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(603) 524-5454

GOLDEN EAGLE MARK IVA SERVICE MANUAL

LIMITED WARRANTY

Browning Laboratories, Inc., warrants each new radio product to be free from defective material and workmanship, and if it is found to be defective within two (2) years from date of first sale to the original retail purchaser, the factory will either, at its discretion, replace or repair equipment or parts which are delivered transportation and insurance prepaid by the owner to us or to our authorized distributor or dealer from whom purchased or to a Browning Authorized Warranty Service Station. As an exception, Vacuum Tubes are warranted for ninety (90) days.

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BROWNING LABORATORIES, INC.

P.O. Box 310

LACONIA, NH 03246

(603)524-5454

MARK IVA SERVICE MANUAL

SECTION 1

GENERAL INFORMATION

1.1 SCOPE OF THIS MANUAL

This service manual contains complete servicing alignment and troubleshooting instructions for the Golden Eagle MARK IVA Base Station.

1.2 FACTORY SERVICE AND RETURNS

Browning maintains a National Customer Service Department for your assistance. This department is available for consultation, assistance on technical problems, parts information or orders, and the availability of local factory authorized repair facilities. It will also assist you and coordinate returns to the factory. In order to expedite the repair of your equipment all returns should include information as to the nature of the problem, your full address and phone number including area code.

For any of the above information or requirements call National Service Manager, at 603-524-54S4, or write:

Service Department

Browning Laboratories, Inc.
P. O. Box 310
Laconia, NH 03246

1.3 PARTS ORDERS

Browning Authorized Service Centers stock the more commonly needed replacement parts. Should a part not be available locally, it may be ordered from the National Customer Service Department. When ordering please supply the following information:

A. Model Number of the Unit.

B. Serial Number of the Unit.

C. Description of the Part.

SECTION 2

GOLDEN EAGLE MARK IVA

SPECIFICATIONS

2.1 GENERAL

Frequency Range:	26.965 - 27.405 MHz.	
Number of Channels:		40
Dimensions:	**Receiver:**	6.75"H x 15.50"W x 9.88"D
	Transmitter	6.75"H x 1S.50"W x 9.88"D
Total Shipping Weight:		51 lbs.
Microphone:	Browning Model 776 High Impedance	
	Desk Style with Push-to-Talk Bar.	
Compliance:	FCC Type Accepted	

2.2 RECEIVER

Sensitivity:	0.3 uV for 10 dB S+N/N AM
	0.1 uV for 10 dB S+N/N SSB
Selectivity:	65 dB minimum at +/- 10 KHz AM
	65 dB minimum at +/- 5 KHz SSB
Audio Output:	4W RMS into 3.2 ohm load.
Squelch Sensitivity:	0.8 uV Threshold
Noise Limiters(2)	SSB-Pulse Diode Type.
	AM -Series Gate Type.
AGC:	Less than 9 dB Audio Change Over
	Full Range with Front Panel defeat switch.
Frequency Range:	Continuous 40 Channel tuning with separate
	bandspread control +HF Band to 27.595 MHz.
Circuitry:	10 Tubes, 10 Diodes, 2 Transistor & 6 LED's.
Intermediate Frequencies:	1st IF = (4.435 - 4.145 MHz)
	2nd IF = 455 kHz
Modes:	AM and Upper and Lower Sideband.

2 . 3 TRANSMITTER:

Emission:	AM and Upper and Lower Sideband
Frequency Control:	>= 0.005% True PLL Circuit from -30°C to +50°C
RF Power Output:	SSB 12W PEP at I17V AC
	AM 3.5W minimum at I17V AC
RF Spurious and Harmonic Attenuation:	Better than -60 dB
Output Impedance:	50 ohms (nominal)
Modulation Capability	(AM): Limited to 100%
Carrier Suppression:	Better than -70 dB
Frequency Range:	26.965 to 27.405 MHz
Circuitry:	8 tubes, 5 IC's, 19 Diodes,
	19 Transistors, 2 LED's and
	1 LED Display.

GOLDEN EAGLE MARK IVA
SECTION 3

INSTALLATION

3 . 1 GENERAL

Of all the factors involved in the installation, the selection and placement of a good antenna is essential for satisfactory performance of the Golden Eagle MARK IVA. Select the antenna location carefully. Install the antenna in an unobstructed area and as high as legally allowed. The feedline should also be carefully selected and low loss foam RG-8U coax is recommended, especially if a long feedline is required. A low VSWR is also important to get the maximum transmitter power to the antenna. The placement of the Golden Eagle MARK IVA Base Station should be placed for best operating ease and convenience. The transmitter and receiver should be placed side-by-Side and not stacked. Stacking the units will cause excessive heat and the receiver frequency stability will be adversely affected. Proper grounding and lightning protection is a must to reduce atmospheric noises and possible damage to the equipment. The use of inline coaxial lightning protectors will eliminate damage from electrical static charges but will not necessarily offer protection from a direct hit Removing the antenna coax from the unit and grounding both center and outer portions and also unplugging the line cord is the best protection, this of course should only be done during an electrical storm. Connect the Control Cable from the Transmitter to the polarized connector on the Receiver. Connect the antenna cable with PL259 plug from the transmitter to the "ANT" connector-on the Receiver. Connect the outside antenna to the "ANT" connector on the Transmitter. Connect the microphone to the transmitter.

