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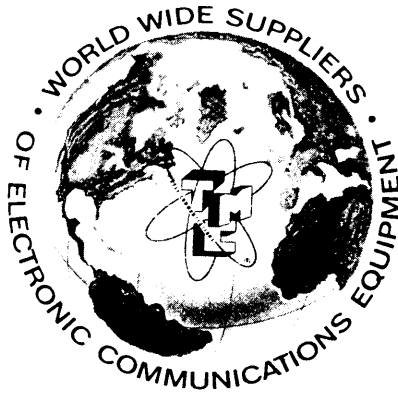


# **TECHNICAL MANUAL**

**FOR**

**ANTENNA MULTICOUPLER  
LMC - 16A**

**THE TECHNICAL MATERIEL CORPORATION**



# TECHNICAL MANUAL

FOR

ANTENNA MULTICOUPLER  
LMC-16A

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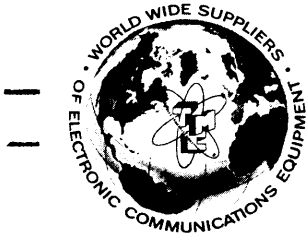
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700 FENIMORE ROAD

MAMARONECK, N. Y.

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3. That the equipment has not been altered in any way either as to design or use whether by replacement parts not supplied or approved by TMC, or otherwise.
4. That any equipment or accessories furnished but not manufactured by TMC, or not of TMC design shall be subject only to such adjustments as TMC may obtain from the supplier thereof.

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\*Electron tubes also include semi-conductor devices.

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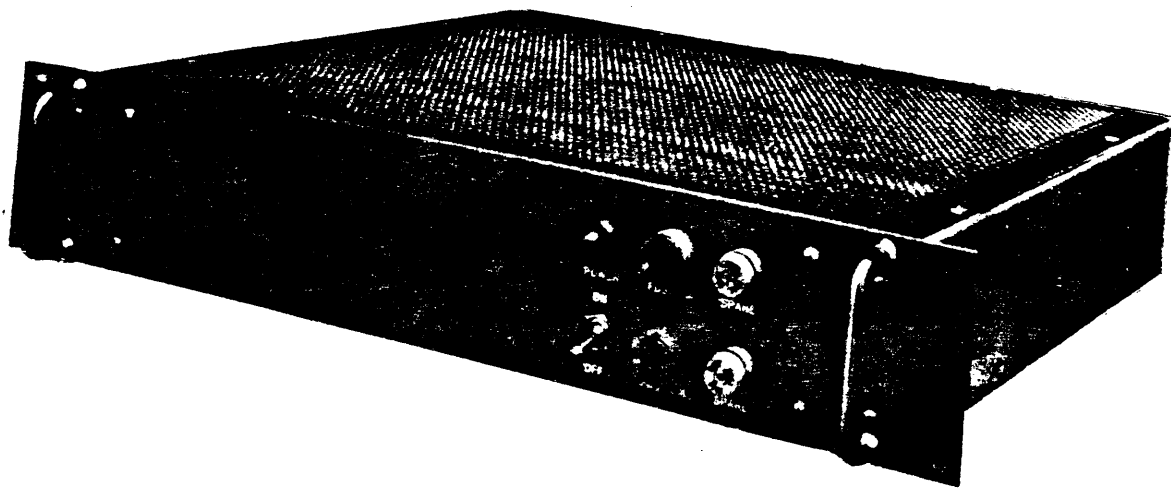


FIGURE 1-1 ANTENNA MULTICOUPLER, MODEL LMC-16A

## SECTION 1

### INTRODUCTION

#### 1-1. GENERAL

The antenna multicoupler LMC-16A manufactured by The Technical Materiel Corporation, is an antenna-to-receiver coupling device which permits the use of a common antenna by a number of communication receivers.

The antenna multicoupler consists of a broadband transistorized pre-amplifier, output modules, power supply and optional filter(s).

#### 1-2. TECHNICAL SPECIFICATIONS

Basic Model	LMC-16A
No. of Outputs	16
Frequency Range w/o Filters	10 KHz-2 MHz
Nominal Gain	2db
Noise Figure Less Than	7db
<u>Isolation</u>	
Output to Input db	55
Output to Output db	40
Desensitization of 3 db @	3.5 V Peak
<u>Intermodulation</u>	
2nd order	60
3rd order	65
<u>VSWR</u>	
Max. Input	1.5
Max. Output	1.2



1-3. INSTALLATION AND ENVIRONMENTAL

<u>Basic Model</u>	LMC-16A
<u>Power Source</u>	
Volts ac	115/230
Freq. Hz	50-400
<u>Power Consumption</u>	
Watts	85
Weight lbs.	17 (8.10 Kg)
<u>Dimensions</u>	
Width	19" (48.25 cm)
Height	3½" (8.89 cm)
Depth	15½" (39.37 cm)

1-4. PHYSICAL DESCRIPTION

The LMC-16A is designed for mounting in a standard 19 inch rack. The unit is supported by four retaining screws on the front panel. All operating controls are located on the front panel. The input output and power supply connectors are mounted on the rear panel. The majority of the discrete components and semi-conductors are mounted on the printed circuit boards which in turn are fastened to the chassis. Some components are mounted directly on the chassis. The loose items supplied with the equipment are listed in table 1-1.

Name	Part No.	Function	Qty.
Power Cable Assembly	CA10625	For connection to power connector	1
Technical Manual		Technical manual	1

Table 1-1 Loose Items Supplied

1-5. FILTERS AVAILABLE

Table 1-2 lists the filters available for use with the LMC-16A. For characteristic curves of these filters refer to figure 1-2 and schematic diagram figure 5-2.

FILTER	TMC PART NUMBER	OHMS	FREQUENCY RANGE (NOMINAL)	CONNECTION IN/OUT
Broadcast Stop	FX10020	60		BNC/BNC
Low Pass	FX10022	60	10KHz-2MHz	BNC/BNC

