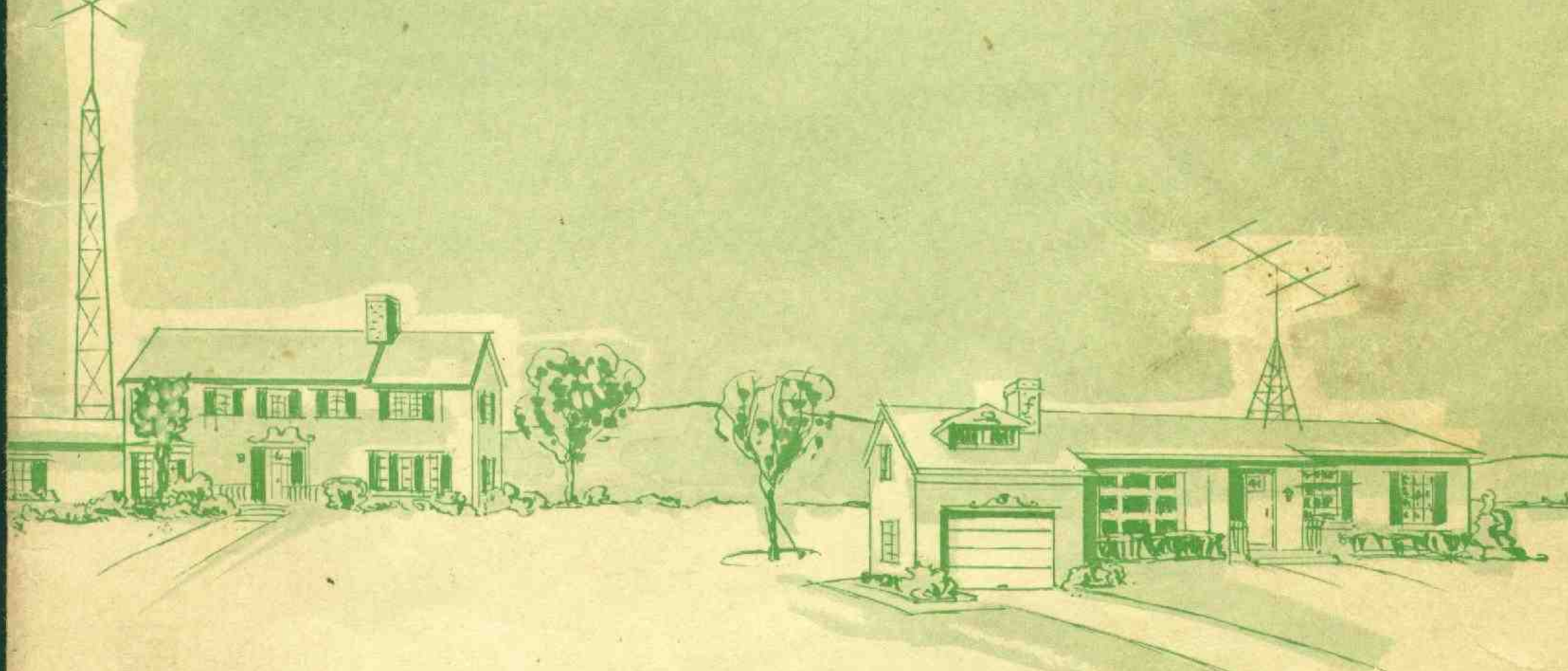
INSTRUCTION BOOK

and

OPERATING MANUAL

Amateur Trans-citer

MODEL AF.68



MULTI-ELMAC

MULTI-PRODUCTS COMPANY
OAK PARK 37, MICHIGAN

SAFETY NOTICE

Equipment is so designed that when all covers are in place there is no shock hazard. Do not leave the equipment unattended with any of the covers removed.

Maintenance and operating personnel must at all times observe all safety precautions. Under certain conditions, dangerous voltages may exist with the power turned off, due to capacitors retaining a charge. To avoid casualties, always remove the power and discharge or ground all circuits prior to touching them or removing components.

Maintenance personnel should familiarize themselves with the technique of resuscitation found in any First Aid manual.

Amateur Trans-citer

MODEL AF-68

MULTI-PRODUCTS COMPANY

Manufacturer of

MULTI-ELMAC

RADIO COMMUNICATIONS

AND CONTROL EQUIPMENT

21470 COOLIDGE HIGHWAY **OAK PARK 37, MICH.**

Form No. M-158

Instruction Manual

FOR

MULTI-ELMAC TRANS-CITER – MODEL AF-68

SECTION 1 — Description

SECTION 2 — Installation and Operation

SECTION 3 — Service and Alignment

SECTION 4 — Appendix

SECTION 1

Description

1.1 GENERAL. The MULTI-ELMAC AF-68 Trans-citer is a 9 tube variable frequency or crystal controlled six band transmitter or exciter. All circuits are simultaneously switched to the desired band by a single bandswitch control.

Designed as a complete transmitter for mobile or fixed installations, or an exciter to drive a higher power transmitter. When used as an exciter the 500 ohm tap on modulation transformer can be used to drive the higher power modulator.

1.2 NOVICE CLASS OPERATION. The AF-68 Trans-citer is ideally suited for novice operation. With the two (2) crystal positions, crystal controlled operation is afforded and the power capabilities are within the legal limits required by novice regulations. Provision for CW keying is included.

1.3 TECHNICAN CLASS OPERATION. With the inclusion of the 6 meter band, a highly stable VFO and full carrier amplitude modulation, the AF-68 is ideally suited for the Technician.

1.4 DIMENSIONS. The maximum external dimensions of the AF-68 Trans-citer, excluding projections of control knobs, is 13-1/2 inches wide, 6-1/2 inches high, and 7-1/2 inches deep behind panel. Approximate weight is 17 pounds.

1.5 CIRCUIT DESCRIPTION. The AF-68 Trans-citer employs a variable frequency oscillator with output on either 3.5 to 4 Mc., 7 to 7.5 Mc. or 12.5 to 13.5 Mc. In addition to the VFO feature, two crystal positions are included for operation on two spot frequencies. Any crystal that will work straight through, double, triple or quadruple to the desired frequency may be used. The oscillator circuit employs a voltage regulator tube to maintain the plate voltage at a constant level.

The multiplier stages are broad tuned with a front panel control for peaking the final grid, insuring best performance on all bands. The audio circuit is designed to use either a carbon microphone or a low output microphone such as a crystal or dynamic. A slide switch on the AF-68 Trans-citer sets up the circuit for use with either type of microphone. The variable frequency oscillator dial and the meter scale is illuminated. The variable frequency oscillator dial scale is directly calibrated in megacycles for each of the amateur bands.

1.6 FREQUENCY COVERAGE.

80 Meter Band	3.5	to 4	mc.
40 Meter Band	7	to 7.3	mc.
20 Meter Band	14	to 14.35	mc.
15 Meter Band	21	to 21.45	mc.
10 Meter Band	28	to 29.7	mc.
6 Meter Band	50	to 54	mc.

American phone band segments are marked by a solid line on the VFO dial.

1.7 TUBE COMPLEMENT. The AF-68 Trans-citer is supplied complete with all tubes, tested in the individual unit, as follows:

6AK6		Oscillator
6AG5		Buffer-multiplier
6AQ5		R.F. Driver
6146		Final R.F. Amplifier
6AU6		Speech amplifier
12AU7		A.F. Driver
6L6GB	(2)	P.P. Modulators
#44	(2)	Pilot bulbs
#C6		Meter pilot bulb

1.8 OUTPUT. The AF-68 Trans-citer is designed for use with a resonant antenna coupled to its output with a transmission line of 50 to 300 ohms impedance. Other impedance or balanced lines can be coupled through the use of an antenna tuning device. When used as an exciter the coupling link of the high powered final can be directly connected to the AF-68 with a suitable length of coaxial cable. The MULTI-ELMAC AF-68 is designed for a maximum plate power input of 60 (sixty) watts. Maximum ratings for this Trans-citer are 600 volts at 100 milliamperes; or 500 volts at 120 milliamperes. Full 100% modulation occurs when the modulator plate current swings to about 60% of the final plate current with normal voice frequencies.

1.9 AUDIO. The modulation transformer is provided with a 500 ohm output tap brought to the power plug for driving the grids of high powered modulators. The 6L6GB's will deliver approximately 35 watts of audio with a plate supply of 500 volts.

1.10 POWER SUPPLY. The AF-68 Trans-citer was intentionally designed to use an external power supply in order to permit (a) use of PMR-7 receiver power supply to supply the low level stages, (b) use of the AF-68 Trans-citer with an AC operated power supply at a fixed or portable location, (c) use of a dynamotor or vibrator supply in mobile installations, or (d) use of the Trans-citer as a driver-exciter for high powered transmitters. A suitable MULTI-ELMAC power supply MODEL PS-2V or M1070, M1071 for portable or fixed station operation from 115 volt AC lines is available.

1.11 POWER CONNECTOR. A 15 prong female connector is provided with each unit. The 15 prong connector allows all circuits to be arranged for maximum flexibility, making it possible to use the AF-68 Trans-citer in various types of installations.

1.12 ACCESSORIES. The following accessories are available for use with the AF-68 Trans-citer:

PS-2V -- A universal 115 volt AC supply. (Supplies 6 or 12 volts for filaments and two separate high voltages.)

M1070 -- A universal 6 or 12 volt DC and 115 volt AC power supply. (Supplies filament voltage, one low voltage regulated source and two separate high voltages.)

M1071 -- Same as M1070 but sold in kit form.

CFS-1 -- Cable with a 15 prong female connector and fanning strip to connect the AF-68 to the PS-2V power supply.

NOTE: Due to different requirements, for individual installations, no cable for the M1070 (or M1071) power supply is available from the factory.

SECTION 2

Installation and Operation

2.1 GENERAL CONSIDERATIONS. No two installations being similar, the individual owner of the AF-68 Trans-citer will vary his installation according to space and operating practices. Regardless of these variations whenever the Trans-citer is installed in a mobile unit, there are two essentials that must be observed for proper installation: (1) convenient location for operation, including ease of observation; (2) rigid mechanical mounting. The owner desiring to use the AF-68 as an exciter for higher powered equipment will have his own methods, etc. The usual standard practices for fixed or portable installations will suffice.

