DUAL T–SERIES FM TRANSMITTER SYSTEMS

September, 1999

IM No. 597–0099–014

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) 224–9600
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.

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.

SCOPE OF MANUAL

This manual consists of two parts which provides the following information for the Broadcast Electronics FM dual transmitter systems.

A. PART I – Contains general information and installation considerations applicable to an overall transmitter system.

B. PART II – Contains information relative to the center control cabinet, the FD–2 dual transmitter controller, the FO–2 output switch controller, and the FW–30 exciter switcher.

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SECTION I
GENERAL INFORMATION

1–1. INTRODUCTION.

1–2. Information presented by this section provides a general description of the Broadcast Electronics FM T–Series dual transmitter systems. Equipment specifications are also listed in this section.

1–3. RELATED PUBLICATIONS.

1–4. The following list of publications provides data for equipment associated with dual transmitter systems.

PUBLICATION NUMBER	EQUIPMENT
597–0096–014	FM–30T/FM–35T Transmitters
597–0220–014	FM–20T Transmitter
597–0098–014	FM–10T Transmitter
597–0033–014	FM–5T/FM–5TS Transmitters
597–1050	FX–50 FM Exciter
597–9900	LYNX FM Digital Stereo Generator
597–8000	PREDATOR FM Digital Exciter
597–0008–004	FC–30 SCA Generator
597–0101–004	FW–30 Automatic Exciter Switcher

1–5. EQUIPMENT DESCRIPTION.

1–6. Each basic dual transmitter system consists of two Broadcast Electronics transmitters less exciters, a high power output hybrid combiner with reject load, associated transmission line components, hardware, cables, and a central control cabinet (refer to Figure 1–1). The control cabinet contains an FM exciter, a dual transmitter controller, an RF hybrid splitter with reject load, an RF phasing assembly, and any additional equipment required by the type of dual system configuration ordered.

1–7. Each system is factory assembled, wired, tested, and documented prior to shipping. The transmitter station test load is not furnished and must be supplied by the customer or purchased as an option.

1–8. The available dual transmitter systems with power levels ranging from 70 kW to 3 kW are as follows:

MODEL NO.	PART NO.	DESCRIPTION
FMD–70T	909–2035–XXX	70 kW Transmitter, consisting of two FM–35T transmitters, center control cabinet, and output combiner.
FMD–60T	909–2030–XXX	60 kW Transmitter, consisting of two FM–30T transmitters, center control cabinet, and output combiner.
FMD–40T	909–2020–XXX	40 kW Transmitter, consisting of two FM–20T transmitters, center control cabinet, and output combiner.
FMD–20T	909–2010–XXX	20 kW Transmitter, consisting of two FM–10T transmitters, center control cabinet, and output combiner.

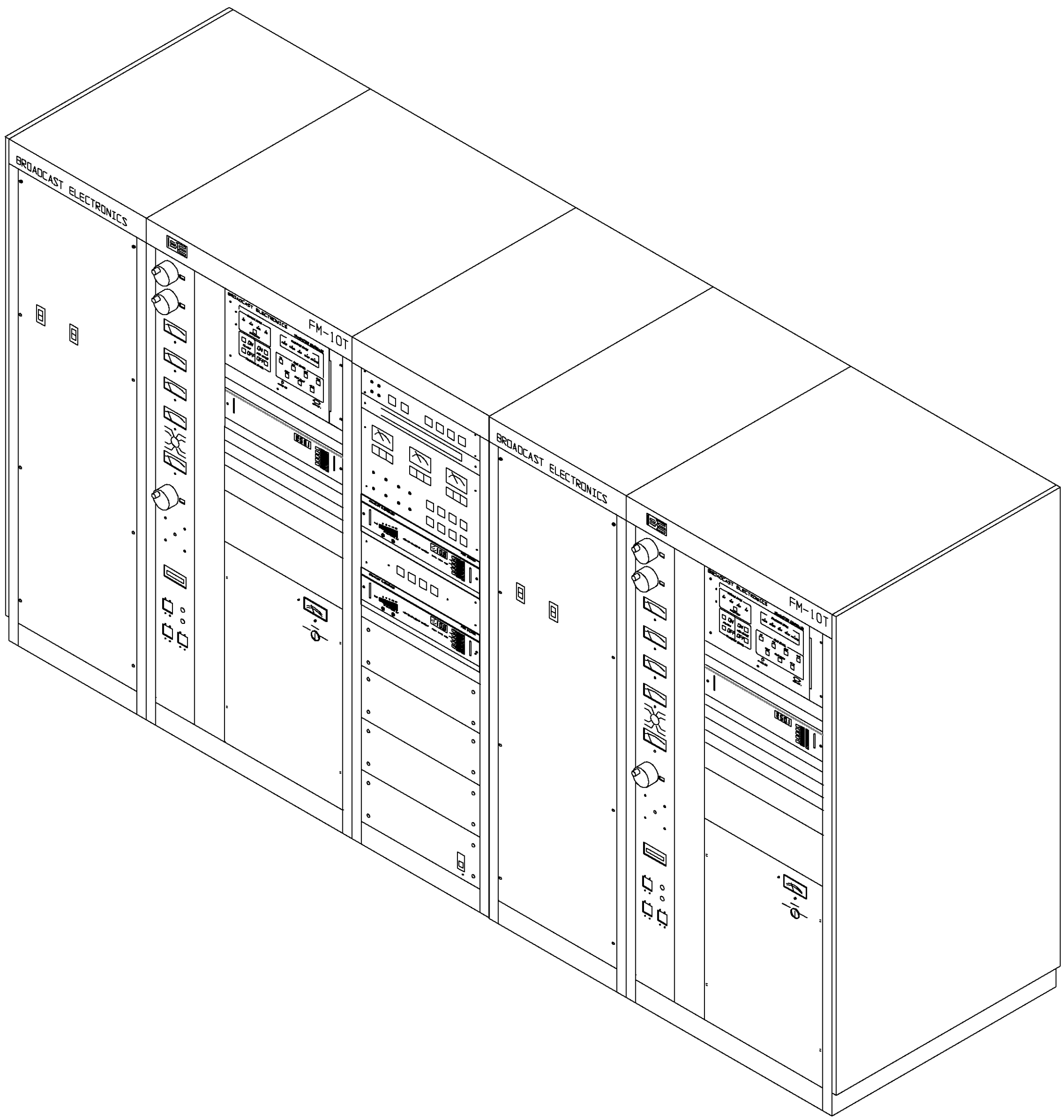

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FIGURE 1-1. DUAL TRANSMITTER SYSTEMS

MODEL NO.	PART NO.	DESCRIPTION
FMD–10T	909–2005–XXX	10 kW Transmitter, consisting of two FM–5T transmitters, center control cabinet, and output combiner.
FMD–10TS	909–2005–XXX	10 kW Transmitter, consisting of two FM–5TS transmitters, center control cabinet, and output combiner.

1–9. **SYSTEM DESCRIPTION.**

1–10. Dual transmitter systems are available in four configurations. Refer to Figures 1–2 through 1–5 for the following configuration descriptions.

1–11. **CONFIGURATION A.** The basic dual transmitter system consists of two transmitters less exciters and a center control cabinet. The control cabinet contains an FM exciter, a dual transmitter controller, an RF hybrid splitter with reject load, an RF phasing assembly, an IPA unit in FM–5T/FM–10T models, and any optional equipment. In the event a transmitter fails, one half the power from the operational transmitter will be routed to the antenna load. The remaining one half power from the operational transmitter will be dissipated in the output reject load.

1–12. **CONFIGURATION B.** Configuration B consists of all the components contained in configuration A with the addition of an optional FM exciter and an optional FW–30 exciter switcher (installed in the control cabinet). The operation of the system is identical to the operation of configuration A with the following exception. In the event the on–air exciter fails, the switcher will automatically transfer the operational exciter into the system and connect the defective exciter to a test load.

1–13. **CONFIGURATION C.** This configuration consists of all the components contained in configuration B with the addition of manually operated coaxial patch–panel output switches. In the event a transmitter fails, the patch–panel allows the entire output power of the operational transmitter to be connected directly to the antenna. The defective transmitter can be connected to the customer–supplied transmitter test load for testing. For safety reasons, the patch–panel is wired into the transmitter interlock system. The patch–panel provides four operating modes.

1–14. **Operating Modes.** The output switching option provides four modes of operation for dual transmitter systems. Refer to Figure 1–6 for the following description of the operating modes.

MODE	DESCRIPTION
A+B AIR	Transmitters A and B are connected to the antenna.
A+B LOAD	Transmitters A and B are connected to the load.
A AIR/B LOAD	Transmitter A is connected to the antenna, transmitter B to the load.
B AIR/A LOAD	Transmitter B is connected to the antenna, transmitter A to the load.

1-15. **CONFIGURATION D.** This configuration consists of all the components contained in configuration B with the addition of an FO-2 automatic transmitter output switch controller and motorized coaxial output switches. In the event a transmitter fails, the automatic output switcher will deenergize both transmitters, operate the motorized switches to connect the operational transmitter directly to the antenna, connect the defective transmitter to a test load, and energize the operational transmitter. For safety reasons, the output switches are connected into the transmitter interlock system. The automatic output switching option provides four operating modes (refer to **Operating Modes** in the preceding text).

1-16. **ACCESSORIES.**

1-17. The following accessory products are available for use with dual transmitter systems.

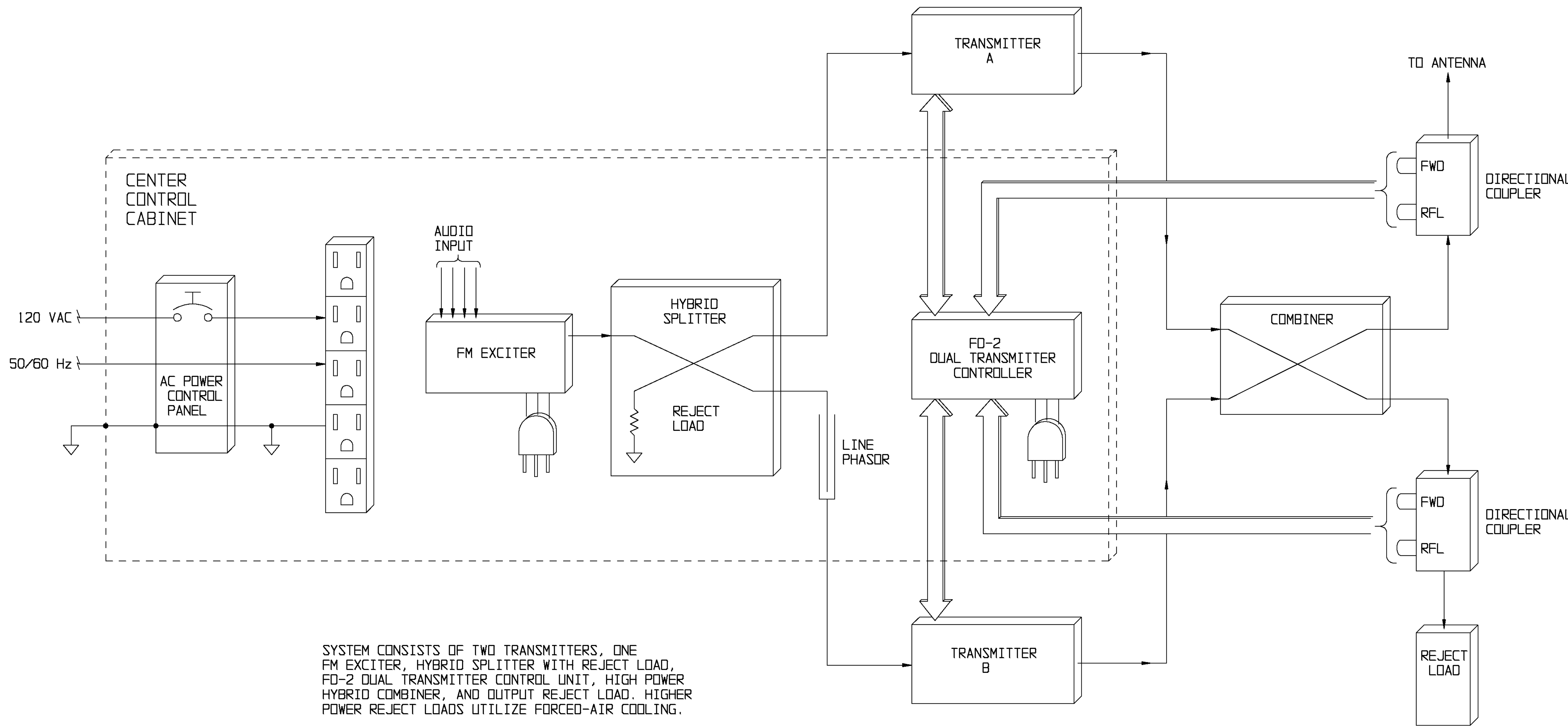
PART NUMBER	DESCRIPTION
909-0117-004	FO-2 Automatic transmitter output switch controller.
909-0120-004	FW-30 Automatic exciter switcher.

1-18. EQUIPMENT SPECIFICATIONS.

1-19. Refer to Table 1-1 for the electrical specifications and Table 1-2 for the physical and environmental specifications of the dual transmitter systems.

TABLE 1-1. ELECTRICAL SPECIFICATIONS
(Sheet 1 of 2)

PARAMETER	SPECIFICATION
RF POWER OUTPUT	
FMD-70T	20 kW to 70 kW.
FMD-60T	15 kW to 60 kW.
FMD-40T	15 kW to 40 kW.
FMD-20T/FMD-20TS	10 kW to 20 kW.
FMD-10T/FMD-10TS	4.9 kW to 11 kW.
RF FREQUENCY RANGE	87.5 MHz to 108 MHz (as ordered).
RF OUTPUT IMPEDANCE	50 Ohms, Resistive.
MAXIMUM VSWR	
FMD-70T, FMD-60T, FMD-40T, FMD-20T/FMD-20TS, FMD-10T/FMD-10TS	1.8:1 (Will operate into higher VSWR with automatic power reduction.)
OUTPUT CONNECTOR	
FMD-70T, FMD-60T, FMD-40T	6 1/8 Inch (15.36 cm) EIA Flange.
FMD-20T/FMD-20TS, FMD-10T/FMD-10TS	3 1/8 Inch (7.75 cm) EIA Flange.



SYSTEM CONSISTS OF TWO TRANSMITTERS, ONE FM EXCITER, HYBRID SPLITTER WITH REJECT LOAD, FD-2 DUAL TRANSMITTER CONTROL UNIT, HIGH POWER HYBRID COMBINER, AND OUTPUT REJECT LOAD. HIGHER POWER REJECT LOADS UTILIZE FORCED-AIR COOLING.

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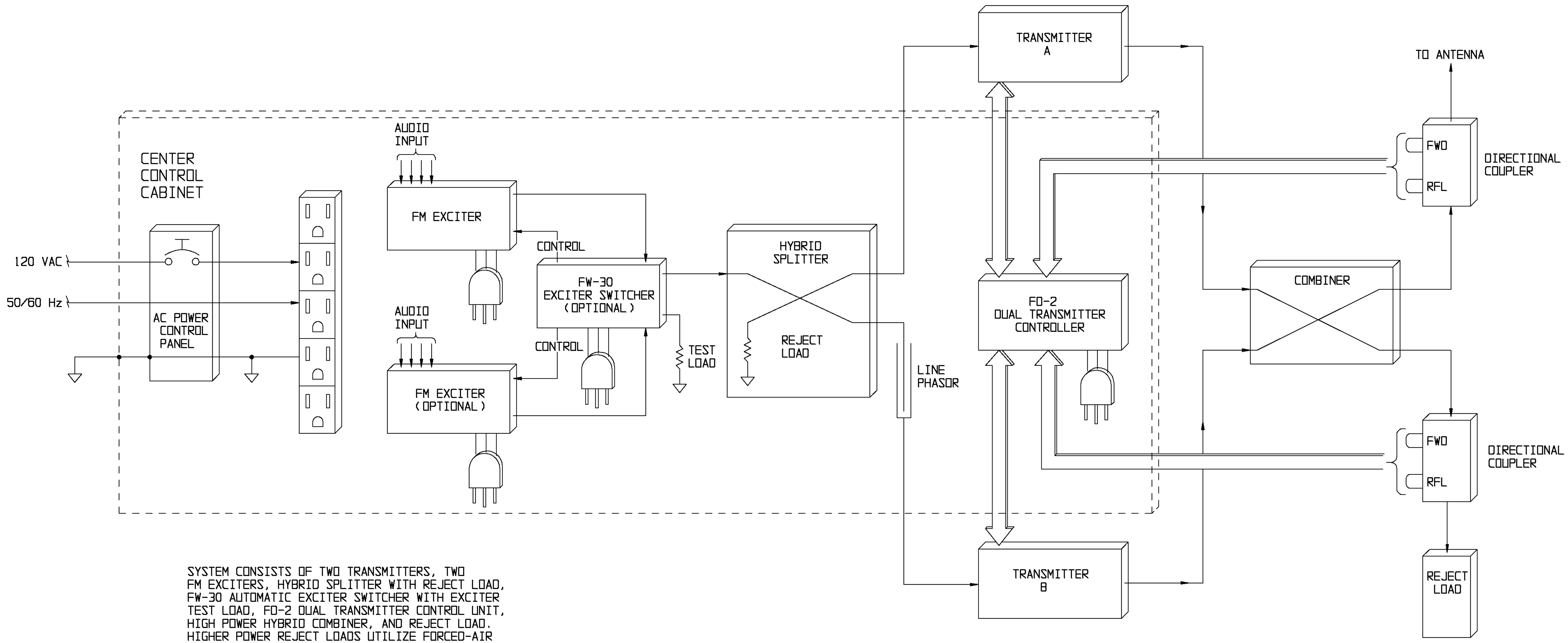
FIGURE 1-2. DUAL TRANSMITTER SYSTEM, CONFIGURATION A



SYSTEM CONSISTS OF TWO TRANSMITTERS, TWO FM EXCITERS, HYBRID SPLITTER WITH REJECT LOAD, FW-30 AUTOMATIC EXCITER SWITCHER WITH EXCITER TEST LOAD, FD-2 DUAL TRANSMITTER CONTROL UNIT, HIGH POWER HYBRID COMBINER, AND REJECT LOAD. HIGHER POWER REJECT LOADS UTILIZE FORCED-AIR COOLING.

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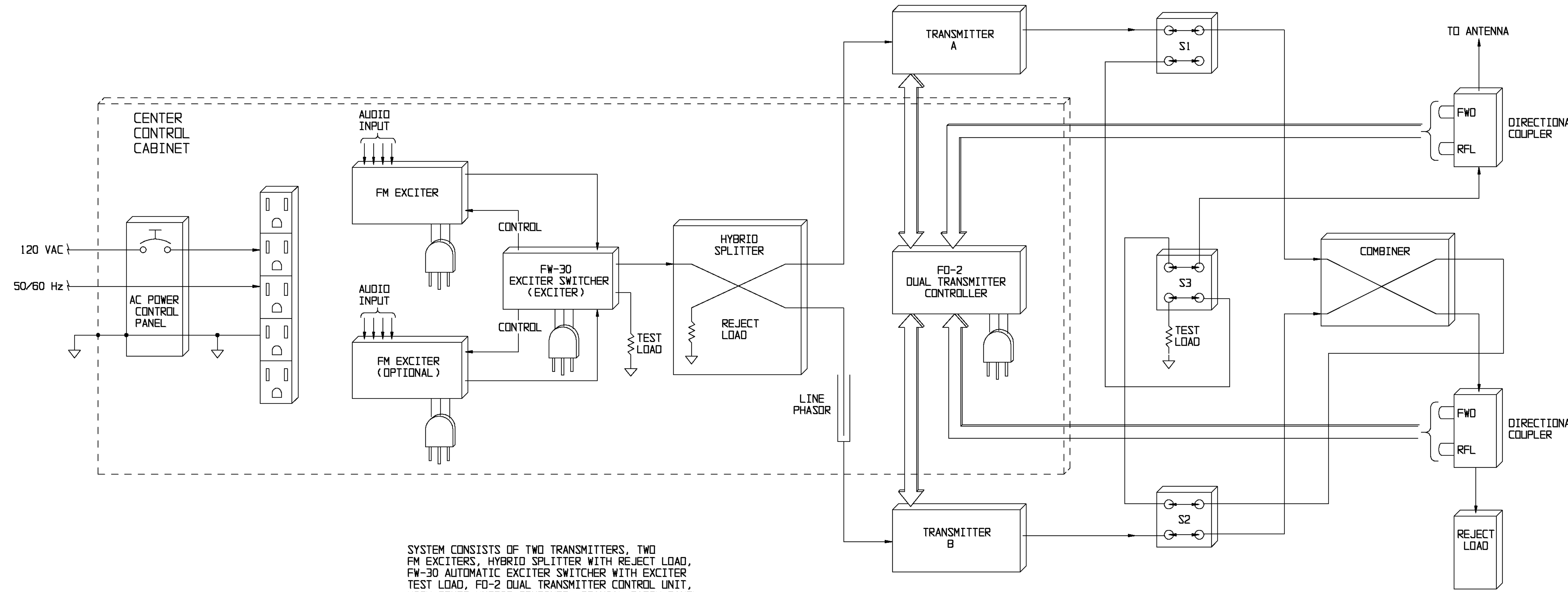
FIGURE 1-3. DUAL TRANSMITTER SYSTEM, CONFIGURATION B



SYSTEM CONSISTS OF TWO TRANSMITTERS, TWO FM EXCITERS, HYBRID SPLITTER WITH REJECT LOAD, FW-30 AUTOMATIC EXCITER SWITCHER WITH EXCITER TEST LOAD, FD-2 DUAL TRANSMITTER CONTROL UNIT, HIGH-POWER HYBRID COMBINER, COAXIAL PATCH PANEL OUTPUT SWITCHING, AND REJECT LOAD. HIGHER POWER REJECT LOADS UTILIZE FORCED-AIR COOLING.

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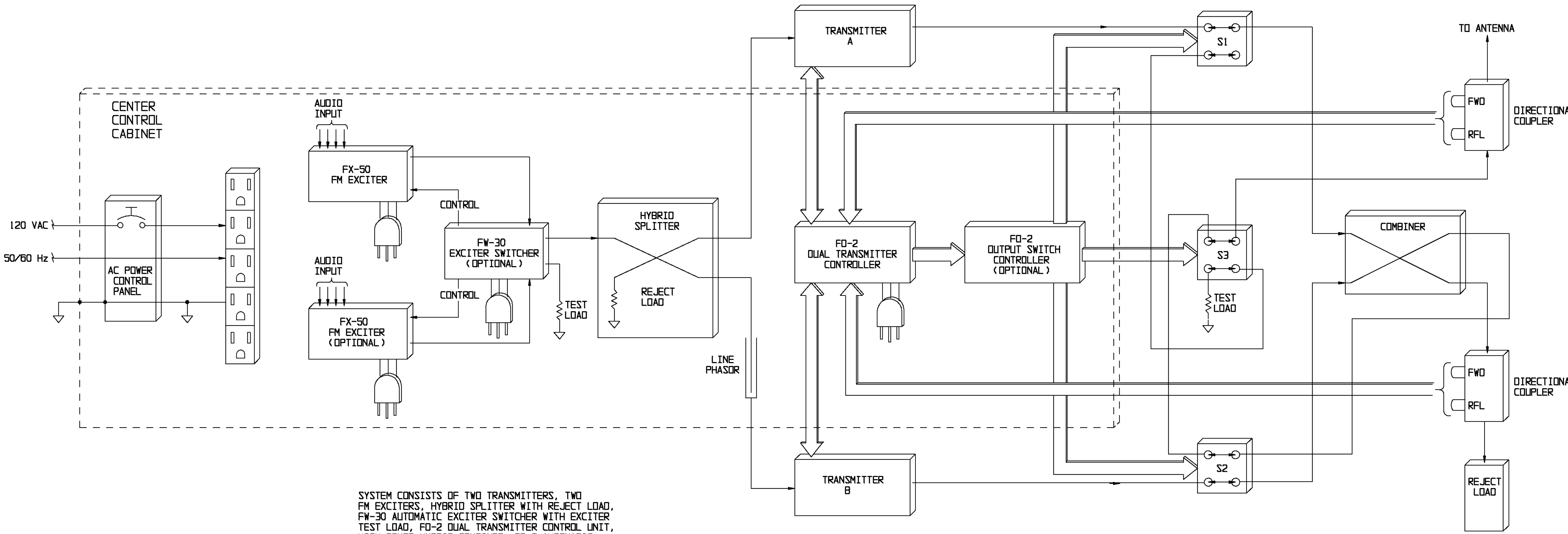
FIGURE 1-4. DUAL TRANSMITTER SYSTEM, CONFIGURATION C



SYSTEM CONSISTS OF TWO TRANSMITTERS, TWO FM EXCITERS, HYBRID SPLITTER WITH REJECT LOAD, FW-30 AUTOMATIC EXCITER SWITCHER WITH EXCITER TEST LOAD, FD-2 DUAL TRANSMITTER CONTROL UNIT, HIGH-POWER HYBRID COMBINER, FD-2 AUTOMATIC TRANSMITTER OUTPUT SWITCH CONTROLLER, SOLENOID OPERATED COAXIAL OUTPUT SWITCHING, AND REJECT LOAD. HIGHER POWER REJECT LOADS UTILIZE FORCED-AIR COOLING.

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FIGURE 1-5. DUAL TRANSMITTER SYSTEM, CONFIGURATION D

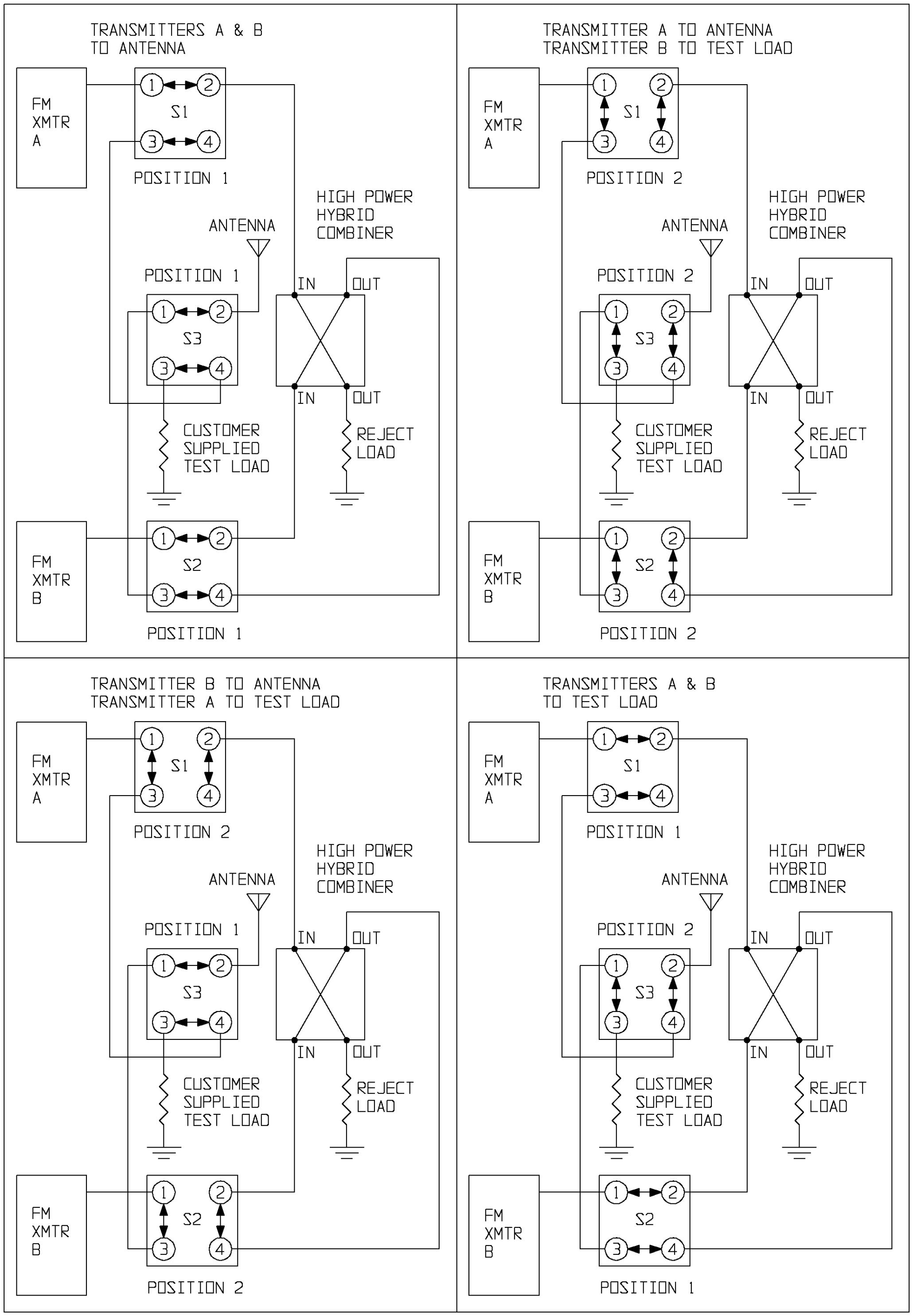

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FIGURE 1-6.
DUAL FM TRANSMITTER OUTPUT SWITCHING SYSTEM AND OPERATING MODES

TABLE 1-1. ELECTRICAL SPECIFICATIONS
(Sheet 2 of 2)

PARAMETER	SPECIFICATION
AC POWER REQUIREMENTS	
FMD–70T	196V to 252V ac 50 or 60 Hz or 341V to 435V 50 Hz, three–phase closed–Delta or Wye (as ordered). 283 Amperes per phase Maximum at 240V. 106 kW at 0.9 pF for 70 kW output (includes exciter).
FMD–60T	196V to 252V ac 50 or 60 Hz or 341V to 435V 50 Hz, three–phase closed–Delta or Wye (as ordered). 243 Amperes per phase Maximum at 240V. 91 kW at 0.9 pF for 60 kW output (includes exciter).
FMD–40T	196V to 252V ac 50 or 60 Hz or 341 to 435V 50 Hz, three–phase closed–Delta or Wye (as ordered). 180 Amperes per phase Maximum at 240V. 70 kW at 0.94 pF for 40 kW output (includes exciter).
FMD–20T	196V to 252V ac 50 or 60 Hz or 341V to 435V 50 Hz, three–phase closed–Delta or Wye (as ordered). 94 Amperes per phase Maximum at 240V. 35 kW at 0.9 pF for 20 kW output (includes exciter).
FMD–20TS	196V to 252V ac 50 or 60 Hz, single–phase. 35 kW at 0.94 pF for 20 kW output (includes exciter).
FMD–10T	196V to 252V ac 50 or 60 Hz or 341V to 435V 50 Hz, three–phase closed–Delta or Wye (as ordered). 58 Amperes per phase Maximum at 240V. 17.48 kW at 0.92 pF for 10 kW output (includes exciter).
FMD–10TS	196V to 252V ac 50 or 60 Hz single–phase. 20.1 kW at 0.98 pF for 10 kW output (includes exciter).

TABLE 1-2. PHYSICAL AND ENVIRONMENTAL CHARACTERISTICS
(Sheet 1 of 4)

PARAMETER	SPECIFICATION
PHYSICAL	
DIMENSIONS:	
FM–35T, FM–30T	
PA/Driver Cabinet	Width: 56.6 Inches (143.5 cm). Height: 70.0 Inches (177.8 cm). Depth: 31.5 Inches (80.0 cm).

TABLE 1-2. PHYSICAL AND ENVIRONMENTAL CHARACTERISTICS
(Sheet 2 of 4)

PARAMETER	SPECIFICATION
PHYSICAL (con't)	
DIMENSIONS:	
FM-35T, FM-30T	
High Voltage Power Supply Cabinet	Width: 34.5 Inches (87.6 cm). Height: 70.0 Inches (177.8 cm). Depth: 31.5 Inches (80.0 cm).
Low-Pass Filter	Length: 52.12 Inches (132.38 cm). Diameter: 6.13 Inches (15.57 cm).
FM-20T	
PA/Driver Cabinet	Width: 50 Inches (127 cm). Height: 70 Inches (177.8 cm). Depth: 31.5 Inches (80.0 cm).
High Voltage Power Supply Cabinet	Width: 27 Inches (68.6 cm). Height: 70 Inches (177.8 cm). Depth: 31.5 Inches (80.0 cm).
Low-Pass Filter	Length: 52.12 Inches (132.38 cm). Diameter: 6.13 Inches (15.57 cm).
FM-10T/FM-10TS	
PA/Driver Cabinet	Width: 33.7 Inches (85.6 cm). Height: 70.0 Inches (143.5 cm). Depth: 37.25 Inches (94.6 cm). Maximum Headroom Required: 82.6 Inches (209.8 cm).
High Voltage Power Supply Cabinet	Width: 22.7 Inches (57.66 cm). Height: 70.0 Inches (177.8 cm). Depth: 37.25 Inches (94.6 cm).
FM-5T/FM-5TS	Width: 34.5 Inches (87.63 cm). Height: 70.0 Inches (143.5 cm). Depth: 37.25 Inches (94.6 cm). Maximum Headroom Required: 82.6 Inches (209.8 cm).
Center Control Cabinet	Width: 23.38 Inches (59.39 cm). Height: 70.0 Inches (177.8 cm). Depth: 31.5 Inches (80.0 cm).

TABLE 1-2. PHYSICAL AND ENVIRONMENTAL CHARACTERISTICS
(Sheet 3 of 4)

PARAMETER	SPECIFICATION
PHYSICAL (con't)	
WEIGHT, Unpacked:	
FM-35T, FM-30T	
PA/Driver Cabinet	1500 Pounds (680 kg).
High Voltage Power Supply Cabinet	1750 Pounds (794 kg).
FM-20T	
PA/Driver Cabinet	1200 Pounds (545 kg).
High Voltage Power Supply Cabinet	1500 Pounds (681 kg).
FM-10T/FM-10TS	
PA/Driver Cabinet	800 Pounds (363 kg).
High Voltage Power Supply Cabinet	1000 Pounds (454 kg).
FM-5T/FM-5TS	1000 Pounds (454 kg).
Center Control Cabinet	265 Pounds (120 kg). (Equipped with the following equipment: FD-2 transmitter controller and FX-50 exciter.)
ENVIRONMENTAL	
AMBIENT TEMPERATURE	+14°F to +122°F (-10°C to +50°C).
MAXIMUM ALTITUDE	
60 Hz Models	0 to 10,000 Feet above sea level (0 to 3048 Meters).
50 Hz Models	0 to 7500 Feet above sea level (0 to 2286 Meters).
MAXIMUM HUMIDITY	95% Non-Condensing.
HEAT DISSIPATION (Including Center Cabinet, Excluding Reject Load)	
FMD-70T	46 kW (154,360 Btu/H).
FMD-60T	39 kW (130,870 Btu/H).
FMD-40T	32 kW (109,445 Btu/H).
FMD-20T/FMD-20TS	15 kW (50,336 Btu/H).
FMD-10T/FMD-10TS	8 kW (26,846 Btu/H).

TABLE 1-2. PHYSICAL AND ENVIRONMENTAL CHARACTERISTICS
(Sheet 4 of 4)

PARAMETER	SPECIFICATION
ENVIRONMENTAL (con't)	
COOLING AIR REQUIREMENTS (Including Center Cabinet, Excluding Reject Load)	
FMD–70T	3650 cubic feet per minute ($103.34\ m^3/min$).
FMD–60T	3650 cubic feet per minute ($103.34\ m^3/min$).
FMD–40T	2870 cubic feet per minute ($81.25\ m^3/min$).
FMD–20T/FMD–20TS	1850 cubic feet per minute ($52.38\ m^3/min$).
FMD–10T/FMD–10TS	1850 cubic feet per minute ($52.38\ m^3/min$).

SECTION II
INSTALLATION

2–1. **INTRODUCTION.**

2–2. This section contains information required for the installation of the Broadcast Electronics T–Series dual transmitter systems.

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 system components. 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, Inc.

2–6. **INSTALLATION REQUIREMENTS.**

2–7. **ENVIRONMENTAL.**

2–8. Table 1–2 (SECTION I, GENERAL INFORMATION) provides physical and environmental conditions which must be considered prior to the dual transmitter system installation.

2–9. **COOLING AIR.**

2–10. If outside air is to be used to ventilate the system, the air inlet duct must be sized to allow adequate air flow. As a minimum requirement, the inlet duct must have a cross–sectional area equal to the total area of all the air inlets on a dual transmitter system (refer to Figures 2–1 through 2–4).

2–11. 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 minimal amount of heat is dissipated into the equipment interior. Refer to Table 1–2 (SECTION I, GENERAL INFORMATION) to determine the minimum air flow requirement for the appropriate dual transmitter system.

2–12. **PRIMARY POWER.**

2–13. The FMD–10TS and FMD–20TS dual transmitter systems are designed for operation from a single–phase primary power source. Prior to installing a transmitter system, assure that an adequate and proper power source is installed.

2–14. The FMD–70T, FMD–60T, FMD–40T, FMD–20T, and FMD–10T dual transmitter systems are designed for operation from a closed–delta or wye connected three–phase power source. Operation from an unsatisfactory power source will void the warranty on the equipment as any resultant damage is beyond the control of the manufacturer. Before attempting installation of a transmitter system, assure that the proper power source is installed. Acceptable power input configurations are shown in Figure 2–5.

2–15. An open–delta, V to V, T to T, T to L, or Scott connected power source will provide unsatisfactory transmitter performance as transients and unstable power can damage components of the transmitter system and provide degraded specifications. Any of these configurations will develop a considerable imbalance between phases in voltage, phase angle, or both voltage and phase angle. These problems can result in premature failure of power supply and RF components.

2–16. It is important that the local electric utility be consulted to ensure that the correct service is provided before connection of the transmitter system to a primary source. The proper power source can be readily identified by the use of three transformers with one winding each or one transformer with three windings instead of the use of two transformers as required for the unacceptable configurations.

2–17. INSTALLATION.

2–18. EQUIPMENT PLACEMENT.

2–19. **GENERAL.** Typical installations for dual transmitter systems are shown in Figures 2–1 through 2–4. Variations in system installation can be achieved by remotely locating the power supply cabinets from the PA/driver cabinets for the FMD–70T, FMD–60T, FMD–40T, and FMD–20T/FMD–20TS. If the cabinets are separated, access holes in the top and bottom allow either overhead or under floor ducting of interconnecting wiring. The coaxial switch/patch panel and the transmitter combining network for any system can be located in almost any position as required by the installation site.

2–20. Regardless of the type of installation, the floor must be capable of supporting the total weight of the transmitter system. The floor support should be more than marginal to maintain proper alignment and reduce vibration. Refer to Table 1–2 (SECTION I, GENERAL INFORMATION) to determine the weight of the appropriate transmitter system.

2–21. **DUAL TRANSMITTER SYSTEM COMPONENT PLACEMENT.** Refer to the following information and place the dual transmitter system components.

2–22. **Factory Assembled Systems.** For dual systems assembled at the factory in a typical configuration, component placement information is presented in Figures 2–1 through 2–4. For dual systems assembled with optional equipment in a special configuration, component placement information is presented in the dual system installation diagram which is located in the instruction manual addendum shipped with the system. To place the dual system components, refer to Figures 2–1 through 2–4 or the installation diagram in the addendum to install the system components as follows:

A. Install transmitter A as shown in the diagram.

B. Install transmitter B as shown in the diagram.

C. Install the center control cabinet as shown in the diagram.

D. Install any optional equipment racks shipped with the system as shown in the diagram.

E. If required, place the coaxial switch/patch panel and RF combining network as shown in the diagram.

F. If required, install the test load as shown in the diagram.

2–23. **Customer Assembled Systems.** For dual systems assembled by the customer, refer to Figures 2–1 through 2–4 and place the system components as required.

WARNING ***ENSURE NO PRIMARY POWER IS CONNECTED TO THE SYSTEM BEFORE PROCEEDING.***

WARNING

2–24. EQUIPMENT INSTALLATION.

2–25. **TRANSMITTERS.** Installation procedures for the dual transmitters are presented in the transmitter manuals shipped with the system. Refer to the transmitter manuals and perform the procedures to install the transmitters. When the transmitter RF output line is to be assembled on FMD–40T, FMD–60T, and FMD–70T models, refer to the following text to assemble the transmitter RF output line.

WARNING *ENSURE NO PRIMARY POWER IS CONNECTED TO THE SYSTEM BEFORE PROCEEDING.*

WARNING

2–26. **RF Transmission Line Installation.** For FMD–40T, FMD–60T, and FMD–70T transmitter models only, the RF transmission lines between the transmitter cavity and low–pass filter must be re–assembled. Locate and separate all transmission line components. Refer to the RF Output Line Assembly procedures in PART I SECTION II, INSTALLATION of the applicable transmitter manual and install the appropriate RF output transmission line components in each transmitter. Ensure the low–pass filter assigned to each transmitter is installed as shown in the assembly diagram. The low–pass filters are identified by serial numbers. The low–pass filter serial number for each transmitter is recorded in the final test data sheets.

2–27. **COAXIAL SWITCH/PATCH PANELS.** If the system is equipped with coaxial switches or patch panels, the coaxial switches/patch panels are mounted external to the system. To install the switches/patch panels, use support brackets and materials as required to mount the equipment in the desired position. The coaxial switch/patch panel interlock connections are presented in the CENTER CONTROL CABINET section of this manual. Perform the procedures during the center control cabinet installation.

2–28. **OUTPUT TRANSMISSION SYSTEM ASSEMBLY.** The output transmission line system consists of the transmission line components from: 1) the low–pass filter to the switches/patch panels and 2) the switches/patch panels to the combiner/test load. The components contain labels to permit re–installation. The labels are referenced in Figures 2–1 through 2–4. To install output transmission line systems assembled in a typical configuration, refer to Figures 2–1 through 2–4 to: 1) connect the low–pass filters to the switches/patch panels and 2) the switches/patch panels to the combiner/test load. For output transmission line systems assembled in a special configuration, assembly information is presented in the dual system installation diagram which is located in the instruction manual addendum shipped with the system. Refer to the addendum information to: 1) connect the low–pass filters to the switches/patch panels and 2) the switches/patch panels to the combiner/test load.

2–29. **TEST LOAD.** Install the test load by performing the following.

WARNING *ENSURE AN EARTH GROUND IS CONNECTED TO THE TEST LOAD GROUND TERMINALS.*

WARNING

2–30. **Ground Connections.** An earth ground must be connected to the test load ground terminal. Connect an earth ground to the test load ground terminal using a 2 inch copper ground strap.

2–31. **Interlock.** The test load interlock interfaces to the dual system at the center control cabinet. The test load interlock connections are presented in the CENTER CONTROL CABINET section of this manual. Perform the procedures during the center control cabinet installation.

2–32. **CENTER CONTROL CABINET.** Installation procedures for the center control cabinet are presented in the PART II, CENTER CONTROL CABINET section of this manual. Refer to PART II, CENTER CONTROL CABINET and perform the procedures to install the center control cabinet.

2–33. **SYSTEM OPERATING PROCEDURES.**

2–34. Standard operating procedures for the dual transmitter system are presented in the FD–2 section of this manual. Refer to the FD–2 section for standard operating procedures.

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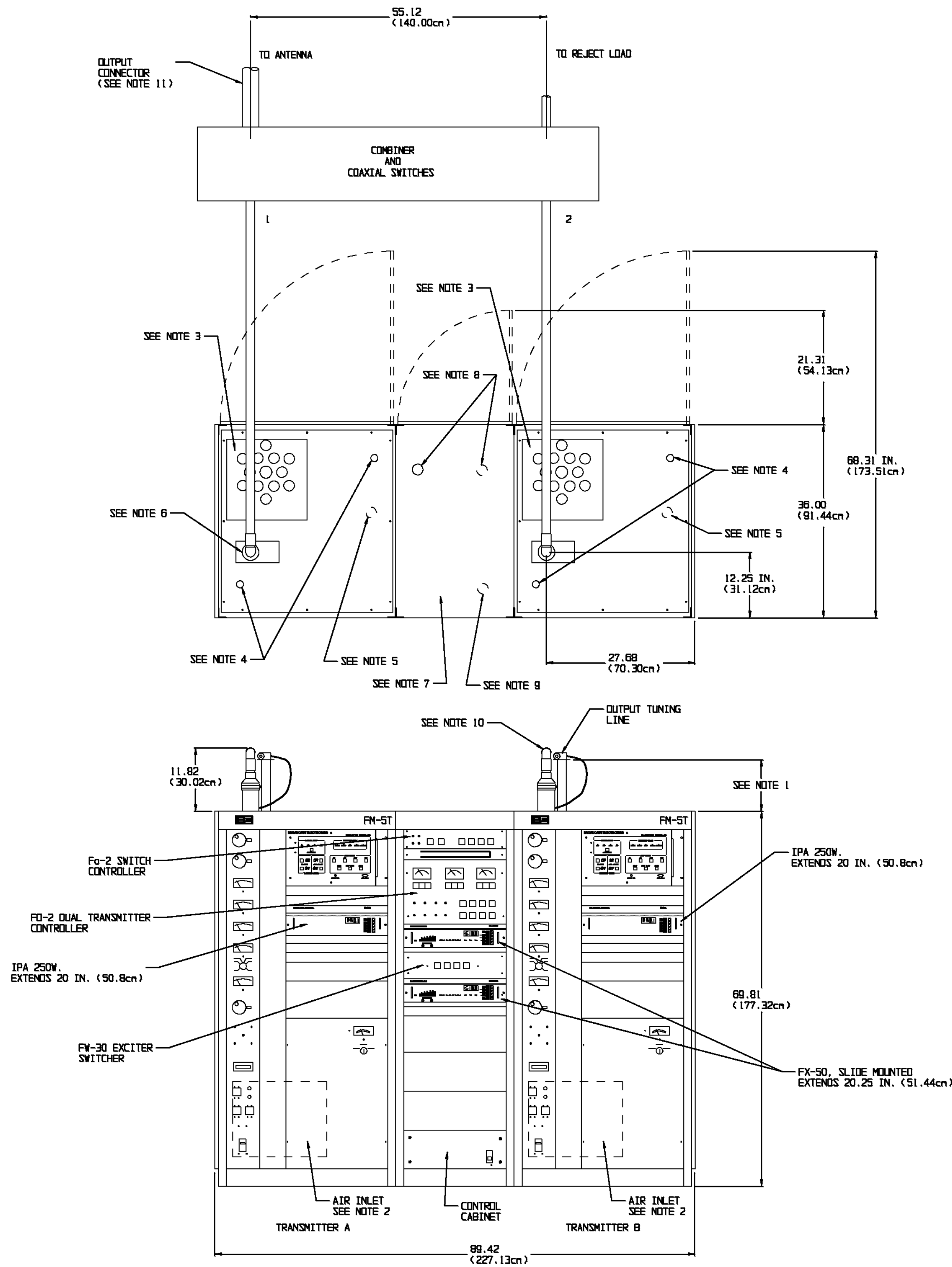
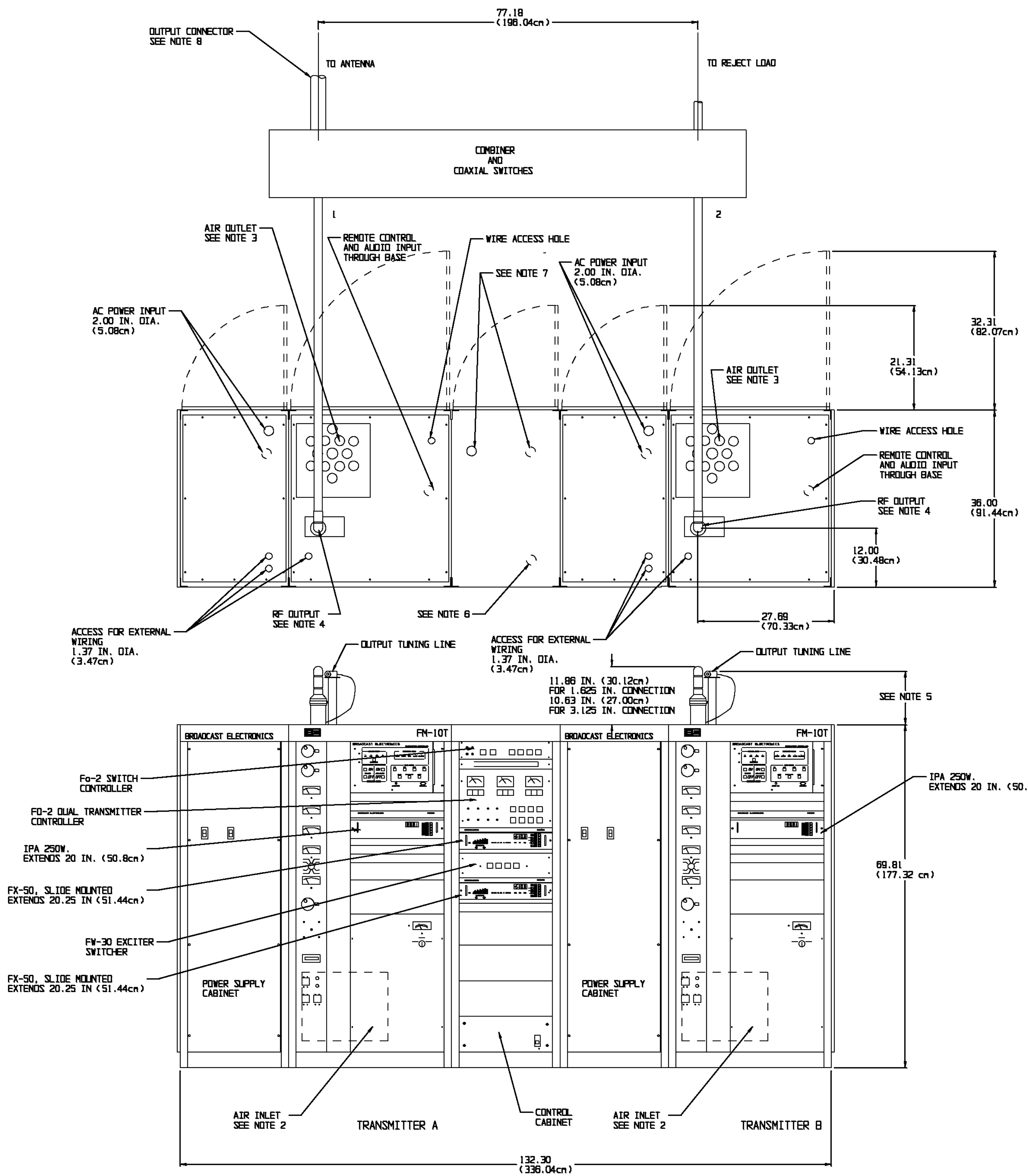


NOTES:

1. TUNING LINE HEIGHT IS DETERMINED BY FREQUENCY OF TRANSMITTER.
   MAX. = 11 IN. @ 108 MHz
   MIN. = 1 IN. @ 87.5 MHz
2. AIR INLET AT REAR OF CABINET, 17 1/2 IN. X 14 IN. (44.45 cm X 33.56 cm).
3. AIR OUTLET AT TOP OF CABINET, 15 IN. X 15 IN. (38.10 cm X 38.10 cm).
4. ACCESS FOR A.C. POWER THROUGH 1 3/8 IN. (3.49 cm) DIA. HOLE IN TOP COVER IN REAR OR THROUGH BASEPLATE IN RIGHT REAR CORNER. GROUND STRAP ENTRY POINT IN LOWER RIGHT REAR CORNER.
5. ACCESS FOR REMOTE CONTROL AND AUDIO CONNECTIONS THROUGH 2 IN. (5.08 cm) DIA. HOLE IN BASEPLATE OR THROUGH EITHER 1 3/8 IN (3.49 cm) DIA. HOLE IN TOP COVER.
6. OUTPUT RF CONNECTION IS 1 5/8 IN. (4.13 cm) EIA FLANGE, B.E. P/N 427-0010; FLANGE IS REMOVABLE IF UNFLANGED CONNECTION IS DESIRED. NO CENTER CONDUCTOR BULLET IS SUPPLIED, B.E. P/N 427-0009 RECOMMENDED.
7. AIR OUTLET AT TOP OF CABINET, 21 3/4 IN. X 25 1/2 IN. (55.25 cm X 64.77 cm).
8. ACCESS FOR REMOTE CONTROL AND AUDIO CONNECTIONS THROUGH TOP OR BOTTOM OF CABINET.
9. ACCESS FOR A.C. POWER THROUGH BASE PLATE; SEE DRAWING. GROUND STRAP ENTRY POINT IN LOWER LEFT CORNER.
10. ELBOW ASSEMBLY, 1 5/8 IN. (4.13 cm), 90 MITER, NOT FURNISHED.
11. OUTPUT CONNECTOR:
    FMD-10T: 3-1/8 IN.

597-0099-415

FIGURE 2-1. TYPICAL INSTALLATION DIAGRAM FMD-10T/FMD-10TS DUAL TRANSMITTER SYSTEMS

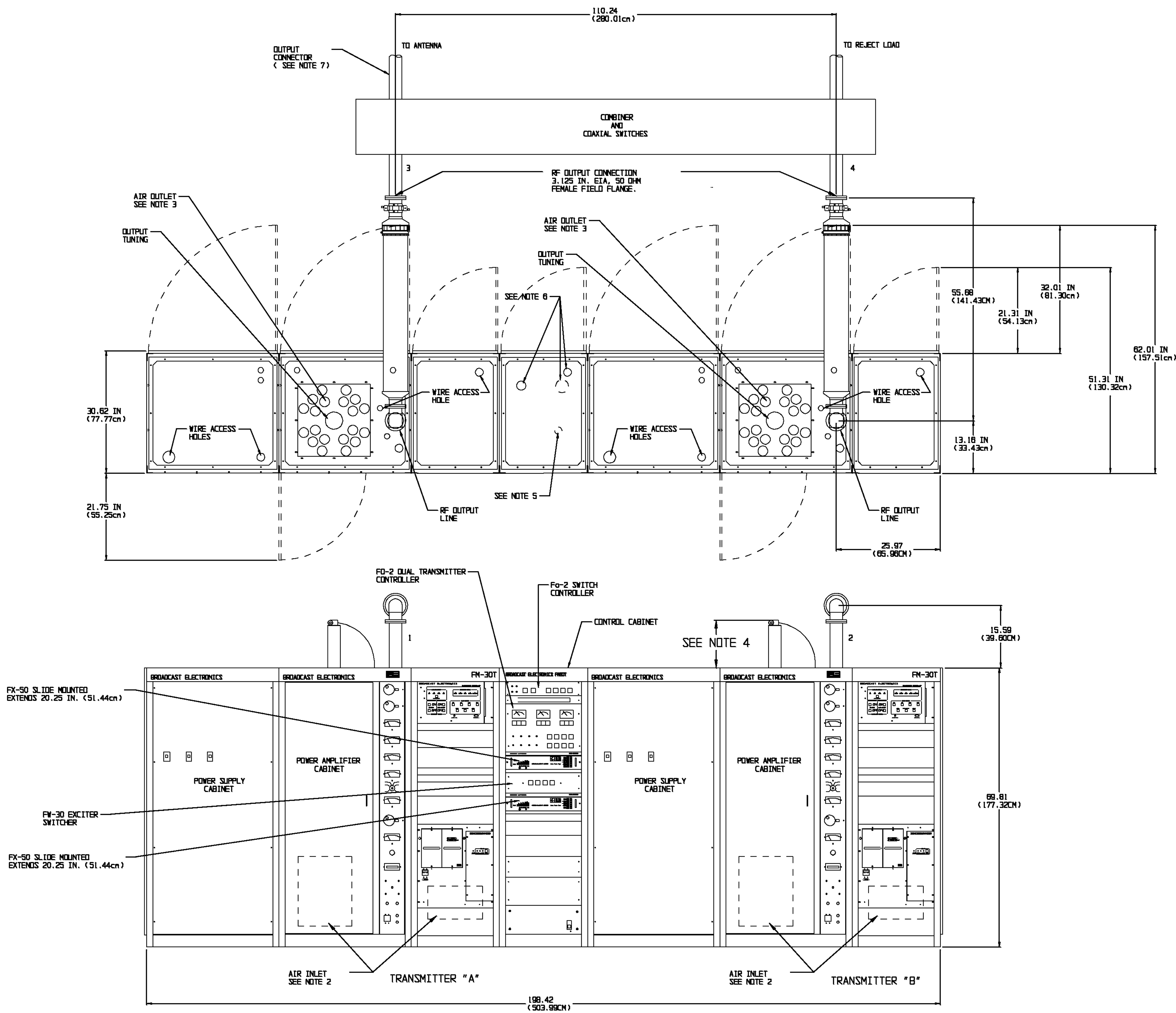


NOTES:

1. POWER SUPPLY CABINETS MAY BE LOCATED REMOTELY FROM PA/DRIVER CABINET IF DESIRED. 30 FEET (9.14M) STANDARD.
2. AIR INLET, FILTER REQUIRED (BE P/N 407-0062).
   LOCATION: REAR OF PA/DRIVER CABINET.
   DIMENSIONS:
   WIDTH: 17.5 INCHES (44.5 CM)
   HEIGHT: 14 INCHES (35.6 CM)
3. AIR OUTLET:
   LOCATION: TOP OF PA/DRIVER CABINET
   DESCRIPTION: 15 INCH (38.1 CM) SQUARE EXHAUST AREA CENTERED AROUND OUTPUT TUNING LINE.
4. RF OUTPUT ASSEMBLY:
   CONNECTION: 1.625 INCH EIA 50 OHM MALE FIELD FLANGE STANDARD.
   3.125 INCH EIA 50 OHM MALE FIELD FLANGE OPTIONAL.
5. TUNING LINE HEIGHT (DETERMINED BY TRANSMITTER FREQUENCY):
   MAXIMUM: 11 INCHES (27.94 CM), FREQUENCY: 108 MHz.
   MINIMUM: 1 INCH (2.54 CM), FREQUENCY: 87.5 MHz.
6. ACCESS FOR A.C. POWER THRU BASE PLATE, SEE DRAWING. GROUND STRAP ENTRY POINT IN LOWER LEFT CORNER.
7. ACCESS FOR REMOTE CONTROL AND AUDIO CONNECTIONS THROUGH TOP OR BOTTOM OF CABINET.
8. OUTPUT CONNECTOR, 3-1/8 IN.