TABLE 1-2. Filters Available

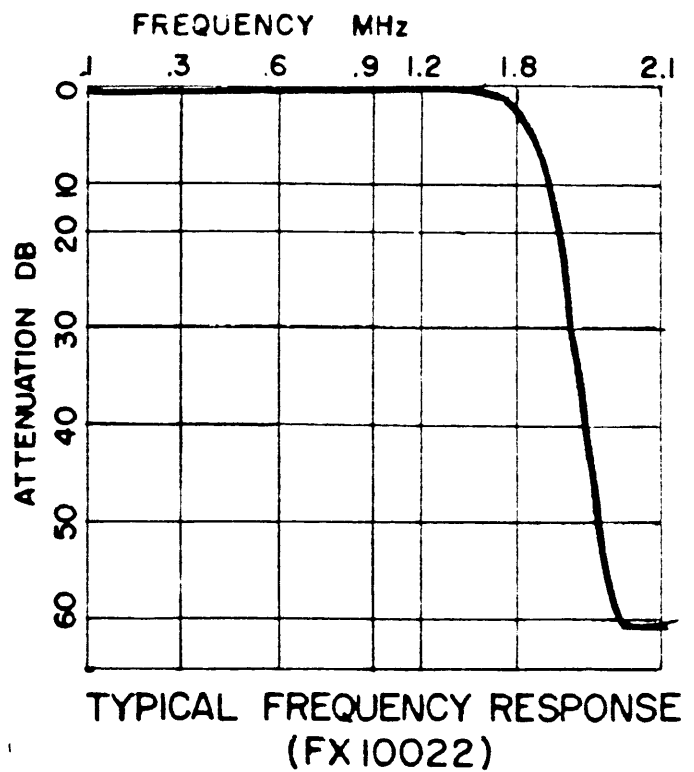
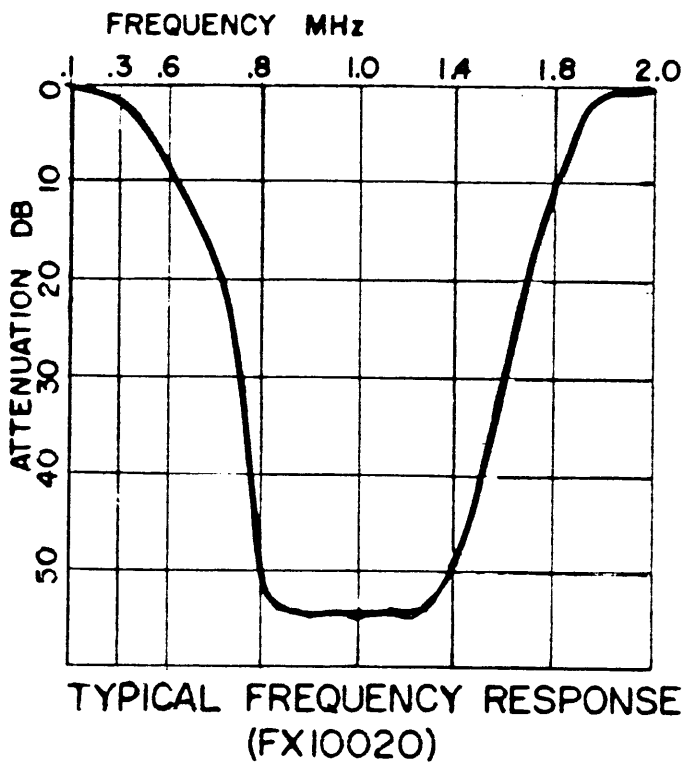


FIGURE 1-2

SECTION 2  
FUNCTIONAL DESCRIPTION

2-1. GENERAL

The sixteen output low frequency antenna multicoupler (LMC-16A) is a broadband antenna distribution system designed to couple a single 75 ohm or 50 ohm antenna to antenna inputs of up to sixteen low frequency communications receivers. The antenna output is coupled directly to a preamplifier printed circuit board.

The preamplifier (para. 2-2) is a low noise, wideband fully transistorized amplifier having a voltage gain of approximately 8 db. The output of the preamplifier is fed to a common feed line. This feed line distributes the signal to two identical 8-output circuits (para. 2-3). The sixteen outputs are terminated at sixteen output connectors with an overall nominal gain of 2 db for each output. The unit can be operated from 115/230 vac, single phase 50 to 400 Hz power source. The built in power supply (para. 2-4) converts the ac supply into dc and then regulates it to the required voltage for operating the preamplifier and output module networks.

2-2. PRE-AMPLIFIER BOARDS (Figure 5-5, 5-7)

The input to the amplifier Q1 is RC coupled through R1 and C1. Q1 provides the required voltage gain. The output of Q1 is coupled to a complementary push-pull amplifier circuit consisting of Q2 and Q3. The latter circuit serves a balancing function to minimize higher order intermodulation products. CR1 and CR2 provides temperature compensation and R8 and C10 provide the negative feedback.

### 2-3. OUTPUT MODULE (Figure 5-3, 5-6)

The general principle of the output module is described in this paragraph. Each module supplies eight (8) outputs. The LMC-16A requires two (2) modules or a total of sixteen (16) outputs. The output module circuit consists of eight (8) identical emitter followers Q11 and Q81. The input from the RF distribution line is RC coupled through C11 and R11 to the base of the emitter follower Q11. The dc bias for the transistor is obtained from a voltage divider network R12 and R13. The output from the emitter follower is applied to the output terminal through a matched 75 ohm or 50 ohm load circuit consisting of R15 and R13.

### 2-4. POWER SUPPLY (Figure 5-4)

The LMC-16A antenna multicoupler can be operated from 115/230 vac supply. Changeover from 115 vac to 230 VAC or vice versa can be made by simple modification of the input power transformer wiring. Primary power source is supplied to the power ON/OFF switch through an ac filter Assembly (A5780). This filter removes an RF content from the ac supply. When the switch S1 is in the ON position, the input power is provided through fuses F1 and F2 to power transformer T1 and power indicator DS1. T1 is a step down transformer and produces a nominal supply of 30 vac. Z1 is a diode bridge network. The AC supply is rectified by this circuit and smoothed by electrolytic capacitor C1 before being applied to the regulator board. Transistor Q2 mounted on regulator board A1 and transistor Q1, mounted on the main chassis form a darlington pair and provide the voltage and current regulation required for operation of the preamplifier and output module networks. Transistor Q2 and diode pair CR1 and CR2 form a voltage reference circuit, sensitive to temperature and load changes. CR3 in series with CR1 and CR2 provide a regulated voltage required to operate the preamplifier and output modules. This voltage is -28 vdc.

SECTION 3  
INSTALLATION AND OPERATION

3-1. INSTALLATION

UNPACKING

The LMC-16A antenna multicoupler has been thoroughly tested and calibrated at the factory before being shipped. Upon receipt of the unit, inspect the packing case and its contents for possible damage. Unpack the equipment carefully, and check the packing material for parts shipped as loose items. The latter are listed in Table 1-1. With respect to damage of the equipment for which the carrier is liable, The Technical Materiel Corporation will assist in describing methods of repair and furnishing of replacement parts.

3-2. POWER REQUIREMENTS

The LMC-16A can operate from either 115 or 230 VAC, single phase, 50 to 400 Hz power source. The unit LMC 32A is normally factory wired for operation from 115 VAC source. If 230 VAC operation is required, the jumper connections for transformer T1 must be changed as shown in figure 5-1. The input to units is protected by two fuses, one on each side of the line. Refer to figure 5-1 for the required fuses for either 115 vac or 230 vac operation.

3-3. EQUIPMENT LOCATION

The equipment should be located in such a way that there is sufficient clearance at the rear of the unit for insertion and removal of the output modules. Front panel controls should be easily accessible to the operator, because of its solid state construction, heat problems have been virtually eliminated; thus several antenna multicouplers may be installed one above the other in a rack.

### 3-4. ELECTRICAL INSTALLATION

The following external connections must be made to the unit after it has been installed in a rack.

1. Connect the antenna to the ANTENNA INPUT jack on the rear panel using coaxial cable of the correct impedance.
2. Power: Connect primary power to the unit by plugging the supplied power cable assembly into POWER INPUT connector on the rear panel ensuring that the keyway on the plug lines up with the key at the top of the POWER INPUT jack.

#### NOTE

When making power connection be sure that the power transformer T1 is correctly wired and the fuses are of the proper value as outlined in figure 5-1.

When wired for 230 vac the power plug is not supplied and the plug to suit the installation must be installed by the customer.

3. Outputs: Connect the outputs from the output modules to the associated receivers as required using coaxial cable of correct impedance.

### 3-5. PERFORMANCE CHECK

#### LIST OF TEST EQUIPMENT REQUIRED

Equipment	Recommended MFR Part No.	Remarks
Multimeter	Simpson 260	For Low Frequency
Audio Generator	HP606A	
Oscilloscope	Tetronix Model 453	

### 3-6. TEST PROCEDURES

1. Switch the power on and note that the power lamp is lit.
2. Check for -28 volts on the input pins of the preamplifier and the output boards.
3. Connect the Audio generator to the antenna input jack of the LMC-16A multicoupler.
4. Set the level of the generator to 100 mv at a frequency in the operating range of the multicoupler.
5. Terminate one output jack of multicoupler in 50 ohms load and connect an oscilloscope across this load.
6. The oscilloscope should indicate an output level of 360 mv Peak to Peak. (130 mv rms)
7. Repeat (6) above for remaining output jacks of the antenna multicoupler.

