FM–30 GRID CIRCUIT RETROFIT KIT

April, 1997 **IM No. 597–0135**

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.

FM-30 GRID CIRCUIT RETROFIT KIT
597-0135

1-1. INTRODUCTION.

1-2. This instruction manual provides the information required to install a retrofit grid circuit in an FM-30 transmitter.

1-3. FM-30 IPA RETROFIT KIT.

1-4. The FM-30 transmitter can also be installed with a new modular solid-state IPA unit. The new IPA unit is designed to replace the five modules contained in the original FM-30 design. Information on the installation of a new IPA unit is presented in IPA RETROFIT manual 597-0154. If the transmitter is to be installed with a new IPA unit, perform the following grid circuit retrofit procedures prior to installing the new IPA unit.

1-5. UNPACKING.

1-6. The equipment becomes the property of the customer when the equipment is delivered to the carrier. Carefully unpack the retrofit kit 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.

1-7. 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.

1-8. SAFETY CONSIDERATIONS.

WARNING

WARNING

WARNING

WARNING

NEVER OPEN THE EQUIPMENT UNLESS ALL TRANSMITTER PRIMARY POWER IS DISCONNECTED. USE THE GROUNDING STICK PROVIDED TO ENSURE ALL COMPONENTS ARE DISCHARGED BEFORE ATTEMPTING MAINTENANCE ON ANY AREA WITHIN THE TRANSMITTER.

1-9. The FM-30 transmitter contains high voltages and currents which if regarded carelessly, could be fatal. Refer to SAFETY CONSIDERATIONS in the transmitter instruction manual and review the transmitter safety procedures. Do not perform any maintenance procedures inside the transmitter with power energized.

1-10. INSTALLATION.

1-11. This instruction manual presents the procedures to install a retrofit grid circuit in an FM-30 transmitter. The grid is tested and inspected at the required frequency and is ready for installation when received. Installation is accomplished by completing the following procedures. The installation of the grid circuit and the exciter RF amplifier assembly requires approximately 10 hours to complete.

1. Removing the grid circuit.
2. Installing the new grid circuit.
3. Installing the new exciter RF amplifier assembly.
4. Initial transmitter operation.

1-12. REMOVING THE GRID CIRCUIT.

1-13. The following text presents the procedure to remove the grid circuit from the transmitter power amplifier cabinet. To remove the grid circuit, proceed as follows:

WARNING

DISCONNECT ALL TRANSMITTER PRIMARY POWER BEFORE PROCEEDING.

WARNING

1. Disconnect all transmitter primary power before proceeding.
2. Ensure all components in the power amplifier cabinet are at ground potential as follows:
   A. Open the power amplifier cabinet rear-door and use the grounding stick to touch each component to ensure the components are at ground potential.
   B. Open the PA cavity access door and use the grounding stick to touch each component to ensure the components in the cavity are at ground potential.
3. Remove the tube from the grid circuit.
4. On the grid circuit bottom-panel, disconnect and label the following wires:
   A. Filament wire 52 and 53.
   B. Filament ground wire 97.
   C. Screen wire 76.
   D. Grid bias wire 89.
5. Remove the air switch connected to the grid circuit bottom panel.
6. Disconnect the air duct hose from the air inlet.
7. Disconnect the air hose from the grid circuit side-panel.
8. Remove the input tuning control drive shaft and U-joint connected to the control drive housing. Repeat the procedure for the input loading control.
9. Remove the air filter housing as follows:
   A. Remove the two bolts securing the air filter housing mounting bar to the cabinet rails.
   B. Remove the air filter.
   C. Remove the three screws located at the bottom of the air filter housing.
   D. Loosen the hose clamp attached to the air filter housing and remove the air hose.
   E. Remove the air filter housing from the rack assembly.

10. From inside the power amplifier cavity, remove the 18 screws securing the grid circuit to the flange on the RF enclosure.
11. Slide the grid circuit down and out of the RF enclosure and remove from the rear of the power amplifier cabinet.
12. Remove the copper angle brackets from the filament terminals. The brackets will be installed on the new grid circuit.

1-14. INSTALLING THE NEW GRID CIRCUIT.

