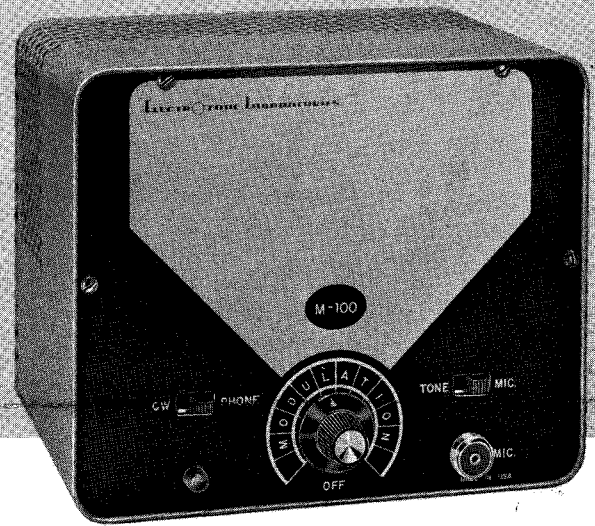


A Universal AM Modulator for Amateur and Commercial Use

M-100

**WILL OUTPERFORM
ANY AM MODULATION
SYSTEM**



GREATEST DEVELOPMENT IN AM MODULATION

FEATURES:

- Most economic and efficient AM modulation ever designed.
- Modulates FULLY any beam tetrode amplifier and LINEAR amplifier up to 1 KW.
- Excellent waveform and modulation linearity.
- Controlled automatic speech clipping.
- Complete elimination of negative and positive peaks overmodulation.
- Compact, small in size, VERY LOW power consumption, IDEAL for mobile use.
- The ONLY modulation system that permits operation at full CW ratings.
- Built-in 1000 cps tone generator.
- Adjustable carrier level.
- Provisions for single, parallel, and push-pull final amplifier tubes.

We are proud to be the first to introduce a self-contained, quality modulator unit which incorporates a unique method of modulation that, though originated in the United States, has already achieved great popularity in Europe and currently is gaining its due place in this country.

Much simplified version of this powerful modulation has found a limited use in some commercial and amateur equipment, but this is the first time that the full potentials of the series gate modulation have been completely utilized.

The most important requirements in communication are readability and intelligibility; the M-100 was designed with these important aspects in mind. Also it enables the transmitter

to give a big punch of reserved power at the moments when you most need it: When you talk. With series gate modulation, the no-talk power input is negligible while the talk power at peaks can reach almost twice as much power input as in full plate modulation.

**CONVERTS MOST COMMERCIAL CW TRANSMITTERS AND
LINEAR AMPLIFIERS INTO A FIRST CLASS PHONE RIG
WITHOUT SACRIFICING CW POWER CAPACITY**

ELECTROTONE LABORATORIES

CUSTOM SOUND SYSTEMS AND AUDIO DEVICES

M-100 SERIES GATE

Here Is Why The M-100 Is Your Best Ham Investment Per Dollar

Extensive field tests on the 20 meter band under severe conditions, where transmitters employing 100% plate modulation could not break through the QRM, proved series gate modulation with the very same transmitters to be far superior, the signal actually penetrated through the QRM and Q5 reports were obtained. It did not happen once or twice, it happened in every comparison made. All the hams we contacted were completely amazed hearing the series gate modulator, expressing it in the QSL cards received.

The advantages of the M-100 speak for themselves, and there is much more: Small size, lightweight, low power consumption, and a unit with extreme versatility and a universal application. The M-100 will fully modulate a 1 KW job with the same ease as it would a tiny 10 watter, and all this for a modest cost that is within reach of everybody.

CIRCUIT DESCRIPTION

Electrotone's series gate modulator model M-100 is an improved version of the device which was described in the R.S.G.B. Bulletin of May, 1959. Series gate modulation is the most effective combination of both control-carrier modulation and screen modulation. Some unique accomplishments have been achieved by simultaneously using a single tube as both AC and DC amplifiers.