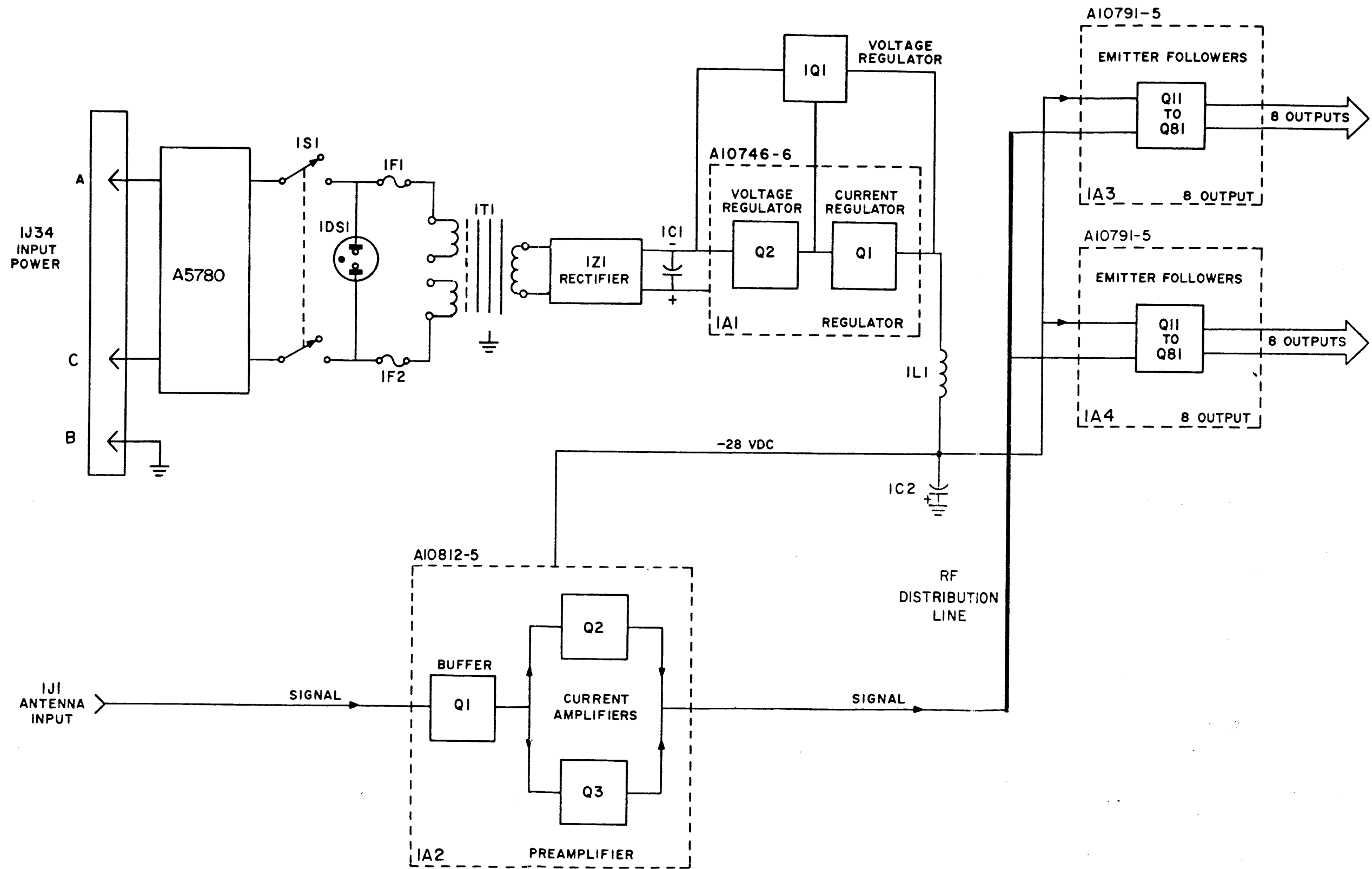


FIGURE 3-1 BLOCK DIAGRAM



SECTION 4  
PARTS LIST

4-1. INTRODUCTION

Reference designations have been assigned to identify all electrical parts. These designations are marked on the equipment adjacent to the parts that they identify and are included on all drawings, diagrams and part lists. The letters of a reference designation indicate the generic group of the parts, such as capacitor, resistor, transistor, etc. The numeral differentiates between parts of the same generic group. Sockets associated with any particular plug-in device, such as a transistor or fuse, are identified by a reference designation which incorporates the designation used for that device as well as a prefix symbol. To expedite delivery when ordering replacement parts, specify the TMC part number and the name and model number of the equipment.

REF. DESIGNATION	DESCRIPTION	TMC PART NUMBER
A1	VOLTAGE REGULATOR	A10746-6
A2	PREAMPLIFIER, 50 ohms	A10812-6
A2	PREAMPLIFIER, 75 ohms	A10812-5
A3, A4	OUTPUT MODULE: 8 output, 50 ohms	A10791-6
A3, A4	OUTPUT MODULE: 8 output, 75 ohms	A10791-5
C1	CAPACITOR: Electrolytic,	CE71C682G
C2	CAPACITOR: 6800 uF Elec. 500 uf	CE10007
DS1	LAMP: Neon	BI10005
DS2	LAMP: Lightning Protection	FU102-1
F1,F2	FUSE: slo-blo, 1.0 amp (115 Vac operation only)	FU102-.5
F1,F2	FUSE: slo-blo, 0.5 amp (230 Vac operation only)	A5780
FL1	FILTER: RF, line	JJ172
J1	CONNECTOR: RF female receptable	UG625 B/U
J2 to J17	CONNECTOR: BNC, female receptable	MS3102A-14S-7P
J18	CONNECTOR: male receptable	CL10047
L1	INDUCTOR: RF, Coil 16 uh	ST22K
S1	SWITCH: toggle	TF445
T1	TRANSFORMER: power	2N3055
Q1	TRANSISTOR	NW10007
Z1	DIODE BRIDGE NETWORK	

MAIN Chassis  
FRONT & REAR PANEL

REF. DESIGNATION	DESCRIPTION	TMC PART NUMBER
C1, C2, C12, C13, C22, C23, C32, C33, C42, C43, C52, C53, C62, C63, C72, C73, C82, C83	CAPACITOR: Fixed, mica 2.2 uf	<b>CC10018</b>
C11, C21, C31, C41, C51, C61, C71, C81	CAPACITOR: Fixed, mica 0.22 uf	CC131-41
L11, L21, L31, L41, L51, L61, L71, L81	INDUCTOR: RF coil, 220 uH	CL275-221
L12, L22, L32, L42, L52, L62, L72, L82	INDUCTOR: RF coil, 2200 uH	CL275-222
R11, R21, R31, R41, R51, R61, R71, R81	RESISTOR: Fixed, composition, 100 ohms, $\frac{1}{4}$ W, 5%	RC07GF101J
R12, R22, R32, R42, R52, R62, R72, R82	RESISTOR: Fixed, Composition, 4.3 K, $\frac{1}{4}$ W, 5%	RC07GF432J
R13, R23, R33, R43, R53, R63, R73, R83	RESISTOR: Fixed, Composition 3.3 K, $\frac{1}{4}$ W, 5%	RC07GF332J
R14, R24, R34, R44, R54, R64, R74, R84	RESISTOR: Fixed, somposition 180 ohms, 1W, 5%	RC32GF181J
*R15, R25, R35, R45, R55, R65, R75, R85	RESISTOR: Fixed, film, 71.5 ohms, $\frac{1}{2}$ W, 1%	<b>RN60D71R5F</b>
Q11, Q21, Q31, Q41, Q51, Q61, Q71, Q81	TRANSISTOR	2N3866

