

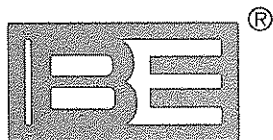
INSTRUCTION MANUAL

FM-1C 1KW
FM-500C 500W
SOLID-STATE
FM BROADCAST
TRANSMITTERS

NOVEMBER, 1994

IM NO. 597-1001

BROADCAST ELECTRONICS, INC.



IMPORTANT INFORMATION

EQUIPMENT LOST OR DAMAGED IN TRANSIT.

When delivering the equipment to you, the truck driver or carrier's agent will present a receipt for your signature. Do not sign it until you have: 1) inspected the containers for visible signs of damage and 2) counted the containers and compared with the amount shown on the shipping papers. If a shortage or evidence of damage is noted, insist that notation to that effect be made on the shipping papers before you sign them.

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

RF PRODUCT TECHNICAL ASSISTANCE - REPAIR SERVICE - REPLACEMENT PARTS.

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

Emergency and warranty replacement parts may be ordered from the following address. Be sure to include the equipment model number, serial number, part description, and part number. Non-emergency replacement parts may be ordered directly from the Broadcast Electronics stock room by fax at the number shown below.

FACILITY CONTACTS -

Broadcast Electronics, Inc. - Quincy Facility
4100 N. 24th St. P.O. BOX 3606
Quincy, Illinois 62305
Telephone: (217) 224-9600
Fax: (217) 224-9607
E-Mail: General - bdcast@bdcast.com
Web Site: www.bdcast.com

RF PRODUCT TECHNICAL ASSISTANCE - REPAIR - EMERGENCY/WARRANTY REPLACEMENT PARTS -

Telephone: (217) 224-9617 (8 AM to 5 PM Central Time)
(217) 224-9600 (During Non-Business Hours)
E-Mail: rfservice@bdcast.com
Fax: (217) 224-9607

NON-EMERGENCY REPLACEMENT PARTS -

Fax: (217) 224-9609

RETURN, REPAIR, AND EXCHANGES.

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

WARRANTY ADJUSTMENT.

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

PROPRIETARY NOTICE.

This document contains proprietary data of Broadcast Electronics, Inc. No disclosure, reproduction, or use of any part thereof may be made except by prior written permission.

MODIFICATIONS.

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

WARNING

OPERATING HAZARDS

READ THIS SHEET AND OBSERVE ALL SAFETY PRECAUTIONS

ALL PERSONS WHO WORK WITH OR ARE EXPOSED TO POWER TRANSISTORS 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 TRANSISTORS

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

- A. HIGH VOLTAGE – Normal operating voltages can be deadly. Additional information follows.
- B. RF RADIATION – Exposure to RF radiation may cause serious bodily injury possibly resulting in blindness or death. Cardiac pacemakers may be affected. Additional information follows.
- C. BERYLLIUM – OXIDE POISONING – Dust or fumes from BeO ceramics used as thermal links with power transistors are highly toxic and can cause serious injury or death. 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

The transmitter operates at voltages high enough to kill through electrocution. Personnel should always break the primary circuits when access to the transmitter is required.

RADIO FREQUENCY RADIATION

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

The effect of prolonged exposure to "low level" RF radiation continues to be a subject of investigation and controversy. It is generally agreed that prolonged exposure of personnel to RF radiation should be limited to an absolute minimum. It is also generally agreed that exposure should be reduced in working areas where personnel heat load is above normal. A 10 mW/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 leakproof. Never operate a power tube without a properly matched RF energy absorbing load attached. Never look into or expose any part of the body to an antenna, open RF generating circuit, or RF transmission system while energized. Monitor the tube and RF system for RF radiation leakage at regular intervals and after servicing.

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

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

TABLE OF CONTENTS

PARAGRAPH		PAGE NO.
SECTION I	GENERAL INFORMATION	
1-1	Introduction	1-1
1-3	Related Publications	1-1
1-5	Equipment Description	1-1
1-6	General	1-1
1-8	FX-50 Exciter	1-1
1-10	Power Supply	1-2
1-11	RF Power Modules	1-2
1-12	Controller	1-2
1-15	Combiner	1-2
1-16	Transmitter Configurations	1-4
1-18	Optional Equipment and Spare Parts Kits	1-4
1-20	Equipment Specifications	1-4
SECTION II	INSTALLATION	
2-1	Introduction	2-1
2-3	Unpacking	2-1
2-6	Environmental Requirements	2-1
2-8	Cooling Air Requirements	2-1
2-12	Installation	2-1
2-14	Equipment Placement	2-1
2-16	Rack Preparation	2-2
2-19	Equipment Installation	2-2
2-20	Transmitter Mounting	2-2
2-24	Transmitter Controller Front Panel Removal	2-8
2-25	Exciter Mounting Bracket Installation	2-8
2-29	Component Installation	2-11
2-33	Wiring	2-13
2-34	Exciter Connections	2-13
2-35	Remote Control	2-14
2-55	External Interlock	2-17
2-56	Modulation Monitor Receptacle	2-17
2-57	Audio Input Connections	2-17
2-58	RF Output Transmission Line Connection	2-17
2-59	AC Power Connections	2-17
2-63	Ground	2-19
2-64	Preliminary Operation	2-19
SECTION III	OPERATION	
3-1	Introduction	3-1
3-3	Controls and Indicators	3-1
3-4	FM-1C	3-1
3-5	FM-500C	3-1
3-6	Operation	3-9
3-7	Turn-On	3-9
3-15	Turn-Off	3-10
3-18	Multimeter Operation	3-10
3-22	Power Adjust	3-10
3-24	Exciter Operation	3-10

PARAGRAPH		PAGE NO.
3-26	Fault Reset	3-10
3-30	RF Power Module Status Indicators	3-11
SECTION IV	THEORY OF OPERATION	
4-1	Introduction	4-1
4-3	Overall Operation	4-1
4-5	Power Supply/RF Circuitry Operation	4-1
4-7	Controller Circuitry Operation	4-1
4-9	RF Amplifier Circuitry Operation	4-1
SECTION V	MAINTENANCE	
5-1	Introduction	5-1
5-3	Safety Considerations	5-1
5-6	Power Amplifier Efficiency	5-1
5-8	First Level Maintenance	5-1
5-10	Routine Maintenance	5-1
5-11	Inspection and Cleaning	5-2
5-12	Controller Battery	5-2
5-13	Air Filters	5-2
5-17	Flushing Fans	5-3
5-19	Second Level Maintenance	5-3
5-22	Controller Front Panel Removal	5-3
5-24	Electrical Adjustments	5-4
5-25	Multimeter Display Calibration	5-4
5-33	Reflected Power Meter Calibration	5-4
5-49	VSWR Foldback Adjustment	5-6
5-63	Over-Temperature Calibration	5-6
5-75	Forward Power Calibration	5-7
5-87	PAV Calibration	5-8
5-99	Temperature Calibration	5-9
5-111	PA Forward Power Calibration	5-10
5-124	VSWR Overload	5-10
5-125	RF Power Amplifier Adjustments	5-10
5-126	Low-Pass Filter	5-10
5-127	Transmitter Frequency Re-Programming	5-11
5-141	Transmitter Power Level Change	5-12
5-154	Troubleshooting	5-13
5-155	Power Supply Modules	5-13
5-175	Power Amplifier Module Troubleshooting/Repair	5-14
5-177	Transmitter Troubleshooting Procedures	5-15
5-178	Transmitter Component Locations	5-15
5-179	Component Replacement Procedure	5-22
SECTION VI	PARTS LIST	
6-1	Introduction	6-1
SECTION VII	DRAWINGS	
7-1	Introduction	7-1

LIST OF TABLES

TABLE	DESCRIPTION	PAGE NO.
1-1	FM-1C/FM-500C ELECTRICAL SPECIFICATIONS	1-5
1-2	FM-1C/FM-500C PHYSICAL AND ENVIRONMENTAL SPECIFICATIONS	1-7
3-1	FM-1C CONTROLS AND INDICATORS	3-1
3-2	FM-500C CONTROLS AND INDICATORS	3-5
5-1	FM-1C/FM-500C TROUBLESHOOTING	5-15
6-1	FM-1C/FM-500C REPLACEABLE PARTS LIST INDEX	6-1

LIST OF ILLUSTRATIONS

FIGURE	DESCRIPTION	PAGE NO.
1-1	FM-1C/FM-500C TRANSMITTERS	1-3
2-1	FM-1C/FM-500C TRANSMITTER INSTALLATION DIAGRAM	2-3
2-2	FM-1C/FM-500C RACK INSTALLATION	2-5
2-3	TRANSMITTER CONTROLLER FRONT PANEL REMOVAL	2-9
2-4	FM-1C/FM-500C EXCITER MOUNTING BRACKET INSTALLATION	2-10
2-5	FM-1C/FM-500C COMPONENT INSTALLATION	2-11
2-6	FM-1C/FM-500C RECONNECTIONS	2-13
2-7	REMOTE CONTROL CONNECTIONS	2-15
2-8	FM-1C/FM-500C AC POWER CONNECTIONS	2-18
3-1	FM-1C CONTROLS AND INDICATORS	3-2
3-2	FM-500C CONTROLS AND INDICATORS	3-6
4-1	FM-1C/FM-500C BLOCK DIAGRAM	4-2
4-2	POWER SUPPLY/RF CIRCUIT SIMPLIFIED SCHEMATIC	4-3
4-3	FM-1C/FM-500C TRANSMITTER CONTROLLER SIMPLIFIED SCHEMATIC	4-5
4-4	FM-1C/FM-500C RF AMPLIFIER MODULE SIMPLIFIED SCHEMATIC	4-7
5-1	FM-1C/FM-500C TYPICAL PA EFFICIENCY	5-2
5-2	CONTROLLER AND METER DISPLAY CIRCUIT BOARD CONTROLS	5-5
5-3	POWER SUPPLY VOLTAGE ADJUST LOCATIONS	5-12
5-4	FM-1C/FM-500C COMPONENT LOCATOR	5-16

SECTION I

GENERAL INFORMATION

1-1. INTRODUCTION.

- 1-2. Information presented by this section provides a general description of the Broadcast Electronics FM-1C/FM-500C transmitters and lists equipment specifications.

1-3. RELATED PUBLICATIONS.

- 1-4. The following list of publications provides data for equipment associated with the FM-1C/FM-500C transmitters.

PUBLICATION NUMBER	EQUIPMENT
597-1050	FX-50 FM Exciter
597-0008-004	FC-30 SCA Generator
597-0009-004	FS-30 Stereo Generator
597-1116	VMC-16 Remote Control Unit

1-5. EQUIPMENT DESCRIPTION.

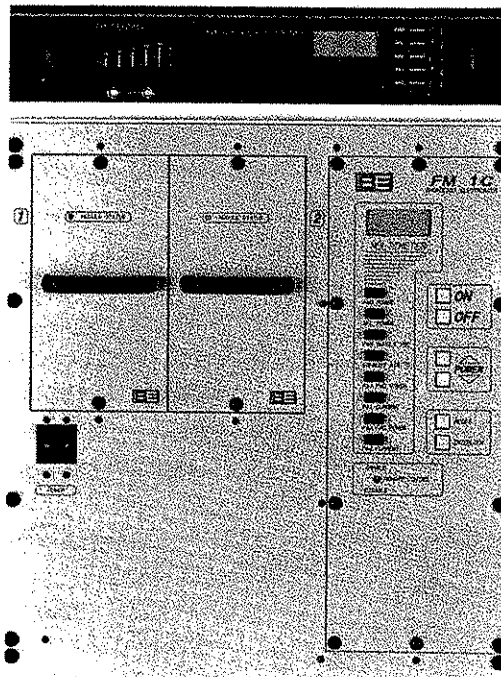
1-6. GENERAL.

- 1-7. The Broadcast Electronics FM-1C transmitter is a 1 kW solid-state FM transmitter designed for continuous operation in the 87.5 MHz to 108 MHz broadcast band (refer to Figure 1-1). The Broadcast Electronics FM-500C transmitter is a 500 watt solid-state FM transmitter designed for continuous operation in the 87.5 MHz to 108 MHz broadcast band (refer to Figure 1-1). The FM-1C transmitter is equipped with: 1) an FX-50 FM exciter, 2) two modular switching power supply assemblies, 3) two modular solid-state broadband plug-in RF amplifier modules, 4) an internal low-pass filter, 5) a combiner, and 6) a CMOS controller. The FM-500C transmitter is equipped with: 1) an FX-50 FM exciter, 2) two modular switching power supply assemblies, 3) a modular solid-state broadband plug-in RF amplifier module, 4) an internal low-pass filter, and 5) a CMOS controller. All the components with the exception of the FX-50 exciter are housed in a single chassis designed for installation in an EIA rack. The FX-50 exciter is housed on slide-rails above the transmitter chassis. Specific FM-1C/FM-500C features include:

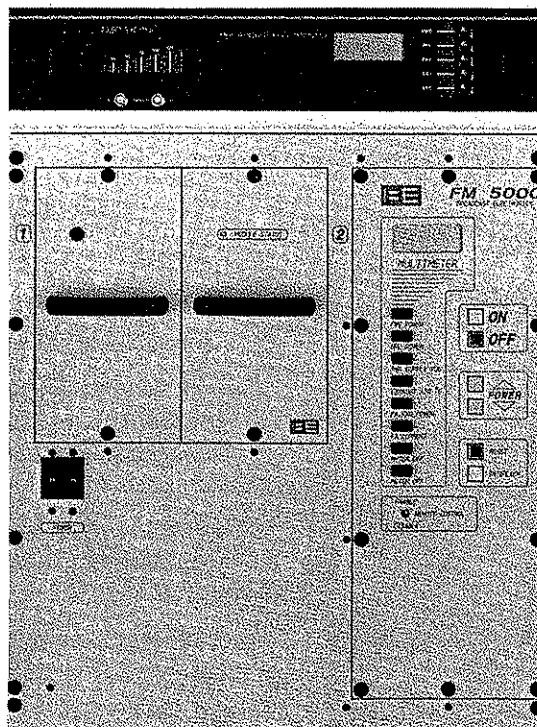
1. The FX-50 exciter. The exciter is equipped with a digital frequency synthesizer and superior audio performance.
2. A broadband design which eliminates tuning controls.
3. Two modular switching power supply units. One power supply provides operating potentials for the power amplifier module (s). The second power supply provides operating potentials for the controller.
4. An internal low-pass filter.
5. Modular solid-state broadband plug-in amplifier modules.
6. A CMOS controller with VSWR detection.

- 1-8. **FX-50 EXCITER.** The FX-50 exciter is a solid-state wideband FM exciter providing a continuously variable RF output at any frequency within the 87.5 MHz to 108 MHz broadcast band in 10 kHz increments. The FX-50 is designed to accept multiple wideband composite inputs from a stereo generator or SCA generator. In addition, the FX-50 is equipped with a 600 Ohm balanced monaural input. A tapped dual primary power transformer and a voltage selector allows operation from a wide range of ac input potentials.

- 1-9. The FX-50 is equipped with a digitally programmed frequency synthesizer which generates and maintains the phase and frequency of the carrier. A temperature compensated reference oscillator and a dual-speed phase-locked-loop control circuit locks the frequency of a modulated oscillator to a precision frequency oscillator allowing prompt on-frequency operation. A solid-state broadband 3 to 50 watt RF amplifier provides amplification of the FM signal. Exciter operating parameters are monitored and displayed by a front-panel digital LCD multimeter and an LED display.
- 1-10. **POWER SUPPLY.** The FM-1C/FM-500C transmitters are equipped with two modular switching power supply assemblies. A primary 2 kW switching power supply unit in FM-1C models and a primary 1 kW switching power supply unit in FM-500C models provide dc operating potentials for the transmitter power amplifier circuitry. A second 40 watt modular switching power supply is provided for the controller circuitry. The primary power supply module is equipped with overload protection, over-voltage protection, high temperature protection, and a soft-start feature which minimizes in-rush currents.
- 1-11. **RF POWER MODULES.** The FM-1C transmitter is equipped with 2 RF power modules. The FM-500C is equipped with one RF power module. Each module consists of a broadband solid-state RF amplifier and a logic circuit board. The RF amplifier contains two dual MOSFET power transistors operated in a push-pull configuration. Each module is designed to output 500 watts of RF power. RF amplifier operations are monitored by the logic circuit board. The logic circuit board is designed to monitor over-current, over-voltage, high reflected power, and high temperature conditions. A limit circuit is designed to limit the RF output during high reflected power, high temperature, over-current, or over-voltage conditions. The operating status of the module is displayed by a front panel LED. The LED displays normal, fault, and limit conditions.
- 1-12. **CONTROLLER.** Transmitter control and monitoring operations are performed by a CMOS logic controller. The controller utilizes extensive RFI filtering and CMOS logic circuitry to ensure maximum reliability. A battery back-up system is incorporated into the design to maintain the controller memory during ac power interruptions. Operating potentials for the controller circuitry are provided by a 40 watt modular switching power supply. The supply provides the controller circuitry with a stable +5 and ± 15 volt dc supply.
- 1-13. The transmitter RF output power is controlled by a power control circuit. The circuit is designed to raise or lower the transmitter power in response to the front panel raise and lower switches. A fault circuit monitors transmitter operations for a PA1 fault, a PA2 fault, high reflected power condition, or a high temperature condition.
- 1-14. The controller is also equipped with metering circuitry. Meter amplifier/buffering circuits are provided for PA1 forward/current samples, PA2 forward/current samples, transmitter forward and reflected power samples, PA voltage, and exhaust air temperature samples. Display of the samples is provided by an LCD multimeter. Samples are selected for application to the multimeter by a meter switch circuit board.
- 1-15. **COMBINER.** In FM-1C models, the RF power module outputs are combined using a 90 degree hybrid combiner assembly. The assembly combines the two RF power module outputs to produce 1 kW of RF output power.



FM-1C TRANSMITTER



FM-500C TRANSMITTER

FIGURE 1-1. FM-1C/FM-500C TRANSMITTERS 597-1001-2

1-16. **TRANSMITTER CONFIGURATIONS.**

1-17. The FM-1C/FM-500C transmitters can be ordered in the following configurations:

P/N	DESCRIPTION
909-1001-204	FM-1C 1 kW FM Transmitter for operation in the 87.5 MHz to 108 MHz broadcast band, 196V to 252V ac 50/60 Hz single phase supply. Includes FX-50 FM exciter, 196V to 252V ac 50/60 Hz single phase operation.
909-1001-001	FM-1C 196V to 252 V ac 50/60 Hz 2 kW single phase power-factor-corrected power supply option.
909-0501-204	FM-500C 500 watt FM Transmitter for operation in the 87.5 MHz to 108 MHz broadcast band, 196V to 252V ac 50/60 Hz single phase supply. Includes FX-50 FM exciter, 196V to 252V ac 50/60 Hz single phase operation.
909-0501-254	FM-500C 500 watt FM Transmitter for operation in the 87.5 MHz to 108 MHz broadcast band, 96V to 133V ac 50/60 Hz single phase supply. Includes FX-50 FM exciter, 96V to 133V ac 50/60 Hz single phase operation.
909-0501-001	FM-500C 196V to 252V ac 50/60 Hz 1 kW single phase power-factor-corrected power supply option.

1-18. **OPTIONAL EQUIPMENT AND SPARE PARTS KITS.**

1-19. The following text presents the optional equipment and spare parts kits available for the use with the FM-1C/FM-500C transmitters.

P/N	DESCRIPTION
909-0050-204	FS-30 Stereo Generator.
909-0051-204	FC-30 FM SCA Generator.
909-0137	Local Control Disable Option, FM-1C/FM-500C.
979-1056	Recommended spare parts kit for the FM-1C/FM-500C transmitter. Includes parts for the FX-50 Exciter. Includes selected switches, relays, etc. Does not include semiconductors.
979-1057	Recommended semiconductor kit for the FM-1C/FM-500C Transmitter. Includes semiconductors for the FX-50 Exciter.
979-1058	100% semiconductor kit for the FM-1C/FM-500C transmitter. Includes parts for the FX-50 exciter.
907-0016-201	VMC-16 Voice Remote Control Unit, FM-1C
907-0016-200	VMC-16 Voice Remote Control Unit, FM-500C

1-20. **EQUIPMENT SPECIFICATIONS.**

1-21. Refer to Table 1-1 for electrical specifications or Table 1-2 for physical specifications of the FM-1C/FM-500C transmitters.

TABLE 1-1. FM-1C/FM-500C ELECTRICAL SPECIFICATIONS
(Sheet 1 of 3)

PARAMETER	SPECIFICATION
RF POWER OUTPUT FM-1C FM-500C	250 watts to 1 kW (as specified). 125 watts to 500 watts (as specified).
FREQUENCY RANGE	87.5 to 108 MHz (as specified). Exciter programmable in 10 kHz increments.
RF OUTPUT IMPEDANCE	50 Ohms.
RF OUTPUT CONNECTOR	Type "N" connector.
MAXIMUM VSWR	Rated power into 1.3:1 maximum without output matching. Capable of operating into high VSWR conditions with automatic power reduction. Open and short circuit protected at all phase angles.
EXCITER	Model FX-50, solid-state 50 watt output with digitally programmed synthesizer. 10 kHz increment programming.
AM SIGNAL-TO-NOISE RATIO: Asynchronous	68 dB below an equivalent reference carrier with 100% AM modulation @ 1000 Hz, 75 microsecond deemphasis (no FM modulation present).
Synchronous FM-1C	58 dB below an equivalent 1 kW reference carrier @ 100% AM modulation @ 1000 Hz. 75 μ S deemphasis with ± 75 kHz FM modulation @ 1000 Hz.
FM-500C	58 dB below an equivalent 500 W reference carrier @ 100% AM modulation @ 1000 Hz. 75 μ S deemphasis with ± 75 kHz FM modulation @ 1000 Hz.
RF HARMONIC SUPPRESSION	Meets all FCC/DOC requirements and CCIR recommendations.
FM SIGNAL-TO-NOISE RATIO: FM-1C Mono/Composite	88 dB below ± 75 kHz deviation @ 400 Hz measured in a 20 Hz to 30 kHz bandwidth with 75 microsecond deemphasis.
Stereo	82 dB below ± 75 kHz deviation @ 400 Hz measured in a 20 Hz to 30 kHz bandwidth with 75 microsecond deemphasis.
FM-500C Mono	88 dB below ± 75 kHz deviation @ 400 Hz measured in a 20 Hz to 30 kHz bandwidth with 75 microsecond deemphasis.

TABLE 1-1. FM-1C/FM-500C ELECTRICAL SPECIFICATIONS
(Sheet 2 of 3)

PARAMETER	SPECIFICATION
Composite	85 dB below ± 75 kHz deviation at 400 Hz measured in a 20 Hz to 30 kHz bandwidth with 75 microsecond deemphasis.
Stereo	82 dB below ± 75 kHz deviation at 400 Hz measured in a 20 Hz to 30 kHz bandwidth with 75 microsecond deemphasis.
DISTORTION	
Mono/Composite	
Harmonic	0.02% or less at 400 Hz.
SMPTE Intermodulation Distortion	0.02% or less, 60 Hz/7 kHz, Ratio: 4:1 Monophonic, 1:1 Composite.
CCIF Intermodulation Distortion	0.02% or less, 15 kHz/14 kHz, 1:1 Ratio.
Transient Intermodulation Distortion	0.02% or less, sine wave/square wave.
Stereo	
Harmonic	0.05% or less at 400 Hz.
SMPTE Intermodulation Distortion	0.05% or less, 60 Hz/7 kHz, 4:1 Ratio.
CCIF Intermodulation Distortion	0.05% or less, 15 kHz/14 kHz, 1:1 Ratio.
Transient Intermodulation Distortion	0.05% or less, sine wave/square wave.
STEREO SEPARATION	50 dB or better, 30 Hz to 15 kHz (sine wave).
DYNAMIC STEREO SEPARATION	40 dB or greater, 30 Hz to 15 kHz (normal program content).
LINEAR CROSSTALK (Main to Sub/Sub to Main Due to Amplitude and Phase Matching)	45 dB Minimum below 100% modulation, 30 Hz to 15 kHz.
NON-LINEAR CROSSTALK (Main to Sub/Sub to Main Due to Distortion Products)	70 dB Minimum below 100% modulation.
AC POWER REQUIREMENTS	
FM-1C	196 to 252V ac 50/60 Hz single phase.
FM-500C	196 to 252V ac 50/60 Hz single phase or 96V to 133V ac 50/60 Hz single phase.

TABLE 1-1. FM-1C/FM-500C ELECTRICAL SPECIFICATIONS
(Sheet 3 of 3)

PARAMETER	SPECIFICATION
AC POWER CONSUMPTION FM-1C	2.2 kW typical at a 1 kW RF power output, 50 Ohm resistive load.
FM-500C	1100 watts typical at a 500 watt RF power output, 50 Ohm resistive load.
OVERALL EFFICIENCY FM-1C	47% or greater (AC line input to RF output).
FM-500C	40% or greater (AC line input to RF output).

TABLE 1-2. FM-1C\FM-500C PHYSICAL AND ENVIRONMENTAL SPECIFICATIONS

PARAMETER	SPECIFICATION
PHYSICAL	
DIMENSIONS:	
FX-50 Exciter	Width: 19.0 inches (48.3 cm). Height: 5.25 inches (13.3 cm). Depth: 19.00 inches (48.3 cm).
Transmitter	Width: 19.0 inches (48.3 cm). Height: 21 inches (53.3 cm). Depth: 22 inches (55.9 cm).
WEIGHT	
FX-50 Exciter	38 pounds (17.2 kg) unpacked.
Transmitter	
FM-1C	103 pounds (46.7 kg) unpacked.
FM-500C	75 pounds (34.0 kg) unpacked.
ENVIRONMENTAL	
HEAT DISSIPATION	
FM-1C (1 kw Output)	1.5 kw (5120 Btu/H) at a 1 kW RF output, 50 Ohm resistive load.
FM-500C (500 watt Output)	800 watts (2730 Btu/H) at a 500 watt RF output, 50 Ohm resistive load.
COOLING AIR REQUIREMENTS	700 cubic feet per minute (19.8 m ³ /min).
AMBIENT TEMPERATURE RANGE	+32°F to +122°F (0°C to +50°C).
MAXIMUM ALTITUDE	
50 Hz Operation	0 to 7,500 feet above sea level (0 to 2286 meters).
60 Hz Operation	0 to 10,000 feet above sea level (0 to 3048 meters).
MAXIMUM HUMIDITY	95%, non-condensing.

SECTION II INSTALLATION

2-1. INTRODUCTION.

- 2-2. This section contains information required for the installation and preliminary checkout of the Broadcast Electronics FM-1C/FM-500C transmitters.

2-3. UNPACKING.

- 2-4. 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.
- 2-5. 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.

2-6. ENVIRONMENTAL REQUIREMENTS.

- 2-7. Table 1-2 provides environmental conditions which must be considered prior to transmitter installation. Refer to Table 1-2 in SECTION I, INTRODUCTION and ensure the transmitter is to be installed in an acceptable environment.

2-8. COOLING AIR REQUIREMENTS.

- 2-9. The FM-1C/FM-500C transmitters require a source of cooling air to maintain an acceptable operating temperature. The transmitters require a cooling air flow of 700 cubic feet per minute (refer to Figure 2-1). The cooling air source must be dry and well filtered.
- 2-10. If the heated transmitter air is to be ducted from the room, the duct system must not introduce any back-pressure on the equipment. Proper allowances for air flow will ensure that only a limited amount of heat is dissipated into the equipment interior. The duct system must allow for a minimum air flow of 700 cubic feet of air per minute.
- 2-11. As a minimum requirement, any duct work must have a cross-sectional area equal to the exhaust area of the transmitter. Sharp bends in the duct system will introduce back pressure and are not permissible. A radius bend must be used if a right angle turn is required.

2-12. INSTALLATION.

- 2-13. Each transmitter is wired, operated, tested, and inspected at the factory prior to shipment and is ready for installation when received. Prior to installation, this publication should be studied to obtain an understanding of the operation, circuitry, nomenclature, and installation requirements. Installation is accomplished as follows: 1) equipment placement, 2) equipment installation, 3) wiring, and 4) preliminary operation.

2-14. EQUIPMENT PLACEMENT.

- 2-15. The FM-1C/FM-500C transmitters are designed for placement in a 19 inch EIA rack assembly. Each transmitter requires approximately 26.25 inches (66.7cm) of a universal or military EIA rack (refer to Figure 2-2). To install the transmitter in a rack, refer to Figure 2-2 and perform the following procedures.

- 2-16. **RACK PREPARATION.** The transmitter can be mounted in any universal or military rack assembly. Refer to Figure 2-2 and determine type of rack for transmitter installation. A universal rack is identified by the location of mounting holes at regular rack spacings. A military rack is identified by a missing mounting hole at regular rack spacings. Each type of rack may be equipped with untapped or tapped mounting holes. To prepare the rack for the transmitter, refer to Figure 2-2 and perform the following procedures.
- 2-17. **Universal Rack.** Prepare a universal rack for transmitter installation as follows:
1. Refer to Figure 2-2 and locate the transmitter mounting holes on the rack assembly. Ensure the top of the transmitter is located at the beginning of a rack unit. Allow 5.25 inches (13.3 cm) above the transmitter for the exciter.
 2. Evaluate the rack and determine if the rack is equipped with tapped or untapped mounting holes.
 3. Prepare the rack for installation as follows:
 - A. For racks with tapped holes, mark the transmitter mounting hole locations.
 - B. For racks with untapped holes, locate the transmitter clip-nuts in the transmitter accessory kit. Refer to Figure 2-2 and install the clip-nuts in each transmitter mounting hole location.
- 2-18. **Military Rack.** Prepare a military rack for transmitter installation by performing the following:
1. Refer to Figure 2-2 and locate the transmitter mounting holes on the rack assembly. Ensure the top of the transmitter is located at the beginning of a rack unit. Allow 5.25 inches (13.3 cm) above the transmitter for the exciter.
 2. Drill holes in the rack assembly for the two upper and two lower mounting screws as follows:
 - A. Locate the upper mounting holes by measuring .625 inches (1.59 cm) from the center line of the existing mounting hole as shown.
 - B. Using a .250 or .281 drill, bore holes in the rack assembly for the two upper transmitter mounting screws.
 - C. Repeat the procedure for the two lower mounting screws.
 3. Evaluate the rack and determine if the rack is equipped with tapped or untapped mounting holes.
 4. Prepare the rack for installation as follows:
 - A. For racks with tapped holes, refer to Figure 2-2 and install the clip-nuts in the drilled hole locations as shown.
 - B. For racks with untapped holes, refer to Figure 2-2 and install the clip-nuts in each mounting hole location.



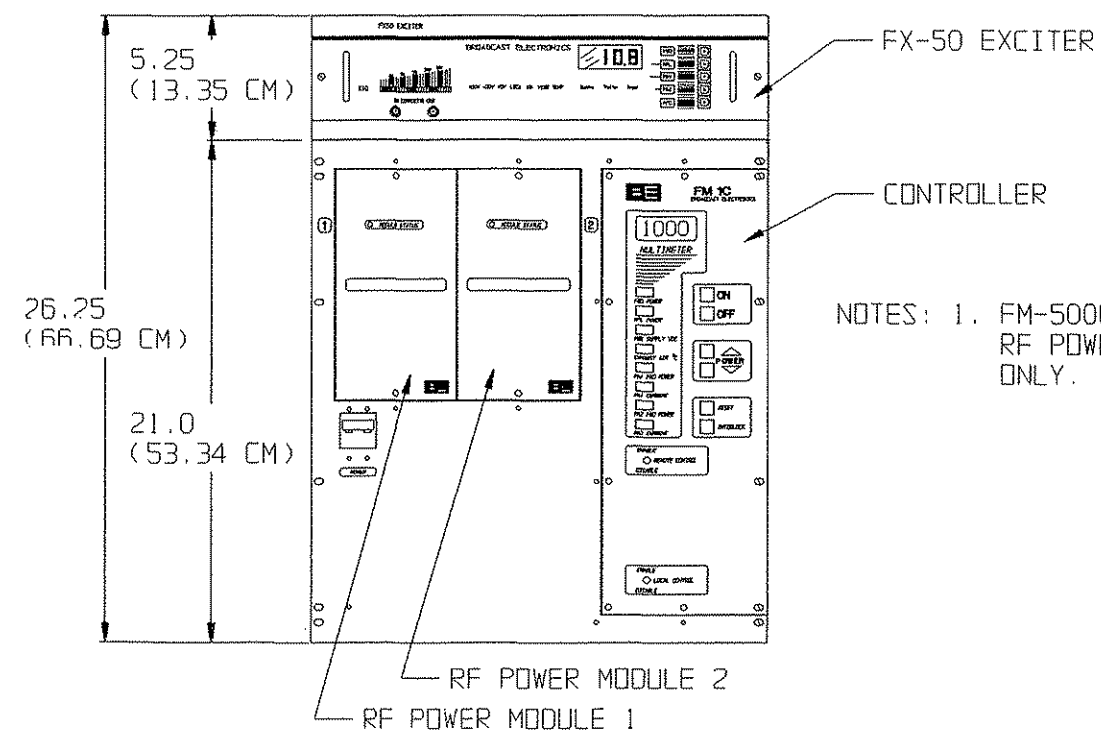
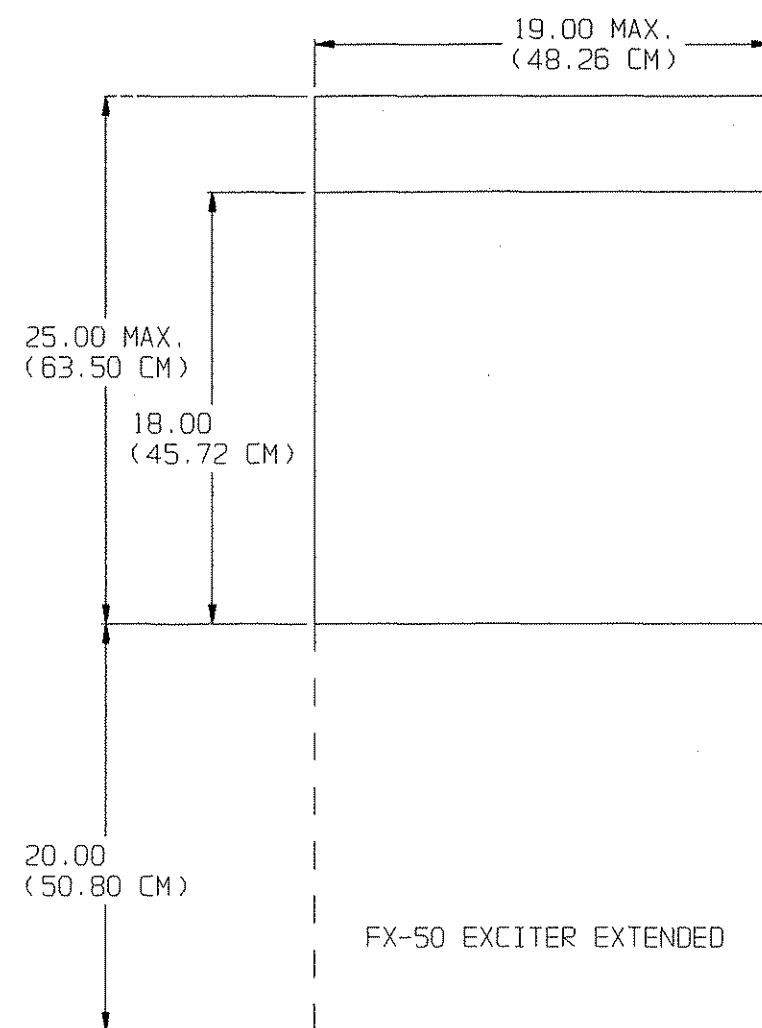
WARNING

ENSURE NO PRIMARY POWER IS CONNECTED TO THE TRANSMITTER BEFORE PROCEEDING.

WARNING

2-19. **EQUIPMENT INSTALLATION.**

2-20. **TRANSMITTER MOUNTING.** Once the transmitter rack is prepared, refer to Figure 2-2 and mount the transmitter in the rack by performing the following procedures.



NOTES: 1. FM-500C EQUIPPED WITH
RF POWER MODULE 2
ONLY.

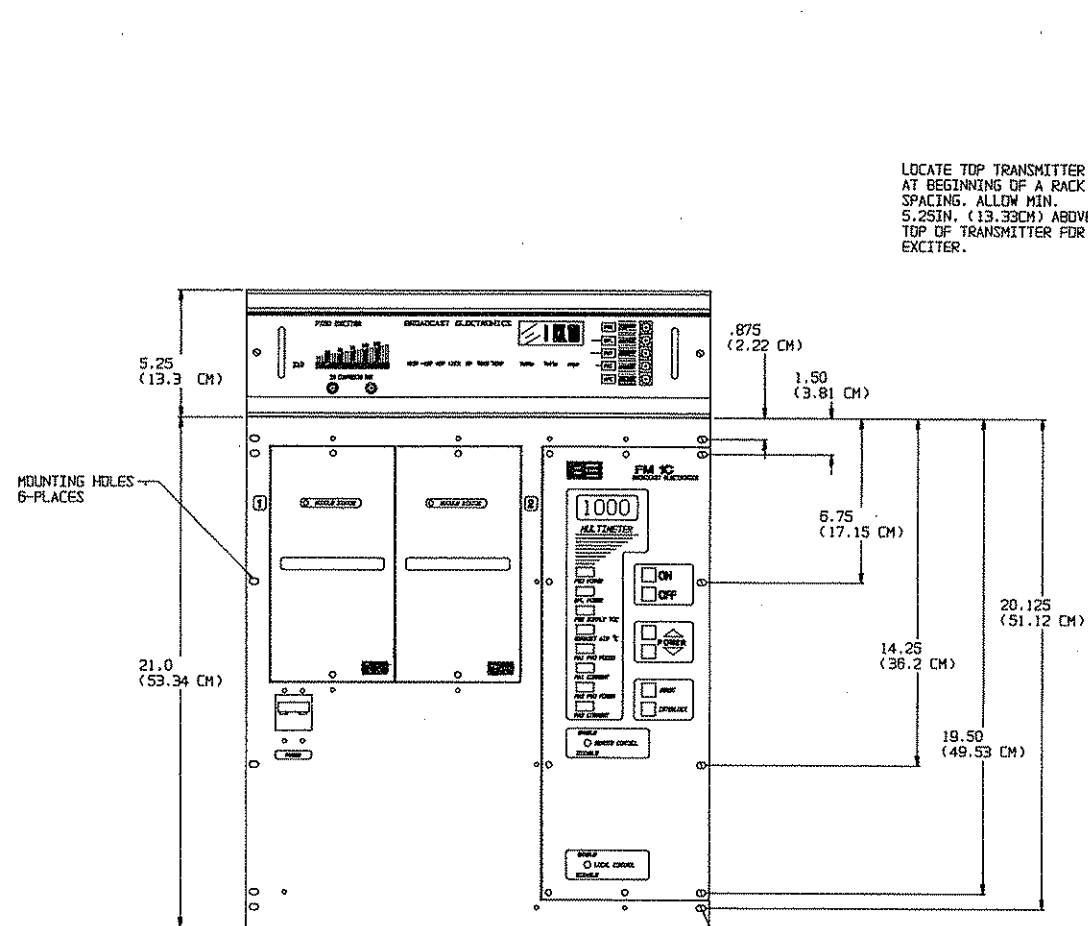
NOTES:

1. COOLING AIR REQUIREMENT- 700CFM (19.8 M³/MIN) FILTER REQUIRED- 407-0162.
2. GROUND STRAP ENTRY IN LOWER LEFT CORNER AT REAR OF CABINET
3. RF OUTPUT CONNECTION- TYPE N CONNECTOR.
4. HEAT DISSIPATION:
FM-1C- 1.5KW (5120 BTU/H) AT A 1KW RF OUTPUT, 50 OHM RESISTIVE LOAD.
FM-500C- 800W (2730 BTU/H) AT A 500 WATT RF OUTPUT, 50 OHM RESISTIVE LOAD.
5. WEIGHT:
FM-1C- TRANSMITTER= 103LBS (46.7KGS) EXCITER= 38LBS (17.2KGS).
FM-500C- TRANSMITTER= 75LBS (34.0KGS) EXCITER= 38LBS (17.2KGS).
6. AC POWER CONSUMPTION:
FM-1C- 2.2KW AT A 1KW RF OUTPUT INTO A 50 OHM RESISTIVE LOAD.
FM-500C- 1.1KW AT A 500W RF OUTPUT INTO A 50 OHM RESISTIVE LOAD.
7. AC POWER INPUT:
FM-1C- 196 TO 252VAC 50/60Hz SINGLE PHASE, 10 AMPERES.
FM-500C- 196 TO 252VAC 50/60Hz SINGLE PHASE, 6 AMPERES.
FUSE DISCONNECT SWITCH RECOMMENDED. FOR PROPER SIZING OF FUSES,
REFER TO FOLLOWING TEXT, NATIONAL ELECTRIC CODES, AND LOCAL CODES.
8. PRIMARY AC FUSED DISCONNECT:
FM-1C:
FUSE SIZE- 20 AMP
WIRE SIZE- #12 COPPER AWG.
FM-500C:
220V OPERATION-
FUSE SIZE- 15 AMP
WIRE SIZE- #14 COPPER AWG.
120V OPERATION-
FUSE SIZE- 30 AMP
WIRE SIZE- #10 COPPER AWG.
9. RACK REQUIREMENTS- 19" RACK UNIVERSAL MOUNTING.
.281 DIAMETER HOLES OR 10-32 TAPPED HOLES, 15 VERTICAL RACK UNITS.
10. AIR EXHAUST SIZE- 320 SQ. IN. (2065 SQ. CM).

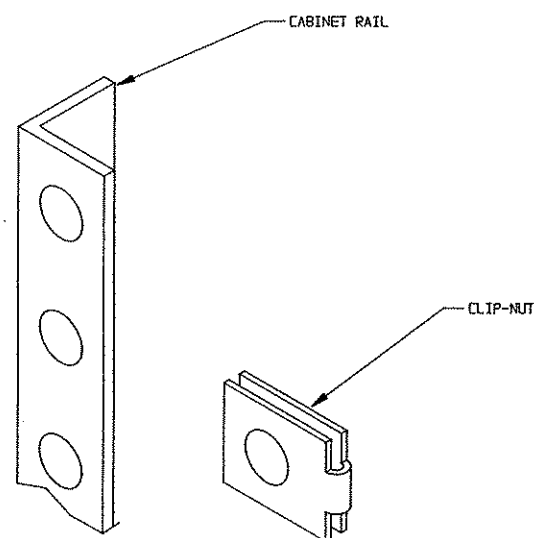
COPYRIGHT © 1992 BROADCAST ELECTRONICS, INC

597-1001-11

**FIGURE 2-1. FM-1C/FM-500C TRANSMITTER
INSTALLATION DIAGRAM
(2-3/2-4)**

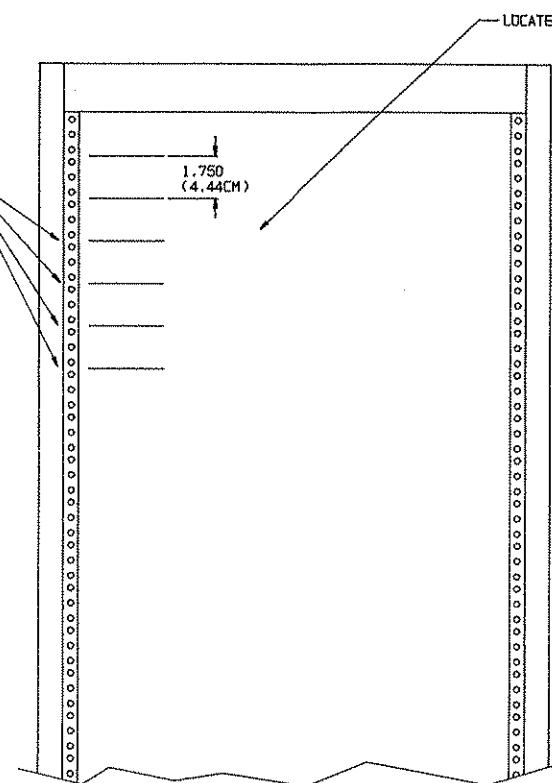


* FM-1C TRANSMITTER



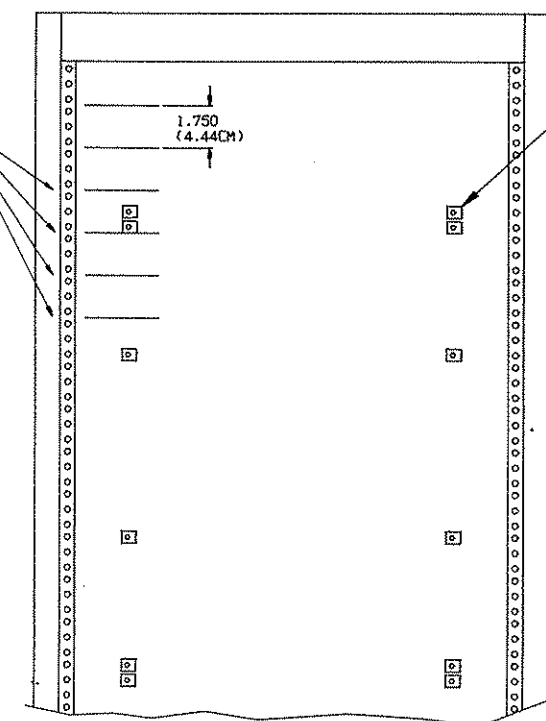
DETAIL A
CLIP-NUT INSTALLATION

LOCATE TOP TRANSMITTER AT BEGINNING OF A RACK SPACING. ALLOW MIN. 5.25IN. (13.33CM) ABOVE TOP OF TRANSMITTER FOR EXCITER.



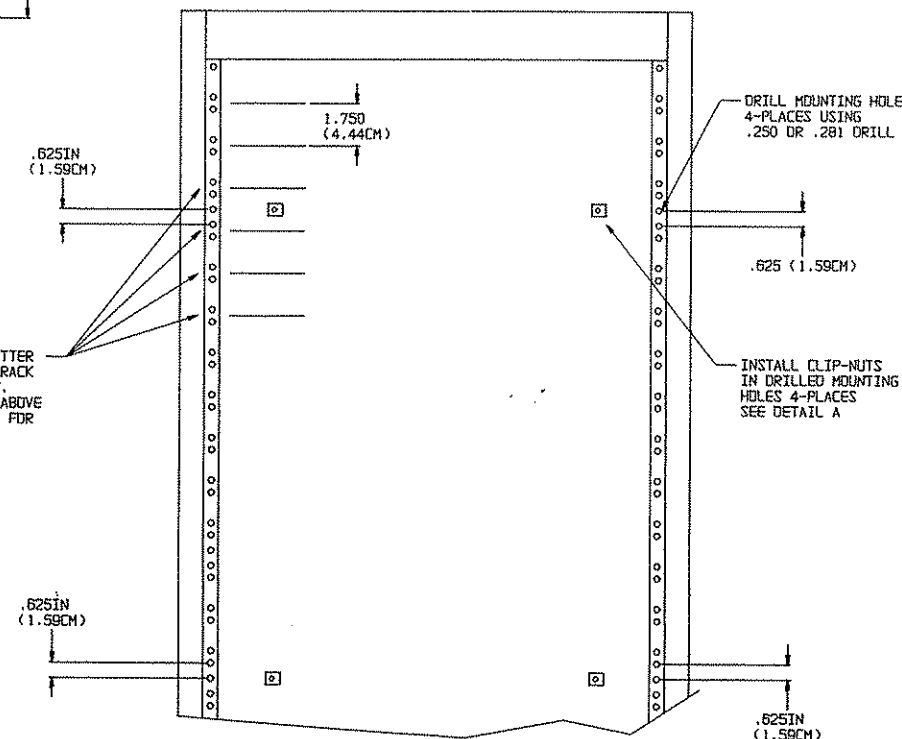
19" EIA UNIVERSAL RACK WITH TAPPED HOLES

LOCATE TOP TRANSMITTER AT BEGINNING OF A RACK SPACING. ALLOW MIN. 5.25IN. (13.33CM) ABOVE TOP OF TRANSMITTER FOR EXCITER.