597-0099-410

FIGURE 2-2. TYPICAL INSTALLATION DIAGRAM FOR THE FMD-20T/FMD-20TS DUAL TRANSMITTER SYSTEMS

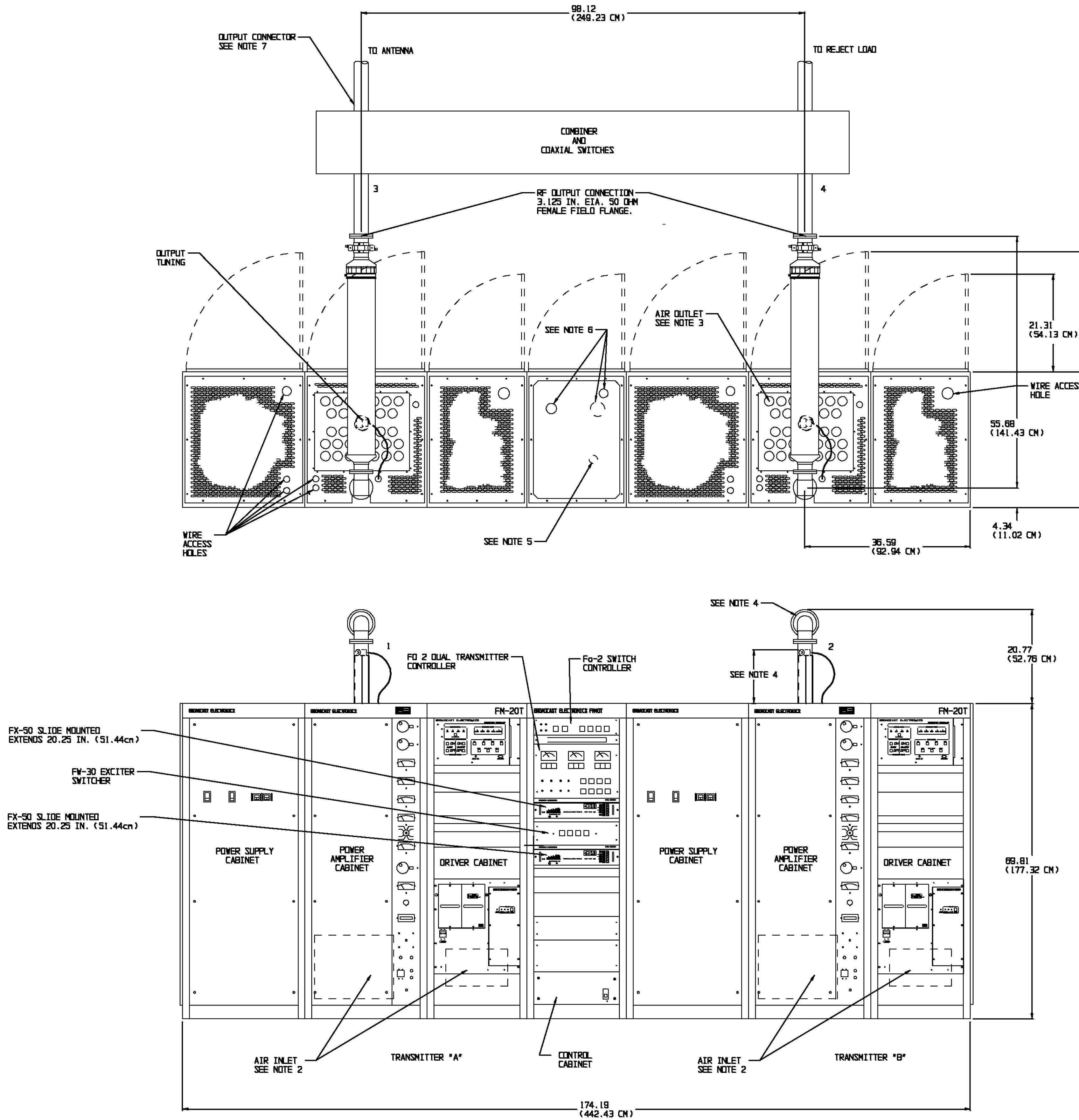


NOTES:

1. POWER SUPPLY CABINET MAY BE LOCATED REMOTELY FROM PA/DRIVER CABINET IF DESIRED. 30 FEET (9.14 M) STANDARD.
2. AIR INLET:
   1. LOCATION: PA CABINET REAR-PANEL.
      DIMENSIONS:
      WIDTH: 13.5 INCHES (34.29 CM)
      HEIGHT: 17.5 INCHES (44.45 CM)
      FILTER: 16 INCHES X 20 INCHES X 1 INCH NOMINAL. BEI P/N 407-0062
   2. LOCATION: DRIVER CABINET REAR-PANEL.
      DIMENSIONS:
      WIDTH: 13.69 INCHES (34.77 CM)
      HEIGHT: 8.22 INCHES (20.88 CM)
      FILTER: 16 INCHES X 20 INCHES X 1 INCH NOMINAL. BEI P/N 407-0062
3. AIR OUTLET:
   DESCRIPTION: 20.62 INCH (52.37 CM) SQUARE EXHAUST AREA CENTERED AROUND OUTPUT TUNING LINE.
4. FM-30B/FM-35B RF OUTPUT ASSEMBLY:
   CONNECTION: 3.125 INCH EIA 50 OHM FEMALE FIELD FLANGE.
   LOW-PASS FILTER (BEI P/N 339-0022):
   DIMENSIONS:
   LENGTH: 52.12 INCH (132.38 CM)
   DIAMETER: 6.13 INCHES (15.57 CM)
   MOUNTING: MECHANICAL SUPPORT REQUIRED EXTERNAL TO TRANSMITTER.
   WEIGHT: 65 POUNDS (29.48 KG)
   TUNING LINE HEIGHT (DETERMINED BY TRANSMITTER FREQUENCY):
   MAXIMUM: 15.5 INCHES (39.37 CM) @ 108 MHz
   MINIMUM: 4.5 INCHES (11.3 CM) @ 88 MHz
5. ACCESS FOR A.C. POWER THRU BASE PLATE, SEE DRAWING. GROUND STRAP ENTRY POINT IN LOWER LEFT CORNER.
6. ACCESS FOR REMOTE CONTROL AND AUDIO CONNECTIONS THROUGH TOP OR BOTTOM OF CABINET.
7. OUTPUT CONNECTOR, 6-1/8 IN.

597-0099-416

FIGURE 2-3. TYPICAL INSTALLATION DIAGRAM FOR THE FMD-60T AND FMD-70T DUAL TRANSMITTER SYSTEMS



NOTES:

1. POWER SUPPLY CABINET MAY BE LOCATED REMOTELY FROM THE PA/DRIVER CABINET IF DESIRED. 30 FEET (9.14 m) STANDARD.
2. AIR INLET:
   1. LOCATION: PA CABINET REAR-PANEL
      DIMENSIONS:
      WIDTH: 17.5 INCHES (44.45 cm)
      HEIGHT: 14.0 INCHES (35.56 cm)
      FILTER: 16 INCHES X 20 INCHES X 1 INCH NOMINAL. BEI P/N 407-0062.
   2. LOCATION: DRIVER CABINET REAR-PANEL
      DIMENSIONS:
      WIDTH: 13.69 INCHES (34.77 cm)
      HEIGHT: 8.22 INCHES (20.88 cm)
      FILTER: 16 INCHES X 20 INCHES X 1 INCH NOMINAL. BEI P/N 407-0062.
3. AIR OUTLET:
   DESCRIPTION: 17 INCHES (43.18 cm) X 20.75 INCHES (52.71 cm) EXHAUST AREA AROUND OUTPUT TUNING LINE.
4. RF OUTPUT ASSEMBLY:
   CONNECTION: 3.125 INCH EIA 50 OHM FEMALE FIELD FLANGE.
   LOW-PASS FILTER (BEI P/N 339-0022):
   DIMENSIONS:
   LENGTH: 52.12 INCHES (132.38 cm)
   DIAMETER: 6.13 INCHES (15.57 cm)
   MOUNTING: MECHANICAL SUPPORT REQUIRED EXTERNAL TO TRANSMITTER.
   WEIGHT: 65 POUNDS (29.48 kg)
   TUNING LINE HEIGHT (DETERMINED BY TRANSMITTER FREQUENCY):
   MAXIMUM: 17.0 INCHES (43.18 cm) @ 108 MHz
   MINIMUM: 5.0 INCHES (12.7 cm) @ 88 MHz
5. ACCESS HOLE FOR A.C. POWER THRU BASE, SEE DRAWING GROUND STRAP ENTRY POINT IN LOWER LEFT REAR CORNER OF CABINET.
6. ACCESS FOR REMOTE CONTROL AND AUDIO CONNECTIONS THROUGH TOP OR BOTTOM OF CABINET.
7. OUTPUT CONNECTOR, 6-1/8 IN.

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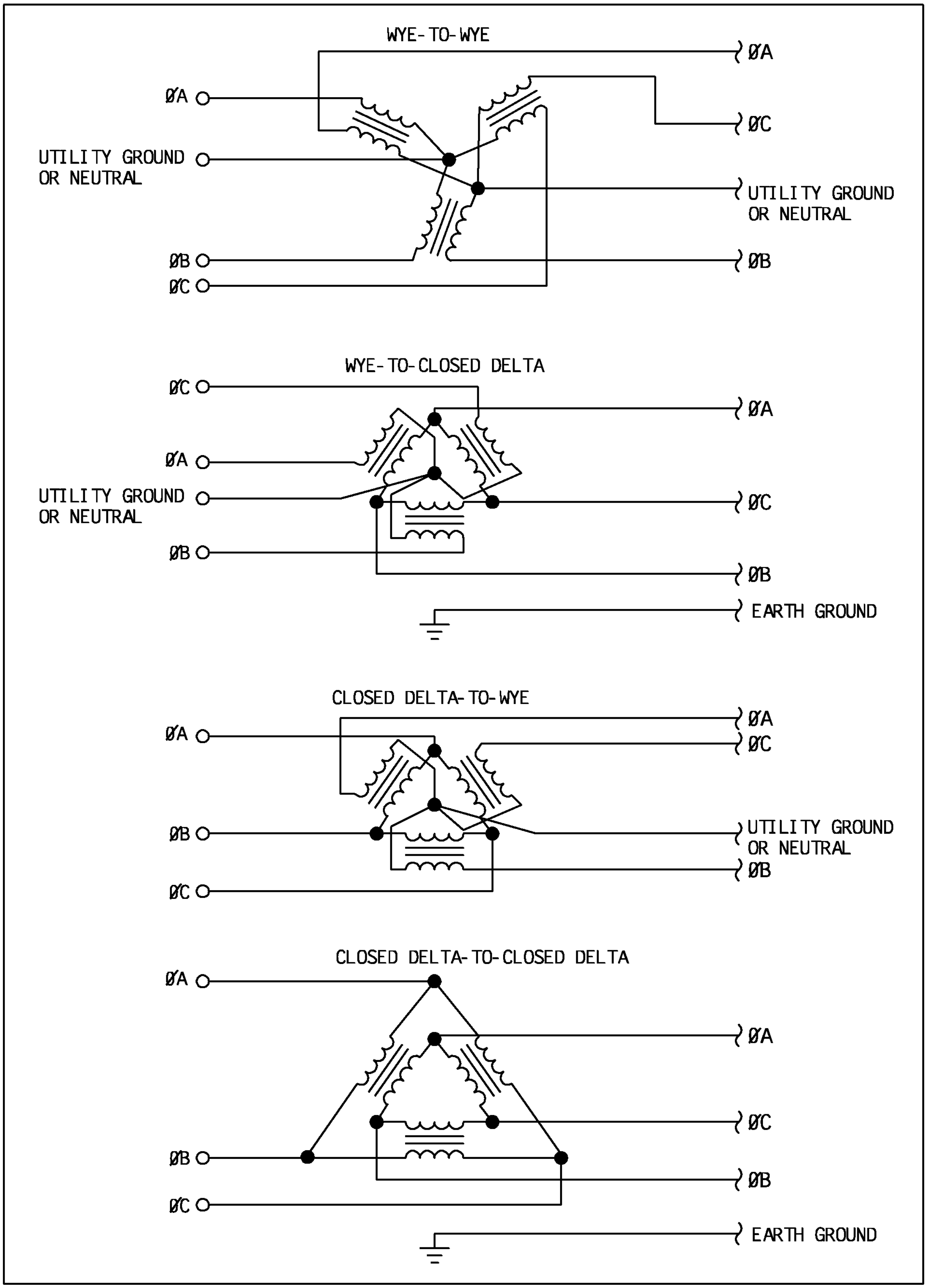
FIGURE 2-4. INSTALLATION DIAGRAM FOR THE FMD-40T DUAL TRANSMITTER SYSTEM



597-0099-11

FIGURE 2-5. ACCEPTABLE AC POWER INPUT CONFIGURATIONS

SECTION III
PARTS LISTS

3-1. INTRODUCTION.

3-2. This section provides descriptions and part numbers of electrical components, assemblies, and selected mechanical parts required for maintenance of the Broadcast Electronics basic T-Series dual transmitter systems.

3-3. Parts for the center control cabinet and FD-2 transmitter controller are listed in the modular publications of this manual.

TABLE 3-1. REPLACEABLE PARTS LISTS

TABLE	DESCRIPTION	PART NO.	PAGE
3-2	FMD-70T DUAL TRANSMITTER SYSTEM	909-2035-XXX	3-2
3-3	FMD-60T DUAL TRANSMITTER SYSTEM	909-2030-XXX	3-2
3-4	FMD-40T DUAL TRANSMITTER SYSTEM	909-2020-XXX	3-2
3-5	FMD-20T DUAL TRANSMITTER SYSTEM	909-2010-XXX	3-2
3-6	FMD-20TS DUAL TRANSMITTER SYSTEM	909-2010-XXX	3-2
3-7	FMD-10T DUAL TRANSMITTER SYSTEM	909-2005-XXX	3-2
3-8	FMD-10TS DUAL TRANSMITTER SYSTEM	909-2005-XXX	3-3

TABLE 3-2. FMD-70T DUAL TRANSMITTER SYSTEM - 909-2035-XXX

REF. DES.	DESCRIPTION	PART NO.	QTY.
----	FM-35T Transmitter	909-0035-205	2
----	Center Control Cabinet	-----	1
----	RF Output System	-----	1

TABLE 3-3. FMD-60T DUAL TRANSMITTER SYSTEM - 909-2030-XXX

REF. DES.	DESCRIPTION	PART NO.	QTY.
----	FM-30T Transmitter	909-0000-205	2
----	Center Control Cabinet	-----	1
----	RF Output System	-----	1

TABLE 3-4. FMD-40T DUAL TRANSMITTER SYSTEM - 909-2020-XXX

REF. DES.	DESCRIPTION	PART NO.	QTY.
----	FM-20T Transmitter	909-0020-205	2
----	Center Control Cabinet	-----	1
----	RF Output System	-----	1

TABLE 3-5. FMD-20T DUAL TRANSMITTER SYSTEM - 909-2010-XXX

REF. DES.	DESCRIPTION	PART NO.	QTY.
----	FM-10T Transmitter	909-1110-205	2
----	Center Control Cabinet	-----	1
----	RF Output System	-----	1

TABLE 3-6. FMD-20TS DUAL TRANSMITTER SYSTEM - 909-2010-XXX

REF. DES.	DESCRIPTION	PART NO.	QTY.
----	FM-10TS Transmitter	909-1110-255	2
----	Center Control Cabinet	-----	1
----	RF Output System	-----	1

TABLE 3-7. FMD-10T DUAL TRANSMITTER SYSTEM - 909-2005-XXX

REF. DES.	DESCRIPTION	PART NO.	QTY.
----	FM-5T Transmitter	909-5000-205	2
----	Center Control Cabinet	-----	1
----	RF Output System	-----	1

TABLE 3-8. FMD-10TS DUAL TRANSMITTER SYSTEM - 909-2005-XXX

REF. DES.	DESCRIPTION	PART NO.	QTY.
----	FM-5TS Transmitter	909-5000-255	2
----	Center Control Cabinet	-----	1
----	RF Output System	-----	1

SECTION IV
DRAWINGS

4-1. INTRODUCTION.

4-2. This section provides wiring diagrams as indexed below for the Broadcast Electronics T-Series dual transmitter systems.

FIGURE	TITLE	NUMBER
4-1	OVERALL WIRING DIAGRAM, T-SERIES DUAL TRANSMITTER SYSTEMS	909-2030-600

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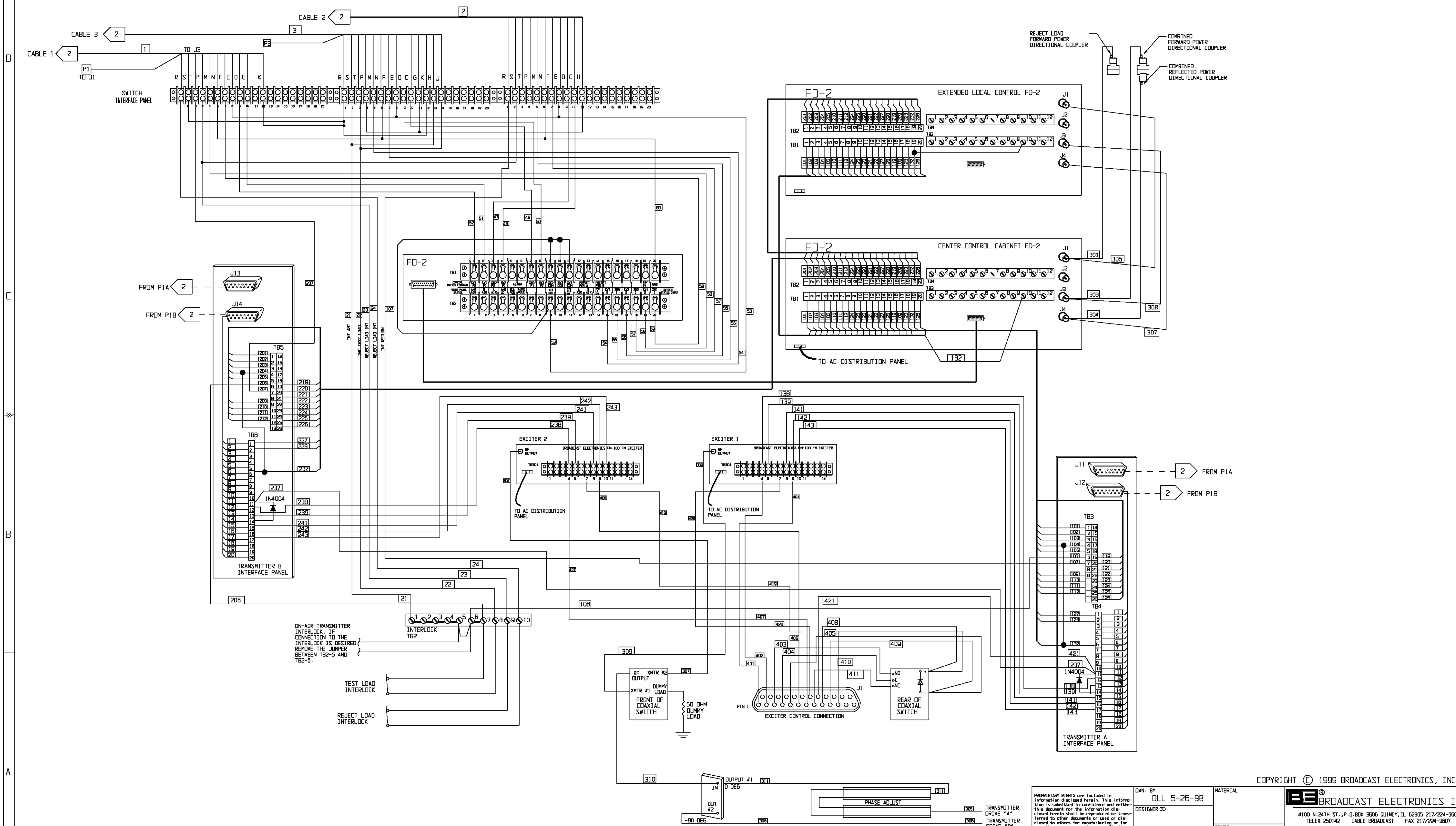

REV	DATE	DESCRIPTION	DRAFTER	APPROVED	ECN

REVISIONS

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

DWN. BY DLL 5-26-98
DESIGNER(S)
PROJ. LEADER
MFG.
MATERIAL
FINISH
SEE DWG 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 OVERALL SCHEMATIC

TYPE S SIZE D DWG. NO. 909-2030-600 REV A

MODEL SCALE SHEET 1 OF 2

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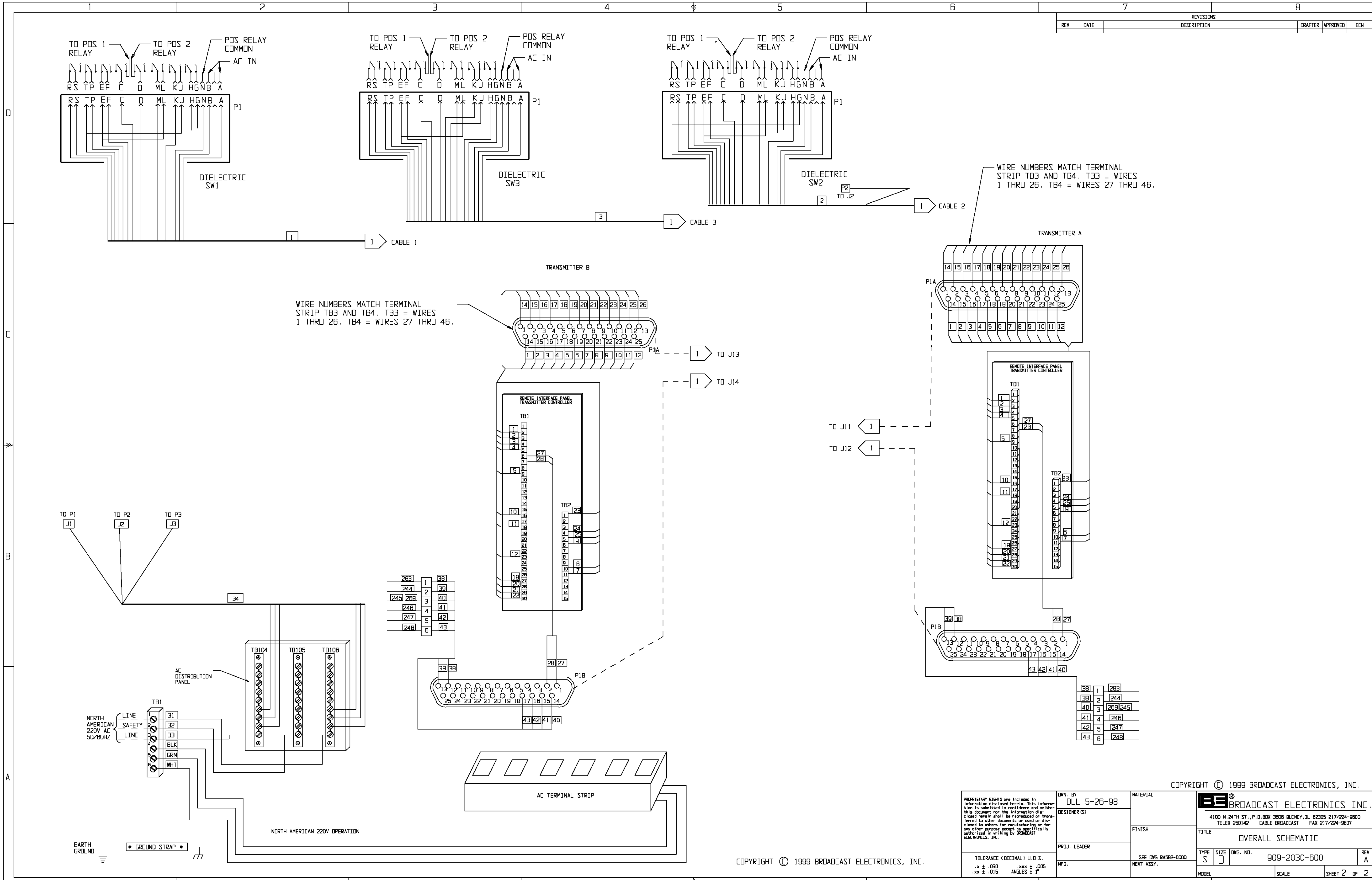
TO POS 1 RELAY
TO POS 2 RELAY
POS RELAY COMMON
AC IN
RS TP EF C D ML KJ HGNB A
P1
DIELECTRIC SW1
DIELECTRIC SW3
DIELECTRIC SW2
CABLE 1
CABLE 2
CABLE 3
P2
TO J2
WIRE NUMBERS MATCH TERMINAL STRIP TB3 AND TB4. TB3 = WIRES 1 THRU 26. TB4 = WIRES 27 THRU 46.
TRANSMITTER A
TRANSMITTER B
P1A
P1B
TO J11
TO J12
TO J13
TO J14
REMOTE INTERFACE PANEL TRANSMITTER CONTROLLER
TB1
TB2
TO P1
TO P2
TO P3
J1
J2
J3
AC DISTRIBUTION PANEL
TB104
TB105
TB106
NORTH AMERICAN 220V AC 50/60HZ
LINE
SAFETY
LINE
BLK
GRN
WHT
AC TERMINAL STRIP
NORTH AMERICAN 220V OPERATION
EARTH GROUND
GROUND STRAP
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REV
DATE
DESCRIPTION
DRAFTER
APPROVED
ECN
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TOLERANCE (DECIMAL) U.O.S.
.x ± .030
.xx ± .015
.xxx ± .005
ANGLES ± 1°
DWN. BY
DLL 5-26-98
DESIGNER(S)
PROJ. LEADER
MFG.
MATERIAL
FINISH
SEE DWG 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
OVERALL SCHEMATIC
TYPE S
SIZE D
DWG. NO. 909-2030-600
REV A
MODEL
SCALE
SHEET 2 OF 2

CENTER CONTROL CABINET
TABLE OF CONTENTS

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SECTION I
GENERAL INFORMATION

1-1. INTRODUCTION.

1-2. Information presented in this section provides a general description of the Broadcast Electronics T-Series dual transmitter system center control cabinet.

1-3. EQUIPMENT DESCRIPTION.

1-4. The center control cabinet operates as a control center for a dual transmitter system. The center cabinet contains the following modular components: 1) an FD-2 dual transmitter controller, 2) an adjustable coaxial line phasor, 3) an FX-50 FM exciter, 4) a hybrid splitter, 5) a circuit breaker panel with circuit breaker, and 6) any additional equipment as determined by the configuration ordered (refer to Figure 1-1). Additional center control cabinet equipment includes: 1) an FO-2 output switch controller, 2) an FW-30 exciter switcher, and 3) an additional FX-50 exciter.

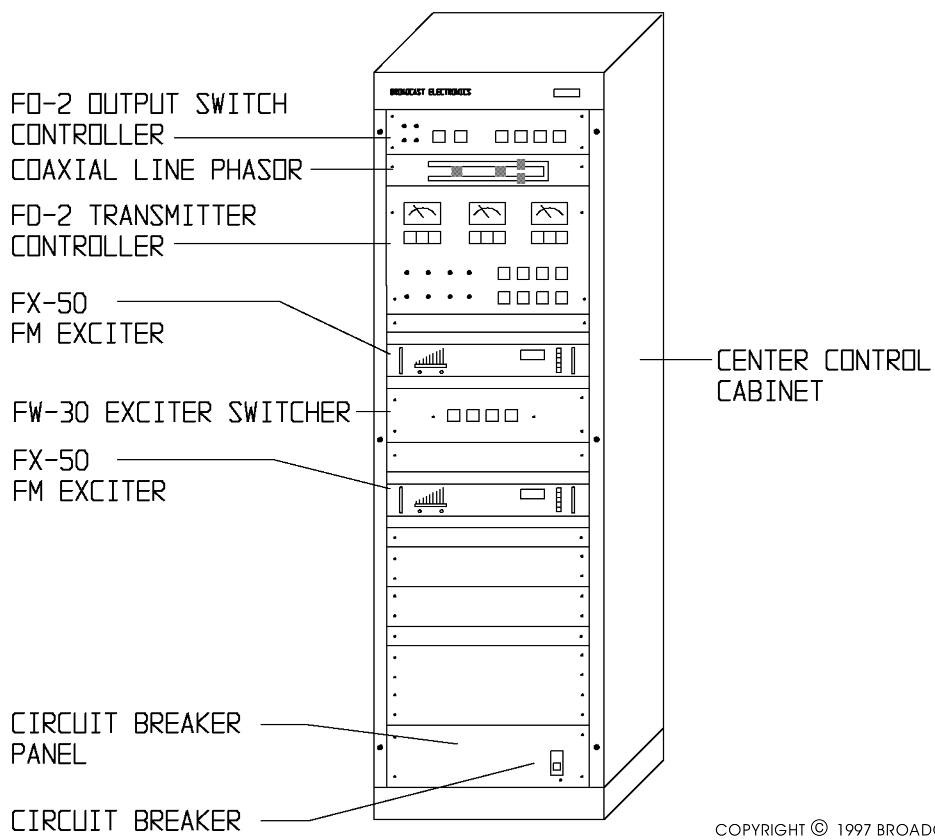

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FIGURE 1-1. CENTER CONTROL CABINET AND EQUIPMENT

1-5. **EQUIPMENT SPECIFICATIONS.**

1-6. Refer to Table 1-1 for electrical, and physical specifications of the center control cabinet.

TABLE 1-1. ELECTRICAL AND PHYSICAL SPECIFICATIONS

PARAMETER	SPECIFICATION
ELECTRICAL	
POWER REQUIREMENTS	96V TO 136V ac or 194V to 266V ac, 50/60 Hz.
PHYSICAL	
DIMENSIONS:	
WIDTH	23.38 Inches (59.39 cm).
DEPTH	31.5 Inches (80.0 cm).
HEIGHT	70.0 Inches (177.8 cm).
WEIGHT, Unpacked	265 Pounds (120 kg). (Equipped with the following items: FD-2 transmitter controller, FO-2 output switch controller, FM exciter, and coaxial line phasor).

SECTION II
INSTALLATION

2–1. INTRODUCTION.

2–2. This section contains information required for the installation of the Broadcast Electronics T–Series dual transmitter system center control cabinet.

2–3. INSTALLATION.

2–4. The center control cabinet is operated, tested, and inspected at the factory prior to shipment and is ready for installation when received. Prior to installation, this publication should be studied to obtain a thorough understanding of the operation, circuitry, nomenclature, and installation requirements.

2–5. COMPONENT INSTALLATION.

2–6. The center control cabinet exciter(s) has been removed from the cabinet to prevent damage during shipment. Locate the exciter shipping container. Remove all tape, wire ties, string, and packing material used for shipment. Install the exciter(s) by performing the following procedures.

1. Install exciter 1 as follows:

   A. Refer to Figure 2–1 to determine the location of exciter 1. The exciter is mounted into the cabinet with slide–rails.

   B. Install exciter 1 by placing the unit onto the slide rails.

   C. Connect the cables to exciter 1 as follows:

      1. Connect the EXCITER 1 RF output cable to the RF OUT receptacle.
      2. Connect the ground wire to a top cover chassis screw.
      3. Connect wire 138 to TB301–4.
      4. Connect wire 402 to TB301–4.
      5. Connect wire 139 to TB301–5.
      6. Connect wire 401 to TB301–9.
      7. Connect wire 142 to TB301–9.
      8. Connect wire 420 to TB301–7.
      9. Connect wire 141 to TB301–8.
      10. Connect wire 143 to TB301–10.

2. Repeat the procedure for exciter 2. Connect wires to TB301 as follows:

   A. Connect wire 238 to TB301–4.

   B. Connect wire 407 to TB301–4.

   C. Connect wire 239 to TB301–5.

   D. Connect wire 406 to TB301–9.

E. Connect wire 242 to TB301-9.

F. Connect wire 419 to TB301-7.

G. Connect wire 241 to TB301-8.

H. Connect wire 243 to TB301-10.

3. If the system is equipped with an exciter switcher, repeat the procedure for exciter 2.

2-7. **WIRING.**

2-8. **TRANSMITTER INTERFACING.** To interface the center control cabinet to the transmitters, refer to Figure 2-1 and perform the following information.

WARNING ***ENSURE NO PRIMARY POWER IS CONNECTED TO THE SYSTEM BEFORE PROCEEDING.***

WARNING

A. Locate 25-pin D connector P1A in transmitter A. Attach connector P1A to J11 in the center control cabinet as shown.

B. Locate 25-pin D connector P1B in transmitter A. Attach connector P1B to J12 in the center control cabinet as shown.

C. Locate 25-pin D connector P1A in transmitter B. Attach connector P1A to J13 in the center control cabinet as shown.

D. Locate 25-pin D connector P1B in transmitter B. Attach connector P1B to J14 in the center control cabinet as shown.

WARNING ***ENSURE NO PRIMARY POWER IS CONNECTED TO THE SYSTEM BEFORE PROCEEDING.***

WARNING

2-9. **COAXIAL SWITCH/PATCH PANEL INTERFACING.** Coaxial switches/patch panels require interfacing to the center control cabinet. The interfacing is accomplished by a cable. Locate the interfacing cable which is attached to the coaxial switches/patch panels. Refer to Figure 2-1 and connect the interfacing cable to P3 in the center control cabinet.

2-10. **DUAL SYSTEM INTERLOCK INTERFACING.** The transmitter A and B external interlock connections at the transmitter A and B remote interface panels are used to create a dual system interlock circuit. Therefore, do not connect any equipment to the external interlock connections on the transmitter A and B remote interface panels.

2-11. The dual system interlock circuit may be accessed at interlock terminal strip TB2 in the center control cabinet (refer to Figure 2-1). The interlock circuit is divided into an on-air transmitter interlock circuit, a test load transmitter interlock circuit, and a reject load interlock circuit. Connect equipment to the interlock circuit as follows.

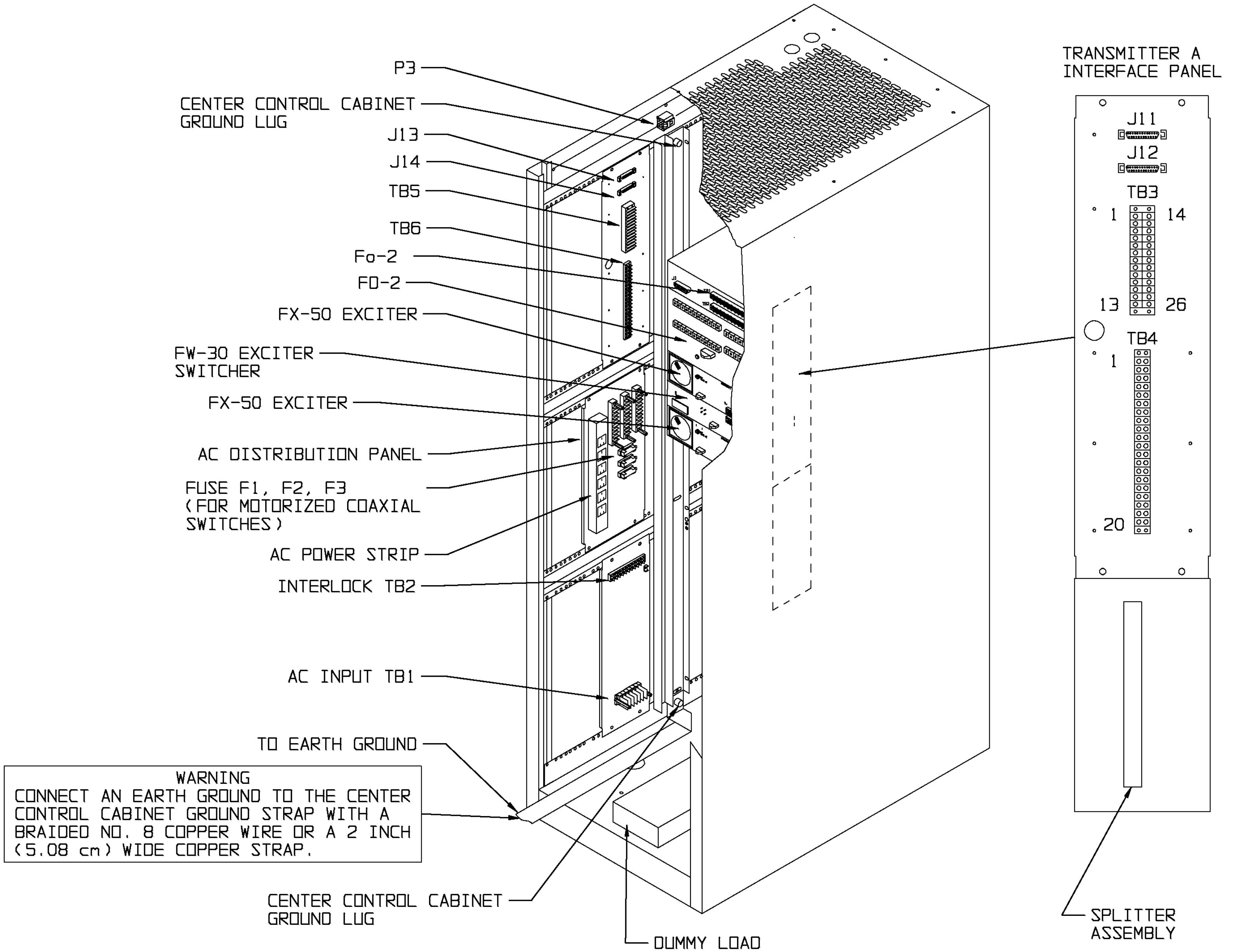

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FIGURE 2-1. CENTER CONTROL CABINET COMPONENT LOCATOR

2–12. **On-Air Transmitter Connections.** The on–air transmitter interlock is located at TB2–5/TB2–6. The interlock is for the connection of equipment such as a remote control fail–safe relay. To interface equipment to the on–air transmitter interlock, proceed as follows:

A. Refer to Figure 2–2 and remove the jumper between terminals TB2–5 and TB2–6.

B. Refer to Figure 2–2 and connect the interlock between terminals TB2–5 and TB2–6.

WARNING ***ENSURE THE TEST LOAD INTERLOCK IS CONNECTED TO THE TEST LOAD TRANSMITTER INTERLOCK.***
WARNING

2–13. **Test Load Transmitter Connections.** The test load transmitter interlock is located at TB2–7/TB2–8. The interlock is for the connection of equipment such as the test load interlock. To interface equipment to the test load transmitter interlock, refer to Figure 2–2 and connect the equipment between terminals TB2–7 and TB2–8.

2–14. **Reject Load Connections.** To protect the reject load from damage, the center control cabinet is equipped with a reject load interlock circuit. Refer to Figure 2–2 and connect the interlock between terminals TB2–9 and TB2–10.

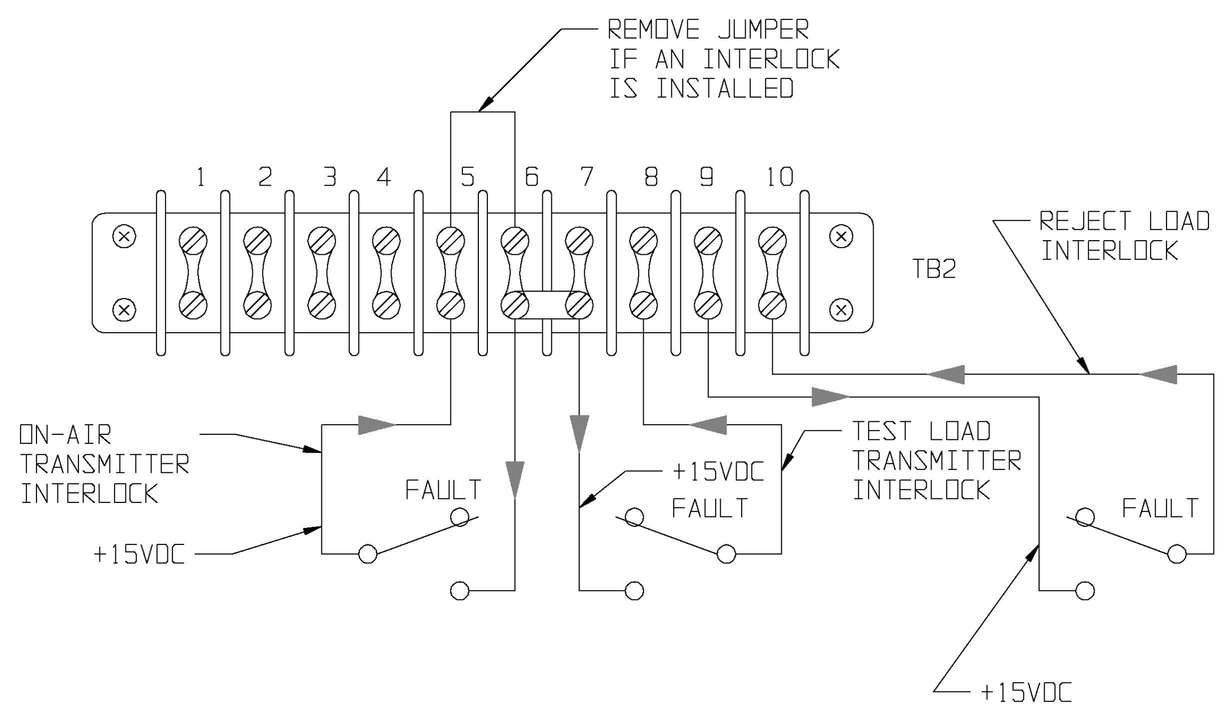

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FIGURE 2-2. DUAL TRANSMITTER SYSTEM INTERLOCK TERMINAL STRIP

2–15. **RF DRIVE INTERFACING.** RF drive from the splitter assembly and the coaxial line phasor in the center control cabinet must be interfaced to each transmitter. Locate RF drive cables 305 and 306 in the center control cabinet. Connect: 1) RF drive cable 305 to the splitter assembly RF IN port in the transmitter A controller cabinet and 2) RF drive cable 306 to the splitter assembly RF IN port in the transmitter B controller cabinet.

2–16. **DIRECTIONAL COUPLER INTERFACING.** The reject load and combiner directional couplers must be interfaced to the center control cabinet. Locate directional coupler cables 301 through 304 in the center control cabinet. Connect the cables as follows:

1. Connect reject load forward power cable 301 to the reject load directional coupler ⇒ port.
2. Connect reject load reflected power cable 302 to the reject load directional coupler ⇐ port.
3. Connect combiner forward power cable 303 to the combiner directional coupler ⇒ port.
4. Connect combiner reflected power cable 304 to the combiner directional coupler ⇐ port.

WARNING ***ENSURE AN EARTH GROUND IS CONNECTED TO A CENTER CONTROL CABINET GROUND TERMINAL.***

WARNING

2–17. **GROUND CONNECTIONS.** The center control cabinet is equipped with ground terminals (refer to Figure 2–1). Refer to Figure 2–1 and connect an earth ground to a center control cabinet ground terminal.

2–18. **INSTALLATION OF OPTIONAL EQUIPMENT.**

2–19. If the system is not assembled at the factory, install any optional equipment in the center control cabinet. Refer to the equipment instruction manuals for installation instructions.

2–20. **PRIMARY AC POWER CONNECTIONS.**

WARNING ***ENSURE THE DUAL TRANSMITTER SYSTEM PRIMARY POWER IS DISCONNECTED BEFORE PROCEEDING.***

WARNING

2–21. **MAIN AC INPUT.** Primary power is interfaced to the center control cabinet at TB1 (refer to Figure 2–3). The center control cabinet requires a: 1) 105V to 132V ac 50/60 Hz power source at 40 amperes, 2) 196V to 252V ac 50/60 Hz European power source at 20 amperes or 3) 196V to 252V ac 50/60 Hz North American power source at 20 amperes. The standard center control cabinet power supply source is 105V to 132V ac 60 Hz. When the center control cabinet is shipped from the factory, the cabinet will be configured for the power source specified in the sales order. For operating safety, the power source must be routed to the center control cabinet through a fused/circuit breaker power disconnect (refer to Figure 2–3).

2–22. The following text presents information on the center control cabinet main ac input. Refer to the appropriate information to connect ac power to the center control cabinet.

WARNING WARNING ***ENSURE THE DUAL TRANSMITTER SYSTEM PRIMARY POWER IS DISCONNECTED BEFORE PROCEEDING.***

WARNING WARNING ***ENSURE AN EARTH GROUND CONDUCTOR IS SECURELY CONNECTED TO A CENTER CONTROL CABINET GROUND TERMINAL.***

2–23. **115V Operation.** For 115V operation, refer to Figure 2–3 and connect a 105V to 132V ac 50/60 Hz power source to ac input terminal strip TB1 through a fused/circuit breaker power disconnect. Ensure an earth ground is securely connected to a center control cabinet ground terminal.

WARNING WARNING ***ENSURE THE DUAL TRANSMITTER SYSTEM PRIMARY POWER IS DISCONNECTED BEFORE PROCEEDING.***

WARNING WARNING ***ENSURE AN EARTH GROUND CONDUCTOR IS SECURELY CONNECTED TO A CENTER CONTROL CABINET GROUND TERMINAL.***

2–24. **220V European Operation.** For 220V European operation, refer to Figure 2–3 and connect a 196V to 252V ac 50/60 Hz European power source to ac input terminal strip TB1 through a fused/circuit breaker power disconnect. Ensure an earth ground is securely connected to a center control cabinet ground terminal.

WARNING WARNING ***ENSURE THE DUAL TRANSMITTER SYSTEM PRIMARY POWER IS DISCONNECTED BEFORE PROCEEDING.***

WARNING WARNING ***ENSURE AN EARTH GROUND CONDUCTOR IS SECURELY CONNECTED TO A CENTER CONTROL CABINET GROUND TERMINAL.***

2–25. **220V North American Operation.** For 220V North American operation, refer to Figure 2–3 and connect a 196V to 252V ac 50/60 Hz North American power source to ac input terminal strip TB1 through a fused/circuit breaker power disconnect. Ensure an earth ground is securely connected to a center control cabinet ground terminal.

WARNING WARNING ***ENSURE THE DUAL TRANSMITTER SYSTEM PRIMARY POWER IS DISCONNECTED BEFORE PROCEEDING.***

2–26. **OUTLET STRIP AC INPUT.** The center control cabinet is equipped with a six–outlet ac receptacle strip. The outlet strip is equipped with a 15 ampere circuit breaker and requires a 105V to 132V ac 50/60 Hz ac input. Refer to Figure 2–3 and connect a 105V to 132V ac 50/60 Hz ac input to TB1 as shown. The supply may be obtained from: 1) the main center control cabinet ac input or 2) a separate fused 115V ac input.

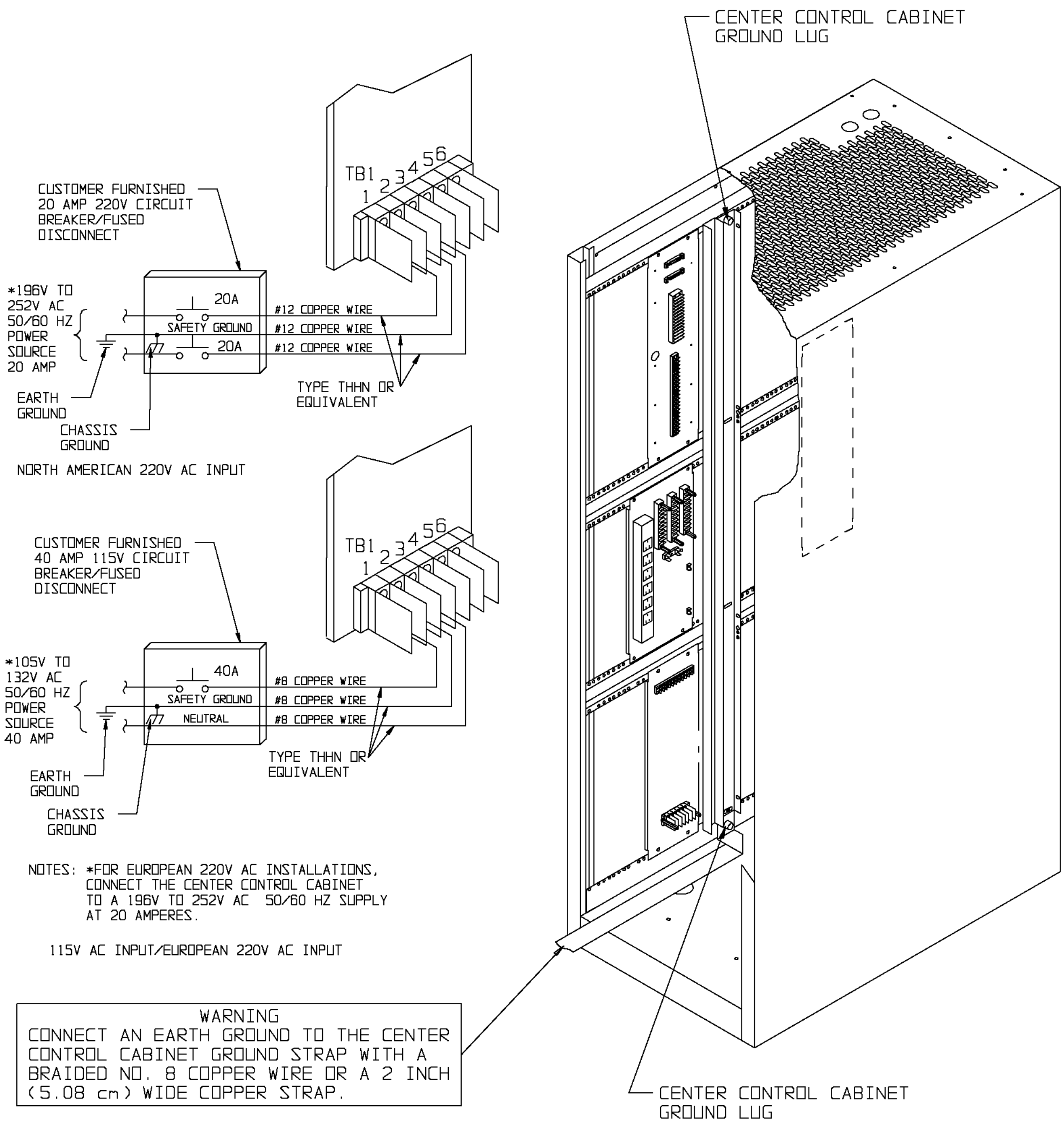

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FIGURE 2-3. PRIMARY AC WIRING

2–27. INSTALLATION ADJUSTMENTS.

2–28. **COAXIAL LINE PHASOR ADJUSTMENT.** The adjustment of the coaxial line phasor requires operation of the dual transmitter system at normal output power. Refer to FD–2 SECTION III, OPERATION for dual transmitter system standard operating procedures. The coaxial line phasor adjustment is as follows.

2–29. **Procedure.** To adjust the coaxial line phasor, proceed as follows:

A. Operate all dual transmitter system circuit breakers to ON.

B. Operate the **FWD/VSWR/VSWR CAL** meter selector switch to **FWD**.

C. Operate the dual transmitter system at the normal output power as indicated on the TOTAL OUTPUT POWER meter.

D. Operate the **FWD/FWD EXPAND/VSWR** meter selector switch to **FWD EXPAND**.

CAUTION ***DO NOT EXCESSIVELY LOOSEN THE PHASOR LOCKING CAPS IN THE FOLLOWING STEP.***

CAUTION

E. Refer to Figure 2–4 and loosen the locking caps until the adjustable section is allowed to slide with some resistance.

F. Extend the line phasor adjustable section approximately 4 inches as indicated in Figure 2–4.

G. Extend or retract the adjustable section of the line phasor as required for minimum reject load forward power as indicated on the REJECT LOAD POWER meter and maximum combined output power as indicated on the TOTAL OUTPUT POWER meter.

H. Secure the line phasor adjustment with the locking caps.

I. De–energize the dual transmitter system and operate all circuit breakers to OFF.

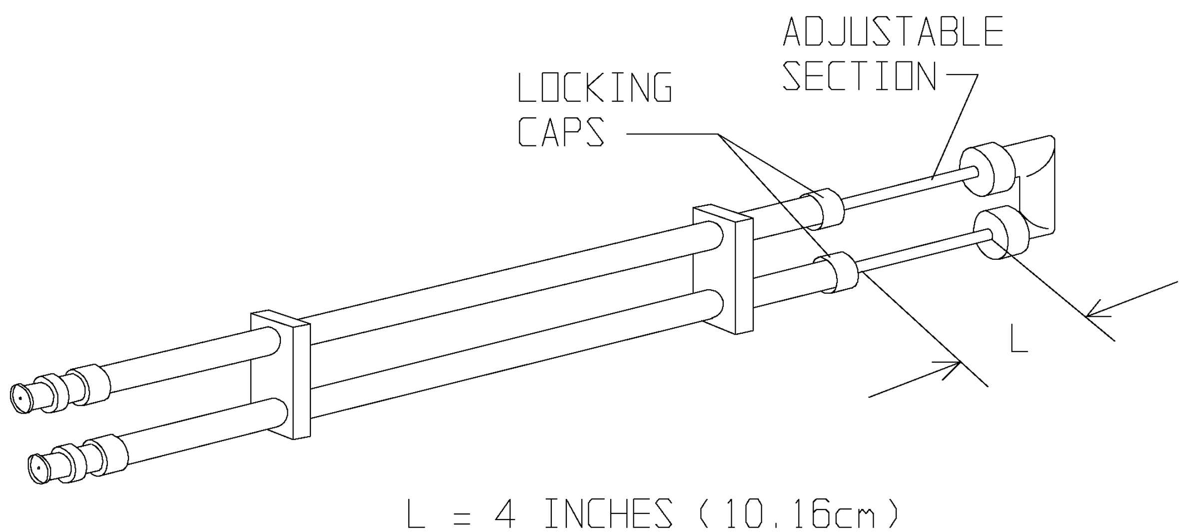

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FIGURE 2-4. COAXIAL LINE PHASOR

SECTION III
OPERATION

3-1. **INTRODUCTION.**

3-2. This section identifies all controls and indicators associated with the Broadcast Electronics T-Series dual transmitter system center control cabinet and provides standard operating procedures.

3-3. **CONTROLS AND INDICATORS.**

3-4. Refer to Figure 3-1 and Table 3-1 for a description of the dual transmitter center cabinet controls and indicators.

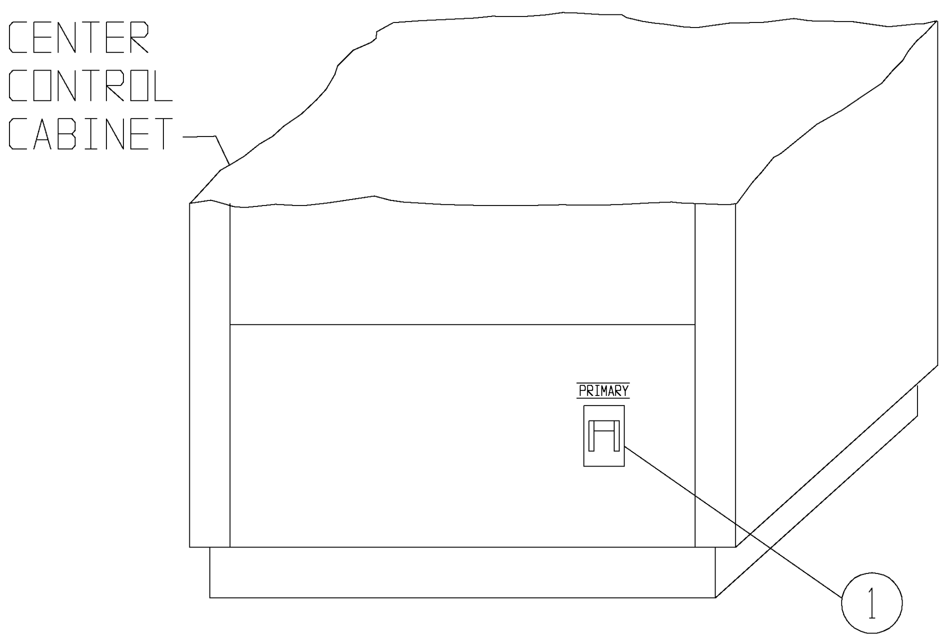

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FIGURE 3-1. CONTROLS AND INDICATORS

3-5. **OPERATION.**

NOTE ***THE FOLLOWING PROCEDURE ASSUMES THAT THE CENTER CONTROL CABINET IS COMPLETELY INSTALLED AND IS FREE OF ANY DISCREPANCIES.*** ***NOTE***

3-6. To energize the equipment in the center control cabinet, operate the front-panel circuit breaker to the on position.