The circuit contains a high gain, low microphonic (important in mobile use) speech amplifier which consists of two EF86's and provides a band pass of 300-4000 cps. The circuit provides either mic. input or converts the 1st speech amplifier into a RC phase shift oscillator generating a 1000 cps tone for transmitter alignment purposes. AM modulation is obtained as the modulator varies the positive potential applied to the final's screen grid in direct proportion to the amplitude of the applied audio voltage.

*A complete discussion and a mathematical analysis appeared in the Nov. 1, 1957 issue of "Electronics".

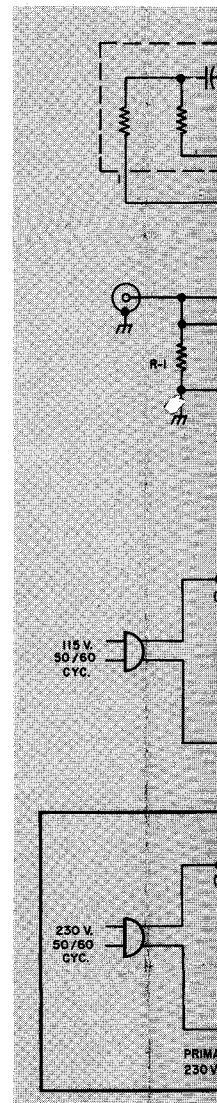
DC STATE CONSIDERATION

If the grid of V-3A is biased to the cut off point, then the full B+ potential appears on the plate and is direct-coupled to the grid of V-3B. V-3B conducts fully and the voltage drop across the cathode resistor R-15 is applied to the final's screen. Hence, a full RF carrier is obtained. As the slider of the carrier control potentiometer R-13 is moved towards the cathode side of V-3A, the bias on the grid diminishes and V-3A starts to conduct, resulting in a voltage drop across its plate load resistor R-14. The reduced voltage appears on the grid of V-3B and reduces the plate current of V-3B proportionately. Hence, the positive potential applied to the final's screen is reduced and RF carrier level is low.

AC STATE CONSIDERATION

With the bias on the grid of V-3A set by the carrier level control to approximately 1 V negative the DC voltage applied to the final's screen is low and, therefore, the RF output is low. If an audio voltage of 1 V peak is now applied from V-2 to the grid of V-3A, it will be amplified by V-3A and appear through V-3B at the screen of the final and will modulate the low RF output approximately 95%. The mean DC potential of the final's screen remains constant.* If the audio voltage applied to V-3A is increased, grid current will flow in V-3A. A negative charge will build up on C-9 proportionately to the peak amplitude of the applied audio. This additional DC bias applied to the grid of V-3A will cause the potential on the plate of V-3A and the grid of V-3B to rise. The mean screen potential of the final will rise too, resulting in increased RF output.

The increased audio voltage at the grid of V-3A will appear as an amplified voltage at the final's screen relative to its previous level, but as the mean screen potential has also been raised the RF carrier is again modulated approximately 95% and no over-modulation occurs.



The bias on V-3A is set by the carrier level control where the bias is approximately 1 V negative. No further audio modulation is applied to the grid of V-3A. The potential of which is a negative charge is applied to the screen potential of the final. The carrier level is controlled by the carrier control potentiometer R-13. The carrier level is controlled by the carrier control potentiometer R-13.

