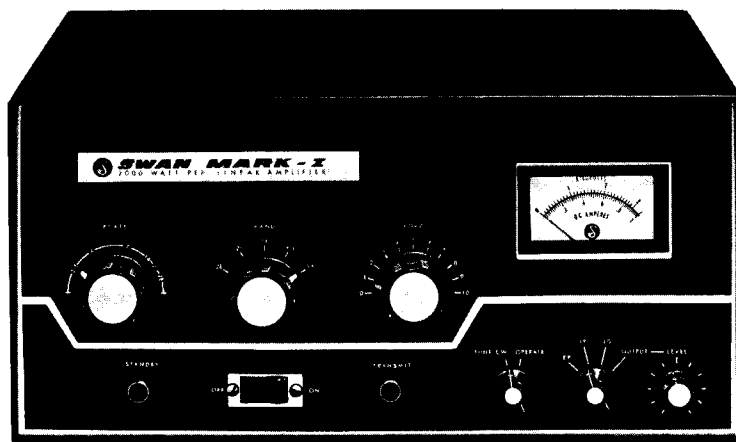


# OPERATING INSTRUCTIONS

## **SWAN MARK I LINEAR AMPLIFIER**

2000 Watt PEP Input, 80 through 10 meters ...



Swan again provides the ultimate in equipment design at a reasonable cost. The new MARK I Linear Amplifier uses two EIMAC 3-400Z zero bias triodes in grounded grid circuit for conservative maximum legal input rating. Power switch reduces input to 1 KW dc input rating for CW and tune-up. Untuned input circuit provides maximum operating ease, fastest QSY capability. Built-in 2500 volt, solid state 117/220 volt AC supply is designed for extended trouble-free operation. New final tube cooling concept guarantees long tube life and reduces initial equipment cost. Dual change-over relays provide automatic barefoot or linear operation as desired. Wide range pi-output network allows use with variety of antenna systems without need for external matching networks. Designed by hams for hams, MARK I provides all necessary features for complete HF band operation. Metering of Grid current, Plate current, Plate voltage, and relative output, allows monitoring of all essential parameters and maximum ease in tune up.

### SPECIFICATIONS

Two Eimac 3-400Z Triodes in grounded grid circuit. (Not supplied with Mark I)

2000 watts PEP input.

1000 watts CW and tune input.

Drive requirements: 100 watts.

Built-in changeover relay.

Wide range pi output.

Weight: Approximately 55 lbs.

Built-in 117/220VAC power supply.

Dimensions: 19" x 8-1/2" x 15-1/2"

**CAUTION: NEVER REMOVE THE CABINET OR BOTTOM PLATE WHEN POWER LINE VOLTAGE IS CONNECTED. HIGHLY LETHAL VOLTAGE IS USED IN THIS AMPLIFIER. ALLOW AT LEAST ONE MINUTE FOR CAPACITORS TO DISCHARGE AFTER TURNING THE AMPLIFIER OFF AND PULLING THE PLUG.**

## INSTALLATION

(a) Remove the cabinet, and install a pair of Eimac 3-400Z tubes.

(b) Connect a short length of coaxial cable (RG-58 or RG8) from the transceiver or exciter to the input jack on the Mark I. This cable should be as short as practical, and preferably not more than 5 feet long. NOTE: Swamping the exciter or driver power with an attenuator is not normally required with drivers up to 400 watt PEP input rating. After proper tuning procedures have been followed, the Mic. Gain control will be used to set the level of drive. If the driver is called on for less than its maximum power, distortion products will be less, and overall performance improved.

(c) Connect a 2 conductor line from auxiliary switching contacts on the driver to the Relay Control jack on the Mark I. When using the Swan-240, 350, or 400 as a driver, the 2 conductors connect to "C" and "T" terminals on back of the transceiver.

(d) Connect the antenna coax. or dummy load to the output jack. If a low-pass filter is to be installed to reduce TVI, connect it between the output jack and the antenna.

(e) Connect a ground lead to the Mark I chassis. A water pipe or ground rod will be suitable.

