

## READING THE METER

Refer to Figure 5 for an illustration of the panel meter scale. The upper scale of the meter reads from 0 to 8 and the lower scale from 0 to 3. The METER switch on the front panel selects the circuit function to be measured as detailed in Figure 6.

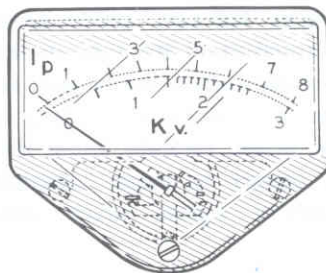


Figure 5

METER SWITCH POSITION	MEASURES	SCALE READING
EXCITER ONLY	Relative power output of exciter.	0 – 8 (upper scale). Adjust needle deflection to full scale with REL PWR SENS control after tune-up.
REL PWR	Relative power output of amplifier.	
PLATE	Plate current	0 – 800 mA (upper scale).
GRID	Grid current	0 – 80 mA (upper scale).
HV	High voltage	0 – 3 (3000 volts lower scale).

Figure 6



return your exciter to the standby mode, without changing the gain control.

( ) At the same gain control setting as in the preceding step, and with the METER switch at REL PWR, return your exciter to the tune or CW mode. Then adjust the REL PWR SENS control for a full-scale amplifier meter deflection.

( ) Return the exciter to the receive mode.

This completes the SSB or CW tune-up procedure.

## RTTY or SSTV PROCEDURE

( ) Preset your amplifier controls as follows:

REL PWR SENS:	12 o'clock (straight up)
METER switch:	EXCITER ONLY
TUNE:	Appropriate band segment
BAND:	Amateur band desired
LOAD:	9 o'clock (1 on scale)
POWER:	OFF

( ) Push the POWER switch to ON. The meter, DELAY and EXCITER lamps should turn on.

( ) Tune your exciter for maximum output in the desired mode while the Amplifier warms up.

( ) With the exciter at full output in either the tune or CW mode, adjust the REL PWR SENS control on the

Amplifier so the meter reads 2 on its upper scale. Then turn the exciter gain down.

( ) When the DELAY lamp turns off (after 60 to 90 seconds), turn the METER switch to PLATE and advance the exciter gain until the Amplifier's meter reads 100 mA (1 on the upper scale).

( ) Quickly turn the METER switch to REL PWR and adjust the TUNE control for full scale meter deflection. Then reduce your exciter's gain.

( ) After a few seconds, turn the METER switch to PLATE and advance the exciter's gain for a meter reading of 200 mA (2 on the upper scale).

( ) Quickly turn the METER switch to REL PWR and adjust the LOAD control for maximum meter deflection. Then reduce the exciter's gain.

( ) After a few seconds (at the same drive level as in the preceding step) check your plate and grid currents. If the plate current is higher than 200 mA, reduce your exciter gain. The grid current should be 5 mA or less. If it is higher, go through the tuning procedure again to make sure the Amplifier is properly tuned and loaded. If the grid current is still over 5 mA, reduce the exciter gain until that reading is secured. Then return your exciter to the receive mode.

This completes the RTTY or SSTV tuning procedure.

## CW or SSB PROCEDURE

**NOTE:** For this explanation, a Heathkit Model SB-104 Transceiver is used as a driver. Other excitors should follow the same principles.

- ( ) Preset your amplifier controls as follows:

REL PWR SENS:	12 o'clock (straight up)
METER switch:	EXCITER ONLY
TUNE:	Appropriate band segment
BAND:	Amateur band desired
LOAD:	9 o'clock (1 on scale)
POWER:	OFF

- ( ) Push the POWER switch to ON. The meter, DELAY, and EXCITER lamps should turn on.
- ( ) Tune your exciter for maximum output in the desired mode while the Amplifier warms up.
- ( ) With the exciter at full output in either the tune or CW mode, adjust the REL PWR SENS control on the Amplifier so the meter reads 2 on its upper scale. Then turn the exciter gain down.
- ( ) When the DELAY lamp turns off (after 60 to 90 seconds), turn the METER switch to PLATE and advance the exciter gain until the Amplifier's meter reads 100 mA (1 on the upper scale).
- ( ) Quickly turn the METER switch to REL PWR and adjust the amplifier's TUNE control for maximum

meter deflection. Then release the exciter's TUNE button.

