THE

RME VHF-152A

RADIO FREQUENCY CONVERTER

OPERATING and SERVICE MANUAL

RADIO MFG. ENGINEERS, INC.
PEORIA 6, ILLINOIS

TABLE OF CONTENTS

Paragraph		Title	Page
	Section I	General Description	
1.1		Introduction	1
1.2		Specifications	1
1.3		Tube Complement	1
	Section II	Installation	
2.1		Inspection	2
2.2		External Connections	2
2.3		Precautions	2
2.4		Antennas	2
	Section III	Operation and Circuit Details	
3.1		Introduction	3
3.2		Line Switch	3
3.3		Changeover Switch	4
3.4		Band Switch	4
3.5		RF Stage Peaking	4
3.6		IF Stage Peaking	4
	Section IV	Maintenance and Service	
4.1		Introduction	4
4.2		IF Coil Alignment	5
4.3		Calibration	5
4.4		RF Alignment	6
4.5		Voltage Chart	6
4.6		Parts List	7
	Section V	Figures and Illustrations	
5.1		Front View (Figure I)	8
5.2		Rear View (Figure II)	8
5.3		Top View (Figure III)	9
5.4		Bottom View (Figure IV)	9
5.5		Bottom View (Figure V)	10
5.6		Antenna Diagrams	11
5.7		Schematic	12

SECTION I

General Description

1.1 Introduction

The VHF-152A Frequency Converter has been designed for use with a conventional communication type receiver to extend its range to cover the 11, 10, 6 and 2 meter amateur bands. The unit consists of an RF amplifier, a mixer, and a high frequency oscillator. The function of the unit is to convert the very high frequencies received by it to a new fixed frequency of 7 megacycles which is fed to the receiver and amplified and detected in the normal manner. This system of receiving may be described as a double heterodyne system. Its advantages are: high image rejection, since the image is 14 megacycles from the signal; and high selectivity which is provided by the selective low frequency intermediate frequency amplifier of the receiver. The auxiliary controls on the receiver, such as the beat frequency oscillator, the noise limiter, and RF and audio gain controls, function in the normal manner, as does the signal strength meter if the receiver is equipped with one. The RME-45 and RME-84 Receivers are admirably suited for use with the VHF-152A Converter.

1.2 Specifications

Power Supply: 115 volts, 50-60 cycles, single phase*
Power Consumption: 40 watts at 115 volts
Output Frequency: 7 mc (7000 kc) (Nominal)
Overall Cabinet Dimensions: Length 12 inches Width 11 inches Depth 11 inches
Weight: 19.5 pounds
Frequency Range: 27.0 - 29.8 mc
49.5 - 54.2 mc
143.8 -148.2 mc

*NOTE: On special order the VHF-152A may be obtained with a special power transformer suitable for operation on 115-230 volts 25-60 cycles.

1.3 Tube Complement

	Type	Use	Schematic Symbol
1.	6AK5	RF Amplifier	VT-1
2.	6J6	Mixer-Oscillator	VT-2
3.	VR150	Voltage Regulator	VT-3
4.	5Y3G	Rectifier	VT-4

SECTION II

Installation

2.1 Inspection

The VHF-152A Converter should be carefully checked on receipt for any mechanical damage that may have resulted in transit. If any such damage is found, a claim should be filed with the carrier. No claim can be filed at the shipping point and Radio Mfg. Engineers, Inc, cannot be responsible for any damage incurred while in the hands of the carrier.

2.2 External Connections

To place the VHF-152A in operation the line cord should be plugged into a suitable power source. The standard model is designed for operation on 110-120 volt 50-60 cycle AC line only. Use of the VHF-152A on any other voltage or frequency may result in damage.

The output cable (Fig. 2) should be connected to the antenna terminal of the receiver. The cable has two shielded leads and a ground lead each ending in a terminal lug. On receivers which have provision for doublet operation, such as the RME-45 and the RME-84, the blue coded lead must be connected to the antenna terminal farthest from the ground terminal. This is the hot side of the converter output. The red lead, or low side, must be connected to the antenna terminal nearest to the ground terminal. The ground braid should be connected to the receiver ground. On receivers not equipped for doublet operation, the blue lead should be connected to the antenna terminal and the red and ground (shield) leads should be connected to the receiver ground. This lead is coded white. Unless the above instructions are followed, the changeover switch (Par. 3.3) will not operate properly.

If an RME-DB-20 Preselector is used ahead of the receiver, the connections will be made as above except that the converter output cable connects in the same manner to the DB-20 antenna terminals instead of to the receiver.