19" EIA UNIVERSAL RACK WITH UNTAPPED HOLES

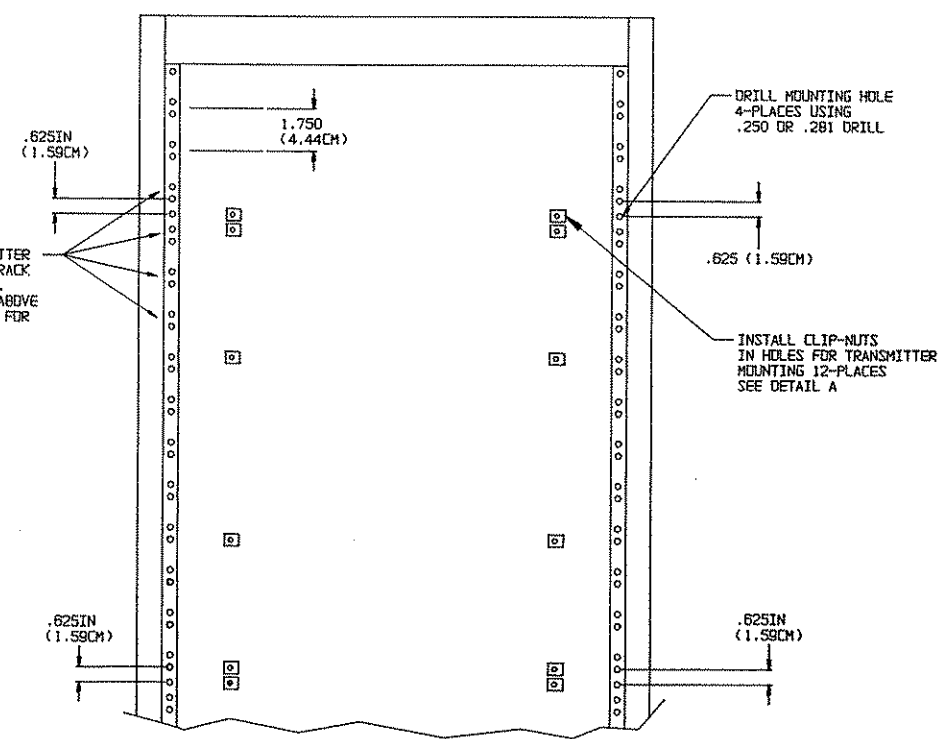
LOCATE TOP TRANSMITTER AT BEGINNING OF A RACK SPACING. ALLOW MIN. 5.25IN. (13.33CM) ABOVE TOP OF TRANSMITTER FOR EXCITER.



19" EIA MILITARY RACK WITH TAPPED HOLES

NOTE: * FM-1C SHOWN. FM-500C IS IDENTICAL.

LOCATE TOP TRANSMITTER AT BEGINNING OF A RACK SPACING. ALLOW MIN. 5.25IN. (13.33CM) ABOVE TOP OF TRANSMITTER FOR EXCITER.

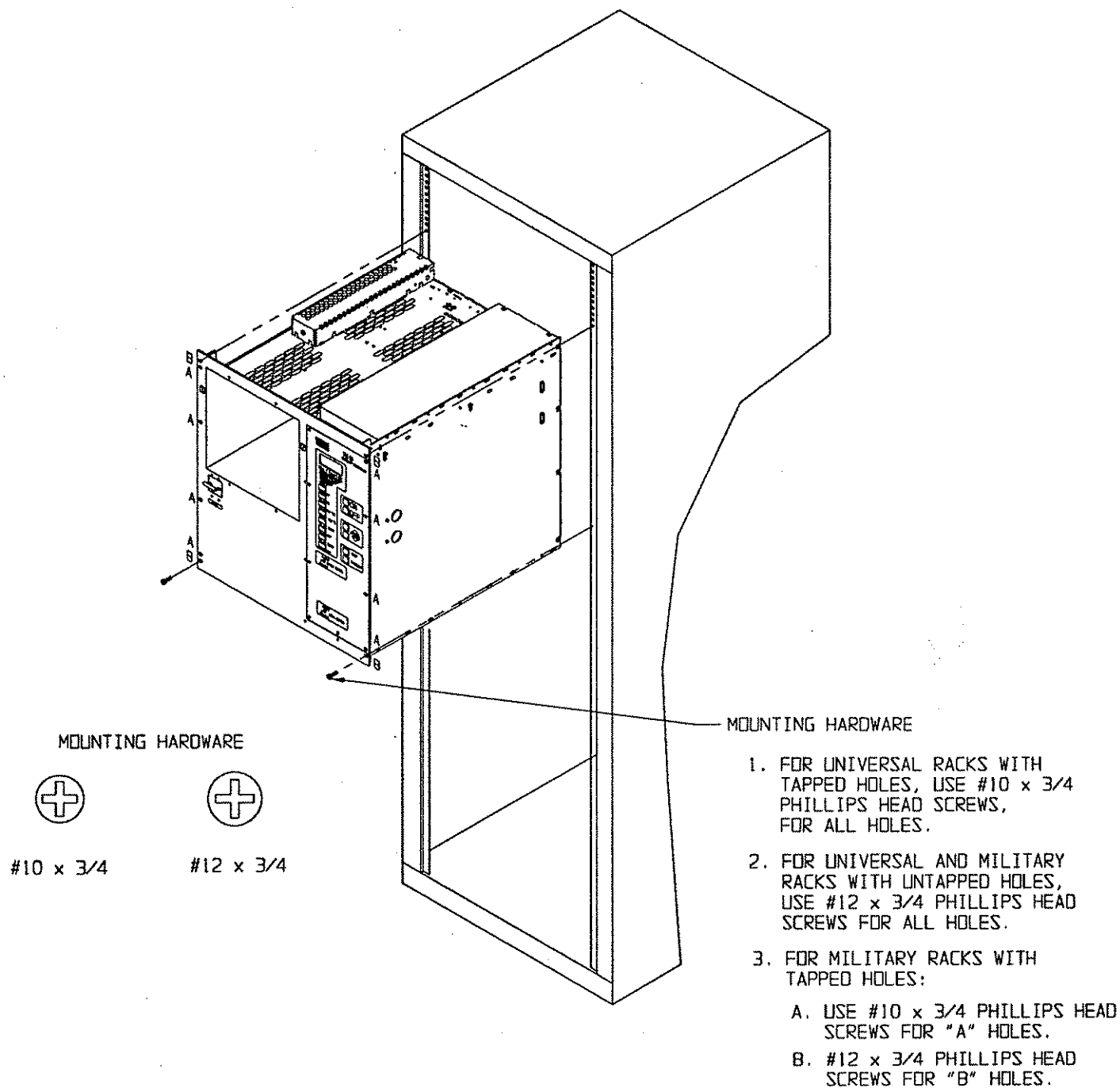


19" EIA MILITARY RACK WITH UNTAPPED HOLES

COPYRIGHT © 1992 BROADCAST ELECTRONICS, INC

597-1001-4A

FIGURE 2-2. FM-1C/FM-500C RACK INSTALLATION
(SHEET 1 OF 2)
2-5/2-6



INSTALLATION

COPYRIGHT © 1992 BROADCAST ELECTRONICS, INC

597-1001-4B

FIGURE 2-2. FM-1C/FM-500C RACK INSTALLATION (SHEET 2 OF 2)

- 2-21. The transmitter accessory kit contains #10 x 3/4 and #12 x 3/4 mounting hardware. The type of hardware used to install the transmitter is determined by the rack assembly. Refer to Figure 2-2 and determine the mounting hardware required to mount the transmitter in the rack.
- 2-22. Insert the transmitter in the rack and install the appropriate hardware in the two lower mounting locations to secure the transmitter in the rack.
- 2-23. Using the appropriate hardware, install the remaining hardware to secure the transmitter in the rack.
- 2-24. **TRANSMITTER CONTROLLER FRONT PANEL REMOVAL.** During installation and maintenance of the FM-1C/FM-500C transmitters, the transmitter controller front panel will be required to be removed. The panel is equipped with a special bracket which allows the panel to be suspended from the chassis for installation and maintenance procedures. To remove the transmitter controller front panel, proceed as follows:
1. Refer to Figure 2-3 and remove the transmitter controller front-panel mounting hardware.
 2. Remove the transmitter controller front panel and rotate the front panel hanger bracket 90° as shown (refer to Figure 2-3).
 3. Refer to Figure 2-3 and install the transmitter controller front panel in the maintenance position by inserting the hanger bracket into the slots in the transmitter chassis as shown.

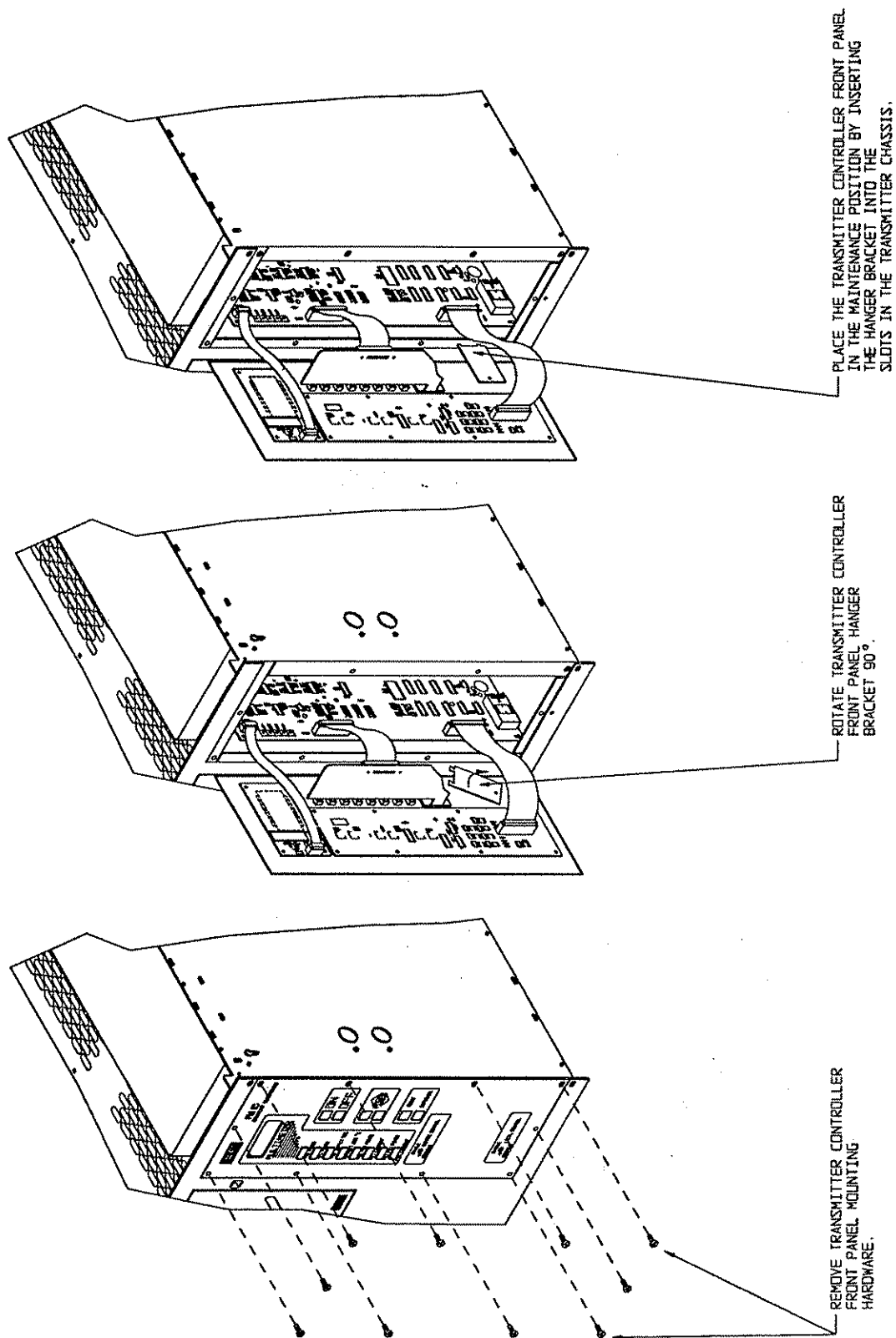


WARNING

ENSURE NO PRIMARY POWER IS CONNECTED TO THE TRANSMITTER BEFORE PROCEEDING.

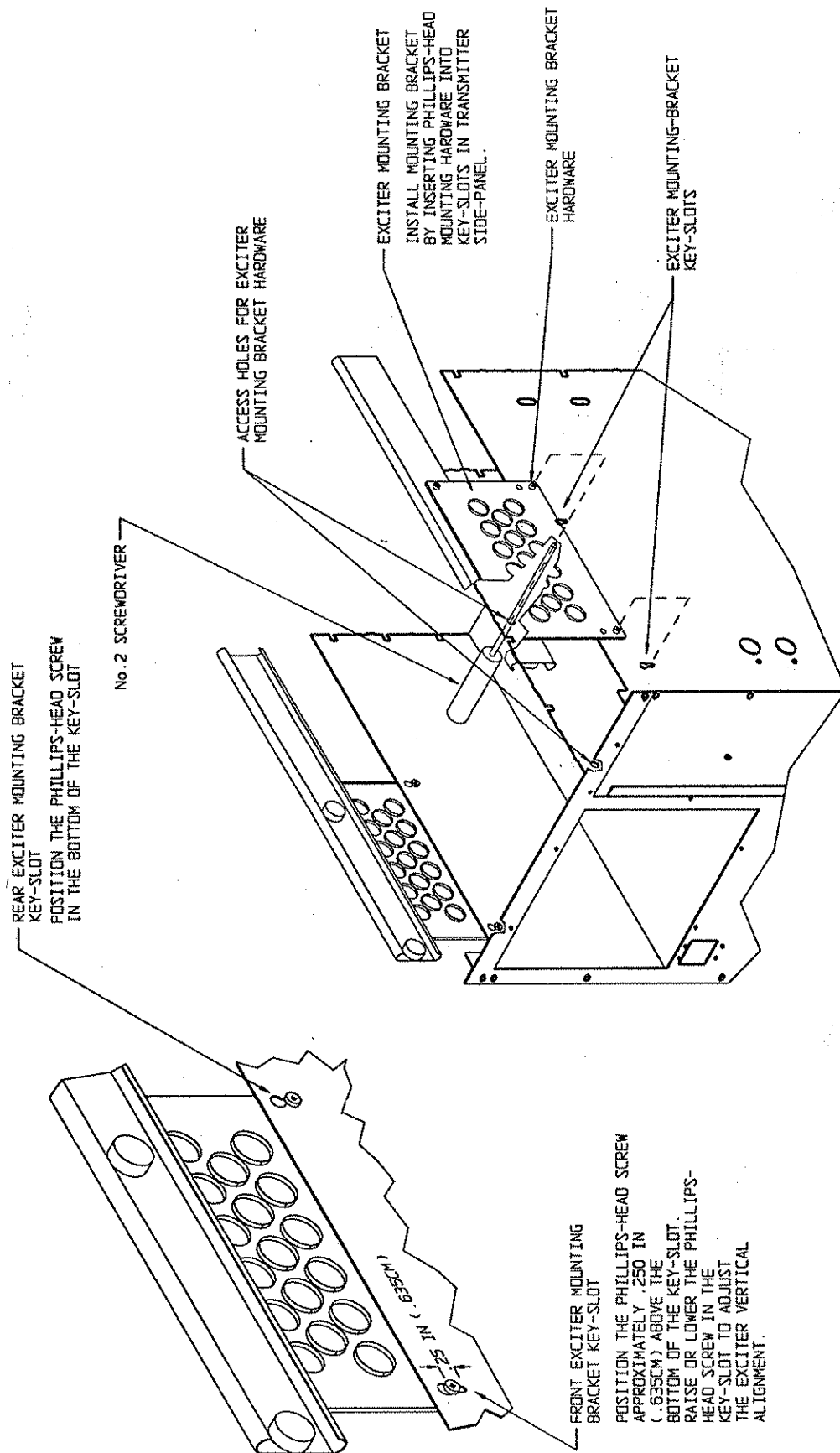
WARNING

- 2-25. **EXCITER MOUNTING BRACKET INSTALLATION.** The FM-1C/FM-500C transmitters are equipped with an FX-50 exciter. The exciter is mounted above the transmitter chassis on slide-rails. To install the FX-50 exciter, proceed as follows:
- 2-26. The exciter is mounted to the transmitter chassis by brackets. The exciter mounting hardware is accessed by removing the transmitter controller front panel. Refer to the **TRANSMITTER CONTROLLER FRONT PANEL REMOVAL** procedure in the preceding text and perform the procedure to remove the transmitter controller front panel.
- 2-27. Locate the exciter mounting brackets.
- 2-28. Refer to Figure 2-4 and install the brackets as follows:
1. Orient a mounting bracket as shown and insert the mounting bracket Phillips-head hardware into the key-slots in the transmitter side-panel as shown.
 2. The positioning of the mounting bracket hardware in the key-slots determines the exciter vertical alignment in the rack. Align the mounting bracket as follows:
 - A. In the rear exciter mounting bracket key-slot, position the Phillips-head hardware in the bottom of the key-slot as shown. Secure the Phillips-head screw.
 - B. In the front exciter mounting bracket key-slot, position the Phillips-head hardware approximately 1/4 inch (0.63 cm) above the bottom of the key-slot as shown. Secure the Phillips-head screw. The exciter vertical alignment is adjusted by raising or lowering the hardware in the key-slot.
 3. Repeat the procedure for the second exciter mounting bracket.



COPYRIGHT © 1992 BROADCAST ELECTRONICS, INC
597-1001-6

FIGURE 2-3. TRANSMITTER CONTROLLER FRONT PANEL REMOVAL



COPYRIGHT © 1992 BROADCAST ELECTRONICS, INC

597-1001-5

FIGURE 2-4. FM-1C/FM-500C EXCITER MOUNTING BRACKET INSTALLATION

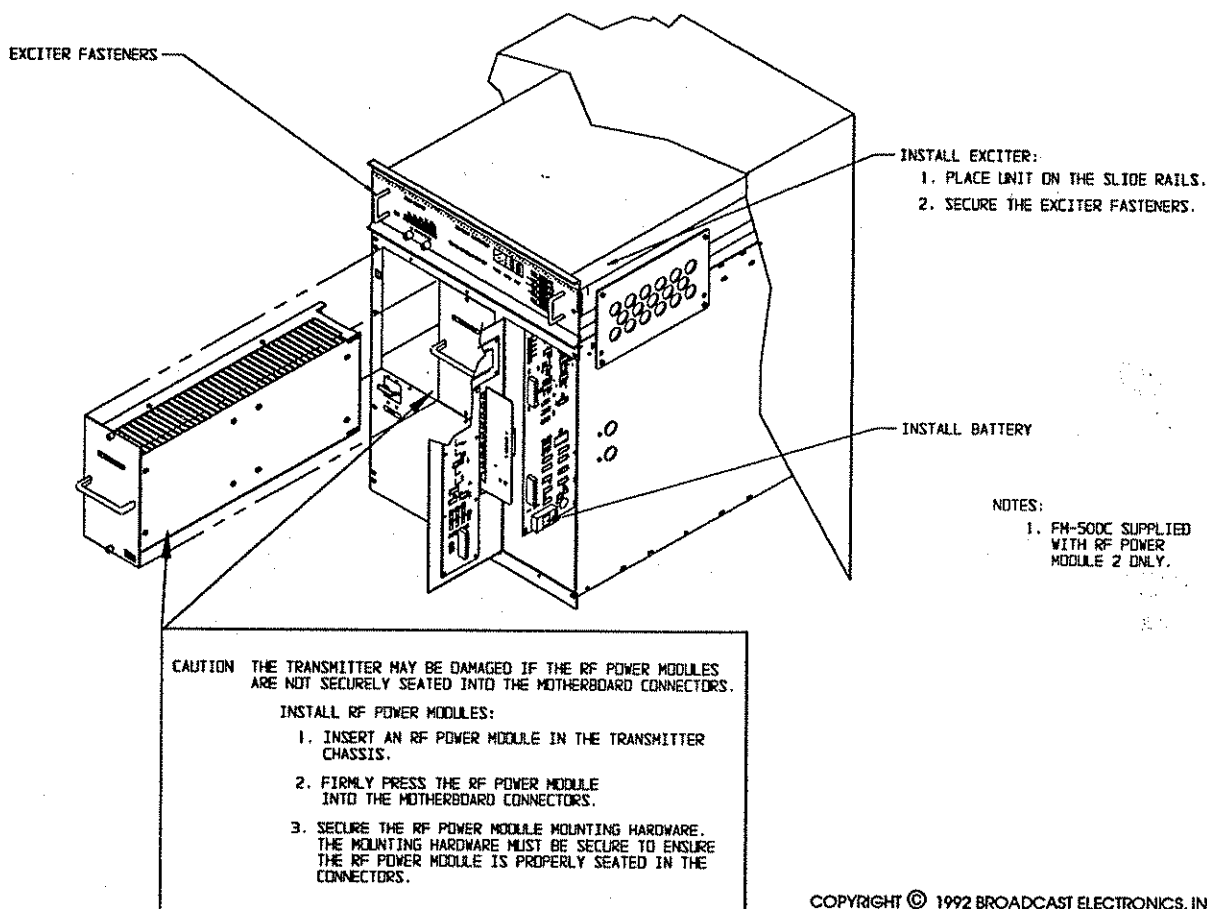


WARNING

ENSURE NO PRIMARY POWER IS CONNECTED TO THE TRANSMITTER BEFORE PROCEEDING.

WARNING

- 2-29. **COMPONENT INSTALLATION.** Selected components of the transmitter have been removed to prevent damage during shipment. The components removed from the transmitter are shipped in separate containers. To re-install the FM-1C/FM-500C components, refer to Figure 2-5 and proceed as follows:



COPYRIGHT © 1992 BROADCAST ELECTRONICS, INC

597-1001-7

FIGURE 2-5. FM-1C/FM-500C COMPONENT INSTALLATION

- 2-30. **Battery Installation.** The transmitter controller is equipped with a battery back-up system to maintain the controller memory during a power failure. A battery for installation in the transmitter is provided in the accessory parts kit. Locate the battery in the accessory parts kit. To install the battery, refer to Figure 2-5 and install the battery in the holder on the controller circuit board as shown.
- 2-31. **Exciter Installation.** The FX-50 exciter is mounted on the slide-rails above the transmitter. To install the exciter, proceed as follows:

1. Locate the FX-50 exciter.
2. Refer to FX-50 exciter manual 597-1050 and perform the PRELIMINARY INSTALLATION PROCEDURES to unpack and configure the exciter for the desired operation.
3. Refer to Figure 2-5 and place the exciter on the slide-rails.
4. Slide the exciter in and out of the rack to check the exciter movement and vertical alignment. If adjustment of the exciter vertical alignment is required, proceed as follows:
 - A. Refer to Figure 2-4 and loosen the mounting bracket hardware on the front key slot.
 - B. Refer to Figure 2-4 and raise or lower the hardware in the key slot to adjust the exciter vertical alignment.
 - C. Secure the exciter front-panel mounting hardware.
5. Once the exciter vertical alignment is adjusted, re-install the transmitter controller front panel and secure the hardware.

2-32. **RF Power Module Installation.** The FM-1C is equipped with RF power module 1 and RF power module 2. The FM-500C is equipped with RF power module 2. Each module is a plug-in device containing a serial number. The serial number is recorded in the final test data sheets and is used to identify each module. On FM-1C models, the RF power modules contain labels to permit re-installation into the appropriate power module locations. To install the RF modules, proceed as follows:



CAUTION *THE TRANSMITTER MAY BE DAMAGED IF AN RF POWER MODULE IS NOT SECURELY SEATED INTO THE MOTHERBOARD CONNECTORS.*



CAUTION *AN RF POWER MODULE IS EQUIPPED WITH REAR-PANEL MOUNTED CONNECTORS. TO PREVENT DAMAGE TO THE CONNECTORS, INSERT/REMOVE THE MODULES CAREFULLY AND DO NOT PLACE A MODULE ON THE REAR-PANEL.*

1. Locate the RF power modules. FM-1C models are equipped with RF power module 1 and RF power module 2. FM-500C models are equipped with RF power module 2.
2. Refer to Figure 2-5 and align RF power module 2 with the guides in the RF power module 2 location.
3. Insert and firmly press the RF module into the motherboard connectors.
4. Secure the RF power module mounting hardware. The mounting hardware must be secure to ensure the RF power is properly seated in the connectors.
5. For FM-1C models, repeat the procedure for the RF power module 1. Install RF power module 1 in the RF power module 1 location.



WARNING
WARNING

ENSURE NO PRIMARY POWER IS CONNECTED TO THE TRANSMITTER BEFORE PROCEEDING.

2-33. WIRING.

2-34. EXCITER CONNECTIONS. The FX-50 exciter will require re-connection to the transmitter. Refer to the following text to re-connect the exciter to the transmitter.

1. Refer to Figure 2-6 and connect P22 to J22 on the transmitter rear-panel.
2. Refer to Figure 2-6 and connect cable 40 to the **RF OUTPUT** receptacle on the exciter rear-panel.

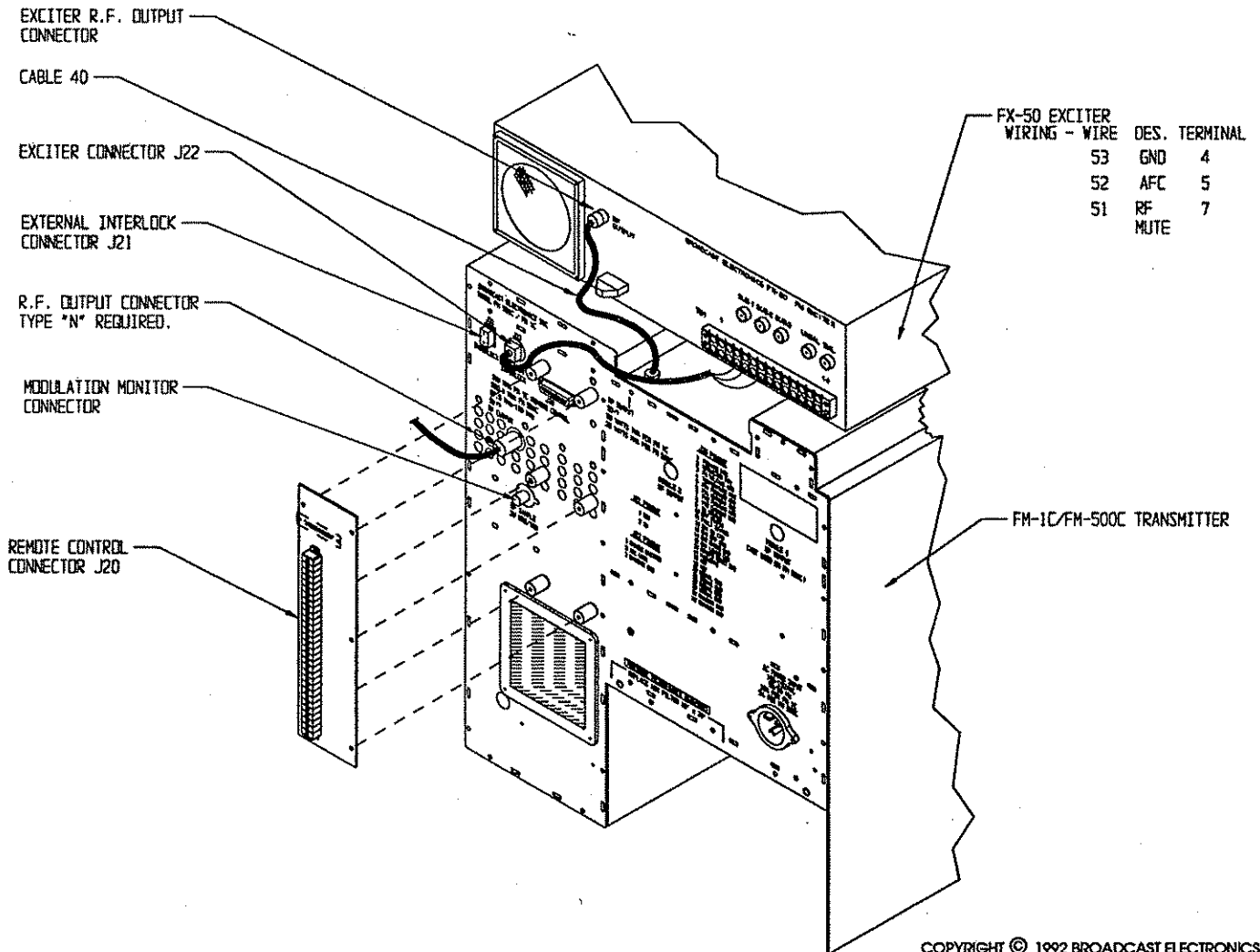
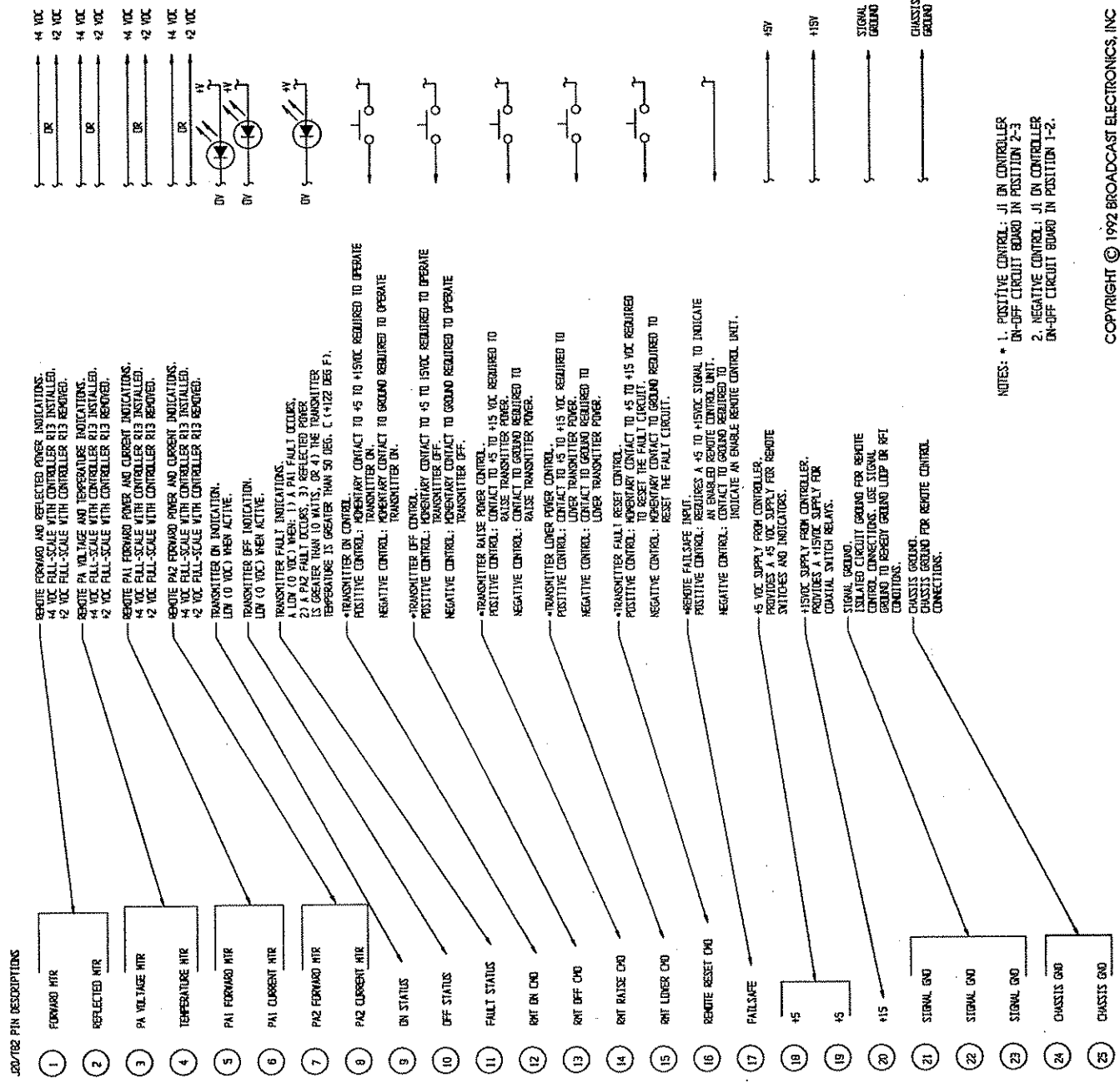
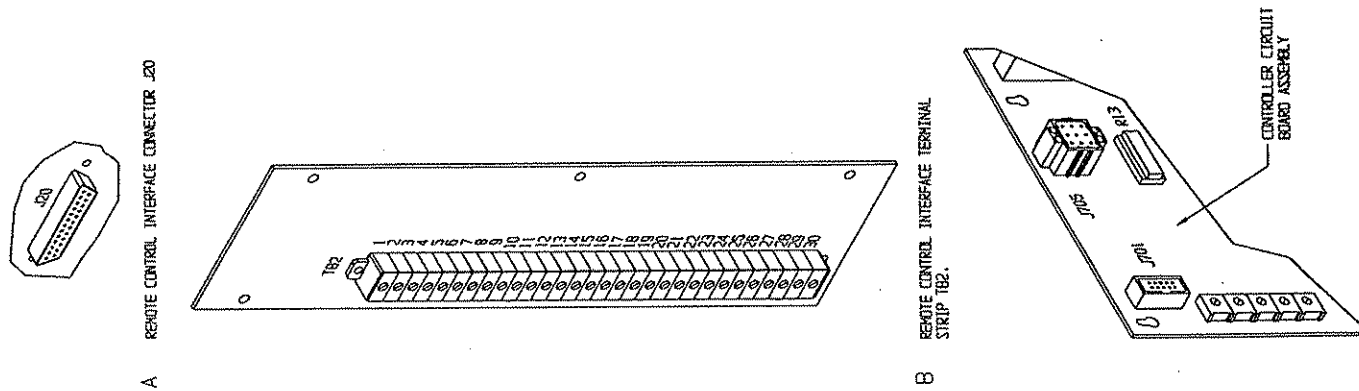


FIGURE 2-6. FM-1C/FM-500C RECONNECTIONS

597-1001-8

COPYRIGHT © 1992 BROADCAST ELECTRONICS, INC.

- 2-35. **REMOTE CONTROL.** The FM-1C/FM-500C transmitters are designed for complete remote control operations (refer to Figure 2-7). The transmitters will interface with almost any remote control unit such as the Broadcast Electronics VMC-16 Voice Remote Control System. The following text presents a description of the FM-1C/FM-500C remote control functions and indications. The remote control connections are located on the transmitter rear-panel (refer to Figure 2-6).
- 2-36. Remote control connections are interfaced to the transmitter at J20 on the transmitter rear-panel (refer to Figure 2-6). Remote control commands and indications can be interfaced to the transmitter using: 1) remote control mating connector P20 or 2) the remote control interface circuit board with remote control terminal strip TB2. The transmitter is shipped with the remote control interface circuit board installed. If the remote control interface circuit board is not desired, refer to Figure 2-6 and remove the interface circuit board.
- 2-37. The remote control system: 1) provides positive or negative control logic and 2) +4/+2 volt remote full-scale meter indications. Positive/negative control is determined by jumper J1 on the controller on/off switch circuit board assembly. Positive control requires the use of a momentary contact to a +5 volt to +15 volt dc signal to activate the function. Negative control requires the use of a momentary contact to ground to activate the function. Remote indication functions: 1) require current limiting resistors and 2) provide up to 100 mA of current for indicators. Refer to Figure 2-7 and the following text to connect remote control equipment to the system. Figure 2-7 presents the remote control system pin descriptions. The text describes the connections using remote control interface circuit board terminal strip TB2. The pin connections for remote control interface connector J20 are identical to terminal strip TB2.
- 2-38. **Remote Forward/Reflected Power Meter Indications.** Remote forward/reflected power meter indications are located at TB2-1 and TB2-2. The indications can be programmed for +4 volt dc full-scale or +2 volt dc full-scale meter indications. The transmitter is shipped with the remote forward and reflected power meter indications programmed for +4 volt full-scale meter indications.
- 2-39. **Remote PA Voltage/Temperature Meter Indications.** Remote PA voltage/temperature meter indications are located at TB2-3 and TB2-4. The indications can be programmed for +4 volt dc full-scale or +2 volt dc full-scale meter indications. The transmitter is shipped with the remote PA voltage/temperature meter indications programmed for +4 volt full-scale meter indications.
- 2-40. **Remote PA1 Forward Power/Current Meter Indications.** Remote PA1 forward power/current meter indications are located at TB2-5 and TB2-6. The indications can be programmed for +4 volt dc full-scale or +2 volt dc full-scale meter indications. The transmitter is shipped with the remote PA1 forward power/current meter indications programmed for +4 volt full-scale meter indications.
- 2-41. **Remote PA2 Forward Power/Current Meter Indications.** Remote PA2 forward power/current meter indications are located at TB2-7 and TB2-8. The indications can be programmed for +4 volt dc full-scale or +2 volt dc full-scale meter indications. The transmitter is shipped with the remote PA2 forward power/current meter indications programmed for +4 volt full-scale meter indications.
- 2-42. **Transmitter On Indications.** The transmitter on indicator provides a signal to indicate when the transmitter is enabled. The transmitter on indicator is located at TB2-9. The indicator will go LOW (0 volts dc) to indicate when the transmitter is enabled.



NOTES: * 1. POSITIVE CONTROL: J1 ON CONTROLLER ON-OFF CIRCUIT BOARD IN POSITION 2-3
2. NEGATIVE CONTROL: J1 ON CONTROLLER ON-OFF CIRCUIT BOARD IN POSITION 1-2.

COPYRIGHT © 1992 BROADCAST ELECTRONICS, INC

597-1001-9

FIGURE 2-7. REMOTE CONTROL CONNECTIONS

- 2-43. **Transmitter Off Indications.** The transmitter off indicator provides a signal to indicate when the transmitter is disabled. The transmitter off indicator is located at TB2-10. The indicator will go LOW (0 volts dc) to indicate when the transmitter is disabled.
- 2-44. **Transmitter Fault Indications.** The transmitter fault indicator provides a signal to indicate when: 1) a PA1 fault occurs, 2) a PA2 fault occurs, 3) reflected power is greater than 10 watts, or 4) the transmitter temperature is greater than 50 °C (+122 °F). The transmitter fault indicator is located at TB2-11. The indicator will go LOW (0 volts dc) to indicate when a PA1, PA2, high reflected power, or a high temperature fault condition has occurred.
- 2-45. **Remote Transmitter On Control.** The transmitter on function is located at TB2-12. The function can be activated using positive or negative control. Positive control requires the use of a momentary contact to a +5 volt to +15 volt dc signal to operate the transmitter to on. Negative control requires the use of a momentary contact to ground to operate the transmitter to on.
- 2-46. **Remote Transmitter Off Control.** The transmitter off control is located at TB2-13. The function can be activated using positive or negative control. Positive control requires the use of a momentary contact to a +5 volt to +15 volt dc signal to operate the transmitter to off. Negative control requires the use of a momentary contact to ground to operate the transmitter to off.
- 2-47. **Remote Power Level Raise Control.** The transmitter power level raise control is located at TB2-14. The function can be activated using positive or negative control. Positive control requires the use of a momentary contact to a +5 volt to +15 volt dc signal to raise the transmitter power level. Negative control requires the use of a momentary contact to ground to raise the transmitter power level.
- 2-48. **Remote Power Level Lower Control.** The transmitter power level lower control is located at TB2-15. The function can be activated using positive or negative control. Positive control requires the use of a momentary contact to a +5 volt to +15 volt dc signal to lower the transmitter power level. Negative control requires the use of a momentary contact to ground to lower the transmitter power level.
- 2-49. **Remote Reset Control.** The reset control is designed to reset the transmitter fault circuitry. The reset control is located at TB2-16. The function can be activated using positive or negative control. Positive control requires the use of a momentary contact to a +5 volt to +15 volt dc signal to reset the transmitter fault circuitry. Negative control requires the use of a momentary contact to ground to reset the transmitter fault circuitry.
- 2-50. **Remote Fail-safe Input.** The remote fail-safe input is designed for the remote control unit fail-safe control line. The input is located at TB2-17. The input can be activated using positive or negative control. Positive control requires the use of a +5 volt to +15 volt dc signal to indicate an enabled remote control unit. Negative control requires the use of a ground to indicate an enabled remote control unit.
- 2-51. **+5V DC Supply.** A +5 volt dc supply is provided for the remote control switches and indicators. The +5 volt dc supply is located at TB2-18 and TB2-19. The supply can provide up to 20 mA for indicator and switch operations.
- 2-52. **+15V DC Supply.** A +15 volt dc supply is provided for coaxial switch control relays. The +15 volt dc supply is located at TB2-20. The supply can provide up to 50 mA control operations.
- 2-53. **Signal Ground.** Signal ground is an isolated circuit ground for remote control connections. Signal ground is to be used to remedy ground loops or to eliminate RFI conditions. Signal ground is located at TB2-21, TB2-22, and TB2-23.
- 2-54. **Chassis Ground.** Chassis ground is designed to be used for remote control connections. Chassis ground is located at TB2-24 and TB2-25.

- 2-55. **EXTERNAL INTERLOCK.** The FM-1C/FM-500C transmitters are equipped with an external interlock such as for a test load. The interlock will mute the transmitter RF output when opened. The interlock is located at J21 on the transmitter rear-panel (refer to Figure 2-6). To connect an external interlock to the transmitter, refer to Figure 2-6 and disconnect external interlock connector P21. Connect the interlock wiring to P21-1 and P21-2. When wiring is complete, attach P21 to J21 on the transmitter rear-panel.
- 2-56. **MODULATION MONITOR RECEPTACLE.** The FM-1C/FM-500C transmitters are equipped with a modulation monitor receptacle. The receptacle is located on the transmitter rear panel (refer to Figure 2-6). Refer to Figure 2-6 and connect the modulation monitor to the modulation monitor receptacle. The receptacle provides a 2V RMS sample at 1 kW for monitoring operations.
- 2-57. **AUDIO INPUT CONNECTIONS.** Audio input connections for the FM-1C/FM-500C transmitters are located on the FX-50 exciter rear panel. To connect audio to the FM-1C/FM-500C transmitters, refer to FX-50 exciter manual 597-1050 and perform the **WIRING** procedures in **SECTION II, INSTALLATION**.
- 2-58. **RF OUTPUT TRANSMISSION LINE CONNECTION.** The FM-1C/FM-500C transmitter RF output connection is located at the **RF OUTPUT** receptacle on the transmitter rear panel (refer to Figure 2-6). The receptacle requires a type N connector. A jumper cable with type N connectors is provided in the accessory kit for RF output transmission line connections. The cable is designed to provide RF output connections when the transmitter is to be interfaced to rigid coaxial cable. To connect the RF output transmission line to the transmitter: 1) Attach the type N connector to the **RF OUTPUT** receptacle on the transmitter rear-panel or 2) use the jumper cable to connect the rigid coaxial cable to the **RF OUTPUT** receptacle on the transmitter rear-panel.



WARNING

ENSURE PRIMARY POWER IS DISCONNECTED BEFORE PROCEEDING.



WARNING

ENSURE AN EARTH GROUND CONDUCTOR IS SECURELY CONNECTED TO THE TRANSMITTER CHASSIS GROUND LUG.

- 2-59. **AC POWER CONNECTIONS.** The FM-1C transmitter requires a single phase source of 196V to 252V ac, 50/60 Hz at 20 Amperes. The FM-500C transmitter requires a single phase source of 196V to 252V ac, 50/60 Hz at 15 Amperes or 96V to 133V ac, 50/60Hz at 30 Amperes. AC power is applied to the transmitter through an ac line cord and modular connector. For FM-1C models, the transmitter ac power source must be protected by a 20 Ampere fused disconnect or circuit breaker. For FM-500C models, the transmitter ac power source must be protected by a 15 Ampere fused disconnect or circuit breaker for 220V ac operation or a 30 Ampere fused disconnect or circuit breaker for 120V ac operation.



WARNING

ENSURE PRIMARY POWER IS DISCONNECTED BEFORE PROCEEDING.

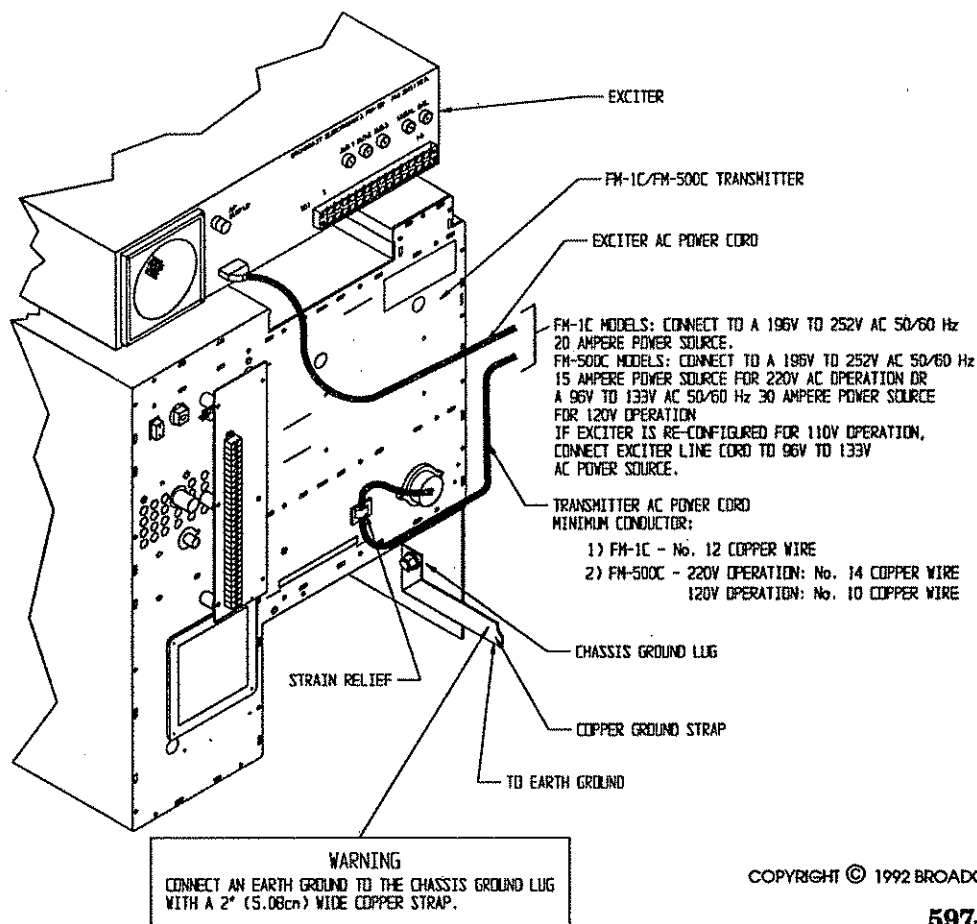
WARNING

- 2-60. **FX-50 Exciter AC Line Voltage Programming.** The FX-50 exciter is shipped from the factory for 194V to 266V ac 50/60 Hz operation. However, the exciter may be re-programmed for 96V to 133V ac 50/60 Hz operation if required. If 110V ac operation is desired, refer to FX-50 exciter instruction manual 597-1050 and perform the **PRELIMINARY INSTALLATION** procedures in **SECTION II, INSTALLATION**.

2-61.

