TECHNICAL MANUAL
FOR
MULTICHANNEL RECEIVER
MODEL SMR-5

THE TECHNICAL MATERIEL CORPORATION
MAMARONECK, N.Y. OTTAWA, CANADA

TECHNICAL MANUAL

FOR

MULTICHANNEL RECEIVER
MODEL SMR-5

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CABLE: TEPEI 700 FENIMORE ROAD, MAMARONECK, NY 10543 U.S.A. TLX: 137-358
TEL: 914-698-4800 TWX: 710-566-1100

TMC (CANADA) LIMITED TMC INTERNATIONAL
RR No. 5, Ottawa K1G 3N3 Ontario CANADA
TEL. 613-521-2050 TLX: 053-4146

NOTICE

RECORD OF REVISIONS

NO.	ISSUED	DESCRIPTION	ENTERED	BY
001				
002	EMN 22021	PAGE 6-8 T2,T3 WAS T10003	5-5-83	RU
003				
004				
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006				
007				
008				
009				
010				

NOTE: Please file Technical Newsletters at back of manual for permanent record.

CHANGE NO. 002

INSTRUCTION BOOK CHANGE NOTICE

Date 5/6/83

Manual affected: SMR-5 **IN** _____

PAGE 6-8

ITEM (REF DESIGNATION) T2 AND T3 CHANGE FROM TT10003 TO TT10004.

REF DESIGNATION	DESCRIPTION	TMC PART NUMBER
R10	RESISTOR, FIXED, COMPOSITION: 12 ohms ±5%; 1/4 watt	RC07GF120J
R11	Not used	
R12	RESISTOR, FIXED, COMPOSITION: 1.8 Kohms ±5%; 1/4 watt	RC07GF182J
R13	Not used	
R14	Not used	
R15	RESISTOR, FIXED, COMPOSITION: 82 ohms ±5%; 1/4 watt	RC07GF820J
R16	RESISTOR, FIXED, COMPOSITION: 510 Kohms ±5%; 1/4 watt	RC07GF514J
R17	Not used	
R18	RESISTOR, VARIABLE, COMPOSITION: 5 Kohms ±10%; 1/4 watt at 70°C	RV111U502A
R19	RESISTOR, FIXED, COMPOSITION: 4.7 Kohms ±5%; 1/4 watt	RC07GF472J
R20	Same as R19	
R21	Same as R3	
R22	RESISTOR, FIXED, COMPOSITION: 1 Mohm ± 5%, 1/4 watt	RC07GF105J
R23	Same as R5	
R24	RESISTOR, FIXED, COMPOSITION: 2.2 Kohms ±5%; 1/4 watt	RC07GF222J
R25	Same as R1	
R26	Same as R1	
R27	RESISTOR, FIXED, COMPOSITION: 2.7 Kohms ±5%; 1/4 watt	RC07GF272J
R28	RESISTOR, FIXED, COMPOSITION: 18 ohms ±5%, 1/4 watt	RC07GF180J
R29	Same as R4	
R30	Same as R22	
T1	TRANSFORMER, RF, FIXED	TZ10002
T2	TRANSFORMER, RF	TT10004
T3	Same as T2	
T4	TRANSFORMER, AF	TF10040
U1	INTEGRATED CIRCUIT	NW MC1550

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MAMARONECK, N.Y. OTTAWA, CANADA

IN - 3018

1st. JANUARY 1969

CHANGE NO: 1

TECHNICAL MANUAL CHANGE NOTICE

DATE: 5 JAN. 1970

MODEL AFFECTED: Strip Receiver, Model SR-5

MANUAL NO.: IN 3020

FIGURE 7-3 SCHEMATIC DIAGRAM, AM IF BOARD

Page 7-7 Delete C1 - 0.1 uF

Insert C1 - 0.22 uF.

PARTS LISTS IF BOARD, A10840-5, AM

Page 6-11 Delete C1, Cap, flat, foil: 0.1 uF, 250 Vdc, CC1CC11-8

Insert C1, Cap, flat, foil; 0.22 uF, 250 Vdc, CC1CC11-10.

REF DESIGNATION	DESCRIPTION	TMC PART NUMBER
R10	RESISTOR, FIXED, COMPOSITION: 12 ohms ±5%; 1/4 watt	RC07GF120J
R11	Not used	
R12	RESISTOR, FIXED, COMPOSITION: 1.8 Kohms ±5%; 1/4 watt	RC07GF182J
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R14	Not used	
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T1	TRANSFORMER, RF, FIXED	TZ10002
T2	TRANSFORMER, RF	TT10004
T3	Same as T2	
T4	TRANSFORMER, AF	TF10040
U1	INTEGRATED CIRCUIT	NW MC1550

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS

LIST OF TABLES

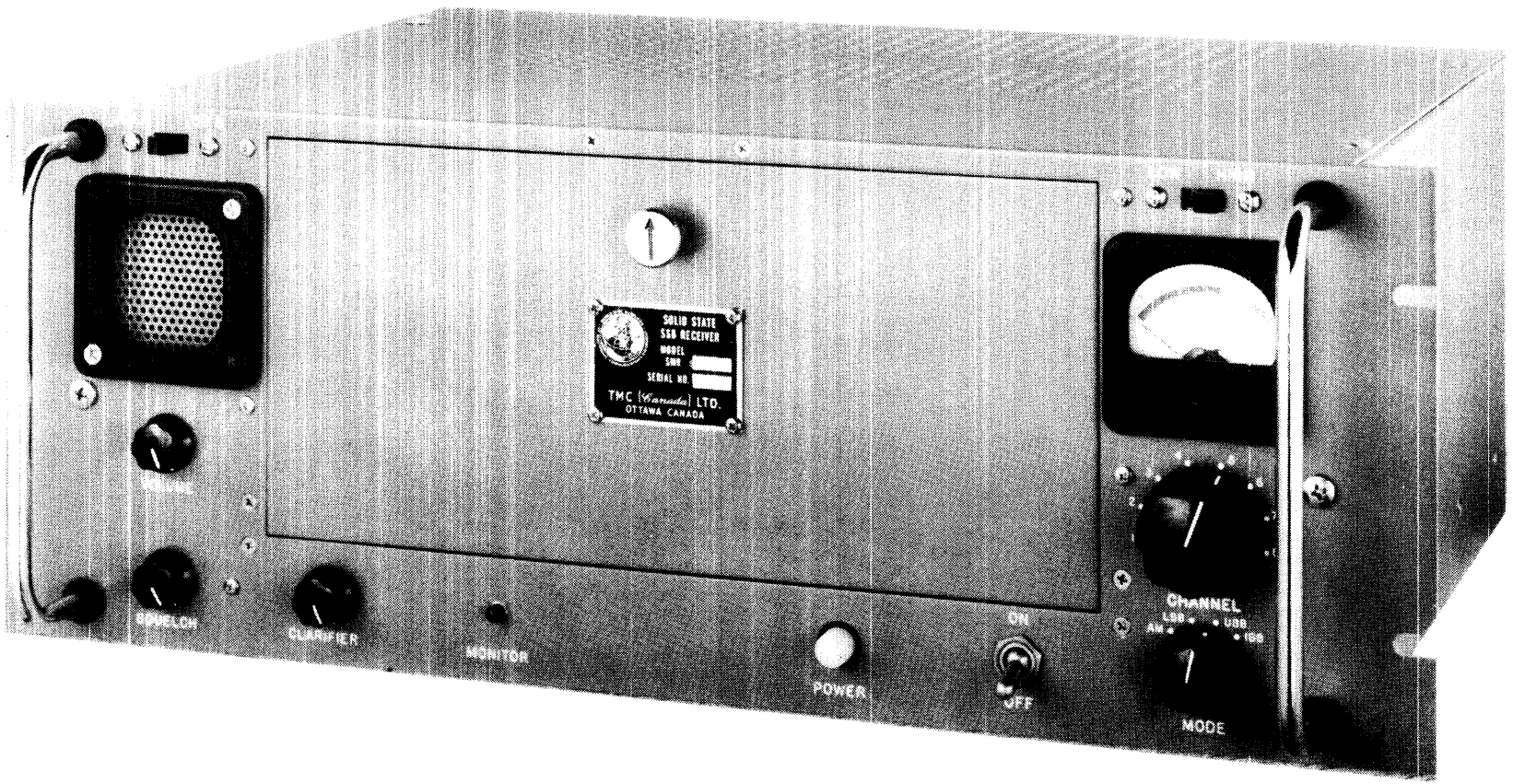


FIGURE 1-1. MULTICHANNEL RECEIVER, MODEL SMR-5

SECTION 1
GENERAL DESCRIPTION

1-1 FUNCTIONAL DESCRIPTION

a. GENERAL – The Multichannel Receiver, Model SMR-5, (figure 1-1) superheterodyne communications receiver operating in the 2 to 32 MHz frequency range. The SMR-5 uses one of eight selectable, fixed-turned, crystal-controlled plug-in modules, Model TTRR - ( ) for its RF section. Various combinations of these modules may be used to provide frequency coverage in accordance with operations requirements (refer to paragraph 1-4).

The SMR-5 is a versatile unit, capable of receiving SSB (single sideband) AM (amplitude modulated equivalent), and CW (continuous wave) transmissions. It is a dual IF channel receiver available in several configurations, depending on the type of signals to be received. The model numbers for the various configurations are as follows:

Model No.	Type of Reception
SMR-5U	USB/CW/AME
SMR-5L	LSB/CW/AME
SMR-5U/L	USB and LSB/CW/AME
SMR-5A	AM
SMR-5A/U	AM and USB/CW
SMR-5A/L	AM and LSB/CW
SMR-5A/U/L	AM, USB and LSB/CW

The model number required must be specified at the time of order.

Other features of the SMR-5 include:

(1) High sensitivity for good reception under weak signal conditions.
(2) Use of transistors and integrated circuits throughout.
(3) A built-in meter for monitoring either of the audio line outputs as selected by the CH A/CH B switch. A HIGH/LOW switch is provided in conjunction with the meter; LOW for audio signals of 3 dBM or less, and HIGH for audio signals greater than 3 dBM.
(4) A speaker output of the selected audio line signal, with SQUELCH and VOLUME controls. A monitor lamp indicates when the speaker is in the unsquelched state.
(5) IF output available in AM mode for use with CODAN equipment.
(6) A clarifier control for fine tuning of the HFO in the selected TTRR module.
(7) An output of the selected HF oscillator signal.
(8) Provision for independent squelch of the AM, LSB and USB audio outputs.
(9) Provision for a remote indication of the mode selected.
(10) Provision for remote adjustment of the clarifier control signal.
(11) Provision for remote control of the BFO signal.
(12) Provision for connection of a remote relay to cut off the +12Vdc operating power for the SMR-5.

NOTE

The + 12Vdc supplied to the HFO is present at all times regardless of the relay position, to maintain stability.

b. OPTIONS – The following features of the SMR-5 are variable and must be specified at the time of order.

(1) The configuration of the SMR-5 is determined by the types and frequencies of signals to be received (refer to paragraph 1-1a).
(2) The power input to the SMR-5 may be 115, 208, 230 or 250 Vac.
(3) The BFO signal may be provided from an external source rather than by the SMR-5.

NOTE

A BFO singal is not required for AM reception.

(4) The HFO signal may be provided from an external source rather than by the SMR-5.
(5) The following components in the SMR-5 may be other than listed on the parts list (section 6) if a special request is made at the time of order.

1-2 PHYSICAL DESCRIPTION

a. EXTERNAL – The SMR-5 is designed for mounting in a standard 19-inch wide rack. The top cover is removeable to allow access to internal components. The operator controls are located on the front and rear panels. The receptacle into which the TTRR modules are inserted is located on the front panel and is covered by a hinged cover.

b. INTERNAL – Most of the components in the SMR-5 are located on printed circuit boards which are mounted to the chassis. The remaining components are mounted directly to the chassis. The semiconductor and integrated circuit complement of the SMR-5 is given in table 1-1.

TABLE 1-1 SEMICONDUCTOR AND INTEGRATED CIRCUIT COMPLEMENT

Reference Designation	Type	Function
Main Chasis	NW10002	Regulator
U1		
Power Supply Board	1N4002	Rectifier
CR1 to CR4		
BFO Distribution Board	2N3904	Emitter followers
Q1 and Q2		
IF Board		
CR1 and CR2	1N753A	Regulate + 6V signals
CR3 and CR4	1N34A	Voltage doubler
CR5	1N34A	Directional protection
Q1	MPF105	Buffer amplifier
Q2	2N3906	AGC dc amplifier
Q3	MPF105	AGC output follower
U1 and U2	NW-MC1550	IF amplifier
U3	NW-MC1550	Product detector (SSB) (U3 not on AM type board)
U4	NW-CA3020	Audio output amplifier (SSB) or audio detector and output amplifier (AM)
U5	NW-CA3028	AGC amplifier
Audio/Squelch Board		
CR1	1N3018A	Regulator
Q1	2N3906	AGC comparator
Q2 and Q5	2N3904	Squelch switches
Q3 and Q4	2N3904	Monitor lamp drive
U1	NW-CA3020	Audio amplifier
Metering Board		
CR1 and CR2	1N34A	Rectifier

1-3 EQUIPMENT SUPPLIED

Table 1-2 lists the equipment supplied with the SMR-5.

TABLE 1-2 EQUIPMENT SUPPLIED

Name	Designation	Function	Qty
Multichannel Receiver	SMR-5	Communications Receiver	1
Power Cable Assembly	CA10523	Provides for connection to power connector J17	1
Connector Assembly	A10709	Provides for connection to J16 on rear panel	1
RF Connector	UG88/U	Provide for connection to jacks on rear panel	4

TECHNICAL SPECIFICATIONS

Frequency range	2 to 32 MHz divided into eight channels using the following TTRR modules: Channel 1: 2-3 MHz, TTRR - (1A) D Channel 2: 3-4 MHz, TTRR - (1B) D Channel 3: 4-6 MHz, TTRR - (2A) D Channel 4: 6-8 MHz, TTRR - (2B) D Channel 5: 8-12 MHz, TTRR - (3A) D Channel 6: 12-16 MHz, TTRR - (3B) D Channel 7: 16-24 MHz, TTRR - (4A) E Channel 8: 24-32 MHz, TTRR - (4B) E
Tuning system	Each TTRR module is fixed-tuned to a particular frequency within its band. (Refer to the appropriate TTRR manual). The SMR-5 is tuned by selecting the appropriate TTRR module.
Frequency control	Crystal-controlled oscillators are used throughout the SMR-5.
Oscillator stability	1 part per million per day.
Types of reception	SSB, AM, AME, CW
Sensitivity	SSB: 1uV input, 15dB signal plus noise to noise ratio. AM: 3 uV input, 10dB signal plus noise to noise ratio.
Audio bandwidth	3 kHz 2 dB between 300 and 3000 Hz.

Intermediate frequency	1.75 MHz.
IF selectivity	SSB: 3 kHz 2dB. AM: 6 kHz 2dB symmetrical
Image rejection	A minimum of 60 dB from 2-16 MHz; minimum of 50 dB from 16-32 MHz.
Intermodulation	Intermodulation products are at least 40 dB below a 100 uV two tone input at the antenna.
AGC	With 100 dB change in input signal from 1 uV, the output will not vary more than 10 dB.
Hum and noise level	At least 40 dB below full output.
Antenna input impedance	50 ohms, nominal unbalanced.
Audio outputs	Each channel provides 0 to 8 dBM into a 600 - ohm balanced output.
Primary power input	115/208/230/250 Vac 10% single phase, 50/50 Hz.
Dimensions	Length: 13 inches Width: 19 inches Height: 7 inches
Weight	Approximately 45 pounds (uncrated)

SECTION 2
INSTALLATION

2-1 UNPACKING AND HANDLING

The SMR-5 is shipped from the factory in a packing case to ensure maximum protection from damage in transit. The inside of the case contains additional packing material to protect the unit not only from breakage due to shock, but also from the elements. The equipment supplied with the SMR-5 (Table 1-2) is packed in the box as loose items.

As soon as the receiver is unpacked it should be visually inspected to make sure that it is not damaged. This examination should include the testing of each control. All of the covers on the unit should be removed, and the inside of the unit checked carefully for damaged components and loose items. With respect to damage to the equipment for which the carrier is liable, TMC (Canada) Limited will assist in describing methods of repair and the furnishing of replacement parts.