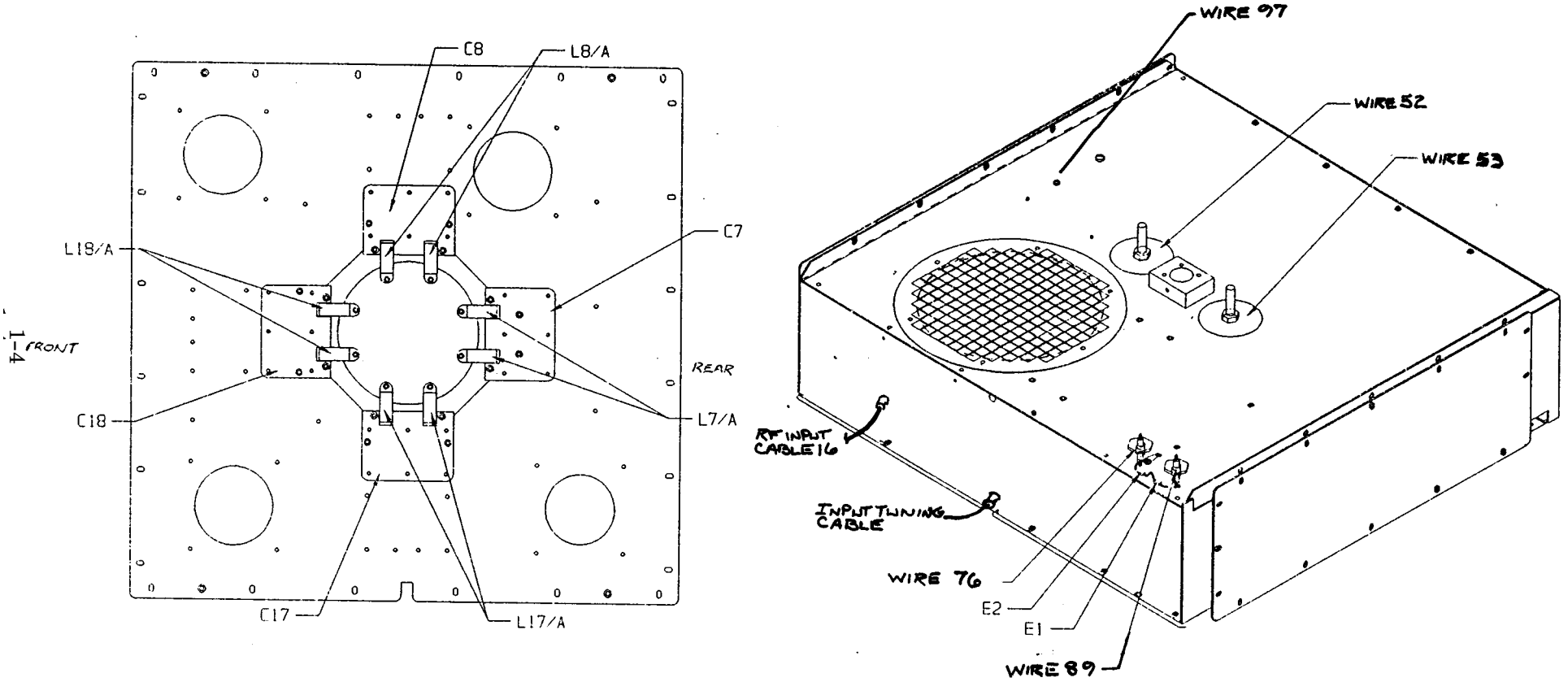
1-15. The following text presents the procedure to install the new grid circuit in the transmitter power amplifier cabinet. To install the grid circuit, proceed as follows:

WARNING

DISCONNECT ALL TRANSMITTER PRIMARY POWER BEFORE PROCEEDING.

WARNING

1. Disconnect all transmitter primary power before proceeding.
2. Use the grounding stick to ensure all components in the cavity are at ground potential before proceeding.
3. Locate the new grid circuit and remove the 18 screws located around the perimeter of the grid circuit.
4. Connect the copper angle brackets removed from the old grid circuit filament terminals to the filament terminals on the new grid circuit.
5. Refer to Figure 1 and orient the grid circuit as shown. From the rear of the power amplifier cabinet, slide the grid circuit into the bottom of the RF enclosure. From inside the RF cavity, install two screws to secure the grid circuit to the flange in the RF enclosure.
6. From inside the RF cavity, install the remaining screws into the grid circuit.
7. Re-mount the air switch to the grid circuit bottom panel. The air switch mounts in the same location as assembled in the previous grid circuit.
8. Locate and install the tuning cable as follows:
   A. Connect one end of the tuning cable to the input tuning control.
   B. Refer to Figure 1 and connect the opposite end of the cable to the tuning control shaft on the grid circuit.
9. Refer to Figure 1 and install the grid circuit wiring as follows:
   A. Install grid bias wire 89 between the negative terminal of meter M202 and the grid bias terminal on the grid circuit as shown.
   B. Connect filament cables 52 and 53 to the filament terminals as shown.
   C. Connect filament ground wire 97 to the filament ground terminal as shown.
   D. Replace wire 76 as follows:
      1. Remove wire 76 from the cabinet. Wire 76 is connected between the screen current meter and the screen terminals on the grid circuit.
      2. Locate the white silicon wire shipped with the retrofit kit.
      3. Connect the white silicon wire from the screen current meter to the screen terminals on the grid circuit.