Transmitter AC Line Cord Assembly. AC power is applied to the transmitter using an ac line cord and connector. The connector must be assembled to the line cord. To assemble the modular connector to an ac line cord, proceed as follows:

1. Refer to local electrical codes and select a line cord material for the transmitter ac line cord assembly. For FM-1C models, the ac line cord material must contain: 1) minimum 12 gauge copper conductors and 2) the appropriate insulation type such as S or SO (refer to Figure 2-8). For FM-500C models, the ac line cord material must contain: 1) minimum 14 gauge copper conductors for 220V ac operation or 10 gauge copper conductors for 120V ac operation and 2) the appropriate insulation type such as S or SO (refer to Figure 2-8). Determine length of the cord required to route power to the transmitter and select the ac line cord material.
2. Locate the modular ac line cord connector in the accessory parts kit.
3. Assemble the ac line cord connector to the ac line cord by following the instructions contained in the ac line cord connector.
4. Connect the ac line cord to the appropriate power source as follows:
 1. FM-1C – 196V to 252V ac 50/60 Hz power source.
 2. FM-500C – 196V to 252V ac 50/60 Hz power source for 220V operation or 96V to 133V 50/60 Hz power source for 120V operation.



COPYRIGHT © 1992 BROADCAST ELECTRONICS, INC

597-1001-10

FIGURE 2-8. FM-1C/FM-500C AC POWER CONNECTIONS

- 2-62. **Main AC Input.** Ensure the transmitter ac line cord is connected to an appropriate power source. Refer to Figure 2-8 and connect the transmitter ac line cord to the ac input receptacle on the transmitter rear-panel as shown. Route the line cord through the strain relief as shown. Refer to Figure 2-8 and connect the exciter line cord to a 196V to 252V ac 50/60 Hz power source. If the exciter has been reprogrammed for 110V operation, connect the exciter line cord to a 96V to 133V ac 50/60 Hz power source.



WARNING

ENSURE PRIMARY POWER IS DISCONNECTED BEFORE PROCEEDING.



WARNING

WARNING

ENSURE AN EARTH GROUND CONDUCTOR IS SECURELY CONNECTED TO THE TRANSMITTER CHASSIS GROUND LUG.

WARNING

- 2-63. **GROUND.** The FM-1C/FM-500C transmitters are equipped with a chassis ground system for operating safety. The ground system requires the connection of an earth ground. Refer to Figure 2-8 and connect an earth ground to the chassis ground lug as shown using a 2 inch (5.08 cm) wide copper strap.

- 2-64. **PRELIMINARY OPERATION.**

- 2-65. The following text presents procedures for the preliminary operation of the FM-1C/FM-500C transmitters. The procedures will reference the factory test data sheets which are shipped with the transmitter. Locate the factory test data sheets. Differences in the values obtained during actual operation may be noted due to differences in primary power and antenna systems. Refer to the following text and perform the procedures to initially operate the FM-1C/FM-500C transmitters.

- 2-66. Ensure the appropriate ac power supply is applied to the transmitter and the FX-50 exciter.

- 2-67. Operate the **POWER** switch to ON. The following events will occur:

1. Each RF power module **MODULE STATUS** indicator will illuminate yellow.
2. The **INTERLOCK** indicator will illuminate.
3. The **OFF** switch/indicator will illuminate.

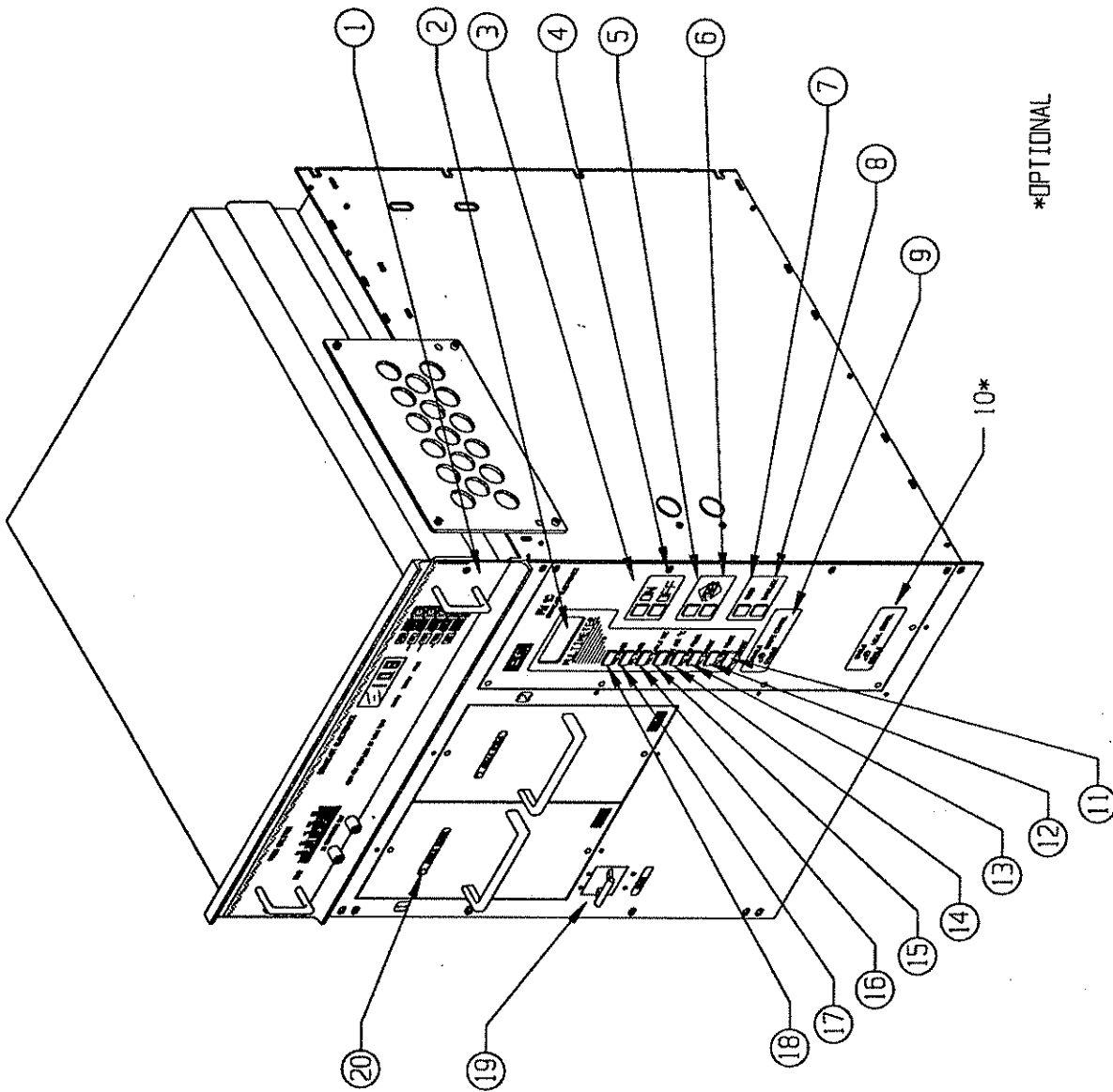
- 2-68. If the **INTERLOCK** indicator does not illuminate, operate the **POWER** switch to OFF. Check the external interlock to ensure the interlock is operating properly. Operate the **POWER** switch to ON.

- 2-69. Depress the transmitter **MULTIMETER FWD POWER** switch/indicator. The **MULTIMETER** will indicate 0 watts forward power.

- 2-70. Depress the **ON** switch/indicator to illuminate the switch/indicator. Each RF power module **MODULE STATUS** indicator will illuminate green.

- 2-71. Depress the exciter **MULTIMETER FWD** switch. The exciter **MULTIMETER** will indicate the forward power recorded in the factory test data sheets.

- 2-72. Depress and hold the transmitter **POWER▲** switch until the **MULTIMETER** indicates the forward power level recorded in the factory test data sheets. If the **RESET** switch/indicator illuminates or the **MODULE STATUS** indicators illuminate yellow during the increase of transmitter power, proceed as follows:



*OPTIONAL

FIGURE 3-1. FM-1C CONTROLS AND INDICATORS

COPYRIGHT © 1990 BROADCAST ELECTRONICS, INC
597-1001-1

TABLE 3-1. FM-1C CONTROLS AND INDICATORS
(Sheet 2 of 4)

INDEX NO.	NOMENCLATURE	FUNCTION
6	POWER ▼ Switch/Indicator	<p>SWITCH: Instructs the system controller to lower the transmitter output power.</p> <p>INDICATOR: Illuminates to indicate the POWER ▼ switch is selected.</p>
7	RESET Switch/Indicator	<p>SWITCH: Clears the transmitter fault circuitry if: 1) the switch is depressed and 2) if the fault condition is removed.</p> <p>INDICATOR: Illuminates to indicate: 1) an RF power module has been removed from the chassis, 2) a power amplifier fault, 3) a high temperature condition, or 4) a high reflected power condition.</p>
8	INTERLOCK Switch/Indicator	<p>SWITCH: No Operation.</p> <p>INDICATOR: Illuminates to indicate: 1) the external interlock is closed, 2) the exciter AFC is locked, and 3) the remote control fail-safe input is closed if remote control operation is enabled. Extinguishes to indicate an open external interlock, the exciter AFC is unlocked, or an open remote control fail-safe input if remote control operation is enabled.</p>
9	REMOTE CONTROL ENABLE/DISABLE Switch	Controls the transmitter remote control operations. When the switch is operated to ENABLE , remote control operation is enabled. When the switch is operated to DISABLE , remote control operation is disabled.
10	LOCAL CONTROL ENABLE/DISABLE Switch (Optional)	Controls the transmitter local control operations. When the switch is operated to ENABLE , the transmitter front-panel controls will be enabled. When the switch is operated to DISABLE , the transmitter front-panel controls will be disabled.
11	PA2 CURRENT Switch/Indicator	<p>SWITCH: Configures the MULTIMETER to display power amplifier module 2 current.</p> <p>INDICATOR: A yellow display indicates the MULTI-METER is configured to present power amplifier module 2 current.</p>
12	PA2 FWD POWER Switch/Indicator	<p>SWITCH: Configures the MULTIMETER to display power amplifier module 2 forward power.</p> <p>INDICATOR: A yellow display indicates the MULTI-METER is configured to present power amplifier module 2 forward power.</p>

TABLE 3-1. FM-1C CONTROLS AND INDICATORS
(Sheet 3 of 4)

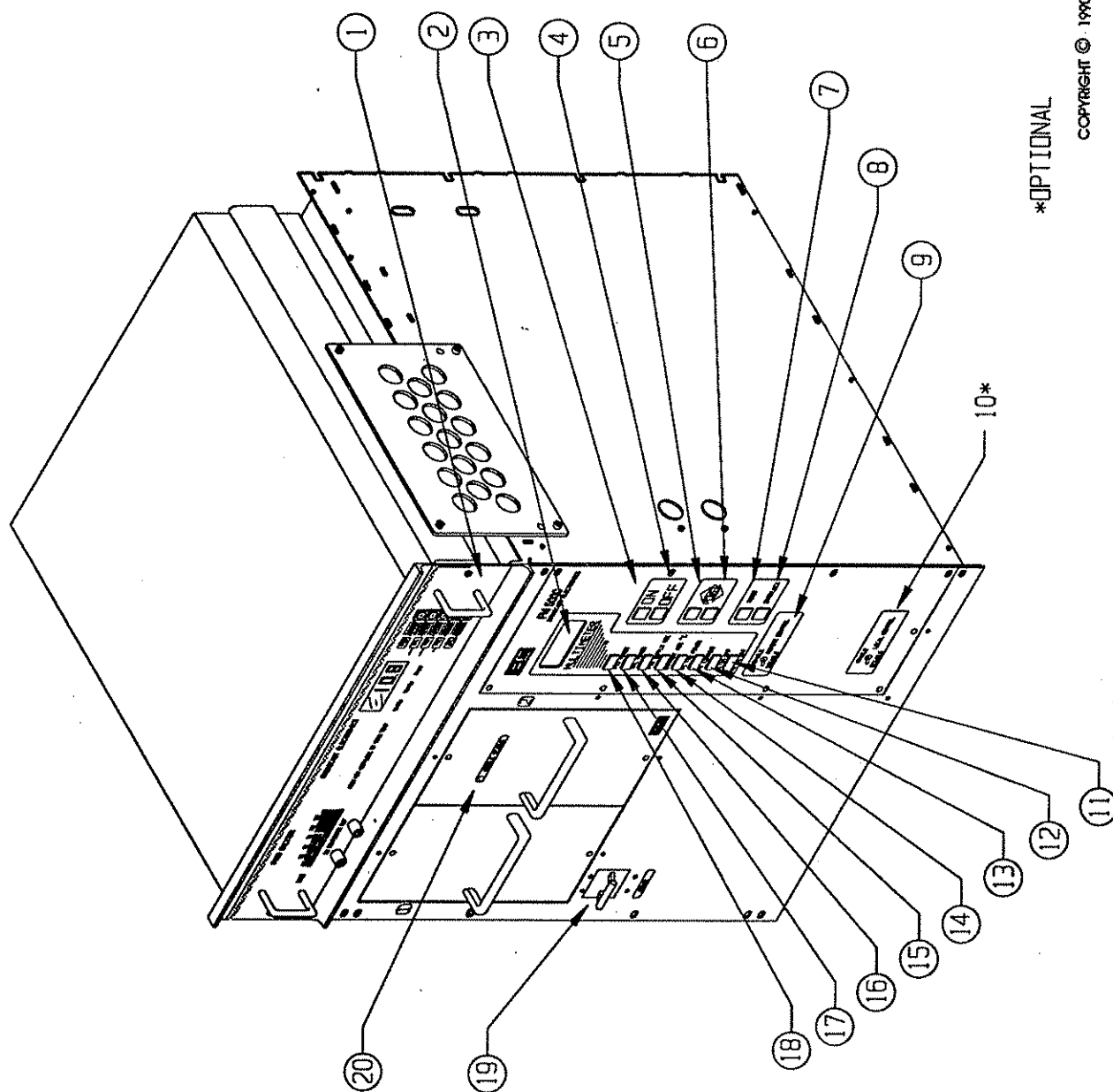
INDEX NO.	NOMENCLATURE	FUNCTION
13	PA1 CURRENT Switch/Indicator	<p>SWITCH: Configures the MULTIMETER to display power amplifier module 1 current.</p> <p>INDICATOR: A yellow display indicates the MULTI-METER is configured to present power amplifier module 1 current.</p>
14	PA1 FWD POWER Switch/Indicator	<p>SWITCH: Configures the MULTIMETER to display power amplifier module 1 forward power.</p> <p>INDICATOR: A yellow display indicates the MULTI-METER is configured to present power amplifier module 1 forward power.</p>
15	EXHAUST AIR ° C Switch/Indicator	<p>SWITCH: Configures the MULTIMETER to display the transmitter exhaust air temperature in ° C.</p> <p>INDICATOR: A yellow display indicates the MULTI-METER is configured to present the transmitter exhaust air temperature.</p>
16	PWR SUPPLY VDC Switch/Indicator	<p>SWITCH: Configures the MULTIMETER to display the power supply voltage.</p> <p>INDICATOR: A yellow display indicates the MULTI-METER is configured to present the power supply voltage.</p>
17	RFL POWER Switch/Indicator	<p>SWITCH: Configures the MULTIMETER to display the transmitter reflected power in watts.</p> <p>INDICATOR: A yellow display indicates the MULTI-METER is configured to present the transmitter reflected power.</p>
18	FWD POWER Switch/Indicator	<p>SWITCH: Configures the MULTIMETER to display the transmitter forward power in watts.</p> <p>INDICATOR: A yellow display indicates the MULTI-METER is configured to present the transmitter forward power.</p>
19	POWER Switch	Provides overload protection and primary ac power control for the transmitter.

TABLE 3-1. FM-1C CONTROLS AND INDICATORS
(Sheet 4 of 4)

INDEX NO.	NOMENCLATURE	FUNCTION
20	MODULE STATUS Indicator	<p>Displays the operating status of the power amplifier module.</p> <p>RED DISPLAY: Indicates a power module fault. Power module faults include: 1) over-current, 2) over-voltage, 3) over-temperature, 4) high reflected power and 5) high forward power demand.</p> <p>YELLOW DISPLAY: Indicates a power module foldback or transmitter off condition.</p> <p>GREEN DISPLAY: Indicates normal power module RF Power output operation.</p>

TABLE 3-2. FM-500C CONTROLS AND INDICATORS
(Sheet 1 of 4)

INDEX NO.	NOMENCLATURE	FUNCTION
1	FX-50 Exciter	Refer to the FX-50 exciter instruction manual for a description of the FX-50 controls and indicators.
2	MULTIMETER Display	Displays forward power, reflected power, power supply voltage, exhaust air temperature, PA forward power, and PA current parameters as selected by the MULTIMETER switches.
3	ON Switch/Indicator	<p>SWITCH: Enables the transmitter RF output by unmuting the exciter, power amplifier modules, and the power amplifier power supply.</p> <p>INDICATOR: Illuminates to indicate the transmitter RF output is enabled.</p>
4	OFF Switch/Indicator	<p>SWITCH: Disables the transmitter RF output by muting the exciter, power amplifier modules, and the power amplifier power supply.</p> <p>INDICATOR: Illuminates to indicate the transmitter RF output is disabled.</p>
5	POWER ▲ Switch/Indicator	<p>SWITCH: Instructs the system controller to raise the transmitter output power.</p> <p>INDICATOR: Illuminates to indicate the POWER ▲ switch is selected.</p>



***OPTIONAL**

TOPS
597-1001-3
COPYRIGHT © 1990 BROADCAST ELECTRONICS, INC.

TABLE 3-2. FM-500C CONTROLS AND INDICATORS
(Sheet 2 of 4)

INDEX NO.	NOMENCLATURE	FUNCTION
6	POWER ▼ Switch/Indicator	<p>SWITCH: Instructs the system controller to lower the transmitter output power.</p> <p>INDICATOR: Illuminates to indicate the POWER ▼ switch is selected.</p>
7	RESET Switch/Indicator	<p>SWITCH: Clears the transmitter fault circuitry if: 1) the switch is depressed and 2) if the fault condition is removed.</p> <p>INDICATOR: Illuminates to indicate a power amplifier fault, a high temperature condition, or a high reflected power condition.</p>
8	INTERLOCK Switch/Indicator	<p>SWITCH: No Operation.</p> <p>INDICATOR: Illuminates to indicate: 1) the external interlock is closed, 2) the exciter AFC is locked, and 3) the remote control fail-safe input is closed if remote control operation is enabled. Extinguishes to indicate an open external interlock, the exciter AFC is unlocked, or an open remote control fail-safe input if remote control operation is enabled.</p>
9	REMOTE CONTROL ENABLE/DISABLE Switch	Controls the transmitter remote control operations. When the switch is operated to ENABLE , remote control operation is enabled. When the switch is operated to DISABLE , remote control operation is disabled.
10	LOCAL CONTROL ENABLE/DISABLE Switch (Optional)	Controls the transmitter local control operations. When the switch is operated to ENABLE , the transmitter front-panel controls will be enabled. When the switch is operated to DISABLE , the transmitter front-panel controls will be disabled.
11	METER OFF Switch/Indicator	<p>SWITCH: Configures the MULTIMETER to off.</p> <p>INDICATOR: A yellow display indicates the MULTI-METER is configured to off.</p>
12	METER OFF Switch/Indicator	<p>SWITCH: Configures the MULTIMETER to off.</p> <p>INDICATOR: A yellow display indicates the MULTI-METER is configured to off.</p>

TABLE 3-2. FM-500C CONTROLS AND INDICATORS
(Sheet 3 of 4)

INDEX NO.	NOMENCLATURE	FUNCTION
13	PA CURRENT Switch/Indicator	SWITCH: Configures the MULTIMETER to display the power amplifier module current. INDICATOR: A yellow display indicates the MULTI-METER is configured to present the power amplifier module current.
14	PA FWD POWER Switch/Indicator	SWITCH: Configures the MULTIMETER to display the power amplifier module forward power. INDICATOR: A yellow display indicates the MULTI-METER is configured to present the power amplifier module forward power.
15	EXHAUST AIR ° C Switch/Indicator	SWITCH: Configures the MULTIMETER to display the transmitter exhaust air temperature in ° C. INDICATOR: A yellow display indicates the MULTI-METER is configured to present the transmitter exhaust air temperature.
16	PWR SUPPLY VDC Switch/Indicator	SWITCH: Configures the MULTIMETER to display the power supply voltage. INDICATOR: A yellow display indicates the MULTI-METER is configured to present the power supply voltage.
17	RFL POWER Switch/Indicator	SWITCH: Configures the MULTIMETER to display the transmitter reflected power in watts. INDICATOR: A yellow display indicates the MULTI-METER is configured to present the transmitter reflected power.
18	FWD POWER Switch/Indicator	SWITCH: Configures the MULTIMETER to display the transmitter forward power in watts. INDICATOR: A yellow display indicates the MULTI-METER is configured to present the transmitter forward power.
19	POWER Switch	Provides overload protection and primary ac power control for the transmitter.

TABLE 3-2. FM-500C CONTROLS AND INDICATORS
(Sheet 4 of 4)

INDEX NO.	NOMENCLATURE	FUNCTION
20	MODULE STATUS Indicator	<p>Displays the operating status of the power amplifier module.</p> <p>RED DISPLAY: Indicates a power module fault. Power module faults include: 1) over-current, 2) over-voltage, 3) over-temperature, 4) high reflected power, and 5) high forward power demand.</p> <p>YELLOW DISPLAY: Indicates a power module current limit, VSWR limit, temperature limit, over-voltage limit, high forward power demand limit, or transmitter off condition.</p> <p>GREEN DISPLAY: Indicates normal power module RF Power output operation.</p>

3-6. OPERATION.



NOTE *ENSURE THE TRANSMITTER IS COMPLETELY INSTALLED PRIOR TO PERFORMING THE FOLLOWING PROCEDURES.*

NOTE

3-7. TURN-ON.

- 3-8. Operate the **POWER** switch to **ON**. The flushing fans will begin operation.
- 3-9. Observe the transmitter front-panel indicators. The **RESET**, **INTERLOCK**, and **MODULE STATUS** indicators will display normal operating conditions. If the **RESET** indicator displays a fault condition, depress the **RESET** switch/indicator. If the fault condition is not cleared, operate the **POWER** switch to **OFF** and locate the problem. If the **INTERLOCK** indicator displays a fault condition, operate the **POWER** switch to **OFF** and troubleshoot: 1) the open remote control fail-safe input, 2) an open external interlock, or 3) an unlocked exciter AFC. If the **MODULE STATUS** indicator displays a fault condition, operate the **POWER** switch to **OFF** and troubleshoot the transmitter.
- 3-10. Depress the **ON** switch/indicator to activate the transmitter. The **ON** switch/indicator will illuminate. The **MODULE STATUS** indicator will illuminate green to indicate normal RF power output operation.
- 3-11. Operate the **MULTIMETER** to observe the transmitter forward and reflected power indications by performing the **MULTIMETER OPERATION** procedure in the following text.
- 3-12. Adjust the transmitter output power by performing the **POWER ADJUST** procedure presented in the following text.
- 3-13. If remote control operation is desired, operate the **REMOTE CONTROL ENABLE/DISABLE** switch to **ENABLE**. This will enable both local and remote operation. If remote control operation is to be disabled, operate the **REMOTE CONTROL ENABLE/DISABLE** switch to **DISABLE**.

- 3-14. If the transmitter is equipped with the optional **LOCAL CONTROL ENABLE/DISABLE** switch and the transmitter front-panel controls are to be disabled, operate the switch to **DISABLE**. If the transmitter front-panel controls are to be enabled, operate the **LOCAL CONTROL ENABLE/DISABLE** switch to **ENABLE**.
- 3-15. **TURN-OFF.**
- 3-16. Operate the transmitter to **OFF** by depressing the **OFF** switch/indicator. The **OFF** switch/indicator will illuminate. The transmitter RF output will be disabled. Each RF power amplifier **MODULE STATUS** indicator will illuminate yellow.
- 3-17. Operate the **POWER** switch to **OFF** to remove ac power from the transmitter.
- 3-18. **MULTIMETER OPERATION.**
- 3-19. The **MULTIMETER** is designed to display several transmitter operating parameters. To operate the multimeter, proceed as follows:
- 3-20. For an FM-1C transmitter, operate the **FWD POWER**, **RFL POWER**, **PWR SUPPLY VDC**, **EXHAUST AIR C**, **PA1 FWD POWER**, **PA1 CURRENT**, **PA2 FWD POWER**, or **PA2 CURRENT** switch/indicator as desired to select the parameter to be displayed on the **MULTIMETER**. The parameter will be displayed on the multimeter.
- 3-21. For an FM-500C transmitter, operate the **FWD POWER**, **RFL POWER**, **PWR SUPPLY VDC**, **EXHAUST AIR C**, **PA FWD POWER**, or **PA CURRENT** switch/indicator as desired to select the parameter to be displayed on the **MULTIMETER**. The parameter will be displayed on the multimeter. Depress the **METER OFF** switch/indicator to operate the **MULTIMETER** to off.
- 3-22. **POWER ADJUST.**
- 3-23. The **POWER** ▲ and ▼ switches adjust the transmitter output power. The switches adjust the transmitter power using a two-speed control feature. When a switch is depressed, the switch controls power using a normal control rate. When a switch is depressed and held, the switch controls power using a fast control rate. To adjust the transmitter output power, proceed as follows:
1. Depress the **POWER** ▲ switch to increase the transmitter output power. Depress and hold the **POWER** switch for fast raise power operation. Observe the transmitter output power indications on the **MULTIMETER**.
- OR**
2. Depress the **POWER** ▼ switch to decrease the transmitter output power. Depress and hold the **POWER** switch for fast lower power operation. Observe the transmitter output power indications on the **MULTIMETER**.
- 3-24. **EXCITER OPERATION.**
- 3-25. Refer to the FX-50 instruction manual for a complete description of the FX-50 operating procedures. Perform the procedures to configure the FX-50 for the desired operation.
- 3-26. **FAULT RESET.**
- 3-27. To reset a transmitter fault condition, depress the **RESET** switch/indicator. If the fault condition is remedied, the **RESET** indicator will extinguish.
- 3-28. If the fault condition is not remedied, operate the **POWER** switch to **OFF** and locate the problem.
- 3-29. Once the fault condition is remedied, depress the **RESET** switch/indicator. The indicator will extinguish.

SECTION IV

THEORY OF OPERATION

4-1. INTRODUCTION.

- 4-2. This section presents the theory of operation for the Broadcast Electronics FM-1C/FM-500C transmitters.

4-3. OVERALL OPERATION.

- 4-4. Information on overall FM-1C/FM-500C transmitter operation is presented in Figure 4-1. Refer to Figure 4-1 for information on overall FM-1C/FM-500C transmitter operation.

4-5. POWER SUPPLY/RF CIRCUITRY OPERATION.

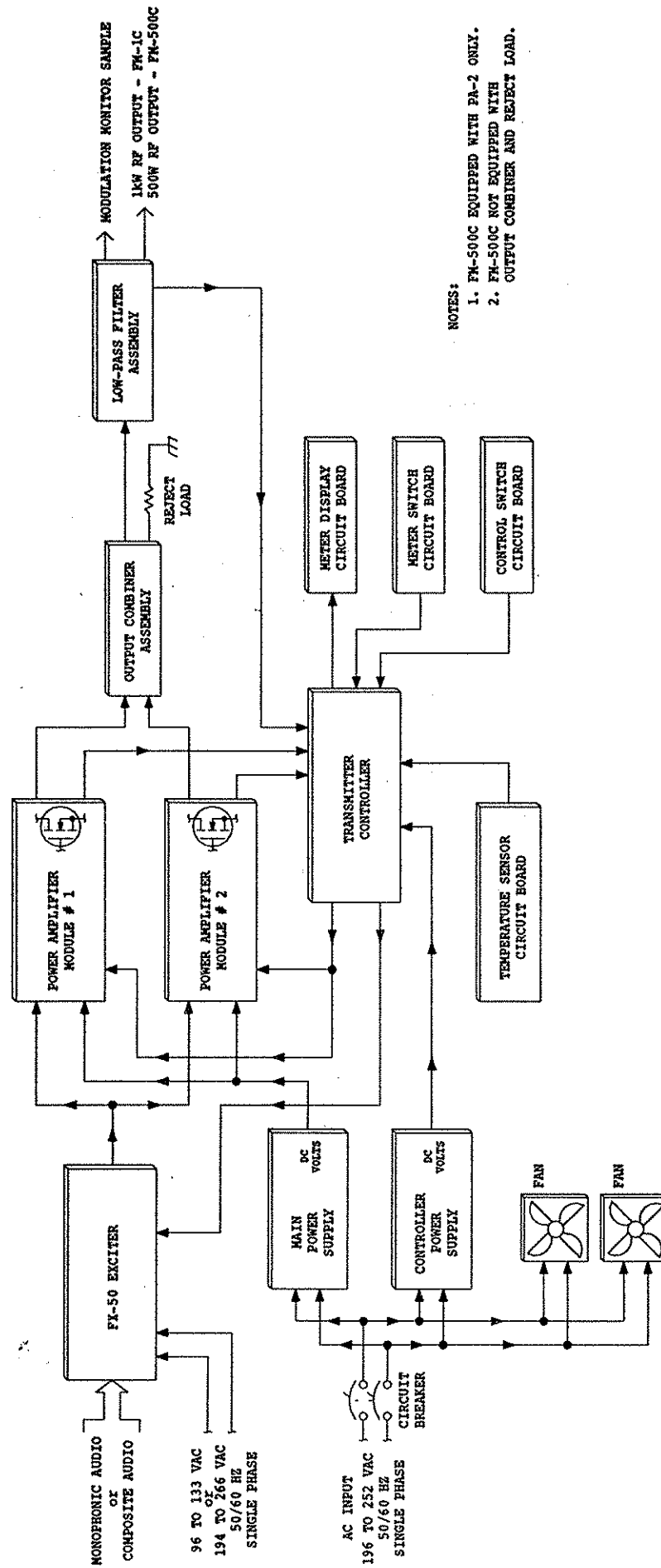
- 4-6. A description of the FM-1C/FM-500C transmitter power supply and RF circuitry is presented in Figure 4-2. Refer to Figure 4-2 for FM-1C/FM-500C power supply/RF circuitry information.

4-7. CONTROLLER CIRCUITRY OPERATION.

- 4-8. A description of the FM-1C/FM-500C transmitter controller circuitry is presented in Figure 4-3. Refer to Figure 4-3 for FM-1C/FM-500C controller circuitry information.

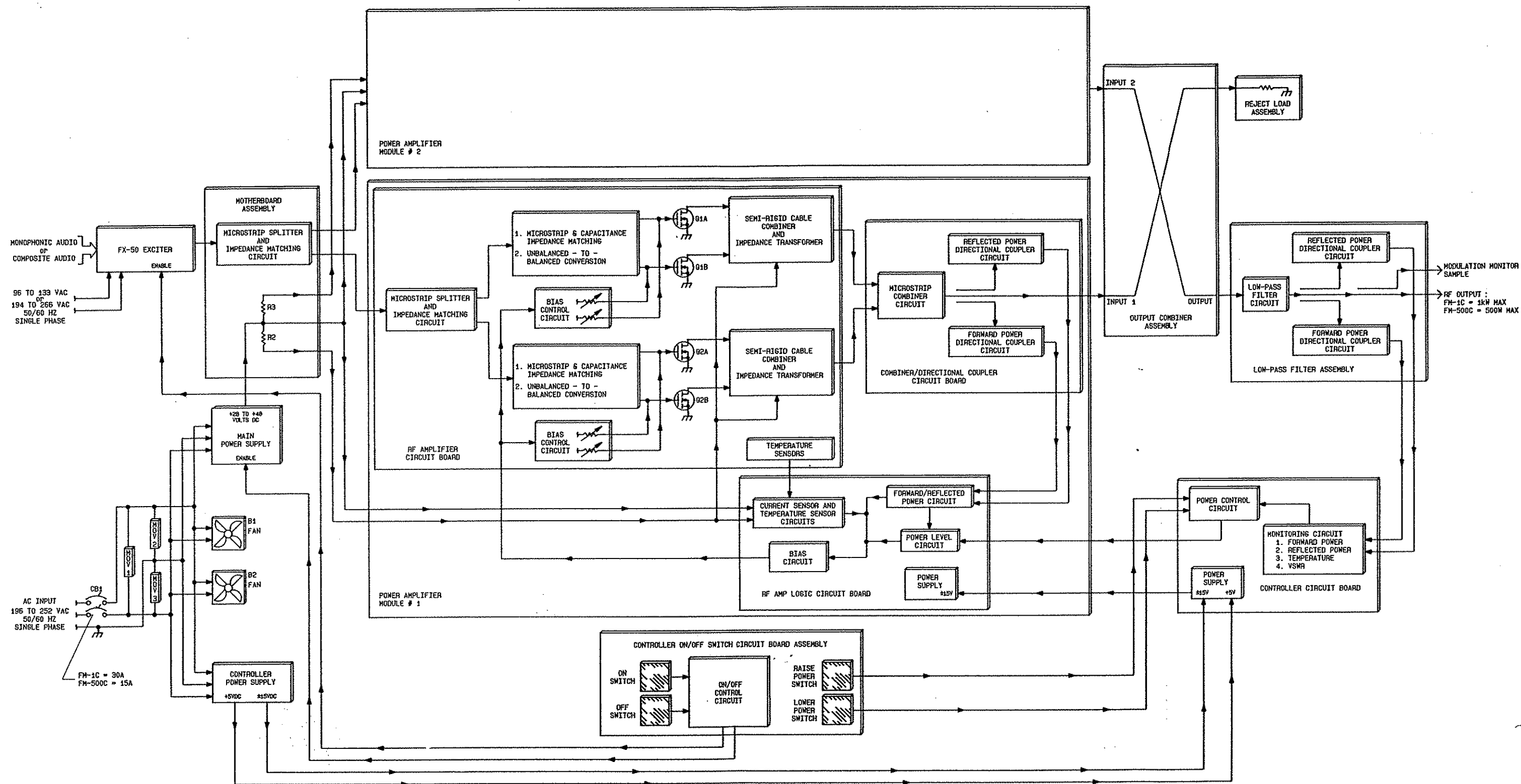
4-9. RF AMPLIFIER CIRCUITRY OPERATION.

- 4-10. A description of the FM-1C/FM-500C transmitter RF amplifier circuitry is presented in Figure 4-4. Refer to Figure 4-4 for FM-1C/FM-500C transmitter RF amplifier circuitry information.



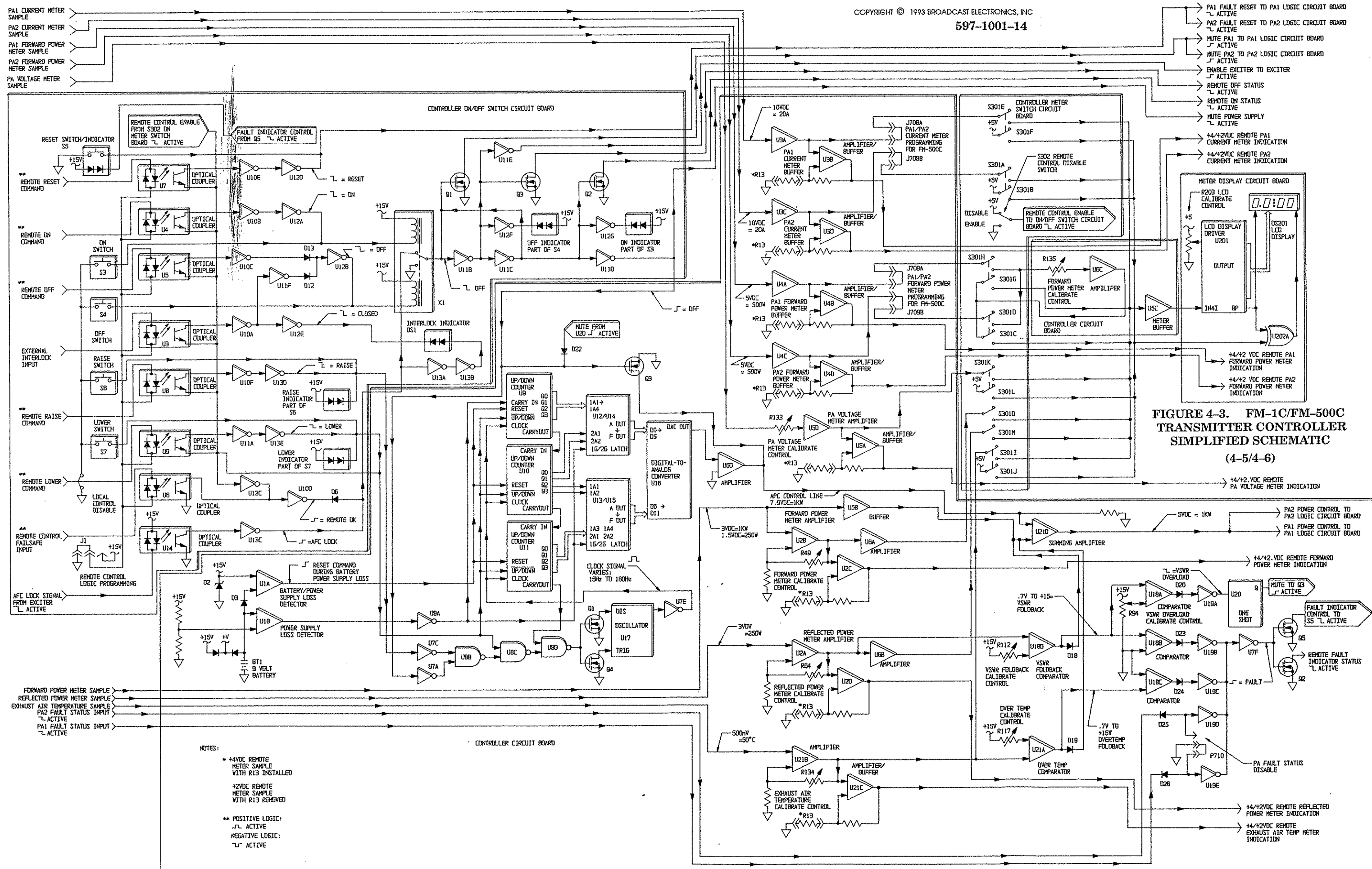
- NOTES:
1. FM-500C EQUIPPED WITH PA-2 ONLY.
 2. FM-500C NOT EQUIPPED WITH OUTPUT COMBINER AND REJECT LOAD.

FIGURE 4-1. FM-1C/FM-500C BLOCK DIAGRAM



NOTES:
1. FM-500C EQUIPPED WITH POWER AMPLIFIER MODULE 2 ONLY.
2. FM-500C NOT EQUIPPED WITH OUTPUT COMBINER AND REJECT LOAD.

FIGURE 4-2. POWER SUPPLY/RF CIRCUIT
SIMPLIFIED SCHEMATIC
(4-3/4-4)



SECTION V MAINTENANCE

5-1. INTRODUCTION.

- 5-2. This section provides maintenance information, electrical adjustment procedures, and troubleshooting information for the Broadcast Electronics FM-1C/FM-500C transmitters.

5-3. SAFETY CONSIDERATIONS.



WARNING *NEVER OPEN THE EQUIPMENT UNLESS ALL TRANSMITTER PRIMARY POWER IS DISCONNECTED. ENSURE ALL TRANSMITTER PRIMARY POWER IS DISCONNECTED BEFORE ATTEMPTING MAINTENANCE ON ANY AREA WITHIN THE TRANSMITTER.*

WARNING

- 5-4. The FM-1C/FM-500C transmitters contain high voltages and currents. If safety precautions are not practiced, contact with the high voltages and currents could cause serious injury or death. The transmitter is equipped with built-in safety features, however good judgement, care, and common sense must be practiced to prevent accidents. The maintenance procedures contained in this section should be performed only by trained and experienced maintenance personnel.

- 5-5. It is dangerous to measure voltages inside the cabinet or replace components with power energized. Therefore, do not measure voltages inside the cabinet or replace components with power energized. Always operate the transmitter POWER circuit breaker to OFF prior to performing any maintenance within the transmitter. Measurements with the power energized can be performed in the controller enclosure if required.

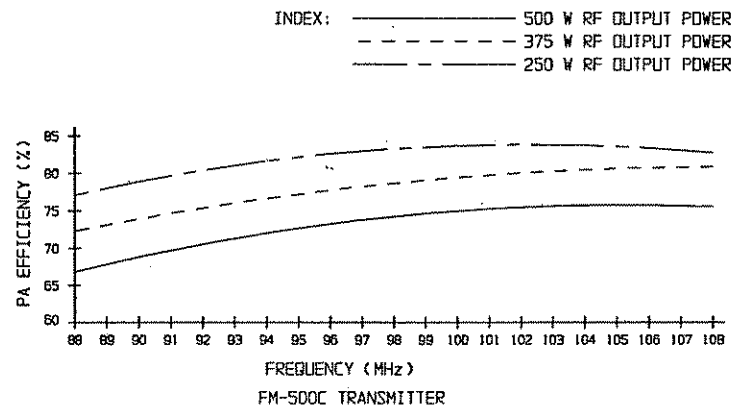
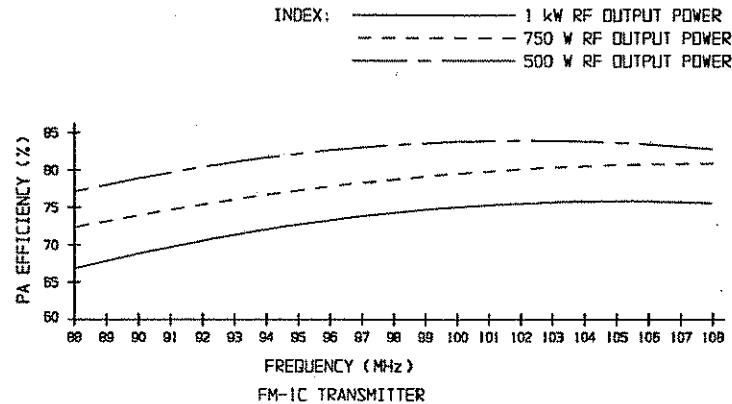
5-6. POWER AMPLIFIER EFFICIENCY.

- 5-7. The FM-1C/FM-500C power amplifier stage consists of solid-state power amplifier devices. Figure 5-1 presents typical FM-1C/FM-500C PA stage efficiency. The PA stage efficiency will vary slightly from the values presented in Figure 5-1 due to component tolerances. Refer to Figure 5-1 as required for typical PA stage efficiency values.

5-8. FIRST LEVEL MAINTENANCE.

- 5-9. First level maintenance consists of procedures applied to the equipment to prevent future failures. The procedures are performed on a regular basis and the results recorded in a maintenance log. Preventive maintenance of the transmitter consists of good housekeeping and checking performance levels using the meters and various indicators built into the equipment.

5-10. ROUTINE MAINTENANCE.



COPYRIGHT © 1993 BROADCAST ELECTRONICS, INC

597-1001-21

FIGURE 5-1. FM-1C/FM-500C TYPICAL PA EFFICIENCY



WARNING

WARNING

NEVER OPEN THE EQUIPMENT UNLESS ALL TRANSMITTER PRIMARY POWER IS DISCONNECTED. ENSURE ALL TRANSMITTER PRIMARY POWER IS DISCONNECTED BEFORE ATTEMPTING MAINTENANCE ON ANY AREA WITHIN THE TRANSMITTER.

- 5-11. **INSPECTION AND CLEANING.** On a regular basis, clean the equipment of accumulated dust using a brush and vacuum cleaner. Inspect the RF amplifier modules and the power supplies for damage caused by component overheating. Overheated components are identified by circuit board discoloration near the component leads. Inspect the circuit boards for loose hardware as required.
- 5-12. **CONTROLLER BATTERY.** Periodically, the battery on the controller circuit board should be checked. If the battery is defective, a good-quality Alkaline battery is recommended for replacement. Typically, it is recommended the controller battery be replaced annually.
- 5-13. **AIR FILTERS.** The FM-1C/FM-500C transmitters are equipped with two air filters. One filter is a disposable type filter located in a housing under the power amplifier modules. The second filter is a screen type filter located on the transmitter rear-panel. The disposable filter can be replaced and the screen filter cleaned without interrupting transmitter operation.

- 5-14. **Disposable Filter.** The disposable filter should be checked approximately once a week with replacement performed on an as-required basis. Never reverse a dirty air filter. Always replace the filter. A dirty filter results in restricted air flow and increased operating temperatures for the transmitter solid-state components.
- 5-15. The transmitter uses disposable type air filters 1 in. X 10 in. X 20 in. (2.54 cm X 25.4 cm X 50.8 cm). Additional filters may be ordered from Broadcast Electronics (BE P/N 407-0162) or purchased locally. Install the blue side of the filter pointing towards the flushing fans. If a filter from a different manufacturer is purchased, install the filter air flow indicator pointing towards the flushing fans. Air filter replacement is accomplished by: 1) sliding the filter out of the housing and 2) inserting the new air filter into the panel with the airflow arrow pointing towards the flushing fans.
- 5-16. **Screen Filter.** The screen filter is designed to be removed and cleaned using a brush and vacuum. Check the filter approximately once a week. Remove dirt from the filter on an as-required basis by: 1) removing the filter from the chassis and 2) cleaning the filter using a brush and vacuum.
- 5-17. **FLUSHING FANS.** Inspect the transmitter flushing fans for dust accumulation and periodically clean the fans using a brush and vacuum cleaner. The fans are cooled by air passing around each motor. If dust is allowed to accumulate on the motors, the ambient air temperature will increase due to restricted air flow. When the ambient air temperature increases, the fan motor bearing lubricant will gradually vaporize and bearing failure will occur.
- 5-18. It is recommended the flushing fan mounting hardware be periodically checked. The flushing fans are equipped with sealed bearings which do not permit lubrication. If a bearing fails, the motor must be replaced.
- 5-19. **SECOND LEVEL MAINTENANCE.**
- 5-20. Second level maintenance consists of procedures required to adjust the transmitter circuitry or restore the transmitter to operation after a fault has occurred. The procedures consists of electrical adjustments, troubleshooting, and component replacement procedures.



WARNING

WARNING

NEVER OPEN THE EQUIPMENT UNLESS ALL TRANSMITTER PRIMARY POWER IS DISCONNECTED. ENSURE ALL TRANSMITTER PRIMARY POWER IS DISCONNECTED BEFORE ATTEMPTING MAINTENANCE ON ANY AREA WITHIN THE TRANSMITTER.

- 5-21. The maintenance philosophy for the FM-1C/FM-500C transmitters consists of isolating a problem to a specific area. Once the specific area is located, subsequent troubleshooting using the information in the following text will assist in problem isolation to a replaceable assembly or component. If required, the replaceable assembly may be: 1) returned to the factory for repair or exchange or 2) repaired locally.
- 5-22. **CONTROLLER FRONT PANEL REMOVAL.**
- 5-23. Several transmitter maintenance and electrical adjustment procedures require the transmitter controller front panel to be removed. Refer to TRANSMITTER CONTROLLER FRONT PANEL REMOVAL in SECTION II, INSTALLATION and perform the procedure to remove the transmitter controller front panel as required.

5-24. **ELECTRICAL ADJUSTMENTS.**



WARNING **NEVER OPEN THE EQUIPMENT UNLESS ALL TRANSMITTER PRIMARY POWER IS DISCONNECTED. ENSURE ALL TRANSMITTER PRIMARY POWER IS DISCONNECTED BEFORE ATTEMPTING MAINTENANCE ON ANY AREA WITHIN THE TRANSMITTER.**

WARNING

5-25. **MULTIMETER DISPLAY CALIBRATION.** Potentiometer R203 on the controller meter display circuit board calibrates the multimeter display. The following text presents the procedure to calibrate the multimeter display.

5-26. **Required Equipment.** The following equipment is required to adjust the multimeter display calibration control.

1. Insulated adjustment tool.
2. Digital voltmeter (Fluke 77 or equivalent).

5-27. **Procedure.** To calibrate the multimeter display, proceed as follows:

5-28. Depress the transmitter OFF switch/indicator to illuminate the switch/indicator.