Be sure that the receiver POWER switch is in the "OFF" position and then plug the AC Line cord into the I17V AC outlet. The Golden Eagle MARK IVA is now ready to be placed into service.

GOLDEN EAGLE MARK IVA

SECTION 4

CIRCUIT DESCRIPTION

4 . 1 GENERAL

While studying the circuit description it may be desirable to refer to the block diagram (Figures 4.1& 4.2) as well as the complete schematics, found in the back of the manual, for a better understanding of the circuitry involved.

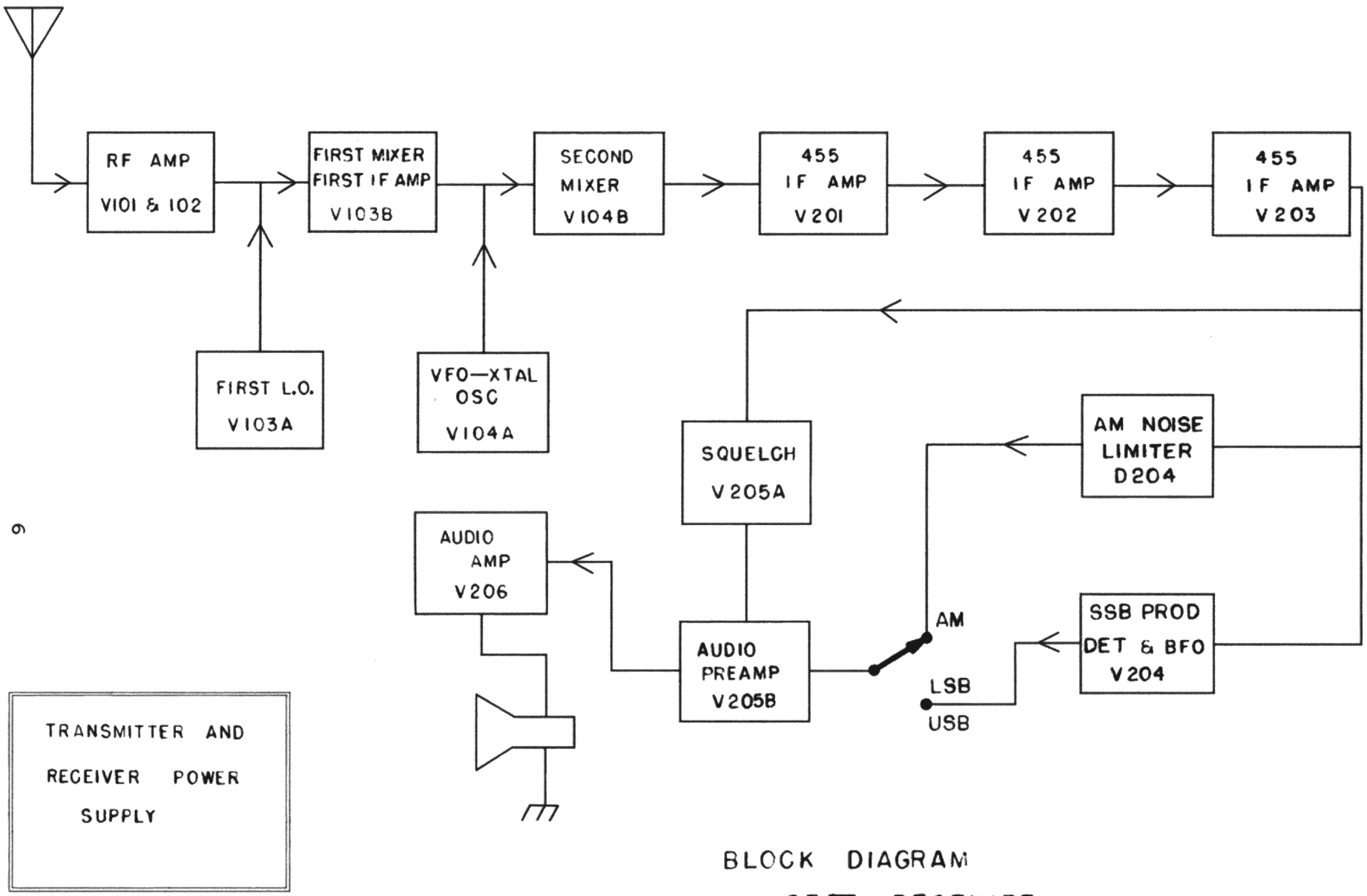
4 . 2 RECEIVER

4 . 2 . 1 GENERAL

The Golden Eagle MARK IVA Receiver is continuously variable front 26.965 - 27.405 MHz (Channels 1 - 40) and 27.415 - 27.595 MHz (HF band). A highly accurate dial and stable variable oscillator allow precise frequency selection. The receiver, a dual conversion super heter-odyne, with intermediate frequencies of (4,435 - 4.145 MHz) and 455 KHz. All interstage transformers are double-tuned. A switchable AGC circuit is incorporated and two separate noise limiters are used, one for SSB (Pulse diode type) and one for AM (series gate type).

4 . 2 . 2 RF AMPLIFIER

During the receive condition the incoming RF signal from the antenna passes through a set of contacts on the transmit-receive relay (K-601) in the Transmitter, to the Receiver, to the tap on L101. Transformer L101 furnishes impedance matching and RF tuning. VI01 and V102 are low noise cascode Nuvistors and provide RF amplification. From the plate of V102, the signal is coupled into T101, a 27 MHz transformer, The output of T101 supplies the 27 MHz energy to the grid of the 1st mixer, V103B. RF Gain Control is achieved by changing the cathode bias on VI01 via R4. AGC voltage is fed to the grid of VI01 and is switched in or out via SW-2. (Part of RF Gain Control).



BLOCK DIAGRAM

GE IV RECEIVER

FIGURE 4.1

CIRCUIT DESCRIPTION (cont'd)

4 . 2 . 3 FIRST LOCAL OSCILLATOR

VI03A utilized third overtone crystals and with the plate tank circuit (L103 and C111), make up the first L.O. In the "CB-1" and "XTAL" positions of SW1-C, V103A generates the frequency of 22.82 MHz via crystal CR501. In the "CB-2" position of SW1-C, V103A generates the frequency of 23.14 MHz via Crystal CR502. Depending on the position of SW1-C, 22.82 or 23.14 MHz is supplied to the grid of the first mixer, V103B.