2.2 MOUNTING METHODS. The construction of the cabinet of the AF-68 Trans-citer is such that it is readily adaptable to a hanging mount from the lower edge of the car dash board; or a fixed bottom bracket to the floor of the car. A brace to the fire wall will help make a more rigid installation. The AF-68 cabinet is equipped with felt feet for desk-top mounting in fixed or portable installations.

2.3 ANTENNA. The MULTI-ELMAC AF-68 Trans-citer will perform most efficiently when coupled to an antenna resonated to the desired operating frequency. Standard practices should be used for antenna relay control. Typical mobile circuits are shown on drawing #219, page 21, of this manual. The coaxial output connector serves as an output terminal for the transmission line. Coaxial connectors allow the installation of low-pass filters between the Trans-citer and the antenna or antenna tuners. The type of antenna depends upon the individual's preference. The following types of antennas can be directly fed from the AF-68 without an antenna tuner:

Center fed half-wave dipole
Folded half-wave dipole
Parasitic beams
Vertical quarter-wave ground plane
Base or center-loaded mobile whips
Vertical half-wave dipoles, center fed
Any antenna fed with low impedance untuned line.

Refer to the various handbooks on operating other types of antennas such as long wires, zepp fed, off center fed, lazy H, sterba curtains, phased arrays and the like.

2.4 T.V.I. PRECAUTIONS. The MULTI-ELMAC Trans-citer's circuitry is such that harmonics falling in the TV channels are at a minimum. The power plug leads are by-passed and other critical circuits designed for maximum harmonic attenuation. Under normal operating conditions the usual low-pass filter in the antenna transmission line, a brute-force filter in the AC power line, and a good efficient ground to the Trans-citer cabinet is sufficient to maintain a harmonic attenuation of 100 db down. Adequate shielding of stages and a completely shielded variable frequency oscillater makes this possible.

2.5 POWER SUPPLY REQUIREMENTS. For maximum flexibility the AF-68 Trans-citer power input is arranged for one or two* separate high voltage supplies. Filament input is arranged for either 6 volts @ 5.2 amp. or 12 volts @ 2.6 amp. AC or DC. (Refer to Drawing #219, page 21, for proper connections.) Plate supply required: 500 volts max. @ 160 ma. and 250 volts max. @ 75 ma.

**Any single high voltage supply may be used with a dropping resistor as determined from the graph on page 14 of this manual. Any supply delivering 350 to 500 volts @ 235 ma. plus the proper filament voltage will suffice.*

For mobile operation the power supply of the PMR-7 receiver may be used for the 250 volt supply and the usual dynamotor for the higher voltage supply. By using the receiver power supply for the low level stages the drain on the dynamotor is minimized resulting in more efficient dynamotor operation. More high voltage at a lower battery drain will be realized. Refer to drawing #219, page 21, for typical circuits.

2.6 CONTROLS. Sufficient controls have been incorporated for maximum flexibility, at the same time keeping operation simple. (See drawing #654, page 17.)

Bandswitch . . . . . Switches all circuits to the desired amateur band simultaneously.

Meter switch . . . . . A 6 position meter function switch.
1. Final grid current, Final off.
2. Final grid current, Final on.
3. Final plate voltage, Final on.
4. Not used. Final on.
5. Modulator plate current, Final on.
6. Final plate current, Final on.

Load control . . . . . Controls final load to antenna.

Plate tuning . . . . . Resonates final tank circuit.

Grid tuning . . . . . Tunes final grid.

Power "on-off" switch . . . Turns filaments on or off in a mobile installation, also controls primary power in an AC installation.

VFO switch . . . . . Connects VFO to receiver power supply for zero beating a carrier.

Mike jack . . . . . Microphone and push-to-talk circuit connections.

Key jack . . . . . Key connections for CW operation.

Crystal socket . . . . . Will hold two crystals in FT 243 holders (located behind the meter).

VFO-Crystal switch . . . . Selects either variable frequency operation or operation from either of the two crystals inserted in the socket above.

VFO control . . . . . Variable frequency oscillator frequency control. Reads directly in megacycles.

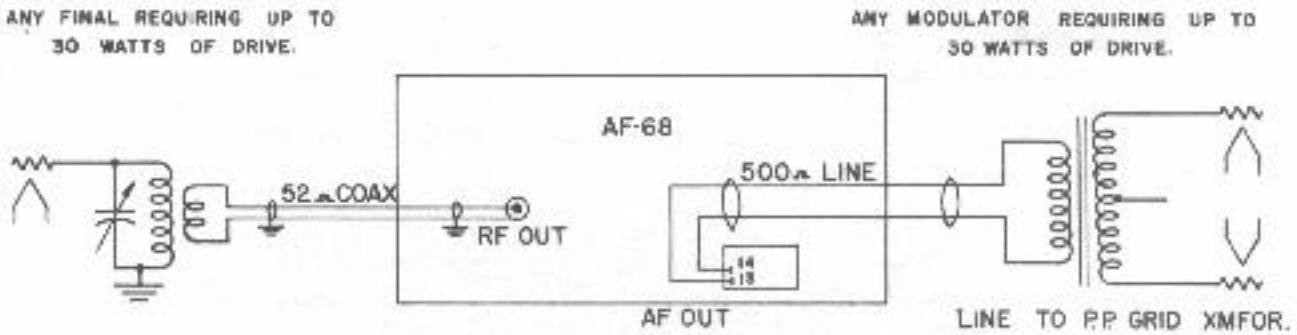
A.F. Gain control . . . . . Controls per-centage of modulation.

AM-CW switch . . . . . Selects either amplitude modulation or A1 emission.

HI-Z or Carbon slide switch . . . . . (On left side of chassis below meter.) High position for crystal or dynamic microphone, low for carbon microphone.

2.7 POWER SUPPLY CONNECTIONS. A 15 prong plug is used for all connections and various possible combinations are diagramed in drawing #219.

2.8 EXCITER. Drawing below shows a method of using the AF-68 Trans-citer as an A.F. and R.F. driver to excite a high power amplifier and modulator. For power plug connections see drawing No. 219, figure 5.



AF-68 USED AS RF EXCITER AND SPEECH AMPLIFIER-DRIVER

SECTION 3

Service and Alignment

3.1 GENERAL. Satisfactory operation of this Trans-citer depends on several factors. Before removing a transmitter which is performing in an unsatisfactory manner, carefully inspect antenna connection, power cables and plugs, the storage battery and its connections (if a vehicular installation), the AC power source (if operated at a fixed location), and the microphone and relay connections. It is an aggravating waste of time and effort to remove and attempt to service a transmitter when the trouble is an external one.

(a) ANTENNA. If the Trans-citer is functioning properly but does not load, look for a broken antenna lead, bad relay contacts or inoperative relay, shorted transmission line or antenna insulator.

(b) LOADING. If a dip in the plate current meter cannot be obtained after several rotations of the plate tunning condenser, with the load control set near minimum, turn the transmitter off and check for an improper output load as outlined under Antenna.

(c) STORAGE BATTERY. Check periodically the terminal voltage, specific gravity, level of electrolyte, and the tightness of connections. Check the battery voltage at the Trans-citer power plug with the Trans-citer operating and drawing full load.

(d) CABLES AND PLUGS. The initial installation should locate all cables and plugs where they will not be exposed to physical shock or subjected to twisting and bending.

(e) TRANSMITTER TESTING. A quick method for checking the transmitter performance is to substitute a 50 watt lamp for the antenna. After the lamp has been connected to the transmitter, either direct or thru the relay, adjust the loading and final controls until the lamp is two thirds normal brilliance. With the audio gain control set normally the bulb should double in brilliance on modulation peaks.

If the lamp loads the transmitter, as outlined above, but the antenna will not load the transmitter it indicates the antenna is not resonate to the frequency of operation or the feedline impedance is incorrect.

NOTE: Never load the AF-68 Trans-citer beyond the point where a dip is no longer indicated by resonance in the final plate current meter. When loading to maximum, adjust the loading control so that approximately a 10% dip can be obtained when the final tuning condenser is rotated through resonance with the load connected.

3.2 TUBES. Even though modern methods produce more reliable tubes than ever, the first source of trouble is likely to be a defective tube. Tube failure will produce low grid drive, low plate current, intermittent operation, or a completely dead transmitter. Where a tube change is made in the R.F. portion of the Trans-citer it should be replaced with the same make of tube. If this is not possible the circuits may have to be realigned according to paragraphs 3.5 and 3.6 of this section.

3.3 CIRCUIT FAILURES. Excluding tubes, the most common source of circuit failure, will invariably be found in the many resistors and capacitors within the Trans-citer. A defective resistor or condenser can usually be found by a point-to-point continuity test, although a careful visual inspection will often show the defective part, such as a charred resistor. The operating voltage chart on page 15 permits a careful check of operating elements. All measurements are taken with the final plate OFF, bandswitch in the 80 meter position, VFO set to 3.8 megacycles, final grid current resonated for maximum grid current, crystal-VFO switch in VFO position, and audio gain control on minimum. A 20,000 ohms per volt meter is used. (DO NOT use a vacuum tube voltmeter since it will read erroneously in an R.F. field.) These measurements were taken using a PS-2V or the M1070 power supply and a line voltage of 117 volts A.C. Any power supply can be used that will give the same high voltage.

3.4 GENERAL ALIGNMENT INSTRUCTIONS. Thoroughly familiarize yourself with the layout of all coils and tuning adjustments as shown on drawing #655, page 19, before beginning an alignment. Check all brass slug adjusting screws to make sure that they are not worn so much that they will not hold their setting. If they are too worn to be serviceable they must be replaced.

Check the pointer to see that it is aligned properly with respect to the stops on the VFO dial.

You will need an accurate receiver and an accurate signal generator and/or crystals to spot the amateur band edges.

An alignment job can never be any better than the equipment with which the Trans-citer was aligned.

3.5 VARIABLE FREQUENCY OSCILLATOR ALIGNMENT.

NOTE: Before the oscillator section is aligned the cover plate must be in position and the retaining screws inserted and tightened.

Turn the meter switch to the left "G" position, final off.

Set bandswitch to the 80 meter position.

Set VFO-crystal switch to the VFO position.
Set the VFO dial to 3.5 megacycles.

Set signal generator at 3.5 megacycles, tune receiver to 3.5 megacycles.
Apply plate power to VFO.
Adjust screw #1 until a beat is obtained at 3.5 Mc.

Set the VFO dial to 4.0 megacycles.
Set signal generator and receiver to 4.0 megacycles.
Adjust trimmer #2 for a beat at 4.0 megacycles.

