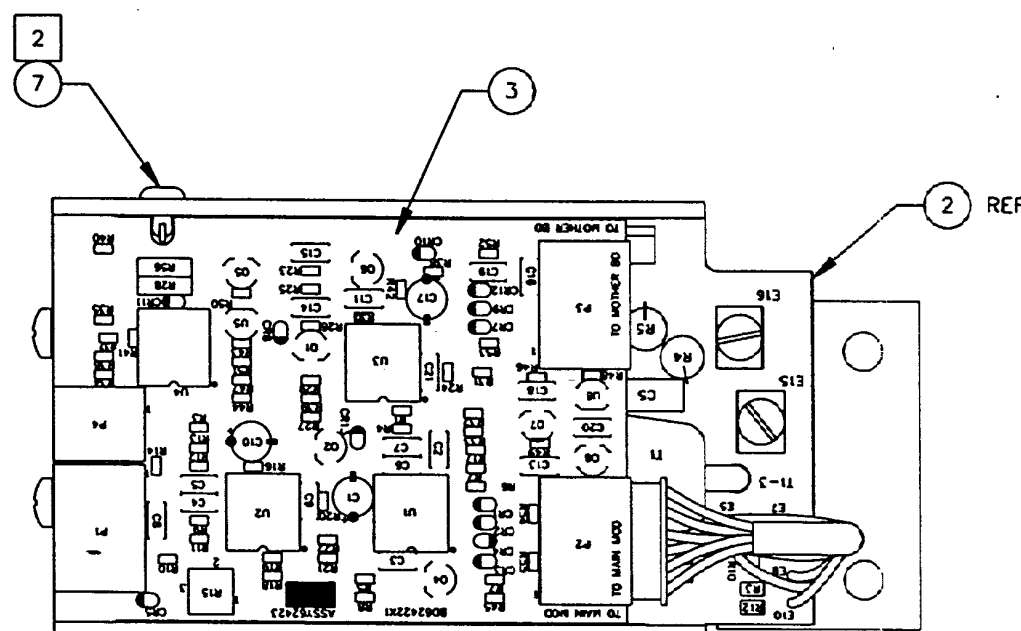
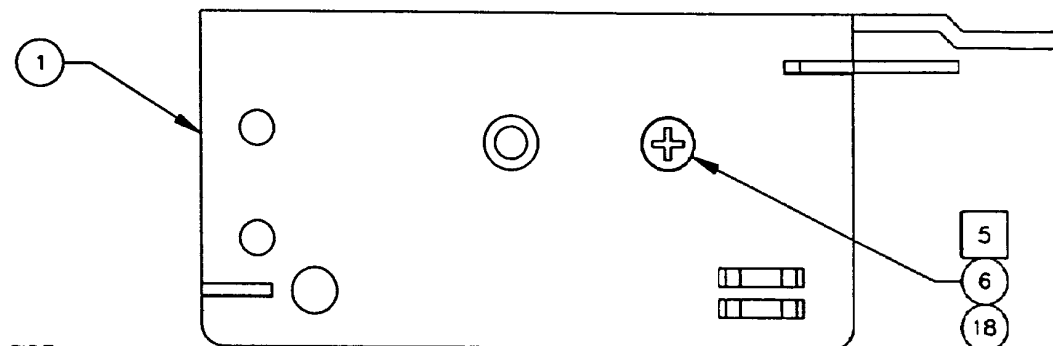
NOTES: UNLESS OTHERWISE SPECIFIED

LAST REFERENCE DESIGNATION USED				
C27	CR21	Q8	R47	
VR1	T5	L2	SA2	RT2
F2	W3	SCR1	S1	U5 E10
REF DESIGNATION NOT USED				
C1,8,CR10,11,F3				

NRG MOTHER BOARD	
NEXT ASSY	USED ON
APPLICATION	

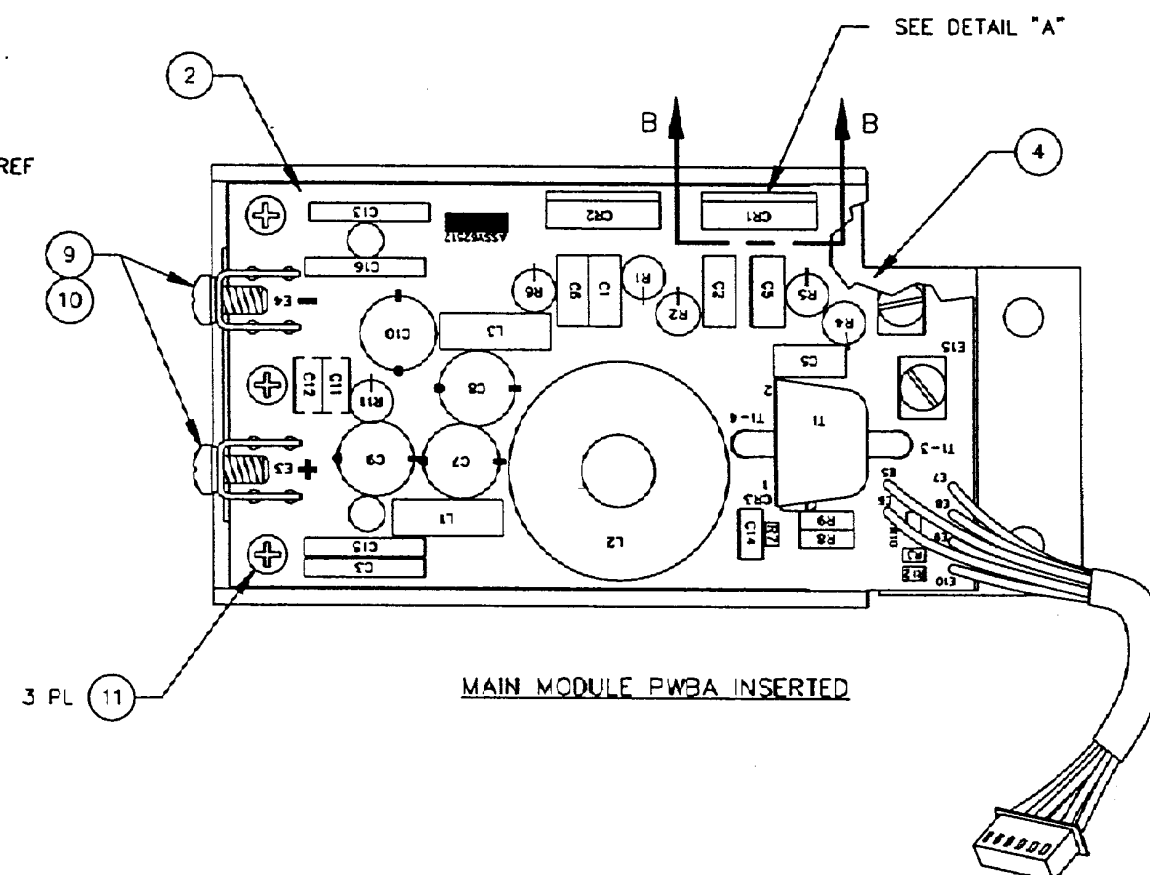
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REVISIONS				
ECO	LTR	DESCRIPTION	DATE	APPROVED
N/A	A	PRODUCTION RELEASE	3/10/94	P.H.F.
4487	B	ADDED TAPE TO CLAMP. DETAIL B	6/3/94	L.F.