2-2 POWER REQUIREMENT

The SMR-5 can operate with 115 Vac, 208 Vac, 230 Vac, or 250 Vac power. If an SMR-5 wired for operation for one ac power source is to be operated from a different ac power source, the wiring of transformers T1 and T2 in the power supply assembly must be modified. Figure 2-1 illustrates the wiring of T1 and T2 for all possible ac power inputs. For operation from 115 Vac, fuse F2 must be 1/2A and fuse F1 must be either 2A (for units with 6 or 8 HFO ovens) or 1A (2 or 4 HFO ovens). For operation from 208 Vac, 230 Vac, or 250 Vac, F2 must be 1/4A and F1 must be either 1A (6 or 8 HFO ovens) or 1/2A (2 or 4 HFO ovens).

2-3 EQUIPMENT LOCATION

The SMR-5 should be located so that there is sufficient clearance for insertion and removal of the TTRR plug-in modules and so that front and rear panel controls are easily accessible to the operator. Sufficient space for fuse replacement is required at the back of the unit. Because its solid-state construction eliminates heat problems, several SMR-5's May be installed one above the other in a rack.

2-4 ELECTRICAL INSTALLATION

Make the following connections from external equipment to the SMR-5. (Refer to figure 2-2.)

a. POWER – Connect primary power to POWER INPUT connector, J17, pins A and C.

b. ANTENNA – Connect a 50-ohm unbalanced antenna with coaxial cable lead-in to ANTENNA jack J1 on the rear panel of the SMR-5.

c. EXTERNAL HFO INPUT – When an external HF oscillator signal is being provided for the TTRR module, connect this input to EXT HFO INPUT jack J2 on the rear panel of the SMR-5. Connect jumpers in the TTRR module as required for operation with an external HFO input (refer to TTRR manual).

d. EXTERNAL BFO INPUT – When the BFO input to the IF boards (for SSB operation) is to be provided from an external source, connect the input to EXT BFO INPUT jack J3 on the rear panel of the SMR-5. Remove resistor R1 from the BFO distribution board.

e. HFO OUTPUT – An output of the HFO signal is provided for use by remote equipment at HF OSC OUTPUT jack J12 on the rear panel of the SMR-5.

f. IF MONITOR – During AM operation, an IF monitor output is provided on pin 5 of J16.

g. REMOTE CLARIFIER CONTROL – When a remote clarifier control unit is used in conjunction with the SMR-5, remove the jumper across pins 1 and 2 of connector J16 (on rear panel) and connect the remote unit.

h. AUDIO OUTPUTS – Balanced, 600-ohm audio outputs are provided on pins 16, 17, and 18 of J16 (channel A) and pins 19, 20 and 21 of J16 (channel B).

i. +12 VDC CONTROL – When it is desired that an external transmit/receive relay be used to cut off reception by the SMR-5, remove the jumper across pins 24 and 25 of J16 and connect the relay to this point. The +12 Vdc output from the SMR-5 is provided at pin 25, and the return signal from the relay should be connected to pin 24.

j. REMOTE MODE INDICATION – Connections are provided on pins 6, 7, 8, 9 and 10 of J16 for a remote indication of the position of the MODE switch (AM, LSB, USB or ISB).

k. REMOTE BFO ON/OFF CONTROL – When a remote BFO on/off switching device is to be used, remove the jumper across pins 12 and 13 of connector J16, and connect the switch across these pins.

m. SQUELCH – When it is desired to have automatic squelch of one or more of the audio line outputs (controlled by the SQUELCH control on the front panel), connect a jumper between pin 22 of J16 and pin 11 (AM squelch), pin 3 (LSB squelch) or pin 23 of J16 (USB squelch).

2-5 PERFORMANCE CHECK

Immediately after the receiver has been installed it should be checked for proper operation. This test consists simply of attempting to receive a signal. When a signal is received, the operation of each control should be checked.

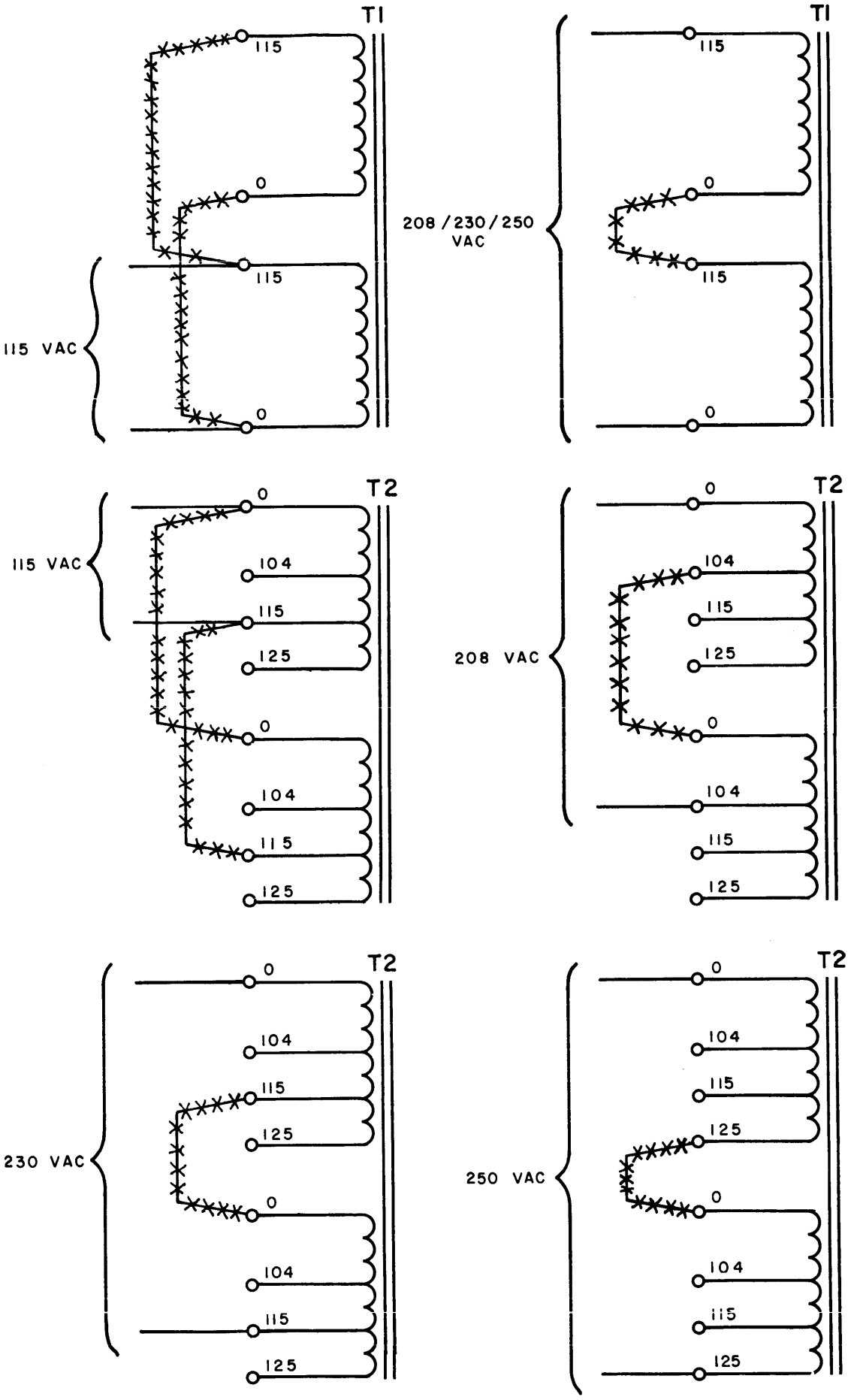


FIGURE 2-1 POWER TRANSFORMER WIRING

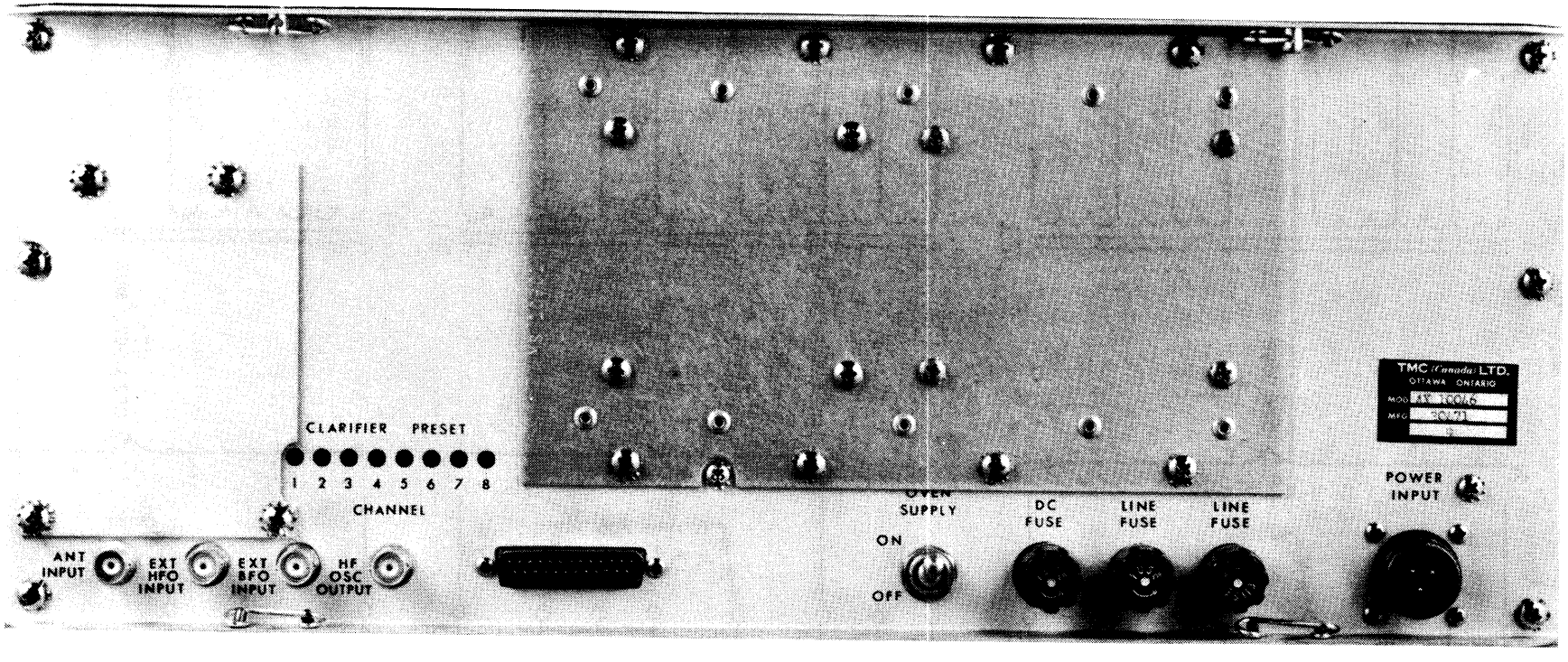


FIGURE 2-2. REAR PANEL, SMR-5

SECTION 3

OPERATION

3-1 CONTROLS AND INDICATORS

Before attempting to operate the SMR-5, the operator should become familiar with the controls and indicators listed in table 3-1 and shown in figures 1-1 and 2-2. The type and purpose of each control is described in the table. Operating instructions are given in paragraph 3-2.

TABLE 3-1. OPERATOR CONTROLS AND INDICATORS

Control or Indicator	Description
CH A/CH B switch (S4)	Selects audio line output to be applied to meter and speaker.
VOLUME control (R14)	Controls level of audio signal applied to speaker.
SQUELCH control (R13)	Determines level of AGC signal that disables speaker.
CLARIFIER control (R10)	Permits fine tuning of HFO in TTRR module.
MONITOR lamp (DS1)	Lights when speaker is in its unsquelched state.
POWER lamp (DS2)	Lights when primary power is supplied to the SMR-5 and the power switch (S5) is on.
POWER switch (S5)	Controls primary power to the SMR-5.
MODE switch (S2)	Permits selection of AM, LSB, USB, or ISB operation.
CHANNEL switch (S1)	Selects operating frequency by selecting 1 of the 8 TTRR modules.
Meter (M)	Indicates channel A or channel B audio line output level as selected by CH A/CH B switch S4.
LOW/HIGH switch (S3)	Selects correct impedance for input to meter; LOW for audio signals of 3 dBM or less, HIGH for audio signals greater than 3 dBM.
CLARIFIER PRESET CHANNEL 1 to 8 (R1 to R8) (on rear panel)	Sets frequency control signal applied to the CLARIFIER control, for each channel.
OVEN SUPPLY ON/OFF switch (S6)	Controls 12 Vac supply to the HFO oven in the TTRR module.

3-2 OPERATING PROCEDURES

a. Set the controls to the following positions:

Control	Position
POWER switch	Off
CHANNEL switch	Channel covering frequency of signal to be received.
MODE switch	Type of signal to be received (AM, USB, LSB or ISB).
CH A/CH B switch	Audio line output to be applied to speaker and meter.
SQUELCH control	Fully clockwise
VOLUME control	Fully counterclockwise
CLARIFIER control	Mid-position
LOW/HIGH switch	LOW for audio line outputs of 3 dBM or less: HIGH for audio line outputs greater than 3 dBM
OVEN supply switch	ON if 12 Vac oven supply is required for HFO in TTRR module.

b. Turn on the power switch to apply power to the SMR-5.

c. Turn the VOLUME control clockwise until a comfortable signal level is obtained.

d. Adjust the CLARIFIER control for maximum voice clarity.

e. Adjust the SQUELCH control by waiting until no signal is being received and then turning the control slowly counterclockwise until the noise from the speaker disappears and the MONITOR lamp goes out.

SECTION 4
PRINCIPLES OF OPERATION

4-1 GENERAL

This section explains the principles of operation of the SMR-5. For purposes of discussion a model SMR-5A/U/L will be described. The TTRR module is described only briefly; for a more detailed analysis, refer to the appropriate TTRR manual.

4-2 CIRCUIT ANALYSIS (refer to figure 4-1)

a. INPUT CIRCUITS – The RF input to the SMR-5 is provided from ANTENNA jack J1 to one of eight TTRR plug-in modules through CHANNEL switch S1. Each TTRR is fixed-tuned to a different frequency so that the SMR-5 can receive on any one of eight frequencies, determined by the TTRR module selected by S1. Additional sections of CHANNEL switch S1 provide the +12 Vdc input, the external HFO input (when present), the AGC input and the frequency control input to the selected TTRR module.

b. RECEIVER CONVERTER MODULE – The TTRR module includes an RF amplifier, an HF oscillator and a mixer. The module amplifies the RF signal and converts it to the IF frequency. The HF oscillator is tuned 1.75 MHz above the carrier frequencies is inverted. The carrier frequency of the IF signal is 1.75 MHz.

c. IF BOARD – GENERAL – Two types of IF board are available; one type for SSB signals and the other for AM signals. The type of IF board(s) provided in the SMR-5 depends upon the model number. For the SMR-5A/U/L, one AM type board is provided for the AM inputs, and two SSB type boards are provided, one for USB inputs and the other for LSB inputs. Each IF board produces an independent 600-ohm, balanced audio line output.

The channel A and channel B audio outputs provided at connector J16 for the various modes of operation are as follows:

Mode	Channel A Audio Output	Channel B Audio Output
AM	AM	——
LSB	LSB	——
USB	USB	——
ISB	USB	LSB

The principles of operation for the IF boards are described separately in the following paragraphs, but it will be seen that in many respects the circuits are identical.

d. SSB TYPE IF BOARD – The IF signal from the selected TTRR module is provided to the IF board through CHANNEL switch S1. It is applied to buffer amplifier Q1 on the IF board and then passes to filter FL1 which is a highly selective filter with a bandpass of 2.70 kHz. Since the RF input to the SMR-5 is inverted by the TTRR module, the signal provided to FL1 is opposite in sideband to the RF input signal. Hence for an upper sideband RF input, FL1 is a filter which passes frequencies from 1747.000 to 1749.700 kHz, and for a lower sideband RF input, FL1 is a filter which passes frequencies from 1750.300 to 1753.000 kHz.