\*The value of R15 and R85 for -6 is 52.3 ohms

8 OUTPUT ASSEMBLY  
A10791-5 and -6

REF. DESIGNATION	DESCRIPTION	TMC PART NUMBER
C1,C6	CAPACITOR: Fixed, ceramic, 0.1 uF	CC131-39
C2	CAPACITOR: Fixed, tantalum, 6.8 uF	CSR13G685ML
C3,C5	CAPACITOR: Fixed, tantalum, 0.47 uF	CSR13G474ML
C4	CAPACITOR: Fixed, ceramic, 0.01 uF	CC100-43
CR1	DIODE: Zener	1N758
CR2, CR3	DIODE	1N914B
R1	RESISTOR: Fixed, composition, 47K, $\frac{1}{2}$ W, 5%	RC20GF473J
R2	RESISTOR: Fixed, composition, 68K, $\frac{1}{2}$ W, 5%	RC20GF683J
R3	RESISTOR: Fixed, composition, 15 ohms, $\frac{1}{2}$ W, 5%	RC20GF150J
R4	RESISTOR: Fixed, composition 560 ohms, $\frac{1}{2}$ W, 5%	RC20GF561J
R5	RESISTOR: Fixed, composition, 1.2K, $\frac{1}{2}$ W, 5%	RC20GF122J
R6	RESISTOR: Fixed, composition, 2.9K, $\frac{1}{2}$ W, 5%	RC20GF392J
R7	RESISTOR: Variable, composition 1K, linear curve, $\frac{1}{4}$ W	RV111U102A
R8	RESISTOR: Fixed, composition, $\frac{1}{2}$ W, 6.8K, 5%	RC20GF682J
Q1	TRANSISTOR: NPN, silicon	TX10001
Q2	TRANSISTOR: PNP, silicon	2N5086

A1, REGULATOR ASSEMBLY  
A10746-6

REF. DESIGNATION	DESCRIPTION	TMC PART NUMBER
C1, C2, C4, C6, C10, C12, C13	CAPACITOR: Fixed, Ceramic, 2.2 uF	<b>CC10018</b>
C3, C7, C8	CAPACITOR: Fixed, Ceramic, 0.1 uF	CC131-39
C5, C14	CAPACITOR: Fixed, <b>ELEC 50UF</b>	CE105-50-50
C9	CAPACITOR: Fixed, ceramic, 0.47 uF	CC131-44
C11	CAPACITOR: Fixed, mica, 5pF	CM04ED050J03
CR1, CR2	DIODE	1N914B
R1*	RESISTOR: Fixed, deposited film high stability, 61.9 ohms, 1/4W, 1%	RN65D61R9F
R2	RESISTOR: Fixed, film 1K, 1/4W, 2%	RC07GF102J
R3	RESISTOR: Fixed, film, 51 ohms, 1/4W, 2%	RC07GF510J
R4	RESISTOR: Fixed, film, 68 ohms, 1/4W, 2%	RC07GF680J
R5	RESISTOR: Fixed film, 560 ohms, 1/4W, 2%	RC07GF561J
R6	RESISTOR: Fixed, film 270 ohms, 1/4W, 2%	RC07GF271J
R7	RESISTOR: Fixed, film, 7.5 K, 1/4W, 2%	RC07GF752J
R8	RESISTOR: Fixed, film, 180 ohms, 1/4W, 2%	RC07GF181J
R9, R10	RESISTOR: Fixed, film, 10 ohms, 1/4W, 2%	RC07GF100J
L1	INDUCTOR: RF, coil, 220 uH	CL275-221
Q1, Q3	TRANSISTOR	2N3866
Q2	TRANSISTOR	2N5160

\*For -6 the value of R1 selected on test

PRE-AMPLIFIER ASSEMBLY  
A10812-5 and -6

FILTER ASSY. LOWPASS  
FX10022

REF. DESIGNATION	DESCRIPTION	TMC PART NUMBER
C2, C11	CAPACITOR: fixed, mica, 1300 pF	CM06FD132F03
C3, C12	CAPACITOR: fixed, mica, 120 pF	CM04FD121F03
C4, C9	CAPACITOR: fixed, mica, 1000 pF	CM06FD102F03
C5, C10	CAPACITOR: fixed, mica, 750 pF	CM06FD751F03
C6	CAPACITOR: fixed, mica, 510 pF	CM06FD511J03
C7	CAPACITOR: fixed, mica, 2000 pF	CM06FD202F03
C8	CAPACITOR: fixed, mica, 390 pF	CM05FD391J03
L1, L4	INDUCTOR: RF coil, 2.6 uH	CL10040-4
L2, L3	INDUCTOR: RF coil, 7.2 uH	CL10040-5

FILTER ASSY, BROADCAST BANDSTOP  
FX10020

REF. DESIGNATION	DESCRIPTION	TMC PART NUMBER
C1, C5	CAPACITOR: fixed, mica, 2000 pF	CM06FD202F03
C3	CAPACITOR: fixed, mica, 6200 pF	CM07FD622F03
C4	CAPACITOR: fixed, mica, 22 pF	CM04FD220J03
L1, L3	INDUCTOR: RF coil, 122.2 uH	CL10039-1
L2	INDUCTOR: RF coil, 4.65 uH	CL10039-2