SECTION B-B 6

CONTROL BOARD NOT SHOWN FOR CLARITY



MAIN MODULE PWBA INSERTED

6. NOTE ORIENTATION OF CLAMPS, ITEM 5.
5. APPLY ITEM 18, ADHESIVE, TO THREADS OF ITEM 6, SCREW, BEFORE INSTALLING INTO ITEM 5, CLAMP.
4. BEFORE INSTALLING CLAMP, ITEM 5, CUT 1.20" LENGTH OF TAPE, ITEM 19, TO WRAP AROUND CLAMP. START TAPE APPROX WHERE SHOWN IN DETAIL B. PINCH TAPE TOGETHER AT END.
3. NOTE ORIENTATION OF LABEL.
2. INSTALL RIVET, ITEM 7, WITH SLIT IN VERTICAL POSITION.
1. ALL ASSEMBLIES PER POWER-ONE WORKMANSHIP STANDARDS MANUAL, DOC. NO. 53857.

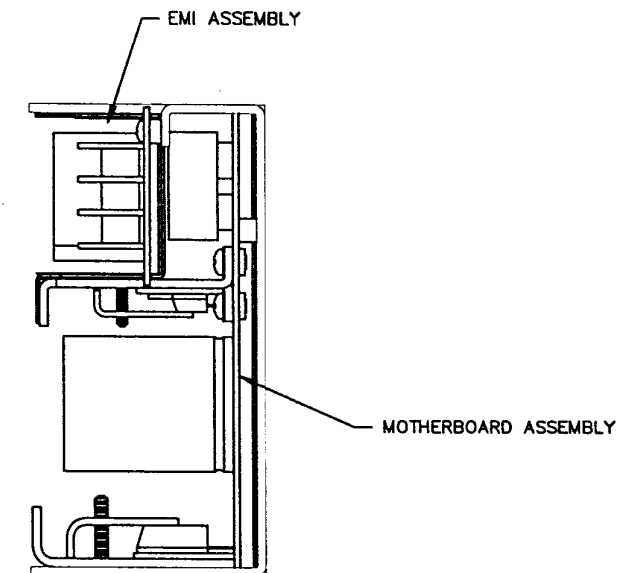
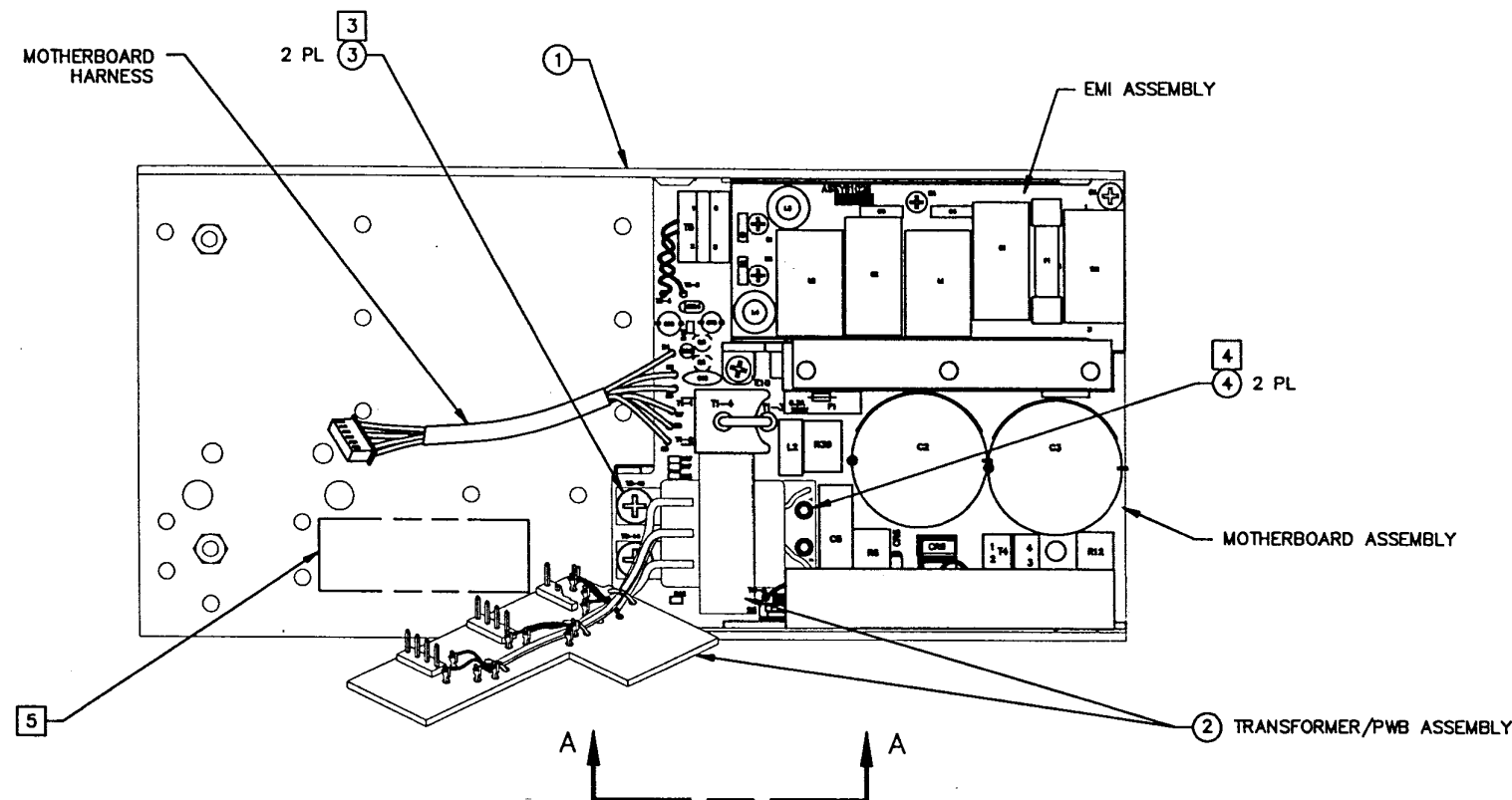
NOTES: UNLESS OTHERWISE SPECIFIED