2.3 Precautions

IMPORTANT - Attempted operation of the VHF-152A on any voltage or frequency other than that for which it is designed will result in damage to the unit. The operator must be sure that the supply is correct before plugging in the converter.

2.4 Antennas

On frequencies of 30 megacycles and above, the use of a resonant antenna is mandatory. For this reason the VHF-152A is provided with separate antenna.

connection for each frequency band. On the terminal strip on the rear apron (Fig. 2) are four sets of two terminals each. These terminals are marked "2" for the 144-148 mc band: "6" for the 50-54 mc band, and "10" for the 27-29.7 mc band. The input impedance for each band has been designed to be 300 ohms so that the owner may make use of the 300 ohm twin lead line now available. The remaining set of two terminals marked "LF" are for connecting the low frequency antenna used with the receiver. This pair of terminals is connected through to the receiver when the antenna changeover switch (Par. 3.3) is turned to "OUT". For information regarding antenna design and dimensions reference should be made to the ARRL Amateur Handbook, available at all Radio Supply Stores.

SECTION III

Operation and Circuit Details

3.1 Introduction

The VHF-152A operates in conjunction with a communication type receiver tuned to approximately 7 mc. The accuracy of setting the receiver will effect the accuracy of calibration of the VHF-152A by the same amount. That is to say if the low frequency receiver is off 100 kilocycles, the calibration of the VHF-152A will also be off by 100 kilocycles. It should be noted that the operator is not bound to use the output frequency of exactly 7.0 mc. If interference is encountered he may move the receiver tuning slightly to a clear channel. realizing that the VHF-152A calibration will change by the same amount the low frequency receiver was moved. If it is necessary to move the receiver frequency so far that the calibration is affected, he may recalibrate by following instructions in Section IV. It is not recommended that the output frequency be moved more than 50 kc higher or lower than 7.0 mc because of tracking troubles that may be encountered. In the factory the I.F. is left aligned at 6950 kc.

In double heterodyne receiving systems spurious signals may be received which are harmonics of the receiver local oscillator. On the VHF-152 two such signals may be received. One signal will be heard at 29.8 mc, which is outside the 27-29.7 mc band. Another may be heard at 52.2 mc. If it is found that this spurious signal falls on a real signal which is desired, the spurious signal may be moved by changing the receiver tuning slightly.

3.2 Line Switch

The equipment is turned on by means of the line switch on the right hand side of the control panel (Fig. 1).

3.3 Changeover Switch

On the left side of the control panel (Fig. 1) is the changeover switch. When this switch is turned to "IN", the output of the VHF-152A is fed to the receiver input terminals. At the same time the low frequency antenna terminals are grounded to prevent 7 mc signals from feeding through the VHF-152A to the receiver. When the changeover switch is turned to "OUT" the output of the VHF-152A is grounded and the low frequency "LF" (Fig. 2) antenna terminals are connected through to the receiver. Thus by turning the changeover switch to "OUT" the receiver functions normally.

3.4 Band Switch

In the center of the control panel (Fig. 1) is the band change switch. This switch has three positions marked: 144-148, 50-54, and 27-29.7, and is used to switch the VHF-152A to the desired range.

3.5 RF Stage Peaking

When the VHF-152A leaves the factory, the stages are peaked to maximum sensitivity. It may be found that some antennas may reflect a reactance into the RF stage that will detune it slightly. With the antenna for a certain band connected the RF padder for that band may be peaked up by listening to a signal. Figure IV shows the location of the RF padders for each band. To get at the padders it is necessary to remove the bottom cover plate.

3.6 IF Stage Peaking

The IF transformer on the VHF-152A (Fig. 3) is peaked at the factory at 6.95 mc. Different receivers connected to the output may change this tuning slightly. The owner should check the peaking of this transformer with the receiver connected. Peaking is accomplished by turning the screw on the top of the can. The screw should be adjusted for maximum gain as indicated by a received signal or maximum background noise if a signal is not available.

SECTION IV

Maintenance and Service

4.1 Introduction

No maintenance of importance is required on the VHF-152A. It is suggested that dust that may accumulate in the cabinet be blown out periodically.

The owner may, if he has an accurate signal source available, recalibrate his converter as discussed in succeeding paragraphs. It should be born in mind that the calibration of the converter is affected by the setting of the companion receiver (Par. 3.1). Therefore, before attempting to recalibrate the converter, the calibration of the receiver should be checked.

The VHF-152A will drift somewhat during the first three minutes after being turned on and to a much less extent during the next ten or twenty minutes. It is recommended that no attempt be made to recalibrate or align the equipment until it has reached a stable temperature.