The output from FL1 passes through IF amplifiers U1 and U2 to product detector U3. The product detector is also provided with a BFO input from the BFO distribution board (refer to paragraph f). The IF input and BFO signal beat together in the product detector to derive the audio information from the IF signal. The audio signal is then amplified by audio amplifier U4 and supplied to connector J16 as the 600-ohm, balanced audio line output.

The output from product detector U3 is also provided through AGC amplifier U5 to voltage doubler CR3 - CR4. The output from the voltage doubler is a dc signal which is amplified by Q3, passes through emitter follower Q2 and provides the AGC output. This AGC signal is fed back to the RF amplifier in the selected TTRR module through MODE switch S2 and CHANNEL switch S1. In addition, it is provided to the audio/squelch board.

e. AM TYPE IF BOARD – As for the SSB type IF board, the IF input passes through buffer Q1, filter FL1, and IF amplifiers U1 and U2. However, filter FL1 is a 6 kHz filter which passes both sidebands of the IF signal. The signal then passes directly to U4 which acts as an audio detector and amplifier to produce the 600-ohm, balanced audio line output at connector J16.

The output from IF amplifier U2 is used to produce the AGC signal in the same way as in the SSB type IF board (see paragraph d). An IF monitor output is also provided from IF amplifier U2 on the AM type IF board.

f. BFO DISTRIBUTION BOARD – The BFO distribution board provides BFO inputs to SSB type IF boards. These signals can be produced either using a BFO signal from an external source or by generating a BFO signal using oscillator Z1 on the BFO distribution board itself. When the externally provided BFO signal is to be used, resistor R1 must be removed from the BFO distribution board. The BFO signal (externally provided or internally produced) is applied to emitter followers Q1 and Q2 from which are provided two identical BFO outputs for use by the SSB IF board(s).

The +12 Vdc supply required by the BFO distribution board to produce the BFO outputs is controlled by part of the MODE switch S2 so that it is provided to the BFO board in LSB, USB and ISB modes, but not in the AM mode. In addition, a remote BFO on/off switch may be connected to the SMR-5 to cut off the +12 Vdc supply in the LSB, USB and ISB modes, so that no BFO signals are produced.

g. CLARIFIER CIRCUITS – The frequency control input to the TTRR module is set using the CLARIFIER control (R10) on the front panel of the SMR-5, or alternately, a remote clarifier control connected across pins 1 and 2 of J16. The frequency control signal is preset for each channel (using the eight CLARIFIER PRESET controls on the back of the SMR-5) so that the TTRR is set at its nominal frequency of reception when the CLARIFIER control is at its mid-position.

h. AUDIO/SQUELCH BOARD – The audio input to the audio/squelch board is taken from either the channel A or channel B audio line signal, depending on the position of the channel selector switch S4. The audio input is amplified by U1 and applied to the speaker. The volume of the speaker output is set by a signal provided to U1 from VOLUME control R14. The AGC input to the audio/squelch board (see paragraph d) is applied to AGC comparator Q1 along with the squelch input signal set by SQUELCH control R13. When the AGC input is below the level set by the squelch input, Q1 is in its "on" condition. As a result, squelch switch Q2 goes on, squelching the audio amplifier U1 so that there is no output from the speaker; MONITOR lamp drive Q3-Q4 goes off and the lamp goes out; and squelch switch Q5 goes on, providing a squelch output to pin 22 of J16. If this pin is jumpered to the squelch input connections for any of the IF boards (pins 3, 11 and 23 of J16) the audio line outputs from these IF boards will be squelched. When the AGC input is above the level set by the squelch input, Q1 goes off. As a result Q2 goes off and U1 is not squelched; Q3 - Q4 goes on and the MONITOR lamp lights; and Q5 goes off so that no squelching of the audio line outputs of the IF boards occurs.

i. METERING BOARD – The input to the metering board is taken from either the channel A or channel B audio line signal, depending on the position of the channel selector switch S4. The input is rectified by CR1 and CR2 and applied to the meter. HIGH/LOW switch S3 is used to set the impedance of the meter circuit for high gain signals (greater than 3 dBM) and low gain signals (3 dBM or less).

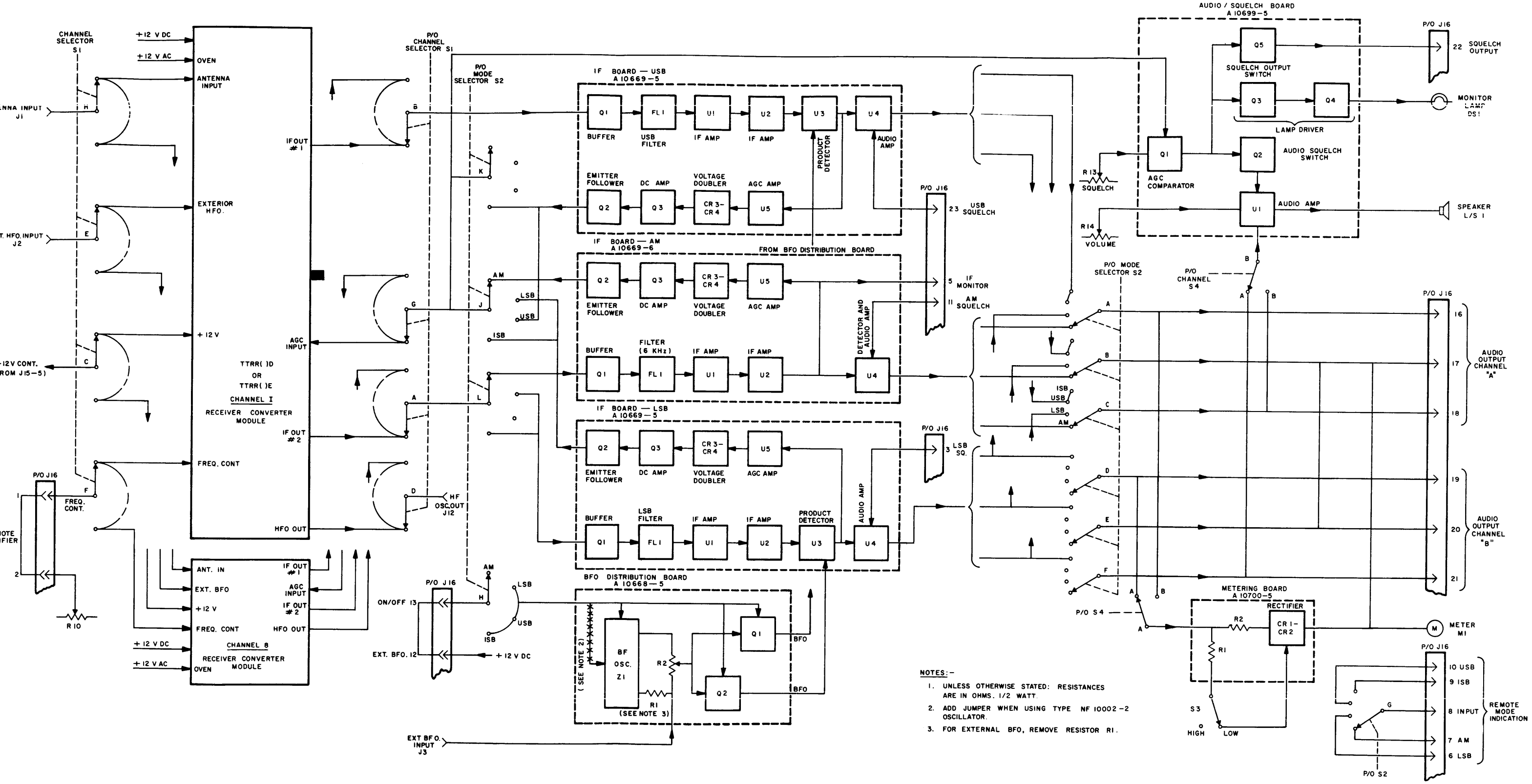
j. POWER SUPPLY – The primary ac power input is provided to the power supply from pins A and C of J17. The input is applied to the primary windings of transformers T1 and T2 through power switch S5 and fuses F1 and F2. The output from T1 is a 12 Vac oven supply which is provided to the HFO oven in the TTRR module through OVEN SUPPLY ON/OFF switch S6. Figure 2-1 shows the jumper connections at the primary windings of T1 and T2 for all possible ac inputs. Transformer T2 produces two outputs. One of these is a 12 Vac signal that is applied to power lamp DS2. The second is an 18 Vac signal which is applied to the rectifier board. Here it is rectified by CR1 - CR2 to a 26 Vac (no load) unregulated output and applied to regulator U1. The output from U1 is a regulated +12 Vdc signal which is returned to the rectifier board through fuse F3 for distribution throughout the SMR-5.

Three outputs of the regulated +12 Vdc signal are provided. One of these is routed to the CLARIFIER and SQUELCH controls and to the MONITOR lamp. A second is routed to the HFO oven assembly in the TTRR module, while the third is connected to pins 12 and 25 of J16.

The + 12 Vdc output at pin 12 of J16 is the power supply for the BFO distribution board. When an external BFO on/off switching device is being used, this +12 Vdc signal is routed through it, and returned to pin 13 of J16 when the switch is closed. From here it is connected to the BFO distribution board, provided the MODE switch S2 is not in the AM position. When no external BFO on/off switching device is connected, pins 12 and 13 of J16 must be jumpered together.

The +12 Vdc signal routed to pin 25 of J16 may be

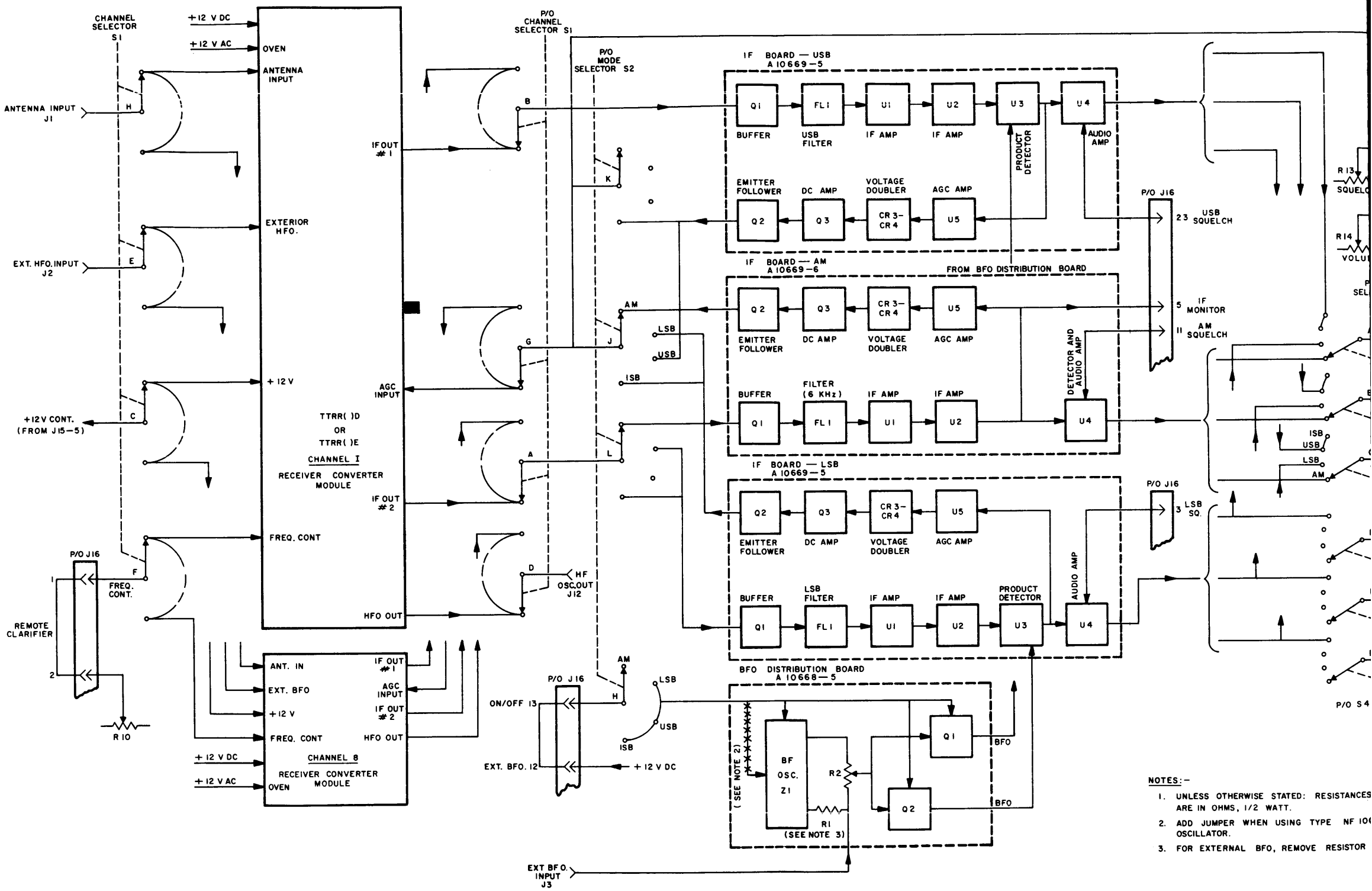
connected to an external transmit/receive relay. A +12 Vdc return signal to pin 24 of J16 is provided only when the relay is closed. This "controlled" + 12 Vdc signal is then routed to various points in the SMR-5. When no transmit/receive relay is used, pins 24 and 25 are jumpered together so that the +12 Vdc controlled signal is present whenever the + 12 Vdc signal is present.



NOTES:-

1. UNLESS OTHERWISE STATED: RESISTANCES ARE IN OHMS. 1/2 WATT.
2. ADD JUMPER WHEN USING TYPE NF 10002-2 OSCILLATOR.
3. FOR EXTERNAL BFO, REMOVE RESISTOR R1.

FIGURE 4-1. BLOCK DIAGRAM (SHEET 1 OF 1), SMR-5



NOTES:-

1. UNLESS OTHERWISE STATED: RESISTANCES ARE IN OHMS, 1/2 WATT.
2. ADD JUMPER WHEN USING TYPE NF 10(OSCILLATOR.
3. FOR EXTERNAL BFO, REMOVE RESISTOR

FIGURE 4-1. BL

SECTION 5
MAINTENANCE

5-1 GENERAL

This section describes preventive maintenance, troubleshooting, repair and alignment procedures for the SMR-5. For maintenance procedures for the TTRR modules, refer to the appropriate TTRR manual. The following equipment is required to perform SMR-5 maintenance procedures.

a. RF Signal Genefator, Hewlett Packard Model 606A, or equivalent.
b. Oscilloscope, Tektronix Model 545, or equivalent.
c. Volt-Ohm-Milliameter, Simpson Model 260, or equivalent.

5-2 PREVENTIVE MAINTENANCE

Preventive maintenance for the SMR-5 consists of routine visual inspection and cleaning. Cleaning is necessary because dust may accumulate on components and not only reduce the efficiency of the receiver, but also increase component wear. Either a vacuum cleaner or compressed air hose should be used to clean the unit. Visually checking the unit when it is opened for cleaning can reduce downtime due to component failure. Often a deteriorating component will look bad before it actually affects the operation of the unit. Some indications of trouble are; discolouration, dirty or pitted switch or relay contacts, warped printed circuit boards, and damaged wiring. Any deteriorating component should be replaced. In addition, all hardware should be checked for tightness.

5-3 TROUBLESHOOTING

For aid in locating components in the SMR-5, refer to figures 5-1 through 5-6.

a. Disconnect external wiring from J16, but ensure that jumpers are connected between terminals 1 and 2, between terminals 24 and 25, and between terminals 12 and 13.

b. Connect a 600-ohm, 1/2 watt resistor across terminals 16 and 18 of J16 and another across terminals 19 and 21 of J16.

c. Check that the +12 Vdc inputs are present at the following terminals:

1. Terminals 5 and 9 on the selected receiver converter module. Select each module in turn.
2. Terminal 3 of J19 on the BFO distribution board (unless MODE switch is at AM).

d. Connect an oscilloscope to terminal 15 of the SSB type IF board(s) to check the BFO input. When an external BFO signal is being used, ensure that resistor R1 has been removed from the BFO distribution board. The signal level observed on the oscilloscope should be between 0.2 and 0.5 volts, peak-to-peak. If this level is not observed, check emitter followers Q1 and Q2 on the BFO board, and the BF oscillator Z1 or the external BFO input.

e. Check the TTRR modules following the procedures in the appropriate TTRR manual.

f. Remove the TTRR modules from the SMR-5.

g. Connect the RF signal generator to terminal 1 of the IF board(s) and adjust it to deliver a 30 uV signal (approximately) at 1750 kHz. This signal should be modulated when checking an AM type IF board. The 600-ohm audio line output on terminals 7, 8 and 9 on the IF board should be 0 dBM. If this level is not obtained, perform steps h and i.

h. Apply a modulated, approximately 2 mV signal to terminal 1 of the IF board(s). Using an oscilloscope, check for the presence of a signal at the following points to locate faulty components. Connect the oscilloscope between ground and the check point.

