KLM

MULTI-2700
INSTRUCTION MANUAL

CONTENTS

FEATURES OF MULTI-2700

The MULTI-2700 is a 144MHz band, all-mode transceiver of the highest class developed by Fukuyama Electronics, a specialized manufacturer of ham equipment, from the latest electronics technology. Capable of Oscar communication, the MULTI-2700 offers the ultimate versatility for every radio operator from beginner to veteran as an unsurpassed 144MHz transceiver.

■ **All solid state, multi-mode (USB-LSB, FM (wide and narrow), CW, AM) 2m transceiver:**
The MULTI-2700 is a completely solid state, 2m band, all-mode transceiver employing many state of the art semiconductors, ICs and FETs.

■ **Employs a phase-locked loop synthesizer for trans - mitting and receiving on 600 channels at intervals of 10kHz; a VXO variable up to ±7kHz and a VFO for continuous coverage from 144MHz to 148MHz:**
The digital phase-locked loop synthesizer (with LED display) permits transmission and reception on 600 channels from 144MHz upward at intervals of 10kHz with exceptional stability. With a VXO variable up to ±7kHz, the unit can continuously cover the frequency range from 144 to 148MHz.
VXO operates only when operating the digital synthesizer, but not in VFO operation.

■ **FM narrow-wide selector switch:**
With an FM band narrow-wide selector switch on the front panel, the narrow or wide mode can be easily selected as desired.

■ **Powerful noise blanker (NB) built in:**
The newly designed noise blanker is especially effective for eliminating pulse noises, such as generated by automobiles, for noise-free transmission and reception. The noise blanker operates on SSB, CW and AM, but not on FM position.

■ **Two meters, one FM center meter and an S-meter for FM, SSB, CW and AM:**
The meter for FM, SSB, CW and AM works as an S-meter in receiving, and as an RF meter (output meter) in transmission. The FM center meter can be accurately tuned to the center frequency of the received signal in FM reception with the RIT knob.
The RIT knob can vary the receiving frequency about ±3.5kHz without changing the transmitting frequency.

■ **Accurate VFO mechanism:**
A newly developed dual-speed dial mechanism consists of an inner main knob, whose one turn corresponds to 20kHz, and an outer knob, whose one turn corresponds to 100kHz (their gear ratio being 5 to 1). This is combined with the VFO to produce utmost stability and allows maximum ease of fine adjustment in SSB and CW reception. Even the beginner will find tuning very easier.

■ **Outstanding accessory circuits:**
VOX (voice operation control) circuit, microphone compressor amplifier, CW monitor, AGC (fast-slow) knob, FM and SSB microphone gain controls allow the maximum individual tailoring of operational transceiver characteristics.
In addition, a headphone jack, a 7-pin connector for a booster, a cooling fan mounting hole, and a leather handle are provided.

■ **Microphone compressor:**
A compressor ON-OFF switch is located inside the top access hatch. When this switch is turned ON during SSB transmission, the average talk power will be more than 3-4 times increases, which is efficient DX communication.

■ **Balanced mixer:**
A heterodyne balanced mixer employing a field effect transistor FET (3SK40) is used for improved spurious elimination during transmission on SSB.

■ **Top access hatch:**
The top box on the left contains the microphone compressor ON-OFF switch, VOX gain control, SSB microphone gain control, FM microphone gain control, and other switches.
It is a very convenient location as these controls and switches can be used whenever necessary.

■ **A receiving preamp can be built in. (Optional)**

■ **Oscar communication is possible through the 29MHz integrated receiver.**

■ **Easy-to-use semi-breakin key operation.**

■ **Headphone jack provided:**
A headphone can be plugged into the headphone jack in the rear panel. Output impedance is 8 ohms.

SPECIFICATIONS

Mode		FM-W (F3)	FM-N (F3)	USB, LSB (A3J)	CW (A1)	AM (A3H)
Frequency range		143 to 149MHz (600 channels from 143.00MHz up at 10kHz intervals) synthesized; VXO variable by more than ±7kHz offers continuous coverage of frequency, range from 144MHz to 148MHz; built-in VFO.				
Power output	High	10W		10W (PEP)	10W	3W
	Low	1W		1W (PEP)	1W	1W
Modulation		Variable reactance frequency modulation		Balanced modulation	—	Low-power modulation
Max. frequency deviation		±15kHz	±5kHz			
IF interference ratio		More than 60dB				
Carrier suppression ratio				More than 40dB		
Side-band suppression ratio				More than 40dB		More than 40dB
Suprious radiation level		Less than —60dB				
Antenna impedance		50 ohm				
Microphone impedance		500 ohm (avariable 500 — 600 ohm)				
Squelch sensitivity		—6dB				
Receiving system		Double superheterodyne		Single superheterodyne		
Receiving sensitivity		S/N more than 34dB for 1μV input	S/N more than 26dB for 1μV input	S/N more than 10dB for 0.5μV input		S/N more than 10dB for 2μV input
Frequency stability (VFO)		Less than ±2kHz against temperature change within range of —10°C to +60°C; less than ±2kHz from 1 to 30 minutes after power is switched ON at normal temperature; less than 200Hz per 30 minutes thereafter.				
IF frequency		1st IF 16.9MHz, 2nd IF 455kHz		16.9MHz		
Image ratio		More than 60dB				
Selectivity	—6dB	More than 20kHz	More than 12kHz	More than 2.4kHz		
	—60dB	Less than 40kHz	Less than 24kHz	Less than 4.8kHz		
Audio output and impedance		More than 2W at 8 ohm. (8 ohm 10% distortion)				
Power consumption		Max. at transmission: 110VA at AC117V 4A at DC13.8V At no signal reception: 40VA at AC117V 1.1A at DC13.8V				
Power source		The rated voltage and frequency for Model **MULTI-2700** correspond to the main's voltage and frequency used in the country to which they are shipped. (The rated voltage and frequency are shown on the rating label on the set.) If it is necessary to alter the rated voltage and/or the rated frequency, contact your **FUKUYAMA** dealer.				
Size		128(H) x 378(W) x 305(D) (m/m)				
Weight		Approx. 14kg				

■ **S/RF meter**
Indicates signal intensity when receiving; and transmitting power when transmitting. Reads 8 or over when output power is 10W in FM operation.

■ **ON AIR indicator**
Lights red when transmitting.

■ **LED digital frequency display**
Desired frequency is numerically displayed during synthesizer operation.

■ **OSCAR lamp**
Lights during OSCAR
tion. (29MHz receptio

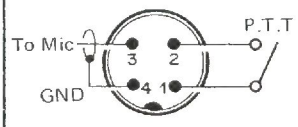
■ **Center meter**
(Not operate on SSB, AM, CW)
Indicates FM receiving frequency deviation. Turn the RIT knob until the pointer comes to the center. In VFO operation, adjust the pointer to the center with the VFO dial.

■ **RECEIVE indicator**
Green Light during reception.

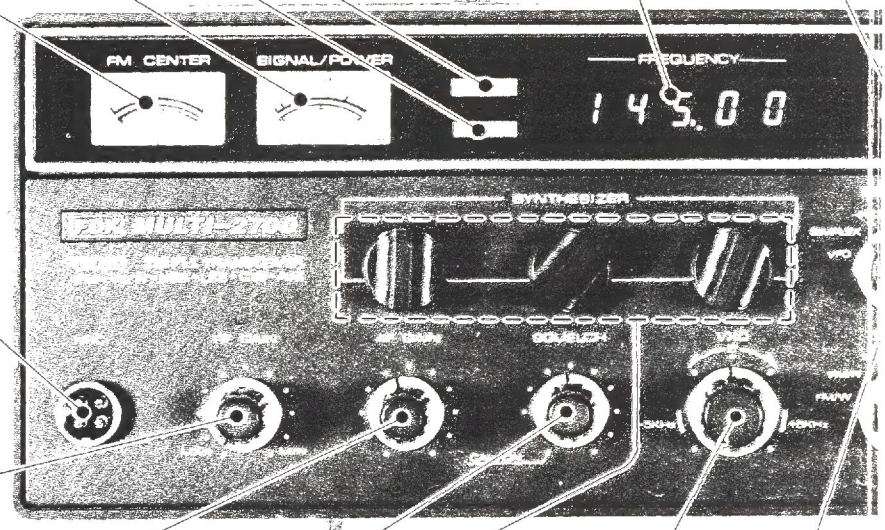
■ **Top hatch**
Has compressor ON-OFF switch, VOX gain knob, MIC gain control, etc.

■ **OSCAR ON-OFF sw**
When used communic
via OSCAR satellite
is ON, the equipment
nected to the RX co
for receiving 29MH

■ **Microphone jack**
For connecting the accessory microphone. Connect it as shown below.



(Plug side)



■ **RF GAIN knob**
For receiving RF gain control.

■ **AF GAIN knob**
Audio control knob. Turning it clockwise increases audio level.

■ **Synthesizer frequency selector knobs**
Left knob is for MHz unit, center for 100kHz unit, right knob for 10kHz unit.

■ **SELECTOR switc**
For selecting VFO
thesizer (Repeater s

■ **SQUELCH knob**
Turning the knob clockwise switches squelch on to cancel noise when no signals are received. Employed our unique AFB squelch circuit.

■ **VXO knob**
This knob is used only in synthesizer operation for a fine adjustment of transmitting and receiving frequencies, which can be varied up to ±7kHz by turning the knob clockwise or counterclockwise. See Fig. 2.

■ **MODE selector kn**
For selecting FM
(N), LSB, USB, CW

OSCAR lamp
Lights during OSCAR operation. (29MHz reception only)

OSCAR ON-OFF switch
When used communicating via OSCAR satellite. When it is ON, the equipment is connected to the RX converter for receiving 29MHz.

■ Frequency indicator lamp
Indicates 144MHz, 145MHz, 146MHz, or 147MHz band during VFO operation.

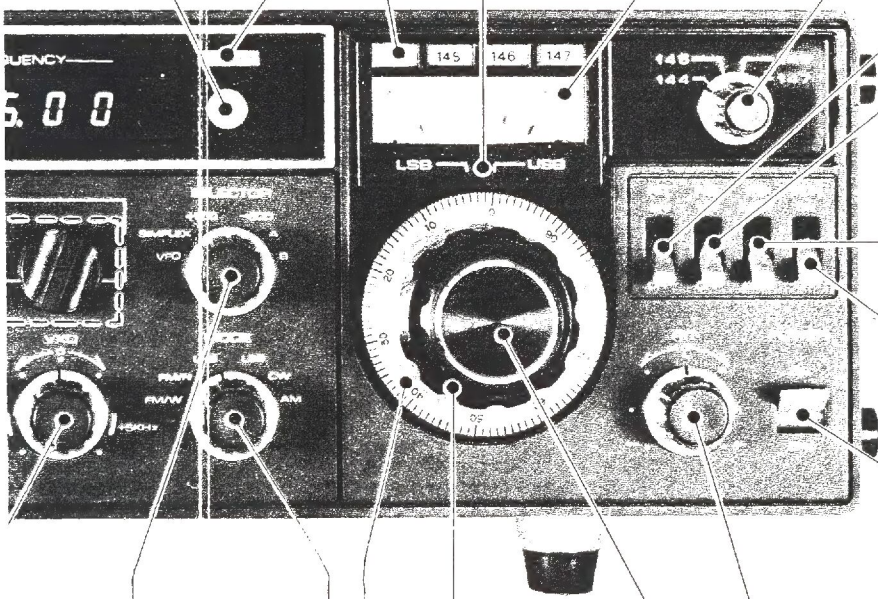
■ LSB/USB reading
References both 1.5kHz can be read, and CW, AM, FM at center position.

■ Main tuning dial
Covers 1MHz with a scale ranging from 0 to 1,000 kHz.

■ VFO bands switch
Covering each 1MHz 144–148 MHz on VFO selection.

■ RIT switch
RIT circuit ON-OFF switch

■ NB (noise blanker) switch
Used for cancelling pulse noises, such as ignition noise, for noise-free communication. (Not operate during FM operation.)



■ Power selector switch
Has two positions for selecting 10W (HIGH) or 1W (LOW) transmitting power.

■ VOX ON-OFF switch
ON when switch is up, OFF when it is down position.

■ SELECTOR switch
For selecting VFO or synthesizer (Repeater sh ft).

■ Fast tuning knob (COARSE)
One turn corresponds to 100kHz.

■ RIT knob
For a fine adjustment of receiving frequency independent of transmitting frequency. Variable range is about ±3.5kHz.

■ Power switch
ON when switch is up, OFF when it is down (AC/DC).

■ MODE selector knob
For selecting FM (N), FM (N), LSB, USB, CW or AM.

■ Main dial (Vernier)
1kHz graduations.

■ Main tuning knob (FINE)
Used for tuning in to a desired frequency. One turn corresponds to 20kHz.

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With an FM band narrow-wide selector switch on the front panel, the narrow or wide mode can be easily selected as desired.

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The newly designed noise blanker is especially effective for eliminating pulse noises, such as generated by automobiles, for noise-free transmission and reception. The noise blanker operates on SSB, CW and AM, but not on FM position.

■ **Two meters, one FM center meter and an S-meter for FM, SSB, CW and AM:**
The meter for FM, SSB, CW and AM works as an S-meter in receiving, and as an RF meter (output meter) in transmission. The FM center meter can be accurately tuned to the center frequency of the received signal in FM reception with the RIT knob.
The RIT knob can vary the receiving frequency about ±3.5kHz without changing the transmitting frequency.

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A newly developed dual-speed dial mechanism consists of an inner main knob, whose one turn corresponds to 20kHz, and an outer knob, whose one turn corresponds to 100kHz (their gear ratio being 5 to 1). This is combined with the VFO to produce utmost stability and allows maximum ease of fine adjustment in SSB and CW reception. Even the beginner will find tuning very easier.

■ **Outstanding accessory circuits:**
VOX (voice operation control) circuit, microphone compressor amplifier, CW monitor, AGC (fast-slow) knob, FM and SSB microphone gain controls allow the maximum individual tailoring of operational transceiver characteristics.
In addition, a headphone jack, a 7-pin connector for a booster, a cooling fan mounting hole, and a leather handle are provided.

■ **Microphone compressor:**
A compressor ON-OFF switch is located inside the top access hatch. When this switch is turned ON during SSB transmission, the average talk power will be more than 3-4 times increases, which is efficient DX communication.

■ **Balanced mixer:**
A heterodyne balanced mixer employing a field effect transistor FET (3SK40) is used for improved spurious elimination during transmission on SSB.

■ **Top access hatch:**
The top box on the left contains the microphone compressor ON-OFF switch, VOX gain control, SSB microphone gain control, FM microphone gain control, and other switches.
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■ **A receiving preamp can be built in. (Optional)**

■ **Oscar communication is possible through the 29MHz integrated receiver.**

■ **Easy-to-use semi-breakin key operation.**

■ **Headphone jack provided:**
A headphone can be plugged into the headphone jack in the rear panel. Output impedance is 8 ohms.

SPECIFICATIONS

Mode		FM-W (F3)	FM-N (F3)	USB, LSB (A3J)	CW (A1)	AM (A3H)
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	Low	1W		1W (PEP)	1W	1W
Modulation		Variable reactance frequency modulation		Balanced modulation	—	Low-power modulation
Max. frequency deviation		±15kHz	±5kHz			
IF interference ratio		More than 60dB				
Carrier suppression ratio				More than 40dB		
Side-band suppression ratio				More than 40dB		More than 40dB
Suprious radiation level		Less than −60dB				
Antenna impedance		50 ohm				
Microphone impedance		500 ohm (avariable 500 − 600 ohm)				
Squelch sensitivity		−6dB				
Receiving system		Double superheterodyne		Single superheterodyne		
Receiving sensitivity		S/N more than 34dB for 1μV input	S/N more than 26dB for 1μV input	S/N more than 10dB for 0.5μV input		S/N more than 10dB for 2μV input
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Image ratio		More than 60dB				
Selectivity	−6dB	More than 20kHz	More than 12kHz	More than 2.4kHz		
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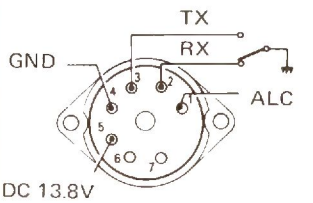
Size		128(H) x 378(W) x 305(D) (m/m)				
Weight		Approx. 14kg				

■Antenna connector (SO-239 type)
Terminal for connecting 2m band antenna.

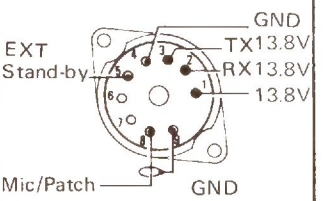
■Radiator fin for cooling power supply

■Fan mounting hole
For mounting optional fan to dissipate heat from output transistors for efficient, for continue operation.

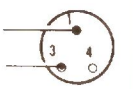
■Accessory socket (2)
7-pin accessory connecting socket. Terminals are as shown below.

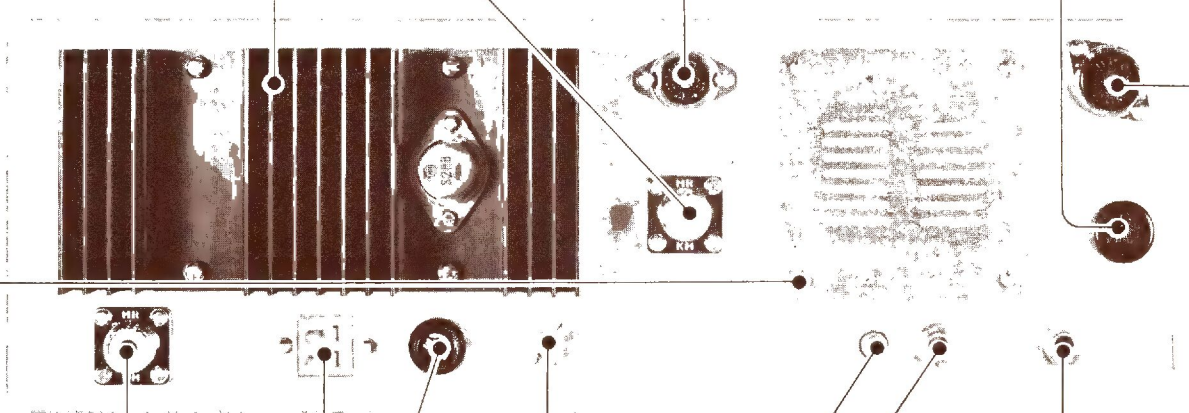


■Accessory socket (1)
9-pin accessory connecting socket. Terminals are as shown below.



■Fan socket
AC socket for driving fan (Option).





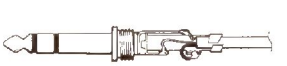
■Ground terminal

■Fuse holder
AC fuse 2A is in it.

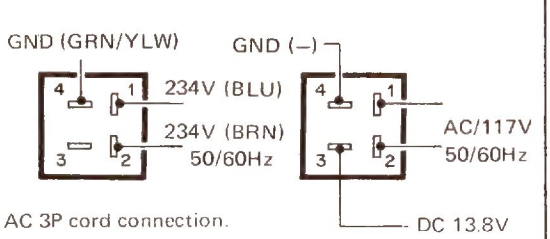
■Key jack
For CW transmission, connect accessory plug to key and insert it into this jack.

■OSCAR receiving antenna connector (SO-239 Type)
Connector for OSCAR receiving 29MHz antenna.

■Headphone jack
Your headphone can be plugged into this jack. When using accessory plug, connect as shown below.



■Power connector
AC/DC connector. Both AC and DC power cords are provided as accessories. Be sure to connect the right one.



AC 3P cord connection.

■Ext. speaker jack
When using external speaker, connect an 8-ohm speaker to accessory plug.

NAMES OF PARTS AND DESCRIPTION

■S/RF meter
Indicates signal intensity when receiving; and transmitting power when transmitting. Reads 8 or over when output power is 10W in FM operation.

■ON AIR indicator
Lights red when transmitting.

■LED digital frequency display
Desired frequency is numerically displayed during synthesizer operation.

■OSCAR lamp
Lights during OSCAR operation. (29MHz reception only)

■Frequency indicator lamp
Indicates 144MHz, 145MHz, 146MHz, or 147MHz band during VFO operation.

■Main tuning dial
Covers 1MHz with a scale ranging from 0 to 1,000 kHz.

■RIT switch
RIT circuit ON-OFF switch.

■Center meter
(Not operate on SSB, AM, CW)
Indicates FM receiving frequency deviation. Turn the RIT knob until the pointer comes to the center. In VFO operation, adjust the pointer to the center with the VFO dial.

■RECEIVE indicator
Green Light during reception.

■Top hatch
Has compressor ON-OFF switch, VOX gain knob,MIC gain control, etc.

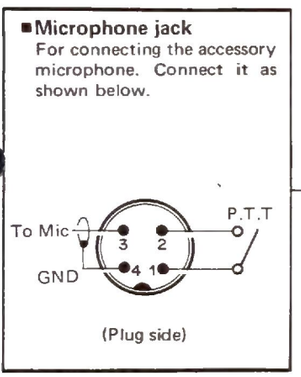
■OSCAR ON-OFF switch
When used communicating via OSCAR satellite. When it is ON, the equipment is connected to the RX converter for receiving 29MHz.

■LSB/USB reading
References both 1.5kHz can be read, and CW, AM, FM at center position.

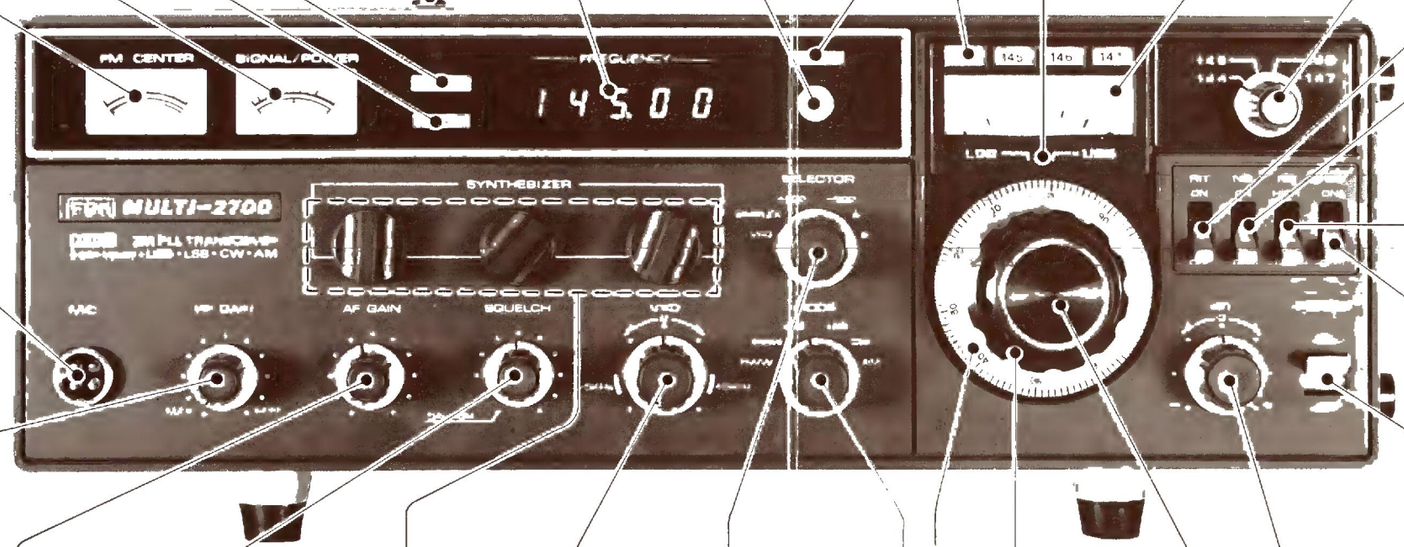
■VFO bands switch
Covering each 1MHz 144–148 MHz on VFO selection.

■NB (noise blanker) switch
Used for cancelling pulse noises, such as ignition noise, for noise-free communication. (Not operate during FM operation.)

■Microphone jack
For connecting the accessory microphone. Connect it as shown below.



(Plug side)



■Power selector switch
Has two positions for selecting 10W (HIGH) or 1W (LOW) transmitting power

■VOX ON-OFF switch
ON when switch is up, OFF when it is down position.

■RF GAIN knob
For receiving RF gain control.

■AF GAIN knob
Audio control knob. Turning it clockwise increases audio level.

■Synthesizer frequency selector knobs
Left knob is for MHz unit, center for 100kHz unit, right knob for 10kHz unit.

■SELECTOR switch
For selecting VFO or synthesizer (Repeater shift).

■Fast tuning knob (COARSE)
One turn corresponds to 100kHz.

■RIT knob
For a fine adjustment of receiving frequency independent of transmitting frequency. Variable range is about ±3.5kHz.

■Power switch
ON when switch is up, OFF when it is down (AC/DC).

■SQUELCH knob
Turning the knob clockwise switches squelch on to cancel noise when no signals are received. Employed our unique AFB squelch circuit.

■VXO knob
This knob is used only in synthesizer operation for a fine adjustment of transmitting and receiving frequencies, which can be varied up to ±7kHz by turning the knob clockwise or counter-clockwise. See Fig. 2.

■MODE selector knob
For selecting FM (W), FM (N), LSB, USB, CW or AM.

■Main dial (Vernier)
1kHz graduations.

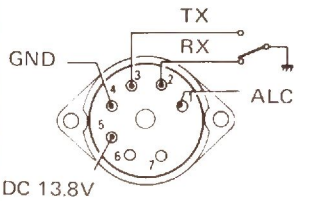
■Main tuning knob (FINE)
Used for tuning in to a desired frequency. One turn corresponds to 20kHz.

■ **Antenna connector (SO-239 type)**
Terminal for connecting 2m band antenna.

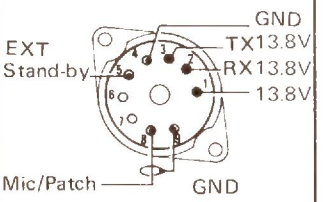
■ **Radiator fin for cooling power supply**

■ **Fan mounting hole**
For mounting optional fan to dissipate heat from output transistors for efficient, for continue operation.

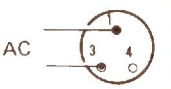
■ **Accessory socket (2)**
7-pin accessory connecting socket. Terminals are as shown below.

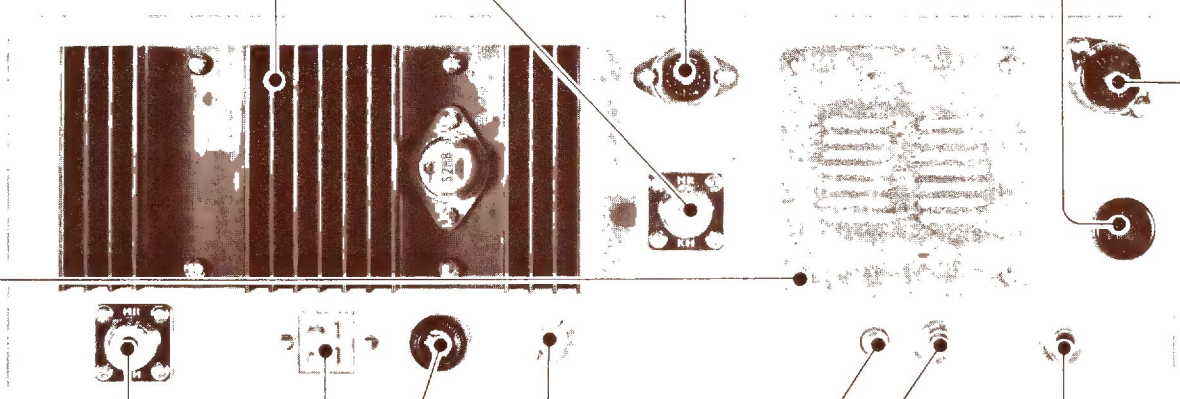


■ **Accessory socket (1)**
9-pin accessory connecting socket. Terminals are as shown below.



■ **Fan socket**
AC socket for driving fan (Option).





■ **Ground terminal**

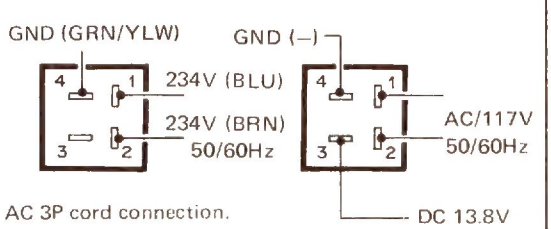
■ **Fuse holder**
AC fuse 2A is in it.

■ **OSCAR receiving antenna connector (SO-239 Type)**
Connector for OSCAR receiving 29MHz antenna.

■ **Key jack**
For CW transmission, connect accessory plug to key and insert it into this jack.

■ **Headphone jack**
Your headphone can be plugged into this jack. When using accessory plug, connect as shown below.

■ **Power connector**
AC/DC connector. Both AC and DC power cords are provided as accessories. Be sure to connect the right one.



■ **Ext. speaker jack**
When using external speaker, connect an 8-ohm speaker to accessory plug.

PRECAUTIONS

The MULTI-2700 is designed for safe operation, but be sure to observe the following instructions for trouble free, enjoyable operation.

- Do not transmit without connecting an antenna.
- Be very careful about the power supply polarities. Do not mistake the AC cord for the DC cord or vice versa.
- Do not connect or disconnect the power cord when the power switch is in the ON position.
- Use the 5A fuse in the fuse holder on the DC cord when operating on DC; or the 2A fuse in the fuse holder in the rear when operating on AC.
- The MULTI-2700 possible to transmission for a long time, but it is suggested that continuous transmission not longer than 30 minutes be avoided as much as possible.
- All the cores and trimmers inside have already been adjusted, and therefore should not require adjustment.
- If the synthesizer cannot be locked, turn the power switch OFF, wait for 4 to 5 seconds, and then turn it ON again.
- Make sure that the SELECTOR switch and the MODE selector switch are in the correct positions.
  Also check the RIT knob and VXO knob to see that they are also in the correct positions.

ACCESSORIES

The MULTI-2700 has the following accessories. Please check that you have all of them.

Instruction manual	1
AC power cord (with connector)	1
DC power cord (with connector and fuse)	1
Key plug	1
Spare fuse (AC 2A, DC 5A)	1 each
Dynamic microphone (with connector)	1
9P accessory plug	1
7P booster plug	1
3P fan plug	1
Headphone plug	1
EXT SP plug	1

1. **Location**
Avoid using the MULTI-2700 in a hot, humid, dusty place.
An airy, dry place is ideal for its operation. Avoid operating your MULTI-2700 in direct sun light. You need not be too nervous about it, but see that the bottom or the back of your MULTI-2700 is not too close to a table or a wall.

2. **Connecting to a power supply**
The MULTI-2700 operates on an AC117V to 240V power supply or a DC13.8V power supply. (Refer to SPECIFICATIONS.)

When changing one kind of power supply to the other, you need only change the accessory power cords. The two-color (red and black) cord is for DC. Each of the power cords need only be inserted into the power socket in the back. When changing the AC cord to the DC cord or vice versa, be sure to confirm the following beforehand.

(1) Turn the power switch on the front of the set to the OFF position and the PTT switch on the microphone to the receiving position.

(2) Disconnect the power cord in use from the AC socket or a battery, and change it with the other. (This is necessary for preventing the set from breaking down and protecting yourself from electric shock.)

(3) The 4-pin square socket on the AC or DC cord has a stopper. When plugging the cord into the set, press the stopper with your fingers and pinch it securely with the stopper clamp on the set. When pulling it out, press the stopper with your fingers again and pull it out.

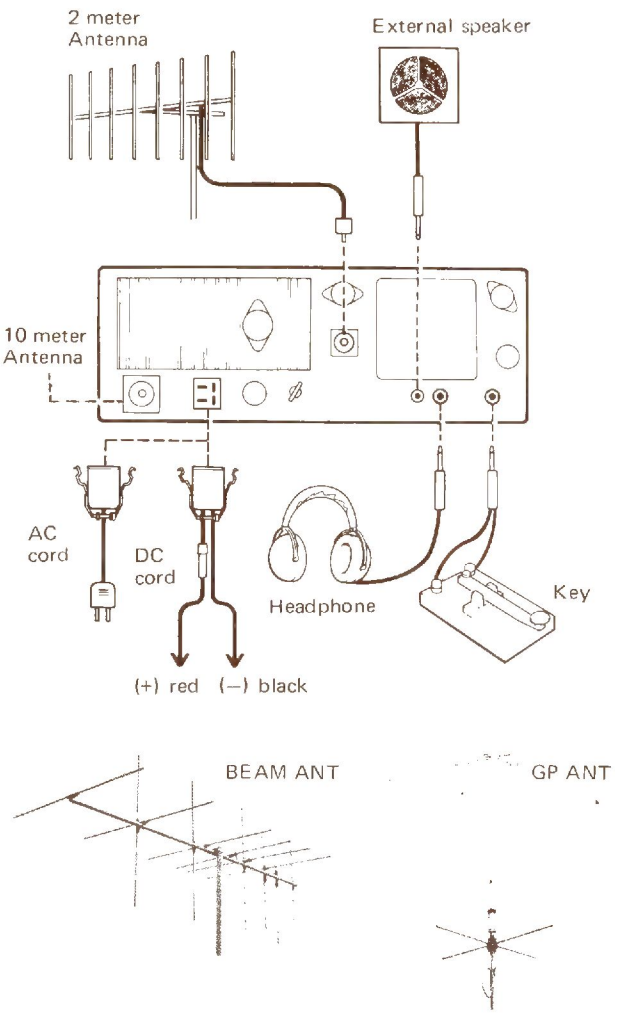
3. **Antenna Connection**
A high-performance antenna is essential to efficient, enjoyable communication.
No matter how excellent a transceiver may be, it cannot deliver full performance with a poor antenna. To assure full performance as a fixed station, install a ground plane (GP) or multiple-element antenna about 10 to 15 meters high, and connect it to the set at its antenna connector (PL-259 type) with high quality, 50-ohm coaxial cable.
The set has an output impedance of 50 ohms, so be sure to use an RG-58, RG-8AU or equivalent coaxial cable.
Generally, a vertical antenna is used for FM reception on the 144MHz band; and a horizontal antenna is mainly used for reception on SSB. Take this into consideration when erecting an antenna.
The case of SSB, a crossed Yagi antenna seems advantageous because it is effective for both vertical and horizontal polarized waves.
A multiple-element, directional, efficient Yagi antenna is recommended for DX (long-distance) communication or communication with a specific party. A GP antenna is recommended this case of communicating with an unspecific local (near) station.

4. **Microphone**
Plug the accessory microphone into the MIC connector in the front panel of the set, and turn the nut to lock it. In case of using any other microphone, use one with an impedance of 500 to 600 ohms. In that case, check against the microphone connection diagram on Page 3 if the connector plug can be connected as shown.

5. **External Speaker and Headphone**
A case of using an external speaker or a headphone, make sure that it has an impedance of 8 to 16 ohms. Use the correct accessory plug and insert it into the jack in the back panel for connection. The larger jack is for a headphone; and the smaller one for a speaker (or attenuated to recordings).

6. **Key**
Transmitting and receiving CW (A1) signals, connect the accessory plug to the key, and insert it into the KEY jack in the rear panel.

Connections on the Rear panel



Synthesizer Operation (VFO not operate)

1. SSB

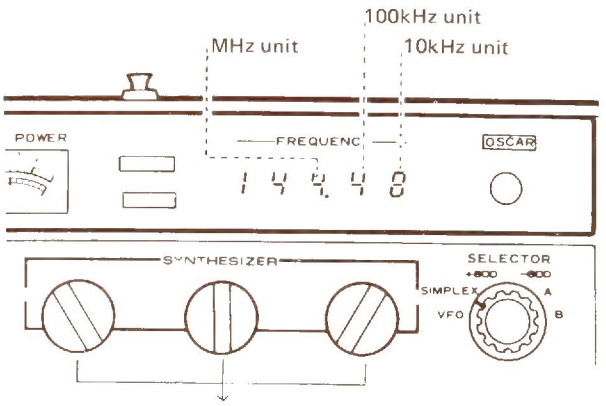
Before switching the power on, connect the correct antenna to the antenna connector in the rear of the set, plug the accessory AC cord into the back socket, and then into the AC socket. For SSB reception, the controls on the front panel of the set must be preset as shown in the table below.

POWER switch	OFF
RF GAIN knob	Turn counterclockwise fully.
AF GAIN knob	Turn counterclockwise fully.
SQUELCH knob	Does not operate. If this knob is turned counterclockwise fully, CAL SW (calibration switch) will be ON.
VXO knob	0
MODE switch	USB*
SELECTOR switch	SIMPLEX
OSCAR switch	OFF
VFO dial	Does not operate.
RIT knob	0
RIT switch	OFF
NB switch	OFF
PO switch	HI or LOW
VOX switch	OFF
Frequency selector switch	Does not operate.

* The set can transmit and receive in two modes, i.e., USB and LSB, But be sure to turn the MODE selector to the USB position because it is a matter of practice to use USB on the 144MHz.