All calibrating and alignment should be done with the receiver connected and the changeover switch (Par. 3.3) in the "IN" position.

If the receiver has a carrier level meter such as is on the RME-45, this meter is used as a tuning indicator when peaking the circuits. If the receiver is not equipped with a meter, it will be necessary to connect an audio output meter to the receiver for a tuning indicator. When using an audio output meter, it is necessary to remove the AVC from the receiver.

4.2 IF Coil Alignment

As pointed out in Paragraph 3.1, the VHF-152A is calibrated and aligned for an output frequency of 6.95 mc. The output tuning is controlled by the screw on the top of the aluminum can on the top of the chassis (Fig. 3). The transformer may be peaked with a 6.95 mc signal fed into the mixer grid or with a signal tuned in on the converter. Connection to the mixer grid is most easily made on the stator of the center section of the tuning condenser. In either case, the transformer is adjusted to maximum sensitivity as indicated by the meter on the receiver.

4.3 Calibration

Calibration of the VHF-152A should not be attempted unless it is definitely established that the calibration is off.

Calibration is controlled by the oscillator padders (Fig. 4). These padders are made accessible by removal of the cabinet botton plate. Beneath this plate is a second aluminum plate in which are padder access holes. All calibrating and aligning should be done with this cover on, the proper padder for each band may be determined by referring to Figure IV.

High beat is used on all bands. That is to say, the oscillator is always 7 mc (approximately) above the received signal. As in the case of all super heterodyne receivers, if sufficient input is used each signal may be received at two points differing by twice the IF frequency. With a signal being received, the padder setting that gives the highest oscillator frequency is the proper setting.

The two low frequency ranges have iron core oscillator coils. The screws for adjusting the inductance of these coils is accessible on the top of the chassis. Unless the screws have been disturbed, adjustment should never be necessary.

4.4 RF Alignment

When the calibration is correct, the RF circuits should be aligned. Figure 4 shows the location of the RF amplifier and mixer grid padders for each band. Each of these padders should be adjusted for maximum sensitivity as indicated by the meter on the receiver.

When using a signal generator in aligning the VHF-152A a 300 ohm resistor should be inserted between the signal generator and the antenna terminals in order that the low impedance of the signal generator will not swamp the RF circuit and cause a misalignment of this circuit. Best results will be obtained when the RF circuit is aligned with the antenna connected. See paragraph 3.5.

4.5 Voltage Charts

As an aid in trouble shooting on the VHF-152A the following chart of voltages at various points in the circuit is tabulated below. Voltage readings should be made with a voltmeter of at least 2000 ohms per volt resistance. Variation of ±15% may be expected. All voltages are measured from the point indicated to ground unless otherwise indicated.

Circuit	Volts
RF Plate	170
RF Screen	115
RF Cathode	2.0
Mixer Plate	150
Osc. Mixer Cathode	5
Osc. Plate	60 (From cold side of choke)
Osc. Grid*	-3.0 (2 Meters), -4.7 (6 Meters), -5.5 (10 Meters)

* Note: Measured between Osc. grid and cathode with a 2.5 mh choke in series with voltmeter lead to grid.

VHF-152A PARTS LIST

Dwg. B-282
Rev. 042147

No.	Component
RESISTORS	
1.1	22 ohm 1/2 watt ±20% carbon
1.2	220 ohm 1/2 watt ±10% carbon
1.3	15K ohm 1/2 watt ±10% carbon
1.4	18K ohm 2 watt ±10% carbon
1.5	55 ohm 1/2 watt ±20% carbon
1.6	1000 ohm 1/2 watt ±10% carbon
1.7	4.7K ohm 1/2 watt ±10% carbon
1.8	18 K ohm 2 watt ±10% carbon
1.9	3.5K ohm 10 watt-wire wound
CAPACITORS	
2.1	30 μμfd. Mica Padder
2.2	10 μμfd. Mica Padder
2.3	10 μμfd. Mica Padder
2.4	15 μμfd. Ceramic ±5%
2.5	Tuning Condenser R.F. Section
2.6	Tuning Condenser Mixer Section
2.7	Tuning Condenser Oscillator Section
2.8	2000 μμfd. 20% Mica
2.9	1000 μμfd. 20% 500 volt
2.10	15 μμfd. 5% Ceramic
2.11	30 μμfd. Mica Padder
2.12	10 μμfd. Mica Padder
2.13	10 μμfd. Mica Padder
2.14	100 μμfd. ±10% Ceramic
2.15	1.5 μμfd. ±.25 μμfd. Ceramic
2.16	1000 μμfd. ±20% Mica
2.17	25 μμfd. ±10% Ceramic
2.18	.01 μfd. 600 volt paper
2.19	100 μμfd. Mica Padder
2.20	1000 μμfd. 500 V. Mica
2.21	1000 μμfd. 20% 500 volt
2.22	1000 μμfd. 20%
2.23	25 μμfd. 10% Ceramic Neg. Temp. Coeff.
2.24	25 μμfd. 10% Ceramic Neg. Temp. Coeff.
2.25	3-13 μμfd. Ceramic Padder Neg. Temp. Coeff.
2.26	4-25 μμfd. Ceramic Padder Neg. Temp. Coeff.
2.27	4-25 μμfd. Ceramic Padder Neg. Temp. Coeff.
2.28	3-13 μμfd. Ceramic Padder Neg. Temp. Coeff.
2.29	25 μμfd. Ceramic Padder Neg. Temp. Coeff.
2.30	10 μfd. Electrolytic 450 volt
2.31	10 μfd. Electrolytic 450 volt
SWITCHES	
3.1	R.F. Switch Section, Ceramic
3.2	R.F. Switch Section, Ceramic
3.3	Mixer Switch Section, Ceramic
3.4	Mixer Switch Section, Ceramic
3.5	Oscillator Switch Section, Ceramic
3.6	Oscillator Switch Section, Ceramic
3.7	AC Line Switch SPST
3.8	Changeover Switch 4PDT