100 SERIES GATE MODULATOR

100 Is Your Best Ham Per Dollar

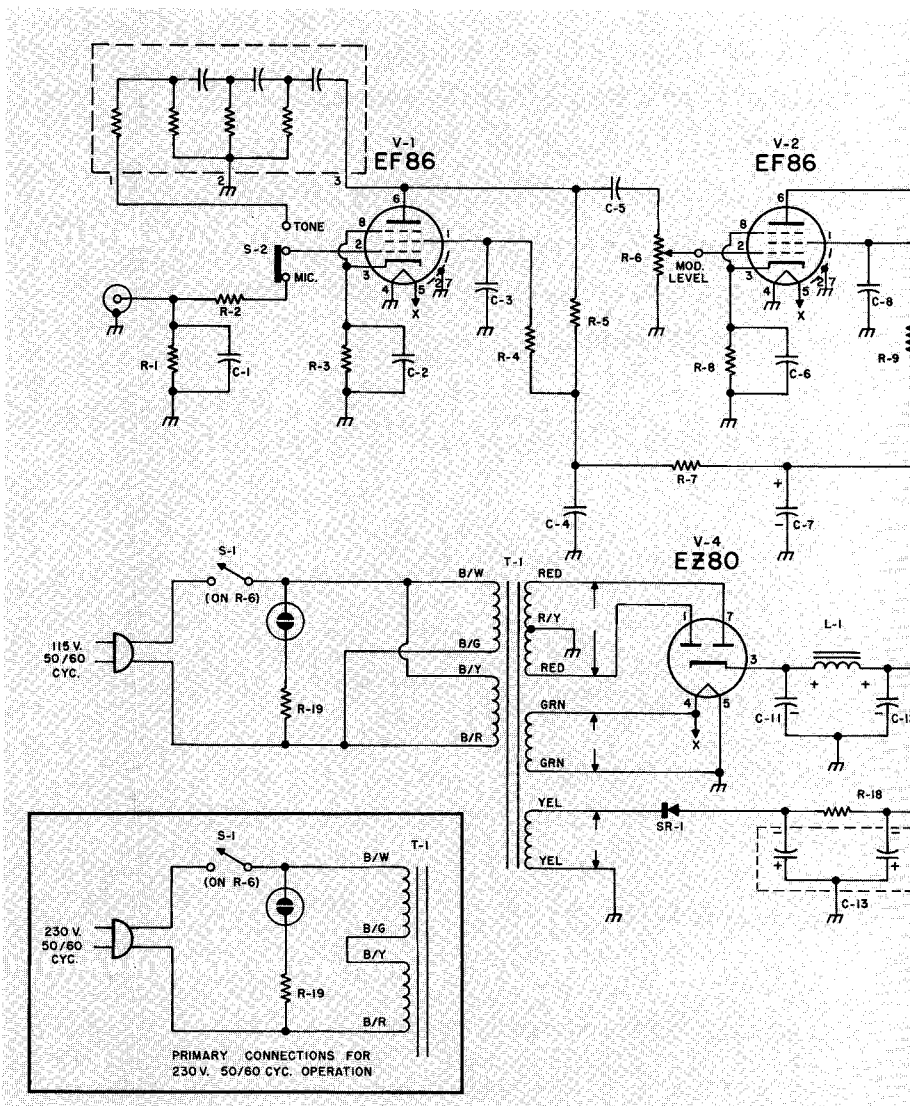
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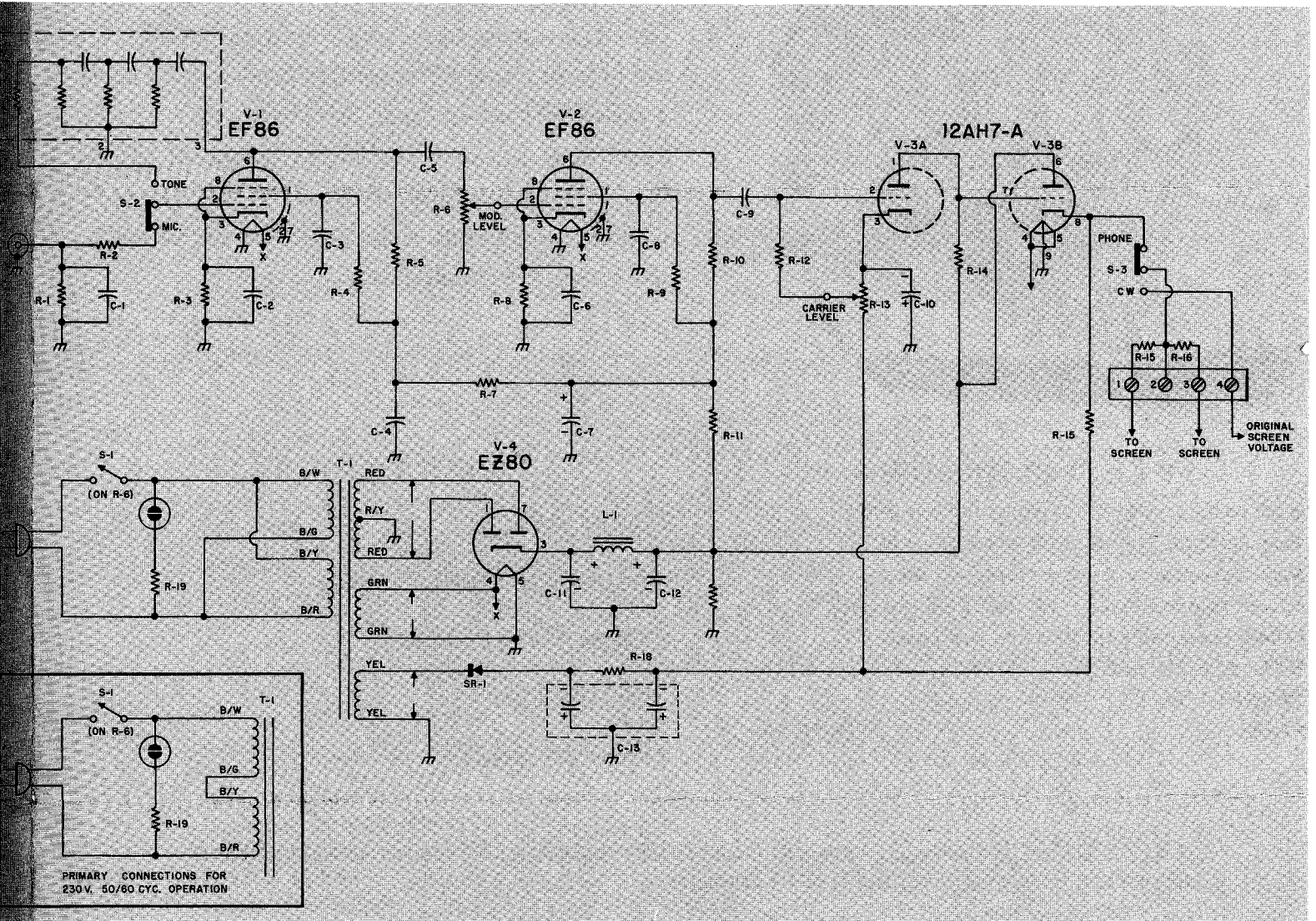
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The increased audio voltage at the grid of V-3A will appear as an amplified voltage at the final's screen relative to its previous level, but as the mean screen potential has also been raised the RF carrier is again modulated approximately 95% and no over-modulation occurs.