Readjust at 3.5 megacycles, then again at 4.0 megacycles.

It may take several excursions between 3.5 and 4.0 megacycles before a good alignment is achieved.

Set the bandswitch to the 10 meter position.
Set the VFO dial to 29 megacycles.
Set the signal generator and receiver to 29 megacycles.
Adjust screw #3 until a beat is obtained at 29 megacycles.
The remainder of the 10 meter band should be correct.

Set the bandswitch to the 15 meter band.
Set the VFO dial to 21.45 megacycles.
Set the signal generator and receiver to 21.45 megacycles.
Adjust trimmer #4 for a beat at 21.45 megacycles.
The remainder of the 15 meter band should be correct.

The 40 and 20 meter bands will be correct after the 15 meter band is aligned.

Set the bandswitch to the 6 meter band.
Set the VFO dial to 51 megacycles.
Set the signal generator and receiver to 51 megacycles.
Adjust screw #5 for a beat at 51 megacycles.
The remainder of the 6 meter band should be correct.

3.6 BUFFER—DRIVER ALIGNMENT.

Alignment must be followed in the sequence as outlined below.

NOTE: Before aligning the buffer-driver section a bare metal plate should be inserted under the open side of the chassis. This will give the same effective capacity and shielding as the cabinet.

Set the bandswitch to the 10 meter position.
Set the VFO dial to 28.5 megacycles.
Set the final grid tuning condenser at about the half capacity position.
Adjust screw #6 and #7 for maximum grid drive as shown on the meter.

Set the bandswitch to the 15 meter position.
Set the VFO dial to 21.3 megacycles.
Set the final grid tuning condenser at about the half capacity position.
Adjust screw #8 and #9 for maximum grid drive as shown on the meter.

Set the bandswitch to the 20 meter position.
Set the VFO dial to 14.2 megacycles.
Set the final grid tuning condenser at about the half capacity position.
Adjust screw #10 for maximum grid drive as shown on the meter.

Set the bandswitch to the 40 meter position.
Set the VFO dial to 7.2 megacycles.
Set the final grid tuning condenser at about the half capacity position.
Adjust screw #11 for maximum grid drive shown on the meter.

Set the bandswitch to the 80 meter position.
Set the VFO dial to 3.75 megacycles.
Set the final grid tuning condenser at about the half capacity position.
Adjust screw #12 for maximum grid drive shown on the meter.

Set the bandswitch to the 6 meter position.
Set the VFO dial to 51 megacycles.
Set the final grid tuning condenser at about the half capacity position.
Adjust screw #13 and #14 for maximum grid drive on the meter (adjustments #13 and #14 should peak with the screws extending about 1/2'').

NOTE: When tuning the buffer and driver slugs it is well to use a grid dip meter or wave meter to make sure all the coils are tuned to the proper bands or harmonics.

Alternate method of aligning the 6 meter buffer-doubler.

Set the bandswitch to the 6 meter position.
Set the VFO dial to 51 megacycles.
Rotate the final grid tuning condenser for maximum grid drive on the meter. (Maximum drive should occur about mid-position of the final grid tuning condenser. If not, check L38 the air form four (4) turn coil mounted under the chassis near the bandswitch. Spacing between turns should be approximately 1/16 inch.)
Alternately rotate the final grid tuning condenser and adjust screw #13 and #14 for maximum output as indicated on the meter. (Screw #13 and #14 should peak when extending about 1/2 inch.)

3.7 CRYSTAL CONTROLLED OPERATION. When operating in the crystal controlled position the doubling, tripling or quadrupling is accomplished in the plate circuits of the 6AG5 and 6AQ5 stages. The following chart gives the recommended crystal frequencies for operation within each of the six (6) amateur bands covered by the AF-68 Trans-citer.

Band							
80	1.75	to 2	mc.	or	3.5	to 4	mc.
40	3.5	to 3.65	mc.	or	7	to 7.3	mc.
20	3.5	to 3.587	mc.	or	7	to 7.175	mc.
15	7	to 7.15	mc.				
10	7	to 7.425	mc.				
6	*12.5	to 13.5	mc.	or	8.5	to 9	mc.

NOTE: *12.5 to 13.5 mc. crystals are recommended for 6 meter crystal controlled operation.

NOTE: It is a good policy not to operate too close to the band edges. Since some crystals do deviate slightly from the marked frequency it is wise to choose a crystal within 2 or 3 kilocycles of the band edge.

SECTION 4

Appendix

4.1 PARTS LIST.

R11	47K	ohms	1 watt	10%
R12	47K	ohms	1 watt	10%
R13	1000	ohms	1 watt	10%
R14	22K	ohms	1 watt	10%
R21	33K	ohms	1 watt	10%
R22	180	ohms	1 watt	10%
R23	47K	ohms	1 watt	10%
R24	680	ohms	1/2 watt	10%
R25	270	ohms	1/2 watt	10%
R26	68	ohms	1/2 watt	10%
R27	180	ohms	1 watt	10%
R31	100K	ohms	1 watt	10%
R32	180	ohms	1 watt	10%
R41	27K	ohms	1 watt	10%
R42	270	ohms	1/2 watt	5%
R43	25K	ohms	10 watt	WW
R44	1000	ohms	1/2 watt	5%
R45	6.8	ohms	1 watt	5%
R51	7500	ohms	10 watt	WW
R61	470K	ohms	1/2 watt	10%
R62	1 meg	ohms	1/2 watt	10%
R63	47K	ohms	2 watt	10%
R64	1000	ohms	1 watt	10%
R65	470K	ohms	1/2 watt	10%
R66	270	ohms	1/2 watt	10%
R67	2200	ohms	1/2 watt	10%
R68	22K	ohms	1/2 watt	10%
R71	500K	ohms	potentiometer	
R72	680	ohms	1/2 watt	10%
R69	6.8	ohms	1 watt	5%
R90	750K	ohms	2 watt	5%

C11A C11B C11C	VFO tuning condenser. Part #196-3		
C12	27mmf.	N750 2-1/2%	tubular ceramic
C13	75mmf.	variable. Part #CT1B075	
C14	33mmf.	NPO 2-1/2%	tubular ceramic
C15	35mmf.	variable. Part #CT1B035	
C16	75mmf.	NPO 2-1/2%	tubular ceramic
C17	.001mfd.	500 volt mica	
C18	.005mfd.	disc ceramic	
C19	.005mfd.	disc ceramic	
C20	.01 mfd.	disc ceramic	
C21	120mmf.	NPO 10%	tubular ceramic
C22	.005mfd.	disc ceramic	
C23	.005mfd.	disc ceramic	
C24	.005mfd.	disc ceramic	
C25	1.5mmf.	tubular ceramic	10%

C31	100mmf. disc ceramic	
C32A, C32B	Dual 25mmf. variable. Part #196-2	
C33	.005mfd. disc ceramic	
C34	.005mfd. disc ceramic	
C35	.01 mfd. disc ceramic	
C36	.01 mfd. disc ceramic	
C41	100mmf. silver mica	
C42	.005mfd. disc ceramic	
C43	.005mfd. disc ceramic	
C44	.001mfd. 1600 volt disc ceramic	
C45	.005mfd. disc ceramic	
C46	.0047mfd. 1500 volt disc ceramic	
C47	.001mfd. 1600 volt disc ceramic	
C48A, C48B	Dual 140mmf. variable. Part #MC912A	
C49A, C49B	Dual 485mmf. variable. Part #196-1	
C51	.1 mfd. 400 volt tubular paper	
C52	.005mfd. disc ceramic	
C53	.005mfd. disc ceramic	
C54	.005mfd. disc ceramic	
C55	.001mfd. disc ceramic	
C56	.005mfd. disc ceramic	
C57	.01 mfd. disc ceramic	
C58	.01 mfd. disc ceramic	
C61	8 mfd. 450 volt electrolytic	
C62	.005mfd. disc ceramic	
C63	250mmf. tubular ceramic	
C64	10 mfd. 50 volt electrolytic	
C65	.002mfd. disc ceramic	
C66	.03 mfd. 400 volt tubular	
C67	.005mfd. disc ceramic	
C71	250mmf. GP tubular ceramic	
C72	10 mfd. 50 volt electrolytic	

L11	Oscillator coil	Part #179	
L12	Oscillator coil	Part #180	
L13	Oscillator coil	Part #634	
L14	2-1/2MH. RF Choke	(125 ma.)	
L15	Oscillator plate coil	Part #B40	less iron core
L16	Oscillator plate coil	Part #B6	
L21	Buffer plate coil	Part #G80	less iron core
L22	Buffer plate coil	Part #G40	
L23	Buffer plate coil	Part #D20	
L24	Buffer plate coil	Part #G6	
L31	Driver plate coil	Part #G80	
L32	Driver plate coil	Part #G40	
L33	Driver plate coil	Part #G20	
L34	Driver plate coil	Part #G15	
L35	Driver plate coil	Part #G10	
L36	Driver plate coil	Part #D6	
L41	2-1/2 MH. RF Choke	(125 ma.)	
L42	.47 Microhenry RF Choke		
L43	2-1/2 MH. RF Choke	(125 ma.)	
L44	2-1/2 MH. RF Choke	(250 ma.)	
L45	80 meter plate coil	Part #635	
L46	40 & 20 meter plate coil	Part #184	

L47	15 & 10 meter plate coil	Part #185
L48	6 meter plate coil	Part #638
T1	Class AB2 driver transformer	Part #121A7
T2	Modulation transformer	Part #121A8

SW11A, SW11B, SW11C, SW11D — VFO section of bandswitch — Part #623

SW12A, SW12B, SW12C — VFO-CRYSTAL selector switch — Part #176

SW21, SW31 — Buffer driver bandswitch — Part #624

SW41A, SW41B, SW41C — Final plate bandswitch — Part #622

SW42A, SW42B, SW42C — Meter switch and final on-off switch — Part #178

SW81A, SW81B — AM-CW switch — Part #631

SW51	VFO spotting switch	S.P.S.T. Toggle switch
SW52	Power on-off switch	S.P.S.T. Toggle switch
SW61	Carbon-crystal microphone switch	S.P.S.T. slide switch

B1 — 22-1/2 volt "B" battery. Burgess #U15

PL1, PL2 — #44 pilot bulbs (Do not use any other number)

PL3 — #C6 switchboard type pilot bulb (Sylvania)

