

OPERATING AND SERVICE INSTRUCTIONS  
BROWNING GOLDEN EAGLE MARK II BASE STATION

RECEIVER MODEL 69R

and

TRANSMITTER MODEL 69T

Price \$2.00

IT PAYS TO KNOW YOUR EQUIPMENT

READ CAREFULLY

BE SURE TO READ PAGE 15

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## SECTION 1

### THE BROWNING GOLDEN EAGLE MARK II BASE STATION

#### GOLDEN EAGLE MARK II RECEIVER 69R

This is truly the most versatile receiver made for use on the 11 Meter Band for with it you can now receive Citizen Band and many Business Band frequencies - whether operating on conventional A.M. or Side Band, stations operating on upper or lower single side band, or double side band suppressed carrier. Also featured are the following -

- New Double conversion
- New R.F. and I.F. Gain Control
- New A.G.C. On-Off Switch
- New On-Air indicator
- New Beat Frequency Oscillator for Side Band Reception
- Cascode nuvistor R.F. Amplifier
- Ultimate selectivity with Collins Mechanical Filter
- Speaker Control Switch
- Fine tune for A.M. and Side Band
- Large jeweled movement "S" Meter
- Effective Noise Limiter with lock out switch
- Exclusive Channel-lok fixed tuning
- Illuminated dials - meters and On Air indicator
- Frequencies as well as Channels on tuning dial

#### GOLDEN EAGLE MARK II TRANSMITTER 69T

Transmitter 69T features are -

- New Antenna Switch for comparison between 2 antennas (Beam or Ground plane)
- Rear illuminated selector dial with large Channel numbers and frequencies
- Precision aircraft plug-in type miniature crystal switch assembly
- Clipper filter and limiter
- Spotting function with tone and visual indicator
- Large meter reads modulation, forward and reflected power
- Visual on air indicator
- Paging System - paging system with front panel level control

## SECTION 2

### ANTENNA REQUIREMENTS

A good quality antenna is most important. By law the power output of your Base Station is limited to 4 Watts. With this small amount of power it is apparent that none should be wasted in a poor antenna system. We recommend using the best antenna obtainable. For Coverage in all directions a ground plane antenna is satisfactory.

## SECTION 2

### ANTENNA REQUIREMENTS (cont'd)

For better results a co-linear type antenna is recommended which will increase your signal at the receiving end by 3½ or more db. This is equal to doubling your input power. A 3 element beam antenna when rotated to the direction of the other station will have a gain of approximately 8 db which gives the same effect as multiplying your input power by 5. A 6 element beam has approximately 11 db gain and effectively multiplies the power by 10.

It is thus very apparent that while your input power is limited much can be gained by a good antenna system. Mount your antenna in the clear away from surrounding objects, especially wires of any kind and as high as allowed by law. Any feed line over 50 feet long should be RG-8/U. The Golden Eagle Mark II Transmitter has a built-in SWR bridge for determining your antenna system efficiency. Refer to Section 6 - OPERATION OF POWER METER.

## SECTION 3

### INSTALLATION

#### CONNECTING TOGETHER THE GOLDEN EAGLE MARK II TRANSMITTER AND RECEIVER.

Unpack your base station carefully.

Arrange your station so the units are side by side.

Connect the "control cable" of the transmitter to the receiver. The key on the octal plug must mate with the keyway in the large center hole of the socket. Do not force, be sure the key and keyway are mated before pushing all the way in.

Permanently connected to the transmitter is the antenna cable for the receiver. Connect the PL-259 on this cable to the socket marked ANT on the receiver.

Connect your antenna PL259 connector to the socket on the transmitter marked Ant. 1 and turn the rear panel switch to the #1 position. Never attempt to operate the transmitter without proper connection to an antenna or dummy load. Serious damage can result and such damage will not be covered by warranty. Never switch to position 2 unless antenna is connected thereto.

Place the microphone in its stand in front of the equipment. Unwrap the microphone cable and insert the connector into the microphone socket on the left of the front panel.

After checking the above connections for correctness and tightness insert the power cord from the transmitter into the utility socket on the rear of the receiver. This can be done neatly without uncoiling the power cord of the transmitter. Insert the receiver power cord plug into a wall outlet.

