

Climaster ZEUS-

OWNER'S MANUAL

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THE CLIMASTER ZEUS TRANSMITTER

I. INSTALLATION

- a. After carefully unpacking both shipping containers, the ZEUS 331 RF unit and the 332 Modulator/Power Supply units should be examined for visible shipping damage. If the transmitter has been damaged in shipping notify transportation company at once. Retain all shipping cartons and packing material.
- b. The 331 RF unit will normally be located on the main operating table in a convenient position where all controls are accessible. It is recommended that the ZEUS be located to the left of the operator's position with the station receiver located to the right. Top of unit should not be covered or obstructed or tube and component life will be materially shortened.

The 332 Modulator/Power Supply Unit can be located at any convenient position remote from the actual operating position. Cables are provided for 10 feet of separation between the RF and MOD/PS units. A 20 foot extension unit can be furnished when it is desirable to locate the MOD/PS at a more remote point than provided by the 10 foot standard cable.

- c. Cable connections should be made:
 1. Power cable with rectangular connector to both units.
 2. Antenna relay coil and receiver mating connections to J302 (octal socket) on MOD/PS unit, per Fig. 1 and schematic CL-10-258.
 3. RF output cables for 2 and/or 6 meter antenna systems to coaxial fittings on RF deck. (As observed from front panel the 6 meter output is to the left.)
 4. Microphone plug with Amphenol #80MC-2M connector.
 5. Connect 110V AC male plug on MOD/PS unit to suitable source of 110-120V AC, 60 cycles, with not less than 6 Amp capacity. (Prior to making power connection make certain that TUNE-OPERATE switch is in OFF position, AUDIO control is in CW position, and TRANSMIT-STANDBY switch is in STANDBY position.)
- d. Turn TUNE-OPERATE switch to TUNE #1 position and observe that VFO dial and meter face are illuminated.
- e. Observe that blower motor can be heard faintly in rear center of unit.

- f. THE 300 VOLT POWER SUPPLY IS ACTIVE AT ALL TIMES EXCEPT WHEN THE TUNE-OPERATE SWITCH IS IN THE OFF POSITION. DO NOT REMOVE COVER PLATES FROM RF OR AF UNITS WITHOUT PLACING THIS SWITCH IN OFF POSITION OR (PREFERABLY) DISCONNECTING UNIT FROM AC POWER LINE.

II. OPERATING INSTRUCTIONS

a. CONTROL FUNCTIONS - RF UNIT

1. TUNE-OPERATE SWITCH (5 positions) (S1)

OFF	All power removed from units
TUNE #1	Activates all filaments and low voltage power supply. Connects meter in V5 grid current position. HV supply is deactivated.
TUNE #2	Same as TUNE #1 except meter moved to read grid current of V6 (final power amplifier)
TUNE #3	Same as OPERATE except meter is connected to read grid current of V6.
OPERATE	Normal operating position with high voltage supply and oscillator controlled by TRANSMIT-STANDBY switch. Meter connected to read plate current of V6 (power amplifier.)

2. TRANSMIT-STANDBY Toggle Switch (S3)

Normal transmitter send receive switch controlling VFO and HV supply.

3. FREQUENCY Control SWITCH (3 positions) (S5)

2M	Sets VFO to cover suitable range for 144 to 148 MC operation
XTAL	Connects crystal socket to oscillator for crystal control on either band.
6M	Sets VFO to cover suitable range for 50 to 54 MC operation.

4. CW-AUDIO Control (S2, R2)

CW Position - opens key jack and shorts modulation transformer

AUDIO Position - after initial calibrations provides means for adjusting clipping level up to 18 db.

5. VFO Tuning (C1) - controls VFO frequency over either 2M or 6M calibrated range.
6. MULTIPLIER (C6) - Tuning control for V3 plate to resonate in either 50 MC range for 6M operation or 72 MC range for 2M operation.
7. 2M DOUBLER - Tuning control for V4 plate to resonate in 144-148 MC range for 2M operation. (Automatically disabled for 6M operation.)
8. AMPLIFIER GRID (C8) - Tuning control for tank circuit between V5 plate and V6 grid. (Tank is of CLIMASTER multiband type simultaneously covering both 2M and 6M range.)
9. AMPLIFIER PLATE-TUNE (C9) -

6 meters - Input (resonating) capacitor of 6 meter PI network.

2 meters - Series tuning capacitor for 2 meter HI-Q tank circuit.
10. AMPLIFIER PLATE-LOAD (C10, L16) -

6 meters - Output (loading) capacitor of 6 meter PI network.

2 meters - Adjusts variable link coupling for control of loading on 2 meters.
11. BANK SELECTOR SWITCH (2 position) (S6) -

6 meters - Disables V4 and establishes circuits for 50-54 MC operation.

2 meters - Connects V4 and establishes circuit for 144 to 148 MC operation.
12. DRIVE (R3) - Varies screen voltage on V5 to establish proper grid current on V6.
13. VFO (S4) - Pushbutton switch to activate only VFO (or crystal) for frequency spotting.
14. AUDIO CALIBRATE (Rear of chassis) (R1)--

Potentiometer for adjusting gain of low level audio for calibration of clipper levels on CW-AUDIO panel control.
15. VFO CALIBRATE - Screwdriver adjustment accessible thru top cover, for correction of any slight error of the dial pointer.

16. METER (M1) - Panel meter whose function is automatically selected by TUNE-OPERATE switch to read driver tube (V5) grid current (0-3 Ma); amplifier (V6) grid current (0-10 Ma) or amplifier plate current (0-400 Ma).

17. MONITOR (I4) - Glow lamp serving as both send-receive pilot light and modulation monitor.

18. MIC (J1) - Receptacle for microphone input with provision for push to talk modification if desired.

19. KEY (J2) - Closed circuit jack for telegraph key.

b. MODULATOR/POWER SUPPLY CONTROLS

A BIAS ADJUSTMENT (R301) is the only control on the MODULATOR/POWER SUPPLY chassis. (This is factory preset and will not normally require adjustment. However, when a suitable DC milliammeter is available it is desirable to check this adjustment during initial installation and periodically thereafter.)

J303 is the associated jack for metering 811A current for adjusting R301.