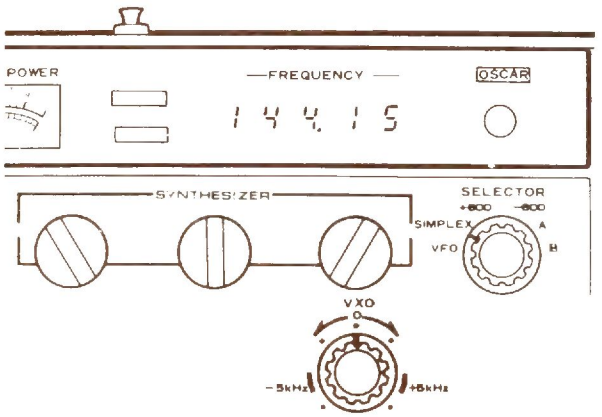
- After all receiving preparations are done, turn the power switch ON. Now, the set is ready for SSB reception. The center meter, S/RF meter and RECEIVE lamp in the upper left part of the front panel light, and the light emission diodes in the center top indicate a frequency.
  Turn the three SYNTHE knobs to the desired receiving frequency until it is displayed. (See Fig. 1.)
  It shows that the set has started operation. Since the set is all solid state in construction, it starts operating moment the set is switched ON.
- As the AF GAIN knob is slowly turned clockwise, you will hear noise or signals. Set the knob to the best position.
- When receiving an SSB station, make sure it is sending signals on a frequency that can be received well. An SSB station operating on a distant frequency cannot be received.
  The 144MHz band can be covered from end to end with the 10kHz SYNTHE knob (the right one) and the VXO knob. For example, turn the SYNTHE knob 144.15 and then turn the VXO knob clockwise or counterclockwise so that 144.143 to 144.157MHz can be continuously covered.
- In SSB reception, the voice of the talking party changes with how the set is tuned in to. Make a fine adjustment with the VXO knob until the voice of the talking party can be heard clearest. Now the set has been tuned in to the talking party.
- In case ignition noise (pulse noise) is generated by an automobile, etc., turn the NB (noise blanker) switch ON so that the noise will be suppressed to allow even feeble signals to be heard clearly.
- When receiving a near station, for example, voice may become distorted due to too great signal intensity. In that case, turn the RF GAIN knob to an appropriate position.

Fig.1 Indicates 144.480MHz



Knobs for changing digital frequency

Fig. 2 Digital frequency display vs VXO



When VXO knob is turned clockwise fully, transmitting and receiving frequencies will be 144.150 + 0.007 = 144.157(MHz).
When VXO knob is turned counterclockwise fully, transmitting and receiving frequencies will be 144.150 – 0.007 = 144.143(MHz).
Frequency can be varied up to ±7kHz with VXO.

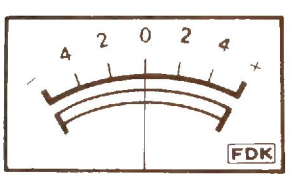
2. CW, AM

For CW reception, turn the MODE selector to the CW position so CW can be received in the same way as SSB. For AM reception, tune the set in until the S-meter reads greatest.

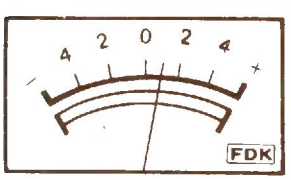
3. FM

- Turn the MODE selector to FM (W) or FM (N). Other than this, preset the controls on the front panel to the same positions as mentioned for SSB. There are two FM modes, i.e., 40kHz-separation FM wide and 20kHz-separation FM narrow. Either FM (W) or FM (N) can be easily selected with the MODE selector on the front panel.
- Turn the power switch ON, and turn the three SYNTHE knobs until your desired frequency is digitally indicated.
- If there are no signals on the selected receiving frequency, plain noise can be heard. In such a case, turn the SQUELCH knob clockwise until the noise is erased. Do not turn the knob beyond the point where the noise is erased because it will also block weak signals.
- Noise will be blanked by signals coming in from a ham station. Turn the AF GAIN knob to an acceptable volume level.
- If the pointer of the center meter at left moves to either the right or left during receiving, it indicates that the received signal frequency is off. Turn the RIT switch ON, turn the RIT knob until the center meter pointer comes back to the center, which represents the correct tuning point. Now the voice can be heard more clearly than before. Fig. 3 shows the center meter vs frequency. When the center meter is at the center, the S-meter reads greatest.

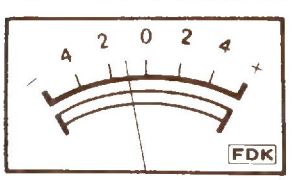
Fig. 3 Center meter indication vs receiving tuning point



Correctly tuned



Other station's transmitting frequency higher



Other station's transmitting frequency lower

Turn the RIT knob until the center meter needle be comes to the O position.

VFO OPERATION
(Synthesizer not operate)

1. SSB

For operation on SSB, preset the controls on the front panel as shown below.

POWER switch	OFF
RF GAIN knob	Turn counter clockwise fully.
AF GAIN knob	Turn counterclockwise fully.
SQUELCH knob	Does not operate.
VXO knob	Does not operate.
MODE switch	USB*
SELECTOR switch	VFO
OSCAR switch	OFF
RIT knob	0
RIT switch	OFF
NB switch	OFF
PO switch	HI or LOW
VOX switch	OFF
Frequency selector switch	144

*** In SSB reception, the S-meter has no point of stability.**

- Connect the correct antenna to the set, and turn the power switch ON. The second meter lamp, RECEIVE lamp, dial and the 144 indicator lamp over the dial will light.
- Turn the VFO dial knob to the frequency used by an SSB station so a ham station can be received. As in the case of using the synthesizer, slowly turn the dial knob until the other station's voice can be heard clearest. SSB reception requires some experience and technique when using VFO. You will get used to it step by step. The point is where the other station received clearly, where to set will tuned exactly.

2. CW, AM

Turn the MODE switch to CW, turn the VFO dial knob as in SSB reception until the correct tuning is obtained. In AM reception, turn the MODE switch to AM, and tune the set in until the S-meter reads greatest.

3. FM

When receiving on the 144MHz band, turn the frequency selector switch to 144MHz. When receiving on the 145MHz band, turn the same to 145MHz. The 144 or 145 indicator lamp will light depending on the frequency selected. The receiving method is the same as in the case of using the synthesizer. But do not forget to turn the MODE switch to FM (WIDE) or FM (NARROW). Turn the VFO knob slowly until the meter reads greatest to indicate the correct tuning in to the other station.

Transmission

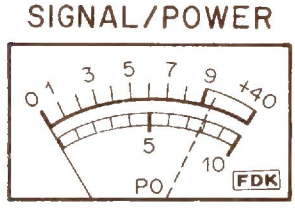
The transmitting method is the same with the synthesizer and VFO. It is important to tune in the set exactly to the other station. Connect the microphone and an antenna properly.

1. SSB, CW

Adjust the set to your desired frequency, turn the MODE selector switch to CW, push the PTT switch on the microphone to make it ready for sending (transmission). At this instant, the ON AIR lamp lights. If the S/RF meter (output meter) reads 7 or 8 (high power), signals are properly being transmitted. If the meter reads less than that, stop transmission. The cause is possibly an antenna mismatch. Check the feed line or the M-type (PL-259) connector. If the meter pointer stays at the 0 point, the cause is either a broken feed line or a disconnected antenna. First, check the antenna system.

If the RF (output) meter indicates a normal value, set the MODE selector switch to USB, press the PTT switch on the microphone and start transmission. (Since the MODE selector switch is turned to USB, the ON AIR lamp lights, but the RF meter pointer stays still.) Speak into the microphone and the RF meter pointer will move up to 7 or 8 maximum. If no sound input enters the microphone in SSB transmission, the RF meter pointer remains still at 0, which is normal.

Fig. 4 Difference in RF meter indications between SSB and FM



In SSB transmission, the meter pointer remains still unless you speak into the microphone. In FM transmission, the meter reads approx 8.

Once communication has started, do not touch the dials and VXO knob except when changing the transmitting frequency. If it becomes difficult to hear the other party due to a frequency deviation, turn the RIT switch ON and turn the RIT knob to adjust only the receiving frequency to the other station.

In CW transmission, set the MODE selector switch to CW, connect the key to the KEY jack of the rear, and enjoy CW operation. Side tone will work during CW operation.

2. FM, AM

Set the MODE selector switch to FM (W), and select a desired frequency. Push the PTT switch on the microphone, and it is ready for transmission as indicated by the lighting of the ON AIR lamp. The RF (output) meter reads 8 or over when LOW transmitting power is selected. Different from SSB transmission, the RF meter pointer remains at 8 or over in FM transmission.

If the RF meter reads far less than that, check the antenna system in the same way as in SSB transmission because the trouble cause is likely to be in it. If the RF meter reads 8 or over, you can start talking with the other party. In case of QSO with a local station, LOW output power is sufficient.

When the 20kHz separation FM (narrow) mode is desired, turn the MODE selector switch to FM (N), so that you can make more effective use of the narrow FM band selected. If FM (N) is selected, your party should be select the same FM (N) mode.

For AM operation, you need only set the MODE selector switch to AM. (If necessary)

How to use VOX

When the VOX switch is turned ON, transmission and receiving standby will be automatically changed over by sound without depressing the PTT switch on the microphone. VOX sensitivity can be adjusted by removing the cover on the top of the hatch and turning the VOX GAIN knob. Then, in receiving condition, operate VOX and adjust the ANTI-TRIP knob so VOX will not be erratically driven by sounds from the speaker.

If the ANTI TRIP knob is turned clockwise excessively, the VOX circuit may be driven by noise, etc., making it impossible for you to proceed to transmission. Exercise care when adjusting this knob. Return time to reception can be adjusted with the DELAY knob.

How to use RIT and VXO

The receiving frequency can be varied up to ±3.5kHz from the preset value by turning the RIT knob. Turning this knob does not affect transmitting frequency.

The VXO knob can vary both transmitting and receiving frequencies simultaneously up to ±7kHz from the frequency indicated by the synthesizer. In this case, the RIT knob must be at 0. If your talking party demands a change in transmitting frequency, turn the VXO knob to adjust the transmitting frequency if the synthesizer is in operation; or turn the VFO knob if VFO is in operation. In both cases, do the final receive frequency touchup by turning the RIT knob.

Frequency Calibration (RIT OFF)

Dial calibration is necessary for the correct frequency reading. For calibration purposes, use the built-in 100kHz marker oscillator.

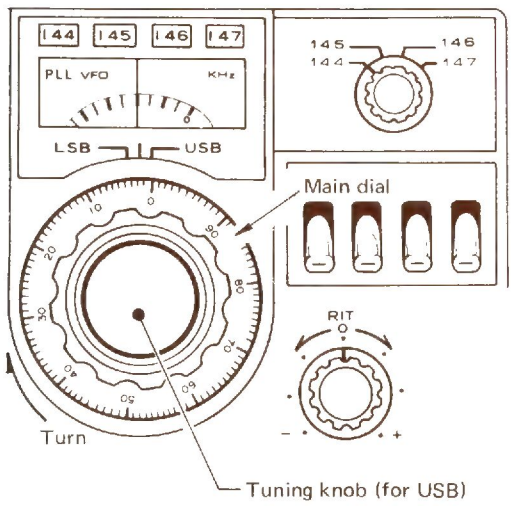
When the SQUELCH knob is turned counterclockwise fully (until it clicks), the CAL (calibration) switch is closed to operate the marker oscillator.

Marker signals are generated every 100kHz. The correct marker beat can be received every 100 divisions from 0 to 1,000 on the subdial for frequency calibration or synthesizer 100kHz unit.

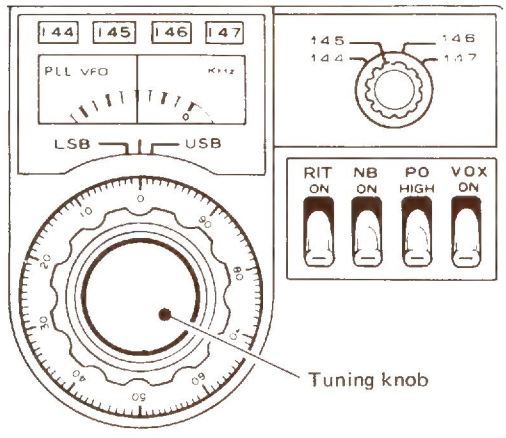
Read for USB (set the MODE selector switch to USB.)

As the main dial knob is turned clockwise, the beat changes from treble to bass. Stop the subdial knob at a point where the beat ceases, and adjust the 0 degree on the main dial to the USB dial gauge by holding the main dial knob, which is pressed against the main dial by a spring, and sliding the main dial until its 0 degree is adjusted to the USB dial gauge. (Fig. 5)

Fig. 5 Frequency Readout (VXO to 0 RIT to OFF)



(For Sideband readout)



(for FM, AM, CW)

Read for LSB

This case, transmitting frequency is 1kHz lower than that for LSB. If dial calibration is necessary in the CW mode, adjust the 0 degree on the main dial to the center of the dial gauge at the point 1kHz below.

As the FM and AM

Zero beat cannot be obtained from marker signals. The point where the S-meter reads greatest when signals are received indicates a tuned-in frequency. As in the case of CW, read the frequency from the center dial gauge.

How to Read VFO Frequency (RIT OFF)

Operating frequency can be correctly read by means of the VFO dials.

The dial mechanism consists of the main dial, subdial, dial gauge, main tuning knob and fast tuning knob. (See page 4 for operational description.)

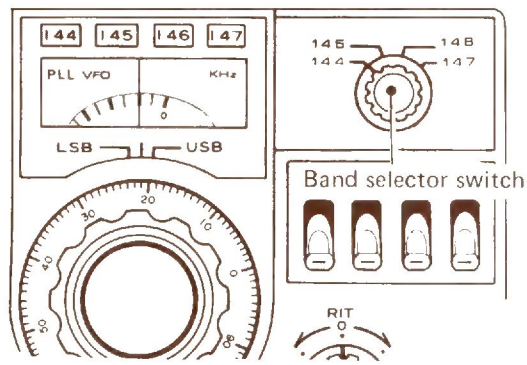
In SSB operation, it is necessary to read frequencies in units as small as 1kHz. Use the main dial for this purpose.

When the 144MHz band (USB), read the main dial against the USB dial gauge when USB waves are completely demodulated and received. (Fig. 6)

When reading VFO, the main dial and subdial must be read and their indications must be added so it seems troublesome at the beginning. But you will get used to it and become able to read VFO frequency quickly and correctly. The subdial's scale from 0 to 1000 corresponds to 1MHz.

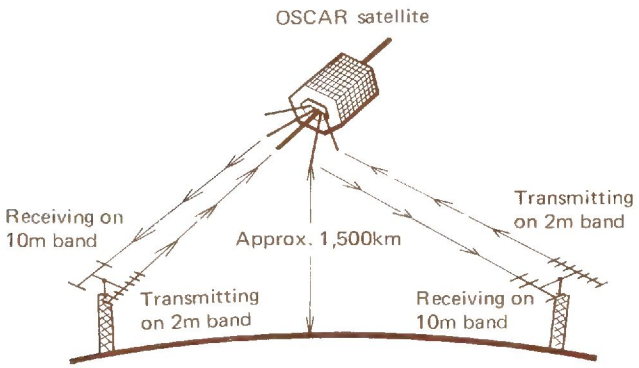
The dial cannot be turned beyond a point a little off the 0 to 1000 scale. If it is forcibly turned beyond that point, the gear will break down. Do not turn it excessively.

Fig. 6 How to Read Tuned Frequency



Frequency is 144.000 + 120 (USB) = 144.120 MHz. If the band selector switch shows 145, frequency is 145.120MHz.

The conventional satellite communication system requires two sets, i.e., a 2m band SSB transmitter and a 10m band receiver, and a high level of operating technique.
The MULTI-2700 is a multiple-mode 2m band transceiver with a 10m OSCAR receiving converter. It is the first transceiver made in Japan that makes OSCAR communication possible with a single set.
At present, two OSCAR satellites, No. 6 and No. 7, are flying about 1,500 kilometers up in the skies. The MULTI-2700 can communicate via OSCAR 6 or 7 in the A mode. When signals are transmitted to the satellite on a specified frequency in the 2m band from the MULTI-2700 satellite communication system (called an up-link), the satellite converts the frequency into a 10m band frequency and sends it back to the ground (called a down-link) as illustrated below.



OSCAR satellite transmitting frequency vs receiving frequency diagram.

AMSAT-OSCAR 6

Up-link	145.000 – 146.000MHz USB
Down-link	29.450 – 29.550MHz USB
Beacon	29.450MHz

AMSAT-OSCAR 7

A-mode:

Up-link	145.850 – 145.950MHz USB
Down-link	29.400 – 29.500MHz USB
Beacon	29.502MHz, 435.100MHz

B-mode:

Up-link	432.125 -432, 175MHz USB
Down-link	145, 975 145, 925MHz LSB
Beacon	145, 972MHz

An OSCAR satellite receives 2m band signals from the ground and sends them back as 10m band signals. The frequency relationship is maintained constant, keeping the difference between them at 116.45MHz (145.9 – 116.45MHz = 29.45MHz).

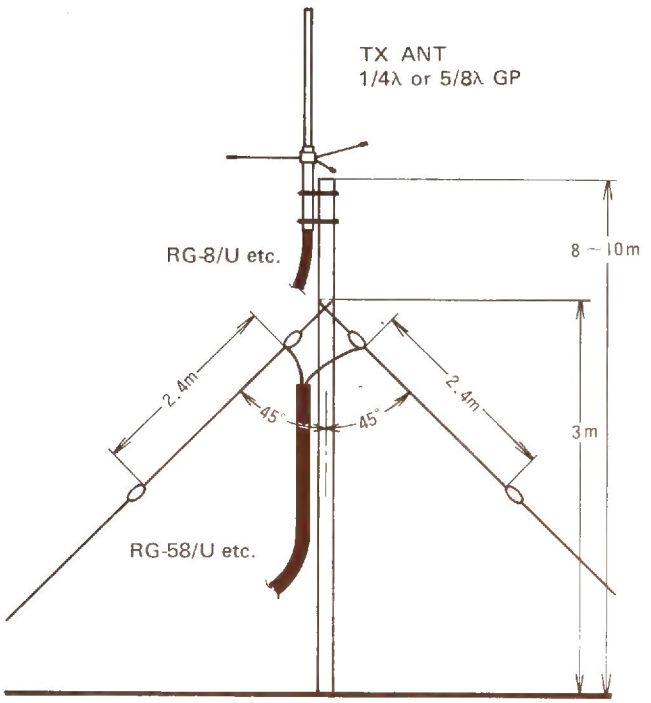
Actual Operating Method

Connect a 2 meter antenna and a 10 meter antenna to the SO-239 connectors to the MULTI-2700.

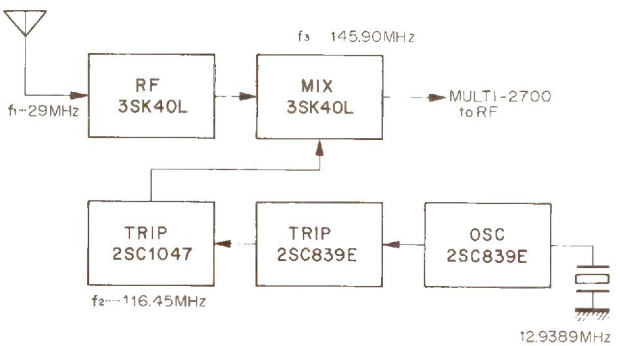
1. Turn the power switch ON, turn the SELECTOR knob to SIMPLEX until the digital display shows 145.95MHz, which is the beacon frequency (29.50 MHz) of OSCAR 7 in the A-mode.
2. Then turn the frequency selector knob at the upper right of the front panel to 145, turn the SELECTOR knob to VFO so that 145.85 to 145.95MHz can be received. When the OSCAR pushbutton is pushed, the transceiver is ready for oscar operation.
3. Then turn the SELECTOR knob again to SIMPLEX and receive OSCAR beacon signals. Turn the VXO knob in the positive direction, i.e., clockwise, so that beacon signals can be heard.
4. Turn the SELECTOR knob to VFO and receive signals within the range of 145.85 to 145.95MHz (29.4 to 29.5MHz). You can hear stations emitting CQs, beacon signals and signals being exchanged between two stations. Tune in the set to a station emitting a CQ. Still keep the RIT switch in the OFF position.
5. When proceeding to reception, turn the RIT switch to the ON position, and slowly turn the RIT knob from the center position in the positive (+) or the negative (–) direction so you should be able to hear a response. Stop the RIT knob at the point where you have received the response, and keep it there.
6. The OSCAR satellites are not synchronized so communicable time is limited. It is important to communicate briefly. Use SSB or CW. Orbit time is about 1 hour and 55 minutes, and operation time is approx. 25 minutes per orbit each communication.

Temporarily using antennas, the following instructions should be observed.

1. Direct the antennas to the satellite from time to time to maintain the best communication condition. Turn the SELECTOR knob to SIMPLEX and set the frequency to 145.95MHz (for OSCAR 7), and you can receive beacon signals. But beacon signals appear to drift as the satellite moves. This is due to the Doppler effect. That is, the receiving frequency appears high as the satellite approaches your station and lowers as it moves away from your station.
2. In this case, tune the VXO knob to maximum signal level. If the antenna's beam direction has deviated too far from the direction which the satellite is flying, adjust the antennas to a direction where beacon signal intensity is greatest. You can generally communicate via OSCAR as long as beacon signals can be received.
3. With the MULTI-2700 twin selector system you can enjoy satellite communication in the best possible condition while monitoring beacon signals from a moving satellite with the SIMPLEX synthesizer. It's only one of the unique features of the MULTI-2700.

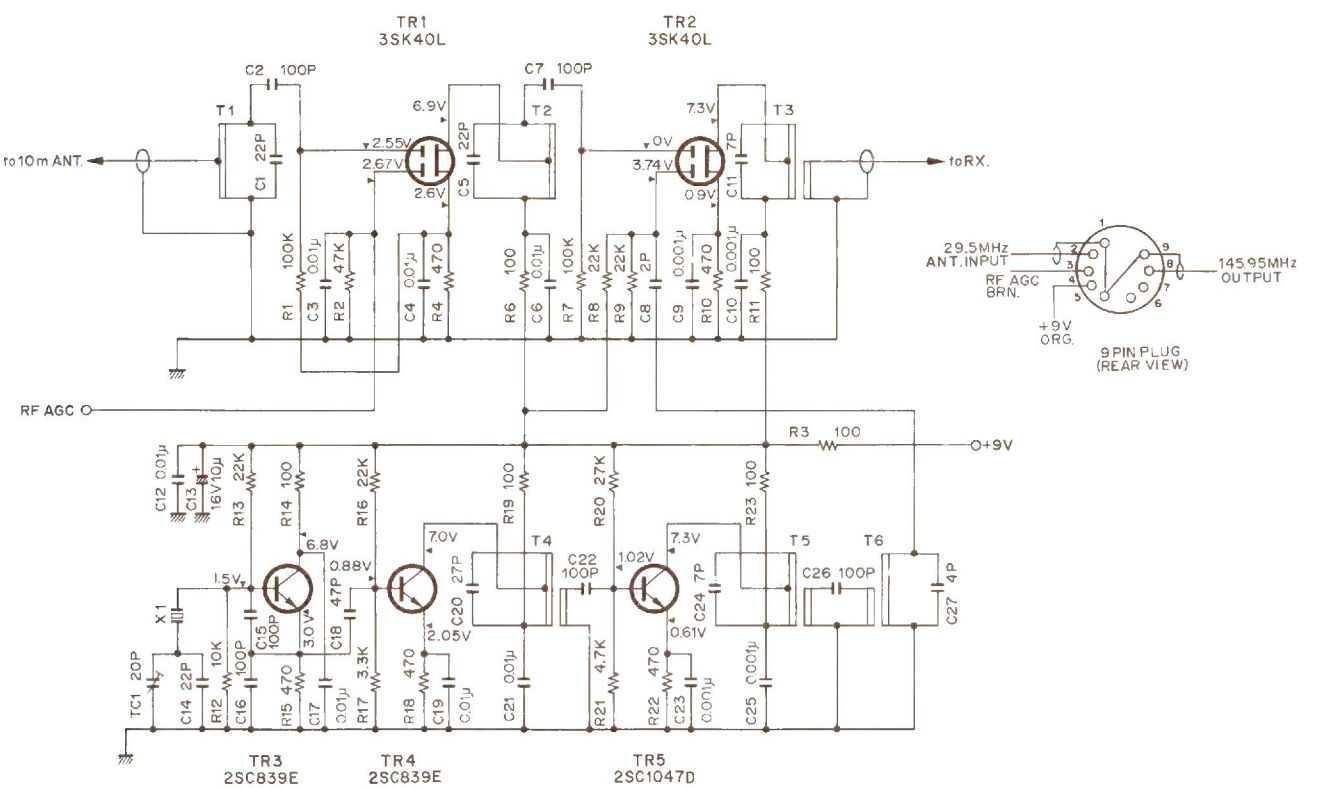


OSCAR CONVERTER BLOCK DIAGRAM



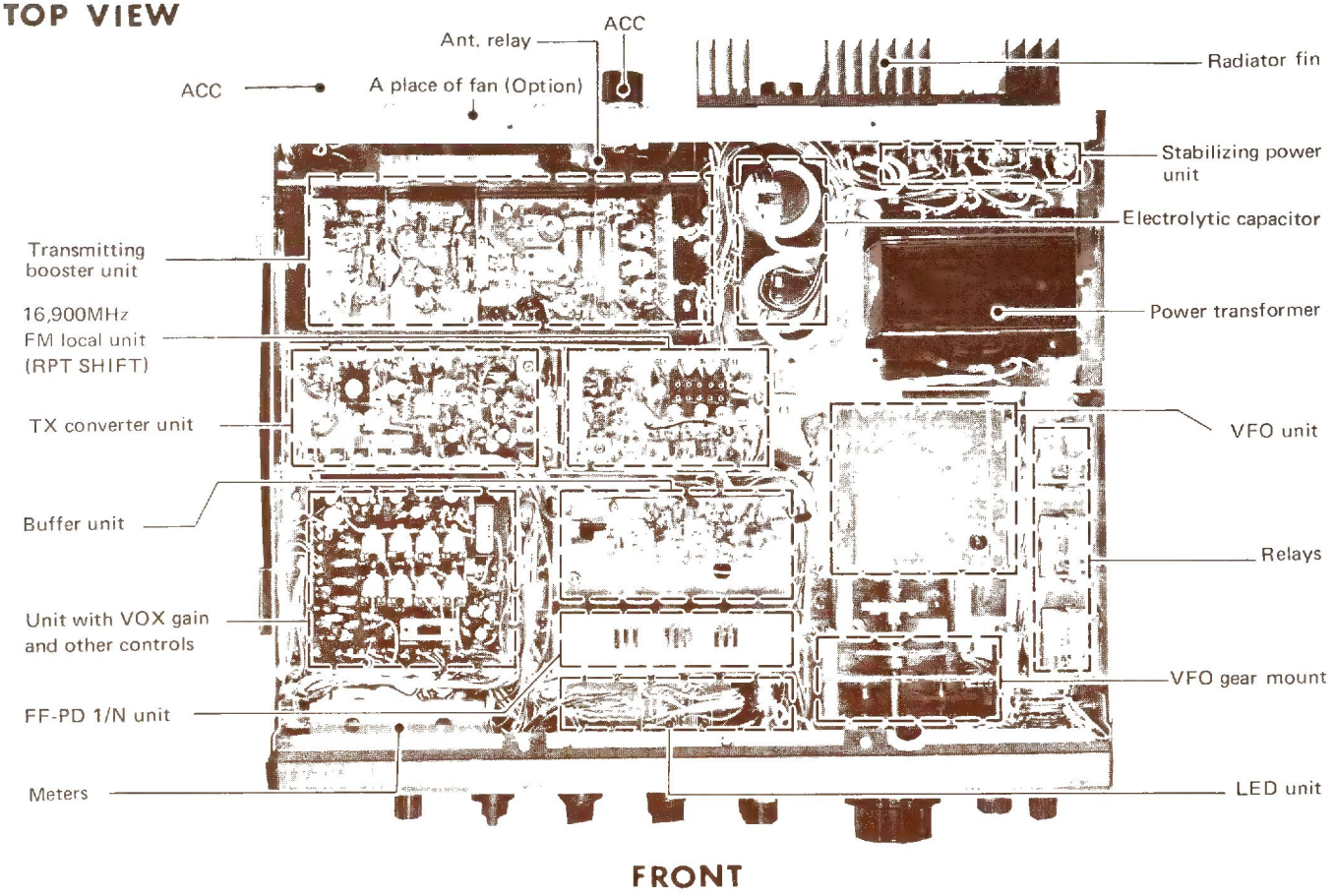
The above-mentioned method applies in cases where you use a GP and inverted V-dipole antenna.
(Temporary recommendation)

OSCAR CONVERTER SCHEMATIC DIAGRAM

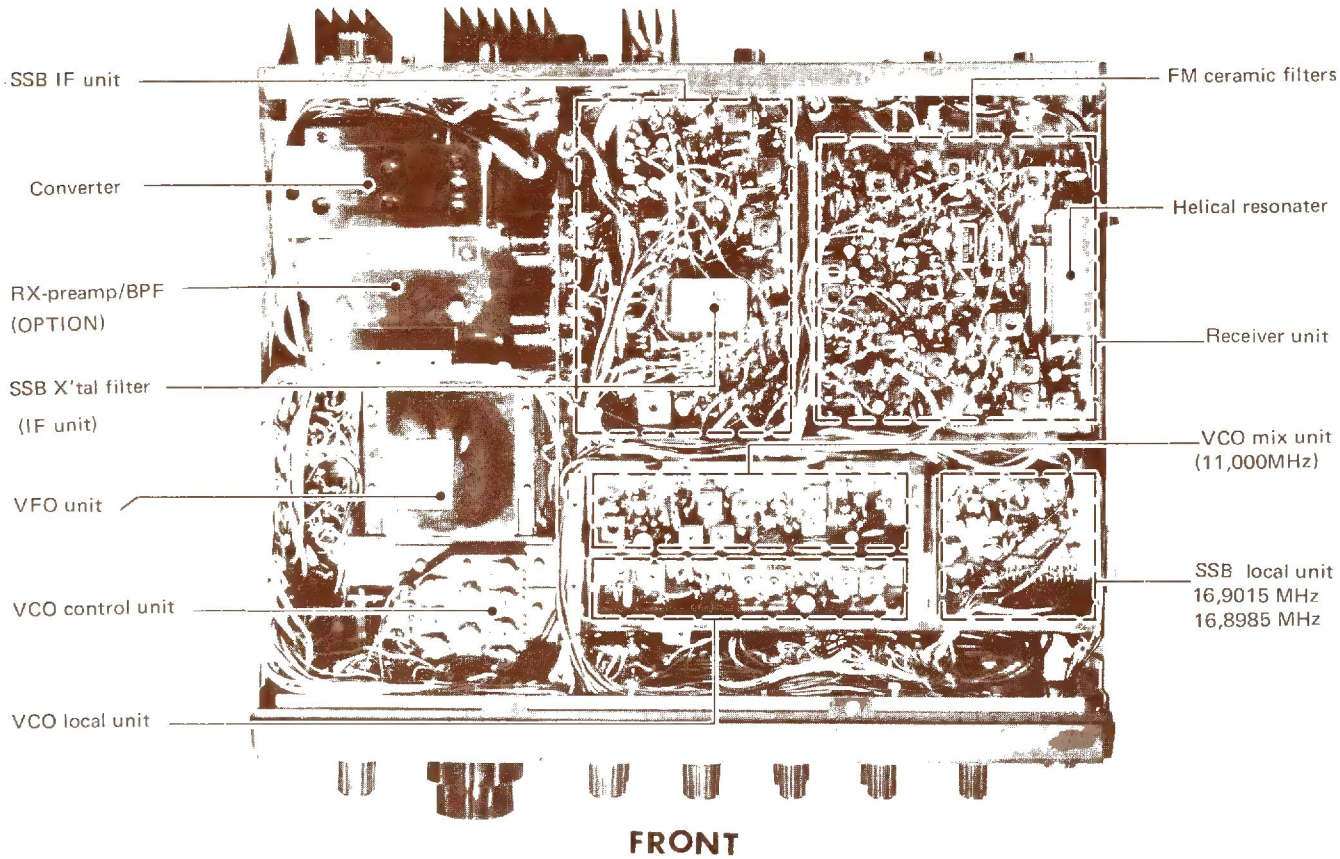


If in case, please be sure to check the antenna system and space conditions, still not properly 10 meters reception or not enough sensitivity oscar reception (10 meter band). Please contact at local dealer/shop or direct to us.
May will be exchange only the oscar converter unit.

TOP VIEW



BOTTOM VIEW



A block diagram of the MULTI-2700 is shown on Page

The MULTI-2700 consists of 18 units, employing a single superheterodyne system for SSB reception, a double superheterodyne system for FM reception, a filter type balanced modulation system for SSB transmission, and a variable reactance frequency modulation system for FM transmission.

The set employs the following crystal oscillators.

PLL section	10.000MHz
	11.000MHz
	11.344MHz
FM LOCAL section	16.900MHz
RX section	16.445MHz
SSB IF section	16.8985MHz (USB)
	16.9015MHz (LSB)
AF section	10.000MHz

PLL section

The PLL section consists of 8 units, i.e., X-1, X-2, X-3, X-4, X-5, X-6, X-7 and X-15.

The PLL circuit composition is as shown in the diagram below. The FF-PD unit (X-1) has an IC 10.000MHz oscillator, a 3-stage IC frequency divider which divides 10.000MHz into 10kHz and a phase comparator (PD) which generates a DC voltage for setting a VCO oscillating frequency. The phase comparator converts a phase difference between the reference signal and a signal from the 1/N unit into a DC voltage.

The 1/N unit (X-2) employs 3 ICs for setting the set's operating frequency. 1/N will be 1/300 for the 144.00 MHz; or 1/400 to the 145.000MHz.

The VCO unit (X-3) has an IC voltage control oscillator and a buffer amplifier by which an oscillating frequency will be set depending on the output voltage of PD applied to a variable capacity diode. The VCO unit's output is fed through the buffer unit (X-7) as a transmitting or receiving local frequency. When the 144MHz, the output will be 127.1MHz; when the 145MHz; it will be 128.1MHz.

The VFO unit (X-4) is a very stable VFO which employs a dual gate MOS FET for oscillation. It generates frequencies within the range of 11.000MHz to 11.500MHz, and its output is doubled by the VCO-MIX unit (X-6) to cover the 1MHz band area. When the digital synthesizer is in use, the VFO oscillator generates frequencies but the frequency doubler circuit will not operate. Instead, the 11.000MHz crystal oscillator will operate to supply a doubled 22.000MHz signal to the mixer. The mixer mixes a 102.100MHz signal, which is obtained by multiplying by 9 the 11.344MHz crystal-oscillated from the VCO-LO unit (X-5), and the 22.000 MHz to produce 124.100MHz. This 124.100MHz frequency is mixed with the VCO output to be converted into 2 to 7MHz, which is fed through a low pass filter into the 1/N unit.

The LED unit (X-15) is a unit to indicate the digital synthesizer's operating frequency and consists of 2 ICs driven at the 1/N unit's frequency dividing ratio, 23 diodes and 5 LEDs.

VXO and RIT frequencies are varied as follows:

When VFO is in use, 11.344MHz is varied by RIT; and when the digital synthesizer is in use, 11.344MHz is varied by VXO and 11.000MHz by RIT.

The PLL section is completely sealed except the buffer unit (X-7).

FM local unit (X-8)

This unit generates 16.900MHz for FM transmission.

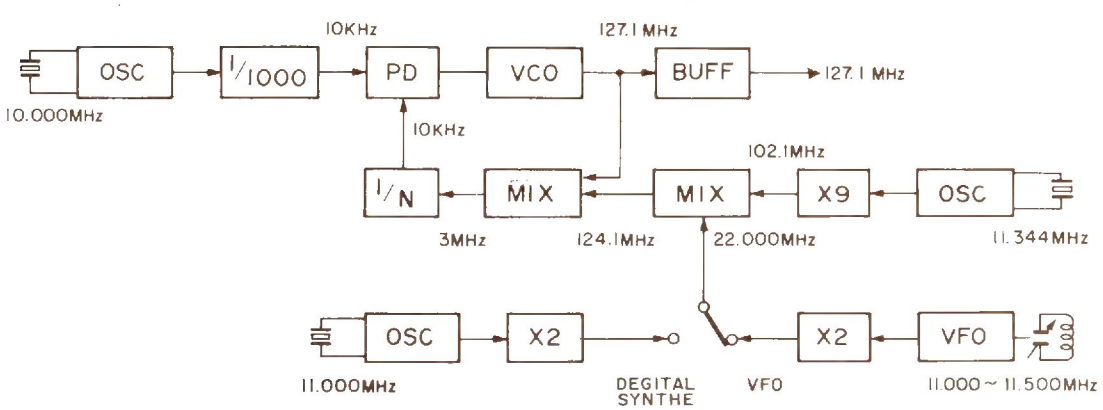
TX converter unit (X-9)

VCO output and 16.9MHz IF signal are converted into 144MHz by a balanced mixer consisting of 2 dual gate MOS FETs, and then amplified in voltage and power. Part of the unit is tuned every 1MHz by a variable capacity diode.

Booster unit (X-10)

This is a 10W output power amplifier circuit, having 2 transistors in a large capacity heat sink. In addition, the unit has a voltage control transistor for output switching, an ALC circuit, APC detecting circuit, etc.