1. Junction of R1 and pin 9 of T1.
2. Output of buffer amplifier Q1.
3. Pin 1 of IF amplifier U1.
4. Junction of R2 and T2.
5. Pin 1 of IF amplifier U2.
6. Junction of C21 and T3.
7. Junction of T3 and R11 (AM type IF board) or pin 1 of product detector U3 (SSB type IF board).
8. Pin 6 of product detector U3 (SSB).
9. Wiper of R18. Check for an audio signal at this point.

i. With a meter, check for 6 Vdc at pin 9 of U4 and pin 7 of U5. If the voltage levels at these points are less than +6 Vdc, check CR2 and CR1 respectively.

j. With no input to the IF board, check that the

voltage at the junction of Q2 and R21 is between 1.8 and 2.5 Vdc. If this voltage level is not observed check the AGC circuit for defective components.

k. Set the SQUELCH control to its fully clockwise position. With a 30 uV, 1750 kHz signal applied to terminal 1 of the IF board, adjust the VOLUME control until an output is heard through the speaker. If no output is obtained, check AGC comparator Q1, squelch switch Q2 and audio amplifier U1 on the audio/squelch board. Check also that the MONITOR lamp is on. If it is not, check MONITOR lamp drive Q3 - Q4 on the audio/squelch board.

m. Connect jumpers between pin 22 of J16 and pins 3, 11 and 23 of J16 if these are not already connected. Turn the SQUELCH control fully counterclockwise. With the input still applied to the IF board (see step c) check that the channel A and channel B audio line outputs are squelched. If not, check squelch switch Q5 on the audio/squelch board.

n. With a meter check for 9 Vdc at pins 8 and 9 of the audio amplifier U1 on the audio/squelch board. If the voltage level at these points is less than 9 Vdc, check CR1.

5-4 REPAIR

In most cases, repair of the SMR-5 will consist of replacement of an electrical component. The following precautions should be observed.

a. Always replace a defective component with its exact duplicate.
b. Always place a new component in the same position as the one it replaces. In general, never change the existing chassis layout, whether in the routing of wiring or component replacement.
c. Never use a soldering iron with a power rating of more than 100 watts. Use a pair of long-nose pliers as a heat sink to protect components while soldering.
d. Be extremely careful when replacing components on printed circuit boards as excessive heat applied to a board may cause the printed wiring to lift off.
e. Always double check any solder joints made. Cold or loose solder connections can cause trouble at a later time.

5-5 ALIGNMENT

a. Disconnect external wiring from J16, but ensure that jumpers are connected between terminals 14 and 15, between terminals 24 and 25 and between terminals 12 and 13. Ensure that the TTRR modules are inserted in the unit.
b. Connect an RF signal generator to terminal 1 of the IF board(s), and adjust it to deliver a 30 uV (approximately) 1750 kHz signal (modulated for AM).
c. Connect a VOM to terminal 3 of the IF board. Tune T2 and T3 for maximum voltage at terminal 3 (AGC).
d. R18 on the IF board is factory adjusted so that the SMR-5 provides a O dBm audio line output into a 600-ohm load for an AM input of 3 uV, 1750 kHz, 30% modulated, or an SSB input of 1 uV, 1750 kHz, unmodulated. If required, however, R18 may be adjusted for up to 8 dBm audio line output with the specified inputs.
e. To set the CLARIFIER PRESET controls on the rear of the SMR-5 first set the CLARIFIER control on the front panel to its mid-position and connect a frequency counter to HF OSC OUTPUT jack J12.

Then adjust the CLARIFIER PRESET controls, CHANNEL 1 to 8 in turn, to obtain the nominal frequency on the counter for the particular channel being set.