4 . 2 . 4 FIRST MIXER

V103B performs as a mixer and combines its two inputs (received frequency and either 22.82 or 23.14 MHz). The desired resultant is: for "CB-I" or "XTAL" Received frequency 22 82 MHz = 4 435 - 4 145 MHz; or for "CB-2" Received frequency 23.14 MHz = 4.435 4.145 MHz. The 4 MHz frequency is the first IF and passes through T102 to the grid of the second mixer, V104B.

4 . 2 . 5 MANUAL OSCILLATOR

V104A, the manual oscillator or variable frequency oscillator (VFO), is a series resonant Colpits oscillator operating in the range of 4.890 to 4.600 MHz. Bandspread is achieved by varying a small D.C. voltage to D101.

D101 acts as a varactor diode and changes its capacitance depending on the voltage impressed across it. V104A, also performs as a crystal oscillator when SW1 - A and B are placed into the "XTAL" position. The crystal is used only for fixed frequency monitoring in the AM mode. The output from the grid of V104A is coupled to the grid of the second mixer, V104B.

4.2.6 2nd MIXER

V104B performs as a mixer and combines its two inputs; lst: IF (4.435 4.145 MHz) and the VFO freq. (4.890 - 4.600 MHz). The desired resultant frequency is 455 KHz. The 455 KHz is the 2nd IF. The 455 KHz passes through two double-tuned transformers, T201 and T202, to the grid of the first IF amplifier V201.

4.2.7 455 KHz IF AMPLIFIERS & AGC

The IF amplifiers, V201, V202, and V203 raise the output of the second mixer to a level suitable for detection by' either the AM detector, D202 or the SSB product detector, V204. AGC voltage is developed by D203. The AGC voltage is fed to the IF amplifiers (via R209, 205 and 201), and the RF amplifier, via R101. IF gain control is supplied to V202 through R206.and-from. the RF gain control, R4. The "S" meter develops its voltage from the cathode of V203 and R2 sets the "S" meter zero. V204 also performs as a Beat Frequency Oscillator (BFO) for carrier injection into the product detector for modulation detection in the SSB modes. SW2-E selects the proper variable capacitor that is preset for the correct BFO frequency, depending on which sideband has been selected.

4.2.8 AUTOMATIC NOISE LIMITERS

The AM Automatic Noise Limiter (ANL) circuit consists of; R216, R217, 218 and 219; C219 and 220 and D204. The SSB ANL consists of R241 and R220, C222 and diode package D205.