- ( ) After a few seconds, turn the METER switch to PLATE and depress the exciter's TUNE button. Advance the exciter's gain for a meter reading of 200 mA (2 on the upper scale).
- ( ) Quickly turn the METER switch to REL PWR and adjust the LOAD control for maximum meter deflection. Then release the exciter's TUNE button.
- ( ) After a few seconds, turn the METER switch to PLATE and depress the exciter's TUNE button. Advance the exciter's gain for a meter reading of 400 mA.
- ( ) Quickly turn the METER switch to REL PWR and touch up the TUNE and LOAD controls for maximum meter deflection.
- ( ) Turn the METER switch back to PLATE and adjust the exciter's gain for a meter reading of 500 mA (or less). Then release the exciter's TUNE button.
- ( ) After a few seconds (at the same drive level) check your plate and grid currents. If the plate current is higher than 500 mA (maximum rated input), reduce your exciter's gain. The grid current should be 40 mA or less. If it is higher, go through the tuning procedure again to make sure the Amplifier is properly tuned and loaded. If the grid current is still over 40 mA, reduce the exciter's gain until that reading is reached. Then

**IMPORTANT:** In no case should the gain control of your exciter be advanced beyond the point where the amplifier relative power indication ceases to increase. If the level control is turned past this point, nonlinear operation may be produced.

### ALC (Automatic Level Control)

When the Amplifier is overdriven, the ALC circuitry creates a negative voltage which is fed back to the exciter to reduce its gain and help prevent "flat topping". Protective circuitry

of this nature is a valuable aid, but it is NOT a substitute for proper adjustment of the exciter drive.

### DC INPUT POWER

In grounded grid amplifier operation, a considerable portion of the driving power is fed through the amplifier tube. The amplifier output is the approximate sum of the driver output and the power added by the Amplifier. Both the driver and amplifier input powers must therefore be considered when calculating DC input power.

## TUNE-UP

MAXIMUM CURRENT RATINGS			NO LOAD VOLTS
MODE	PLATE	GRID	PLATE
CW, SSB	500 mA*	30 to 40 mA	2500 (120 VAC line)
RTTY, SSTV	200 mA	5 mA	

\*In SSB mode, with voice modulation, the plate current meter indication on voice peaks will be 175 mA to 250 mA, depending upon the voice characteristics of the operator. This current indication is due to the inability of a meter to follow instantaneous voice peaks.

Figure 10

The current and voltage figures given in Figure 10 are approximations. Actual readings will vary at each installation with such factors as line voltage, exciter drive, and load impedance.

The following procedure for tuning the Amplifier should take only a few seconds after you go through it a few times. Note the LOAD control position so it can be preset the next time a particular band is used.

Before proceeding, make sure that:

1. OUTPUT on the rear panel is connected to an antenna for the band to be used, or to a dummy load.
2. Your exciter output is connected to the amplifier INPUT.
3. Provision has been made to ground the RELAY connector in the transmit mode so the amplifier transmit-receive relay will operate.

4. The ALC socket has been connected back to your exciter's ALC input.
5. The Amplifier has been connected to your station's ground system.
6. The Amplifier's line cord is plugged in.

### IMPORTANT:

1. During the tune-up procedure, DO NOT furnish excitation to the Amplifier for more than 30 seconds continuously. This requirement is fulfilled by turning your exciter's gain control fully counterclockwise between adjustments.
2. During tune-up, be SURE to observe the duty cycle limitations, if any, of your exciter.