No.	Component
COILS	
4.1	2 Meter R.F. Coil
4.2	10 Meter R.F. Coil
4.3	6 Meter R.F. Coil
4.4	2 Meter Mixer Coil
4.5	10 Meter Mixer Coil
4.6	6 Meter Mixer Coil
4.7	2 Meter Oscillator Coil
4.8	10 Meter Oscillator Coil
4.9	6 Meter Oscillator Coil.
4.10	Oscillator Plate Choke
4.11	Power Supply Filter Choke
4.12	7 mc I.F. Coil
TRANSFORMERS	
5.1	7 mc I.F. Transformer
5.2	Power Transformer

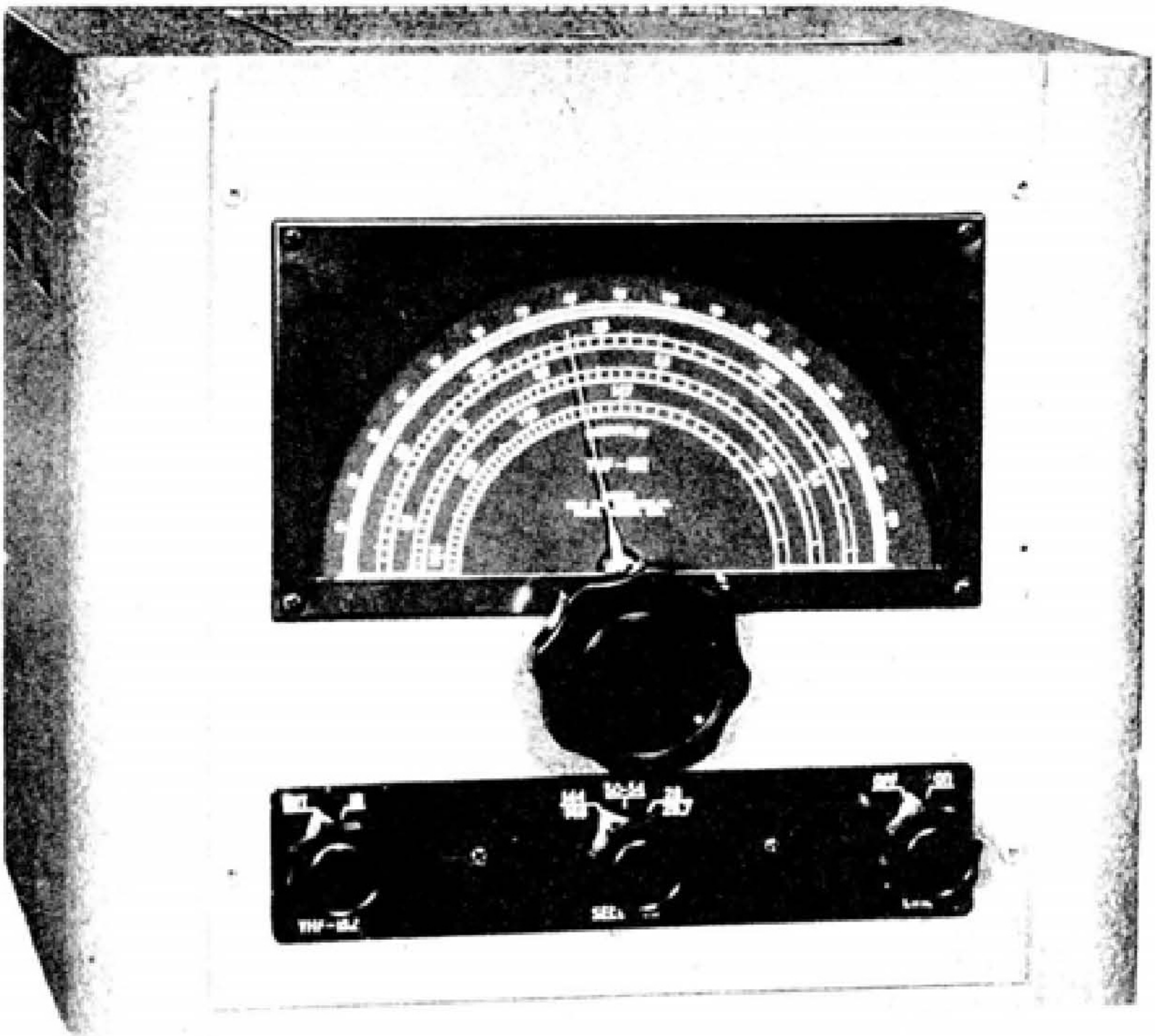


FIG. 1

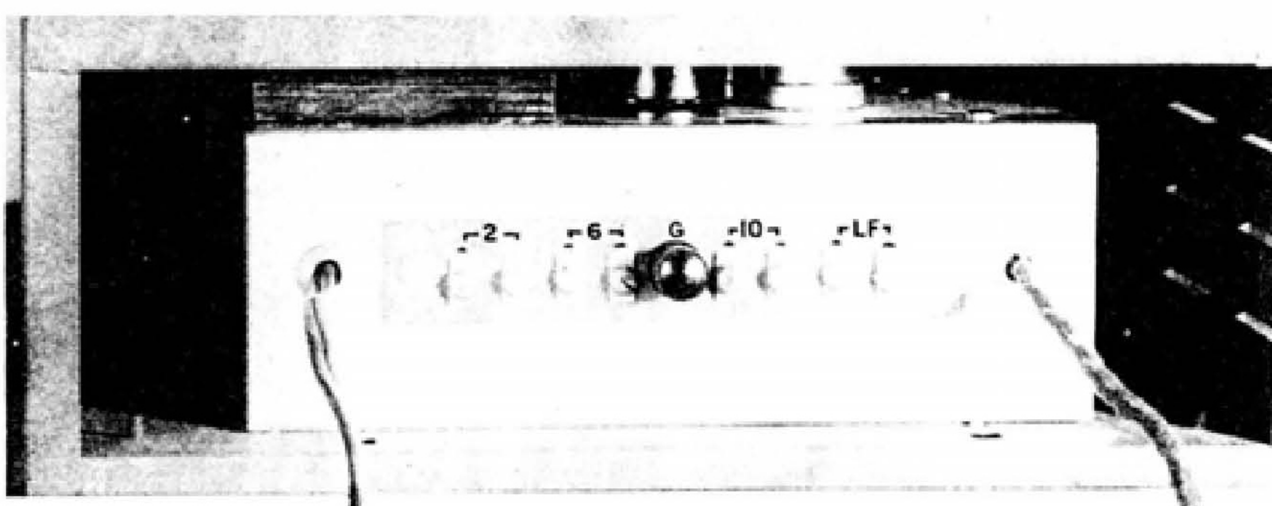


FIG. - 2