4.2.9 SQUELCH

R7, The squelch control, adjusts the voltage to the cathode of the squelch tube,V205A. When the voltage from the last IF transformer is below a certain level (determined by the adjustment of R7), V205A will go into conduction and through the network of R230, 231, 232 and 233 will change the bias to the grid of V205B and will cut V205B off. When the level of detected audio now exceeds a certain value, V205B will go back into conduction and amplify the detected audio.

4.2.10 AUDIO AND TONE CONTROL

Audio detected by either the AM detector or the SSB product detector is applied through SW2-D to R6, the volume control. This signal is applied to V205B, the 1st Audio Amp and is raised to a level to drive V206, the Audio Output Amplifier. The output of V206 is transformer coupled to the speaker or via J1 to either an external speaker or low impedance headphones.

Also, at the junction of R6, Volume Control, and SW2-D is the network of C1 and R5 which comprise the Tone Control Circuit. By varying the Tone Control, the higher audio frequencies are attenuated.

4.2.11 POWER SUPPLY

The power supply located in the receiver supplies all voltages required for both the Transmitter and the Receiver. I17V AC is applied to the primary of T2 via the fuse (FI) and the Power Switch (part of Volume Control, R6). The secondary of T2 supplies four separate voltages; (1) the Green wires supply the §.3V AC for all filaments in both the transmitter and receiver; i2) the Green-Yellow wires feed the full wave bridge rectifier D3 which supplies +13V DC (@II7V AC) and is filtered by C5 and C6 to supply the receiver LED's and is also sent to the transmitter via J2 Pin 6; (3) the Red wires feed the full wave bridge rectifier D2. The high voltage (+420V DC) from D2 is filtered by C3A. R9 drops the high voltage and through R8, supplies the receiver B+, +285V. Also from R9, the transmitter high B+, is passed to the transmitter via J2 Pin 5 and the transmitter low B+ through RI0 is passed to the transmitter via J2 Pin 3. (4) The Blue wires feed the full wave bridge rectifier D1.The -45V DC output of D1 is filtered by C4 and feeds the transmitter final bias via J2 Pin 4.

GOLDEN EAGLE MARK IVA

SECTION 4

CIRCUIT DESCRIPTION (cont'd)

4.3 TRANSMITTER

4.3.1 GENERAL

The Browning Laboratories GE MARK IVA is a Phase Locked Loop 40-channel combination AM (Class C plate and screen-modulated) and SSB (Class AB1) Transmitter.

4.3.2 CARRIER OSCILLATOR AND MIXERS

Referring to the schematic and block diagram, the carrier oscillator frequency is generated at V201A for both AM and SSB at a frequency of 5.645 MHz. In the SSB Mode the cathode output of oscillator V201A is fed into the balanced modulator through a tuned circuit, and the double-sideband suppressed-carrier signal is amplified by V202. In the AM Mode the balanced modulator is bypassed through C207 The output of V202 is fed through a 5 MHz tuned circuit T202 to an 8-pole crystal lattice filter (FL201 or FL202). In AM the filters are bypassed by R609. The signal (sideband or AM carrier) is heterodyned to 27 MHz in mixer V301 with the 21 MHz PLL output from CI13: This the sum frequency of V201A (5 MHz) and PLL output (21 MHz).

The 27-MHz output of mixer V301 is coupled by two double- tuned circuits T301 and T30 to amplifier V302. The amplified signal is coupled to the output stage, V303, by another double-tuned circuit, T303. The Pi Network output of V303 consists of C602, L602 and C603. L603 and C605 form an additional L.C. network to further attenuate any harmonics

4.3.3 MODULATION

The audio for both AM and SSB modulation is fed through V203A and through C214, to the grid of V203B. In the SSB mode, V203B is a cathode follower with its output coupled through C216 to T201, the balanced modulator assembly.

4 . 3 . 3 MODULATION cont.

In the AM mode, V203B becomes a triode amplifier; its output is fed into V204A and V204B, a clipper-limiter stage, to prevent overmodulation. Audio output of V204B is connected to a Low Pass Filter (C213, L601 and C219) to remove the high frequency harmonics resulting from the clipping. The audio signal is then amplified by modulator V205 and transformer coupled to the plate and screen of V303, the output stage.

4 . 3 . 4 AUTOMATIC LEVEL CONTROL

In the SSB mode, an ALC (Automatic Level Control) circuit is used. This circuit consists of back-biased diodes D303 and D304. When the crest of the RF envelope exceeds the back bias on the diodes, a negative voltage is developed across R320. This voltage is buffered by Emitter follower Q301, amplified by Q302 and Q303, and filtered by R325 and C325. The resulting negative going voltage is applied as bias to V202, which reduces its gain.