NOTE: A low resistance (2 ohms or less) meter should be employed. Most VOM meters more than meet this requirement on their 200 Ma or less sensitive scales.

c. TUNING PROCEDURE (6 Meters)

Initial tuneup on 6 meters is recommended. The following step-by-step procedure should be followed:

1. Set controls as follows:

TUNE-OPERATE SWITCH	OFF
FREQ. CONTROL SW	XTAL or 6M
CW-AUDIO CONTROL	CW position
MULTIPLIER) AMP GRID)	Center of 6M segments marked on panel
AMP PLATE-TUNE	Counter-clockwise
AMP PLATE-LOAD	Counter-clockwise
BAND SELECTOR SWITCH	6M
DRIVE	Mid range

TRANSMIT-STANDBY STANDBY

2. Insert suitable 6 meter crystal in crystal socket on panel or set VFO to desired frequency.
3. Close key (or remove plug from key jack).
4. Switch to TUNE #1 position. After 3 minute warmup, switch TRANSMIT-STANDBY to TRANSMIT position.
5. Tune MULTIPLIER to max. meter reading.
6. Switch to TUNE #2 position and tune AMP GRID for max. meter reading. Adjust DRIVE control for meter reading of 6 to 7.5 Ma.
7. Return TRANSMIT-STANDBY switch to STANDBY position.
8. Connect suitable coaxial cable from antenna to 6 meter output jack (P3) (located on rear of unit).
9. Turn switch to OPERATE position.
10. Switch to TRANSMIT position and quickly adjust AMP PLATE-TUNE to resonance as indicated by minimum current on the meter.
11. Rotate AMP-PLATE LOAD in clockwise direction while simultaneously adjusting AMP PLATE TUNE until minimum dip in meter current is between 190 and 210 Ma.

d. TUNING PROCEDURE (2 Meters)

1. Set controls as follows:

TUNE-OPERATE Switch	OFF
FREQ CONTROL Switch	XTAL or 2M
CW-AUDIO Control	CW position
MULTIPLIER	Center of 2M segment
2M DOUBLER	"
AMP GRID	"
AMP PLATE TUNE	Pointer at "2 o'clock"
AMP PLATE LOAD	Pointer at "12 o'clock"
BAND SELECTOR Switch	2M
DRIVE	"12 o'clock"
TRANSMIT-STANDBY Switch	STANDBY

CAUTION - READ THOROUGHLY BEFORE OPERATION

Several operators have experienced arcing in the final amplifier tank circuit of the ZEUS. Investigation has shown that this condition results from inadequate loading of the final, either during tune-up or operation. The following precautions should be observed to prevent arcing:

1. Always be certain, when changing bands, that the antenna load is connected to the proper coaxial output receptacle. Even a short period of operation on 6 or 2 meters with improper load on the proper output terminal can cause destructive arcs on the amplifier plate tuning capacitor.
2. Be sure the antenna relay is of the coaxial type and is functioning properly before operating the ZEUS.
3. When adjusting loading on 2 METERS set LOAD control to "12 o'clock" before applying high voltage.
4. Never operate with AMPLIFIER plate current "dipped" below 120 Ma.
5. Although the ZEUS will operate on both bands with antenna systems having moderately high standing wave ratio, it is highly recommended that every effort be made to employ antenna systems with VSWR of less than 1.8 to 1.0. It has been observed that many otherwise good antenna systems on 2 and 6 meters have been greatly degraded with poorly designed antenna relays. We recommend the DOW KEY DX-60 as an accessory to the ZEUS.
6. Some operators have reported difficulty in reducing plate current to 200 Ma on 6 meters, particularly when operating below 50.2 MC. All observed instances have shown that the 6 meter antenna used had at least a 2:1 SWR. If possible, the SWR should be reduced.

If it is not practical to improve the SWR the loading can be reduced by increasing or decreasing the length of coaxial cable between the transmitter and the antenna relay. Normally a change of 3 feet will be satisfactory.

2. Insert suitable crystal or set VFO to desired frequency.
3. Close key or remove plug from key jack.
4. Switch to TUNE #2 position. Allow 3 minutes for filament warmup.
5. Switch TRANSMIT-STANDBY to TRANSMIT position.
6. Adjust MULTIPLIER, 2M DOUBLER and AMP GRID all for maximum meter reading.
7. Adjust DRIVE control for 6 to 7.5 Ma meter reading.
8. Return TRANSMIT-STANDBY switch to STANDBY position.
9. Connect suitable coaxial cable from antenna to 2 meter output jack (P2) located on rear of unit.
10. Turn switch to OPERATE position.
11. Switch to TRANSMIT position and quickly adjust AMP PLATE-TUNE to resonance as indicated by minimum current on the meter.
12. Increase antenna coupling by rotating AMP PLATE-LOAD control in clockwise direction until meter reads 200 Ma. Retune AMP PLATE TUNE to minimum if required and again increase loading to 200 Ma.
13. Recheck grid current by switching to TUNE 3 position. Readjust AMP GRID for maximum meter reading. Readjust DRIVE control to between 6 and 7 Ma.
14. Return to OPERATE position.

NOTE: When a suitable output indicator such as a micro-match or other RF output meter is available it will normally be possible to obtain somewhat higher output on 2 meters by adjusting the PLATE TUNE and LOAD controls for maximum indicated power output rather than minimum plate current dip. In either case, amplifier plate current should not exceed 200 Ma for AM operation or 250 Ma for CW operation.

e. CW operation (2 or 6 meters)

1. After following the 2 or 6 meter tuneup procedure outlined in the previous sections the ZEUS is ready for CW operation on either band.
2. The ZEUS is designed to furnish clean, chirpless keying with a very minor back-wave output. Keying is of the grid block type of the 6CL6 multiplier stage.

g. VFO DIAL SCALE

1. The ZEUS VFO has been designed both mechanically and electrically to provide stable frequency control over both the 6 and 2 meter bands.
2. Direct frequency calibration of the ZEUS VFO employs a unique system of frequency readout which permits setting frequency to greater accuracy than any other similar unit. Study of the dial calibration will indicate that each 250 KC point is subdivided into 5 segments projected across diagonal lines. Each successive intersection of a diagonal line with one of the horizontal lines covers a 50 KC step. With a little practice it is possible to employ this dial scale system to set to within 10 KC of the desired frequency.

3. A screwdriver control, accessible from the top of the RF unit, is provided for calibration of the VFO dial parts.
4. Differential frequency readout is another unique feature of the ZEUS VFO. The logging scale is marked with a series of circled numbers which depict the frequency change per division of the vernier calibrator visible through the recessed window. For example, the number 5 appears near the low edges of both the 144 MC and 50 MC VFO range. This indicates when QSYing 5 KC from, let's say, 50, 110 DC it is only necessary to move the VFO one vernier division and you are there. Likewise, to QSY down 20 KC one would move the dial 4 divisions.
5. The ZEUS VFO dial utilizes a somewhat unlinear dial scale for the purpose of furnishing the greatest band spread in that portion of both the 6 and 2 meter bands where most activity is centered while still providing adequate frequency reset over all portions of the band.

h. OSCILLATOR OPERATION

1. The proper selection of VFO range for the particular band to be used is accomplished by the panel switch captioned 2M - XTAL - 6M.
2. Crystal controlled operation on either band is accomplished by inserting a crystal in the panel receptacle and switching the 2M - XTAL - 6M switch to the XTAL position.
3. Crystal control on either band can be achieved with crystals as follows:

2 meters: 8000 to 8222 KC
 12,000 to 12,333 KC

6 meters: 8333 to 9000 KC
 12,500 to 13,500 KC

NOTE: 12-13 MC crystals are recommended for maximum freedom from spurious outputs and minimum TVI problems.
4. A panel switch, S4, captioned VFO is utilized for spotting frequency of oscillator (VFO or XTAL) and for zero beating purposes.



III. SPECIFICATIONS

1. Frequency Range:

- a) 2 meter band - 143 to 148.5 MC
- b) 6 meter band - 49.5 to 54.1 MC

2. Frequency control:

- a) 2 meter band - Internal VFO or crystals in 8 or 12 MC range.
- b) 6 meter band - Internal VFO or crystals in 8.3 or 12.5 MC range.