TABLE 3-1. CONTROLS AND INDICATORS

INDEX NO.	NOMENCLATURE	FUNCTION
1	PRIMARY Circuit Breaker	Provides overload protection and primary control for the center control cabinet.

SECTION IV
PARTS LIST

4–1. INTRODUCTION.

4–2. The following data provides descriptions and part numbers of parts and assemblies required for maintenance of the center control cabinet. Each table is indexed by reference designators on the applicable schematic diagram.

TABLE 4-1. REPLACEABLE PARTS LIST INDEX

TABLE NO.	DESCRIPTION	PART NO.	PAGE
4–2	CENTER CONTROL CABINET ASSEMBLY	––––	4–2

TABLE 4-2. CENTER CONTROL CABINET ASSEMBLY

REF.DES.	DESCRIPTION	PART NO.	QTY.
J11	Connector, 25-Pin D to Ribbon Cable, Male	417-0129	1
J12	Connector, 25-Pin D, Female	417-0252	1
J13	Connector, 25-Pin D to Ribbon Cable, Male	417-0120	1
J14, P1A, P1B	Connector, 25-Pin D, Female	417-0252	5
P1	Plug, 25-Pin, D-Type (for exciter switcher)	418-3219	1
R1, R2	Resistor, 150 K Ohm ±2%, 1/4W	100-1563	2
TB1	Barrier Strip, Single Section, 600V	412-0725	6
TB2	Barrier Strip, 10 Position	412-0010-1	1
TB3	26-Pin Terminal Block with Ribbon Cable Plug	412-0045	1
TB4	Barrier Strip, 20 Position	412-0019	1
TB5	26-Pin Terminal Block with Ribbon Cable Plug	412-0045	1
TB6	Barrier Strip, 20 Position	412-0019	1
TB104, TB105, TB106	Barrier Strip, 9 Position	412-0090	3
----	Connector, 15-Pin	418-2379	1
----	Connector, 25-Pin D	417-0251	4
----	Connector, Pins, Amp	417-0036	15
----	Connector, Pins, Male	417-0142	88
----	Connector, 15-Pin	417-2379	1
----	Plug, 26-Pin Dual In-Line	417-0047	1
----	Pins, Connector, Socket	417-0053	13
----	Pins, Connector	417-0142	10
----	Pins, Socket	417-0143	40
----	Connector, Plug, 25-Pin	417-0251	1
----	Resistor, 50 Ohm, 250W (Dummy Load)	131-5028	1
----	Barrier Strip, End Cap (For TB1)	412-0730	1
----	Hood (for P1)	418-3223	1
----	Connector, Type N, Barrel, Jack-to-Jack	417-3841	2
----	Coaxial Line Phasor, 50 Ohm	NPN	1
----	Hybrid Splitter, 3 dB, 50 Ohm	959-0176	1
----	AC Outlet Strip, 6 Receptacle	840-4007	1
----	AC Distribution Panel	959-0128	1
----	Adapter, Type-N Angle	417-0105	2
	110V AC POWER SUPPLY CABINET OPERATION		
CB1	Circuit Breaker, 240V, 30 Ampere	341-0047	1
----	FO-2, Output Switch Controller, 110V ac Operation (Optional)	909-0117-004	1
----	FD-2 Dual Transmitter Controller, 110V ac Operation	909-6001-204	1
----	FX-50 Exciter, 110V ac Operation (1 Exciter Optional)	909-1050-225	2
----	IPA Unit, Solid-State, 500W, 110V ac Operation	959-0421	1
----	FW-30 Exciter Switcher, 110V ac Operation (Optional)	909-0120-004	1
	220V AC POWER SUPPLY CABINET OPERATION		
CB1	Circuit Breaker, 240V, 15 Ampere	341-0032	1
----	FO-2, Output Switch Controller, 110V ac Operation (Optional)	909-0117-004	1
----	FD-2 Dual Transmitter Controller, 110V ac Operation	909-6001-304	1
----	FX-50 Exciter, 220V ac Operation (1 Exciter Optional)	909-1050-325	2
----	IPA Unit, Solid-State, 500W, 220V ac Operation	959-0421	1
----	FW-30 Exciter Switcher, 110V ac Operation (Optional)	909-0120-004	1

FD-2 TRANSMITTER CONTROLLER

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LIST OF ILLUSTRATIONS

LIST OF TABLES

SECTION I
GENERAL INFORMATION

1-1. INTRODUCTION.

1-2. Information presented in this section provides a general description of the FD-2 dual transmitter controller and lists equipment specifications.

1-3. EQUIPMENT DESCRIPTION.

1-4. The Broadcast Electronics FD-2 dual transmitter controller is designed to provide monitoring and control operations of both transmitters in a dual transmitter system (refer to Figure 1-1). The FD-2 features front-panel LEDs to indicate the status of both transmitters, external VSWR overload alarm circuitry, and remote control capability. In addition, a power lock circuit which allows simultaneous operation of the raise and lower power functions of both transmitters is incorporated in the design. The FD-2 will monitor the combined VSWR and issue a recycle command to both transmitters if the combined VSWR exceeds a preset level.

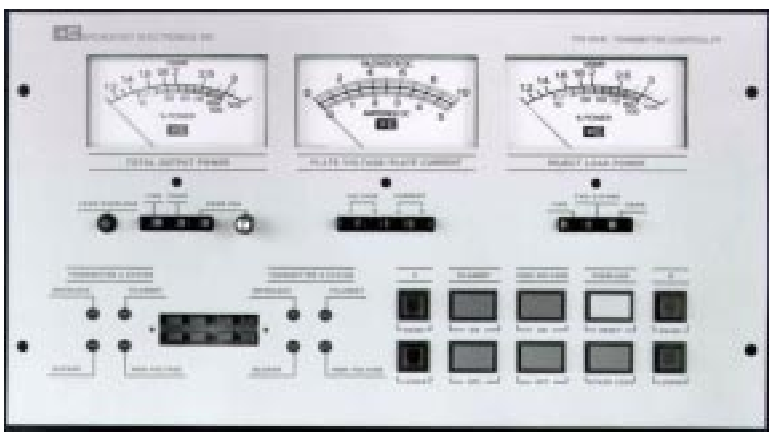

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FIGURE 1–1. FD–2 DUAL TRANSMITTER CONTROLLER

1-5. The FD-2 dual transmitter controller is available in two configurations as follows:

MODEL	PART NUMBER	DESCRIPTION
FD-2	909-6001-204	Dual transmitter controller, rack mount 117V ac 50/60 Hz operation.
FD-2	909-6001-304	Dual transmitter controller, rack mount 220V ac 50/60 Hz operation.

1-6. EQUIPMENT SPECIFICATIONS.

1-7. Refer to Table 1-1 for electrical, physical, and environmental specifications of the FD-2 dual transmitter controller.

TABLE 1-1. FD-2 ELECTRICAL, PHYSICAL, AND ENVIRONMENTAL SPECIFICATIONS

PARAMETER	SPECIFICATION
ELECTRICAL	
POWER REQUIREMENTS	97 to 133V ac or 194 to 266V ac 50/60 Hz (as ordered).
REMOTE INPUTS	Switch or Relay Contact Closure.
PHYSICAL	
SIZE:	
WIDTH	19 Inches (48.26 cm).
DEPTH	16.0 Inches (40.64 cm).
HEIGHT	10.5 Inches (26.67 cm).
WEIGHT (PACKED)	26 Pounds (11.9 Kg).
ENVIRONMENTAL	
AMBIENT TEMPERATURE RANGE	+14°F to 122°5F (–10°5C to +50°5C).
MAXIMUM HUMIDITY	95%, Non–condensing.
MAXIMUM ALTITUDE	15,000 Feet Above Sea Level (4572 Meters).

SECTION II
INSTALLATION

2–1. **INTRODUCTION.**

2–2. This section contains information required for the installation of the Broadcast Electronics FD–2 dual transmitter controller.

2–3. **INSTALLATION.**

2–4. Each FD–2 dual transmitter controller is operated, tested, and inspected at the factory prior to shipment and is ready for installation when received. Prior to installation, this publication should be studied to obtain a thorough understanding of the operation, circuitry, nomenclature, and installation requirements. For factor/assembled systems, the transmitter interfacing and FD–2 interfacing procedures will not be required.

2–5. **WIRING.**

2–6. **TRANSMITTER INTERFACING.** Interfacing between the FD–2 and transmitters A and B is provided by rear–panel barrier strips TB1 and TB2 terminals 1 through 20 respectively. The unit is designed to provide transmitter command, status information, and metering connections to meet any system requirement. Figure 2–1 and Table 2–1 present a functional description of the connection terminals. The connections will vary depending on the type of dual transmitter system installation.

2–7. Refer to Figure 2–1 and connect the coaxial cables from the combiner directional coupler and reject load directional coupler are required to be interfaced to RF connectors J1, J2, J3, and J4 on the FD–2 transmitter controller rear–panel. The connectors are installed in the center control cabinet procedures. Refer to the CENTER CONTROL CABINET section as required.

2–8. **FO-2 INTERFACING.** The FD–2 dual transmitter controller is designed to interface with the FO–2 transmitter output switcher in a dual transmitter system (refer to Figure 2–2). Locate and connect the interface cable between FD–2 rear–panel connector J10 and FO–2 rear–panel connector J1.

2–9. **REMOTE METERING.** The FD–2 remote metering connections are provided on rear–panel barrier strip TB3 terminals 1 through 4 (refer to Figure 2–3). If remote metering is desired, connect a meter between the appropriate terminal and meter ground terminal TB3–10. Remote meter circuit calibration procedures are provided in SECTION V, MAINTENANCE.

2–10. **REMOTE VSWR OVERLOAD INDICATOR.** An FD–2 external overload indicator connection is provided on rear–panel barrier strip TB3–9 (refer to Figure 2–3). If remote overload indication is desired, connect an indicator or aural device between TB3–9 and TB4–10 (ground).

2–11. **REMOTE TRANSMITTER COMMANDS.** The FD–2 remote transmitter command connections are provided on rear–panel barrier strip TB4 terminals 4 through 8 (refer to Figure 2–3). +15V dc is provided at TB4–9 for remote operations. If a remote transmitter command operation is desired, connect a switch between the appropriate terminal and +15V dc.

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

WARNING

2-12. **POWER SUPPLY.** The FD-2 is programmed for the proper power supply voltage and fuse protection when shipped from the factory. If an alternate power source is required, re-program the unit by operating the voltage selector circuit board in the RFI filter and ac receptacle module to the desired position (refer to Figure 2-3). Ensure the power supply voltage to be used is visible from the ac voltage selector window and proper fuses installed. For 120V operation, install two 3/4 ampere slow-blow type fuses. For 240V operation, two 3/8 ampere slow-blow type fuses are required.

TABLE 2-1. TB1 AND TB2 REAR-PANEL TERMINAL CONNECTIONS. (Sheet 1 of 2)

TB1/TB2 TERMINAL	NOMENCLATURE	FUNCTIONAL DESCRIPTION
1	Filament On Command	Provides an active HIGH for the filament on command operation.
2	Filament Off Command	Provides an active HIGH for the filament off command operation.
3	High Voltage On Command	Provides and active HIGH for the high voltage on command.
4	High voltage Off Command	Provides and active HIGH for the high voltage off command.
5	Overload Reset Command	Provides and active HIGH for the overload reset command.
6	Filament On Indicator	An active HIGH required to acknowledge the filament on command.
7	High Voltage On Indicator	An active HIGH required to acknowledge the high voltage on command.
8	Overload Indicator	An active HIGH required to indicate an overload condition.
9	Plate Voltage	0 to +5V dc potential required for plate voltage meter indication.
10	Plate Current	0 to +5V dc potential required for plate current meter indication.
11	Blower Status	An active HIGH required to indicate normal blower circuit operation.
12	Filament Status	An active HIGH required to indicate normal filament circuit operation.

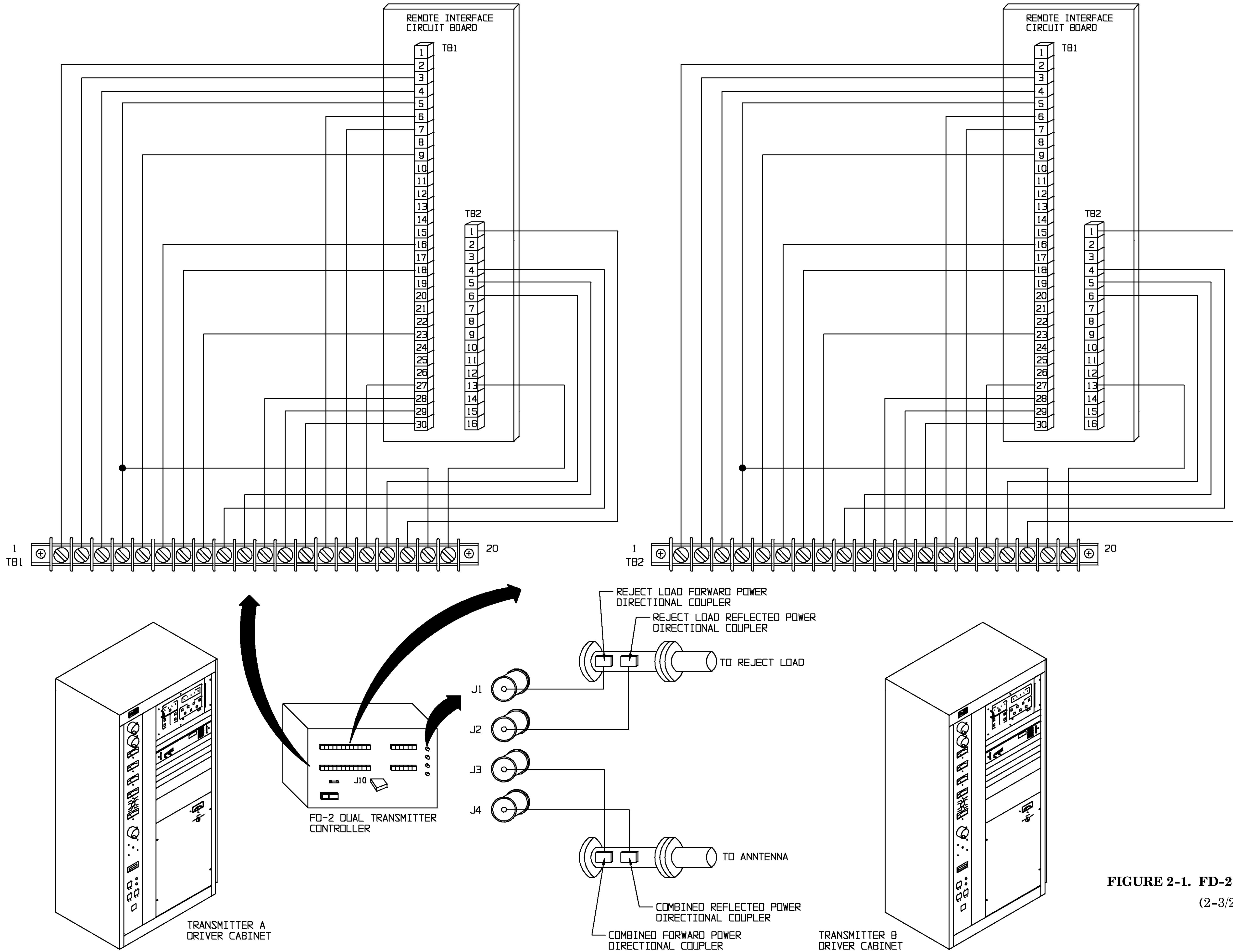

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FIGURE 2-1. FD-2 INTERFACE WIRING DIAGRAM

(2-3/2-4)

TABLE 2-1. TB1 AND TB2 REAR-PANEL TERMINAL CONNECTIONS.
(Sheet 2 of 2)

TB1/TB2 TERMINAL	NOMENCLATURE	FUNCTIONAL DESCRIPTION
13	High Voltage Status	An active HIGH required to indicate normal high voltage circuit operation.
14	Raise Power	Provides an active HIGH for the raise power operation.
15	Lower Power	Provides an active HIGH for the lower power operation.
16	Interlock Status	An active HIGH required to indicate closed interlock circuit.
17	Meter Ground	Provides a ground potential for normal meter circuit operation.
18	Forward Power Sample Voltage	0 to +5V dc potential required for FO-2 output switcher operation.
19	Automatic Power Control	Provides an active HIGH for recycle operation during a VSWR overload condition.
20	Common Ground	Provides a common ground potential between the FD-2 and transmitters.

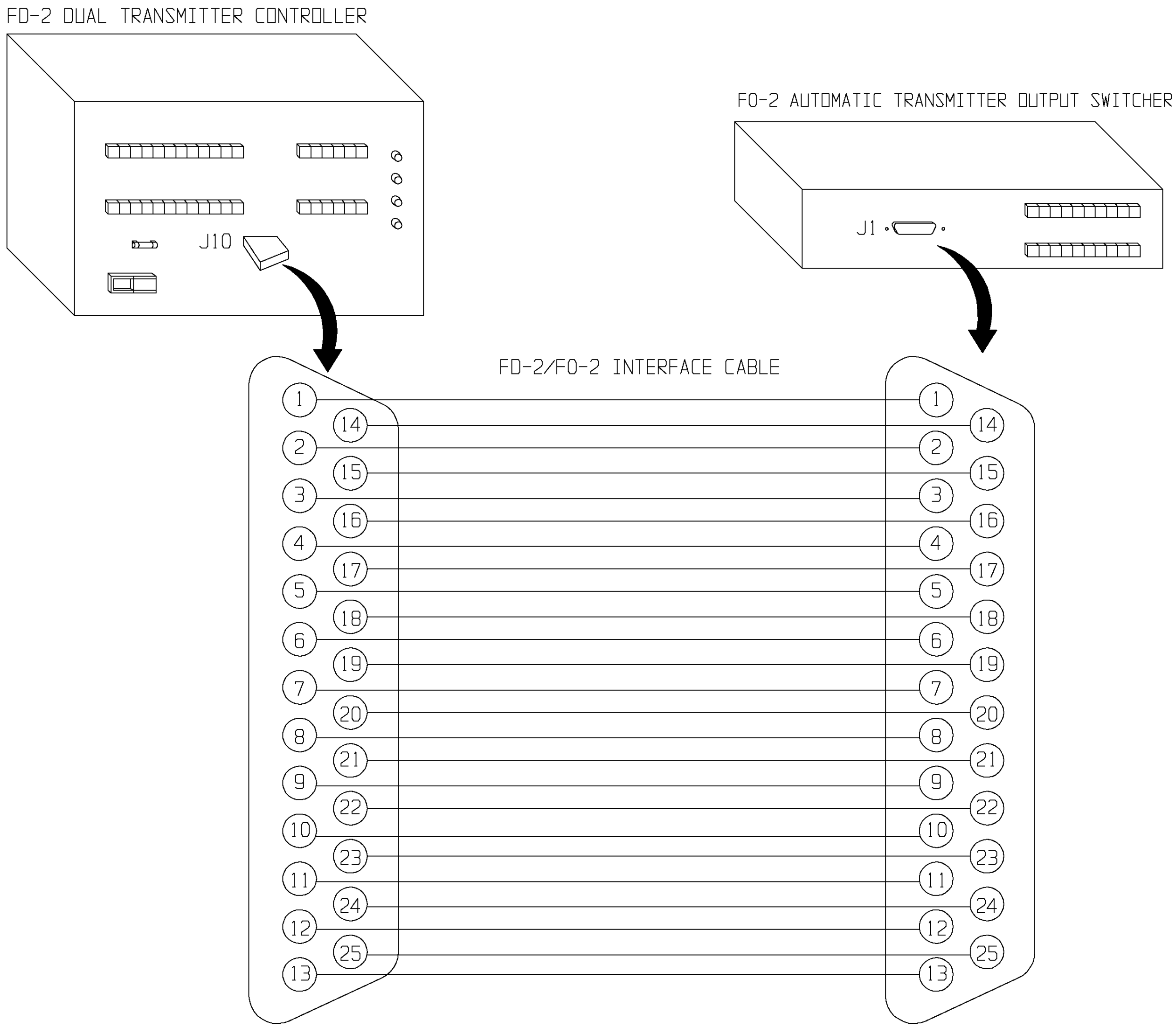

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FIGURE 2-2. FD-2/FO-2 INTERFACING

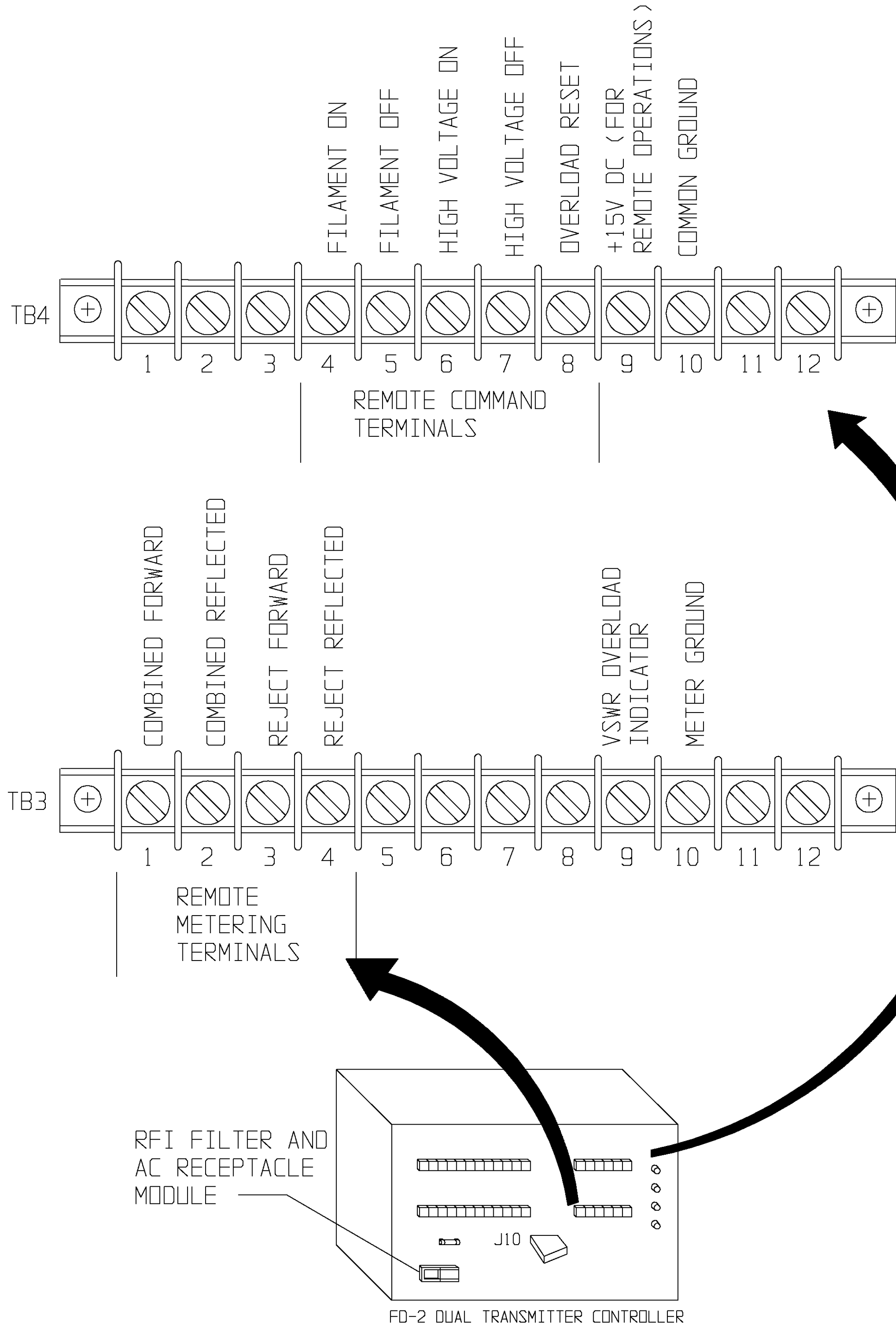


FIGURE 2-3. FD-2 REMOTE INTERFACING **597-0099-44**

SECTION III
OPERATION

3–1. **INTRODUCTION.**

3–2. This section identifies all controls and indicators associated with the FD–2 dual transmitter controller and provides standard operating procedures.

3–3. **CONTROLS AND INDICATORS.**

3–4. Refer to Figure 3–1 for the location of all controls and indicators associated with normal operation of the FD–2 dual transmitter controller. The function of each control or indicator is described in Table 3–1 and Table 3–2.

3–5. **OPERATION.**

WARNING ***THE FOLLOWING PROCEDURE ASSUMES THAT THE FD-2 IS COMPLETELY INSTALLED AND IS FREE OF***
WARNING ***ANY DISCREPANCIES.***

3–6. **ENERGIZE TRANSMITTERS.**

3–7. Ensure the **REMOTE DISABLE** switch/indicator on the APC unit of each transmitter driver cabinet is extinguished.

3–8. Connect the FD–2 power cord to an appropriate power source.

3–9. With primary power applied, the following events will occur if all the interlocks are closed.

A. The transmitter **A INTERLOCK** status indicator will illuminate.

B. The transmitter **B INTERLOCK** status indicator will illuminate.

3–10. Depress the **FILAMENT ON** switch/indicator to operate the PA tube filament circuit of both transmitters. The following events will occur:

A. The **FILAMENT ON** switch/indicator will illuminate.

B. The transmitter **A FILAMENT** and **BLOWER** status indicators will illuminate.

C. The transmitter **B FILAMENT** and **BLOWER** status indicators will illuminate.

3–11. Depress the **HIGH VOLTAGE ON** switch/indicator to operate the high voltage circuit of both transmitters. The following events will occur:

A. The **HIGH VOLTAGE ON** switch/indicator will illuminate.

B. The transmitter **A HIGH VOLTAGE** status indicator and transmitter **B HIGH VOLTAGE** status indicator will illuminate after a short delay to allow the PA tubes to attain operating temperature.

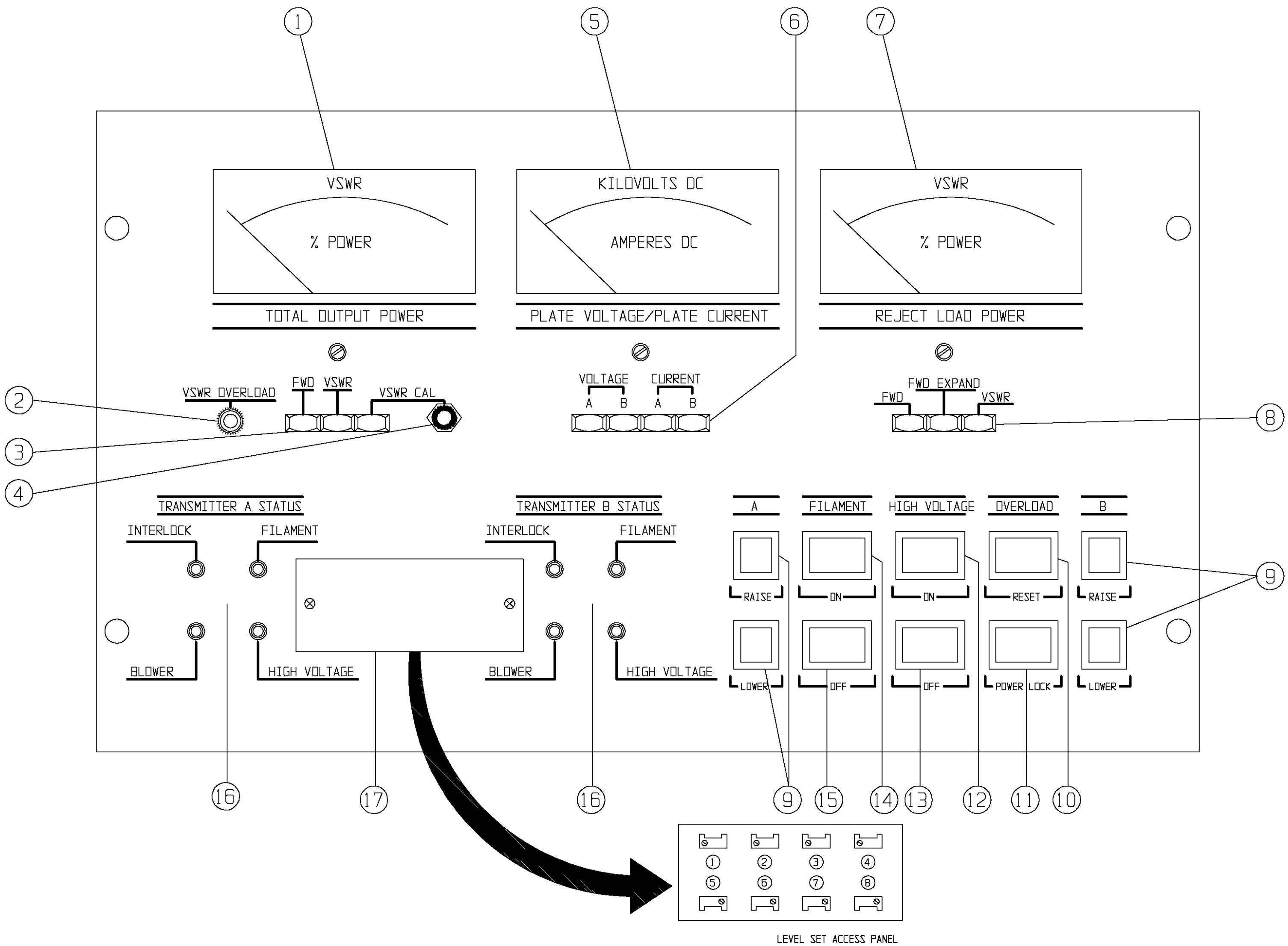
3–12. **TOTAL OUTPUT POWER METER.**

3–13. Operate the **FWD/VSWR/VSWR CAL** switch to FWD to observe the combined forward power output as indicated on the TOTAL OUTPUT POWER meter. To observe the combined VSWR, proceed as follows:

A. Operate the **FWD/VSWR/VSWR CAL** switch to VSWR CAL.

B. Adjust the **VSWR CAL** control to obtain a 100% indication on the TOTAL OUTPUT POWER meter.

C. Operate the **FWD/VSWR/VSWR CAL** switch to VSWR to observe the combined VSWR.



597-099-47

FIGURE 3-1. FD-2 CONTROLS AND INDICATORS

3–14. **INCREASE/DECREASE POWER.**

3–15. To increase or decrease the output power of transmitter A or transmitter B, depress the appropriate **A/B RAISE/LOWER** switch as required. To increase or decrease the output power of transmitter A and transmitter B simultaneously, proceed as follows:

A. Operate the **POWER LOCK** switch/indicator to illuminate the switch/indicator.

B. To increase the output power of transmitter A and transmitter B, depress the **A RAISE** or **B RAISE** switch as required.

C. To decrease the output power of transmitter A and transmitter B, depress the **A LOWER** or **B LOWER** switch as required.

3–16. **OVERLOAD RESET.**

3–17. To reset the overload memory circuit of the FD–2 and both transmitters, depress the **OVERLOAD RESET** switch/indicator. The **OVERLOAD RESET** switch/indicator and **VSWR OVERLOAD** indicator will extinguish if the overload condition is corrected.

3–18. **DEENERGIZE TRANSMITTERS.**

3–19. To deenergize both transmitters, depress the **FILAMENT OFF** switch/indicator. The following events will occur:

A. The **FILAMENT ON** switch/indicator will extinguish.

B. The **HIGH VOLTAGE ON** switch/indicator will extinguish.

C. The transmitter **A FILAMENT** and **HIGH VOLTAGE** status indicators will extinguish.

D. The transmitter **B FILAMENT** and **HIGH VOLTAGE** status indicators will extinguish.

E. The transmitter **A BLOWER** status indicator and transmitter **B BLOWER** status indicator will extinguish after a short delay of blower operation to allow the PA tubes to cool.

3–20. COMBINER VSWR OVERLOAD OPERATION - SYSTEMS WITH EXTENDED LOCAL CONTROL UNIT.

3–21. The following text describes combiner VSWR overload operation in a dual transmitter system equipped with an extended local control unit. Refer to the following text as required to respond to a VSWR overload at the combiner.

3–22. **COMBINED VSWR OVERLOAD.**

3–23. When a greater than 3.1:1 VSWR condition appears at the combiner output: 1) the FD–2 dual transmitter controller VSWR OVERLOAD indicator will illuminate and 2) the FD–2 will operate the high voltage in each transmitter to OFF. If this condition occurs: 1) check the combiner and antenna system to remove the VSWR condition, 2) depress the center control cabinet FD–2 OVERLOAD RESET switch/indicator to extinguish the switch/indicator, and 3) depress either the center control cabinet or extended local control FD–2 HIGH VOLTAGE ON switch/indicator to illuminate the switch/indicator.

3–24. **COMBINED VSWR OVERLOAD RESET.**

3–25. When a greater than 3.1:1 VSWR condition appears at the combiner output, the extended local control FD–2 OVERLOAD RESET switch/indicator will not reset the overload. The overload must be reset using the center control cabinet FD–2 OVERLOAD RESET switch/indicator.

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

INDEX NO.	NOMENCLATURE	FUNCTION
1	TOTAL OUTPUT POWER Meter	Displays combined percentage of forward power output or combined VSWR as selected by the **FWD/ VSWR/VSWR CAL** switch.
2	**VSWR OVERLOAD** Indicator	Indicates a combined VSWR overload when illuminated.
3	**FWD/VSWR/VSWR CAL** Switch	Selects the parameter to be displayed by the TOTAL OUTPUT POWER meter.
4	**VSWR CAL** Control	Allows calibration of the TOTAL OUTPUT POWER meter VSWR display.
5	PLATE VOLTAGE/ PLATE CURRENT Meter	Upper scale displays plate voltage for transmitter A or B as selected by the **VOLTAGE/CURRENT A/B** switches. Lower scale displays plate current for transmitter A or B as selected by the **VOLTAGE/CURRENT A/B** switches.
6	**VOLTAGE/CURRENT A/B** Switches	Selects the parameter to be displayed by the PLATE VOLTAGE/PLATE CURRENT meter.
7	REJECT LOAD POWER Meter	Displays reject load forward power, expanded forward power, or VSWR as selected by the **FWD/FWD EXPAND/VSWR** switch.
8	**FWD/FWD EXPAND/ VSWR** Switch	Selects the parameter to be displayed by the REJECT LOAD POWER meter.
9	**A/B RAISE/LOWER** Switches	A/B RAISE: Increases the automatic power control circuit reference level in the respective transmitter when depressed. A/B LOWER: Decreases the automatic power control circuit reference level in the respective transmitter when depressed.
10	**OVERLOAD RESET** Switch/Indicator	SWITCH: Clears the overload circuit memory of both transmitters and VSWR overload circuit in the dual transmitter controller when depressed. INDICATOR: Indicates an overload condition when illuminated.

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

INDEX NO.	NOMENCLATURE	FUNCTION
11	**POWER LOCK** Switch/Indicator	SWITCH: When depressed, enables the power lock circuit. Allows either set of **A/B RAISE/ LOWER** switches to simultaneously increase or decrease the automatic power control circuit reference level in each transmitter. INDICATOR: Indicates the power lock circuit is enabled when illuminated.
12	**HIGH VOLTAGE ON** Switch/Indicator	SWITCH: Energizes the high voltage supply circuit of both transmitters when depressed. This switch also allows one-button start of both transmitters by energizing the filament supply circuit followed by the high voltage supply circuit after a short delay. INDICATOR: Indicates the high voltage control circuit is energized when illuminated.
13	**HIGH VOLTAGE OFF** Switch	Deenergizes the high voltage supply circuit of both transmitters when depressed.
14	**FILAMENT ON** Switch/Indicator	SWITCH: Energizes the filament supply circuit of both transmitters when depressed. INDICATOR: Indicates the filament supply circuit is energized when illuminated.
15	FILAMENT OFF	Deenergizes the filament supply circuit of both transmitters and all transmitter functions powered by the primary power source when depressed. The blowers will continue to operate for a pre-determined time period.
16	**TRANSMITTER A/B STATUS** Indicators	Indicators which illuminate to indicate the status of the respective transmitter.
---	**INTERLOCK** Status Indicator	Indicates all safety interlocks are closed when illuminated.
---	**BLOWER** Status Indicator	Indicates the blower is operational when illuminated.
---	**FILAMENT** Status Indicator	Indicates the PA filament power supply circuit is operational when illuminated.

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

INDEX NO.	NOMENCLATURE	FUNCTION
---	**HIGH VOLTAGE** Status Indicator	Indicates the high voltage power supply is operational when illuminated.
17	Level Adjust Access Panel	Metering calibration controls. Refer to Table 3–2 for complete description.

TABLE 3-2. LEVEL ADJUST ACCESS PANEL CONTROLS

INDEX NO.	NOMENCLATURE	FUNCTION
1	Reject Reflected Power Adjust	Calibrates reject load VSWR metering.
2	Forward Power Calibration Control	Calibrates combined forward output power metering.
3	Overload Threshold Adjust	Adjusts the combined VSWR overload threshold level. The threshold level is factory adjusted to recycle the transmitters at a VSWR of 3:1.
4	Reject Forward Power Adjust	Calibrates the reject load forward power metering.
	TRANSMITTER A	
5	Plate Voltage Adjust	Calibrates transmitter A plate voltage metering.
6	Plate Current Adjust	Calibrates transmitter A plate current metering.
	TRANSMITTER B	
7	Plate Voltage Adjust	Calibrates transmitter B plate voltage metering.
8	Plate Current Adjust	Calibrates transmitter B plate current metering.

SECTION IV
THEORY OF OPERATION

4–1. INTRODUCTION.

4–2. This section presents the theory of operation for the Broadcast Electronics FD–2 dual transmitter controller. A simplified schematic of the FD–2 is presented in Figure 4–1. Refer to the simplified schematic as required for the following functional equipment description.

4–3. When applicable, the text will describe the operation of the transmitter A and transmitter B control, status indication, and metering circuits. The control, status indication, and metering circuits for transmitters A and B are identical; therefore, only the transmitter A circuits will be discussed.

4–4. FUNCTIONAL DESCRIPTION.

4–5. RAISE/LOWER OUTPUT POWER OPERATION.

4–6. The raise and lower output power circuit operations are identical. Therefore, only the raise output power circuit will be explained.

4–7. When front–panel **A RAISE** power switch S4 is depressed, a logic HIGH is routed to rear–panel barrier strip TB1–14 and power lock relay K1. The logic HIGH at TB1–14 increases the power output reference level of transmitter A. When front–panel **B RAISE** power switch S8 is depressed, a logic HIGH is routed to rear–panel barrier strip TB2–14 and power lock relay K1. The logic HIGH at TB2–14 increases the power output reference level of transmitter B.

4–8. **POWER LOCK OPERATION.** The FD–2 is equipped with a power lock circuit which allows simultaneous operation of the raise power function of both transmitters with either **RAISE** power switch. When front–panel **POWER LOCK** switch/indicator S10 is depressed, power lock relay K1 energizes which connects the A raise power circuit to the B raise power circuit. Power lock indicator DS12 illuminates to indicate the power lock circuit is enabled.

4–9. COMMAND ACKNOWLEDGMENT OPERATION.

4–10. The filament on, high voltage on, and overload command acknowledgment circuit operations are identical. Therefore, only the filament on circuit operation will be discussed.

4–11. When a transmitter recognizes a filament on command from the FD–2, the transmitter will output a logic HIGH to the FD–2 to acknowledge reception of the command. The HIGH from the transmitter is routed to the input of filament indicator driver U1A through rear–panel barrier strip TB1–6. U1A inverts the HIGH to LOW which illuminates **FILAMENT ON** indicator DS9.

4–12. STATUS INDICATION OPERATION.

4–13. When the transmitter blower, filament, high voltage, and interlock circuits are operating normally, the transmitter will output logic HIGHs to the FD–2 to indicate normal operation. The HIGHs from the transmitter are routed to the input of the status indicator driver/inverter circuit through rear–panel barrier strip TB1–11, 12, 13, and 16. The status indicator driver/inverter circuit will output logic LOWs which illuminate front–panel indicators DS3, DS5, DS7, and DS1 respectively.

4–14. **COMMAND OPERATION.**

4–15. **LOCAL COMMAND OPERATION.** Front–panel **FILAMENT ON** switch/indicator S1, **FILAMENT OFF** switch S2, **HIGH VOLTAGE ON** switch/indicator S3, **HIGH VOLTAGE OFF** switch S7, and **OVERLOAD RESET** switch/indicator S6, and associated circuitry provide simultaneous local operation of both transmitters. When a switch/indicator or switch is depressed, a HIGH is routed to the appropriate input of the transmitter A control logic circuit and transmitter B control logic circuit.

4–16. The transmitter control logic circuits will output a HIGH to the transmitter A command circuit and transmitter B command circuit. The transmitter command circuits will route a HIGH to both transmitters through the appropriate terminal of rear–panel barrier strips TB1 and TB2.

4–17. **REMOTE COMMAND OPERATION.** Remote commands are routed to the input of an optical coupler network through rear–panel barrier strip TB4–4 through TB4–8. The active HIGH outputs of the optical coupler network are routed to the transmitter A control logic circuit and transmitter B control logic circuit which generate commands to both transmitters.

4–18. **FO-2 SWITCH CONTROLLER COMMAND OPERATION.** FO–2 output switch controller command operations are routed directly from FD–2 rear–panel D connector J10 to rear–panel barrier strips TB1 and TB2. This circuitry provides the FO–2 with direct control of either transmitter.

4–19. **FO-2 SAMPLE VOLTAGE.**

4–20. A forward power sample voltage from transmitter A is routed to FD–2 rear–panel barrier strip TB1–18. This sample voltage is routed directly to the FO–2 output switch controller through rear–panel D connector J10–24.

4–21. **OVERLOAD RESET OPERATION.**

4–22. When **OVERLOAD RESET** switch/indicator S6 is depressed, a HIGH is routed to transmitter A control logic circuit and transmitter B control logic circuit which generate an overload reset command to each transmitter. A HIGH is also applied to the input of overload latch U11. U11 outputs a LOW to the input of inverter U10E. U10E inverts the LOW to HIGH which extinguishes front–panel **VSWR OVERLOAD** indicator DS1. A HIGH is also routed to rear–panel barrier strip TB3–9 to disable an external indicator/alarm.

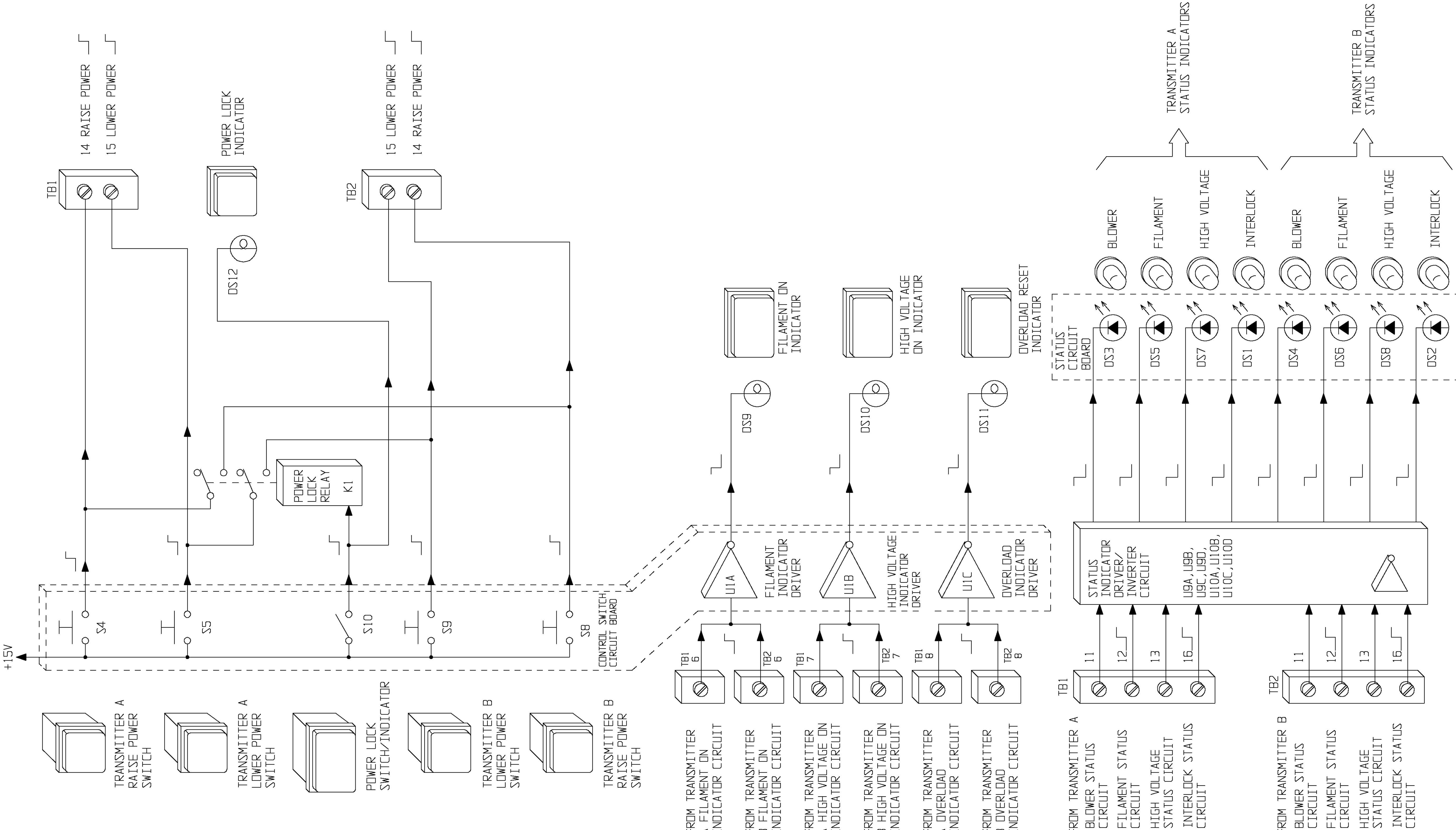
4–23. **METERING OPERATION.**

4–24. **COMBINED FORWARD OUTPUT POWER.** A forward RF potential from the combined directional coupler is routed to the input of a converter on the RF sample circuit board through rear–panel connector J3. A dc potential is routed from the converter to rear–panel barrier strip TB3–1 for remote metering applications.

4–25. A dc potential from the converter is also applied to the input of the meter amplifier circuit. The output of the meter amplifier circuit is routed to front–panel meter selector switch S1 and forward calibration control R10 on the status circuit board. S1 selects the parameter to be displayed by output power meter M1.

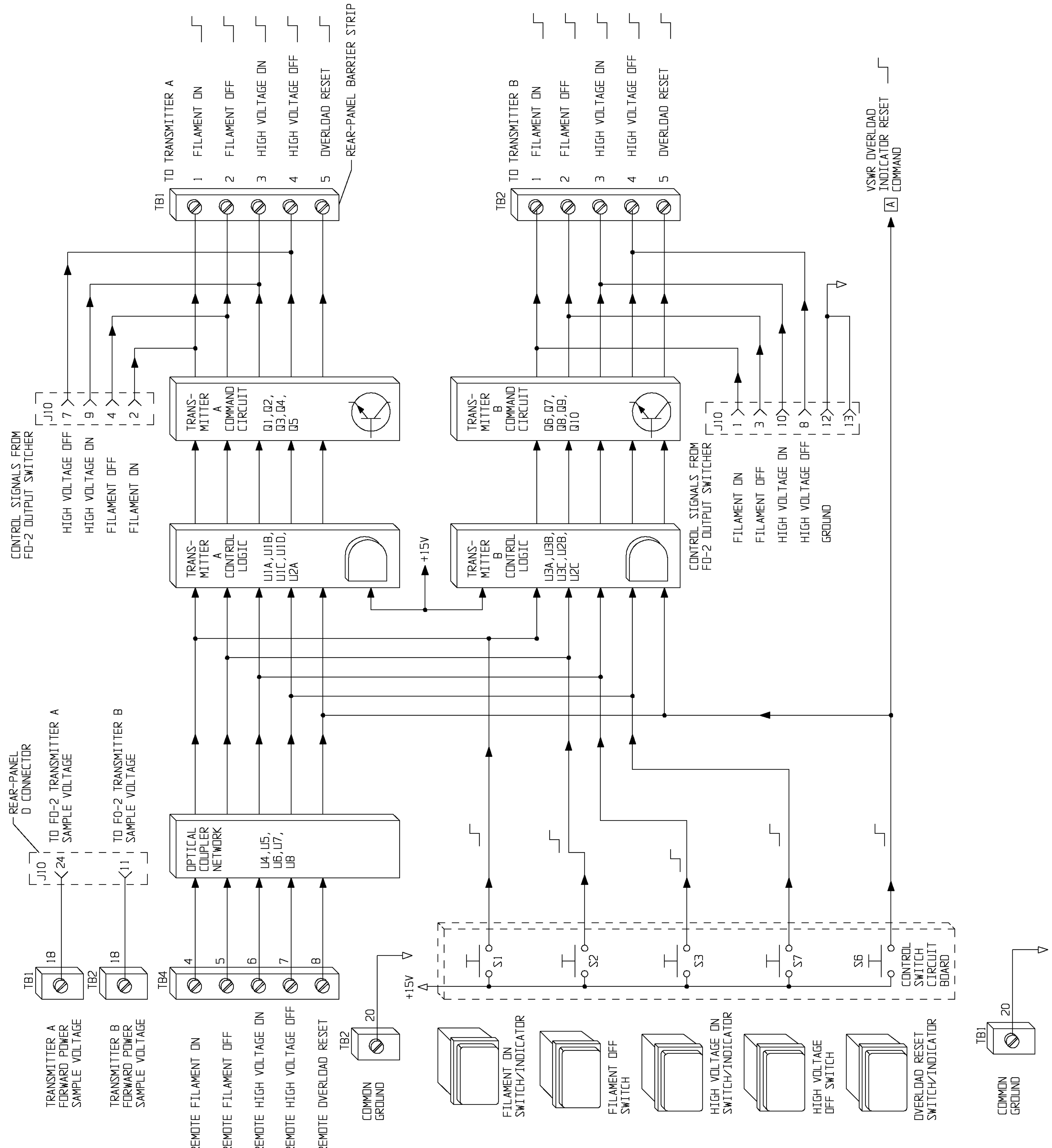
4–26. **COMBINED REFLECTED OUTPUT POWER.** A reflected RF potential from the combined directional coupler is routed to the input of a converter on the RF sample circuit board through rear–panel connector J4. A dc potential is routed from the converter to rear–panel barrier strip TB3–2 for remote metering applications.

4–27. A dc potential from the converter is also applied to the input of the meter amplifier circuit and comparator U12. The output of the meter amplifier circuit is routed to front–panel meter selector switch S1 and front–panel VSWR calibration control R1.



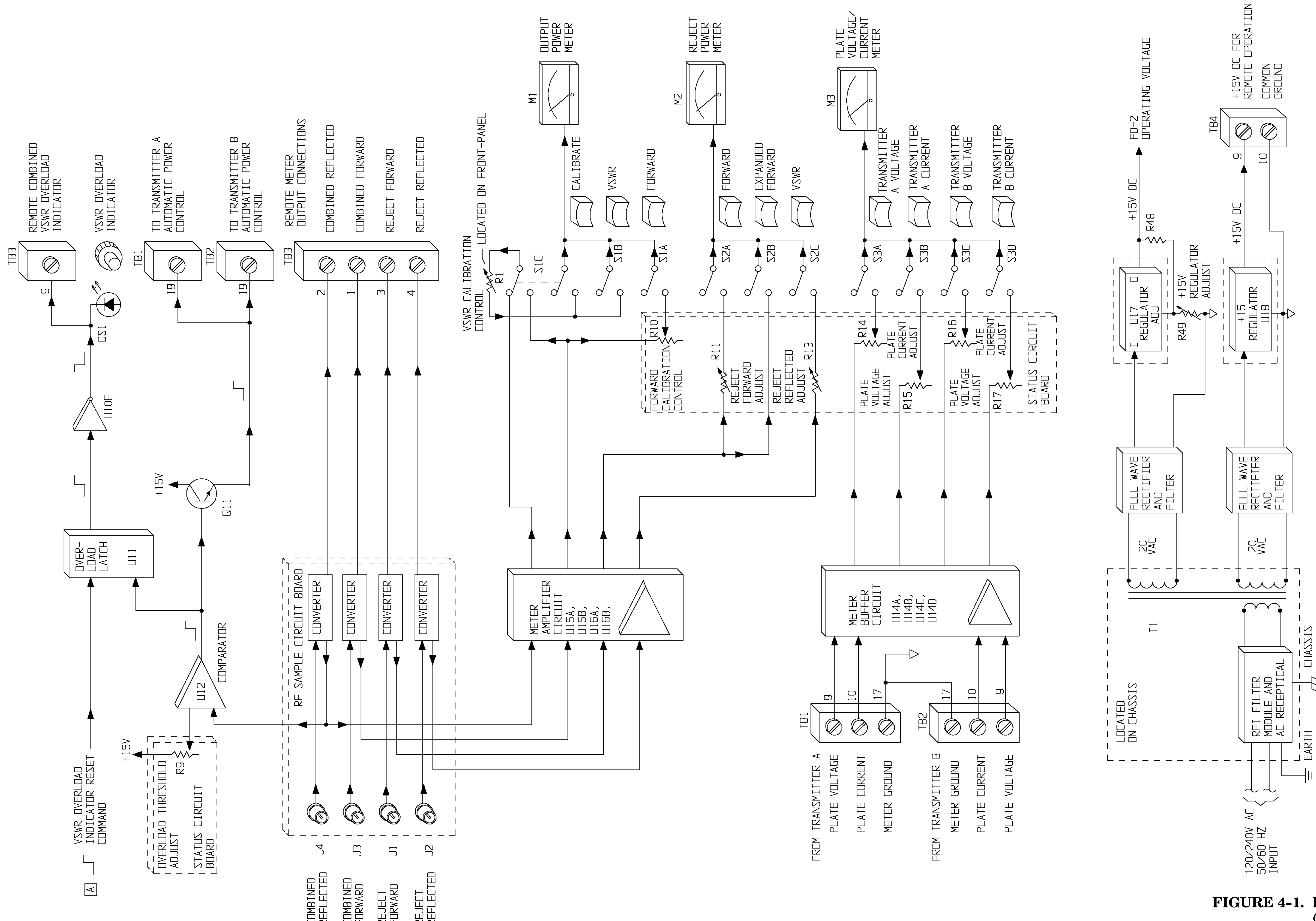
597-0099-50A

FIGURE 4-1. FD-2 SIMPLIFIED SCHEMATIC (Sheet 1 of 3)



597-0099-50B

FIGURE 4-1. FD-2 SIMPLIFIED SCHEMATIC (Sheet 2 of 3)
(4-5/4-6)



597-0099-50C

FIGURE 4-1. FD-2 SIMPLIFIED SCHEMATIC (Sheet 3 of 3)

4–28. **REJECT FORWARD POWER.** A forward RF potential from the reject load directional coupler is routed to the input of a converter on the RF sample circuit board through rear–panel connector J1. A dc potential is routed from the converter to rear–panel barrier strip TB3–3 for remote metering applications.

4–29. A dc potential from the converter is also applied to the input of the meter amplifier circuit. The output of the meter amplifier circuit is routed to front–panel selector switch S2 and reject forward adjust R11 on the status circuit board. S2 selects the parameter to be displayed by reject power meter M2.

4–30. **REJECT REFLECTED POWER.** A reflected RF potential from the reject load directional coupler is routed to the input of a converter on the RF sample circuit board through rear–panel connector J2. A dc potential is routed from the converter to rear–panel barrier strip TB3–4 for remote metering applications.

4–31. A dc potential from the converter is also applied to the input of the meter amplifier circuit. The output of the meter amplifier circuit is routed to front–panel selector switch S2 through reject reflected calibration control R13 on the status circuit board.

4–32. **PLATE VOLTAGE/CURRENT.** The plate voltage and plate current potentials from transmitter A are routed to the appropriate inputs of the meter buffer circuit through rear–panel barrier strip TB1–9 and 10. The outputs of the meter buffer circuit are routed to front–panel selector switch S3 through plate voltage calibration control R14, and plate current calibration control R15. S3 selects the parameter to be displayed by plate voltage/current meter M3.

4–33. **VSWR OVERLOAD PROTECTION CIRCUIT OPERATION.**

4–34. The VSWR overload protection circuit provides an automatic recycle operation of both transmitters if an overload is detected. A dc voltage from a converter on the RF sample circuit board is applied to the input of comparator U12. When this voltage exceeds a preset threshold level established by overload threshold adjust R9, the output of U12 will go HIGH.