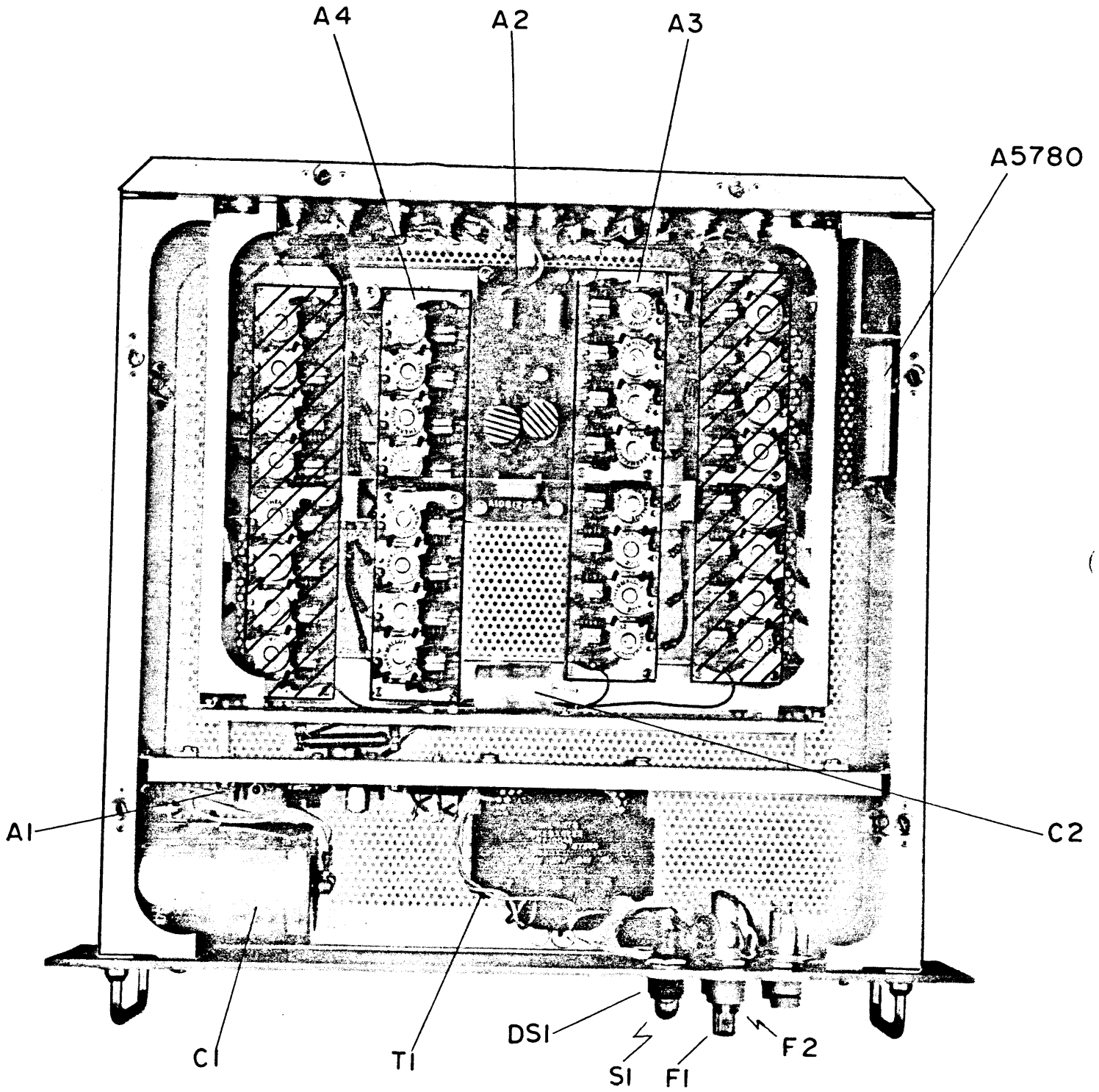
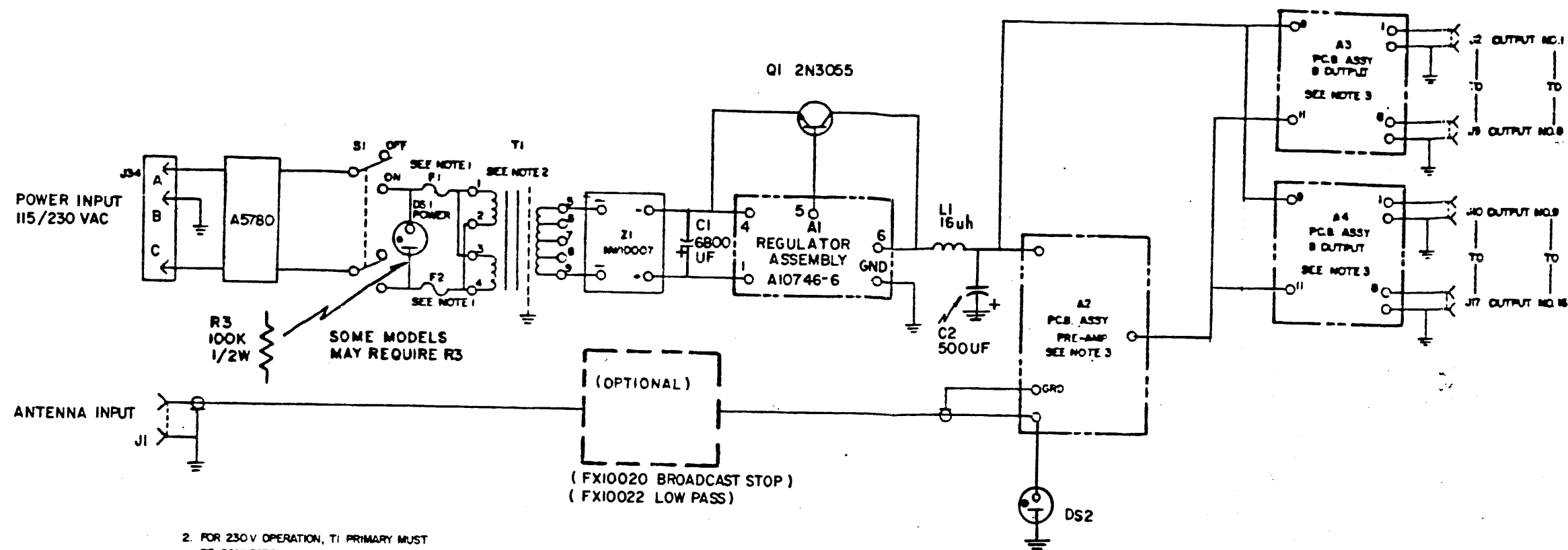


FIGURE 5-0  
 COMPONENTS PARTS  
 LMC-16A



2. FOR 230 V OPERATION, T1 PRIMARY MUST BE CONNECTED IN SERIES (TERMINALS 2 & 3 CONNECTED TOGETHER) 230 VAC APPLIED TO TERMINALS 1 & 4.