SEE SEPARATE PARTS LIST

UNLESS OTHERWISE SPECIFIED CORNER RADIUS 8 INCHES (203.2MM) HOLE TOLERANCES F/G: .005 INCH / -0.010 / +0.012 DIMENSIONS ARE IN INCHES DIMENSIONS ARE IN MILLIMETERS FINISHES ARE:		APPROVALS		DATE	TITLE ASSY, MAIN MODULE	CAMARILLO, CALIF. 93001 (805)987-8741
		DRAWING NO. 62624 REV. B		DATE 3/10/94		
MATERIAL		DRAWING NO. 62624 REV. B		DATE 3/10/94	ASSY, MAIN MODULE	CAMARILLO, CALIF. 93001 (805)987-8741
FINISH		DRAWING NO. 62624 REV. B		DATE 3/10/94		
NEXT ASSY USED ON		DRAWING NO. 62624 REV. B		DATE 3/10/94	ASSY, MAIN MODULE	CAMARILLO, CALIF. 93001 (805)987-8741
APPLICATION		DRAWING NO. 62624 REV. B		DATE 3/10/94		

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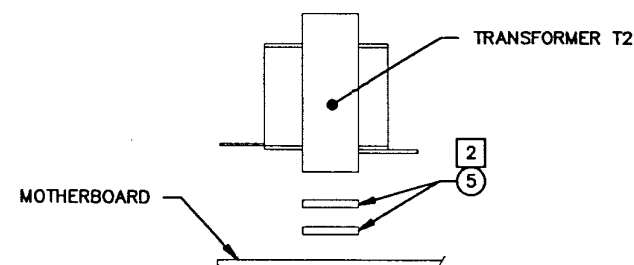
REVISIONS				
ECO	LTR	DESCRIPTION	DATE	APPROVED
N/A	A	PRODUCTION RELEASE	3/18/93	P.H.F.
3555	B	INC. E.C.O.	5/6/93	J.B.
3779	C	INC. E.C.O.	7/21/93	JCU
6444	D	CHG'D NOTE 3.	7-1-96	Z.M.



REFERENCE

OCT 30 1998

ONLY



VIEW A-A
CHASSIS NOT SHOWN FOR CLARITY

5 IN LOCATION INDICATED, ADD MARKING WITH FOLLOWING INFORMATION:

- "ASSEMBLED IN MEXICO"
- ASSEMBLY & REVISION
- P.O. NUMBER
- DATE CODE
- PROCESS STAMPS

4 ITEM 4 TORQUE: 6.5 - 7.5 INCH-POUNDS.

3 DO NOT TORQUE; FINGER TIGHTEN ONLY. ITEM 3 IS NOT STUFFED ON ASSEMBLIES 61955-104, 61955-105.

2 INSURE THAT BOTTOM SURFACE OF TRANSFORMER CORE IS CLEAN AND DRY. ADHERE FOAM TAPE, ITEM 5, TO BOTTOM OF CORE, ALIGNING IT SO THAT NO PORTION OF TAPE EXCEEDS OUTLINE OF CORE BOTTOM. RUB TAPE TO CORE TO REMOVE AIR BUBBLES. REMOVE TAPE LINER AND ADHERE SECOND PIECE OF TAPE IN ALIGNMENT WITH FIRST PIECE. REMOVE TAPE LINER AND ADHERE TRANSFORMER TO MOTHERBOARD.

1. ALL ASSEMBLIES SHALL COMPLY WITH POWER-ONE WORKMANSHIP STANDARDS DOCUMENT NUMBER 53857.

NOTES: UNLESS OTHERWISE SPECIFIED

SEE SEPARATE PARTS LIST

ALL DIMENSIONS ARE IN INCHES		TOLERANCES:		ANGLES	
.XX = ± .02		.XXX = ± .010			
MATERIAL		FINISH			
NEXT ASSY		USED ON			
APPLICATION		DO NOT SCALE DRAWING			

APPROVALS		DATE	TITLE
DRAWN	S. LAMBURRINO	8/4/93	CHASSIS ASSEMBLY
CHECKED	E. GEHRKE	1/25/93	W/TRANSFORMER, NRG3
ENG. APPD.	S. KUNG	1/25/93	
APPROVED	F. BOECK	1/25/93	
MFG. APPD.	C. MATOS	1/25/93	