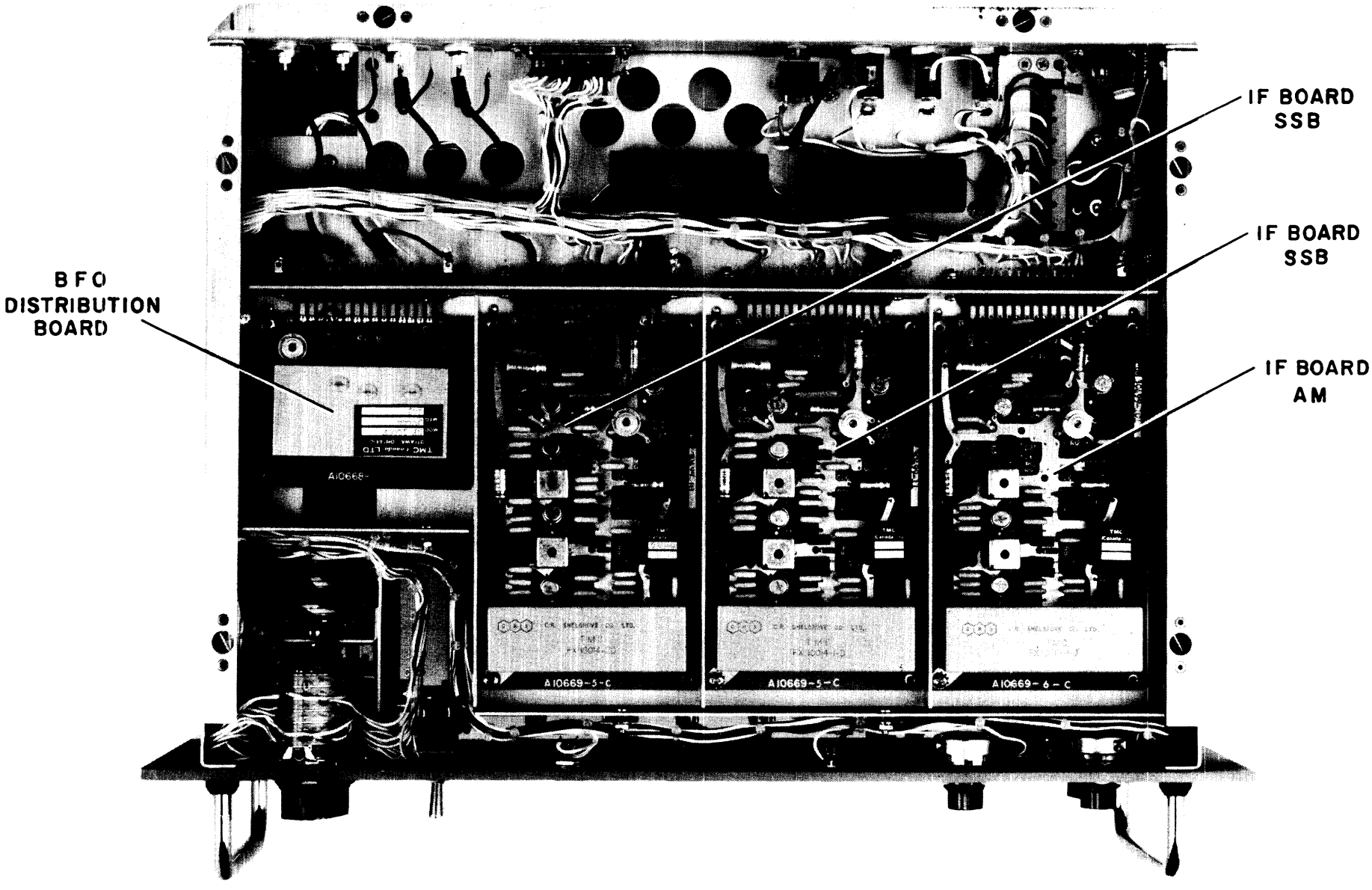


FIGURE 5-1. TOP VIEW WITH COVER REMOVED, SMR-5

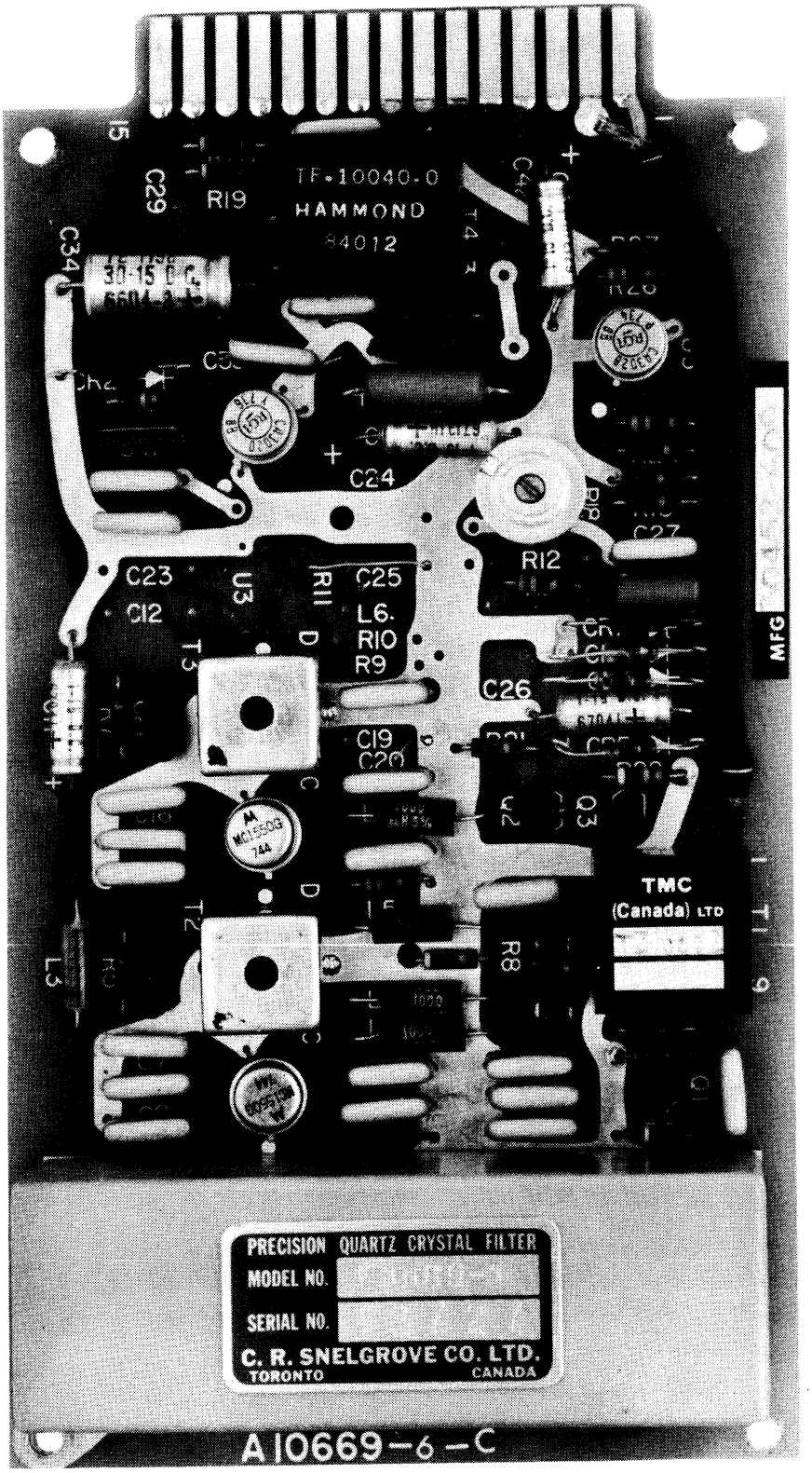


FIGURE 5-2. IF BOARD - AM TYPE, SMR-5

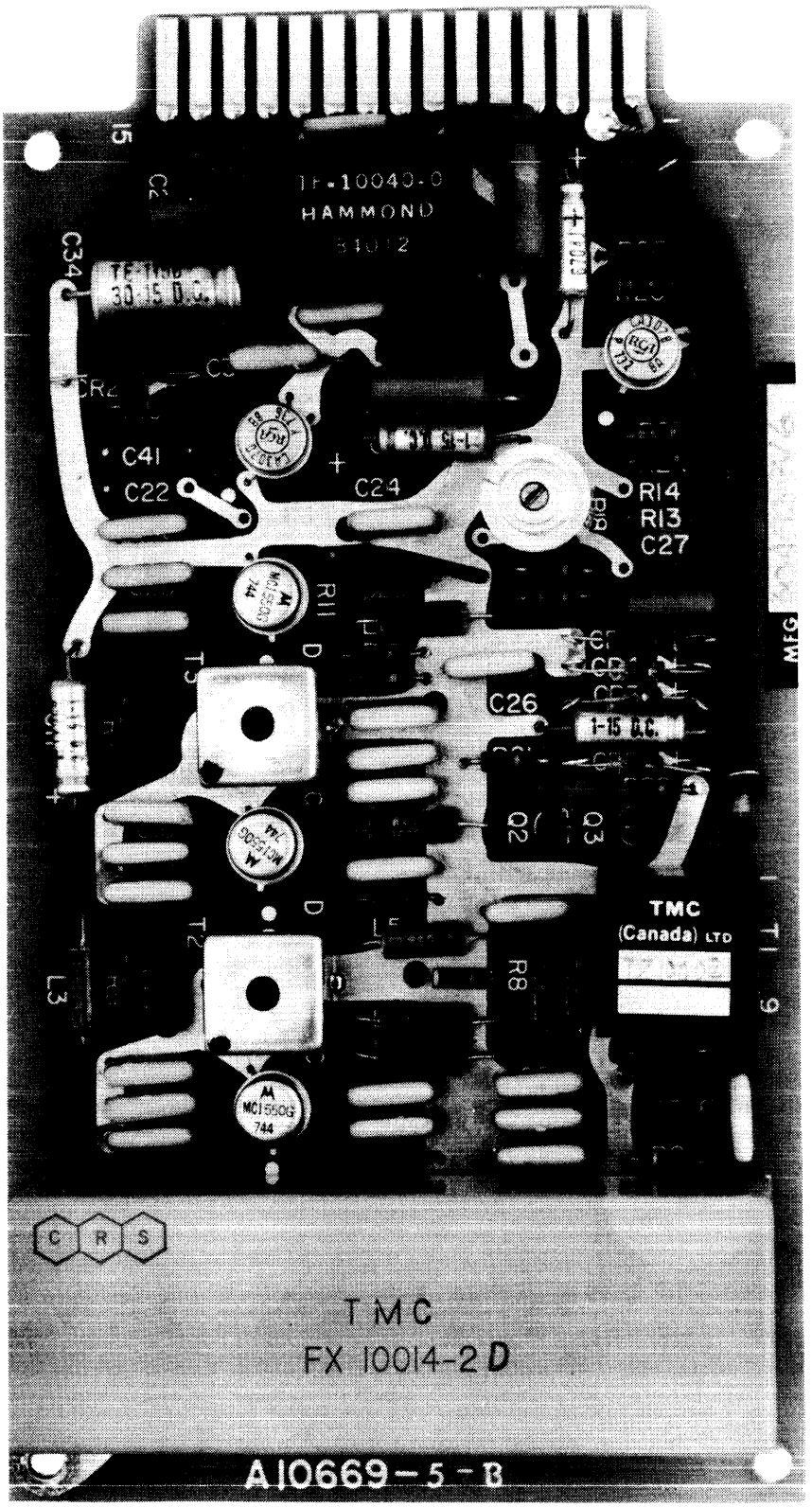


FIGURE 5-3. IF BOARD - SSB TYPE, SMR-5

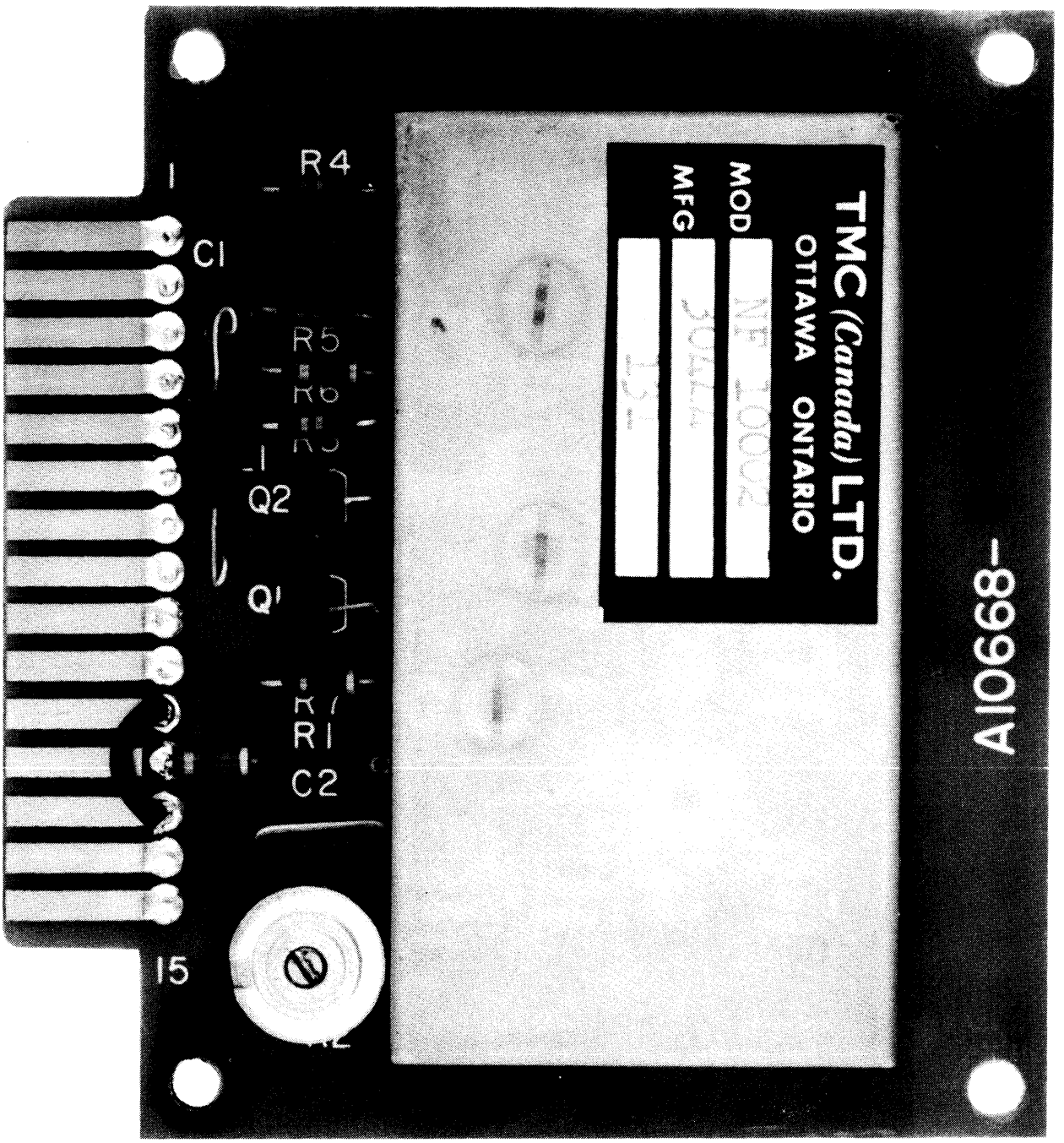


FIGURE 5-4. BFO DISTRIBUTION BOARD, SMR-5

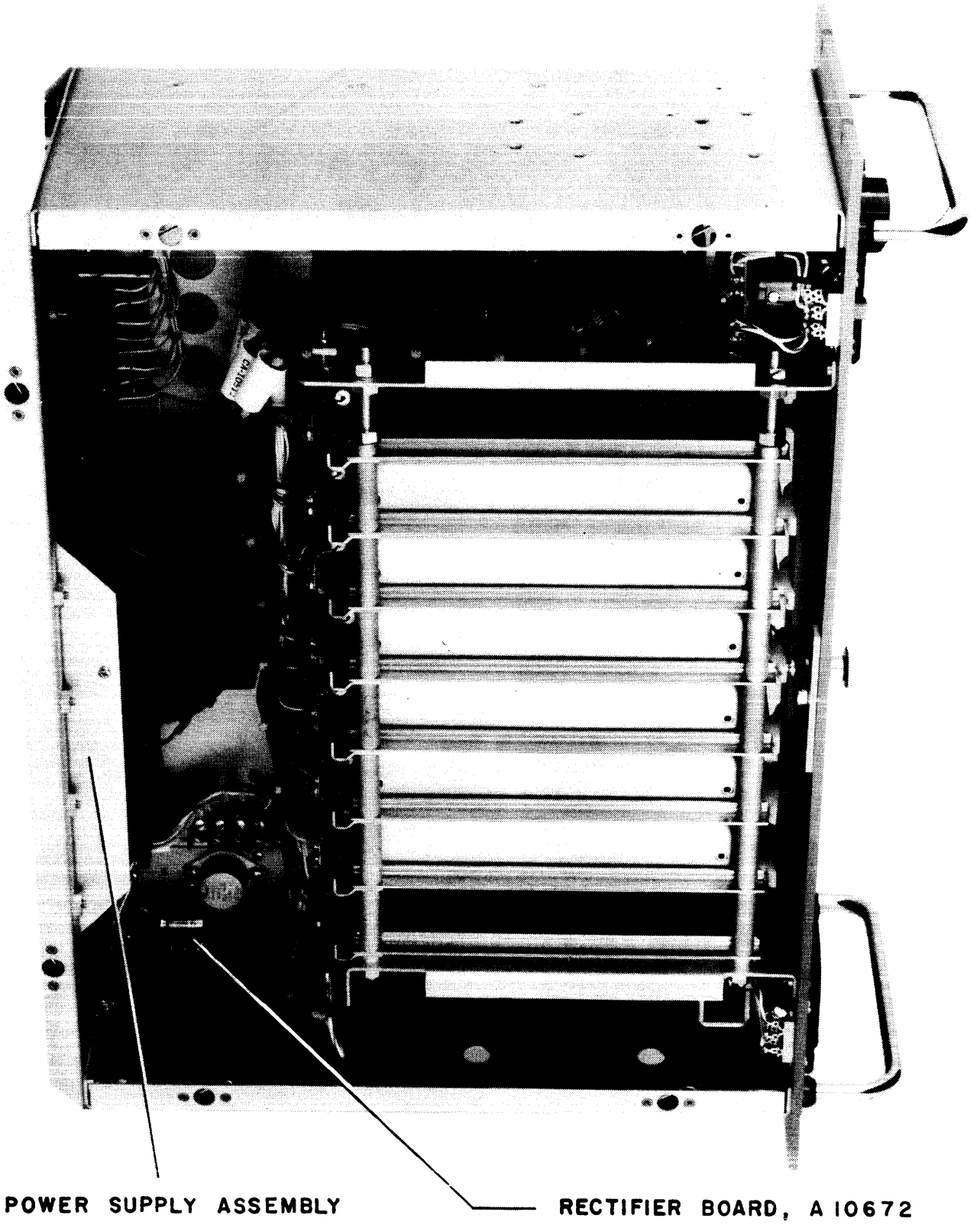


FIGURE 5-5. BOTTOM VIEW WITH COVER REMOVED, SMR-5

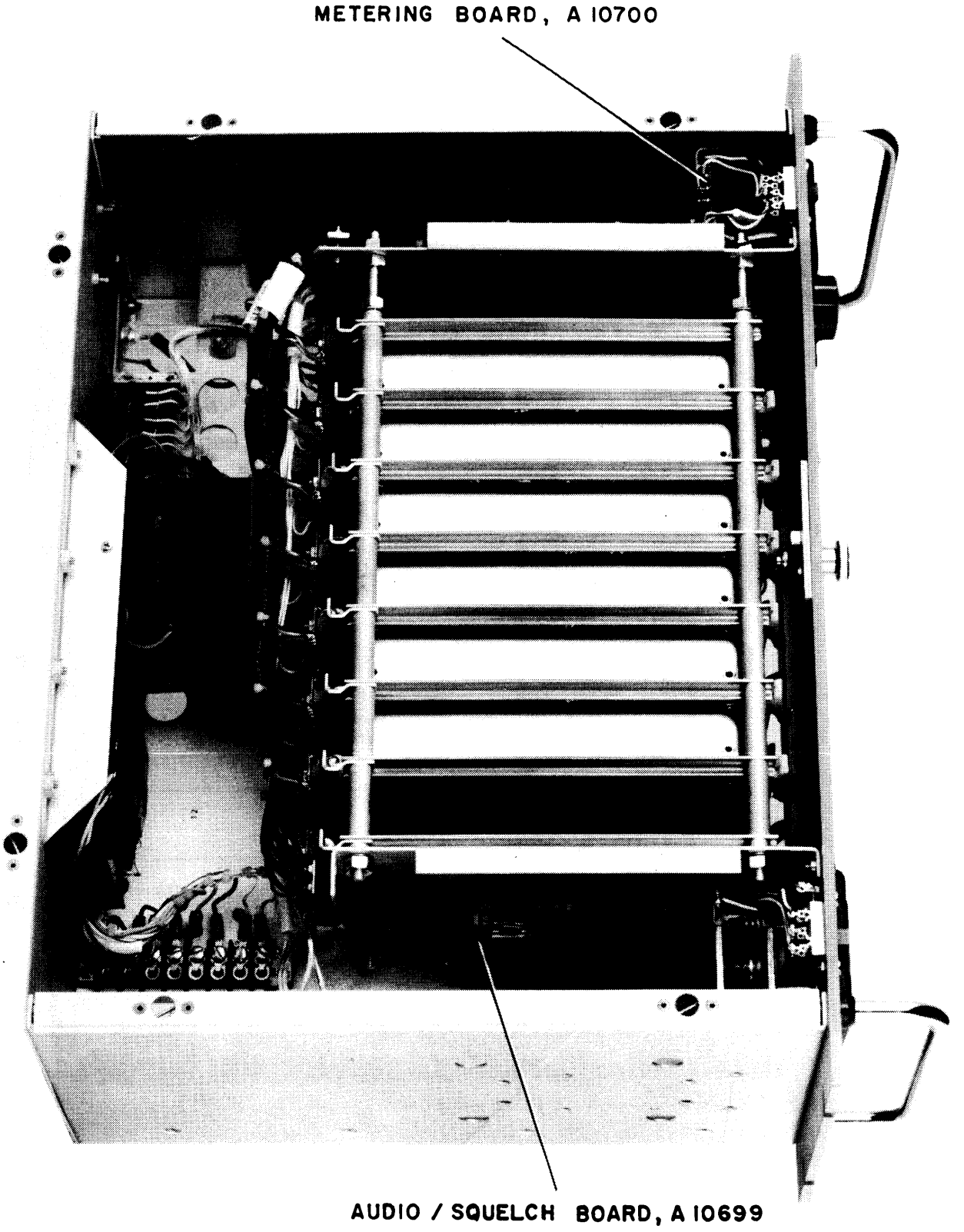


FIGURE 5-6. BOTTOM VIEW WITH COVER REMOVED, SMR-5

SECTION 6
PARTS LIST

6-1 INTRODUCTION

Reference designations have been assigned to identify all electrical parts of the equipment. These designations are used for marking the equipment (adjacent to the parts they identify) and are included on drawings, diagrams and the parts list. The letters of a reference designation indicate the kind of part (generic group), such as resistor, capacitor, transistor, etc. The number differentiates between parts of the same generic group. Sockets associated with a particular plug-in device, such as transistor or fuse, are identified by a reference designation which includes the reference designation of the plug-in device. For example, the socket for crystal Y101 is designated XY101. To expedite delivery, when ordering replacement parts, specify the TMC part number and the model number of the equipment.

REF DESIGNATION	DESCRIPTION	TMC PART NUMBER
C1	Not used.	
C2	CAPACITOR, FIXED, CERAMIC: 0.047 uF; 250 Vdc	CC10011-5
C3	Same as C2	
C4	CAPACITOR, FIXED, ELECTROLYTIC: 2000 uF; 25 WVdc	CE116-5VN
C5	Same as C4	
C6	CAPACITOR, FIXED, CERAMIC: 0.01 uF; GMV; 500 Vdc	CC100-16
C7	CAPACITOR, FIXED, ELECTROLYTIC: 50 uF, -10% +150%; 15 WVdc	CE105-50-15
C8 thru C14	Same as C7	
DS1	LIGHT: red, 10 Vdc, 0.027 A	TS10009
DS2	LAMP, INCANDESCENT: single contact, miniature T-1-3/4 bulb; 14.0 Vac or Vdc; 0.08A; 750 hours life	B1110-6
F1	FUSE, CARTRIDGE: slow-blow; 2A; for use with 115 Vac, 6 or 8 HFO ovens	FU102-2.00
F1	FUSE, CARTRIDGE: slow-blow; 1A; for use with 115 Vac, 2 or 4 HFO ovens OR 208, 230 or 250 Vac, 6 or 8 HFO ovens	FU102-1.00
F1	FUSE, CARTRIDGE: slow-blow; 1/2A; for use with 208, 230 or 250 Vac, 2 or 4 HFO ovens	FU102-.500
F2	FUSE, CARTRIDGE: slow-blow; 1/2 A; for use with 115 Vac	FU102-.500
F2	FUSE, CARTRIDGE: slow-blow; 1/4 A; for use with 208, 230 or 250 Vac	FU102-.250
F3	FUSE, CARTRIDGE: slow-blow; 3/4 A	FU102-.750
J1	CONNECTOR, RECEPTACLE - BNC: bulkhead mounting; 1 bayonet type female contact	UG625/U
J2	Same as J1	
J3	Same as J1	
J4	CONNECTOR, PC BOARD: 15 eyelet type contacts	JJ10010-015-1
J5 thru J11	Same as J4	

REF DESIGNATION	DESCRIPTION	TMC PART NUMBER
J12	Same as J1	
J13 thru J15	Same as J4	
J16	CONNECTOR, SUBMINIATURE: non-removeable contacts	PL10007-5
J17	CONNECTOR, RECEPTACLE: box mounting; pin type contacts	MS3102A-14S-7P
J18	Same as J4	
J19	Same as J4	
LS1	LOUDSPEAKER: permanent magnet; 2 inch; 3.2 ohm	LS106
M1	METER, AF; 2000 ohms, 50 uA	MR194
R1	RESISTOR, VARIABLE, COMPOSITION: 500 Kohms	RV10006-5S
R2 thru R8	Same as R1	
R9	RESISTOR, FIXED, COMPOSITION: 10 Kohms, ±5%; 1/4 watt	RC07GF103J
R10	RESISTOR, VARIABLE, COMPOSITION: 500 Kohms, ±10%	RV4NAYSA504BYY
R11	Same as R9	
R12	RESISTOR, FIXED, COMPOSITION: 820 ohms, ±5%; 1/4 watt	RC07GF821J
R13	RESISTOR, VARIABLE, COMPOSITION: 500 ohms, ±10%	RV4NAYSA501BYY
R14	RESISTOR, VARIABLE, COMPOSITION: 5 Kohms, ±10%	RV4NAYSA502DYY
S1	SWITCH, ROTARY; CHANNEL: 8 position, 8 sections	SW10043
S2	SWITCH, ROTARY: 4 positions, 11 sections	SW10044
S3	SWITCH, SLIDE, DPDT	SW163
S4	Same as S3	
S5	SWITCH, TOGGLE, DPDT	ST22K
T1	TRANSFORMER, POWER:	TF10044
T2	TRANSFORMER, POWER:	TF10036
TB1	TERMINAL BOARD, BARRIER LUG TYPE	TM100-8
TB2	TERMINAL BOARD, BARRIER LUG TYPE	TM102-2
U1	INTEGRATED CIRCUIT	NW10002

REF DESIGNATION	DESCRIPTION	TMC PART NUMBER
C1	CAPACITOR, FIXED, ELECTROLYTIC: 100 uF, -10%, +150%; 15 WVdc	CE105-100-15
CR1	DIODE	1N4002
CR2 thru CR4	Same as CR1	
R1	RESISTOR, FIXED, COMPOSITION: 3.0 ohms +5%; 2 watts	RC32GF3ROJ

REF DESIGNATION	DESCRIPTION	TMC PART NUMBER
C1	CAPACITOR, FLAT, FOIL: 0.1 uF; 250 Vdc,	CC10011-8
C2	CAPACITOR, FLAT, FOIL: 0.01 uF; 250 Vdc	CC10011-1
L1	COIL, RF, FIXED: 470 uH	CL275-471
Q1	TRANSISTOR	2N3904
Q2	Same as Q1	
R1	RESISTOR, FIXED, COMPOSITION: 2.2 Kohms ±5%; 1/4 watt	RC07GF222J
R2	RESISTOR, VARIABLE, COMPOSITION: 1 Kohm ± 10%	RV111U102A
R3	RESISTOR, FIXED, COMPOSITION: 22 Kohms ±5%; 1/4 watt	RC07GF223J
R4	RESISTOR, FIXED, COMPOSITION: 18 Kohms ±5%; 1/4 watt	RC07GF183J
R5	Same as R4	
R6	RESISTOR, FIXED, COMPOSITION: 4.7 Kohms ±5%; 1/4 watt	RC07GF472J
R7	Same as R6	
Z1	OSCILLATOR, OVEN: 12 Vdc reg. (max.)/10 mA	NF10001 *
	* a. NF10001 supplied as standard.	
	b. Temperature compensated oven oscillator (NF10002) supplied as option at customer request.	
	c. Oscillator omitted for external BFO operation as option at customer request.	