5-29. Refer to TRANSMITTER CONTROLLER FRONT PANEL REMOVAL in SECTION II, INSTALLATION and perform the procedure to remove the transmitter controller front panel.

5-30. Connect the digital voltmeter between TP205 on the controller meter display circuit board and TP204 ground.

5-31. Refer to Figure 5-2 and adjust multimeter display calibration control R203 on the meter display circuit board for a 3.0 volt dc indication on the voltmeter.

5-32. Remove the test equipment and replace the controller front panel.

5-33. **REFLECTED POWER METER CALIBRATION.** Potentiometer R64 on the controller circuit board calibrates the reflected power meter display. The following text presents the procedure to adjust the reflected power meter calibrate control.

5-34. **Required Equipment.** The following equipment is required to adjust the reflected power meter calibration control.

1. Insulated adjustment tool.
2. Test load and cable (50 Ohm Non-Inductive, Type N connector, 50 W minimum).

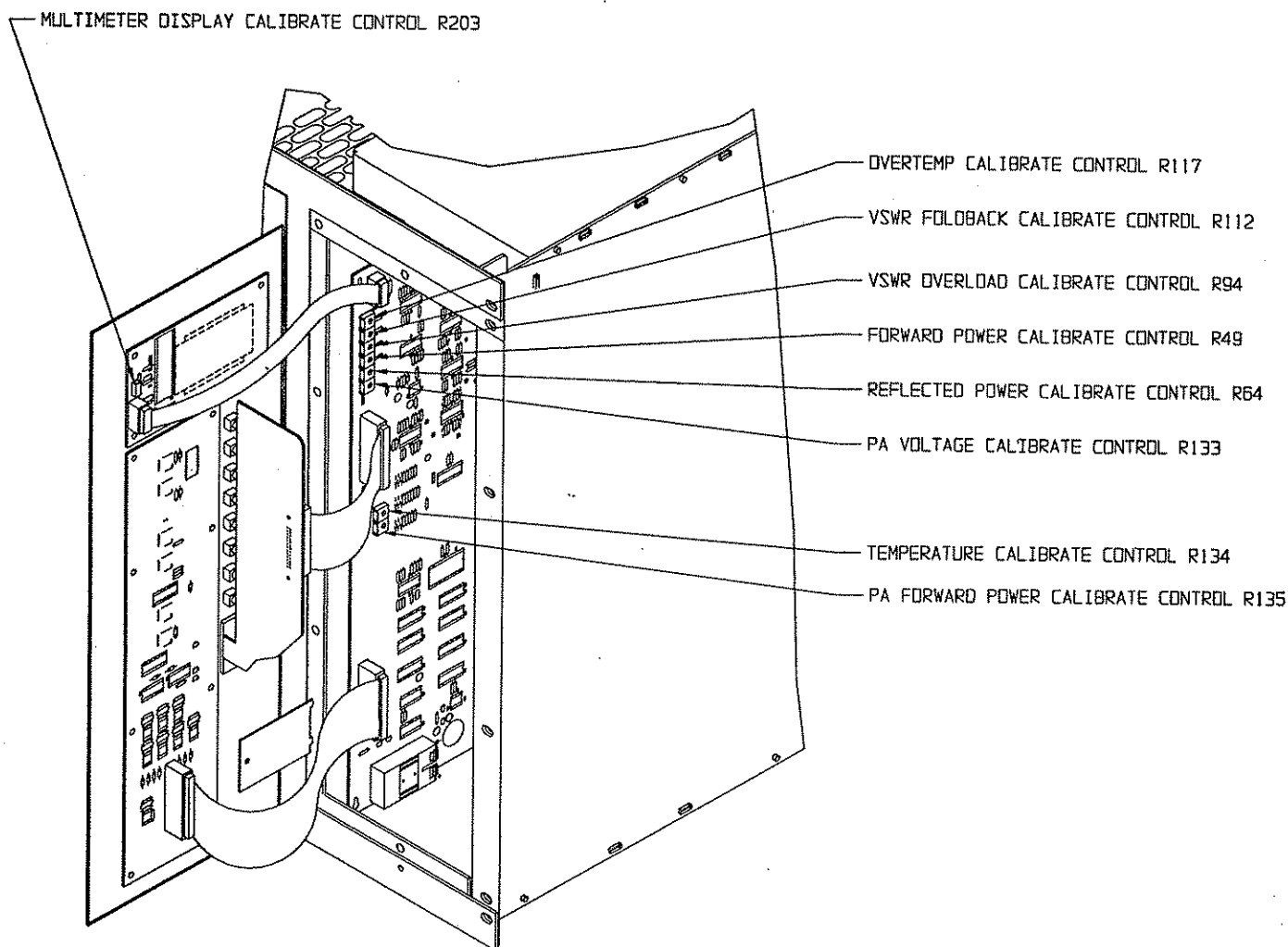
5-35. **Procedure.** To adjust the reflected power meter calibration control, proceed as follows:

5-36. The transmitter MULTIMETER must be calibrated prior to adjusting the reflected power meter calibrate control. Refer to MULTIMETER DISPLAY CALIBRATION in the preceding text and perform the procedure to calibrate the display.

5-37. Depress the transmitter OFF switch/indicator to illuminate the switch/indicator.

5-38. Refer to TRANSMITTER CONTROLLER FRONT PANEL REMOVAL in SECTION II, INSTALLATION and perform the procedure to remove the transmitter controller front panel.

5-39. Disconnect: 1) cable 45 from the low-pass filter input on FM-500C models or 2) cable 43 from the low-pass filter input on FM-1C models.



COPYRIGHT © 1993 BROADCAST ELECTRONICS, INC

597-1001-17

FIGURE 5-2. CONTROLLER AND METER DISPLAY CIRCUIT BOARD CONTROLS

- 5-40. Connect a test cable between the test load and the low-pass filter input.
- 5-41. Disconnect cable 40 from the exciter RF output.
- 5-42. Disconnect the transmitter RF output cable.
- 5-43. Connect a test cable from the exciter RF output to the transmitter output connector.
- 5-44. Remove the exciter top cover and operate the MUTE switch to NEG.
- 5-45. Depress the transmitter MULTIMETER RFL POWER switch/indicator.
- 5-46. Operate the exciter to on and adjust the exciter POWER SET control if required for a: 1) 40 watt forward power indication on the exciter multimeter for an FM-1C or 2) 20 watt forward power indication on the exciter multimeter for an FM-500C.

- 5-47. Refer to Figure 5-2 and adjust reflected power meter calibrate control R64 on the controller circuit board for the following indication on the transmitter multimeter: 1) FM-1C = 40 watts and 2) FM-500C = 20 watts.
- 5-48. Remove the test equipment, replace the controller front panel, operate the exciter MUTE switch to POS, and reconnect the exciter and transmitter cables.
- 5-49. **VSWR FOLDBACK ADJUSTMENT.** Potentiometer R112 on the controller circuit board determines the VSWR level for foldback operations. The following text presents the procedure to adjust the VSWR foldback control.
- 5-50. **Required Equipment.** The following equipment is required to adjust the VSWR foldback control.
1. Insulated adjustment tool.
 2. Test load and cable (50 Ohm Non-Inductive, Type N connector, 50 W minimum).
- 5-51. **Procedure.** To adjust the VSWR foldback control, proceed as follows:
- 5-52. Depress the transmitter OFF switch/indicator to illuminate the switch/indicator.
- 5-53. Refer to TRANSMITTER CONTROLLER FRONT PANEL REMOVAL in SECTION II, INSTALLATION and perform the procedure to remove the transmitter controller front panel.
- 5-54. Disconnect: 1) cable 45 from the low-pass filter input on FM-500C models or 2) cable 43 from the low-pass filter input on FM-1C models.
- 5-55. Connect a test cable between the test load and the low-pass filter input.
- 5-56. Disconnect cable 40 from the exciter RF output.
- 5-57. Disconnect the transmitter RF output cable.
- 5-58. Connect a test cable from the exciter RF output to the transmitter output connector.
- 5-59. Remove the exciter top cover and operate the MUTE switch to NEG.
- 5-60. Operate the exciter to on and adjust the exciter POWER SET control if required for a: 1) 20 watt forward power indication on the exciter multimeter for an FM-1C or 2) 10 watt forward power indication on the exciter multimeter for an FM-500C.
- 5-61. Refer to Figure 5-2 and adjust VSWR foldback control R112 on the controller circuit board until the RESET indicator just illuminates.
- 5-62. Remove the test equipment, replace the controller front panel, re-adjust the exciter output power to 40 watts for an FM-1C or 20 watts for an FM-500C, operate the exciter MUTE switch to POS, and reconnect the exciter and transmitter cables.
- 5-63. **OVER-TEMPERATURE CALIBRATION.** Potentiometer R117 on the controller circuit board calibrates the over-temperature detector circuitry. The following text presents the procedure to calibrate the over-temperature detector circuitry.
- 5-64. **Required Equipment.** The following equipment is required to adjust the over-temperature calibration control.
1. Insulated adjustment tool.
 2. Soldering iron or heat gun.

- 5-65. **Procedure.** To adjust the over-temperature calibration control, proceed as follows:
- 5-66. The transmitter MULTIMETER must be calibrated prior to adjusting the over temperature calibration circuitry. Refer to MULTIMETER DISPLAY CALIBRATION in the preceding text and perform the procedure to calibrate the display.
- 5-67. Depress the transmitter OFF switch/indicator to illuminate the switch/indicator.
- 5-68. Refer to TRANSMITTER CONTROLLER FRONT PANEL REMOVAL in SECTION II, INSTALLATION and perform the procedure to remove the transmitter controller front panel.
- 5-69. Energize the transmitter primary ac power and operate the transmitter at the desired output power level.
- 5-70. Depress the transmitter MULTIMETER EXHAUST AIR C switch/indicator.
- 5-71. Locate the temperature sensor circuit board and place the heat source (soldering iron or heat gun) near the transistor temperature sensor. Hold the heat source near the temperature sensor circuit board to obtain a 48 degree exhaust air temperature indication on the transmitter multimeter.
- 5-72. Refer to Figure 5-2 and adjust over-temperature calibrate control R117 on the controller circuit board until the RESET indicator just illuminates.
- 5-73. Depress the transmitter OFF switch/indicator to illuminate the switch/indicator.
- 5-74. Remove the test equipment and replace the controller front panel.
- 5-75. **FORWARD POWER CALIBRATION.** Potentiometer R49 on the controller circuit board calibrates the forward power detector circuitry. The following text presents the procedure to calibrate the forward power detector circuitry.
- 5-76. **Required Equipment.** The following equipment is required to adjust the forward power calibration control.
1. Insulated adjustment tool.
 2. Calibrated in-line wattmeter with 1 kW element (Bird 43 or equivalent).
 3. Test load and cable (50 Ohm Non-Inductive, Type N connector, 1.5 kW minimum).
- 5-77. **Procedure.** To adjust the forward power calibration control, proceed as follows:



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

WARNING

- 5-78. Disconnect all transmitter primary power before proceeding.
- 5-79. The transmitter MULTIMETER must be calibrated prior to adjusting the forward power detector circuitry. Refer to MULTIMETER DISPLAY CALIBRATION in the preceding text and perform the procedure to calibrate the display.
- 5-80. Refer to TRANSMITTER CONTROLLER FRONT PANEL REMOVAL in SECTION II, INSTALLATION and perform the procedure to remove the transmitter controller front panel.
- 5-81. Connect the test load and wattmeter to the transmitter output.

- 5-82. Energize the transmitter primary ac power and operate the transmitter at the desired output power level as indicated by the in-line wattmeter.
- 5-83. Depress the transmitter MULTIMETER FWD POWER switch/indicator.
- 5-84. Refer to Figure 5-2 and adjust FORWARD POWER CAL control R49 on the controller circuit board until the transmitter MULTIMETER display is equal to the value presented on the in-line wattmeter.



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

- 5-85. Disconnect all transmitter primary power.
- 5-86. Remove the test equipment replace the controller front panel, and reconnect the transmitter output to the antenna.
- 5-87. **PAV CALIBRATION.** Potentiometer R133 on the controller circuit board calibrates the PA voltage detector circuitry. The following text presents the procedure to calibrate the PA voltage detector circuitry.
- 5-88. **Required Equipment.** The following equipment is required to adjust the PA voltage calibration control.
 - 1. Insulated adjustment tool.
 - 2. Digital voltmeter (Fluke 77 or equivalent).

- 5-89. **Procedure.** To adjust the PA voltage calibration control, proceed as follows:



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

- 5-90. Disconnect all transmitter primary power before proceeding.
- 5-91. The transmitter MULTIMETER must be calibrated prior to adjusting the PA voltage detector circuitry. Refer to MULTIMETER DISPLAY CALIBRATION in the preceding text and perform the procedure to calibrate the display.
- 5-92. Refer to TRANSMITTER CONTROLLER FRONT PANEL REMOVAL in SECTION II, INSTALLATION and perform the procedure to remove the transmitter controller front panel.
- 5-93. Remove an RF power module and connect the voltmeter between J603-A2 on the motherboard assembly and ground.
- 5-94. Energize the transmitter primary ac power.
- 5-95. Depress the transmitter MULTIMETER PWR SUPPLY VDC switch/indicator.
- 5-96. Refer to Figure 5-2 and adjust PAV CAL control R133 on the controller circuit board until the transmitter MULTIMETER display is equal to the value presented on the digital voltmeter.



WARNING

***DISCONNECT ALL TRANSMITTER PRIMARY POWER
BEFORE PROCEEDING.***

WARNING

- 5-97. Disconnect all transmitter primary power.
- 5-98. Remove the test equipment, replace the controller front panel, and replace the RF power module.
- 5-99. **TEMPERATURE CALIBRATION.** Potentiometer R134 on the controller circuit board calibrates the temperature detector circuitry. The following text presents the procedure to calibrate the temperature detector circuitry.
- 5-100. **Required Equipment.** The following equipment is required to adjust the temperature calibration control.
 - 1. Insulated adjustment tool.
 - 2. Digital voltmeter (Fluke 77 or equivalent).
 - 3. Fluke 80T-150 temperature probe or equivalent Celsius indicating temperature probe.
- 5-101. **Procedure.** To adjust the temperature calibration control, proceed as follows:



WARNING

***DISCONNECT ALL TRANSMITTER PRIMARY POWER
BEFORE PROCEEDING.***

WARNING

- 5-102. Disconnect all transmitter primary power before proceeding.
- 5-103. The transmitter MULTIMETER must be calibrated prior to adjusting the temperature detector circuitry. Refer to MULTIMETER DISPLAY CALIBRATION in the preceding text and perform the procedure to calibrate the display.
- 5-104. Refer to TRANSMITTER CONTROLLER FRONT PANEL REMOVAL in SECTION II, INSTALLATION and perform the procedure to remove the transmitter controller front panel.
- 5-105. Energize the transmitter primary ac power.
- 5-106. Locate the temperature sensor circuit board and place the temperature probe near the transistor temperature sensor.
- 5-107. Depress the transmitter MULTIMETER EXHAUST AIR C switch/indicator.
- 5-108. Refer to Figure 5-2 and adjust TEMP CAL control R134 on the controller circuit board until the transmitter MULTIMETER display is equal to the value presented on the digital voltmeter.



WARNING

***DISCONNECT ALL TRANSMITTER PRIMARY POWER
BEFORE PROCEEDING.***

WARNING

- 5-109. Disconnect all transmitter primary power.
- 5-110. Remove the test equipment and replace the controller front panel.

- 5-111. **PA FORWARD POWER CALIBRATION.** Potentiometer R135 on the controller circuit board calibrates the PA forward power detector circuitry. The following text presents the procedure to calibrate the PA forward power detector circuitry.
- 5-112. **Required Equipment.** The following equipment is required to adjust the PA forward power calibration control.
1. Insulated adjustment tool.
 2. Digital voltmeter (Fluke 77 or equivalent).
- 5-113. **Procedure.** To adjust the PA forward power calibration control, proceed as follows:
- 5-114. The transmitter MULTIMETER must be calibrated prior to adjusting the PA forward power detector circuitry. Refer to MULTIMETER DISPLAY CALIBRATION in the preceding text and perform the procedure to calibrate the display.
- 5-115. Refer to TRANSMITTER CONTROLLER FRONT PANEL REMOVAL in SECTION II, INSTALLATION and perform the procedure to remove the transmitter controller front panel.
- 5-116. Depress the transmitter OFF switch/indicator to illuminate the switch/indicator.
- 5-117. Connect the digital voltmeter between TP8 on the controller circuit board and ground.
- 5-118. Energize the transmitter primary ac power and operate the transmitter.
- 5-119. Depress the transmitter RAISE switch/indicator to obtain a +5.0 volt dc indication on the digital voltmeter.
- 5-120. Depress the transmitter MULTIMETER PA1 FWD POWER switch/indicator.
- 5-121. Refer to Figure 5-2 and adjust PA FWD CAL control R135 on the controller circuit board until the transmitter MULTIMETER display equals 500 watts.
- 5-122. Depress the transmitter OFF switch/indicator to illuminate the switch/indicator.
- 5-123. Remove the test equipment and replace the controller front panel.
- 5-124. **VSWR OVERLOAD.** The VSWR overload level is established by potentiometer R94 on the controller circuit board. Potentiometer 94 is adjusted by operating the control fully clockwise. Refer to Figure 5-2 and adjust VSWR overload control R94 on the controller circuit board fully clockwise.
- 5-125. **RF POWER AMPLIFIER ADJUSTMENTS.** The RF power amplifier circuit board and the power amplifier logic circuit board contain calibration controls. The power amplifier circuit board is equipped with bias level controls R9, R12, R22, and R25. The RF amplifier logic circuit board contains current offset control R11, current limit control R5, forward power calibration control R51, forward power limit control R15, and reflected power limit control R25. Due to the critical nature and specialized test equipment required to adjust the controls, the controls are not considered field adjustable. If the controls are to be adjusted, contact the Broadcast Electronics Customer Service Department.
- 5-126. **LOW-PASS FILTER.** The low-pass filter is equipped with a reflected power null control. Due to the critical nature and specialized test equipment required to adjust the control, the control is not considered field adjustable. If the control is to be adjusted, contact the Broadcast Electronics Customer Service Department.



CAUTION
CAUTION

ENSURE THE POWER SUPPLY VOLTAGE IS PROPERLY ADJUSTED IN THE FOLLOWING PROCEDURE. THIS ALLOWS THE TRANSMITTER TO OPERATE AT OPTIMUM EFFICIENCY AND PREVENTS THE AMPLIFIER DEVICES FROM OVER-DISSIPATION.

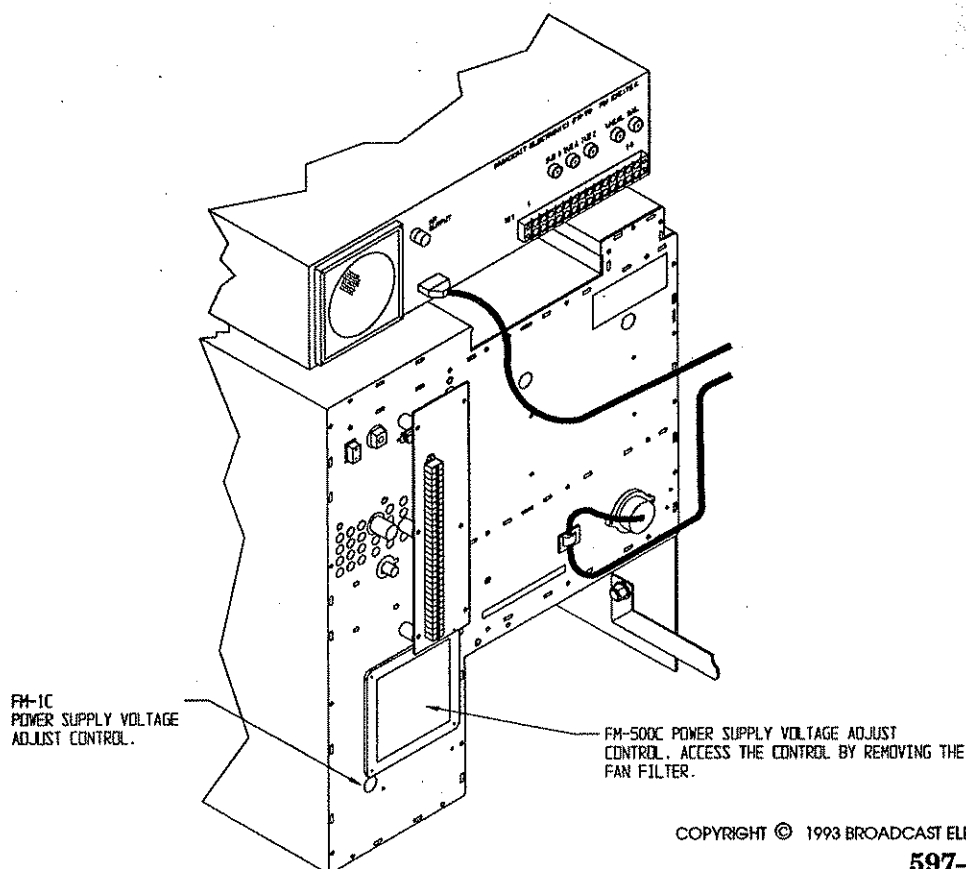
- 5-127. **TRANSMITTER FREQUENCY RE-PROGRAMMING.** The FM-1C/FM-500C transmitters are configured for a specific frequency when shipped from the factory. However, the transmitters can be re-programmed for a different frequency in the field if required. The following text presents the procedure to change an FM-1C/FM-500C the transmitter operating frequency.
- 5-128. **Required Equipment.** The following equipment is required to re-program the transmitter operating frequency.
1. Calibrated in-line wattmeter with 1 kW element (Bird 43 or equivalent).
 2. Test load and cable (50 Ohm Non-Inductive, Type N connector, 1.5 kW minimum).
- 5-129. **Procedure.** To re-program the transmitter operating frequency, proceed as follows:



WARNING
WARNING

DISCONNECT ALL TRANSMITTER PRIMARY POWER BEFORE PROCEEDING.

- 5-130. Disconnect all transmitter primary power before proceeding.
- 5-131. Connect the test load and wattmeter to the transmitter output.
- 5-132. Refer to SECTION 4, AFC/PLL ASSEMBLY in FX-50 exciter publication 597-1050 and perform the FREQUENCY SELECTION procedure.
- 5-133. Energize the transmitter primary ac power and operate the transmitter at the desired output power level as indicated by the in-line wattmeter.
- 5-134. Depress the transmitter MULTIMETER FWD POWER switch/indicator.
- 5-135. Refer to Figure 5-2 and adjust FORWARD POWER CAL control R49 on the controller circuit board until the transmitter MULTIMETER display is equal to the value presented on the in-line wattmeter.
- 5-136. Operate the transmitter RAISE and LOWER switch/indicators until the transmitter MULTIMETER indicates a level 80 to 90 watts greater than the desired output power level.
- 5-137. Refer to Figure 5-3 and adjust the power supply voltage control until both MODULE STATUS indicators illuminate yellow.
- 5-138. Operate the transmitter LOWER switch/indicator until the transmitter MULTIMETER indicates the desired output power level.



COPYRIGHT © 1993 BROADCAST ELECTRONICS, INC

597-1001-18

FIGURE 5-3. POWER SUPPLY VOLTAGE ADJUST LOCATIONS



WARNING

DISCONNECT ALL TRANSMITTER PRIMARY POWER BEFORE PROCEEDING.

WARNING

5-139. Disconnect all transmitter primary power.

5-140. Remove the test equipment, replace the controller front panel, and reconnect the transmitter output to the antenna.



CAUTION

CAUTION

ENSURE THE POWER SUPPLY VOLTAGE IS PROPERLY ADJUSTED IN THE FOLLOWING PROCEDURE. THIS ALLOWS THE TRANSMITTER TO OPERATE AT OPTIMUM EFFICIENCY AND PREVENTS THE AMPLIFIER DEVICES FROM OVER-DISSIPATION.

5-141. **TRANSMITTER POWER LEVEL CHANGE.** The FM-1C/FM-500C transmitters are programmed, operated, and tested at a specific power level when shipped from the factory. If at a future date the transmitter is to be operated at a power level other than the original factory programmed level, perform the following procedure to adjust the transmitter for the optimum efficiency.

5-142. **Required Equipment.** The following equipment is required to change the output power level.

1. Calibrated in-line wattmeter with 1 kW element (Bird 43 or equivalent).
2. Test load and cable (50 Ohm Non-Inductive, Type N connector, 1.5 kW minimum).

5-143. **Procedure.** To change the transmitter output power level, proceed as follows:



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

WARNING

5-144. Disconnect all transmitter primary power before proceeding.

5-145. Connect the test load and wattmeter to the transmitter output.

5-146. Energize the transmitter primary ac power and operate the transmitter at the desired output power level as indicated by the in-line wattmeter.

5-147. Depress the transmitter MULTIMETER FWD POWER switch/indicator.

5-148. Refer to Figure 5-2 and adjust FORWARD POWER CAL control R49 on the controller circuit board until the transmitter MULTIMETER display is equal to the value presented on the in-line wattmeter.

5-149. Operate the transmitter RAISE and LOWER switch/indicators until the transmitter MULTIMETER indicates a level 80 to 90 watts greater than the desired output power level.

5-150. Refer to Figure 5-3 and adjust the power supply voltage control until both MODULE STATUS indicators illuminate yellow.

5-151. Operate the transmitter LOWER switch/indicator until the transmitter MULTIMETER indicates the desired output power level.



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

WARNING

5-152. Disconnect all transmitter primary power.

5-153. Remove the test equipment, replace the controller front panel, and reconnect the transmitter output to the antenna.

5-154. **TROUBLESHOOTING.**



CAUTION **REMOVING OR INSTALLING A POWER MODULE WITH THE TRANSMITTER ENERGIZED MAY RESULT IN DAMAGE TO THE MODULE. DO NOT REMOVE/INSERT A POWER MODULE WITH THE TRANSMITTER ENERGIZED.**

CAUTION

5-155. **POWER SUPPLY MODULES.** The FM-1C/FM-500C transmitters are equipped with two modular switching power supply modules. One module provides dc potentials for the controller circuitry. A second power supply module provides dc potentials for the PA circuitry. Each power supply module is equipped with an ac line fuse. The following text presents the procedures to remove the power supply modules.

- 5-156. Once a module is removed, check the power supply fuse. If the power supply fuse has not blown, contact the Broadcast Electronics Customer Service Department. Due to the hazardous procedures and the proprietary information required to troubleshoot a power supply module, additional troubleshooting operations are limited to visual inspections and resistance checks using a voltmeter.

- 5-157. **Controller Power Supply Removal.** To remove the controller power supply module, proceed as follows:



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

WARNING

- 5-158. Disconnect all transmitter primary power.
- 5-159. Remove all the Phillips-Head screws securing the transmitter rear-panel to the side panels.
- 5-160. Remove the transmitter rear panel.
- 5-161. Remove the two Knurled nuts securing fan B2 to the interior panel.
- 5-162. Remove the fan.
- 5-163. Remove the two stand-offs securing the controller power supply module to the side panel.
- 5-164. Disconnect the wiring and remove the controller power supply module.
- 5-165. Once power supply troubleshooting is complete, re-install the supply by reversing the preceding procedure.
- 5-166. **Main Power Supply Removal.** To remove the Main power supply module, proceed as follows:



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

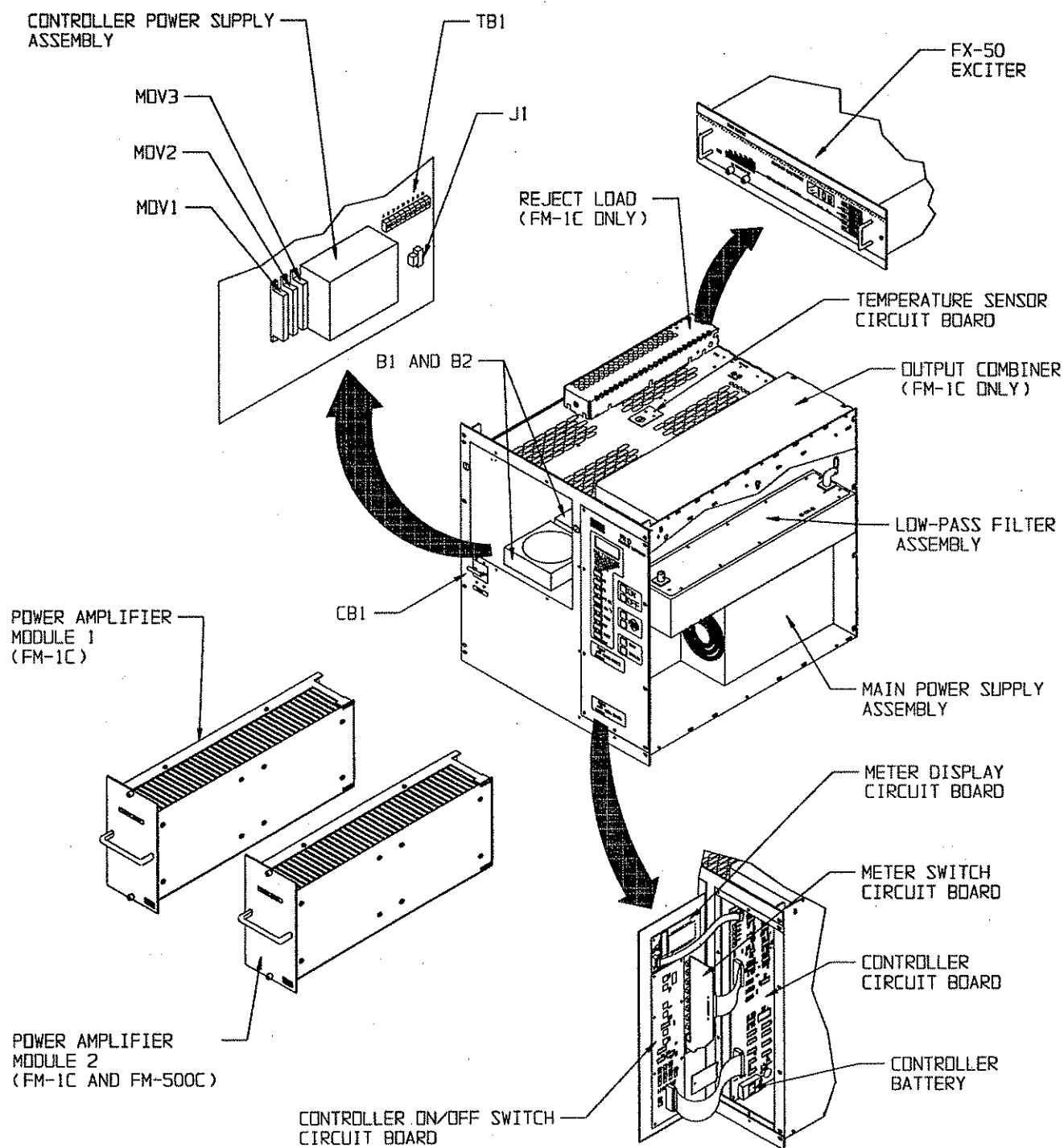
WARNING

- 5-167. Disconnect all transmitter primary power.
- 5-168. Remove all the Phillips-Head screws securing the transmitter rear-panel to the side panels.
- 5-169. Remove the transmitter rear panel.
- 5-170. Remove the two Knurled nuts securing fan B2 to the interior panel.
- 5-171. Remove the fan.
- 5-172. Remove the three Phillips-Head screws securing the Main power supply module to the interior panel.
- 5-173. Disconnect the wiring and remove the Main power supply module.
- 5-174. Once power supply troubleshooting is complete, re-install the supply by reversing the preceding procedure.
- 5-175. **POWER AMPLIFIER MODULE TROUBLESHOOTING/REPAIR.** Each transmitter power amplifier module contains circuitry requiring specialized equipment and test procedures for troubleshooting and repair operations. Therefore, almost all power amplifier module troubleshooting and repair can not be performed in the field. If a power amplifier module is determined to be defective, contact the Broadcast Electronics Customer Service department for: 1) troubleshooting information and 2) information on a power amplifier module exchange program (refer to the following text).

- 5-176. **Power Amplifier Module Exchange Program.** If a power amplifier module is determined to be defective, Broadcast Electronics has established a power amplifier module exchange program. The program allows the customer to: 1) exchange a defective module for a reconditioned module or 2) obtain a module on loan during the repair of the defective module. Terms of the program are available from the Broadcast Electronics Customer Service Department.
- 5-177. **TRANSMITTER TROUBLESHOOTING PROCEDURES.** Table 5-1 presents troubleshooting information for the FM-1C/FM-500C transmitters. Refer to Table 5-1 to isolate the problem to a specific assembly. Once the trouble is isolated, refer to the theory of operation and schematic diagrams to assist in problem resolution.
- 5-178. **TRANSMITTER COMPONENT LOCATIONS.** Figure 5-4 presents the transmitter component locations. Refer to Figure 5-4 as required during the troubleshooting procedures to locate components within the transmitter.

TABLE 5-1. FM-1C/FM-500C TROUBLESHOOTING
(Sheet 1 of 7)

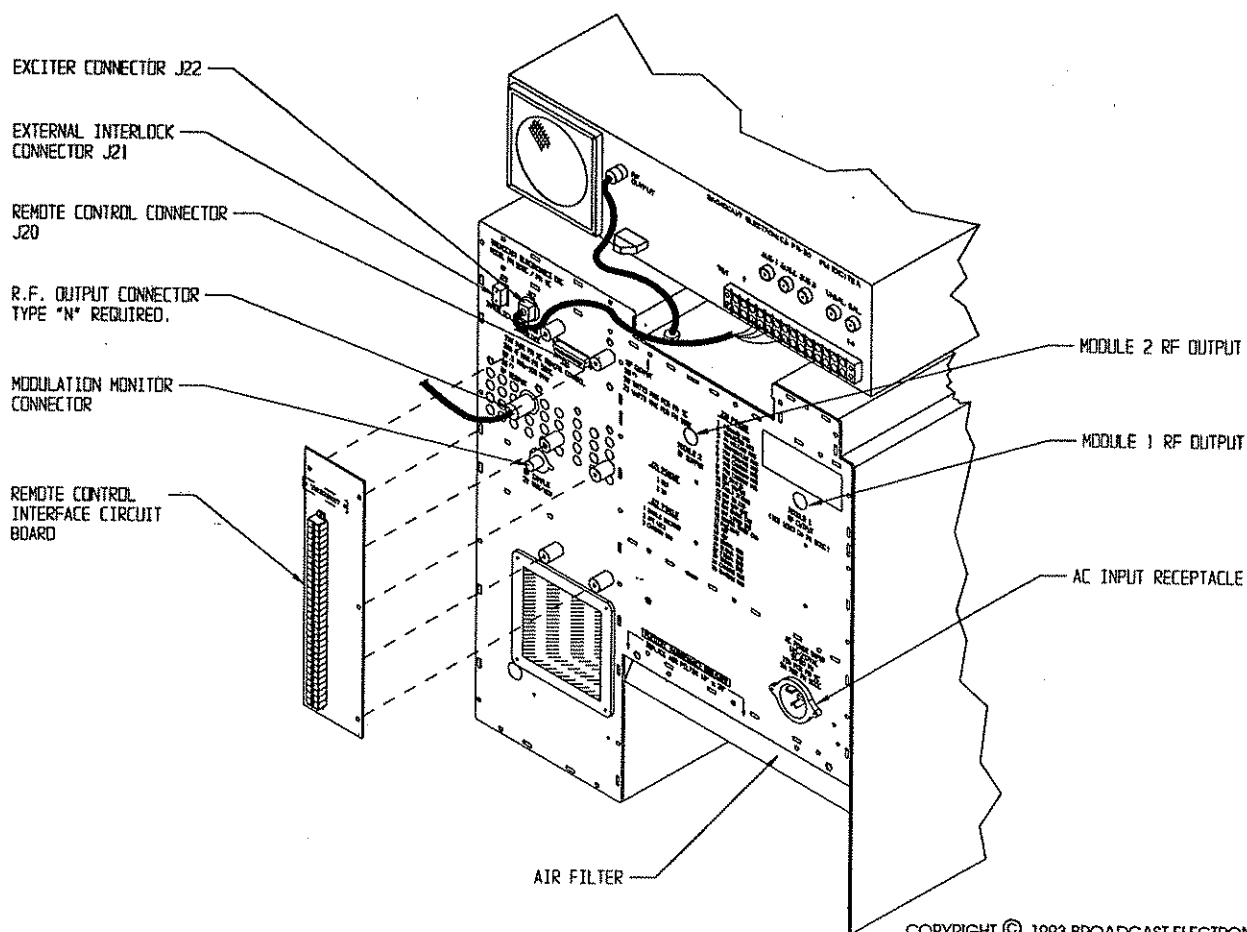
SYMPTOM	CIRCUITRY TO CHECK
NO OUTPUT POWER INTERLOCK INDICATOR EXTINGUISHED MODULE STATUS INDICATORS ILLUMINATE YELLOW EXCITER LOCK INDICATOR EXTINGUISHED	1. Exciter AFC is unlocked. Refer to the FX-50 exciter manual and troubleshoot the exciter.
NO OUTPUT POWER MODULE STATUS INDICATORS ILLUMINATE YELLOW INTERLOCK INDICATOR EXTINGUISHED	1. Operate the remote control switch to disable. A. If the interlock indicator is extinguished, check the external interlock. B. If the interlock indicator illuminates, check the remote control unit.
FM-1C LOW OUTPUT POWER MODULE STATUS INDICATORS ILLUMINATE YELLOW	1. Check the exciter forward power. The forward power must be 40 W. 2. If the exciter forward power is low, refer to the FX-50 exciter manual and troubleshoot the exciter. 3. If the correct exciter forward power is present, depress the PWR SUPPLY VDC switch. The voltage must be equal to the normal operating voltage. 4. If the PA voltage is normal, bypass the low-pass filter and connect the transmitter output to a test load. 1. If the MODULE STATUS indicators remain yellow, defective combiner or both RF amplifier modules. 2. If the MODULE STATUS indicators illuminate green, defective low-pass filter. 5. If the PA voltage is low, increase the PA voltage until the MODULE STATUS indicators illuminate green.



COPYRIGHT © 1993 BROADCAST ELECTRONICS, INC

597-1001-16

FIGURE 5-4. FM-1C/FM-500C COMPONENT LOCATOR (SHEET 1 OF 2)



COPYRIGHT © 1993 BROADCAST ELECTRONICS, INC
597-1001-16A

FIGURE 5-4. FM-1C/FM-500C COMPONENT LOCATOR (SHEET 2 OF 2)

TABLE 5-1. FM-1C/FM-500C TROUBLESHOOTING
(Sheet 2 of 7)

SYMPTOM	CIRCUITRY TO CHECK
FM-500C LOW OUTPUT POWER MODULE STATUS INDICATOR ILLUMINATE YELLOW	<ol style="list-style-type: none"> 1. Check the exciter forward power. The forward power must be 20W. 2. If the exciter forward power is low, refer to the FX-50 exciter manual and troubleshoot the exciter. 3. If the correct exciter forward power is present, depress the PWR SUPPLY VDC switch. The voltage must be equal to the normal operating voltage. 4. If the PA voltage is normal, bypass the low-pass filter and connect the transmitter output to a test load. <ol style="list-style-type: none"> 1. If the MODULE STATUS indicator remains yellow, defective RF amplifier module. 2. If the MODULE STATUS indicator illuminates green, defective low-pass filter.

TABLE 5-1. FM-1C/FM-500C TROUBLESHOOTING
(Sheet 3 of 7)

SYMPTOM	CIRCUITRY TO CHECK
<p>MODULE STATUS INDICATORS ILLUMINATE YELLOW RESET INDICATOR ILLUMINATED</p>	<ol style="list-style-type: none"> 5. If the PA voltage is low, increase the PA voltage until the MODULE STATUS indicators illuminate green. 1. Depress the reset switch. 2. If the module status and reset indicators do not display normal indications, depress the transmitter multimeter FWD PWR switch. The forward power must be equal to the TPO. 3. If the transmitter forward power is high, depress the LOWER switch to lower the output power to the TPO level. 4. If the transmitter forward power is low or equal to the TPO, depress the multimeter TEMP switch. The temperature must be less than 9 degrees above the ambient room temperature. 5. If the temperature is greater than 9 degrees above the ambient room temperature, check the flushing fans and the filter. 6. If the temperature is less than 9 degrees above the ambient room temperature, depress the RFL PWR switch. The reflected power must be less than 20 watts on FM-1C models and 10 watts on FM-500C models. 7. If the reflected power is greater than 20 watts for an FM-1C or 10 watts for an FM-500C, check the output transmission line and the antenna. 8. If the reflected power is less than 20 watts for an FM-1C or 10 watts for an FM-500C, check the RF power module logic circuit board.
<p>RED MODULE STATUS INDICATORS RESET INDICATOR ILLUMINATED</p>	<ol style="list-style-type: none"> 1. Depress the reset switch. 2. If the module status and reset indicators do not display normal indications, check the exciter forward power. The forward power must be: 1) FM-1C = 40W or 2) FM-500C = 20W. 3. If the exciter forward power is low or not present, refer to the FX-50 exciter manual and troubleshoot the exciter. 4. If the exciter forward power is normal, depress the transmitter multimeter FWD PWR switch. The transmitter forward power must be equal to the TPO. 5. If the transmitter forward power is high, depress the LOWER switch and lower the output power to the TPO level.

TABLE 5-1. FM-1C/FM-500C TROUBLESHOOTING
(Sheet 4 of 7)

SYMPTOM	CIRCUITRY TO CHECK
<p>TRANSMITTER WILL NOT AUTOMATICALLY RETURN TO RATED POWER AFTER AN AC POWER LOSS</p> <p>TRANSMITTER OFF WITH NO FRONT PANEL INDICATIONS</p>	<ol style="list-style-type: none"> 6. If the transmitter forward power is low or equal to the TPO, depress the multimeter TEMP switch. The temperature must be less than 9 degrees above the ambient room temperature. 7. If the temperature is greater than 9 degrees above the ambient room temperature, check the flushing fans and the filter. 8. If the temperature is less than 9 degrees above the ambient room temperature, depress the RFL PWR switch. The reflected power must be less than 20 watts for an FM-1C or 10 watts for an FM-500C. 9. If the reflected power is greater than 20 watts for an FM-1C or 10 watts for an FM-500C, check the output transmission line and the antenna. 10. If the reflected power is less than 20 watts for an FM-1C or 10 watts for an FM-500C, bypass the low-pass filter and connect the transmitter output to a test load. 11. If the MODULE STATUS indicators illuminate green, defective low-pass filter. 12. If the MODULE STATUS indicators remain red, depress the transmitter multimeter PWR SUPPLY VDC switch. The voltage must be equal to the normal operating voltage. 13. If the PA voltage is not present, check the main power supply. 14. If the PA voltage is low or normal, increase the voltage one volt and check for a green MODULE STATUS indication. Repeat the procedure as required up to a maximum voltage increase of four volts. 15. If the MODULE STATUS indicators remain red after the PA voltage increase, defective RF amplifier modules. <ol style="list-style-type: none"> 1. Replace the battery in the controller. <ol style="list-style-type: none"> 1. Ensure primary ac power is applied to the unit and ensure the POWER switch is operated to on. 2. If the primary ac power is on, defective controller power supply.

TABLE 5-1. FM-1C/FM-500C TROUBLESHOOTING
(Sheet 5 of 7)

SYMPTOM	CIRCUITRY TO CHECK
<p>TRANSMITTER OFF NO OFF INDICATOR NO INTERLOCK INDICATOR NO MODULE STATUS INDICATORS</p> <p>TRANSMITTER OFF WITH FRONT PANEL INDICATIONS NO MULTIMETER DISPLAY MODULE STATUS INDICATORS ILLUMINATE YELLOW</p> <p>TRANSMITTER OFF WITH FRONT PANEL INDICATIONS MODULE STATUS INDICATORS ILLUMINATE YELLOW</p>	<p>1. Defective controller power supply +15V output.</p> <p>1. Defective controller power supply +5V output.</p> <p>1. Defective controller power supply -15V output.</p>
<p>FM-1C MODULE STATUS INDICATOR ILLUMINATES YELLOW</p>	<p>1. Depress the multimeter PWR SUPPLY VDC switch. Increase the PA voltage one volt dc and check the module for a green status indicator. Repeat the procedure as required up to a maximum voltage increase of four volts.</p> <p>2. If the MODULE STATUS indicator remains yellow, on FM-1C models record the module and location (module 1 or module 2) and place module 1 in location 2 and module 2 in location 1.</p> <p>3. If the module inserted into the location recorded in the preceding step displays a yellow MODULE STATUS indicator, check the transmitter combiner.</p> <p>4. If the status indicator on the module recorded in the preceding step remains yellow, the module is defective. Troubleshoot the module and return the PA voltage to the level recorded on the factory test data sheet.</p>
<p>ERRATIC POWER CONTROL</p>	<p>1. Depress the RAISE switch and check for a HIGH at U7 pin 6 on the controller circuit board.</p> <p>2. If the HIGH is present, check U6D, U9, U10, U11, U12, U13, U14, U15, U16, U7E, U17, Q1, Q4, U8D, U8C, U8D, and U8B on the controller circuit board.</p> <p>3. If the HIGH is not present, check U7C on the controller circuit board and S7 on the controller on/off circuit board.</p>

TABLE 5-1. FM-1C/FM-500C TROUBLESHOOTING
(Sheet 6 of 7)

SYMPTOM	CIRCUITRY TO CHECK
NO POWER CONTROL	<ol style="list-style-type: none"> 1. Check for a dc voltage at TP3 on the controller circuit board. 2. If the voltage at TP3 is present, check U3C, U3A, U3B, and U4C on each RF power module logic circuit board. 3. If the voltage at TP3 is not present, check for a 3.9 volt dc signal at U21 pin 12 on the controller circuit board. 4. If the 3.9 volt signal is present, check U21 on the controller circuit board. 5. If the 3.9 volt signal is not present, check for a 7.9 volt dc signal at U6 pin 14 on the controller circuit board. 6. If the 7.9 volt signal is present, check Q3, U20, U19A, U18A, and U18D on the controller circuit board. Check U11D, U11C, U11B, K1, U10D, U13C, U6 and U14 on the controller on/off circuit board. 7. If the 7.9 volt signal is not present, check U6D, U9, U10, U11, U12, U13, U14, U15, U16, U7E, U17, Q1, Q4, U8D, U8C, U8D, and U7C on the controller circuit board.
TRANSMITTER OPERATES NO MULTIMETER OPERATION	<ol style="list-style-type: none"> 1. Depress the transmitter multimeter PWR SUPPLY VDC switch and check for a dc voltage at U201 pin 31 on the meter circuit board. 2. If the voltage is present, check U201 and DS201 on the meter circuit board. 3. If the voltage is not present, check U5C on the controller circuit board.
TRANSMITTER OPERATES NO FORWARD POWER METER DISPLAY	<ol style="list-style-type: none"> 1. Check for a 3 VDC signal for a 1 kW output or a 1.5 VDC signal for a 250 W output at U2 pin 5 on the controller circuit board. 2. If the voltage is not present, check the directional coupler. 3. If the voltage is present, check U2B and U6A on the controller circuit board and S301 on the meter switch circuit board.
TRANSMITTER OPERATES WITH NORMAL INDICATIONS RATED POWER CAN NOT BE OBTAINED	<ol style="list-style-type: none"> 1. Check U5B on the controller circuit board.

TABLE 5-1. FM-1C/FM-500C TROUBLESHOOTING
(Sheet 7 of 7)

SYMPTOM	CIRCUITRY TO CHECK
TRANSMITTER OPERATES NO REFLECTED POWER METER DISPLAY	<ol style="list-style-type: none"> 1. Check for a voltage at U2 pin 3 on the controller circuit board. 2. If the voltage is not present, check the directional coupler. 3. If the voltage is present, check U21A and U6B on the controller circuit board and S301 on the meter switch circuit board.
CIRCUIT BREAKER OPERATION	<ol style="list-style-type: none"> 1. Check the MOVs, main power supply, controller power supply, and the circuit breaker.