SIZE	CODE IDENT NO.	DRAWING NO.	REV.
B	54407	61955	D

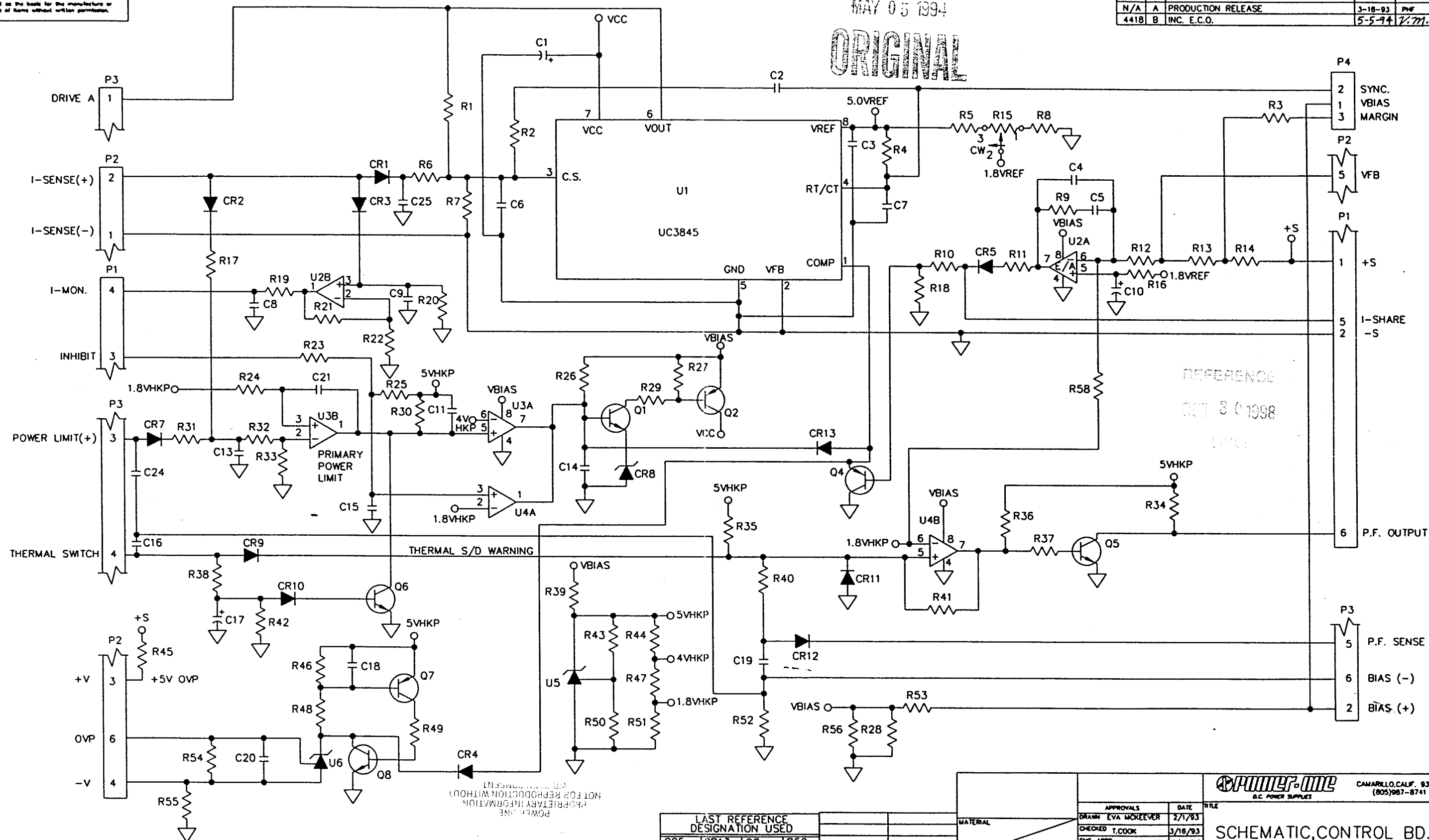
SCALE	COMPUTER/GEN/DWG	SHEET	1 OF 1
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FILE COPY
JUL 02 1996

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CD-ROM

REVISIONS				
ECO	LTR	DESCRIPTION	DATE	APPROV
N/A	A	PRODUCTION RELEASE	3-18-93	PMF
4418	B	INC. E.C.O.	5-5-94	W.M.



1. FOR PARTS LIST DASH NUMBER SEE APPROPRIATE MODEL MDL.

NOTES: UNLESS OTHERWISE SPECIFIED

LAST REFERENCE DESIGNATION USED			
C25	CR13	Q8	R58
SCR	P4	U6	
REF DESIGNATION NOT USED			
C12,22,23,CR6,Q3,R57			

	NRG
NEXT ASSY	USED ON

APPROVALS	DATE
DRAWN EVA MCKEEVER	2/1/93
CHECKED T.COOK	3/16/93
ENG. APPD. S.GONZALEZ	3/12/93
APPROVED P.BOECK	3/19/93
MFG.APPD. DOM MATOS	3/19/93