4–35. The HIGH from U12 is applied to the input of overload latch U11 and transistor switch Q11. U11 will output a HIGH to inverter U10E. U10E inverts the HIGH to LOW which illuminates front–panel **VSWR OVERLOAD** indicator DS1. A HIGH is also routed to TB3–9 to enable an external indicator/alarm. Q11 will route an active HIGH to the automatic power control (APC) unit of each transmitter through TB1–19 and TB2–19.

4–36. **POWER SUPPLY.**

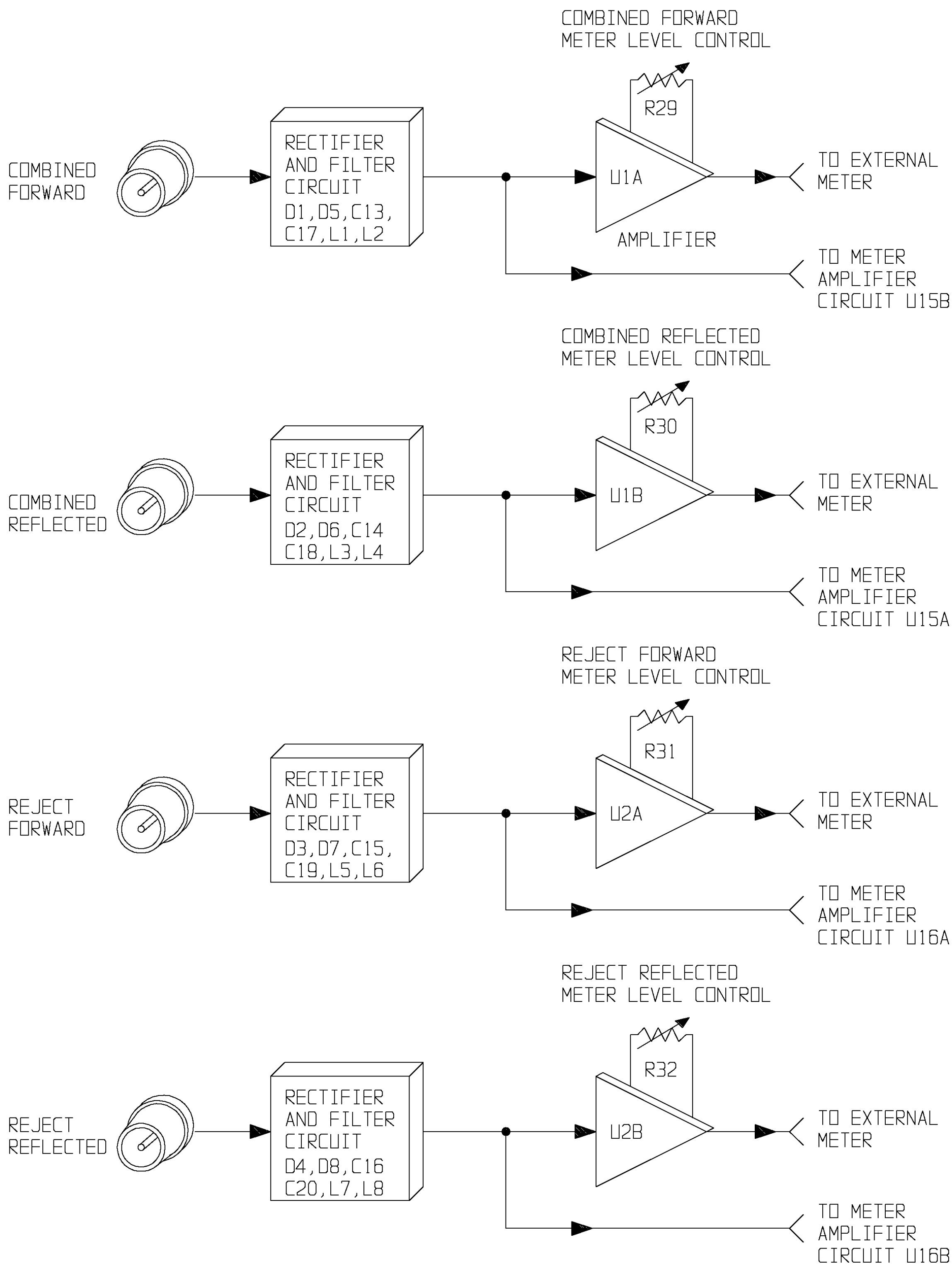
4–37. Primary power is applied to the FD–2 through the RFI filter and ac receptacle module. Power from the receptacle is routed to the primary of power transformer T1 to provide two 20 volt ac potentials at the secondaries.

4–38. A 20 volt ac potential is routed to a full–wave rectifier and filter network and applied to a voltage regulator circuit consisting of U17, resistor R48, and regulator adjust R49. The output of the circuit provides a regulated +15 volt dc potential for all FD–2 circuit board components.

4–39. A second 20 volt ac potential is routed to a full–wave rectifier and filter network and applied to voltage regulator U18. U18 provides a regulated +15 volt dc potential to rear–panel barrier strip TB4–9 for remote applications.

4–40. **RF SAMPLE CIRCUIT BOARD OPERATION.**

4–41. The RF sample circuit board converts RF potentials to dc potentials for the output power, reject power, and remote meter circuitry (refer to Figure 4–2). The combined forward/reflected, and reject forward/reflected circuits are identical. Therefore, only the combined forward circuit operation will be discussed.



597-0099-51

FIGURE 4-2. RF SAMPLE CIRCUIT BOARD SIMPLIFIED DIAGRAM

4–42. An RF potential from the combined forward connector is applied to the input of a rectifier and filter circuit consisting of D1, D5, C13, C17, L1, and L2. The output of this circuit is applied to the input of amplifier circuit U1A and meter amplifier circuit U15B (located on the main circuit board). Combined forward meter level control R29 adjusts the output level of amplifier circuit U1A which varies an external meter indication.

SECTION V
MAINTENANCE

5–1. **INTRODUCTION.**

5–2. This section provides general maintenance and troubleshooting information, electrical adjustment procedures, and component replacement procedures for the Broadcast Electronics FD–2 dual transmitter controller.

5–3. **SAFETY CONSIDERATIONS.**

5–4. Low voltages are used throughout the FD–2 circuit boards. Several power supply components on the chassis contain primary ac line voltage. Therefore, do not perform any maintenance or troubleshooting procedures on the power supply circuitry with power applied. Maintenance with power on is always considered hazardous and caution should be observed. Good judgment, care, and common sense must be practiced to prevent accidents. The procedures contained in this section should be performed only by experienced and trained personnel.

5–5. **FIRST LEVEL MAINTENANCE.**

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

WARNING *DISCONNECT THE POWER SOURCE FROM THE FD-2 BEFORE ATTEMPTING ANY EQUIPMENT MAINTENANCE.*
WARNING

5–7. **GENERAL.**

5–8. Periodically clean the FD–2 chassis with a cloth moistened with a mild household cleaner. Remove dust from the chassis exterior with a brush and vacuum cleaner as required.

5–9. **ELECTRICAL.**

5–10. The controller circuit boards should be periodically cleaned of accumulated dust using a soft brush and vacuum cleaner. Check the circuit boards for improperly seated semiconductors and components damaged by overheating.

5–11. **SECOND LEVEL MAINTENANCE.**

5–12. The second level maintenance consists of procedures required to restore an FD–2 dual transmitter controller to operation after a fault has occurred. The procedures are divided into electrical adjustments, troubleshooting, and electrical component replacement procedures.

5–13. **ELECTRICAL ADJUSTMENTS.**

5–14. The following text provides electrical adjustment procedures for all controls associated with the FD–2 dual transmitter controller. The procedures are presented in the following order:

A. +15 Volt Regulator Adjust (R49).

B. Forward Calibration Control (R10).

C. VSWR Overload Threshold Adjust (R9).

D. Reject Forward/Reflected Adjusts (R11, R13).

E. Transmitter A Plate Voltage Adjust (R14).

F. Transmitter A Plate Current Adjust (R15).

G. Transmitter B Plate Voltage Adjust (R16).

H. Transmitter B Plate Current Adjust (R17).

I. Remote Combined Forward Control (R29).

J. Remote Combined Reflected Control (R30).

K. Remote Reject Forward Control (R31).

L. Remote Reject Reflected Control (R32).

5-15. The following equipment is required for electrical adjustment procedures:

A. Insulated adjustment tool, flat tip (BE P/N 407-0083).

B. Test load and connecting line.

FMD-70T FMD-60T FMD-40T	50 Ohm Non-inductive, 6 1/8 inch line input, 80 kW minimum.
FMD-20T	50 Ohm Non-inductive, 3 1/8 inch line input, 20 kW minimum.
FMD-10T	50 Ohm Non-inductive, 3 1/8 inch line input, 10kW minimum.

C. Calibrated in-line RF directional wattmeter.

FMD-70T	100 kW element, with 6 1/8 inch sampling section and cables.
FMD-60T FMD-40T	80 kW element, with 6 1/8 inch sampling section and cables.
FMD-20T	25 kW element, with 3 1/8 inch sampling section and cables.
FMD-10T	10 kW element, with 3 1/8 inch sampling section and cables.

5-16. **+15 VOLT REGULATOR ADJUST (R49).** Potentiometer R49 on the main circuit board adjusts the +15 volt regulator circuit. Adjustment of the +15 volt regulator circuit is not required unless replacement components are installed in the circuit. The +15 volt regulator circuit is adjusted as follows.

5-17. **Procedure.** To adjust the +15 volt regulator circuit, proceed as follows:

A. Disconnect the primary power to the FD-2 and remove the top-cover.

B. Refer to Figure 5-1 and connect a voltmeter between the cathode of diode D28 on the main circuit board and ground.

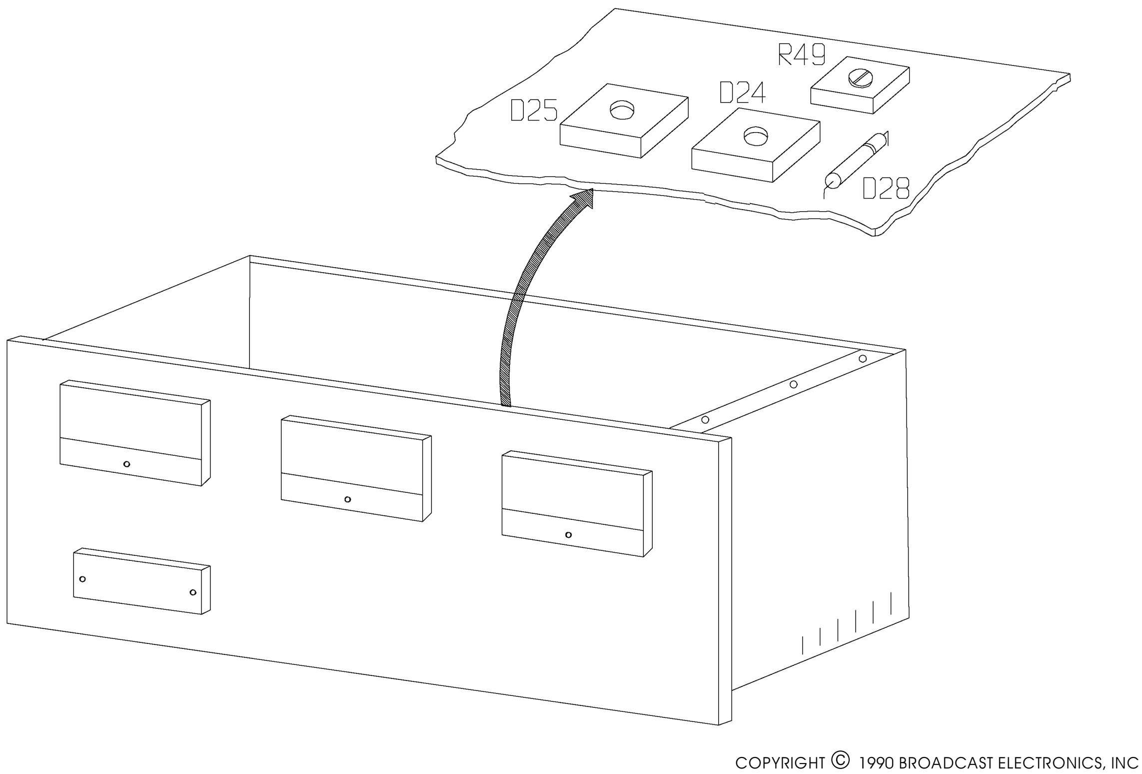


FIGURE 5-1. +15 VOLT REGULATOR CONTROL **597-0099-52**

C. Apply power to the FD-2.

D. Refer to Figure 5-1 and adjust R49 until the voltmeter indicates +15.0V dc.

E. Disconnect the primary power to the FD-2.

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

5-18. **FORWARD CALIBRATION CONTROL (R10).** Forward calibration control R10 on the status circuit board calibrates the TOTAL OUTPUT POWER meter. Adjustment of R10 is not required unless replacement components are installed in the circuit or the entire circuit board is replaced. The control is adjusted as follows.

5-19. **Procedure.** To adjust the forward calibration control, proceed as follows:

A. Refer to Figure 5-2 and remove the access panel.

WARNING ***DISCONNECT PRIMARY POWER TO BOTH TRANSMITTERS BEFORE PROCEEDING.***

WARNING

B. Disconnect primary power to both transmitters.

C. Connect an appropriate test load and wattmeter to the combiner antenna output.

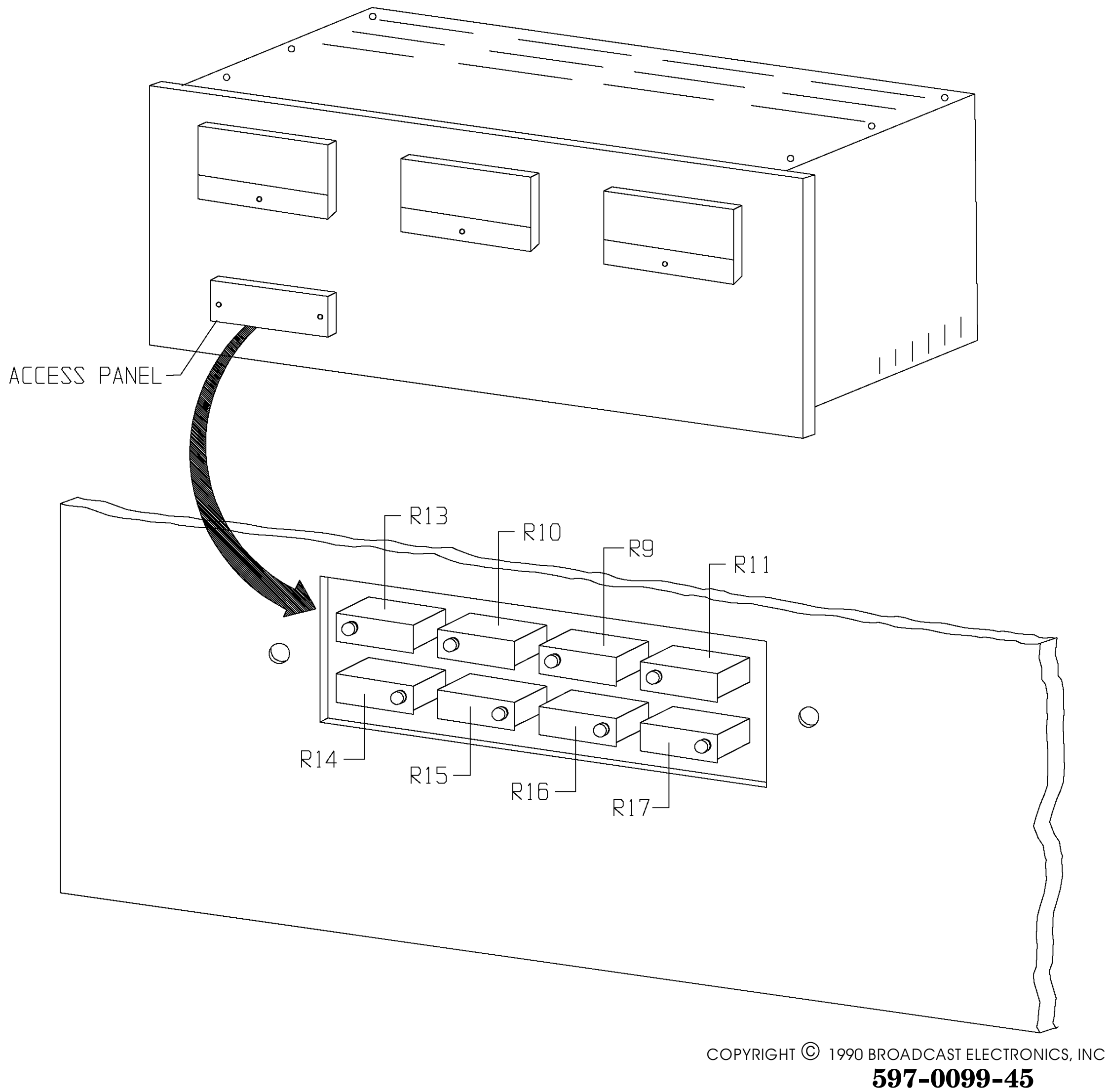


FIGURE 5-2. STATUS CIRCUIT BOARD CONTROLS

WARNING	***MAINTENANCE WITH POWER ENERGIZED IS ALWAYS CONSIDERED HAZARDOUS AND THEREFORE CAUTION SHOULD BE OBSERVED.***
WARNING	

D. Apply power to both transmitters.

E. Operate the **APC ON** switch/indicator on each transmitter to extinguish the switch/indicator.

F. Operate the **REMOTE DISABLE** switch/indicator on each transmitter to extinguish the switch/indicator.

G. Operate the dual transmitter system in manual mode at the normal RF power output as indicated by the in–line wattmeter.

H. Operate the **FWD/VSWR/VSWR CAL** meter selector switch to FWD.

I. Refer to Figure 5–2 and adjust forward calibration control R10 on the status circuit board until the TOTAL OUTPUT POWER meter indicates 100%.

J. The front–panel **VSWR CAL** control must also be adjusted to 100% at this time (Refer to SECTION III, OPERATION).

WARNING ***DISCONNECT PRIMARY POWER TO BOTH TRANSMITTERS BEFORE PROCEEDING.***

WARNING

K. Disconnect primary power to both transmitters.

L. Remove the test equipment and reconnect the combiner output to the antenna load.

5–20. **VSWR OVERLOAD THRESHOLD ADJUST (R9).** Potentiometer R9 on the status circuit board adjusts the VSWR overload threshold level. Adjustment of R9 is not required unless replacement components are installed in the circuit or the entire circuit board is replaced. The VSWR overload control is adjusted as follows.

5–21. **Procedure.** To adjust the VSWR overload threshold adjust, proceed as follows:

A. Refer to the preceding text and perform the FORWARD CALIBRATION CONTROL (R10) adjustment procedure.

B. Refer to Figure 5–2 and remove the access panel. Adjust VSWR threshold control R9 fully clockwise.

C. Operate the **APC ON** switch/indicator on both transmitters to illuminate the switch/indicator.

D. Operate the **REMOTE DISABLE** switch/indicator on each transmitter to extinguish the switch/indicator.

E. Operate the dual transmitter system at the normal output power.

F. Operate the **FWD/VSWR/VSWR CAL** meter selector switch to FWD. Assure the meter indicates 100%.

G. Depress the **HIGH VOLTAGE OFF** switch.

H. When the **LOWER** switch/indicator on both APC units remain extinguished, operate the **APC ON** switch/indicators to extinguish the switch/indicators.

I. Remove the cable from FD–2 rear–panel combined forward RF connector J3 and connect to combined reflected RF connector J4.

CAUTION ***ADJUSTMENT OF THE OVERLOAD CONTROL DETERMINES THE THRESHOLD LEVEL THE FD-2 WILL INITIATE A TRANSFER OPERATION. IF A CONTROL IS INCORRECTLY ADJUSTED, THE FD-2 MAY NOT SENSE A FAULT AND DAMAGE TO ONE OR BOTH TRANSMITTERS MAY RESULT.***

CAUTION

J. Operate the **HIGH VOLTAGE ON** switch/indicator to illuminate the switch/ indicator.

K. Operate the **FWD/VSWR/VSWR CAL** meter selector switch to VSWR.

L. Operate the **POWER LOCK** switch/indicator to illuminate the switch/indicator.

M. Raise power manually by depressing either **RAISE** power switch until the TOTAL OUTPUT POWER meter indicates a VSWR of 3 : 1.

N. Refer to Figure 5-2 and adjust R9 until the **VSWR OVERLOAD** indicator and **OVERLOAD RESET** switch/indicator illuminate and both transmitters cycle off.

O. Depress either **LOWER** switch to lower the power, then depress the **OVERLOAD RESET** switch/indicator.

P. Depress either **RAISE** power switch to raise power. The transmitters will cycle off at a VSWR indication of 3 : 1. If not, repeat the procedure as required.

CAUTION ***ENSURE THE CABLE FROM THE COMBINED FORWARD POWER DIRECTIONAL COUPLER IS RECONNECTED TO REAR-PANEL RF CONNECTOR J3.***

CAUTION

Q. Disconnect primary power to both transmitters, reconnect the cable from the combined forward power directional coupler to rear-panel RF connector J3, and replace the access panel.

5-22. **REJECT FORWARD/REFLECTED ADJUSTS (R11, R13).** Reject forward power adjust R11 and reject reflected power adjust R13 on the status circuit board calibrate the REJECT LOAD POWER meter. Adjustment of R11 and R13 is not required unless replacement components are installed in the circuit or the entire circuit board is replaced. The reject forward power and reflected power controls are adjusted as follows.

5-23. **Procedure.** To adjust the reject forward power and reject reflected power controls, proceed as follows:

A. Refer to Figure 5-2 and remove the access panel.

WARNING ***DISCONNECT PRIMARY POWER TO BOTH TRANSMITTERS BEFORE PROCEEDING.***

WARNING

B. Disconnect primary power to both transmitters.

C. Connect an appropriate RF in-line wattmeter between the combiner reject output and reject load.

D. If an FO-2 output switch controller is installed in the system, operate the FO-2 **AUTO ON** switch/indicator to extinguish the switch/indicator (manual mode) to prevent a switching operation.

E. Operate all transmitter B circuit breakers to OFF to disable transmitter B.

WARNING ***MAINTENANCE WITH POWER ENERGIZED IS ALWAYS CONSIDERED HAZARDOUS AND THEREFORE CAUTION SHOULD BE OBSERVED.***

WARNING

F. Apply primary power to transmitter A.

G. Operate and adjust transmitter A until the in-line wattmeter indicates one half of transmitter A rated output power.

H. Refer to Figure 5–2 and adjust reject forward power control R11 until the REJECT LOAD POWER meter indicates 100%.

I. Remove the reject forward power cable from FD–2 rear–panel RF connector J1 and connect to RF connector J2.

J. Refer to Figure 5–2 and adjust reject reflected power control R13 until the REJECT LOAD POWER meter indicates 100%.

WARNING ***DISCONNECT PRIMARY POWER TO TRANSMITTER A BEFORE PROCEEDING.***

WARNING

CAUTION ***ENSURE THE REJECT FORWARD POWER CABLE IS RECONNECTED TO RF CONNECTOR J1.***

CAUTION

K. Disconnect the primary power to transmitter A and reconnect the reject forward power cable to RF connector J1.

L. Remove all test equipment, replace the access panel, and operate all transmitter B circuit breakers to ON.

5–24. **TRANSMITTER A PLATE VOLTAGE ADJUST (R14).** Plate voltage adjust R14 on the status circuit board calibrates the transmitter A plate voltage meter circuit. Adjustment of R14 is not required unless replacement components are installed in the circuit or the entire circuit board is replaced. The control is adjusted as follows.

5–25. **Procedure.** To adjust plate voltage control R14, proceed as follows:

A. Refer to Figure 5–2 and remove the access panel.

B. Apply primary power and operate the dual transmitter system at the normal output power.

C. Observe the plate voltage meter on the transmitter A PA cabinet and record the measurement ____________ .

D. Operate the **VOLTAGE/CURRENT A/B** meter selector switch to VOLTAGE A.

E. Refer to Figure 5–2 and adjust R14 until the PLATE VOLTAGE/PLATE CURRENT meter indicates the measurement recorded in step C.

F. Disconnect power and replace the access panel.

5–26. **TRANSMITTER A PLATE CURRENT ADJUST (R15).** Plate current adjust R15 on the status circuit board calibrates the transmitter A plate current meter circuit. Adjustment of R15 is not required unless replacement components are installed in the circuit or the entire circuit board is replaced. The control is adjusted as follows.

5–27. **Procedure.** To adjust plate current control R15, proceed as follows:

A. Refer to Figure 5–2 and remove the access panel.

B. Apply primary power and operate the dual transmitter system at the normal output power.

C. Observe the plate current meter on the transmitter A PA cabinet and record the measurement ____________.

D. Operate the **VOLTAGE/CURRENT A/B** meter selector switch to CURRENT A.

E. Refer to Figure 5-2 and adjust R15 until the PLATE VOLTAGE/PLATE/ CURRENT meter indicates the measurement recorded in step C.

F. Disconnect power and replace the access panel.

5-28. **TRANSMITTER B PLATE VOLTAGE ADJUST (R16).** Plate voltage adjust R16 on the status circuit board calibrates the transmitter B plate voltage meter meter circuit. Adjustment of R16 is not required unless replacement components are installed in the circuit or the entire circuit board is replaced. The control is adjusted as follows.

5-29. **Procedure.** To adjust plate voltage control R16, proceed as follows:

A. Refer to Figure 5-2 and remove the access panel.

B. Apply primary power and operate the dual transmitter system at the normal output power.

C. Observe the plate voltage meter on the transmitter B PA cabinet and record the measurement ____________.

D. Operate the **VOLTAGE/CURRENT A/B** meter selector switch to VOLTAGE B.

E. Refer to Figure 5-2 and adjust R16 until the PLATE VOLTAGE/PLATE/ CURRENT meter indicates the measurement recorded in step C.

F. Disconnect power and replace the access panel.

5-30. **TRANSMITTER B PLATE CURRENT ADJUST (R17).** Plate current adjust R17 on the status circuit board calibrates the transmitter B plate current meter circuit. Adjustment of R17 is not required unless replacement components are installed in the circuit or the entire circuit board is replaced. The control is adjusted as follows.

5-31. **Procedure.** To adjust plate current control R17, proceed as follows:

A. Refer to Figure 5-2 and remove the access panel.

B. Apply primary power and operate the dual transmitter system at the normal output power.

C. Observe the plate current meter on the transmitter B PA cabinet and record the measurement ____________.

D. Operate the **VOLTAGE/CURRENT A/B** meter selector switch to CURRENT B.

E. Refer to Figure 5-2 and adjust R17 until the PLATE VOLTAGE/PLATE/ CURRENT meter indicates the measurement recorded in step C.

F. Disconnect power and replace the access panel.

5-32. **REMOTE COMBINED FORWARD POWER CONTROL (R29).** Remote combined forward power control R29 on the RF sample circuit board adjusts the remote combined forward power meter circuit. The control is adjusted as follows.

5-33. **Procedure.** To adjust remote combined forward power control R29, proceed as follows:

A. Refer to Figure 5-3 and remove the top-panel.

B. Operate the **FWD/VSWR/VSWR CAL** meter selector switch to FWD.

C. Apply primary power and operate the dual transmitter system at the normal output power.

D. Observe the TOTAL OUTPUT POWER meter and record the measurement ____________.

E. Refer to Figure 5-3 and adjust R29 until the remote combined forward meter indicates the measurement recorded in step D.

F. Disconnect power and replace the top-panel.

5-34. **REMOTE COMBINED REFLECTED POWER CONTROL (R30).** Remote combined reflected power control R30 on the RF sample circuit board adjusts the remote combined reflected power meter circuit. The control is adjusted as follows.

5-35. **Procedure.** To adjust remote combined reflected power control R30, proceed as follows:

A. Refer to Figure 5-3 and remove the top-panel.

B. Operate the **FWD/VSWR/VSWR CAL** meter selector switch to VSWR.

C. Apply primary power and operate the dual transmitter system at the normal output power.

D. Observe the TOTAL OUTPUT POWER meter and record the measurement ____________.

E. Refer to Figure 5-3 and adjust R30 until the remote combined reflected meter indicates the measurement recorded in step D.

F. Disconnect power and replace the top-panel.

5-36. **REMOTE REJECT FORWARD POWER CONTROL (R31).** Remote reject forward power control R31 on the RF sample circuit board adjusts the remote reject forward power meter circuit. The control is adjusted as follows.

5-37. **Procedure.** To adjust remote reject forward power control R31, proceed as follows:

A. Refer to Figure 5-3 and remove the top-panel.

B. Operate the **FWD/FWD EXPAND/VSWR** meter selector switch to FWD EXPAND.

C. Apply primary power and operate the dual transmitter system at the normal output power.

D. Observe the REJECT LOAD POWER meter and record the measurement ____________.

E. Refer to Figure 5-3 and adjust R31 until the remote reject forward power meter indicates the measurement recorded in step D.

F. Disconnect power and replace the top-panel.

5-38. **REMOTE REJECT REFLECTED POWER CONTROL (R32).** Remote reject reflected power control R32 on the RF sample circuit board adjusts the remote reject reflected power meter circuit. The control is adjusted as follows.

5-39. **Procedure.** To adjust remote reject reflected power control R32, proceed as follows:

A. Refer to Figure 5-3 and remove the top-panel.

B. Operate the **FWD/FWD EXPAND/VSWR** meter selector switch to VSWR.

C. Apply primary power and operate the dual transmitter system at the normal output power.

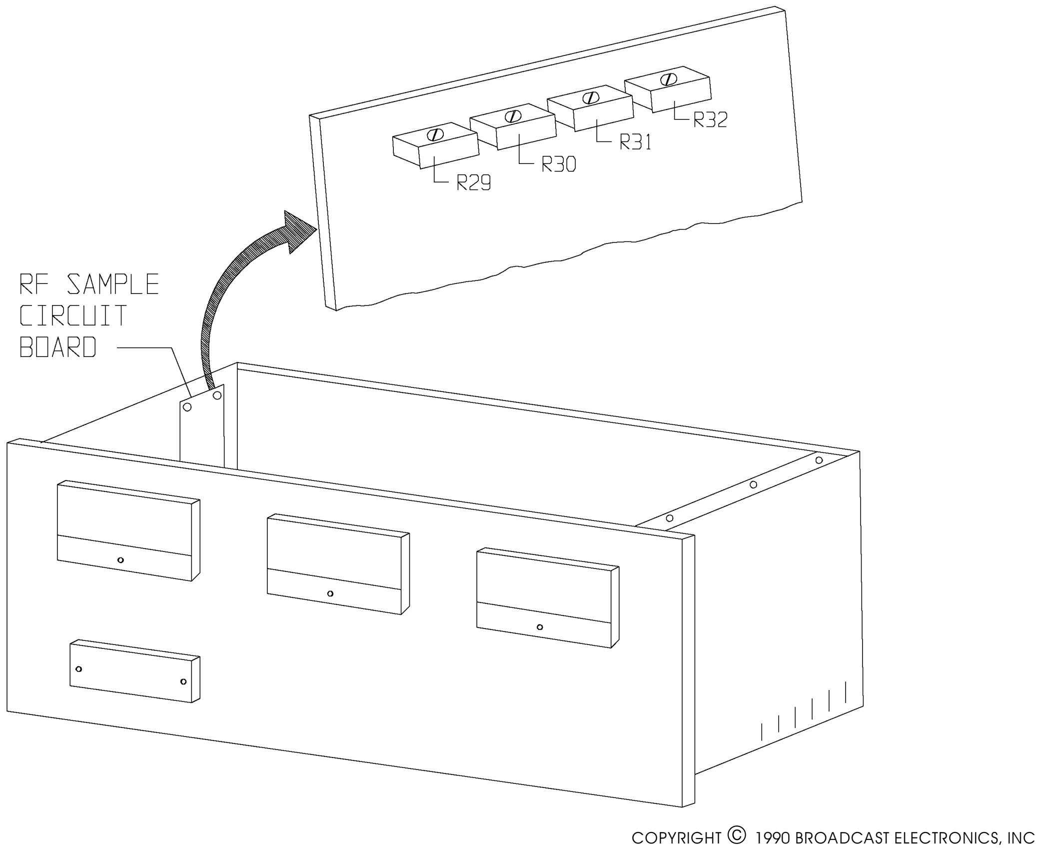


FIGURE 5-3. REMOTE METERING CONTROLS

D. Observe the REJECT LOAD POWER meter and record the measurement ____________.

E. Refer to Figure 5-3 and adjust R32 until the remote reject reflected power meter indicates the measurement recorded in step D.

F. Disconnect power and replace the top-panel.

5-40. TROUBLESHOOTING.

5-41. The troubleshooting philosophy for the FD-2 transmitter controller consists of isolating a problem to a specific circuit. The problem may be further isolated by referencing the following information and Table 5-1 which presents FD-2 troubleshooting information.

	WARNING WARNING	***DISCONNECT THE POWER SOURCE FROM THE FD-2 BEFORE REMOVING OR REPLACING ANY COMPONENTS.***
	CAUTION CAUTION	***INADVERTENT CONTACT BETWEEN ADJACENT COMPONENTS OR CIRCUIT BOARDS WITH TEST EQUIPMENT MAY CAUSE SERIOUS DAMAGE TO THE FD-2 CONTROLLER.***

5-42. After the problem is isolated and power is totally deenergized, refer to the schematic diagrams and the theory of operation to assist in problem resolution. The defective component may be repaired locally or the entire device may be returned to Broadcast Electronics Inc. for repair or replacement.

TABLE 5-1. FD-2 TROUBLESHOOTING
(Sheet 1 of 2)

SYMPTOM	DEFECT/REMEDY
NO INDICATOR, COMMAND, and METER OPERATION	1. Check the ac line fuses on the FD-2 rear-panel.
NO FILAMENT ON COMMAND OPERATION	1. Check **FILAMENT ON** switch/indicator S1 on the control switch circuit board.
NO TRANSMITTER A FILAMENT ON COMMAND OPERATION	1. Check integrated circuit U1A on the main circuit board. 2. Check switching transistor Q1 and associated circuitry on the main circuit board.
NO FILAMENT ON INDICATOR OPERATION	1. Check filament on indicator DS9 on the control switch circuit board. 2. Check filament on indicator driver circuit U1A on the control switch circuit board.
NO REMOTE FILAMENT ON INDICATOR OPERATION	1. Check optical coupler U4 on the main circuit board.
NO TRANSMITTER A BLOWER STATUS INDICATOR OPERATION	1. Check **BLOWER** status indicator DS3 on the status circuit board. 2. Check integrated circuit U9C on the main circuit board.
NO POWER LOCK OPERATION	1. Check power lock relay K1 on the control switch circuit board. 2. Check **POWER LOCK** switch/indicator S10 on the control switch circuit board.

TABLE 5-1. FD-2 TROUBLESHOOTING
(Sheet 2 of 2)

SYMPTOM	DEFECT/REMEDY
NO VSWR OVERLOAD INDICATOR RESET OPERATION	1. Check integrated circuit U11 on the main circuit board. 2. Check integrated circuit U10E on the main circuit board. 3. Check front-panel VSWR OVERLOAD indicator DS1.
NO VSWR OVERLOAD RECYCLE OPERATION	1. Check integrated circuit U12 and associated circuitry on the main circuit board. 2. Check transistor Q11 and associated circuitry on the main circuit board.
NO PLATE VOLTAGE/PLATE CURRENT METER OPERATION	1. Check front-panel PLATE VOLTAGE/ PLATE CURRENT meter M3.
NO TRANSMITTER A PLATE VOLTAGE METER OPERATION	1. Check selector switch S3A on the main circuit board. 2. Check plate voltage adjust R14 on the status circuit board. 3. Check integrated circuit U14A on the main circuit board.
NO REMOTE COMBINED REFLECTED METER OPERATION	1. Check remote meter amplifier U1B and associated circuitry on the RF sample circuit board.

5-43. COMPONENT REPLACEMENT.

5-44. On all circuit boards, the adhesion between the copper trace and the circuit board fails at almost the same temperature as solder melts. A circuit board trace can be destroyed by excessive heat or lateral movement during soldering. Use of a small soldering iron with steady pressure is required for circuit board repairs.

5-45. To remove a soldered component from a circuit board, cut the leads from the body of the defective component while the device is still soldered to the board. Grip a component lead with needle-nose pliers. Touch the soldering iron to the lead at the solder connection on the circuit side of the board.

5-46. When the solder begins to melt, push the lead through the back side of the board and cut off the clinched end of the lead. Each lead may now be heated independently and pulled out of each hole. The holes may be cleared by careful re-heating with a low wattage iron and removing solder with a soldering vacuum tool.

5-47. Install the new component and apply solder from the circuit side of the board. If no damage has been incurred to the plated-through holes, soldering of the component side of the board will not be required.

WARNING

WARNING

MOST SOLVENTS WHICH REMOVE ROSIN FLUX ARE VOLATILE AND TOXIC BY NATURE AND SHOULD BE USED ONLY IN SMALL AMOUNTS IN A WELL VENTILATED AREA AWAY FROM FLAME, CIGARETTES, AND HOT SOLDERING IRONS.

WARNING

WARNING

OBSERVE THE MANUFACTURES CAUTIONARY INSTRUCTIONS.

5-48. After soldering, remove residual flux with a suitable solvent. Rubbing alcohol is highly diluted and is not effective.

5-49. The board should be checked to ensure the flux has been completely removed. Rosin flux is not normally corrosive; however, in time the flux will absorb enough moisture to become conductive and create problems.

5-50. **INTEGRATED CIRCUITS.** Special care should be exercised with integrated circuits. Each integrated circuit must be installed by matching the integrated circuit notch with the notch on the socket. Do not attempt to remove an integrated circuit from a socket with your fingers. Use an integrated circuit puller to pry the component from the socket.

SECTION VI
FD-2 DUAL TRANSMITTER CONTROLLER PARTS LISTS

6-1. INTRODUCTION.

6-2. This section provides descriptions and part numbers of electrical components, assemblies, and selected mechanical parts required for maintenance of the Broadcast Electronics FD-2 dual transmitter controller. Each table entry in this section is indexed by reference designators appearing on the applicable schematic diagram.

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

TABLE 6-1. REPLACEABLE PARTS LIST INDEX

TABLE	DESCRIPTION	PART NO.	PAGE
6-2	DUAL TRANSMITTER CONTROLLER	909-6001-204/ 909-6001-304	6-2
6-3	MAIN CIRCUIT BOARD ASSEMBLY	919-0088	6-3
6-4	24 CIRCUIT EMI FILTER CIRCUIT BOARD ASSEMBLY	919-0085	6-4
6-5	40 CIRCUIT EMI FILTER CIRCUIT BOARD ASSEMBLY	919-0087	6-5
6-6	RF SAMPLE CIRCUIT BOARD ASSEMBLY	919-0083	6-5
6-7	STATUS CIRCUIT BOARD ASSEMBLY	919-0086	6-6
6-8	CONTROL SWITCH CIRCUIT BOARD ASSEMBLY	919-0084	6-6
6-9	TRANSMITTER CONTROLLER WIRE HARNESS ASSEMBLY	949-0116	6-7

TABLE 6-2. DUAL TRANSMITTER CONTROLLER - 909-6001-204/909-6001-304 (Sheet 1 of 2)

REF. DES.	DESCRIPTION	PART NO.	QTY.
C1 THRU C3	Capacitor, Ceramic, Disc, 0.001 uF, 1kV	002-1034	3
C6	Capacitor, Electrolytic, 15,000 uF, 50V	024-1590	1
DS1	Indicator, LED, Red, 14V dc @ 18 mA (VSWR OVERLOAD)	320-0010	1
DS9 THRU DS12	Lamp, #73, 14V, 0.08 Ampere, T-1 3/4 Bulb, Wedge Type (for FILAMENT ON, HIGH VOLTAGE ON,OVERLOAD RESET, and POWER LOCK)	320-0007	4
F1,F2, SPARE	Fuse, AGC, 250V, 3/4 Ampere, Slow-Blow (909-6001-000 Assembly)	334-0075	3
	Fuse, MDL, 250V, 3/8 Ampere, Slow-Blow (909-6001-300 Assembly)	334-0375	3
J10	Automatic Control Disable Jumper	959-0221	1
M1,M2	Meter, 3.5 inch (8.89 cm), Taut Band Type, FS= 200 uA dc ±2%, 230 Ohm Movement (TOTAL OUTPUT POWER, REJECT LOAD POWER)	310-0058	2
M3	Meter, 3.5 inch (8.89 cm), Taut Band Type, FS= 1 mA dc ±1%, 35 Ohm Resistance (PLATE VOLTAGE/PLATE CURRENT)	310-0059	1
MOV1	Metal Oxide Varistor, V250LA15A, 250V dc RMS, 15 Joules	140-0008	1
R1	Potentiometer, 50 k Ohm ±10%, 2W	190-5302	1
S1 THRU S3	Switch, Push, Momentary, SPST, Illuminated, 3 Amperes @ 125V (**FILAMENT ON, FILAMENT OFF, HIGH VOLTAGE ON**)	340-0018	3
S4,S5	Switch, Push, Momentary, SPST, 3 Amperes @ 125V (**A & B RAISE POWER** and **LOWER POWER**)	340-0015	2
S6,S7	Switch, Push, Momentary, SPST, Illuminated, 3 Amperes @ 125V (**HIGH VOLTAGE OFF** and **OVERLOAD RESET**)	340-0018	2
S8,S9	Switch, Push, Momentary, SPST, 3 Amperes @ 125V (**A & B RAISE POWER** and **LOWER POWER**)	340-0015	2
S10	Switch, Push, Latching, DPDT, 3 Amperes @ 125V (**POWER LOCK**)	340-0057	1
T1	Transformer, Power, Single Phase, 50/60 Hz Primary: Dual 115 Volt Windings, One winding taped at 90V Secondary: 17.6V RMS @ 0.1 Ampere, Open Circuit 20.4V RMS @ 0.4 Amperes, Open Circuit 20.4V RMS @ 2 Amperes, Open Circuit	370-0005	1
U17	Integrated Circuit, LM350K, Adjustable Positive Voltage Regulator, 1.2V to 33V, 3 Amperes Maximum, TO-3 Case	227-0350	1
U18	Integrated Circuit, MC7815C, Voltage Regulator, 15V @ 1A, TO-220 Case	227-7815-C	1
XF1	Fuse Holder, AGC	415-2012	1
XF2	Fused Power Connector/Voltage Selector/EMI Filter, 120/240V	360-6504	1
XU17	Socket, Transistor, TO-3 Case	417-0298	1
----	Fuse Clip for spare fuse, AGC	415-1001	2
----	Shoulder Washers (for U18)	407-0132	1
----	Lens, Green (for FILAMENT and HIGH VOLTAGE ON)	340-0016	2
----	Lens, Smoke (for A & B RAISE and LOWER)	340-0022	4
----	Lens, Amber (for OVERLOAD RESET)	346-1017	1
----	Lens, Red (for FILAMENT OFF and HIGH VOLTAGE OFF)	346-1018	2
----	Lens, Blue (for POWER LOCK)	346-1019	1
----	Pad, Transistor Mounting, TO-220 Case (for U18)	409-7403	1
----	Insulator, Transistor Mounting, TO-3 Case (for U17)	418-0010	1
----	Top Cover Retainer		
	Stud	420-0019	9
	Retainer	420-0021	9
	Receptacle	420-0022	9
----	Bushing, LED Mounting	454-0004	8
----	Knob, Black, 1/4 inch ID (0.64 cm) (for VSWR CAL)	482-0028	1
----	AC Line Cord, N.E.M.A. 3-wire North American Plug, 7.5 feet (2.3 m) long	682-0001	1

TABLE 6-2. DUAL TRANSMITTER CONTROLLER - 909-6001-204/909-6001-304 (Sheet 2 of 2)

REF. DES.	DESCRIPTION	PART NO.	QTY.
----	RF Sample Circuit Board Assembly	919-0083	1
----	Control Switch Circuit Board Assembly	919-0084	1
----	24 Circuit EMI Filter Circuit Board Assembly	919-0085	1
----	Status Circuit Board Assembly	919-0086	1
----	40 Circuit EMI Filter Circuit Board Assembly	919-0087	1
----	Main Circuit Board Assembly	919-0088	1
----	Transmitter Controller Wire Harness Assembly	949-0116	1

TABLE 6-3. MAIN CIRCUIT BOARD ASSEMBLY - 919-0088 (Sheet 1 of 2)

REF. DES.	DESCRIPTION	PART NO.	QTY.
C4	Capacitor, Electrolytic, 100 uF, 25V	023-1084	1
C5	Capacitor, Mylar, 0.1 uF, 100V	030-1053	1
C7,C8	Capacitor, Electrolytic, 1 uF, 50V	024-1064	2
C9	Capacitor, Mylar, 0.1 uF, 100V	030-1053	1
D1 THRU D23	Diode, 1N4005, Silicon, 1 Ampere @ 600V	203-4005	23
D24,D25	Bridge Rectifier, Silicon, 6 Ampere @ 200V	239-0004	2
D26 THRU D30	Diode, 1N4005, Silicon, 1 Ampere @ 600V	203-4005	5
J1	Receptacle, 40-Pin Dual In-line	417-0117	1
J2	Socket, 16-Pin DIP	417-1604	1
J3	Receptacle, 12-Pin	417-1276	1
J4	Socket, 16-Pin DIP	417-1604	1
J5	Socket, 40-Pin DIP	417-4005	1
J6	Receptacle, 26-Pin Dual In-line	418-2602	1
J7	Receptacle, 25-Pin	417-2500	1
J8	Receptacle, 12-Pin	417-1276	1
K1	Relay, Coil: 12V dc, 185 Ohms Contacts: DPDT, 28V ac or dc at 2 Amperes Maximum	270-0050	1
Q1 THRU Q11	Transistor, MPS-A14, Darlington, NPN, TO-92 Case	211-0014	11
R1 THRU R22	Resistor, 10 k Ohm ±1%, 1/4W	100-1051	22
R23	Resistor, 1 Meg Ohm ±1%, 1/4W	103-1007	1
R24	Resistor, 100 Ohm ±1%, 1/4W	100-1031	1
R25	Resistor, 3.32 k Ohm ±1%, 1/4W	103-3324	1
R26, R27	Resistor, 1.78 k Ohm ±1%, 1/4W	103-1743	2
R28	Resistor, 3.32 k Ohm ±1%, 1/4W	103-3324	1
R29	Resistor, 49.9 k Ohm ±1%, 1/4W	103-4951	1
R30	Resistor, 26.7 k Ohm ±1%, 1/4W	103-2675	1
R31	Resistor, 40.2 k Ohm ±1%, 1/4W	103-4025	1
R32	Resistor, 80.6 k Ohm ±1%, 1/4W	103-8065	1
R33	Resistor, 26.7 k Ohm ±1%, 1/4W	103-2675	1
R34	Resistor, 19.6 k Ohm ±1%, 1/4W	103-1965	1
R35	Potentiometer, 500 k Ohm ±10%, 1/2W	178-5064	1
R36	Resistor, 40.2 k Ohm ±1%, 1/4W	103-4025	1
R37	Resistor, 26.7 k Ohm ±1%, 1/4W	103-2675	1
R38	Resistor, 80.6 k Ohm ±1%, 1/4W	103-8065	1
R39, R40	Resistor, 5.11 k Ohm ±1%, 1/4W	103-5141	2
R41	Resistor, 1 k Ohm ±1%, 1/4W	103-1041	1

TABLE 6-3. MAIN CIRCUIT BOARD ASSEMBLY - 919-0088
(Sheet 2 of 2)

REF. DES.	DESCRIPTION	PART NO.	QTY.
R42	Resistor, 3.65 k Ohm ±1%, 1/4W	103-3641	1
R43	Resistor, 6.81 k Ohm ±1%, 1/4W	103-6814	1
R44 THRU R46	Resistor, 100 k Ohm ±1%, 1/4W	103-1062	3
R47	Resistor, 1.5 k Ohm ±1%, 1/4W	103-1504	1
R48	Resistor, 118 Ohm ±1%, 1/4W	100-1111	1
R49	Potentiometer, 500 Ohm ±10%, 1/2W	177-5032	1
R51	Resistor, 1 k Ohm ±1%, 1/4W	100-1041	1
R52 THRU R55	Resistor, 100 k Ohm ±1%, 1/4W	103-1062	4
R56	Resistor, 1 k Ohm ±1%, 1/4W	100-1041	1
----	Resistor, 10 k Ohm ±1%, 1/4W	100-1051	6
S1,S2	Switch, Push, Interlocked, 4PDT, 3 Station	343-1204	2
S3	Switch, Push, Interlocked, 4PDT, 4 Station	343-0920	1
U1 THRU U3	Integrated Circuit, CD4081BE, AND Gate, CMOS, 14-Pin DIP	225-0008	3
U4 THRU U8	Integrated Circuit, 4N33, Optical Isolator, NPN Photo-Transistor/ Infared Emitting Diode Type, 1500V Isolation, 6-Pin DIP	229-0033	5
U11	Integrated Circuit, MC14043BP, CMOS, Quad NOR Gate, 16-Pin DIP	220-4043	1
U12 THRU U14	Integrated Circuit, TLC274CN, Quad N-Channel, JFET-Input Operational Amplifier, 14-Pin DIP	221-0094	3
U15,U16	Integrated Circuit, LM358N, Dual Operational Amplifier, 8-Pin DIP	221-0358	2
XK1	Relay Socket, 10-Pin	417-1230	1
XU1 THRU XU3	Socket, 14-Pin DIP	417-1404	3
XU4 THRU XU8	Socket, 6-Pin DIP	417-0600	5
XU9 THRU XU11	Socket, 16-Pin DIP	417-1604	3
XU12 THRU XU14	Socket, 14-Pin DIP	417-1404	3
XU15,XU16	Socket, 8-Pin DIP	417-0804	2
----	Switch Cap, Black (for FWD, VSWR, VSWR CAL, A & B VOLTAGE, A & B CURRENT, FWD, FWD EXPAND, and VSWR)	343-6401	10
----	Blank Circuit Board	519-0088	1

TABLE 6-4. 24 CIRCUIT EMI FILTER CIRCUIT BOARD ASSEMBLY - 919-0085

REF. DES.	DESCRIPTION	PART NO.	QTY.
C1 THRU C20	Capacitor, Ceramic, 0.001 uF, 1 kV	002-1034	20
J3	Receptacle, 26-Pin Dual In-line	418-2602	1
L1,L2	RF Choke, 4.7 uH ±10%, 430 mA Maximum, 0.55 Ohm dc Resistance, 115 MHz	360-0022	2
R1 THRU R18	Resistor, 1 k Ohm ±1%, 1/4W	100-1041	18
TB3,TB4	Barrier Strip, 12 Terminal	411-2512	2
----	Blank Circuit Board	519-0085	1

TABLE 6-5. 40 CIRCUIT EMI FILTER CIRCUIT BOARD ASSEMBLY - 919-0087

REF. DES.	DESCRIPTION	PART NO.	QTY.
C1 THRU C38	Capacitor, Ceramic, 0.001 uF, 1kV	002-1034	38
J4	Receptacle, 40 Pin Dual In-line	417-0117	1
L1,L2	RF Choke, 4.7 uH ±10%, 430 mA Maximum, 0.55 Ohm dc Resistance, 115 MHz	360-0022	2
R1 THRU R10, R13, R14, R17, R18, R21 THRU R32, R35, R36,	Resistor, 1 k Ohm ±1%, 1/4W	100-1041	28
TB1,TB2	Barrier Strip, 20 Terminal	412-0120	2
----	RF Choke, 4.7 uH ±10%, 430 mA Maximum, 0.55 Ohm dc Resistance, 115 MHz	360-0022	6
----	Blank Circuit Board	519-0087	1

TABLE 6-6. RF SAMPLE CIRCUIT BOARD ASSEMBLY - 919-0083 (Sheet 1 of 2)

REF. DES.	DESCRIPTION	PART NO.	QTY.
C1 THRU C4	Capacitor, Ceramic, 5 pF ±5%, 500V, NPO	001-5004	4
C5	Capacitor, Mica, 390 pF ±5%, 100V	042-3922	1
C6	Capacitor, Mica, 1000 pF ±10%, 350V	046-0002	1
C7	Capacitor, Mica, 390 pF ±5%, 100V	042-3922	1
C8	Capacitor, Mica, 1000 pF ±10%, 350V	046-0002	1
C9	Capacitor, Mica, 390 pF ±5%, 100V	042-3922	1
C10	Capacitor, Mica, 1000 pF ±10%, 350V	046-0002	1
C11	Capacitor, Mica, 390 pF ±5%, 100V	042-3922	1
C12	Capacitor, Mica, 1000 pF ±10%, 350V	046-0002	1
C13 THRU C20	Capacitor, Mica, 390 pF ±5%, 100V	042-3922	8
C21 THRU C24	Capacitor, Mylar, 0.1 uF ±10%, 100V	030-1053	4
D1 THRU D8	Diode, HP5082-2800, High Voltage, Schottky Barrier Type, 70V, 15 mA	201-2800	8
J1 THRU J4	Receptacle, BNC	417-0049	4
J5	Socket, 16-Pin DIP	417-1604	1
L1 THRU L8	RF Choke, 4.7 uH ±10%, 430 mA Maximum, 0.55 Ohm dc Resistance, 115 MHz	360-0022	8
R1 THRU R4	Resistor, 47 Ohm ±5%, 2W	130-4723	4
R5 THRU R8	Resistor, 475 Ohm ±1%, 1/4W	103-4753	4
R9 THRU R12	Resistor, 10 k Ohm ±1%, 1/4W	100-1051	4
R13	Resistor, 26.7 k Ohm ±1%, 1/4W	103-2675	1
R14	Resistor, 47.5 k Ohm ±1%, 1/4W	103-4755	1
R15	Resistor, 26.7 k Ohm ±1%, 1/4W	103-2675	1
R16	Resistor, 47.5 k Ohm ±1%, 1/4W	103-4755	1
R17	Resistor, 26.7 k Ohm ±1%, 1/4W	103-2675	1
R18	Resistor, 47.5 k Ohm ±1%, 1/4W	103-4755	1
R19	Resistor, 26.7 k Ohm ±1%, 1/4W	103-2675	1
R20	Resistor, 47.5 k Ohm ±1%, 1/4W	103-4755	1
R21	Resistor, 2.21 k Ohm ±1%, 1/4W	103-2241	1
R22	Resistor, 1.33 k Ohm ±1%, 1/4W	103-1331	1
R23	Resistor, 3.32 k Ohm ±1%, 1/4W	103-3324	1
R24	Resistor, 3.92 k Ohm ±1%, 1/4W	103-3924	1

TABLE 6-6. RF SAMPLE CIRCUIT BOARD ASSEMBLY - 919-0083
(Sheet 2 of 2)

REF. DES.	DESCRIPTION	PART NO.	QTY.
R25 THRU R28	Resistor, 1 k Ohm ±1%, 1/4W	100-1041	4
R29	Potentiometer, 10 k Ohm ±10%, 1/2W	178-1054	1
R30	Potentiometer, 50 k Ohm ±10%, 1/2W	178-5054	1
R31	Potentiometer, 10 k Ohm ±10%, 1/2W	178-1054	1
R32	Potentiometer, 50 k Ohm ±10%, 1/2W	178-5054	1
R33 THRU R36	Resistor, 100 Ohm ±1%, 1/4W	100-1031	4
U1,U2	Integrated Circuit, TLO92CP, Dual N-Channel JFET-Input Operational Amplifier, 8-Pin DIP	221-0092	2
XU1,XU2	Socket, 8-Pin DIP	417-0804	2
----	Blank Circuit Board	519-0083	1

TABLE 6-7. STATUS CIRCUIT BOARD ASSEMBLY - 919-0086

REF. DES.	DESCRIPTION	PART NO.	QTY.
DS1 THRU DS8	Indicator, LED, Green, 521-9175, 2.3V @ 40 mA Maximum (for TRANSMITTER A & B STATUS: INTERLOCK, FILAMENT, BLOWER, HIGH VOLTAGE)	323-9224	8
J2	Socket, 40-Pin DIP	417-4005	1
R1 THRU R8	Resistor, 750 Ohm ±1%, 1/4W	103-7503	8
R9	Potentiometer, 5 k Ohm ±10%, 1/2W	178-5045	1
R10	Potentiometer, 50 k Ohm ±10%, 1/2W	177-5050	1
R11,R13	Potentiometer, 10 k Ohm ±10%, 1/2W	177-1055	2
R14 THRU R17	Potentiometer, 2 k Ohm ±10%, 1/2W	177-2045	4
----	Blank Circuit Board	519-0086	1

TABLE 6-8. CONTROL SWITCH CIRCUIT BOARD ASSEMBLY - 919-0084

REF. DES.	DESCRIPTION	PART NO.	QTY.
J1	Socket, 16-Pin DIP	417-1604	1
R1 THRU R5	Resistor, 100 k Ohm ±1%, 1/4W	103-1062	5
U1	Integrated Circuit, ULN2003A, Seven Section NPN Darlington Driver, CMOS, 16-Pin DIP	229-2003	1
XU1	Socket, 16-Pin DIP	417-1604	1
----	Blank Circuit Board	519-0084	1

TABLE 6-9. TRANSMITTER CONTROLLER WIRE HARNESS ASSEMBLY - 949-0116

REF. DES.	DESCRIPTION	PART NO.	QTY.
P1,P2	Plug, 16–Pin Dual In–line	417–1602	2
P1	Plug, 40–Pin Dual In–line	417–0118	1
P2	Plug, 40–Pin Dual In–line	418–0041	1
P3	Plug, 12–Pin	418–1271	1
P3	Plug, 26–Pin Dual In–line	418–2600	1
P4,P5	Plug, 16–Pin Dual In–line	417–1602	2
P4	Plug, 40–Pin Dual In–line	417–0118	1
P5	Plug, 40–Pin Dual In–line	418–0041	1
P6	Plug, 26–Pin Dual In–Line	418–2600	1
P7	Plug, 25 Pin Dual In–line	418–0609	1
P8	Plug, 12–Pin	418–1271	1
P10	Plug, 25 Pin Dual In–line	418–0609	1
----	Pins, Connector	417–0053	20

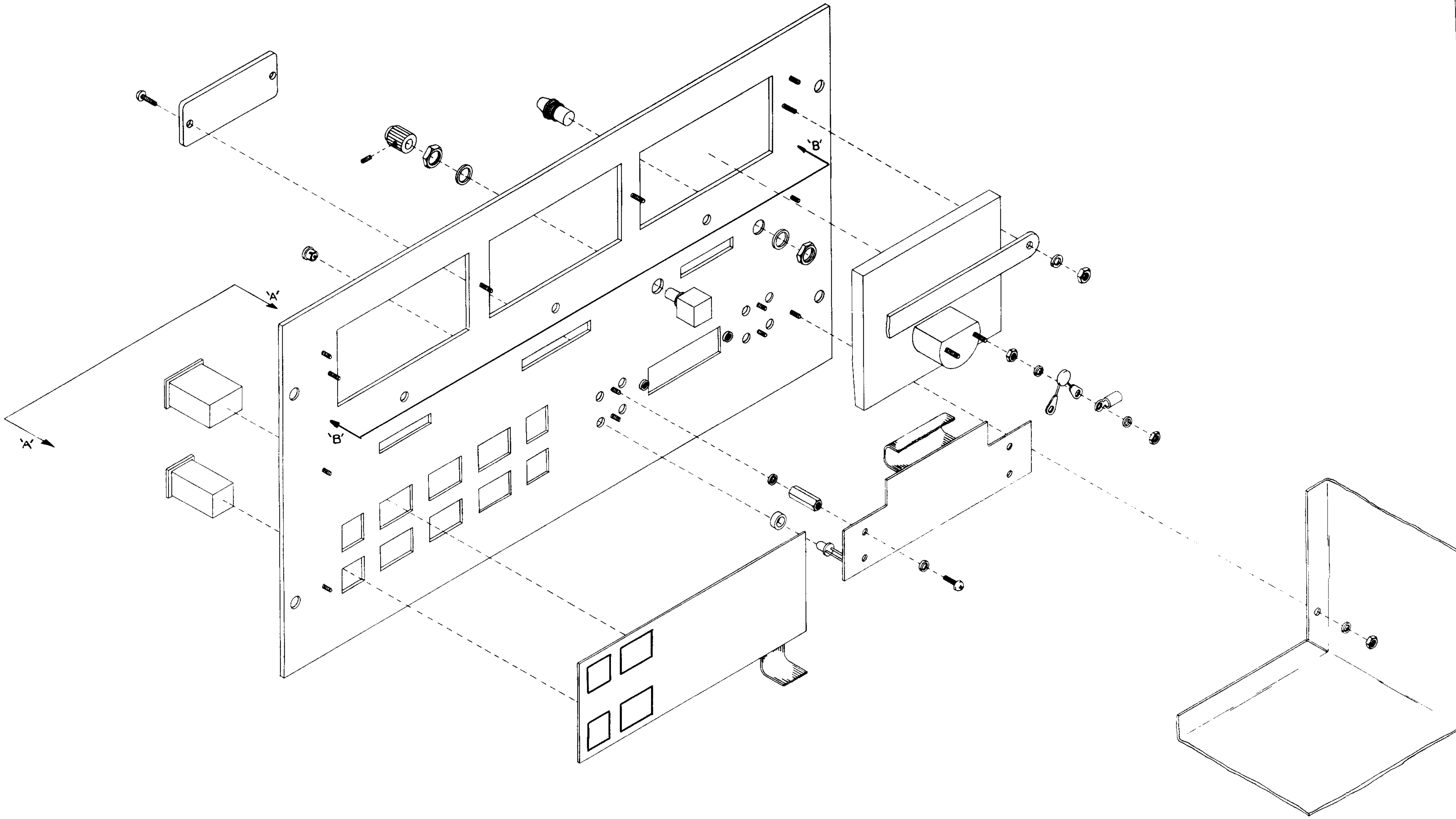
SECTION VII
DUAL TRANSMITTER CONTROLLER DRAWINGS

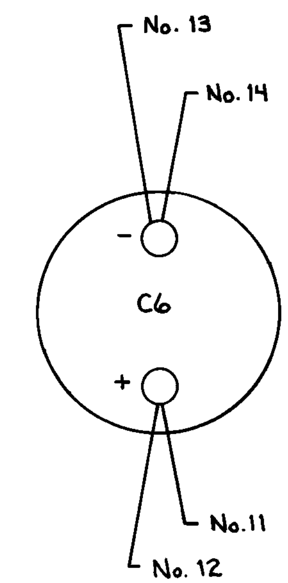
7-1. INTRODUCTION.