M — 0 to 1 milliampere meter

V1	6AK6 Oscillator tube
V2	6AG5 Buffer-multiplier tube
V3	6AQ5 R.F. driver tube (use Tung-Sol 6AQ5 tube only for best results)
V4	6146 R.F. final amplifier tube
V5	OB2 Voltage Regulator Tube
V6	6AU6 Speech amplifier tube
V7	12AU7 A.F. driver tube
V8	6L6GB Modulator tube
V9	6L6GB Modulator tube
J1	Antenna Coax connector Amphenol #831R
J2	Two conductor closed circuit jack
J3	Three conductor open circuit jack

Plastic dial escutcheon	Part #643
Cabinet	Part #642-C
Front panel	Part #642
Bevel gears	Part #615
Pull handle (2)	Part #158

4.2 RESISTOR GRAPH

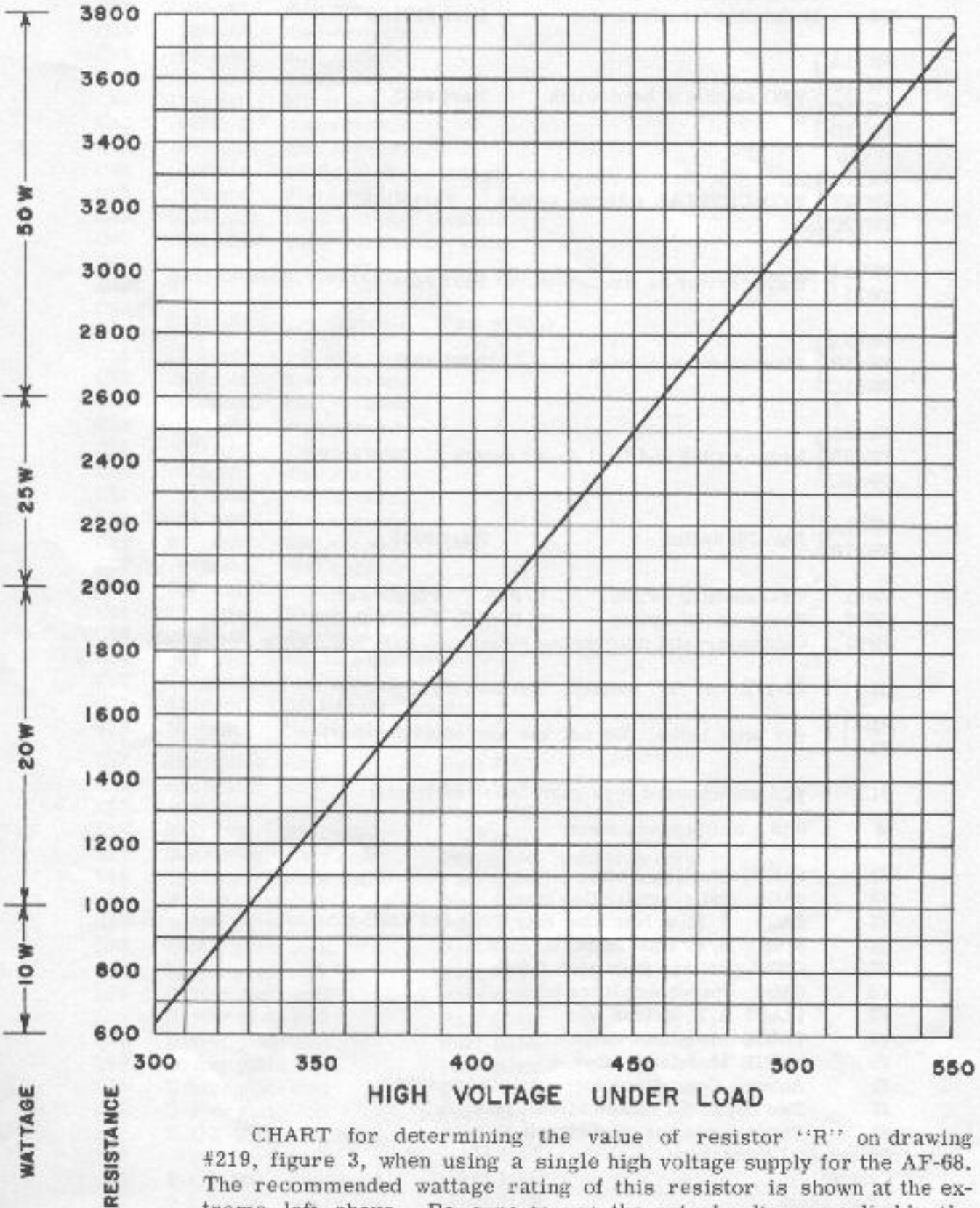


CHART for determining the value of resistor "R" on drawing #219, figure 3, when using a single high voltage supply for the AF-68. The recommended wattage rating of this resistor is shown at the extreme left above. Be sure to use the actual voltage supplied by the power supply under load when using the chart above.

DRWG. NO. 653

4.3 OPERATING VOLTAGE CHART.

PIN NO. / TUBE NO.		1	2	3	4	5	6	7	8	9
V2	Buffer 6AG5	-8*	1.5	zero (12.6)**	6.3**	200	145	1.5	--	--
V3	Driver 6AQ5	-7*	6.7	6.3**	zero	225	230	zero	--	--
V4	Final 6146	1	zero (12.6)**	Note 1	1	--	1	6.3**	zero	--
V5	Regulator OB2	105	zero	--	zero	105	--	zero	--	--
V6	Speech 6AU6	zero	zero	6.3**	zero	25	40	1.2	--	--
V7	Audio Driver 12AU7	220	zero	8	zero	zero (12.6)**	220	zero	8	6.3**
V8	Modulator 6L6GB	zero	zero (12.6)**	Note 1	225	-22.5	--	6.3**	zero	--
V9	Modulator 6L6GB	zero	zero	Note 1	225	-22.5	--	6.3**	zero	--

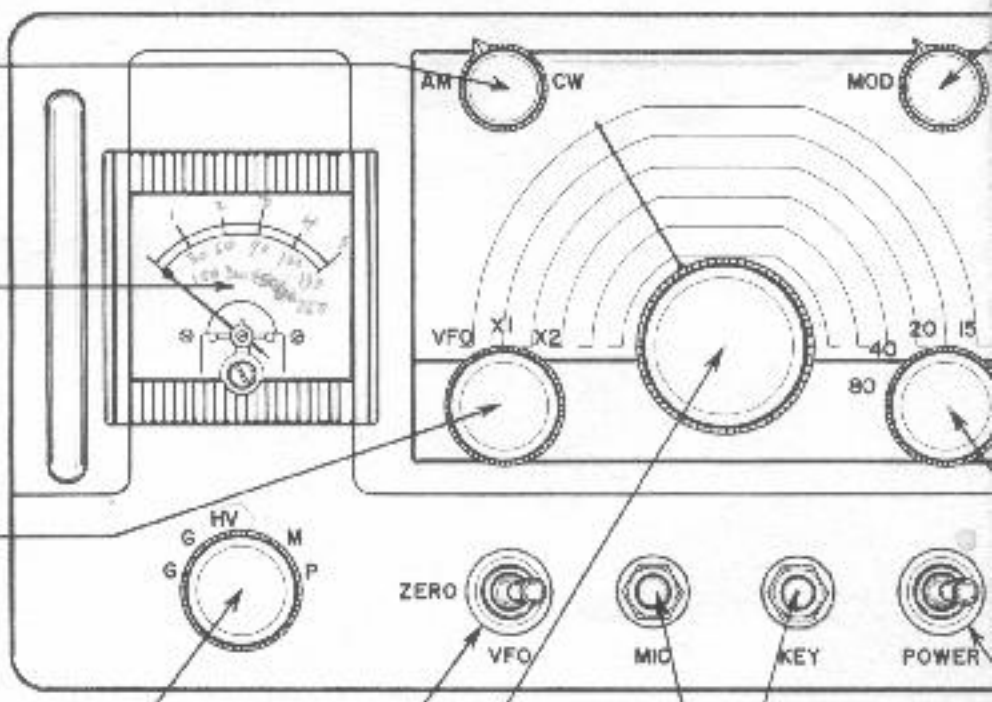
This chart serves only as a guide, individual sets may vary from these readings.

All measurements made with a 20,000 ohms per volt voltmeter, using a PS-2V or M1070 power supply or equivalent. Bandswitch in the 80 meter position, VFO dial set at 3.8 megacycles, audio gain control set at minimum, VFO-CRYSTAL switch set in the VFO position, meter switch set to the first "G" (plate off) position, final grid tuning condenser resonated for maximum grid current, and the AM-CW switch set in the AM position.

Note 1 -- These readings depend upon final plate supply voltage.

* These measurements taken with a 100,000 ohm, 1 watt carbon resistor on the end of the negative voltmeter probe.

** Either AC or DC. Numbers in brackets are in effect when connected for 12 volt operation.



SWITCHES CIRCUITS FOR AM OR CW OPERATION.

METER

HAS THREE SCALES.
0-5 MILLIAMPERES
0-150 MILLIAMPERES
0-750 VOLTS D.C.

V.F.O. - CRYSTAL, SELECTOR SWITCH

THE EIMAC AF-60 TRANS-CITER CAN BE OPERATED FROM THE BUILT-IN V.F.O. OR EITHER OF TWO CRYSTALS INSERTED INTO THE SOCKET INSIDE THE UNIT.

STEP 3

METER SWITCH

SIX POSITIONS.

ONE (G) READS FINAL GRID CURRENT WITH FINAL AMPLIFIER OFF. (FINAL IS ON IN ALL OTHER METER SWITCH POSITIONS).

TWO (G) READS FINAL GRID CURRENT WITH THE FINAL AMPLIFIER ON.

THREE (V) READS FINAL PLATE VOLTAGE.

FOUR (NOT USED).

FIVE (M) READS MODULATOR PLATE CURRENT.

SIX (P) READS FINAL AMPLIFIER PLATE CURRENT.

STEP 5, 7, 8

V.F.O. SPOTTING SWITCH

WHEN IT IS DESIRED TO ZERO-BEAT A SIGNAL FLIP THIS SWITCH TO THE LEFT POSITION. THIS CONNECTS THE V.F.O. 3 PLUG LEAD TO PIN 2R ON THE POWER PLUG WHICH CAN BE CONNECTED TO THE RECEIVER B SUPPLY.