## DRIVING POWER

This Amplifier is designed to operate at full ratings when it is used with the usual "100 watt" exciter, which will drive it to the currents specified in the tune-up procedures. An exciter of lower power output may be used as a driver, but the amplifier's output will be less. If you use an exciter capable of higher power, carefully adjust the exciter gain control (driving power) to avoid "overdrive" and the creation of spurious signals which create needless

interference to others. The use of the Heathkit Monitor Scope is highly recommended for continuous output monitoring (see Figures 7, 8 and 9). The display on an oscilloscope is the best readily available way of determining the amplitude of the voice peaks which, if excessive, can cause "flat topping" and the radiation of distortion products.

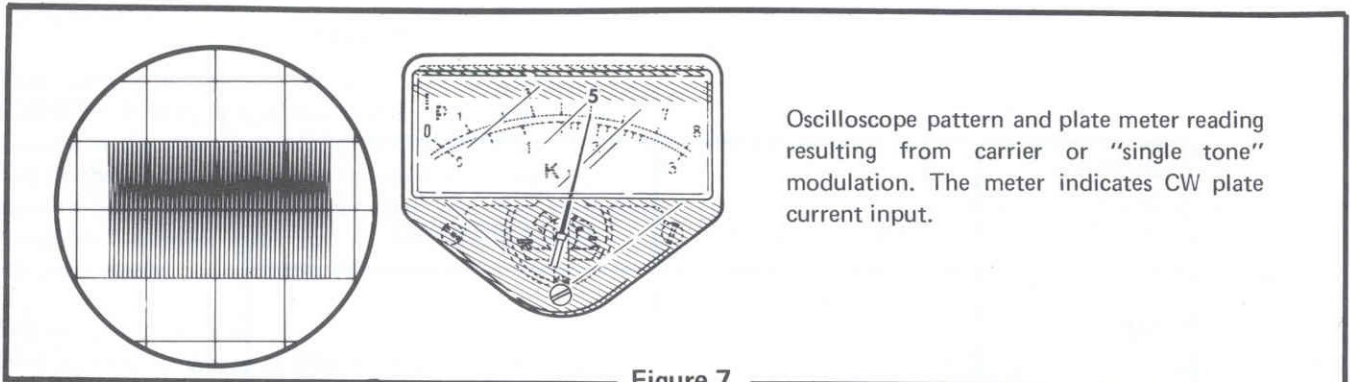


Figure 7

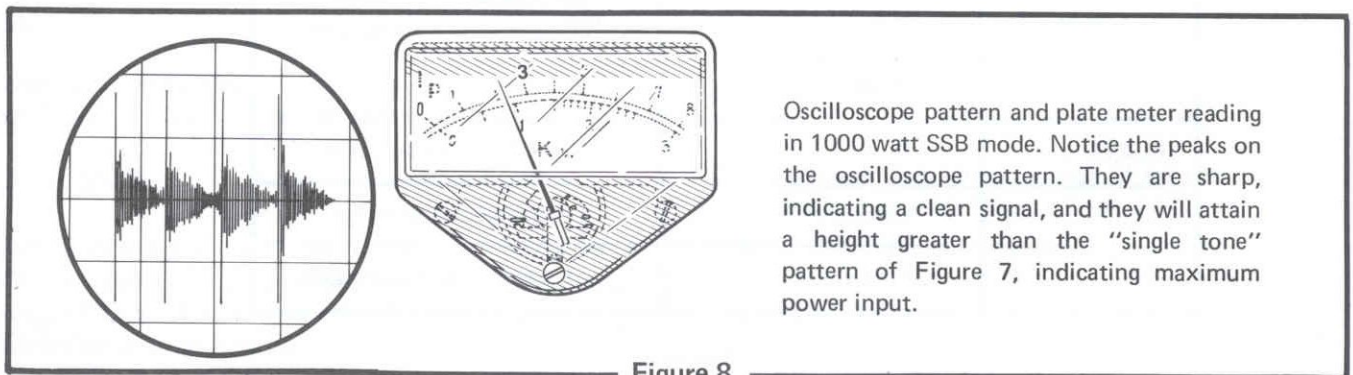


Figure 8

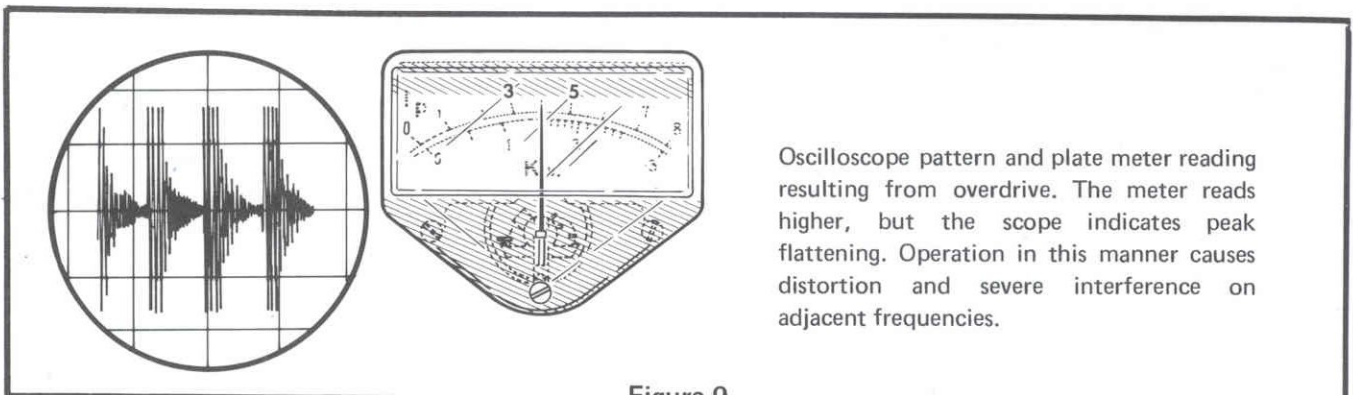
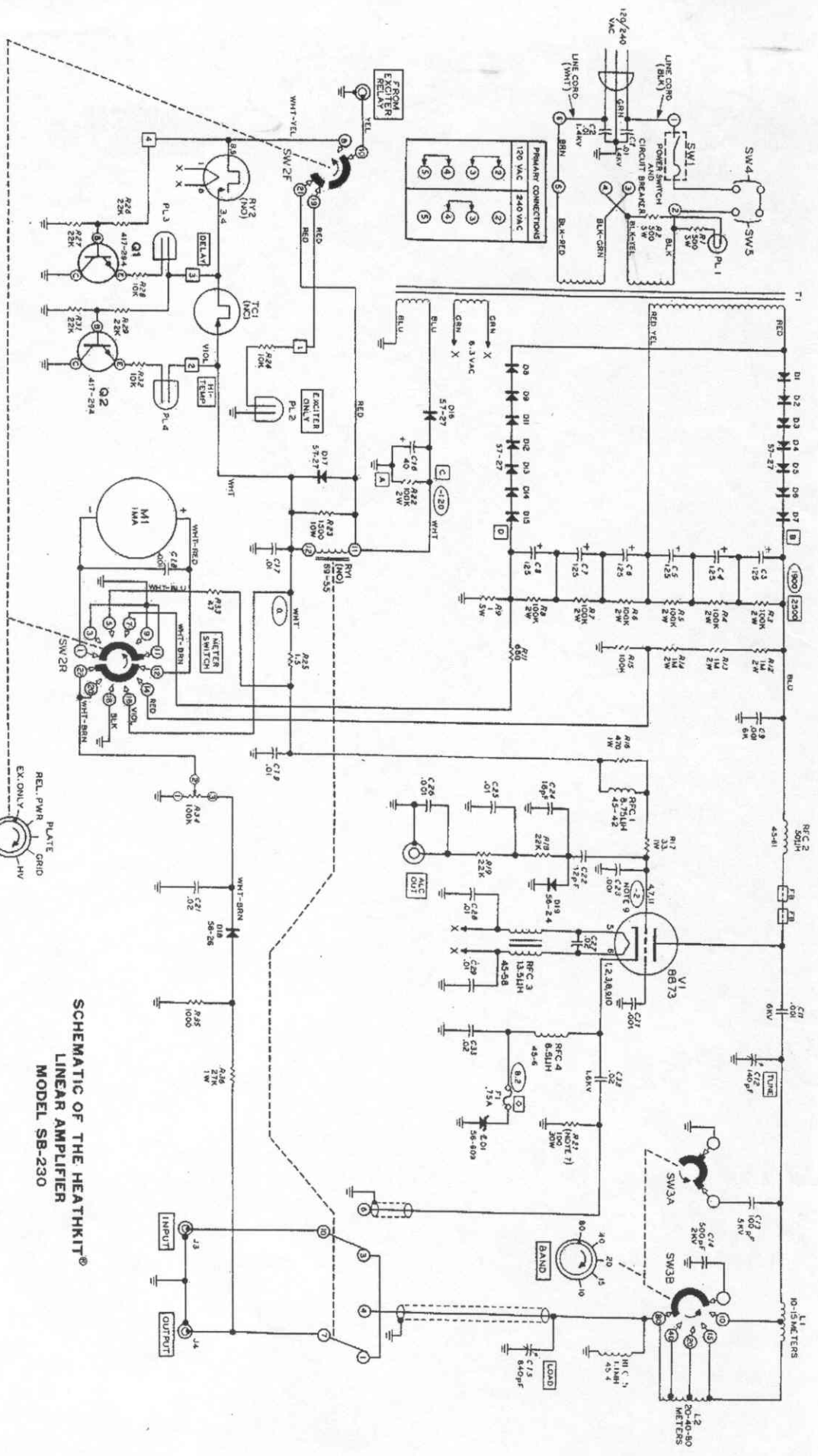