Your Golden Eagle Mark II Base Station is now ready for operation.

## SECTION 4

### OPERATING THE GOLDEN EAGLE MARK II BASE STATION

#### NORMAL OPERATION - A.M. (Simplified Instructions)

Set the controls on the Receiver and Transmitter as follows:

1. Mode switch - A.M.
2. Volume on-off - Turn on and set at approximately 9 o'clock
3. Squelch - Pushed in and counter clockwise
4. Tuning - Man.
5. RF Gain and AGC - Max clockwise - AGC pushed in and on
6. Speaker - Int.
7. Fine Tuning - Indicator dot at 12 o'clock
8. Main Tuning Receiver - Desired Channel
9. SWR Cal. - Approximately 12 o'clock
10. Meter Switch - Modulation position
11. Channel Selector Transmitter - Desired Channel
12. CB - PA Switch - CB Position

Become familiar with the equipment on A.M. before attempting Side Band operation.

#### NORMAL OPERATION OF RECEIVER ON S.B. (Simplified Instructions)

1. Mode switch - USB or LSB
2. Volume on-off - Turn on and set at approximately 9 o'clock
3. Squelch - Pushed in and counter clockwise
4. Tuning - Man.
5. RF Gain and AGC (Important) Approx. 3 o'clock depending on signal strength - AGC Pulled Out and Off.
6. Speaker - Int.
7. Fine Tuning - Indicator dot at 12 o'clock
8. Main Tuning Receiver - Desired Channel

For tuning Side Band Stations see Section 9.

#### NOTE:

The power to the utility outlet on the rear of the receiver is controlled by the receiver volume ON-OFF switch. When the transmitter power cord is plugged into the utility outlet, the power switch on the transmitter may be left on at all times and the power to the complete base station can be switched on and off with the Receiver Power Switch.

The meters and channel indicators will light up when the power is on. Allow at least one minute warm up before transmitting. Now press the push to talk switch on the microphone and you are on the air. The On-Air indicator will light up.

## NORMAL OPERATION - (cont'd)

Be sure to announce your station call sign any time you turn on your carrier even just for short tests. Release the switch to turn off the transmitter.

Disconnect the antenna connection to the receiver and adjust the S Meter Zero Adj. control at the rear of the chassis. Watch the S Meter while turning the control and set the needle at 0, the lowest line on the meter. This adjustment may vary slightly with changes in line voltage. Now reconnect the Antenna cable.

## SECTION 5

### OPERATING THE GOLDEN EAGLE MARK II RECEIVER

#### FUNCTION OF OPERATING CONTROLS

##### Mode Switch

The position of this switch determines what type of signal is received.

1. A.M. Position -

With the Mode Switch in the A.M. position, Normal Amplitude Modulated signals may be received.

2. U.S.B. Position -

With the Mode Switch in the USB position, only Upper Side Band signals may be received.

3. L.S.B. Position -

With the Mode Switch in the LSB position, only Lower Side Band signals may be received.

##### Volume ON-Off Control

The On-Off Switch at the extreme counter clockwise rotation of the volume control, controls the power to the receiver as well as the utility outlet on the rear of the receiver. The Transmitter can be plugged into this outlet and the power to the complete Base Station can be controlled by the Receiver volume On-Off control.

##### Squelch Control

When rotated clockwise, the squelch control can be set so that the speaker will be silent until a signal comes on. Further clockwise adjustment will keep the speaker silent on weaker signals and turn on the audio only on strong local signals. When set at the maximum counter-clockwise position, the audio will be on all the time.

## SECTION 5

### Tuning Control

This Switch controls the Tuning Mode.

1. Man.

In the manual position the main tuning knob varies the frequency of the second oscillator. The received channel number can be read in the Tuning window.

Business Band Channels 22A, 22B, 23A, and 23B may also be received in this position.

2. Fix

In the Fixed position the frequency of the received signal is controlled by the Channel-lok located on the right hand side of the receiver. The dial light is switched off to remind the operator that the main tuning control will not operate when the switch is in the Fixed position.