STEP 4B

V.F.O. CONTROL

A VERNIER DRIVE CONTROL THAT INDICATES THE FREQUENCY OF OPERATION DIRECTLY IN MEGACYCLES.

STEP 4A

MICROPHONE JACK

ALSO CARRIES THE PUSH-TO-TALK CIRCUIT. USES A THREE CIRCUIT PHONE PLUG SUCH AS MALLORY TYPE 76 OR EQUAL.

KEY JACK

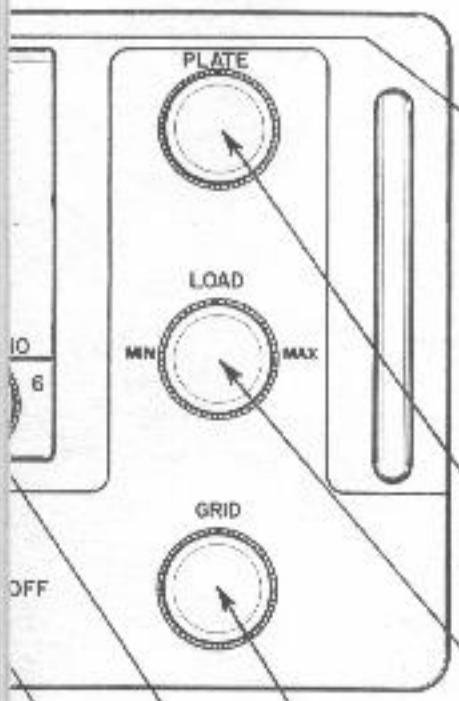
USES A TWO CIRCUIT PH
PL-55 OR EQUAL.

OPERATING INSTRUCTIONS

1. TURN ON FILAMENTS AND ALLOW ABOUT TWO MINUTES WARM-UP TIME.
2. SELECT BAND DESIRED WITH BANDSWITCH.
3. SELECT TYPE OF OPERATION DESIRED, CRYSTAL OR V.F.O. (FOR THESE INSTR
V.F.O. OPERATION).
- 3a. SELECT TYPE OF EMISSION DESIRED; AM OR CW.
- 4a. SET V.F.O. DIAL TO DESIRED FREQUENCY IN MEGACYCLES.

—OR—

- 4b. FLIP V.F.O. SPOTTING SWITCH TO THE LEFT POSITION AND TURN V.F.O. C
IS OBTAINED WITH THE SIGNAL ON WHOSE FREQUENCY YOU WISH TO OPERA
IS MADE FLIP THE V.F.O. SPOTTING SWITCH TO THE RIGHT.
5. SET THE METER SWITCH TO THE FIRST (G) POSITION.
6. OPERATE THE PUSH-TO-TALK BUTTON ON THE MICROPHONE OR OPERATE ALTE
SWITCH AND ADJUST GRID TUNING CONTROL FOR PROPER GRID DRIVE (2-1/2
7. SET METER SWITCH TO (P) POSITION AND LOAD THE TRANSMITTER TO THE
LEFT. NOTE: ANTENNA MUST BE RESONANT AT THE FREQUENCY ON WH
GRID CURRENT SHOULD NOW BE CHECKED UNDER LOAD IN THE SECOND (G)
8. SET METER SWITCH TO POSITION (M) AND CHECK MODULATOR CURRENT (WHEN
THE A.F. GAIN CONTROL LOCATED IN THE UPPER RIGHT CORNER OF THE
PER-CENTAGE OF MODULATION. MODULATOR PLATE CURRENT SHOULD SWI
FINAL AMPLIFIER PLATE CURRENT VALUE FOR 100% MODULATION.



STEP 8

A.F. GAIN CONTROL

CONTROLS PER CENTAGE OF MODULATION WHEN USING "AM".

CONTROLS A.F. GAIN WHEN USING THE ELMAC AF-68 TRANS CITER AS A SPEECH AMPLIFIER EXCITER FOR A HIGHER POWER TRANSMITTER.

STEP 7

LOAD CONTROL

PLATE TUNING CONTROL

THESE TWO CONTROLS ARE ALWAYS TUNED TOGETHER.

FIRST WITH THE LOAD CONTROL SET AT MINIMUM (COUNTER CLOCKWISE) RESONATE PLATE TUNING CONTROL. (METER SWITCH IN POSITION "P" AND TUNE FOR LOWEST PLATE CURRENT)

NEXT TURN LOAD CONTROL CLOCKWISE SLOWLY UNTIL PLATE CURRENT READS APPROXIMATELY 100 TO 120 MILLIAMPERES.

STEP 7

AGAIN RESONATE PLATE TUNING CONTROL.

IF THE PLATE CURRENT DROPS BELOW THE DESIRED PLATE CURRENT INCREASE THE SETTING OF THE LOAD CONTROL.

ALWAYS RESONATE PLATE TUNING CONTROL AFTER LOAD CONTROL HAS BEEN CHANGED.

STEP 6

FINAL GRID TUNING

ADJUST FOR PROPER FINAL GRID CURRENT. (2½ TO 3 MA.)

STEP 2

BANDSWITCH

SWITCHES ALL CIRCUITS TO THE DESIRED BAND SIMULTANEOUSLY.

STEP 1

POWER ON-OFF SWITCH

CONTROLS FILAMENTS ON D.C. OPERATION.

CONTROLS THE MAIN A.C. LINE ON 115 VOLT A.C. OPERATION.

ONE PLUG SUCH AS

CTIONS WE WILL CONSIDER

NTROL UNTIL A ZERO BEAT
TE. WHEN THIS ADJUSTMENT

RNATE "TRANSMIT-RECEIVER"
to 3 MILLIAMPERES).

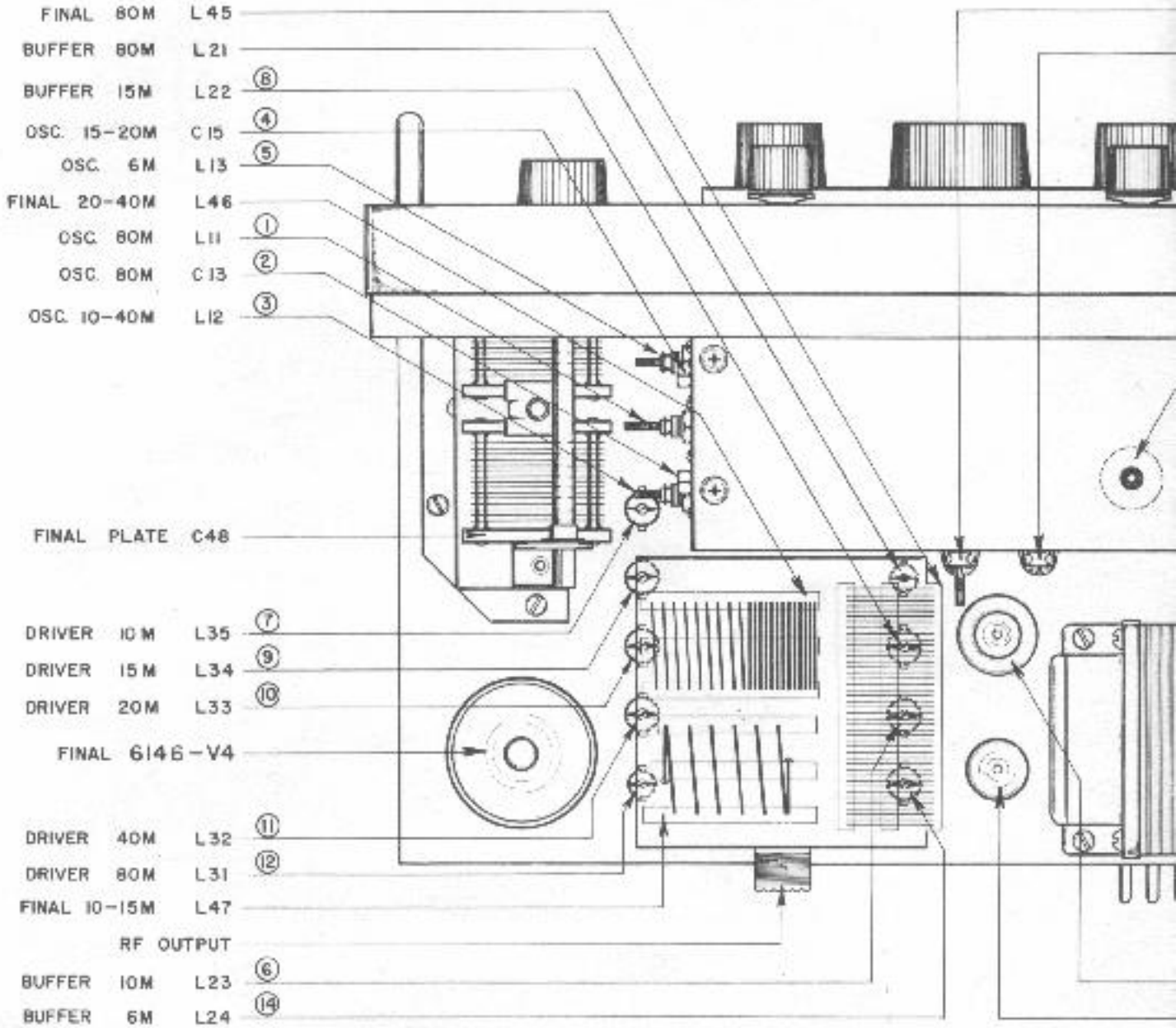
NTENNA AS EXPLAINED AT
CH OPERATION IS DESIRED,
POSITION.