The bias on V-3A will increase until a limiting condition is reached where the bias built up on the coupling capacitor C-9 cuts off V-3A. No further audio voltage can reach the final's screen, the DC potential of which is at maximum; thus positive over-modulation is prevented. Negative peak over-modulation is prevented because the DC screen potential of the final can never fall below the level selected by the carrier control potentiometer; the audio voltage can only modulate this screen DC potential to produce full modulation.

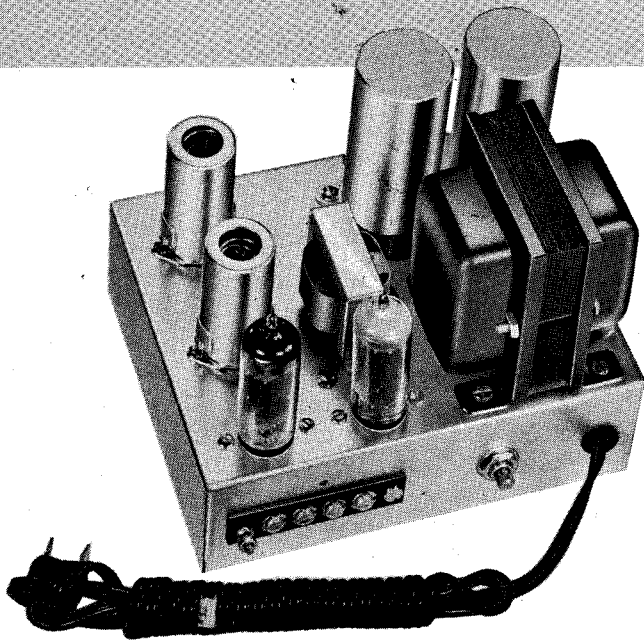
ATE MODULATOR



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It can be seen that very effective means of speech clipping is obtained merely by increasing the audio voltage input above the level that will produce approximately 95% modulation of the full RF output. Because no reactive components appear in the modulator after the clipping and because of the DC coupling between V-3A to V-3B no filter is needed. The low output impedance of V-3B helps maintain good waveform and modulation linearity.

AN IDEAL MODULATOR FOR THE HOME-BREW TRANSMITTER



Now you can get appreciably more peak power out of your present transmitter by switching to a series gate modulation. Moreover, it is permissible to increase the plate voltage of the final tube up to 65% above its rated ICAS class C plate modulation value without exceeding the rated plate dissipation.

SPECIFICATIONS

High gain, crystal or dynamic mike input.
Max. voltage output: 400 peak dc volts.
Max. instantaneous dc current: 40 ma.
Power requirements: 115/230 V 50/60 cps.
Power consumption: 30 watts average.
SIZE: 6" x 7½" x 5½"
WEIGHT: 5½ lbs.
PRICE **\$39.95** Net
(Delivered Continental U.S.A.)

CONTROLS

ON-OFF SWITCH
MODULATION LEVEL CONTROL
CARRIER LEVEL CONTROL
TONE SWITCH
CW-PHONE SWITCH

GROUP ORDERS through clubs will receive 15% discount. Units for demonstration purposes are available to clubs free of charge.

2 years unconditional guarantee.

Replacement of parts and labor free. (Tubes guaranteed for 6 months.)

10 DAYS TRIAL: Try the M-100 on the air for 10 DAYS. If it does not measure up to our claims and exceed your expectations, your money will be refunded.