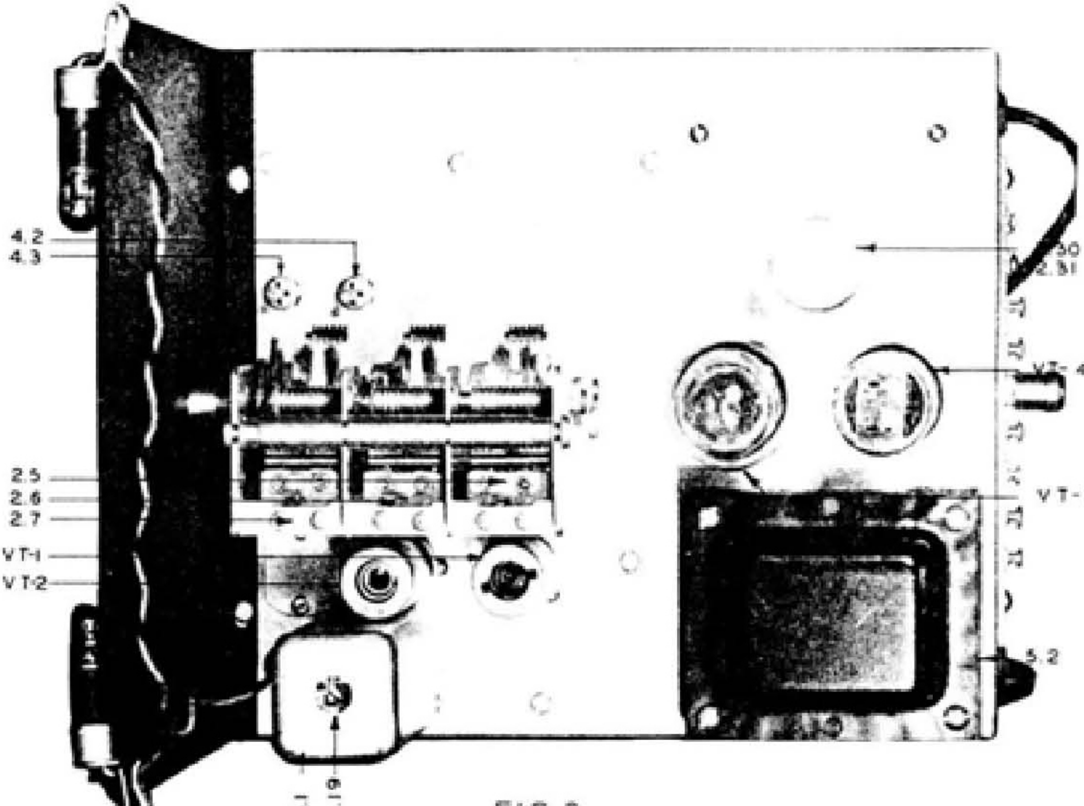

4.2
4.3
2.5
2.6
2.7
VT-1
VT-2
5.1
2.19
2.51
VT-4
VT-3
5.2

FIG. 3

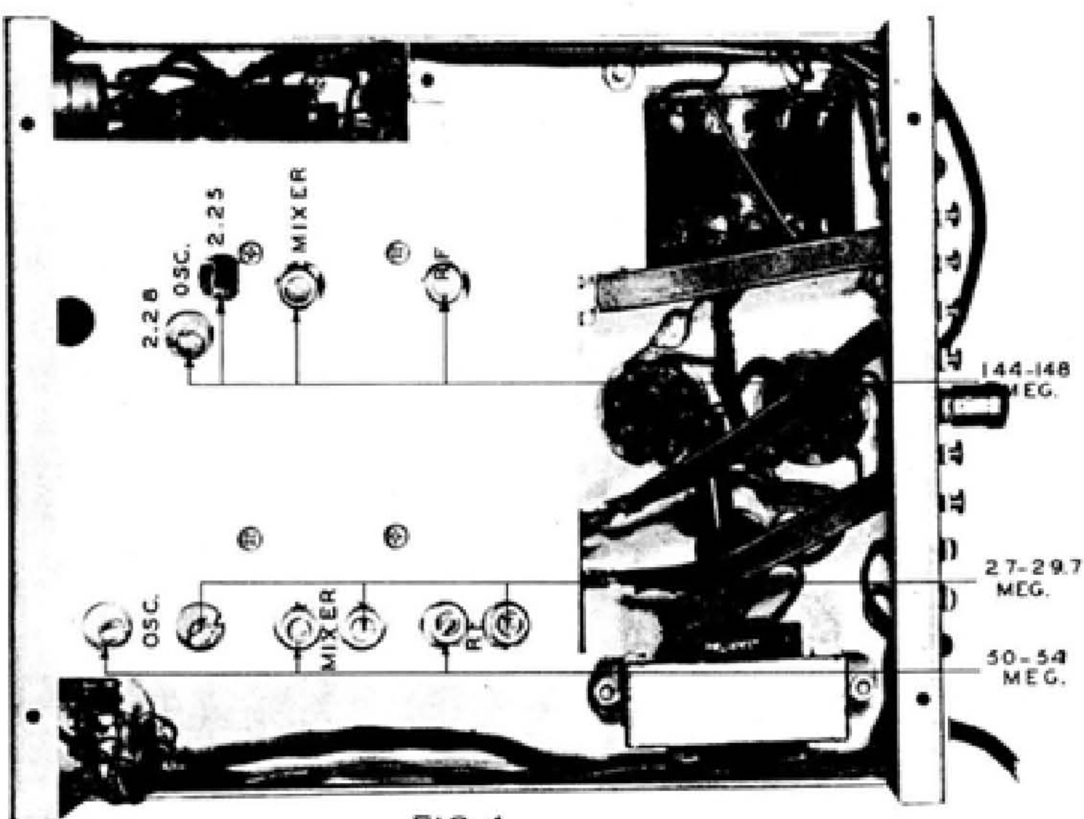

2.28
OSC.
2.25
MIXER
RF
144-148
MEG.
OSC.
MIXER
RF
27-29.7
MEG.
50-54
MEG.

FIG. 4

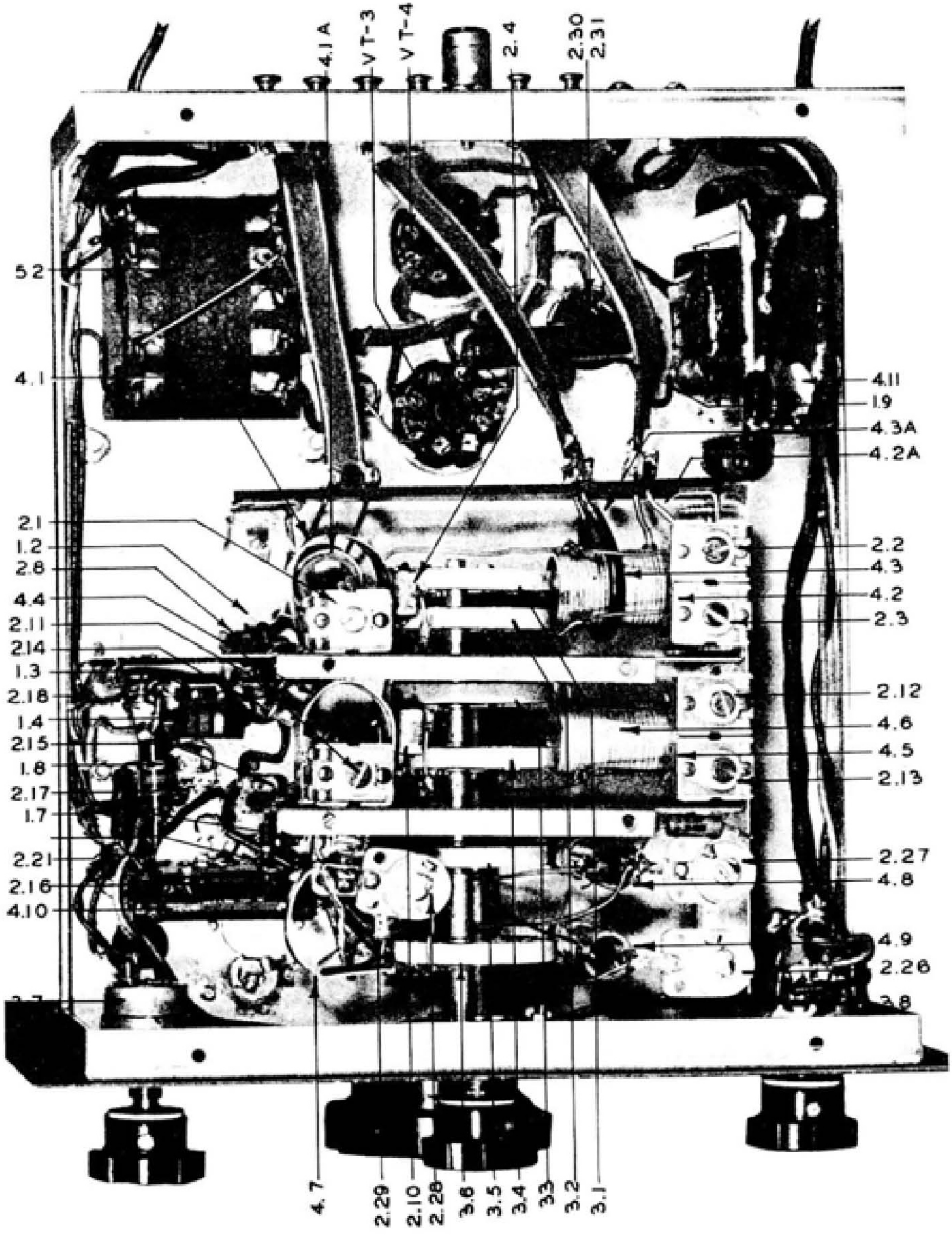