7-2. This section provides assembly drawings and schematic diagrams as listed below for the Broadcast Electronics FD-2 dual transmitter controller.

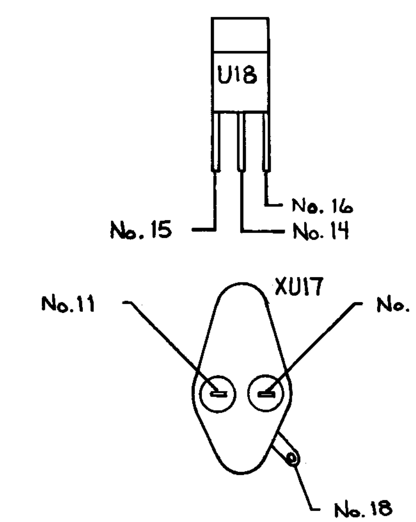
TABLE 7-1. TRANSMITTER CONTROLLER DRAWING INDEX

FIGURE	TITLE	NUMBER
7-1	DUAL TRANSMITTER CONTROLLER OVERALL ASSEMBLY DIAGRAM	597-0099-1
7-2	MAIN CIRCUIT BOARD SCHEMATIC DIAGRAM	SD919-0088
7-3	MAIN CIRCUIT BOARD ASSEMBLY DIAGRAM	AD919-0088
7-4	RF SAMPLE CIRCUIT BOARD SCHEMATIC DIAGRAM	SD919-0083
7-5	RF SAMPLE CIRCUIT BOARD ASSEMBLY DIAGRAM	AC919-0083
7-6	CONTROL SWITCH CIRCUIT BOARD ASSEMBLY DIAGRAM	AC919-0084
7-7	24 CIRCUIT EMI FILTER CIRCUIT BOARD ASSEMBLY DIAGRAM	AC919-0085
7-8	STATUS CIRCUIT BOARD ASSEMBLY DIAGRAM	AC919-0086
7-9	40 CIRCUIT EMI FILTER CIRCUIT BOARD ASSEMBLY DIAGRAM	AD919-0087

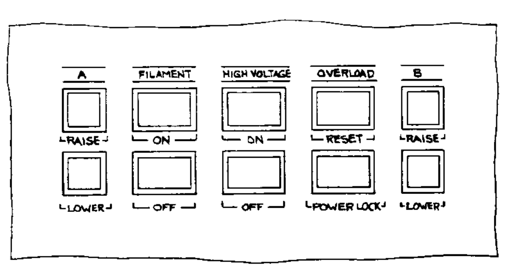




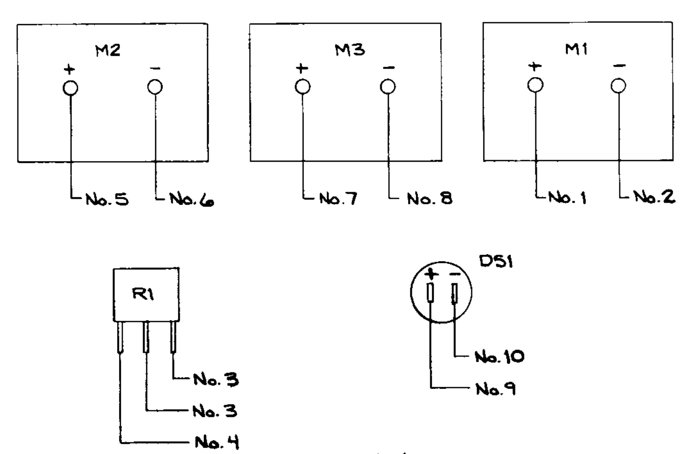
DETAIL 'C'
WIRING OF C6



DETAIL 'E'
WIRING OF XU17 & U18



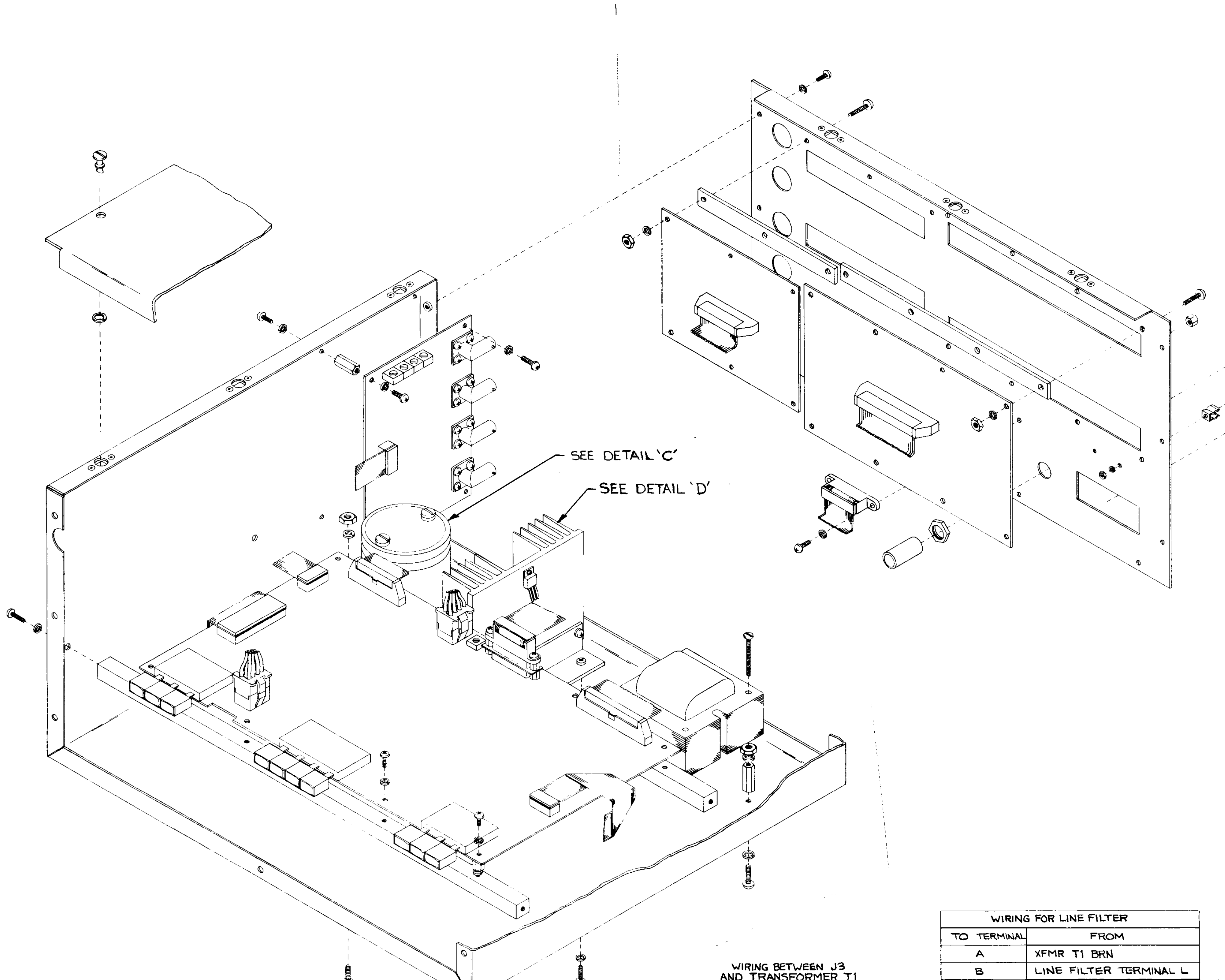
DETAIL 'A'
FRONT VIEW

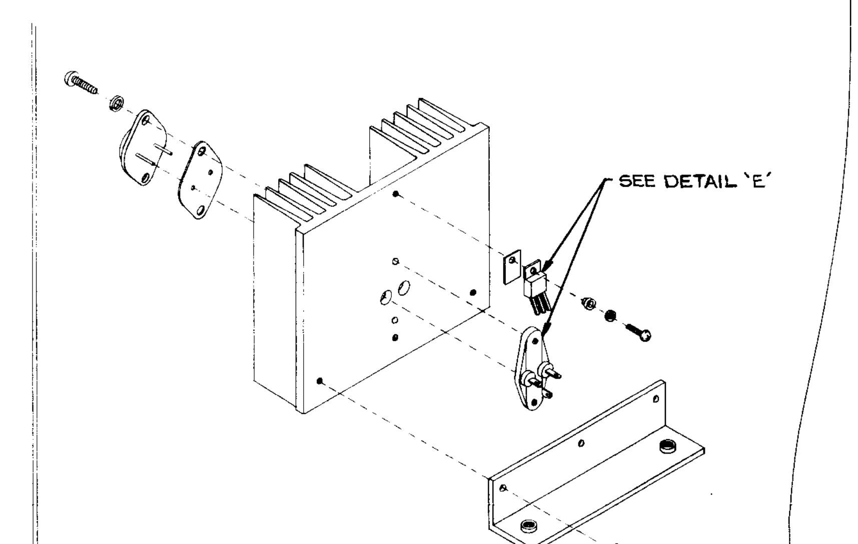


DETAIL 'B'
WIRING OF UPPER FRONT PANEL

597-0099-1A

FIGURE 7-1.
DUAL TRANSMITTER CONTROL AND METERING OVERALL ASSEMBLY DIAGRAM
(Sheet 1 of 2)





DETAIL 'D'
HEATSINK ASSEMBLY

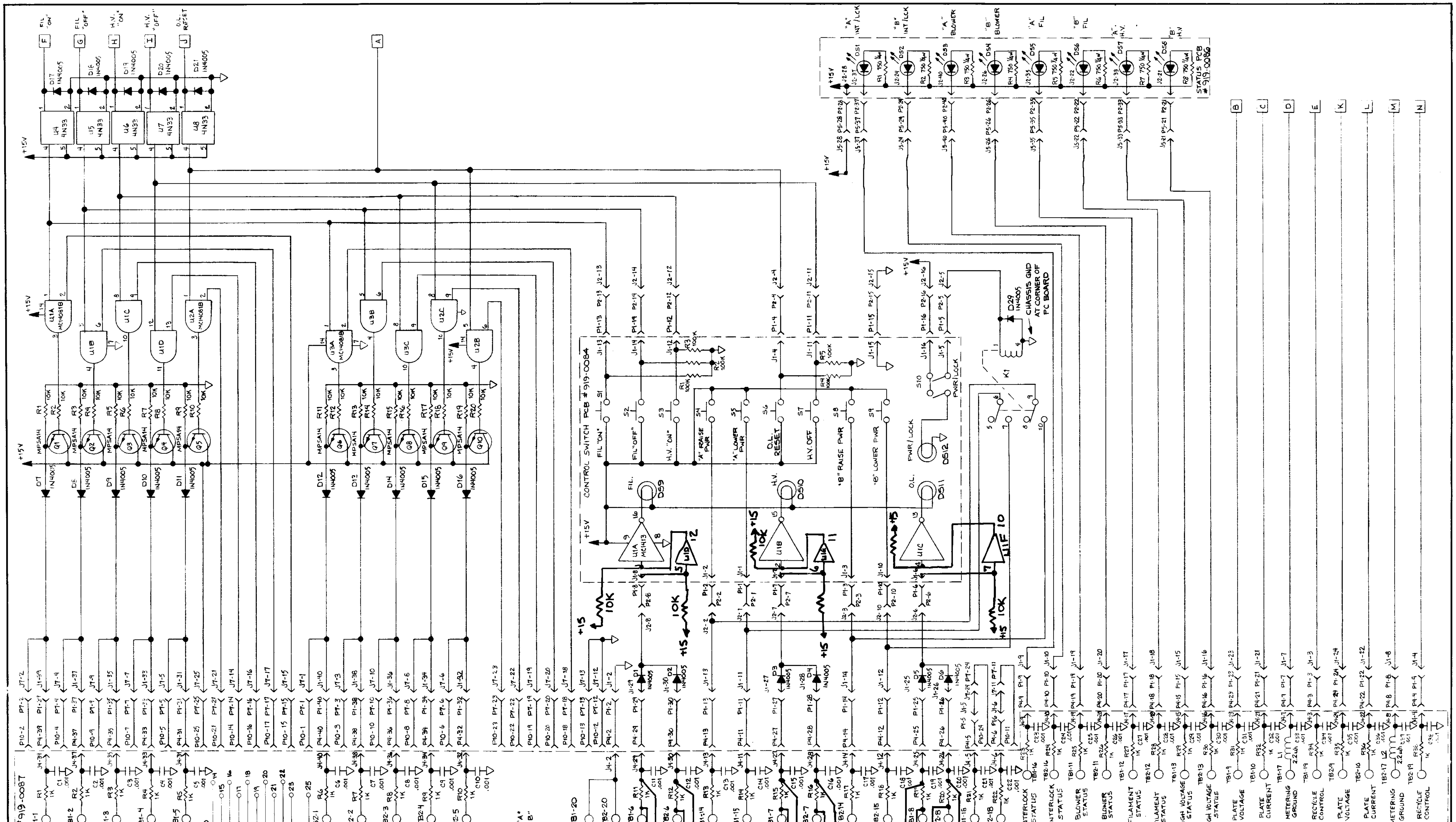
WIRING BETWEEN J3
AND TRANSFORMER T1

WIRING FOR 417-1271 (J3) TO XFMR 370-0005	
TO PIN	FROM XFMR
2	TO XFMR T1 YEL
4	TO XFMR T1 ORN
5	TO XFMR T1 ORN
9	TO XFMR T1 YEL
—	VIOLET WIRES NOT USED

WIRING FOR LINE FILTER	
TO TERMINAL	FROM
A	XFMR T1 BRN
B	LINE FILTER TERMINAL L
C	XFMR T1 BLK
D	XFMR T1 BLU
E	XFMR T1 BLK/WHT
F	XFMR T1 BLU/WHT
J	FUSEHOLDER BLK
L	LINE FILTER TERMINAL N
N	FUSE HOLDER WHT

597–0099–1B

FIGURE 7–1.
DUAL TRANSMITTER CONTROL AND METERING
OVERALL ASSEMBLY DIAGRAM
(Sheet 2 of 2)



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

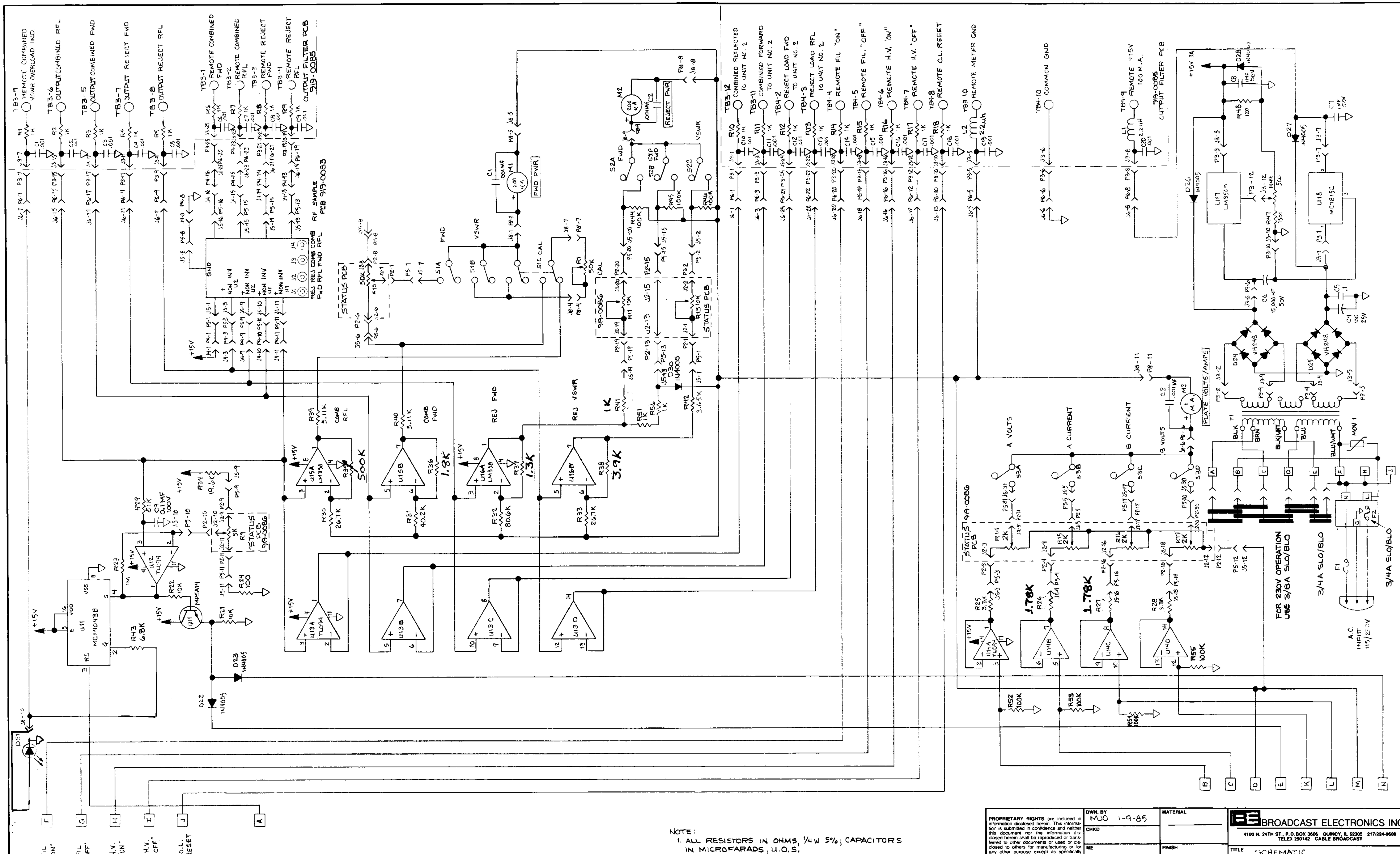
DWN. BY MJO 1-9-85	MATERIAL	
CHKD		
ME	FINISH	
PROJ. ENGR.		
MFG.	NEXT ASSY.	

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

TITLE SCHEMATIC
EXTENDED CONTROL MAIN PCB

TYPE	SIZE	DWG. NO.	REV
S	D	919-0088	F

MODEL FD-2 | SCALE NTS | SHEET 1 OF 2



NOTE:
1. ALL RESISTORS IN OHMS, 1/4 W 5%; CAPACITORS IN MICROFARADS, U.O.S.
2. COMPONENTS LAST USED: C9, D30, DS1, J8, K1, Q11, R56, S3 & U16
3. SEE ASSY. # AD911-0088

REV	DATE	DESCRIPTION	DFTR	ENG	ECN
F	10-20-93	R56 WAS 5.1K; DELETED R50. R40 WAS 15K; R41 WAS 18K; R44 & R45 WERE 430; R51 WAS 3.6K; R36 WAS 1.8K; R37 WAS 1.3K; R38 WAS 3.9K; R39 & R42 WERE 39K; R30-R33 WERE 470; R34 WAS 68K; R35 WAS 6.2K;	mH		9083

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

DWN. BY	MJO 1-9-85
CHKD	
ME	
PROJ. ENGR.	
MFG.	
MATERIAL	
FINISH	
NEXT ASSY.	

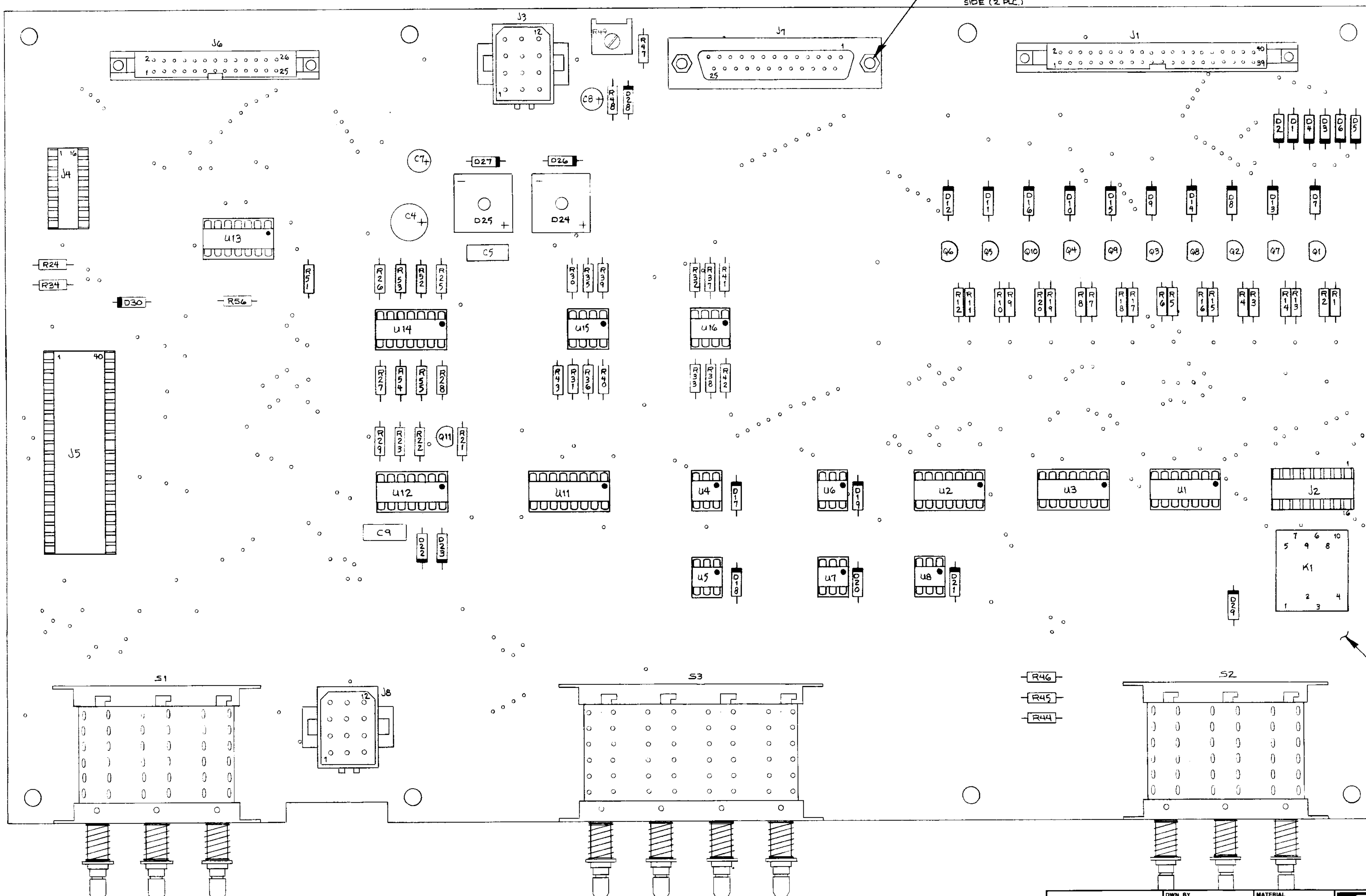
BROADCAST ELECTRONICS INC.
4100 N. 24TH ST., P.O. BOX 3606 QUINCY, IL 62305 217/224-9600
TELEX 250142 CABLE BROADCAST

TITLE SCHEMATIC EXTENDED CONTROL MAIN PCB

TYPE	SIZE	DWG. NO.	REV
S	D	919-0088	F

MODEL FD-2 SCALE NTS SHEET 2 OF 2

420-4104 (SCREW) TO BE INSERTED FROM CIRCUIT SIDE OF PCB INTO 441-8402 (STANDOFF), AND SECURED WITH 700-0015 (LOCTITE). (2 PLC)
420-0817 TO BE MOUNTED FROM COMPONENT SIDE (2 PLC.)



PCB BLANK #MD519-0028

SEE SCHEM. # SD919-0088
SEE B/M # 919-0088

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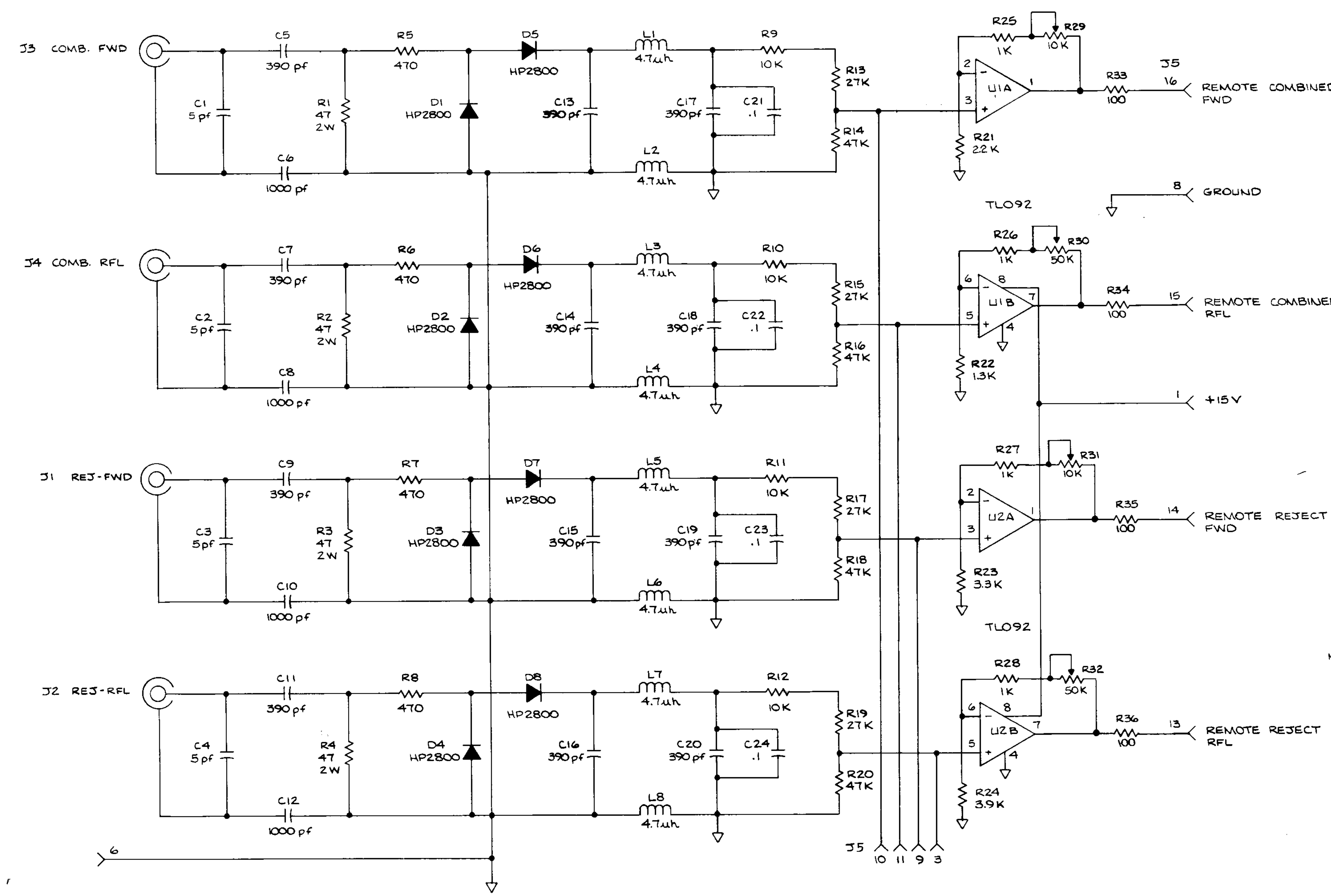
	CHKD		
	ME	FINISH	TITLE PCB ASSEMBLY EXTENDED CONTROL MAIN BOARD
	PROJ. ENGR.		TYPE A / SIZE D / DWG. NO 919-0088 / REV E
TOLERANCE (DECIMAL) U.O.S. .x ± .030 .xxx ± .005 .xx ± .015 ANGLES ± 1°	MFG.	NEXT ASSY.	MODEL FD-2 / SCALE 2/1 / SHEET 1 OF 1

REVISIONS					
REV	DATE	DESCRIPTION	DFTSMN	ENGR	ECN



NOTES:
1) ALL RESISTORS IN OHMS, 1/4 W; CAPACITORS IN MICROFARADS, UNLESS OTHERWISE NOTED.
2) LAST COMPONENTS USED: R36, C24, D8, L8, U2, J5.
3) SEE PCB ASM & B/M 919-0083

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

DWN. BY MSE 5-31-84
CHKD
ME
PROJ. ENGR.
MFG.
MATERIAL
FINISH
NEXT ASSY.

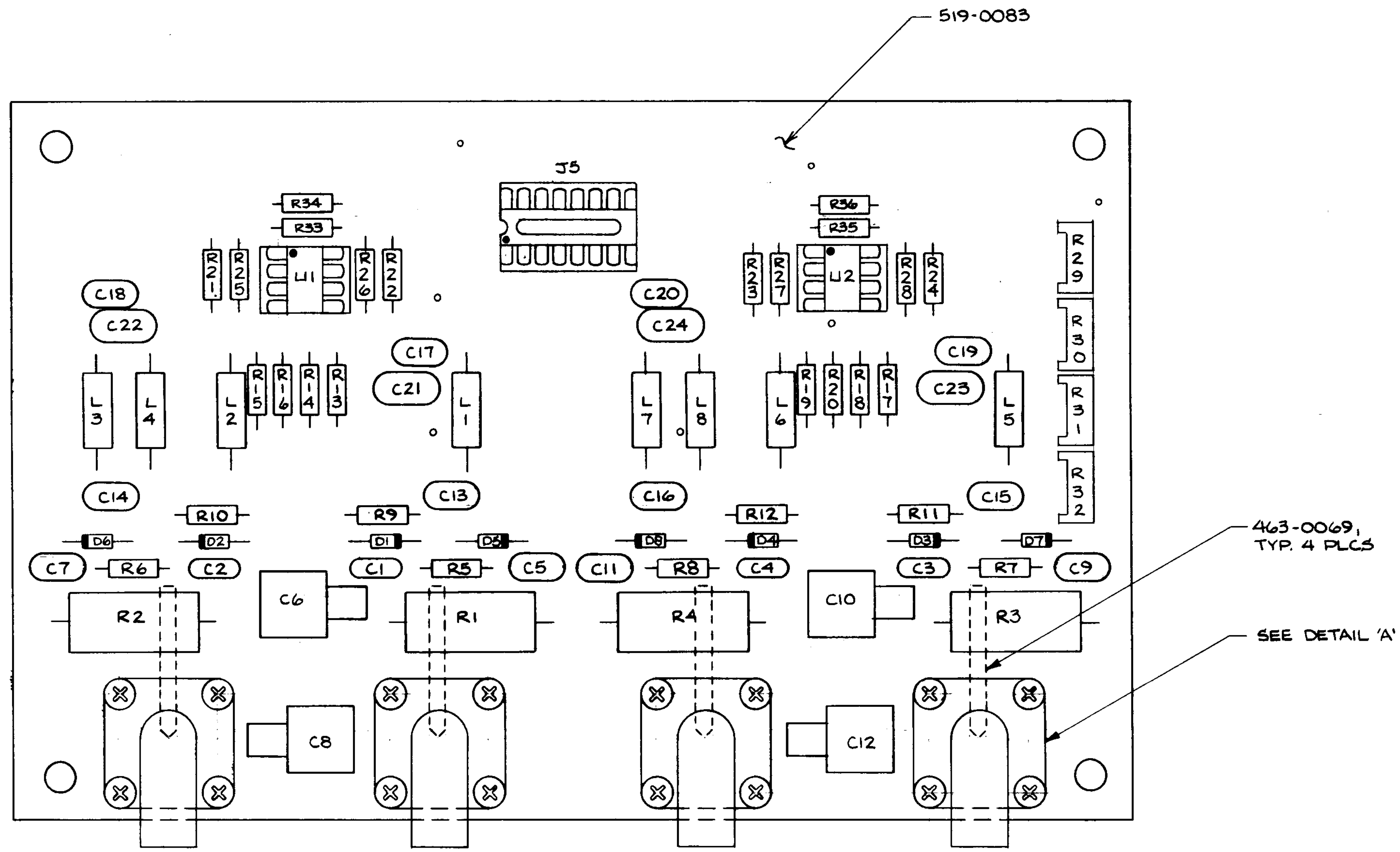
BROADCAST ELECTRONICS INC.
4100 N. 24TH ST., P.O. BOX 3606 QUINCY, IL 62305 217/224-9600
TELEX 250142 CABLE BROADCAST

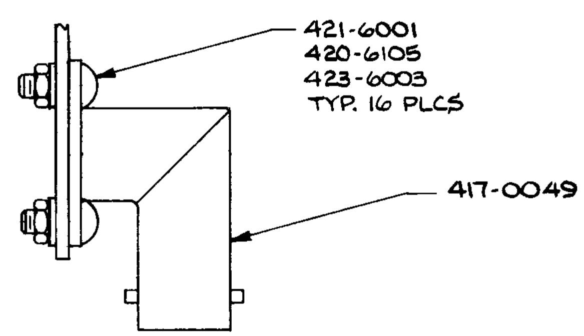
TITLE SCHEMATIC, RF SAMPLE BOARD

TYPE S | SIZE D | DWG. NO. 919-0083 | REV B

MODEL FD-2 | SCALE ~ | SHEET 1 OF 1

REVISIONS					
REV	DATE	DESCRIPTION	DFTSMN	ENGR	ECN





DETAIL 'A'

SEE SCHEMATIC SD 919-0083
SEE B/M 919-0083

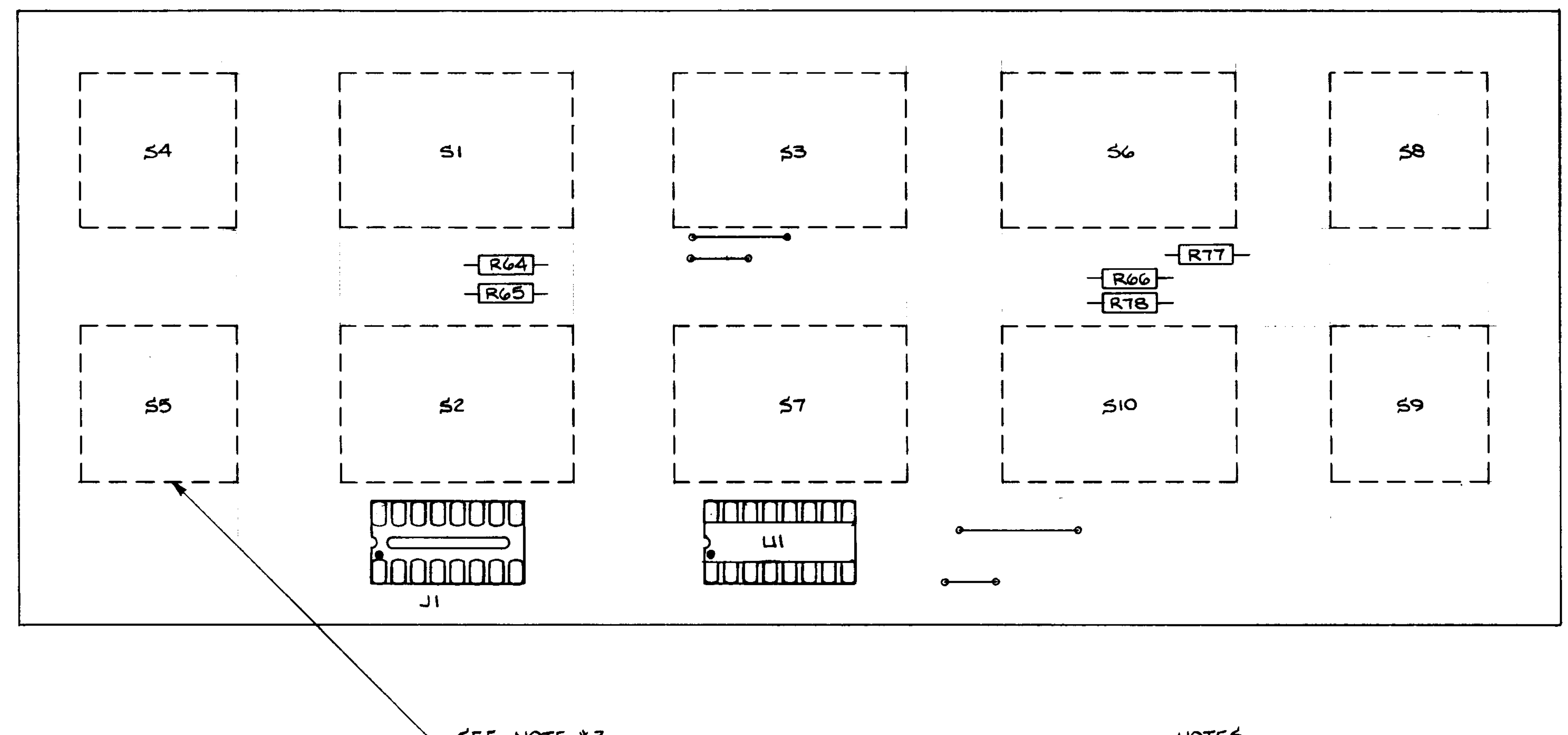
TOLERANCE (DECIMAL) U.O.S.
.X ± .030 .XXX ± .005
.XX ± .015 ANGLES ± 1°

DWN. BY MSE 6-6-84	NEXT ASSY.	
CHKD.		
ME	PRODUCT USED ON FD-2	
EE		
PROJ. ENGR.	FINISH	
DFTG. SUPVR.		
MFG.		

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

TITLE	SHEET 1 OF 1	
PCB ASSEMBLY, RF SAMPLE BOARD	SCALE 2/1	REV A
TYPE A	SIZE C	DWG. NO. 919-0083

REVISIONS					
REV	DATE	DESCRIPTION	DFTSMN	ENGR	ECN



SEE NOTE #3

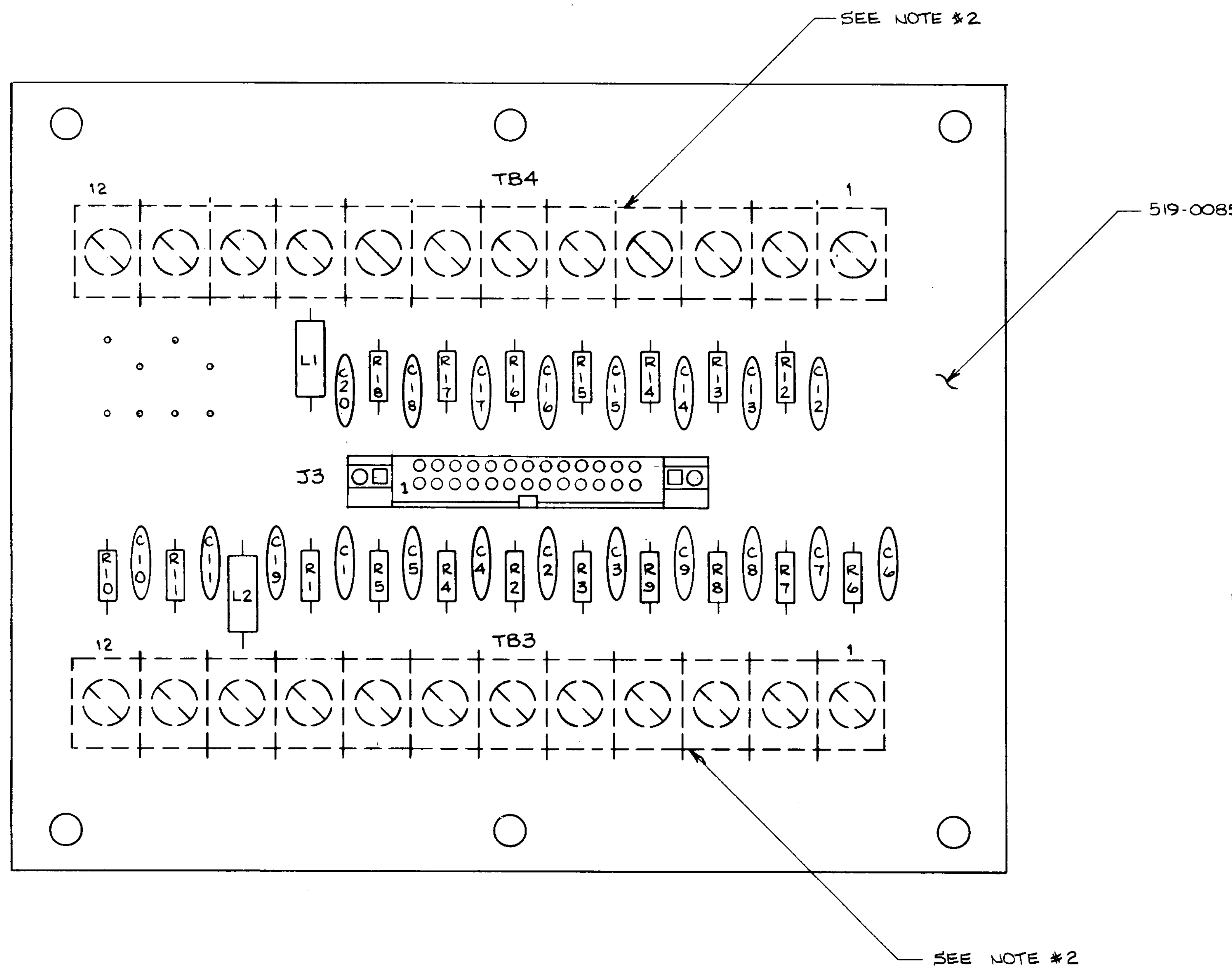
NOTES
1) SEE SCHEMATIC SD 909-6000-600
2) LAST COMPONENTS USED: R78, U1, J1
3) SWITCHES MUST BE MOUNTED IN PANEL BEFORE PCB CAN BE ATTACHED.

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

DWN. BY MSE 12-10-84	MATERIAL SEE B/M 919-0084	BROADCAST ELECTRONICS INC. 4100 N. 24TH ST., P.O. BOX 3606 QUINCY, IL 62305 217/224-9600 TELEX 250142 CABLE BROADCAST
CHKD		TITLE PCB ASSY, CONTROL SWITCH BOARD
ME	FINISH	TYPE A · SIZE C · DWG. NO. 919-0084 · REV
PROJ. ENGR.		
MFG.	NEXT ASSY.	MODEL FD-2 · SCALE 2/1 · SHEET 1 OF 1

REV	DATE	DESCRIPTION	DFTSMN	ENGR	ECN

REVISIONS



NOTES:

1) SEE SCHEMATIC #SD 909-6000-600
2) TB3 + TB4 MOUNTED ON CIRCUIT SIDE OF PCB.
3) LAST COMPONENT USED: R18, C20, L2, TB4, J3

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

DWN. BY MSE 8-10-84
CHKD
ME
PROJ. ENGR.
MFG.

MATERIAL SEE B/M 919-0085
FINISH
NEXT ASSY.

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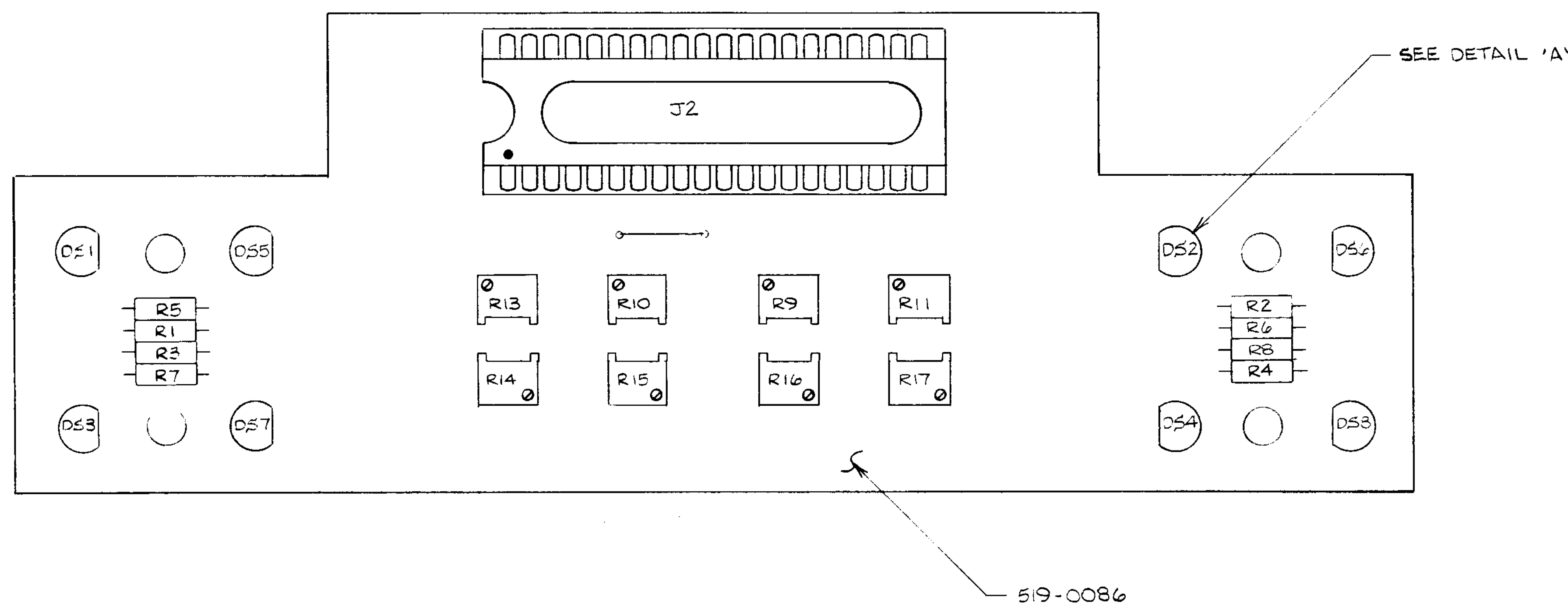
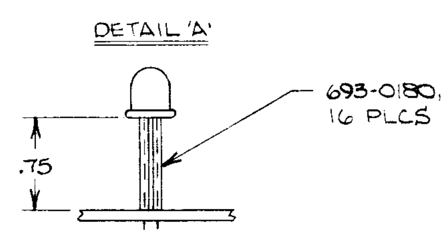
4100 N. 24TH ST., P.O. BOX 3606 QUINCY, IL 62305 217/224-9600
TELEX 250142 CABLE BROADCAST

TITLE PCB ASM.
24 POS. EMI FILTER BOARD

TYPE A | SIZE C | DWG. NO. 919-0085 | REV B

MODEL FD-2 | SCALE 2/1 | SHEET 1 OF 1





SEE SCHEMATIC # SD 909-6000-600
LAST COMPONENT USED: R17, DS8, J2

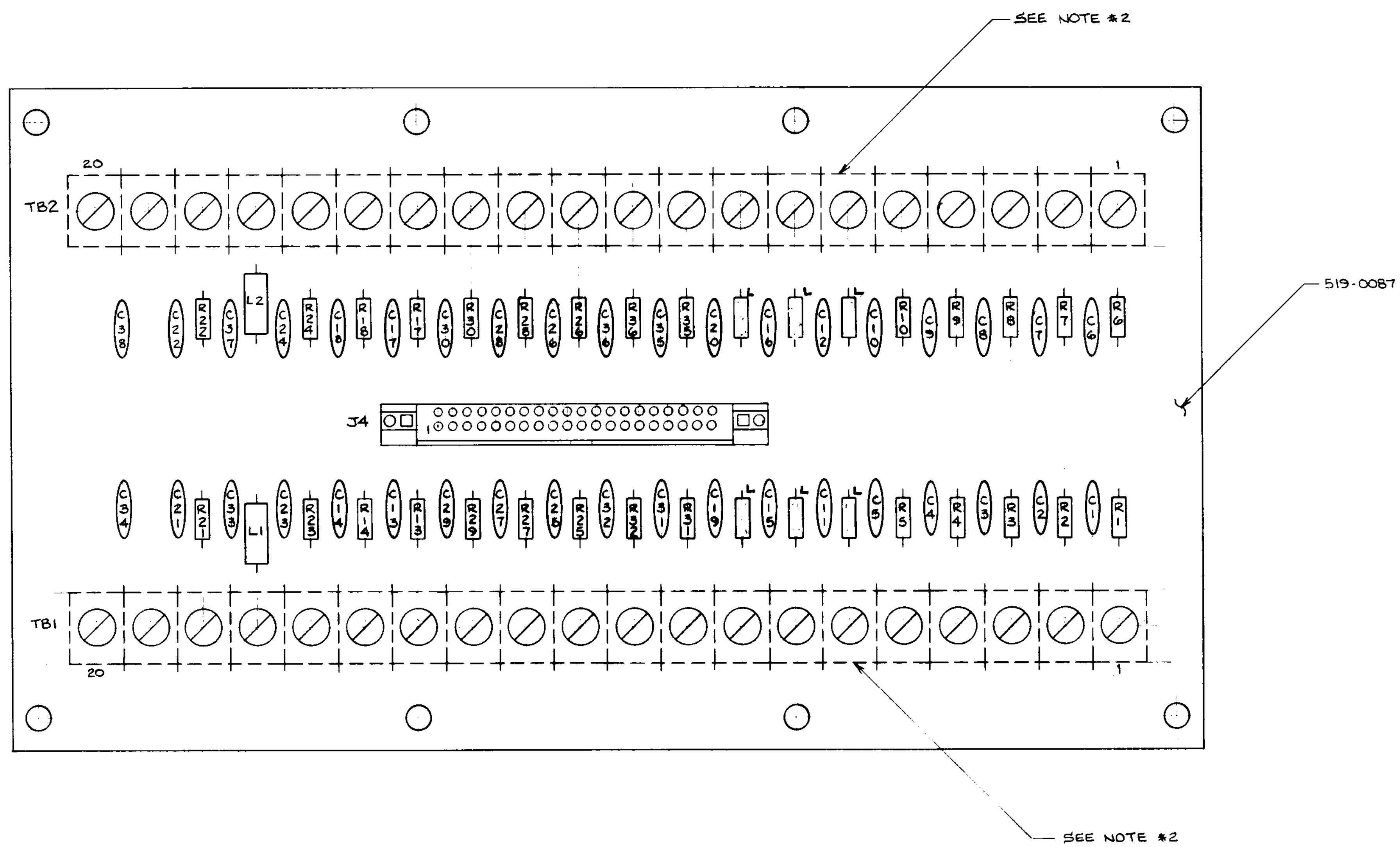
TOLERANCE (DECIMAL) U.O.S.
.x ± .030 .xxx ± .005
.xx ± .015 ANGLES ± 1

DWN. BY	MSE 8-15-84
CHKD	
ME	
PROJ. ENGR.	
MFG.	
MATERIAL	SEE B/M 919-0086
FINISH	
NEXT ASSY.	

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

TITLE	PCB ASM. STATUS BOARD
TYPE	A
SIZE	C
DWG. NO.	919-0086
REV	C
MODEL	FD-2
SCALE	2/1
SHEET	1 OF 1

REVISIONS					
REV	DATE	DESCRIPTION	DFTSMN	ENGR	ECN



NOTES:

1) SEE SCHEMATIC # SD 919-0088
2) TB1 + TB2 MOUNTED ON CIRCUIT SIDE ON PCB.
3) LAST COMPONENTS USED: C38, R38, L2, TB2, J4

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

DWN. BY	MSE 8-17-84
CHKD	
ME	
PROJ. ENGR.	
MFG.	
MATERIAL	SEE B/M 919-0087
FINISH	
NEXT ASSY.	