597-0135-1

FIGURE 1. NEW GRID CIRCUIT INSTALLATION

10. Re-install the air filter housing as follows:
    A. Re-insert the air filter housing in the rack assembly.
    B. Re-place the two bolts securing the air filter housing mounting bar to the cabinet rails.
    C. Re-install the three screws located at the bottom of the air filter housing.
    D. Re-install the air hose to the air filter air outlet connection.
    E. Replace the air filter.
11. Raise the coarse tuning line 1/2 inch as follows:
    A. Loosen the PA tuning line clamp at the top of the PA cabinet.
    B. Raise the tuning line until the factory scribed line is 1/2 inch above the top of the cavity clamping flange.
    C. Secure the PA tuning line clamp.
12. Remove the lower PA cabinet access panel.
13. Refer to Figure 2 to perform the following procedures.
    A. Locate and create an "A" hole on the panel using a 7/16 inch drill.
    B. Locate and create an "B" hole on the panel using a 3/8 inch drill.
    C. From the bottom of the panel, measure 7 1/4 inches and scribe a line.
    D. Cut the panel at the scribed line. This panel will be used as the top panel and will allow the meter to fit below the new grid circuit.
14. Refer to Figure 3 and perform the following:
    A. Scribe the lines on the panel as shown.
    B. Remove the 1/2 square from each corner and fold the panel as shown.
15. Refer to Figure 4 install the 2-piece lower panel in the transmitter cabinet as shown.

1-16. INITIAL TRANSMITTER OPERATION.

1-17. Once the grid circuit is installed, it is recommended the transmitter be operated at a minimum output power level during initial turn-on. Energize primary ac power and operate the APC unit to lower the transmitter output power level. The VSWR will be slightly higher at low power levels. Once the minimum output power level is obtained from the transmitter, slowly increase the output power using the APC unit. Tune the grid circuit at regular intervals for minimum reflected power. Slowly raise the output power level and tune the grid circuit to obtain the rated transmitter output power level.