3. B.B.

In the Business Band position the first conversion oscillator is changed and on the lower part of the tuning dial a direct reading in frequency will show the bands covered for Business Band also some frequencies used by Industrial and Government services. Business Band frequencies covered are from 27.390 to 27.530 MHz.

### RF Gain Control and AGC

The RF Gain Control not only varies the gain of the Cascode RF Stage but also the first two IF stages. Maximum Gain is obtained with the control set maximum clockwise. As the control is rotated counter clockwise, the bias of the first RF and first two IF tubes increases with a resultant decrease in Gain. This control is used for decreasing the sensitivity to prevent overload from strong signals.

The S Meter reading will not be accurate except at full clockwise setting.

In Side Band operation this control becomes very important and should be adjusted carefully dependent on the strength of the incoming signal.

## SECTION 5

### RF Gain Control and AGC (cont'd)

The AGC Switch can be disabled by pulling out on the RF Gain Control Knob. When operating in the AM position, the AGC Switch should be on to prevent blasting when tuning from weak to strong signals. It can be helpful, however, when tuning for very weak stations to disable the AGC for maximum sensitivity. When operating in the USB or LSB Position, be sure to remove the AGC by pulling out on the RF Gain Control Knob.

### Noise Limiter Switch

This switch is controlled by a pull-push action of the squelch control knob. When pushed IN this places the automatic series gated noise limiter circuit in operation to reduce pulse type noises such as ignition noise and other electrical interference. The limiter is turned OFF by pulling the squelch knob out.

### "S" Meter

The "S" Meter provides a visual indication of the relative signal strength of an incoming signal. The "S" Meter is calibrated in "S" units from 1 to 9 and in decibels above S-9 to plus 40 db.

The S Meter is inoperative when the AGC control is pulled out and off.

### Speaker Switch

The slide designated EXT for external, INT for internal, and All controls the speaker system of the receiver by the use of an external speaker obtainable separately from Browning Laboratories. An external speaker may be installed at the remote position from the base station in the work shop, in the basement, in the garage, and by proper setting of this selector switch, in the external position, the receiver will be heard only at this remote location, in the internal position the built in speaker in the receiver only will be heard. In the ALL position the internal and any remote speakers will be heard simultaneously. This remote speaker will also be used on the paging system as explained under the transmitter section.

Any 8 ohm speaker may be used in the external system. A second external speaker may be installed if desired with a slight loss of volume. Be sure (in this case) to use 2 - 8 ohm speakers in parallel.

CAUTION: When operating a head set in the external speaker function, be sure not to operate the paging from the transmitter.

Note: Use a #40 Switchcraft plug or equivalent with a remote speaker. The wires can be connected to either terminal on the Browning remote speaker.

## SECTION 5

### Fine Tuning

The fine tuning front panel control varies the frequency, in all tuning functions, approximately 1/2 of a channel.

This feature gives added ease of differentiating between two or more stations close together and is especially useful for tuning in Side Band stations.

### Channel-Lok

The FIXED channel is set for any one channel by adjusting, with a small screwdriver, the capacitor through the small channel-lok hole. Use the spot switch on the Golden Eagle Transmitter to provide a signal for tuning the channel-lok. Adjust the channel-lok for maximum S Meter reading when pushing the spot switch with the transmitter set to the desired channel. This feature allows "fixed controlled" receiving without crystals.

Note: In set lok position the added feature of fine tuning is incorporated.

## SECTION 6

### OPERATING THE GOLDEN EAGLE MARK II TRANSMITTER

#### FUNCTION OF OPERATING CONTROLS

##### Channel Selector

The MARK II Transmitter has a built in crystal switch assembly with all 23 crystals factory installed. These plug in miniature type 3rd overtone crystals are made especially for Browning and afford better frequency accuracy than previous types.

CAUTION: Use only direct factory replacement crystals.

##### CB - PA Switch

When this switch is in the CB position, the Transmitter operates in the normal fashion. When the switch is placed in the PA position it automatically disables the RF section of your transmitter and connects the output of your audio circuitry to a special winding on the modulation transformer which in turn is tied in with the external speaker. The Transmitter channel indicator light and on the air light will go out in the PA function which alerts the operator that there is no power to the antenna. When depressing the push-to-talk button on your microphone you have a high quality paging system with full audio power available wherever you wish to place these remote speakers.