PLL block diagram



RX unit (X-11)

SSB signals received run through an RF amplifier, helical resonator, heterodyne mixer and a crystal filter into the SSB IF unit. IF frequency will be 16.9MHz. FM signals are then fed through a crystal filter to be converted into 455kHz, and enter a 455kHz ceramic filter. The ceramic filter consists of two parts, one for wide and the other for narrow, either of which can be selected by means of a diode switch. The signals run through a limiter for FM detection before running into the AF section. Two FM squelch noise amplifiers and an AFB amplifier assure Fukuyama's unique smooth squelch operation.
A noise blanker (NB) circuit is built in for SSB. This circuit cancels ignition noise, etc. to make signal reception clear.

SSB IF unit (X-12)

This unit consists of basic circuits for SSB transmission and reception.
Specifically, it has a transmitting ring modulation circuit, a receiving ring detecting circuit, an AGC circuit, an IF circuit for SSB, CW and AM, an SSB AF circuit and an AM detecting circuit that are all built inside the unit. In SSB operation, this unit generates a DSB which is fed through a high-performance crystal filter to be fed out as an SSB. In case of CW, carriers are generated by unbalancing the ring modulator with a DC voltage.

SSB LOCAL unit (X-13)

The unit generates carriers in SSB transmission, and functions as a ring detecting BFO in SSB reception. It uses 2 crystal oscillators for oscillation, and a diode switching, and for selecting USB, LSB or CW.

AF unit (X-16)

A large-capacity IC is used as a power amplifier for received AF. The unit has a marker 100kHz oscillation circuit (3 ICs), a CW monitor circuit, a CW keying circuit and a transmission protective circuit (APC).

Microphone amplifier unit (X-17)

This is a transmitting microphone AF amplifier unit for FM, SSB and AM. FM signals run through a preamplifier, 2 AF amplifiers, IDC, an integrating amplifier and a splatter filter to a wide-narrow selecting diode switch. Thus the VCO unit's variable capacity diode is directly modulated.
In SSB and AM operation, signals run through 3 AF amplifiers and the splatter filter to the SSB IF unit. The X-17 unit has compression amplifier, which assure an excellent effective SSB, AM DX communication.

VOX unit (X-18)

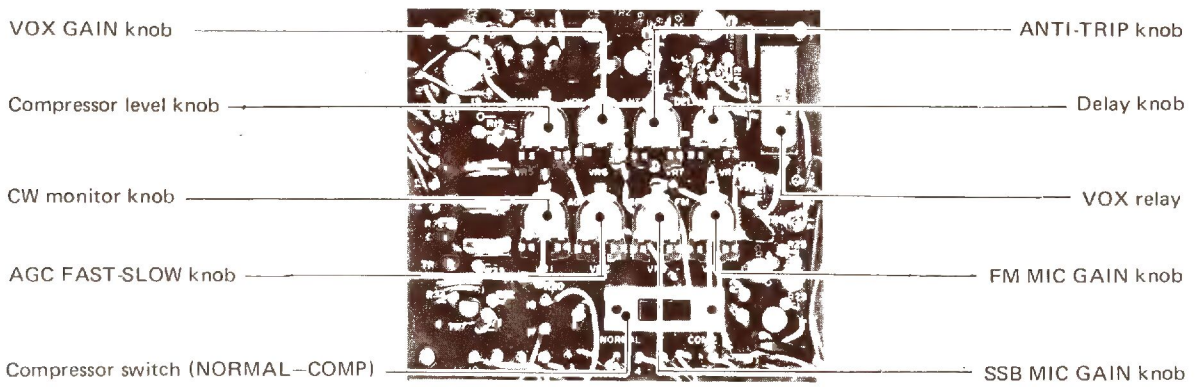
The unit has an AF amplifier, Schmitt circuit and a DC amplifier for VOX operation (voice control operation). The unit offers sufficient VOX gain, and is complete with an anti-trip delay circuit for satisfactory VOX operation. The unit also has a CW break-in circuit. The unit has microphone gain (FM, SSB), VOX gain, anti-trip gain, delay time, CW monitor gain, SSB-AGC time constant and compressor gain control knobs and a compressor switch.

AVR unit (X-14)

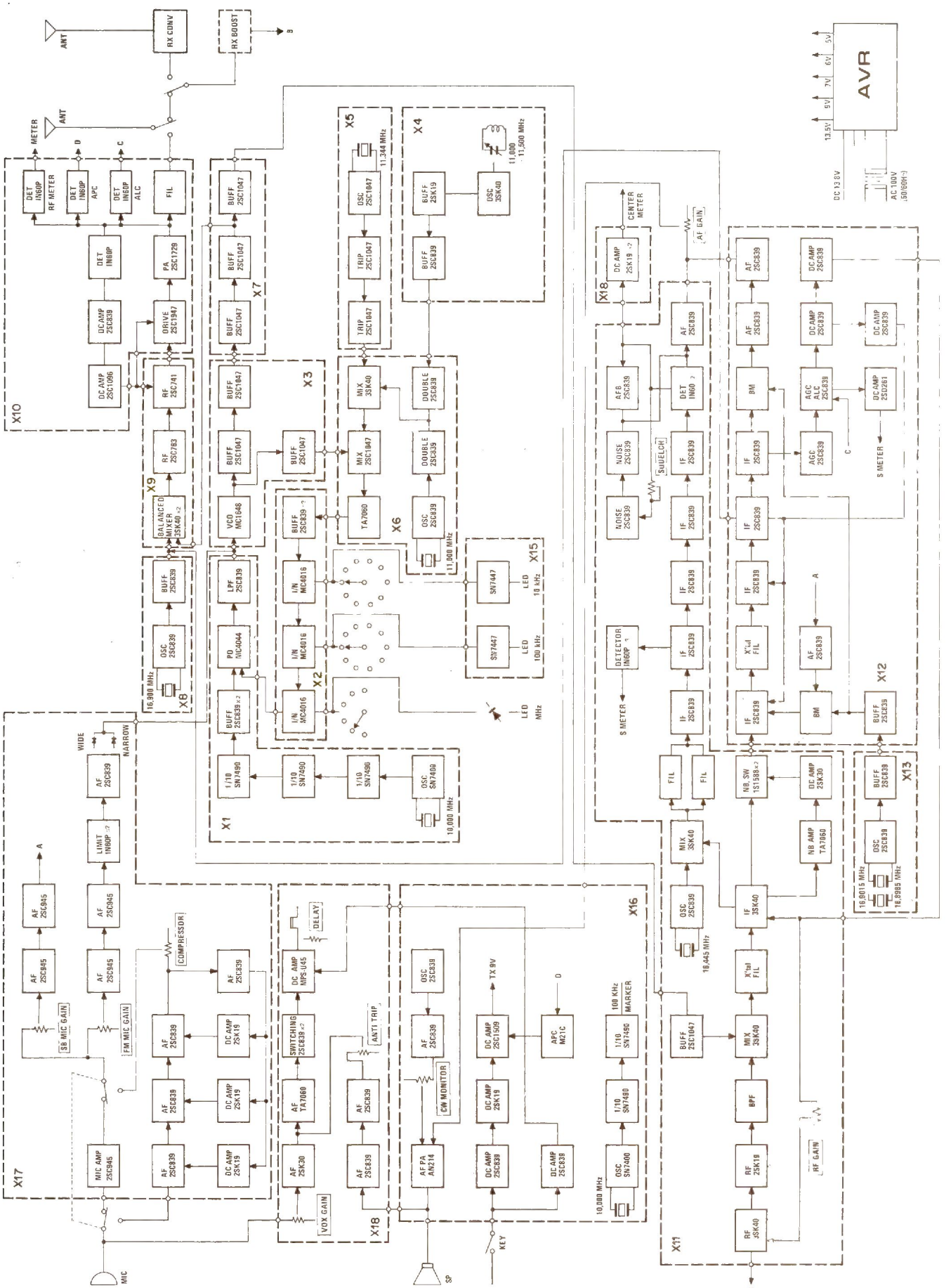
The set operates on either AC or DC.
The unit has a rectifier bridge installed in a large-capacity heat sink, a current control transistor, power transformer, and various control circuits on a printed circuit board to generate five voltages, i.e., 13.5V, 9V, 7V, 6V and 5V. Each of these voltages is completely stabilized before being supplied to each circuit of the units.
The photo below shows the controls located inside of the hatch (X-18). Use them appropriately whenever necessary.

CONTROL KNOBS

Top view, when open the hatch



BLOCK DIAGRAM



The symptoms shown in the table below do not necessarily indicate faults. Please carefully check the set against the table. If trouble persists even after an appropriate step has been taken please contact the Dealer/shop or our company immediately.

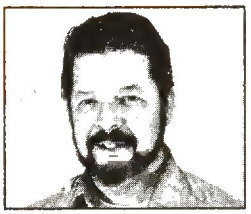
Symptom	Cause	Remedy
No power	• Power cord is not plugged in properly. • Fuse is blown.	• Plug it in completely. • Replace fuse. (Turn power switch ON. If fuse is blown again, something is wrong.)
No sound from speaker	• AC plug is not fully inserted into electrical outlet. • Speaker voice coil is broken. • Headphone is plugged into headphone jack.	• Insert it fully into it. • Replace speaker. • Disconnect headphone from jack.
No signals can be received when antenna is connected.	• Coaxial cable is disconnected or not soldered properly. • SELECTOR switch in wrong position.	• Resolder securely. • Set it to SIMPLEX or VFO.
Poor sensitivity	• Antenna is not well connected to antenna connector, or coaxial cable is about to break. • RF GAIN knob is in center position.	• Insert antenna connector (PL-259) again into antenna socket securely. • Turn RF GAIN knob (to MAX position).
SSB signals are received but no sound comes out.	• MODE selector switch is set at other than USB/LSB & CW position.	• Set MODE switch to USB/LSB & CW position correctly.
Frequency will not move even if RIT knob is turned.	• RIT switch is in OFF position.	• Turn RIT switch to ON position.
Receiving and transmitting no problem, except can not be communication.	• Transmit and receive frequency is differenced.	• RIT switch off position or correctly 0 position.
No transmission	• Microphone connector is not properly connected so PTT switch does not work. • Coaxial cable is broken or shorted.	• Insert microphone connector securely(or check connector wiring). • Check antenna system.
No SSB output	• SSB MIC GAIN knob is turned to MIN position. • Microphone is faulty.	• Open top cover and turn SSB MIC GAIN knob clockwise. • Substitute microphones.
Lack of modulation depth in FM	• FM MIC GAIN knob is turned to MIN position. • Microphone is faulty.	• Turn FM MIC GAIN knob clockwise. • Replace microphone.
No digital display	• SELECTOR switch is not in FM mode SIMPLEX or DUPLEX.	• Set it to FM SIMPLEX or DUPPLEX.
Ham station can not be received when VFO dial knob is turned.	• SELECTOR switch is not at VFO. • SELECTOR switch at upper right on front panel is out of position.	• Set it to VFO. • Select 144, 145, 146, 147MHz switch position.
Nothing but local stations can be received in FM.	• SQUELCH knob is turned fully clockwise.	• Turn it counterclockwise to a point just before plain noise begins to be heard.
Lamps will not light.	• Lamp is burnt out.	• Replace lamp (or check wiring).

Warranty

Ninety days on parts and labor. Returned unit must include dealer name, date of purchase, explanation of failure symptoms and return shipping instructions. KLM will pay the return shipping costs. Out-of-warranty repairs will be handled on a basis of parts cost plus minimum service charge plus shipping cost. An explanation of failure symptoms and return shipping instructions must be included with the returned unit. No authorization for return is necessary for units in or out of warranty.

KLM reserves the right to make revisions in current production of equipment and assumes no obligation to incorporate these changes in earlier equipment models.

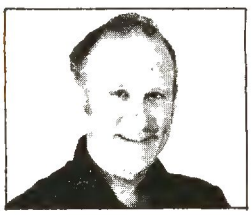
LELAND M.
"MEL" FARRER
President



K6KBE

KLM electronics, inc.

MICHAEL B.
"MIKE" STAAL
Vice President, Treasurer



K6MYC

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MULTI 2700 MANUAL ADDENDUM

PLEASE READ THIS DESCRIPTION OF PROPER OPERATION OF YOUR MULTI 2700:

1. FM SIMPLEX: Either the VFO or Synthesizer can be used for transceiving on the same frequency (simplex).

2. FM DUPLEX(split): The Synthesizer section is used for split frequency operation(duplex). The +600 position puts the transmit frequency 600 KHz above the receive frequency. The -600 position puts the transmit frequency 600 KHz below the receive frequency.
   In either case, the dial or readout will indicate receive frequency.

   Additionally, your Multi-2700 has two positions for other duplex splits. The "A" and "B" positions can be set up for any reasonable split other than 600 KHz by installing the appropriate crystal.
   To calculate the crystal frequency for an "oddball split", add the amount of the split to 16.9 MHz for a + split or subtract it for a - split. (EG. 1 MHz split--16.9 + 1.0 = 17.9 MHz for a + 1 MHz split. A - 1 MHz split would be 16.9 - 1.0 MHz = 15.9 MHz.)

   Crystal specifications for splits are:

   HC-25/U, 30 pF Load Cap., Fundamental Mode, Equiv. Series Resistance less than 20 ohms.

3. MARS OPERATION: Guaranteed operation of the Multi-2700 is 143-148.990 MHz. However, many have successfully used their 2700 on MARS frequencies as low as 142 Mhz. Use of the VFO allows operation about 200KHz above 148 and 200 KHz below 144 MHz so that the VFO can be used to transmit (or receive) above the band while switching to SIMPLEX to receive (or transmit) below the band. The "A" and "B" Splits can be used for other splits but power and sensitivity outside 143-148.9 will be degraded.

4. Deviation, Mike Sensitivity - Deviation is set by using the "Devi" pot on OX-117 board (under OX-118 under hatch cover). Mike sensitivity and clipping level is set by the FM mike gain control (usually 1/3 to 1/2 of range).

5. SSB: By selecting "USB" or "LSB" either upper or lower sideband can be used. Using the synthesizer calibration will be correct at about +1.5 KHz on the VXO (USB) or -1.5 KHz (LSB). Exact calibration can be checked by zero beating the crystal calibrator.

Using VFO the calibration will be correct at the "USB" or "LSB" marks on the VFO dial. To calibrate the dial, adjust the outer dial skirt by holding the fast tuning knob with one hand while slipping the skirt with the other. FM carrier frequency is indicated by the center mark on the VFO dial.

Note that average meter readings on SSB transmit will be about half that of FM since the meter reads average not peak voltage (PEP = 2x average).

6. AM: Carrier level should be about 5w (adjustable by VR3 next to crystal filter on SSB/IF board factory preset). SSB MIC GAIN should be set so that peaks barely flicker the RFO meter on voice peaks. Some on-the-air adjustment may be required.

Receiving AM requires careful tuning since the IF filter is quite narrow. Use of RIT may be helpful when more than one station is involved.

(AM is LSB with carrier. When working units having USB with carrier there will be offset of 3KHz between TX and RX. RIT can be used to adjust for this.)

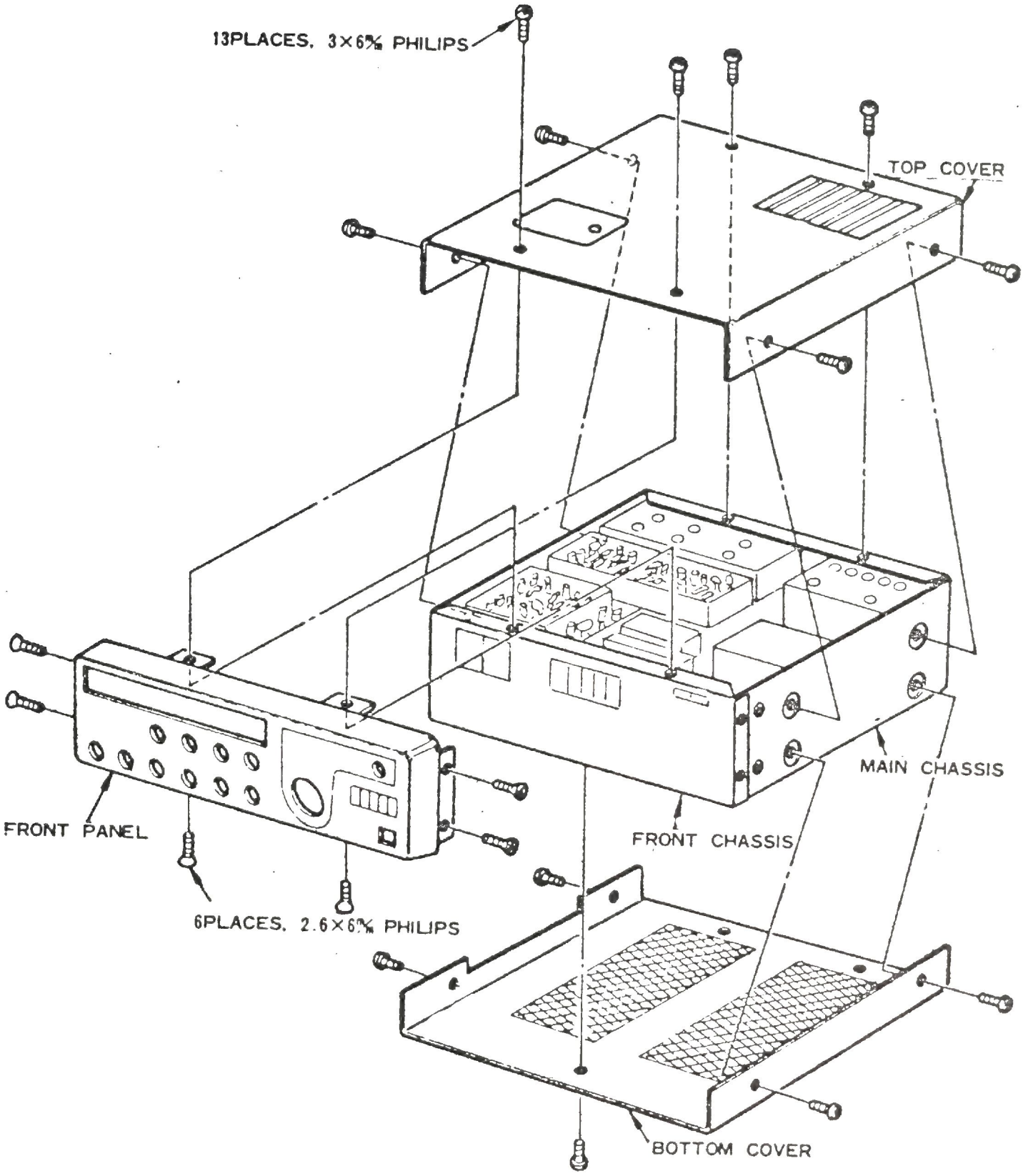
7. CW OPERATION - CW is semi-break in with delayed dropout of TX/RX relay. Delay is adjusted with VOX delay control under the hatch cover. If a keyer is used, it must key to ground (Ø volts). Some keyers do not key to ground. With these units use an external relay (reed relay preferred) to key your 2700.

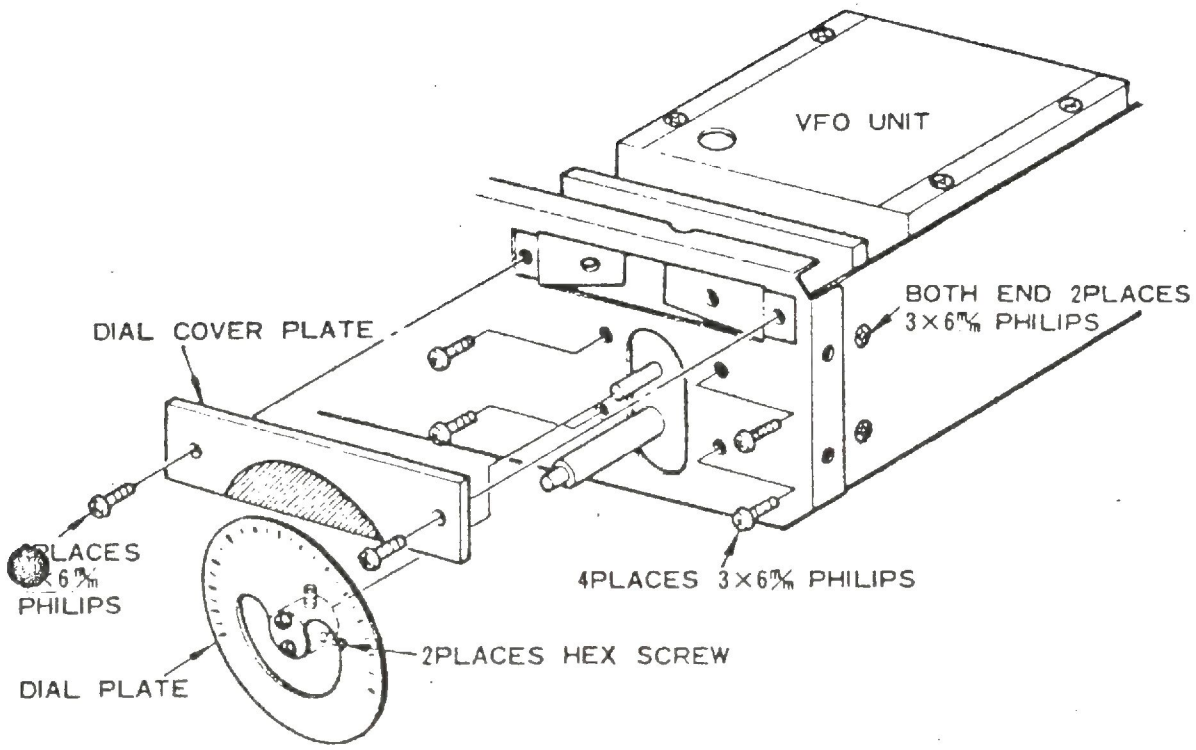
Transmit frequency is about 1.5KHz below receive frequency since CW works on lower sideband (calibration for CW is the same as LSB).

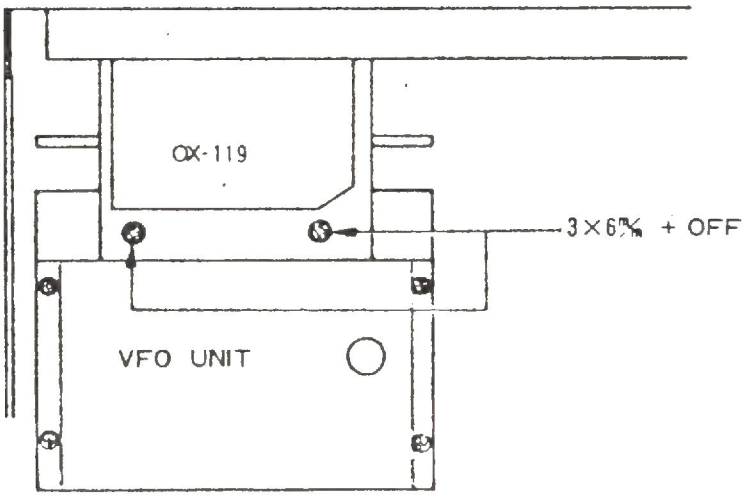
(LSB was chosen to accomodate reception of the inverted output of OSCAR "Mode B" - the main use of CW on two meters. A modification sheet is available telling how CW can be put on USB.)

8. NOISE BLANKER - Use of the noise blanker is limited to SSB/CW modes. Strong signals on frequency or near frequency will cause cross-modulation or distortion (typical of this kind of simple circuit). Since the blanker should not be necessary on strong signals, it can be turned off to eliminate the problem.

9. CRYSTAL CALIBRATOR - Some units have a very strong set of calibrate signals. Reducing RF gain will aid in zero beating the calibrator for SSB/CW.


13PLACES. 3×6% PHILIPS
TOP COVER
MAIN CHASSIS
FRONT CHASSIS
FRONT PANEL
6PLACES. 2.6×6% PHILIPS
BOTTOM COVER


VFO UNIT
BOTH END 2PLACES
3×6㎜ PHILIPS
DIAL COVER PLATE
PLACES
6㎜
PHILIPS
4PLACES 3×6㎜ PHILIPS
2PLACES HEX SCREW
DIAL PLATE


OX-119
3×6㎜ + OFF
VFO UNIT

TROUBLE SHOOTING

A. Doesn't Turn On

1. Check Power Cord (AC or DC)
2. Check Fuse
3. Check Voltages:
   a) 5V at FF/PD Box(Fig 2)
   b) 9.5V at Buff Unit(OX-107, Fig 2)
   c) 13.8 V at Filter Cap #1 (near transformer Fig 2)

   Symptoms:
   1) No Panel Lights-14V line
   2) No LED's, VCO, VFO out-5V line
   3) No TX or RX, panel lights O-K-9V line

4. Defective Power Switch?

B. Transmitter Problems

1. Check Voltages in the transmitter section.
2. SSB O-K, FM OUT
   a) FM Local Unit(OX-108, Fig 2)
      1) Defective crystal
         (a) Simplex= 16.900 MHz
         (b) +600KHz= 17.500 MHz
         (c) -600KHz+ 16.300 MHz
      2)Tuning off(VR 1-VR 5 (OX-108, Fig 2)

3. FM O-K, No SSB, CW, AM
   a) BFO unit defective(OX-113, Fig 3)
   b) SSB IF unit defective(OX-112, Fig 3)

4. Low Power or No Power Output
   a) Check Final Transistor(2SC1729)
   b) Check Driver Transistor(2SC1947)
      (An ohmmeter should show low resistance from Base to Collector or Base to Emitter in one direction but high in the other.)
   c) Make sure that the VSWR Protection circuit is adjusted correctly (see instructions in Tune Up section).
   d) Check level from the Mixer Board (OX-109, Conv. Unit, Fig 2). Level here should be 50-100 mW.

5. No SSB, AM Carrier with no Modulation
   a) Mic Level turned down.
   b) SSB Mod Level turned down(VR-2, ox-112, Fig 3)
   c) TR-1 AF Preamp Board bad(OX-117, Fig 2) Confirm by switching to Compressor. This should restore modulation since it by-passes TR-1.
   d) No Modulation with or without compressor points to TR-9,10 (OX-117, Fig 2)

6. No FM Modulation
   a) FM Mic Gain turned down
   b) TR-1 bad (will also affect SSB, using the compressor by-passes it to confirm)
   c) TR-13,14,15 bad(OX-117, Fig 2)

7. Low or No Audio on SSB or FM
   a) SSB Mic Gain, FM Mic Gain(under hatch cover)
   b) SSB Mod Level control(OX-112, VR-2, Fig 3)
   c) FM Deviation not set properly(VR-1, OX-117, Fig 2... normally set for 4.5KHz at FM-N)

8. SSB Distortion
   a) Transmitter poorly aligned(see TX Alignment)
   b) SSB Mic Gain too high(Check balance between this control..typically set mid range..and the SSB Mod level control on OX-112, VR-2)
   c) ALC not set or not set properly. With SSB Mic Gain set mid range a whistle into the mike should not exceed 12-12.5W at 144 or 145 MHz.(VR-8, OX-112, Fig 3)
   d) RF Feedback from Linear Amplifier. Check cabling, Power Supply leads, VSWR, and physical location of Amp, Antenna, and M-2700. Use double shielded interconnections to the Power Amp. Use an electrical half wavelength for interconnection(38 inches X velocity factor of the coax).

9. FM Distortion
   a) FM Mike Gain set too high(Too much clipping..reduce FM Mic Gain under hatch cover)
   b) Deviation set too high or switch in FM-W(wide) position. Reduce Deviation control(VR-1, OX-117, Fig 2)

10. AM Distortion
   a) Not enough carrier. Set carrier to 5-6 Watts at your operating frequency using VR-3, OX-112, Fig 3.
   b) SSB Mic Gain not reduced enough for proper modulation level. Voice peaks should just flicker the RFO Meter.
   c) Receiving station not tuned to favor lower sideband with carrier.

11. TX Cuts Out on an antenna..O-K on Dummy Load. (Will also usually be O-K on Low Power.)
   a) VSWR PROTECTION CIRCUIT ADJUSTMENT required.
      1) Transmit into a Dummy Load.
      2) Adjust APC DIP (VR-4, Booster Unit, Fig 6) for a dip at Test Point on VR-6 (APC Sens).
      3) Adjust VR-6 (APC Sens) so that it does not cut off the transmitter into your antenna system(assuming a VSWR of less than 2:1) You will need to unkey after each cut out to reset the trigger mechanism.
      4) Confirm proper operation by BRIEFLY keying the unit with no antenna connected. The VSWR circuit should cut off the transmitter after a brief flicker of the RFO meter.
      5) Adjust VR-5 for a maximum reading on the RFO Meter of 8 or 9. Use FM in midband.

b) Final PA tuning requires adjustment.
   1) To eliminate a VSWR problem between the PA and TR relay, retune the PA slightly. (TC-4,5 Booster Unit Fig 6)

c) Relay problems
   1) Check voltages to see if proper keying is occuring. 14 V will occur on both coil terminals during receive. 14 V on one and less than 1 V on the other will occur during transmit. Any imbalance in voltages during receive may keep the relay from returning fully to receive condition.
   (Note: the TR relay is located near the back wall of the unit under the Booster Unit..Fig 2)
   2) Use point file to clean contacts of relay.

12. Transmitter Spurious

a) General tuning(best done with a Spectrum Analyzer)
   1) L.O. Tuning(T3 FM Local Unit OX-108) (Fig 5)
   Each offset is marked next to the trimpot controlling its tuning. T3 may require adjustment as well.
   2) Mixer Tuning(T2, T4, VR-6,7,8,9,10) (OX-109)
   Each trimpot tunes a varacter to peak each band segment (except 148).
      VR 6= 143 MHz
      VR 7= 144
      VR 8= 145
      VR 9= 146
      VR10= 147
   Mixer Balance is affected by T2 tuning and the setting of VR 11. This affects the $\pm$16.9 MHz spurs.
   3) Pre-Driver Tuning is done with TC-6,7
   4) Booster Unit tuning should be evident from Figure 6.

C. Receiver Problems

1. No Audio on SSB or FM
   a) AF Output IC defective(OX-116, IC-4, AN-214, Fig 2)
   b) Speaker or Speaker lead or Speaker jack defective.

2. No Audio-FM
   a) SQ Circuit Defective(TR-14 thru 17, OX-111, Fig 3)
   b) FM IF Defective(TR-7 thru 13, OX-111, Fig 3)

3. No Audio-SSB
   a) BFO Defective(OX-113, Fig 3)
   b) AF Preamps defective(OX-112, TR-13, 14 Fig 3)
   c) SSB IF Amps defective(OX-112, Fig 3)

d) AGC defective(OX-112, Fig 3)
e) VR-7, OX-112 turned down(Normally adjusted for receiver noise that is 10 dB down from FM level with no signal input)

4. No Audio-AM
a)AM Mod not installed(See "AM MOD")
b)SSB IF Board problems(OX-112, Fig 3)

5. AGC Doesn't Work, Distorts
a) Distortion caused by Noise Blanker on strong signals...turn off NB.
b) Set AGC so that a 0.1uV signal is 1.5-2 dB below maximum possible level as set by AGC control, VR-5, OX-112.
c) See"AGC Mod"
d) IF Regenerative. Tune T-2,3,4,5 on OX-112 for maximum gain without the hollow sound characteristic of regeneration (typically, a 1.5 KHz beat note on USB is the best tone to use for tune up).

6. Distorted FM Reception
a) Multipath distortion caused by multiple reflections may be the cause if distortion is only on one or a few signals, especially if they are all in one direction or your QTH is in hilly terrain.
b) Discriminator Tuning (T-10,11, OX-111, Fig 3) Tune for least distortion with maximum quieting.
c) FM IF Tuning. (T-3,6,9, OX-111, Fig 3) Tune for least distortion with best quieting.
d) Check frequency of 2nd Converter (16.445 MHz).
e) Make sure the received signal is actually centered in the IF as the FM Center Meter could be giving erroneous readings.

7. Squelch Not Functional
a) Squelch Circuit defective(OX-111, TR-14,15,16,17)
b) IF gain low (not enough noise output)

8. Center Meter Defective
a) Adjust Sensitivity Control-VR-12, OX-118, Fig 7
b) Adjust Centering Control-VR-11, OX-118, Fig 7
c) Check TR 7,8. May be defective or heat sensitive. (OX-118)

9. "S" Meter Defective
a) SSB- Check VR-14, OX-118, Fig 7
b) FM- Check VR-13, OX-118, Fig 7
c) Check Meter mechanically and electrically.
d) Check IF gain..may be insufficient.

10. Crystal Calibrator defective
a) Off Frequency operation. Adjust VC-1, OX-116, Fig 2. Also note that some temperature drift is unavoidable when multiplying more than 14 times to get to Two Meters. It

should be very small after the initial half-hour warmup period, however.

The calibrator can be calibrated against 10 or 15 MHz WWV or a known Two Meter source. Remember that any error at 10 MHz will be multiplied by 14 times at Two Meters. This is only a few cycles if a one-beat-per-second beat note is obtained at 10 or 15 MHz, but can be hundreds of cycles if accuracy is only 50 Hz or so at WWV's frequency.

11. OSCAR Converter

a) Off frequency...(See OSCAR VIII Sheet) Adjust frequency with TC-1, T-4 (See Fig 8)
b) Lacks Sensitivity
   1) Remove the 3.3K resistor on the bottom of the PC Board across T-1 if it has not already been done.
   2) Tune T-1, 2 (Ten Meters), T-3 (Two Meters), and T-4 thru 6 (Local Oscillator). See Figure 8.
   3) Check All Transistors
   4) Check Converter plug connections.
   5) Make sure that you're not misinterpreting the normally very weak signals from the satellite with lack of sensitivity. Most signals will be less than 2 uV. If you are hearing a distinct increase in receiver noise when you connect an antenna to the 10 Meter position, sensitivity is not the problem. Try different antenna locations (to minimize external noise pickup) and check with other users.

D. Synthesizer problems

1. LED's read right, wrong frequency
   a) MC4016's bad(check programming)
   b) VCO not locked
   c) FM Local Unit crystals off frequency.
   d) VXO circuit problems in relays or wiring.

2. VFO OK, Synthesizer out
   a) Since the same VCO and dividers are used for both, the problem is probably in circuits common only to the program switches, steering diodes(D-2 thru 15 OX-102), or VCO Mix(OX-106, Fig 1 & 3) or VCO Local (OX-105, Fig 1 & 3). Consult schematic and Fig 1.

Generally speaking the Synthesizer section should only be worked on by those familiar with the operation of sythesizers. There are many interacting circuits and special test equipment (spectrum analyzer, 30 MHz Triggered Scope, etc.) are frequently required. If you are unable to determine a course of action by reviewing Fig 1, the Block Diagram, and the PLL Description, a factory return is in order.

E. VFO problems

1. Rough tuning knob...send for new VFO shaft(free).
2. Adjust frequency using VC-2 & VC-3 to set upper and lower range limits adjust dial skirts as required.

KLM electronics, inc.

COMMUNICATIONS EQUIPMENT/ANTENNA INNOVATIONS

SYNTHESIZER:

FREQUENCY:__
RIT SET: __
LED DISPLAY: ___

VFO:

FREQUENCY: ___
RIT SET: ___

CW LEVEL(10W) ____W
AM LEVEL (5.5W @ 145-146) ____
DEVIATION SET(4.5KHz) _____KHz

SUPPLY VOLTAGES:

5V _____V
9V _____V
14V _____V

Rx:
SENSITIVITY _____
AGC ADJUST _____
SSB "S" METER(10uV/S9) ____
FM "s" METER(NOT PEGGED) ____
FM DEVIATION METER ADJ FOR 5 KHz___
CENTERING ADJUSTED___
CRYSTAL CALIBRATOR CHECKED ___
BFO PITCH ___
OSCAR CONVERTER(0.2uV/10dB) ____

TESTED BY:_____
M-2700 S/N_____
DATE: __/____/____

Tx:
FREQUENCY:
SIMPLEX____, +600___,-600____Hz
VFO(0-500-1000) _____
POWER OUT____W(144) ___W(146) ___W(147.9)
SSB ALC ADJUSTED(12W MAX)____
CARRIER SUPPRESSION____DB(40dB)
COMPRESSOR SET(5-6W AVG)_____
VOX SET___
SPURIOUS GREATER THAN 60 dB ____

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MULTI-2700 CHECK-OUT PROCEDURES:

1. Turn the unit on.
2. Set controls for normal operation.
   a) RF gain at maximum.
   b) AF gain as desired.
   c) Squelch off
   d) VXO centered.
   e) Mode FM
   f) RIT centered.
   g) Selector "simplex".
   h) OSCAR buttom "off" (out).
   i) RIT switch "off".
   j) NB switch "off".
   k) PO switch "high".
   l) VOX switch "off".
   m) Synthesizer switches 146.00.
3. Check voltages.
   a) 14V.D.C. at filter cap near transformer (see Figure 2, Capacitor 1). It should be 13.7 - 14.2 VDC.
   b) 9V.D.C. at OX-107 (Figure 2). Buff unit (9V pin). It should be 9.5 - 9.8VDC.
   c) 5V.D.C. at FF/PD unit (upper pin) OX-101 should read 4.7 - 5.0VDC. (Figure 2).
4. Check panel lights.
   a) Two behind "S"/"RFO" meter
   b) Two behind "Center Meter"
   c) Two behind VFO dial (VFO turned "on").
   d) One behind OSCAR button (OSCAR turned "on").
   e) One for "Receive".
   f) One for "On the Air" (transmitter keyed).
   g) One for each VFO Range (144,145,146,147).
5. Check LED's on Synthesizer.
   a) 0-9 on 10's and 100's of KHz.
   b) 3-8 on MHz.
   c) Problems here are usually due to wires shorting, etc.
6. Check Synthesizer receive frequency.
   a) Inject a known 145.000 ± 100Hz frequency into the radio.
   b) Adjust VXO center (VR5) of VXO/VFO adjustment board

(Figure 3, Figure 4) for equal pitch on USB and LSB (about 1.5KHz tone). (Make sure that the VXO knob is centered and RIT is "off"!)

c) Center RIT knob and switch RIT "on" and "off" while adjusting Simplex RIT "ON" Center (VR2) on the VXO/VFO adjustment board (Fig. 3,4). Equalize pitch between RIT "on" and RIT "off".

d) Switch to FM and adjust "Center Meter" centering pot for Ø deflection. (VR11, OX-118 VOX board ... under hatch cover; Fig. 2 & 7).

e) Switch to AM. Inject a strong 145.000MHz ± 100Hz signal into the radio while the crystal calibrator is turned on (squelch pot fully counter-clockwise). Adjust calibrator trimmer, TC-1, for zero beat (located on OX-116 under two PC boards, OX-118 & OX-117, under hatch cover; Fig. 2). There is some interaction with the top PC boards so some over-correction may be required.