- 5-179. **COMPONENT REPLACEMENT PROCEDURE.** Component replacement on printed circuit boards requires extreme care to avoid damage to the circuit board traces. The following text describes the procedure to replace components on FM-1C/FM-500C circuit boards.
- 5-180. On all circuit boards, the adhesive securing the copper trace to the board melts at almost the same temperature at which solder melts. A circuit board trace can be destroyed by excessive heat or lateral movement during soldering. Use of a small iron with steady pressure is required for circuit board repairs.
- 5-181. To remove a component from a circuit board, cut the leads from the body of the defective component while the device is still soldered to the board.
- 5-182. Grip each component lead, one at a time, with long-nose pliers. Rotate the circuit board and touch a soldering iron to the lead at the solder connection. When the solder begins to melt, push the lead through the back side of the board. Each lead may now be heated independently and pulled out of each hole. The holes may be cleared of solder by carefully re-heating each hole with a low wattage iron and removing the residual solder with a soldering vacuum tool.



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 SUCH AS FROM A SOLDERING IRON OR SMOKING MATERIALS. OBSERVE THE MANUFACTURER'S CAUTIONARY INSTRUCTIONS.**

WARNING

WARNING

WARNING

- 5-183. Install the new component and apply solder from the bottom side of the circuit board. After soldering, remove flux with a cotton swab moistened with a suitable solvent. Rubbing alcohol is highly diluted and is not effective.

- 5-184. The board should be checked to ensure the flux has been removed and not just smeared. Rosin flux is not normally corrosive, but rosin will absorb enough moisture in time to become conductive and cause problems.

SECTION VI PARTS LIST

6-1. INTRODUCTION.

- 6-2. This section provides parts lists for the FM-1C/FM-500C 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.

TABLE 6-1. FM-1C/FM-500C REPLACEABLE PARTS LIST INDEX

TABLE	DESCRIPTION	PART NO.	PAGE
6-2	FM-1C Transmitter	909-1001-204	6-2
6-3	FM-500C Transmitter	909-0501-204 /-254	6-2
6-4	Motherboard Circuit Board Assembly, FM-1C	919-0400	6-3
6-5	Motherboard Assembly, FM-500C	919-0400-001	6-4
6-6	Control Switch Circuit Board Assembly	919-0406-001	6-4
6-7	Display Circuit Board Assembly	919-0406-002	6-5
6-8	Meter Switch Circuit Board Assembly	919-0406-003	6-6
6-9	Remote Control Interface Circuit Board Assembly	919-0406-004	6-6
6-10	Temperature Sensor Circuit Board Assembly	919-0406-005	6-6
6-11	Controller Circuit Board Assembly	919-0407-001	6-7
6-12	Controller RFI Filter Circuit Board Assembly	919-0407-002	6-12
6-13	Basic Harness Assembly	949-0400	6-12
6-14	RF Cables Harness Assembly - FM-1C	949-0402	6-13
6-15	RF Cable Harness Assembly - FM-500C	949-0401	6-13
6-16	RF Amplifier Module Assembly	959-0400	6-13
6-17	RF Amplifier Circuit Board Assembly	919-0401	6-14
6-18	RF Amplifier Cables Assembly	949-0403	6-15
6-19	Combiner/Directional Coupler Circuit Board Assembly	919-0402	6-16
6-20	RF Amplifier Logic Circuit Board Assembly	919-0403	6-16
6-21	Output Combiner, FM-1C	959-0401	6-18
6-22	Low Pass Filter Assembly	959-0402	6-18
6-23	Low Pass Filter Main Circuit Board Assembly	919-0405-001	6-19
6-24	Reject Load Assembly, FM-1C	959-0403	6-19
6-25	Accessory Parts Kit, FM-1C/FM-500C	979-0400 /-0401	6-19
6-26	Local Control Disable Kit	909-0137	6-19

TABLE 6-2. FM-1C TRANSMITTER - 909-1001-204

REF. DES.	DESCRIPTION	PART NO.	QTY.
B1, B2	Fan 6 inch (15.24 cm), 250 ft ³ /min 220V ac, 50/60 Hz, 40 Watt	380-7650	2
CB1	Circuit Breaker, 2-Pole, 250V, 30 Amperes	341-0047	1
J4, J5	Housing, Pin, 2-Pin	418-0702	2
J9, J10	Bulkhead Receptacle, Type N. Jack-to-Jack, UG30/U	418-0035	2
MOV 1 thru MOV3	Metal-Oxide Varistor, B40K275, 275V, 1680 Joules	140-0021	3
R4	Resistor, 100 Ohm $\pm 1\%$, 20W, TO-220 Power Package	132-1032	1
TB1	Barrier Strip, 9 Terminal	412-0090	1
—	Resistor, 100 Ohm $\pm 5\%$, 40W	131-1033	1
—	Pin Connector	417-0036	4
—	Power Supply, Computer Products, NFN40-7610, -15V $\pm 5\%$, +5 $\pm 2\%$, +15V +10%/-3%, 85V to 264V Operation, 40W	540-0006	1
—	FX-50 Exciter, 194-266 50/60 Hz Operation	909-1050-325	1
—	Motherboard Assembly	919-0400	1
—	Control Switch Circuit Board Assembly	919-0406-001	1
—	Display Circuit Board Assembly	919-0406-002	1
—	Meter Switch Circuit Board Assembly	919-0406-003	1
—	Remote Control Interface Circuit Board Assembly	919-0406-004	1
—	Temperature Sensor Circuit Board Assembly	919-0406-005	1
—	Controller Circuit Board Assembly	919-0407-001	1
—	Controller RFI Filter Circuit Board Assembly	919-0407-002	1
—	Basic Harness Assembly	949-0400	1
—	RF Cable Harness Assembly	949-0402	1
—	RF Amp Module Assembly	959-0400	2
—	Output Combiner Assembly	959-0401	1
—	Low Pass Filter Assembly	959-0402	1
—	Reject Load Assembly	959-0403	1
—	Accessory Parts Kit	979-0400	1
—	Power Supply, Pioneer Magnetics, PM2512A2-48D50-0-2F-4-25- 122, 48V $\pm 10\%$, 2 kW	540-0008	1
909-1001-001 OPTION			
—	Power Supply, Pioneer Magnetics, PM2549A-5-48D46-0-2F-Y -25-122, 48V $\pm 10\%$, 2 kW, Power Factor Corrected	540-0011	1

TABLE 6-3. FM-500C TRANSMITTER - 909-0501-204/-254
(Sheet 1 of 2)

REF. DES.	DESCRIPTION	PART NO.	QTY.
FOR 220V MODELS			
B1, B2	Fan 6 inch (15.24 cm), 250 ft ³ /min 220V ac, 50/60 Hz, 40 Watt	380-7650	2
CB1	Circuit Breaker, 2-Pole, 250V, 15 Amperes	341-0032	1

TABLE 6-3. FM-500C TRANSMITTER - 909-0501-204/-254
(Sheet 2 of 2)

REF. DES.	DESCRIPTION	PART NO.	QTY.
FOR 120V MODELS			
B1, B2	Fan 6 inch (15.24 cm), 250 ft ³ /min 120V ac, 50/60 Hz, 40 Watt	380-7600	2
CB1	Circuit Breaker, 2-Pole, 250V, 30 Amperes	341-0047	1
J4, J5	Housing, Pin, 2-Pin	418-0702	2
J9, J10	Bulkhead Receptacle, Type N. Jack-to-Jack, UG30/U	418-0035	2
MOV 1 thru MOV3	Metal-Oxide Varistor, B40K275, 275V, 1680 Joules	140-0021	3
TB1	Barrier Strip, 9 Terminal	412-0090	1
—	Filter, Fan	380-5502	1
—	Pin Connector	417-0036	4
—	Power Supply, Computer Products, NFN40-7610, -15V $\pm 5\%$, +5 $\pm 2\%$, +15V +10%/-3%, 85V to 264V Operation, 40W	540-0006	1
—	Power Supply, 48V dc Adj, 1 kW	540-0007	1
—	FX-50 Exciter, 194-266 50/60 Hz Operation	909-1050-325	1
—	Motherboard Assembly	919-0400-001	1
—	Control Switch Circuit Board Assembly	919-0406-001	1
—	Display Circuit Board Assembly	919-0406-002	1
—	Meter Switch Circuit Board Assembly	919-0406-003	1
—	Remote Control Interface Circuit Board Assembly	919-0406-004	1
—	Temperature Sensor Circuit Board Assembly	919-0406-005	1
—	Controller Circuit Board Assembly	919-0407-001	1
—	Controller RFI Filter Circuit Board Assembly	919-0407-002	1
—	Basic Harness Assembly	949-0400	1
—	RF Cables Harness Assembly	949-0401	1
—	RF Amp Module Assembly	959-0400	1
—	Low Pass Filter Assembly	959-0402	1
—	Accessory Parts Kit	979-0401	1
—	Power Supply, Pioneer Magnetics, PM2926A-3-48D25-0-2F-4 -25-122, 48V $\pm 10\%$, 1 kW	540-0007	1
909-0501-001 OPTION			
—	Power Supply, Pioneer Magnetics, PM2926A-3-48D25-0-2F-4 -25-122, 48V $\pm 10\%$, 1 kW, Power-Factor-Corrected	540-0010	1

TABLE 6-4. MOTHERBOARD ASSEMBLY, FM-1C - 919-0400
(Sheet 1 of 2)

REF. DES.	DESCRIPTION	PART NO.	QTY.
C1, C2	Capacitor, Ceramic Chip, 56 pF $\pm 5\%$, 500V	009-5613	2
C3	Capacitor, Ceramic, 2-8 pF, 350V dc, Non-Polarized	096-0008	1
C4, C5	Capacitor, Electrolytic, 47 uF, 35V	020-4770	2

TABLE 6-4. MOTHERBOARD ASSEMBLY, FM-1C - 919-0400
(Sheet 2 of 2)

REF. DES.	DESCRIPTION	PART NO.	QTY.
C6, C7	Capacitor, Mylar, 0.1 uF $\pm 10\%$, 100V	030-1053	2
J601	Receptacle, 26-Pin Dual In-line	418-2602	1
J602, J603	Connector, Female	417-0322	2
L1	Coil, Molded, .11 uH, 1A	364-0011	1
R2, R3	Resistor, .005 Ohm $\pm 3\%$, 5W	139-0007	2
R5	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	1
—	Plug, BNC for RG-142 cable	417-0095	1
—	Blank, Motherboard	519-0400	1

TABLE 6-5. MOTHERBOARD ASSEMBLY, FM-500C - 919-0400-001

REF. DES.	DESCRIPTION	PART NO.	QTY.
C5	Capacitor, Electrolytic, 47 uF, 35V	020-4770	1
C7	Capacitor, Mylar, 0.1 uF $\pm 10\%$, 100V	030-1053	1
J601	Receptacle, 26-Pin Dual In-line	418-2602	1
J603	Connector, Female	417-0322	1
R3	Resistor, .005 Ohm $\pm 3\%$, 5W, WW	139-0007	1
R5	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	1
—	Plug, BNC for RG-142 Cable	417-0095	1
—	Blank, Motherboard	519-0400	1

TABLE 6-6. CONTROL SWITCH CIRCUIT BOARD ASSEMBLY - 919-0406-001
(Sheet 1 of 2)

REF. DES.	DESCRIPTION	PART NO.	QTY.
C8 thru C14	Capacitor, Mica, 470 pF $\pm 1\%$, 500V	040-4721	7
C15, C16	Capacitor, Monolythic Ceramic, 0.1 uF $\pm 20\%$, 50V	003-1054	2
C17	Capacitor, Mica, 470 pF $\pm 1\%$, 500V	040-4721	1
D6, D12 thru D16	Diode, 1N4005, Silicon, 600V @ 1 Ampere	203-4005	5
DS1	Switch, PB, Momentary, LED Illuminated, Green	340-0140	1
J1	Receptacle, Male, 3-Pin In-line	417-0003	1
J101	Receptacle, 26-Pin Dual In-line	418-2602	1
K1	Relay, Coil: 12V dc Contact: DPDT, 120V ac @ 1 Ampere	270-0058	1
P1	Jumper, Programmable, 2-Pin	340-0004	1
Q1 thru Q3	Transistor, 2N7000, Mosfet, TO-92 Case	210-7000	3
R8	Resistor, 3.3 Meg Ohm $\pm 5\%$, 1/4W	100-3373	1
R9, R10	Resistor, 100 k Ohm $\pm 1\%$, 1/4W	103-1062	2

TABLE 6-6. CONTROL SWITCH CIRCUIT BOARD ASSEMBLY - 919-0406-001
(Sheet 2 of 2)

REF. DES.	DESCRIPTION	PART NO.	QTY.
R11	Resistor, 3.3 Meg Ohm $\pm 5\%$, 1/4W	100-3373	1
R12	Resistor, 3.01 k Ohm $\pm 1\%$, 1/4W	103-3014	1
R13	Resistor, 100 k Ohm $\pm 1\%$, 1/4W	103-1062	1
R14	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	1
R15	Resistor, 3.3 Meg Ohm $\pm 5\%$, 1/4W	100-3373	1
R16	Resistor, 100 k Ohm $\pm 1\%$, 1/4W	103-1062	1
R17	Resistor, 3.3 Meg Ohm $\pm 5\%$, 1/4W	100-3373	1
R18	Resistor, 100 k Ohm $\pm 1\%$, 1/4W	103-1062	1
R19	Resistor, 3.3 Meg Ohm $\pm 5\%$, 1/4W	100-3373	1
R20 thru R22	Resistor, 715 Ohm $\pm 1\%$, 1/4W	100-7132	3
R23, R24	Resistor, 100 k Ohm $\pm 1\%$, 1/4W	103-1062	2
R25	Resistor, 3.3 Meg Ohm $\pm 5\%$, 1/4W	100-3373	1
R26	Resistor, 100 k Ohm $\pm 1\%$, 1/4W	103-1062	1
R27	Resistor, 3.3 Meg Ohm $\pm 5\%$, 1/4W	100-3373	1
R28, R29	Resistor, 715 Ohm $\pm 1\%$, 1/4W	100-7132	2
R30	Resistor, 1 k Ohm $\pm 1\%$, 1/4W	100-1041	1
R31	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	2
R32	Resistor, 3.3 Meg Ohm $\pm 5\%$, 1/4W	100-3373	1
S3	Switch, PB, Momentary, LED Illuminated, Green	340-0140	1
S4, S5	Switch, Pushbutton, Momentary, LED Illuminated, Red	340-0143	2
S6, S7	Switch, Pushbutton, Momentary, LED Illuminated, Yellow	340-0139	2
U3 thru U9	Integrated Circuit, H11AA1, Optical Isolator, AC Input NPN Phototransistor, 6-Pin Dual In-Line Package.	229-0111	7
U10, U11	Integrated Circuit, MC14106BP, Hex Schmitt Trigger, 14-Pin	228-4106	2
U12	Integrated Circuit, ULN2004, 7 NPN Darlington Driver Pack, 16-Pin DIP	226-2004	1
U13	Integrated Circuit, ULN2004, 7 NPN Darlington Driver Pack, 16-Pin DIP	226-2004	1
U14	Integrated Circuit, Optical Isolator, NPN Photo Transistor, 6-Pin DIP	229-0111	1
XU3 thru XU9	Socket, 6-Pin DIP	417-0600	7
XU10, XU11	Socket, 14-Pin DIP	417-1404	2
XU12, XU13	Socket, 16-Pin DIP	417-1604	2
XU14	Socket, 6-Pin DIP	417-0600	1
—	Blank, Control Switch Circuit Board, FM-1C	519-0406-001	1

TABLE 6-7. DISPLAY CIRCUIT BOARD ASSEMBLY - 919-0406-002
(Sheet 1 of 2)

REF. DES.	DESCRIPTION	PART NO.	QTY.
C201	Capacitor, Monolythic Ceramic, 0.1 uF $\pm 20\%$, 50V	003-1054	1

TABLE 6-7. DISPLAY CIRCUIT BOARD ASSEMBLY - 919-0406-002
(Sheet 2 of 2)

REF. DES.	DESCRIPTION	PART NO.	QTY.
C202	Capacitor, Mica, 50 pF $\pm 5\%$, 500V	040-5013	1
C203	Capacitor, Monolithic Ceramic, 0.1 μ F $\pm 20\%$, 50V	003-1054	1
C204	Capacitor, Mica, 390 pF $\pm 5\%$, 100V	042-3922	1
C205 thru C209	Capacitor, Monolithic Ceramic, 0.1 μ F $\pm 20\%$, 50V	003-1054	5
DS201	Display, FE0502W-DU LCD 4 Digit, 0.7" High	320-0021	1
J201	Connector, Printed Circuit Board Mounting, 10-PIN(Dual 5)	418-1003	1
R201	Resistor, 1 Meg Ohm $\pm 1\%$, 1/4W	103-1007	1
R202	Resistor, 30.1 k Ohm $\pm 1\%$, 1/4W	100-3051	1
R203	Potentiometer, 10 k Ohm $\pm 10\%$ 1/2W	178-1054	1
R204	Resistor, 47.5K Ohm $\pm 1\%$, 1/4W	103-4755	1
R205	Resistor, 182 k Ohm $\pm 1\%$, 1/4W	103-1826	1
R206	Resistor, 1.8 Meg Ohm $\pm 5\%$, 1/4W	100-1873	1
R207, R208	Resistor, 100 k Ohm $\pm 1\%$, 1/4W	103-1062	2
TP201 thru TP205	Terminal, Turret, Double Shoulder	413-1597	5
U201	Integrated Circuit, ICL7136CPL, 3-1/2-Digit A/D Converter,	220-7136	1
U202	Integrated Circuit, MC14070BCP, Quad Exclusive OR Gate, CMOS 14-Pin DIP	228-4071	1
XU201	Socket, 40-Pin DIP	417-4005	1
XU202	Socket, 14-Pin DIP	417-1404	1
—	Blank, Display Circuit Board	519-0406-002	1

TABLE 6-8. METER SWITCH CIRCUIT BOARD ASSEMBLY - 919-0406-003

REF. DES.	DESCRIPTION	PART NO.	QTY.
J301	Receptacle, 26-Pin Dual In-line	418-2602	1
R301	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	1
S301	Switch, 8 Section, 2PDT Pushbutton, Black/Yellow Indication	340-0124	1
S302	Switch, Toggle, SPDT, 5A @ 125V ac & 28V dc	348-0123	1
—	Blank, Meter Switch Circuit Board	519-0406-003	1

TABLE 6-9. REMOTE CONTROL INTERFACE CIRCUIT BOARD ASSEMBLY - 919-0406-004

REF. DES.	DESCRIPTION	PART NO.	QTY.
P20	Plug, 205737-1 AMP, Printed Circuit Board Mount, 25-PIN	417-2501	1
TB2	Barrier Strip, 30 Terminal	412-3000	1
—	Blank, Remote Interface Circuit Board	519-0406-004	1

TABLE 6-10. TEMPERATURE SENSOR CIRCUIT BOARD ASSEMBLY - 919-0406-005

REF. DES.	DESCRIPTION	PART NO.	QTY.
C501	Capacitor, Mica, 390 pF $\pm 5\%$, 100V	042-3922	1
C502	Capacitor, Monolythic Ceramic, 0.1 μ F $\pm 20\%$, 50V	003-1054	1
C503	Capacitor, Mica, 390 pF $\pm 5\%$, 100V	042-3922	1
C504	Capacitor, Ceramic, 0.001 μ F, 1 kV	002-1034	1
C505	Capacitor, Monolythic Ceramic, 0.1 μ F $\pm 20\%$, 50V	003-1054	1
C506	Capacitor, Ceramic, 0.001 μ F, 1 kV	002-1034	1
J501	Socket, 4-Pin	418-0255	1
R501	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	1
R502	Resistor, 2.21 k Ohm $\pm 1\%$, 1/4W	103-2241	1
U501	Integrated Circuit, LM35DZ, Celsius Temperature Sensor, TO-92 Case	220-0035	1
—	Blank, Temperature Sensor Circuit Board	519-0406-005	1

TABLE 6-11. CONTROLLER CIRCUIT BOARD ASSEMBLY - 919-0407-001
(Sheet 1 of 6)

REF. DES.	DESCRIPTION	PART NO.	QTY.
BT1	Battery Holder, 9 Volt Rectangular	415-0002	1
C1	Capacitor, Electrolytic, 10 μ F, 35V	023-1076	1
C2	Capacitor, Electrolytic, 1000 μ F $\pm 20\%$, 35V	024-1000	1
C3	Capacitor, Electrolytic, 1 μ F, 50V	024-1064	1
C4	Capacitor, Monolythic Ceramic, 0.1 μ F $\pm 20\%$, 50V	003-1054	1
C5	Capacitor, Electrolytic, 10 μ F, 35V	023-1076	1
C6 thru C33	Capacitor, Monolythic Ceramic, 0.1 μ F $\pm 20\%$, 50V	003-1054	27
C34	Capacitor, Mica, 390 pF $\pm 5\%$, 100V	042-3922	1
C35 thru C39	Capacitor, Monolythic Ceramic, 0.1 μ F $\pm 20\%$, 50V	003-1054	5
C40	Capacitor, Electrolytic, 10 μ F, 35V	023-1076	1
C41 thru C44	Capacitor, Monolythic Ceramic, 0.1 μ F $\pm 20\%$, 50V	003-1054	4
C45, C46	Capacitor, Electrolytic, 1 μ F, 50V	024-1064	2
C47 thru C49	Capacitor, Monolythic Ceramic, 0.1 μ F $\pm 20\%$, 50V	003-1054	3
C50, C51	Capacitor, Electrolytic, 1 μ F, 50V	024-1064	2
C52, C53	Capacitor, Monolythic Ceramic, 0.1 μ F $\pm 20\%$, 50V	003-1054	2
D1, D2	Diode, Zener, 1N4733A, 5.1V $\pm 5\%$, 1W	200-4733	2
D3	Diode, 1N4148, Silicon, 75V @ 0.3 Amperes	203-4148	1
D4, D5	Diode, 1N4005, Silicon, 600V @ 1 Ampere	203-4005	2
D6	Diode, 1N4148, Silicon, 75V @ 0.3 Amperes	203-4148	1
D7 thru D9	Diode, HP5082-2800, High Voltage, Schottky Barrier Type,	201-2800	3
D10 thru D14	Diode, 1N4148, Silicon, 75V @ 0.3 Amperes	203-4148	5

TABLE 6-11. CONTROLLER CIRCUIT BOARD ASSEMBLY - 919-0407-001
(Sheet 2 of 6)

REF. DES.	DESCRIPTION	PART NO.	QTY.
D15, D16	Diode, HP5082-2800, High Voltage, Schottky Barrier Type, 70V, 15 mA	201-2800	2
D17	Diode, 1N4005, Silicon, 600V @ 1 Ampere	203-4005	1
D18 thru D20	Diode, HP5082-2800, High Voltage, Schottky Barrier Type, 70V, 15 mA	201-2800	3
D21	Diode, Zener, 1N4733A, 5.1V $\pm 5\%$, 1W	200-4733	1
D22	Diode, 1N4005, Silicon, 600V @ 1 Ampere	203-4005	1
D23 thru D28	Diode, HP5082-2800, High Voltage, Schottky Barrier Type, 70V, 15 mA	201-2800	6
D29	Diode, 1N4005, Silicon, 600V @ 1 Ampere	203-4005	1
J701	Connector, Printed Circuit Board Mounting, 10-PIN, Dual-In-Line	418-1003	1
J702, J703	Receptacle, 26-Pin Dual In-line	418-2602	2
J704	Socket, 4-Pin	418-0255	1
J705	Connector, 9-Pin	418-0900	1
J706, J707	Receptacle, 26-Pin Dual In-line	418-2602	2
J708, J709	Receptacle, Male, 4-Pin In-Line	417-0070	2
J710	Receptacle, Male, 3-Pin In-line	417-0003	1
P708 thru P710	Jumper, Programmable, 2-Pin	340-0004	3
P708A, P709A	Jumper, Programmable, 2-Pin	340-0004	2
Q1 thru Q5	Transistor, 2N7000, Mosfet, TO-92 Case	210-7000	5
R1	Resistor, 470 Ohm $\pm 5\%$, 1/2W	110-4733	1
R2	Resistor, 4.99 k Ohm $\pm 1\%$, 1/4W	100-5041	1
R3	Resistor, 1 Meg Ohm $\pm 1\%$, 1/4W	103-1007	1
R4	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	1
R5	Resistor, 34 K Ohm $\pm 1\%$, 1/4W, Metal	103-3405	1
R6	Resistor, 10 Meg Ohm $\pm 5\%$, 1/4W	100-1083	1
R7	Resistor, 49.9 k Ohm $\pm 1\%$, 1/4W	103-4951	1
R8	Resistor, 100 k Ohm $\pm 1\%$, 1/4W	103-1062	1
R9	Resistor, 4.99 k Ohm $\pm 1\%$, 1/4W	100-5041	1
R10	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	1
R11	Resistor, 2 k Ohm $\pm 1\%$, 1/4W	100-2041	1
R12	Resistor, 4.99 k Ohm $\pm 1\%$, 1/4W	100-5041	1
R13	Resistor Network, 8-10 k Ohm $\pm 1\%$, 1/4W, 16-Pin DIP	226-1055	1
R14	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	1
R15	Resistor, 1 k Ohm $\pm 1\%$, 1/4W	100-1041	1
R16	Resistor, 49.9 k Ohm $\pm 1\%$, 1/4W	103-4951	1
R17	Resistor, 16.2 k Ohm $\pm 1\%$, 1/4W	103-1625	1
R18	Resistor, 34K Ohm, $\pm 1\%$, 1/4W	103-3405	1
R19	Resistor, 442 Ohm, $\pm 1\%$, 1/4W	103-4423	1
R20	Resistor, 4.53 k Ohm $\pm 1\%$, 1/4W	103-4534	1

TABLE 6-11. CONTROLLER CIRCUIT BOARD ASSEMBLY - 919-0407-001
(Sheet 3 of 6)

REF. DES.	DESCRIPTION	PART NO.	QTY.
R21	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	1
R22	Resistor, 1 k Ohm $\pm 1\%$, 1/4W	100-1041	1
R23	Resistor, 100 k Ohm $\pm 1\%$, 1/4W	103-1062	1
R24	Resistor, 24.9 k Ohm $\pm 1\%$, 1/4W	103-2495	1
R25	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	1
R26	Resistor, 4.75 k Ohm $\pm 1\%$, 1/4W	103-4741	1
R27	Resistor, 2 k Ohm $\pm 1\%$, 1/4W	100-2041	1
R28	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	1
R29	Resistor, 1 k Ohm $\pm 1\%$, 1/4W	100-1041	1
R30	Resistor, 100 k Ohm $\pm 1\%$, 1/4W	103-1062	1
R31	Resistor, 24.9 k Ohm $\pm 1\%$, 1/4W	103-2495	1
R32	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	1
R33	Resistor, 4.75 k Ohm $\pm 1\%$, 1/4W	103-4741	1
R34	Resistor, 2 k Ohm $\pm 1\%$, 1/4W	100-2041	1
R35	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	1
R36	Resistor, 1 k Ohm $\pm 1\%$, 1/4W	100-1041	1
R37	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	1
R38	Resistor, 49.9 k Ohm $\pm 1\%$, 1/4W	103-4951	1
R39	Resistor, 24.9 k Ohm $\pm 1\%$, 1/4W	103-2495	1
R40	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	1
R41	Resistor, 1 k Ohm $\pm 1\%$, 1/4W	100-1041	1
R42	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	1
R43	Resistor, 49.9 k Ohm $\pm 1\%$, 1/4W	103-4951	1
R44	Resistor, 24.9 k Ohm $\pm 1\%$, 1/4W	103-2495	1
R45	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	1
R46	Resistor, 1 k Ohm $\pm 1\%$, 1/4W	100-1041	1
R47	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	1
R48	Resistor, 1 k Ohm $\pm 1\%$, 1/4W	100-1041	1
R49	Potentiometer, 10 k Ohm $\pm 10\%$, 1/2W	177-1054	1
R50 thru R52	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	3
R53	Resistor, 1 k Ohm $\pm 1\%$, 1/4W	100-1041	1
R54	Resistor, 2.15 k Ohm $\pm 1\%$, 1/4W	103-2154	1
R55	Resistor, 432 Ohm $\pm 1\%$, 1/4W	103-4323	1
R56	Resistor, 8.87 k Ohm $\pm 1\%$, 1/4W	103-8874	1
R57	Resistor, 649 Ohm $\pm 1\%$, 1/4W	103-6493	1
R58	Resistor, 1.62 k Ohm $\pm 1\%$, 1/4W	103-1624	1
R59	Resistor, 1 k Ohm $\pm 1\%$, 1/4W	100-1041	1
R60	Resistor, 23.2 k Ohm $\pm 1\%$, 1/4W	103-2325	1
R61	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	1
R62	Resistor, 16.2 k Ohm $\pm 1\%$, 1/4W	103-1625	1
R63	Resistor, 34K Ohm $\pm 1\%$, 1/4W	103-3405	1
R64	Potentiometer, 50 k Ohm $\pm 10\%$, 1/2W	177-5054	1
R65	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	1

TABLE 6-11. CONTROLLER CIRCUIT BOARD ASSEMBLY - 919-0407-001
(Sheet 4 of 6)

REF. DES.	DESCRIPTION	PART NO.	QTY.
R66	Resistor, 1 k Ohm $\pm 1\%$, 1/4W	100-1041	1
R67	Resistor, 20.0 k Ohm $\pm 1\%$, 1/4W	103-2051	1
R68	Resistor, 2.15 k Ohm $\pm 1\%$, 1/4W	103-2154	1
R69	Resistor, 49.9 k Ohm $\pm 1\%$, 1/4W	103-4951	1
R70	Resistor, 3.65 k Ohm $\pm 1\%$, 1/4W	103-3641	1
R71	Resistor, 8.06 k Ohm $\pm 1\%$, 1/4W	103-8064	1
R72	Resistor, 1.62 k Ohm $\pm 1\%$, 1/4W	103-1624	1
R73	Resistor, 1 k Ohm $\pm 1\%$, 1/4W	100-1041	1
R74	Resistor, 34K Ohm, $\pm 1\%$, 1/4W	103-3405	1
R75	Resistor, 845 Ohm $\pm 1\%$, 1/4W	103-8453	1
R76	Resistor, 4.75 k Ohm $\pm 1\%$, 1/4W	103-4741	1
R77	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	1
R78	Resistor, 2.67 k Ohm $\pm 1\%$, 1/4W	103-2674	1
R79	Resistor, 442 Ohm, $\pm 1\%$, 1/4W	103-4423	1
R80	Resistor, 8.66 k Ohm $\pm 1\%$, 1/4W	100-8641	1
R81	Resistor, 665 Ohm $\pm 1\%$, 1/4W	103-6653	1
R82	Resistor, 3.65 k Ohm $\pm 1\%$, 1/4W	103-3641	1
R83	Resistor, 1 k Ohm $\pm 1\%$, 1/4W	100-1041	1
R84	Resistor, 3.65 k Ohm $\pm 1\%$, 1/4W	103-3641	1
R85	Resistor, 845 Ohm $\pm 1\%$, 1/4W	103-8453	1
R86, R87	Resistor, 100 k Ohm $\pm 1\%$, 1/4W	103-1062	2
R88	Resistor, 12.7 k Ohm $\pm 1\%$, 1/4W	103-1275	1
R89	Resistor, 34K Ohm, $\pm 1\%$, 1/4W	103-3405	1
R90, R91	Resistor, 51.1 Ohm $\pm 1\%$, 1/4W	103-5112	2
R92	Resistor, 2.43 k Ohm $\pm 1\%$, 1/4W	103-2434	1
R93	Resistor, 2.49 k Ohm $\pm 1\%$, 1/4W	103-2494	1
R94	Potentiometer, 10 k Ohm $\pm 10\%$, 1/2W	177-1054	1
R95	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	1
R96, R97	Resistor, 1 Meg Ohm $\pm 1\%$, 1/4W	103-1007	2
R98	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	1
R99	Resistor, 100 k Ohm $\pm 1\%$, 1/4W	103-1062	1
R100	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	1
R101, R102	Resistor, 1 Meg Ohm $\pm 1\%$, 1/4W	103-1007	2
R103	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	1
R104, R105	Resistor, 1 Meg Ohm $\pm 1\%$, 1/4W	103-1007	2
R106, R107	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	2
R108	Resistor, 715 Ohm, $\pm 1\%$, 1/4W	100-7132	1
R109, R110	Resistor, 100 k Ohm $\pm 1\%$, 1/4W	103-1062	2
R111	Resistor, 4.99 k Ohm $\pm 1\%$, 1/4W	100-5041	1
R112	Potentiometer, 10 k Ohm $\pm 10\%$, 1/2W	177-1054	1
R113	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	1
R114, R115	Resistor, 100 k Ohm $\pm 1\%$, 1/4W	103-1062	1
R116	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	1

TABLE 6-11. CONTROLLER CIRCUIT BOARD ASSEMBLY - 919-0407-001
(Sheet 5 of 6)

REF. DES.	DESCRIPTION	PART NO.	QTY.
R117	Potentiometer, 500 Ohm $\pm 10\%$, 1/2W	177-5032	1
R118	Resistor, 1 k Ohm $\pm 1\%$, 1/4W	100-1041	1
R119	Resistor, 4.99 k Ohm $\pm 1\%$, 1/4W	100-5041	1
R120	Resistor, 100 k Ohm $\pm 1\%$, 1/4W	103-1062	1
R121	Resistor, 34K Ohm $\pm 1\%$, 1/4W	103-3405	1
R122, R123	Resistor, 100 k Ohm $\pm 1\%$, 1/4W	103-1062	2
R124	Resistor, 1 Meg Ohm $\pm 1\%$, 1/4W	103-1007	1
R125	Resistor, 1 k Ohm $\pm 1\%$, 1/4W	100-1041	1
R126	Resistor, 100 k Ohm $\pm 1\%$, 1/4W	103-1062	1
R127, R128	Resistor, 4.99 k Ohm $\pm 1\%$, 1/4W	100-5041	2
R129	Resistor, 2 k Ohm $\pm 1\%$, 1/4W	100-2041	1
R130	Resistor, 4.99 k Ohm $\pm 1\%$, 1/4W	100-5041	1
R131, R132	Resistor, 1 Meg Ohm $\pm 1\%$, 1/4W	103-1007	2
R133, R134	Potentiometer, 10 k Ohm $\pm 10\%$, 1/2W	177-1054	2
R135	Potentiometer, 1 k Ohm $\pm 10\%$, 1/2W	175-1034	1
R136	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	1
TP1 thru TP9	Terminal, Turret, Double Shoulder	413-1597	9
U1	Integrated Circuit, LM358N, Dual Operational Amplifier, 8-Pin DIP	221-0358	1
U2 thru U6	Integrated Circuit, TLO74CN, Quad JFET-Input Operational Amplifier, 14-Pin DIP	221-0074	5
U7	Integrated Circuit, MC14106BP, Hex Schmitt Trigger, 14-Pin	228-4106	1
U8	Integrated Circuit, MC14011BCP, Quad 2-Input NAND Gate, CMOS, 14-Pin DIP	228-4011	1
U9 thru U11	Integrated Circuit, MC14516B, Binary Up/Down Counter, CMOS, 16-Pin DIP	228-4516	3
U12, U13	Integrated Circuit, MC14503B, Hex Non-Inverting 3-State Buffer, CMOS, 16-Pin DIP	228-4503	2
U14, U15	Integrated Circuit, 14505, Hex Level Shifter, TTL to CMOS, 16-Pin DIP	228-4504	2
U16	Integrated Circuit, AD565AJ, 12-Bit Digital/Analog Converter, 24-Pin DIP	220-0565	1
U17	Integrated Circuit, NE555N, Timer, 8-Pin DIP	229-0555	1
U18	Integrated Circuit, TLO74CN, Quad JFET-Input Operational Amplifier, 14-Pin DIP	221-0074	1
U19	Integrated Circuit, ULN2004, 7 NPN Darlington Driver Pack, 16-Pin DIP	226-2004	1
U20	Integrated Circuit, NE555N, Timer, 8-Pin DIP	229-0555	1
U21	Integrated Circuit, TLO74CN, Quad JFET-Input Operational Amplifier, 14-Pin DIP	221-0074	1
XR13	Socket, 16-Pin DIP	417-1604	1
XU1	Socket, 8-Pin DIP	417-0804	1
XU2 thru XU8	Socket, 14-Pin DIP	417-1404	7

TABLE 6-11. CONTROLLER CIRCUIT BOARD ASSEMBLY - 919-0407-001
(Sheet 6 of 6)

REF. DES.	DESCRIPTION	PART NO.	QTY.
XU9 thru XU15	Socket, 16-Pin DIP	417-1604	7
XU16	Socket, 24-Pin DIP	417-2404	1
XU17	Socket, 8-Pin DIP	417-0804	1
XU18	Socket, 14-Pin DIP	417-1404	1
XU19	Socket, 16-Pin DIP	417-1604	1
XU20	Socket, 8-Pin DIP	417-0804	1
XU21	Socket, 14-Pin DIP	417-1404	1
—	Blank, Controller Circuit Board,	519-0407-001	1

TABLE 6-12. CONTROLLER RFI FILTER CIRCUIT BOARD ASSEMBLY - 919-0407-002

REF. DES.	DESCRIPTION	PART NO.	QTY.
C201 thru C224	Capacitor, Mica, 390 pF $\pm 5\%$, 100V	042-3922	22
J19	Receptacle, 26-Pin Dual In-line	418-2602	1
J20	Receptacle, 25-Pin	417-2500	1
J21	Connector, 2-Pin	417-0700	1
J22	Socket, 4-Pin	418-0255	1
R201 thru R211	Resistor, 51.1 Ohm $\pm 1\%$, 1/4W	103-5112	11
R212 thru R217	Resistor, 1 k Ohm $\pm 1\%$, 1/4W	100-1041	6
R218 thru R220	Resistor, 100 Ohm $\pm 5\%$, 1/2W	110-1033	3
R221 thru R223	Resistor, 1 k Ohm $\pm 1\%$, 1/4W	100-1041	3
R224, R225	Resistor, 47 Ohm $\pm 5\%$, 3-1/4W, WW	132-4721	2
—	Blank, Controller RFI Filter Circuit Board	519-0407-002	1

TABLE 6-13. BASIC HARNESS ASSEMBLY - 949-0400
(Sheet 1 of 2)

REF. DES.	DESCRIPTION	PART NO.	QTY.
J1	AC Input Receptacle, 2 Pole 3 Wire 15A 250V Service	418-0320	1
J2	Connector, Male, PLA03M1B00	417-0380	1
P2	Connector, Female, PLA03F1000-135.0	417-0379	1
P3	Connector, AMP 770355-1, 6-Pin	417-0236	1
P4, P5	Connector Housing, 2-Pin	418-0701	2
P6,	Connector Housing, SL-156, 3 Position	417-0306	1
P7	Connector Housing, SL-156, 6 Position	417-0606	1
P19	Plug, Ribbon Cable, 26-Pin Dual In-line	418-2600	1

TABLE 6-13. BASIC HARNESS ASSEMBLY - 949-0400
(Sheet 2 of 2)

REF. DES.	DESCRIPTION	PART NO.	QTY.
P21	Connector Housing, 2-Pin	418-0701	1
P22	Plug, Housing, 4-Pin	418-0240	1
P23	Contact Housing, 4-Pin In-line	417-0138	1
P101	Plug, Ribbon Cable, 26-Pin Dual In-line	418-2600	1
P201	Socket, Connector, 10-Pin	417-1003	1
P301	Plug, Ribbon Cable, 26-Pin Dual In-line	418-2600	1
P501	Plug, Housing, 4-Pin	418-0240	1
P601	Plug, 26-Pin Dual In-Line	417-0047	1
P701	Socket, Connector, 10-Pin	417-1003	1
P702	Plug, Ribbon Cable, 26-Pin Dual In-line	418-2600	1
P703	Plug, 26-Pin Dual In-Line	417-0047	1
P704	Plug, Housing, 4-Pin	418-0240	1
P705	Connector Plug, 9-Pin	417-0059	1
P706	Plug, Ribbon Cable, 26-Pin Dual In-line	418-2600	1
P707	Plug, Ribbon Cable, 26-Pin Dual In-line	418-2600	1
—	Pins, Crimp Type	417-8766	1
—	Connector, MC112N, Crimp Contact	417-0381	3
—	Connector, FC112N2, Crimp Contact	417-0372	3
—	Pin Connector, 350629-1	417-0237	1
—	Pins, Connector	417-0053	22
—	Crimp Terminal, AMP 640707-1	410-2478	6

TABLE 6-14. RF CABLES HARNESS ASSEMBLY - FM-1C - 949-0402

REF. DES.	DESCRIPTION	PART NO.	QTY.
—	Connector, Straight N for 82-340 Cable	417-0120	8
—	Plug, BNC for RG-142 cable	417-0095	1
—	Plug, Type N for RG-142 cable	418-0031	1

TABLE 6-15. RF CABLES HARNESS ASSEMBLY - FM-500C - 949-0401

REF. DES.	DESCRIPTION	PART NO.	QTY.
—	Connector, Straight N for 82-340 Cable	417-0120	4

TABLE 6-16. RF AMPLIFIER MODULE ASSEMBLY - 959-0400
(Sheet 1 of 2)

REF. DES.	DESCRIPTION	PART NO.	QTY.
C10	Capacitor, Ceramic Chip, 15 pF $\pm 5\%$, 500V	009-1513	1

TABLE 6-16. RF AMPLIFIER MODULE ASSEMBLY - 959-0400
(Sheet 2 of 2)

REF. DES.	DESCRIPTION	PART NO.	QTY.
C13 thru C16	Capacitor, Ceramic Chip, 470 pF $\pm 5\%$, 200V	009-4723	4
C24	Capacitor, Ceramic Chip, 15 pF $\pm 5\%$, 500V	009-1513	1
C27 thru C30	Capacitor, Ceramic Chip, 470 pF $\pm 5\%$, 200V	009-4723	4
P803	Connector, N Type, Right Angle, PCB Mount	417-0235	1
Q1, Q2	Transistor, RF Power Mosfet, MRF-151G, 175 MHz, 50V, 300W	210-0151	2
R1	Resistor, 100 Ohm $\pm 1\%$, 20W, TO-220 Package	132-1032	1
R203	Resistor, 100 Ohm $\pm 5\%$, 250W	131-1034	1
T1, T2	Transformer, RF Amplifier Output	370-0050	1
W7, W9	Coaxial Cable Sections: 50 Ohm Rigid Coaxial Cable Matching Section	610-0026	2
—	RF Amp Circuit Board Assembly	919-0401	1
—	Combiner/Directional Coupler Circuit Board Assembly	919-0402	1
—	Logic, RF Amplifier Circuit Board Assembly	919-0403	1

TABLE 6-17. RF AMPLIFIER CIRCUIT BOARD ASSEMBLY - 919-0401
(Sheet 1 of 2)

REF. DES.	DESCRIPTION	PART NO.	QTY.
C1, C2	Capacitor, Electrolytic, 47 μ F, 35V	020-4770	2
C3	Capacitor, Ceramic Chip, 36 pF $\pm 5\%$, 500V	009-3613	1
C4	Capacitor, Mica, 27 pF $\pm 5\%$, 250Vdc	046-0027	1
C5	Capacitor, Mica, 22 pF $\pm 5\%$, 250Vdc	046-0022	1
C6, C7	Capacitor, Ceramic Chip, 1000 pF $\pm 5\%$, 100V	009-1032	2
C9	Capacitor, Ceramic Chip, 68 pF $\pm 5\%$, 500V	009-6813	1
C11, C12	Capacitor, Ceramic Chip, 1000 pF $\pm 5\%$, 100V	009-1032	2
C17	Capacitor, Mica, Feedthru, 1000 pF $\pm 10\%$, 350V	046-1030	1
C18	Capacitor, Mica, 680 pF $\pm 10\%$, 350V	046-0006	1
C20, C21	Capacitor, Ceramic Chip, 1000 pF $\pm 5\%$, 100V	009-1032	2
C23	Capacitor, Ceramic Chip, 68 pF $\pm 5\%$, 500V	009-6813	1
C25, C26	Capacitor, Ceramic Chip, 1000 pF $\pm 5\%$, 100V	009-1032	2
C31	Capacitor, Mica, Feedthru, 1000 pF $\pm 10\%$, 350V	046-1030	1
C32	Capacitor, Mica, 680 pF $\pm 10\%$, 350V	046-0006	1
C34	Capacitor, Ceramic Chip, 1000 pF $\pm 5\%$, 500V	009-1033	1
C35, C36	Capacitor, Ceramic Chip, 1000 pF $\pm 5\%$, 100V	009-1032	2
C38	Capacitor, Ceramic Chip, 1000 pF $\pm 5\%$, 500V	009-1033	1
C40	Capacitor, Ceramic, 2-8 pF, 350V dc, Non-Polarized	096-0008	1
D1, D2	Diode, 1N4148, Silicon, 75V @ 0.3 Amperes	203-4148	2
DS1	Led, Tri-Color, Common Cathode	320-0031	1
F1	Fuse, 25A Type ATC	334-2500	1

TABLE 6-17. RF AMPLIFIER CIRCUIT BOARD ASSEMBLY - 919-0401
(Sheet 2 of 2)

REF. DES.	DESCRIPTION	PART NO.	QTY.
J1, J2	Receptacle, Male, 3-Pin In-line	417-0003	2
J801	Connector, Header, 40-Pin Dual-In-Line	417-4040	1
L1, L2	Choke, RF Amplifier Decoupling, FM-1C	360-0146	2
P1, P2	Jumper, Programmable, 2-Pin	340-0004	2
R2	Resistor, Chip, 2.2 k Ohm $\pm 5\%$, 1/4W	101-2243	1
R3	Resistor, 1 k Ohm $\pm 1\%$, 1/4W	100-1041	1
R4	Resistor, 267 k Ohm $\pm 1\%$, 1/4W	103-2676	1
R5 thru R8	Resistor, Chip, 22 Ohm $\pm 5\%$, 1/2W	111-2223	4
R9	Potentiometer, 10 k Ohm $\pm 10\%$, 1/2W	177-1054	1
R10	Resistor, Chip, 2.2 k Ohm $\pm 5\%$, 1/4W	101-2243	1
R11	Resistor, 47.5 k Ohm $\pm 1\%$, 1/4W	103-4755	1
R12	Potentiometer, 10 k Ohm $\pm 10\%$, 1/2W	177-1054	1
R13	Resistor, Chip, 2.2 k Ohm $\pm 5\%$, 1/4W	101-2243	1
R14	Resistor, 499 k Ohm $\pm 1\%$, 1/4W	103-4996	1
R15	Resistor, Chip, 2.2 k Ohm $\pm 5\%$, 1/4W	101-2243	1
R16	Resistor, 1 k Ohm $\pm 1\%$, 1/4W	100-1041	1
R17	Resistor, 47.5 k Ohm $\pm 1\%$, 1/4W	103-4755	1
R18 thru R21	Resistor, Chip, 22 Ohm $\pm 5\%$, 1/2W	111-2223	4
R22	Potentiometer, 10 k Ohm $\pm 10\%$, 1/2W	177-1054	1
R23	Resistor, Chip, 2.2 k Ohm $\pm 5\%$, 1/4W	101-2243	1
R25	Potentiometer, 10 k Ohm $\pm 10\%$, 1/2W	177-1054	1
R26	Resistor, Chip, 2.2 k Ohm $\pm 5\%$, 1/4W	101-2243	1
U1	Integrated Circuit, LM35DZ, Celsius Temperature Sensor, TO-92 Case	220-0035	1
U2	Integrated Circuit, LM35DZ, Celsius Temperature Sensor, TO-92 Case	220-0035	1
W6	Coaxial Cable Sections: 25 Ohm Rigid Coaxial Cable Matching Section	610-0025	1
W8	Coaxial Cable Sections: 25 Ohm Rigid Coaxial Cable Matching Section	610-0025	1
—	Fuse Clip	415-0015	2
—	Blank, RF Amplifier Circuit Board	519-0401	1
—	RF Amplifier Cables Assembly	949-0403	1