USING AM MODULATION).
V.F.O. DIAL CONTROLS THE
IG TO ABOUT 60 to 70% OF

4.4 CONTROL LAYOUT

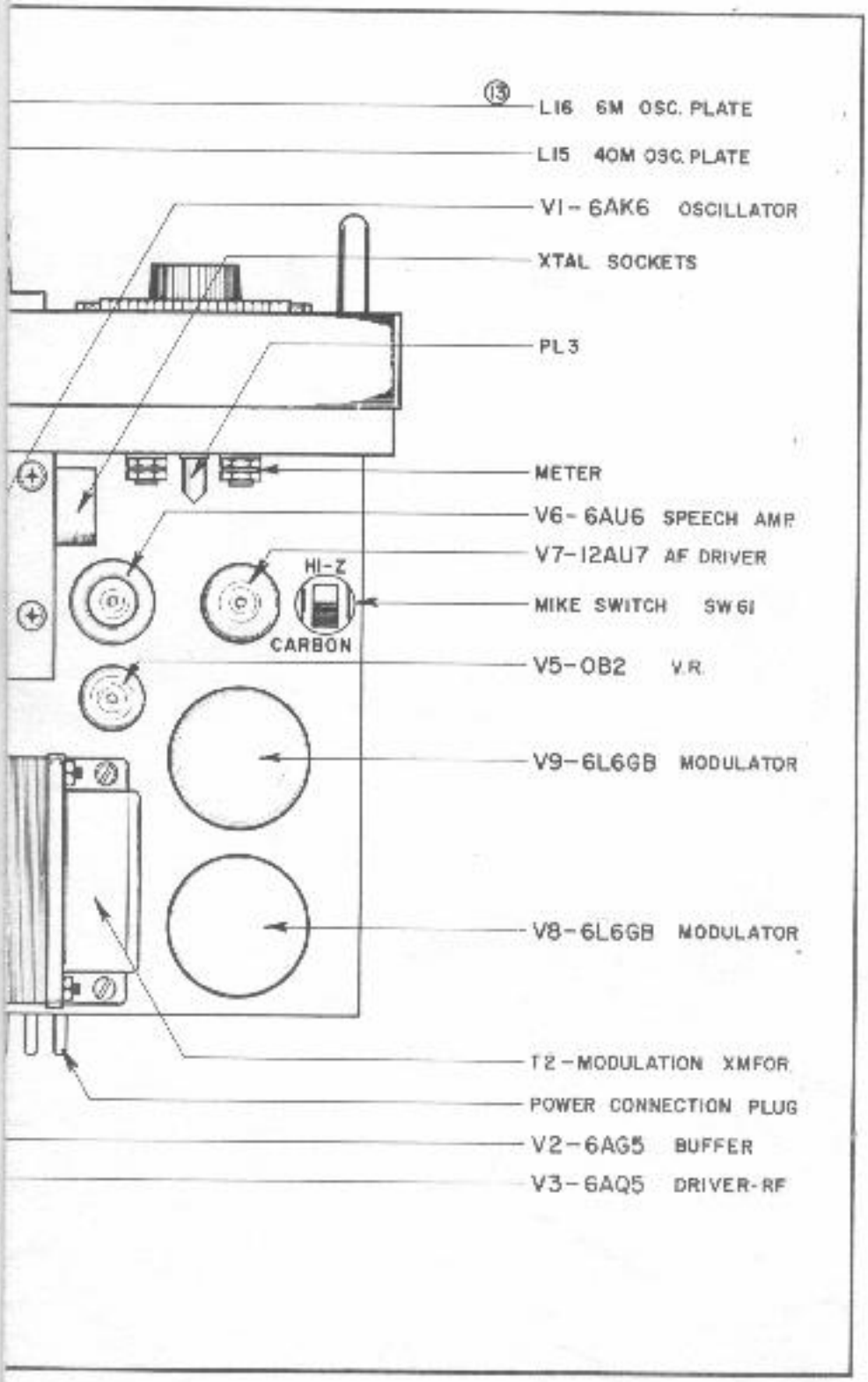
MULTI-PRODUCTS CO. 21470 COOLIDGE HIGHWAY OAK PARK MICHIGAN			
AF-68 OPERATING INSTRUCTIONS			
MODEL AF-68		SCALE	
DRAWN BY A.D.	DATE 2-26-60	MATERIAL	DRAWING NO. 654
CHK'D BY W.M.	DATE	FINISH	

4.5 CHASSIS LAYOUT.



AF 68 COMPONENT LAYOUT

DWG. 655


L16 6M OSC. PLATE
L15 40M OSC. PLATE
V1 - 6AK6 OSCILLATOR
XTAL SOCKETS
PL3
METER
V6 - 6AU6 SPEECH AMP.
V7 - 12AU7 AF DRIVER
HI-Z
CARBON
MIKE SWITCH SW 6I
V5 - 0B2 V.R.
V9 - 6L6GB MODULATOR
V8 - 6L6GB MODULATOR
T2 - MODULATION XMFOR.
POWER CONNECTION PLUG
V2 - 6AG5 BUFFER
V3 - 6AQ5 DRIVER-RF

4.6-TYPICAL POWER PLUG CONNECTIONS.

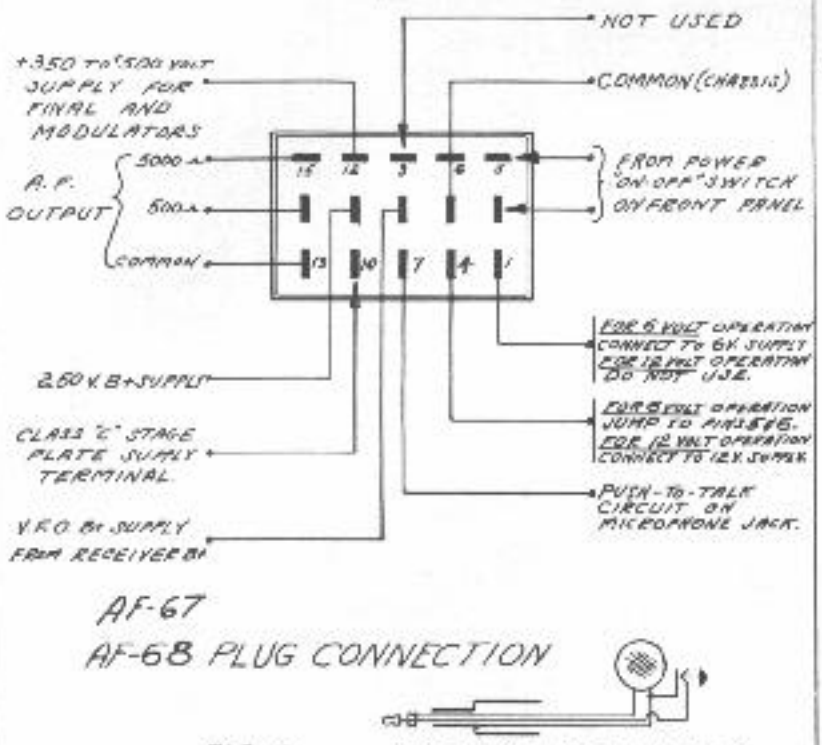


FIG. 1

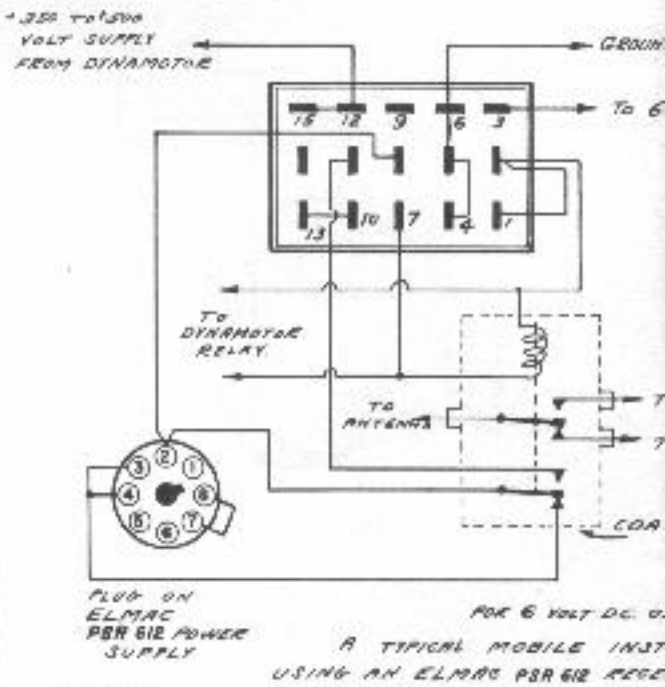
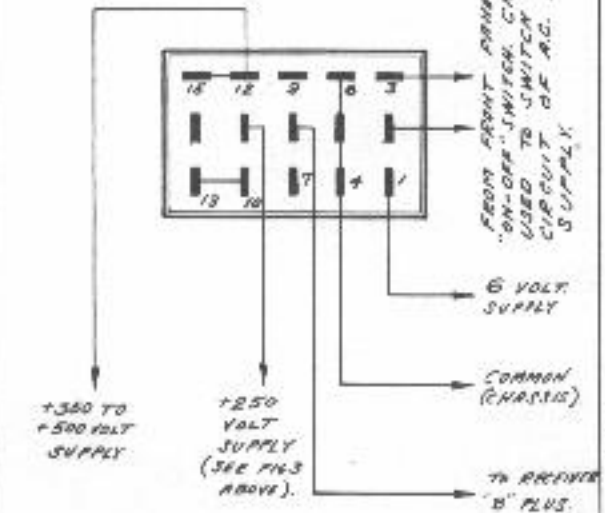
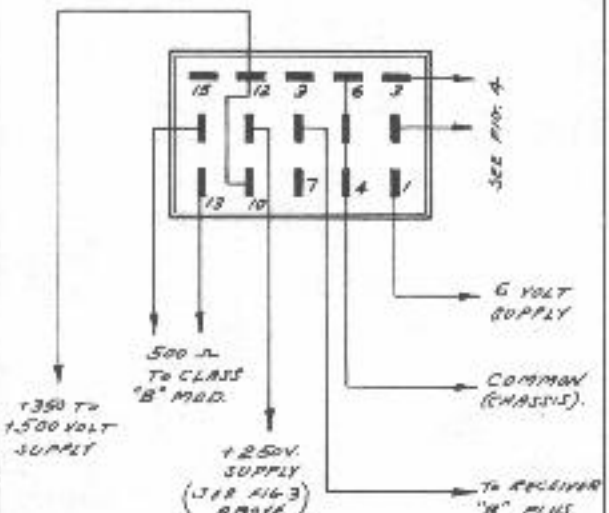


FIG. 2



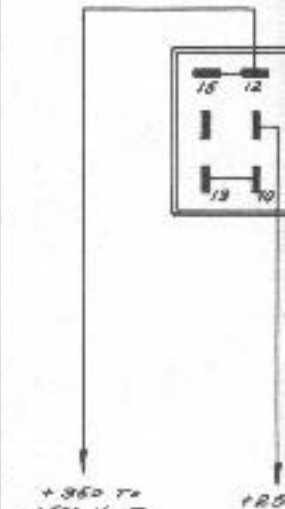
TYPICAL A.C. OPERATION USING AM OR CW EMISSION.