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

TITLE PCB ASM.
40 POS. EMI FILTER BOARD

TYPE	SIZE	DWG. NO.	REV
A	D	919-0087	C

MODEL FD-2 SCALE 2/1 SHEET 1 OF 1

FO-2 OUTPUT SWITCHER
TABLE OF CONTENTS

LIST OF TABLES

LIST OF ILLUSTRATIONS

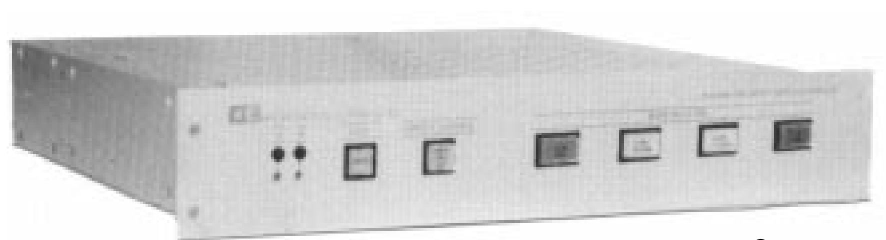
SECTION I
GENERAL INFORMATION

1–1. INTRODUCTION.

1–2. Information presented in this section provides a general description of the FO–2 automatic transmitter output switch controller and lists equipment specifications.

1–3. EQUIPMENT DESCRIPTION.

1–4. The Broadcast Electronics FO–2 transmitter output switch controller is specifically designed to automatically transfer the antenna to the operational transmitter and by–pass the combiner in a dual transmitter system (refer to Figure 1–1). The FO–2 features adjustable switching threshold and delay circuitry, external alarm, remote control and status indication circuitry, and front–panel switch/indicators to indicate the system configuration. In addition, a preset power output level circuit is incorporated into the design.



597-0117-61

FIGURE 1-1. FO-2 AUTOMATIC TRANSMITTER OUTPUT SWITCH CONTROLLER

1–5. The FO–2 is designed to monitor the output power of both transmitters for a failure condition. If a fault occurs in either transmitter which exceeds a preset threshold level and delay period, the FO–2 will automatically initiate the following transfer sequence.

A. If connected, an external alarm will be activated.

B. The high voltage of both transmitters will be deenergized.

C. The coaxial switches will operate to connect the output from the operational transmitter directly to the antenna and the defective transmitter to the dummy load.

D. The automatic switching circuitry will be disabled.

E. If connected, the preset output power level circuit will be activated.

F. When the coaxial switches are correctly positioned, the operational transmitter high voltage will be energized for on–air operation.

1–6. The FO–2 is available in one configuration as follows:

MODEL	PART NUMBER	DESCRIPTION
FO-2	909-0117-004	Transmitter output switch controller for a dual transmitter system, rack mount, used in combination with the FD-2 dual transmitter controller.

1-7. EQUIPMENT SPECIFICATIONS.

1-8. Refer to Table 1-1 for electrical specifications of the FO-2 output switch controller.

TABLE 1-1. FO-2 ELECTRICAL AND ENVIRONMENTAL SPECIFICATIONS

PARAMETER	SPECIFICATION
ELECTRICAL	
POWER REQUIREMENTS	+15V dc, 1.5 Amperes, (supplied from FD-2 transmitter controller).
REMOTE INPUTS	Switch or Relay Contact Closure.
REMOTE OUTPUTS	Negative or Positive Logic.
SIZE:	
WIDTH	19 Inches (48.26 cm).
DEPTH	15.625 Inches (39.68 cm).
HEIGHT	3.5 Inches (8.89 cm).
WEIGHT (PACKED)	16 Pounds (7.3 Kg).
ENVIRONMENTAL	
AMBIENT TEMPERATURE RANGE	+14°5F to 122°F (-10°C to +50°C).
MAXIMUM HUMIDITY	95%, Non-condensing.
MAXIMUM ALTITUDE	10,000 Feet Above Sea Level (3048 Meters).

SECTION II
INSTALLATION

2–1. INTRODUCTION.

2–2. This section contains information required for the installation and preliminary checkout of the Broadcast Electronics FO–2 automatic transmitter output switch controller.

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 output switcher. 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, Inc.

2–6. INSTALLATION.

2–7. Each FO–2 is operated, tested, and inspected at the factory prior to shipment and is ready for installation when received. Prior to installation, this publication should be studied to obtain a thorough understanding of the operation, circuitry, nomenclature, and installation requirements. Installation is accomplished as follows: 1) preliminary installation, 2) placement, 3) wiring, 4) installation adjustments, and 5) initial checkout.

2–8. PRELIMINARY INSTALLATION.

WARNING *ENSURE ALL FO-2 PRIMARY POWER IS DISCONNECTED BEFORE PROCEEDING.*

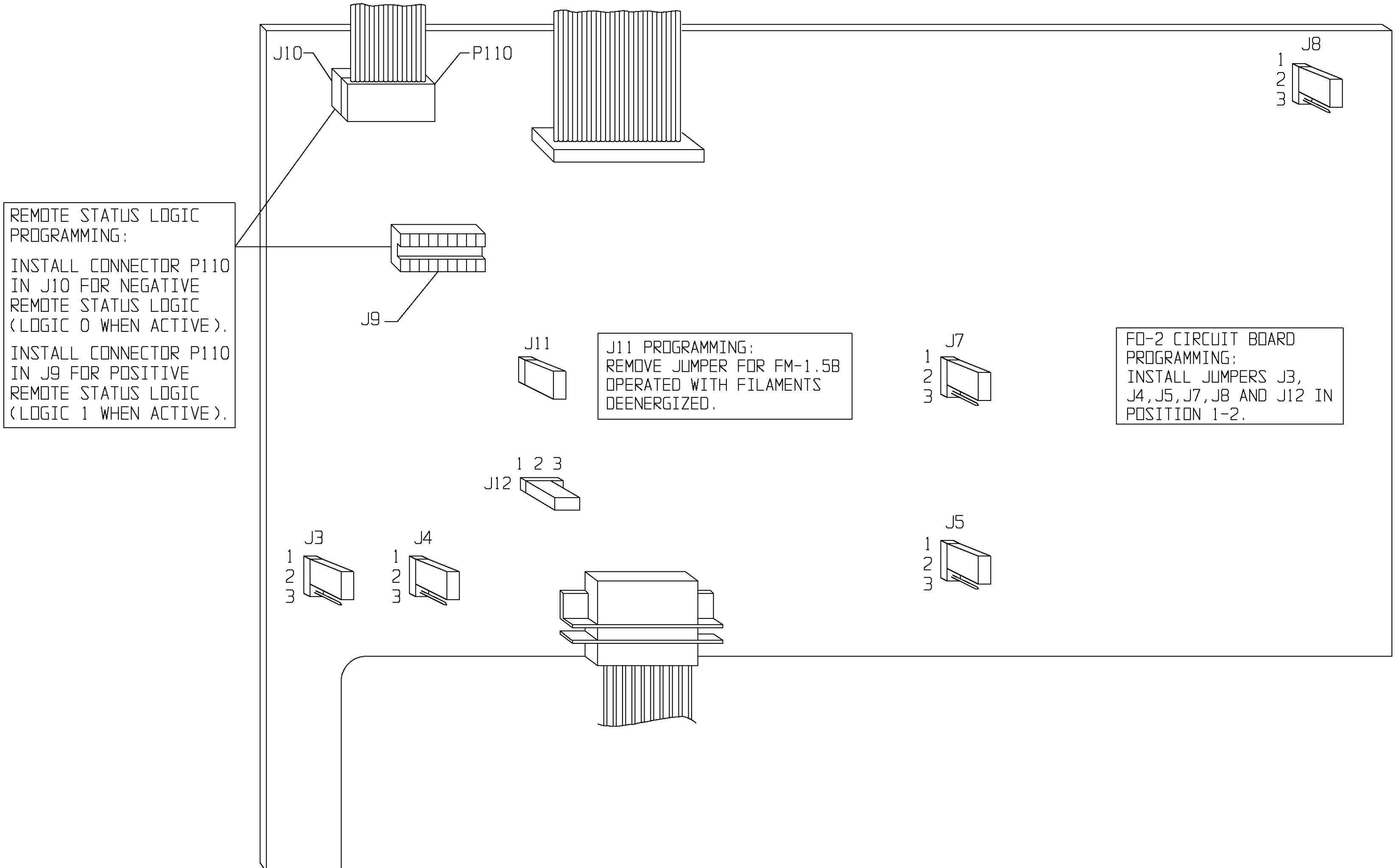
WARNING

2–9. Refer to the following information and perform the preliminary installation procedures. The procedures will require the unit be placed on a work surface with the top–panel removed. After completion of the procedures, replace the unit top–panel.

2–10. **CIRCUIT BOARD PROGRAMMING CHECK.** The FO–2 circuit boards are factory programmed during final test. To assure the circuit board jumpers have not become dislodged or changed during shipment, refer to Figure 2–1 and check the position of each jumper. Programmable jumpers J3, J4, J5, J7, and J8 must be installed in position 1–2.

2–11. Programmable jumper J11 must be removed when FM–1.5B transmitters are operated with the filaments in the deenergized condition during a transfer operation. Refer to Figure 2–1 and program J11 as required.

2–12. **REMOTE CONTROL LOGIC PROGRAMMING.** The FO–2 is equipped with programmable remote status logic. The circuitry provides either positive or negative logic for remote status indications. Refer to Figure 2–1 and program the circuitry for positive or negative logic as required.



597-0117-63

FIGURE 2-1. FO-2 CIRCUIT BOARD PROGRAMMING

2–13. **PLACEMENT.**

2–14. The FO–2 requires 3.5 inches (8.9 cm) of a 19 inch cabinet and may be mounted in any convenient location within reach of signal and power cables. An additional one inch of rack space above and below the unit should be provided for adequate cooling. The unit should not be mounted directly above or below heat–generating equipment, otherwise no special requirements need be observed.

2–15. **WIRING.**

2–16. FO–2 wiring is presented in the following text. For factory assembled systems, only the REMOTE CONTROL CONNECTION procedure will be required to be performed.

2–17. **FO-2/FD-2 INTERFACING.** The FO–2 automatic transmitter output switch controller is designed to interface with the FD–2 transmitter controller in a dual transmitter system (refer to Figure 2–2). Locate the interface cable and connect the cable between FO–2 rear–panel connector J1 and FD–2 rear–panel connector J10.

2–18. **DUMMY LOAD PROTECTION.** To provide dummy load protection, connect the wiring to the coaxial switches as follows.

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

2–19. Disconnect all transmitter primary power.

2–20. Refer to Figure 2–3 and connect the transmitter A and transmitter B interlock system, the remote control device, the reject load, and the dummy load to the coaxial switches as required. The connections will vary depending upon the type of dual transmitter system installation.

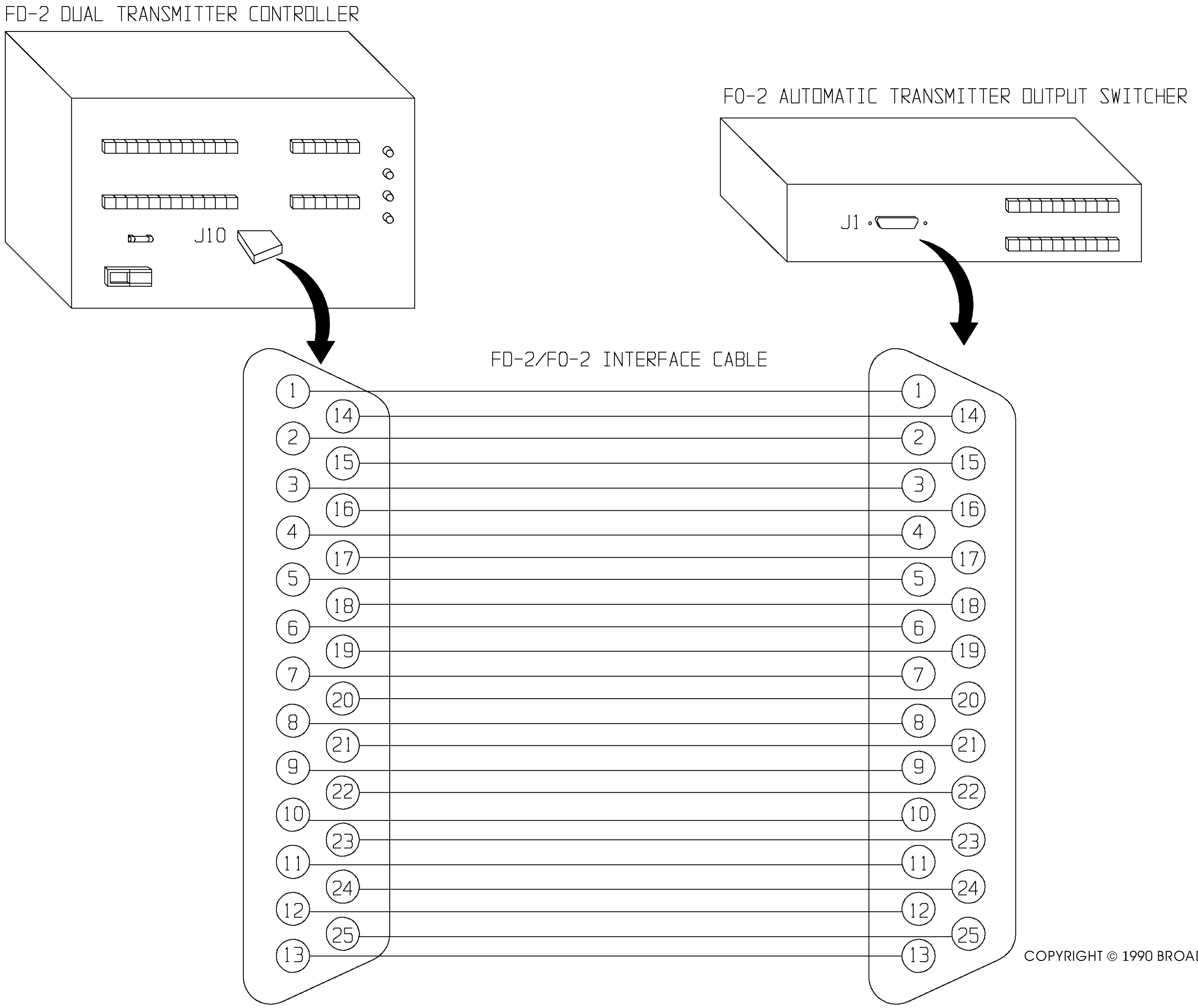
WARNING *ENSURE ALL TRANSMITTER SYSTEM POWER IS DISCONNECTED BEFORE PROCEEDING.*
WARNING

2–21. **PRESET POWER CONTROL.** The FO–2 is equipped with a preset power level control circuit for the operational transmitter in the event of a transmitter failure. The preset power control connections are provided on a rear–panel barrier strip.

2–22. If preset power control is desired, refer to detail A in Figure 2–4 and fabricate two interface cables. Connect a cable between the PRESET PWR A terminals and the transmitter A remote interface panel. Connect a cable between the PRESET PWR B terminals and the transmitter B remote interface panel.

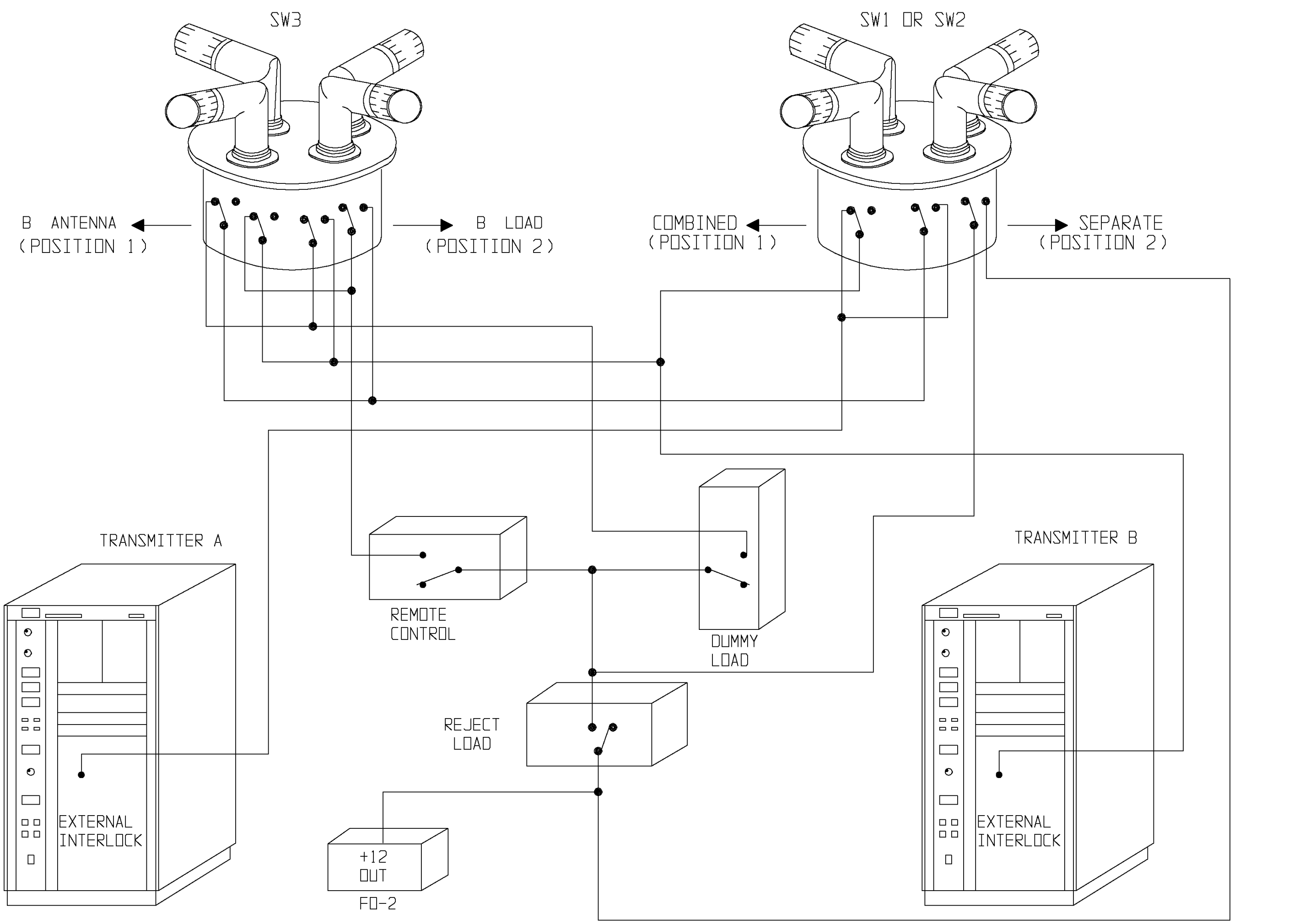
2–23. **TRANSMITTER OUTPUT SWITCHING CONTROL.** The FO–2 transmitter output switching control connections are provided on rear–panel barrier strips TB1 and TB2. The unit is designed to provide multiple control and status connections to meet any system requirement. Table 2–1 and Figure 2–4 present a functional description of the connection terminals. The connections will vary depending upon the type of dual transmitter system installation.

2–24. **Coaxial Switch Status.** The FO–2 coaxial switch status connections are provided on rear–panel barrier strip TB2 (refer to Figure 2–5). TB2–9 provides a +12V dc logic potential for the position 1 and position 2 status contacts on each coaxial switch. Connect the status contacts to the FO–2 switch status terminals. The connections will vary depending on the type of dual transmitter system installation.



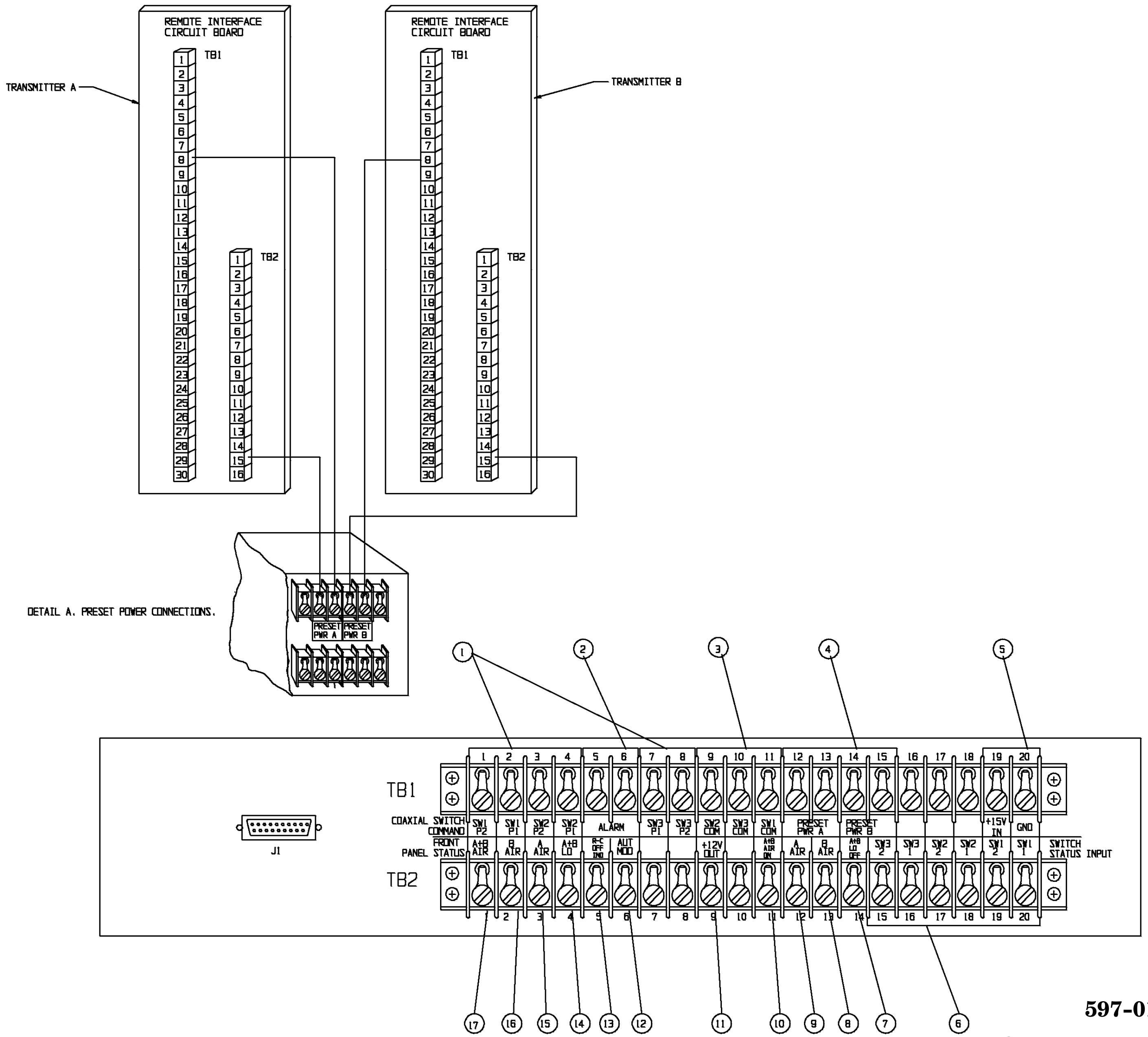
597-0117-64

FIGURE 2-2. FO-2 INTERFACING



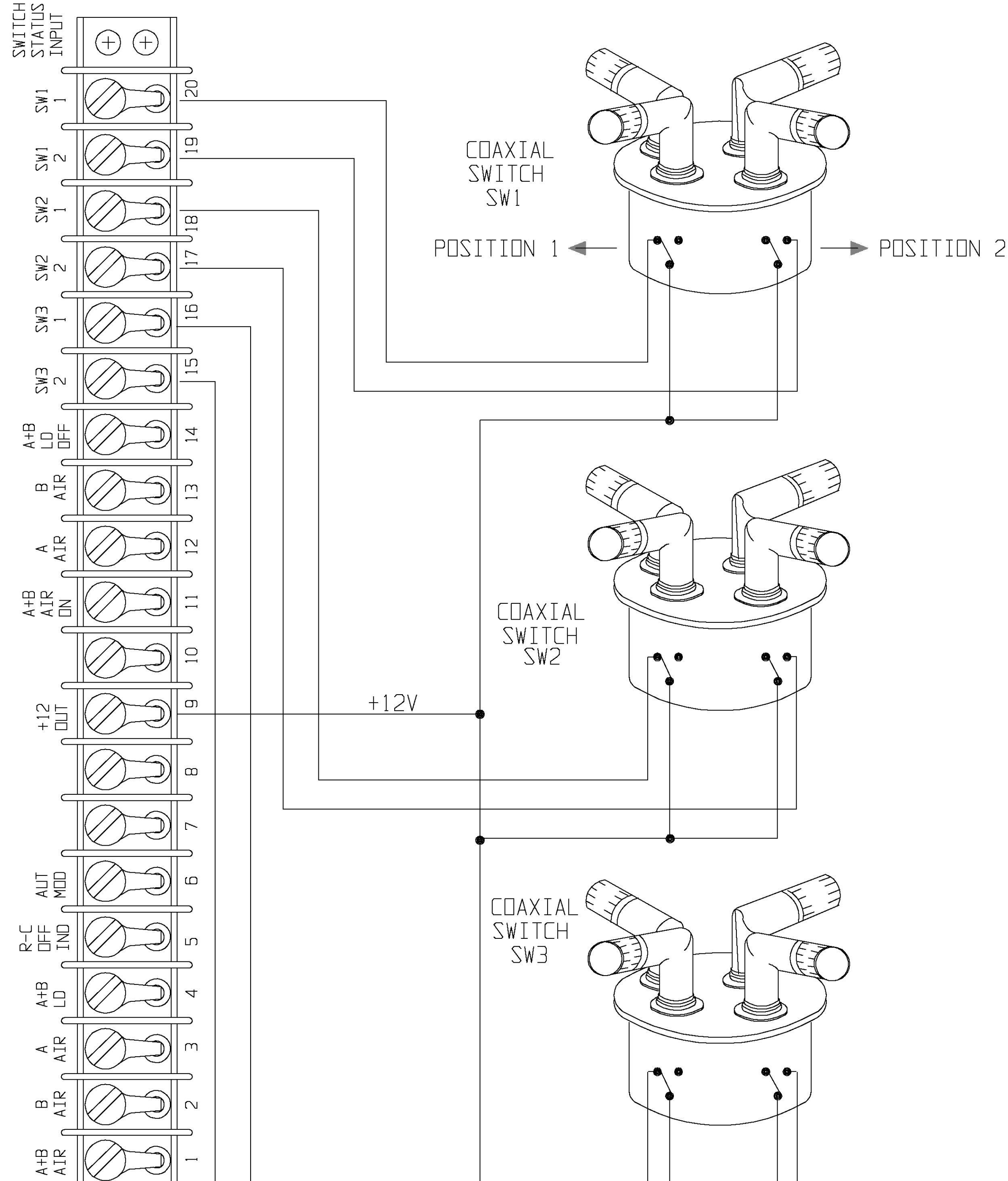
597-0117-65

FIGURE 2-3. TYPICAL FO-2 DUMMY LOAD PROTECTION SYSTEM



597-0117-66A

FIGURE 2-4. FO-2 REAR-PANEL TERMINAL CONNECTIONS



597-0117-67

FIGURE 2-5. TYPICAL COAXIAL SWITCH STATUS WIRING

2–25. **Coaxial Switch Command.** The FO–2 coaxial switch command connections are provided on rear–panel barrier strip TB1 (refer to Figure 2–6). Coaxial switches require an ac or dc motor control power source. Refer to the coaxial switch instruction manual to determine the proper power source for the motor control. Connect the appropriate motor control power source and status contacts to the FO–2 switch command terminals. The connections will vary depending on the type of dual transmitter system installation.

2–26. **REMOTE CONTROL CONNECTIONS.** Remote control connections are provided on the FO–2 rear–panel terminal strips. Refer to the FO–2 Remote Control Wiring Diagram, SECTION VII, DRAWINGS and Table 2–1 and connect the remote circuitry to the rear–panel terminals as required.

2–27. **INSTALLATION ADJUSTMENTS.**

2–28. **POWER FAILURE THRESHOLD ADJUSTMENTS.** Potentiometers R4 and R5 located on the front panel (refer to Figure 2–7) adjust the power failure limit for transmitters A and B. R4 and R5 are individually adjusted for the desired transmitter power failure level. The power failure threshold controls are adjusted as follows.

2–29. **Procedure.** To adjust transmitter A power failure threshold level control R4, proceed as follows:

A. Apply power to the dual transmitter system.

B. Operate the **FO–2 AUTO** switch/indicator to the out position (manual mode).

C. Refer to Figure 2–7 and operate transmitter A power failure threshold level control R4 fully clockwise.

D. Depress the transmitter A **HIGH VOLTAGE ON** switch/indicator to illuminate the switch/indicator. The transmitter will be operational after the filament warm–up delay.

E. Operate the transmitter to the desired power failure level.

F. Refer to Figure 2–7 and adjust transmitter A power failure threshold level control R4 until the transmitter A indicator just extinguishes.

G. Terminate transmitter A operation.

H. Repeat the procedure for transmitter B. Adjust the threshold level using transmitter B threshold level control R5 and the transmitter B threshold indicator (refer to Figure 2–7).

2–30. **POWER FAILURE DELAY ADJUSTMENT.** Potentiometer R38 on the logic circuit board adjusts the time delay between the detection of a power failure and the initiation of a transfer operation. Prior to adjustment of R38, the automatic power control (APC) duration and RF transfer duration must be determined.

2–31. **Procedure.** To determine the APC and RF transfer durations, proceed as follows:

A. Operate either transmitter for normal power output. Measure the duration between the initiation of high voltage and power output (APC duration).

B. The RF transfer duration measurement will require the operation of the FO–2. Refer to SECTION III, OPERATION and manually operate the system in the combined mode.

C. Initiate a manual transfer operation. Measure the duration between the initiation and completion of the transfer.

TABLE 2-1. FO-2 REAR-PANEL TERMINAL CONNECTIONS
(Sheet 1 of 2)

INDEX NO.	NOMENCLATURE	FUNCTIONAL DESCRIPTION
1	Coaxial switch SW1, SW2, and SW3 position P1 and position P2 control connections.	Internal relay circuitry provides a contact closure to activate switch operation.
2	ALARM control connections.	Internal relay circuitry provides a contact closure to activate external visual or aural alarm.
3	Coaxial switch COM connections.	Common connections for coaxial switches SW1, SW2, and SW3.
4	PRESET PWR A and PRESET PWR B control connections.	Internal relay circuitry provides a contact closure to activate transmitter preset power command (refer to Detail A of Figure 2–4).
5	15V IN and GND power supply connections.	NOT USED.
6	Coaxial switch SW1, SW2, and SW3 position 1 and position 2 status connections.	Continuous contact to positive voltage from appropriate coaxial switch required to indicate switch position status.
7	A+B LD OFF remote control connection.	Momentary contact to positive voltage configures transmitter A and transmitter B for dummy load operation.
8	B AIR remote control connection.	Momentary contact to positive voltage configures transmitter B for on–air operation.
9	A AIR remote control connection.	Momentary contact to positive voltage configures transmitter A for on–air operation.
10	A+B AIR ON remote control connection.	Momentary contact to positive voltage configures transmitter A and transmitter B for on–air operation.
11	+12 OUT connection.	Provides approximately +12 volts dc for remote control switch circuitry and coaxial switch position logic.
12	AUT MOD remote status connection.	Indicates the status of the automatic switching circuitry. Programmable internal circuitry provides either positive or negative logic to indicate enabled status.
13	R–C OFF IND remote status connection.	Indicates the status of the remote control. Programmable internal circuitry provides positive or negative logic to indicate disabled status.

TABLE 2-1. FO-2 REAR-PANEL TERMINAL CONNECTIONS
(Sheet 2 of 2)

INDEX NO.	NOMENCLATURE	FUNCTIONAL DESCRIPTION
14	A+B LD remote status connection.	Indicates transmitter A and transmitter B are configured for dummy load operation. Programmable internal circuitry provides either positive or negative logic to indicate status.
15	A AIR remote status connection.	Indicates transmitter A is configured for on–air operation. Programmable internal circuitry provides either positive or negative logic to indicate status.
16	B AIR remote status connection.	Indicates transmitter B is configured for on–air operation. Programmable internal circuitry provides either positive or negative logic to indicate status.
17	A+B AIR remote status connection.	Indicates transmitter A and transmitter B are configured for on–air operation. Programmable internal circuitry provides either positive or negative logic to indicate status.

2–32. **Procedure.** To adjust power failure delay control R38, proceed as follows:

A. Calculate and record the total delay time by adding the APC and RF transfer durations and any additional delay if desired ____________.

WARNING ***DISCONNECT PRIMARY POWER FROM THE DUAL TRANSMITTER SYSTEM BEFORE PROCEEDING.***

WARNING

B. Disconnect power from the dual transmitter system.

C. Remove the FO–2 top–panel.

D. Refer to Figure 2–7 and program P6 for the required delay range recorded in step A.

E. Apply primary power and manually operate the system in the combined mode.

F. Operate the FO–2 in the automatic mode and deenergize either transmitter.

G. Refer to Figure 2–7 and adjust R38 until the required delay duration is attained. Repeat steps D through G if required.

H. Replace the FO–2 top–panel.

2–33. **INITIAL CHECKOUT.**

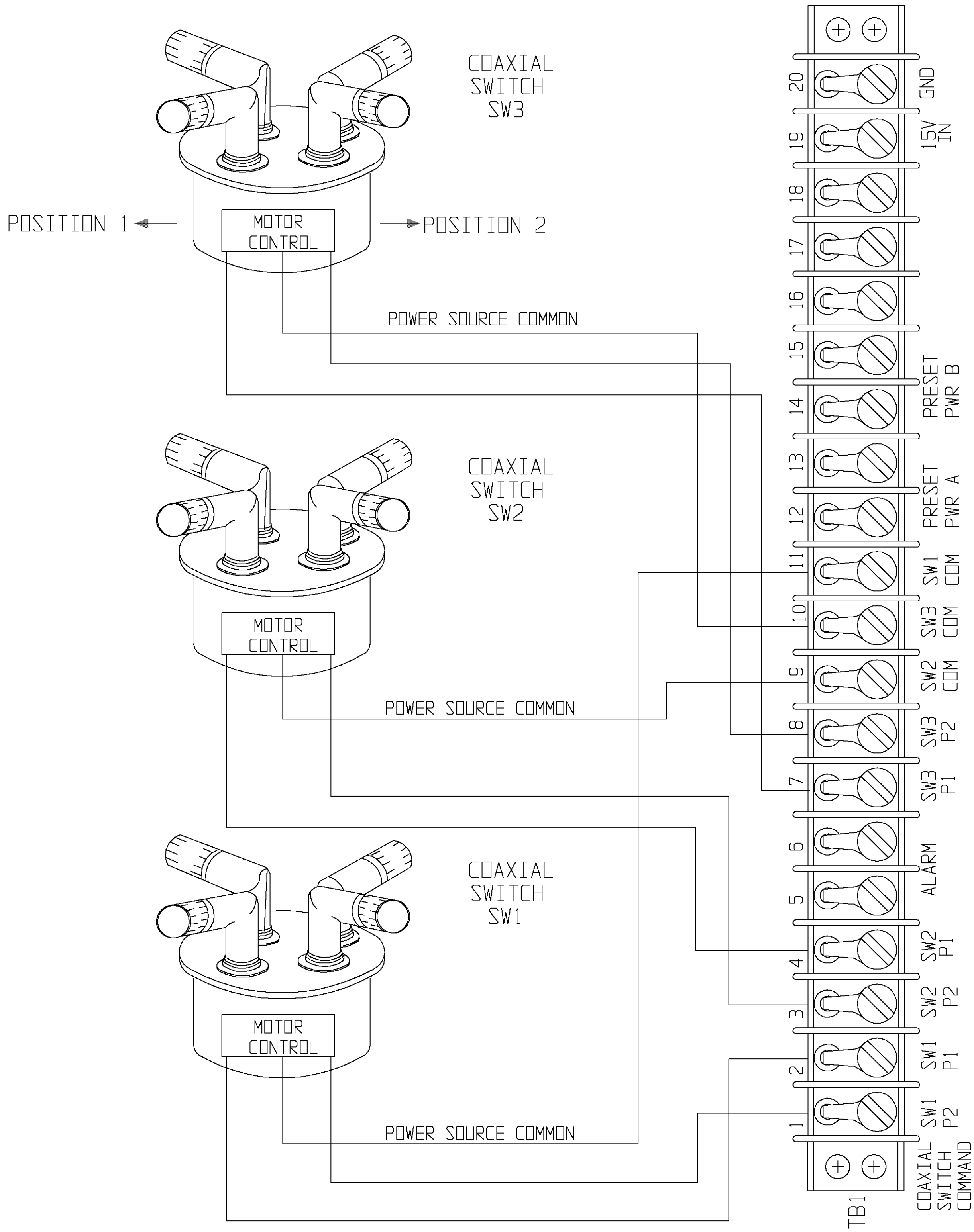


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FIGURE 2-6. TYPICAL COAXIAL SWITCH COMMAND WIRING

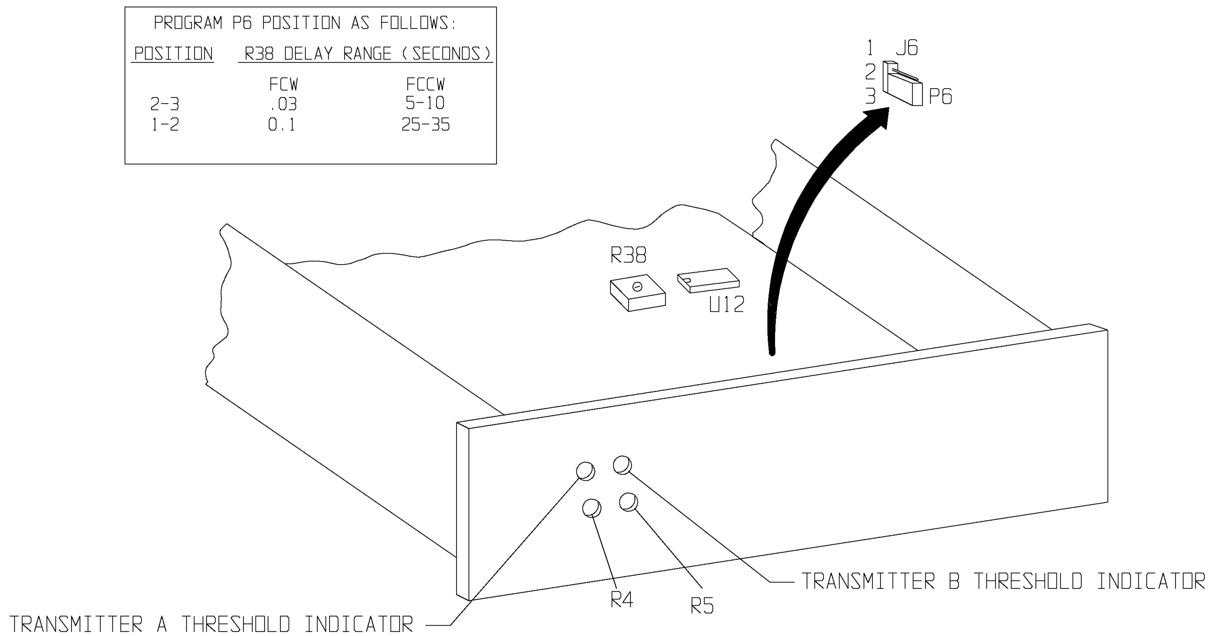

FIGURE 2-7. LOCATION OF R4, R5, R38, AND J6

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

WARNING

A. Operate all system circuit breakers to the OFF position.

B. Ensure primary power to the center control cabinet is properly connected and secured.

C. Ensure all ground connections are secure.

D. Ensure the center cabinet ground strap is properly connected to the transmitter ground strap.

E. Ensure all RF connections are secure.

F. Ensure all connections in the center control cabinet are secure.

G. Ensure all connections on transmitter A and transmitter B remote interface panel terminals are secure.

H. Remove any extra hardware and wire lying within the center control cabinet.

I. Replace all rear doors and panels on the system cabinets.

J. Operate the front-panel **AUTO** and **RMTE CNTL OFF** switch/indicators to the OUT position.

2-34. Operate all system circuit breakers to the ON position.

2-35. Apply primary power to the system.

2–36. An FO–2 front–panel mode selection switch/indicator will illuminate to indicate the system configuration.

2–37. Operate the front–panel **RMTE CNTL OFF** switch/indicator to illuminate the switch/indicator (remote control disabled). Operate the switch/indicator to extinguish the switch/indicator (remote control enabled).

2–38. The front–panel **AUTO** switch/indicator activates the automatic switching circuitry when the switch/indicator is positioned IN. Operate the switch/indicator to the IN position. The indicator will only illuminate when RF is present.

2–39. Disconnect primary power to the system.

SECTION III
OPERATION

3–1. INTRODUCTION.

3–2. This section identifies all controls and indicators associated with the FO–2 automatic transmitter output switch controller and provides standard operating procedures.

3–3. CONTROLS AND INDICATORS.

3–4. Refer to Figure 3–1 for the location of all controls and indicators associated with normal operation of the FO–2 automatic transmitter output switch controller. The function of each control or indicator is described in Table 3–1.

3–5. OPERATION.

NOTE ***THE FOLLOWING PROCEDURE ASSUMES THAT THE FO-2 IS COMPLETELY INSTALLED AND IS FREE OF ANY DISCREPANCIES.***
NOTE

3–6. Energize the FO–2 circuitry by applying power to the FD–2 dual transmitter controller.

3–7. Energize and operate the dual transmitter system via the FD–2 dual transmitter controller.

3–8. Select the type of transmitter output configuration by depressing one of the following switch/indicators.

A. A+B AIR

B. A AIR B LOAD

C. B AIR A LOAD

D. A+B LOAD

3–9. Select automatic or manual transmitter output switching as follows:

A. If automatic output switching is desired, depress the **AUTO ON** switch/indicator to illuminate the switch/indicator. This will enable both automatic and manual transmitter output switching. If a fault is detected, the FO–2 will respond as follows: 1) initiate a switching operation, 2) inhibit the automatic switching circuitry, and 3) complete the switching operation.

B. If manual only output switching is desired, depress the **AUTO ON** switch/indicator to extinguish the switch/indicator. Depress the **A+B AIR, A AIR B LOAD, B AIR A LOAD**, or **A+B LOAD** switch/indicator to configure the dual transmitter system as desired.

3–10. If remote operation is desired, operate the **REMOTE CONTROL OFF** switch/indicator to extinguish the switch/indicator. This will enable both local and remote operation.

3–11. EXTERNAL ALARM RESET.

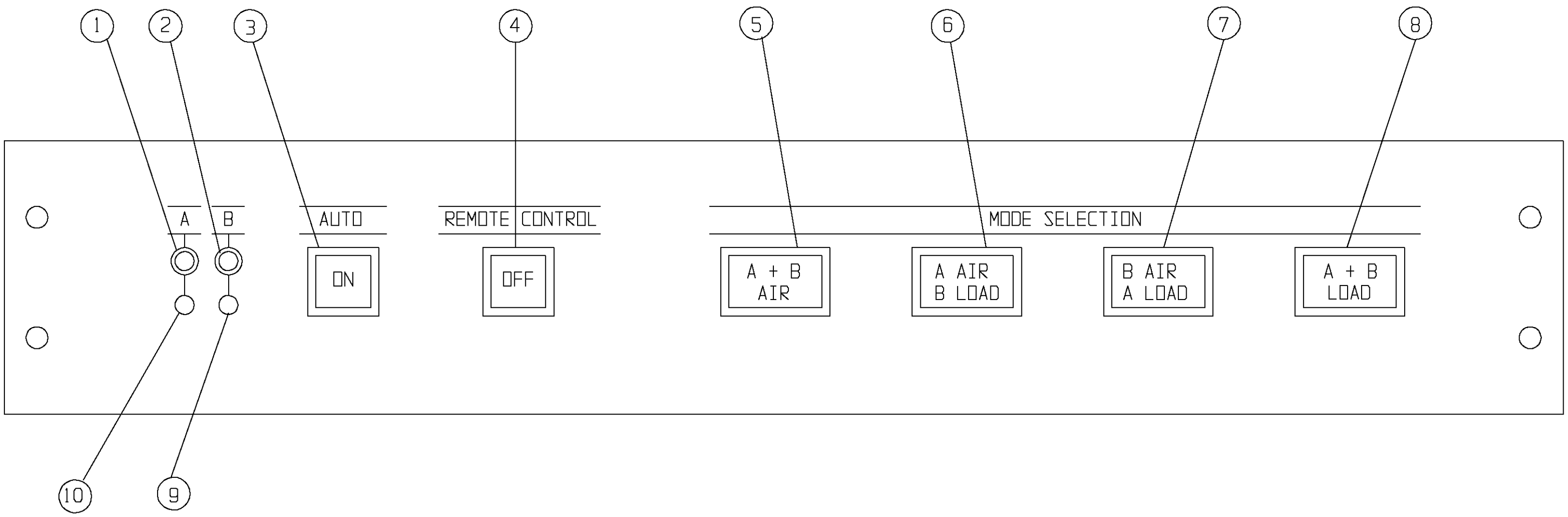

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FIGURE 3-1. FO-2 CONTROLS AND INDICATORS

3–12. The FO–2 external alarm circuit can be reset locally or remotely in the automatic and manual mode. To reset the alarm circuit, depress one of the following front–panel or remote switch/indicators.

A. A+B AIR

B. A AIR B LOAD

C. B AIR A LOAD

D. A+B LOAD

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

INDEX NO.	NOMENCLATURE	FUNCTION
1	Transmitter A Indicator	Indicates transmitter A output power level is normal when illuminated.
2	Transmitter B Indicator	Indicates transmitter B output power level is normal when illuminated.
3	**AUTO ON** Switch/ Indicator	SWITCH: Enables or disables the internal automatic output switching circuitry. INDICATOR: Indicates the automatic transmitter output switching circuitry is enabled when illuminated.
4	**REMOTE CONTROL OFF** Switch/Indicator	SWITCH: Enables or disables transmitter remote control operation. INDICATOR: Indicates transmitter remote operation is disabled when illuminated.
5	**A + B AIR** Switch/ Indicator	SWITCH: Configures transmitter A and transmitter B for on–air operation. INDICATOR: Indicates transmitter A and transmitter B are configured for on–air operation when illuminated.
6	**A AIR B LOAD** Switch/Indicator	SWITCH: Configures transmitter A for on–air operation and transmitter B for dummy load operation. INDICATOR: Indicates transmitter A is configured for on–air operation and transmitter B for dummy load operation when illuminated.

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

INDEX NO.	NOMENCLATURE	FUNCTION
7	**B AIR A LOAD** Switch/Indicator	SWITCH: Configures transmitter B for on–air operation and transmitter A for dummy load operation. INDICATOR: Indicates transmitter B is configured for on–air operation and transmitter A for dummy load operation when illuminated.
8	**A + B LOAD** Switch/ Indicator	SWITCH: Configures transmitter A and transmitter B for dummy load operation. INDICATOR: Indicates transmitter A and transmitter B are configured for dummy load operation when illuminated.
9	Transmitter B Output Power Failure Threshold Adjust.	Adjusts the output power threshold at which the control circuitry will recognize a transmitter B failure.
10	Transmitter A Output Power Failure Threshold Adjust.	Adjusts the output power threshold at which the control circuitry will recognize a transmitter A failure.

SECTION IV
THEORY OF OPERATION

4–1. INTRODUCTION.

4–2. This section presents the theory of operation for the Broadcast Electronics FO–2 automatic transmitter output switch controller.

4–3. GENERAL DESCRIPTION.

4–4. The FO–2 is designed to automatically transfer the antenna to the operational transmitter in the event a fault occurs in either transmitter. Figure 4–1 presents a block diagram of the FO–2 automatic control circuitry. Refer to Figure 4–1 and the following description of the automatic control circuitry.

4–5. Two RF presence signals are provided by the FO–2 detector circuits which are derived from the RF sample voltage of transmitter A and transmitter B. These signals are routed to the command control logic, and automatic monitoring and delay logic circuits. The automatic monitoring and delay logic will detect the loss of an RF presence signal when either transmitter fails.

4–6. With the loss of an RF presence signal, the following two events will occur. 1) The command control logic will generate instructions to deenergize the transmitter A and transmitter B high voltage, and 2) the automatic monitoring and delay logic will generate and route a transfer request to the mode control logic.

4–7. The mode control logic provides mode information to the switch comparator logic. The comparator logic will generate and route a transfer command to the command control logic.

4–8. The command control logic will generate and route instructions to the coaxial switches which will transfer the antenna to the output of the operational transmitter. The coaxial switches will provide position status information to the switch comparator logic. When the position status and mode information are compared, the comparator will terminate the transfer command to the command control logic.

4–9. With the absence of the transfer command, the command control logic will generate instructions to energize the operational transmitter high voltage for on–air operation. If connected, the preset power control circuit will instruct the transmitter to raise or lower the output power to a predetermined level. To facilitate maintenance, the output of the defective transmitter is connected to the dummy load.

4–10. FUNCTIONAL DESCRIPTION.

4–11. A simplified schematic of the FO–2 is presented in Figure 4–2. Refer to the simplified schematic as required for the following functional equipment description.

4–12. When applicable, the text will describe the operation of the transmitter A and the transmitter B threshold detector and automatic monitor circuits. The detection and automatic monitor circuits for transmitters A and B are identical; therefore, only the transmitter A circuit will be discussed.

4–13. The following information is presented with transmitters A and B operating at a normal output power level into the antenna (A+B AIR). The text describes the automatic process of switching transmitter B into the antenna and transmitter A into the load (B AIR/A LOAD) when a fault occurs in transmitter A.

4–14. **AUTOMATIC ENABLE.** Automatic enable gate U26A provides automatic mode switching when an RF output power failure is detected. When the front–panel **AUTO ON** switch/indicator is depressed, a HIGH is input to U26A and ANDed with HIGHs from U30C and J7 pin 2. U26A will output a HIGH to automatic control gate U27A. A HIGH is also applied to inverter U31A which outputs a LOW to the front–panel **AUTO MODE** indicator and optical isolator U36. U36 outputs a HIGH to illuminate an external indicator.

4–15. **THRESHOLD DETECTOR CIRCUIT.** The threshold detector circuit monitors a sample voltage from transmitter A. The sample voltage is routed to comparator U1B through buffer U1A. When the sample voltage decreases below the preset threshold level established by potentiometer R4, U1B will generate a LOW to inverters U7A/U8A. U7A/U8A will apply a HIGH to threshold indicator DS1, motor drive inhibit gate U25C, and NAND gate U9A.

4–16. With a HIGH from mode control relay K2, U9A will output a LOW to U9C and U12A. A HIGH from U9B is also applied to the input of U12A and U9C. The output of U12A will apply a HIGH to transfer timer reset gate U24C/U24D.

4–17. **OUTPUT POWER FAILURE CIRCUIT.** The RF output power failure circuit provides a delay before a mode change is initiated after a fault is detected. Integrated circuits U12A, U12B, U12C, and U12D operate as an exclusive OR gate. With a LOW from U9B, exclusive OR gate U12 will output a HIGH to RF failure delay timer U20 through potentiometer R38.

4–18. If the duration of the fault exceeds the delay determined by R38 and C15, U20 will apply a HIGH through inverter U22A to automatic control gate U27A and alarm latch U28. With the presence of a HIGH at the input, U27A will output a HIGH to U9D and U9C.

4–19. **ALARM CIRCUIT.** The alarm circuit provides an external indication of an RF output power failure. With a HIGH from U22A, alarm latch U28 will output a LOW to inverter U32E to energize alarm relay K4. A HIGH from U32E is applied to transfer timer reset gate U24C/U24D.

4–20. Alarm latch U28 also applies a LOW to AND gate U30C. U30C will output a LOW to U26A which disables the automatic enable gate.

4–21. **AUTOMATIC MONITOR CIRCUIT.** The monitor circuit automatically generates a switching command. With both inputs HIGH, U9C will output a LOW to mode command one shot U10A. U10A will output a HIGH which is inverted LOW by U7D and applied to transistor switch Q6.

4–22. **MODE CONTROL CIRCUIT.** The mode control circuit generates the various logic control signals for mode switching. The control logic signals are determined by the position of mode control latch relays K2 and K3 which operate as flip–flops. The HIGH and LOW logic signals (and inverted signals through U8C and U8E) from the relays are input to the combined detector logic. The combined detector logic processes the information to provide the logic control signals.

4–23. With a LOW from U7D, transistor switch Q6 outputs a HIGH through diodes D16 and D18 to relays K2 and K3 which operate to the B AIR/A LOAD position. The control logic for the appropriate mode change is established and routed to switch direction relays K6 and K7, the transmitter control decoder, the status decoder logic, and the switch comparator circuit. Relay K6 will energize and relay K7 will deenergize to establish the position of coaxial switches SW1, SW2, and SW3. In addition, a HIGH is applied to inverter U22B which applies a LOW to U26A to ensure the automatic enable gate remains disabled.