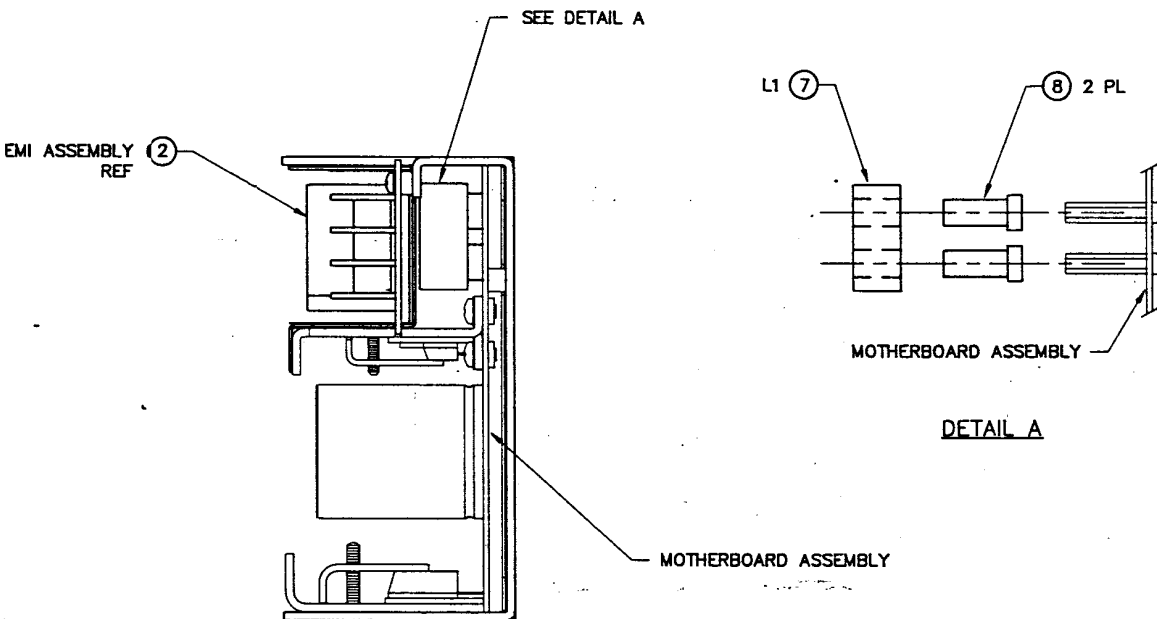
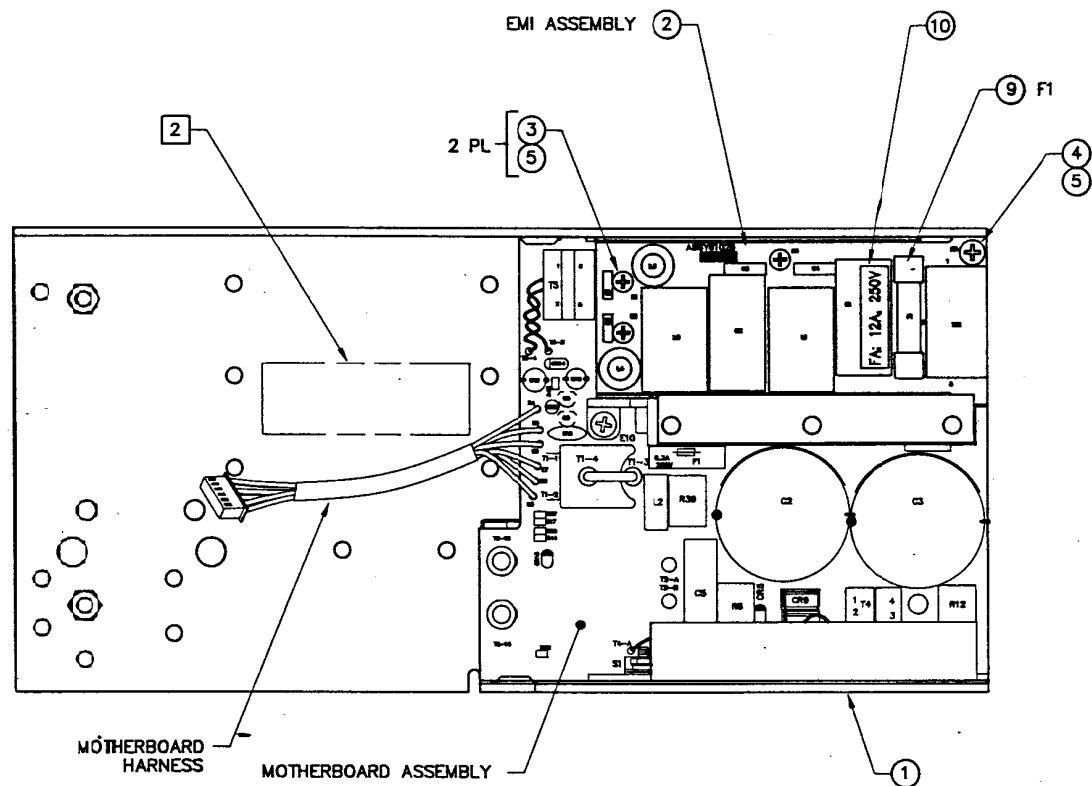
POWER-ONE
A.C. POWER SUPPLIES

SCHEMATIC, CONTROL BD.

SIZE	CODE IDENT NO.	DRAWING NO.	REV
B	54407	62423.	B
SCALE	NONE	COMPUTER/GEN/DWG	SHEET 1 OF 1

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REVISIONS				
ECO	LTR	DESCRIPTION	DATE	APPROVED
N/A	A	PRODUCTION RELEASE	1-25-93	7-6-93



FEB 17 1993

ORIGINAL

REFERENCE

02/15/1998

SEE SEPARATE PARTS LIST

- 2 IN LOCATION INDICATED, ADD MARKING WITH FOLLOWING INFORMATION:
- "ASSEMBLED IN MEXICO"
 - ASSEMBLY & REVISION
 - P.O. NUMBER
 - DATE CODE
 - PROCESS STAMPS

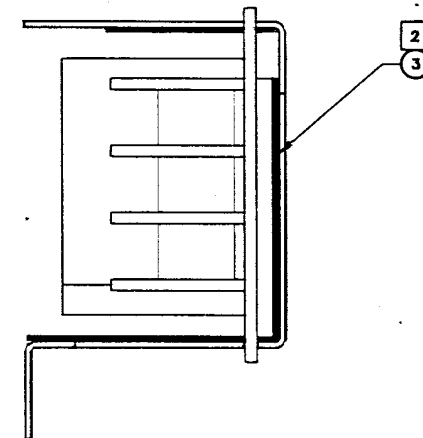
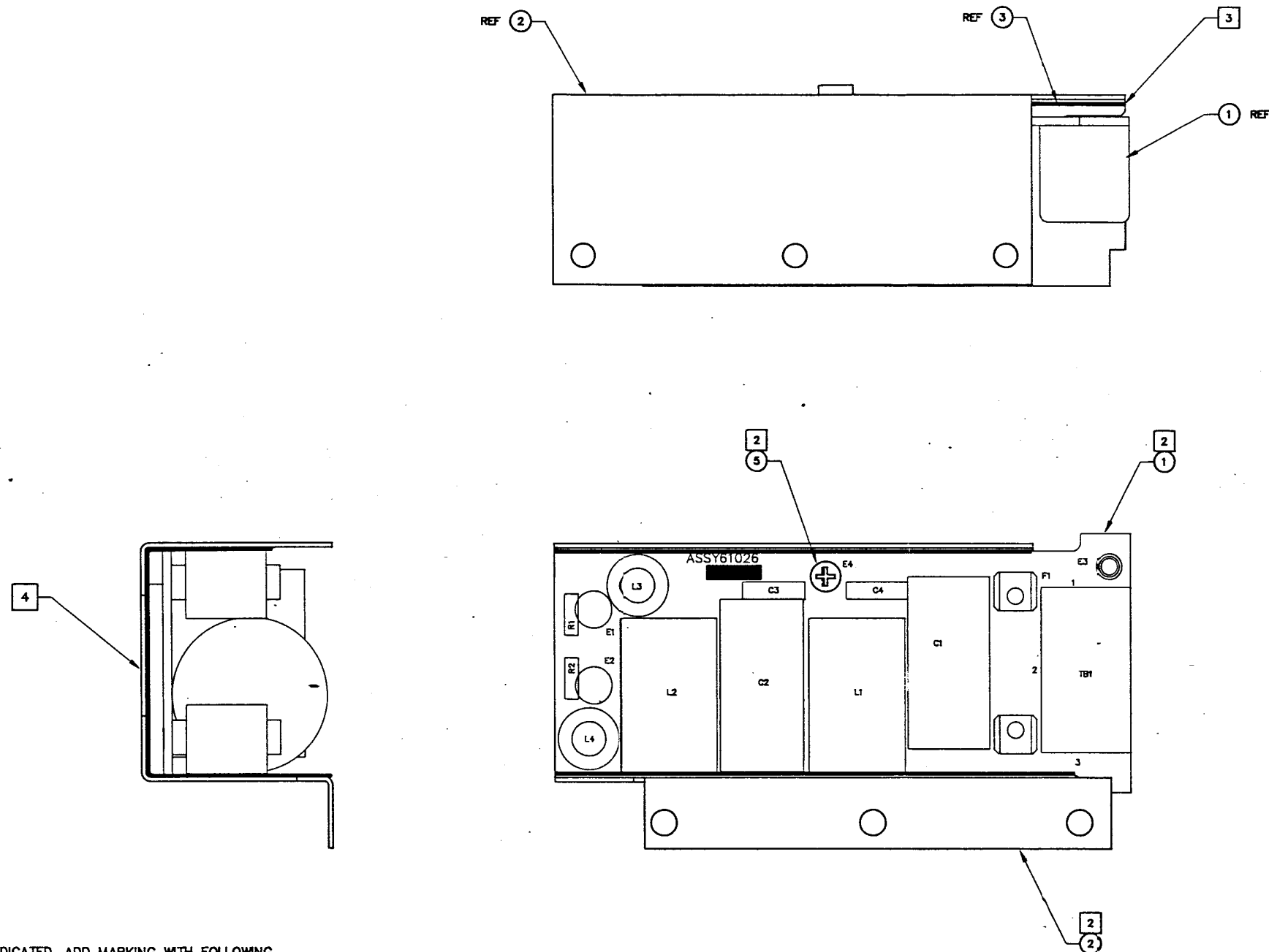
1. ALL ASSEMBLY SHALL COMPLY WITH POWER-ONE WORKMANSHIP STANDARDS DOCUMENT NUMBER 53857.