7. Check VFO frequency.

a) Inject known 145.000 MHz ± 100 Hz..

b) Tune the signal in on the 145MHz range so that you have a 1.5KHz tone on USB and LSB.

c) Adjust KHz dial to read 145.000 on the center calibration mark (FM calibration mark, page 11 of Owners Manual). This adjustment is done by holding the fast tuning knob (outside knob) while sliding the outer metal KHz calibration skirt to the appropriate position.

d) If the internal 100KHz (0-1000KHz) per division dial is slightly off, it can be adjusted by loosening two slotted set screws on its hub (see VFO exploded view). Access is under the top cover.

e) VFO RIT adjustment is made by turning the RIT "on" and "off" while adjusting VFO RIT ON, CENTER (VR-7) on the VXO/VFO adjustment board (Fig. 4).

8. Receiver performance.

a) Sensitivity - inject 0.1µv from a signal generator at 144,145,146, and 147 MHz. At least 12db signal-to-noise should be obtainable (14-16db typical) on SSB. 20db quieting should occur at 0.25µv or so.

b) AGC adjustment-With the 0.1µv injected into the unit at 145.0MHz, adjust VR5 on OX-112 (SSB IF) for maximum audio output. Back the pot off about 1-2db from this position.

c) SSB "S" meter - inject 10µv and adjust SSB "S" meter adjustment (VR 14, OX-118 under hatch cover, Fig. 7) for 10db over S-9 (1/8" or so).

d) FM "S" meter - turn on crystal calibrator and adjust VR13 for just under full scale (OX-118 under hatch cover, Fig. 7).

e) FM deviation meter sensitivity is adjusted by VR-12 (OX-118 under hatch cover, Fig. 7).
f) Centering meter (previously adjusted).
g) BFO pitch-Slight adjustment of BFO frequency may be required for best tonal quality or USB and LSB. Nominal frequency for USB is 16.8985 and for LSB is 16.9015 MHz.
h) OSCAR converter (Fig. 8)

T1, T2, and T3 tune 10 meters
T5 and T6 tune 145 MHz
TC1 adjusts local oscillator frequency
T4 adjusts local oscillator tuning (will affect frequency)
Sensitivity 0.1μv/10db typical (If sensitivity is poor, check for a 3.3K across T1. Remove it.)

9. Transmitter Performance

a) Key on FM simplex with VXO centered and 145.00 on the synthesizer.
b) Adjust FM local unit (OX-108, Fig. 2) for 145.000MHz ± 100Hz (capacitor TC-1 "simplex").
c) Set to "+600", adjust cap TC-2 "+600" for 145.600MHz ± 100Hz.
d) Set to "-600", adjust cap TC-3 "-600" for 144.400MHz ± 100Hz.
e) Check VFO at 145.000, 145.500, 146.00. Total variation should be ± 2000Hz. If more, see VFO Calibration Procedures.
f) Check power output

1) Simplex (FM)

143 ≧ 9W
144 ≧ 11W
145-146 ≧ 12W
147 ≧ 11W
148 ≧ 9W

Each range can be adjusted by trim pots on OX-109 (conv. unit; Fig. 2, Fig. 5).

2) +600, -600, A, B.

143 ≧ 8W (-600)
148 ≧ 8W (+600)

Adjust level by VR-1 to VR-5 of OX-108 (FM local unit).

*CAUTION: Adjustment of OX-109, OX-108 tuning can affect spurious levels. If a spectrum analyzer is available, a final check using the analyzer is recommended!

Typically, Power Out is 10W on band edges and 15W on 145, 146 ranges. More than 15W output is not recommended as device failure potential is increased significantly.

g) SSB ALC Adjustment - Inject audio into the mike jack while keying in USB mode (a whistle is sufficient). Adjust ALC pot, VR8, OX-112 (SSB IF) for 12-12.5 watts with mic gain set to approximately half of its range. While talking into the mike (Hello, Test?") adjust SSB mod level, VR-2, OX-112 (SSB IF board) for half of the 12 watt level on average peaks. (See Fig. 3).

h) CW Level - Insert a key into CW key jack and key the unit. Adjust CW sidetone knob under the hatch cover for desired sidetone level. Adjust CW carrier level control, VR-4, OX-112 (SSB IF) for 10-12W, 144-148 MHz. (See Fig. 3).

i) AM Level - Adjust AM Carrier level, VR-3 on OX-112 (SSB IF) for 5-5.5W of carrier at the desired operating frequency. Adjust SSB mike level knob (under hatch cover) so that audio peaks just flicker the RFO meter.

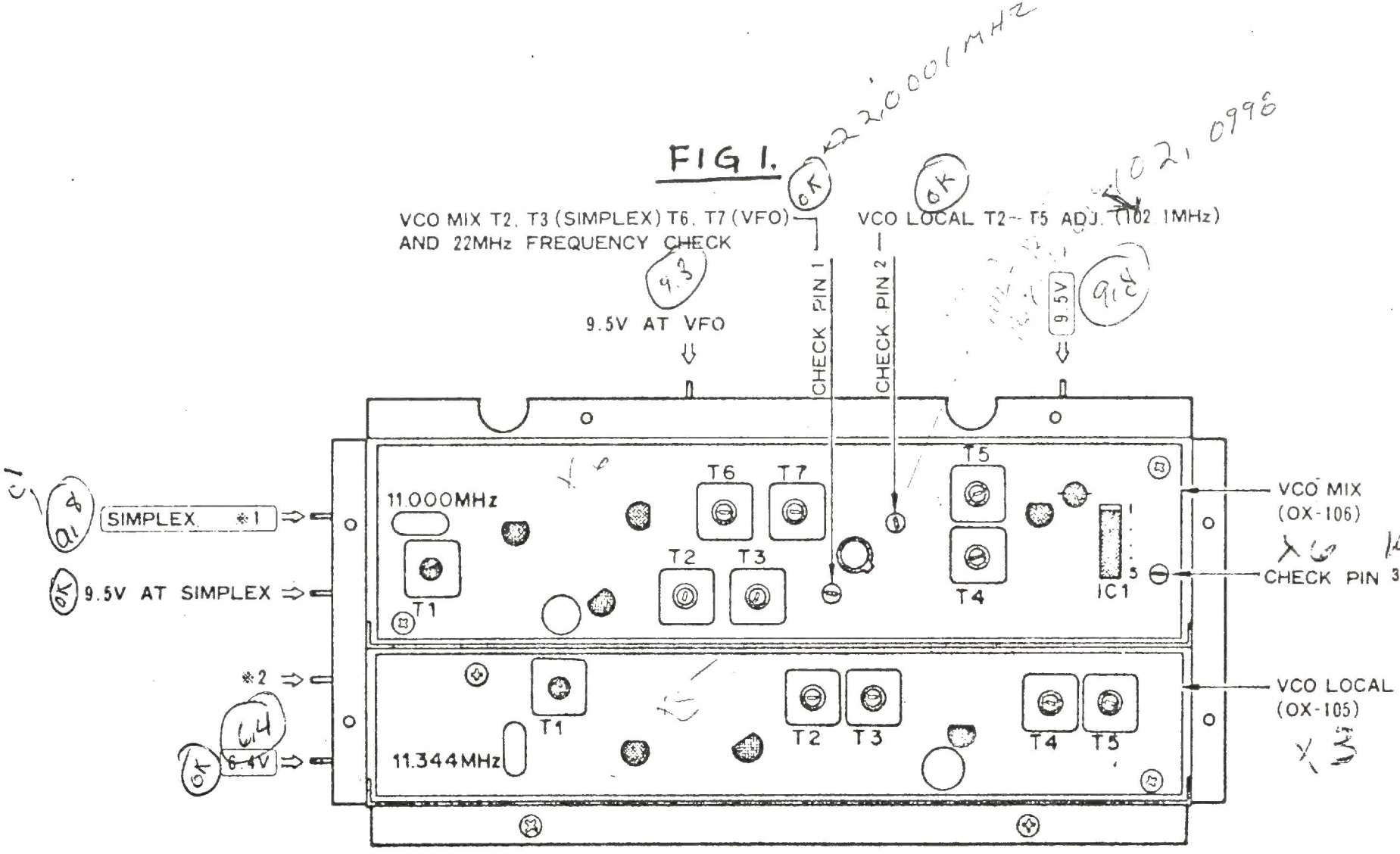
j) Compressor Level - Adjust Comp Level knob (under hatch cover) so that a whistle just reaches 12W PEP. Average peaks on voice will be about 5-6 watts.

k) Carrier Suppression - Using a receiver or spectrum analyzer, null the carrier by turning SSB mike gain all the way down then adjusting VR-1 and TC-1 on OX-112 (SSB IF). (See Fig. 3)

1) VOX Adjustment - Adjust VOX sensitivity to about half of its range. Adjust VOX delay for desired drop-out delay
Adjust anti-vox and VOX sensivity for fast attack with no receiver tripping.

m) FM Deviation and clipping level - Adjust deviation pot, VR-1, OX-117 (mic amp board - see Fig. 2) for desired deviation with FM mic knob set to 1/4 of its range (4.5KHz on FM-N recommended). Adjust FM Mic knob (under hatch cover) for desired clipping level and readjust deviation if necessary. (See Fig. 2).

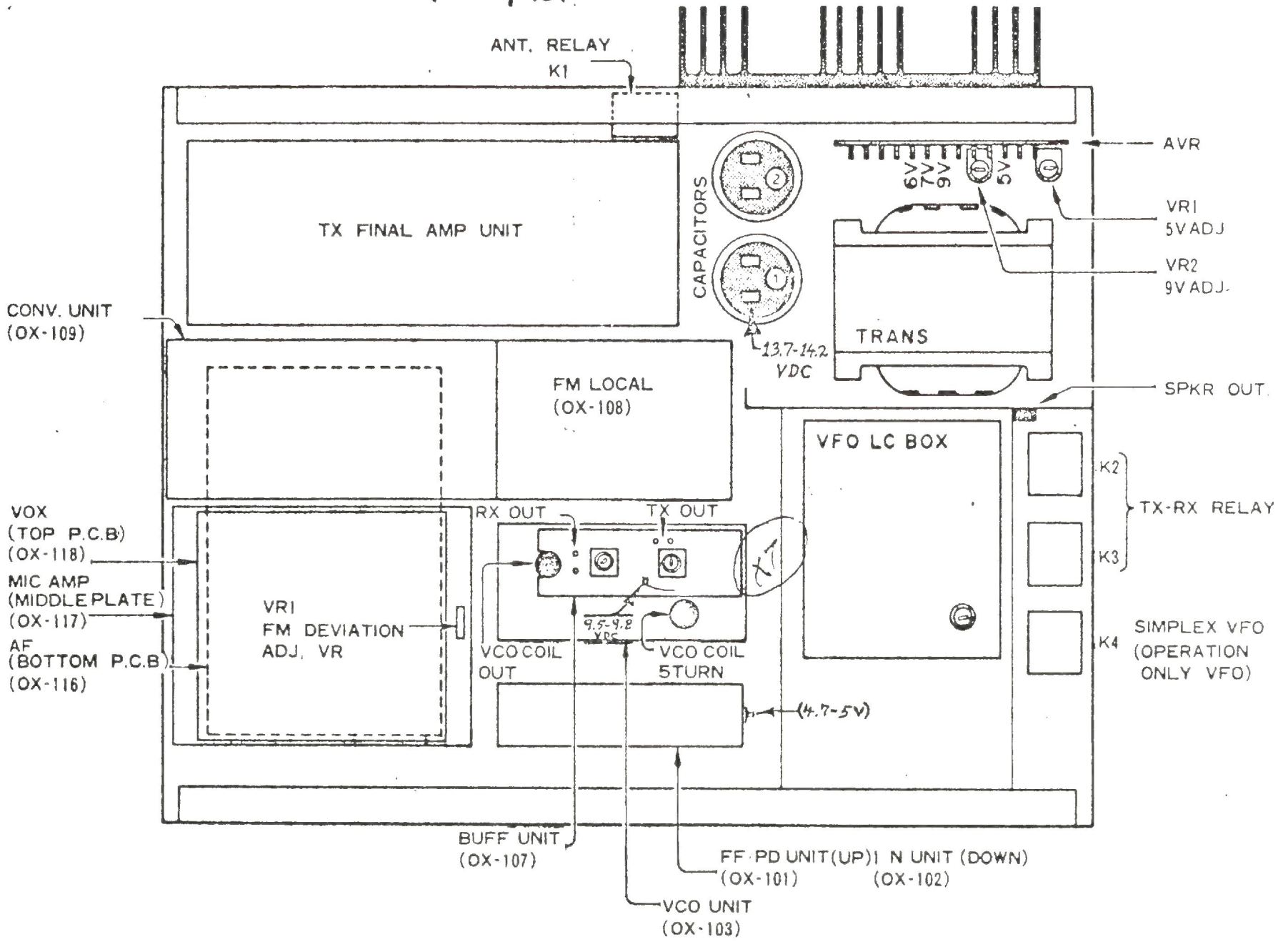
FIG 1.



※1 0~9.5V AT RIT SW OFF VCO. CONT. VR3.
1.0(0)~9.5V AT RIT SW ON RIT VR

※2 1.5(0)~6.4V AT SIMPLEX AT VXO VR
0~6.4V AT VFO AT RIT OFF VCO CONT VR9
3.0(0)~4.0(6.4)V AT RIT ON RIT VR

FIG 2.


ANT. RELAY
K1
TX FINAL AMP UNIT
CAPACITORS
AVR
6V
7V
9V
5V
VR1
5VADJ
VR2
9VADJ
CONV. UNIT
(OX-109)
TRANS
13.7-14.2
VDC
SPKR OUT
FM LOCAL
(OX-108)
VFO LC BOX
K2
TX-RX RELAY
K3
VOX
(TOP P.C.B)
(OX-118)
MIC AMP
(MIDDLE PLATE)
(OX-117)
AF
(BOTTOM P.C.B)
(OX-116)
VR1
FM DEVIATION
ADJ. VR
RX OUT
TX OUT
9.5-9.8
VDC
VCO COIL
OUT
VCO COIL
5TURN
K4
SIMPLEX VFO
(OPERATION
ONLY VFO)
(4.7-5V)
BUFF UNIT
(OX-107)
FF PD UNIT (UP)
(OX-101)
I N UNIT (DOWN)
(OX-102)
VCO UNIT
(OX-103)

91

FIG 3

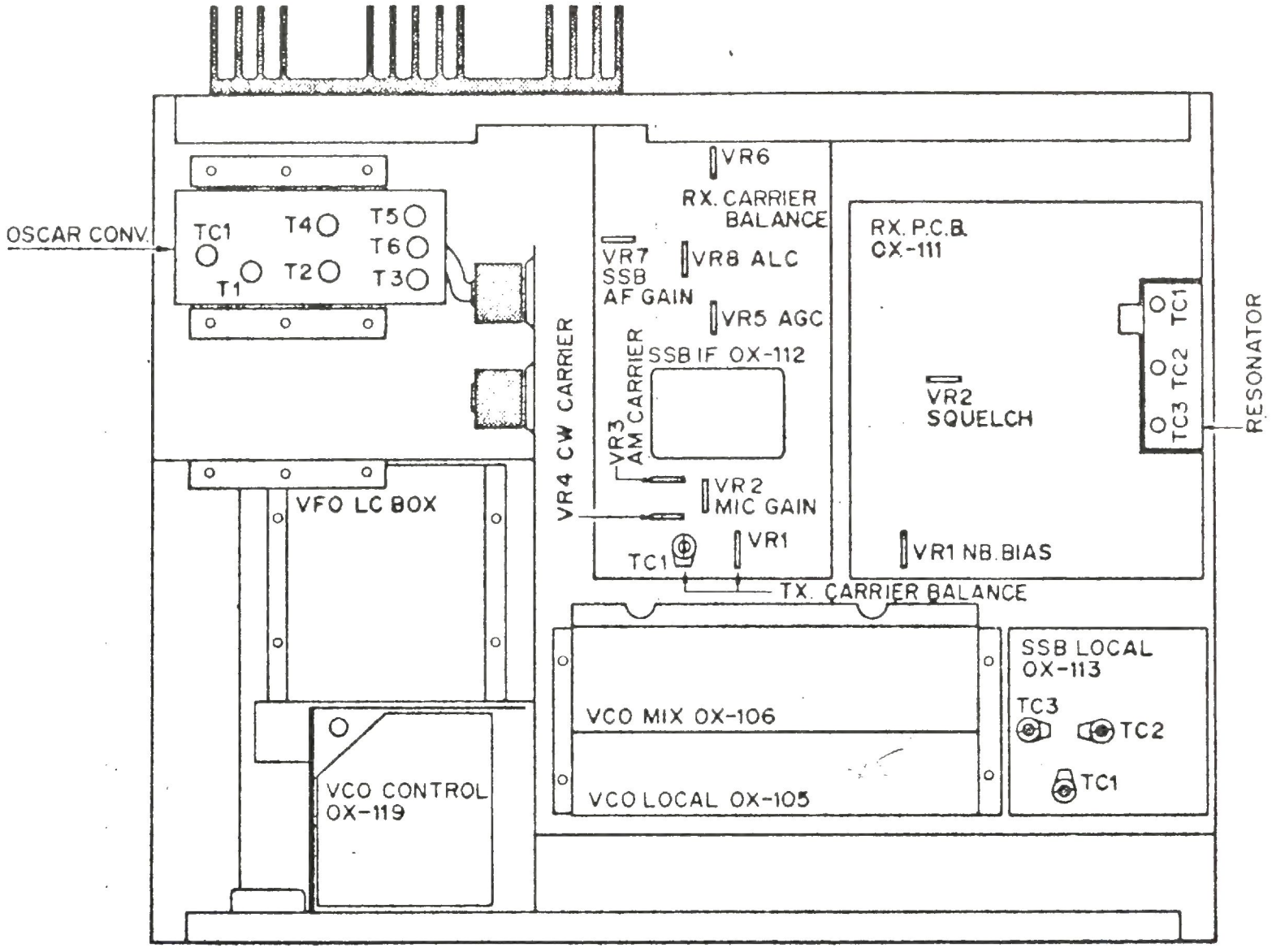
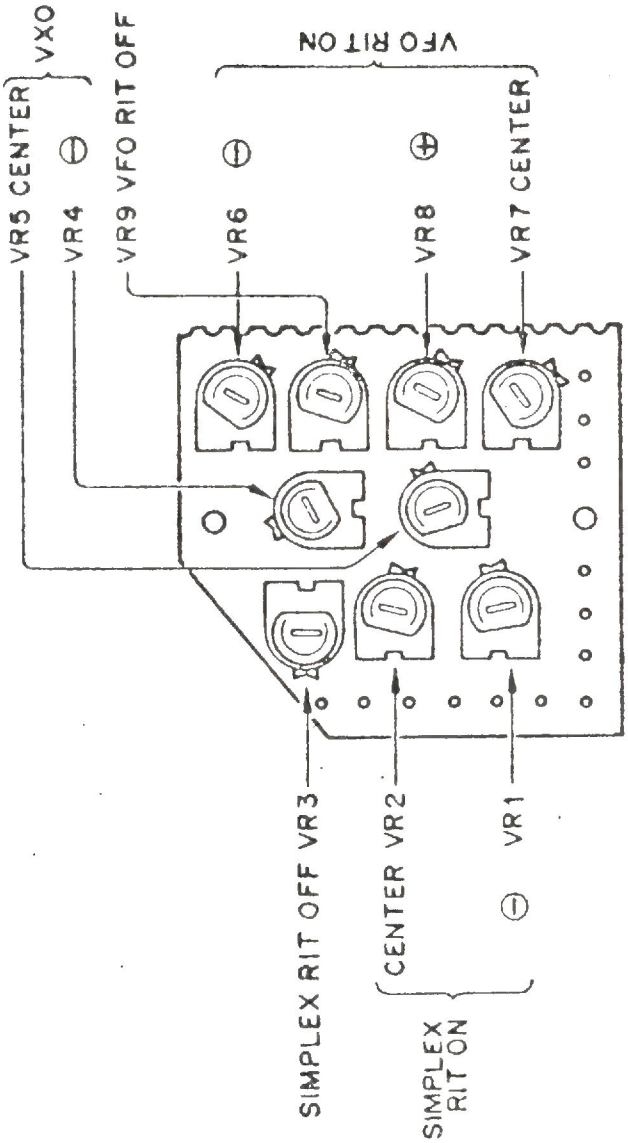

OSCAR CONV.
TC1
T4
T5
T6
T1
T2
T3
VFO LC BOX
VCO CONTROL
OX-119
VR6
RX. CARRIER
BALANCE
VR7
SSB
AF GAIN
VR8 ALC
VR5 AGC
SSB IF OX-112
VR3
AM CARRIER
VR4 CW CARRIER
VR2
MIC GAIN
TC1
VR1
TX. CARRIER BALANCE
RX. P.C.B.
OX-111
VR2
SQUELCH
TC3 TC2 TC1
RESONATOR
VR1 NB. BIAS
VCO MIX OX-106
VCO LOCAL OX-105
SSB LOCAL
OX-113
TC3
TC2
TC1

FIG 4


VXO
VR5 CENTER
VR4
VR9 VFO RIT OFF
VFO RIT ON
VR6
VR8
VR7 CENTER
SIMPLEX RIT OFF VR3
CENTER VR2
VR1
SIMPLEX RIT ON

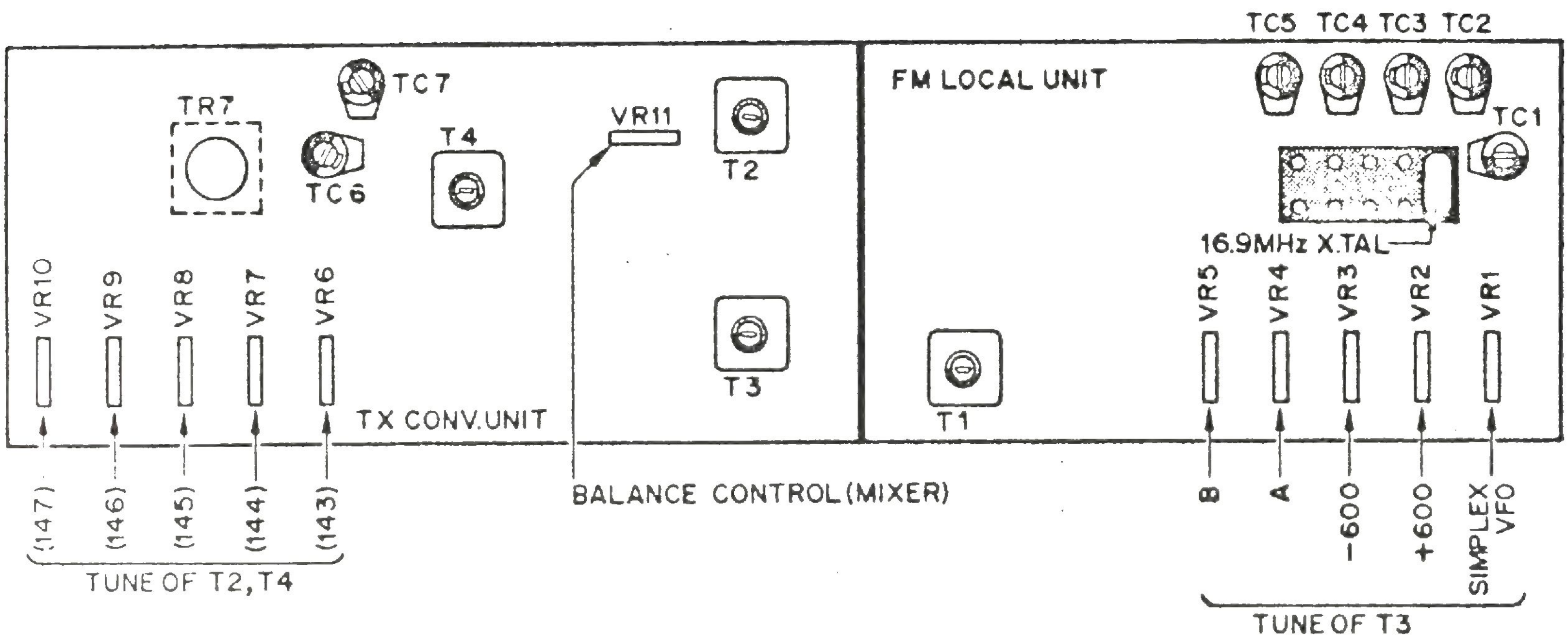

TC5 TC4 TC3 TC2
TC7
TR7
TC6
T4
VR11
T2
FM LOCAL UNIT
TC1
16.9MHz X.TAL
VR10
VR9
VR8
VR7
VR6
T3
T1
VR5
VR4
VR3
VR2
VR1
TX CONV.UNIT
(147)
(146)
(145)
(144)
(143)
TUNE OF T2,T4
BALANCE CONTROL(MIXER)
B
A
−600
+600
SIMPLEX VFO
TUNE OF T3

FIG 5

FIG 6

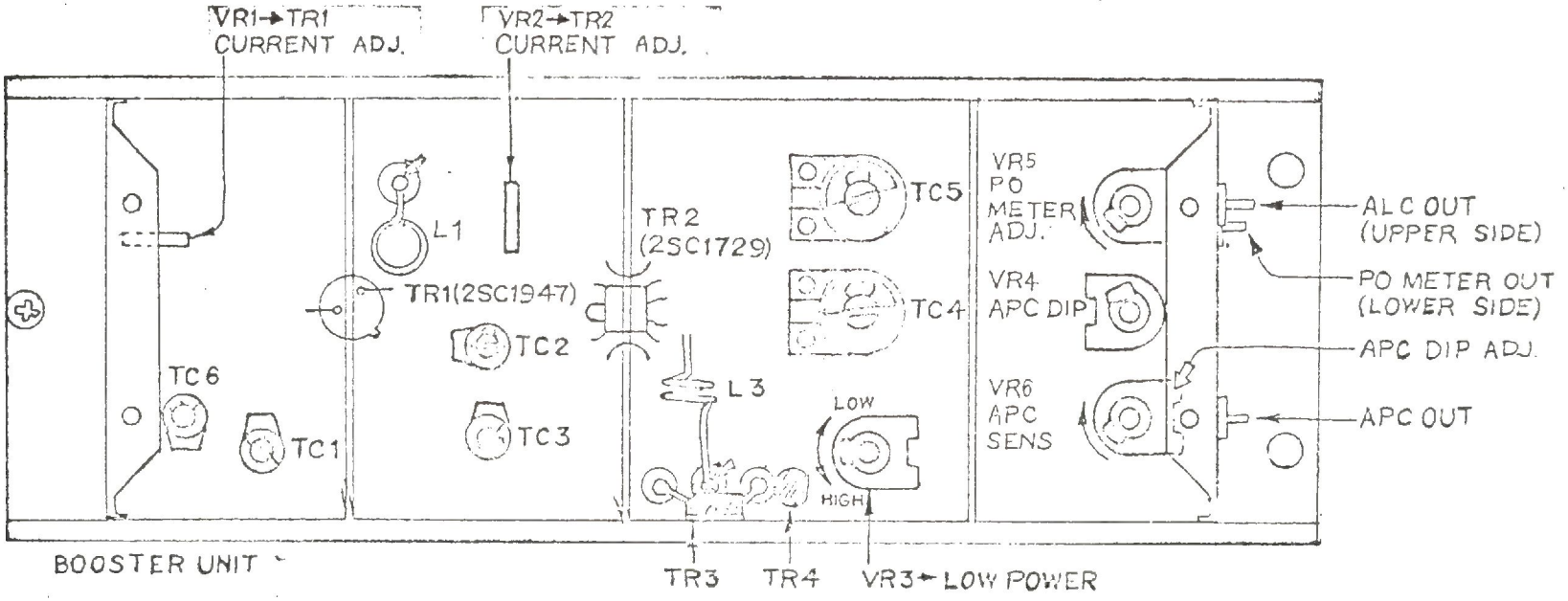

VR1→TR1
CURRENT ADJ.
VR2→TR2
CURRENT ADJ.
L1
TR1(2SC1947)
TC2
TC6
TC1
TC3
TR2
(2SC1729)
L3
TC5
TC4
VR5
PO
METER
ADJ.
VR4
APC DIP
VR6
APC
SENS
LOW
HIGH
ALC OUT
(UPPER SIDE)
PO METER OUT
(LOWER SIDE)
APC DIP ADJ.
APC OUT
BOOSTER UNIT
TR3
TR4
VR3→LOW POWER

FIG 7

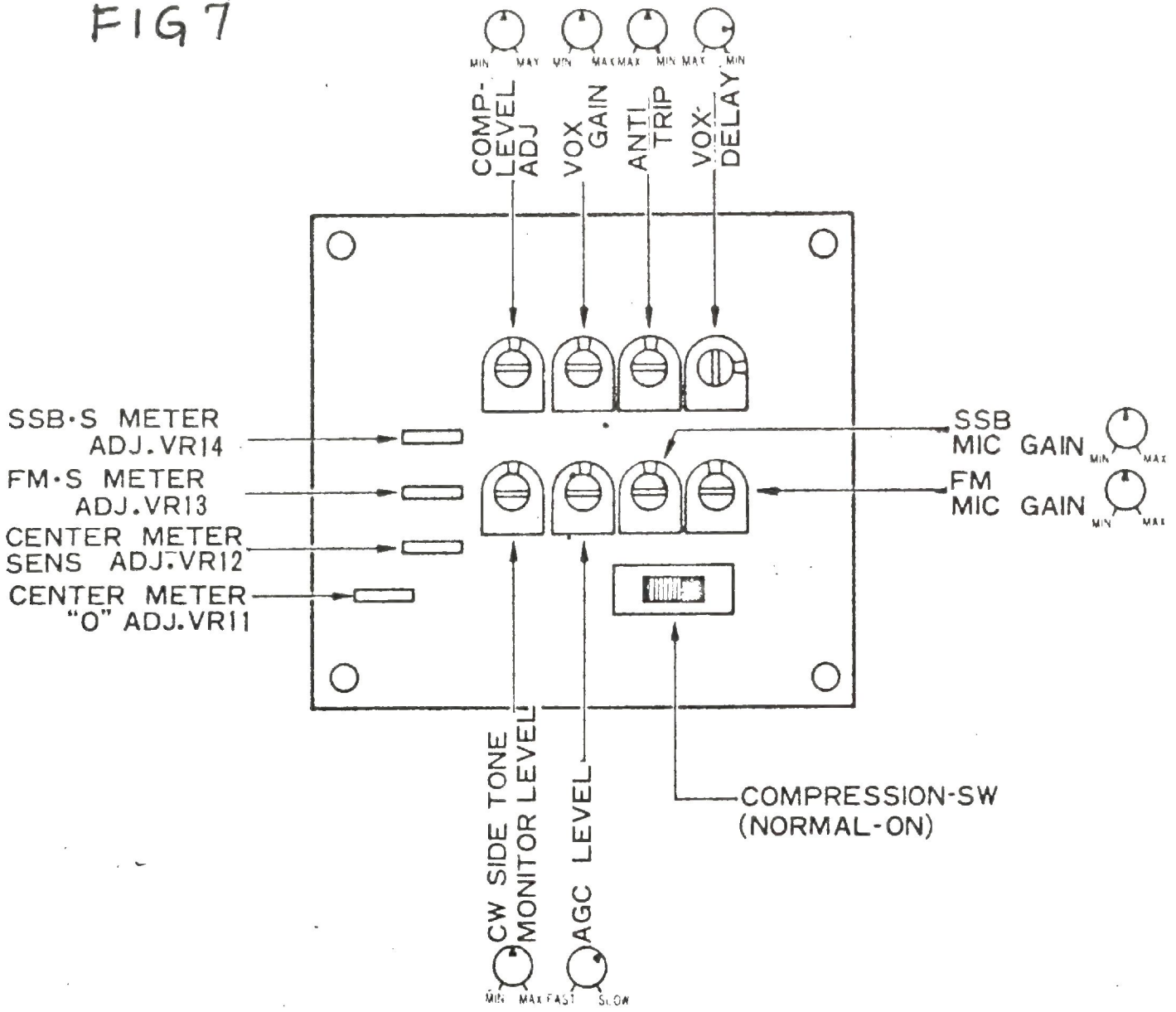
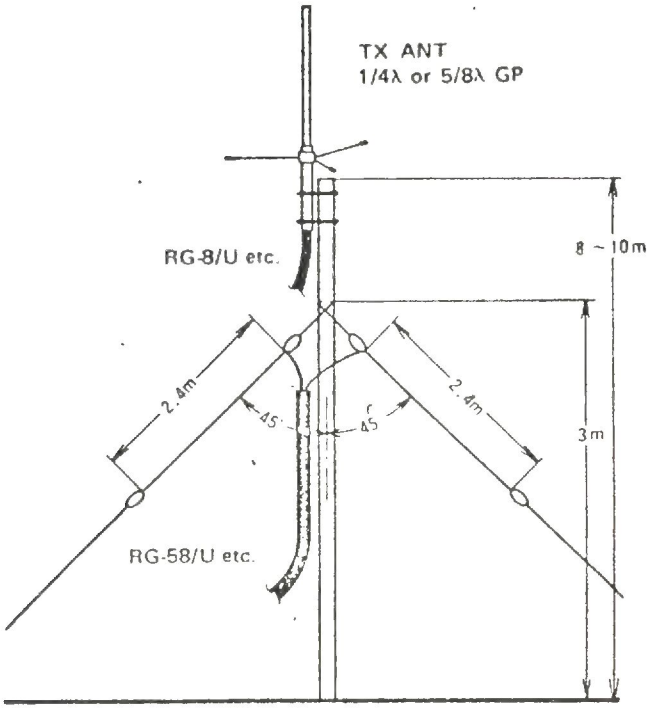
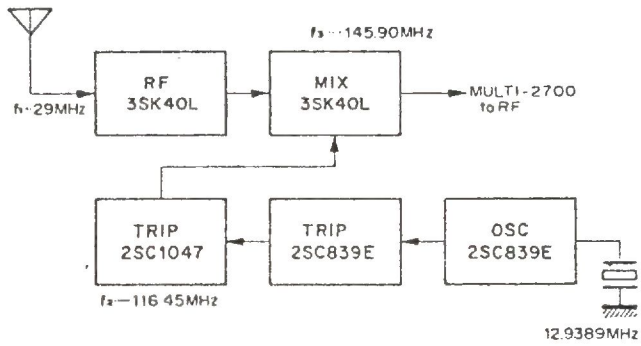

MIN MAX
COMP-LEVEL ADJ
MIN MAX
VOX GAIN
MAX MIN
ANTI TRIP
MAX MIN
VOX-DELAY
SSB·S METER ADJ.VR14
FM·S METER ADJ.VR13
CENTER METER SENS ADJ.VR12
CENTER METER "O" ADJ.VR11
SSB MIC GAIN
FM MIC GAIN
MIN MAX
CW SIDE TONE MONITOR LEVEL
MIN MAX
AGC LEVEL
FAST SLOW
COMPRESSION-SW (NORMAL-ON)

Fig 8

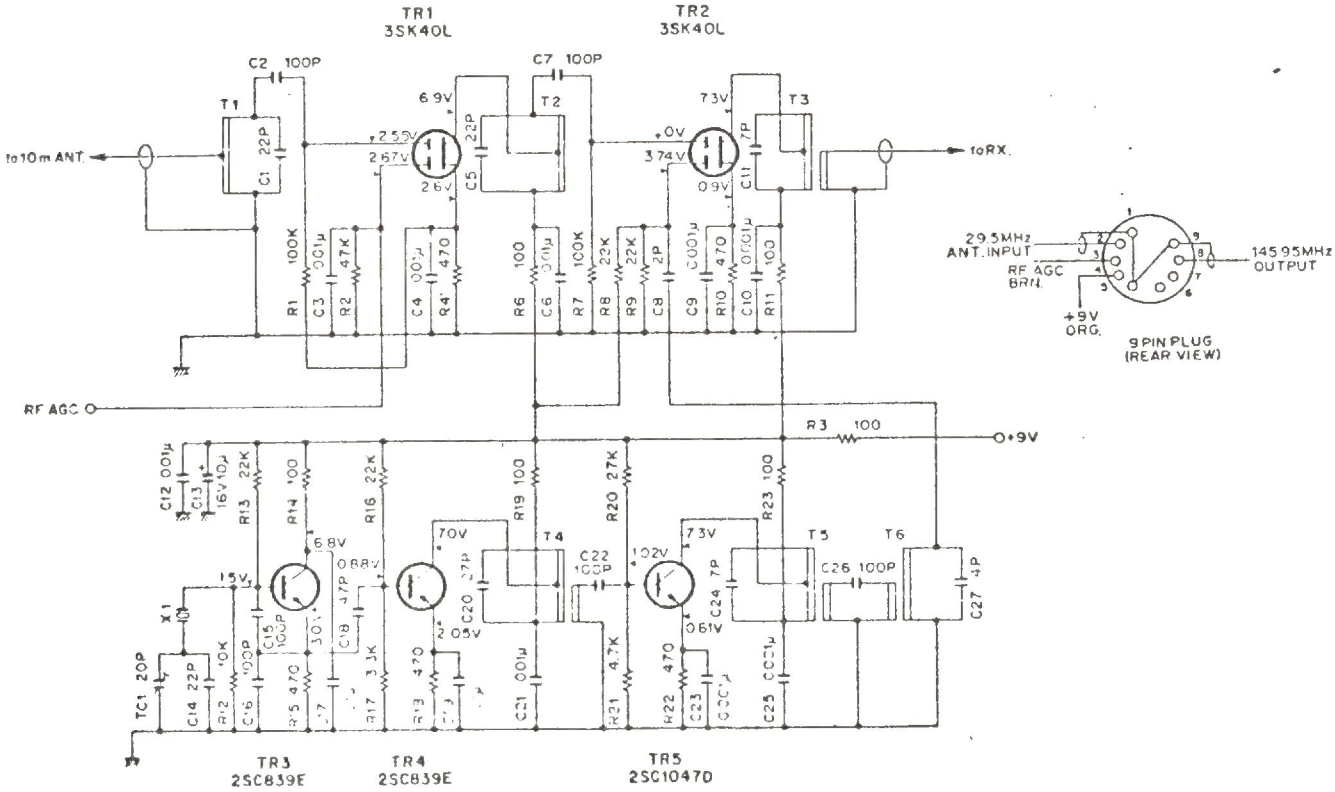


OSCAR CONVERTER BLOCK DIAGRAM



The above-mentioned method applies in cases where you use a GP and inverted V-dipole antenna.
(Temporary recommendation)

OSCAR CONVERTER SCHEMATIC DIAGRAM



If in case, please be sure to check the antenna system and space conditions, still not properly 10 meters reception or not enough sensitivity oscar reception (10 meter band). Please contact at local dealer/shop or direct to us.
May will be exchange only the oscar converter unit.