REF DESIGNATION	DESCRIPTION	TMC PART NUMBER
C1	CAPACITOR, FLAT, FOIL: 0.1 uF; 250 Vdc	CC10011-8
C2	CAPACITOR, FLAT, FOIL: 0.047 uF;	CC10011-5
C3 thru C9	Same as C2	
C10	CAPACITOR, FIXED, MICA: 180 pF ±5%; 100 WVdc	CM111E181J1S
C11	CAPACITOR, FIXED, ELECTROLYTIC: 1 uF, -10% +150%; 15 WVdc	CE105-1-15
C12 thru C20	Same as C2	
C21	Same as C10	
C22	Not used	
C23	Same as C2	
C24	Same as C2	
C25	CAPACITOR, FLAT, FOIL: 0.01 uF; 250 WVdc	CC10011-1
C26	Same as C2	
C27	Not used	
C28	Same as C2	
C29	CAPACITOR, FLAT, FOIL: 0.22 uF; 250 WVdc	CC10011-10
C30	Same as C2	
C31	Same as C29	
C32	Same as C25	
C33	Same as C11	
C34	CAPACITOR, FIXED, ELECTROLYTIC: 30 uF, -10% +150%; 15 WVdc	CE105-30-15
C35	Same as C2	
C36	Same as C2	
C37	Same as C2	
C38	Same as C11	
C39	Same as C1	
C40	Same as C11	

REF DESIGNATION	DESCRIPTION	TMC PART NUMBER
C41	Not used	
C42	Same as C29	
CR1	DIODE	1N753A
CR2	Same as CR1	
CR3	DIODE	1N34A
CR4	Same as CR3	
CR5	Same as CR3	
FL1	FILTER: 1750.300 to 1753.000 kHz bandwidth	FX10014-1
FL1	FILTER: 1747.000 to 1749.700 kHz bandwidth	FX10014-2 *
L1	COIL, RF, FIXED: 1000 uH	CL275-102
L2	Same as L1	
L3	COIL, RF, FIXED: 220 uH	CL275-221
L4	Same as L1	
L5	Same as L3	
L6	COIL, RF, FIXED: 10 uH	CL275-100
Q1	TRANSISTOR	MPF105
Q2	TRANSISTOR	2N3906
Q3	Same as Q1	
R1	RESISTOR, FIXED, COMPOSITION: 3.3 Kohms ±5%; 1/4 watt	RC07GF332J
R2	RESISTOR, FIXED, COMPOSITION: 390 ohms ±5%; 1/4 watt	RC07GF391J
R3	RESISTOR, FIXED, COMPOSITION: 510 ohms ±5%; 1/4 watt	RC07GF511J
R4	RESISTOR, FIXED, COMPOSITION: 100 ohms ±5%; 1/4 watt	RC07GF101J
R5	RESISTOR, FIXED, COMPOSITION: 5.6 Kohms ±5%; 1/4 watt	RC07GF562J
R6	RESISTOR, FIXED, COMPOSITION: 33 ohms ±5%; 1/4 watt	RC07GF330J
R7	Same as R5	
R8	RESISTOR, FIXED, COMPOSITION: 470 ohms ±5%; 1/4 watt	RC07GF471J
R9	RESISTOR, FIXED, COMPOSITION: 68 ohms ±5%; 1/4 watt	RC07GF680J

Subject to customer requirements

REF DESIGNATION	DESCRIPTION	TMC PART NUMBER
R10	RESISTOR, FIXED, COMPOSITION: 12 ohms ±5%; 1/4 watt	RC07GF120J
R11	Not used	
R12	RESISTOR, FIXED, COMPOSITION: 1.8 Kohms ±5%; 1/4 watt	RC07GF182J
R13	Not used	
R14	Not used	
R15	RESISTOR, FIXED, COMPOSITION: 82 ohms ±5%; 1/4 watt	RC07GF820J
R16	RESISTOR, FIXED, COMPOSITION: 510 Kohms ±5%; 1/4 watt	RC07GF514J
R17	Not used	
R18	RESISTOR, VARIABLE, COMPOSITION: 5 Kohms ±10%; 1/4 watt at 70°C	RV111U502A
R19	RESISTOR, FIXED, COMPOSITION: 4.7 Kohms ±5%; 1/4 watt	RC07GF472J
R20	Same as R19	
R21	Same as R3	
R22	RESISTOR, FIXED, COMPOSITION: 1 Mohm ± 5%, 1/4 watt	RC07GF105J
R23	Same as R5	
R24	RESISTOR, FIXED, COMPOSITION: 2.2 Kohms ±5%; 1/4 watt	RC07GF222J
R25	Same as R1	
R26	Same as R1	
R27	RESISTOR, FIXED, COMPOSITION: 2.7 Kohms ±5%; 1/4 watt	RC07GF272J
R28	RESISTOR, FIXED, COMPOSITION: 18 ohms ±5%; 1/4 watt	RC07GF180J
R29	Same as R4	
R30	Same as R22	
T1	TRANSFORMER, RF, FIXED	TZ10002
T2	TRANSFORMER, RF	TT10003
T3	Same as T2	
T4	TRANSFORMER, AF	TF10040
U1	INTEGRATED CIRCUIT	NW-MC1550

REF DESIGNATION	DESCRIPTION	TMC PART NUMBER
U2	Same as U1	
U3	Same as U1	
U4	INTEGRATED CIRCUIT	NW-CA3020
U5	INTEGRATED CIRCUIT	NW-CA3028

DESIGNATION	DESCRIPTION	TMC PART NUMBER
C1	CAPACITOR, FLAT, FOIL: 0.22 uF; 250 Vdc	CC10011-10
C2	CAPACITOR, FLAT, FOIL: 0.047 uF; 250 Vdc	CC10011-5
C3	Same as C2	
C4	Same as C2	
C5	Same as C2	
C6	Same as C2	
C7	Same as C2	
C8	Same as C2	
C9	Same as C2	
C10	CAPACITOR, FIXED, ELECTROLYTIC: 1 uF, -10% + 150%; 15 WVdc	CE105-1-15
C11	CAPACITOR, FIXED, MICA: 180 pF ± 5%; 100 WVdc	CM111E181J1S
C12	Same as C2	
C13	Same as C2	
C14	Same as C2	
C15	Same as C2	
C16	Same as C2	
C17	Same as C2	
C18	Same as C11	
C19	CAPACITOR, FLAT, FOIL: 0.01 uF; 250 Vdc	CC10011-1
C20	Same as C2	
C21	Same as C2	
C22	Same as C2	
C23	CAPACITOR, FLAT, FOIL: 0.22 uF; 250 Vdc	CC10011-10
C24	Same as C19	
C25	Same as C10	
C26	Same as C2	

DESIGNATION	DESCRIPTION	TMC PART NUMBER
C27	CAPACITOR, FIXED, ELECTROLYTIC: 30 uF, –10%, +150%; 15 WVdc	CE105-30-15
C28	Same as C2	
C29	Same as C2	
C30	CAPACITOR, FIXED, ELECTROLYTIC: 50 uF, –10%, +150%; 25 WVdc	CE105-50-25
C31	Same as C10	
C32	CAPACITOR, FIXED, ELECTROLYTIC: 10 uF, –10%, +150$, 25 WVdc	CE105-10-25
C33	Same as C1	
C34	Same as C2	
C35	Same as C10	
CR1	DIODE	1N753A
CR2	DIODE	1N4370
CR3	Same as CR2	
CR4	DIODE	1N34
CR5	Same as CR4	
CR6	Same as CR1	
FL1	FILTER, AM, 4 POLE: 1750 kHz carrier; 6 kHz nominal bandwidth	FX10019-1*
L1	COIL, RF, FIXED: 100 uH	CL275-102
L2	Same as L1	
L3	COIL, RF, FIXED: 220 uH	CL275-221
L4	Same as L1	
L5	Same as L3	
Q1	TRANSISTOR	MPF105
Q2	TRANSISTOR	2N3906

* A 4 pole filter (FX10019-1) is supplied as standard; however, an 8 pole filter (FX10019-2) will be supplied instead when requested.

DESIGNATION	DESCRIPTION		TMC PART NUMBER
Q3	Same as Q1		
Q4	Same as Q2		
Q5	Same as Q1		
R1	RESISTOR, FIXED, COMPOSITION: ± 5%, 1/4 watt	3.3 Kohms	RC07GF332J
R2	RESISTOR, FIXED, COMPOSITION: ± 5%; 1/4 watt	510 ohms	RC07GF511J
R3	RESISTOR, FIXED, COMPOSITION: ± 5%; 1/4 watt	390 ohms	RC07GF391J
R4	RESISTOR, FIXED, COMPOSITION: ± 5%; 1/4 watt	100 ohms	RC07GF101J
R5	RESISTOR, FIXED, COMPOSITION: ± 5%; 1/4 watt	470 ohms	RC07GF471J
R6	RESISTOR, FIXED, COMPOSITION: ± 5%; 1/4 watt	33 ohms	RC07GF330J
R7	RESISTOR, FIXED, COMPOSITION: ± 5%; 1/4 watt	8.2 Kohms	RC07GF822J
R8	RESISTOR, VARIABLE, COMPOSITION: ± 5%; 1/4 watt	510 Kohms	RC07GF514J
R9	RESISTOR, FIXED, COMPOSITION: ±10%; 1/4 watt at 70°C	5 Kohms	RV111U502A
R10	RESISTOR, FIXED, COMPOSITION: ±5%; 1/4 watt	1.5 Kohms	RC07GF152J
R11	RESISTOR, FIXED, COMPOSITION: ± 5%; 1/4 watt	56 ohms	RC07GF560J
R12	RESISTOR, FIXED, COMPOSITION: ± 5%; 1/4 watt	82 ohms	RC07GF820J
R13	RESISTOR, FIXED, COMPOSITION: ± 5%, 1/4 watt	4.7 ohms	RC07GF472J
R14	Same as R13		
R15	RESISTOR, FIXED, COMPOSITION: ± 5%; 1/4 watt	18 ohms	RC07GF180J
R16	Same as R1		

DESIGNATION	DESCRIPTION	TMC PART NUMBER
R17	Same as R4	
R18	RESISTOR, FIXED, COMPOSITION: 820 ohms ± 5%; 1/4 watt	RC07GF821J
R19	RESISTOR, FIXED, COMPOSITION: 330 Kohms ± 5%; 1/4 watt	RC07GF334J
R20	RESISTOR, VARIABLE: 50 Kohms	RV10007-13
R21	Same as R12	
R22	RESISTOR, FIXED, COMPOSITION: 2.7 Kohms ± 5%; 1/4 watt	RC07GF272J
R23	Same as R4	
R24	Same as R18	
R25	Same as R20	
R26	RESISTOR, FIXED, COMPOSITION: 5.6 Kohms ± 5%; 1/4 watt	RC07GF562J
R27	RESISTOR, FIXED, COMPOSITION: 2.2 Kohms ± 5%; 1/4 watt	RC07GF222J
R28	Same as R1	
R29	Same as R22	
R30	Same as R1	
T1	TRANSFORMER, RF, FIXED	TZ10002
T2	TRANSFORMER, RF, FIXED	TT10004
T3	Same as T2	
T4	TRANSFORMER, AF	TF10040
U1	INTEGRATED CIRCUIT	NW-MC1550
U2	Same as U1	
U3	INTEGRATED CIRCUIT	NW-CA3020
U4	INTEGRATED CIRCUIT NW-CA3028	

REF DESIGNATION	DESCRIPTION	TMC PART NUMBER
C1	CAPACITOR, FLAT, FOIL: 0.1 uF; 250 Vdc	CC10011-8
C2	CAPACITOR, FLAT, FOIL: 0.022 uF; 250 Vdc	CC10011-3
C3	CAPACITOR, FIXED, ELECTROLYTIC: 1 uF, -10% +150%; 15 WVdc	CE105-1-15
C4	Same as C1	
C5	CAPACITOR, FIXED, ELECTROLYTIC: 30 uF, -10% +150%; 15 WVdc	CE105-30-15
C6	CAPACITOR, FLAT, FOIL: 0.22 uF; 250 Vdc	CC10011-10
C7	CAPACITOR, FIXED, ELECTROLYTIC: 2 uF, -10% +150%; 15 WVdc	CE105-2-15
CR1	DIODE, ZENER	1N3018A
Q1	TRANSISTOR	2N3906
Q2	TRANSISTOR	2N3904
Q3	Same as Q2	
Q4	Same as Q2	
Q5	Same as Q2	
R1	RESISTOR, FIXED, COMPOSITION: 33 ohms ±5%; 1 watt	RC32GF330J
R2	RESISTOR, FIXED, COMPOSITION: 510 Kohms ±5%; 1/2 watt	RC20GF514J
R3	RESISTOR, FIXED, COMPOSITION: 15 Kohms ±5%; 1/2 watt	RC20GF153J
R4	RESISTOR, FIXED, COMPOSITION: 1.5 Kohms ±5%; 1/2 watt	RC20GF152J
R5	RESISTOR, FIXED, COMPOSITION: 10 Kohms ±5%; 1/2 watt	RC20GF103J
R6	RESISTOR, FIXED, COMPOSITION: 27 Kohms ±5%; 1/2 watt	RC20GF273J
R7	Same as R6	
R8	Same as R6	
R9	Same as R5	
T1	TRANSFORMER, AUDIO	TF10047
U1	INTEGRATED CIRCUIT	NW-CA3020

REF DESIGNATION	DESCRIPTION	TMC PART NUMBER
C1	CAPACITOR, FIXED, ELECTROLYTIC: 30 uF, -10% +150%; 15 WVdc	CE105-30-15
C2	Same as C1	
CR1	DIODE	1N34A
CR2	Same as CR1	
R1	RESISTOR, FIXED, COMPOSITION: 2.2 Kohms ±5%; 1/4 watt	RC07GF222J
R2	RESISTOR, FIXED, COMPOSITION: 47 Kohms ±5%; 1/4 watt	RC07GF473J
R3	Same as R2	
R4	Same as R1	
R5	RESISTOR, VARIABLE, WIREWOUND: 10 Kohms	RV10005-7