4 . 3 . 5 PHASE LOCKED LOOP CIRCUIT DESCRIPTION

IC701, MC145106, is a multi-function C- MOS PLL chip. Pins 3 and 4 and internal chip circuitry form a 10.24 MHz oscillator. Pin 2 is the Div. by N input. Pin 7 is the phase detector output. Pin 8 is the lock detector output. Pins 9 - 17 are the Div. by N binary encoding lines. From the10.24 MHz crystal C703 and C704 form a capacitor divider. C703 takes a sample of 10.24 MHz energy and supplies to the base of Q701. QT01 is a frequency doubler and via its tank circuit, L701 and C702, supplies 20.48 MHz via C706 to the mixer, Q702. From IC701 Pin 7, the phase detector pulses are passed thru the loop filter (C708, R715, C734, C712, R716 and C713). Out of the loop filter the D.C. control voltage is fed via L704 to the varactor. Q707 and its associated components make up the VCO which operates at 21 MHz. Q704 and Q705 shape and buffer the VCO signal and via C710 also feed the input of the mixer, Q702.

CIRCUIT DESCRIPTION (cont'd)

4.3.5 PHASE LOCKED LOOP CIRCUIT DESCRIPTION (cont'd)

Q702 and Q703 mixes the 20.48 MHz and the VCO 21 MHz and provide an output of 840 to 1280 KHz (Ch 1-40) to the input of the Div. by N (Pin 2 of IC701). Q706 samples the VCO output and thru its tank circuit, L702 and C721, provide the 21 MHz signal to the output buffer Q708. L707, C737, L708, C736, C739 and L709 comprise a low pass filter and impedance matching to input of the transmitter. IC702, Q709 and Q710 provide code conversion from the output of the readout controller.

Q711, 712 and 713 supply the out-of-lock indications as well as the control circuitry to prevent transmission during an out-of-lock condition.

IC703 is the PLL and Readout +8V voltage regulator.

4.3.6 READOUT AND PLL CONTROL CIRCUIT DESCRIPTION

IC802, TMS1022NL, is a PLL Controller and Readout Driver. Via the HI-LO channel switch, IC802 will step or scan Channel 1 thru 40 and supply a binary code to the PLL as well as drive the Readout, 1801, for the proper channel numbers.

IC801, C801 and R801 supply the initial power up pulse to program IC802 for the proper output codes. C805 and R802 provide with the front panel "Rate" control the RC time constant which controls the speed of stepping or scanning.

Q801 and Q802 take the multiplex control signals from IC802 and drive the Display Readout, I801.

I802 and I803 are the Lock Detector indicators. C803, C804 and LB01 provide filtering and isolation from the PLL supply voltage.

GOLDEN EAGLE MARK IVA

SECTION 5

ALIGNMENT

5 . 1 GENERAL

The Golden Eagle MARK IVA Transmitter and Receiver are carefully aligned at the factory. Complete realignment is not. recommended except by technicians familiar with transistors and integrated circuits, possessing a 2nd Class FCC license and who have the necessary test equipment, and then only if absolutely necessary. Replacement of defective components in any stage should require re-alignment of that particular stage only.

5 . 2 RECEIVER ALIGNMENT

A. 455 KHz Connect the test equipment as shown in Figure 5.1. Inject a modulated455 KHz signal to the Junction of RI13 and T201 (at Point A), through a 0.1 uF capacitor. Connect the VTVM to the junction of T-205, C217, R217, R219 and R229. Peak T201., 202, 203, 204 and.205 top and bottom cores for maximum on the. DC-VTVM. Be sure that you have peaked to the outer peaks. (One slug of T201 may be tuned to inner peak if necessary for gain). There may be interaction between T201 and T202. Tune them alternately until no more increase can be achieved.

B. OSCILLATOR

Place a small capacitor (2-5 PF) in series with the scope probe then connect to Pin 7 of V103B. Set the Mode switch to CB-2 and tune L103 for highest P-P oscillator level. Then tune L103 CCW to reduce level by 20%. Example, if peak level is 2V. reduce to 1.§V. PP. Switch to CB-1. Level should be less than on CB-2.

C. VFO

Connect the test equipment as in A above. Inject 27.105 MHz (Channel 12) into the antenna terminal. Center the dial channel 12 to the line on the channel window opening. Set the Receiver for AM, CB-1 RF Gain Maximum CW, Squelch CCW, AGC pushed in, and ANL pushed in. Adjust L105 for a peak on the DC VTVM. Remove Ch. 12 signal.

5.2 RECEIVER ALIGNMENT (cont'd)

D. 27 MHz

Connect as in Step C. Set the receiver for Channel 27 and inject a Channel 27 signal into the antenna.