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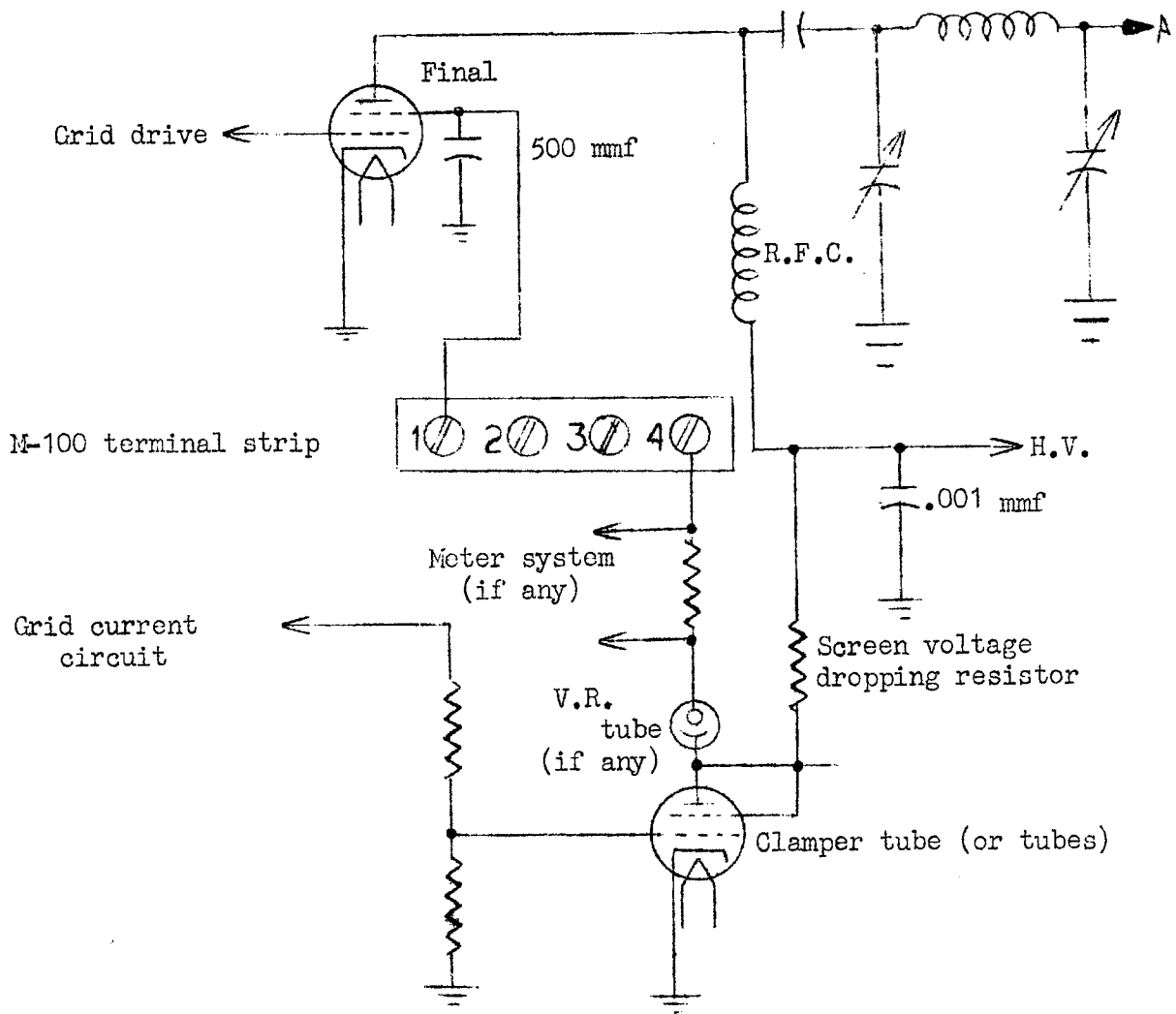
O P E R A T I O N M A N U A L
SERIES GATE MODULATOR
MODEL M-100

The Series Gate Modulator can be used with almost any amateur and commercial transmitter. The only requirement in order to obtain full modulation is a final which employs a screen grid tube (or tubes) which require a screen voltage of 400 VDC or less. The M-100 is completely self-contained and no external power is needed.

CONVERSION OF AN EXISTING CW TRANSMITTER

- Step No. 1. Disconnect your final's screen grid lead from its voltage source. Be sure to disconnect the lead as close as possible to the tube socket, preferably right on the socket terminal itself.
- Step No. 2. Solder one end of an insulated wire to the screen grid terminal on the final's tube socket (or at the point where the disconnection was made). Bring the other end of the wire through the transmitter chassis outside.
- Step No. 3. Connect the wire that was brought outside to terminal 1 on the rear of the M-100 chassis (see circuit diagram for terminal designation).
For parallel or push-pull final:
Perform steps No. 1 and No. 2 for each one of the pair, bring the two leads outside the transmitter, and connect them respectively to terminals 1 and 3 on the rear of the M-100 chassis.
- Step No. 4. Remove the RF bypass capacitor from the screen grid socket terminal and replace it with a 500mmf 600wvdc capacitor. If the screen grid is bypassed at 2 points, replace each capacitor so that the total capacitance (as seen by the modulator) shall not exceed 500mmf.
For parallel or push-pull final:
The total capacitance as seen by the modulator must not exceed 800 mmf, which means that each one of the pair must be bypassed with not more than 400 mmf.
- Step No. 5. Solder one end of an insulated wire to the screen grid voltage source which was disconnected in step No. 1, bring the other end of the wire through the transmitter chassis and connect it to terminal 4 on the rear of the chassis. (This original screen voltage will be reconnected to the final's screen grid when the CW-PHONE switch on the M-100 is moved into CW position, thus restoring your transmitter to its original condition.
- Step No. 6. Connect a wire from your transmitter's chassis to the M-100 chassis where a ground connection is provided. The screw is located at the left side of the terminal board on the rear of the M-100 chassis.