3. Frequency Stability: VFO drift after 15 minute warmup less than 7 parts per million per hour for normal room temperature variation.

4. Power Ratings: 150 to 180 watts carrier input
100 to 120 watts carrier output

5. Modulation

Characteristics: a) Class B high level plate and screen modulation of Power Amplifier stage.

b) Low level speech clipping with automatic level control actuated by peak detection of modulator output. (Preset to start speech clipper at approx. 90% negative modulation.)

c) Modulation monitor lamp indicates when clipping starts.

d) Response characteristics (with 3 db clipping):

Flat to within ± 3 db from 350 to 3000 cps.

Down more than 10 db at 200 cps and 3600 cps.

Down more than 18 db at 120 cps and 4200 cps.

e) Calibrated clipping level control with up to 18 db useable speech clipping at 95% modulation with -50 db, high impedance microphone at normal voice level.

f) Internally produced hum and noise down more than 40 db below 95% modulation with 12 db clipping.

6. Spurious Output: Less than 5 milliwatts spurious output at any frequency when operated into matched load.
7. Output Impedance: 40 to 80 ohm nominal.
8. Keying Characteristics:
 - a) Keying speed to more than 40 WPM
 - b) Rise time approx. 2 milliseconds
 - c) Decay time approx. 4 milliseconds
9. Power Requirements: 115 volts, 58-62 cps, 600 VA

IV. CIRCUIT DESCRIPTION

A. RF SECTION

- 1) OSCILLATOR: V1, a type 6BK7 is employed as a series tuned, high C VFO in the 24 to 27 MC range. Output is coupled from the oscillator cathode and fed thru low capacity cable to the following stage.

The use of the paralleled sections of the 6BK7 with its resultant high GM and mechanical stability provides an unusually stable oscillator. Plate voltage of approximately 45 volts from a regulated source and filament current regulation contribute materially to frequency stability.

S5 serves to select proper range for 2 or 6 meter operation. The same switch converts the oscillator to crystal control when desired.

Oscillator tuning ranges are:

2 meters: 24.0 - 24.67 MC

6 meters: 25.0 - 27.0 MC

In the XTAL position the 6BK7 serves as a modified Colpitts oscillator and furnishes extremely stable crystal frequency control. 8 or 12 MC fundamental mode crystals may be used.

2. BUFFER: V2 is a Class A buffer stage following the VFO. (When crystal control is employed this stage becomes a Class C. frequency multiplier.) Loose coupling to the oscillator and regulated supply voltages on this 6AH6 stage contribute to overall stability.
3. MULTIPLIER: V3, a type 6CL6, is employed as a frequency multiplier. The plate tank capacitor (C6) covers sufficient range to permit operation as either a doubler to 50 MC for 6 meter operation or as a tripler to 72 MC for 2 meter operation.

4. 2 Meter DOUBLER: V4, a type 7558, is used to double frequency to 144 MC range for 2 meter operation. This stage is disabled (by S6) for operation on 6 meters.
5. DRIVER: V5 is a straight-thru amplifier utilizing a multiband coupler in its plate circuit. Straight-thru operation of this stage contributes considerably to the spurious-free, harmonic-free output of the ZEUS. A screen voltage control (R3) in this stage serves as means for adjusting grid drive to optimum on the final amplifier stage.
6. FINAL AMPLIFIER: V6 is an RCA 7034 tetrode amplifier with a specially devised, high efficiency multiband tank circuit. The tank circuit operates as a modified PI network on 6 meters wherein C10 and C9 serve as plate tuning and plate loading capacitors, respectively. The tank circuit operates as a half-wave lumped tank on 2 meters with adjustable link coupling. Mechanical linkage on the shaft of C9 varies the link coupling on the 2 meter tank, permitting a single panel knob to serve as loading control for both bands. Separate VHF receptacles at the rear are provided for each of the two bands.

B. LOW LEVEL AUDIO

V7 (12AX7) and V8 (12AU7) are low level audio stages located in the RF unit. A special feature of the ZEUS audio system is the use of two separate audio gain controls. R1 is located at the rear apron of the RF chassis and is used to preset the audio gain of the unit in such a manner as to permit the panel gain control, R2 to read speech clipping level directly in decibels. Once set for a given microphone and operator this control will seldom require readjustment. (The MONITOR lamp, I4 gives a continuous check on this adjustment.)

R/C time constants in the low level audio stages are selected to yield optimum performance from the clipper and high level audio stages.

The second half of V8 is employed as a cathode follower to furnish low impedance output permitting separation of the RF UNIT and the MODULATOR/PS UNIT.

Output level from the cathode follower is 45 peak to peak volts or more before overload.

C. HIGH LEVEL AUDIO

The high level audio circuits components are entirely contained within the MODULATOR/POWER SUPPLY UNIT. They may be considered as three separate circuit groups.

1. Speech Clipper - Filter consisting of two type 1N34-A diodes (CR302, CR303) arranged to furnish symmetrical clipping of audio signals above a certain level. A sine wave exceeding this level is clipped into a square waveform. Single voice peaks exceeding this certain level are clipped off at their tops. The level at which clipping starts is established by V306, a type 6C4 whose action is described in paragraph IV-D.

The filter following the clipper circuit is especially designed to attenuate high frequency components including those above 3500 cycles in the original voice input as well as those generated by the clipper process.

2. Phase Inverter - Driver section employs a 12AT7 (V301) as a cathode coupled phase inverter and a 6BX7 (V302) as a push-pull direct coupled cathode follower driver. Direct coupling between the driver and the modulator stage greatly minimizes the two major disadvantages of a Class B modulator system. Low frequency distortion is eliminated and grid current clipping is virtually eliminated. R301 establishes the operating point of the driver system to set proper zero signal conditions on the modulator tubes.
3. Modulator stage - employs 2 type 811-A (V303, V304) as conventional zero bias modulators with a specially designed modulation transformer to transfer modulated output power in proper proportion to the Class C RF final amplifier plate and screen.

D. AUTOMATIC MODULATION SYSTEM

The exclusive AUTOMATIC MODULATION CONTROL system in the ZEUS provides a simple, trouble free technique for control of speech clipping over wide range of modulator load and speech input conditions.

A type 6W4 (V305) is utilized as a biased peak detector with circuit constants so arranged as to produce no output until a negative modulation peak exceeding 90% modulation is encountered. A single such peak produces a signal across the 6W4 load, and to the 6C4 (V306) cathode follower. The clipper bias on the 1N34 stage is reduced by this action. Time constants are such that corrective action starts in less than 100 microseconds. Release time is of the order of 50 milliseconds. This has proven to be an ideal balance for normal voice characteristics and microphone techniques.

A glow lamp, located on the panel of the RF UNIT and captioned MONITOR provides a visual indication of the action of the clipper circuitry and provides the operator with an effective modulation indicator.

E. POWER SUPPLIES

Several separate power supplies are utilized in the ZEUS. These are all of conventional and conservative design.