(f) Power Line Connections—The Mark I is shipped from the factory for 230 volts operation. The white and black power cord wires go to 230 volts, with the green wire going to neutral-center, (ground). A plug is not supplied because of the many different types being used. To operate from a 117 volt source, remove the bottom cover and find the 4 screw terminal strip located near the power transformer. Remove the jumper wire which connects the two center screws, B and C. Connect a jumper wire from A to B and another jumper wire from C to D. Refer to the schematic for clarification. Then connect the white and black power cord wires to 117 volts, and the green wire to ground. Finally, remove the 20 amp. line fuses, and replace with 30 amp. fuses. NOTE: When the Mark I is used with 117 volts, current drain will exceed most outlet ratings, particularly in OPERATE position. It may be necessary to use only the TUNE-CW position, which will reduce

power input, but will keep circuit breakers from kicking out. If it is necessary to operate with 117 volts try to run the Mark I on a separate circuit, and if possible, on the opposite side of the primary house circuit from the side used for the rest of the station. Always use 230 volts for the Mark I, when possible.

## TUNING INSTRUCTIONS

1—Always tune the exciter or transceiver first, with the Mark I turned OFF. Exciter output will be by-passed around the linear amplifier by the internal relay, and will go to whatever antenna or load is connected. The "Output" position of the Mark I meter circuit will indicate exciter output, and may be used conveniently as a tuning meter. Simply adjust the exciter controls for maximum output, using whatever tuning procedure is prescribed for the particular exciter. Then switch the exciter to standby or receive.

2—Turn the Mark I to the ON position and allow several seconds for filament warm up. Leave the Meter switch in "Output" position. Set the Function Switch to TUNE-CW position. The green "Standby" light will be on, and the 3-400Z tube filaments will be lit brightly. The tubes are biased to cut-off in standby position, so IP and IG will read zero. EP will read approximately 1600 volts, depending on line voltage.

3—Switch the exciter to TRANSMIT position, but with Mic. Gain turned down, and the carrier balanced out, so there is no R. F. output. (With the Swan 350 transceiver this is done by pressing the push-to-talk button). The Mark I will now be switched to TRANSMIT mode by the closing of the auxiliary contacts, and the red indicator light will come on. The 3-400Z tubes will now be drawing idling current, so IP will read approximately .1 amperes and EP approximately 1500 volts. IG should still read zero.

4—Switch the Exciter to its "TUNE" position, and quickly adjust P.A. TUNE on the Mark I for maximum output. Then go back to the Exciter and adjust its P.A. TUNE for maximum output. (It may have changed slightly when switched into the Mark I). Next, adjust P.A. LOAD on the Mark I for maximum output, and then alternate between adjusting P.A. TUNE and P.A. LOAD until maximum output is reached. Set the Output Level Control as required to keep the meter from going off scale. The output reading is a relative indication, only. CAUTION: DO NOT KEEP THE EXCITER OR TRANSCEIVER IN TUNE POSITION FOR LONGER THAN 30 SECONDS AT A TIME. This caution note concerns the exciter more than the Mark I, but since the power

amplifiers are operating at full input during tune, the time should always be kept short. If longer time is required, switch to standby for a minute, and then back to TUNE for 30 seconds. With experience in tuning procedures, it will be found that 30 seconds is more than enough time.

5—After tuning all controls for maximum output indication as described, other meter readings may be observed. IG (grid current) should indicate .2 to .5 amperes in TUNE position, depending on the amount of driving power. Swan transceivers will generally supply more driving power than others presently on the market. However, most transceivers will provide enough to drive the Mark I to full legal power. IP (plate current) should indicate between .6 and .8 amperes (see paragraph 9). The exact values of grid and plate current are not critical providing they do not exceed .6 grid amperes, and .8 plate amperes, and this only during short duration tuning periods.

6—To operate with SSB voice modulation, switch the Mark I to "OPERATE" position, and apply excitation with the driver, using the MIC. GAIN control directly as a power control. **IMPORTANT:** Once tuning procedures have been completed, set the meter switch to IP, and using average plate current as an indication of proper power level, set the Mic. Gain control for an average reading of .35 amperes. Only occasional voice peaks should kick to .5 amperes. Peak envelope power input will be at the legal limit of 2000 watts under these tuning conditions. **CAUTION:** Exercise care in setting the Mic. Gain control. Too high a setting will produce higher meter readings, but flat-topping and spurious emissions will result, as well as the possibility of exceeding legal power limits.