TYPICAL CIRCUIT CONVERSION OF A CLAMPED FINAL AMPLIFIER USING THE M-100



The so called "original screen voltage" is the voltage which is applied to the screen grid final tube. This voltage is obtained either from the H.V. through a dropping resistor, or from a separate power supply. A circuit may include a clamp tube, also it may have a V.R. tube in series with the screen voltage line in order to improve the clamping function. The M-100 will function properly with any of these arrangements once the "original screen voltage" point is located and is connected to terminal 4 on the rear of the M-100 chassis.

GROUNDING GRID AMPLIFIER

Any Grounded Grid amplifier using a beam tetrode or pentode final tubes can be used with the M-100 provided that the screen grid is not connected to the control grid. If the screen grid is tied to the control grid, it must be removed and reconnected according to this operating manual (see step #1 - #6). If possible, always Class C operation is preferred.

Electrotone Laboratories will be glad to advise on any problem concerning conversion of circuits not described in this manual.

OPERATING THE M-100, SERIES GATE MODULATOR

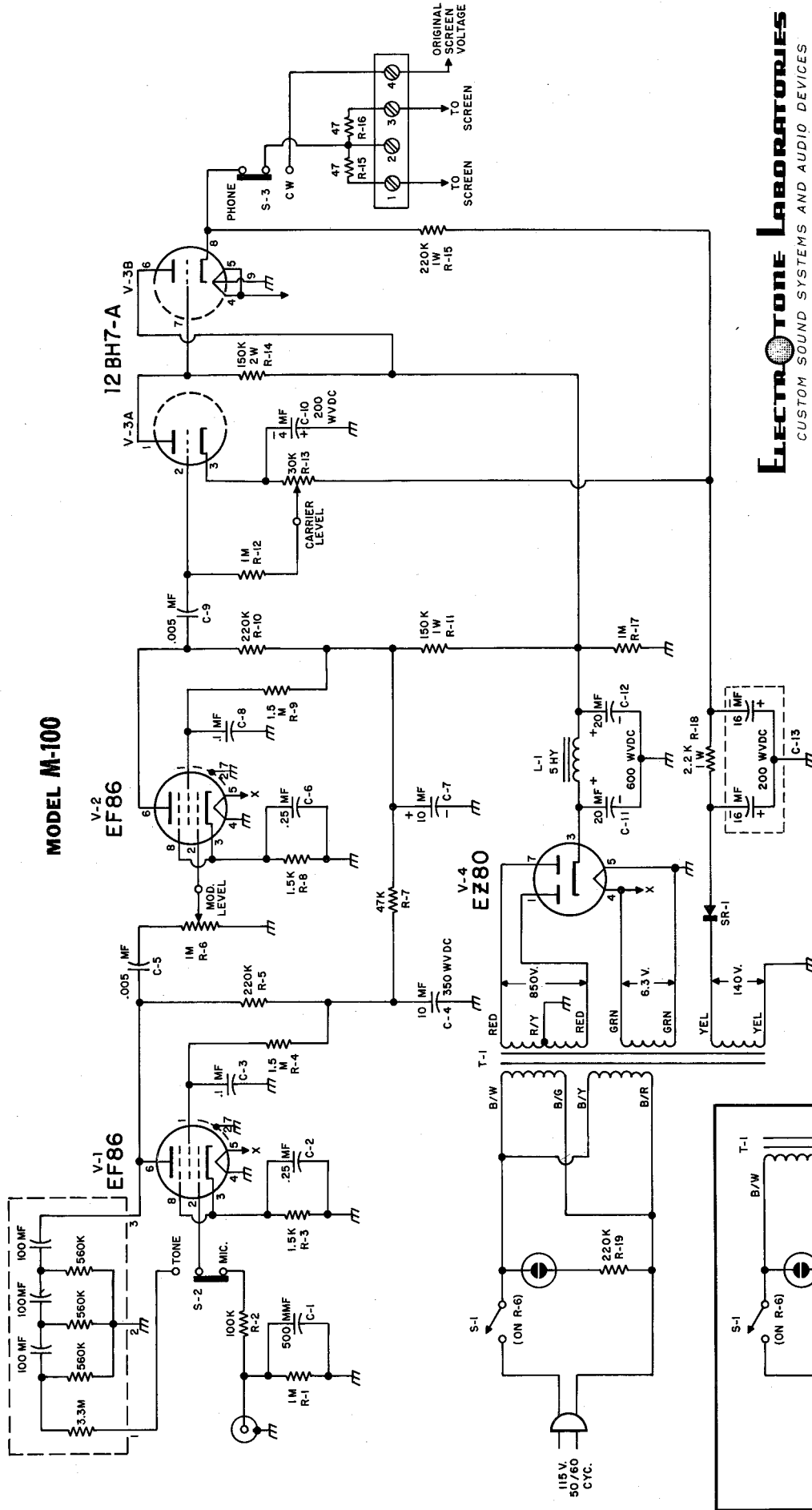
Switch the CW-PHONE switch to CW position. Set the carrier level control to produce minimum carrier (completely counter clockwise). The transmitter can now be tuned in the normal way, as for CW operation. Return the CW-PHONE switch to PHONE position. While talking into the mike, advance the modulation control clockwise until the transmitter's plate current meter shows an apparent saturation point when further advance of the modulation control does not increase the plate current. This is the point where clipping starts to take place. For best speech quality, the modulation control advancement should be stopped once this point is reached.