FIG. 4



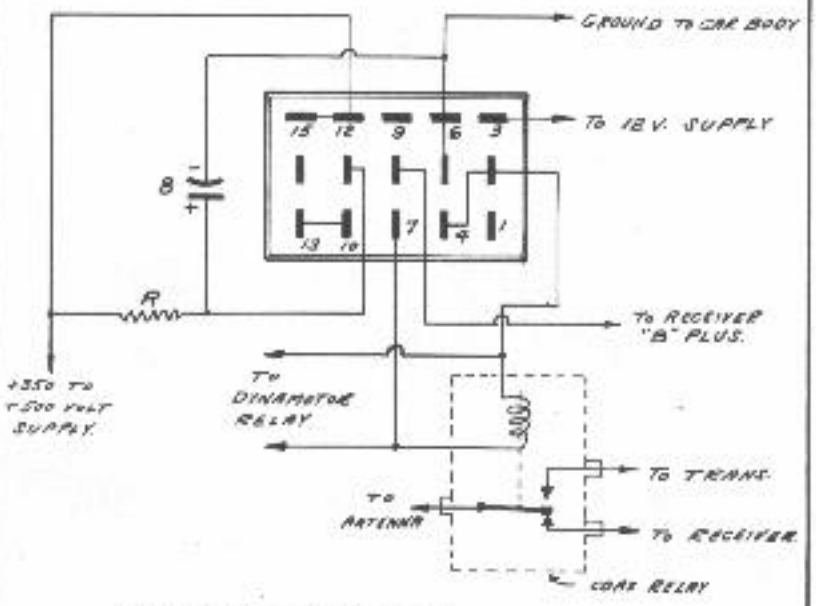
A.C. OPERATED EXCITER AND SPEECH AMPLIFIER.

FIG. 5



A.C. OPERATE
CLASS "B" LI
(RA

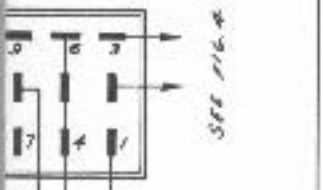
FIG



FOR 12 VOLT OPERATION:

A TYPICAL MOBILE INSTALLATION USING A COMMON HIGH VOLTAGE SUPPLY. THE VALUE OF RESISTOR "R" IS DETERMINED FROM THE CHART

FIG. 3



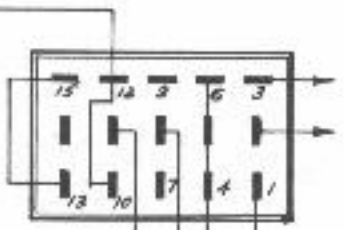
6 VOLT SUPPLY

COMMON (CHASSIS).

TO RECEIVER "B" PLUS.

EXCITER, DRIVING AMPLIFIER. ONLY)

6



6 VOLT SUPPLY

COMMON (CHASSIS)

+350 TO +500 VOLT SUPPLY

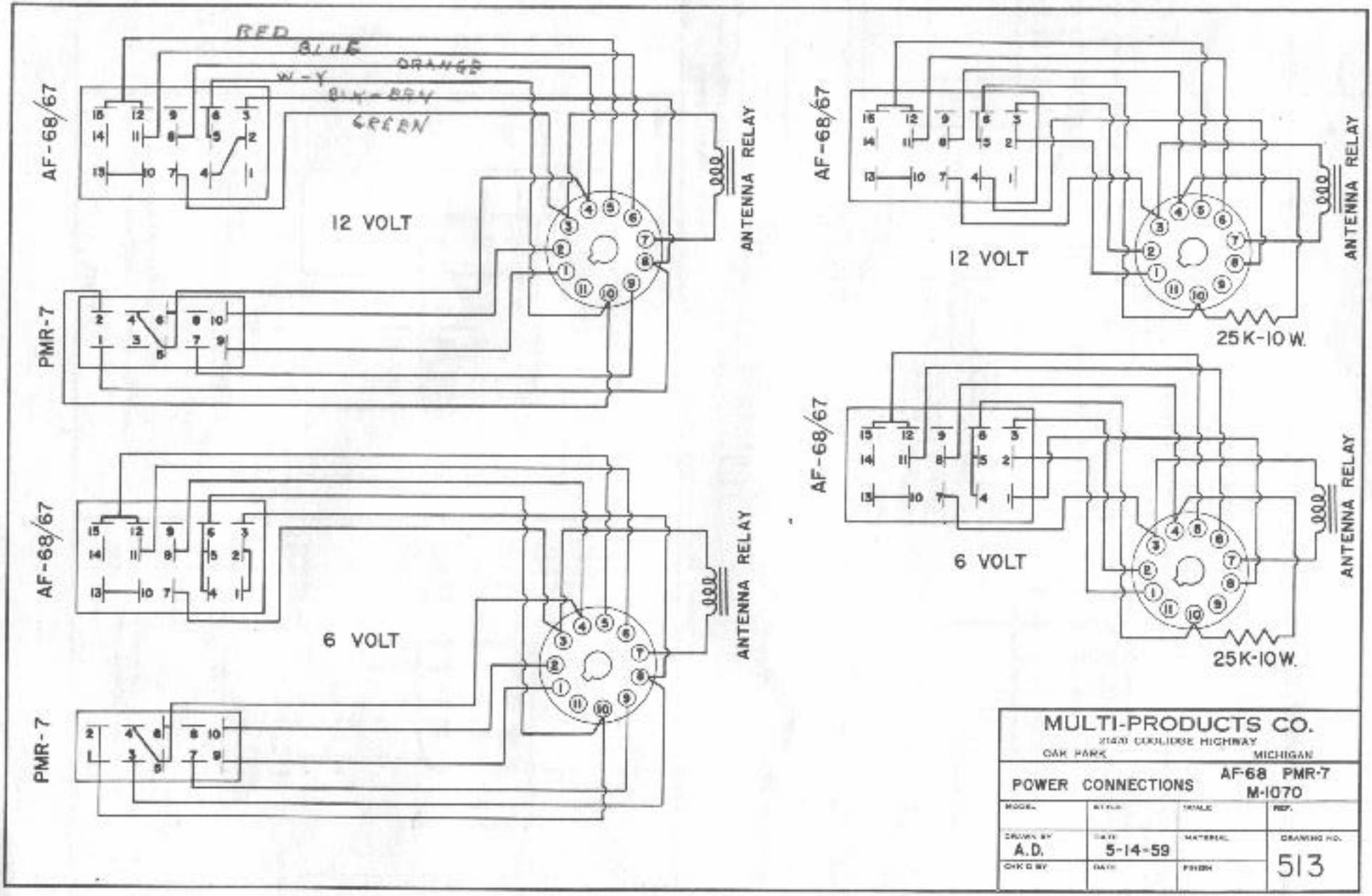
+250 VOLT SUPPLY (SEE FIG 3 ABOVE)

TO RECEIVER "B" PLUS.

A.C. OPERATED. EXCITER DRIVING CLASS 'C' AMPLIFIER CW ONLY.