7—When the Mark I Function Switch is in OPERATE position for SSB voice transmission, plate voltage is increased from the CW-TUNE value. In Standby or Receive condition, the 3-400Z tubes are biased to cut-off, so IP will be zero, and EP will indicate 2900 volts. In TRANSMIT position, without modulation, IP will show an idling current of .18 amperes, and EP will drop to 2650 volts. With voice modulation averaging .35 amperes, EP will drop to about 2500 volts. Occasional voice syllables may drop the plate voltage further, but with proper setting of the Mic. Gain control, dynamic regulation of the internal power supply is more than adequate. Use of computer grade electrolytics assures long capacitor life, and a net capacity of 40 mfd. across the plate supply. (Voltage readings are subject to line voltage variations).

8—To operate without the Mark I Linear Amplifier, simply switch it to "OFF". The antenna circuit is then by-passed around the amplifier by the internal relay and the transceiver-driver will operate "Barefoot".

9—To operate on CW—always keep the Function Switch in the TUNE-CW position in order to limit input power to 1000 watts. **CAUTION:** Because the Mark I uses a grounded grid amplifier circuit, input power measurements must include the driver stage input. Thus, if the driver is running 300 watts input, the linear amplifier input must be limited to 700 watts when in CW mode. Thus, you must first measure driver input, in order to determine how much input you may run to the Mark I. Use the EP meter position to measure plate voltage, and then calculate how much IP (plate current) you can run and stay within the legal limit. Then use the P.A. Load control to hold IP down to this level.

#### WARRANTY POLICY

SWAN ELECTRONICS CORPORATION WARRANTS THIS EQUIPMENT AGAINST DEFECTS IN MATERIAL OR WORKMANSHIP, EXCEPT FOR TUBES, TRANSISTORS, AND DIODES, UNDER NORMAL SERVICE FOR A PERIOD OF ONE YEAR FROM DATE OF ORIGINAL PURCHASE. THIS WARRANTY IS VALID ONLY IF THE ENCLOSED CARD IS PROPERLY FILLED IN AND MAILED TO THE FACTORY WITHIN TEN DAYS OF DATE OF PURCHASE. DO NOT SHIP TO THE FACTORY WITHOUT PRIOR AUTHORIZATION. THIS WARRANTY IS LIMITED TO REPAIRING OR REPLACING ONLY THE DEFECTIVE PARTS, AND IS NOT VALID IF THE EQUIPMENT HAS BEEN TAMPERED WITH, MISUSED OR DAMAGED.

**NOTE:** It is quite possible to run well in excess of the legal power limit on CW as well as SSB with the Mark I. The design of an amplifier with linear characteristics up to the legal limit results in this capability. The burden of operating within legal limits falls on the operator and Swan Electronics Corporation is not responsible for improper or illegal operation. Every well informed operator should be familiar with measurement procedures, and with mathematical calculations of power level. Whenever possible, an oscilloscope should be used to monitor peak power levels, since ordinary meters are unable to do so.



The Mark I Linear Amplifier will operate with either Eimac 3-400Z tubes, or Amperex 8163 tubes. A heat dissipating connector is supplied by Eimac with each tube, and installs directly in the Mark I. The Amperex tube does not normally come with such a connector, so we have found it necessary to supply a special connector for use with Amperex tubes. Tubes shipped from the Swan factory will be fitted with this connector. If tubes are purchased elsewhere, please advise and we will Air Mail the special connector free of charge (for use in Mark I only).

NOTICE:

The Amperex 8163 is somewhat higher than the Eimac 3-400Z, and clearance to the cabinet top must be maintained. The terminal screw on the special plate connector must face down.

First attach the wire lead coming from the R.F. choke to the connector with the terminal screw. Then slip the connector over the plate cap with terminal screw facing down toward the tube envelope, and tighten the 4-40 set screw carefully.