SECTION 7

SCHEMATIC DIAGRAMS

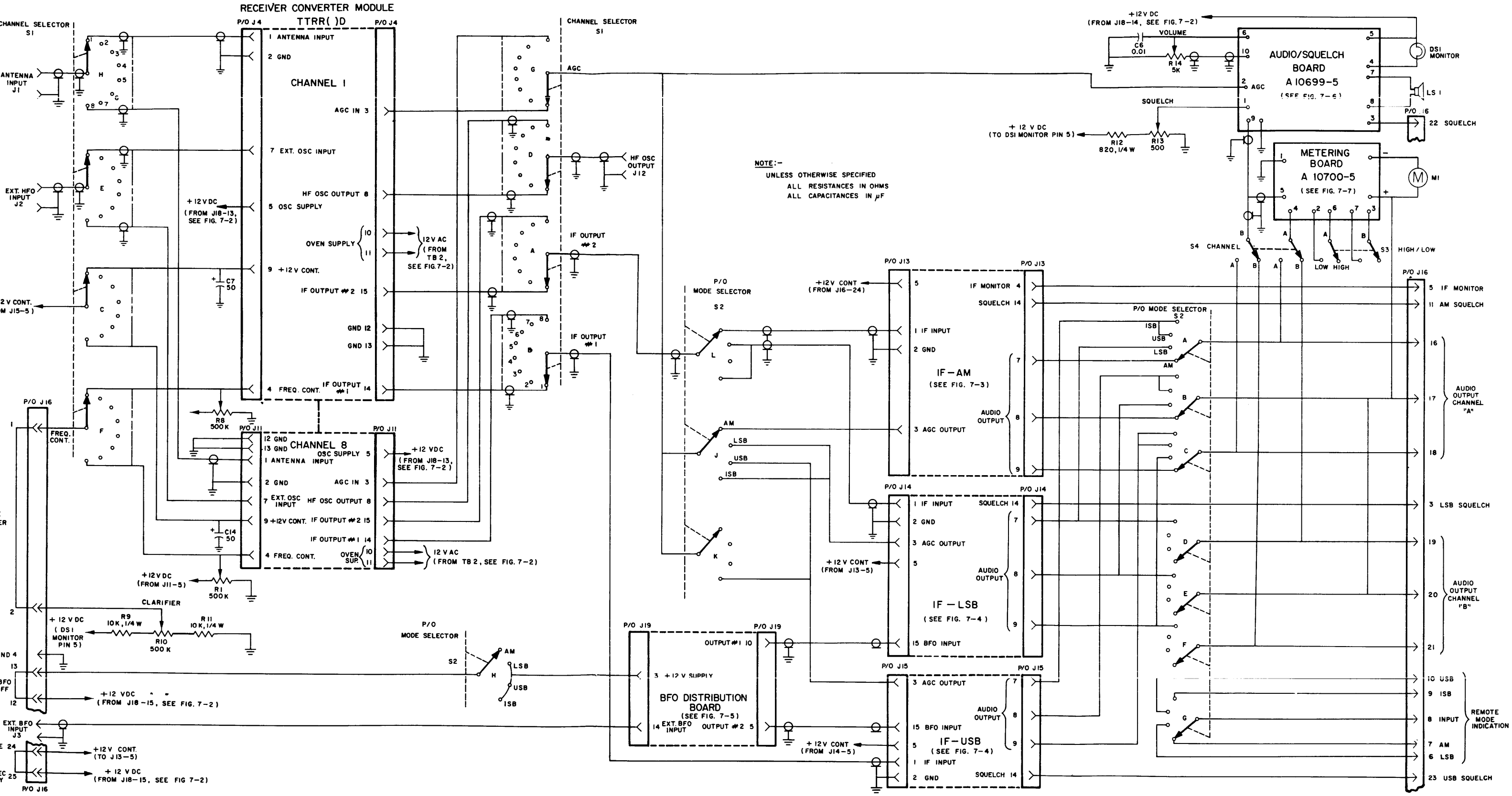


FIGURE 7-1. SCHEMATIC DIAGRAM (SHEET 1 OF 1), SMR-5

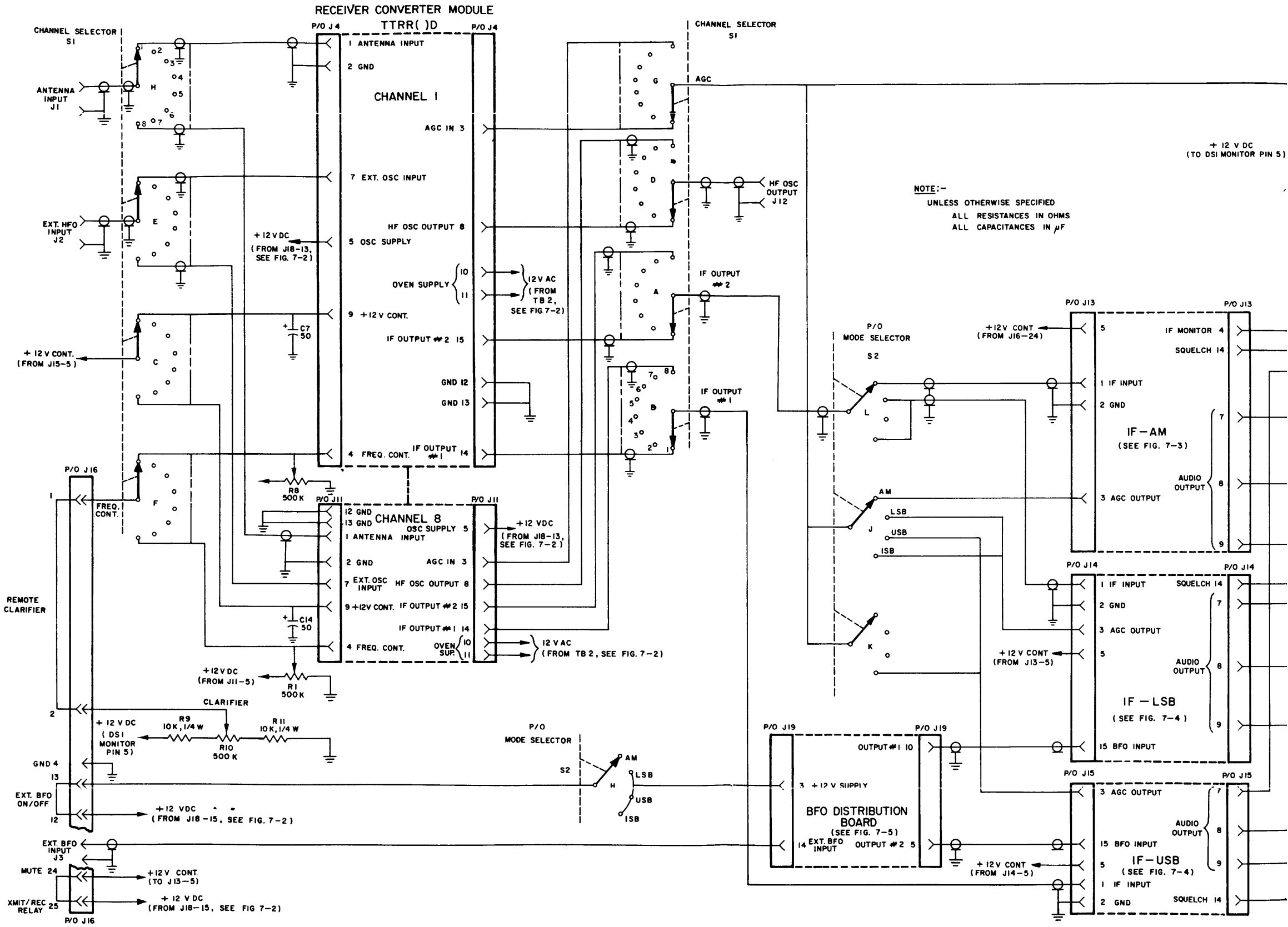
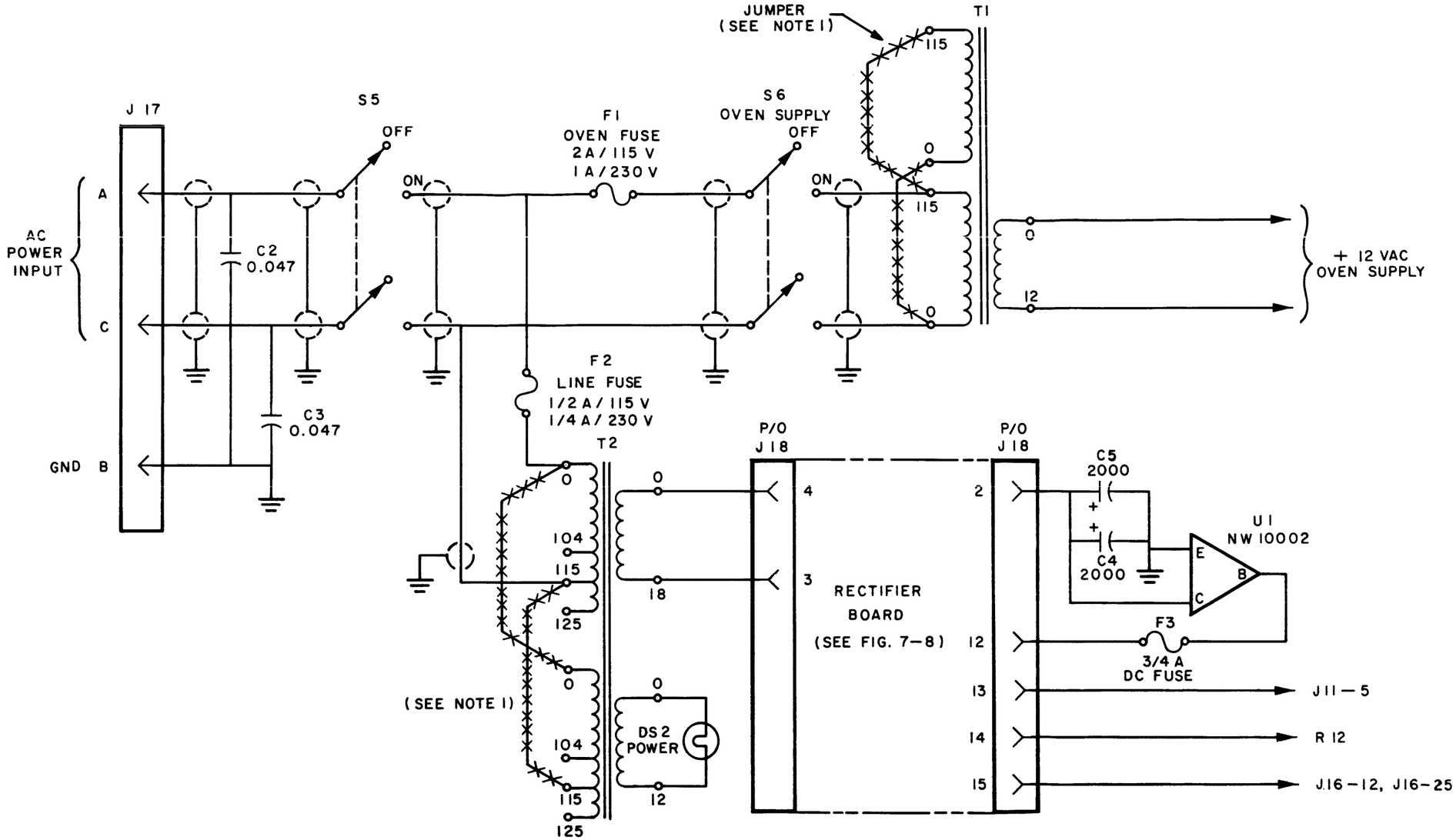