POWER INPUT	F1/F2 P/N	F1/F2 RATING
115 VAC	FU102-1.5	1.5A
230 VAC	FU102-750	75A

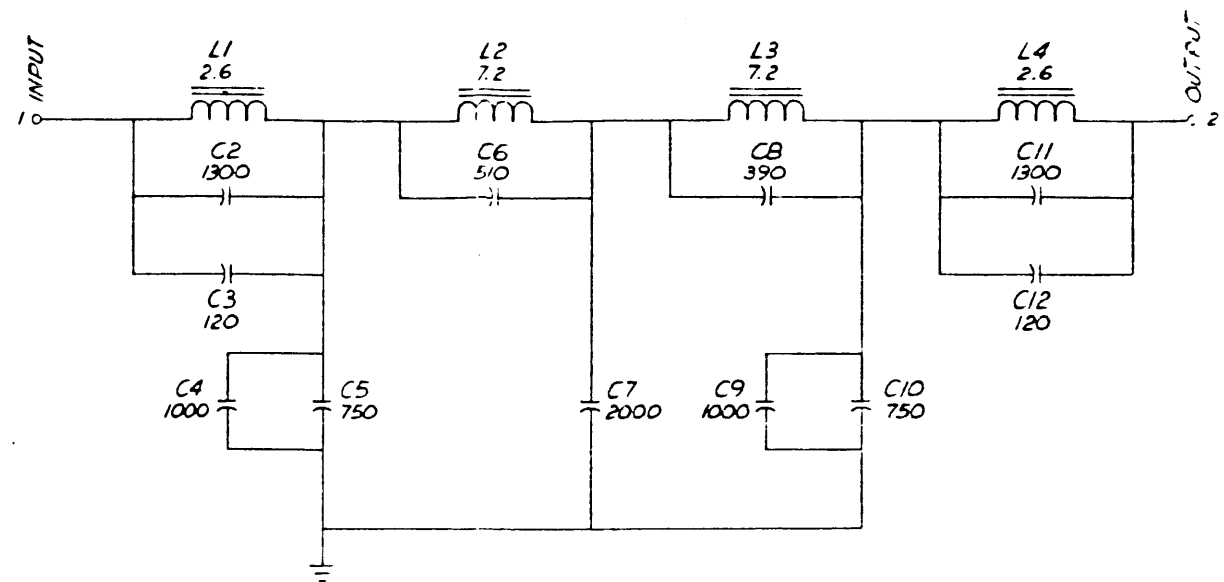
NOTES

UNIT	A2	A3 TO A6
LMC-16, 50 Ω	A10812-6	A10791-6
LMC-16, 75 Ω	A10812-5	A10791-5

Figure 5-1

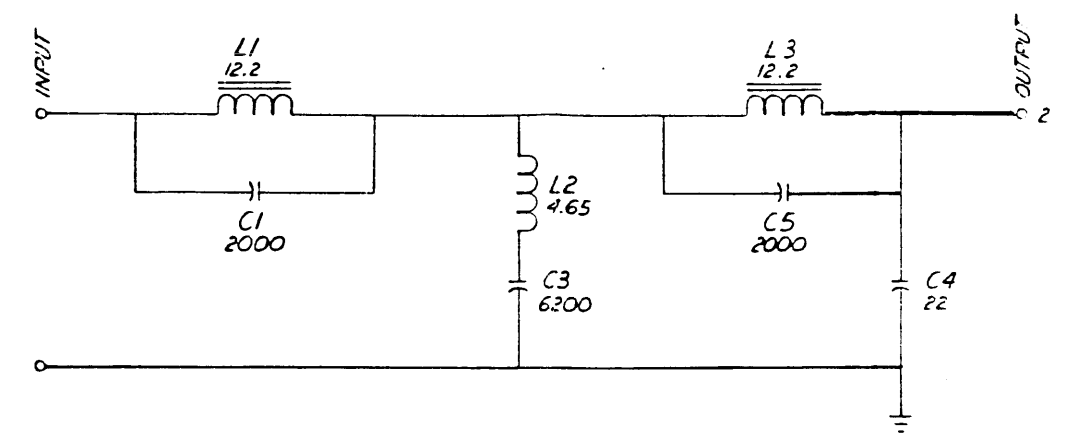
LMC-16A MAIN SCHEMATIC





C12	14	C1	
LAST COMP USED		MISSING COMP	

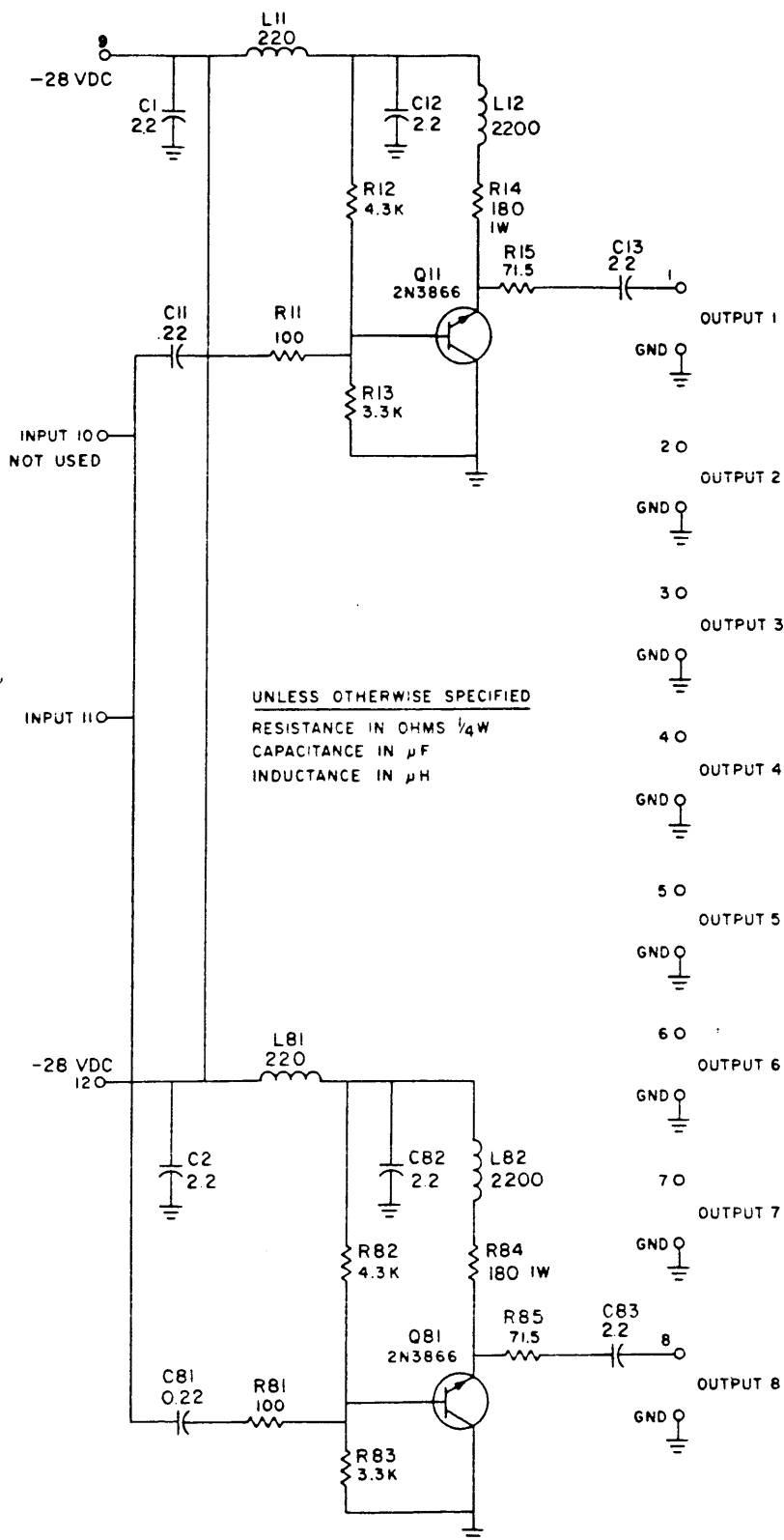
BROADCAST BANDSTOP FILTER  