It should be mentioned that the meter cannot follow the peaks of the current and will indicate only the average value which is approximately 50% of the peak value. Therefore, under single tone test, which can be simulated by the tone generator of the M-100, the plate current meter will indicate approximately 50% of the expected reading. As the modulation control is advanced beyond the plate current saturation point, the clipping is increased, and the meter will indicate higher value without real increase in peak current. Setting of the modulation control is not critical because no over-modulation can take place. If preferred, the transmitter can be tuned by using the tone generator as a constant modulating signal which provides the recommended screen voltage. (A DC voltmeter can be connected across the modulator chassis and terminal 2 on the rear of the M-100). The DC voltmeter will read approximately 50-60 percent of the peak voltage for the same reasons explained previously. The transmitter should now be tuned and loaded to produce maximum RF power output. (NOTE: If the transmitter is keyed in this position it will function as an excellent MCW transmitter). The TONE-MIC switch should now be moved to MIC and the modulation level control should be advanced while talking into the mike until maximum RF output is obtained.

LINEAR AMPLIFIERS:

A linear amplifier can be converted and modulated the same way as a Class C amplifier. A carrier should be inserted and the amplifier can be tuned and loaded as recommended before. Using the M-100 will result in a very effective amplitude modulation with the linear stage running much cooler with less power consumption than in the case when the AM signal is applied to its grid input.

MODEL M-100



NOTE: RESISTOR VALUES INDICATED IN OHMS.
 K = 1,000 OHMS.
 M = MEGOHM (1,000,000 OHMS).

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