TABLE 6-18. RF AMPLIFIER CABLES ASSEMBLY - 949-0403

REF. DES.	DESCRIPTION	PART NO.	QTY.
P802	Connector, Male, Circuit Board Right Angle D,	418-0322	1
W1, W2	Coaxial Cable, RG316/U, Teflon, Impedance: 50 OHM Capacitance: 29.3 pF/ft. Nominal	621-1359	2

**TABLE 6-19. COMBINER/DIRECTIONAL COUPLER CIRCUIT BOARD ASSEMBLY
-919-0402**

REF. DES.	DESCRIPTION	PART NO.	QTY.
C205	Capacitor, Mica, 1 pF, 500V	042-5025	1
C206	Capacitor, Ceramic Chip, 1000 pF $\pm 5\%$, 100V	009-1032	1
C207, C208	Capacitor, Ceramic, 47 pF $\pm 5\%$, 50V	003-4712	2
C209	Capacitor, Ceramic Chip, 1000 pF $\pm 5\%$, 100V	009-1032	1
C212 thru C214	Capacitor, Ceramic Chip, 1000 pF $\pm 5\%$, 100V	009-1032	3
C215, C216	Capacitor, Ceramic Chip, 15 pF $\pm 5\%$, 500V	009-1513	2
D203 thru D205	Diode, HP5082-2800, High Voltage, Schottky Barrier Type, 70V, 15 mA	201-2800	1
L201, L202	Coil, Molded, .11 uH, 1A	364-0011	2
L203, L204	Inductor, Molded, 68 uH	360-0106	2
R204, R205	Resistor, 66.5 Ohm $\pm 1\%$, 1/4W	103-6652	2
R209, R210	Resistor, 1 k Ohm $\pm 1\%$, 1/4W	100-1041	2
—	Blank, Combiner/Directional Coupler Circuit Board, FM-1C	519-0402	1

**TABLE 6-20. RF AMPLIFIER LOGIC CIRCUIT BOARD ASSEMBLY - 919-0403
(Sheet 1 of 3)**

REF. DES.	DESCRIPTION	PART NO.	QTY.
C1	Capacitor, Ceramic Disc, 20 pF $\pm 10\%$, 1kV	002-2013	1
C2	Capacitor, Monolythic Ceramic, .047 uF $\pm 5\%$, 50V	003-4733	1
C3, C4	Capacitor, Monolythic Ceramic, 0.1 uF $\pm 20\%$, 50V	003-1054	2
C5, C6	Capacitor, Monolythic Ceramic, .047 uF $\pm 5\%$, 50V	003-4733	2
C7 thru C10	Capacitor, Monolythic Ceramic, 0.1 uF $\pm 20\%$, 50V	003-1054	4
C11	Capacitor, Monolythic Ceramic, .047 uF $\pm 5\%$, 50V	003-4733	1
C12 thru C14	Capacitor, Ceramic Disc, 20 pF $\pm 10\%$, 1kV	002-2013	3
C15	Capacitor, Monolythic Ceramic, 0.1 uF $\pm 20\%$, 50V	003-1054	1
C16 thru C18	Capacitor, Electrolytic, 10 uF, 35V	023-1076	3
C19	Capacitor, Monolythic Ceramic, 0.1 uF $\pm 20\%$, 50V	003-1054	1
C20	Capacitor, Electrolytic, 10 uF, 35V	023-1076	1
C21	Capacitor, Monolythic Ceramic, 0.1 uF $\pm 20\%$, 50V	003-1054	1
C22	Capacitor, Electrolytic, 10 uF, 35V	023-1076	1
C23, C24	Capacitor, Monolythic Ceramic, 0.1 uF $\pm 20\%$, 50V	003-1054	2
C25, C26	Capacitor, Monolythic Ceramic, .047 uF $\pm 5\%$, 50V	003-4733	2
D1 thru D16	Diode, 1N4148, Silicon, 75V @ 0.3 Amperes	203-4148	1
D17	Diode, Zener, 1N4742A, 12V $\pm 5\%$, 1W	200-4742	1
D18	Diode, 1N5229 4.3V	201-0035	1
D19	Diode, 1N4148, Silicon, 75V @ 0.3 Amperes	203-4148	1

TABLE 6-20. RF AMPLIFIER LOGIC CIRCUIT BOARD ASSEMBLY - 919-0403
(Sheet 2 of 3)

REF. DES.	DESCRIPTION	PART NO.	QTY.
P801	Receptacle, 40-Pin Dual In-line	417-4041	1
Q1 thru Q7	Transistor, MPSA06, NPN, TO-92 Case	211-0006	7
Q8	Transistor, 2N3906, PNP, Silicon, TO-92 Case	210-3906	1
R1	Resistor Network, 5 k Ohm $\pm 1\%$, 1/4W, 16-Pin DIP	226-0500	1
R2	Resistor, 499 k Ohm $\pm 1\%$, 1/4W	103-4996	1
R3	Resistor, 2.74 k Ohm $\pm 1\%$, 1/4W	103-2744	1
R4	Resistor, 499 k Ohm $\pm 1\%$, 1/4W	103-4996	1
R5	Potentiometer, 10 k Ohm $\pm 10\%$, 1/2W	178-1054	1
R6 thru R8	Resistor, 22.1 k Ohm $\pm 1\%$, 1/4W	103-2211	3
R9	Resistor, 162 k Ohm $\pm 1\%$, 1/4W	103-1626	1
R10	Resistor, 22.1 k Ohm $\pm 1\%$, 1/4W	103-2211	1
R11	Potentiometer, 100 Ohm $\pm 10\%$, 1/2W	177-1035	1
R12	Resistor, 499 k Ohm $\pm 1\%$, 1/4W	103-4996	1
R13	Resistor, 2.74 k Ohm $\pm 1\%$, 1/4W	103-2744	1
R14	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	1
R15	Potentiometer, 10 k Ohm $\pm 10\%$ 1/2W	178-1054	1
R16	Resistor, 499 k Ohm $\pm 1\%$, 1/4W	103-4996	1
R17	Resistor, 2.74 k Ohm $\pm 1\%$, 1/4W	103-2744	1
R18	Resistor, 499 k Ohm $\pm 1\%$, 1/4W	103-4996	1
R19	Resistor, 140 Ohm $\pm 1\%$, 1/4W	103-1403	1
R20	Resistor, 499 k Ohm $\pm 1\%$, 1/4W	103-4996	1
R21	Resistor, 510 Ohm $\pm 5\%$, 1/2W	110-5133	1
R22	Resistor, 162 k Ohm $\pm 1\%$, 1/4W	103-1626	1
R23	Resistor, 499 k Ohm $\pm 1\%$, 1/4W	103-4996	1
R24	Resistor, 22.1 k Ohm $\pm 1\%$, 1/4W	103-2211	1
R25	Potentiometer, 10 k Ohm $\pm 10\%$ 1/2W	178-1054	1
R26	Resistor, 2.74 k Ohm $\pm 1\%$, 1/4W	103-2744	1
R27	Resistor, 499 k Ohm $\pm 1\%$, 1/4W	103-4996	1
R28, R29	Resistor, 1 k Ohm $\pm 1\%$, 1/4W	100-1041	2
R30	Resistor, 15.8 k Ohm $\pm 1\%$, 1/4W	103-1585	1
R31, R32	Resistor, 499 k Ohm $\pm 1\%$, 1/4W	103-4996	1
R33	Resistor, 1 k Ohm $\pm 1\%$, 1/4W	100-1041	1
R34	Resistor, 5.11 k Ohm $\pm 1\%$, 1/4W	103-5141	1
R35	Resistor Network, 8-22 k Ohm 1/4W Resistors, 16-Pin DIP	226-2250	1
R36, R37	Resistor, 22.1 k Ohm $\pm 1\%$, 1/4W	103-2211	2
R38	Resistor, 499 k Ohm $\pm 1\%$, 1/4W	103-4996	1
R39, R40	Resistor, 1 k Ohm $\pm 1\%$, 1/4W	100-1041	1
R41, R42	Resistor, 499 k Ohm $\pm 1\%$, 1/4W	103-4996	2
R43	Resistor, 1 k Ohm $\pm 1\%$, 1/4W	100-1041	1
R44, R45	Resistor, 22.1 k Ohm $\pm 1\%$, 1/4W	103-2211	2
R46, R47	Resistor, 1 k Ohm $\pm 1\%$, 1/4W	100-1041	2

TABLE 6-20. RF AMPLIFIER LOGIC CIRCUIT BOARD ASSEMBLY - 919-0403
(Sheet 3 of 3)

REF. DES.	DESCRIPTION	PART NO.	QTY.
R48	Resistor, 7.68 k Ohm $\pm 1\%$, 1/4W	103-7684	1
R49, R50	Resistor, 22.1 k Ohm $\pm 1\%$, 1/4W	103-2211	2
R51	Potentiometer, 20 k Ohm $\pm 10\%$, 1/2W	178-2054	1
R52	Resistor, 162 k Ohm $\pm 1\%$, 1/4W	103-1626	1
R53	Resistor, 1 k Ohm $\pm 1\%$, 1/4W	100-1041	1
R54	Resistor, 47.5 k Ohm $\pm 1\%$, 1/4W	103-4755	1
R55	Resistor, 1 k Ohm $\pm 1\%$, 1/4W	100-1041	1
R56	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	1
R57, R58	Resistor, 1 k Ohm $\pm 1\%$, 1/4W	100-1041	2
R59, R60	Resistor, 51.1 Ohm $\pm 1\%$, 1/4W	103-5112	2
R61 thru R64	Resistor, 5.11 k Ohm $\pm 1\%$, 1/4W	103-5141	4
R65, R66	Resistor, 499 k Ohm, $\pm 1\%$, 1/4W	103-4996	2
R67	Resistor, 100 k Ohm $\pm 1\%$, 1/4W	103-1062	1
R68	Resistor, 16.9 k Ohm $\pm 1\%$, 1/4W	103-1695	1
R69	Resistor, 22.1 k Ohm $\pm 1\%$, 1/4W	103-2211	1
TP1 thru TP3	Terminal, Turret, Double Shoulder	413-1597	3
U1	Integrated Circuit, MPQ3799, Quad Amplifier, PNP, 14-Pin DIP	220-3799	1
U2 thru U6	Integrated Circuit, TLO74CN, Quad JFET-Input Operational Amplifier, 14-Pin DIP	221-0074	5
—	Blank, Logic, RF Amplifier Circuit Board, FM-1C	519-0403	1
—	Sheetmetal Edge Connector, Southco	421-6908	2

TABLE 6-21. OUTPUT COMBINER, FM-1C - 959-0401

REF. DES.	DESCRIPTION	PART NO.	QTY.
—	Connector, Female N to Printed Circuit Board, Panel Mount	417-0321	4
—	Output Combiner Circuit Board	519-0404	1

TABLE 6-22. LOW PASS FILTER ASSEMBLY- 959-0402

REF. DES.	DESCRIPTION	PART NO.	QTY.
—	Receptacle, BNC	417-0016	1
—	Receptacle, Type N	417-0204	1
—	Right Angle Plug-Jack, Type N	417-0105	1
—	Low Pass Filter Main Circuit Board Assembly	919-0405-001	1
—	Low Pass Filter Inductor Circuit Board	519-0409	1

TABLE 6-23. LOW PASS FILTER MAIN CIRCUIT BOARD ASSEMBLY- 919-0405-001

REF. DES.	DESCRIPTION	PART NO.	QTY.
C8	Capacitor, Mica, 390 pF $\pm 5\%$, 100V	042-3922	1
C9	Capacitor, Ceramic, 47 pF $\pm 5\%$, 50V	003-4712	1
C10, C11	Capacitor, Mica, 390 pF $\pm 5\%$, 100V	042-3922	2
C12	Capacitor, Ceramic, 47 pF $\pm 5\%$, 50V	003-4712	1
C13, C14	Capacitor, Mica, 390 pF $\pm 5\%$, 100V	042-3922	2
D1, D2	Diode, HP5082-2800, High Voltage, Schottky Barrier Type, 70V, 15 mA	201-2800	2
J23	Receptacle, Male, 4-Pin In-Line	417-0070	1
L1	Coil	360-0145	1
L2	RF Choke, .68 μ H $\pm 10\%$, 495 mA Maximum, DC Resistance 0.60 Ohms	360-0106	1
L3	RF Choke, 1.5 μ H $\pm 10\%$, 580 mA Maximum, DC Resistance = 0.30 Ohms	360-0032	2
R1 thru R6	Resistor, 453 Ohm $\pm 1\%$, 1/4W	103-4533	6
R7, R8	Resistor, 1 k Ohm $\pm 1\%$, 1/4W	103-1041	2
R9	Resistor, 100 k Ohm $\pm 1\%$, 1/4W	103-1062	1
R10 thru R13	Resistor, 249 Ohm $\pm 1\%$, 1/4W	103-2493	4
R14	Resistor, 1 k Ohm $\pm 1\%$, 1/4W	103-1041	1
R15	Resistor, 100 k Ohm $\pm 1\%$, 1/4W	103-1062	1
—	Blank, Low Pass Filter Main Circuit Board	519-0405-001	1

TABLE 6-24. REJECT LOAD ASSEMBLY, FM-1C - 959-0403

REF. DES.	DESCRIPTION	PART NO.	QTY.
—	Resistor 50 Ohm $\pm 5\%$, 275W	140-0025	1
—	Receptacle, BNC	417-0016	1
—	Reject Load Matching Circuit Board	519-0405-002	1

TABLE 6-25. ACCESSORY PARTS KIT, FM-1C/FM-500C - 979-0400/-0401

REF. DES.	DESCRIPTION	PART NO.	QTY.
—	AC Input Connector, Female, 2 Pole 3 Wire 15 Amp 250V Service	417-0320	1
—	Air Filter, 9 3/4 X 19 3/4 X 3/4 Inches (24.77 X 50.17 X 1.91 cm)	407-0162	2

TABLE 6-26. LOCAL CONTROL DISABLE OPTION - 909-0137
(Sheet 1 of 2)

REF. DES.	DESCRIPTION	PART NO.	QTY.
—	Switch, Miniature Toggle, SPDT, 5A @ 120V ac or 2A @ 250V	348-7101	1

TABLE 6-26. LOCAL CONTROL DISABLE OPTION - 909-0137
(Sheet 2 of 2)

REF. DES.	DESCRIPTION	PART NO.	QTY.
—	Plug, Housing, 2-Pin	417-0499	1
—	Receptacle, Male, 2-Pin In-Line	417-4004	1

SECTION VII DRAWINGS

7-1. INTRODUCTION.

- 7-2. This section provides schematic and assembly diagrams as indexed below for the Broadcast Electronics FM-1C/FM-500C transmitters. For transmitters equipped with Revision A Remote Control Systems, use the drawings presented in the Revision A Remote Control System section.

FIGURE	TITLE	NUMBER
7-1	OVERALL SCHEMATIC DIAGRAM, FM-1 TRANSMITTER	SD909-1001-204
7-2	OVERALL SCHEMATIC DIAGRAM, FM-500C TRANSMITTER	SD909-0501-204 /-254
7-3	SCHEMATIC DIAGRAM, MOTHERBOARD	SC919-0400/-001
7-4	ASSEMBLY DIAGRAM, MOTHERBOARD	AC919-0400/-001
7-5	SCHEMATIC DIAGRAM, CONTROLLER CIRCUIT BOARD	SC919-0407-001
7-6	SCHEMATIC DIAGRAM, CONTROLLER RFI FILTER CIRCUIT BOARD	SC919-0407-002
7-7	ASSEMBLY DIAGRAM, CONTROLLER / RFI CIRCUIT BOARDS	AD919-0407-001 /-002
7-8	SCHEMATIC DIAGRAM, CONTROL ON-OFF SWITCH CIRCUIT BOARD	SC919-0406-001
7-9	SCHEMATIC DIAGRAM, CONTROLLER METER DISPLAY	SC919-0406-002
7-10	SCHEMATIC DIAGRAM, CONTROLLER METER SWITCH	SC919-0406-003
7-11	SCHEMATIC DIAGRAM, REMOTE INTERFACE BARRIER STRIP	SB919-0406-004
7-12	SCHEMATIC DIAGRAM, TEMPERATURE SENSOR	SA919-0406-005
7-13	ASSEMBLY DIAGRAM, CONTROL CIRCUIT BOARDS	AD919-0406-001 /-005
7-14	SCHEMATIC DIAGRAM, RF POWER MODULE	SD959-0400
7-15	ASSEMBLY DIAGRAM, RF AMPLIFIER CIRCUIT BOARD	AD919-0401
7-16	ASSEMBLY DIAGRAM, COMBINER/DIRECTIONAL COUPLER	AC919-0402
7-17	SCHEMATIC DIAGRAM, RF AMPLIFIER LOGIC CIRCUIT BOARD	SD919-0403
7-18	ASSEMBLY DIAGRAM, RF AMPLIFIER LOGIC CIRCUIT BOARD	AB919-0403
7-19	SCHEMATIC DIAGRAM, LOW-PASS FILTER ASSEMBLY	SB959-0402
7-20	ASSEMBLY DIAGRAM, LOW-PASS FILTER MAIN CIRCUIT BOARD	AD919-0405-001

- J703 <--> J601
- 1 GND
 - 2 PA2 MUTE
 - 3 PA2 -15V
 - 4 PA2 LOGIC GND
 - 5 PA2 +15V
 - 6 PA2 FAULT RESET
 - 7 PA1 LOGIC GND
 - 8 PA1 -15V
 - 9 PA1 +15V
 - 10 PA1 FAULT RESET
 - 11 PA1 MUTE
 - 12 GND
 - 13 PA2 FOLDBACK STATUS
 - 14 PA2 FAULT STATUS
 - 15 PA2 MODULE CURRENT
 - 16 PA2 POWER LEVEL CONTROL
 - 17 PA2 FORWARD POWER SAMPLE
 - 18 PA2 METERING SAMPLE
 - 19 PA1 MODULE CURRENT
 - 20 PA1 POWER LEVEL CONTROL
 - 21 PA1 FORWARD POWER SAMPLE
 - 22 PA1 FAULT STATUS
 - 23 PA1 FOLDBACK STATUS
 - 24 GND
 - 25
 - 26

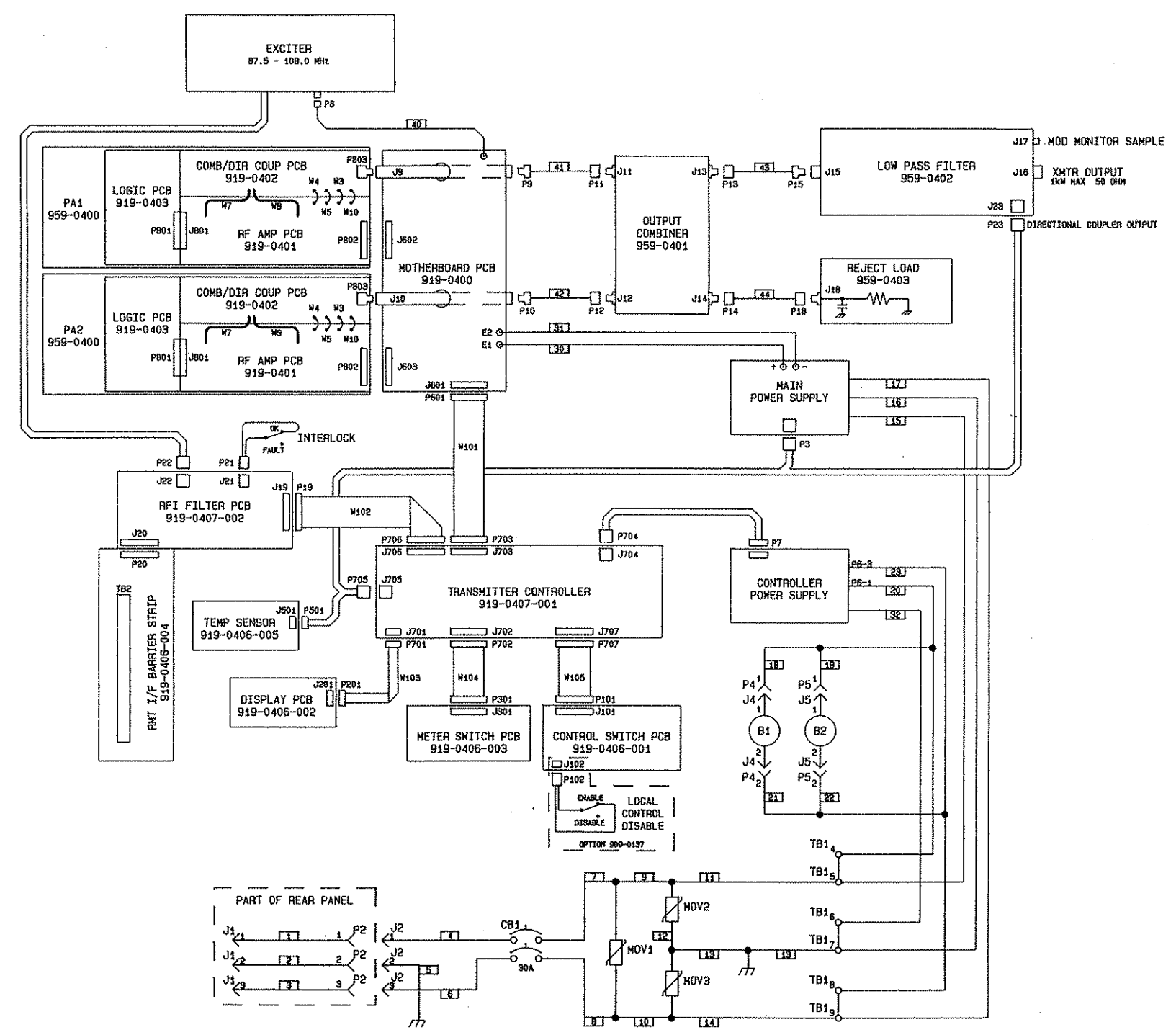
- J706 <--> J19
- 1 FORWARD MTR
 - 2 REFLECTED MTR
 - 3 PA VOLTAGE
 - 4 TEMPERATURE MTR
 - 5 PA1 FORWARD MTR
 - 6 PA1 CURRENT MTR
 - 7 PA2 FORWARD MTR
 - 8 PA2 CURRENT MTR
 - 9 ON STATUS
 - 10 OFF STATUS
 - 11 FAULT STATUS
 - 12 RMT ON CHD
 - 13 RMT OFF CHD
 - 14 RMT RAISE CHD
 - 15 RMT LOWER CHD
 - 16 RMT RESET CHD
 - 17 FAILSAFE
 - 18 INTERLOCK
 - 19 ENABLE EXCITER
 - 20 +15V
 - 21 GND
 - 22 GND
 - 23 GND
 - 24 GND
 - 25
 - 26

- J702 <--> J301
- 1 FAILSAFE
 - 2 RMT OFF CHD
 - 3 RMT ON CHD
 - 4 INTERLOCK
 - 5 GND
 - 6 +15V
 - 7 REMOTE CONTROL DISABLE
 - 8 TEMPERATURE
 - 9 PA1 FORWARD POWER
 - 10 PA1 CURRENT
 - 11 PA2 FORWARD POWER
 - 12 PA2 CURRENT
 - 13
 - 14
 - 15
 - 16 METER SAMPLE
 - 17 +15V
 - 18 DECIMAL POINT ENABLE
 - 19 GND
 - 20 REMOTE CONTROL DISABLE
 - 21 +15V
 - 22
 - 23
 - 24
 - 25
 - 26

- J707 <--> J101
- 1 FAILSAFE
 - 2 RMT OFF CHD
 - 3 RMT ON CHD
 - 4 INTERLOCK
 - 5 GND
 - 6 +15V
 - 7 REMOTE CONTROL DISABLE
 - 8 TEMPERATURE
 - 9 PA1 FORWARD POWER
 - 10 PA1 CURRENT
 - 11 PA2 FORWARD POWER
 - 12 PA2 CURRENT
 - 13
 - 14
 - 15
 - 16
 - 17 APC LOCK
 - 18 GND
 - 19 +15V
 - 20 ENABLE EXCITER
 - 21 MUTE POWER SUPPLY
 - 22 MUTE PA1
 - 23 MUTE PA2
 - 24 ON STATUS
 - 25 OFF STATUS
 - 26 LOWER

- J701 <--> J201
- 1 GND
 - 2 GND
 - 3 GND
 - 4 ANALOG METER SAMPLE
 - 5 GND
 - 6 DECIMAL POINT ENABLE
 - 7 GND
 - 8 +15V
 - 9 GND
 - 10 +15V

FROM	SIGNAL	TO	WIRE
P7 - 1	+15V	J704 - 1	26
P7 - 2	+15V	J704 - 3	27
P7 - 4	GND	J704 - 2	28
P7 - 6	-15V	J704 - 4	29
J705 - 1	FWD PWR SAMPLE	J23 - 1	33
J705 - 2	GND	J23 - 3	34
J705 - 3	RFL PWR SAMPLE	J23 - 4	35
J705 - 4	+15V	J501 - 1	36
J705 - 5	TEMP SAMPLE	J501 - 2	37
J705 - 6	GND	J501 - 4	38
J705 - 7	MUTE P.S.	P3 - 6	24
J22 - 1	ENABLE EXCITER	EXCITER	51
J22 - 2	APC LOCK	EXCITER	52
J22 - 3	GND	EXCITER	53



J703 <--> J601

- 1 GND
- 2 PA2 MUTE
- 3 PA2 -15V
- 4 PA2 LOGIC GND
- 5 PA2 +15V
- 6 PA2 FAULT RESET
- 7 PA1 -15V
- 8 PA1 LOGIC GND
- 9 PA1 +15V
- 10 PA1 FAULT RESET
- 11 PA1 MUTE
- 12 GND
- 13 PA2 FOLDBACK STATUS
- 14 PA2 FAULT STATUS
- 15 PA2 MODULE CURRENT
- 16 PA2 POWER LEVEL CONTROL
- 17 PA2 FORWARD POWER SAMPLE
- 18 PA2 METERING SAMPLE
- 19 PA1 MODULE CURRENT
- 20 PA1 POWER LEVEL CONTROL
- 21 PA1 FORWARD POWER SAMPLE
- 22 PA1 FAULT STATUS
- 23 PA1 FOLDBACK STATUS
- 24 GND
- 25
- 26

J706 <--> J19

- 1 FORWARD MTR
- 2 REFLECTED MTR
- 3 PA VOLTAGE
- 4 TEMPERATURE MTR
- 5 PA1 FORWARD MTR
- 6 PA1 CURRENT MTR
- 7 PA2 FORWARD MTR
- 8 PA2 CURRENT MTR
- 9 ON STATUS
- 10 OFF STATUS
- 11 FAULT STATUS
- 12 RMT ON CMD
- 13 RMT OFF CMD
- 14 RMT RAISE CMD
- 15 RMT LOWER CMD
- 16 RMT RESET CMD
- 17 FAILSAFE
- 18 INTERLOCK
- 19 ENABLE EXCITER
- 20 +5V
- 21 GND
- 22 GND
- 23 GND
- 24 GND
- 25
- 26

J702 <--> J301

- 1 PA1 FORWARD POWER
- 2 PA2 FORWARD POWER
- 3 FORWARD POWER
- 4 REFLECTED POWER
- 5 POWER SUPPLY VOLTAGE
- 6 TEMPERATURE
- 7 PA1 FORWARD POWER
- 8 PA1 CURRENT
- 9 PA2 FORWARD POWER
- 10 PA2 CURRENT
- 11 GND
- 12 GND
- 13 GND
- 14 GND
- 15 METER SAMPLE
- 16 +15V
- 17 DECIMAL POINT ENABLE
- 18 GND
- 19 REMOTE CONTROL DISABLE
- 20 +5V
- 21 GND
- 22 GND
- 23 GND
- 24 GND
- 25 GND
- 26

J707 <--> J101

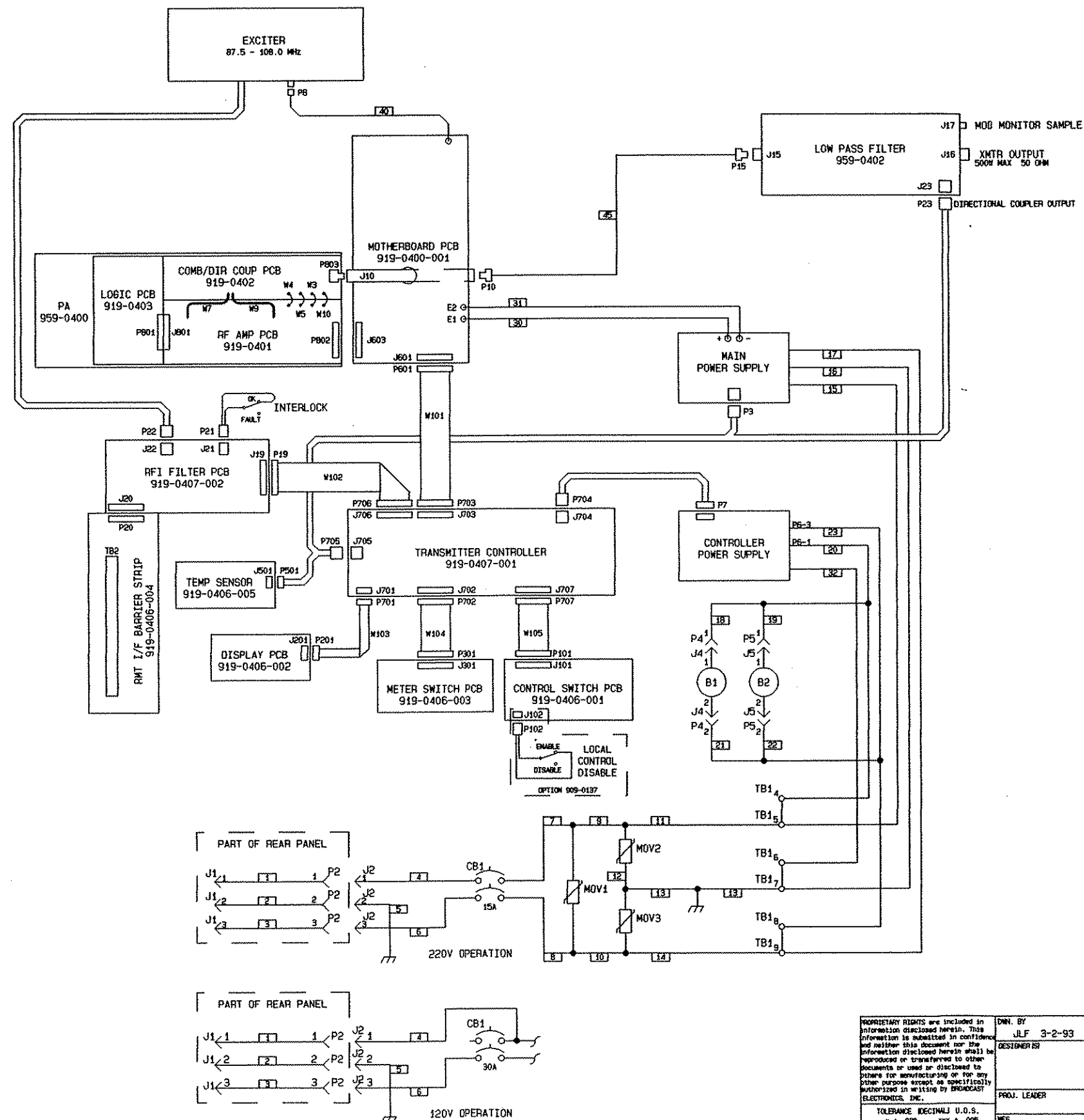
- 1 FAILSAFE
- 2 RMT OFF CMD
- 3 RMT ON CMD
- 4 INTERLOCK
- 5 GND
- 6 +15V
- 7 REMOTE CONTROL DISABLE
- 8 PA2 FAULT RESET
- 9 PA1 FAULT RESET
- 10 FAULT RESET INDICATOR
- 11
- 12
- 13 RAISE
- 14 RMT RESET CMD
- 15
- 16
- 17 APC LOCK
- 18 GND
- 19 +15V
- 20 ENABLE EXCITER
- 21 MUTE POWER SUPPLY
- 22 MUTE PA1
- 23 MUTE PA2
- 24 ON STATUS
- 25 OFF STATUS
- 26 LOWER

J701 <--> J201

- 1 GND
- 2 GND
- 3 ANALOG METER SAMPLE
- 4 GND
- 5 DECIMAL POINT ENABLE
- 6 GND
- 7 +5V
- 8 GND
- 9 GND
- 10 +5V

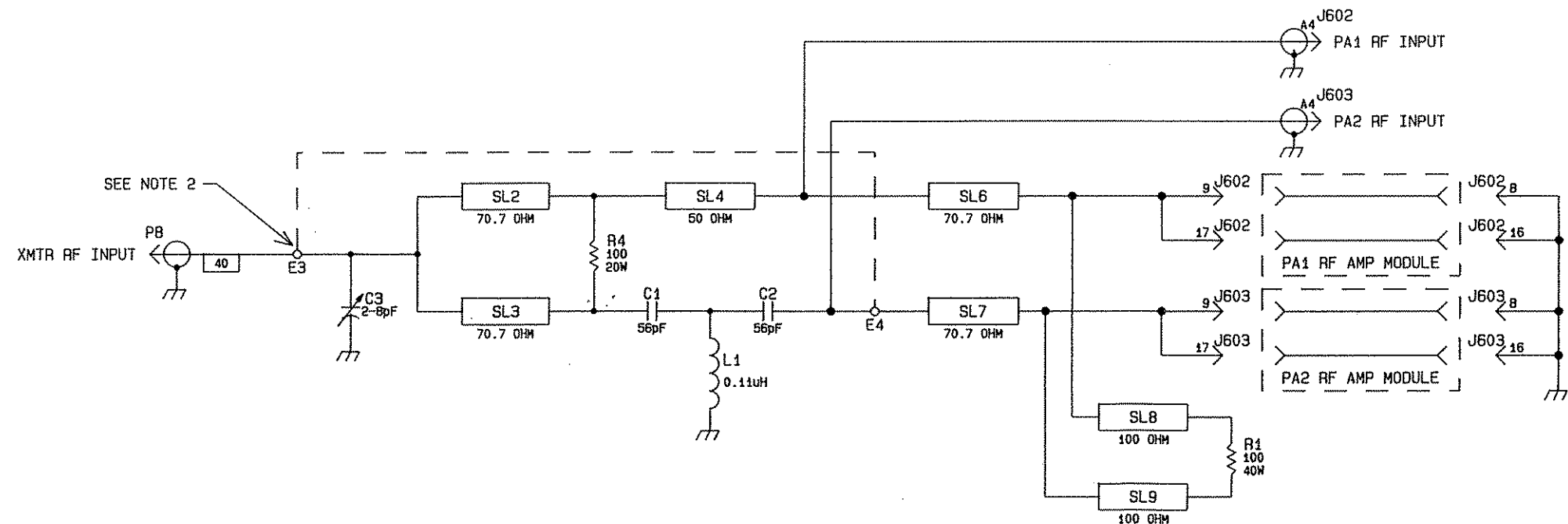
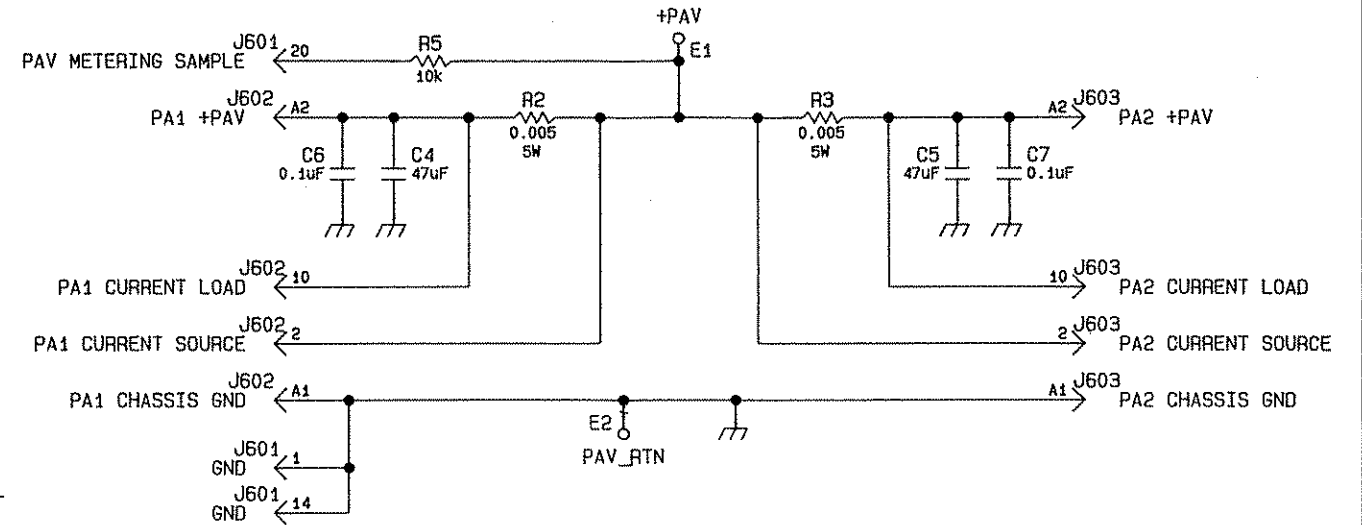
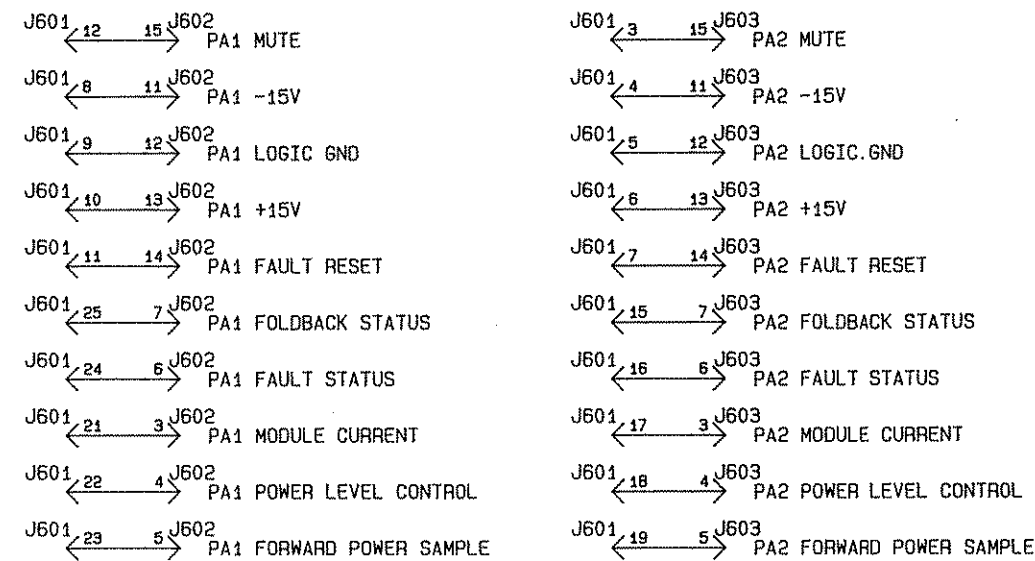
FROM	SIGNAL	TO	WIRE
P7 - 1	+15V	J704 - 1	26
P7 - 2	+5V	J704 - 3	27
P7 - 4	GND	J704 - 2	28
P7 - 5	-15V	J704 - 4	29
J705 - 1	FWD PWR SAMPLE	J23 - 1	33
J705 - 2	GND	J23 - 3	34
J705 - 3	REF PWR SAMPLE	J23 - 4	35
J705 - 4	+15V	J501 - 1	36
J705 - 5	TEMP SAMPLE	J501 - 2	37
J705 - 6	GND	J501 - 4	38
J705 - 7	MUTE P.S.	P3 - 6	24
J22 - 1	ENABLE EXCITER	EXCITER	51
J22 - 2	APC LOCK	EXCITER	52
J22 - 3	GND	EXCITER	53

COPYRIGHT © 1993 BROADCAST ELECTRONICS, INC.



COPYRIGHT © 1993 BROADCAST ELECTRONICS, INC.

PROPRIETARY RIGHTS are included in information disclosed herein. This information is submitted in confidence and neither this document nor the information disclosed herein shall be reproduced or transferred to other documents or used or disclosed to others for manufacturing or for any other purpose except as specifically authorized in writing by BROADCAST ELECTRONICS, INC.	DWN. BY JLF 3-2-93	MATERIAL FINISH SEE DWG DAS92-0000 NEXT ASSY.	BROADCAST ELECTRONICS, INC. 4100 N. 24TH ST., P.O. BOX 3005 QUINCY, IL 62305 217/224-9900 TELEX 250142 CABLE BROADCAST FAX 217/224-9507
	DESIGNER PROJ. LEADER MFG.	TITLE FM-500C OVERALL SCHEMATIC TYPE SIZE (DWG. NO.) S/B 909-0501-204/254 MODEL FM-500C SCALE N/A SHEET 1 OF 1	TOLERANCE (DECIMAL) U.O.S. .X ± .030 .XXX ± .005 .XX ± .015 ANGLES ± .1°

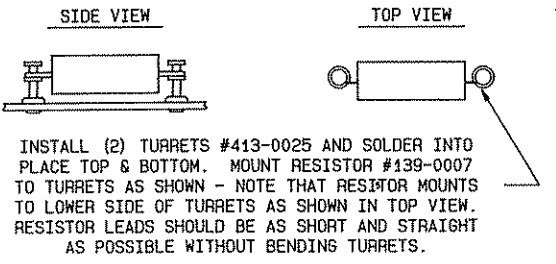
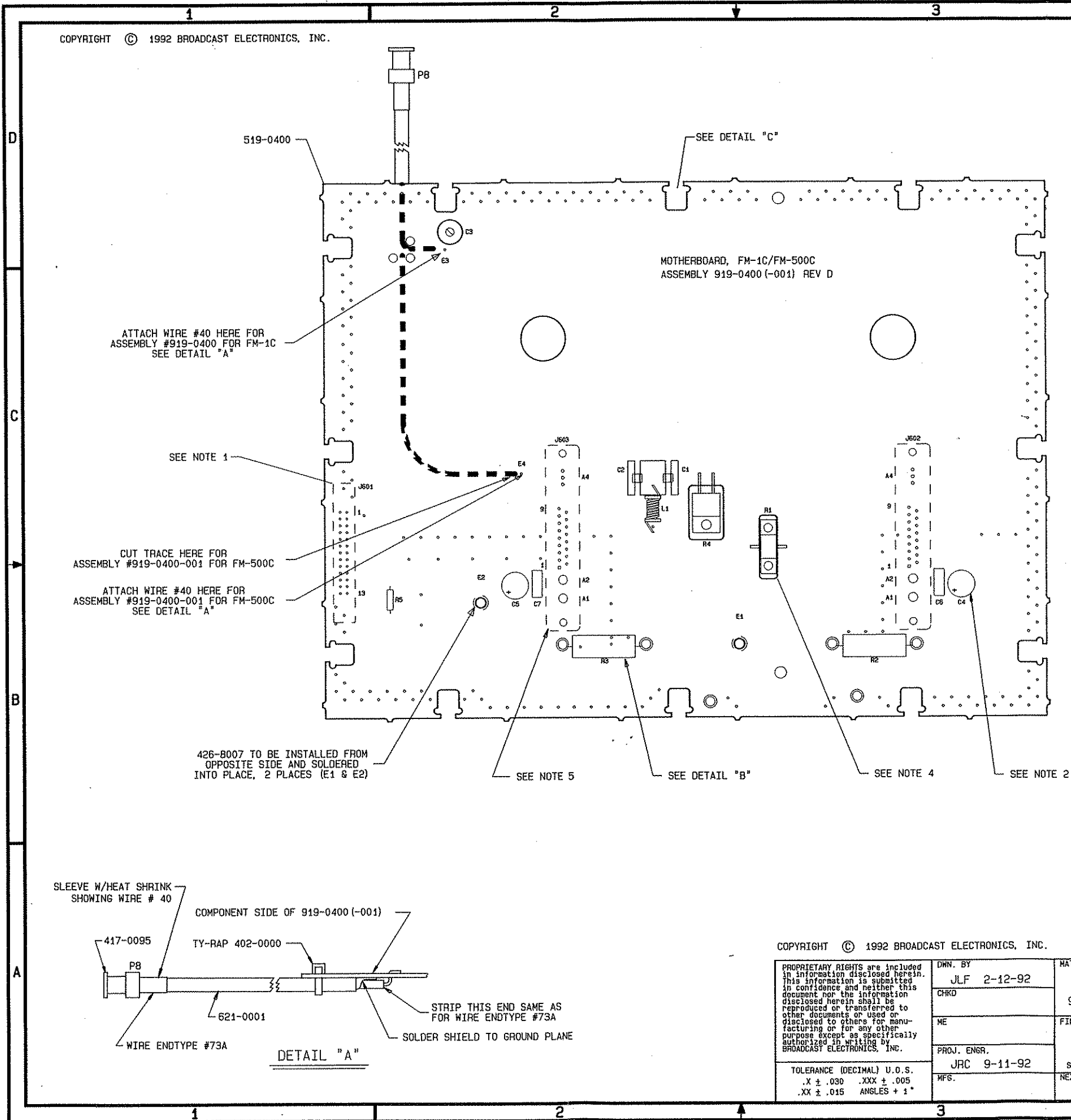


NOTES:

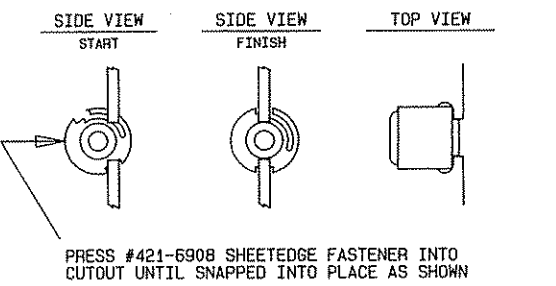
- "SL" DESIGNATES STRIPLINE ETCHED ON PCB.
- FOR FM-1C (919-0400) CONNECT WIRE #40 TO E3.
FOR FM-500C (919-0400-001) CUT TRACE BETWEEN E4 & SL7; THEN CONNECT WIRE #40 TO E4.
- COMPONENTS C1-C4, C6, J602, R1, R2, R4, & L1 NOT INSTALLED ON ASSEMBLY 919-0400-001 FOR FM-500C.
- SEE ASSEMBLY: AC919-0400 (-001)

COPYRIGHT © 1992 BROADCAST ELECTRONICS, INC.