FX10020



C5	L3	C2	
LAST COMP USED		MISSING COMP	

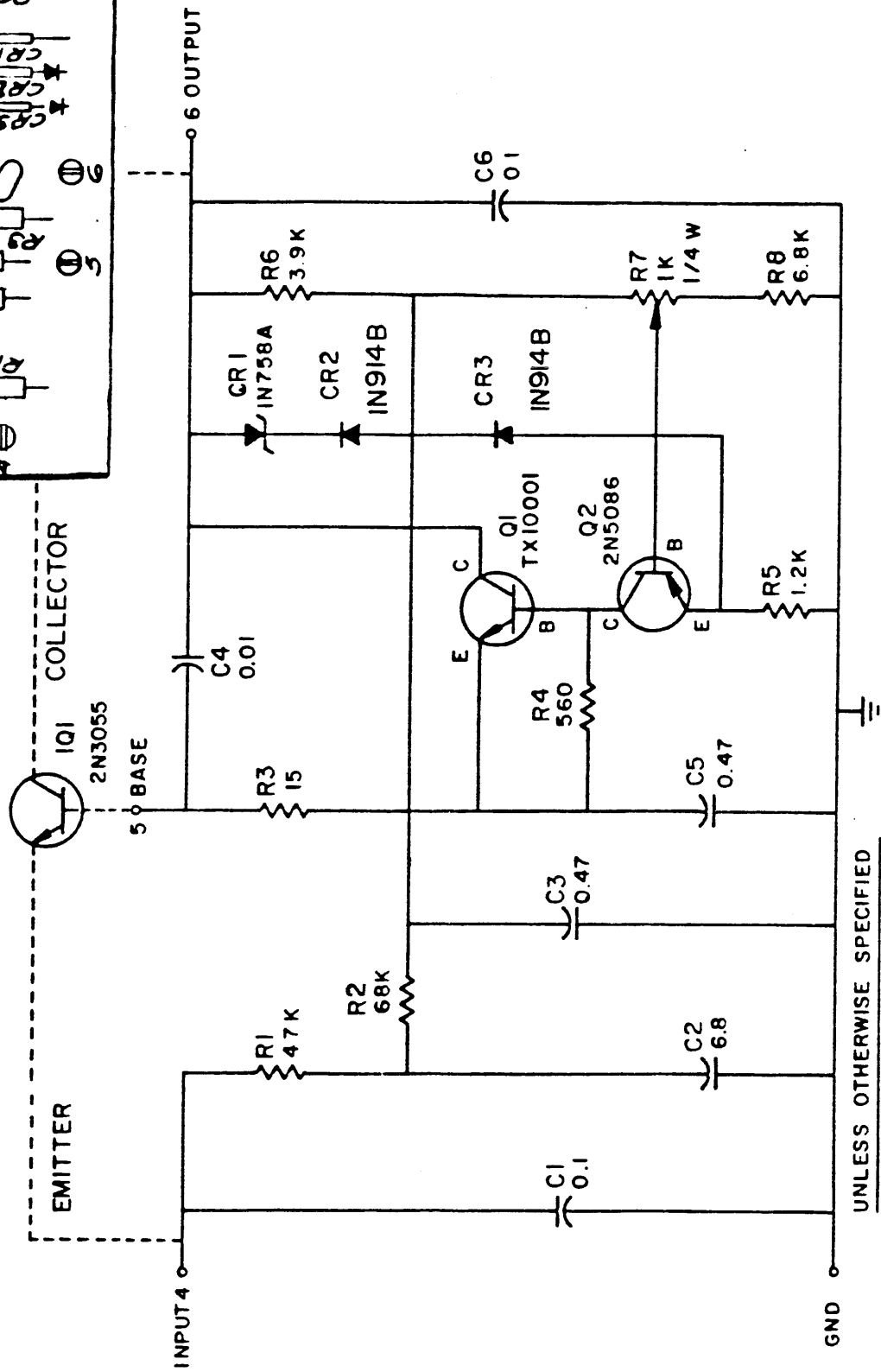
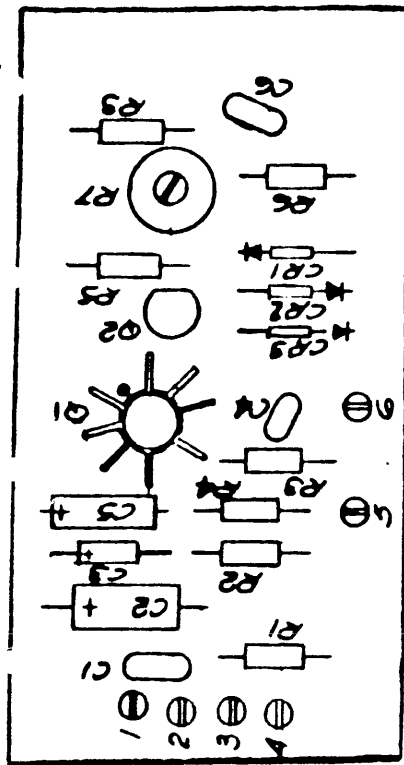
LOW PASS FILTER  
FX10022

FIGURE 5-2  
FX10020, FX10022  
SCHEMATIC DIAGRAM



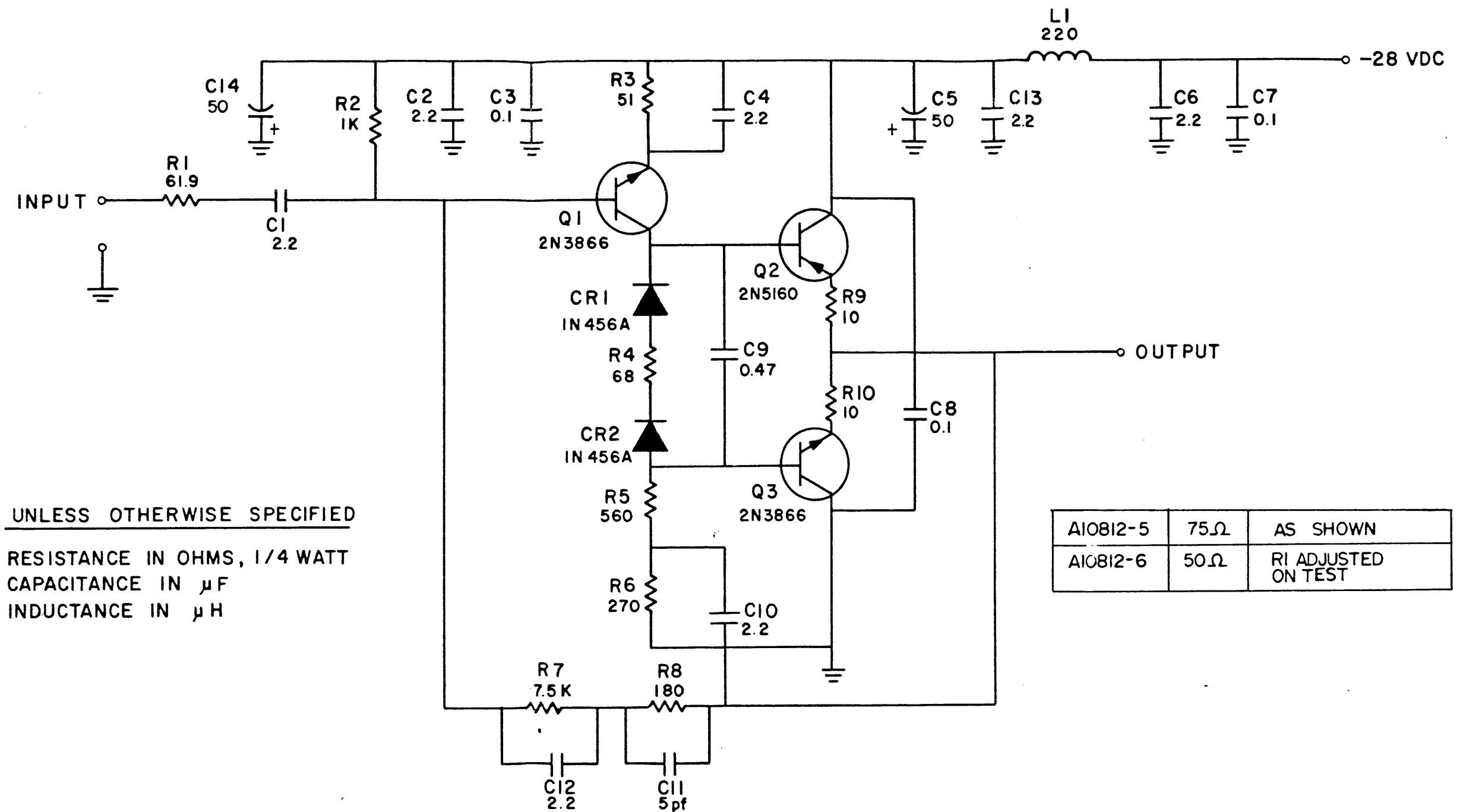
	R15	R85
AI0791-5	75 $\Omega$	71.5 $\Omega$
AI0791-6	50 $\Omega$	52.3 $\Omega$

FIGURE 5-3  
(B) OUTPUT ASSEMBLY AI0791-( )