The MULTI-2700 consists of 18 units, employing a single superheterodyne system for SSB reception, a double superheterodyne system for FM reception, a filter type balanced modulation system for SSB transmission, and a variable reactance frequency modulation system for FM transmission.
The set employs the following crystal oscillators.

PLL section	10.000MHz
	11.000MHz
	11.344MHz
FM LOCAL section	16.900MHz
RX section	16.445MHz
SSB IF section	16.8985MHz (USB)
	16.9015MHz (LSB)
AF section	10.000MHz

PLL section
The PLL section consists of 8 units, i.e., X-1, X-2, X-3, X-4, X-5, X-6, X-7 and X-15.
The PLL circuit composition is as shown in the diagram below. The FF-PD unit (X-1) has an IC 10.000MHz oscillator, a 3-stage IC frequency divider which divides 10.000MHz into 10kHz and a phase comparator (PD) which generates a DC voltage for setting a VCO oscillating frequency. The phase comparator converts a phase difference between the reference signal and a signal from the 1/N unit into a DC voltage.

The 1/N unit (X-2) employs 3 ICs for setting the set's operating frequency. 1/N will be 1/300 for the 144.00 MHz; or 1/400 to the 145.000MHz.

The VCO unit (X-3) has an IC voltage control oscillator and a buffer amplifier by which an oscillating frequency will be set depending on the output voltage of PD applied to a variable capacity diode. The VCO unit's output is fed through the buffer unit (X-7) as a transmitting or receiving local frequency. When the 144MHz, the output will be 127.1MHz; when the 145MHz; it will be 128.1MHz.

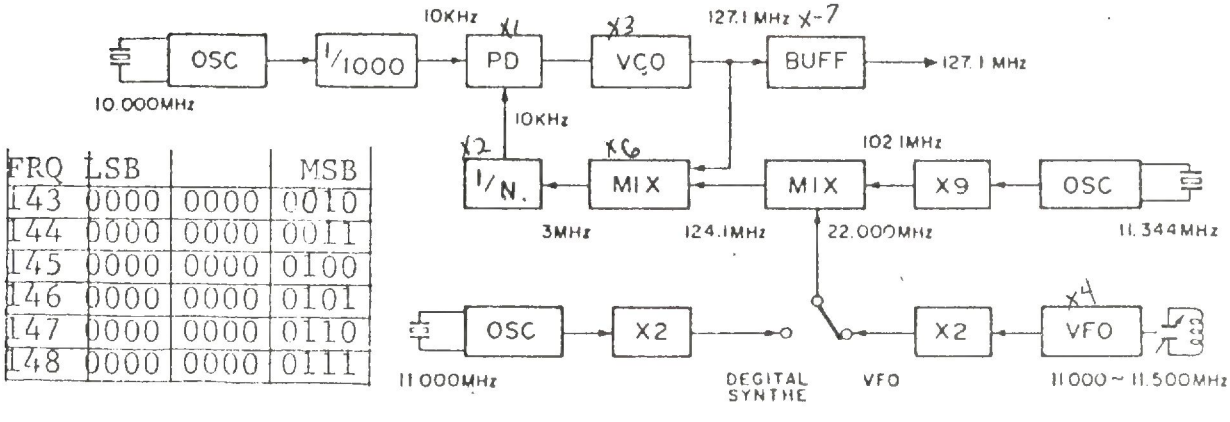
The VFO unit (X-4) is a very stable VFO which employs a dual gate MOS FET for oscillation. It generates frequencies within the range of 11.000MHz to 11.500MHz, and its output is doubled by the VCO-MIX unit (X-6) to cover the 1MHz band area. When the digital synthesizer is in use, the VFO oscillator generates frequencies but the frequency doubler circuit will not operate. Instead, the 11.000MHz crystal oscillator will operate to supply a doubled 22.000MHz signal to the mixer. The mixer mixes a 102.100MHz signal, which is obtained by multiplying by 9 the 11.344MHz crystal-oscillated from the VCO-LO unit (X-5), and the 22.000 MHz to produce 124.100MHz. This 124.100MHz frequency is mixed with the VCO output to be converted into 2 to 7MHz, which is fed through a low pass filter into the 1/N unit.
The LED unit (X-15) is a unit to indicate the digital synthesizer's operating frequency and consists of 2 ICs driven at the 1/N unit's frequency dividing ratio, 23 diodes and 5 LEDs.
VXO and RIT frequencies are varied as follows:
When VFO is in use, 11.344MHz is varied by RIT; and when the digital synthesizer is in use, 11.344MHz is varied by VXO and 11.000MHz by RIT.
The PLL section is completely sealed except the buffer unit (X-7).

FM local unit (X-8)
This unit generates 16.900MHz for FM transmission.

TX converter unit (X-9)
VCO output and 16.9MHz IF signal are converted into 144MHz by a balanced mixer consisting of 2 dual gate MOS FETs, and then amplified in voltage and power. Part of the unit is tuned every 1MHz by a variable capacity diode.

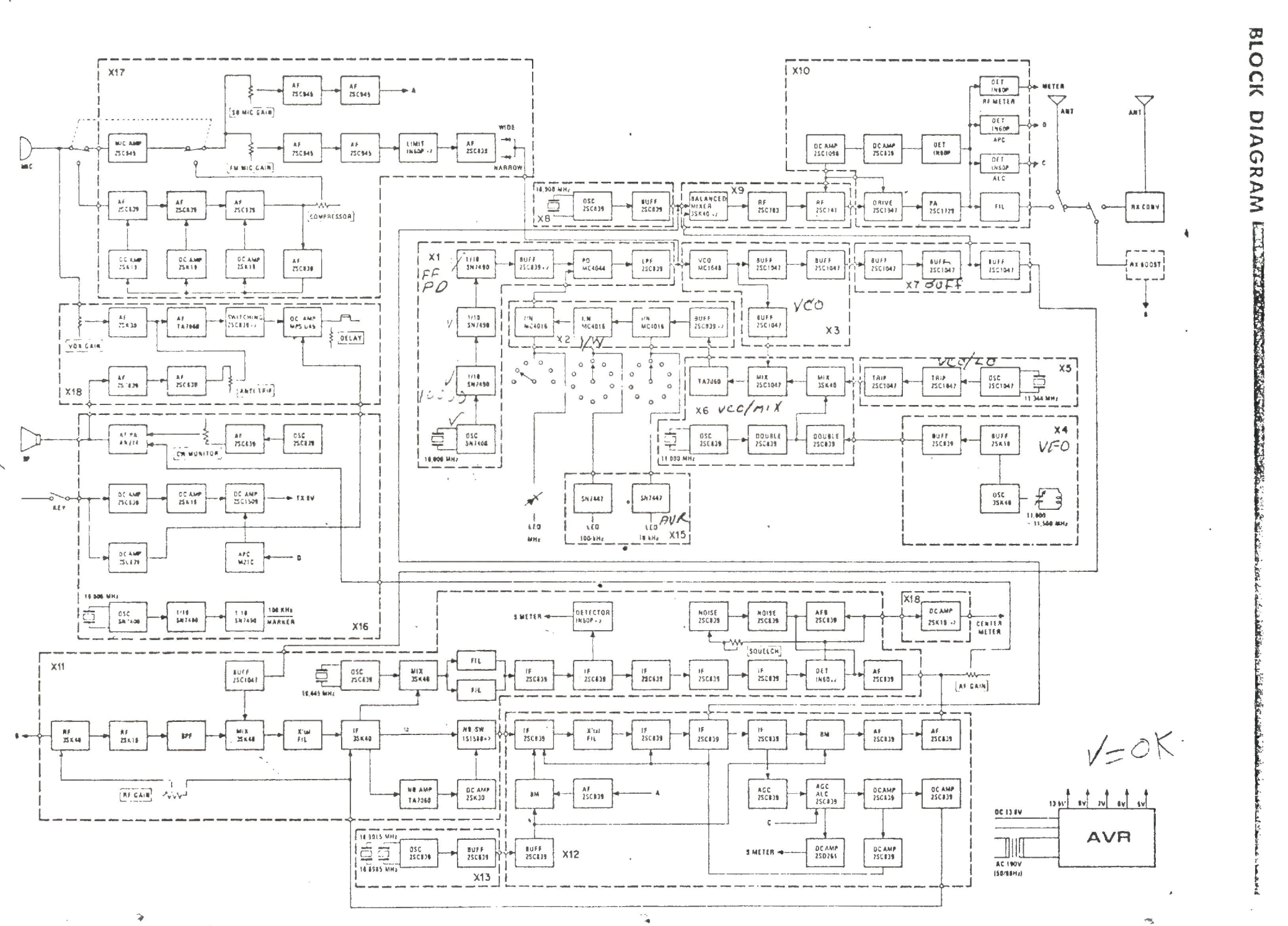
Booster unit (X-10)
This is a 10W output power amplifier circuit, having 2 transistors in a large capacity heat sink. In addition, the unit has a voltage control transistor for output switching, an ALC circuit, APC detecting circuit, etc.

PLL block diagram



FRQ	LSB		MSB
143	0000	0000	0010
144	0000	0000	0011
145	0000	0000	0100
146	0000	0000	0101
147	0000	0000	0110
148	0000	0000	0111

BLOCK DIAGRAM

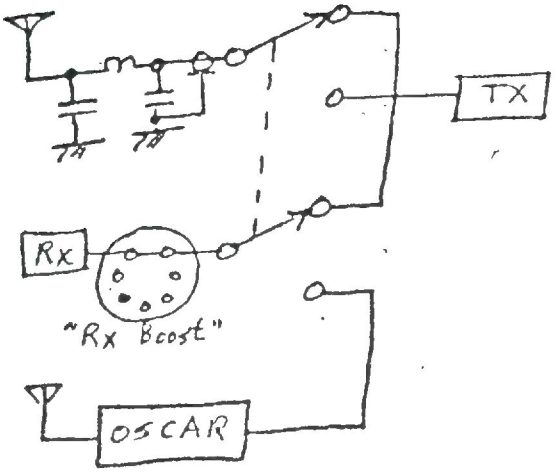


RELAYS
MULTI 2700

(K1) (K3)

K1-1 Ant sw
K1-2 OSCAR sw
K3-1 VFO RIT
K3-2 SYN RIT
K3-3 cw/AM offset
K3-4 "S"/"RFO" Meter
K4-2 SYN VXO

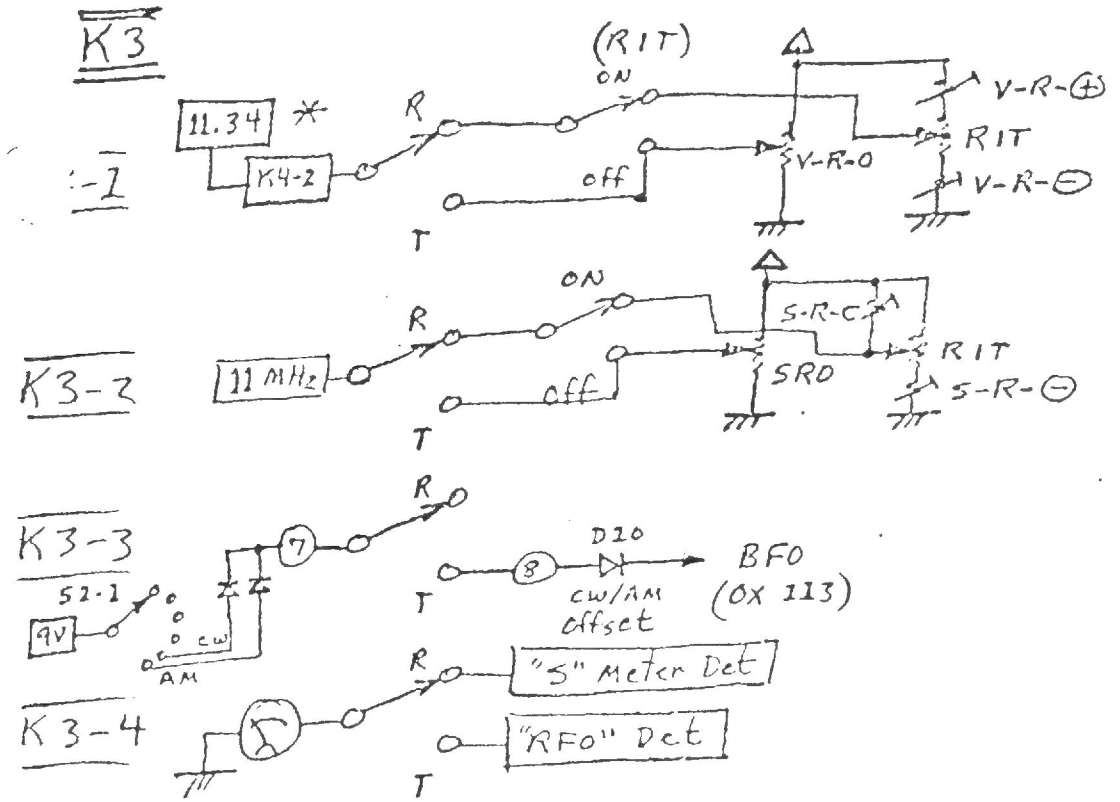
K1

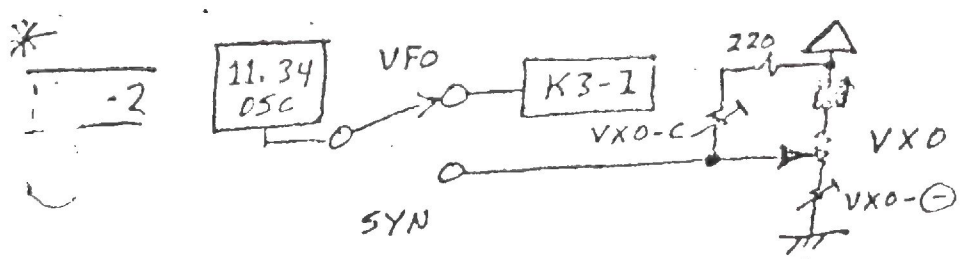


K1-1

K1-2

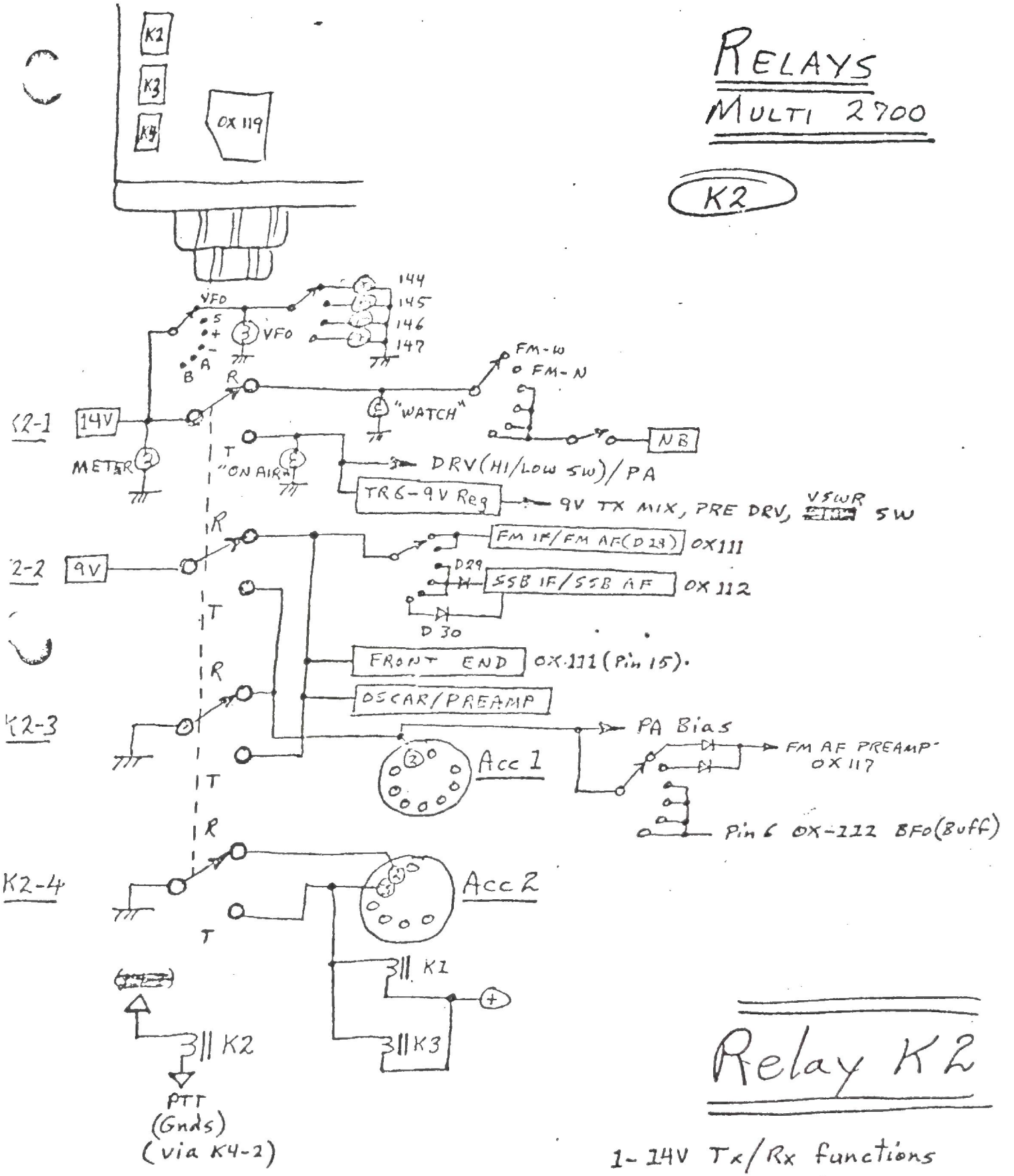
K3





RELAYS
MULTI 2700

K2



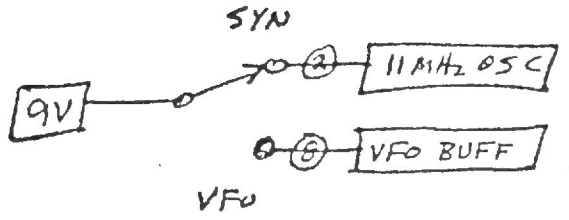
Relay K2

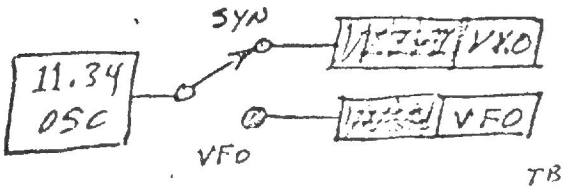
1- 14V Tx/Rx functions
2- 9V Tx/Rx functions
3- Gnd Tx/Rx functions
4- K1/K3 Keying - Acc 2 Pin

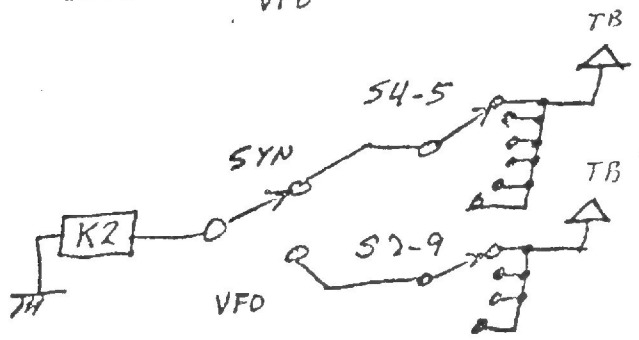
RELAYS

MULTI 2700

K4

K4-1 

K4-2 

K4-3 

K4-4 (NOT USED)

K4-1- 11 MHz OSC
VFO BUFF

2- 11.34 VXO
VFO

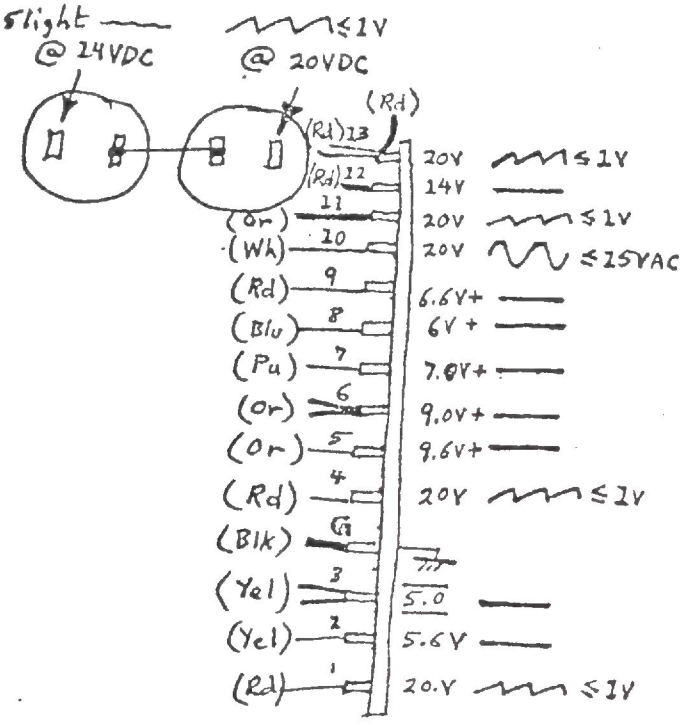
3- Muting for
Jap Versi

4- (unused)

KLM electronics, inc.

COMMUNICATIONS EQUIPMENT/ANTENNA INNOVATIONS

MULTI 2700 – Power Supply



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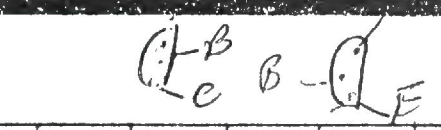
DC VOLTAGE



UNIT	TR	C	B	E	D	G1	G2	S	DESCRIPTION
X-1 FF PD	1	3.4	−0.02	0.04	–	–	–	–	
	2	3.7	3.4	2.55	–	–	–	–	
	3	2.55	1.7	1.3	–	–	–	–	144
	3	2.9	1.7	1.28	–	–	–	–	146
X-2 I/N	1	3.3	1.38	0.83	–	–	–	–	
	2	8.2	2.25	1.8	–	–	–	–	
X-3 VCO	1	6.4	1.84	1.1					
	2	8.0	3.05	2.3					
	3	7.6	1.58	0.82					
X-4 VFO	1	–	–	–	9.0	0	1.02	1.02	
	2	–	–	–	8.8	0	–	1.58	
	3	7.2	2.06	1.42					
X-5 VCO LO.	1	6.3	1.45	1.03					
	2	6.4	0.98	0.42					
	3	6.6	1.12	0.69					
X-6 VCO MIX	1	9.1	2.1	2.03					SYN
	2	9.3	1.63	2.37					SYN
	3				9.3	0	0	0.84	
	4	5.2	1.38	0.95					
	5	8.7	1.5	0.83					VFO
	IC 1	1.5	1.5	0	5.9	9.5			
X-7 BUFF	1	8.9	3.3	2.55					
	2	8.8	1.4	0.64					
	3	9.2	1.57	0.87					
X-8 FM LO.	1	8.7	3.48	3.27					
	2	8.2	1.47	0.92					
X-9 TX CONV.	4				9.6	0	0	0.71	
	5				9.6	0	0	0.71	
	6	9.3	1.1	0.3					
	7	12.9	0.73	0.16					HI POWER
	7	2.5	0.73	0.115					LO POWER
X-10 BOOSTER	1	12.8	0.28	0					HI POWER
	1	2.5	0.61	0					LO POWER
	2	12.8	0.28	0					HI POWER
	3	12.8	2.5	12.8					HI POWER
	3	13.1	3.1	2.5					LO POWER
	4	2.5	0.75	0					HI POWER
	4	3.1	0.65	0					LO POWER
X-11 RX	1				8.5	0	3.63	0.47	FM
	1				8.6	0	2.58	0.43	SSB NO SIGNAL
	1				8.8	0	1.03	0.36	SSB 60 dB IN
	2				9.1	0	–	0.38	
	3				7.8	0	4.7	0.79	
	4	9.2	1.55	0.92					
	5				8.4	0	3.8	0.51	FM
	5				8.5	0	2.7	0.47	SSB NO SIGNAL
	5				8.7	0	1.08	0.38	SSB 60 dB IN
	6				3.6	0	–	0.09	SSB CW. AM

DC VOLTAGE

UNIT	TR	C	B	E	D	G1	G2	S	DESCRIPTION
X-11 RX	7	8.9	3.0	2.43					
	8				6.8	0	4.7	0.65	
	9	8.2	0.7	0					
	10	3.85	3.15	2.45					
	11	1.75	0.68	0					
	12	1.9	2.38	1.22					
	13	4.8	2.97	2.27					
	14	4.86	1.23	0.54					
	15	8.3	0.75	0.11					NO SIGNAL
	15	8.5	0.72	0.086					CW 60 dB
	15	7.3	0.88	0.22					FM (7k) 60 dB
	16	6.7	1.92	1.26					
	17	2.54	1.83	1.13					
	IC 1	1.5	[3] 1.5	[5] 0	[4] 7.2	[1] 12.3			
V-12 SB IF	1	7.3	3.4	2.65					TX ONLY
	2	8.1	3.2	2.5					TX ONLY-
	3	6.5	1.88	1.2					NO SIGNAL INPUT
	3	7.8	0.72	0.10					60 dB INPUT
	3	6.7	1.73	1.1					TX
	4	7.5	1.96	1.25					NO SIGNAL
	4	8.0	0.73	0.11					60 dB INPUT
	4	7.5	1.81	1.12					TX
	5	8.2	1.9	1.2					NO SIGNAL
	5	8.7	0.72	0.10					60 dB INPUT
	6	8.2	1.96	1.26					NO SIGNAL
	7	5.4	1.15	0.47					NO SIGNAL
	8	8.0	0.83	0.41					NO SIGNAL
	8	8.0	1.28	0.75					60 dB IN
	8	8.0	0.375	0.17					TX
	9	8.8	0.41	0					NO SIGNAL
	9	8.8	0.75	0.23					60 dB INPUT
	10	7.1	0.40	0					NO SIGNAL
	10	3.64	0.76	0					60 dB INPUT
	10	7.0	0.037	0					TX
	11	8.0	2.65	1.95					NO SIGNAL
	11	8.0	1.41	0.73					60 dB INPUT
	11	8.0	2.5	1.83					TX
	12	9.5	3.37	2.7					NO SIGNAL
	12	9.5	1.76	1.08					60 dB INPUT
	13	5.9	1.8	0.63					RX
	13	7.8	1.37	1.53					TX
	14	3.05	1.73	1.03					
X-13 SB LO.	1	6.3	1.81	1.83					
	2	7.1	2.15	1.62					
X-14 AVR	1	6.3	12.3	5.7					
	2	6.3	3.8	3.16					
	MJE3055	12.4	5.7	5.0					
	3	12.4	10.7	10.2					
	4	10.7	6.1	6.7					
	MJE3055	12.4	10.2	9.5					
	5	9.2	7.1	6.5					AC 117/234V
	6	16.0	24.4	25.0					AC 117/234V
	7	26.6	16.0	15.3					AC 117/234V
	MJE3055	20.7	15.3	14.7					AC 117/234V

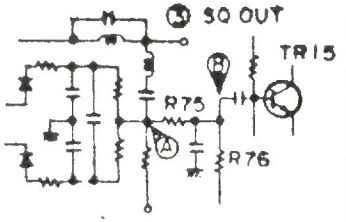
DC VOLTAGE

UNIT	TR	C	B	E	D	G1	G2	S	DESCRIPTION
X-16 AF	1	5.2	1.25	0.59					
	2	9.8	1.25	0.63					CW ON
	3	0.04	0.75	0					CW OFF
	3	7.5	0	0					CW ON
	4	0	0.75	0					CW OFF
	4	10.5	0	0					CW ON
	6	13.1	10.5	9.8					TX
	IC 4	[1] 6.1	[2] 0	[3] 7.5	[4] 10.8	[5] 6.0	[6] 0	[7] 6.0	[8] 11.7 [9] 13.2
X-17 MIC	1	12.2	1.39	0.76					APC ON
	2	6.3	1.77	1.1					
	3	6.3	1.83	1.14					
	4	3.88	1.77	1.04					
	5, 6, 7					0.1	–	0	
	5, 6, 7				0.06	–1.15	–	0	MIC INPUT–30dBm
	8	6.3	1.8	1.1					
	9	4.5	2.16	1.5					
	10	3.2	1.34	0.68					
	13	2.13	0.6	0.015					
	14	5.7	2.13	1.48					
	15	6.2	1.34	0.65					
X-18 VOX	1				4.0	0	–	0.5	
	2	8.8	0.37	0					
	2	0.4	0.71	0					MIC INPUT–30dBm
	3	0.82	1.41	0.68					
	3	6.5	–1.8	0					MIC INPUT–30dBm
	4	9.4	0.37	0					
	4	0.64	1.3	0					MIC INPUT–30dBm
	5	7.8	1.4	0.73					NO AF OUT
	6	9.5	0	0.48					
	6	9.5	4.1	3.4					SP OUT 0 dB
	7				8.4	0	–	1.15	C-METER "0"
	8				8.4	0	–	1.21	
	IC 1	[1] –	[2] –	[3] –	[4] –	[5] –			
X-22 OSCAR	1				6.9	2.67	2.55	2.6	SSB NO SIGNAL
	2				7.3	3.74	0	0.9	
	3	6.8	1.5	3.0					
	4	7.0	0.88	2.05					
	5	7.3	1.02	0.61					

NOTE (REF. 1-9 are IC Pin Numbers)

AC VOLTAGE (RECEIVER UNIT)

UNIT	TRANSFORMER	VOLTAGE	UNIT	WAVEFORM	INPUT SIGNAL	DEVIATION	DESCRIPTION
16.445MHz Lo.	7 E	1.6	V p-p		–	–	
455kHz IF	9 C	3.0	V p-p		60 dB	CW	
	10 C	1.0	V p-p		0 dB	CW	
	10 C	1.6	V p-p	Same as above	60 dB	CW	
	11 C	6.5	V p-p		0 dB	CW	
	11 C	6.7	V p-p		60 dB	CW	
	12 C	2.6	V p-p		0 ~ 60 dB	CW	
	13 C	4.4	V p-p	Sine Wave	0 ~ 60 dB	CW	
AF	POINT (A)	1.0	V p-p	1V, 1mS	0 ~ 60 dB	7kHz	
	POINT (B)	44	mV	1kHz S.W.	0 ~ 60 dB	7kHz	
	POINT (B)	22	mV	1kHz S.W.	0 ~ 60 dB	3.5kHz	
	(B) SQ OUT	6	mV	NOISE	NOTHING		MODE - FM/W
	(B) SQ OUT	5	mV	NOISE	NOTHING		MODE – FM/N
	(B) SQ OUT	1.4	mV	NOISE	60 dB	CW	W/N
	(B) SQ OUT	4	mV		60 dB	7kHz	W/N
	14 B	11	mV	1kHz S.W.	0 ~ 60 dB	7kHz	
	14 B	5.2	mV	1kHz S.W.	0 ~ 60 dB	3.5kHz	
	14 C	0.52	V	1kHz S.W.	0 ~ 60 dB	7kHz	
	14 C	0.33	V	1kHz S.W.	0 ~ 60 dB.	3.5kHz	
	15 B	16	mV	1kHz S.W.	0 ~ 60 dB	7kHz	
	15 B	8	mV	1kHz S.W.	0 ~ 60 dB	3.5kHz	
	15 C	200	mV	1kHz S.W.	0 ~ 60 dB	7kHz	
	15 C	80	mV	1kHz S.W.	0 ~ 60 dB	3.5kHz	
	16 C	60	mV	NOISE	NOTHING		SQ VR MAX
	17 C	1.1	V	NOISE	NOTHING		SQ VR MAX



DC VOLTAGE

UNIT	TR	C	B	E					DESCR
X-1 FF PD	1	3.4	-0.02	0.04					
	2	3.7	3.4	2.55					
	3	2.55	1.7	1.3					144
	3	2.9	1.7	1.28					146
X-2 I/N	1	3.3	1.38	0.83					
	2	8.2	2.25	1.8				–	
X-3 VCO	1	6.4	1.84	1.1					
	2	8.0	3.06	2.3					
	3	7.6	1.68	0.82					
X-4 VFO	1	–	–	–	9.0	0	1.02	1.02	
	2	–	–	–	8.8	0	–	1.68	
	3	7.2	2.06	1.42					
X-5 VCO LO.	1	6.3	1.46	1.03					
	2	6.4	0.98	0.42					
	3	6.6	1.12	0.59					
X-6 VCO MIX	1	9.1	2.1	2.03					SYN
	2	9.3	1.63	2.37					SYN
	3				9.3	0	0	0.84	
	4	5.2	1.38	0.95					
	5	8.7	1.5	0.83					VFO
	IC 1	[1] 1.5	[2] 1.5	[3] 0	[4] 5.9	[5] 9.5			
X-7 BUFF	1	8.9	3.3	2.55					
	2	8.8	1.4	0.64					
	3	9.2	1.57	0.87					

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COMMUNICATIONS EQUIPMENT/ANTENNA INNOVATIONS

AGC MODIFICATION

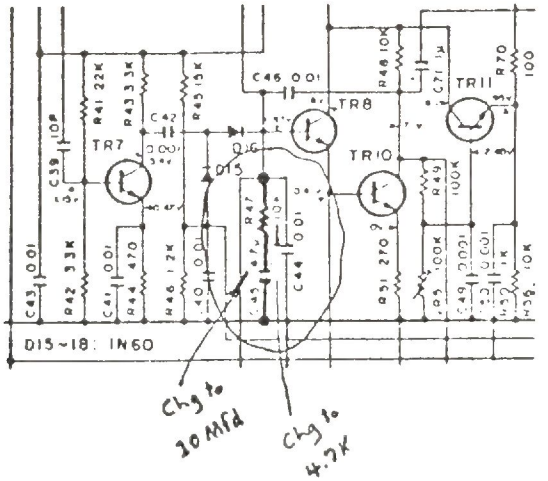
FOR RADIOS WHICH DISPLAY A TENDENCY TO OVERLOAD ON SSB/CW

TO MAKE THE AGC CIRCUIT MORE EFFICIENT, A COUPLE OF COMPONENT CHANGES ARE MADE ON THE SSB IF BOARD X-12, LOCATED IN THE BOTTOM PORTION OF THE UNIT.