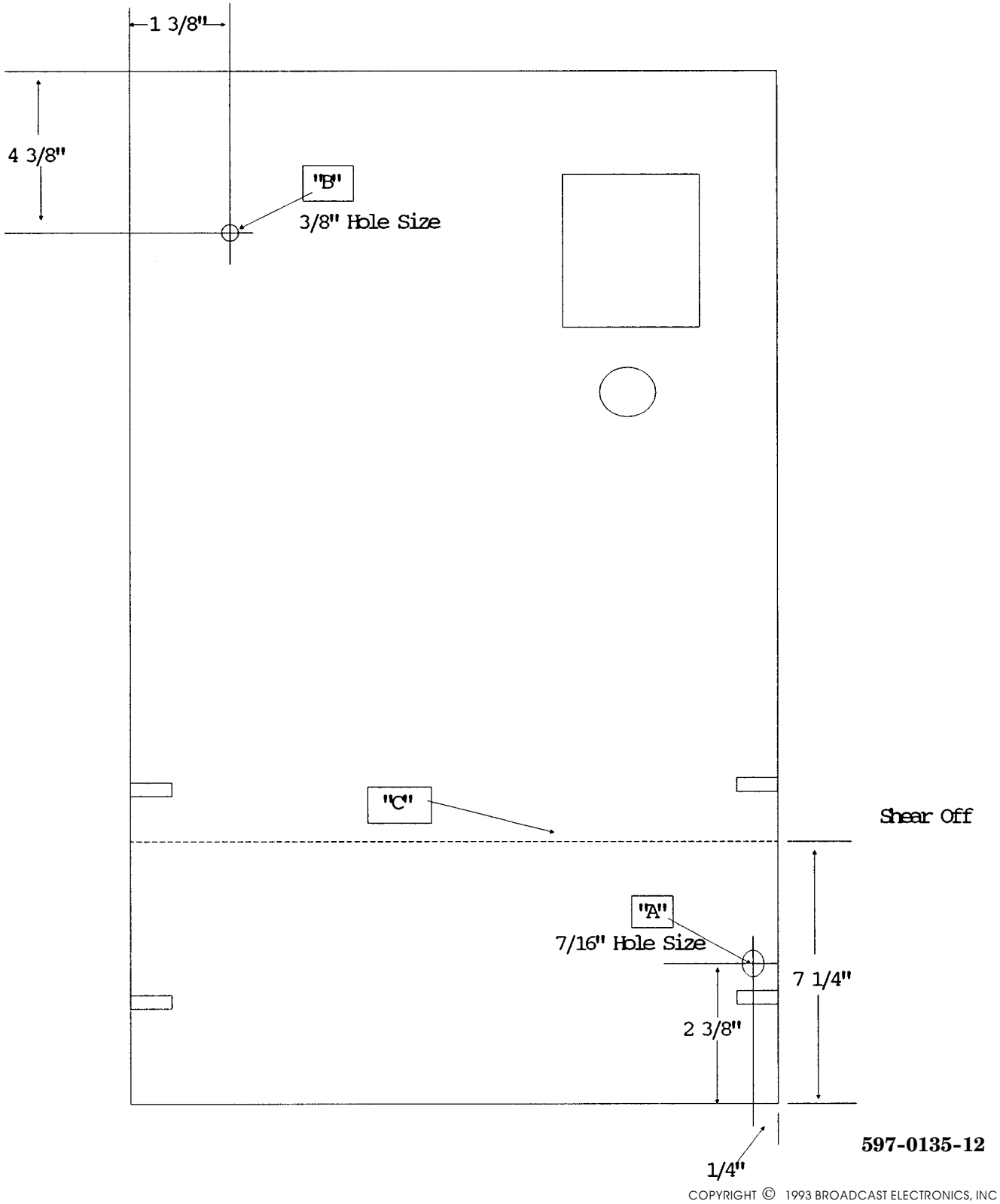


FIGURE 2. PA LOWER FRONT ACCESS PANEL MODIFICATIONS

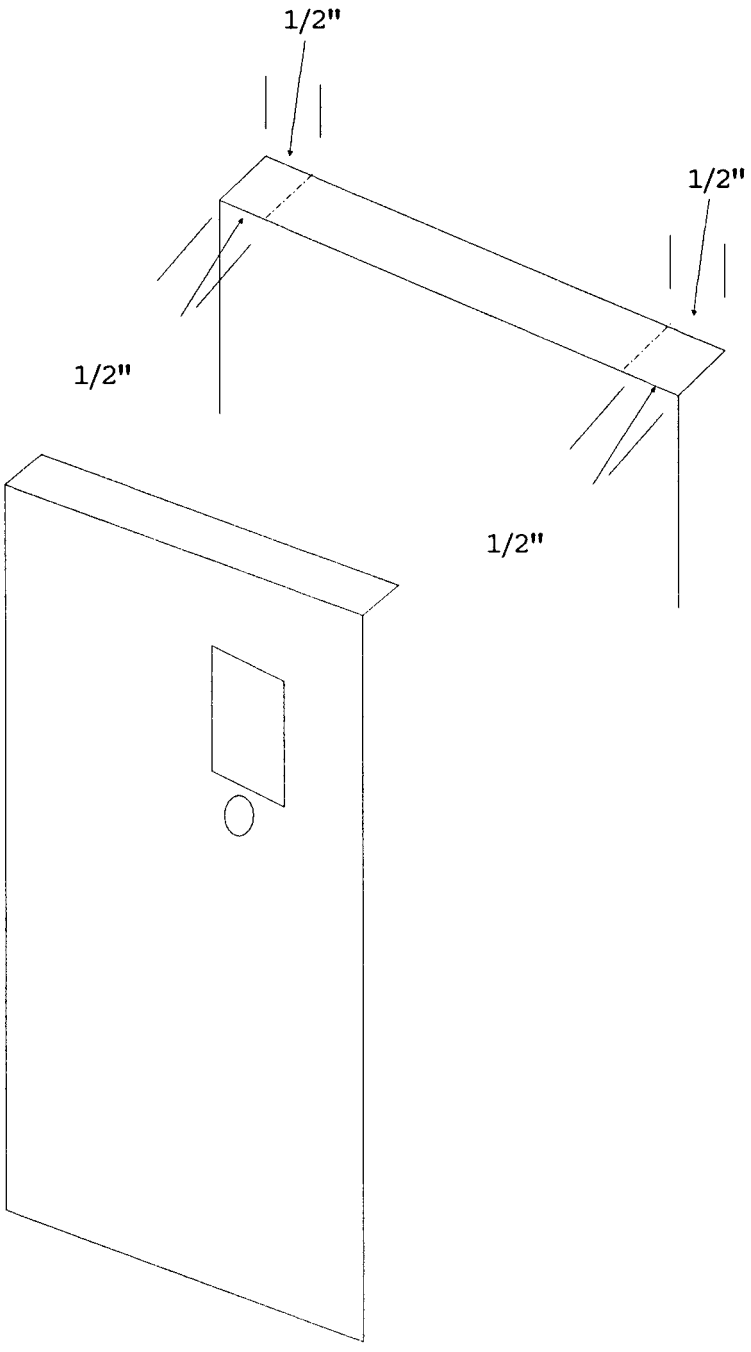


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FIGURE 3. PA LOWER FRONT ACCESS PANEL FOLD

