OPERATION AND MAINTENANCE

SWAN CYGNET MODEL 270

SWAN
ELECTRONICS
Oceanside, California
A Subsidiary of Cubic Corporation

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INTRODUCTION

The Swan Cygnet Model 270 Single Sideband Transceiver together with its accessories and optional equipment, is designed to be used in either CW or SSB modes on all portions of the 80-, 40-, 20-, 15-, and 10 meter amateur radio bands. MARS frequencies may also be covered by using the Model 510X oscillator accessory.

The Model 270 generates a single sideband signal by means of a crystal lattice filter, and the transceive operation automatically tunes the transmitter to the received frequency. Provisions are included in the transceiver for operation on either upper or lower sideband.

Basic circuitry of the single conversion design has been proven in several thousand of the popular Swan transceivers. Mechanical, electrical, and thermal stability is exceptionally high. All oscillators are temperature compensated and voltage regulated. Push-to-talk operation is standard, with provision for plugging in the Model VX-2 accessory Vox unit for automatic voice control.

The basic transceiver provides coverage of all portions of the 80 through 10-meter amateur bands In addition to this, the amplifier circuits will tune to most MARS frequencies near the 80-, 40-, and 20-meter bands. By using the Model 510X crystal oscillator accessory, MARS operation is thus possible.

With the built-in dual power supply, operation may be fixed, portable, or mobile. Power input on all bands exceeds 260 watts, PEP, on single sideband and 180 watts on CW. The Model 270 includes automatic gain control, (AGC), automatic level control, (ALC), and grid block keying.

REVISION 1 MARCH 1970

SPECIFICATIONS

FREQUENCY RANGES

80 Meters	3. 5 to 4 mc.
40 Meters	7. 0 to 7. 300 mc.
20 Meters	14. 0 to 14. 350 mc.
15 Meters	21. 0 to 21. 450 mc.
10 Meters	28. 0 to 29. 7 mc.

POWER INPUT

Single Sideband, Suppressed Carrier:
260 watts, PEP, minimum on all bands.
CW: 180 watts, dc input on all bands.

AM: (Single Sideband with Carrier)
65 watts dc input on all bands.

DISTORTION

Distortion products down approx. 30 db.

UNWANTED SIDEBAND SUPPRESSION

Unwanted sideband down more than 50 db.

CARRIER SUPPRESSION

Carrier suppression greater than 50 db.

RECEIVER SENSITIVITY

Less than 0. 5 microvolt at 50 ohms impedance for signal-plus-noise to noise ratio of 10 db.

AUDIO OUTPUT AND RESPONSE

Audio output, 3 watts to 3. 2 ohm load. Response essentially flat from 300 to 3000 cps in both receive and transmit.

TRANSMITTER OUTPUT

Wide-range Pi-network output matches resistive loads from 50 to 75 ohms.

METERING

Power amplifier cathode current 0-400 ma on transmit, S-Meter 0-70 db over S9 on receive.

FRONT PANEL CONTROLS

AF Gain, RF Gain, Sideband Selector, CAL-REC-TUNE/CW, Mic. Gain, Bandswitch, Carrier Balance, PA Plate Tune, Driver Tune, PA Load, Dial set, Meter Switch.

REAR PANEL CONTROLS AND CONNECTIONS

Bias potentiometer, CW key jack, Jones plug power connector, Antenna jack, S-Meter zero, Auxiliary relay switching, Outboard VFO connector, Headphone Jack. The Vox Connector is located on the side of the chassis.

VACUUM TUBE COMPLEMENT

V1	12AU6 VFO Amplifier
V2	12BE6 Transmitter Mixer
V3	6GK6 Driver
V4	6LQ6 Power Amplifier
V5	6BZ6 Receiver RF Amplifier
V6	12BE6 Receiver Mixer
V7	12BA6 First IF Amplifier
V8	12BA6 Second IF Amplifier
V9	12AX7 Product Detector/Receive Audio
V10	6AV6 AGC Amplifier/Rectifier
V11	6AQ5 AF Output
V12	12BA6 100 KC Calibrator
V13	6JH8 Balanced Modulator
V14	12AX7 Microphone Amplifier