1. 325 Volt DC supply utilizes a 5U4G (V307) as a full wave rectifier and provides B positive level for all tubes except the 811 MODULATORS and the 7034 POWER AMP. A regulated 150V DC is derived from this source by means of a type OA2 (V308) and is used as plate and screen supply for V1 and V2. A negative bias voltage (CR301) is also derived from this supply for keying, biasing and similar purposes.
2. 875 Volt supply employing two 6R4GY (V310, V311) furnishes plate supply for the 811A MODULATOR tubes and plate and screen supply for the 7034/4X150 POWER AMPLIFIER.
3. A type 6BK7GT (V312) is employed as a DC clamp tube for protection of the screen of the 7034/4X150 tube.
4. Filament current regulation for the 6BK7 oscillator tube is furnished by a unique cascaded ballast tube (V309, V313) arrangement making VFO frequency essentially independent of line voltage variation of normal proportions.

MERCURY-ZEUS RF UNIT

Model 331

ELECTRICAL PARTS LIST

<u>SYMBOL</u>	<u>DESCRIPTION</u>	<u>MFR.</u>	<u>TYPE</u>
<u>BLOWER</u>			
BL1	115VAC-60 cycles, 16 Watt	Ripley	8483
<u>CAPACITORS</u>			
C1	variable, 9-100pf	Hammarlund	RCM-100-S
C2A	trimmer, 1.5-7pf NPO		
C2, C3	trimmer, 3-12pf, NPO	CRL	822
C3A	ceramic, 75pf, 2.5%, NPO	Aerovox	NPO-S1
C4	ceramic, 47pf, 5%		
C5	trimmer, 4.5-25pf, NPO	CRL	822
C5A	trimmer, 4.5-25pf, N650	CRL	822
C5B	ceramic, 68pf, N750	Arco	CCTN-680
C6	variable, 50pf	Hammarlund	HF-50
C7, C8	variable, 35pf	Hammarlund	HF-35
C9	variable, 4.7-13pf	Johnson	165-4
C10	variable, 140pf	Johnson	149-6
C11	variable, 1.8-8.7pf	Johnson	160-104
C12	ceramic, 3.3pf, NPO		
C13	ceramic, 51pf, 1%, NPO	Arco	NPO-S1
C13A	selected and added as required		
C14	ceramic, 180pf, 2.5%	Arco	CM-15-F-181-G
C14A	selected and added as required		
C15, C16	ceramic, 270pf, 5%, NPO	Arco	CM-15-F-271-J
C17	ceramic, 15pf	Arco	CM-15-C-150
C18	ceramic, 39pf	Arco	CM-15-E-390
C19	ceramic, .0022 mfd.	Aerovox	BCD-D1-1GMV
C20, C21, C22	ceramic, .01 mfd.	Aerovox	BCD-D1-4GMV
C23	ceramic, 47pf	Arco	CCD-470
C24, C25	ceramic, .0022 mfd.	Aerovox	BCD-D1-1GMV
C26, C27, C28	ceramic, .01 mfd.	Aerovox	BCD-D1-4GMV
C29	ceramic, 47pf	Arco	CCD-470
C30, C31, C32	ceramic, .0022 mfd.	Aerovox	BCD-D1-1GMV
C33	mica, 62pf	Arco	CM-15
C34 thru C37	ceramic, .0022 mfd.	Aerovox	BCD-D1-1GMV
C39	ceramic, 50pf	CRL	850S-50Z
C40, C41	ceramic, .0022 mfd	Aerovox	BCD-D1-1GMV
C42	mica, .0006 mfd, 2500VDC	Sangamo	A2
C43	ceramic, 500pf, TV	CRL	TV-3-50A
C44	ceramic, .01 mfd.	Aerovox	BCD-D1-4GMV
C45	ceramic, 47pf	Arco	CCD-470
C46	ceramic, 470pf,	Aerovox	BCD-D1-1-20%
C47, C49	ceramic, 47pf	Arco	CCD-470
C48	ceramic, 470pf,	Aerovox	BCD-D1-1-20%
C50, C51	ceramic, .0022 mfd	Aerovox	BCD-D1-1GMV
C52	ceramic, 47pf	Arco	CCD-470
C53	ceramic, .01 mfd	Aerovox	BCD-D1-4GMV
C54 thru C61	ceramic, .0022 mfd	Aerovox	BCD-D1-1GMV
<u>FUSES</u>			
FI	3AG, 1 amp	Littelfuse	

INDICATOR LAMPS

I1, I2	6.3V at .25 amp	G.E.	#44
I3	6.3V at .15 amp	G.E.	47
I4	neon	G.E.	NE51

INDUCTORS

L1	1.29uh	National	XR70 (form)
L2	.75MH, 125MA	Miller	#620
L3	20 turns, #26 enamel wire	North Hills	F120 (form)
L4	3 turns, #18 wire, $\frac{1}{2}$ inch dia.		
L5	3 turns, #14 wire, $\frac{1}{2}$ inch dia.		
L6	7 uh	Ohmite	Z50
L7	3 turns, #12 wire $\frac{3}{4}$ inch dia.		
L8	2 $\frac{1}{2}$ turns, #16 wire, 1 inch dia.		
L9	1.8 uh	Ohmite	Z144
L10	7 uh	Ohmite	Z50
L11	7 uh	Ohmite	Z50
L12	4 turns, 3/16 tubing, 1 inch dia.		
L13	5 turns, #8 wire, 1 $\frac{1}{2}$ inch dia.		
L14	7 uh	Ohmite	Z50
L15	1.8 uh	Ohmite	Z144
L16	1 turn, #14 wire, 1 inch dia.		
L17	0.84 uh	Ohmite	Z235

METER

M1	0-400MA, 0-10MA, 0-3MA F.S.	Ideal Precision Meter
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RESISTORS

R1, R2	variable, comp, 1 meg, 20%, $\frac{1}{2}$ W	CRL	B70
R3	variable, comp, 100K, 10%, 2W	AB	
R4	fixed, comp, 47 ohm, 10%, $\frac{1}{2}$ W	AB	
R5	fixed, comp, 12K, 10%, $\frac{1}{2}$ W	AB	
R6	fixed, comp, 47 ohm, 10%, $\frac{1}{2}$ W	AB	
R7	fixed, comp, 330 ohm, 10%, $\frac{1}{2}$ W	AB	
R8	fixed, comp, 1K, 10%, $\frac{1}{2}$ W	AB	
R9, R10	fixed, comp, 47K, 10%, $\frac{1}{2}$ W	AB	
R11	fixed, comp, 120 ohm, 10%, $\frac{1}{2}$ W	AB	
R12	fixed, comp, 27K, 10%, $\frac{1}{2}$ W	AB	
R13	fixed, comp, 2.2K, 10%, $\frac{1}{2}$ W	AB	
R14	fixed, comp, 220K, 10%, $\frac{1}{2}$ W	AB	
R15	fixed, comp, 68K, 10%, $\frac{1}{2}$ W	AB	
R16, R43	fixed, comp, 33K, 10%, $\frac{1}{2}$ W	AB	
R17	fixed, comp, 50K 10%, $\frac{1}{2}$ W, 220K	AB	
R18	fixed, comp, 120K, 10%, $\frac{1}{2}$ W	AB	
R19	fixed, comp, 22K, 10%, $\frac{1}{2}$ W	AB	
R20	fixed, comp, 1K, 5%, $\frac{1}{2}$ W	AB	
R21	fixed, comp, 12K, 10%, $\frac{1}{2}$ W	AB	
R22	fixed, comp, 22K, 10%, $\frac{1}{2}$ W	AB	
R23	fixed, comp, 2.2K, 10%, 1W	AB	
R24	fixed, comp, 22K, 10%, $\frac{1}{2}$ W	AB	
R25	fixed, comp, 6.8K, 10%, 2W	AB	
R26	fixed, comp, 15 ohm, 5%, $\frac{1}{2}$ W	AB	
R27	fixed, comp, 1500 ohm, 10%, $\frac{1}{2}$ W	AB	
R27A	selected and added as required		
R28	fixed, comp, 10 ohm, 5%, 2W	AB	
R29	fixed, comp, 220K, 10%, $\frac{1}{2}$ W	AB	
R30	fixed, comp, 33K, 10%, $\frac{1}{2}$ W	AB	