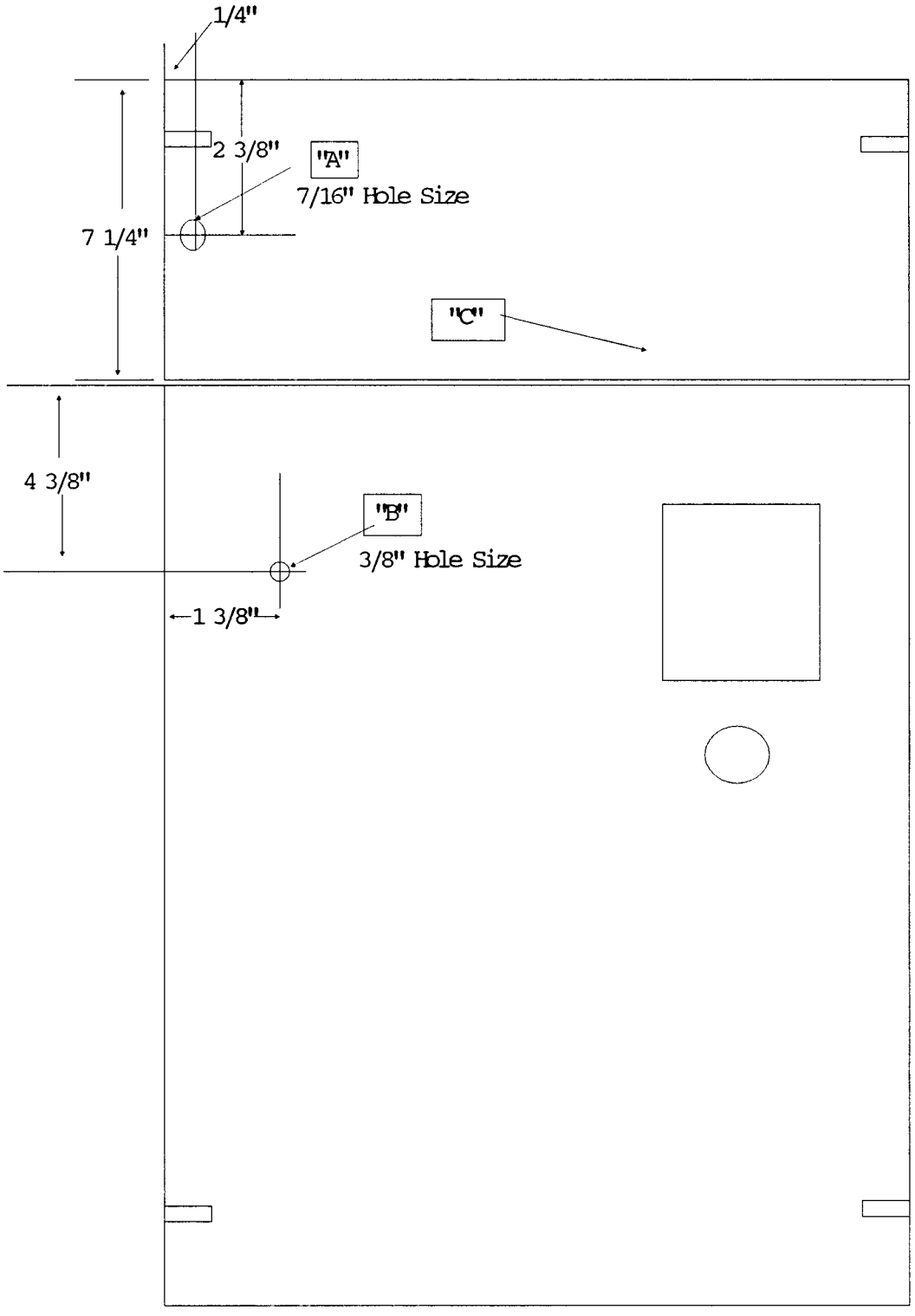

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FIGURE 4. PA LOWER FRONT ACCESS PANEL INSTALLATION

1-18. GRID CIRCUIT PARTS LISTS.

1-19. The following text presents part numbers of electrical components and selected mechanical parts required for maintenance of the grid circuit assembly. Each table entry is indexed by reference designators appearing on the applicable schematic diagram.

TABLE 1. TUBE SOCKET ASSEMBLY - 959-0301

REF. DES.	DESCRIPTION	PART NO.	QTY.
C4,C5	Capacitor, Ceramic, 500 pF ±20%, 5 kV	008-5024	2
C7,C8	Capacitor, Screen Bypass, Printed Circuit Board	519-0037	2
C10,C11	Capacitor, Grid Tuning, Printed Circuit Board	519-0208	2
C15	Capacitor, Ceramic, 500 pF ±20%, 5 kV	008-5024	1
C16	Capacitor, Ceramic, 1000 pF ±20%, 5 kV	008-1036	1
C17,C18	Capacitor, Screen Bypass, Printed Circuit Board	519-0037	2
C19	Capacitor, Grid Tuning, Printed Circuit Board	519-0208	1
C20	Capacitor, Ceramic, 500 pF ±20%, 5 kV	008-5024	1
L5A	Inductor, Input Matching	463-0082-001	
	Optional Inductor	463-0096	1
	Optional Inductor	463-0082	1
L5B	Inductor, Input	474-0313	1
L7/A, L8/A	Inductor, Neutralization	463-0083	4
L9,L10	Inductor, Input Tuning	474-0321	2
L11,L12,	Inductor, Tube Socket Mounting		
L14,L15	88 MHz to 91 MHz	441-8587	4
	91 MHz to 94 MHz	441-0157	4
	94 MHz to 98 MHz	441-8587	5
	98 MHz to 102 MHz	441-0162	4
	102 MHz to 108 MHz	[441-0162	4]
		[441-8587	2]
L17/A, L18/A	Inductor, Neutralization	463-0083	4
L19	Inductor, Input Tuning	474-0370	1
R1	Resistor, 750 Ohm ±10%, 50W	139-7532	1
RFC2,RFC3	Choke, RF	360-0144	2
XV1	Assembly, Tube Socket	417-0360	1
----	Input Matching Circuit Board Assembly	919-0064-002	1
----	Cable Assembly, Tube Socket	949-0181	1
----	Capacitor, Filament Feedthru	519-0039	4
----	Spark Gap, 2500V dc ±20% Breakdown, 5000A Discharge Maximum	140-0016	1
----	Spark Gap, 1000V dc ±20% Breakdown, 2500A Discharge Maximum	140-0015	1

TABLE 2. INPUT MATCHING CIRCUIT BOARD ASSEMBLY - 919-0064-002

REF. DES.	DESCRIPTION	PART NO.	QTY.
E1 THRU E5	Terminal, Turret, Double Shoulder	413-0025	5
E8	Terminal, Turret, Single Shoulder	413-0315	1
J2	Connector, BNC	417-0014	1
----	Blank PA Input Matching Circuit Board	519-0064	1
----	Matching Capacitor Circuit Board	519-0064-001	1

1-20. GRID CIRCUIT ASSEMBLY DRAWINGS.