TRANSISTOR COMPLEMENT

Q1	2N706 Oscillator
Q2	2N5130 Buffer
Q3	2N706 Carrier Oscillator
Q4	2N1522 P. S. Switching
Q5	2N1522 P. S. Switching

POWER REQUIREMENTS

12-14 volts dc
8 amps receive, 12 amps ave. w/voice mod.
25 amps max. in TUNE

117 Vac., 60 cps, at 4 amps
(208-220-240 volt, 50-60 cps, at 2. 5 amps max., export model)

DIMENSIONS

Height	5-1/2 in.
Width	13 in.
Depth	11 in.

WEIGHT

Weight	24 lbs.

CIRCUIT THEORY

GENERAL DISCUSSION

The Swan 270 transceiver provides single sideband, suppressed carrier transceive operation, and generates the single sideband signal by means of a crystal lattice filter. To permit a logical discussion of this mode of operation certain definitions are necessary. In a normal AM signal, (double sideband with carrier), a radio frequency signal is modulated with an audio frequency signal. This is considered by many to be merely a case of varying the amplitude of the carrier at an audio rate. In fact, however, there are actually sideband frequencies generated, which are the results of mixing the RF and the AF signals. These sidebands are the sum of, and the difference between the two heterodyned signals. In the detection of this conventional AM signal, the two sidebands are mixed with the carrier to recover and reproduce the audio intelligence. This is an inefficient means of transmission, because only 25 percent of the transmitted power is used to transmit intelligence. There are other attendant drawbacks, also. The bandwidth of AM voice transmission is approximately 6 kc, while the actual demodulated audio is only approximately 3 kc. The result is inefficient use of the frequency band, and over half of the allotted band is unusable due to heterodynes, interference, and congestion.

In the single sideband, suppressed carrier mode of transmission, only one of the sideband signals is transmitted. The other sideband and the carrier are suppressed to negligible level. In addition to increasing the transmission efficiency by a factor of four, single sideband effectively doubles the number of stations or channels which can be used in a given band of frequencies.

It should be remembered that in the single sideband, suppressed carrier mode of transmitting, the unwanted sideband and carrier are only suppressed, not entirely eliminated. Thus, with a transmitted signal from a transmitter with 50 db sideband suppression, the other or unwanted sideband will be present, and will be transmitted, but its level will be 50 db below the wanted sideband. When this signal is received at a level of 20 db over S9, the unwanted sideband will be present at a level of approximately S5. The same is true of carrier suppression. With carrier suppression of 60 db, and a signal level of 20 db over S9, carrier will be present at a level of approximately S3 to S4.

For the following discussion refer to the schematic diagram, and to Figures 1, 2, and 3.

SIGNAL GENERATION

When the push-to-talk switch on the microphone is pressed, the transmitter portion of the transceiver is activated, and it generates a single sideband, suppressed carrier signal in the following manner. Carrier is generated by Q3 Carrier Oscillator, which is a Pierce oscillator with the crystal operating in parallel resonance. This stage operates in both the transmit and receive modes. When transmitting, the RF output of the oscillator is injected into the control grid of the Balanced Modulator, V13. This balanced modulator is a beam deflection tube, and operates similar to a cathode ray tube in that the electron beam from the cathode is deflected to one output plate or the other by the charge appearing on the deflection plates. The carrier signal fed to the control grid of the balanced modulator appears on both plates of the output. The two plates are connected to Transformer T1301 in push-pull, so the carrier signal cancels itself out in T1301. The deflection plate dc voltages are adjusted by means of the carrier balance control so that the RF being fed to the output plates will cancel out, and the output from T1301 will be zero. Audio signals from the Microphone Amplifier, V14, are applied as a modulating voltage to one deflection plate, and the two sidebands resulting from the sum and difference frequencies of the audio and carrier signals appear in the output of transformer T1301. Carrier suppression is approximately 60 db.