NOTES: UNLESS OTHERWISE SPECIFIED

ITEM	QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	POWER ONE STD. P/N
PARTS LIST				
ALL DIMENSIONS ARE IN INCHES				
TOLERANCES:				
.XX = ± .02				
.XXX = ± .010				
MATERIAL				
FINISH				
APPLICATION				
DO NOT SCALE DRAWING				
APPROVALS				
DATE				
DRAWN S. TAMBURRINO 7/24/92				
CHECKED D. ELI 1-25-93				
ENG. APPD. SK 1-25-93				
APPROVED J. P. 1-25-93				
MFG. APPD. J. P. 1-25-93				
SIZE CODE IDENT NO. DRAWING NO. REV.				
D 54407 61952 A				
SCALE 1:1 COMPUTER/GEN/DWG SHEET 1 OF 1				

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REVISIONS				
ECO	LTR	DESCRIPTION	DATE	APPROVED
N/A	A	PRODUCTION RELEASE	1-27-93	<i>[Signature]</i>



REFERENCE
OCT 20 1998
POWER-ONE
PROPRIETARY INFORMATION
NOT FOR REPRODUCTION WITHOUT
WRITTEN CONSENT

FEB 1 1993
ORIGINAL

4. IN LOCATION INDICATED, ADD MARKING WITH FOLLOWING INFORMATION:

- PROCESS STAMPS
- "ASSEMBLED IN MEXICO"
- DATE STAMP
- P.O. NO.

3. EDGE OF ITEM 3 (INSULATOR) MUST ALIGN WITH EDGE OF ITEM 2 (EMI CHASSIS) WHERE SHOWN.

2. WRAP ITEM 3 (INSULATOR) AROUND ITEM 1 (PWB ASSY) ALIGNING HOLE IN ITEM 3 WITH STANDOFF ON ITEM 1. HOLD ITEMS 1 AND 3 IN ALIGNMENT WHILE INSTALLING IN ITEM 2 (EMI CHASSIS) INSTALL ITEM 5 (SCREW).