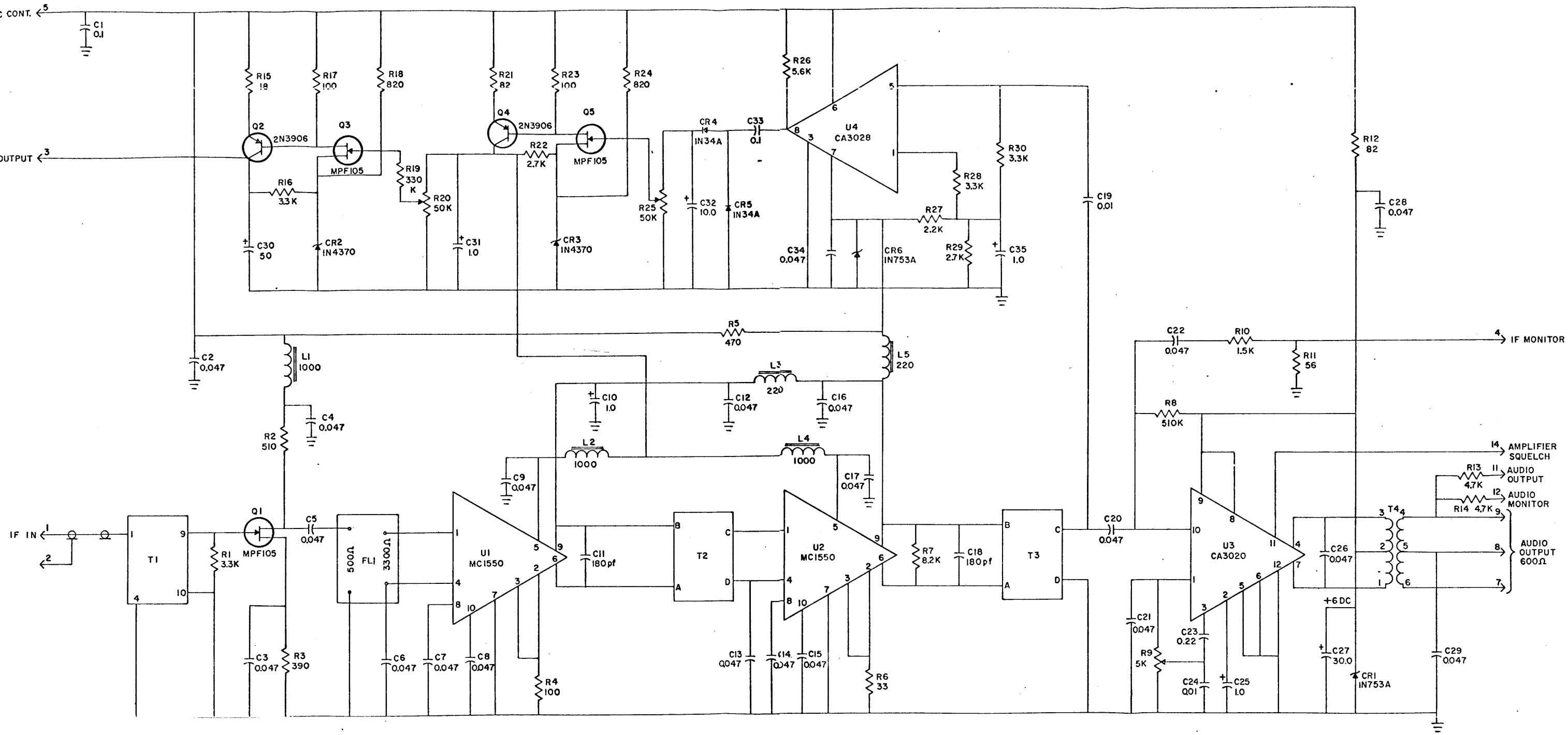
FIGURE 7-1. SCH



NOTE:-

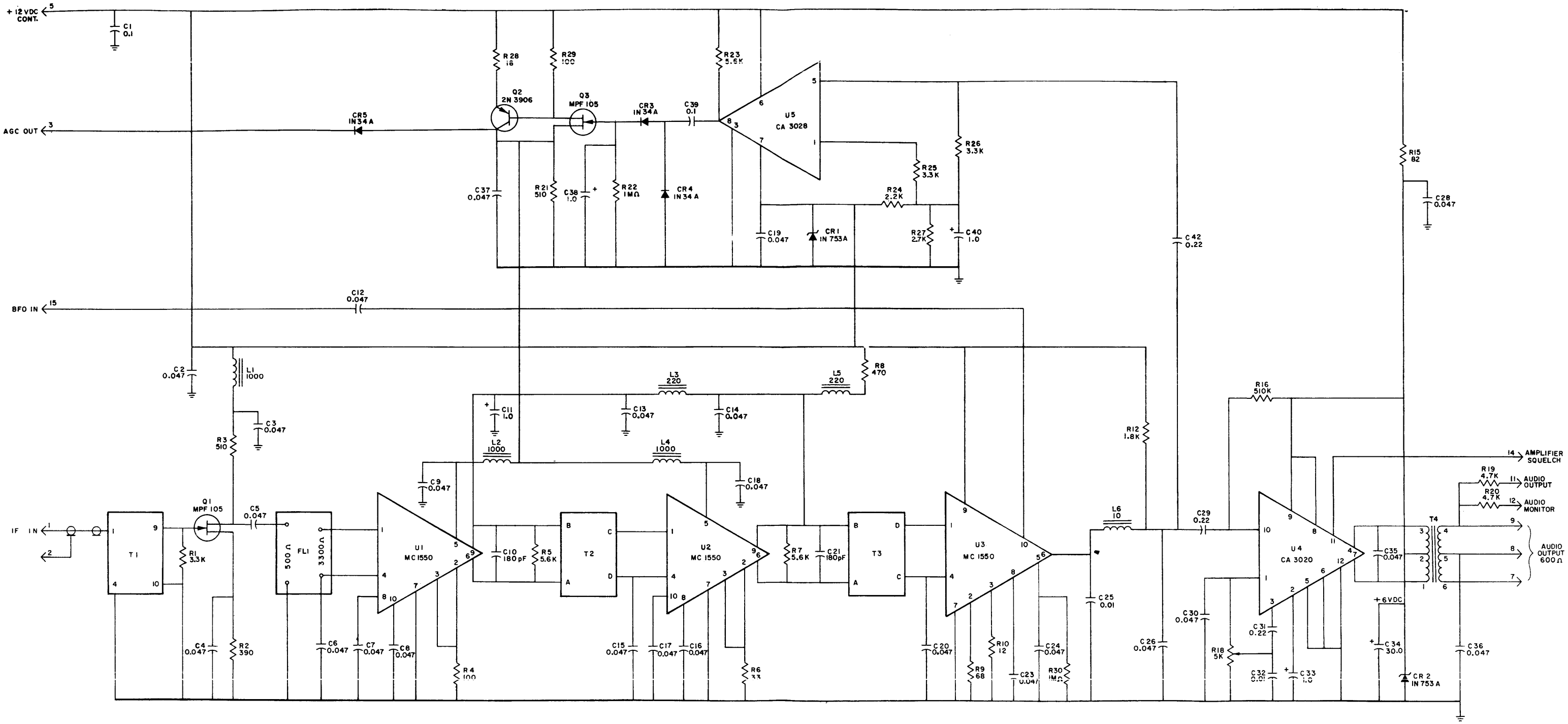
1. CONNECT JUMPERS AS SHOWN FOR 115 VAC OPERATION.
   SEE FIG. 2-1 FOR JUMPER CONNECTIONS FOR 208, 230 AND 250 VAC.
2. UNLESS OTHERWISE SPECIFIED, ALL CAPACITANCES ARE IN μF.

FIGURE 7-2. SCHEMATIC DIAGRAM, POWER SUPPLY (SHEET 1 OF 1), SMR-5



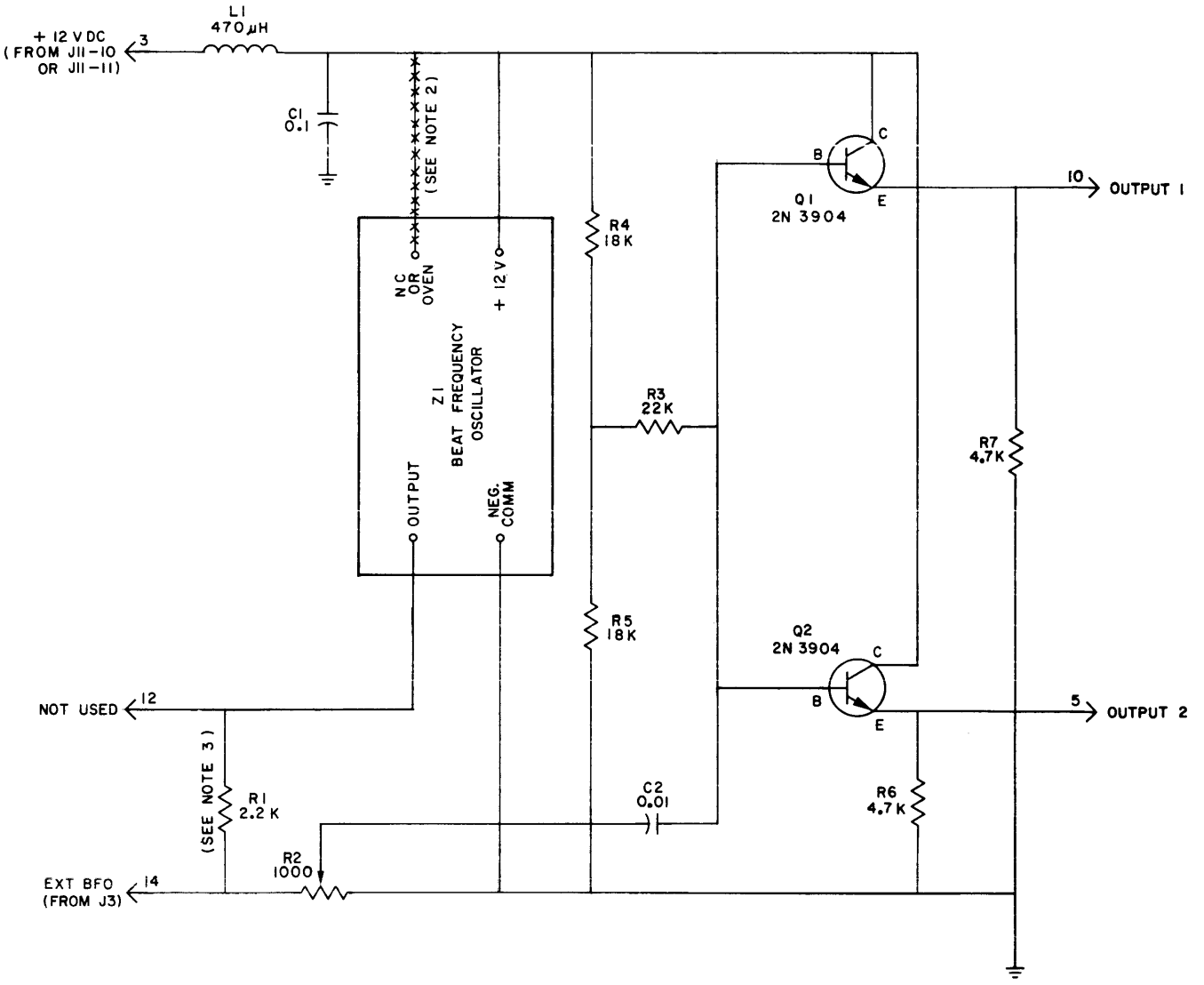
NOTES
UNLESS OTHERWISE STATED:
RESISTANCE- IN OHMS- 0.25 WATTS
CAPACITANCE- IN μF
INDUCTANCE- IN μH

FIGURE 7-3 SCHEMATIC DIAGRAM, AM IF BOARD, SMR-5



NOTES:
UNLESS OTHERWISE STATED;
RESISTANCES IN OHMS, 0.25 WATTS
CAPACITANCE IN μF
INDUCTANCE IN μH

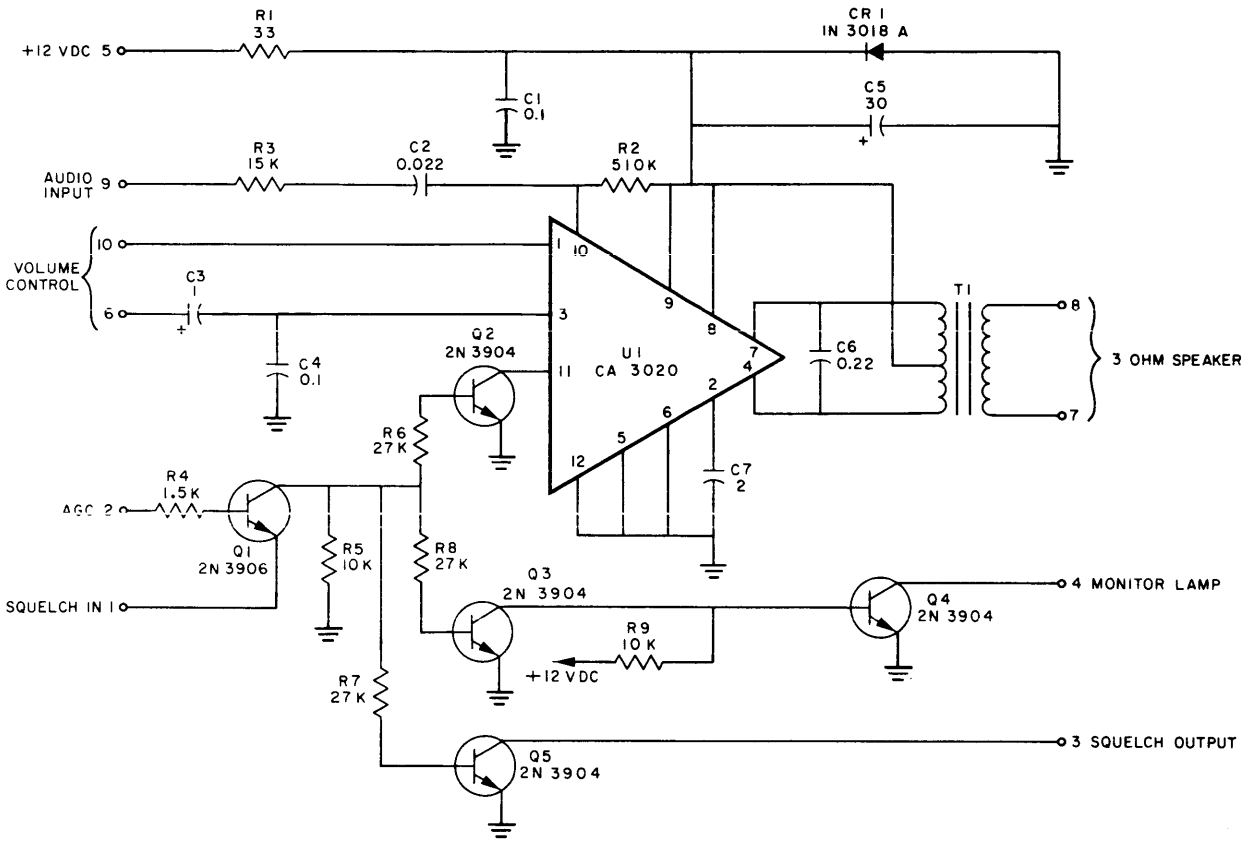
FIGURE 7-4. SCHEMATIC DIAGRAM, SSB TYPE IF BOARD (SHEET 1 OF 1), SMR-5



NOTES:

1. UNLESS OTHERWISE STATED ;
   ALL RESISTORS IN OHMS 1/4 WATT
   ALL CAPACITORS IN µF
2. ADD JUMPER WHEN USING NF10002-2
3. FOR EXTERNAL BFO REMOVE RESISTOR R1 (2.2K)

FIGURE 7-5. SCHEMATIC DIAGRAM, BFO DISTRIBUTION BOARD (SHEET 1 OF 1), SMR-5

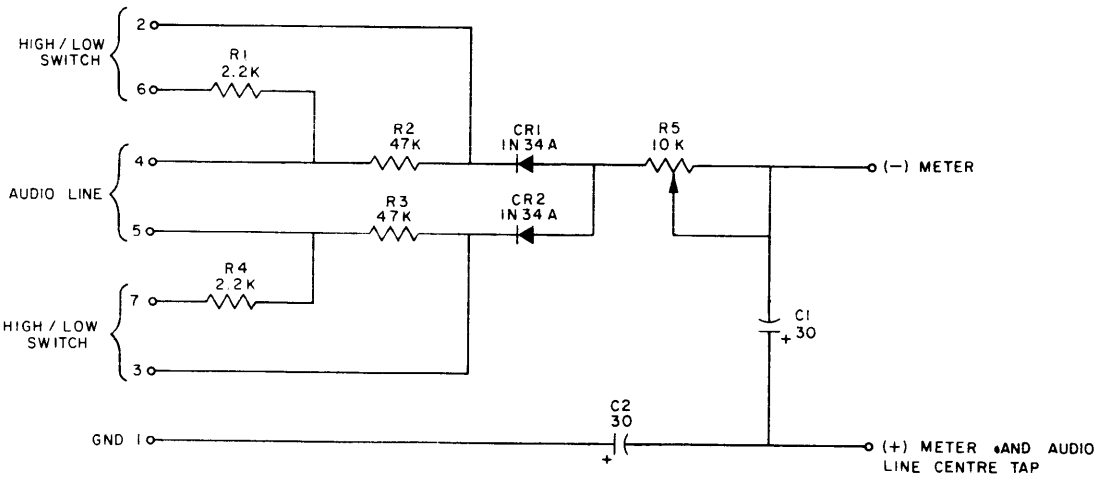


NOTE:

UNLESS OTHERWISE SPECIFIED:

ALL RESISTANCES IN OHMS, 1/2 WATT
ALL CAPACITANCES IN μF

FIGURE 7-6 AUDIO/SQUELCH BOARD



NOTE:

UNLESS OTHERWISE SPECIFIED:

ALL RESISTANCES IN OHMS, 1/4 WATT
ALL CAPACITANCES IN μF

FIGURE 7-7. SCHEMATIC DIAGRAM, METERING BOARD, SMR-5

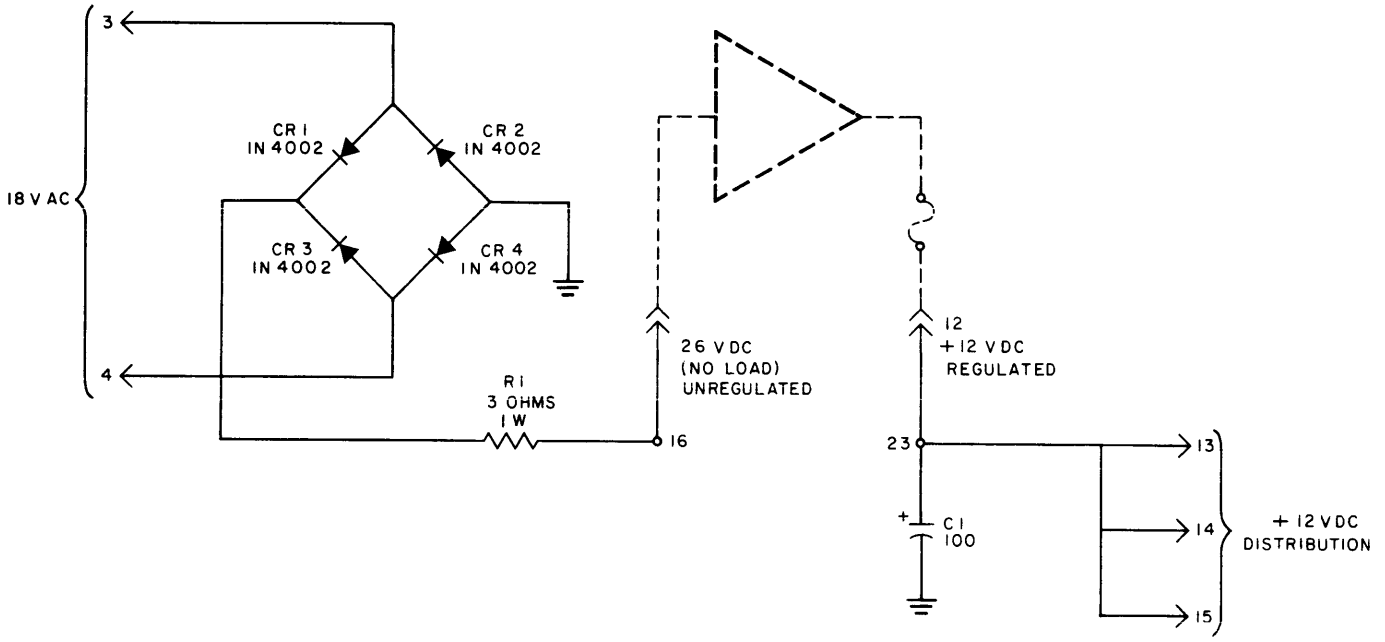


FIGURE 7-8. SCHEMATIC DIAGRAM, RECTIFIER BOARD (SHEET 1 OF 1), SMR-5