##### PA Volume

This front panel control varies only the audio circuitry when in the paging position. It does not affect your modulation in any way as the circuit is properly interlocked to prevent feedback or any other effect upon your regular citizens band operations. If the external speaker is close to your transmitter, you may not be able to use the P. A. function due to feedback. However, if it is close there is no need for paging.

## SECTION 6

### Spotting Switch

The spotting switch is for finding your own transmitter signal in the base station receiver.

Press the spot button and tune the main tuning dial on the receiver until a strong signal is indicated on the receiver "S" meter. The spotting signal is modulated with a tone for easy identification. The spotting function is useful in setting the fixed tuned channel-look on the receiver. Refer to the receiver operating controls for adjustment.

### Modulation Meter

The illuminated meter on the front panel varies directly with modulation and reads in percent. This meter will indicate low readings if the operator is too far from the microphone. The meter needle will bounce up and down quite rapidly as you speak into the microphone and will normally reach 100% on voice peaks. These readings are obtained when the meter switch is in the MOD position and the transmitter is "On the Air".

### MATCHING THE GOLDEN EAGLE TO YOUR ANTENNA SYSTEM

The Federal Communications Commission allows the adjustments of a citizens band transmitter's antenna loading system providing it does not in any way alter the frequency thereof. The following instructions will not alter the frequency of transmission, therefore, can be done by anyone:

The Golden Eagle Mark II transmitter has a built-in RF Power meter for reading both forward and reflected power. This function is useful in determining the efficiency of your antenna system. By using the readings from this meter it is possible to measure the standing wave ratio (SWR) of your antenna system.

For best efficiency, an antenna system must have a low SWR reading. High SWR readings result from a mismatch of impedances between the coaxial feedline and the antenna. In simple language loose connections or broken elements in the antenna system CANNOT be corrected at the transmitter. Retuning of the transmitter will not change the SWR. The power meter in this transmitter will indicate the efficiency of your antenna system, but the efficiency can be changed only at the antenna and not at the transmitter.

If your system is a 52 ohm load for the transmitter, you are ready to operate without any further adjustment. **DO NOT ADJUST TRANSMITTER UNTIL AFTER YOU HAVE HAD IT ON THE AIR AND ARE FAMILIAR WITH ITS OPERATION.**

It is recommended that the first adjustments be made with a "Dummy Load" attached in place of the antenna. This keeps your signal off the air and reduces interference and keeps you "legal" while becoming familiar with the tuning methods involved.

## SECTION 6

### MATCHING THE GOLDEN EAGLE MARK II TO YOUR ANTENNA SYSTEM

It should be noted here that the meter adjust control has absolutely no effect on the output of the transmitter nor will it affect the reading of the meter when the meter is switched to "Modulation" position. The sole function of this control is to assist in Antenna Loading as explained later.

#### READ AT LEAST TWICE BEFORE PROCEEDING WITH ACTUAL ADJUSTMENTS TO THOROUGHLY UNDERSTAND WHAT YOU ARE TO DO

1. Install "Dummy Load" to antenna connection on rear of chassis.
2. Set Meter Switch on "Forward Power".
3. Selector Switch in middle area, ie. Channel 10, 11 or 12.
4. Turn on transmitter and let it warm up at least one minute.

Push the push-to-talk switch on microphone and adjust meter sensitivity control to approximately 50.

With a small screw driver inserted in the opening on the rear of the chassis nearest the left side, very, very, carefully adjust the plate tuning condenser (C 11) for the highest reading on meter obtainable. Do not adjust the meter sensitivity control. These adjustments are very critical and the slightest movement, even 1/16" makes a big difference in output. Now do the same to the antenna loading condenser (C 12) just to the right of C11 again seeking maximum output reading and working, very, very carefully.

These steps should be repeated at least (3) times as there is an interaction between these two controls. Always adjust antenna loading last. After making the adjustments once, take transmitter "off the air" with mike switch and wait about one minute to give Dummy load a chance to cool off. FAILURE TO DO SO MAY RESULT IN BURNING OUT THE DUMMY LOAD. It is most likely that you will not be able to increase the readings the first time as this adjustment has been made at the factory. There will be a setting on both adjustments beyond which you cannot increase your output reading. This is where your transmitter is working at the absolute maximum output for a 50 - 52 ohm load.