FIG 7

RECOMMENED POWER CONNECTIONS FOR AF-67 AF-68 219

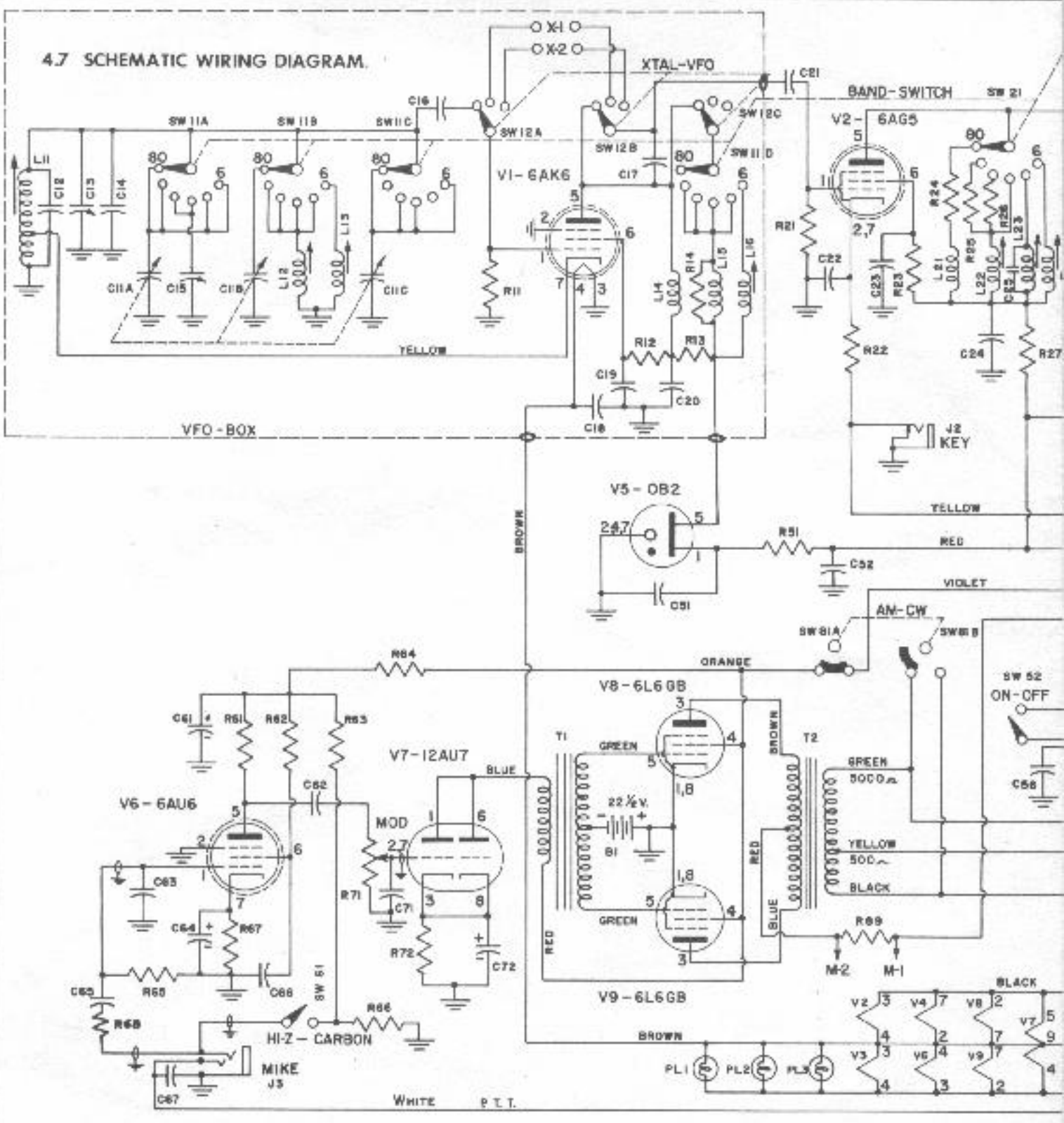


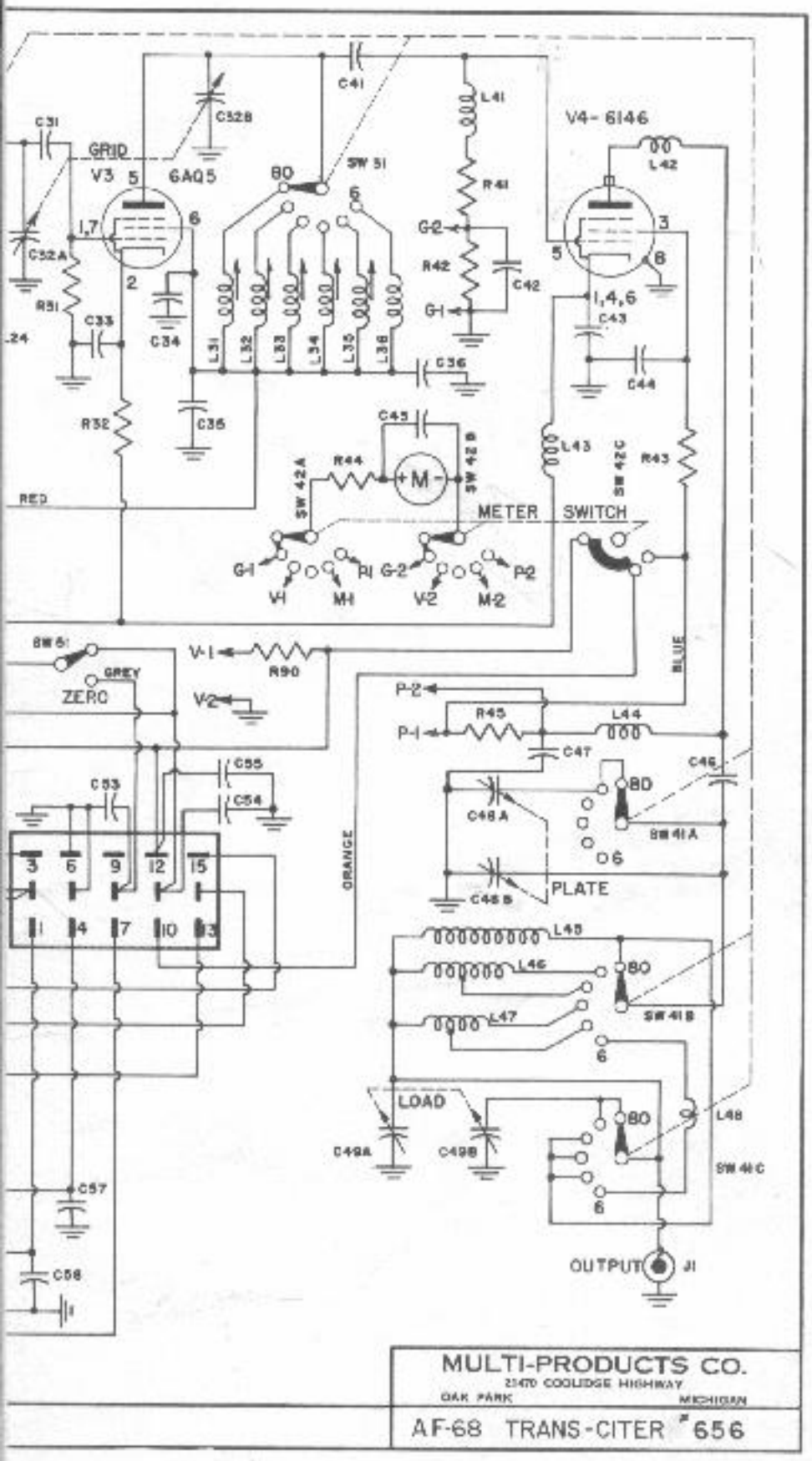
MULTI-PRODUCTS CO.
21631 COOLIDGE HIGHWAY
OAK PARK MICHIGAN

POWER CONNECTIONS AF-68 PMR-7 M-1070

MODEL	STYLE	SCALE	REF.
DRAWN BY A.D.	DATE 5-14-59	MATERIAL	DRAWING NO. 513
CHK'D BY	DATE	FINISH	

4.7 SCHEMATIC WIRING DIAGRAM.





MULTI-PRODUCTS CO.
21470 COOLIDGE HIGHWAY
OAK PARK MICHIGAN

AF-68 TRANS-CITER # 656

OWNERS WARRANTY

All equipment manufactured by the Multi-Products Co. has been thoroughly tested and shipped from the factory in proper operating condition. This equipment is guaranteed to be free from any defects in workmanship and/or material for a period of 90 (ninety) days from date of original purchase as follows: Any part or accessory except tubes, crystals, microphones, and other trade articles not of our manufacture, shall be replaced free of charge providing the defect is in our opinion due to faulty workmanship and/or material, and not caused by tampering, abuse or normal wear. Tubes, crystals, microphones and other trade articles not of our manufacture are generally guaranteed by their respective manufacturers. The Multi-Products Co. will act as agent of these manufactures in replacing such parts provided that such parts are returned to us pre-paid within a period of 90 (ninety) days from date of original purchase by the owner. The replacement of such parts will be in accordance with the warranty of the respective manufacturers. No further guarantee or warranty is implied. In accepting delivery, the purchaser assumes full responsibility for proper installation and service arrangements.

This warranty is valid only if the Owner's Registration Card has been filled out by the purchaser and mailed to the Multi-Products Co. at the time of original purchase.

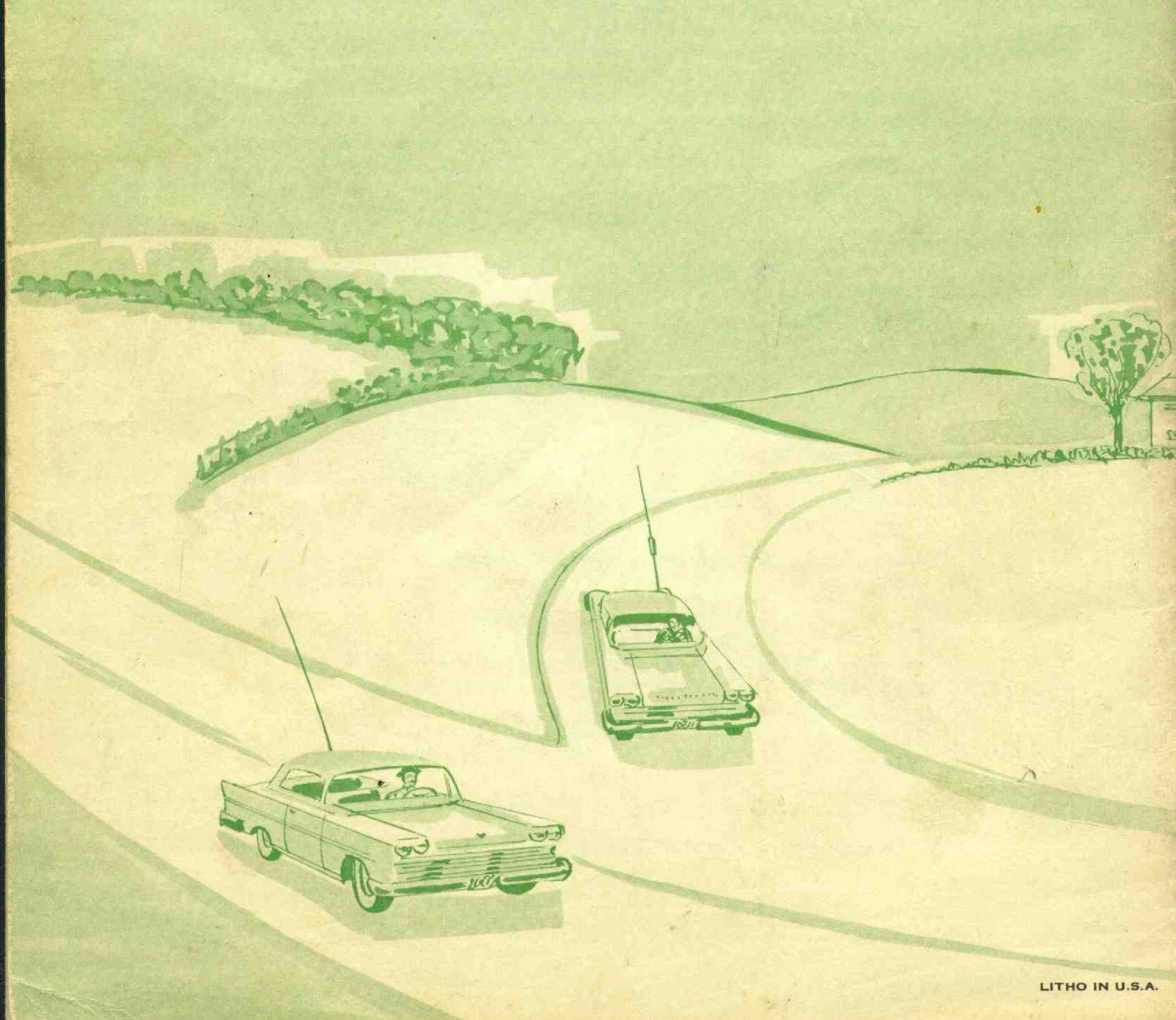
This warranty is void if the equipment has been modified or if failure is due to the application of voltages other than those specified in this manual.

Do not return any equipment or accessory direct to the factory without first obtaining authorization from the factory. All equipment to be returned shall be shipped pre-paid and insured by the owner.

Any claims for damage or loss in transit must be filed with the carrier. The Multi-Products Co. will give any necessary assistance in filing such claims.

The Multi-Products Co. reserves the right to make changes in current production models without being obligated to incorporate such changes in earlier production models.

Multi-Products Co.



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