The double sideband, suppressed carrier signal is then coupled from the secondary winding of T1301 to the crystal filter, which suppresses the lower sideband, and permits only the upper sideband to be fed to the First IF Amplifier V7. The carrier frequency is generated at approximately 5500. 0 kc, normal sideband. With the opposite sideband crystal, the carrier crystal frequency will be 5503. 3 kc, and this positions the double sideband signal on the other side of the filter response curve, attenuating the upper sideband by at least 50 db. In the single conversion mixing process, these sidebands become inverted on 80 and 40 meters. Thus the Swan 270 normally operates on lower sideband on 80 and 40, while on 20, 15, and 10 meters normal operation is on upper sideband.

Q1, the VFO 2N706 Oscillator, operates in the common base configuration as a Colpitts oscillator. Q2, the buffer is used for isolation. The extremely good regulation achieved through using the Zener diode regulator D1713 across the bias supply voltage, also contributes to the stability.

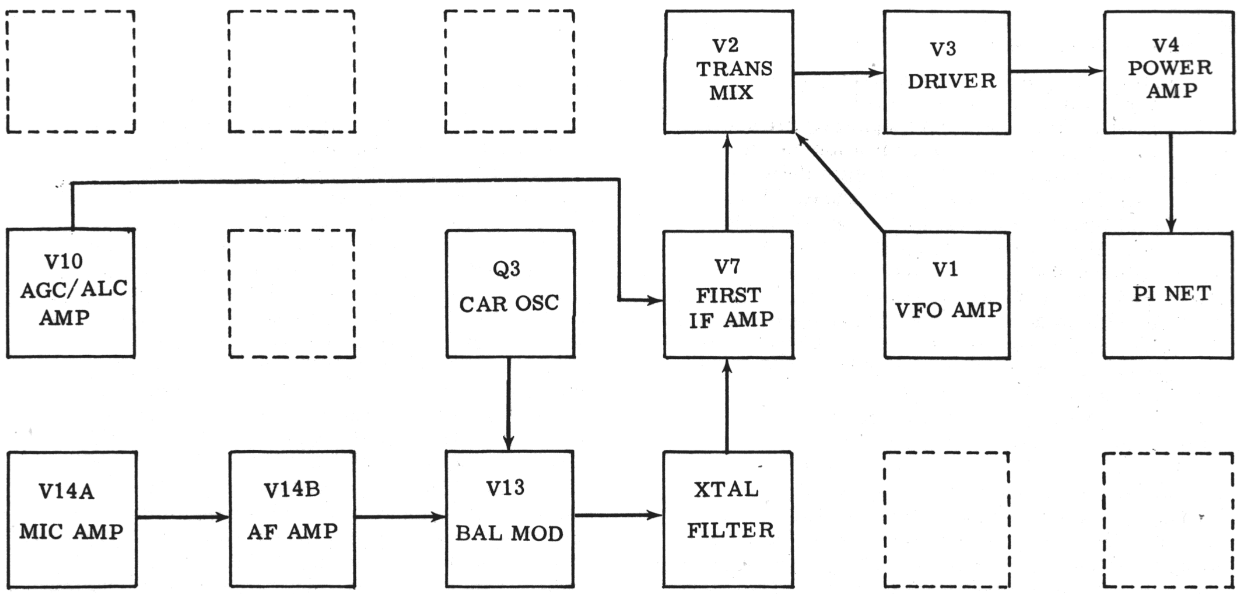


FIGURE 1. BLOCK DIAGRAM, TRANSMIT MODE

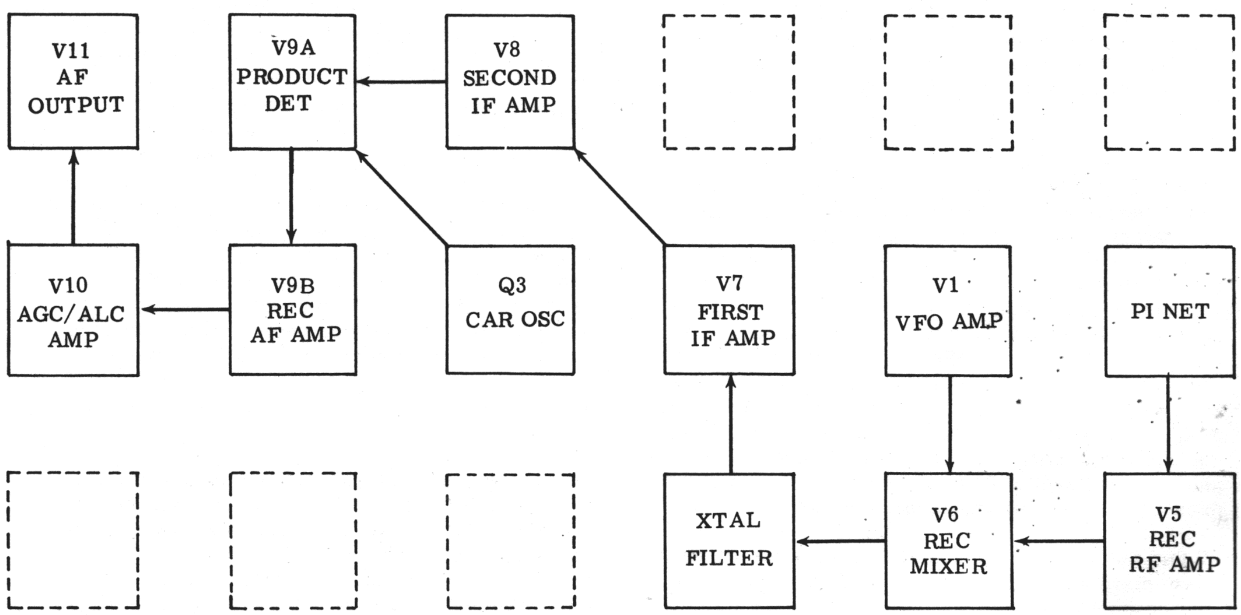


FIGURE 2. BLOCK DIAGRAM, RECEIVE MODE

Bandswitching is accomplished by changing the tank circuit coil. The VFO in the Model 270 exhibits extremely good stability after the initial warm-up period. Drift from a cold start will be less than 1 kc for the first hour on 80, 40-, and 20-meter bands, and less than 2 kc on 10 and 15 meters. After the initial warm-up period, drift will be negligible.

The single sideband, suppressed carrier signal from the first IF Amplifier is fed to the Transmitter Mixer, V2, where it is heterodyned with the VFO signal. The resultant signal at the desired transmit frequency is amplified by the Driver, V3, and the Power Amplifier, V4. The signal from the VFO Amplifier is initiated in the transistorized VFO/Buffer circuit Q1 and Q2. The signal from the VFO is routed to the VFO Amplifier, and on 40 and 80 meters, is subtractively mixed with the single sideband signal from the IF Amplifier, to result in LSB operation. On 20, 15, and 10 meters, the frequencies are additively mixed, resulting in output on the upper sideband.