1. Adjust L101 and both slugs, of T101 for maximum reading on the DC VTVM.
2. Repeat oscillator adjustment in Step B.
3. Set the Receiver to Channel 12 and inject a Channel 12 signal into the antenna. Tune both. slugs of T102 for peak reading on. the DC VTVM.
4. Reset both receiver and signal generator for Channel 27 (27.275 MHz). Tune the bottom slug of T1O2 for a 1 volt increase on the DC VTVM. Note this voltage.
5. Reset both receiver and signal generator for Channel 1 (26.965 MHz). The voltage on the DC VTVM should be within 0.iV of the voltage noted in Item 1 above. If not, adjust the top slug of T-102 until the voltage is approximately the same. Again, note this voltage.
6. Reset both receiver and signal generator again for Channel 12 (27.105 MHz). Recheck the DC VTVM for a voltage within 1 volt of the readings noted at Channels 1 and 27.

E. DIAL CALIBRATION

1. With the dial full CCW make sure the vertical line on the dial lines up with that on the window. If not, reset the dial so that it does lineup.
2. On 40-channel units (Channel 1 is on right side of the dial and the RF and oscillator sections are inside a shield cage which must be in place for dial calibration).
3. Set Receiver and signal generator to Channel 23. Adjust C126 for peak on the S-Meter.

5 . 2 RECEIVER ALIGNMENT (cont'd)

E. DIAL CALIBRATION (cont'd)

4. Set Receiver and signal generator to Channel 3. If necessary bend the right side near the Bakelite separator of outer sections of the movable portion of the main tuning capacitor (C8) until S-Meter peaks on Channel 3.

5. Repeat Steps 2, 3 and 4 until no further adjustment is necessary. For a 23-channel set use the same procedure but use Channel 3 in Step 3 and Channel 22 in Step 4.

F. LSB

For SSB alignment use either the transmitter Spot or a signal generator. In either case make sure the Spot or signal is exactly on center of the channel being used. For LSB set the Receiver dial 1/3 channel below center and adjust C-223 for Zero beat (a null between 2 rising tones). Note the S-Meter reading. Adjust the signal generator level or receiver RF gain so that it is between S-6 and S-9.