PROPRIETARY RIGHTS are included in information disclosed herein. This information is submitted in confidence and neither this document nor the information disclosed herein shall be reproduced or transferred to other documents or used or disclosed to others for manufacturing or for any other purpose except as specifically authorized in writing by BROADCAST ELECTRONICS, INC.		DWN. BY JLF 3-30-92 CHKD ME PROJ. ENGR. 9/11/92 HF6	MATERIAL FINISH SEE DWS RA592-0000 NEXT ASSY.	BROADCAST ELECTRONICS, INC. 4100 N. 24TH ST., P.O. BOX 3606 QUINCY, IL, 62305 217/224-9600 TELEX 250142 CABLE BROADCAST FAX 217/224-9607
TITLE SCHEMATIC MOTHERBOARD				
TYPE SIZE DWS. NO. S C 919-0400 (-001)		REV C		
MODEL FM-1C/FM-500C		SCALE NONE SHEET 1 OF 1		




DETAIL "B"
2 PLCS (R2, R3)



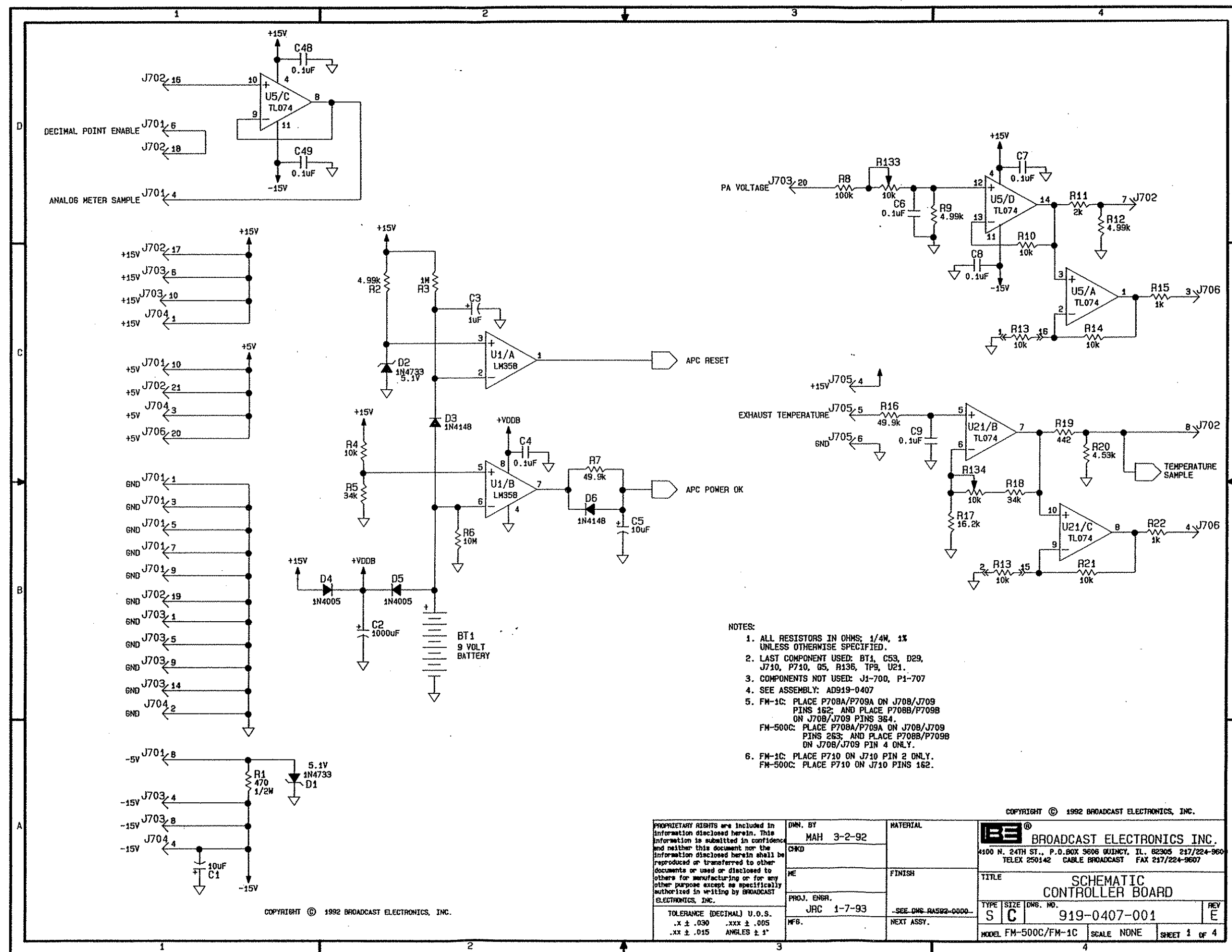
DETAIL "C"
12 PLCS

- NOTES:
1. COMPONENTS SHOWN WITH DASHED LINES TO BE INSTALLED ON OPPOSITE SIDE.
 2. COMPONENTS C1-C4, C6, J602, R1, R2, R4, & L1 NOT INSTALLED ON ASSEMBLY # 919-0400-001 FOR FM-500C.
 3. SEE SCHEMATIC: SC919-0400 (-001)
 4. R1 & R4 TO BE INSTALLED DURING TRANSMITTER FINAL ASSEMBLY.
 5. MOUNT J602/J603 TO PCB WITH:
QTY (2) EACH #423-4002 SPLIT
QTY (2) EACH #441-0187 STIFF
BEFORE SOLDERING INTO PLACE.


PROPRIETARY RIGHTS are included in information disclosed herein. This information is submitted in confidence and neither this document nor the information disclosed herein shall be reproduced or transferred to other documents or used or disclosed to others for manufacturing or for any other purpose except as specifically authorized in writing by BROADCAST ELECTRONICS, INC.	DWN. BY	MATERIAL	 BROADCAST ELECTRONICS INC. 4100 N. 24TH ST. P. O. BOX 3606 QUINCY, IL. 62305 PH. 217/224-9600 TELEX 250142 CABLE BROADCAST FAX 217/224-9607
	JLF 2-12-92	SEE BOM 919-0400 919-0400-001	
	CHKD		
	ME	FINISH ----	
	PROJ. ENGR.		
JRC 9-11-92	SEE DWG RA592-0000		
MFG.	NEXT ASSY.		
TOLERANCE (DECIMAL) U.O.S. .X ± .030 .XXX ± .005 .XX ± .015 ANGLES ± 1°			

TITLE		PCB ASSEMBLY MOTHERBOARD		
TYPE	SIZE	DWG No.	919-0400 919-0400-001	REV D
A	C			
MODEL		FM-1C FM-500C	SCALE 1:1	SHEET 1 OF 1

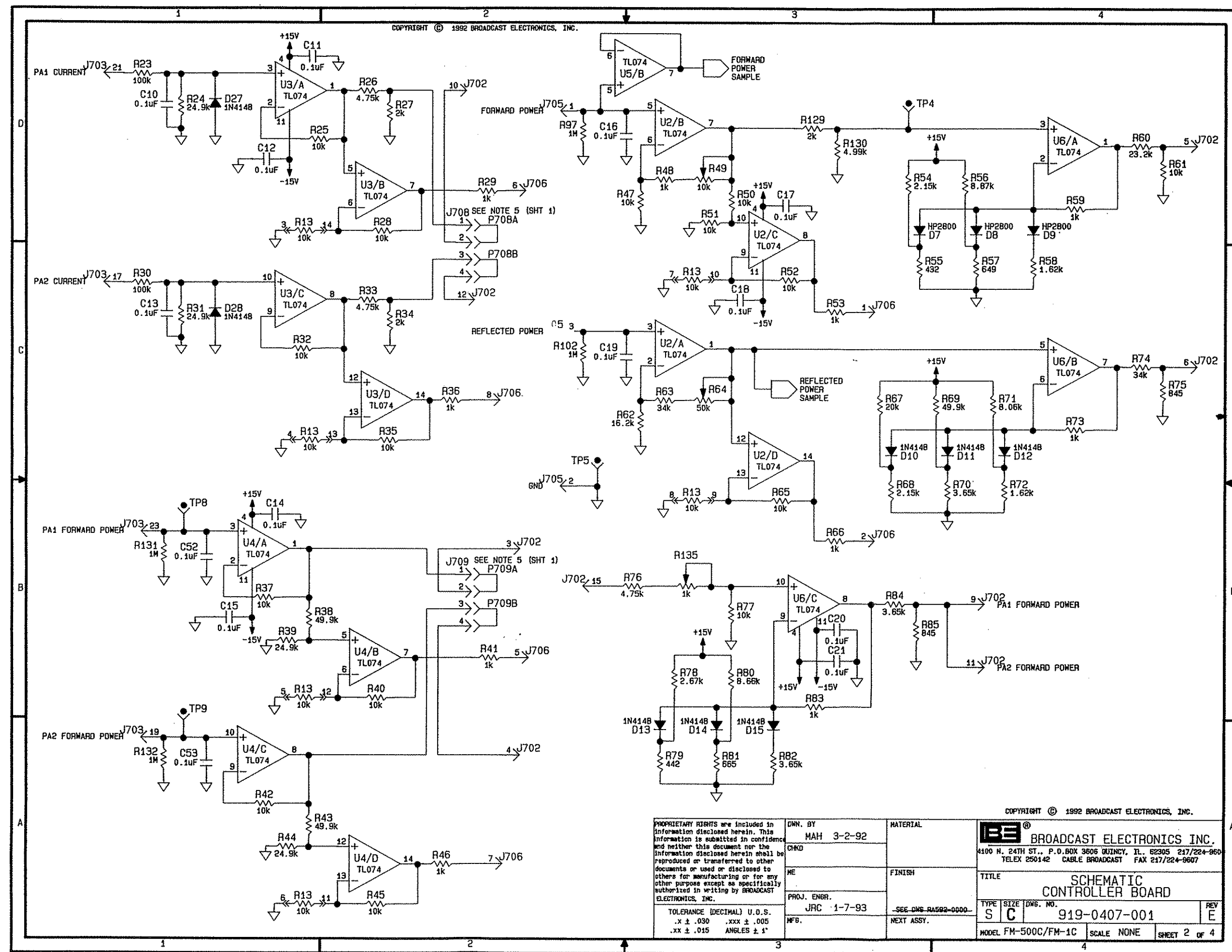
TOLERANCE (DECIMAL) U.O.S.
.X ± .030 .XXX ± .005
.XX ± .015 ANGLES ± 1°



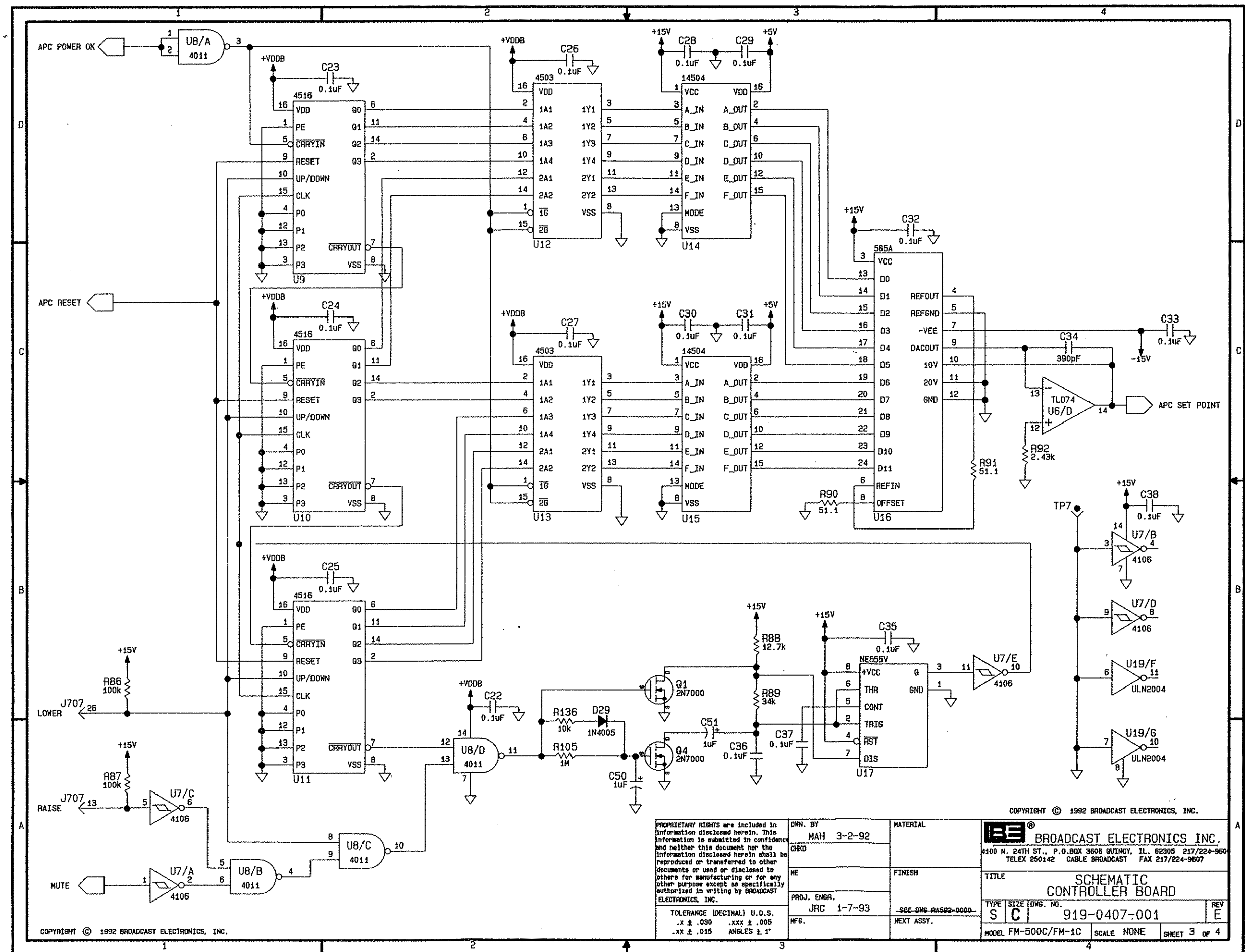
COPYRIGHT © 1992 BROADCAST ELECTRONICS, INC.

PROPRIETARY RIGHTS are included in information disclosed herein. This information is submitted in confidence and neither this document nor the information disclosed herein shall be reproduced or transferred to other documents or used or disclosed to others for manufacturing or for any other purpose except as specifically authorized in writing by BROADCAST ELECTRONICS, INC.	DWN. BY	MAH 3-2-92	MATERIAL		 BROADCAST ELECTRONICS INC. 4100 N. 24TH ST., P.O. BOX 3606 QUINCY, IL. 62305 217/224-9606 TELEX 250142 CABLE BROADCAST FAX 217/224-9607	
	CHKD		FINISH		TITLE SCHEMATIC CONTROLLER BOARD	
	ME		PROJ. ENGR.		TYPE SIZE DWS. NO. REV	
	JRC 1-7-93	SEE DWS RA592-0000		S C 919-0407-001 E		
TOLERANCE (DECIMAL) U.O.S. .X ± .030 .XXX ± .005 .XX ± .015 ANGLES ± 1°	HF6.	NEXT ASSY.		MODEL FM-500C/FM-1C SCALE NONE SHEET 1 OF 4		

COPYRIGHT © 1992 BROADCAST ELECTRONICS, INC.



PROPRIETARY RIGHTS are included in information disclosed herein. This information is submitted in confidence and neither this document nor the information disclosed herein shall be reproduced or transferred to other documents or used or disclosed to others for manufacturing or for any other purpose except as specifically authorized in writing by BROADCAST ELECTRONICS, INC.				DWN. BY MAH 3-2-92		MATERIAL		BROADCAST ELECTRONICS INC. 4100 N. 24TH ST., P.O. BOX 3606 QUINCY, IL. 62305 217/224-8607 TELEX 250142 CABLE BROADCAST FAX 217/224-8607	
TOLERANCE (DECIMAL) U.S.S. .X ± .030 .XXX ± .005 .XX ± .015 ANGLES ± 1°				FINISH		TITLE SCHEMATIC CONTROLLER BOARD		TYPE SIZE DWG. NO. S C 919-0407-001	
NEXT ASSY.				REV E		MODEL FM-500C/FM-1C		SCALE NONE SHEET 2 OF 4	



Copyright © 1992 Broadcast Electronics, Inc.

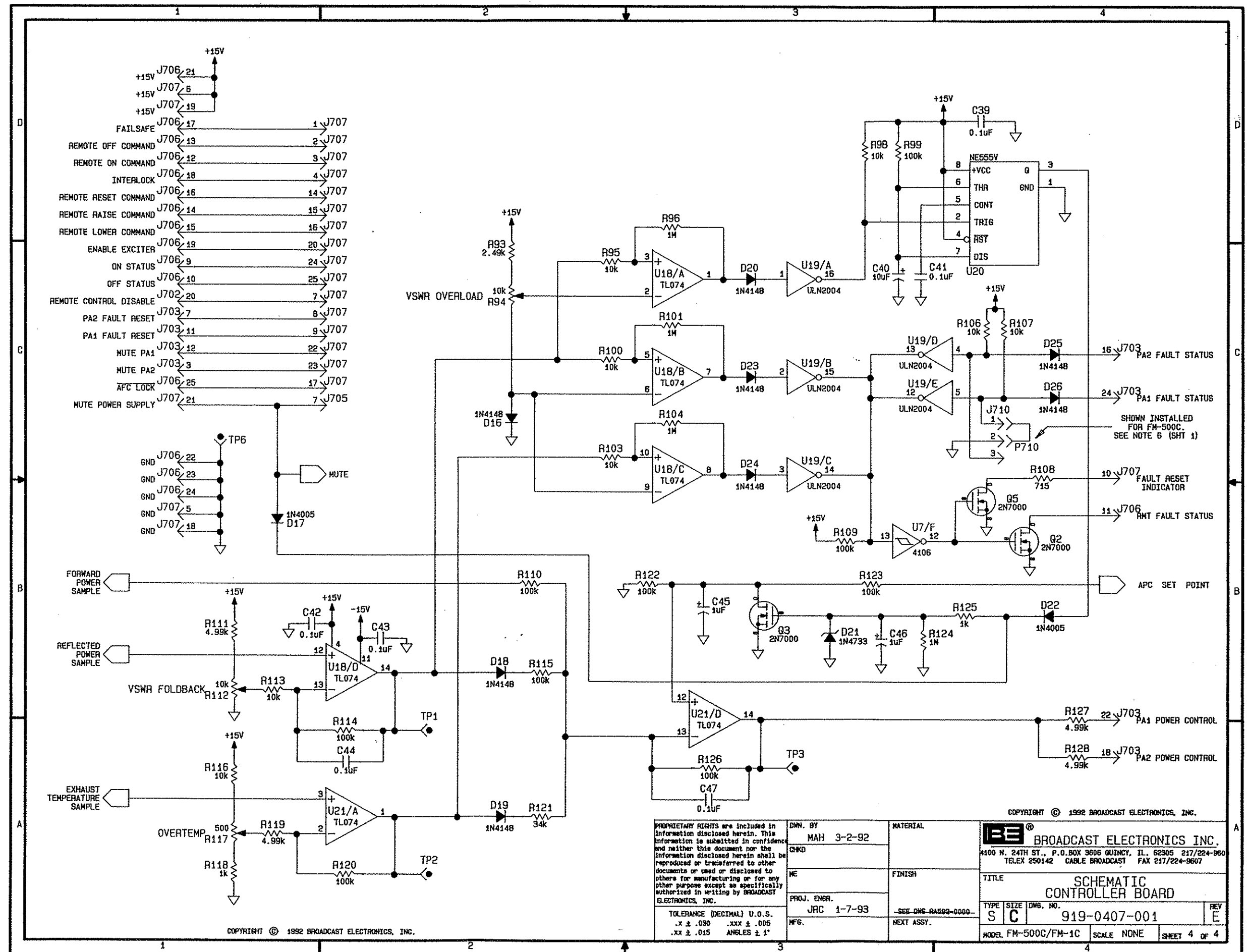
PROPRIETARY RIGHTS are included in information disclosed herein. This information is submitted in confidence and neither this document nor the information disclosed herein shall be reproduced or transferred to other documents or used or disclosed to others for manufacturing or for any other purpose except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

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

OWN. BY
 MAH 3-2-92
 CHKD
 ME
 PROJ. ENGR.
 JRC 1-7-93
 MFG.

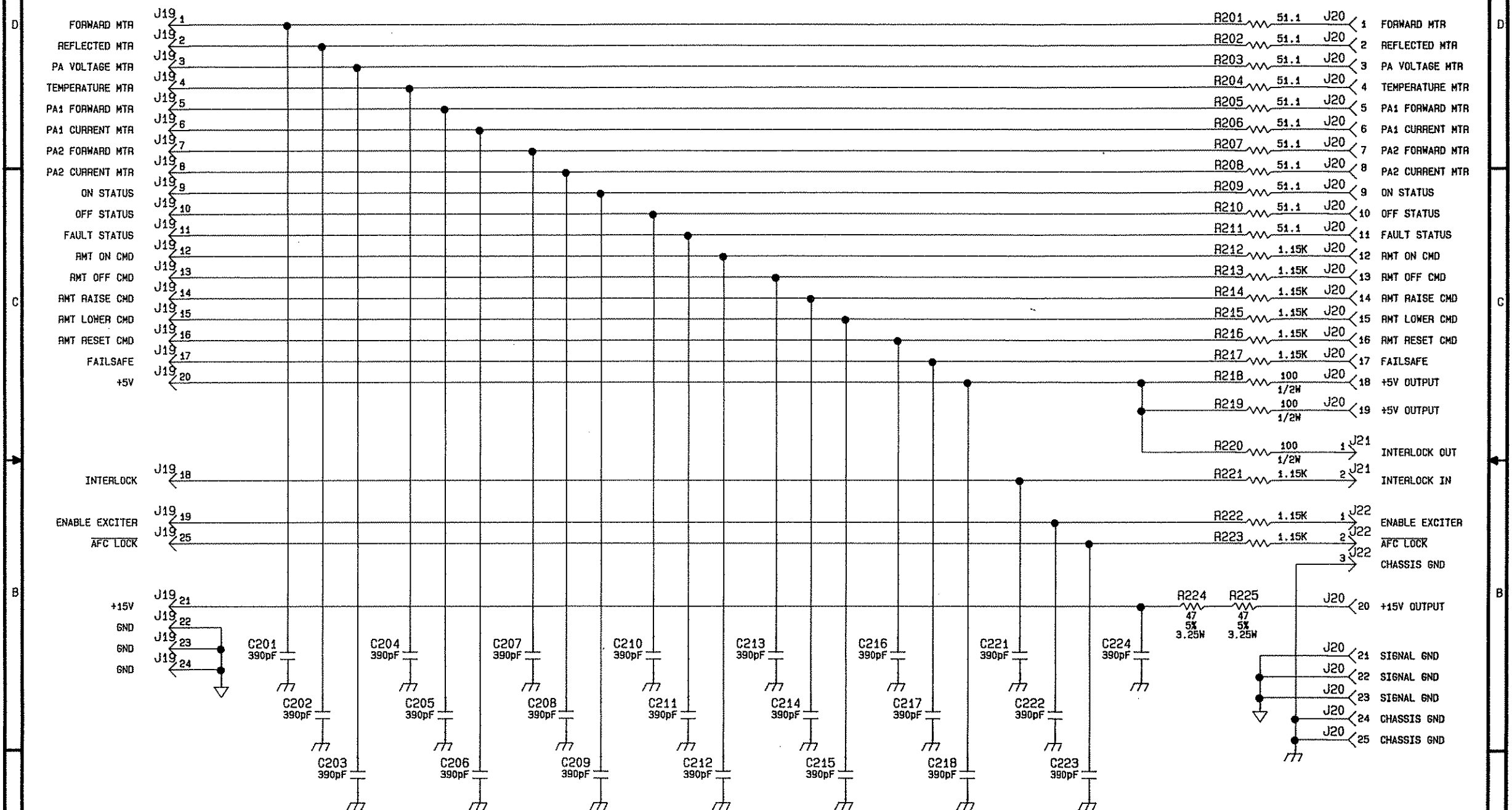
MATERIAL
 FINISH
 -SEE DWG. RA592-0000-
 NEXT ASSY.

COPYRIGHT © 1992 BROADCAST ELECTRONICS, INC.
BE BROADCAST ELECTRONICS, INC.
 4100 N. 24TH ST., P.O. BOX 3605 QUINCY, IL. 62305 217/224-9600
 TELEX 250142 CABLE BROADCAST FAX 217/224-9607
 TITLE
 SCHEMATIC
 CONTROLLER BOARD
 TYPE SIZE DWS. NO. REV
 S C 919-0407-001 E
 MODEL FM-500C/FM-1C SCALE NONE SHEET 3 OF 4



PROPRIETARY RIGHTS are included in information disclosed herein. This information is submitted in confidence and neither this document nor the information disclosed herein shall be reproduced or transferred to other documents or used or disclosed to others for manufacturing or for any other purpose except as specifically authorized in writing by BROADCAST ELECTRONICS, INC.		DWN. BY MAH 3-2-92	MATERIAL	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
		CHKD		
		HE	FINISH	TITLE SCHEMATIC CONTROLLER BOARD
		PROJ. ENGR. JRC 1-7-93		
TOLERANCE (DECIMAL) U.O.S. .X ± .030 .XXX ± .005 .XX ± .015 ANGLES ± 1°		WF6.	SEE DWS-RA502-0000 NEXT ASSY.	TYPE SIZE DWS. NO. S C 919-0407-001
				MODEL FM-500C/FM-1C SCALE NONE SHEET 4 OF 4

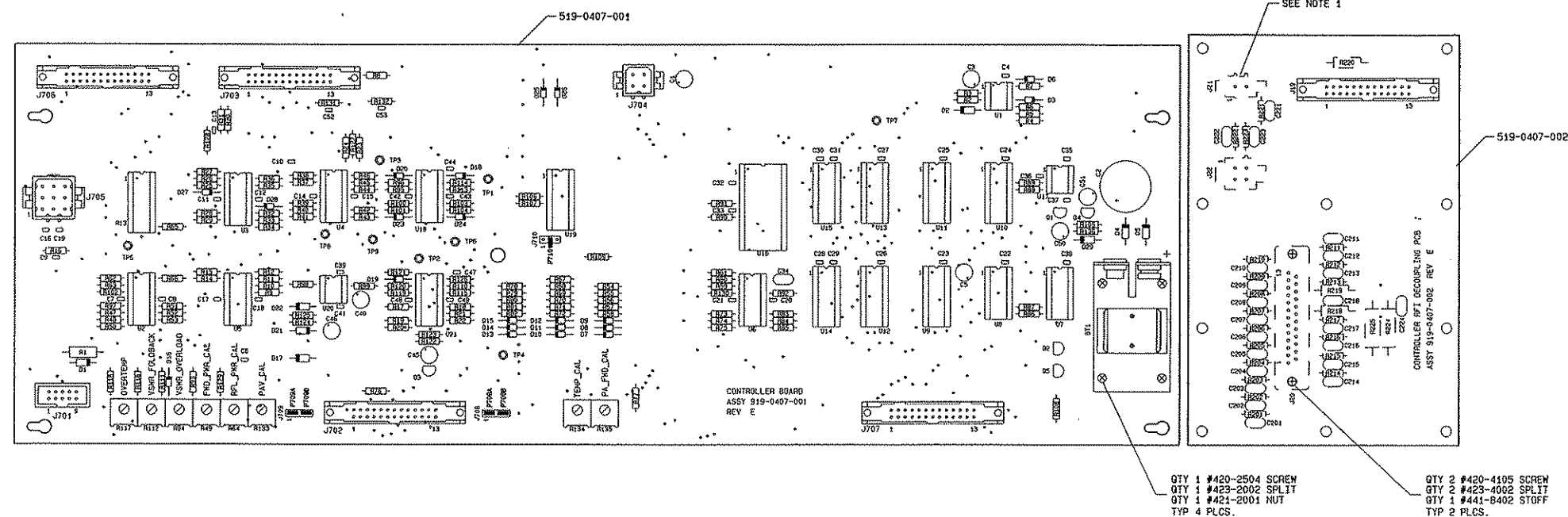
COPYRIGHT © 1992 BROADCAST ELECTRONICS, INC.



NOTES:

1. ALL RESISTORS IN OHMS; 1/4W, 1%, UNLESS OTHERWISE SPECIFIED.
2. LAST COMPONENT USED: C224, J22, R225
3. COMPONENTS NOT USED: C219, C220, J1-J18
4. SEE ASSEMBLY: AD919-0407

PROPRIETARY RIGHTS are included in information disclosed herein. This information is submitted in confidence and neither this document nor the information disclosed herein shall be reproduced or transferred to other documents or used or disclosed to others for manufacturing or for any other purpose except as specifically authorized in writing by BROADCAST ELECTRONICS, INC.		DWN. BY JLF 7-29-92	MATERIAL SEE BOM 919-0407-002	BROADCAST ELECTRONICS, INC. 4100 N. 24TH ST., P.O. BOX 3606 QUINCY, IL. 62305 217/224-9607 TELEX 250142 CABLE BROADCAST FAX 217/224-9607	
TOLERANCE (DECIMAL) U.O.S. .X ± .030 .XXX ± .005 .XX ± .015 ANGLES ± 1°		CHND	FINISH SEE ONE RA592-0000	TITLE SCHEMATIC CONTROLLER RFI DECOUPLING	
PRD. ENGR. JRC 1-11-93		HE	TYPE S	SIZE C	DWG. NO. 919-0407-002
MFG.		REV.	MODEL FM-1C	SCALE NONE	SHEET 1 OF 1

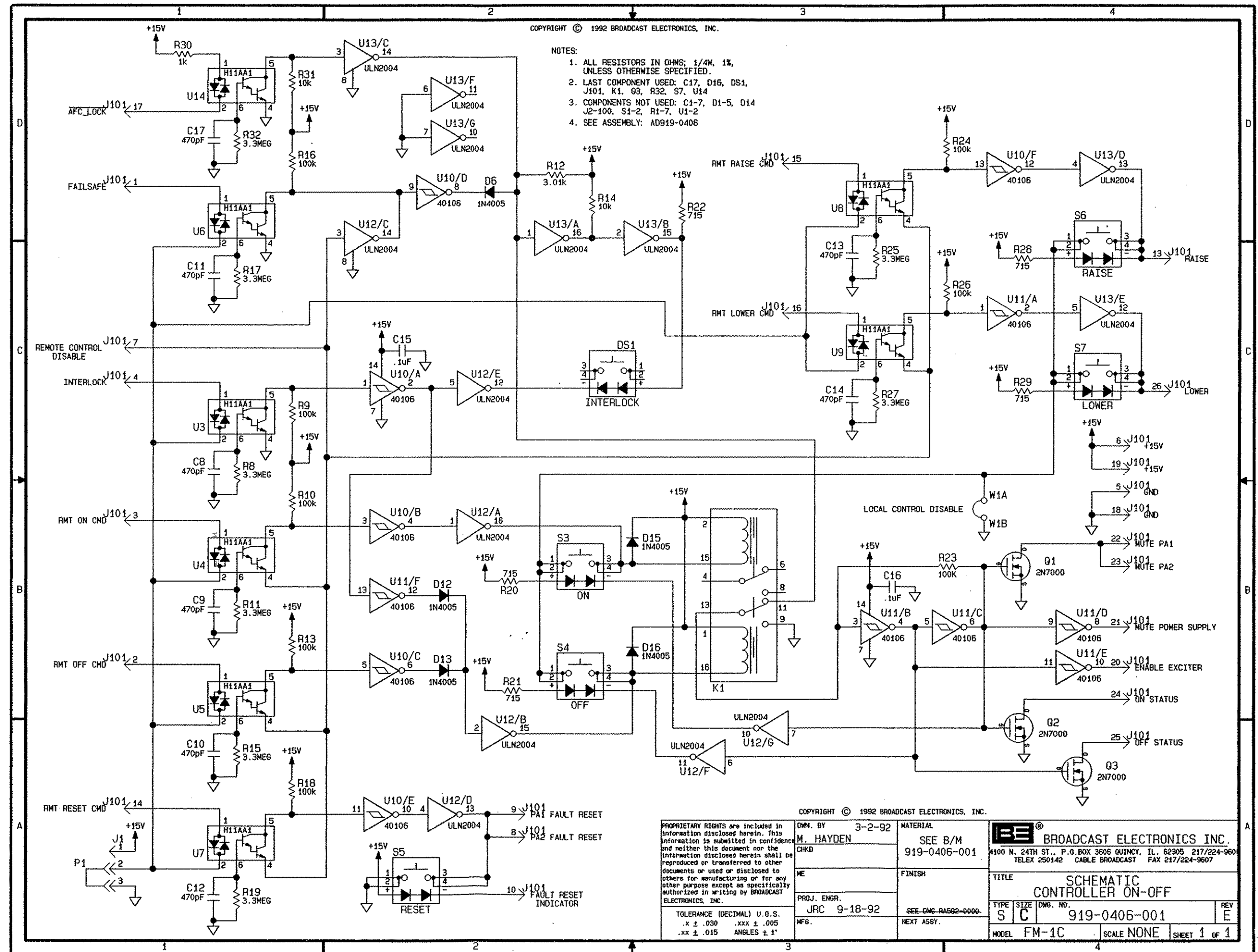


- NOTES:
1. COMPONENTS SHOWN WITH DASHED LINES TO BE INSTALLED ON OPPOSITE SIDE.
 2. PROGRAMMABLE JUMPERS SHOWN AS INSTALLED FOR FM-1C.
 3. SEE SCHEMATICS: SC919-0407-001, SC919-0407-002.

COPYRIGHT © 1992 BROADCAST ELECTRONICS, INC.

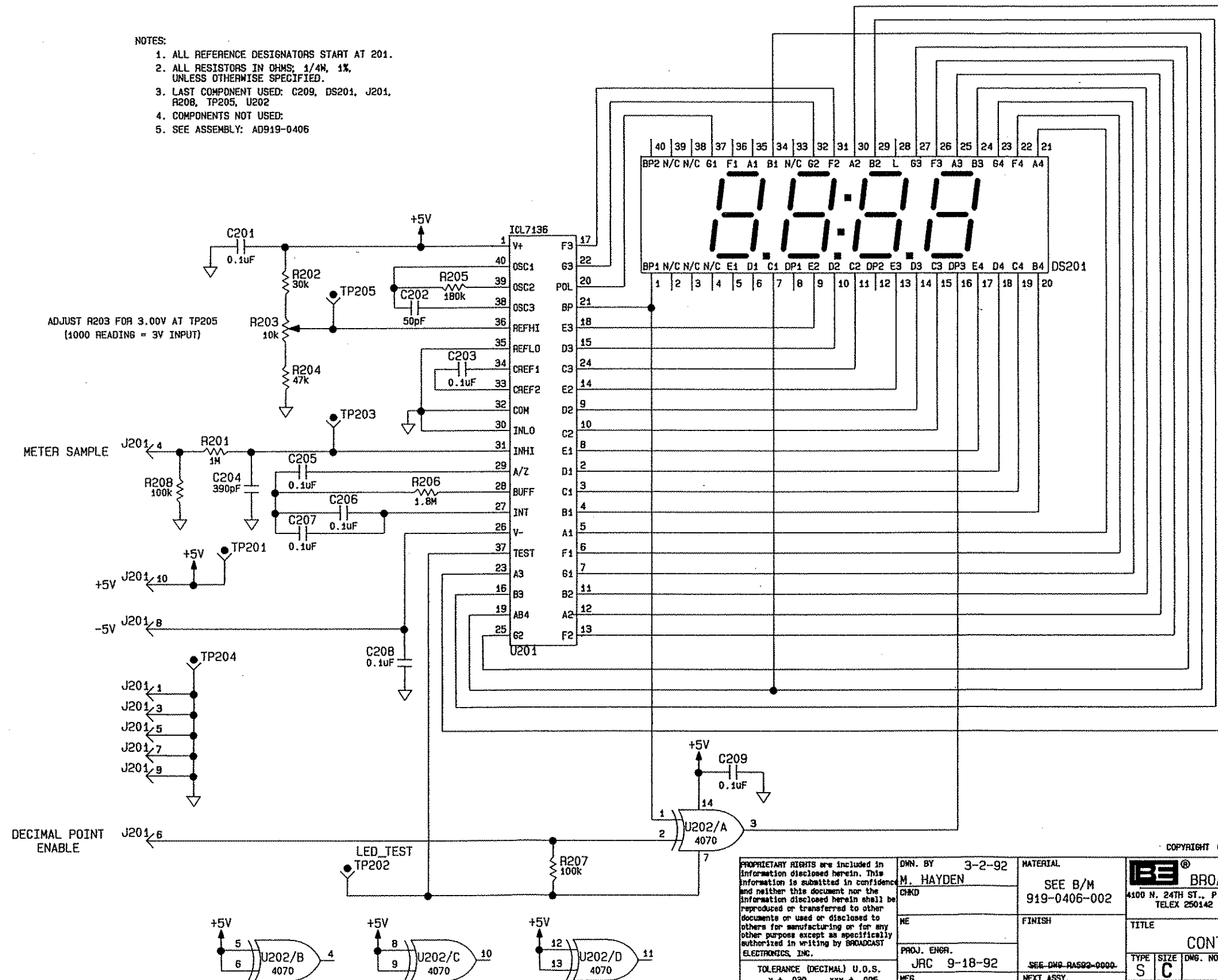
PROPRIETARY RIGHTS are included in information disclosed herein. This information is submitted in confidence and neither this document nor the information disclosed herein shall be reproduced or transmitted to other persons or used or disclosed to others for manufacturing or for any other purpose except as specifically authorized in writing by BROADCAST ELECTRONICS, INC.		DMN. BY JLF 3-17-92	MATERIAL SEE BOMs 919-0407-001 919-0407-002	BROADCAST ELECTRONICS, INC. 4100 N. 24TH ST., P.O. BOX 3606 OMAHA, NE 68135 TELEX 250142 CABLE BROADCAST FAX 217/224-9607
TOLERANCE (DECIMAL) U.S. .X ± .030 .XXX ± .005 .XX ± .015 ANGLES ± 1°		ME JRC 1-6-93	FINISH -SEE DWG-PA592-0000- NEXT ASSY.	TITLE PCB ASSEMBLY CONTROLLER/RFI BREAKWAY
TYPE A D		DWG NO. 919-0407-001/-002		REV E
MODEL FM-1C		SCALE 1:1		SHEET 1 OF 1

COPYRIGHT © 1992 BROADCAST ELECTRONICS, INC.



NOTES:

1. ALL REFERENCE DESIGNATORS START AT 201.
2. ALL RESISTORS IN OHMS; 1/4W, 1%, UNLESS OTHERWISE SPECIFIED.
3. LAST COMPONENT USED: C209, DS201, J201, R208, TP205, U202.
4. COMPONENTS NOT USED:
5. SEE ASSEMBLY: AD919-0406



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

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

DWN. BY 3-2-92
M. HAYDEN
CHND

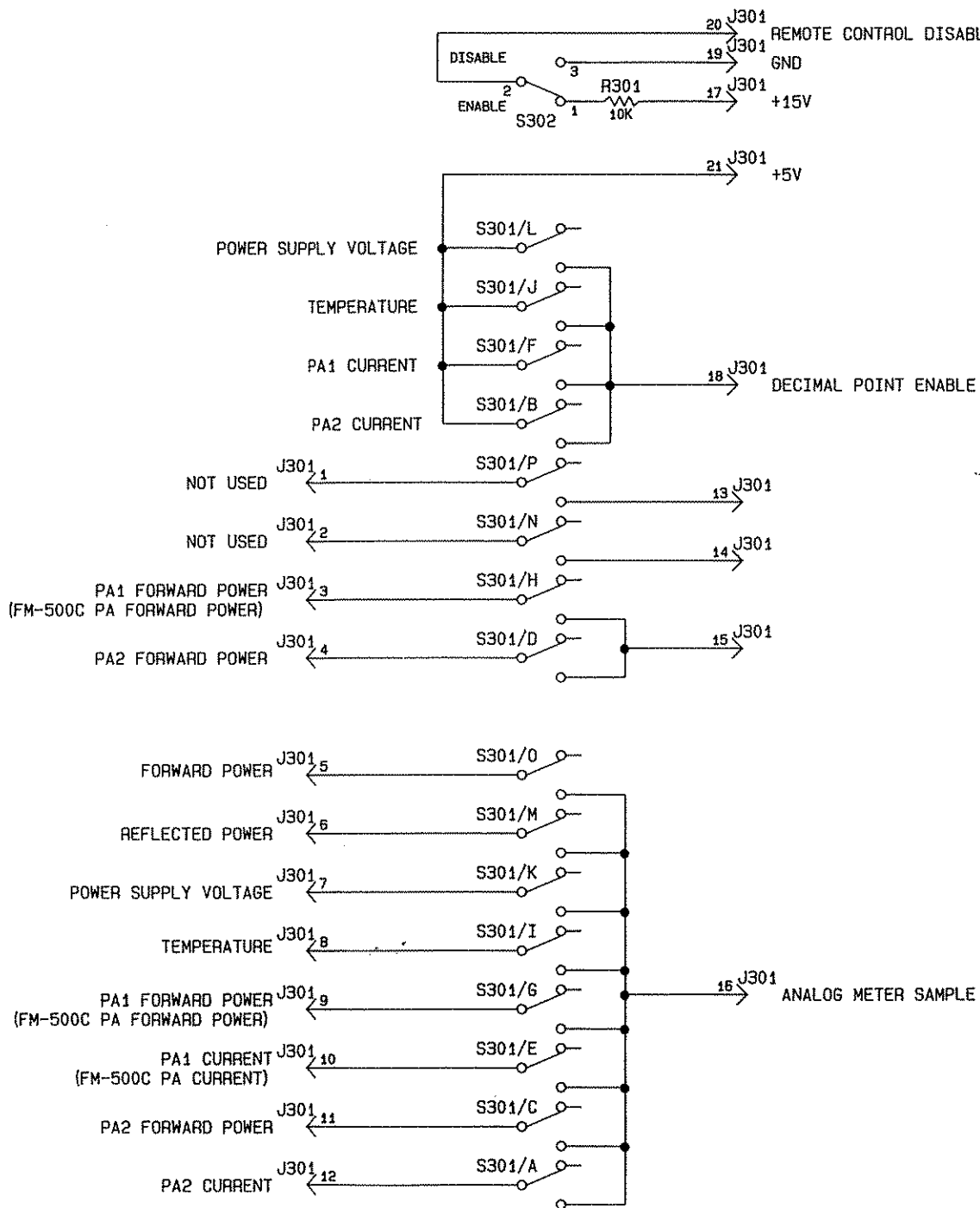
PROJ. ENGR.
JRC 9-18-92
MFB.

MATERIAL
SEE B/M
919-0406-002


FINISH
SEE DWG-RA592-0000
NEXT ASSY.

BROADCAST ELECTRONICS, INC.
4100 N. 24TH ST., P.O. BOX 3605 QUINCY, IL. 62305 217/224-9600
TELEX 250142 CABLE BROADCAST FAX 217/224-9607

TITLE
SCHEMATIC
CONTROLLER METER
TYPE SIZE DWS. NO.
S C 919-0406-002
MODEL FM-1C SCALE NONE SHEET 1 OF 1



- NOTES:
1. ALL REFERENCE DESIGNATORS START AT 301.
 2. ALL RESISTORS IN OHMS; 1/4W, 1% UNLESS OTHERWISE SPECIFIED.
 3. LAST COMPONENT USED: J301, R301, S302
 4. COMPONENTS NOT USED:
 5. SEE ASSEMBLY: AD919-0406
 6. S301 SECTIONS A&B, C&D, E&F, etc. ARE GANGED SWITCHES AND INTERLOCKED.

PROPRIETARY RIGHTS are included in information disclosed herein. This information is submitted in confidence and neither this document nor the information disclosed herein shall be reproduced or transferred to other documents or used or disclosed to others for manufacturing or for any other purpose except as specifically authorized in writing by BROADCAST ELECTRONICS, INC.	OWN. BY 3-3-92 M. HAYDEN CHKD	MATERIAL SEE B/M 919-0406-003	 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			
	ME	FINISH	TITLE SCHEMATIC CONTROLLER METER SWITCH			
	PROJ. ENGR. <i>JK Campbell</i>	SEE DWS-PA592-0000	TYPE S	SIZE C	DWG. NO. 919-0406-003	REV B
	TOLERANCE (DECIMAL) U.O.S. .X ± .030 .XXX ± .005 .XX ± .015 ANGLES ± 1°	MFG.	NEXT ASSY.	MODEL FM-1C	SCALE NONE	SHEET 1 OF 1

B



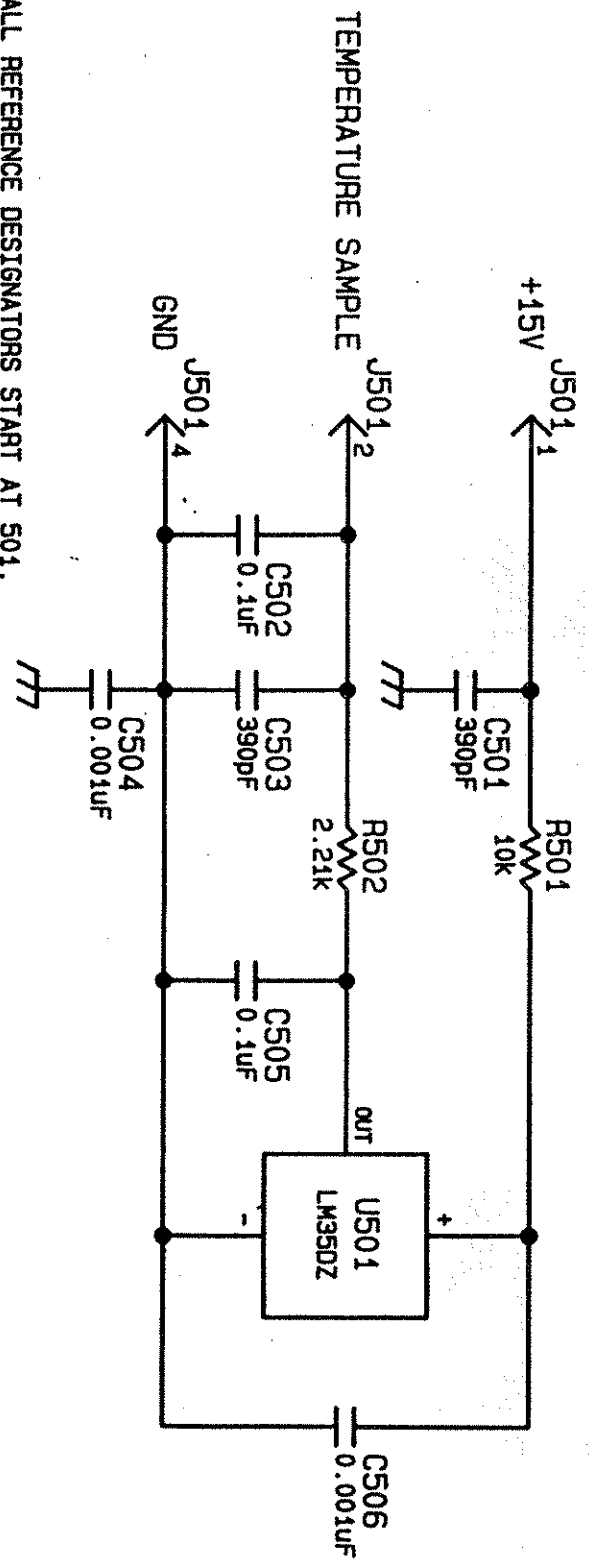
- B**

A

MATERIAL	SEE B/M 919-0406-003
FINISH	
	SEE DNG RA592-0000
	NEXT ASSY.