When in TRANSMIT, the gain of the First IF Amplifier is controlled through the Automatic Level Control network (using the AGC Amplifier V10) to control the gain of the stage in response to the average input power to the Power Amplifier. This ALC system will compensate for any extremely strong input signals, but does not completely eliminate the necessity of proper adjustment of the Mic. Gain Control. This feature will help prevent the transmitter from flat topping and spurious emissions, but considerable distortion may occur if the Mic. Gain Control is not properly adjusted. Refer to Operating Instructions.

TUNE AND CW OPERATION

Normally, the frequency of the carrier oscillator is approximately 300 cps outside the 6 db passband of the crystal lattice filter. In TUNE position, the frequency of the carrier oscillator is moved approximately 800 cps to place it well within the passband of the crystal lattice filter. A similar procedure is followed for CW to allow full carrier output during CW operation.

RECEIVE

In RECEIVE position, or at any time when the transmitter is not in TRANSMIT, all circuits used in transmitting are disabled through the relay controlled circuits, K1. The relay is energized for transmitting and de-energized for receiving. One contact, when de-energized, allows signals from the transmitting tank circuit and antenna to be fed to the Receiver RF Amplifier, V5, where they are amplified and then fed to the control grid of the Receiver Mixer, V6. The local oscillator signal from the VFO Amplifier is now used to heterodyne the received signal to the IF frequency. All IF amplification is accomplished at this frequency, nominally 5500.0 kc, through V7 and V8 IF amplifiers. In the Product Detector V9A, the IF signal is heterodyned with the carrier frequency generated by Carrier Oscillator, Q3. The resultant audio is then amplified by V9B, which then couples to V10, the AGC amplifier, and V11, the output audio stage.