ON THE X-12 BOARD C-45 CHANGES FROM A 4.7 MFD ELECTROLYIC CAPACITOR TO A 10-25 UF 12-16V ELECTRICAL CAPACITOR. R-47 CHANGES FROM A 10KΩ 1/4 WATT RESISTOR TO A 4.7KΩ 1/4 WATT RESISTOR.

THESE TWO COMPONENTS ARE LOCATED BETWEEN TR-8 AND D-16 ON THE BOARD.

ON SOME UNITS THERE IS A 1 MFD TANTALUM CAPACITOR ACROSS VR-5. THIS NEEDS TO BE REMOVED. THIS COMPLETES THE MODIFICATION.



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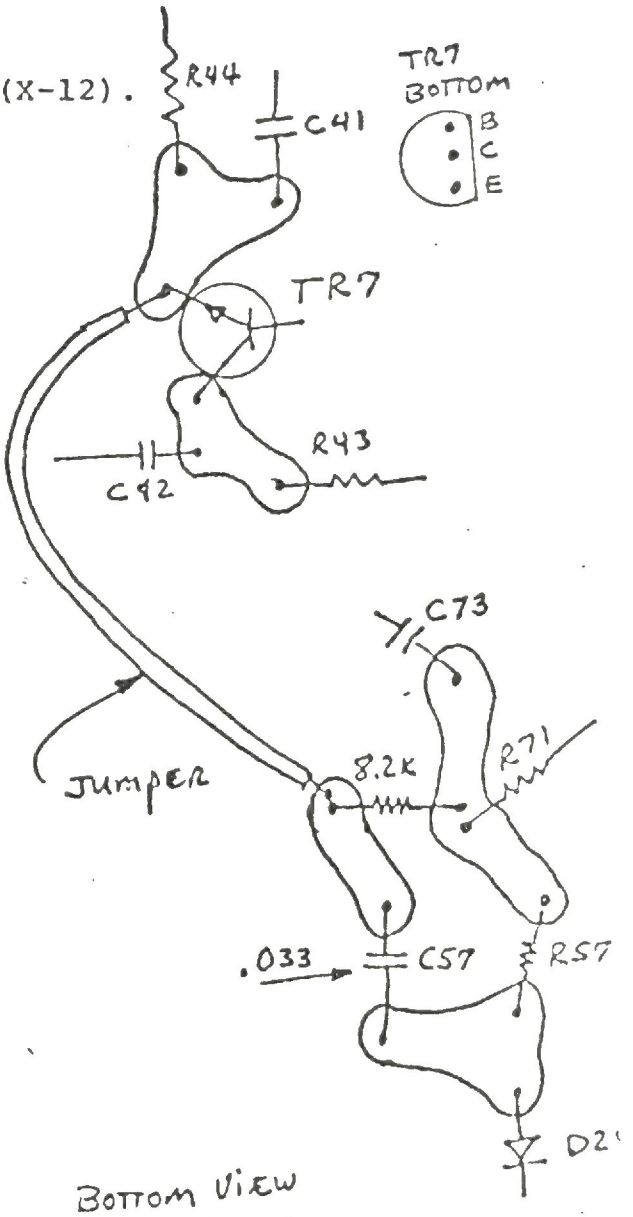
COMMUNICATIONS EQUIPMENT/ANTENNA INNOVATIONS

A.M. MODIFICATION FOR MULTI-2700

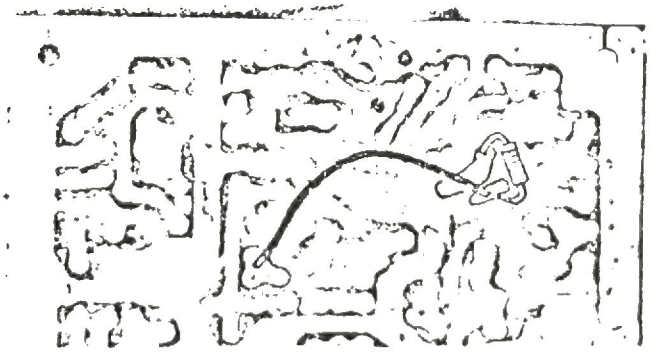
MODIFICATIONS TAKE PLACE ON THE SSB IF BOARD (X-12).

1. First remove the four screws holding the board to the chassis. Carefully lift the board so the traces underneath are accessable.
2. Remove C-57 (1µf capacitor) and replace with a 0.033 µf capacitor.
3. Remove the jumper from the anode of D-15 and C-57(-) jumper is located on the top side of the board.
4. Add a jumper from C-57 (-) to the emitter of TR-7. This jumper can be seen on the bottom of the board.
5. Add the 8.2K ohm resistor on the bottom of the board between C-57(-) and C073(+).



PARTS LIST

1	0.033uf cap.
1	8.2K ohm ¼ watt resistor
1½"	#22 wire



BOTTOM VIEW
OX 112 (X 12)
PC BOARD

/2/77

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COMMUNICATIONS EQUIPMENT/ANTENNA INNOVATIONS

CONNECTION OF A TONE ENCODER BELOW 300 HZ

1. To connect the encoder and have it function below 300 HZ you must connect it directly to the VCO.

2. Location of the VCO is in the TOP center part of the unit behind the FF-PD 1/N unit (p 14 TOP VIEW Owner's Manual)

3. Two different VCO'S have been used in the 2700. One uses a 1648 VCO IC. This IC will be located near the center of the PC board and the 5 turn air-wound coil will be directly under the hole in the VCO box.

4. The second VCO unit uses a MOSFET VCO and has a MC-4044 IC on one end (instead of a 1648).

5. To remove the VCO, pull six (6) screws holding the VCO box to the main frame. Unsolder the straps connecting the VCO to the FF-PD box located in front of it. It should then pull up and flip over to gain access to the bottom of the PC board.

6. Power for the PL can be taken from pin 3 of the Accessory Socket (#1) which has 13.8 VDC on TX only.

7. A switch will be needed to turn the unit off during SSB operation (otherwise it will FM modulate the SSB signal).

8. Alternately, the 9V FM TX Bus going into the SIM/+600/-600 KHz box can be used. This is only active on FM Tx and is in the 16.900 MHz FM LOCAL UNIT box (center, top view, page 14 owner's manual). The terminal is marked +9V and is near a molded PC type choke (220 MHz).

9. It may be necessary to use a 1 mfd cap to block DC if the CTCSS (PL) unit doesn't have one.

10. Refer to diagrams for details of location.

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12-8-77

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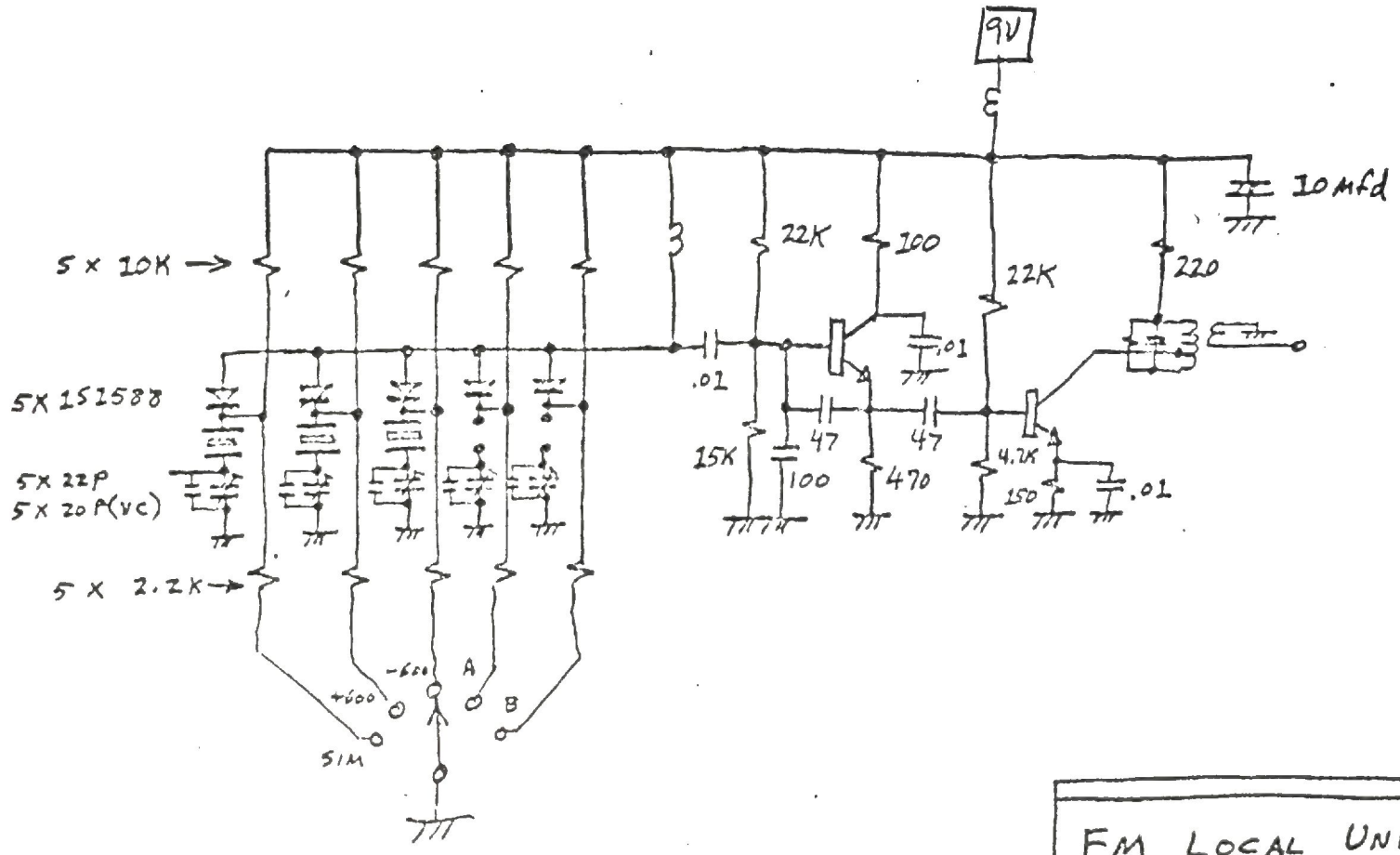
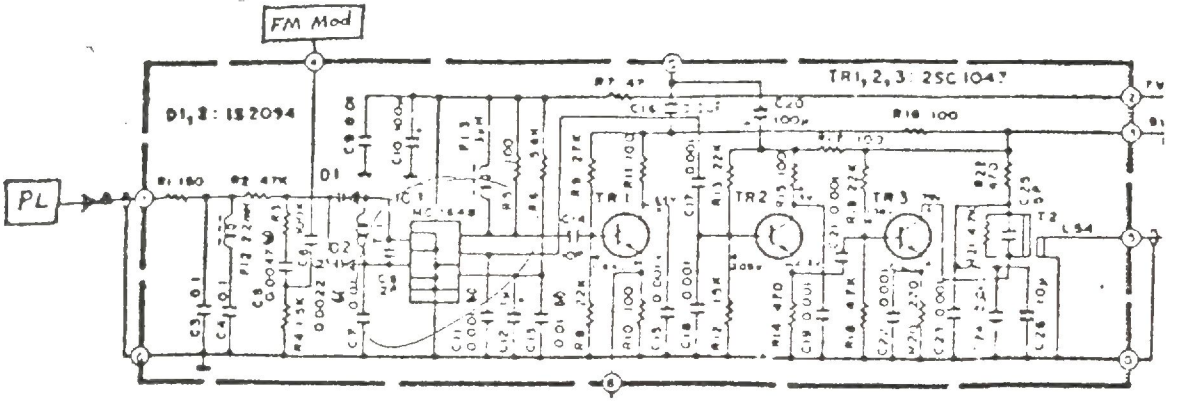


FM LOCAL UNIT

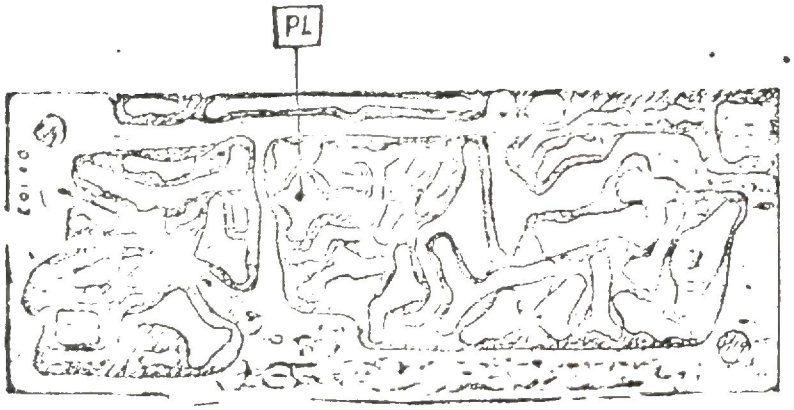
4-10-78

A

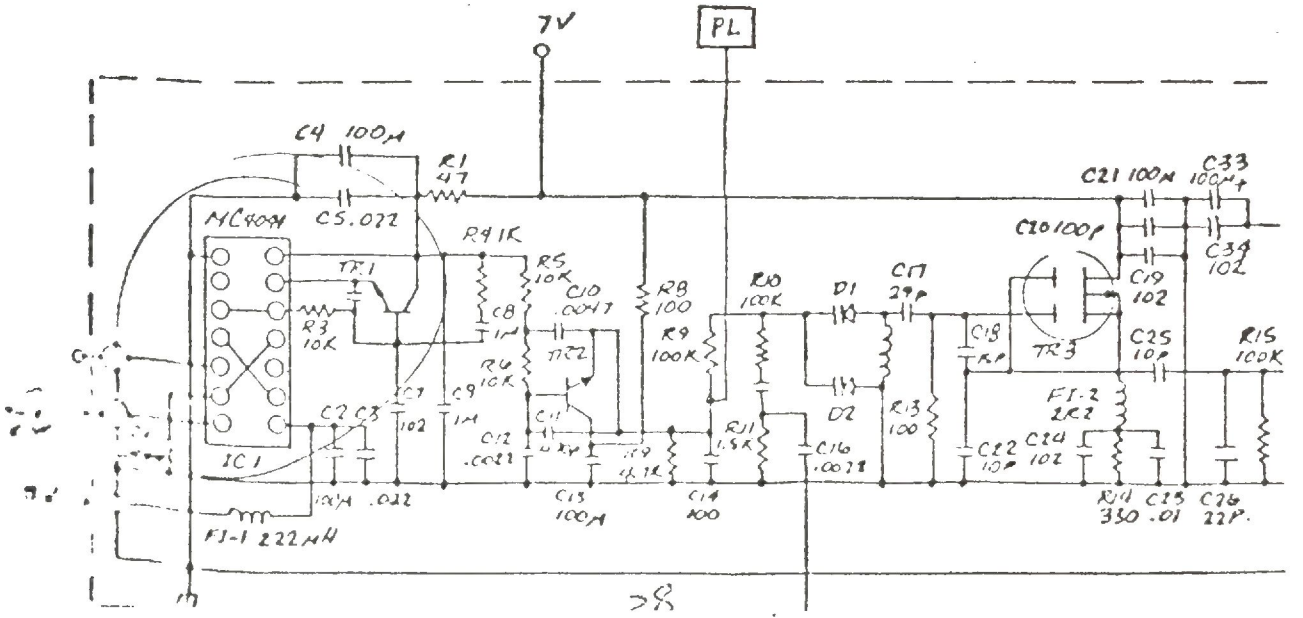
OLDER UNITS
(Has MC 1648)



B



NEWER UNITS
(Has MC 4044)



KLM MULTI 2700 TRANSCEIVER

1. Remove bottom cover of the 2700 and orient front of radio towards you.

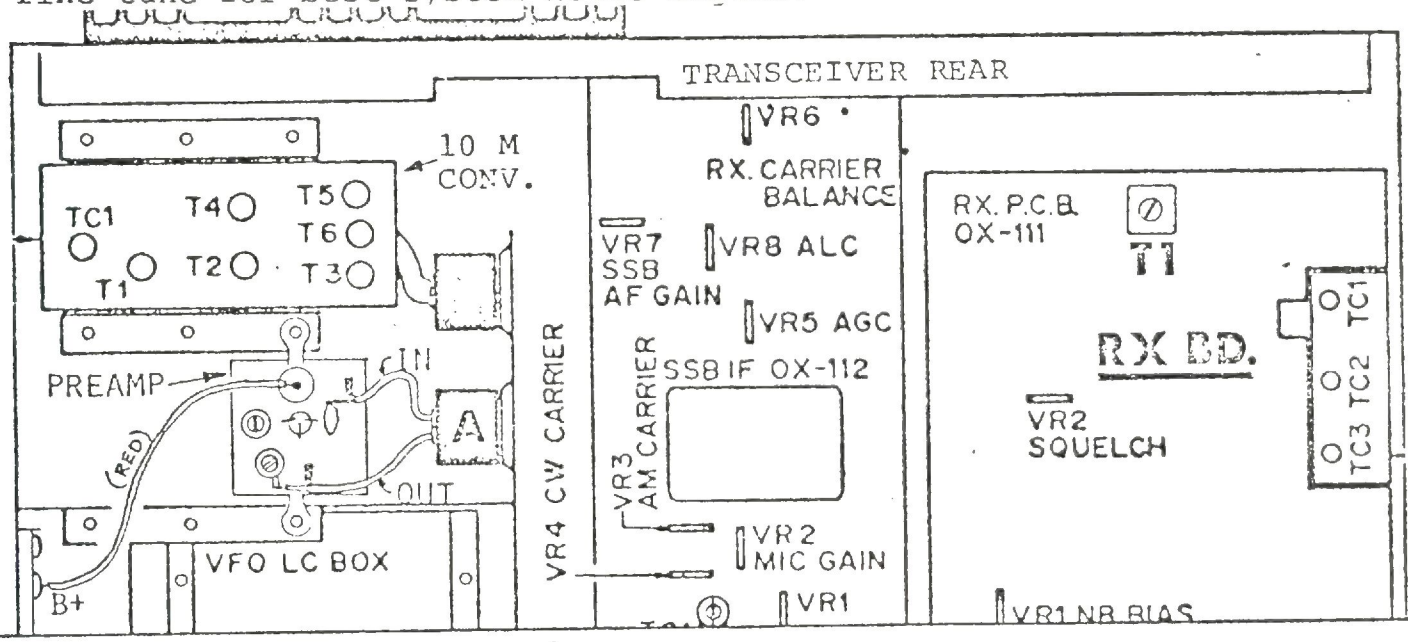
2. Remove Plug "A" (no wires) located in left rear area of radio near the 10 meter converter. Open the plug and unsolder the jumpers across the pins.

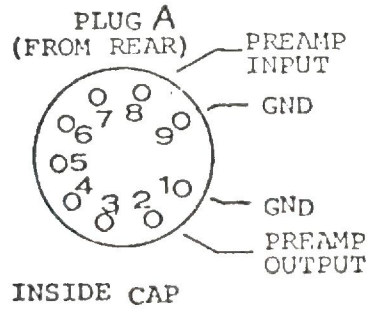
3. Attach Preamp input coax center lead (from .001 cap.) to pin 8 with the shield to pin 9.

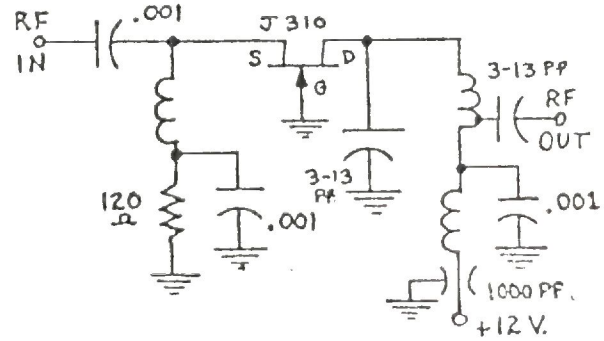
4. Attach the Preamp output coax center lead (from tuning cap.) to pin 2 with the shield to pin 1.

5. Connect the red B+ line from the Preamp to the second terminal from the rear on the terminal strip located at the left hand side of the radio.

6. Turn the unit on, tune the Two caps. on the Preamp board and the slug tuned coil on the RX board (T-1) for either max. noise to the ear or measure with a VU meter on the speaker jack at the rear of the 2700. This completes the tune-up unless you have a noise generator and want to fine tune for best system noise figure.







PREAMP PARTS LIST

PC BOARD	(1)
J 310 FET	(1)
.001 CAPS.	(3)
4.7 uh CHOKE	(1)
1000 pf. FEED THRU	(1)
3.3-13 pf CAP.	(2)
#18 WIRE (red)	(1)
MTG LUGS	(2)
120 ohm RESISTOR	(1)

KLM electronics, inc.

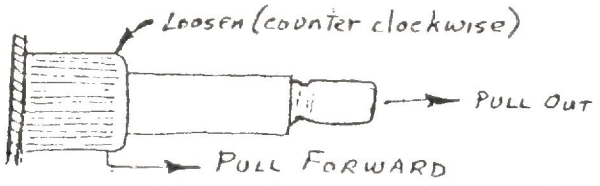
COMMUNICATIONS EQUIPMENT/ANTENNA INNOVATIONS

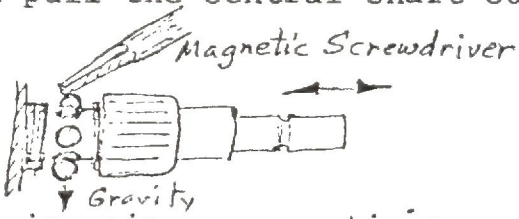
Dear Customer:

In order to save you time--shipping time, time at the factory, etc.--we are sending you a new VFO shaft and bearings.

Installation should be simple. Remove the VFO knobs(two hex screws each). Remove the top cabinet cover (8 screws). You will note the knurled knob on the main shaft where it enters the gear box. Loosen this with long-nosed pliers or a bladed screwdriver. Hopefully it will not be too tight to turn. (If it is, a factory return is in order).

When this nut is loosened sufficiently, pull it forward to expose the ball bearings. These can now be dislodged by pulling and pushing the central shaft in and out and either allowed to drop out or removed with a magnetic screwdriver. Then pull the central shaft out.





To re-assemble, place each new bearing in using a magnetic screwdriver letting the bearing grease hold it in the bearing hole. This takes a little care in doing. Push the knurled knob back over the bearings to hold them in place while pushing the new VFO shaft into the outer shaft. (Otherwise you will push the bearings out when the shaft goes in!). Tighten the knurled shaft (clockwise) until the vernier turns the non-vernier shaft in the normal manner. If you don't tighten it sufficiently, it will not turn the outer shaft. Overtightening will cause binding.

If you are unable to get the old shaft out or the new shaft in or if the problem re-occurs, please return it under warantee(with a note stating what was done)for factory repair.

KLM Service Dept.

4-10-78

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COMMUNICATIONS EQUIPMENT/ANTENNA INNOVATIONS

CORRECTIONS TO MULTI-2700 OWNERS MANUAL

PAGE 8 SYNTHESIZER OPERATION

#1. SSB

RF GAIN knob Turn clockwise fully.

PAGE 9 #3. FM

40kHz - separation FM wide change to
20kHz - separation FM wide

20kHz - separation FM narrow change to
10kHz - separation FM narrow

PAGE 10 #1. SSB CW

First paragraph should read:

Adjust the set to your desired frequency. Turn the mode selection swtich to CW. Insert a CW key in the jack on the rear of the Multi-2700. Close the key, the "on air" lamp should light, the output meter should read 7 or 8 (all else ok).

PAGE 10 #2. FM/AM

First paragraph, third line should read . . . meter reads 8 or more when High transmitting power is selected.

Third paragraph, first line should read ... 10kHz separation FM (narrow) . . .

Third paragraph, last line should read ... For AM operation, you must set the mode selector switch to AM and turn the SSB microphone GAIN (located on the top hatch) down so that the P.O. meter barely fluctuates. The P.O. out-meter should read about 4 with the AM carrier on.

GH/to
8/31/77

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COMMUNICATIONS EQUIPMENT/ANTENNA INNOVATIONS

ODDBALL OFF-SET SPLIT CYRSTAL INFORMATION FOR A AND B MODE

IF THE RECEIVE FREQUENCY IS HIGHER THAN THE TRANSMIT, THE FORMULA IS:

RX - TX = OFFSET FREQUENCY
16.9 MHZ - OFFSET FREQ. = CRYSTAL FREQ.

IF THE TRANSMIT FREQUENCY IS HIGHER THAN THE RECEIVE, THEN THE FORMULA IS:

TX - RX = OFFSET FREQUENCY
16.9 MHZ + OFFSET FREQ. = CRYSTAL FREQ.

THE CRYSTAL IS A FUNDAMENTAL FREQUENCY WITH A LOADING CAPACITY OF 30PF. CRYSTAL CASE STYLE IS HC-25/U.

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COMMUNICATIONS EQUIPMENT/ANTENNA INNOVATIONS

CONNECTION OF A TONE ENCODER BELOW 300HZ

TO CONNECT THE ENCODER AND HAVE IT WORK BELOW 300HZ YOU MUST CONNECT DIRECTLY INTO THE VCO. THE LOCATION OF THE VCO IS IN A BOX SHOWN IN FIG. 7 (VCO UNIT) OX-103 OF THE UNIT LAYOUT. TO REMOVE IT, YOU MUST UNSCREW SIX SCREWS LOCATED ALONG THE BOTTOM OF THE BOX AND THEN UNSOLDER OR UNSCREW THE GROUND CONNECTION BETWEEN THE VCO BOX AND THE FF-PD BOX. THE VCO BOX SHOULD THEN PULL UP AND YOU CAN FLIP IT OVER TO GAIN ACCESS TO THE BOTTOM OF THE PC BOARD.

THE SCHEMATIC AND BOARD LAYOUTS SHOW WHERE THE OUTPUT OF THE ENCODER SHOULD BE ATTACHED (FIG. 7 THRU 9). YOU SHOULD ATTACH THE ENCODER THROUGH A 1MFD CAPACITOR.

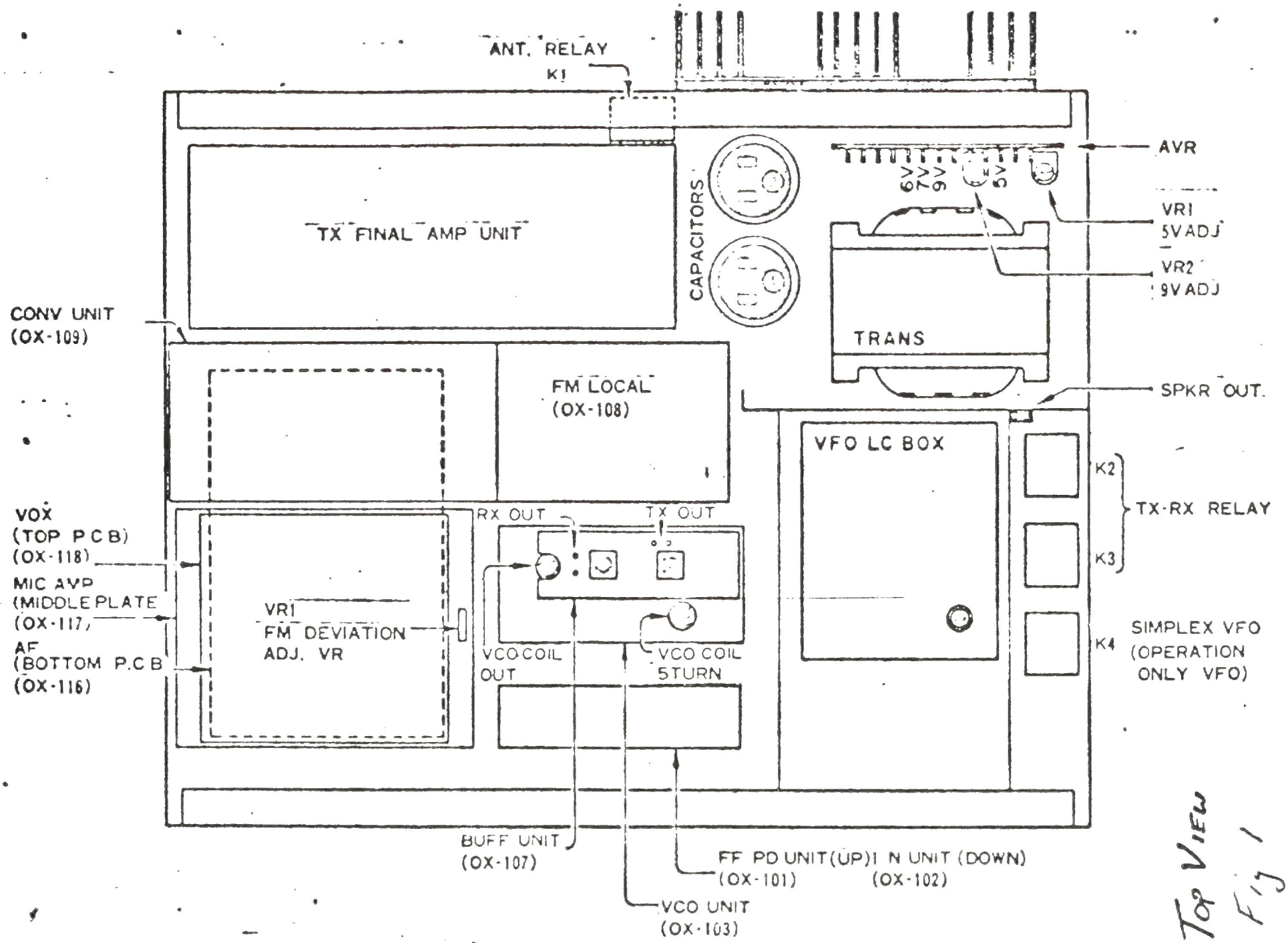
TO KNOW WHETHER YOU HAVE A NEW OR OLD VCO, ALL YOU HAVE TO DO IS LOOK INTO THE HOLE IN THE TOP OF THE VCO BOX. IF THE VCO COIL IS VISIBLE DIRECTLY THRU THE HOLE THEN IT IS THE OLD VCO; IF THE COIL IS OFF TO THE LEFT OF THE HOLE IT IS THEN THE NEW VCO.

THE POWER FOR THE ENCODER SHOULD BE TAKEN FROM THE TX-RX RELAY SO AS TO HAVE THE ENCODER ON ONLY DURING TRANSMIT. A 13.5V SOURCE IS MARKED ON FIG. 2 ON THE BOTTOM VIEW OF THE UNIT.

KLM ELECTRONICS, INC.
SERVICE DEPARTMENT
AUGUST 31, 1977

GH/to

17025 LAUREL ROAD, MORGAN HILL, CALIFORNIA 95037 • (408) 779-7363



Top View
Fig 1

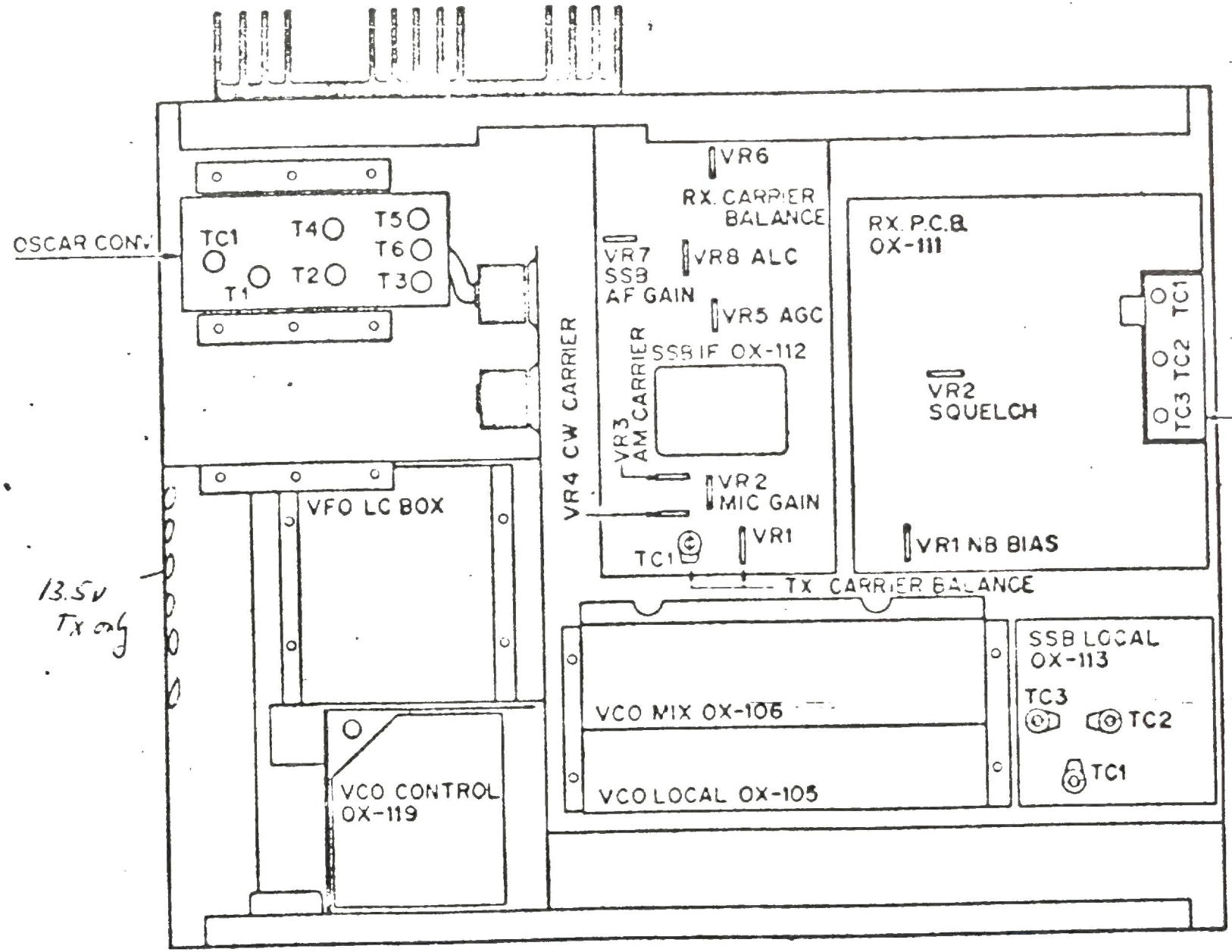
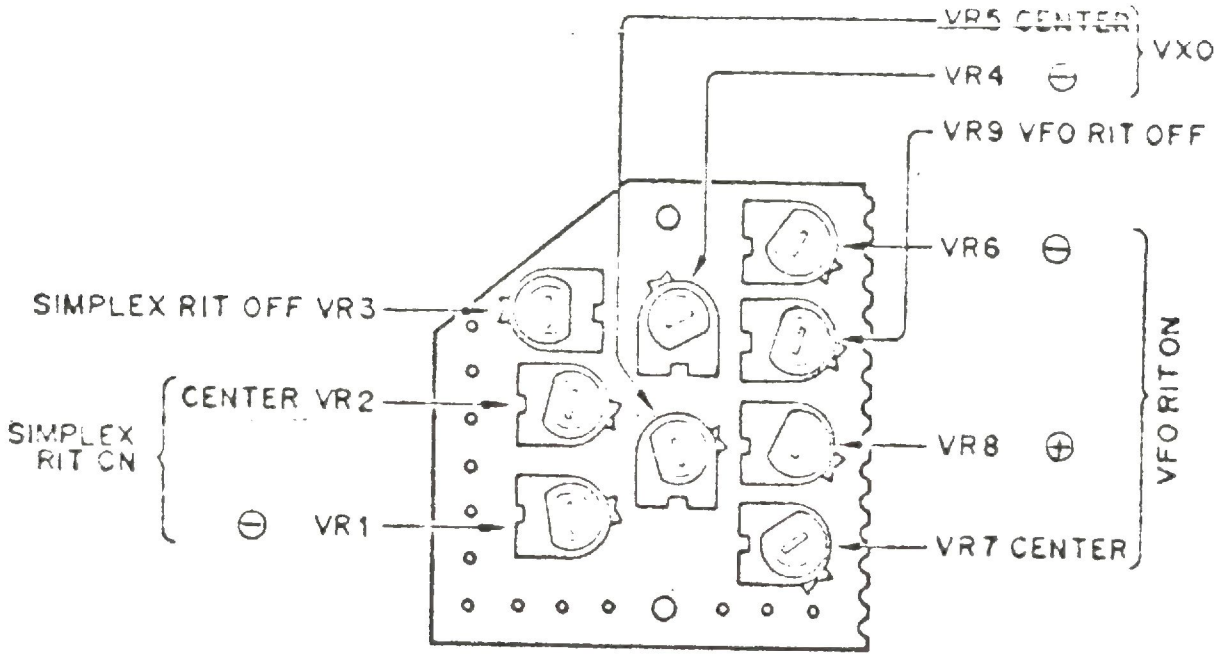
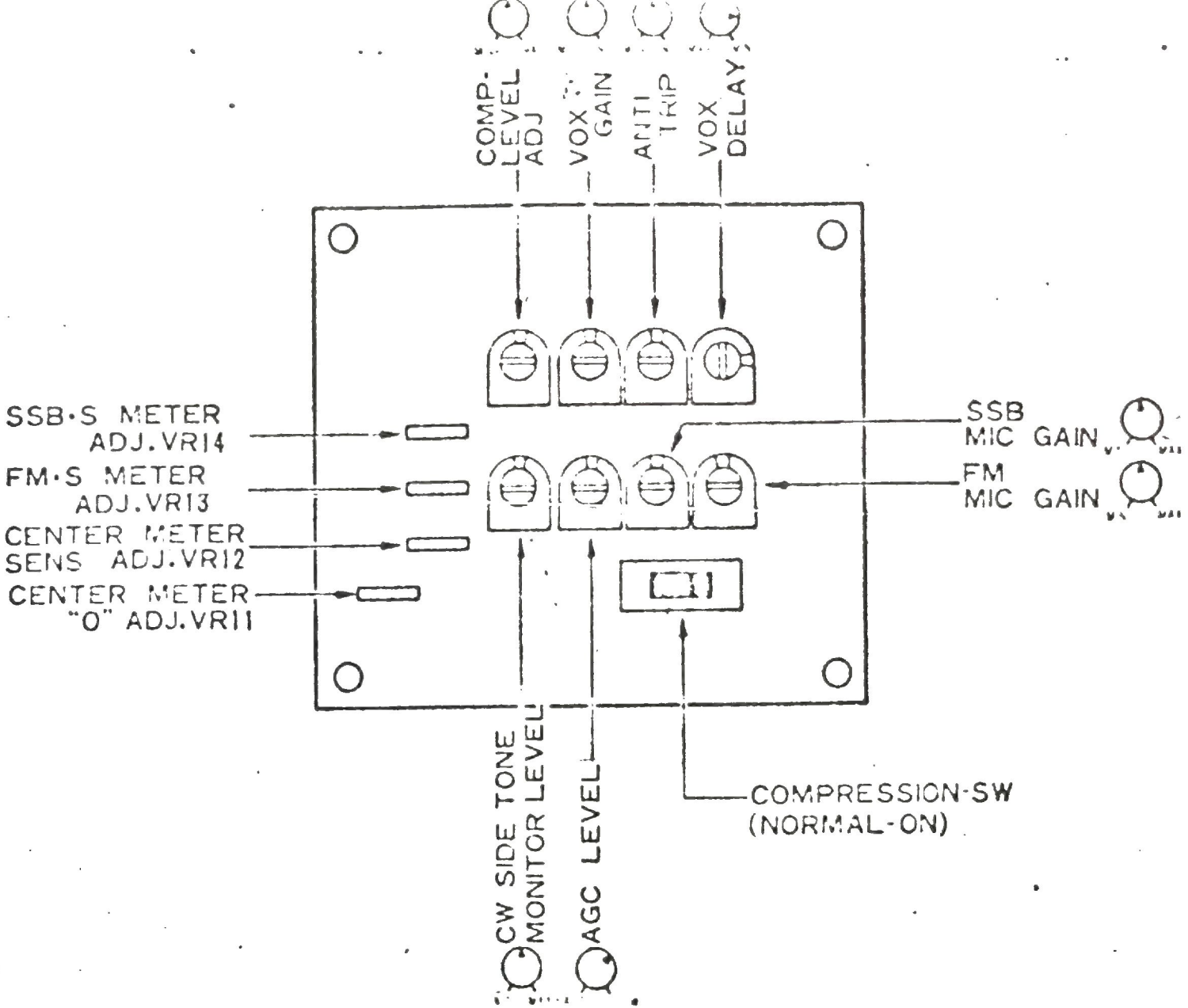