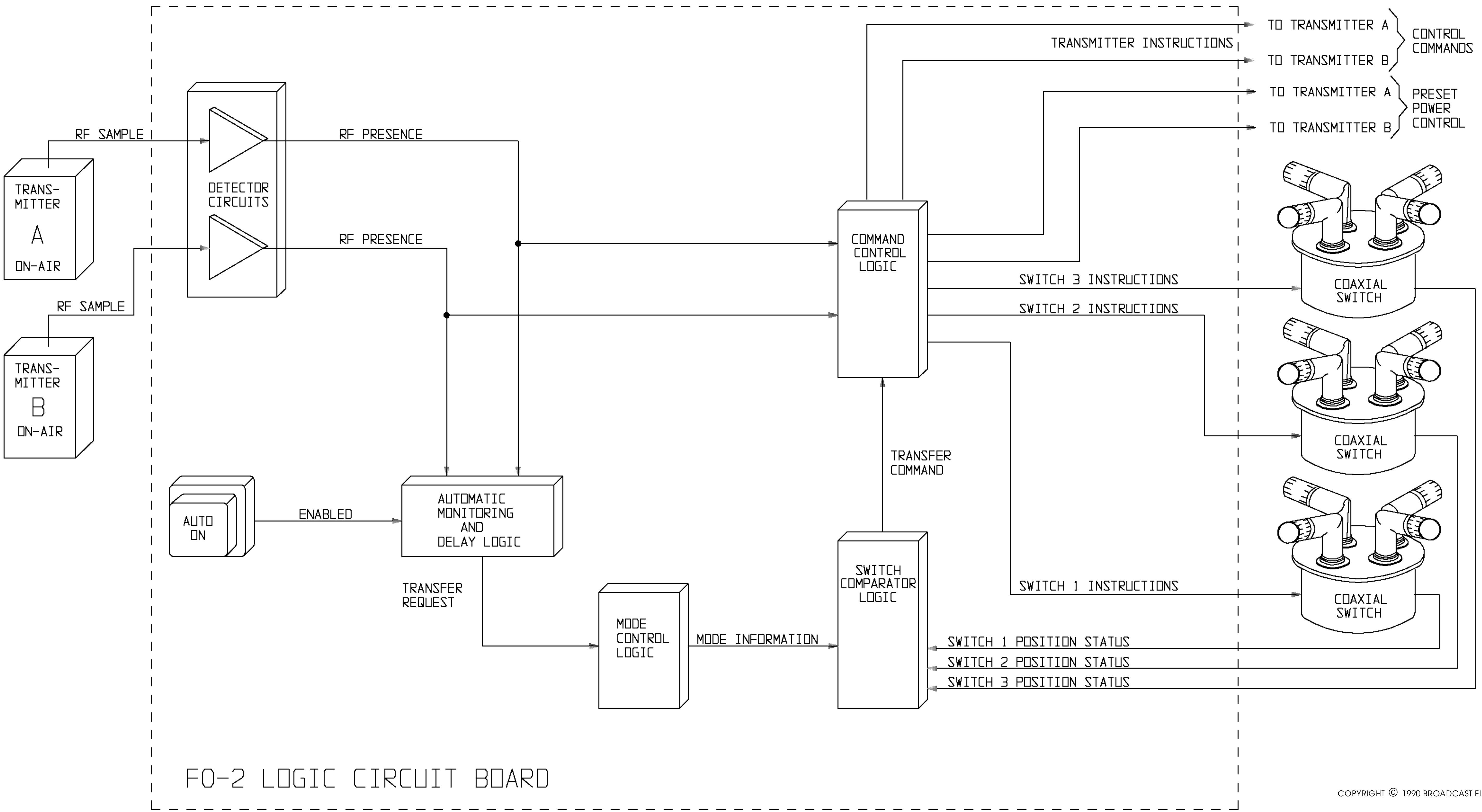

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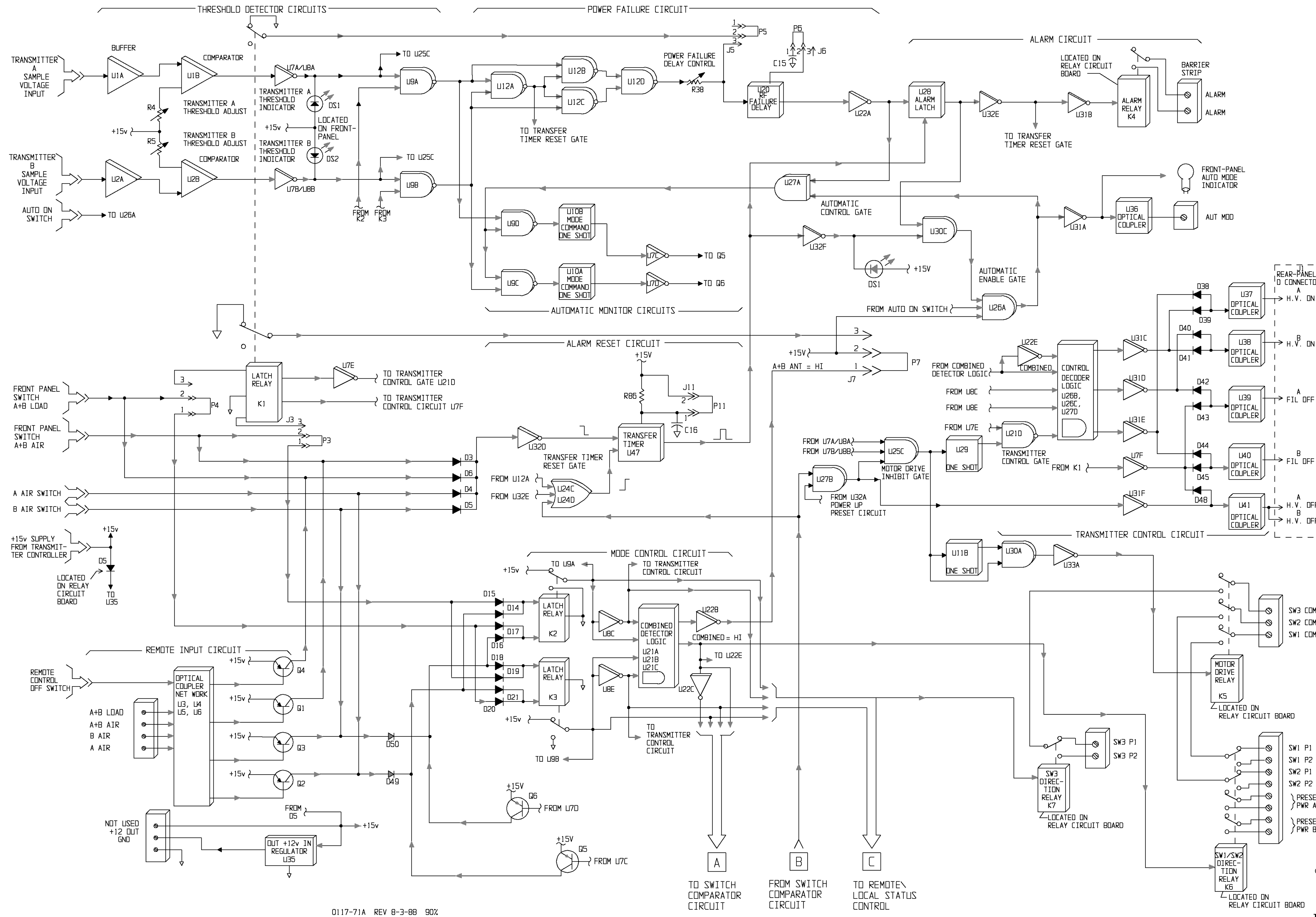
FIGURE 4-1. FO-2 AUTOMATIC CONTROL CIRCUITRY BLOCK DIAGRAM



597-0117-71A

FIGURE 4-2.
FO-2 SIMPLIFIED SCHEMATIC DIAGRAM

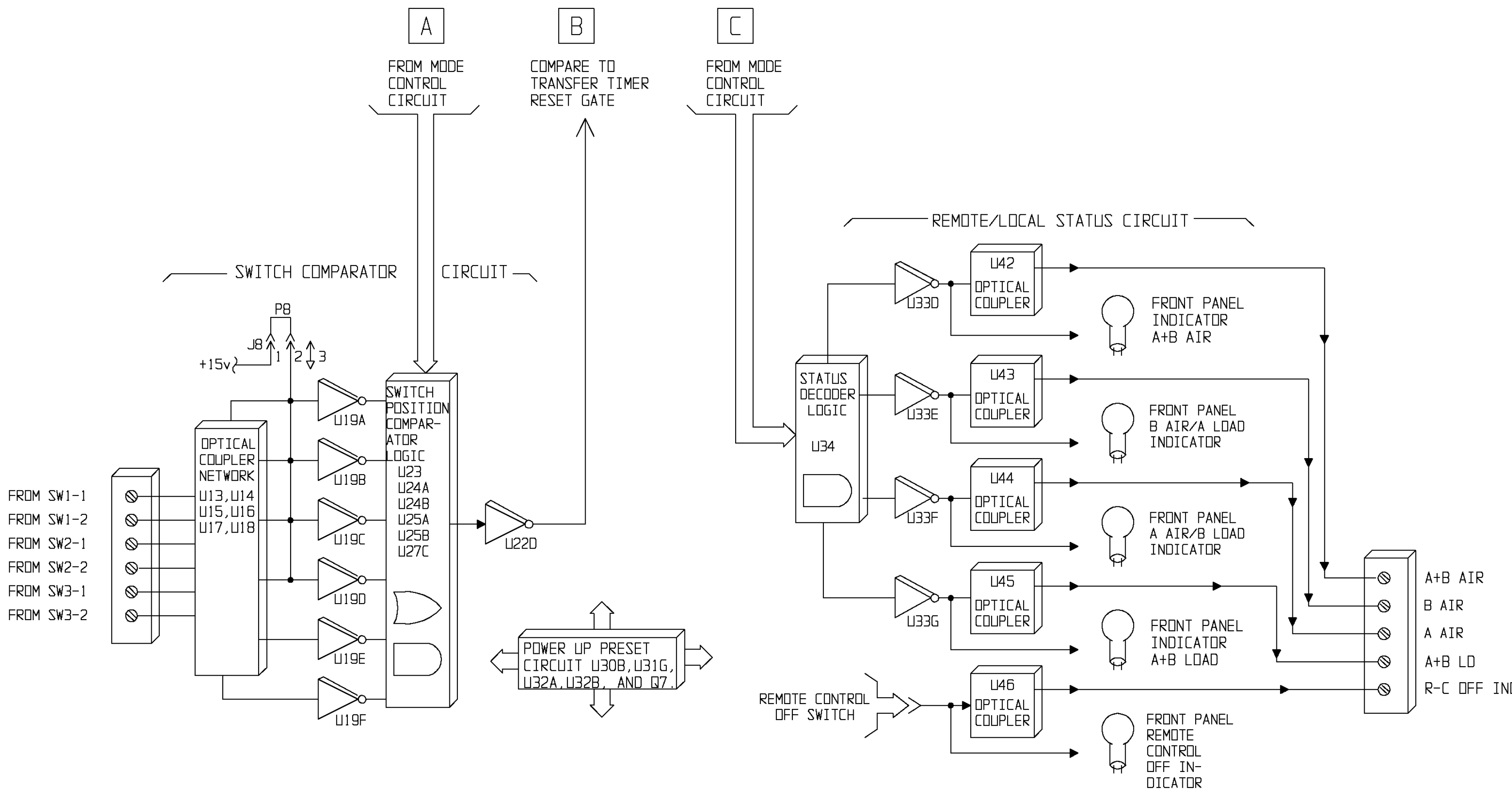


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FIGURE 4-2. FO-2 SIMPLIFIED SCHEMATIC DIAGRAM
(Sheet 2 of 2)

4–24. **SWITCH COMPARATOR CIRCUIT.** The switch comparator circuit generates the control logic which terminates the high voltage of both transmitters until the coaxial switches are correctly positioned. Logic from coaxial switches SW1, SW2, and SW3 are input to the switch position comparator logic through inverter U19 and the optical isolator network. With the mode control logic from the mode control circuit, the switch comparator logic will output a LOW to inverter U22D which applies a HIGH to U27B and transfer timer reset gate U24C/U24D.

4–25. **High Voltage Off.** U27B will output a HIGH to inverter U31F which applies a LOW to optical isolator U41. U41 outputs a HIGH to both transmitters which terminates the high voltage. A HIGH is also applied to motor drive inhibit gate U25C.

4–26. With high voltage termination of both transmitters, U25C will output a HIGH to AND gate U30A and timers U29 and U11B. U11B will output a HIGH to U30A which applies a HIGH to inverter U33A. U33A applies a LOW to K5 to enable the motor drive relay.

4–27. When coaxial switches SW1, SW2, and SW3 are correctly positioned, the switch comparator logic will output a HIGH to inverter U22D which applies a LOW to U27B. U27B outputs a LOW to U25C which applies a LOW to timer U29. U29 applies a LOW to transmitter control gate U21D.

4–28. **TRANSMITTER CONTROL CIRCUIT.** The transmitter control circuit provides commands to the transmitters. A LOW from latch relay K1 is applied to inverter U7E which outputs a HIGH to U21D. The HIGH from U7E and LOW from U29 are NANDed by U21D which outputs a HIGH to enable the control decoder logic.

4–29. With the mode control logic and a HIGH from transmitter control gate U21D, the control decoder logic will output a HIGH to inverter U31D. U31D applies a LOW through steering diodes D40 and D42 to optical isolators U38 and U39. Finally, U38 and U39 output a HIGH which enables transmitter B high voltage and terminates transmitter A filaments.

4–30. **REMOTE/LOCAL STATUS CIRCUIT.** The remote/local status circuit provides mode information to the front–panel and external indicators. When the mode control logic is applied to status decoder logic U34, a HIGH is output to inverter U33E. U33E outputs a LOW to illuminate front–panel switch/indicator **B AIR/A LOAD**. A LOW is also applied to optical isolator U43 which outputs a HIGH to an external indicator.

4–31. **REMOTE INPUT CIRCUIT.** The remote input circuit provides external control of the FO–2. When a remote mode switch is depressed, a HIGH is input to the optical isolator network. The optical isolator network outputs a LOW to transistor switch Q1, Q2, Q3, or Q4 which applies a HIGH to the appropriate mode control input circuit and alarm reset circuit.

4–32. **Remote Off.** When the front–panel **REMOTE CONTROL OFF** switch/indicator is illuminated, the ground potential at the input of the optical isolator network is removed which disables the remote input circuit.

4–33. **ALARM RESET CIRCUIT.** The alarm reset circuit reactivates the alarm and automatic switching circuitry. This circuit consists of inverter U32D, transfer timer U47, and transfer timer reset gate U24C/U24D.

4–34. With the HIGH from U32E, OR gate U24C/U24D will output a HIGH to enable transfer timer U47. When a front–panel or remote control switch is depressed, a HIGH is input to inverter U32D through diode D3, D4, D5, or D6. U32D applies a LOW to U47 which generates a momentary HIGH to U32F and U28.

4–35. With the momentary HIGH from U47, alarm latch U28 will output a HIGH through inverters U32E and U31B to deenergize relay K4. The HIGH from U28 is also applied to U30C. Inverter U32F will output a momentary LOW to U30C and DS1 which illuminates to indicate that the transfer timer is energized.

4-36. The duration of the HIGH from U47 is determined by the position of programmable jumper P11. When the output of U47 returns to a logic LOW, a HIGH is applied to U30C through inverter U32F. U30C will output a HIGH to automatic enable gate U26A which activates the automatic switching circuitry.

4-37. **POWER PRESET CIRCUIT.** Integrated circuits U30B, U31G, U32A, U32B, and transistor Q7 operate as a preset power circuit. Whenever power is applied to the FO-2, the preset circuit will initialize the logic circuitry to a preset format.

4-38. **POWER SUPPLY CIRCUIT.** +15V dc is supplied from the dual transmitter controller through D5 (located on the relay circuit board) and routed to all integrated logic circuits. Integrated circuit U35 operates as a voltage regulator circuit to produce a regulated +12V dc supply for the remote source voltage.

SECTION V
MAINTENANCE

5-1. **INTRODUCTION.**

5-2. This section provides general maintenance information, electrical adjustment procedures, troubleshooting information, and component replacement procedures for the Broadcast Electronics FO-2 transmitter output switch controller.

5-3. **SAFETY CONSIDERATIONS.**

5-4. Low voltages are used throughout the FO-2 logic control and relay circuit boards. Maintenance with power on is always considered hazardous and caution should be observed. Good judgment, care, and common sense must be practiced to prevent accidents. The procedures contained in this section should be performed only by experienced and trained personnel.

5-5. **FIRST LEVEL MAINTENANCE.**

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

WARNING ***DISCONNECT THE POWER SOURCE FROM THE OUTPUT SWITCHER BEFORE ATTEMPTING ANY EQUIPMENT MAINTENANCE.***
WARNING

5-7. **GENERAL.**

5-8. Periodically remove abrasions from the FO-2 chassis with a cloth moistened with a mild household cleaner. Remove dust from the chassis exterior with a brush and vacuum cleaner as required.

5-9. **ELECTRICAL.**

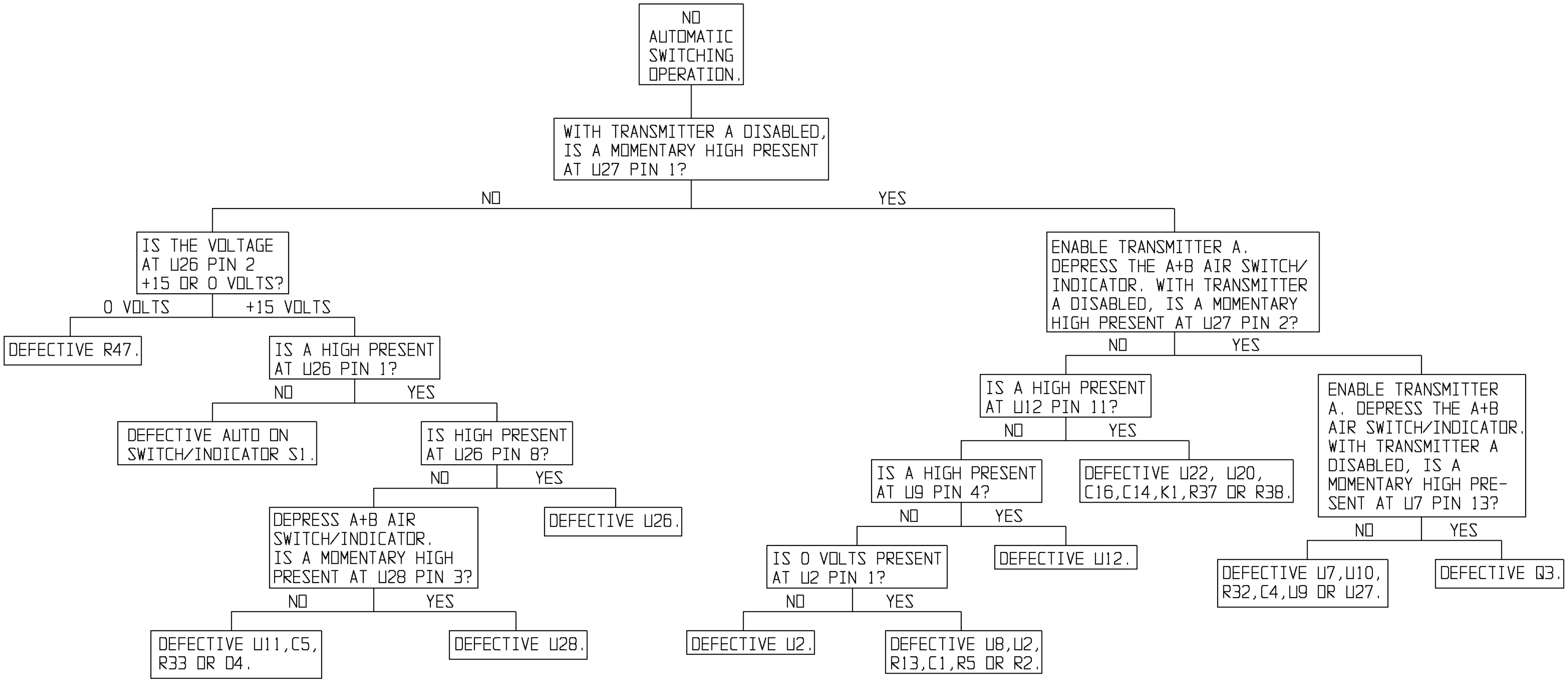
5-10. The switcher circuit boards should be periodically cleaned of accumulated dust using a soft brush and vacuum cleaner. Check the circuit boards for improperly seated semiconductors and components damaged by overheating.

5-11. **SECOND LEVEL MAINTENANCE.**

5-12. The second level maintenance consists of procedures required to restore an FO-2 to operation after a fault has occurred. The procedures are divided into troubleshooting and component replacement procedures.

5-13. **TROUBLESHOOTING.**

5-14. The troubleshooting philosophy for the FO-2 output switch controller consists of isolating a problem to a specific circuit. The problem may be further isolated by referencing the following information and Figure 5-1 which presents the FO-2 troubleshooting information.



NOTES:

1. THE TROUBLESHOOTING INFORMATION PRESENTED IS FOR THE FO-2 SWITCHER OPERATED IN THE A+B AIR MODE WITH THE AUTOMATIC SWITCHING CIRCUITRY ENABLED.
2. THE MANUAL SWITCHING CIRCUITRY IS OPERATIONAL.
3. ALL COMPONENTS ARE LOCATED ON THE LOGIC CONTROL CIRCUIT BOARD UNLESS OTHERWISE SPECIFIED.

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FIGURE 5-1. TROUBLESHOOTING TREE. NO AUTOMATIC SWITCHING OPERATION

WARNING ***DISCONNECT THE POWER SOURCE FROM THE OUTPUT SWITCHER BEFORE REMOVING OR REPLACING ANY COMPONENTS.***

WARNING

CAUTION ***INADVERTENT CONTACT BETWEEN ADJACENT COMPONENTS OR CIRCUIT BOARDS WITH TEST EQUIPMENT MAY CAUSE SERIOUS DAMAGE TO THE OUTPUT SWITCHER.***

CAUTION

5-15. After the problem is isolated and power is totally deenergized, refer to the schematic diagrams and the theory of operation to assist in problem resolution. The defective component may be repaired locally or the entire device may be returned to Broadcast Electronics, Inc. for repair or replacement.

5-16. **COMPONENT REPLACEMENT.**

5-17. On all circuit boards, the adhesion between the copper trace and the circuit board fails at almost the same temperature as solder melts. A circuit board trace can be destroyed by excessive heat or lateral movement during soldering. Use of a small soldering iron with steady pressure is required for circuit board repairs.

5-18. To remove a soldered component from a circuit board, cut the leads from the body of the defective component while the device is still soldered to the board. Grip a component lead with needle-nose pliers. Touch the soldering iron to the lead at the solder connection on the circuit side of the board. When the solder begins to melt, push the lead through the back side of the board and cut off the clinched end of the lead. Each lead may now be heated independently and pulled out of each hole. The holes may be cleared by careful re-heating with a low wattage iron and removing solder with a soldering vacuum tool.

5-19. Install the new component and apply solder from the circuit side of the board. If no damage has been incurred to the plated-through holes, soldering of the component side of the board will not be required.

WARNING ***MOST SOLVENTS WHICH REMOVE ROSIN FLUX ARE VOLATILE AND TOXIC BY NATURE AND SHOULD BE USED ONLY IN SMALL AMOUNTS IN A WELL VENTILATED AREA AWAY FROM FLAME, CIGARETTES, AND HOT SOLDERING IRONS.***

WARNING

WARNING ***OBSERVE THE MANUFACTURERS CAUTIONARY INSTRUCTIONS.***

WARNING

5-20. After soldering, remove residual flux with a suitable solvent. Rubbing alcohol is highly diluted and is not effective.

5-21. The board should be checked to ensure the flux has been completely removed. Rosin flux is not normally corrosive; however, in time the flux will absorb enough moisture to become conductive and create problems.

5-22. **INTEGRATED CIRCUITS.** Special care should be exercised with integrated circuits. Each integrated circuit must be installed by matching the integrated circuit notch with the notch on the socket. Do not attempt to remove an integrated circuit from a socket with your fingers. Use an integrated circuit puller to pry the component from the socket.

SECTION VI
PARTS LISTS

6-1. INTRODUCTION.

6-2. This section provides descriptions and part numbers of electrical components, assemblies, and selected mechanical parts required for maintenance of the Broadcast Electronics FO-2 output switch controller. Each table entry in this section is indexed by reference designators appearing on the applicable schematic diagram.

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

TABLE 6-1. REPLACEABLE PARTS LISTS

TABLE 6-2. FO-2 OUTPUT SWITCH CONTROLLER FINAL ASSEMBLY - 909-0117-004

REF. DES.	DESCRIPTION	PART NO.	QTY.
----	Final Assembly, FO-2	959-0279	1
----	FO-2 to FD-2 Interface Cable	949-0138-001	1

TABLE 6-3. FO-2 FINAL ASSEMBLY - 959-0279

REF. DES.	DESCRIPTION	PART NO.	QTY.
DS3 THRU DS8	Lamp, No. 73, 14V, 0.08A, T-1 3/4 Bulb, Wedge Base	320-0007	6
L1,L2	Ferrite Shield, Impedance: 58 - 108 MHz	360-0058	2
S1,S2	Switch, Square Illuminated Pushbutton, SPDT, Panel Mount, 0.1A @ 125V dc	340-0067	2
S3 THRU S6	Switch, Push, Rectangular, Momentary Contact, Illuminated, SPDT, 0.1A @ 125V dc	340-0071	4
TB1,TB2	Barrier Strip, 20 Terminals	412-0020	2
----	Switchbutton, Micro, White, Rectangular, Incandescent Display	340-0048	2
----	Switchbutton, Micro, Red, Rectangular, Incandescent Display	340-0068	1
----	Switchbutton, Micro, Green, Rectangular, Incandescent Display	340-0069	1
----	Switchbutton, Micro, Yellow, Square, Incandescent Display	340-0070	2
----	Logic Output Switcher Circuit Board Assembly	919-0193-001	1
----	Relay Output Switcher Circuit Board Assembly	919-0094	1
----	Output Switcher Cable Assembly	949-0132	1
----	LED Circuit Board Assembly	919-0193-002	1

TABLE 6-4. FO-2 LOGIC CIRCUIT BOARD ASSEMBLY - 919-0193-001
(Sheet 1 of 4)

REF. DES.	DESCRIPTION	PART NO.	QTY.
C1,C2	Capacitor, Electrolytic, 10 uF, 35V	023-1076	2
C3	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	1
C4	Capacitor, Electrolytic, 10 uF, 35V	023-1076	1
C5	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	1
C6	Capacitor, Electrolytic, 10 uF, 35V	023-1076	1
C7 THRU C13	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	7
C14	Capacitor, Electrolytic, 3.3 uF, 50V	020-3363	1
C15	Capacitor, Electrolytic, 10 uF, 35V	023-1076	1
C16	Capacitor, Electrolytic, 470 uF, 50V	024-4783	1
C18	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	1
C19,C20,C21	Capacitor, Electrolytic, 10 uF, 35V	023-1076	3
C22	Capacitor, Electrolytic, 1 uF, 50V	024-1064	1
C23	Capacitor, Electrolytic, 10 uF, 35V	023-1076	1
C24,C25	Capacitor, Electrolytic, 100 uF, 35V	023-1084	2
C26 THRU C44	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	19
C45,C46	Capacitor, Electrolytic, 33 uF, 35V	024-3335	2
D1 THRU D51	Diode, 1N4005, Silicon, 400V @ 30 uA	203-4005	51
D52	Diode, Zener, 1N4740A, 10V, 1W	200-4740	1
D53 THRU D58	Diode, 1N4005, Silicon, 400V @ 30 uA	203-4005	6
DS1	Indicator, LED, Red, 521-9212, 1.7V @ 50 mA Maximum	323-9217	1

TABLE 6-4. FO-2 LOGIC CIRCUIT BOARD ASSEMBLY - 919-0193-001
(Sheet 2 of 4)

REF. DES.	DESCRIPTION	PART NO.	QTY.
J1	Connector, Header, 26-Pin Dual In-line	417-2600	1
J2	Connector, 25-Pin D Type	418-2500	1
J3 THRU J8	Connector, Header, 3-Pin In-Line	417-0003	6
J9,J10	Socket, 16-Pin DIP	417-1604	2
J11	Connector, Header, 2-Pin In-line	417-4004	1
J12	Connector, Header, 3-Pin In-line	417-0003	1
K1 THRU K3	Relay, Coil: 12V dc Contact: DPDT, 120V ac @ 1 Ampere	270-0058	3
P3 THRU P8, P11, P12	Jumper, Programmable, 2-Pin	340-0004	8
Q1 THRU Q7	Transistor, 2N3906, PNP, Silicon, 40V, TO-92 Case	210-3906	7
R1	Resistor, 10 k Ohm ±1%, 1/4W	100-1051	1
R2	Resistor, 34.8 k Ohm ±1%, 1/4W	103-3485	1
R3	Resistor, 10 k Ohm ±1%, 1/4W	100-1051	1
R4,R5	Potentiometer, 20 k Ohm ±10%, 1/2W	178-2054	2
R6	Resistor, 4.75 k Ohm ±1%, 1/4W	103-4741	1
R7	Resistor, 10 k Ohm ±1%, 1/4W	100-1051	1
R8,R9	Resistor, 30 Ohm ±5%, 1W	120-3023	2
R12	Resistor, 499 k Ohm ±5%, 1/4W	103-4996	1
R13	Resistor, 10 k Ohm ±1%, 1/4W	100-1051	1
R14	Resistor, 499 k Ohm ±1%, 1/4W	103-4996	1
R15,R16	Resistor, 1 k Ohm ±5%, 1/2W	110-1043	2
R17 THRU R20	Resistor, 100 k Ohm ±1%, 1/4W	103-1062	4
R21 THRU R24	Resistor, 10 k Ohm ±1%, 1/4W	100-1051	4
R25	Resistor, 20 Ohm ±5%, 1/4W	100-2023	1
R26	Resistor, 560 Ohm ±5%, 1/2W	110-5633	1
R27	Resistor, 10 k Ohm ±1%, 1/4W	100-1051	1
R32	Resistor, 47.5 k Ohm ±1%, 1/4W	103-4755	1
R33	Resistor, 2.43 k Ohm ±5%, 1/4W	103-2434	1
R34	Resistor, 47.5 k Ohm ±1%, 1/4W	103-4755	1
R35,R36	Resistor, 100 k Ohm ±1%, 1/4W	103-1062	2
R37	Resistor, 10 k Ohm ±1%, 1/4W	100-1051	1
R38	Potentiometer, 2 Meg Ohm ±10%, 1/2W	178-2074	1
R39 THRU R44	Resistor, 10 k Ohm ±1%, 1/4W	100-1051	6
R46	Resistor, 1 k Ohm ±1%, 1/4W	100-1041	1
R47	Resistor, 100 k Ohm ±1%, 1/4W	103-1062	1
R48,R49	Resistor, 47.5 k Ohm ±1%, 1/4W	100-4755	2
R50	Resistor, 10 k Ohm ±1%, 1/4W	100-1051	1
R51	Resistor, 47.5 k Ohm ±1%, 1/4W	103-4755	1
R52	Resistor, 560 Ohm ±5%, 1/2W	110-5633	1
R53	Resistor, 20 Ohm ±5%, 1/4W	100-2023	1
R54	Resistor, 30 Ohm ±5%, 1W	120-3023	1
R55	Resistor, 10 k Ohm ±1%, 1/4W	100-1051	1
R56	Resistor, 100 k Ohm ±1%, 1/4W	103-1062	1
R57,R58,R59	Resistor, 30 Ohm ±5%, 1W	120-3023	3

TABLE 6-4. FO-2 LOGIC CIRCUIT BOARD ASSEMBLY - 919-0193-001
(Sheet 3 of 4)

REF. DES.	DESCRIPTION	PART NO.	QTY.
R60 THRU R63	Resistor, 20 Ohm ±5%, 1/4W	100-2023	4
R64 THRU R67	Resistor, 560 Ohm ±5%, 1/2W	110-5633	4
R68 THRU R77	Resistor, 1 k Ohm ±1%, 1/4W	100-1041	10
R78	Resistor, 332 Ohm ±1%, 1/4W	103-3323	1
R79 THRU R81	Resistor, 100 k Ohm ±1%, 1/4W	103-1062	3
R82 THRU R84	Resistor, 10 k Ohm ±1%, 1/4W	100-1051	3
R85	Resistor, 76.8 k Ohm ±1%, 1/4W	103-7685	1
R86	Resistor, 383 k Ohm ±1%, 1/4W	103-3836	1
R87 THRU R91	Resistor, 100 Ohm ±1%, 1/4W	100-1031	5
U1,U2	Integrated Circuit, LM358N, Dual Operational Amplifier, 8-Pin DIP	221-0358	2
U3 THRU U6	Integrated Circuit, 4N33, Optical Isolator, NPN Photo Transistor/ Infared Emitting Diode Type, 1500V Isolation, Response: 30 kHz Maximum, Current: 50 mA Maximum, 6-Pin DIP	229-0033	4
U7	Integrated Circuit, MC1416P, 7 NPN Darlington Driver Pack, 16-Pin DIP	226-2004	1
U8	Integrated Circuit, MC14584, Hex Schmitt Trigger, CMOS, 14-Pin DIP	228-4584	1
U9	Integrated Circuit, MC14011BCP, Quad 2-Input NAND Gate, CMOS,14-Pin DIP	228-4011	1
U10,U11	Integrated Circuit, MC14538B, Dual Retriggerable, Resettable Monostable Multivibrator, CMOS, 16-Pin DIP	228-4538	2
U12	Integrated Circuit, MC14011BCP, Quad 2-Input NAND Gate, CMOS, 14-Pin DIP	228-4011	1
U13 THRU U18	Integrated Circuit, 4N33, Optical Isolator, NPN Photo Transistor/Infared Emitting Diode Type, 1500V Isolation, Response: 30 kHz Maximum, Current: 50 mA Maximum, 6-Pin DIP	229-0033	6
U19	Integrated Circuit, MC14584, Hex Schmitt Trigger, CMOS, 14-Pin DIP	228-4584	1
U20	Integrated Circuit, NE555V, Timer, 8-Pin DIP	229-0555	1
U21	Integrated Circuit, MC14011BCP, Quad 2-Input NAND Gate, CMOS, 14-Pin DIP	228-4011	1
U22	Integrated Circuit, MC14584, Hex Schmitt Trigger, CMOS, 14-Pin DIP	228-4584	1
U23,U24	Integrated Circuit, CD4071B, OR Gate, CMOS, 14-Pin DIP	225-0005	2
U25,U26	Integrated Circuit, MC14073B, Tripple 3-Input AND Gate, CMOS, 14-Pin DIP	228-4073	2
U27	Integrated Circuit, CD4081B, AND Gate, CMOS, 14-Pin DIP	225-0008	1
U28	Integrated Circuit, MC14013BCP, Dual Type D Flip-Flop, CMOS, 14-Pin DIP	228-4013	1
U29	Integrated Circuit, MC14538B, Dual Retriggerable, Resettable Monostable Multivibrator, CMOS, 16-Pin DIP	228-4538	1
U30	Integrated Circuit, CD4081B, AND Gate, CMOS, 14-Pin DIP	225-0008	1
U31	Integrated Circuit, MC1416P, 7 NPN Darlington Driver Pack, 16-Pin DIP	226-2004	1
U32	Integrated Circuit, MC14584, Hex Schmitt Trigger, CMOS, 14-Pin DIP	228-4584	1
U33	Integrated Circuit, MC1416P, 7 NPN Darlington Driver Pack, 16-Pin DIP	226-2004	1

TABLE 6-4. FO-2 LOGIC CIRCUIT BOARD ASSEMBLY - 919-0193-001
(Sheet 4 of 4)

REF. DES.	DESCRIPTION	PART NO.	QTY.
U34	Integrated Circuit, CD4081B, AND Gate, CMOS, 14-Pin DIP	225-0008	1
U35	Integrated Circuit, LM78L12CZ, Three-Terminal Positive 12V Regulator, TO-92 Case	220-7812	1
U36 THRU U46	Integrated Circuit, 4N33, Optical Isolator, NPN Photo Transistor/Infared Emitting Diode Type, 1500V Isolation, Response: 30 kHz Maximum, Current: 50 mA Maximum, 6-Pin DIP	229-0033	11
U47	Integrated Circuit, NE555V, Timer, 8-Pin DIP	229-0555	1
----	Socket, 6-Pin DIP	417-0600	21
----	Socket, 8-Pin DIP	417-0804	4
----	Socket, 14-Pin DIP	417-1404	15
----	Blank Circuit Board	519-0193-001	1

TABLE 6-5. LED CIRCUIT BOARD ASSEMBLY - 919-0193-002

REF. DES.	DESCRIPTION	PART NO.	QTY.
DS201, DS202	Indicator, LED, RED, 521-9212, 1.7V @ 50 mA Maximum	323-9217	2
----	Receptacle, Male, 20-Pin In-Line	417-0200	.250
----	Blank, Circuit Board	519-0193-002	1

TABLE 6-6. FO-2 RELAY CIRCUIT BOARD ASSEMBLY - 919-0094

REF. DES.	DESCRIPTION	PART NO.	QTY.
C1 THRU C50	Capacitor, Ceramic, 0.001 uF, 1 kV	002-1034	50
D1 THRU D4	Diode, 1N4005, Silicon, 600V @ 1 Ampere	203-4005	4
D5,D6	Diode, MR502, Silicon, 200V @ 3 Amperes	202-0502	2
J100,J101	Connector, Header, 13-Pin Dual In-line	417-2600	2
J102 THRU J104	Receptacle, 12-Pin	417-1276	3
J110	Socket, 16-Pin DIP	417-1604	1
K4 THRU K7	Relay, Coil: 12V dc, 160 Ohms Contact: 4PDT, 5A @ 240V ac	270-0053	4
L1 THRU L15	RF Choke,4.7 uH ±10%, 430 mA, DC Resistance: 0.55 Ohms, 0.43 Amperes Maximum, Resonant at 115 MHz	360-0022	15
R1 THRU R11	Resistor, 1 k Ohm ±1%, 1/4W	100-1041	11
XK4 THRU XK7	Socket, Relay	270-0055	4
----	Blank Circuit Board	519-0094	1

TABLE 6-7. FO-2 CABLE ASSEMBLY - 949-0132
(Sheet 1 of 2)

REF. DES.	DESCRIPTION	PART NO.	QTY.
J1	Connector, Female, 25-Pin D-Type	417-0129	1
P1	Plug, Ribbon Cable, Dual 13 Contact	418-2600	1
P2	Plug, 25-Pin, D-Type	417-0251	1
P9	Plug, 16-Pin DIP	417-1605	1
P100,P101	Plug, Ribbon Cable, Dual 13 Contact	418-2600	2

TABLE 6-7. FO-2 CABLE ASSEMBLY - 949-0132
(Sheet 2 of 2)

REF. DES.	DESCRIPTION	PART NO.	QTY.
P102 THRU P104	Connector, Housing, 12-Pin	418-1271	3
P110	Plug, 16-Pin DIP	417-1605	1
P201	Connector, Housing, 5-Pin In-Line	417-0165	1
----	Socket, MR Amp Type	417-0053	34
----	Pins, Crimp Type	417-8766	4

TABLE 6-8. FO-2 TO FD-2 INTERFACE CABLE ASSEMBLY - 949-0138-001

REF. DES.	DESCRIPTION	PART NO.	QTY.
----	Connector, 25-Pin Dual In-Line	418-0609	1
----	Connector, 25-Pin, Female, HDF	417-0129	1

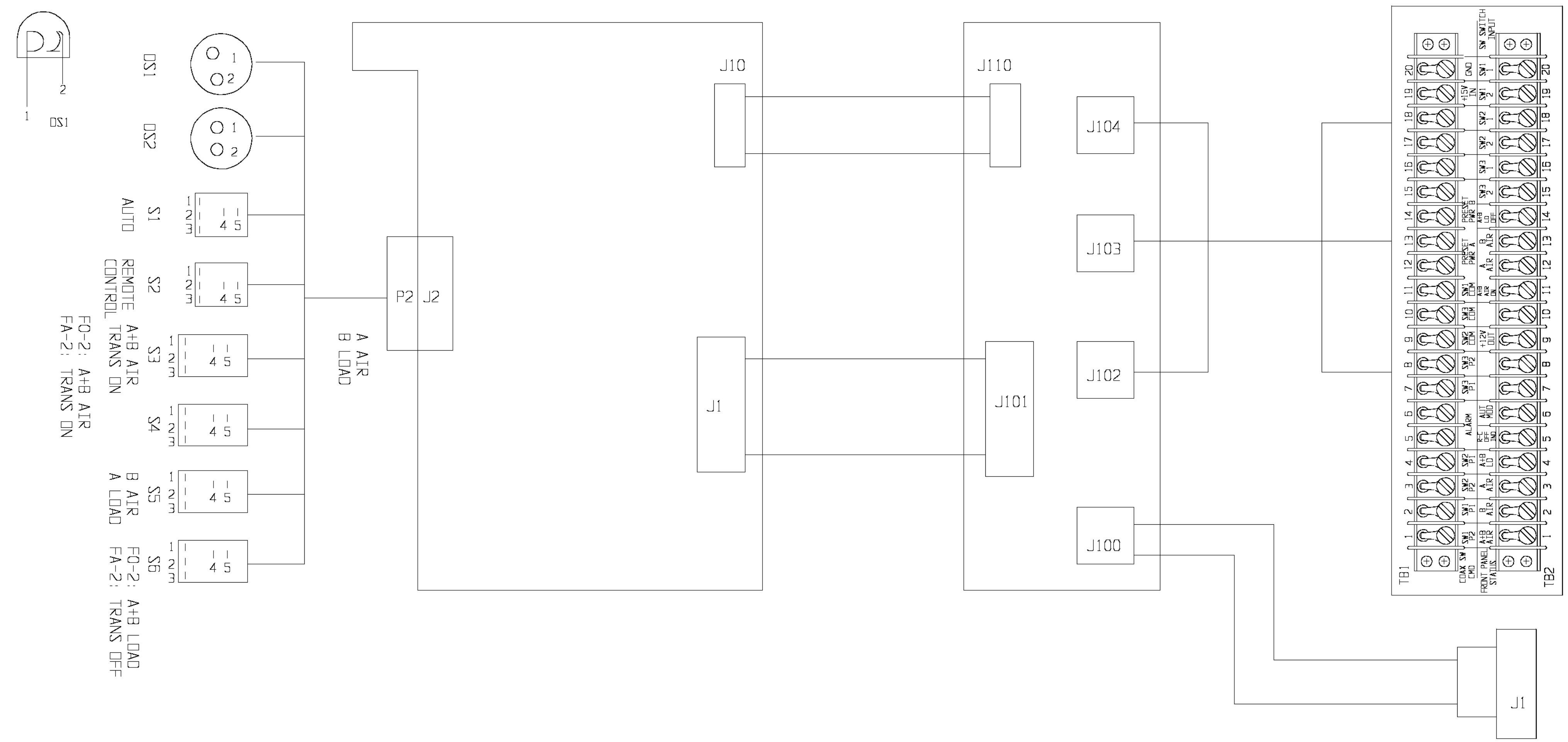
SECTION VII
DRAWINGS

7-1. INTRODUCTION.

7-2. This section provides assembly drawings, wiring diagrams, and schematic diagrams as listed below for the Broadcast Electronics FO-2 transmitter output switch controller.

FIGURE	TITLE	NUMBER
7-1	FA-2/FO-2 OVERALL SCHEMATIC DIAGRAM	SD909-0117, 909-0200
7-2	FO-2 ASSEMBLY DIAGRAM	AD909-0117-004
7-3	RELAY CIRCUIT BOARD SCHEMATIC DIAGRAM	SC919-0094
7-4	RELAY CIRCUIT BOARD ASSEMBLY DIAGRAM	AD919-0094
7-5	LOGIC OUTPUT SWITCHER SCHEMATIC DIAGRAM	SD919-0193-001/ -002
7-6	LOGIC OUTPUT SWITCHER ASSEMBLY DIAGRAM	AC919-0193-001/ -002
7-7	FO-2 REMOTE CONTROL WIRING DIAGRAM	597-0117-700

REVISIONS					
REV	DATE	DESCRIPTION	DFTSMN	ENGR	ECN



J1 ⟷ J101	
PIN #	DESCRIPTION
1	ALARM RELAY (K4)
2	TRANS A H.V. ON
3	TRANS B H.V. ON
4	TRANS A FIL OFF
5	TRANS B FIL OFF
6	TRANS A H.V. OFF
7	TRANS B H.V. OFF
8	MOTOR SWITCH RELAY (K5)
9	SWITCH 1 & 2 MOTOR DIRECTION RELAY (K6)
10	SWITCH 3 MOTOR DIRECTION RELAY (K7)
11	+15V DC
12	GND
13	GND
14	TRANS A SAMPLE V
15	TRANS B SAMPLE V
16	A+B LO (TRANS OFF)
17	B-AIR
18	A-AIR
19	A+B APC (TRANS ON)
20	R-C COMM
21	SW1-1
22	SW1-2
23	SW2-1
24	SW2-2
25	SW3-1
26	SW3-2

J100 ⟷ J1	
PIN #	DESCRIPTION
1	N.C.
2	N.C.
3	TRANS B FIL OFF
4	TRANS A FIL OFF
5	N.C.
6	N.C.
7	TRANS A H.V. OFF
8	TRANS B H.V. OFF
9	TRANS A H.V. ON
10	TRANS B H.V. ON
11	TRANS B POWER SAMPLE
12	GND
13	GND
14	+15V-ENABLE FOR DUAL XMTR CONTROLLER
15	+15V-ENABLE FOR DUAL XMTR CONTROLLER
16	+15V-ENABLE FOR DUAL XMTR CONTROLLER
17	+15V-ENABLE FOR DUAL XMTR CONTROLLER
18	+15V-ENABLE FOR DUAL XMTR CONTROLLER
19	+15V-ENABLE FOR DUAL XMTR CONTROLLER
20	+15V-ENABLE FOR DUAL XMTR CONTROLLER
21	+15V-ENABLE FOR DUAL XMTR CONTROLLER
22	+15V-ENABLE FOR DUAL XMTR CONTROLLER
23	+15V-ENABLE FOR DUAL XMTR CONTROLLER
24	TRANS A POWER SAMPLE
25	+15V SUPPLY VOLTAGE

J104 ⟷ REAR PANEL TERMINAL STRIP		
PIN #	TERMINAL	DESCRIPTION
1	PRESET A	SWITCH CONTROLS
2	SW3-2	SWITCH STATUS
3	+15V IN	
4	PRESET B	SWITCH CONTROLS
5	SW3-1	SWITCH STATUS
6	SW2-2	SWITCH STATUS
7	GND	
8	SW1-2	SWITCH STATUS
9	SW2-1	SWITCH STATUS
10	N.C.	
11	SW1-1	SWITCH STATUS
12	N.C.	

J102 ⟷ REAR PANEL TERMINAL STRIP		
PIN #	TERMINAL	DESCRIPTION
1	SW1 P2	SWITCH CONTROLS
2	A+B AIR	RC STATUS
3	A AIR	RC STATUS
4	SW1 P1	SWITCH CONTROLS
5	B AIR	RC STATUS
6	A+B LOAD	RC STATUS
7	SW2 P2	SWITCH CONTROLS
8	ALARM	
9	R-C OFF IND	RC STATUS
10	SW2 P1	SWITCH CONTROLS
11	ALARM	
12	AUTO MODE	RC STATUS

J103 ⟷ REAR PANEL TERMINAL STRIP		
PIN #	TERMINAL	DESCRIPTION
1	SW3-P2	SWITCH CONTROLS
2	SW3-P1	SWITCH CONTROLS
3	+12V OUT	REMOTE CONTROL
4	SW3 COM	SWITCH CONTROLS
5	SW2 COM	SWITCH CONTROLS
6	A+B AIR ON	REMOTE CONTROL
7	PRESET A	SWITCH CONTROLS
8	SW1 COM	SWITCH CONTROLS
9	A AIR	REMOTE CONTROL
10	PRESET A	SWITCH CONTROLS
11	A+B LOAD OFF	REMOTE CONTROL
12	B AIR	REMOTE CONTROL

SWITCH JUMPERS		
WIRE #	SWITCH	CONNECTION
17	S3-4 ⟷	S2-5
18	S3-2 ⟷	DS1-1
19	S5-4 ⟷	S4-2
20	S6-4 ⟷	S5-2
21	S4-4 ⟷	S3-2
22	S2-2 ⟷	S1-1
23	S2-5 ⟷	S1-3
----	DS2-1 ⟷	DS1-1
----	S6-2 ⟷	S6-4
----	S5-2 ⟷	S5-4
----	S4-2 ⟷	S4-4
----	S3-2 ⟷	S3-4
----	S1-3 ⟷	S1-4

P2 ⟷ FRONT PANEL COMPONENTS					
PIN #	TERMINAL	PIN #	TERMINAL	PIN #	TERMINAL
1	S1-2	10	S6-3	19	N.C.
2	S1-5	11	S5-3	20	N.C.
3	S6-5	12	S4-3	21	N.C.
4	S4-5	13	S3-3	22	N.C.
5	S5-5	14	DS2-2	23	N.C.
6	S3-5	15	DS1-2	24	N.C.
7	S2-4	16	S2-2	25	DS2-1
8	S2-3	17	N.C.		
9	S2-1	18	N.C.		

J10 ⟷ J110	
PIN #	DESCRIPTION
1	A+B AIR (TRANS ON)
2	B AIR
3	A AIR
4	A+B LOAD (TRANS OFF)
5	RMT CNT OFF
6	AUTO MODE
7	N.C.
8	N.C.
9	STATUS SUPPLY
10	STATUS SUPPLY
11	STATUS SUPPLY
12	STATUS SUPPLY
13	STATUS SUPPLY
14	STATUS SUPPLY
15	STATUS SUPPLY
16	STATUS SUPPLY

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

DWN. BY TLL 4-20-87	MATERIAL	
CHKD		
ME J.STEINKAMP 9-11-87	FINISH	
PROJ. ENGR. J. TUCKER 3-18-88	SEE DWG RA592-0000	
MFG.	NEXT ASSY.	

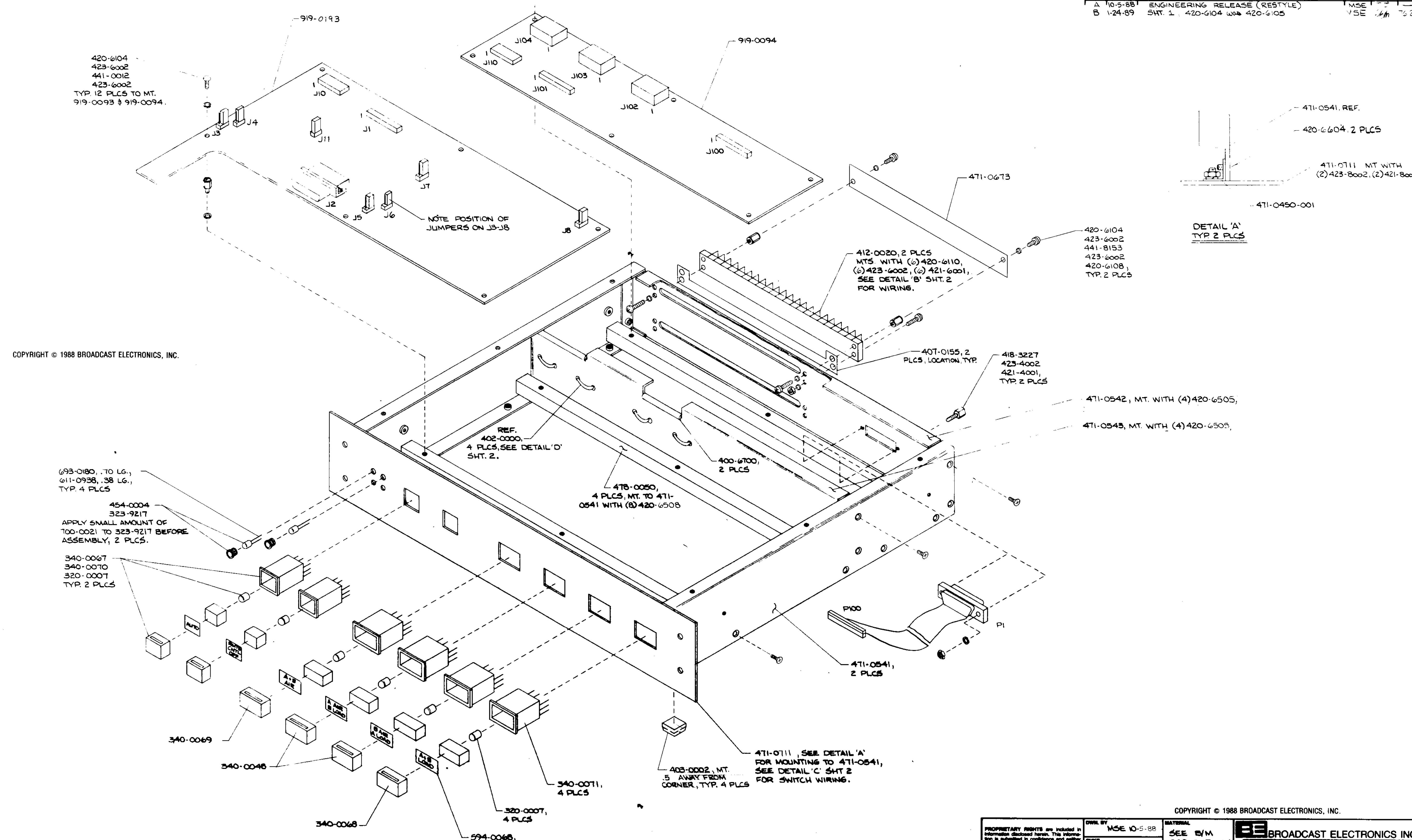
BROADCAST ELECTRONICS INC.
4100 N.24TH ST.,P.O.BOX 3606 QUINCY,IL 62305 217/224-9600
TELEX 250142 CABLE BROADCAST

TITLE FA-2/FO-2 OVERALL SCHEMATIC

TYPE	SIZE	DWG. NO.	REV
S	D	909-0117 & 909-0200	C

MODEL SCALE NONE SHEET 1 OF 1

REVISIONS					
REV	DATE	DESCRIPTION	DFTSMN	ENGR	ECN
A	10-5-88	ENGINEERING RELEASE (RESTYLE)	MSE		—
B	1-24-89	SHT. 1 . 420-6104 was 420-6105	MSE		762



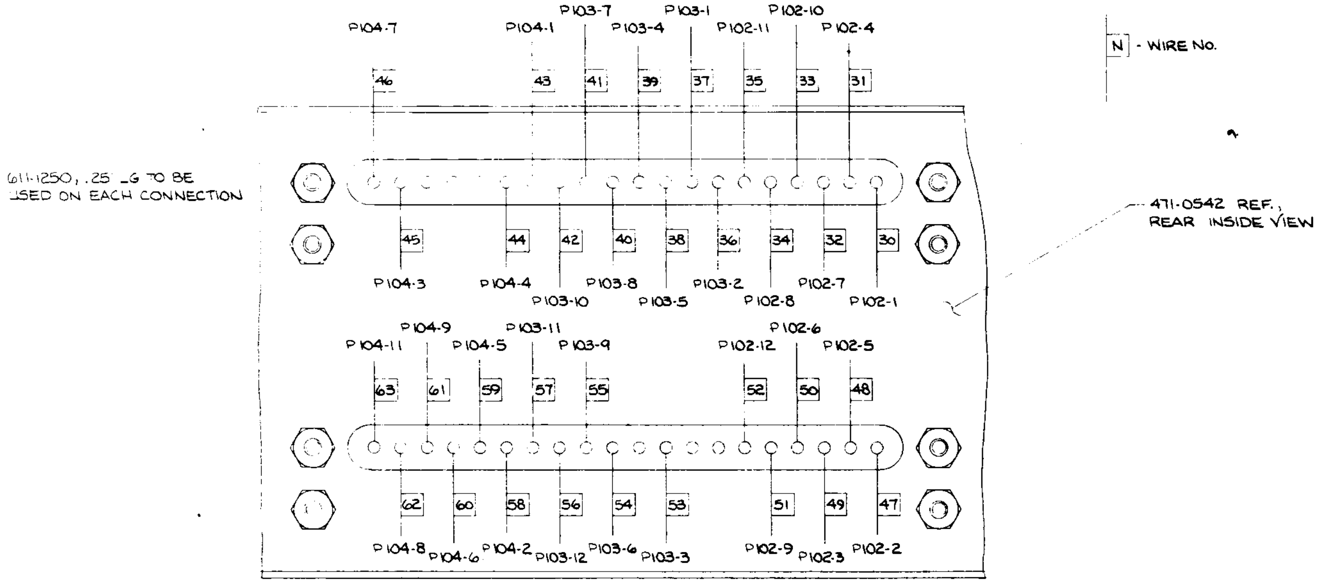
TOLERANCE (DECIMAL) U.O.S.
.x ± .030 .xxx ± .005
.xx ± .015 ANGLES ± 1°

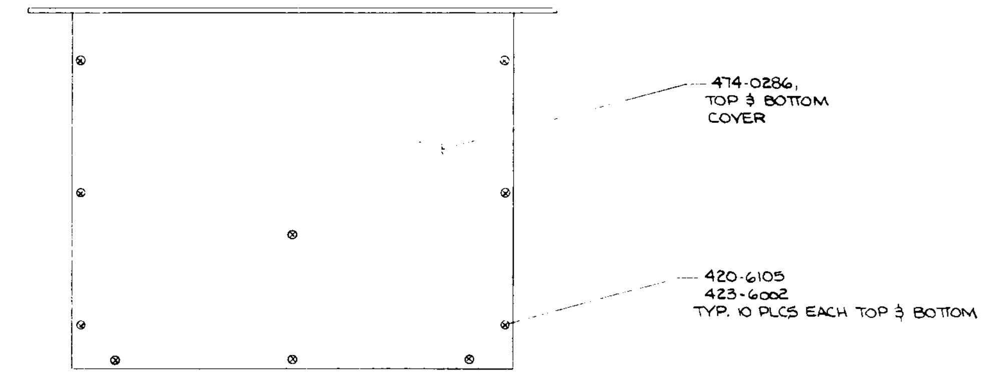
DWN. BY: MSE 10-5-88	MATERIAL: SEE B/M 909-0117-004	BROADCAST ELECTRONICS INC. 4100 N. 24TH ST., P.O. BOX 3606 QUINCY, IL 62305 217/224-9600 TELEX 250142 CABLE BROADCAST
CHKD: MH 11-3-88		
ME	FINISH	TITLE: ASSEMBLY, FO2 OUTPUT SWITCHER
PROJ. ENGR.: J. Tucker 11-1-88	SEE DWG RA000-0000	TYPE: A SIZE: D DWG. NO. 909-0117-004 REV: B
MFG.: 11-1-88	NEXT ASSY.	MODEL: FO2 SCALE: ~ SHEET 1 OF 2

REVISIONS

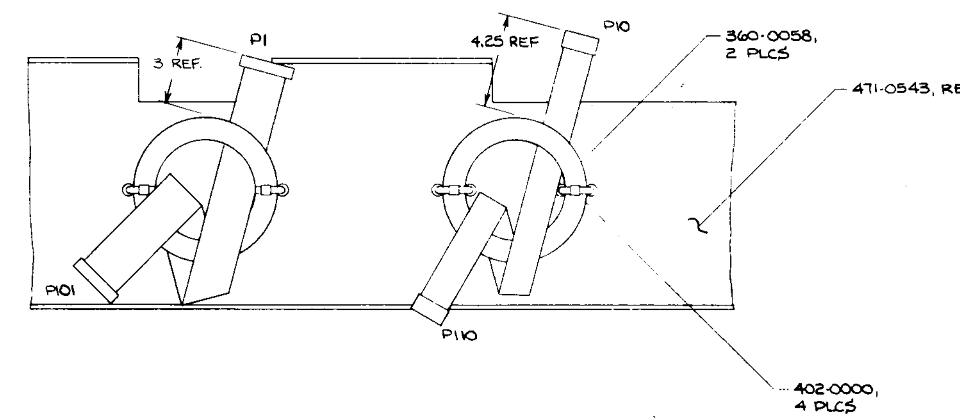
REV	DATE	DESCRIPTION	DFTSMN	ENGR	ECN
A	10-5-88	ENGINEERING RELEASE (RESTYLE)	MSE		—

DETAIL 'B'

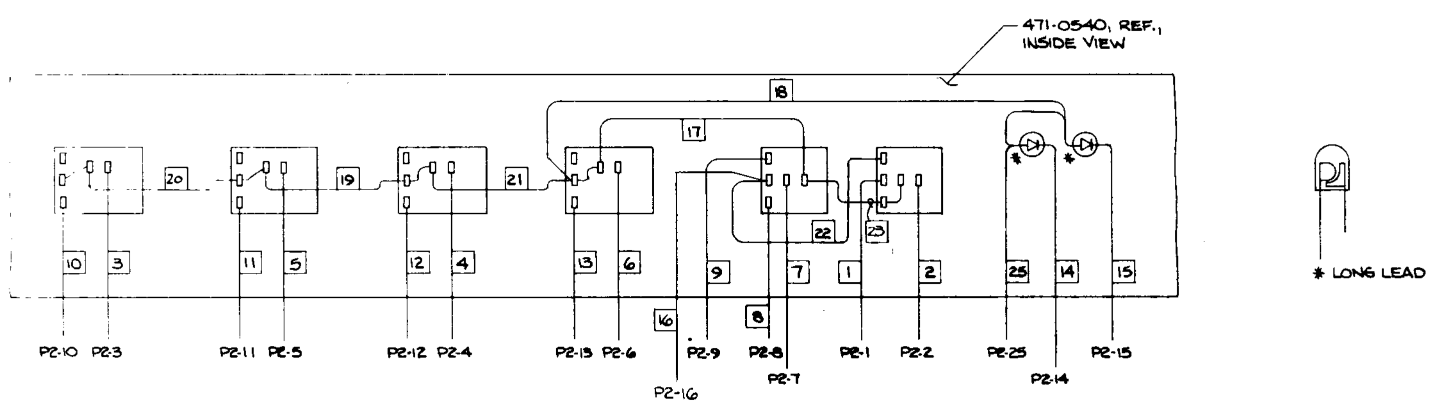




DETAIL 'D'



DETAIL 'C'



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

DWN. BY MSE 10-5-88
CHKD mH 11-3-88
ME
PROJ. ENGR. J. Tucker 11-1-88
MFG. 11-1-88

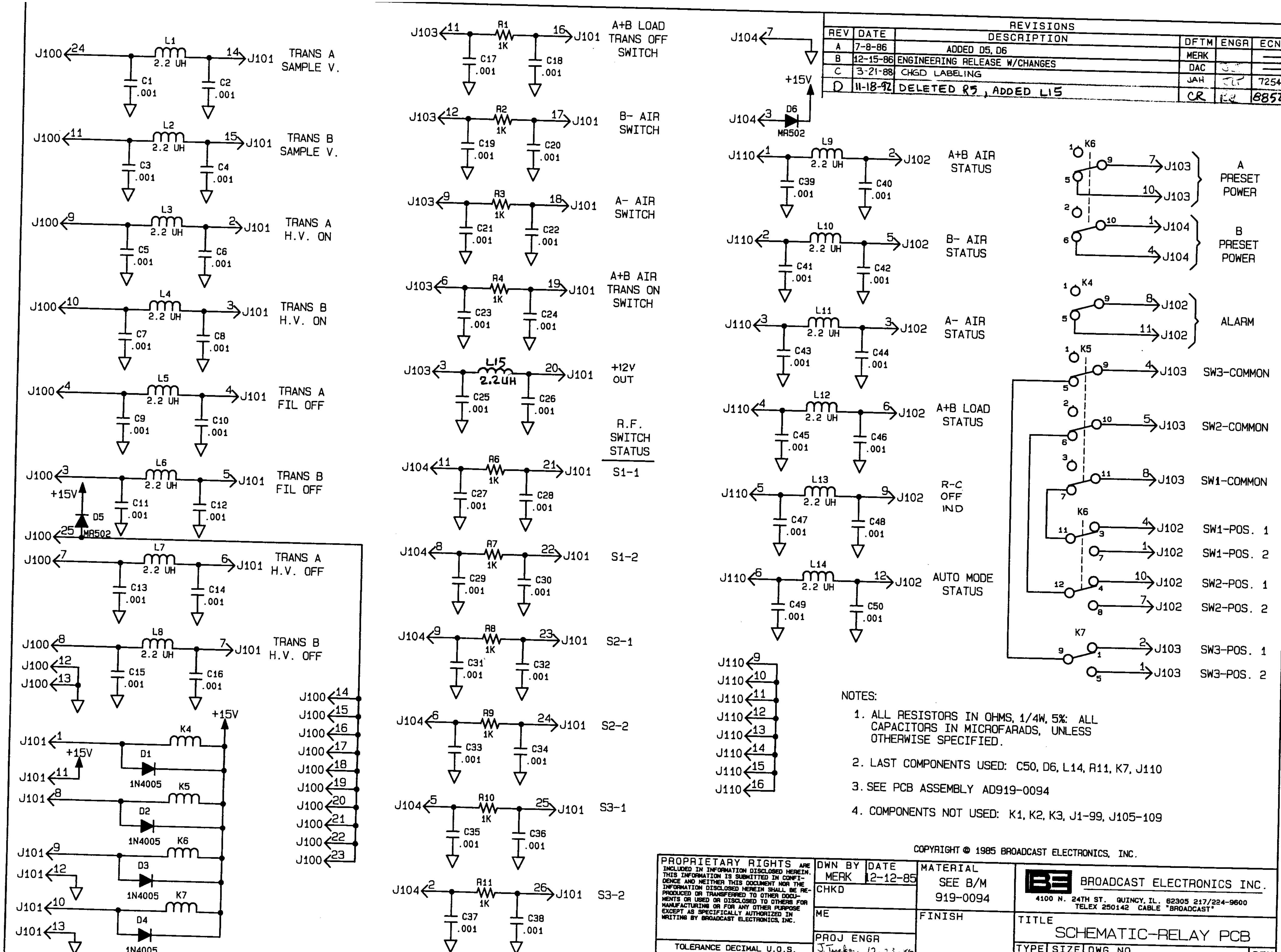
MATERIAL SEE B/M 909-0117-004
FINISH
SEE DWG RA882-0000
NEXT ASSY.