A

REVISIONS				DESCRIPTION				DESIGN			
REV	DATE	DESCRIPTION	BY	ENG	ECN	REV	DATE	DESCRIPTION	BY	ENG	ECN
A	8-3-92	PROTOTYPE RELEASE	JLF								
-	9-18-92	RAPD RELEASE	JLF								



- NOTES:
1. ALL REFERENCE DESIGNATORS START AT 501.
 2. ALL RESISTORS IN OHMS: 1/4W, 1% UNLESS OTHERWISE SPECIFIED.
 3. LAST COMPONENT USED: C506, J501, R502, U501
 4. COMPONENTS NOT USED:
 5. SEE ASSEMBLY: AD919-0406

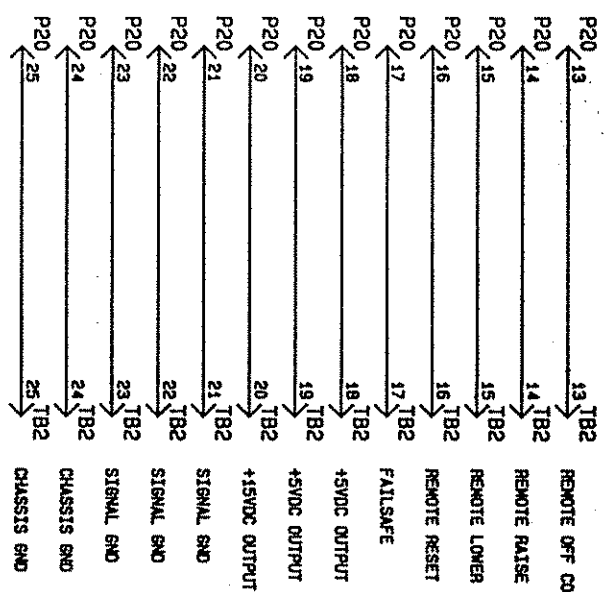
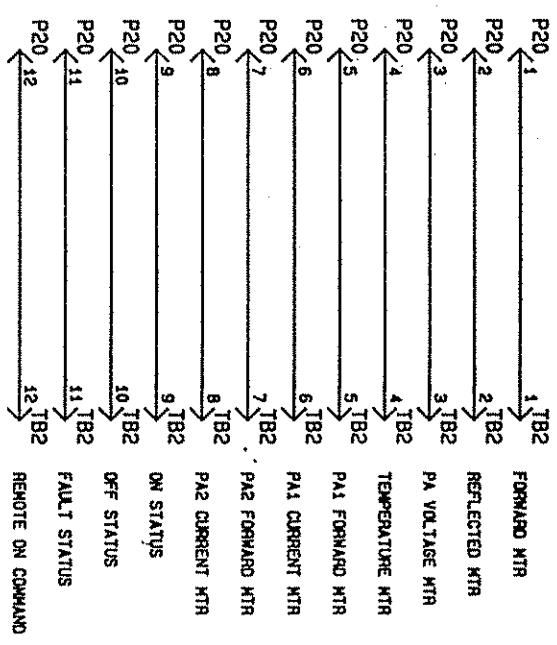
COPYRIGHT © 1992 BROADCAST ELECTRONICS, INC.

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

TOLERANCE (DECIMAL) U.O.S. .X ± .030 .XXX ± .005 .XX ± .015 ANGLES ± 1°		DMN. BY JLF 8-3-92 CHKD ME PROJ. ENGR. 9-11-92 HFG.		MATERIAL SEE BOM 919-0406-005 FINISH SEE DMG RA592-0000 NEXT ASSY.		TITLE SCHEMATIC TEMPERATURE SENSOR PCB TYPE SIZE DMG. NO. S A 919-0406-005 MODEL FM-500C/FM-1C SCALE NONE SHEET 1 OF 1	
---	--	---	--	---	--	---	--

BROADCAST ELECTRONICS INC.
 4100 N. 24TH ST., P.O. BOX 3606 QUINCY, IL. 62305 217/224-9800
 TELEX 250142 CABLE BROADCAST FAX 217/224-9807

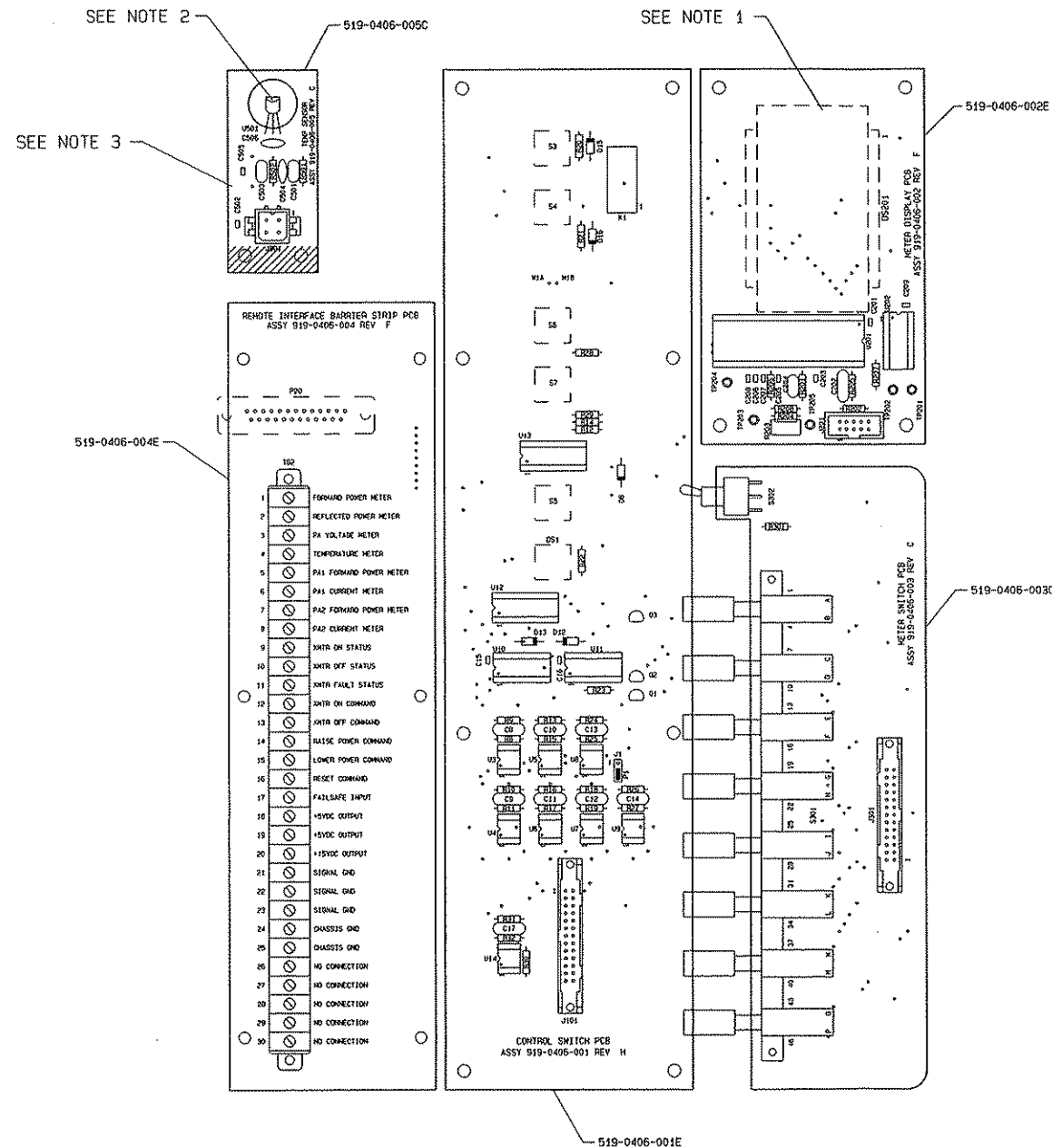
REVISIONS				DESCRIPTION				DATE				BY			
REV	DATE	DESCRIPTION	BY	DATE	DESCRIPTION	BY	DATE	DESCRIPTION	BY	DATE	DESCRIPTION	BY	DATE	DESCRIPTION	BY
A	3-7-92	PROTOTYPE RELEASE	U.F.	7-29-92	REDESIGNED	U.F.	9-18-92	REMO RELEASE	U.F.	9-18-92	CHSD P20-20/TB2-20 TO +15VDC OUTPUT.	U.F.	9-18-92	CHSD P20-20/TB2-20 TO +15VDC OUTPUT.	U.F.
B	7-29-92	REDESIGNED	U.F.	9-18-92	REMO RELEASE	U.F.	9-18-92	CHSD P20-20/TB2-20 TO +15VDC OUTPUT.	U.F.	9-18-92	CHSD P20-20/TB2-20 TO +15VDC OUTPUT.	U.F.	9-18-92	CHSD P20-20/TB2-20 TO +15VDC OUTPUT.	U.F.
C	2-2-93	CHSD P20-20/TB2-20 TO +15VDC OUTPUT.	U.F.	9-18-92	CHSD P20-20/TB2-20 TO +15VDC OUTPUT.	U.F.	9-18-92	CHSD P20-20/TB2-20 TO +15VDC OUTPUT.	U.F.	9-18-92	CHSD P20-20/TB2-20 TO +15VDC OUTPUT.	U.F.	9-18-92	CHSD P20-20/TB2-20 TO +15VDC OUTPUT.	U.F.



NOTES:
1. SEE ASSEMBLY: A0919-0405

PROPRIETARY RIGHTS ARE INCLUDED IN INFORMATION DISCLOSED HEREIN. THIS INFORMATION IS EXCLUDED IN CONFIDENTIALITY AND THIS DOCUMENT MAY BE USED OR DISCLOSED TO OTHERS FOR MANUFACTURING OR FOR ANY OTHER PURPOSE EXCEPT AS SPECIFICALLY AUTHORIZED IN WRITING BY BROADCAST ELECTRONICS, INC.		DIM. BY U.F. 7-29-92		MATERIAL SEE BOM 919-0405-004		FINISH SEE ENG. 919-0405-004		TITLE SCHEMATIC REMOTE I/F BARRIER STRIP	
TOLERANCE DECIMAL U.O.S. .X 2 .030 .X 3 .015		PROJ. ENGR. JRC 9-18-92		NEXT ASST.		TYPE SIZE DWG. NO. S B 919-0405-004		MODEL FM-1C SCALE NONE SHEET 1 OF 1	

BROADCAST ELECTRONICS, INC.
 4100 N. 24TH ST., P.O. BOX 3006 GAITHERSBURG, MD 20878
 TEL: 201-224-2000 FAX: 201-224-2007



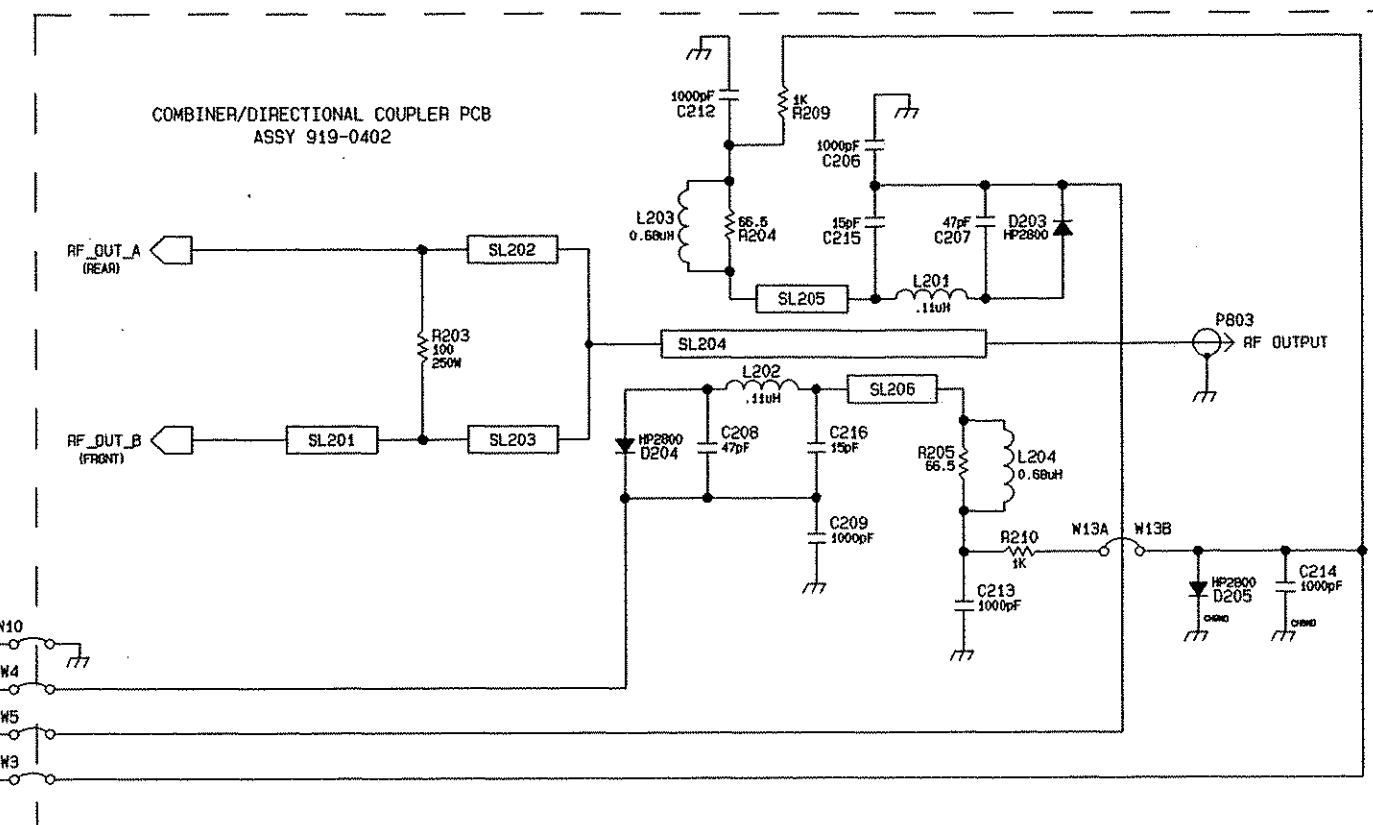
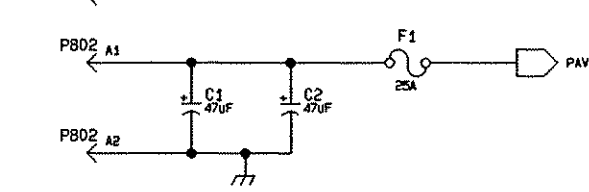
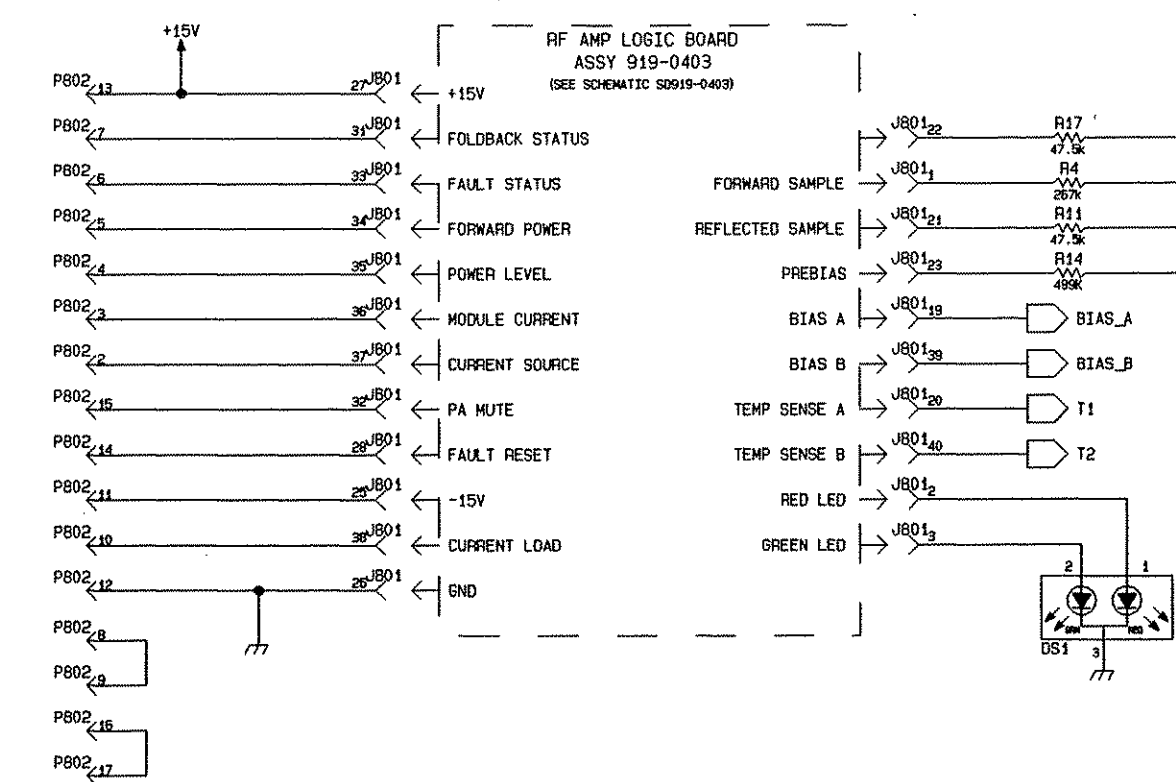
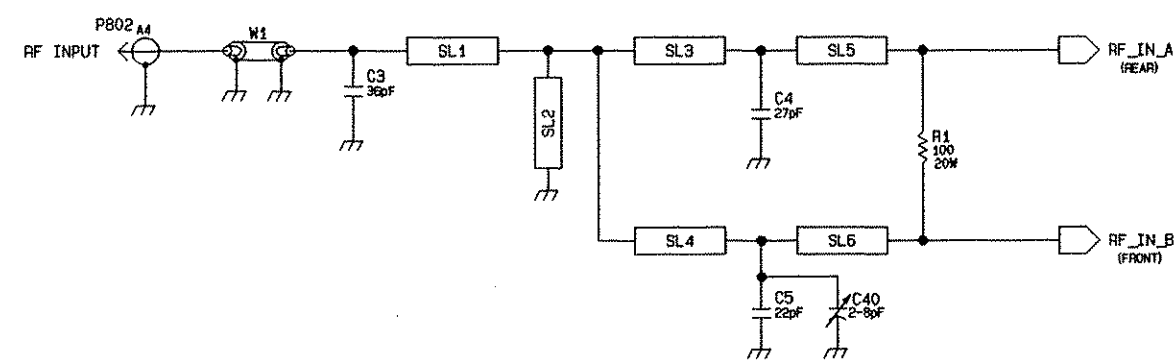
NOTES:

1. ALL PARTS SHOWN WITH DASHED LINES TO BE MOUNTED FROM OPPOSITE SIDE.
2. U501 TO BE CENTERED IN .650 HOLE WITH ROUNDED SIDE OF DEVICE POINTING UP.
3. TEMP SENSOR PCB #919-0406-005 IS TO RECEIVE CONFORMAL COATING AFTER ASSEMBLY. SEE COATING INSTRUCTIONS.
4. SEE SCHEMATICS: SC919-0406-001, SC919-0406-002, SC919-0406-003, SB919-0406-004, & SA919-0406-005.

COATING INSTRUCTIONS: (919-0406-005 PCB ONLY)

1. MASK BODY OF DEVICE U501 COMPLETELY. INSERT 418-0240 DUMMY PLUG INTO J501. MASK BOTH SIDES OF PCB AT MOUNTING HOLES AS SHADED.
2. APPLY ONE COAT OF URETHANE CONFORMAL COATING (700-0126), TO BOTH SIDES OF PCB, PER VENDOR INSTRUCTIONS; THEN REMOVE MASKING.
3. ALLOW 15 MINUTES DRYING TIME.

PROPRIETARY RIGHTS ARE RESERVED IN THE INFORMATION DISCLOSED HEREIN. THIS INFORMATION IS UNCLASSIFIED IN CONFIDENCE AND NEITHER THIS DOCUMENT NOR THE INFORMATION DISCLOSED HEREIN SHALL BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC OR MECHANICAL, INCLUDING PHOTOCOPYING, RECORDING, OR BY ANY INFORMATION STORAGE AND RETRIEVAL SYSTEM, WITHOUT THE WRITTEN PERMISSION OF BROADCAST ELECTRONICS, INC.		DWN. BY 3-12-92 M. HAYDEN CHKD ME PROJ. ENGR. JRC 9-18-92 WFS.	MATERIAL SEE BOMs 919-0406-001 THRU 919-0406-005 FINISH SEE-OMP-BA500-0000- NEXT ASSY.	BROADCAST ELECTRONICS, INC. 4100 N. 24TH ST., P.O. BOX 3006 GURNEE, IL 60039 PH. 817/224-9000 TELEX 250142 CABLE BROADCAST FAX 217/224-9607
TOLERANCE (DECIMAL) U.O.S. .X ± .030 .XX ± .005 .XX ± .015 ANGLES ± .1°		TITLE PCB ASSEMBLY CONTROL BREAKAWAY TYPE SIZE DWG NO. A D 919-0406-001/005 MODEL FM-1C SCALE 1/1 SHEET 1 OF 1		



- NOTES:
1. SEE PCB ASSEMBLIES AD919-0401, AC919-0402, & AB919-0403.
 2. ALL COMPONENTS PART OF ASSEMBLY 919-0401 UNLESS OTHERWISE SPECIFIED.
 3. ALL RESISTORS IN OHMS, 1/4W, 1%, UNLESS OTHERWISE SPECIFIED.

COPYRIGHT © 1992 BROADCAST ELECTRONICS, INC.

COPYRIGHT © 1992 BROADCAST ELECTRONICS, INC.

PROPRIETARY RIGHTS ARE INCLUDED IN INFORMATION DISCLOSED HEREIN. THIS INFORMATION IS SUBMITTED IN CONFIDENCE AND NEITHER THIS DOCUMENT NOR THE INFORMATION DISCLOSED HEREIN SHALL BE REPRODUCED OR TRANSFERRED TO OTHERS FOR MANUFACTURING OR FOR ANY OTHER PURPOSE EXCEPT AS SPECIFICALLY AUTHORIZED IN WRITING BY BROADCAST ELECTRONICS, INC.		OWN. BY JLF 3-20-92 CND	MATERIAL FINISH PROJ. ENGR. CLL 1-6-93 NFB.	SEE DWG RAD92-0000 NEXT ASSY.	TITLE BROADCAST ELECTRONICS INC. 4100 N. 24TH ST., P.O. BOX 9606 GAITHERSBURG, IL 60142 TEL 217/224-9600 FAX 217/224-9607
TOLERANCE (DECIMAL) U.S.S. .XX ± .030 .XXX ± .005 .XX ± .015 ANGLES ± .1°		TYPE SIZE DWG. NO. S D 959-0400		MODEL FM-1C	SCALE NONE SHEET 1 OF 2

INSTALL PEM NUT #426-4003 THIS SIDE (2) PLACES.
MOUNT P802 TO OPPOSITE SIDE SHOWN USING QTY (2)
#420-4106 SCREW, & (2) #423-4002 SPLIT LOCK.

SEE NOTE 2

THIS SHADED AREA TO BE
COVERED WITH KAPTON TAPE.

519-0401

BACK EDGE OF DS1 TO BE ALIGNED WITH
EDGE OF GROUND PLANE. MOUNT WITH
BOTTOM EDGE RESTING ON PCB.

INSTALL QTY (2) #415-0015
FUSE CLIPS ON OPPOSITE SIDE
(SOLDER ON TOP & BOTTOM).
INSTALL FUSE F1 IN CLIPS.

SEE NOTE 1

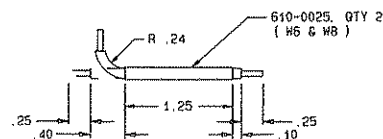
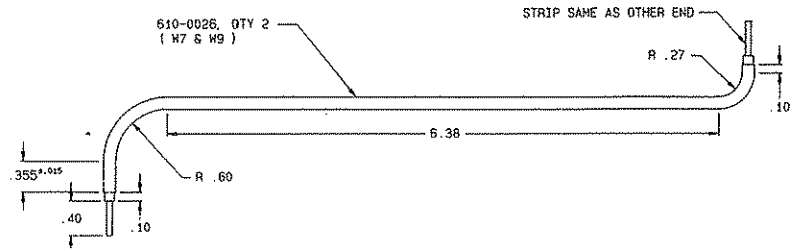
TYPICAL ROUTING FOR CABLE W1.

SEE NOTE 3

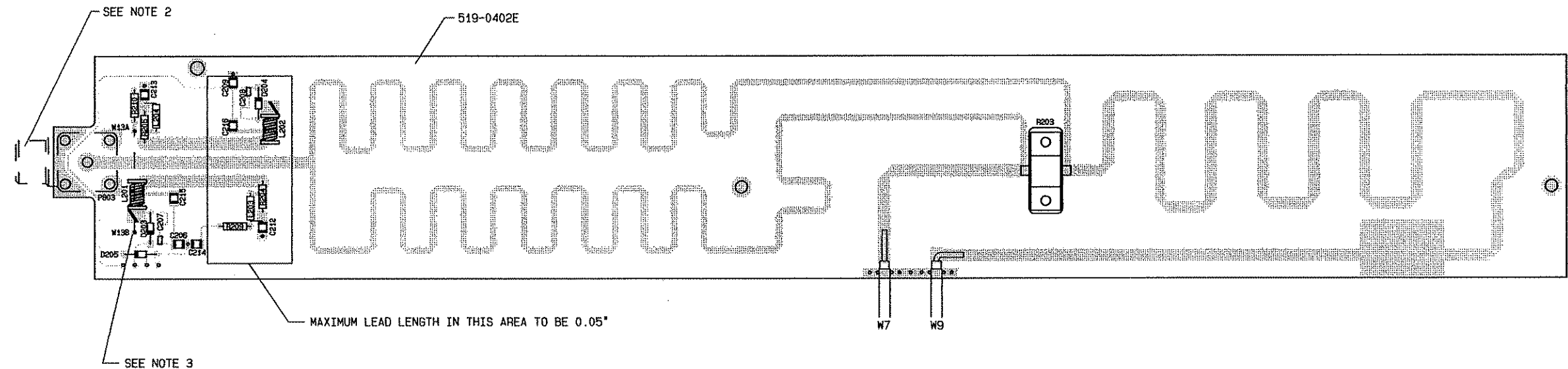
SEE NOTE 4

NOTES:

1. FOLLOWING COMPONENTS ARE SHOWN FOR REFERENCE ONLY:
C10, C13-16, C24, C27-30, C41-42, DS1, Q1-2, R1, T1-2,
T1-2, W3-5, W7, W9-10.
2. COMPONENTS WITH DASHED LINES TO BE INSTALLED ON
OPPOSITE SIDE - INSTALL LAST, PRIOR TO MODULE ASSEMBLY.
3. OUTER CONDUCTOR OF T1, T2, W6, & W8 TO BE SOLDERED
TO PCB WHERE INDICATED BY SHADING.
4. COMPONENTS U1 & U2 TO BE MOUNTED ON OPPOSITE SIDE
OF PCB WITH A MAXIMUM COMPONENT HEIGHT OF 0.28".



<p>PROPRIETARY RIGHTS ARE INCLUDED IN INFORMATION DISCLOSED HEREIN. THIS INFORMATION IS SUBMITTED IN CONFIDENCE AND NEITHER THIS DOCUMENT NOR THE INFORMATION DISCLOSED HEREIN SHALL BE REPRODUCED OR TRANSMITTED TO OTHER DOCUMENTS OR USED OR DISCLOSED TO OTHERS FOR MANU- FACTURING OR FOR ANY OTHER PURPOSE EXCEPT AS SPECIFICALLY AUTHORIZED IN WRITING BY BROADCAST ELECTRONICS, INC.</p>	<p>OWN. BY JLF 1-28-92</p>	<p>MATERIAL SEE BOM 919-0401</p>	<p>BROADCAST ELECTRONICS INC. 4100 N. 24TH ST., P.O. BOX 3008 GAINESVILLE, FL 32609 PH. 217/224-9600 TELEX 250142 CABLE BROADCAST FAX 217/224-9607</p>
	<p>DATE 1-28-92</p>	<p>FINISH ---</p>	
<p>TOLERANCE (DECIMAL) U.O.S. .X ± .030 .XXX ± .005 .XX ± .035 ANGLES ± 1°</p>	<p>PROJ. ENGR. WFB</p>	<p>SEE DWG RA592-0000 REXY ASST. 959-0400</p>	<p>TYPE SIZE DWS No. A D 919-0401 F</p>
<p>MODEL FM-1C SCALE 1:1 SHEET 1 OF 1</p>			




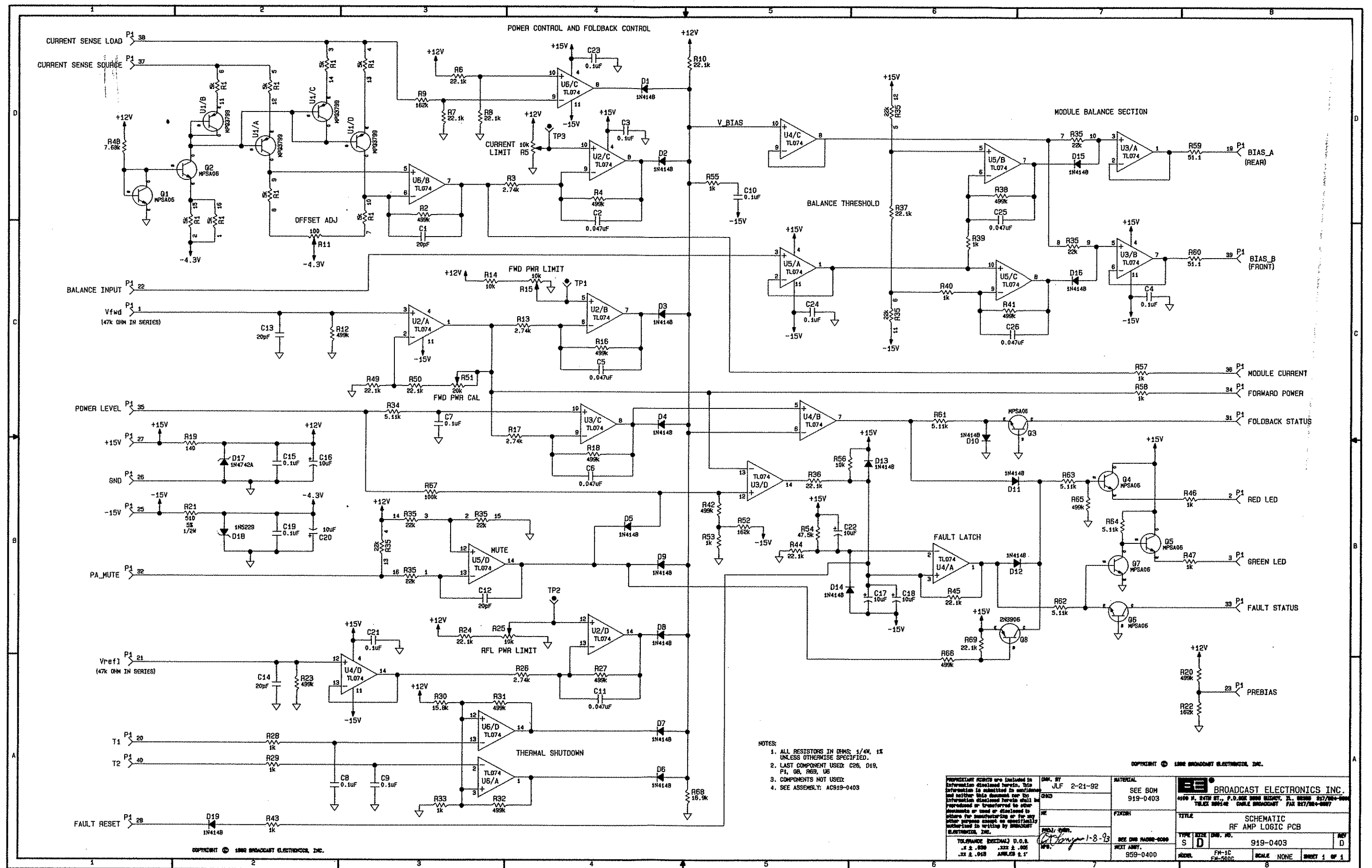
NOTES:

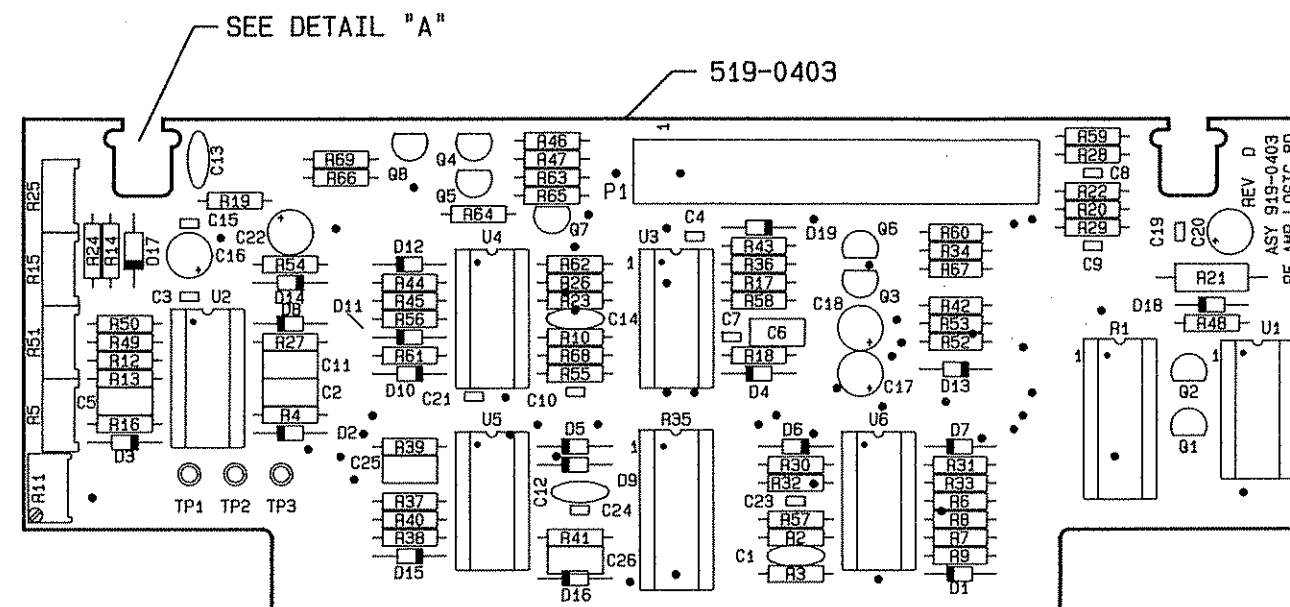
- SEE SCHEMATIC SD959-0400.
- P803, R203, W7 & W9 SHOWN FOR REFERENCE ONLY; TO BE INSTALLED DURING RF AMP MODULE FINAL ASSEMBLY.
- JUMPER WIRE W13 TO BE INSTALLED ON SOLDER SIDE USING WIRE 601-0022 INSULATED WITH TEFLON TUBING 693-0220.

COPYRIGHT © 1992 BROADCAST ELECTRONICS, INC.

COPYRIGHT © 1992 BROADCAST ELECTRONICS, INC.

PROPRIETARY RIGHTS are included in information disclosed herein. This information is submitted in confidence and neither this document nor the information disclosed herein shall be reproduced or transferred to other documents or used or disclosed to others for manufacturing or for any other purpose except as specifically authorized in writing by BROADCAST ELECTRONICS, INC.	DWN. BY JLF 1-14-92		MATERIAL SEE BOM 919-0402		 BROADCAST ELECTRONICS INC. 4100 N.24TH ST. P. O. BOX 3606 QUINCY, IL. 62305 PH. 217/224-9600 TELEX 250142 CABLE BROADCAST FAX 217/224-9607							
	CHKD		FINISH		TITLE PCB ASSEMBLY COMBINER / DIRECTIONAL COUPLER							
	ME		-SEE DWG RA592-0000-		TYPE A		SIZE C		DWG No. 919-0402		REV G	
	PROJ. ENGR. CLL 1-5-93		NEXT ASSY. 959-0400		MODEL FM-1C/FM-500C		SCALE 1:1		SHEET 1 OF 1			
TOLERANCE (DECIMAL) U.O.S. .X ± .030 .XXX ± .005 .XX ± .015 ANGLES ± 1°		MFG.										





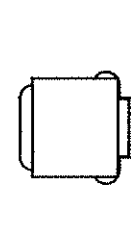
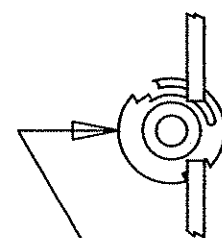
NOTES:

1. SEE SCHEMATIC SD919-0403.

SIDE VIEW
START

SIDE VIEW
FINISH

FRONT VIEW



PRESS #421-6908 SHEETEDGE FASTENER INTO
CUTOUT UNTIL SNAPPED INTO PLACE AS SHOWN

DETAIL "A"

2 PLCS

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

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

DWN. BY
JLF 2-25-92

CHKD

ME

PROJ. ENGR.

MFG.

MATERIAL

SEE BOM
919-0403

FINISH

SEE DWG RA592-0000

NEXT ASSY.

959-0400

COPYRIGHT © 1992 BROADCAST ELECTRONICS, INC.



BROADCAST ELECTRONICS INC.

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

TITLE
PCB ASSEMBLY
RF AMP LOGIC BOARD

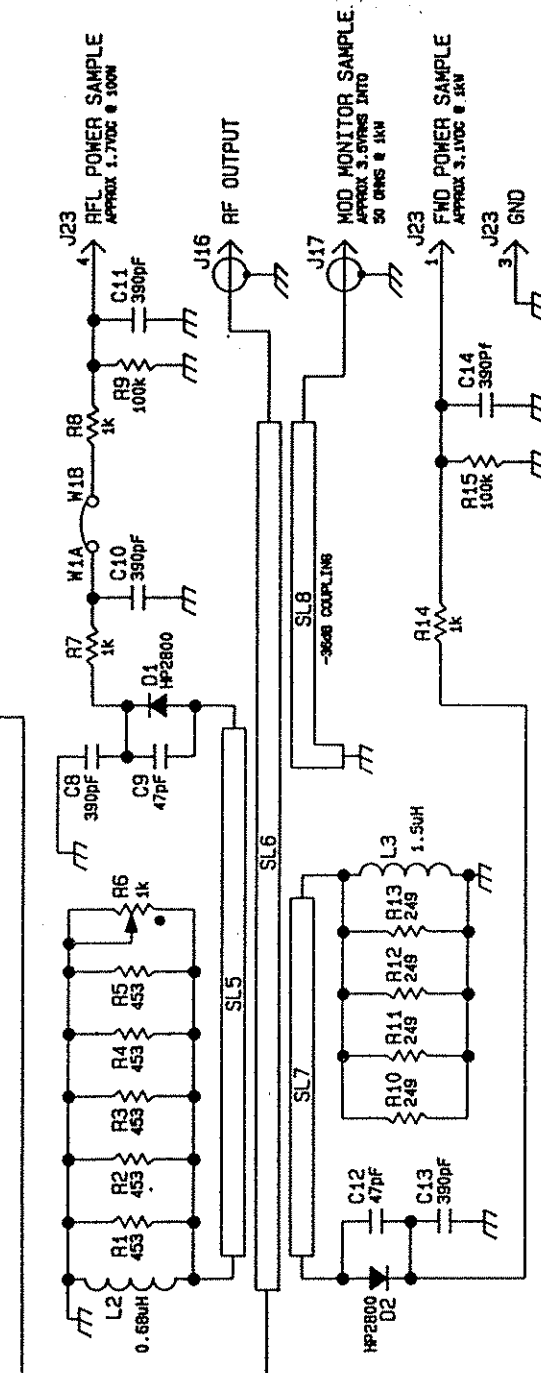
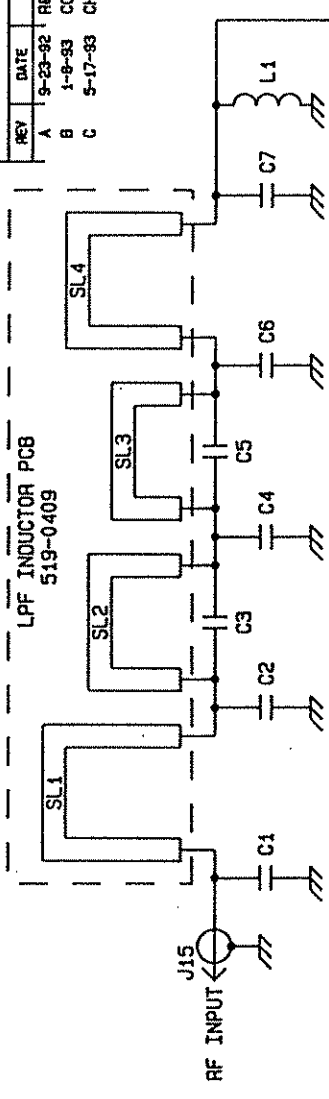
TYPE	SIZE	DWG No.	REV
A	B	919-0403	D

MODEL FM-1C/FM-500C SCALE 1: 1 SHEET 1 OF 1

REVISIONS			
REV	DATE	DESCRIPTION	BY
A	9-23-92	RFPO RELEASE.	JLF
B	1-8-93	CORRECTED D2 ORIENTATION.	JLF
C	5-17-93	CH60 L2 FROM 1.5uH TO .68uH, R6 FROM 453 TO 1k POT.	JLF

REV	DATE	DESCRIPTION	BY
A	9-23-92	RFPO RELEASE.	JLF
B	1-8-93	CORRECTED D2 ORIENTATION.	JLF
C	5-17-93	CH60 L2 FROM 1.5uH TO .68uH, R6 FROM 453 TO 1k POT.	JLF

LPF INDUCTOR PCB
519-0409



- NOTES:
1. "SL" INDICATES ETCHED STRIPLINE ON PCB.
 2. C1-C7 ARE ETCHED ON PCB.
 3. ALL RESISTORS IN OHMS, 1/4W, 1%, UNLESS OTHERWISE SPECIFIED.
 4. SEE PCB ASSEMBLY DRAWING AD919-0405.

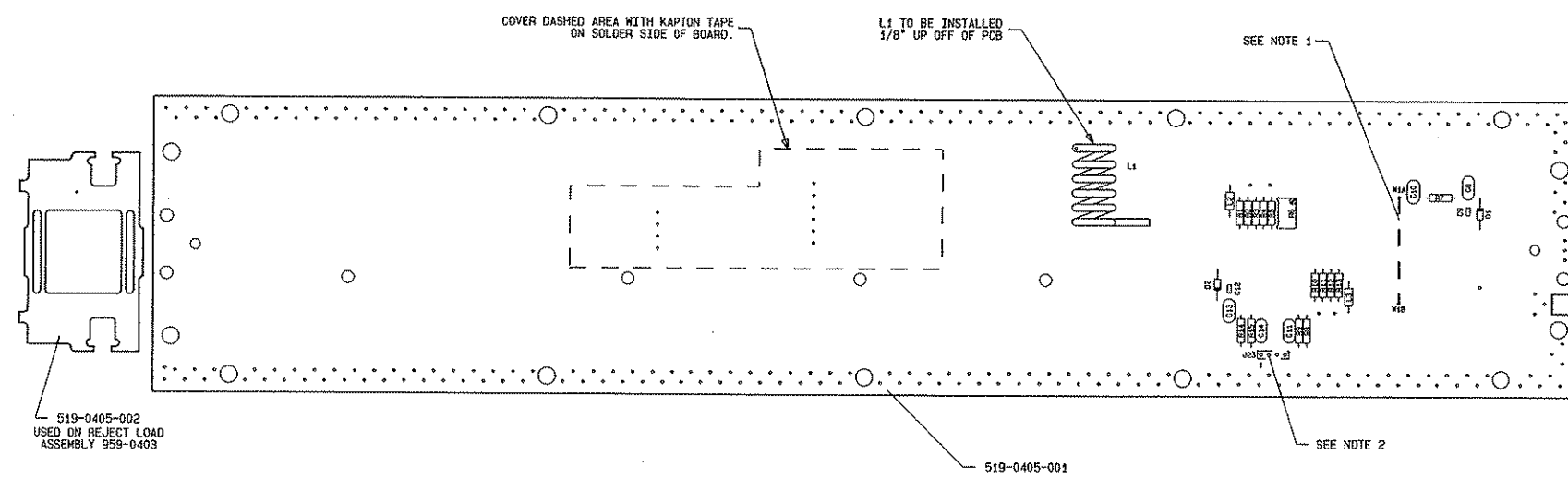
PROPRIETARY RIGHTS ARE INCLUDED IN INFORMATION DISCLOSED HEREIN. THIS INFORMATION IS SUBMITTED IN CONFIDENCE AND WILL BE KEPT AS SUCH. IT WILL BE REPRODUCED OR TRANSMITTED TO OTHERS OR USED OR DISCLOSED TO OTHERS FOR ANY PURPOSE EXCEPT AS SPECIFICALLY AUTHORIZED IN WRITING BY BROADCAST ELECTRONICS, INC.

OWN. BY	JLF
DATE	9-23-92
CHKD	ME
DATE	9-24-92
PROJ. ENGR.	GNM
DATE	9-24-92
DATE	9-24-92

MATERIAL	SEE DWS R4592-0000
FINISH	NEXT ASST.
TITLE	LOW PASS FILTER ASSEMBLY
TYPE SIZE (DWG. NO.)	S B 959-0402
REV	C

BROADCAST ELECTRONICS INC.
4100 N. 24TH ST., P.O. BOX 3908 QUINCY, IL 62305 217/224-8600
TELEX 250142 CABLE BROADCAST FAX 217/224-8607

COPYRIGHT © 1992 BROADCAST ELECTRONICS, INC.



- NOTES:
1. JUMPER WIRE W1 TO BE INSTALLED ON SOLDER SIDE USING WIRE 601-0022 INSULATED WITH TEFLON TUBING 693-0220.
 2. INSTALL J23 ON OPPOSITE SIDE AND REMOVE PIN 2 FOR KEYING PIN.
 3. SEE SCHEMATIC SB959-0402.

COPYRIGHT © 1992 BROADCAST ELECTRONICS, INC.

PROPRIETARY RIGHTS are included in information disclosed herein. This information is supplied in confidence and neither the document nor the information disclosed herein shall be reproduced or transferred to other documents or used or disclosed to others for manufacturing or for any other purpose except as specifically authorized in writing by BROADCAST ELECTRONICS, INC.		OWN. BY JLF 2-27-92		MATERIAL SEE BOM 919-0405-001		BROADCAST ELECTRONICS, INC. 4100 N. 24TH ST., P.O. BOX 3606 MINNETONKA, IL. 62005 PH. 217/224-9600 TELEX 250142 CABLE BROADCAST FAX 217/224-9607	
TOLERANCE (DECIMAL) U.O.S. .X ± .030 .XXX ± .005 .XX ± .015 ANGLES ± 1°		PROJ. ENGR. GNM 9-24-92		FINISH SEE DWS RAS92-0000		TITLE PCB ASSEMBLY LOW PASS FILTER	
		MFG.		NEXT ASSY. 959-0402		TYPE SIZE DWS No. A D 919-0405-001	
				MODEL FM-1C		SCALE 1:1 SHEET 1 of 1	

COPYRIGHT © 1992 BROADCAST ELECTRONICS, INC.

PRODUCT WARRANTY

LIMITED TWO YEAR

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

Broadcast Electronics, Inc. ("Seller") hereby warrants cartridge machines, consoles, and other new Equipment manufactured by Seller against any defects in material or workmanship at the time of delivery thereof, that develop under normal use within a period of two (2) years (one year for cartridge and blower motors) from the date of shipment, as such term is defined herein. Other manufacturer's and suppliers' Equipment and services, if any, including electronic tubes, solid state devices, transmission line, antennas, towers, related equipment and installation and erection services, shall carry only such manufacturer's or suppliers' standard warranty. This warranty extends to the original user and any subsequent purchaser during the warranty period. Seller's sole responsibility with respect to any equipment or parts not conforming to this warranty is to replace such equipment or parts upon the return thereof F.O.B. Seller's factory or authorized repair depot within the period aforesaid.

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

Seller shall not be liable to Purchaser for any and all incidental or consequential damages for breach of either expressed or implied warranties. However, some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to Purchaser. All express and implied warranties shall terminate at the conclusion of the period set forth herein. Any card which is enclosed with the equipment will be used by Seller for survey purposes only.

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

EXCEPT AS SET FORTH HEREIN, AND EXCEPT AS TO TITLE, THERE ARE NO WARRANTIES, OR ANY AFFIRMATIONS OF FACT OR PROMISES BY SELLER, WITH REFERENCE TO THE EQUIPMENT, OR TO MERCHANTABILITY, FITNESS FOR A PARTICULAR APPLICATION, SIGNAL COVERAGE, INFRINGEMENT, OR OTHERWISE, WHICH EXTEND BEYOND THE DESCRIPTION OF THE EQUIPMENT ON THE FACE HEREOF.

BROADCAST ELECTRONICS, INC.

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