1-21. The following text presents schematic and assembly diagrams as indexed below for the grid circuit assembly.

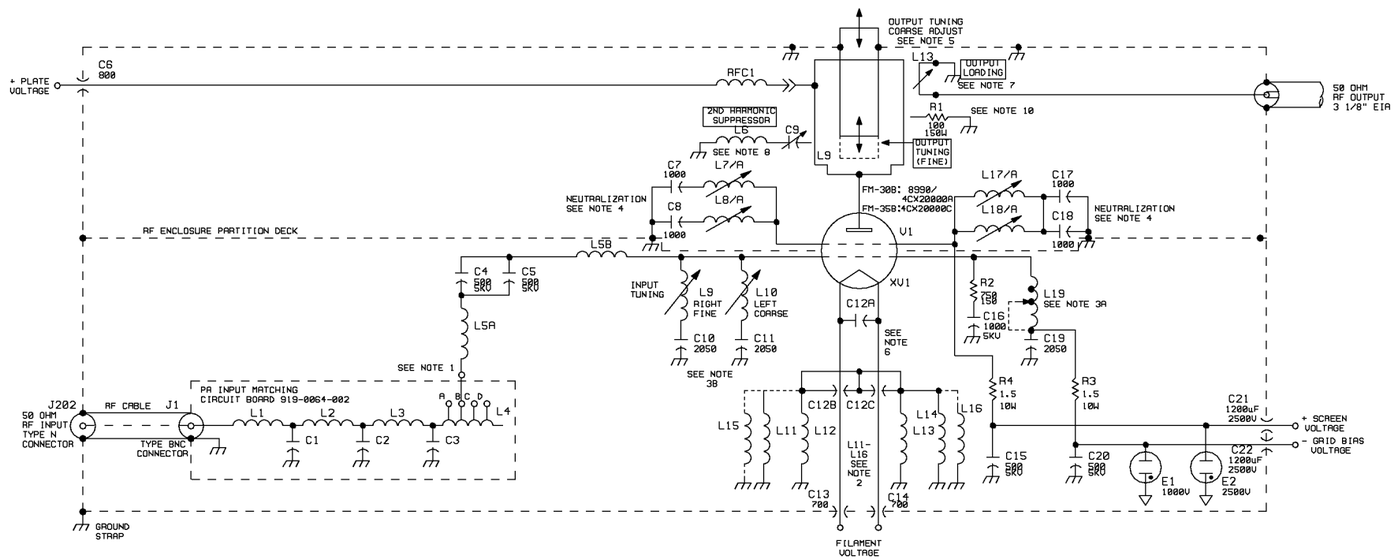
FIGURE	TITLE	NUMBER
----	SCHEMATIC DIAGRAM, OVERALL FM-30 TRANSMITTER, WITH GRID RETROFIT	SD909-0300
----	SCHEMATIC DIAGRAM, FM-30T/FM-35T TRANSMITTER GRID CIRCUIT DIAGRAM (SHEET 4 OF 4)	SD909-0000-205/ -385, 909-0035-205/-385
----	ASSEMBLY DIAGRAM, PA INPUT CIRCUIT COMPONENT LOCATOR (SHEET 1 OF 2)	597-0096-132A
----	ASSEMBLY DIAGRAM, PA INPUT CIRCUIT COMPONENT LOCATOR (SHEET 2 OF 2)	597-0096-132B

ON– LINE FILE NOT AVAILABLE FOR SD909–0300

ONLY PAPER DRAWING AVAILABLE FOR SD 909–0300 REV Y

OVERALL SCHEMATIC

30 KW TRANSMITTER WITH GRID RETROFIT



NOTES:

CONSULT INSTRUCTION MANUAL FOR THE FOLLOWING:

1. SCHEMATIC SHOWS PA INPUT MATCHING STRAP (L5A) CONNECTED TO STANDARD TAP (POSITION B) OF INDUCTOR (L4) ON THE PA INPUT MATCHING PCB.
2. TUBE SOCKET MOUNTING STANDOFF (L11-L16) FREQUENCY DEPENDENT PART.
3. A) INPUT TUNING PLATE "SIDE" (L19) FREQUENCY DEPENDENT ADJUSTMENT.
   B) INPUT TUNING PLATES "FINE & COARSE" (L9,L10) FREQUENCY DEPENDENT ADJUSTMENT.
4. NEUTRALIZATION STRAPS (L7,L8,L17,L18) FREQUENCY DEPENDENT ADJUSTMENT.
5. OUTPUT TUNING HALF-WAVE FOLDED TRANSMISSION LINE (L9), COARSE AND FINE ADJUSTMENT, FREQUENCY DEPENDENT.
6. CAPACITORS C12A,B, & C ARE PART OF TUBE SOCKET XV1.
7. OUTPUT LOADING LOOP (L13) FREQUENCY AND OUTPUT POWER DEPENDENT ADJUSTMENT.
8. SECOND HARMONIC SUPPRESSOR (L6&C9) FREQUENCY DEPENDENT PARTS AND ADJUSTMENT.
9. ALL CAPACITORS IN pF; ALL RESISTORS IN OHMS, UNLESS OTHERWISE SPECIFIED.
10. SUPPRESSOR RESISTOR R1 USED IN FM-35B ONLY.