Adjust the meter sensitivity control for a reading of exactly 80.

Now switch to Reflected Power and make notation of lowest reading on meter. It may not be ZERO. DO NOT be concerned if it is not. Control R32 is used for obtaining the deepest null when reading reflected power with a Dummy Load fastened to the output of the transmitter.

## SECTION 6

Proceed as follows:

Adjust Potentiometer R32 for lowest reading against the Dummy load, a non-inductive load of 50 - 52 ohms across the coaxial output connector of the transmitter.

This may not read zero. In every case, however, adjust for the lowest reading obtainable with power on, meter switch in reflected power position.

Take transmitter off the air and replace the dummy load with the antenna cable which should be RG8U or RG58U. Again switch to forward power, put transmitter on the air announcing your call letters. Set meter sensitivity control to reading of 80 again and shut off transmitter. You now have your transmitter adjusted to maximum output into a 50-52 ohm antenna. Nothing you can do at the transmitter will get you any more power into the antenna and NO FURTHER ADJUSTMENTS SHOULD BE MADE.

Now turn the meter switch to "REF" and put the carrier on again. Read the meter and write down the reading. Turn Carrier off.

The SWR can be found by referring to the table below:

The following readings are an indication of SWR on the Antenna System.

<u>Reflected Reading</u>	<u>SWR</u>
0	1 to 1
5	1.3 to 1
10	1.6 to 1
15	1.8 to 1
20	2 to 1
25	2.8 to 1

Any SWR less than 2 to 1 is good and any effort spent to reduce it will have little effect on efficiency. You will also find that the SWR of any antenna system is not the same on all channels.

With the many types of specially constructed antennas available you should consult the manufacturer of your particular antenna for information on matching the antenna to the feedline. Following the manufacturers recommendations and using the Golden Eagle Mark II transmitter power meter will eliminate your purchasing expensive SWR meters.

GOLDEN EAGLE MARK II RECEIVER CIRCUIT DESCRIPTION  
SECTION 7

The Golden Eagle Mark II Receiver is a deluxe communications type receiver capable of receiving conventional AM citizens band and business band signals plus upper or lower sideband citizen band signals. This receiver covers the CB radio frequency spectrum between 26.965 megahertz and 27.255 megahertz and the Business Band radio frequency spectrums between 27.235 to 27.275 megahertz and 27.390 to 27.490 megahertz. This receiver utilizes a dual nuvistor cascode front end, dual conversion mixing to minimize spurious interference, a mechanical filter to enhance the selectivity, and a high gain IF strip for that extra measure of sensitivity often needed on weak stations.

For conventional AM reception circuit operation is as follows:

The signal from the antenna is coupled into a broadband tuned circuit followed by two nuvistors (V1 and V2) which form a cascode RF amplifier. A cascode amplifier is used because it offers better signal-to-noise performance than does the conventional grounded cathode or grounded grid RF amplifiers. The output of V2 is coupled into the grid of V3B ( $\frac{1}{2}$  12AT7) which serves as the 1st mixer. The other  $\frac{1}{2}$  12AT7 (V3A) operates as a tuned plate crystal controlled oscillator. In the manual and fixed positions of the front panel tuning switch the oscillator frequency is 31.400 MHz and in the BB position it is 31.795 MHz. The 1st mixer output, therefore, contains a frequency product between 4.125 and 4.435 MHz the actual value depending upon the incoming signal frequency. The output of the 1st mixer (V3B) is coupled into the grid of V4B ( $\frac{1}{2}$  6GH8) which operates as the 2nd mixer. The other half of this 6GH8 (V4A) is a Series Tuned Colpitts Oscillator serving as a variable frequency oscillator. This oscillator operated at a frequency between 4.580 and 4.890 MHz, the actual frequency being determined by the rotation of the main tuning capacitor (C44). A small variable tuning capacitor (the series combination of C46 and C47) allows fine tune variation of the oscillator frequency. The output of the second mixer (V4B) is a 455 kHz signal which is fed into a mechanical filter (FL1) to electrically shape the signal and provide greatly increased selectivity over that which can be obtained with a doubletuned IF transformer which is customarily used. The mechanical filter output is fed into a three stage 455 kHz IF strip comprised of V5, T3, V6, T4, V7 and T5. The amplitude modulated 455 kHz output of the IF strip is converted into audio by use of crystal diode detector circuit incorporating CR3, the secondary of T5 and C40. Delayed AGC is obtained from V8A ( $\frac{1}{2}$  6AL5) allowing full audio output from the weakest input signals yet preventing overload with strong input signals. AGC is applied to the cascode RF stage and to all three IF amplifiers. A front panel push-pull switch provides grounding of the AGC buss thereby allowing the receiver to operate at full gain but subject to overload with strong input signals. An RF gain control is provided on the front panel which allows manual adjustment of the gain of the cascode RF amplifier and the first two IF amplifier tubes. V8B ( $\frac{1}{2}$  6AL5) is a series gated noise limiter which can be by passed with the ANL ON-OFF push-pull switch on the front panel. The audio output of the detector and noise limiter is fed to the top of the volume control through the Mode Switch (SW6B). A portion of this audio signal, the amount being dependent on the position of its wiper arm, is fed into the audio amplifiers V9B and V10 ( $\frac{1}{2}$  12AX7 and 6AQ5 respectively).

## SECTION 7

The audio amplifier circuitry provides four watts of audio to drive the built-in speaker, an optional external speaker system or both. Speaker switching is controlled by a three position slide switch located on the front panel. V9A ( $\frac{1}{2}$  12AX7) is the squelch amplifier tube. The plate of V9A is dc connected to the grid of V9B, the audio amplifier, and controls its conduction. When the receiver is squelched V9A conducts heavily, lowering its plate voltage which in turn cuts off V9B and does not allow audio to be amplified by V9B. In the presence of an input signal a negative voltage is developed in the detector circuit at the junction of C40, R38, R39 and R46. If this voltage is sufficiently large it increases the bias applied to the grid of V9A, decreasing its plate current flow and increasing its plate voltage thereby allowing V9B to conduct and amplify audio normally. The squelch threshold is adjusted by varying the cathode voltage of V9A by means of the squelch potentiometer (R45) located on the front panel.

The power supply consists of a voltage doubler circuit with capacitor input filtering and two RC filter networks. A voltage regulator tube V11 (OB2) is used to regulate the supply voltage for the variable frequency oscillator to insure frequency stability and compensate for line voltage variations and fluctuations.

The "S" Meter is in the cathode circuit of the last IF amplifier stage (V7) and incorporates diode protection against meter damage in case of tube removal or failure.

The rear illuminated dial is calibrated with both channel numbers and citizen band channel frequencies thereby enabling quick identification of the channel being received. The dial light is interlocked with the tuning switch so that the dial is illuminated in the CB and BB positions but not in the SET-LOCK position. The meter light is on whenever the unit is turned on and indicates the presence of power applied to the unit. An "On the Air" light activated by the transmitter relay is also mounted in the receiver.

For Upper or Lower Sideband reception circuit operation is as follows:

Operation is identical to that described above for AM reception up to and including the three stage 455 KHz IF strip. For Sideband reception the carrier must be reinserted prior to detection. The output of the last 455 KHz IF amplifier stage (V7) is coupled to the third grid of a pentagrid converter tube V12 (6BE6). A pentagrid converter tube is used to simultaneously perform both oscillator and mixing functions. The first grid, screen and cathode elements of the tube are connected as a Series Tuned Colpitts Beat Frequency Oscillator tuned to approximately 455 KHz. The actual frequency is dependent on which of the two sidebands is being recovered and is switched by the Front Panel Mode Switch (SW6C). The remaining elements of the pentagrid converter perform the mixing action and audio output is obtained from the plate of V12 and after some processing is fed to the top of the volume control through the Mode Switch (SW6B). The mode switch also removes B+ from this tube when the receiver is operating in the AM Mode to prevent the beat frequency oscillator from oscillating. The operation of the audio section, power supply, etc., are also identical to that described above for AM reception.