RESISTORS (cont'd)

R31	fixed, comp, 15K, 10%, $\frac{1}{2}$ W	AB
R32	fixed, comp, 1.8 meg, 10%, $\frac{1}{2}$ W	AB
R33	fixed, comp, 470K, 10%, $\frac{1}{2}$ W	AB
R34	fixed, comp, 180K, 10%, $\frac{1}{2}$ W	AB
R35	fixed, comp, 3.3K, 10%, $\frac{1}{2}$ W	AB
R36	fixed, comp, 22K, 10%, $\frac{1}{2}$ W	AB
R37	fixed, comp, 1 meg, 10%, $\frac{1}{2}$ W	AB
R38	fixed, comp, 3.3K, 10%, $\frac{1}{2}$ W	AB
R39	fixed, comp, 56K, 10%, $\frac{1}{2}$ W	AB
R40	fixed, comp, 2.2K, 10%, $\frac{1}{2}$ W	AB
R41	fixed, comp, 12K, 10%, $\frac{1}{2}$ W	AB
R42	fixed, comp, 47K, 10%, $\frac{1}{2}$ W	AB
R44	fixed, comp, 39 ohm, 10%, $\frac{1}{2}$ W	AB

SWITCHES

S1A, B, C, D	wafer, 4 poles, 5 position	CRL	
S2 A, B	2 pole, 2 position (part of R2)		
S3 A, B	toggle, double pole, single throw	Carling	
S4	pushbutton	Switchcraft	#4006
S5A, B, C	wafer, 3 poles, 3 position	CRL	PA-1006
S6A, B, C	wafer, 3 poles, 2 position	CRL (modified)	

TRANSFORMER

T1	6.3V at 8A	Epcor Prod. Inc.	2205
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TUBES, ELECTRON

V1	6BK7B	G.E.
V2	6AH6	G.E.
V3	6CL6	G.E.
V4, V5	7558	RCA
V6	7034	RCA
V7	12AX7	G.E.
V8	12AU7	G.E.

ZEUS MODULATOR AND POWER SUPPLY UNIT

Model 332

ELECTRICAL PARTS LIST

<u>SYMBOL</u>	<u>DESCRIPTION</u>	<u>MFR.</u>	<u>TYPE</u>
<u>CAPACITORS</u>			
C301	paper, .1 mfd, 200V	Sangamo	33
C302	ceramic, 470pf, 500V	Aerovox	BCD
C303	ceramic, 2200pf, 500V	Aerovox	BCD
C304	ceramic, .01 mfd, 600V	Aerovox	BCD
C305	paper, .1 mfd, 200V	Sangamo	33
C306, C307	paper, .05 mfd, 400V	Sangamo	33
C308, C309	ceramic, .02 mfd, 600V	Erie	ED-.02
C310	paper, .1 mfd, 200V	Sangamo	33
C311, C312	electrolytic, 10 mfd/250V	Mallory	TCS52
C313, A, B, C	electrolytic, 60/20/40 mfd 450V/450V/350V	Mallory	PP375.6
C314, C315, C17	electrolytic, 90mfd/500V	Pyramid	TMS1910
C316	paper, .01 mfd, 1600V	Cornell-Dubilier	16S1
<u>RECTIFIERS & DIODES</u>			
CR301	selenium rectifier	Radio Receptor Co.	16Y1
CR302, CR303	germanium diode	Amperex	1N34A
<u>FUSE</u>			
F301	3AG 6A ^{125V, regular} slow-blow	Littelfuse	312co8 313008
<u>RELAYS</u>			
K301	DPST 6V. AC	Artisan	RHX72
K302	3PDT 115V. AC	Artisan	RGX54
<u>INDUCTORS</u>			
L301	1 HY	Chicago	TM-1000A
L302	swinging choke, 12-2HY, 200MA	Stancor	CL401
L303	filter choke, 8HY, 300MA	Stancor	C2308
L304	filter choke, 20HY, 15MA	Stancor	CL515
<u>RESISTORS</u>			
R301	variable, comp, 25K, 10%, 2W	Allen-Bradley	
R302	fixed, comp, 12K, 10%, 1/2W	Allen-Bradley	
R303	fixed, comp, 82K, 10%, 1/2W	Allen-Bradley	
R304	fixed, comp, 33K, 10%, 1/2W	Allen-Bradley	
R305	fixed, comp, 22K, 10%, 1/2W	Allen-Bradley	
R306	fixed, comp, 1 meg, 10%, 1/2W	Allen-Bradley	
R307	fixed, comp, 820 ohm, 10%, 1/2W	Allen-Bradley	
R308	fixed, comp, 33K, 10%, 1/2W	Allen-Bradley	
R309	fixed, comp, 1 meg, 10%, 1/2W	Allen-Bradley	
R310	fixed, comp, 180K, 10%, 1/2W	Allen-Bradley	
R311	fixed, comp, 220K, 10%, 1/2W	Allen-Bradley	
R312, R313	fixed, comp, 1 meg, 10%, 1/2W	Allen-Bradley	
R314	fixed, comp, 100K, 10%, 1/2W 68K	Allen-Bradley	
R315	fixed, comp, 47K, 10%, 1/2W	Allen-Bradley	
R316	fixed, comp, 56K, 10%, 1/2W	Allen-Bradley	
R317, R318	fixed, comp, 22K, 10%, 1/2W	Allen-Bradley	
R319	fixed, comp, 6.8 meg, 10%, 2W	Allen-Bradley	
R320	fixed, comp, 8.2 meg, 10%, 2W	Allen-Bradley	

RESISTORS, (cont'd)

R321	fixed, comp, 2.7 meg, 10%, 1/2W	Allen-Bradley
R322	fixed, comp, 1.8 meg, 10%, 1/2W	Allen-Bradley
R323	fixed, comp, 120 ohm, 10%, 1/2W	Allen-Bradley
R324	fixed, comp, 10K, 10%, 1/2W	Allen-Bradley
R325	fixed, wirewound, 7.5K, 10%, 10W	Allen-Bradley
R326, R327	fixed, wirewound, 50K, 10%, 10W	Allen-Bradley
R328	fixed, wirewound, 15K, 10%, 50W	Allen-Bradley
R329	fixed, wirewound, 25K, 10%, 5W	Allen-Bradley
R330	fixed, comp, 2.7K, 10%, 1/2W	Allen-Bradley
R331	variable, comp, 50K, 10%, 1/2W	Chicago
R332	fixed, comp, 22K, 10%, 2W	Allen-Bradley
R333	fixed, comp, 56 ohm, 10%, 2W	Allen-Bradley
R334	fixed, comp, 47 ohm, 10%, 1/2W	Allen-Bradley
R335	fixed, wirewound, 50K, 10W	Allen-Bradley
R336	selected and added as required	