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

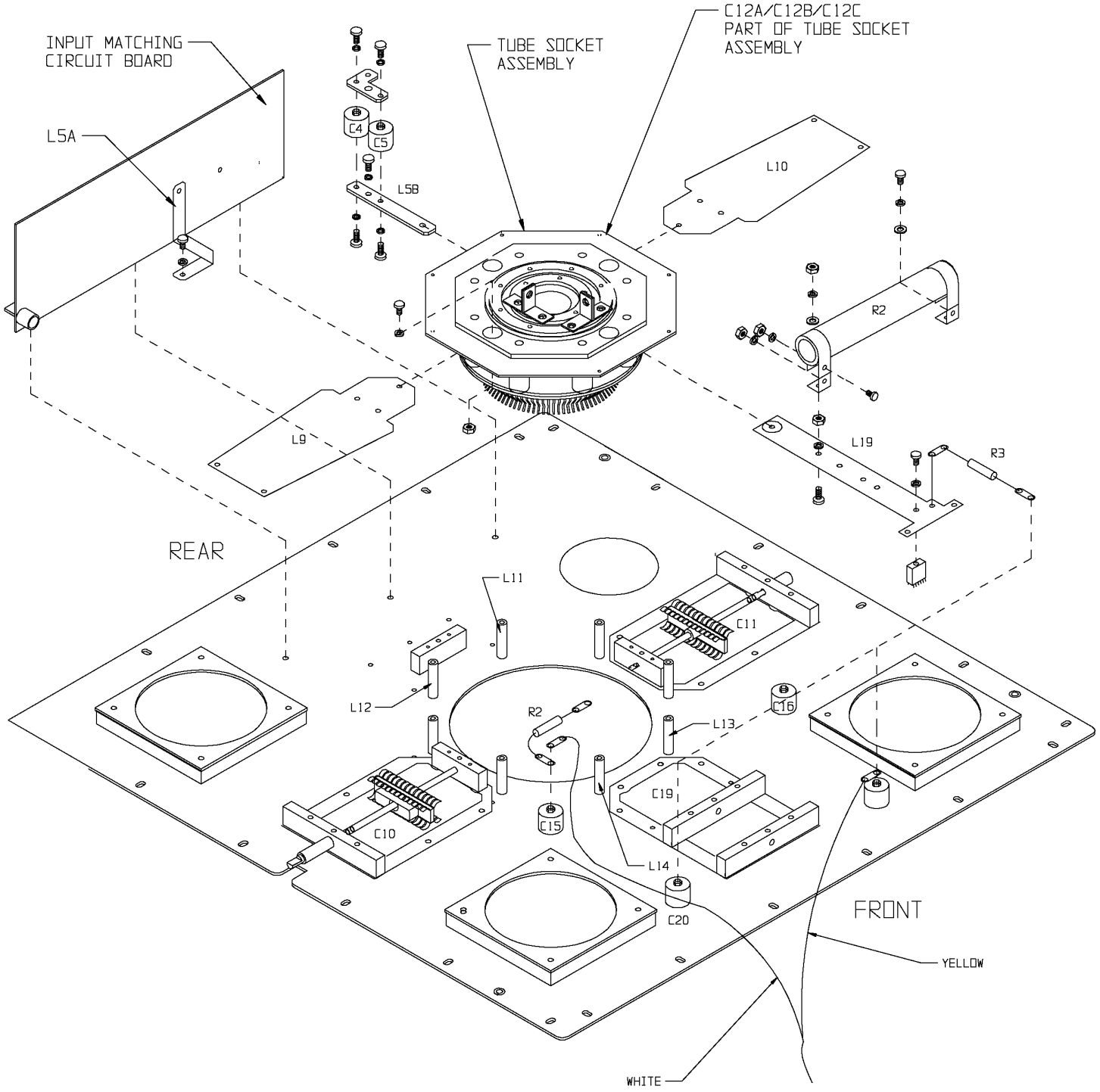
DWN. BY	MSE 11-14-96
DESIGNER(S)	
PROJ. LEADER	MBS
MFG.	
MATERIAL	SEE B/M 909-0000-205,-385 909-0035-205,-385
FINISH	
NEXT ASSY.	