1. ALL ASSEMBLIES PER POWER-ONE WORKMANSHIP STANDARDS MANUAL, DOC. NO. 53857.

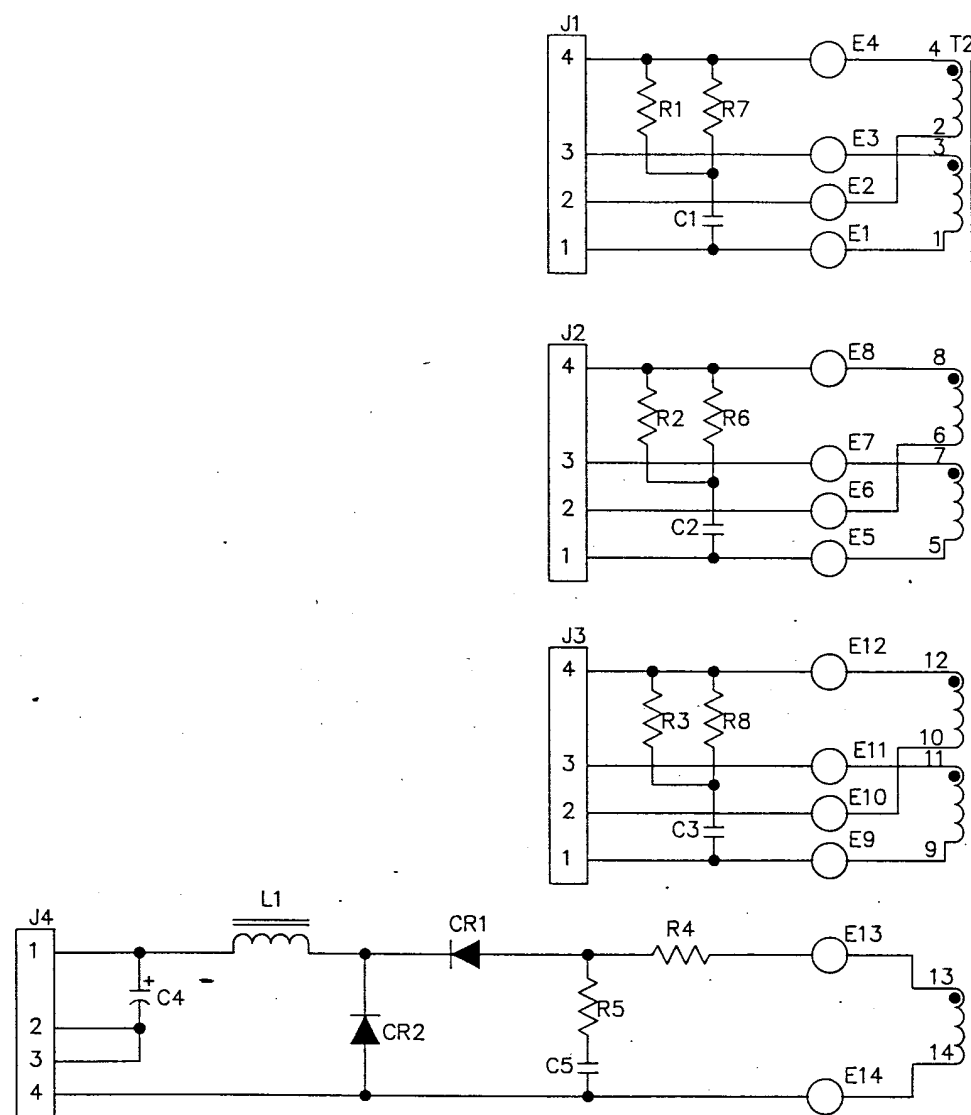
NOTES: UNLESS OTHERWISE SPECIFIED

SEE SEPARATE PARTS LIST

ITEM	QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	POWER ONE STD. P/N
PARTS LIST				
UNLESS OTHERWISE SPECIFIED REMOVE ALL BURRS & BREAK SHARP EDGES HOLE TOLERANCES FOR HOLE DIA. TYP. ±.012 DIMENSIONS ARE IN INCHES TOLERANCES ARE: FRACTIONS DECIMALS ANGLES 21/16 .001 .001 .001				
MATERIAL		APPROVALS	DATE	TITLE
62297		DRAWN: TAM BURRINO	12/21/92	FINAL ASSEMBLY, EMI
61953		CHECKED: D. BURRINO	1-27-93	
61952		ENG. APPD: [Signature]	1-27-93	
61951		APPROVED: [Signature]	1-27-93	
NEXT ASSY USED ON		INFLAPD: [Signature]	1-27-93	
APPLICATION		DO NOT SCALE DRAWING		
SIZE		CODE IDENT NO.	DRAWING NO.	REV.
D 54407		61160		A
SCALE 2:1		COMPUTER/GEN/DWG	SHEET 1 OF 1	

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REVISIONS				
ECO	LTR	DESCRIPTION	DATE	APPROVED
N/A	A	PRODUCTION RELEASE	1-27-95	445



FEB 17 1993
ORIGINAL

REFERENCE

OCT 3 1998

POWER-ONE
PROPRIETARY INFORMATION
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WRITTEN CONSENT

1. FOR PARTS LIST DASH NUMBER SEE APPROPRIATE MODEL MDL.

NOTES: UNLESS OTHERWISE SPECIFIED

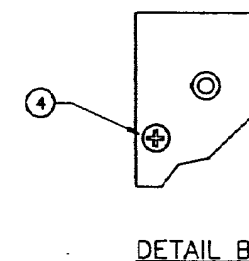
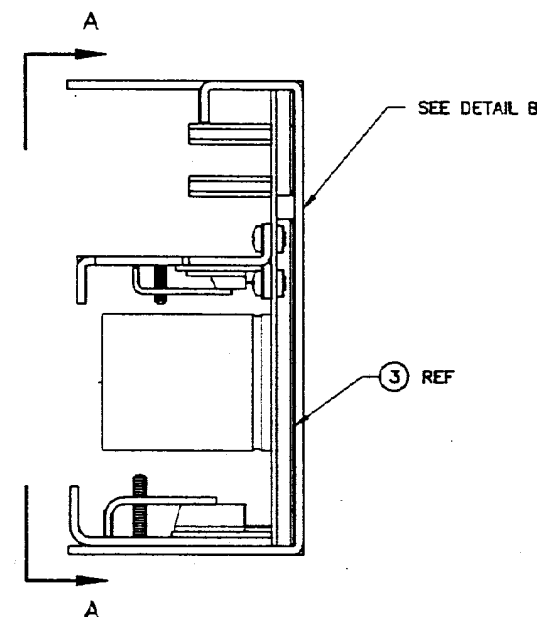
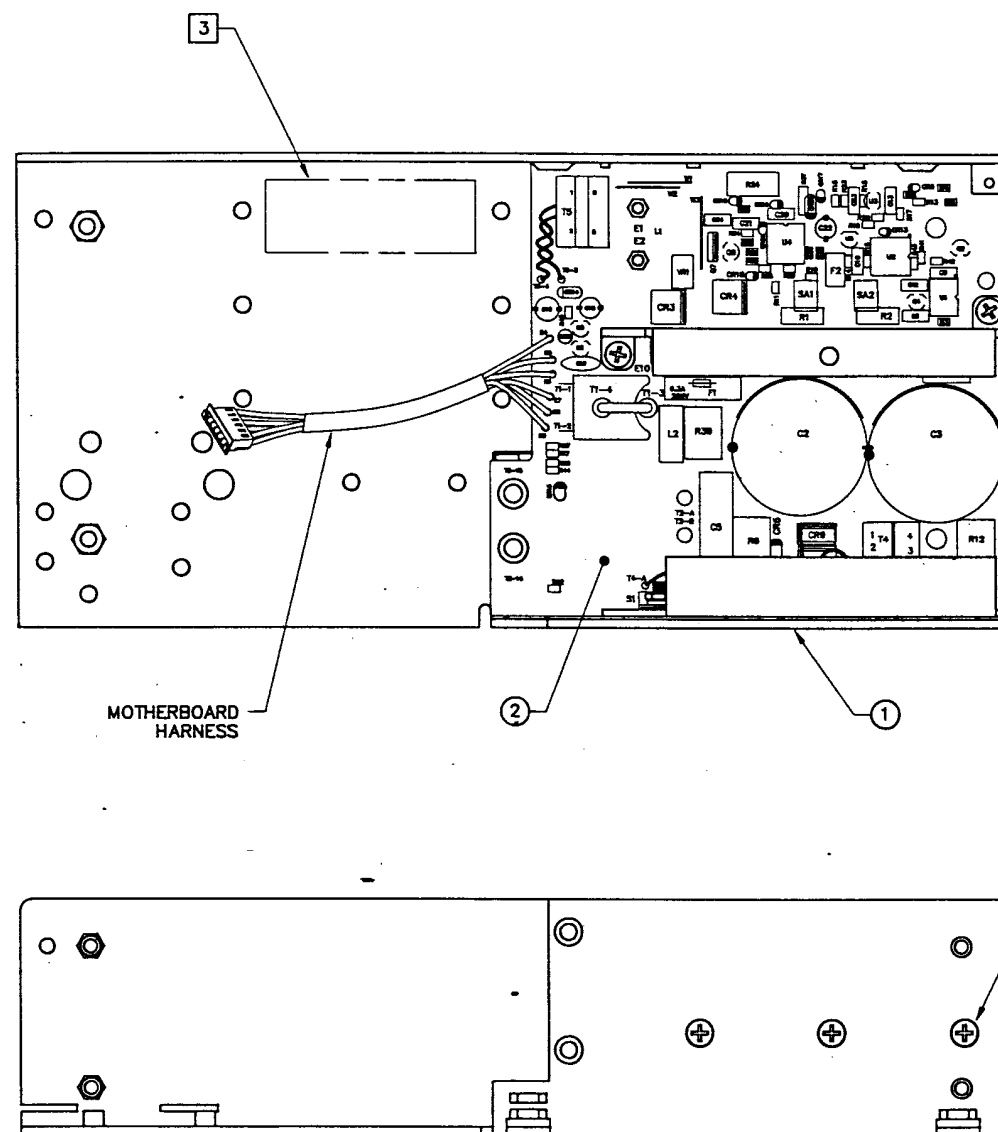
LAST REFERENCE DESIGNATION USED			
C5	CR2	J4	R8
E14	L1	T2	W
REF DESIGNATION NOT USED			
T1			