GT3 Type 65

TRANSFORMERS

T301	plate	Epcor Products	2225
T302	plate & filaments	Epcor Products	2215
T303	modulation	Epcor Products	2214

TUBES, ELECTRON

V301	12AT7	Amperex
V302	6BX7	G.E.
V303, V304	811-A	RCA
V305	6X4	G.E.
V306	6C4	G.E.
V307	5U4	G.E.
V308	0A2	Amperex
V309	3H7	Amperite
V310	3H7	Amperite
V311, V312	5R4	G.E.
V313	6BX7	G.E.

VI. -a. VFO Alignment Procedure

The VFO of the Climaster ZEUS 331 Transmitter is carefully calibrated before shipment and should not normally need realignment.

Realignment of the VFO should not be attempted unless conclusive tests indicate that the VFO CAL control range is inadequate.

The alignment procedure is as follows:

Refer to Fig. 2 (component location of RF unit). Note the location of the three VFO padders C5, C2 and C3.

A calibrated receiver covering the range of 24 to 25 MC is required.

Align the VFO with all covers in place and secured.

Set the VFO CAL control slot to 10 o'clock (or 4 o'clock) as view from the front of the unit.

Set the TUNE-OPERATE switch to TUNE 2. Set the TRANSMIT-STANDBY switch to TRANSMIT. Set the 2M - XTAL - 6M switch to 2M.

Step 1 - Set the VFO dial to 144 MC. Tune the receiver to 24 MC, carefully zero-beat the VFO by adjusting the padder C5.

Step 2 - Set the VFO dial to 148 MC. Tune the receiver to 24.667 MC. Again zero-beat the VFO by adjusting the padder C3.

Repeat steps 1 and 2 until the two ends of the 2M band agree to within 1 KC or better.

Step 3 - Set the 2M - XTAL - 6M switch to 6M. Tune the receiver to 25 MC, and adjust padder C2 to zero-beat.

NOTE: Where a receiver with sufficient calibration accuracy at 24 to 25 MC is not available the above procedure can be followed utilizing the appropriate harmonic frequencies in both the 2 and 6 meter band.

VI. -b. Blower Lubrication and Cleaning

The blower bearings should be oiled about once every three months with a few drops of not too light machine oil.

At about the same intervals remove accumulated dust from the blower vanes and the radiator of the final amplifier tube.

VI. -c. Tube Replacement

Replacement of certain tubes may require resetting of one or more adjustments.

After replacement of V302 (6BX7), V303 (811A) or V304 (811A) the current on the metering jack J303 must be reset to 50 to 70 ma with an external meter. Do not interchange the plate connectors on the 811A's.

Replacing the filament voltage regulator tubes V309 and V310 check the heater voltage of the VFO tube V1. It should read 6.0 to 6.4 VAC at nominal line voltage of 115 VAC.

The replacement of the remaining tubes does not require adjustments but indiscriminate tube changing should be avoided.

VI. -d. Resistance and Voltage Measurements - RF UNIT

All measurements taken from tube pin to chassis; resistance measurements taken with power supply cable disconnected.

Voltage measurements taken with 115V AC input to power supply, TUNE switch in position 1, AUDIO at minimum, DRIVE at minimum, BAND in 2M, toggle switch in TRANSMIT position. Voltage measurements are taken with VTVM.

<u>TUBE</u>	<u>PIN</u>	<u>RESISTANCE</u>	<u>VOLTAGE</u>
V1 6BE7B	1, 6	Inf	65V
	2, 7	33K	-.4V
	3, 8	17	.1V
	4	0	0
	5	0	6.3V AC
	9	62	.1
V2 6AH6	1	62	.1V
	2, 4	0	0
	3	0	6.3V AC
	5	Inf	150V
	6	Inf	115V
	7	330	2.15V
V3 6CL6	1	120	3V
	2, 9	70K	-.45V
	3, 8	150K	210V
	4	0	6.3V AC
	5, 7	0	0
	6	130K	350V
V4 7558	1, 5, 7, 9	0	0
	2	90K	-.35V
	3, 8	175K	270V
	4	0	6.3V AC
	6	120K	400V

VI -d cont'd. RF UNIT

V5 7558	1, 5, 7, 9	0	0
	2	32K	-28V
	3, 8	0 (varies with DRIVE from 0 to 50K)	0 (varies with DRIVE from 0 to 250V)
	4	0	6.3V AC
	6	120K	400V
V6 7034	1 & ring terminal	Inf	0 (do not check with HV on)
	2, 4, 6, 8	0	0
	3	0	6.3V AC
	7	0	0
	Radiator	Inf	0 (do not check with HV on)
	Base Index Plug	9K	-100V
V7 12AX7	1	Inf	265V
	2	0-1M (varies with AUDIO CALIBRATE control)	0
	3	3.3K	2.7V
	4, 5	0	6.3V AC
	6	Inf	90V
	7	1.8M	0
	8, 9	0	0
V8 12AU7	1	Inf	400V
	2	12K to 1M (varies with AUDIO control)	75V
	3	14K	90V
	4, 5	0	6.3V AC
	6	Inf	215V
	7	1M	0
	8	3.3K	12V
	9	0	0

VI. -d. Resistance and Voltage Measurements

MODULATOR/POWER SUPPLY

Voltages measured in operating condition with proper loading but without modulation.

Resistance measurements taken with RF Unit disconnected.

<u>TUBE</u>	<u>PIN</u>	<u>RESISTANCE</u>	<u>VOLTAGE</u>
V301 12AT7	1	10M	65V
	2	1.2M	-29V
	3, 8	200K	-30V
	4, 5	0	3.15V AC
	6	10M	75V
	7	10M	-29V
	9	0	3.15V AC
V302 6BX7	1	1M	-40V
	2, 5	10M	350V
	3	150K	2V
	4	1M	-40V
	6	150K	2V
	7, 8	0	3.15V AC
V303 811A	1, 4	0	3.15V AC
	3	150K	2V
	Plate cap	32K	920V
V304 811A	1, 4	0	3.15V AC
	3	150K	2V
	Plate cap	32K	920V
V305 6W4	3	30K	920V
	5	3.2M	150V
	7	Inf	} 6.3V AC pin to pin
	8	Inf	

cont d

VI. -d. MODULATOR/POWER SUPPLY (cont'd)

V306 6C4	1, 5	10M	350V
	3, 4	0	3.15V AC
	6	1.6M	90V
	7	50K (varies with meter polarity)	110V
V307 5U4	2, 8	10M	375V
	4, 6	60	450V AC
V308 0A2	1, 5	10M	150V
	2, 4, 7	0	0
V309 3H7	2	1	20V AC
	7	1.5	6.3V AC
V310 3H7	2	1	20V AC
	7	1.5	6.3V AC
V311 5R4	2, 8	30K	920V
	4, 6	75	1000V AC
V312 5R4	2, 8	30K	920V
	4, 6	75	1000V AC
V313 6BX7	1, 4	Inf	-140V
	2, 5	20K	350V
	3, 6	0	0
	7, 8	0	3.15V AC