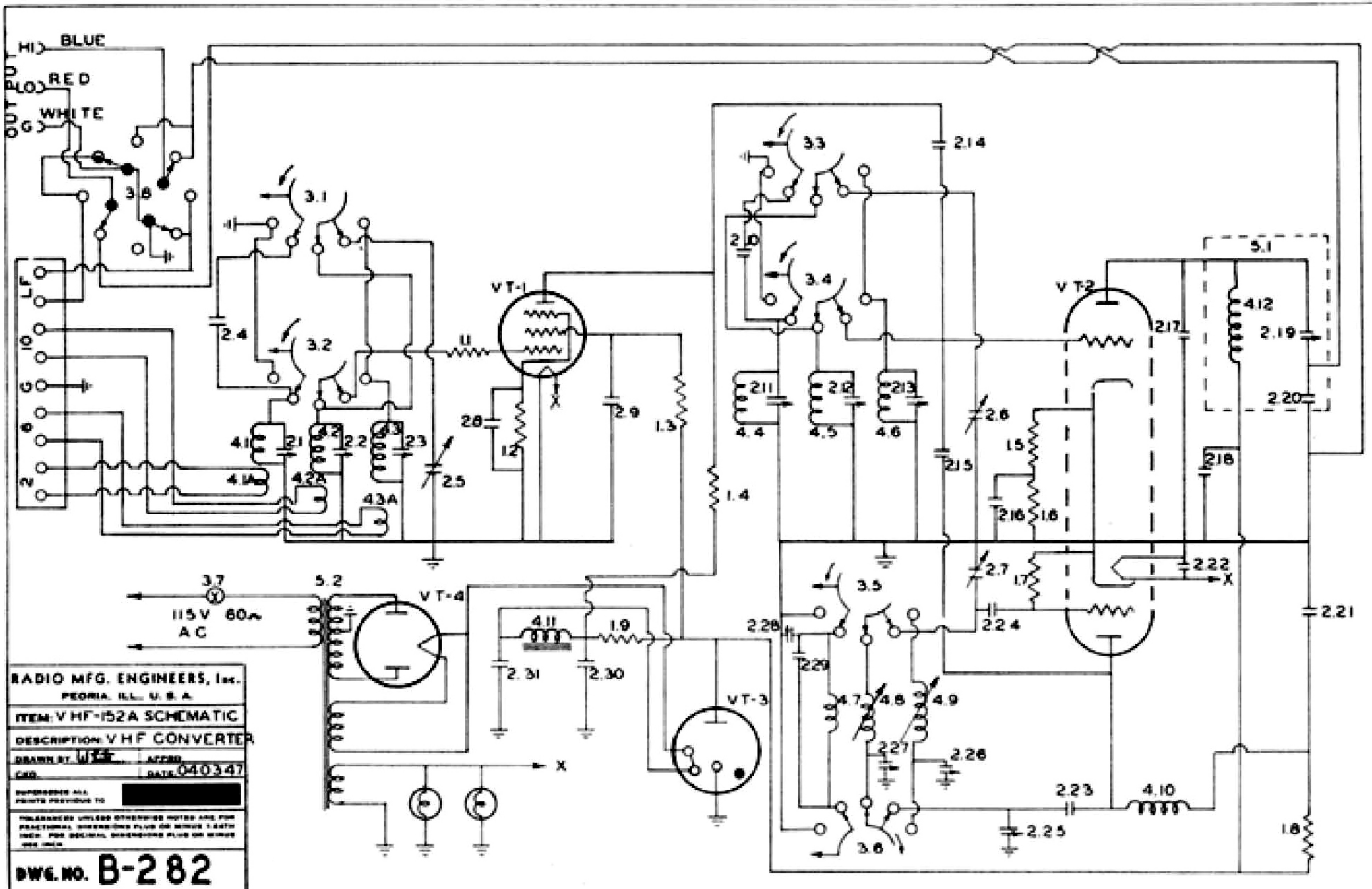

4.1A
VT-3
VT-4
2.4
2.30
2.31
5.2
4.1
4.11
1.9
4.3A
4.2A
2.1
1.2
2.8
4.4
2.11
2.14
1.3
2.18
1.4
2.15
1.8
2.17
1.7
2.21
2.16
4.10
2.2
4.3
4.2
2.3
2.12
4.6
4.5
2.13
2.27
4.8
4.9
2.26
3.8
4.7
2.29
2.10
2.28
3.6
3.5
3.4
33
3.2
3.1

FIG. 5



RADIO MFG. ENGINEERS, Inc.
PEORIA, ILL., U. S. A.

ITEM: VHF-152A SCHEMATIC

DESCRIPTION: VHF CONVERTER

DRAWN BY: WEE APPRD.

CKD. DATE: 040347

SUPERSEDES ALL PRINTS PREVIOUS TO [redacted]

DWG. NO. B-282