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

TITLE ASSEMBLY, FO2 OUTPUT SWITCHER

TYPE A | SIZE D | DWG. NO. 909-0117-004 | REV B

MODEL FO2 | SCALE ~ | SHEET 2 OF 2



REVISIONS				
REV	DATE	DESCRIPTION	DFTM	ENGR	ECN
A	7-8-86	ADDED D5, D6	MERK		
B	12-15-86	ENGINEERING RELEASE W/CHANGES	MERK		
C	3-21-88	CHGD LABELING	DAC		
D	11-18-92	DELETED R5, ADDED L15	JAH		7254
			CR		8852

NOTES:

1. ALL RESISTORS IN OHMS, 1/4W, 5%: ALL CAPACITORS IN MICROFARADS, UNLESS OTHERWISE SPECIFIED.
2. LAST COMPONENTS USED: C50, D6, L14, R11, K7, J110
3. SEE PCB ASSEMBLY AD919-0094
4. COMPONENTS NOT USED: K1, K2, K3, J1-99, J105-109

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

DWN BY MERK | DATE 12-12-85 | CHKD | ME | PROJ ENGR | MFG

MATERIAL SEE B/M 919-0094 | FINISH | NEXT ASSY

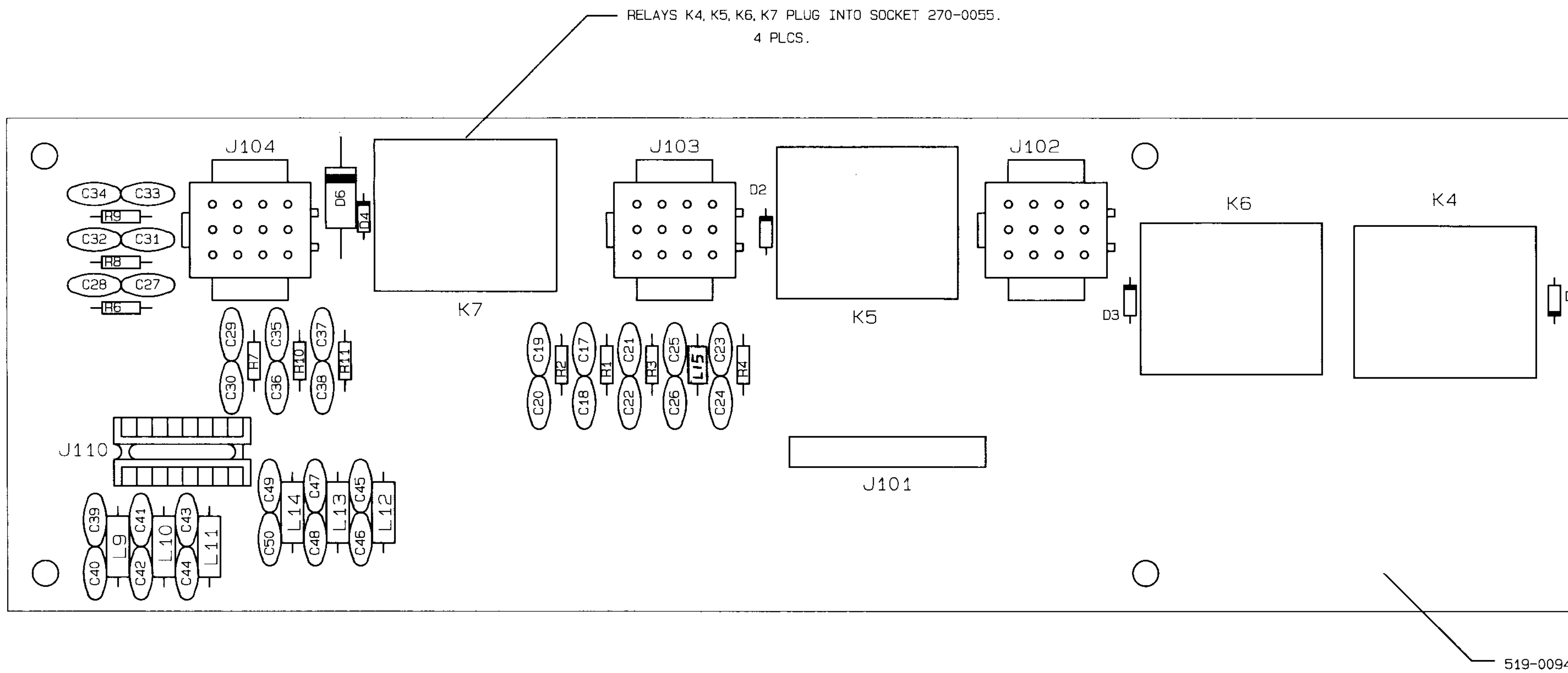
BROADCAST ELECTRONICS INC. 4100 N. 24TH ST. QUINCY, IL. 62305 217/224-9600 TELEX 250142 CABLE "BROADCAST"

TITLE SCHEMATIC-RELAY PCB

TYPE S | SIZE C | DWG.NO. 919-0094 | REV D

MODEL OUTPUT SWITCHER | SCALE NONE | SHEET 1 OF 1

REVISIONS					
REV	DATE	DESCRIPTION	DFTM	ENGR	ECN
A	7-9-86	ADDED D5, D6 REDRAWN	MERK		—
B	12-15-86	ENGINEERING RELEASE W/CHANGES	DAC	[illegible]	—
C	11-18-92	DELETED R5, ADDED L15	CR	[illegible]	8352



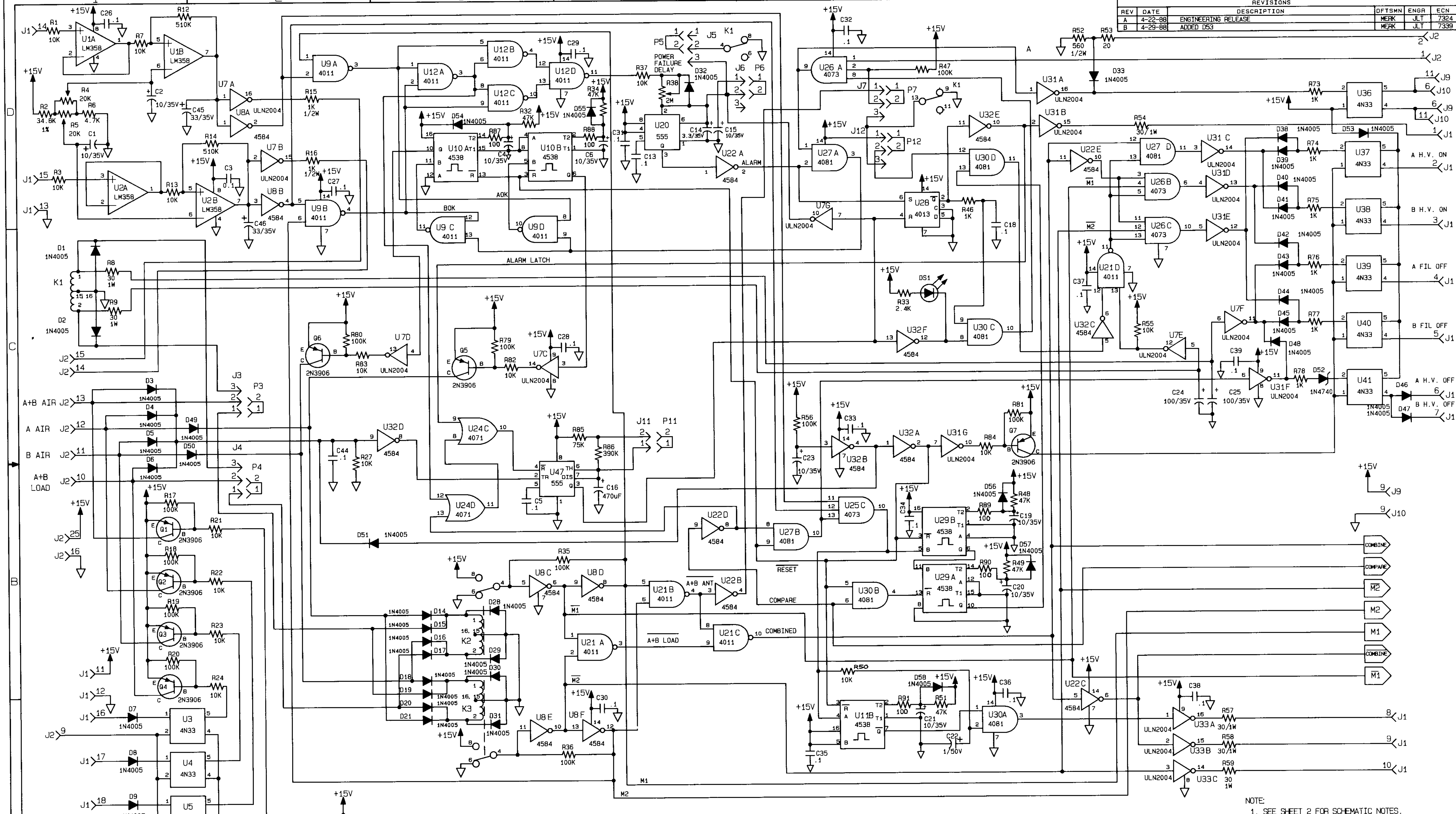
NOTE:
1. SEE SCHEMATIC SC919-0094.

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

DWN BY MERK	DATE 7-9-86	MATERIAL SEE B/M 919-0094	BROADCAST ELECTRONICS INC. 4100 N. 24TH ST. QUINCY, IL. 62305 217/224-9600 TELEX 250142 CABLE "BROADCAST"
CHKD			
ME		FINISH	TITLE PCB ASSEMBLY-RELAY BOARD
PROJ ENGR [illegible] -23-86			TYPE A SIZE D DWG.NO. 919-0094 REV C
MFG		NEXT ASSY	MODEL OUTPUT SWITCHER SCALE 2/1 SHEET 1 OF 1

REVISIONS

REV	DATE	DESCRIPTION	DFTSMN	ENGR	ECN
A	4-22-88	ENGINEERING RELEASE	MERK	JLT	7324
B	4-29-88	ADDED D53	MERK	JLT	7339



NOTE:
1. SEE SHEET 2 FOR SCHEMATIC NOTES.

REV	DATE	DESCRIPTION	DFTSMN	ENGR	ECN
G	10-8-92	Rev SHT 2 - ADDED 919-0193-002 SCHEMATIC	CR		8788A
F	3-28-90	R87 THRU R91 WERE 10K	RLC	JLT	8245
E	3-2-90	ADDED D54, D55, D56, D57, D58, J12 : USED GATES U32C, U30D ADDED R87-R91	ELP	JLT	8087
D	11-29-88	ADDED C45, C46	KLS	JLT	7591
C	7-27-88	ADDED C44	MERK	JLT	7435

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

DWN BY MERK 3-28-88
CHKD MH 4-22-88
ME
PROJ. ENGR. J. TUCKER 4-22-88
MFG. PR BROSE 4-22-88

MATERIAL SEE B/M 919-0193-001,002
FINISH
NEXT ASSY AC 919-0193-001,002

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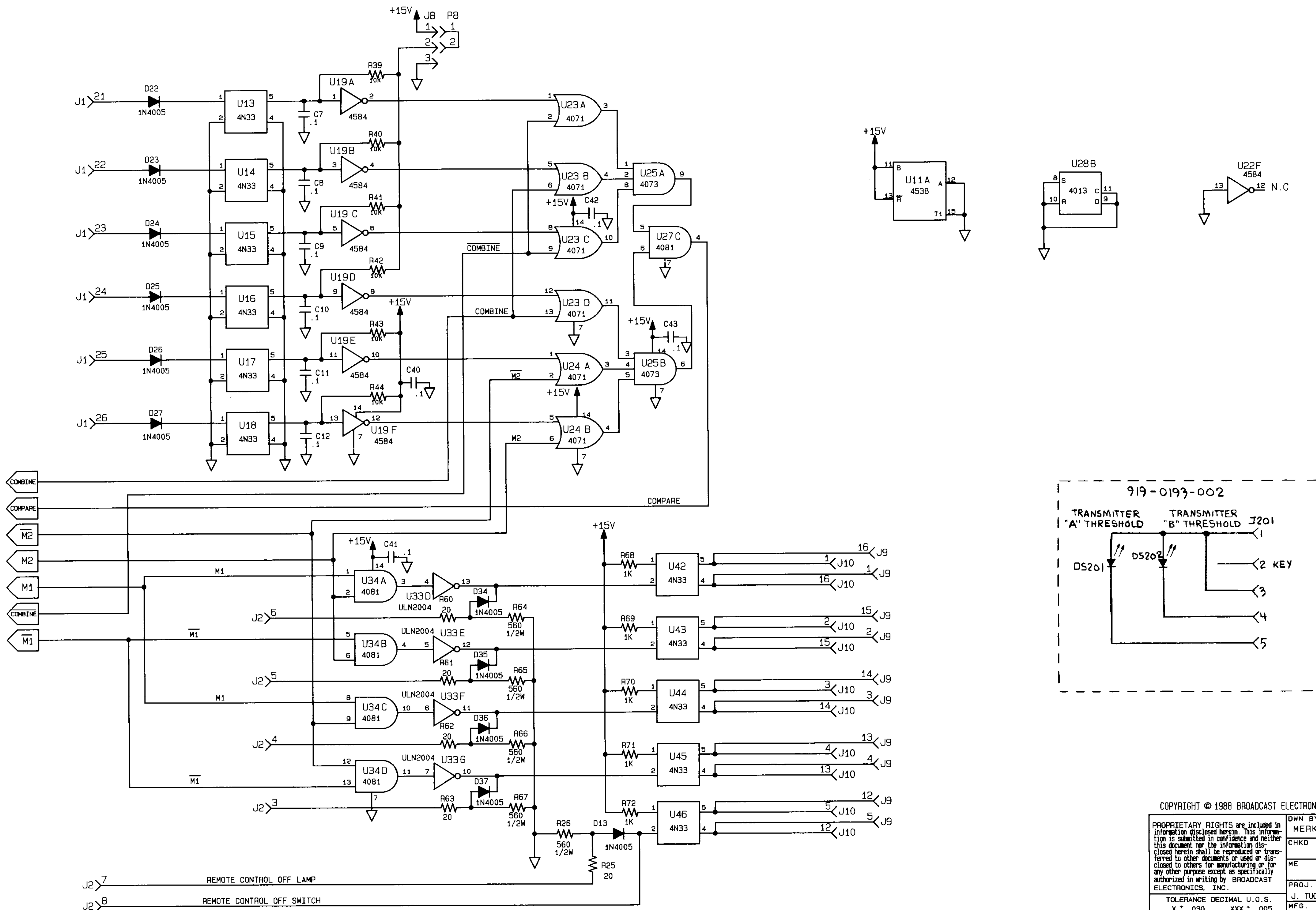
4100 N.24TH ST., P.O.BOX 3606 QUINCY, IL 62305 217/224-9600
TELEX 250142 CABLE BROADCAST FAX 217/224-9607

TITLE SCHEMATIC LOGIC OUTPUT SWITCHER

TYPE S | SIZE D | DWG.NO. 919-0193-001,002 | REV G
MODEL FA2, F02 | SCALE NONE | SHEET 1 OF 2

REV	DATE	DESCRIPTION	DFTSMN	ENGR	ECN
A	4-22-88	ENGINEERING RELEASE	MERK	JLT	7324
G	10-8-92	ADDED 919-0193-002 SCHEMATIC	CR	[illegible]	8788A



NOTES:

1. ALL RESISTORS IN OHMS, 1/4W, 5%; ALL CAPACITORS IN MICROFARADS, UNLESS OTHERWISE SPECIFIED.
2. LAST COMPONENTS USED: C46, D58, J12, K3, Q7, R91, U47, DS1
3. SEE PCB ASSEMBLY AC919-0193
4. COMPONENTS NOT USED: C17, R10-R11, R28-R31, R45

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

DWN BY	MERK 3-28-88
CHKD	
ME	
PROJ. ENGR.	J. TUCKER 4-22-88
MFG.	PR BROSE 4-22-88
MATERIAL	SEE B/M 919-0193-001,002
FINISH	
NEXT ASSY	AC919-0193-001,002

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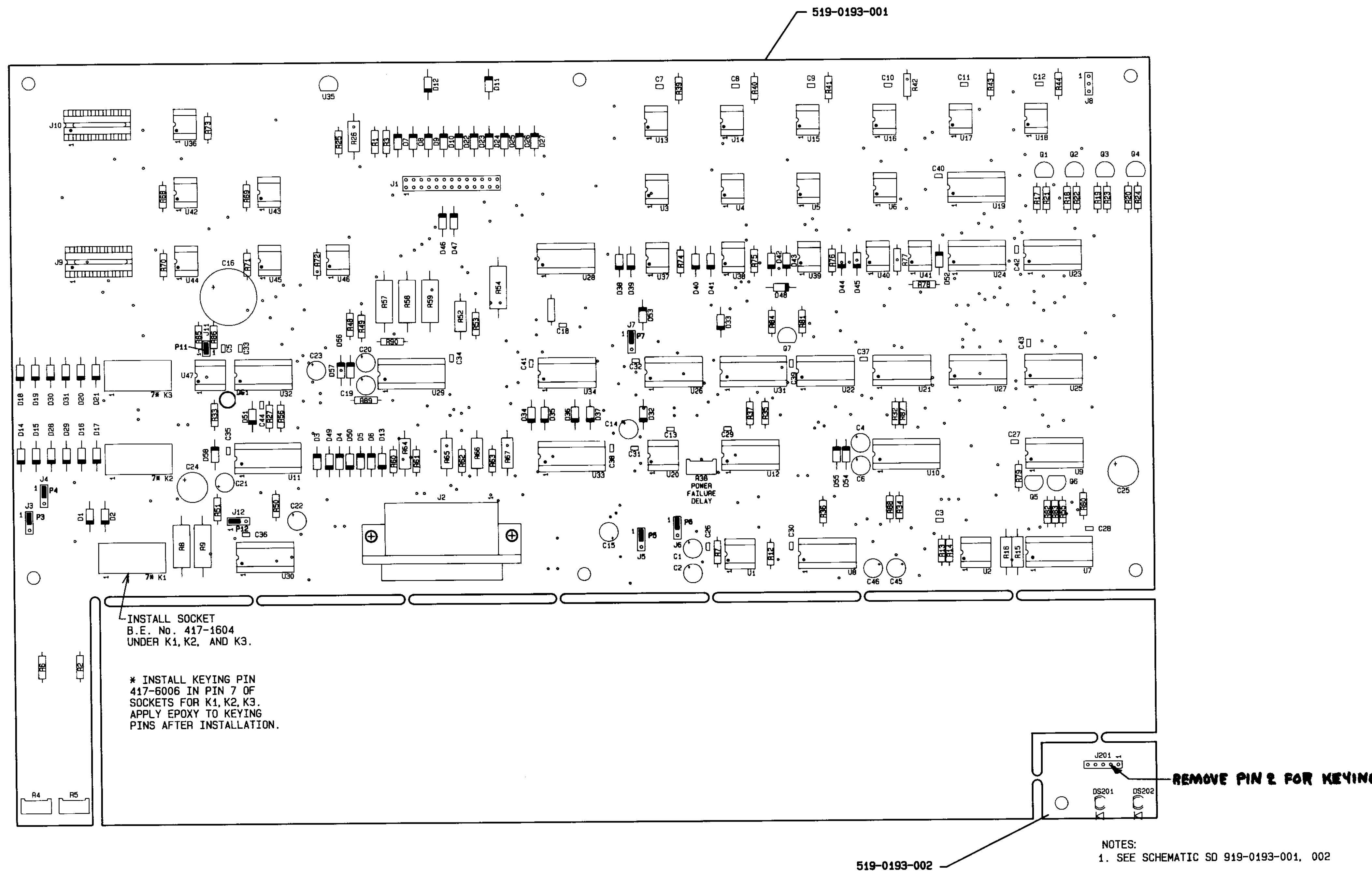
TITLE SCHEMATIC LOGIC OUTPUT SWITCHER

TYPE	SIZE	DWG. NO.	REV
S	D	919-0193-001,002	G

MODEL FA2, F02 SCALE NONE SHEET 2 OF 2

REVISIONS

REV	DATE	DESCRIPTION	DFTSMN	ENGR	ECN
A	10-6-92	ENGINEERING RELEASE	CR		8788
[illegible]	[illegible]	[illegible] TO NOTE	CR	[illegible]	[illegible]



NOTES:
1. SEE SCHEMATIC SD 919-0193-001, 002

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

DWN. BY	CR 10-6-92
CHKD	
ME	
PROJ. ENGR.	
MFG.	
MATERIAL	SEE B/M 919-0193-001, 002
FINISH	SEE DWG RA592-0000
NEXT ASSY.	

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TELEX 250142 CABLE BROADCAST FAX 217/224-9607

TITLE: PCB ASSEMBLY
LOGIC OUTPUT SWITCHER

TYPE	SIZE	DWG No.	REV
A	C	919-0193-001, 002	A

MODEL FA2, F02 SCALE 1/1 SHEET 1 OF 1

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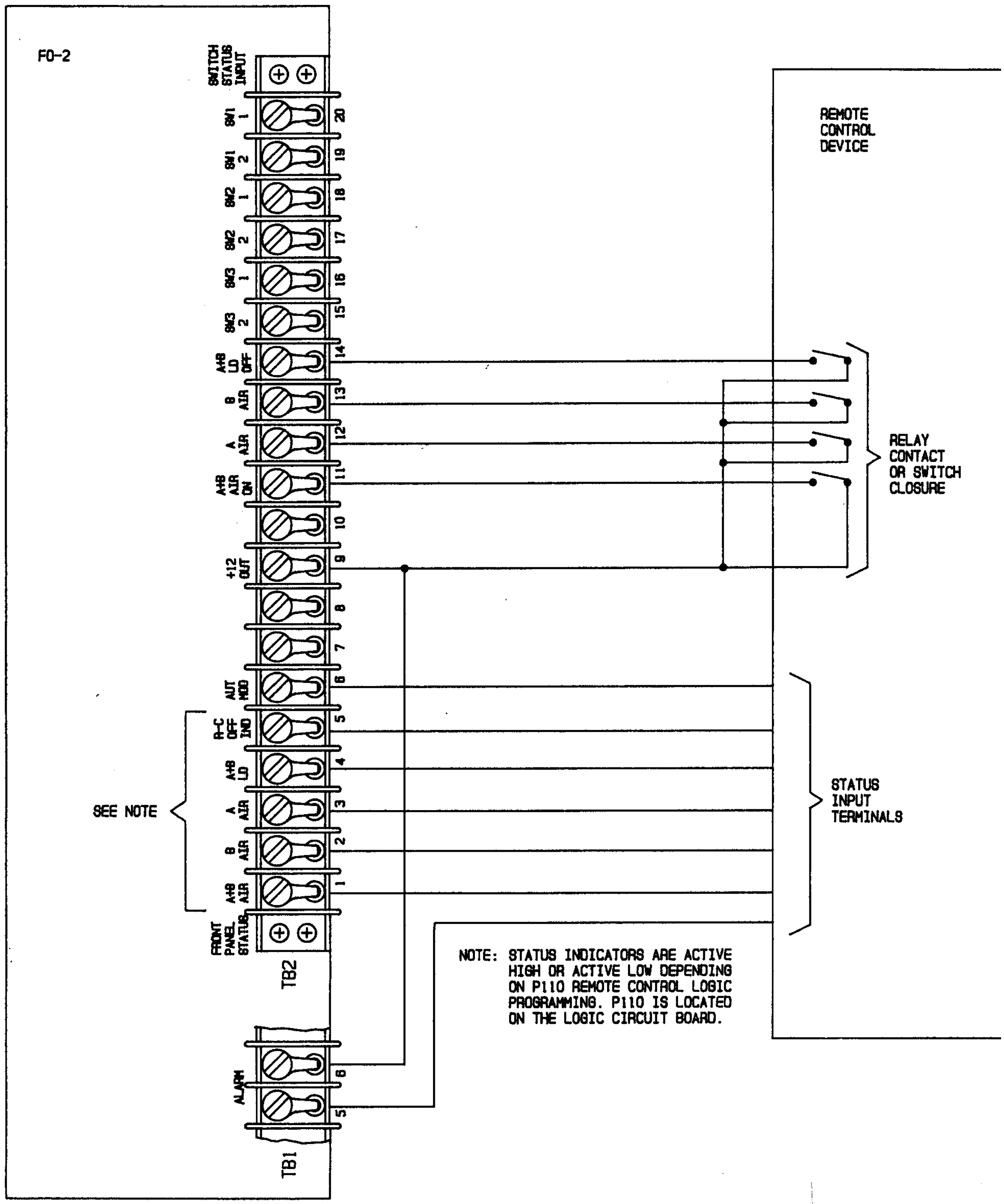


597-0117-700

FIGURE 7-7. FO-2 REMOTE CONTROL WIRING DIAGRAM

FW-30 AUTOMATIC EXCITER SWITCHER

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS

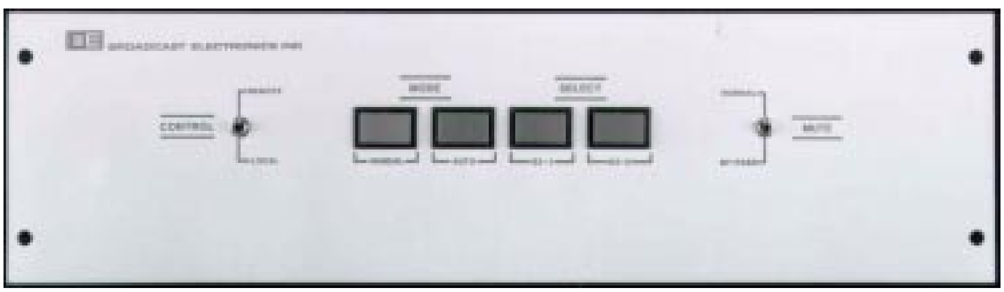
LIST OF TABLES

INSTRUCTION MANUAL

FW-30

AUTOMATIC EXCITER SWITCHER

The following information is only a brief description of the FW–30 automatic exciter switcher. Complete information is contained in FW–30 instruction manual 597–0101–004.



MODEL	PART NUMBER	DESCRIPTION
FW–30	909–0120–004	Exciter switcher for a main/alternate exciter system, rack mount, 120 or 240V ac, 50/60 Hz.
	979–0054	Recommended spare parts kit for the FW–30.

SECTION I
GENERAL INFORMATION

1-1. INTRODUCTION.

1-2. Information presented in this section provides a general description of the FW-30 automatic exciter switcher and lists equipment specifications.

1-3. EQUIPMENT DESCRIPTION.

1-4. The Broadcast Electronics FW-30 automatic exciter switcher is designed to provide maximum flexibility for a main/alternate exciter system. The FW-30 features adjustable switching threshold and delay circuitry, automatic or manual switching operation, remote control, and remote status indication circuitry. The FW-30 will monitor the on-air exciter and automatically initiate a switching sequence if a fault is detected.

1-5. The FW-30 also features an automatic battery back-up system to provide memory retention in the event of a power failure. The batteries are protected from damage due to excessive discharge by a special monitor circuit.

1-6. EQUIPMENT SPECIFICATIONS.

1-7. Refer to Table 1-1 for electrical, physical, and environmental specifications of the FW-30 exciter switcher.

TABLE 1-1. FW-30 ELECTRICAL, PHYSICAL, AND ENVIRONMENTAL SPECIFICATIONS (Sheet 1 of 2)

PARAMETER	SPECIFICATION
ELECTRICAL	
POWER REQUIREMENTS:	96V to 136V ac or 194V to 266V ac, 50/60 Hz.
REMOTE INPUTS	Negative or Positive Polarity, 5 to 28 volt ac or dc.
REMOTE OUTPUTS	Positive Logic.
INTERNAL MEMORY	Retains operational configuration during power failures with battery back-up system enabled.
EXCITER MUTING	Logic LOW required to mute. Logic HIGH required to enable (+15V in Broadcast Electronics transmitters).
TRANSFER TIME	Less than 1.0 second.
SWITCHING CAPABILITY	200 watts at 50 Ohms.
EXCITER TEST LOAD	30 Watt continuous, 50 Ohms ¿
MONITOR PORT	1.475V RMS at 50 Ohms with 30 Watts RF from exciter.

TABLE 1-1. FW-30 ELECTRICAL, PHYSICAL, AND ENVIRONMENTAL SPECIFICATIONS (Sheet 2 of 2)

PARAMETER	SPECIFICATION
PHYSICAL	
DIMENSIONS:	
WIDTH	19 Inches (48.26 cm).
DEPTH	15.25 Inches (38.74 cm).
HEIGHT	5.25 Inches (13.34 cm).
WEIGHT (PACKED)	25 Pounds (11.34 Kg).
ENVIRONMENTAL	
OPERATING TEMPERATURE RANGE	+32° F to +122° F (0° C to +50° C).
MAXIMUM HUMIDITY	95%, Non–condensing.
MAXIMUM ALTITUDE	15,000 Feet Above Sea Level (4572 Meters).

SECTION II
OPERATION

2-1. **INTRODUCTION.**

2-2. This section identifies all controls and indicators associated with the Broadcast Electronics FW-30 Automatic Exciter Switcher and provides standard procedures.

2-3. **CONTROLS AND INDICATORS.**

2-4. Refer to Figure 2-1 for the location of all controls and indicators associated with normal operation of the FW-30 exciter switcher. The function of each control or indicator is described in Table 2-1.

2-5. **OPERATION.**

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

2-6. **ENABLE SYSTEM.**

2-7. To enable the system, apply primary power to the FW-30 automatic exciter switcher. Energize the transmitter(s) and both exciters.

2-8. **MUTING.**

2-9. Operate the front-panel **MUTE** switch to the NORMAL position to disable the exciters during a switching operation. The BY-PASS position enables the RF output of both exciters for testing purposes.

2-10. **BATTERY.**

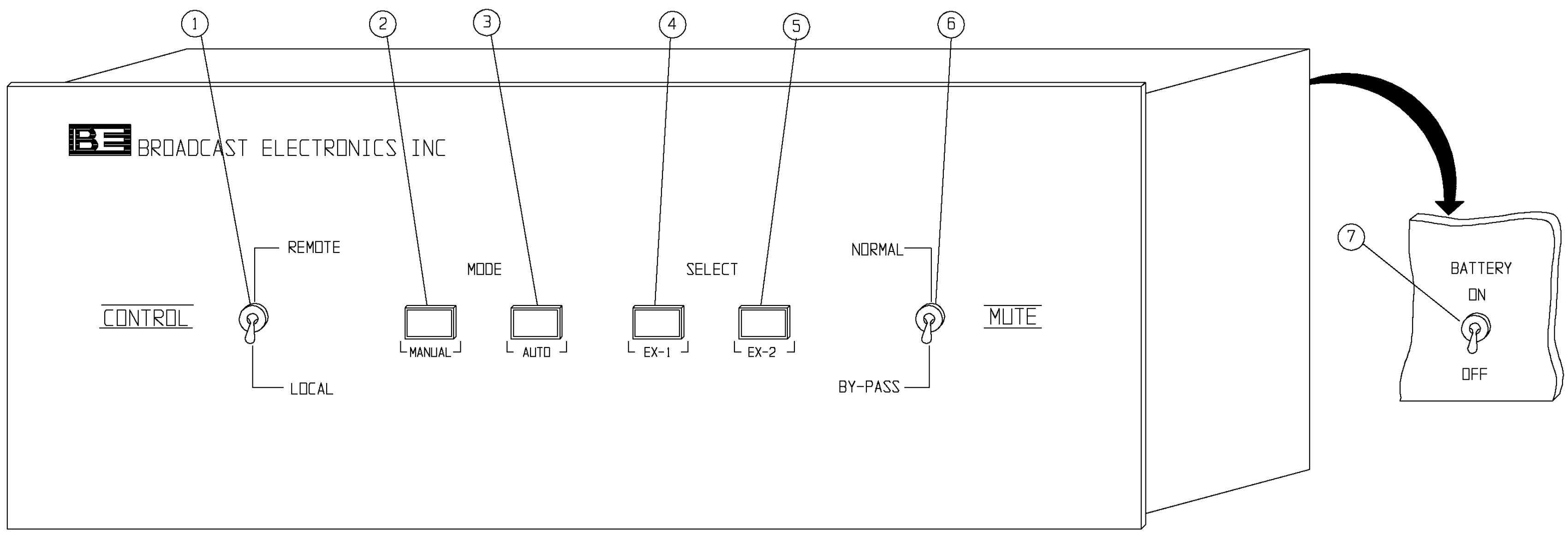
2-11. Operate the rear-panel **BATTERY ON/OFF** switch to ON if battery back-up system operation is desired during a power failure. With the switch in the ON position, the batteries are continuously charged during normal operation.

2-12. **MODE SELECTION.**

2-13. If automatic switching is desired in the event of a failure, depress the front-panel **AUTO MODE** switch/indicator. In the automatic mode, manual operation of the switcher is also allowed. If only manual switching is desired when a fault occurs, depress the front-panel **MANUAL MODE** switch/indicator. The appropriate switch/indicator will illuminate when depressed.

2-14. **EXCITER SELECTION.**

2-15. To select exciter 1 as the operational unit, depress the front-panel **EX-1 SELECT** switch/indicator. To select exciter 2 as the active unit, depress the **EX-2 SELECT** switch/indicator. The appropriate switch/indicator will illuminate when depressed.



597-0101-2

FIGURE 2-1. FW-30 CONTROLS AND INDICATORS

TABLE 2-1. AUTOMATIC EXCITER SWITCHER CONTROLS AND INDICATORS

INDEX NO.	NOMENCLATURE	FUNCTION
1	**REMOTE/LOCAL CONTROL** Switch	Remote and local control is enabled when operated to REMOTE. Local control only is enabled when operated to LOCAL.
2	**MANUAL MODE** Switch/Indicator	SWITCH: Disables automatic switching circuitry. Allows only manual switching operation. INDICATOR: Indicates exciter switcher is in the manual mode when illuminated.
3	**AUTO MODE** Switch/Indicator	SWITCH: Enables automatic switching circuitry. Allows automatic and manual switching operation. INDICATOR: Indicates exciter switcher is in the automatic mode when illuminated.
4	**EX-1 SELECT** Switch/Indicator	SWITCH: Selects exciter No. 1 for on–air operation when depressed. INDICATOR: Indicates exciter No. 1 is selected when illuminated.
5	**EX-2 SELECT** Switch/Indicator	SWITCH: Selects exciter No. 2 for on–air operation when depressed. INDICATOR: Indicates exciter No. 2 is selected when illuminated.
6	**NORMAL/BY-PASS MUTE** Switch	Allows normal exciter muting (on–air exciter is operational; standby exciter is muted) when operated to NORMAL. When operated to BY–PASS, neither exciter is muted. Intended for exciter testing.
7	**BATTERY ON/OFF** Switch	Controls the battery back–up and charging system. The batteries are charged when the switch is in the ON position.

2–16. LOCAL/REMOTE OPERATION.

2–17. If external control of the exciter switcher is desired, operate the front–panel **LOCAL/REMOTE** switch to REMOTE. When the switch is in the remote position, both external and local control of the switcher is allowed. If only local control is desired, operate the **REMOTE/LOCAL** switch to LOCAL.

2–18. DISABLE SYSTEM.

2–19. The design of the automatic exciter switcher assumes that primary power will be applied continuously at all times. To disable the system, de–energize the transmitter(s) and both exciters.

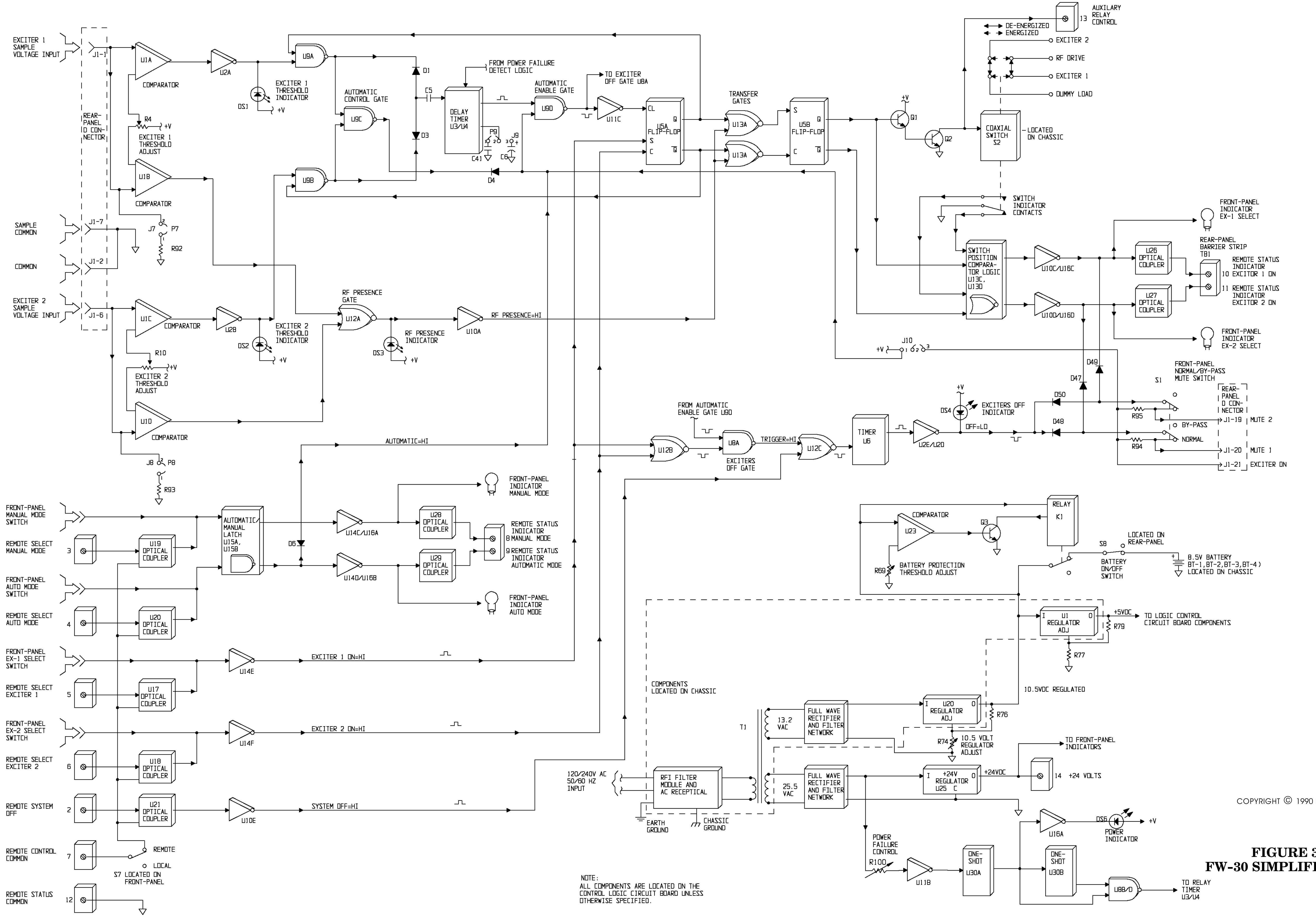
2–20. If ac power must be removed from the automatic exciter switcher, operate the rear–panel **BATTERY ON/OFF** switch to OFF.

SECTION III
DRAWINGS

3-1. INTRODUCTION.

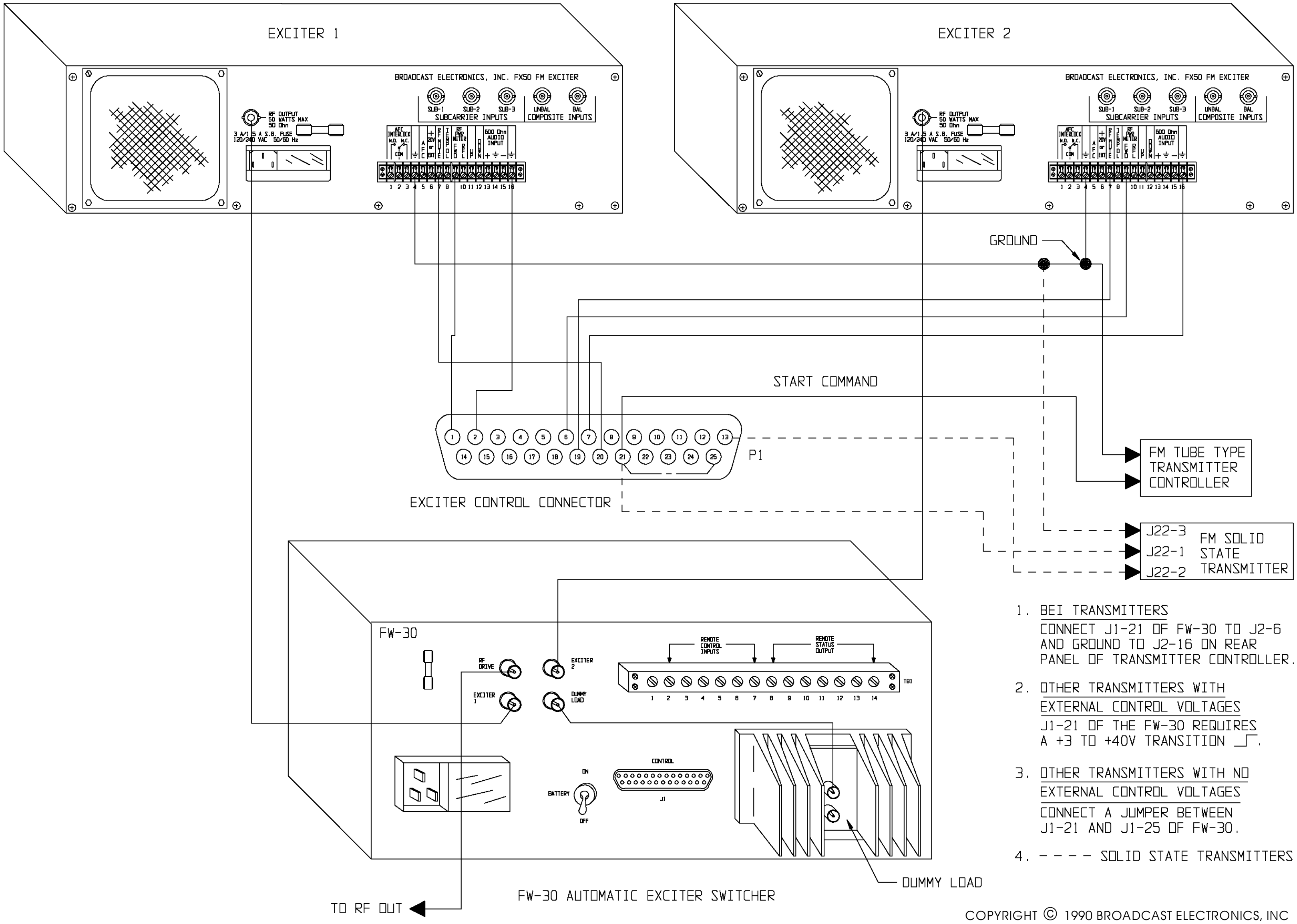
3-2. This section provides schematic diagrams and installation diagrams as indexed below for the FW-30 automatic exciter switcher.

FIGURE	TITLE	DRAWING NO.
3-1	FW-30 SIMPLIFIED SCHEMATIC	597-0101-3
3-2	FW-30 INTERFACE WIRING DIAGRAM	597-0101-1
3-3	AUTOMATIC EXCITER SWITCHER OVERALL SCHEMATIC DIAGRAM	SD909-0120



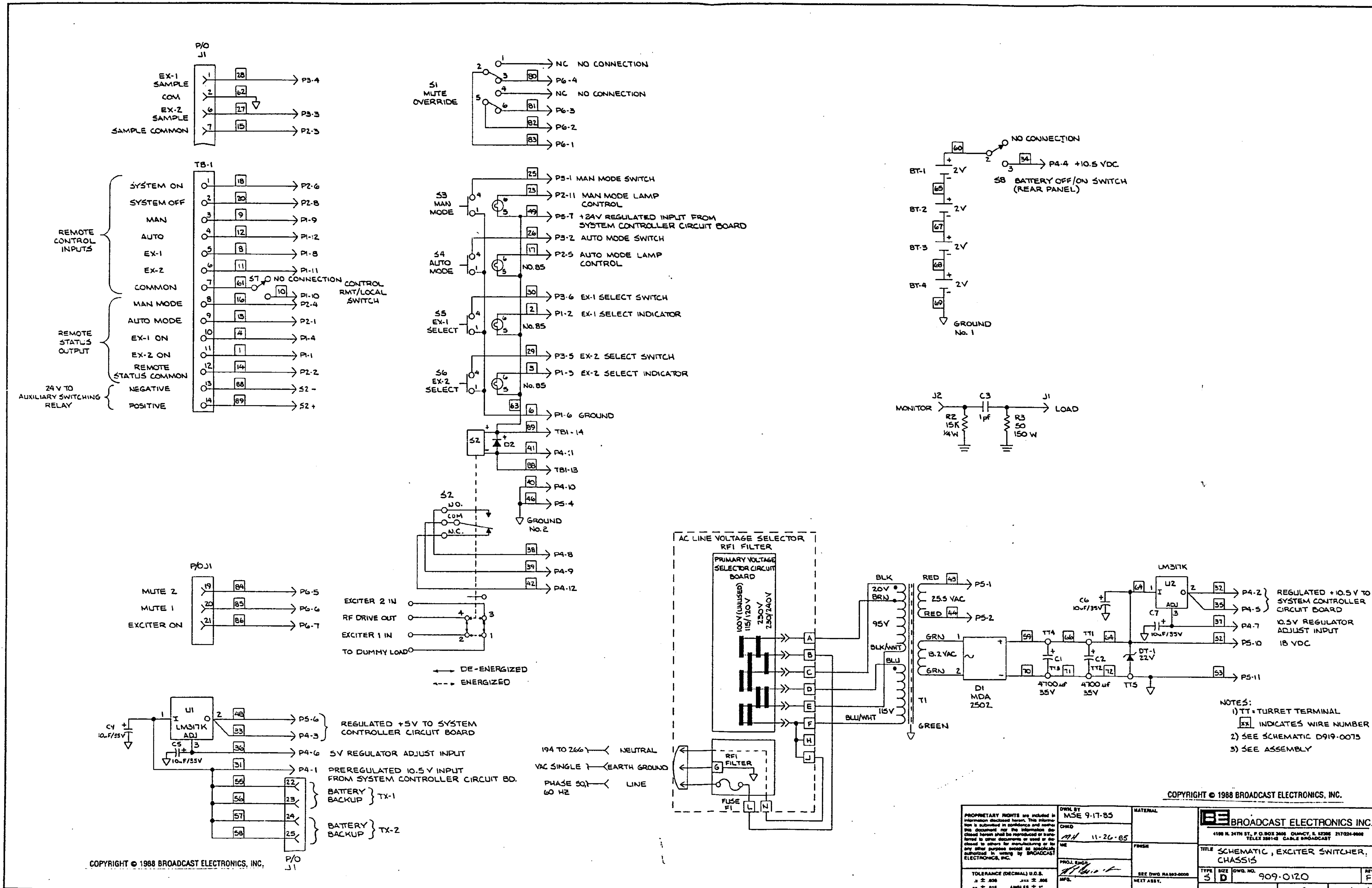
597-0101-3

FIGURE 3-1. FW-30 SIMPLIFIED SCHEMATIC



597-0101-1

FIGURE 3-2. FW-30 INTERFACING


P/O J1
EX-1 SAMPLE
COM
EX-2 SAMPLE
SAMPLE COMMON
P3-4
P3-3
P2-3
TB-1
REMOTE CONTROL INPUTS
SYSTEM ON
SYSTEM OFF
MAN
AUTO
EX-1
EX-2
COMMON
REMOTE STATUS OUTPUT
MAN MODE
AUTO MODE
EX-1 ON
EX-2 ON
REMOTE STATUS COMMON
24 V TO AUXILIARY SWITCHING RELAY
NEGATIVE
POSITIVE
P2-6
P2-8
P1-9
P1-12
P1-8
P1-11
S7 NO CONNECTION
CONTROL RMT/LOCAL SWITCH
P1-10
P2-4
P2-1
P1-4
P1-1
P2-2
S2 -
S2 +
S1 MUTE OVERRIDE
NC NO CONNECTION
P6-4
NC NO CONNECTION
P6-3
P6-2
P6-1
S3 MAN MODE
S4 AUTO MODE
S5 EX-1 SELECT
S6 EX-2 SELECT
P3-1 MAN MODE SWITCH
P2-11 MAN MODE LAMP CONTROL
P5-7 +24V REGULATED INPUT FROM SYSTEM CONTROLLER CIRCUIT BOARD
P3-2 AUTO MODE SWITCH
P2-5 AUTO MODE LAMP CONTROL
NO.85
P3-6 EX-1 SELECT SWITCH
P1-2 EX-1 SELECT INDICATOR
P3-5 EX-2 SELECT SWITCH
P1-3 EX-2 SELECT INDICATOR
P1-6 GROUND
TB1-14
D2
P4-11
TB1-13
P4-10
P5-4
GROUND No. 2
S2
N.O.
COM
N.C.
P4-8
P4-9
P4-12
P/O J1
MUTE 2
MUTE 1
EXCITER ON
P6-5
P6-6
P6-7
EXCITER 2 IN
RF DRIVE OUT
EXCITER 1 IN
TO DUMMY LOAD
DE-ENERGIZED
ENERGIZED
U1 LM317K ADJ
C4 10µF/35V
C5 10µF/35V
P5-6
P4-3
REGULATED +5V TO SYSTEM CONTROLLER CIRCUIT BOARD
P4-6 5V REGULATOR ADJUST INPUT
P4-1 PREREGULATED 10.5 V INPUT FROM SYSTEM CONTROLLER CIRCUIT BD.
BATTERY BACKUP TX-1
BATTERY BACKUP TX-2
P/O J1
COPYRIGHT © 1988 BROADCAST ELECTRONICS, INC.
NO CONNECTION
BT-1 2V
BT-2 2V
BT-3 2V
BT-4 2V
P4-4 +10.5 VDC
S8 BATTERY OFF/ON SWITCH (REAR PANEL)
GROUND No. 1
J2 MONITOR
C3 1pf
J1 LOAD
R2 15K 1/4W
R3 50 150 W
AC LINE VOLTAGE SELECTOR RFI FILTER
PRIMARY VOLTAGE SELECTOR CIRCUIT BOARD
100V (UNUSED)
115/120V
230V
230/240V
194 TO 266 VAC SINGLE PHASE 50/60 HZ
NEUTRAL
EARTH GROUND
LINE
RFI FILTER
FUSE F1
BLK
20V
BRN
95V
BLK/WHT
BLU
115V
BLU/WHT
T1
GREEN
RED P5-1
25.5 VAC
RED P5-2
GRN
8.2 VAC
GRN
D1 MDA 2502
TT4
TT1
C1 4700 µf 35V
C2 4700 µf 35V
TT5
DT-1 22V
C6 10µF/35V
C7 10µF/35V
LM317K U2 ADJ
P4-2
P4-5
REGULATED +10.5 V TO SYSTEM CONTROLLER CIRCUIT BOARD
P4-7 10.5V REGULATOR ADJUST INPUT
P5-10 18 VDC
P5-11
NOTES:
1) TT = TURRET TERMINAL
XX INDICATES WIRE NUMBER
2) SEE SCHEMATIC D919-0073
3) SEE ASSEMBLY
COPYRIGHT © 1988 BROADCAST ELECTRONICS, INC.
DWN. BY MSE 9-17-85
CHKD 11-26-85
BROADCAST ELECTRONICS INC.
TITLE SCHEMATIC, EXCITER SWITCHER, CHASSIS
TYPE S SIZE D DWG. NO. 909-0120 REV F
SHEET 1 OF 1