NEXT ASSY	
USED ON	
APPLICATION	

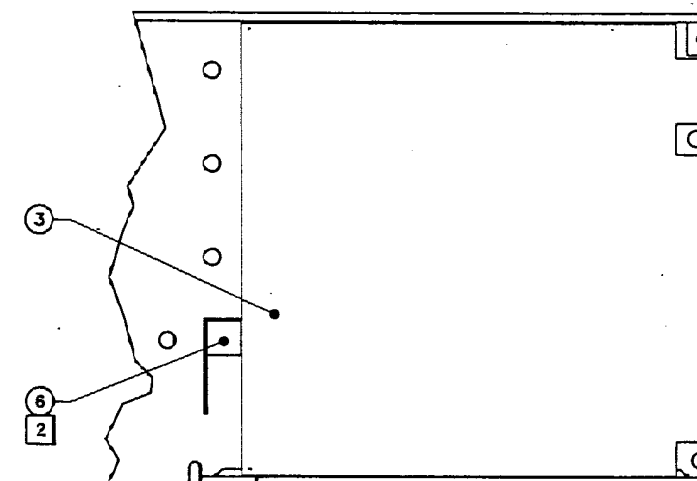
ITEM	QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	POWER ONE STD. P/N
PARTS LIST				
<div><div><div>APPROVALS</div><div>DATE</div><div>TITLE</div></div><div><div>DRAWN EVA MCKEEVER 10-23-92</div><div>CHECKED P. G. P. 1-27-93</div><div>ENG. APPD. 1-27-93</div><div>APPROVED 1-27-93</div><div>MFG. APPD. 01/27/93</div></div></div>				
SCHEMATIC, XFMR INTERCONNECT				
<div><div>SIZE</div><div>CODE IDENT NO.</div><div>DRAWING NO.</div><div>REV.</div></div> <div><div>D</div><div>54407</div><div>61146</div><div>A</div></div>				
SCALE COMPUTER/GEN/DWG SHEET 1 OF 1				

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REVISIONS				
ECO	LTR	DESCRIPTION	DATE	APPROVED
-	A	PRODUCTION RELEASE	11/25/93	144



REFERENCE
11/25/93



VIEW A-A

CHASSIS SHOWN WITHOUT MOTHERBOARD PWBA, ITEM 2, FOR CLARITY

FEB 17 1994
ORIGINAL

SEE SEPARATE PARTS LIST

3. IN LOCATION INDICATED, ADD MARKING WITH FOLLOWING INFORMATION:
- "ASSEMBLED IN MEXICO"
 - ASSEMBLY & REVISION
 - P.O. NUMBER
 - DATE CODE
 - PROCESS STAMPS

2. BEFORE MOUNTING P.C.B., ITEM 2, TO CHASSIS, ITEM 1, ADHERE ITEM 6 IN CORNER OF SCRIBE LINES MARKED ON BOTTOM OF CHASSIS, ITEM 1.
1. ALL ASSEMBLY SHALL COMPLY WITH POWER-ONE WORKMANSHIP STANDARDS DOCUMENT NUMBER 53857.

NOTES: UNLESS OTHERWISE SPECIFIED

ITEM	QTY REQD	PART OR IDENTIFYING NO.	NOVENCATURE OR DESCRIPTION	POWER ONE STD. P/N
PARTS LIST				
ALL DIMENSIONS ARE IN INCHES				
TOLERANCES:				
XXX = ± .02				
XXX = ± .010				
ANGLES				
MATERIAL				
FINISH				
APPLICATION				
DO NOT SCALE DRAWING				
APPROVALS				
DRAWN S. TAMBUKUNO 11/21/91				
CHECKED E. TAMBUKUNO 11/25/93				
ENG APPD. SLC 11/25/93				
APPROVED D. TAMBUKUNO 11/25/93				
MFG APPD. 11/25/93				
SIZE CODE IDENT NO. DRAWING NO. REV.				
D 54407 61133 A				
SCALE 1:1 COMPUTER/GEN/DWG SHEET 1 OF 1				