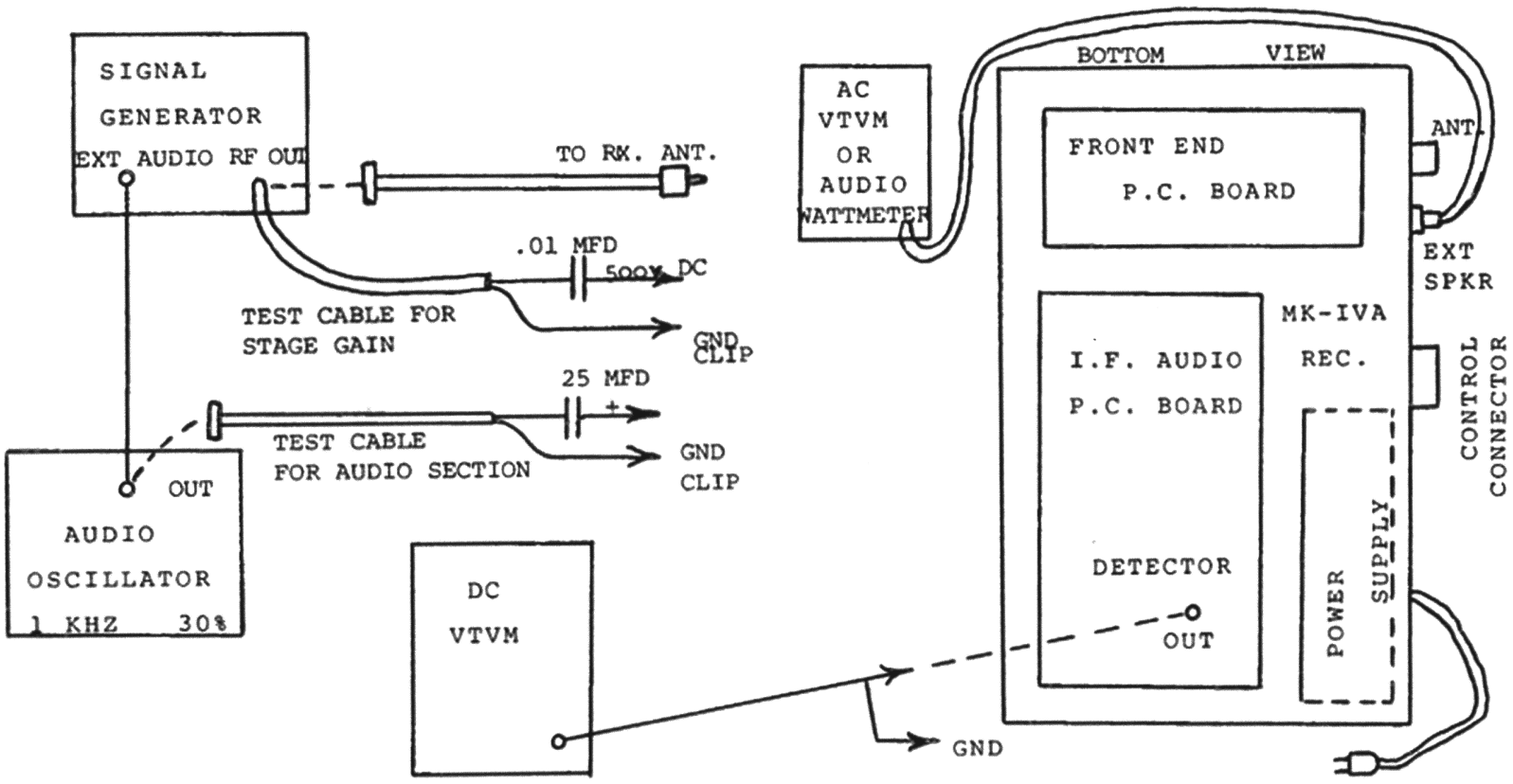
G. USB

Switch the Receiver to USB and tune the dial above the channel until you get the same S-Meter reading as in Step F. Adjust C224 for Zero beat at this point. If USB is now more than 1/2 a channel high go back to F. and set dial 1/4 below center and repeat Steps F and G. If USB is less than 1/4 channel high go back to Step F. and set dial 1/2 channel low then repeat Steps F and G. LSB and USB may or may not be the same distance from center. It is more important that they be of equal sensitivity as indicated by the S-Meter level.

H. OVERALL GAIN CHECK

Connect a modulated (1000 Hz, 30%) Channel 12 (27.105 MHz) to the receiver antenna terminal. Connect the AC VTVM across the speaker terminals. Adjust the signal generator output for 0.3 uV. Adjust the receiver volume control for a convenient reading on the high end of VTVM scale. Remove the modulation from the signal generator and the VTVM reading should drop by 10 dB.

FIGURE 5.1


SIGNAL
GENERATOR
EXT AUDIO RF OUT
TO RX. ANT.
.01 MFD
500v DC
TEST CABLE FOR
STAGE GAIN
GND
CLIP
25 MFD
+
TEST CABLE
FOR AUDIO SECTION
GND
CLIP
OUT
AUDIO
OSCILLATOR
1 KHZ 30%
DC
VTVM
AC
VTVM
OR
AUDIO
WATTMETER
BOTTOM VIEW
FRONT END
P.C. BOARD
ANT.
EXT
SPKR
MK-IVA
REC.
I.F. AUDIO
P.C. BOARD
DETECTOR
OUT
POWER SUPPLY
CONTROL
CONNECTOR
GND

GOLDEN EAGLE MARK IVA

SECTION 5

ALIGNMENT

5 . 3 TRANSMITTER ALIGNMENT

A. EQUIPMENT-REQUIRED:

Bird Thruline Model 43 with 25 watt element or equivalent.

50 ohm Dummy Load - Heath Cantenna or equivalent.

Frequency Counter — Frequencies up to 30 MHz with 10 Hz accuracy.

DC VTVM

Monitor Scope Heath SB610 or equivalent
(in line with transmitter output)

AC VTVM

High Frequency (above 27 MHz bandwidth) Scope with
low capacity probe.

Audio Oscillator.

Control Box with switch to key transmitter and Audio cable with switch wired to Amphenol SL-40-4M on one end, other end to Audio Oscillator. See Fig. 5-2.

B. PROCEDURE:

1. Preset Controls as follows only for complete Alignment.

a.	Mode SW	LSB
b.	Bias Control:	CCW (rear of chassis)
c.	R219 Mike Gain:	1/2 Turn CW
d.	R318 ALC Control:	CCW
e.	R603 Clipper Control:	CW
f.	Plate Tuning:	1/2 Mesh
g.	Meter Switch:	to MA
h.	C201:	90° Rotation
i.	Test Switch	Reset position

2. Connect Cables
   - **a.** Plug Power Cable into Receiver.
   - **b.** Connect SL-40-4M from Control Box to Transmitter (Keying and Audio Switch Off).
   - **c.** Connect RF Wattmeter with Scope and Dummy Load to Antenna.
   - **d.** Connect RX Antenna Cable to Test Receiver.

5 . 3 TRANSMITTER ALIGNMENT (cont'd)

3. Set Bias

a. Turn Transmitter Power On at Receiver.

b. Check for Meter Switch in MA Position and warm up approximately 30 seconds.

c. Key Transmitter (SW on Keying Box).

d. Adjust Bias Control so Transmitter Meter reads to center of Bias Box. (Plate current should equal 29 M.A.)