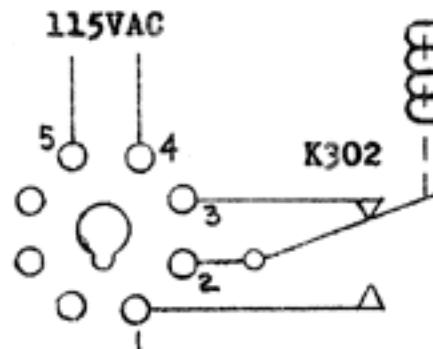


Fig. 1

Octal socket for auxiliary equipment control

(located on skirt of MOD/POWER SUPPLY Unit)

Pin #1 - normally open relay contact

#2 - common relay contact

#3 - normally closed relay contact

(The relay K302 is activated for transmission)

Pins #4 & 5 - 115VAC for aux. antenna relay

(ON for transmission)

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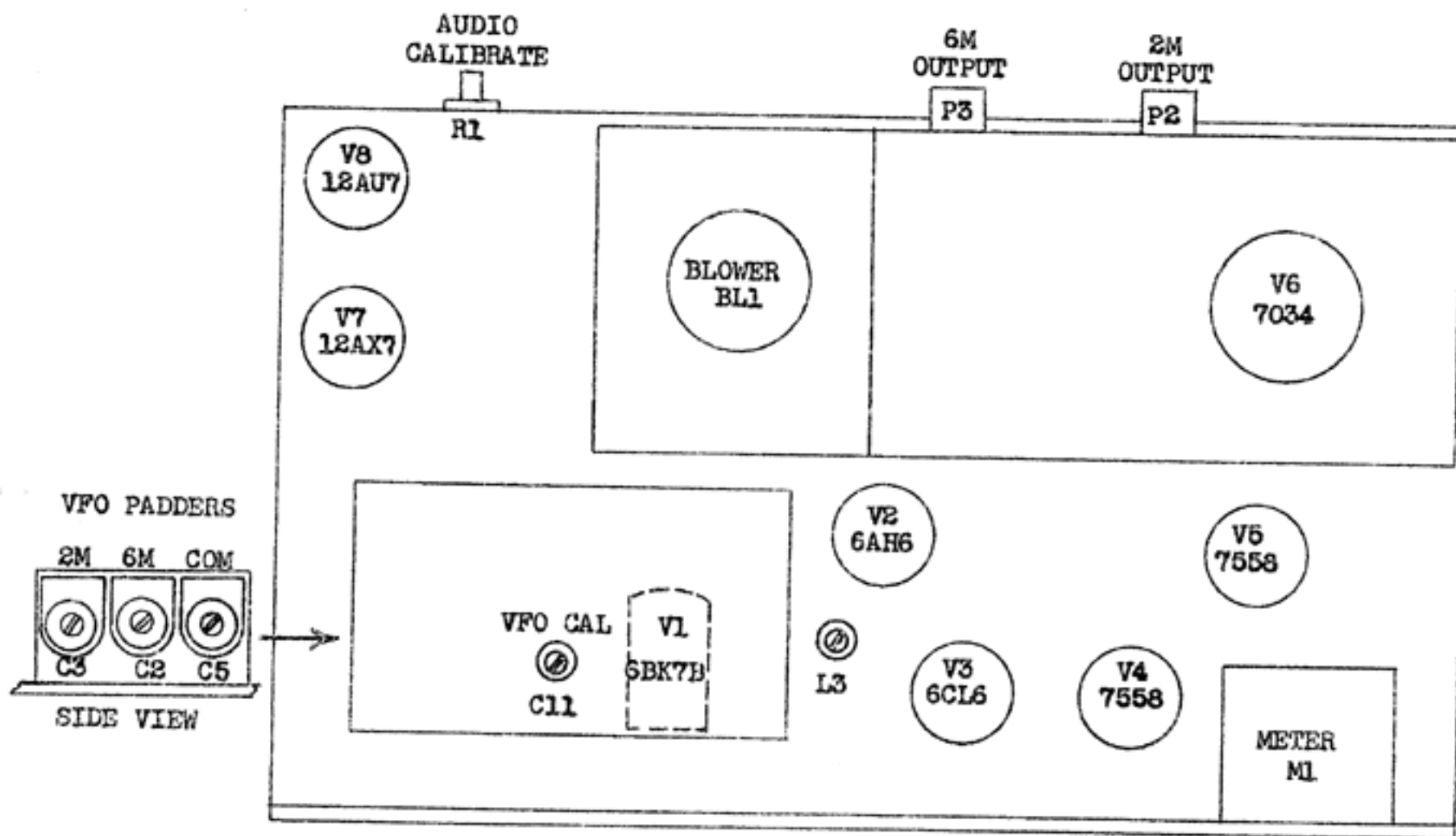
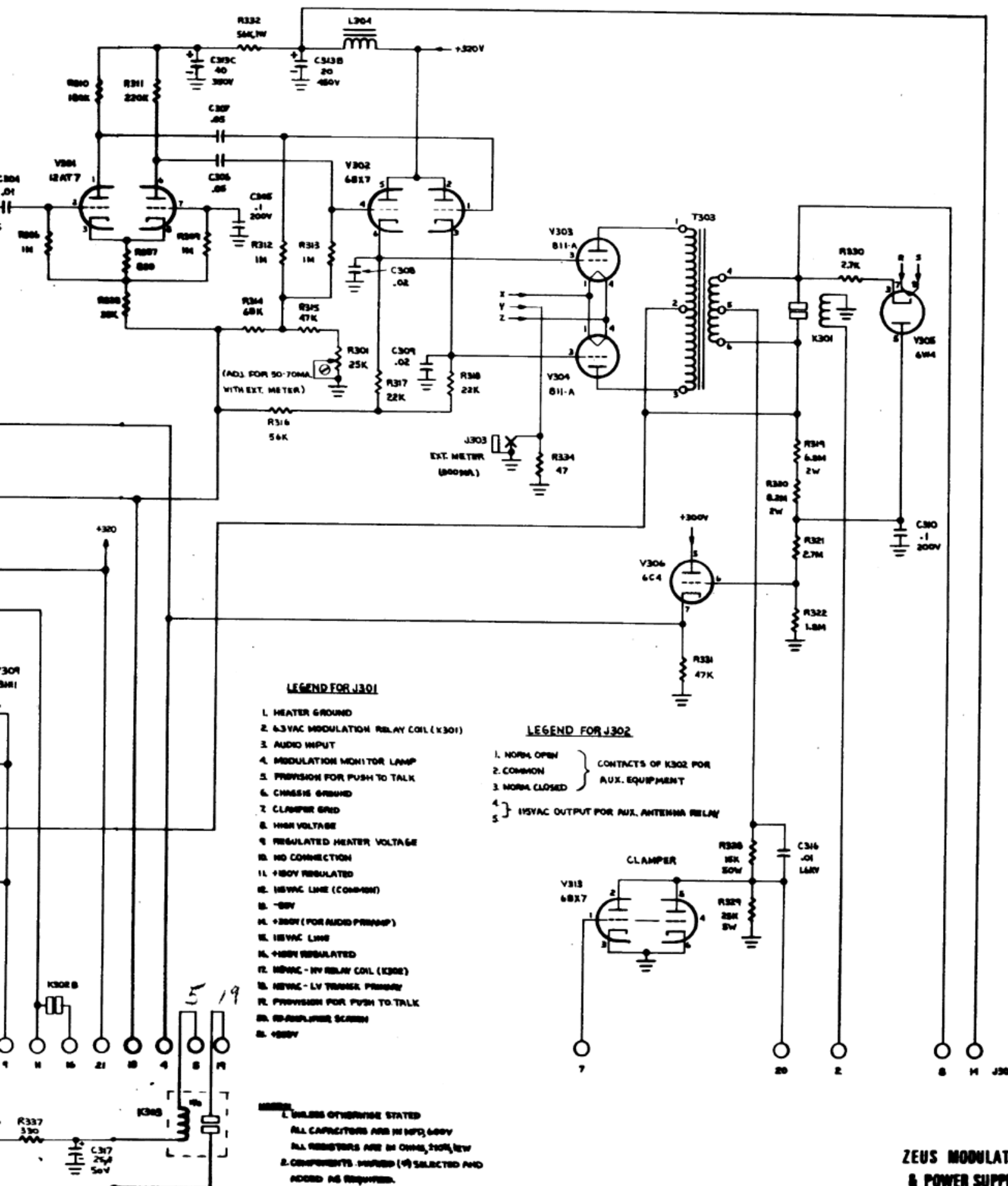
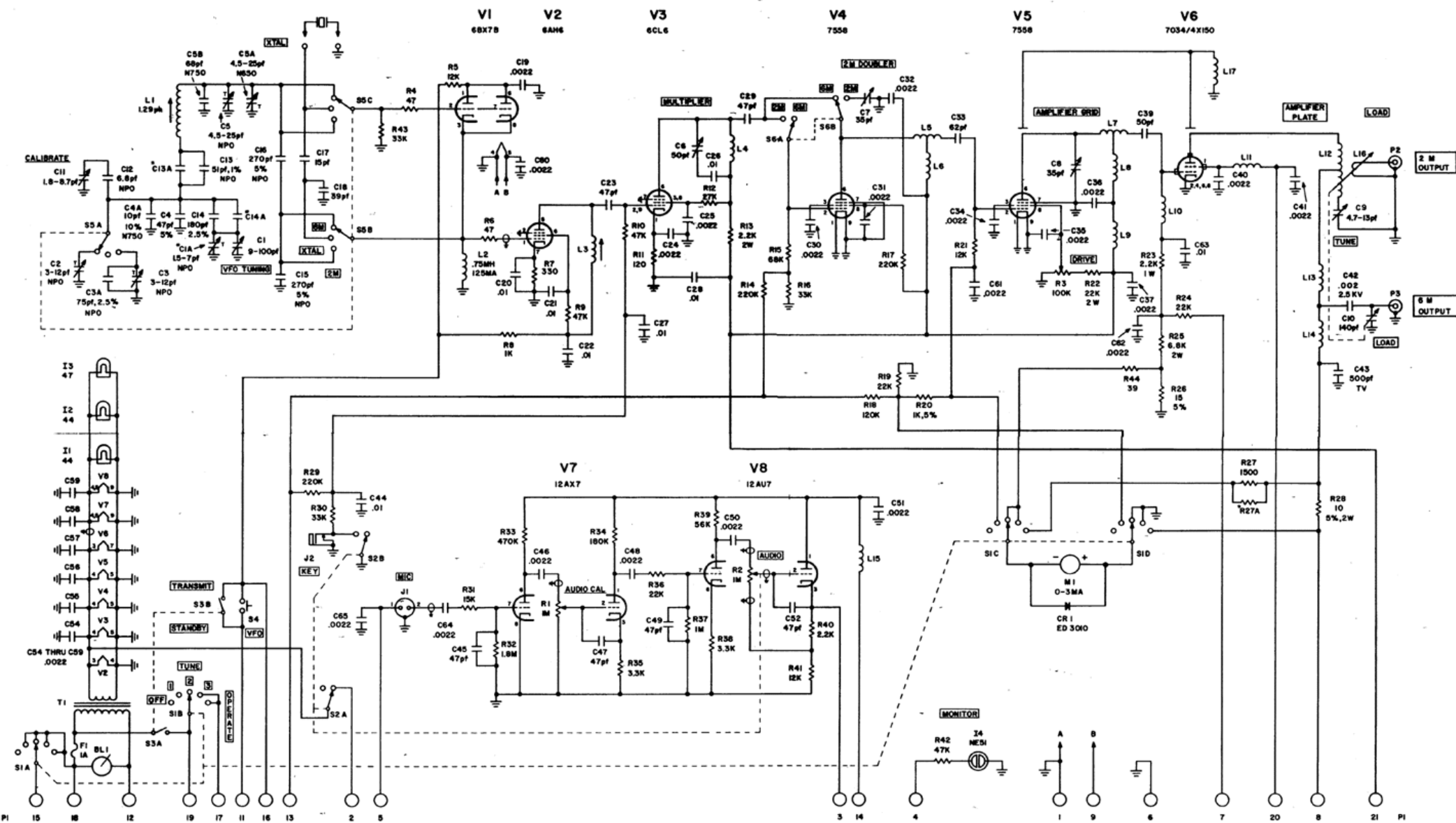