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

TITLE: OVERALL SCHEMATIC

TYPE	SIZE	DWG. NO.	REV
S	B	909-0000-205,-385 909-0035-205,-385	A

MODEL FM-30T/35T | SCALE NONE | SHEET 4 OF 4



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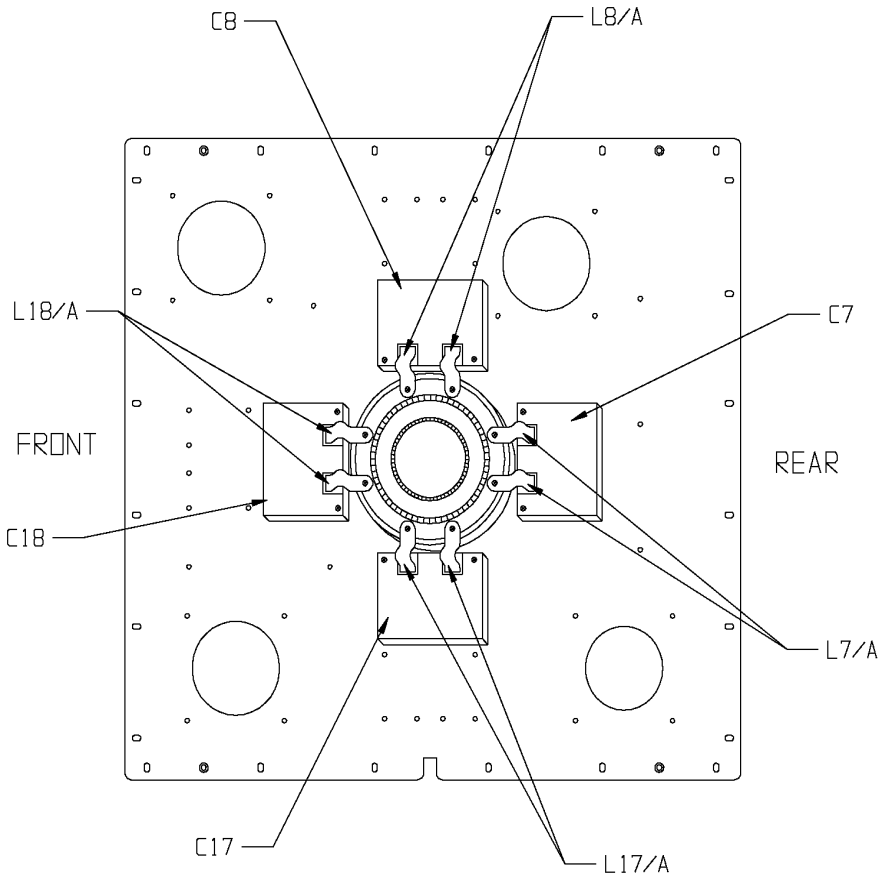
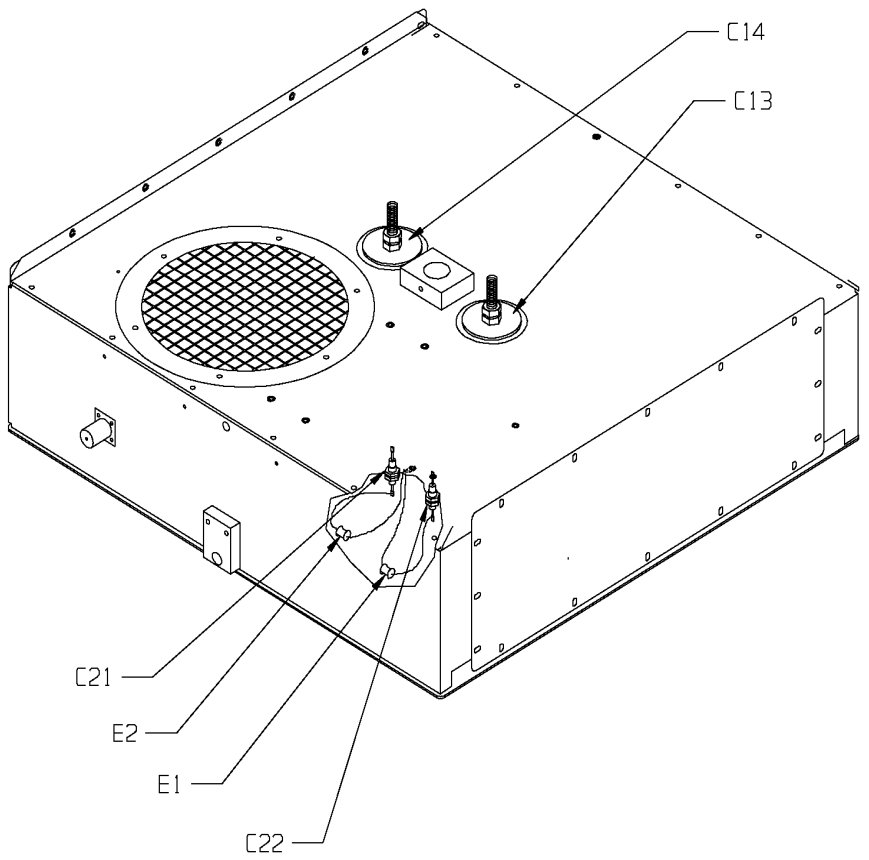
PA INPUT CIRCUIT COMPONENT LOCATOR
(Sheet 1 of 2)





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PA INPUT CIRCUIT COMPONENT LOCATOR
(Sheet 2 of 2)