4. Align PLL Synthesizer

a. Connect frequency counter to the base of Q701 and adjust C705 for 10.24000 MHz.

b. Connect the oscilloscope to the Collector of Q703 and tune L701 for the following Wave Form: 8v. p-p

c. Connect VTVM at the Junction of L704, C713, C712, C734 and R715 and adjust L705 for +3.0V. on Channel 1. Channel 40 should have about +5V.

d. Go to Channel 20 and adjust L702 for peak RF output at the Junction of L709 and C739. It should be 4-5V.P.P.

e. Check output frequency at the Junction of C739 and L709. It should be 21.320 on Channel 1 and21.760 on Channel 40.

5. Adjust Carrier Oscillator

With Transmitter in LSB, connect Frequency Counter to one leg of R204. Tune C201 for 5.645 MHz, exactly.

6. Tune for Output

a. Turn Audio Switch ON

b. Set Audio Test Oscillator to 1000 Hz and increase level.

c. Set Channel Selector to Channel 20.

d. If you have power reading on. the wattmeter go to Step G. If not, connect Scope to input of LSB filter (FL202) and adjust T201 and T202 for Peak.

e. Connect scope to V302 Pin 2'and adjust T301 and 302(2 slugs each) for peak.

f. Connect scope to Antenna Jack (on inside of set. Do not remove Dummy load) and adjust T303 and C602 for peak. If at any point you have power on the wattmeter go to Step G.

5.3 TRANSMITTER ALIGNMENT (cont'd)

g. RF should be present on Wattmeter. Use Wattmeter for peak from now on.

H. Set C602 (plate tuning) for peak on wattmeter.

i. Adjust audio level for. approx. 3 watts.

j. Adjust T201 for peak on wattmeter.

k. Adjust T202 for peak on wattmeter.

l. Repeak T301, 2 and 3 for peak on wattmeter. Reduce audio input level as needed.

7. SUPPRESS CARRIER

a. Adjust audio level for 4 watts output.

b. Remove V203 (12AXY) connect scope to output of T202

c. There may be an A.C. ripple with RF riding on it.
Adjust R204 and C205 to minimize the RF portion. It should be below 50 my. P-P on both LSB and USB.

d. Remove scope, install V203, switch back to LSB.

8. CHECK AUDIO CUT OFF FREQUENCY

a. Set audio level to 4 watts, at 1000 Hz.

b. On LSB increase AUDIO generator frequency until power drops to 1/10W (at approximately 2900 Hz). Note the exact audio frequency.

c. Repeat Step B for USB.

d. Average the two audio frequencies and-adjust C201 for1/1OW output at that average frequency. It should now be the same for LSB and USB.

e. The average audio frequency should, be between 2800-3000 Hz. If not, the filter whose frequency in Steps B and C is farthest from 2900 Hz is out of tolerance.

9. CHECK AM POWER

a. Switch to AM and check for 3.5 - 4 watts power.

10. CHECK AM MODULATION AND METER FUNCTION

a. Switch audio on at 1000 Hz adjust to 100% Modulation. Check for clear audio signal on scope.

b. Switch meter to MOD and check for full scale reading.

c. Switch meter to FWD. Adjust SWR calibrate for full scale reading.

d. Switch meter to REF. reading should be under 3 Division.

5 . 3 TRANSMITTER ALIGNMENT (cont'd)

11. CHECK SSB POWER

a. Switch to LSB increase audio input until maximum power is obtained. It should be at least 10W (equivalent to12W PEP with 2 tone test).

12. CHECK TRANSMITTER PANEL CONTROL FUNCTIONS

a. Power Cable still in Receiver. Connect Receiver Antenna cable to Receiver.

b. Key transmitter and check that Receiver cuts off and the "On the Air" light operates.

c. Switch modes to AM, LSB, USB and observe mode indicator lights for operation.

d. Hold Channel Selector (HI-LOW Switch) CW and observe Channel Display counting upwards and CCW for the display to count downwards. The display will continuously scan all 40 channels until the channel selector is released. A slight delay before the scan starts is normal and the slower the Scan Rate is the longer the delay will be.

e. Check that the Scan Rate Control will vary the Scan Rate.

f. Set the Test Switch to LED. Channel Display will scan upwards continuously enabling operator to check for proper Display on all channels. The Channel Selector is disabled. Switch to RESET and the Channel Selector is again operational.

g. Lock Detector Lights (LED's) on each side of the Channel Display will light if the 21 MHZ PLL circuit is not operating properly. They normally come on momentarily when first turned on and when the display scans past 40 and returns to 1.

h. Unkey Transmitter, press spot on AM and LSB, USB (observe Meter on Receiver with transmitter and receiver on same channel.) Minimum level on S Meter S6.

i. Install Bottom Plate.

13. FINAL ALIGNMENT

Refer to Transmitter Test Set Up- Fig. 5-2

Control Settings:

Mode: **AM**
Close Test Switch 2 (No audio input)
Close Test Switch 1
R219 1/2 Volume
Audio Osc. 1000 Hz (Check Accuracy)