UNLESS OTHERWISE SPECIFIED  
 RESISTANCE IN OHMS 5%, 1/2 W  
 CAPACITANCE IN  $\mu$ F  
 INDUCTANCE IN  $\mu$ h

FIGURE 5-4  
 REGULATOR A10746-6



UNLESS OTHERWISE SPECIFIED  
 RESISTANCE IN OHMS, 1/4 WATT  
 CAPACITANCE IN  $\mu$ F  
 INDUCTANCE IN  $\mu$ H

A10812-5	75 $\Omega$	AS SHOWN
A10812-6	50 $\Omega$	R1 ADJUSTED ON TEST

FIGURE 5-5  
 PRE-AMPLIFIER

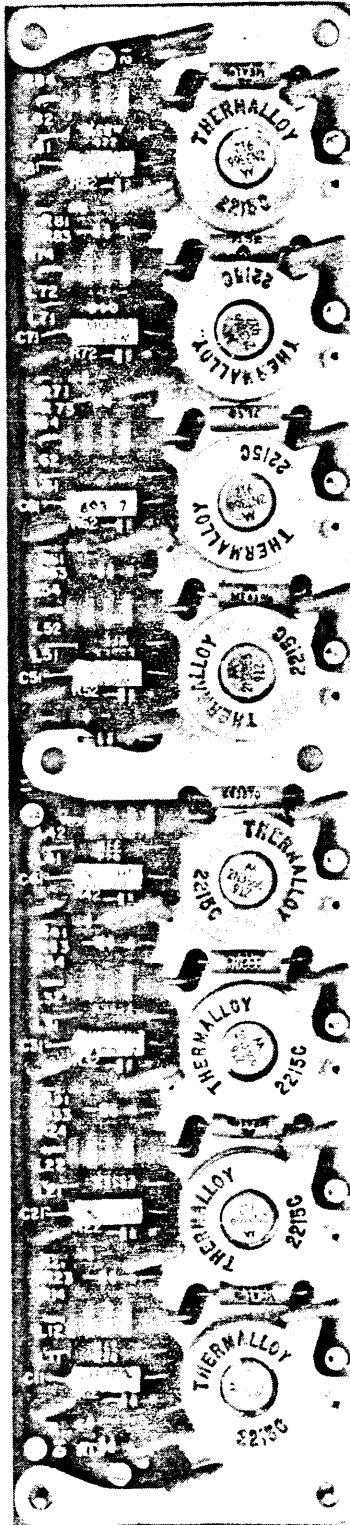


FIGURE 5-6  
OUTPUT ASSEMBLY

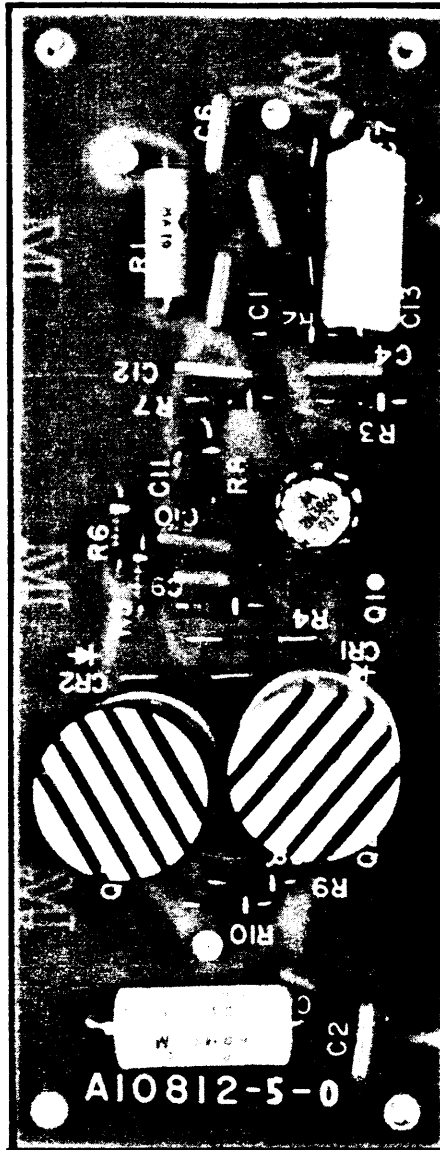
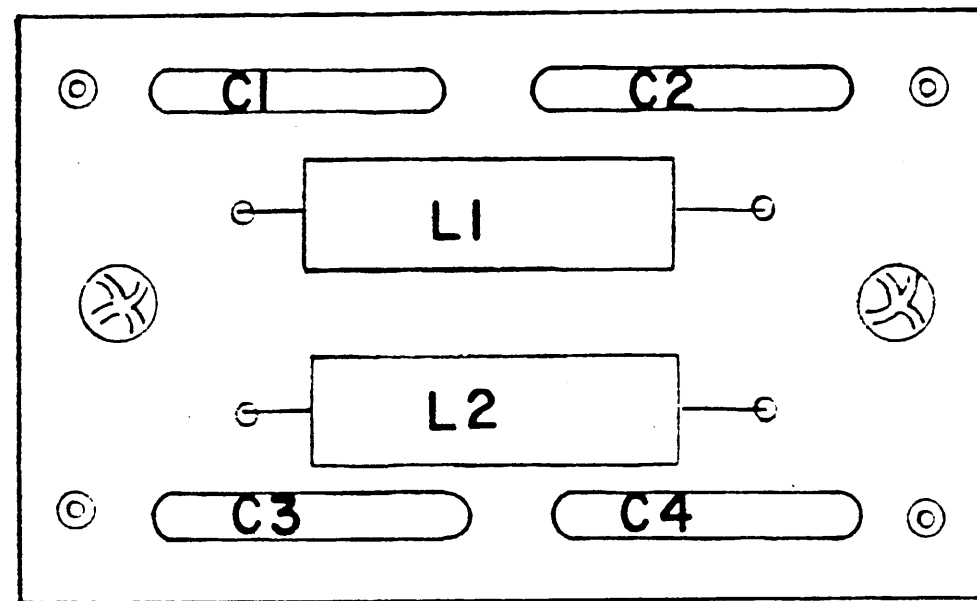


FIGURE 5-7  
PRE-AMPLIFIER

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C1,C2 C3,C4	CAPACITOR: Fixed	CC100-32
L1,L2	COIL: Fixed	CL105-1



A5780 (FL1)

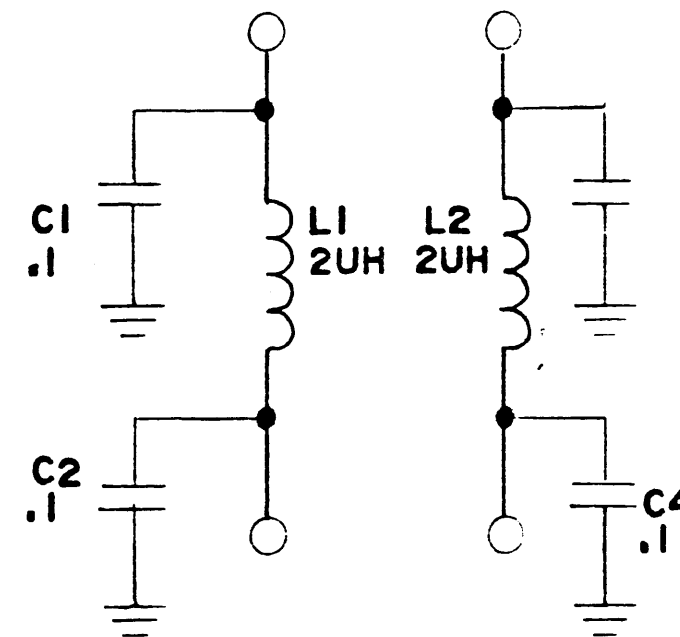


Figure 5-8  
AC Filter Diagram