Fig 2 Bottom View

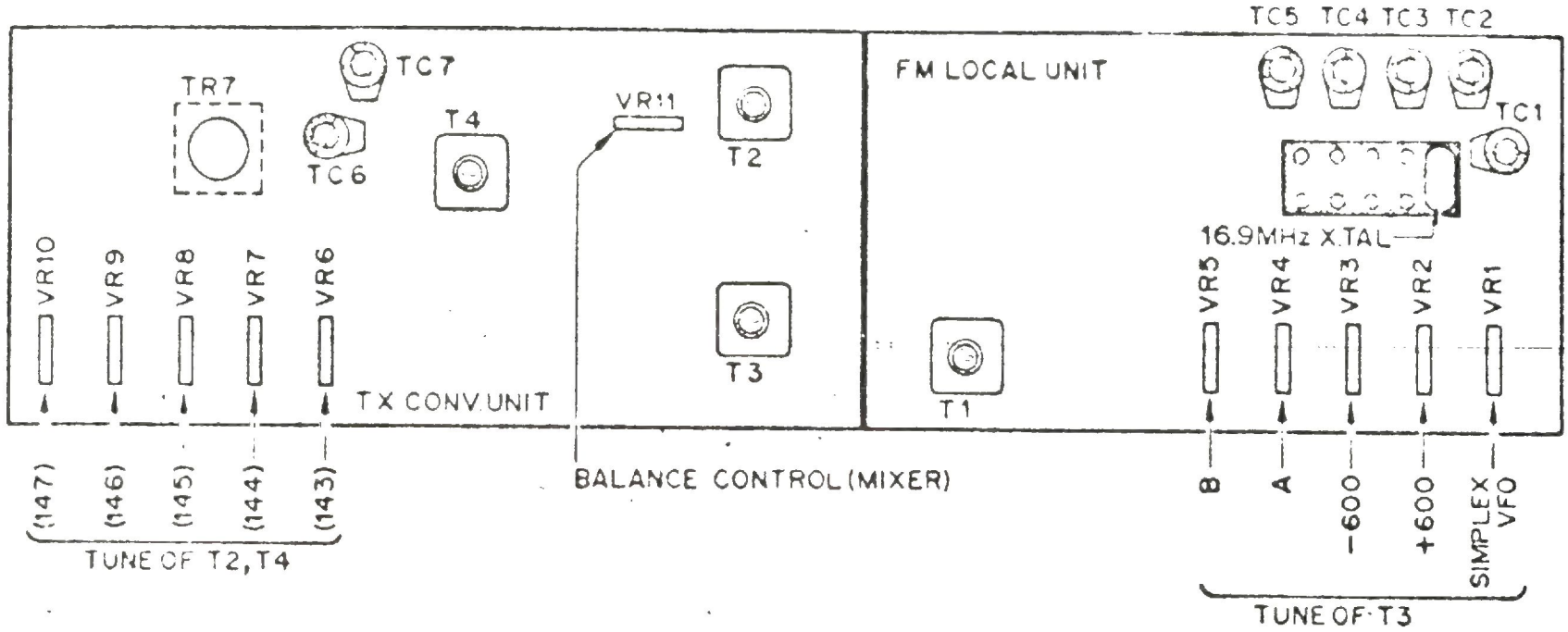
Fig 3



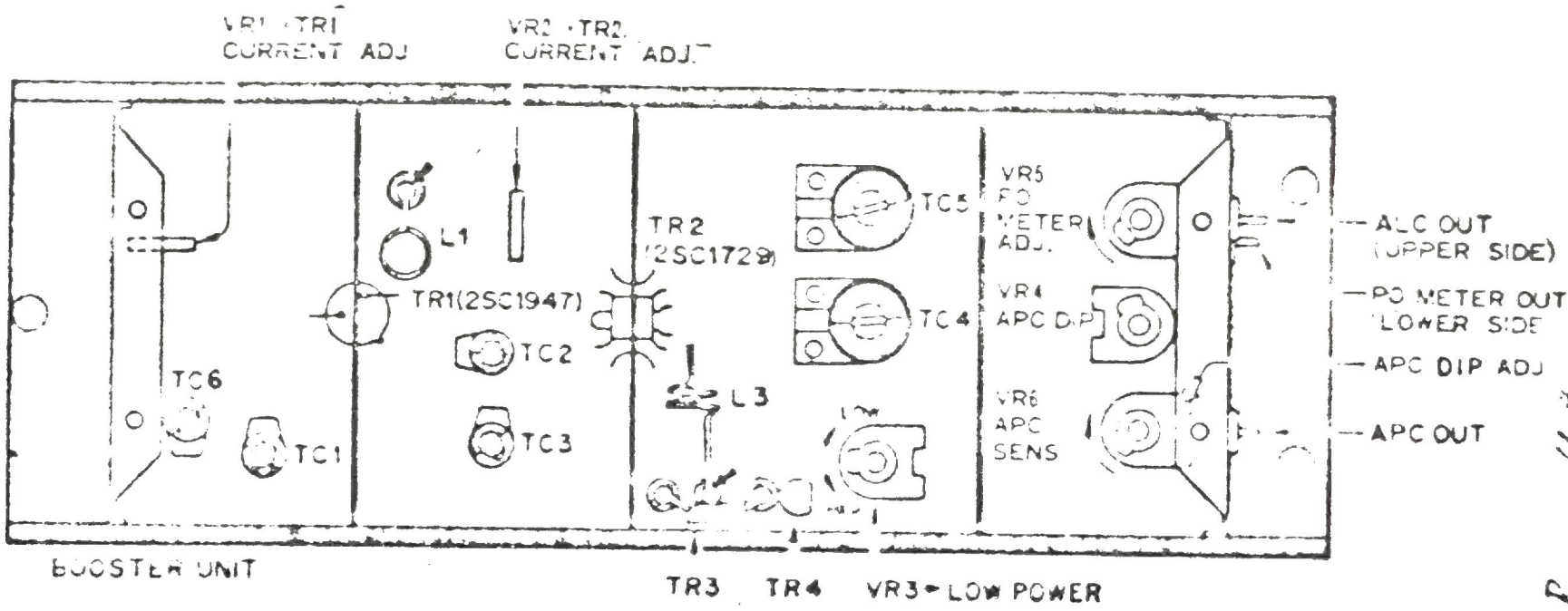
VCO Control
OX-119



Vox (Top PC Board)
OX-118



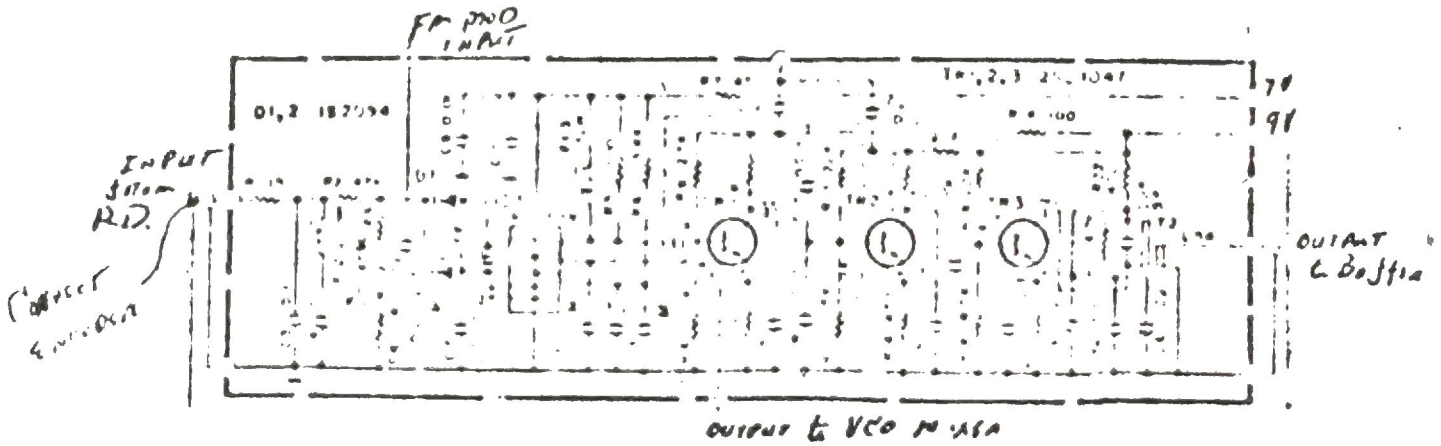
TX CONV. UNIT
OX-109 + FM LOCAL UNIT
OX-108


VR1 -TR1
CURRENT ADJ
VR2 -TR2
CURRENT ADJ
L1
TR1(2SC1947)
TC2
TC6
TC1
TC3
TR2
(2SC1728)
L3
TC5
TC4
VR5
FO
METER
ADJ.
VR4
APC DIP
VR6
APC
SENS
ALC OUT
(UPPER SIDE)
PO METER OUT
(LOWER SIDE)
APC DIP ADJ
APC OUT
BOOSTER UNIT
TR3 TR4 VR3-LOW POWER

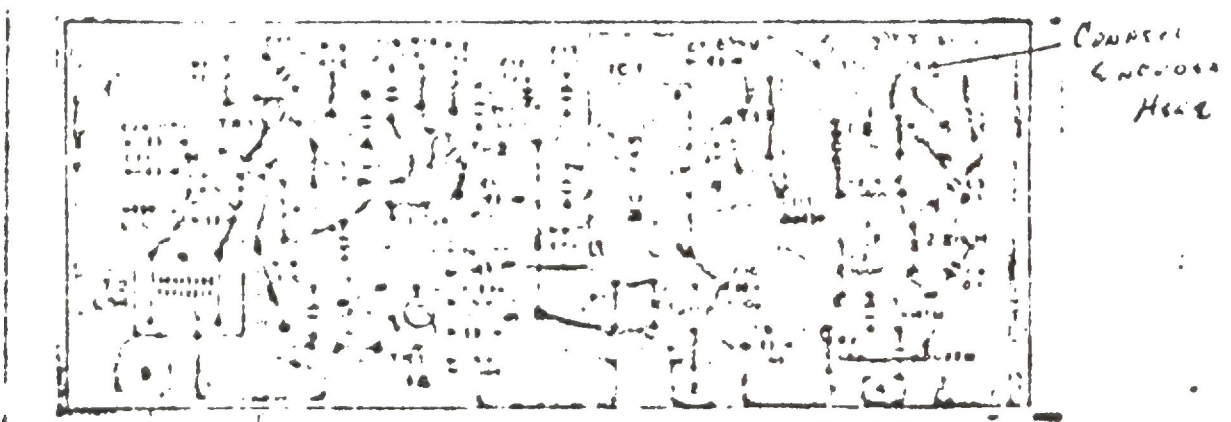
Ref. No.	Description		Q'ty
	IC		1
	Transistor		1
	Varistor		1
L1	Coil		1
L2	Coil		1
L3	Inductor		1
L4	Inductor		1
R1	Carbon Resistor	150Ω	1
R2	Carbon Resistor	47Ω	1
R3	Carbon Resistor	100Ω	1
R4	Carbon Resistor	1.5k	1
R5, 10, 11, 15, 16, 17	Carbon Resistor	100Ω	6
R6	Carbon Resistor	5.6k	1
R7	Carbon Resistor	470Ω	1
R8, 13, 19	Carbon Resistor	22k	3
R9	Carbon Resistor	27k	1
R12	Carbon Resistor	15k	1

Ref. No.	Description		Q'ty
R14, 22	Carbon Resistor	47Ω	2
R18, 21	Carbon Resistor	4.7k	2
R20	Carbon Resistor	2.2k	1
C3, 4	Ceramic Capacitor	0.1μ	2
C5	Mylar Capacitor	0.047μ	1
C6	Mylar Capacitor	0.022μ	1
C7, 23	Mylar Capacitor	0.01μ	2
C11	Mylar Capacitor	0.68μ	1
C12	Ceramic Capacitor	33p	1
C20, 24	Ceramic Capacitor	0.01μ	2
C14	Ceramic Capacitor	10p	1
C15, 16, 17, 18, 19, 21, 22, 23	Ceramic Capacitor	0.047μ	8
C25	Ceramic Capacitor	5p	1
C10, 20	Electrolytic Capacitor	10μ	2
C12	Electrolytic Capacitor	1μ	1
C26	Electrolytic Capacitor	10μ	1

CIRCUIT X-3



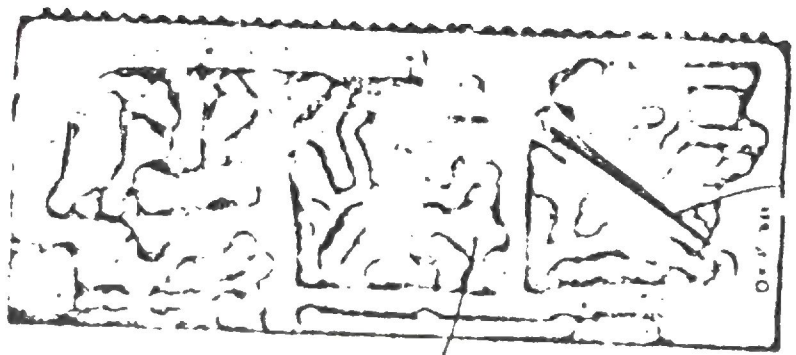
PRINTED BOARD OX-103



Bottom View of PC Board

Fig 7

Fig 8



New VCO Board (Bottom View).

KLM electronics, inc.

COMMUNICATIONS EQUIPMENT/ANTENNA INNOVATIONS

KLM MULTI-2700 CHECK LIST

Date 11/9/77

S.N. 10374

Transmitter

Spurious across band < 60db	✓
Power level across band 10 to 15 watts	✓
CW level 10 watts	✓
AM level 5 watts	✓
Deviation set	✓

Receiver

SSB sensitivity	✓
SSB 'S' meter	✓
FM Squelch	✓
FM 'S' meter	✓
FM 'C' meter	✓
RIT	✓
Oscar sensitivity	✓
LED display	✓
Calibrator	✓

Frequency Check

VFO within 2KHz across dial	✓
Synthesizer ±250Hz simplex	✓
+600	✓
−600	✓

Power Supply

5V	✓
9V	✓

SSB carrier suppression < 40db	✓
Sideband pitch	✓
Speech Compressor	✓
VOX	✓
Noise Blanker	✓

Tested By: Walt Hess

GH/to

17025 LAUREL ROAD, MORGAN HILL, CALIFORNIA 95037 • (408) 779-7363

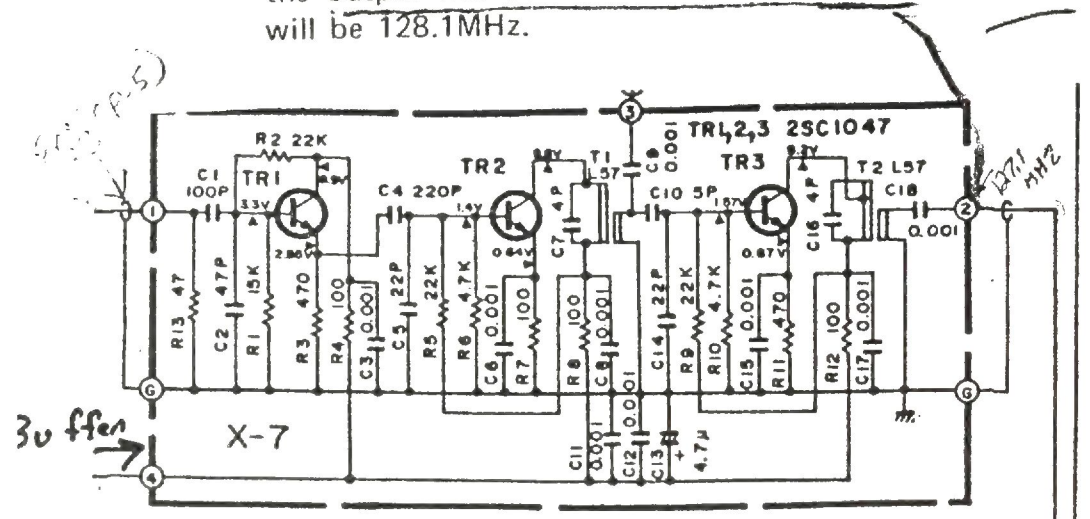
VFO (OUTPUT TRANSMIT)

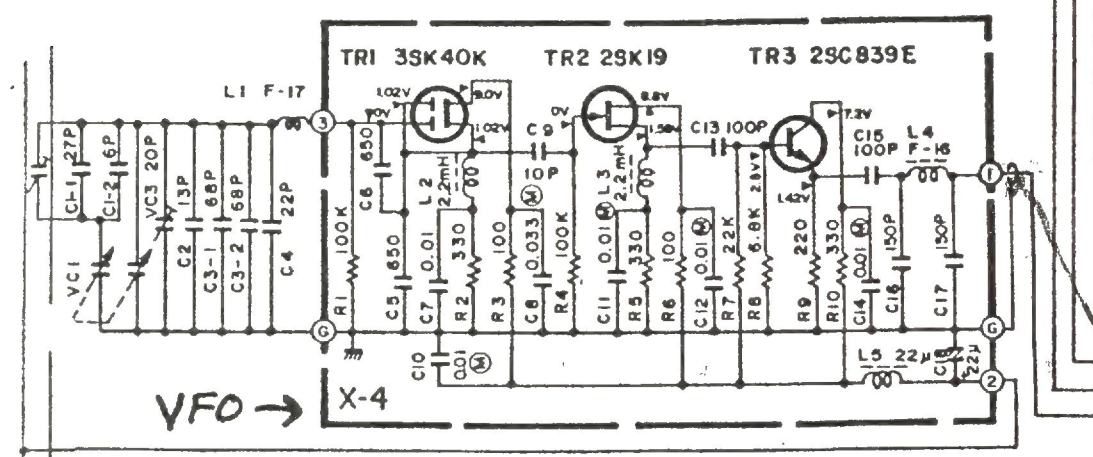
144 = 142.207
145 = 142.622
147 = 143.407
148 = 144.435

FREQ	Reading at UCC (X3)	should
148 =	127.535	
147 =	126.512	127.1
145 =	125.312	= 125.1
144 =		

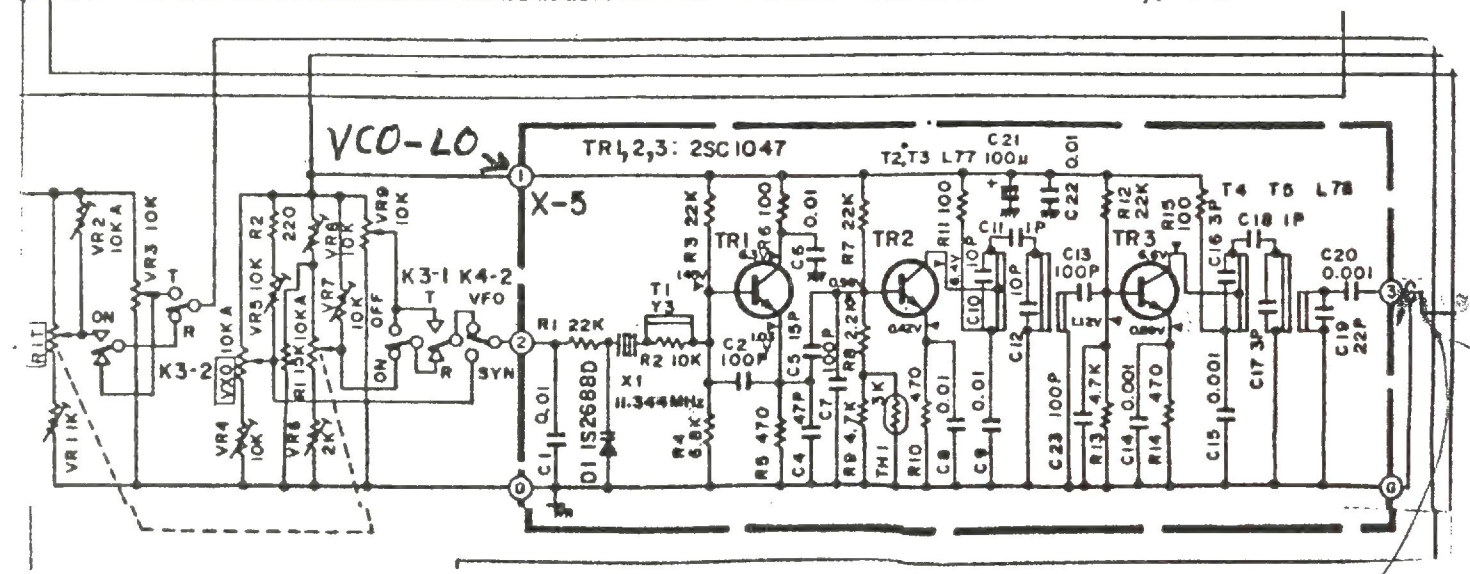
✓ 11.1116
YTDL

(X-7) as a transmitting or receiving local frequency. When the 144MHz, the output will be 127.1MHz; when the 145MHz; it will be 128.1MHz.





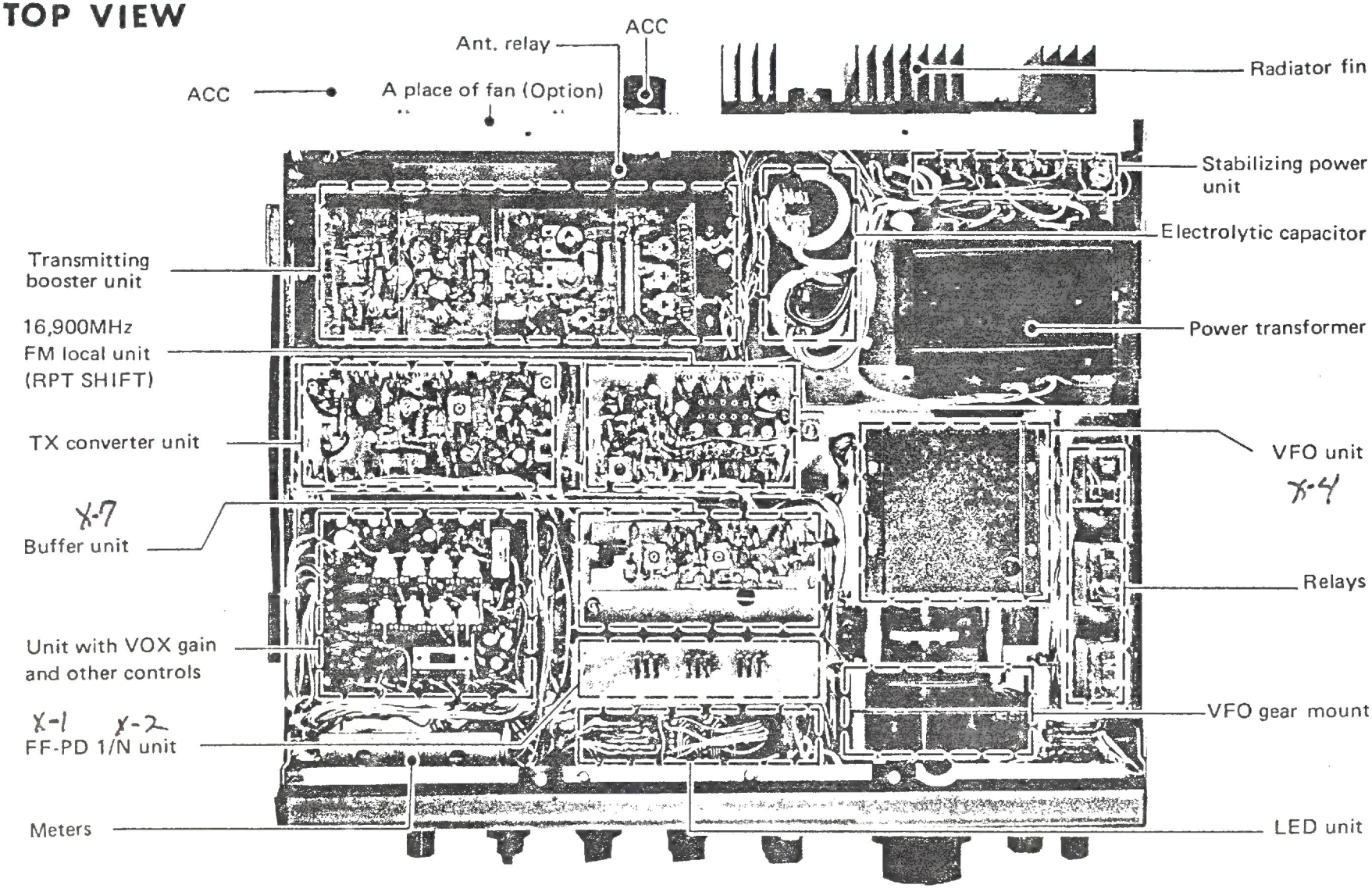
The VFO unit (X-4) is a very stable VFO which employs a dual gate MOS FET for oscillation. It generates frequencies within the range of 11.000MHz to 11.500MHz, and its output is doubled by the VCO-MIX unit (X-6) to cover the 1MHz band area. When the digital synthesizer is in use, the VFO oscillator generates frequencies but the frequency doubler circuit will not operate. Instead, the 11.000MHz crystal oscillator will operate to supply a doubled 22.000MHz signal to the mixer. The mixer mixes a 102.100MHz signal, which is obtained by multiplying by 9 the 11.344MHz crystal-os..lated from the VCO-LO unit



(X-5) and the 22.000 MHz to produce 124.100MHz. This 124.100MHz frequency is mixed with the VCO output to be converted into 2 to 7MHz, which is fed through a low pass filter into the 1/N unit.

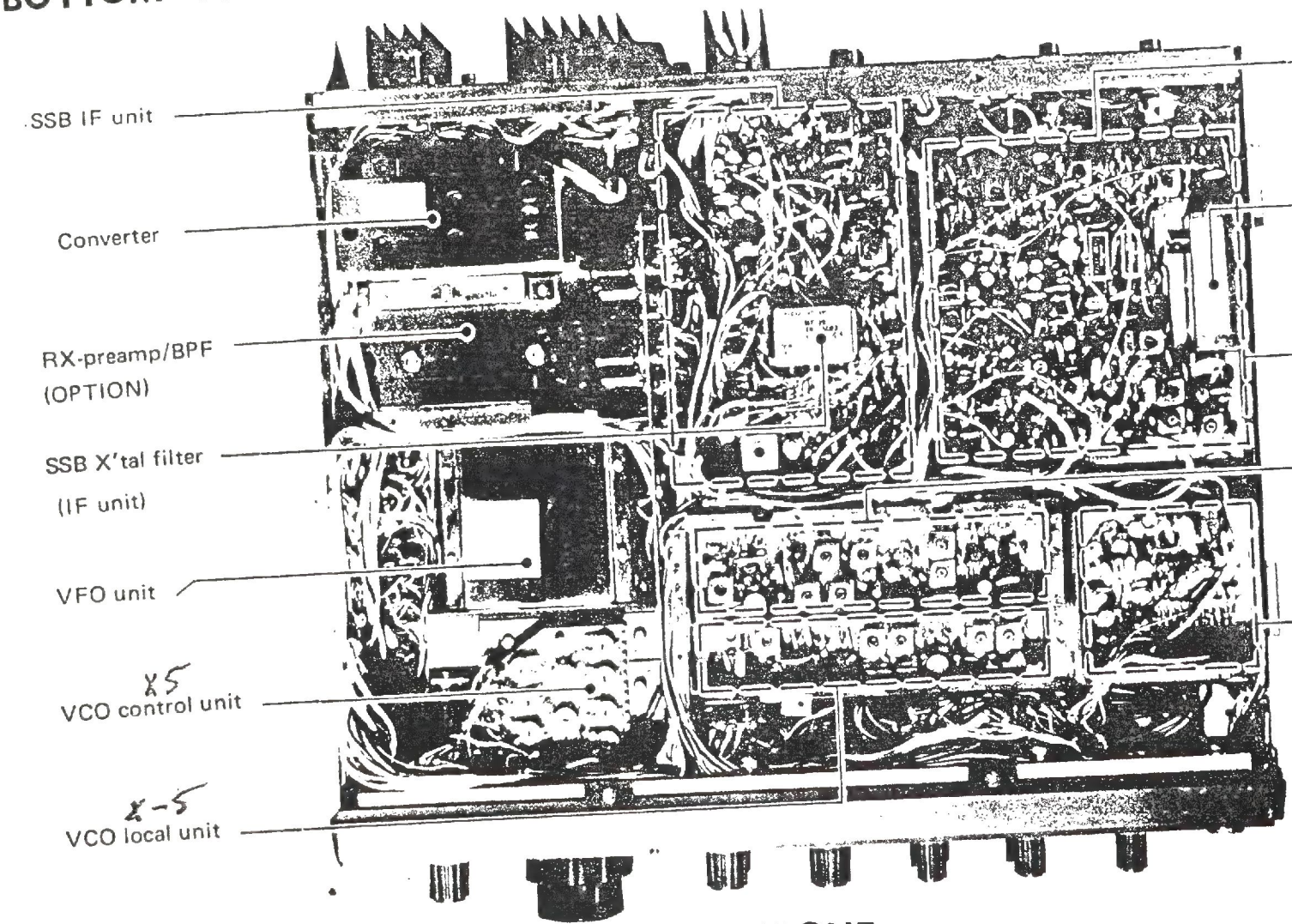
X-4.5.7

TOP VIEW


ACC
Ant. relay
ACC
A place of fan (Option)
Radiator fin
Stabilizing power unit
Electrolytic capacitor
Transmitting booster unit
16,900MHz FM local unit (RPT SHIFT)
Power transformer
TX converter unit
VFO unit
X-4
X-7
Buffer unit
Relays
Unit with VOX gain and other controls
VFO gear mount
X-1 X-2
FF-PD 1/N unit
Meters
LED unit

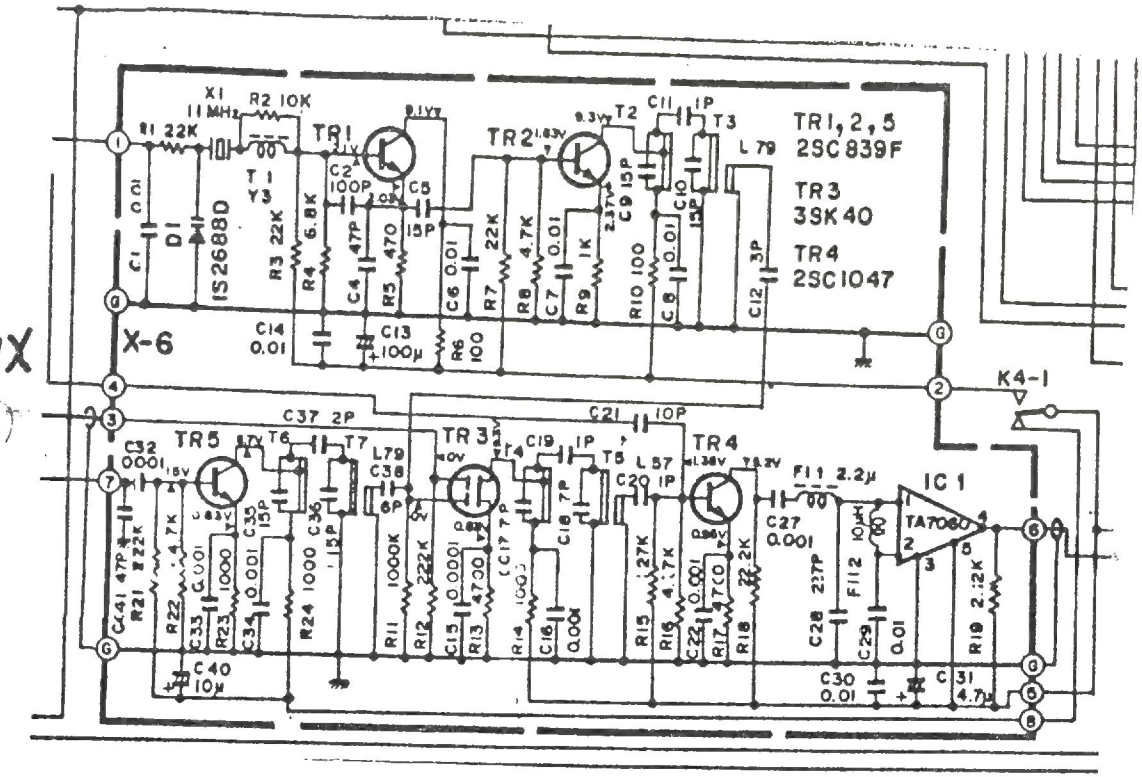
FRONT

BOTTOM VIEW



FRONT

X-4, 5, 7

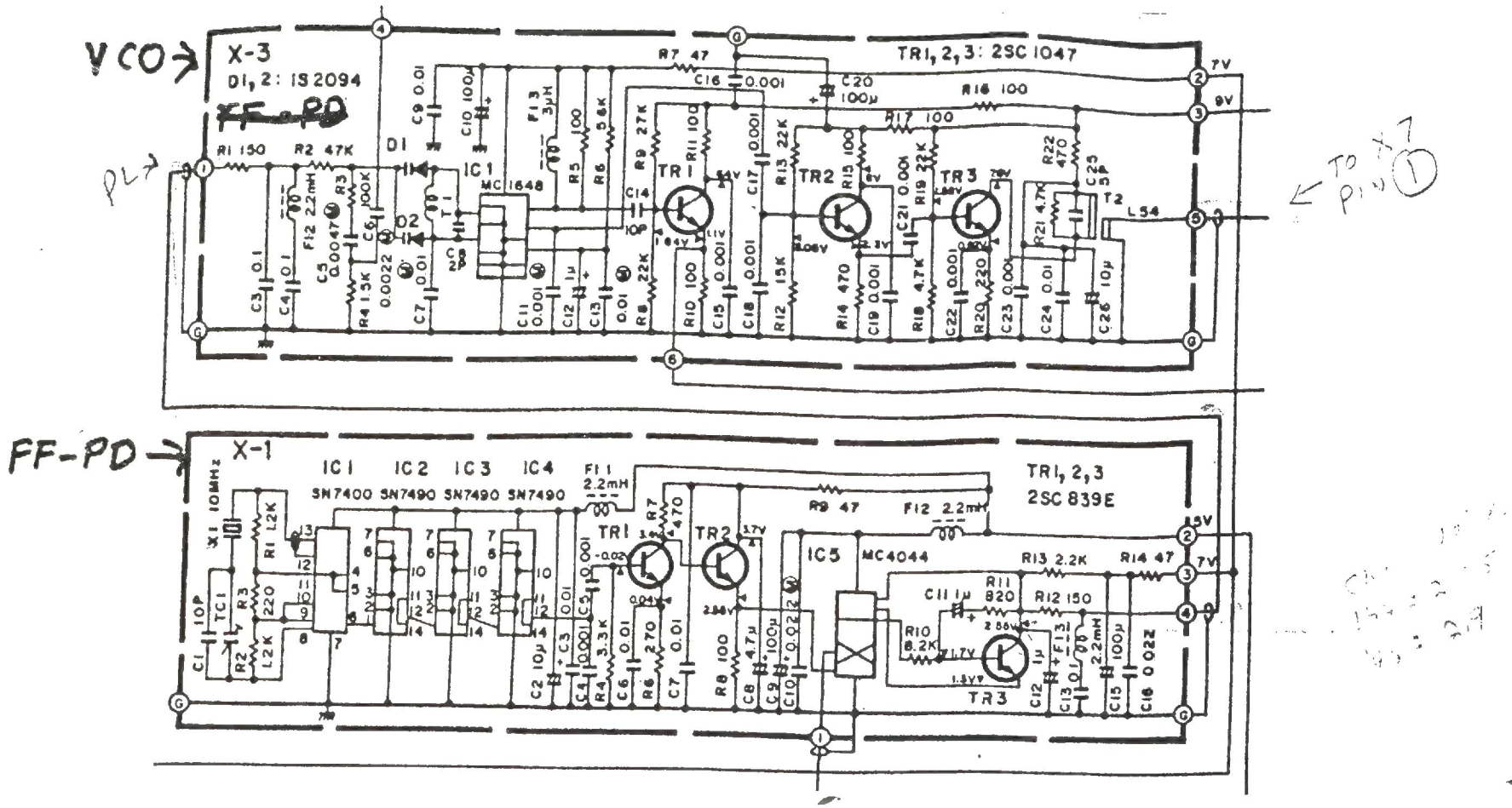


and its output is doubled by the VCO-MIX unit (X-6) to cover the 1MHz band area. When the digital synthesizer is in use, the VFO oscillator generates frequencies but the frequency doubler circuit will not operate. Instead, the 11.000MHz crystal oscillator will operate to supply a doubled 22.000MHz signal to the mixer. The mixer mixes a 102.100MHz signal, which is obtained by multiplying by 9 the 11.344MHz crystal-oscillated from the VCO-LO unit

The FF-PD unit (X-1) has an IC 10.000MHz oscillator, a 3-stage IC frequency divider which divides 10.000MHz into 10kHz and a phase comparator (PD) which generates a DC voltage for setting a VCO oscillating frequency. The phase comparator converts a phase difference between the reference signal and a signal from the 1/N unit into a DC voltage.