FIG. 2 COMPONENT LOCATION: TOP VIEW
331 RF UNIT







NOTES:

- 1 UNLESS OTHERWISE STATED
ALL CAPACITORS ARE IN MFD., 600V
ALL RESISTORS ARE IN OHMS, 210%, 1/2W
- 2 INDICATES FRONT PANEL FACILITY
- 3 COMPONENTS MARKED (*) ARE SELECTED AND
ADDED AS REQUIRED

- 1 HEATER GROUND
- 2 6.3VAC - MODULATION RELAY COIL (K301)
- 3 AUDIO OUTPUT
- 4 MODULATION MONITOR LAMP
- 5 PROVISION FOR PUSH TO TALK
- 6 CHASSIS GROUND
- 7 CLAMPER GRID

LEGEND FOR P1

- 8 HIGH VOLTAGE
- 9 REGULATED HEATER VOLTAGE
- 10 NO CONNECTION
- 11 +150V REGULATED
- 12 115VAC - LINE (COMMON)
- 13 -80V
- 14 +300V (FOR AUDIO PREAMP)

- 15 115VAC - LINE
- 16 +150V REGULATED
- 17 115VAC - H.V. RELAY COIL (K302)
- 18 115VAC - L.V. TRANSF. PRIMARY
- 19 PROVISION FOR PUSH TO TALK
- 20 RF AMPLIFIER SCREEN
- 21 +320V

SCHEMATIC ZEUS RF UNIT