Figure 9



**SCHEMATIC OF THE HEATHKIT®  
LINEAR AMPLIFIER  
MODEL SB-230**

**DIODE AND TRANSISTOR IDENTIFICATION CHART**

COMPONENT	HEATH PART NO.	MAY BE REPLACED WITH	IDENTIFICATION
D1 THROUGH D17	57-27	1N2071	NOTE: DIODES MAY BE SUPPLIED IN ANY OF THE FOLLOWING FIVE SHAPES. HEATH PART NUMBERS ARE STAMPED ON MOST DIODES.
D18	56-26	1N391	
D19	56-24	1N458	
D20	56-24	1N280GA	
ZD1	56-609	1R.2V.1.5A1	
Q1, Q2	417-294	MPS442	

- NOTES:**
1. ALL RESISTOR VALUES ARE IN OHMS (K=1,000; M=1,000,000).
  2. ALL CAPACITOR VALUES ARE IN MICROFARADS UNLESS OTHERWISE MARKED (P=PICTORADS).
  3. RELAY CONTACTS ARE IN THE INACTIVATED POSITION (RECEIVE OR EXCITER ONLY).
  4. SWITCH CONTACTS ARE SHOWN REAR VIEW. THE SWITCH POSITION IS SHOWN IN THE KNOB VIEW. AN ARROW SHOWS SWITCH MOVEMENT WITH CLOCKWISE ROTATION OF THE KNOB.
  5. REFER TO THE CHASSIS PHOTOGRAPHS AND X-RAY VIEWS FOR THE ACTUAL LOCATION OF PARTS.
  6. K = 1,000
  7. RELAYS COMPOSED OF FIFTEEN 1500Ω, 2-WATT RESISTORS CONNECTED IN PARALLEL TO FORM A 300Ω, 30 WATT RESISTANCE.
  8. ○ = DC VOLTS AT 500mA PLATE CURRENT.
  9. GRID VOLTS = 110V WITH METER SWITCH AT "EXCITER ONLY".
- K = 1,000  
 KV = KILOVOLTS  
 M = 1,000,000  
 MH = MILLIHENRIES  
 pf = PICOFARADS  
 PL = PILOT LAMP  
 T.S. = THERMAL SWITCH  
 μH = MICROHENRIES  
 = CIRCUIT BOARD HOLE OR PIN.  
 = FERRITE BEAD  
 GRID VOLTS = 110V WITH METER SWITCH AT "EXCITER ONLY".