The VCO unit (X-3) has an IC voltage control oscillator and a buffer amplifier by which an oscillating frequency will be set depending on the output voltage of PD applied to a variable capacity diode. The VCO unit's output is fed through the buffer unit

X1,3



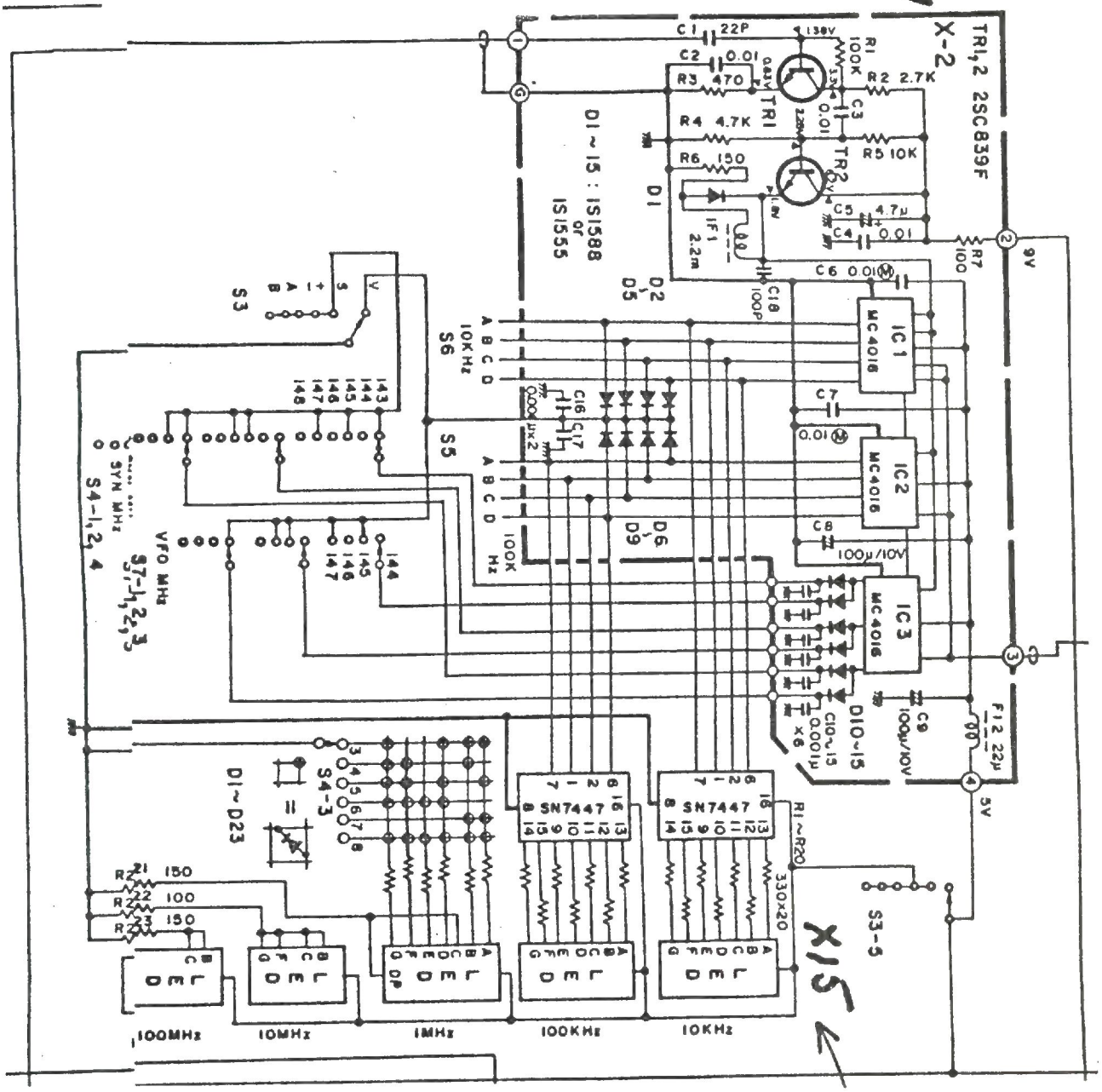
driven at the 1/N unit's frequency dividing ratio, 25 diodes and 5 LEDs.

VXO and RIT frequencies are varied as follows:

When VFO is in use, 11.344MHz is varied by RIT; and when the digital synthesizer is in use, 11.344MHz is varied by VXO and 11.000MHz by RIT.

The PLL section is completely sealed except the buffer unit (X-7).

1/N UNIT → X-2

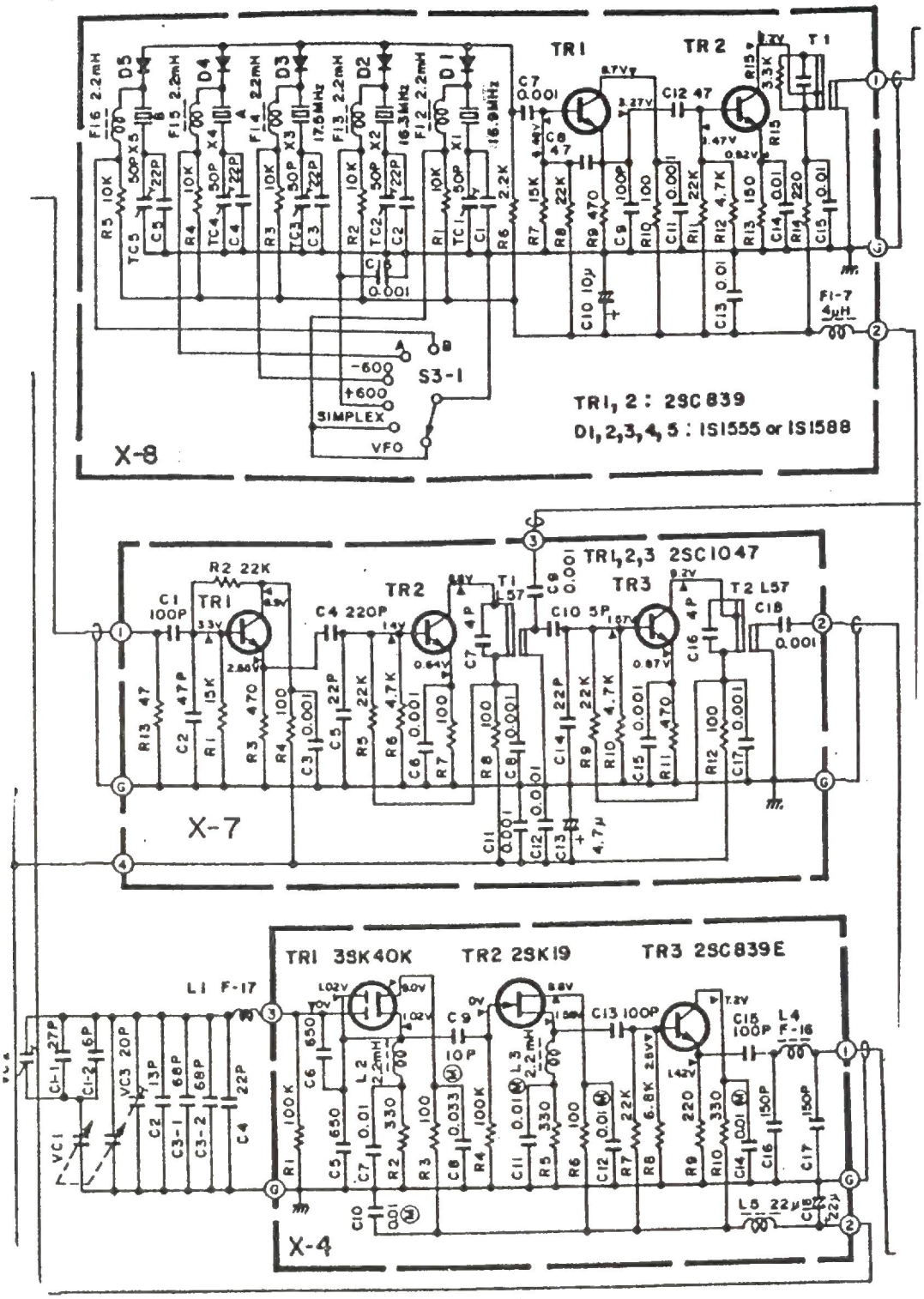


LED UNIT

X15

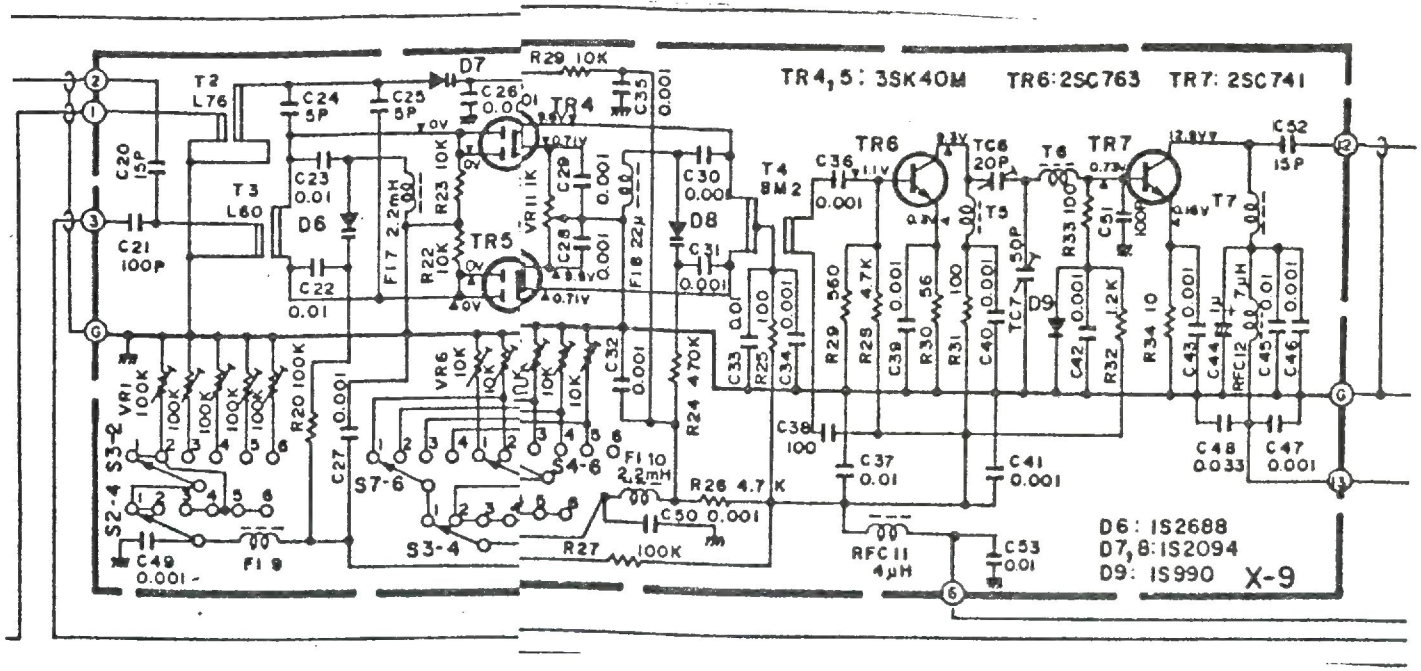
The 1/N unit (X-2) employs 3 ICs for setting the set's operating frequency. 1/N will be 1/300 for the 144.00 MHz; or 1/400 to the 145.000MHz.

X2, X15

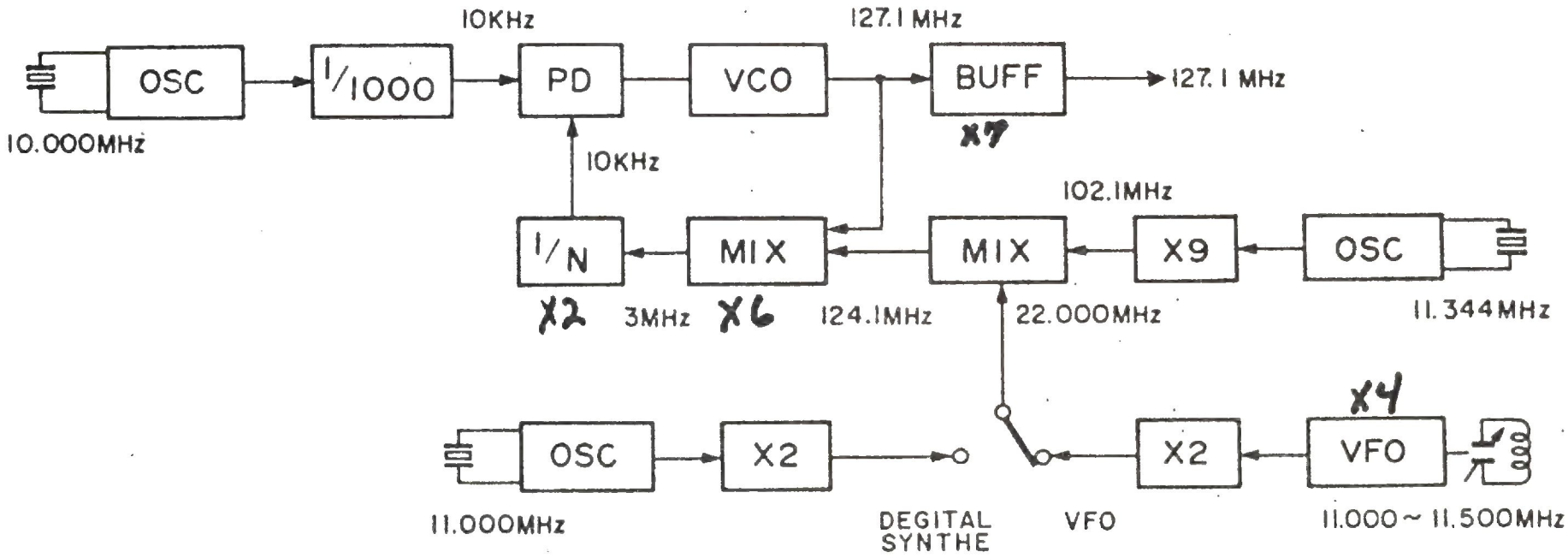

TR1
TR2
T1
D5
D4
D3
D2
D1
F16 2.2mH
F15 2.2mH
F14 2.2mH
F13 2.2mH
F12 2.2mH
17.5MHz
16.3MHz
16.9MHz
X5
X4
X3
X2
X1
S3-1
-600
+600
SIMPLEX
VFO
A
B
X-8
TR1, 2 : 2SC839
D1, 2, 3, 4, 5 : 1S1555 or 1S1588
TR1,2,3 2SC1047
TR2
TR3
T2 L57
X-7
TR1 3SK40K
TR2 2SK19
TR3 2SC839E
L1 F-17
L2
L3
L4 F-16
L5 22μH
X-4

TX converter unit (X-9)

VCO output and 16.9MHz IF signal are converted into 144MHz by a balanced mixer consisting of 2 dual gate MOS FETs, and then amplified in voltage and power. Part of the unit is tuned every 1MHz by a variable capacity diode.



PLL block diagram



KLM electronics, inc.

COMMUNICATIONS EQUIPMENT/ANTENNA INNOVATIONS

May 23, 1978

TO: KLM Owners, AMSAT
FROM: Jim WB6JNN, KLM Service Manager
RE: OSCAR 8 Mode A Offset

OSCAR 6 and OSCAR 7 both used a downconverting Local Oscillator of 116.450 MHz.

OSCAR 8, however, (due to pre-launch problems) has an L.O. of 116.4586 MHz.

This presents problems for KLM Multi 2700 owners. It is not possible to use OSCAR 8 without using the synthesizer to transmit and then switching to VFO for receive (to overcome an offset more than the VXO/RIT range).

Since OSCAR 7 is normally left on Mode B (2 Meter output) and OSCAR 8 is normally on Mode A (10 Meter output), we suggest changing the 2700's OSCAR Converter L.O. frequency to 116.4586 by changing the 12.93889 crystal to 12.93984 MHz. Either a new crystal can be substituted (send old crystal to crystal maker for reference), or the trimmer (20p) and padder cap (22p) changed to pull the old crystal on frequency (not always possible, of course).

73's

Jim Eagleson, WB6JNN
Service Manager

P.S. An alternate way to tune in OSCAR VIII signals is to offset the RIT to +2 KHz, tune in a station using the Synthesizer and VXO, then transmit one channel higher (Eg. 146.900 Rx, 146.910 Tx). A similar procedure would be possible using the VFO but less conveniently.

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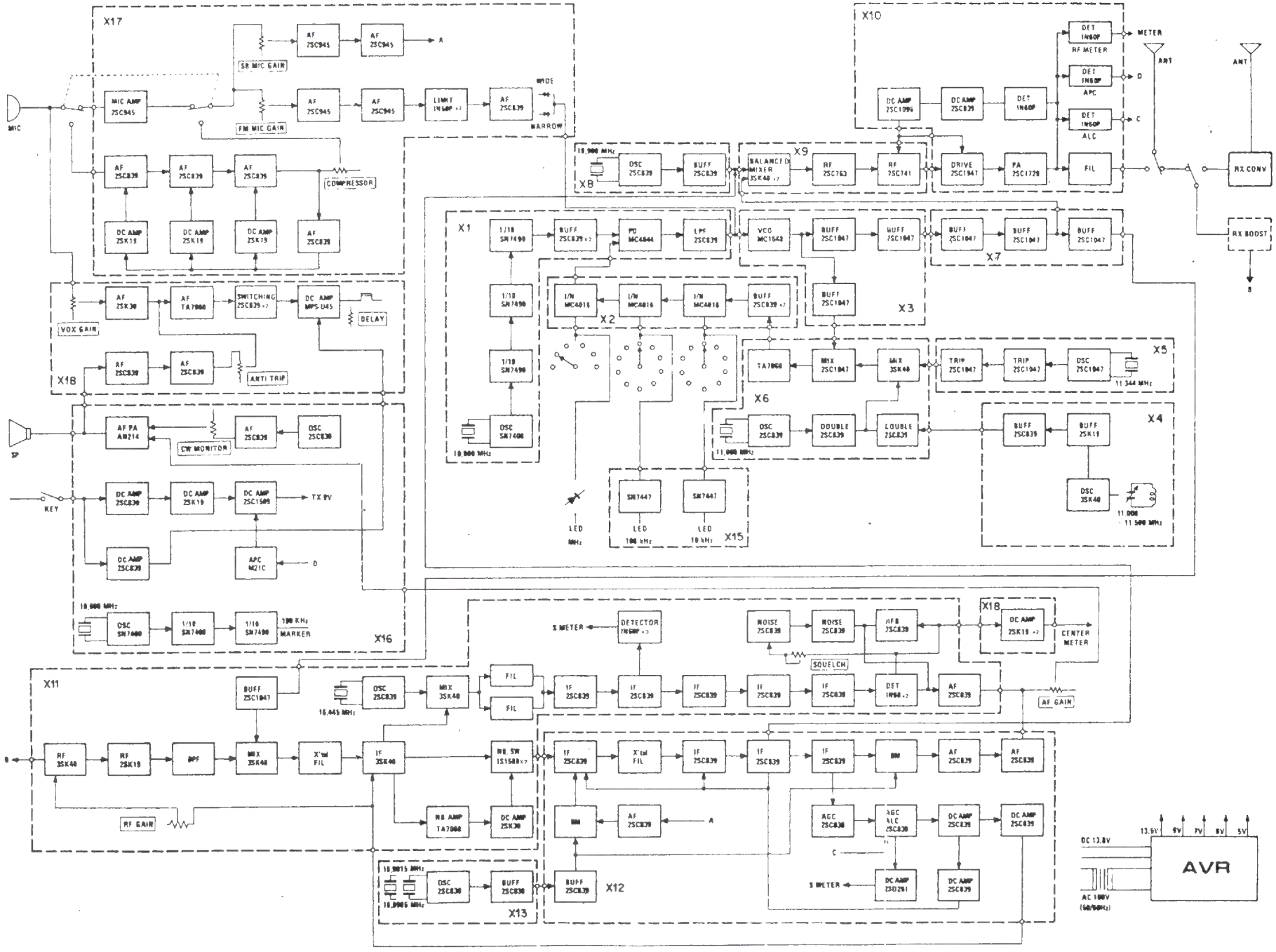
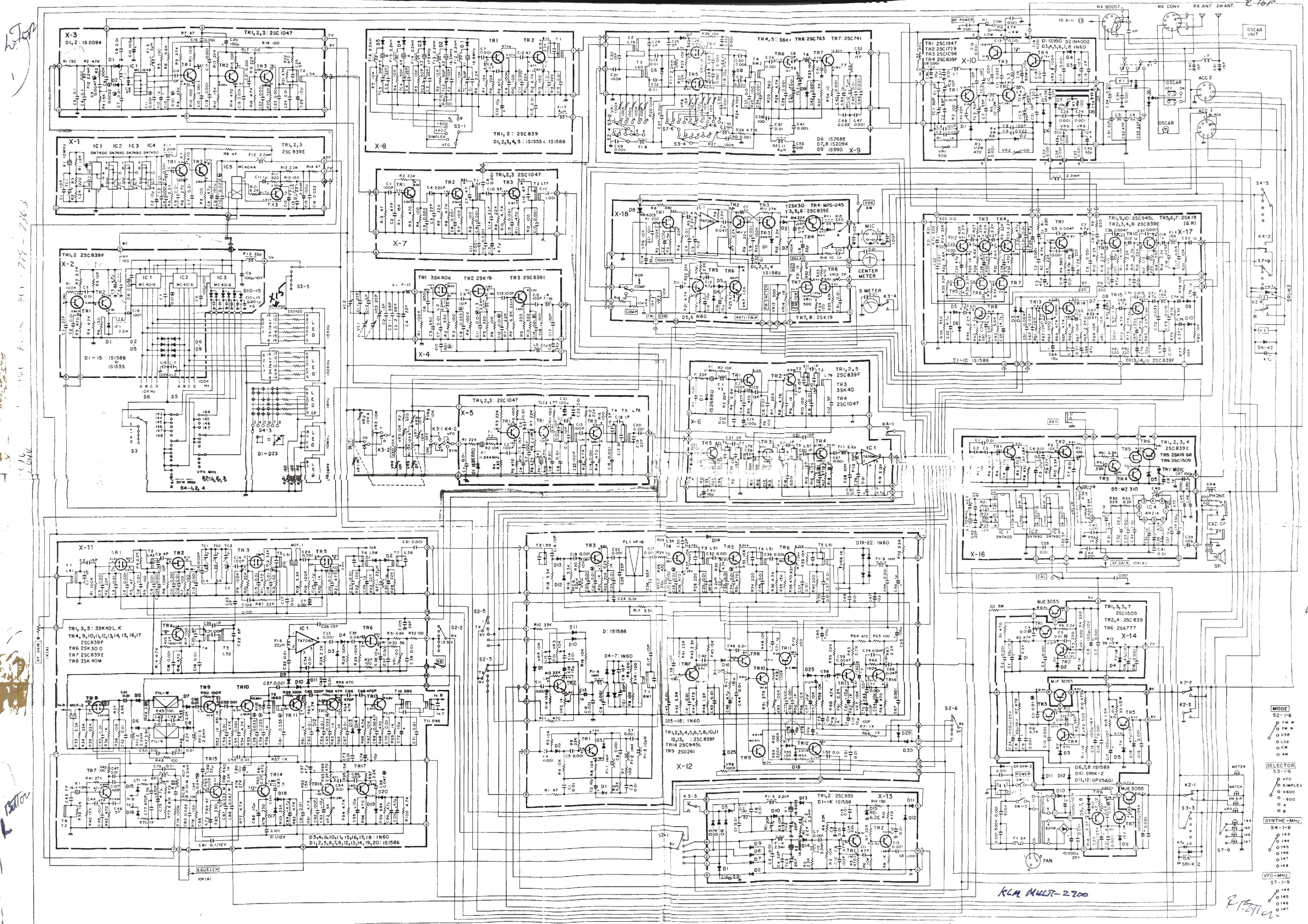
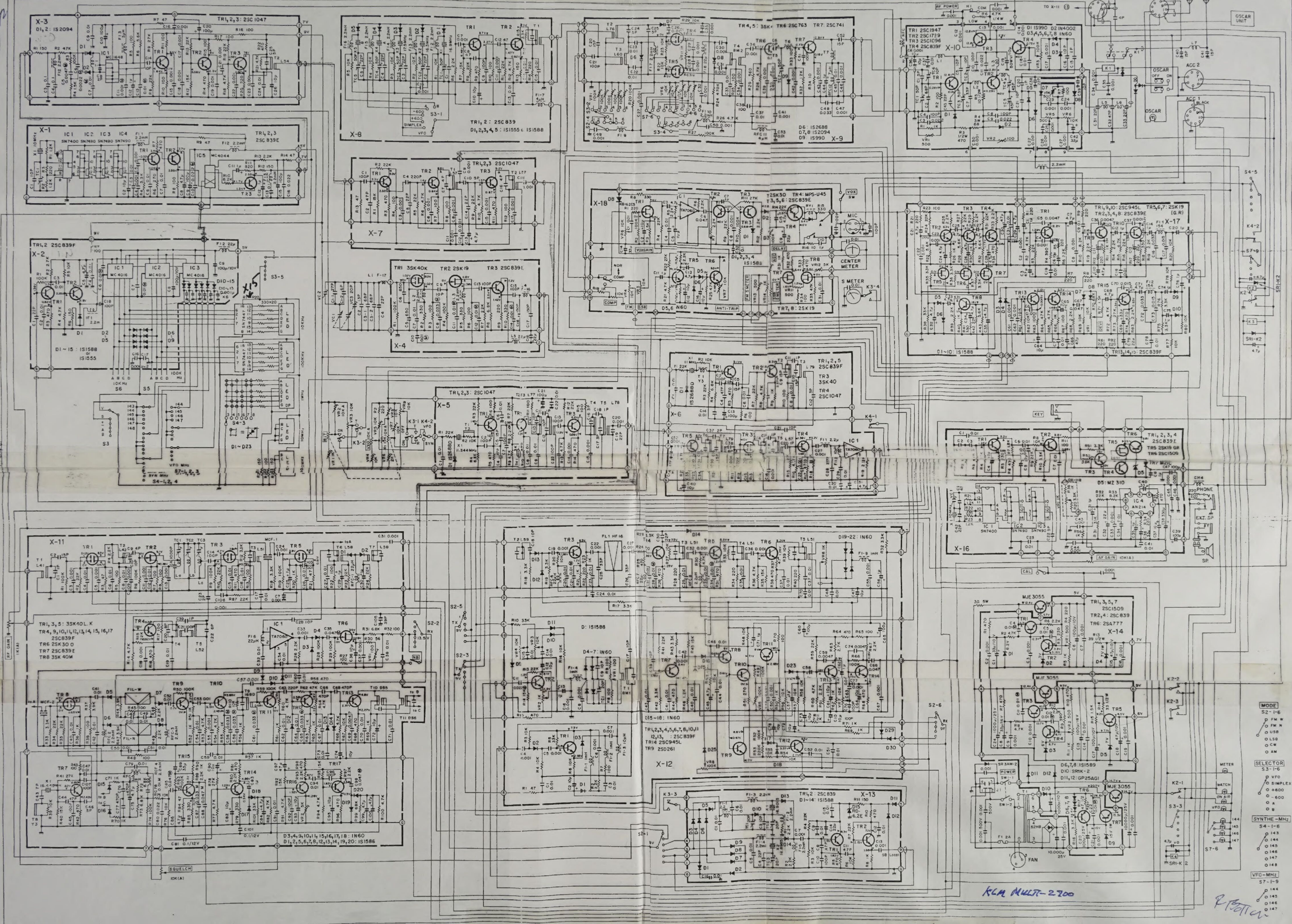

X17
MIC
MIC AMP 2SC945
SB MIC GAIN
FM MIC GAIN
AF 2SC945
AF 2SC945
AF 2SC945
LIMIT 1N60P ×2
AF 2SC839
WIDE
NARROW
AF 2SC839
AF 2SC839
AF 2SC839
COMPRESSOR
DC AMP 2SK19
DC AMP 2SK19
DC AMP 2SK19
AF 2SC839
X18
VOX GAIN
AF 2SK30
AF TA7060
SWITCHING 2SC839 ×2
DC AMP MPS U45
DELAY
AF 2SC839
AF 2SC839
ANTI TRIP
SP
AF PA AN214
CW MONITOR
AF 2SC839
OSC 2SC838
KEY
DC AMP 2SC839
DC AMP 2SK19
DC AMP 2SC1509
TX 9V
DC AMP 2SC839
APC M21C
D
X16
10.000 MHz
OSC SN7400
1/10 SN7490
1/10 SN7490
100 KHz MARKER
X10
DC AMP 2SC1096
DC AMP 2SC839
DET 1N60P
DET 1N60P RF METER
DET 1N60P APC
DET 1N60P ALC
METER
ANT
D
C
X8
10.000 MHz
OSC 2SC839
BUFF 2SC839
X9
BALANCED MIXER 3SK40 ×2
RF 2SC763
RF 2SC741
DRIVE 2SC1947
PA 2SC1729
FIL
ANT
RX CONV
RX BOOST
B
X1
1/10 SN7490
BUFF 2SC839 ×2
PD MC4044
LPF 2SC839
VCO MC1648
BUFF 2SC1947
BUFF 2SC1947
BUFF 2SC1947
BUFF 2SC1947
BUFF 2SC1947
X7
1/10 SN7490
1/N MC4016
1/N MC4016
1/N MC4016
BUFF 2SC839 ×2
BUFF 2SC1947
X3
X2
1/10 SN7490
OSC SN7400
10.000 MHz
TA7060
MIX 2SC1947
MIX 3SK40
TRIP 2SC1947
TRIP 2SC1947
OSC 2SC1947
11.344 MHz
X5
X6
OSC 2SC839
DOUBLE 2SC839
DOUBLE 2SC839
11.000 MHz
BUFF 2SC839
BUFF 2SK19
X4
DSC 3SK40
11.000 ~ 11.500 MHz
LED MHz
SN7447
SN7447
LED 100 kHz
LED 10 kHz
X15
X11
BUFF 2SC1947
OSC 2SC839
16.445 MHz
MIX 3SK40
FIL
FIL
RF 3SK40
RF 2SK19
BPF
MIX 3SK40
X'tal FIL
IF 3SK40
NB SW 1S1588 ×2
RF GAIN
NB AMP TA7060
DC AMP 2SK30
S METER
DETECTOR 1N60P ×3
NOISE 2SC838
NOISE 2SC838
AFB 2SC839
SQUELCH
IF 2SC839
IF 2SC839
IF 2SC839
IF 2SC839
IF 2SC839
DET 1N60 ×2
AF 2SC839
AF GAIN
X18
DC AMP 2SK19 ×2
CENTER METER
IF 2SC839
X'tal FIL
IF 2SC839
IF 2SC839
IF 2SC839
BM
AF 2SC839
AF 2SC839
BM
AF 2SC839
A
AGC 2SC838
AGC NLC 2SC838
DC AMP 2SC839
DC AMP 2SC839
C
S METER
DC AMP 2SD291
DC AMP 2SC839
10.3015 MHz
10.0965 MHz
OSC 2SC838
BUFF 2SC838
X13
BUFF 2SC839
X12
DC 13.8V
AC 100V (50/60Hz)
13.6V
9V
7V
6V
5V
AVR

X-9,5,7


X-3
X-1
X-2
X-8
X-7
X-4
X-5
X-9
X-18
X-6
X-10
X-17
X-16
X-11
X-12
X-13
X-14
RX BOOST
RX CONV
RX ANT
OSCAR UNIT
ACC 2
ACC 3
MIC
CENTER METER
S METER
PHONE
EXT. SP
SP.
FAN
SQUELCH
AF GAIN
RF GAIN
MODE
S2-1-6
SELECTOR
S3-1-6
SYNTHE-MHz
S4-1-6
VFO-MHz
S7-1-9
KLM MULTI-2700


X-3
X-1
X-2
X-8
X-7
X-4
X-5
X-18
X-6
X-9
X-10
X-17
X-16
X-14
X-11
X-12
X-13
TR1,2,3: 2SC1047
TR1,2: 2SC839
TR4,5: 3SK40
TR6:2SC763
TR7: 2SC741
TR1,9,10: 2SC945L TR5,6,7: 2SK19 (G.R)
TR2,3,4,8: 2SC839E
TR1,2,5 2SC839F
TR3 3SK40
TR4 2SC1047
TR1,3,5 2SC1509
TR2,4: 2SC839
TR6: 2SA777
TR1,2,3,4 2SC839E
TR5 2SK19 GR
TR6 2SC1509
TR1,3,5: 3SK40L.K
TR4,9,10,11,12,13,14,15,16,17 2SC839F
TR6 2SK30 O
TR7 2SC839E
TR8 3SK 40M
TRI,2 2SC839F
TR1,2,3 2SC839E
SN7400 SN7480 SN7490 SN7490
MC4044
MC 4016
MC 1648
IC1 TA7060
D1~15 : IS1588 or IS1555
D1~10: IS1588
D1~D23
D1,2,3,4 IS1588
D5,6 N60
D7,8: 2SK19
D15~18: 1N60
D19~22: 1N60
D1,2,3,4,5,6,7,8,10,11 12,13 : 2SC839F
TR14 2SC945L
TR9 2SD261
D3,4,9,10,11,15,16,17,18 : 1N60
D1,2,5,6,7,8,12,13,14,19,20: IS1586
D6: IS2688
D7,8:IS2094
D9 IS990
D1,2,3,4,5 : IS1555 or IS1588
D5: MZ 310
D6,7,8:IS1589
D10: SR1K-2
D11,12: GP25AGI
TX
RX
VOX SW
MIC
CENTER METER
S METER
SQUELCH
FAN
SP.
OSCAR UNIT
OSCAR
ACC 1
ACC 2
RX BOOST
RX CONV.
RX ANT.
2m ANT.
TO X-11
MODE
S2-1~6
SELECTOR
S3-1~6
SYNTHE~MHz
S4-1~6
VFO~MHz
S7-1~9
KLM MULTI-2700