FREQUENCY CALIBRATION

Frequency calibration of the Model 270 is in 5 kc increments on 80-, 40-, 20-, and 15-meters, and in 20 kc increments on 10 meters. Dial accuracy and tracking are very good on the 270, but caution must always be observed when operating near band edges. Measuring the frequency with the 100 kc calibrator when working near band edges is recommended.

DIAL SET

A dial-set control has been provided so that dial adjustment can be made at any 100 kc point of the dial. With calibrator on, set the dial to any 100 kc point closest to the frequency you wish to work. Now adjust dial-set control to zero-beat the VFO with the 100 kc Calibrator. This provides greater accuracy of dial readout.

CAUTION

CARE MUST BE EXERCISED WHEN TUNING FOR THE 100 KC HARMONICS OF THE CALIBRATOR. SEVERAL SPURIOUS IMAGE SIGNALS MAY BE HEARD, ALTHOUGH THEY WILL BE DEFINITELY WEAKER THAN THE CORRECT HARMONICS.

TRANSMIT AND RECEIVE SWITCHING

Transmit and receive switching is performed by relay K1. In TRANSMIT position, only those tubes that operate in the transmit mode are operative, all others being biased to cutoff through the relay contacts. In the RECEIVE position, with the relays de-energized, the tubes that are used only in transmit are cut off in the same manner. Relay K1 when de-energized, feeds signals from the output pi-network to the receiver, and is used also to control external switching circuits. In transmit position the meter indicates the cathode current of the power amplifier. In receive position, it indicates the voltage across R703 in the screen grid of the first IF Amplifier, V7, which is inversely proportional to the AGC voltage used to control the gain of the tube. Thus, the meter indicates the relative strength of received signals.

POWER RATING

The Swan 270 is capable of 180 watts, PEP input under steady state two-tone test conditions, when operated with any of the recommended power supplies. The peak envelope power, when voice modulated, is considerably greater, typically 260 watts, or more.

The built-in power supply produces a no-load plate voltage of approximately 880 volts. Under TUNE conditions, or CW operation, this voltage will drop to approximately 680 volts. Under steady state two-tone modulation, the voltage will drop to approximately 710 volts. If the power amplifier idling current is 30 ma, and the two-tone current, just before flat-topping, is 200 ma, the peak two-tone current will be 300 ma. Under these conditions the PEP input will be 710 volts times 300 ma = 213 watts. Under voice modulation, because average power is considerably less, the power amplifier plate and screen voltages will be maintained higher, even during voice peaks, by the power supply filter capacitors. Peak plate current will therefore also be higher than with two-tone test conditions. Under typical operating conditions, peak plate current before flat-topping will be 350 ma at 800 volts, to result in an input of 280 watts, PEP. Readings of cathode current will not reflect this power input, however, because of the damping in the cathode current meter, cathode current readings under normal voice input should not average more than 100 to 120 ma.

POWER AMPLIFIER PLATE DISSIPATION

There is often a misunderstanding about the plate dissipation of tubes operated as AB1 amplifiers under voice modulation. In the Swan 270, while in the transmit position, and with no modulation, the plate voltage will be approximately 830 volts, the plate current 30 ma, and the power input will be 25 watts.

Authorities agree that the average voice power is 10 to 20 db below peak voice power. Normally, some peak clipping in the power amplifier can be tolerated, and a peak-to-average ratio of only 6 db may sometimes occur. Under such conditions, the average power input will be 80 watts, and average plate current will be 100 ma. With power amplifier efficiency of 65 percent plate dissipation will be approximately 26 watts. The 6LQ6 is rated at 30 watts, continuous duty cycle, in normal TV service. Thus it can be seen that under normal operating conditions, the power amplifier tube in the Swan 270 is not being driven very hard. Note, however, that proper modulation level must be maintained by correct setting of Mic. Gain, and that the length of time in TUNE position must be limited to not more than 30 sec. at a time.

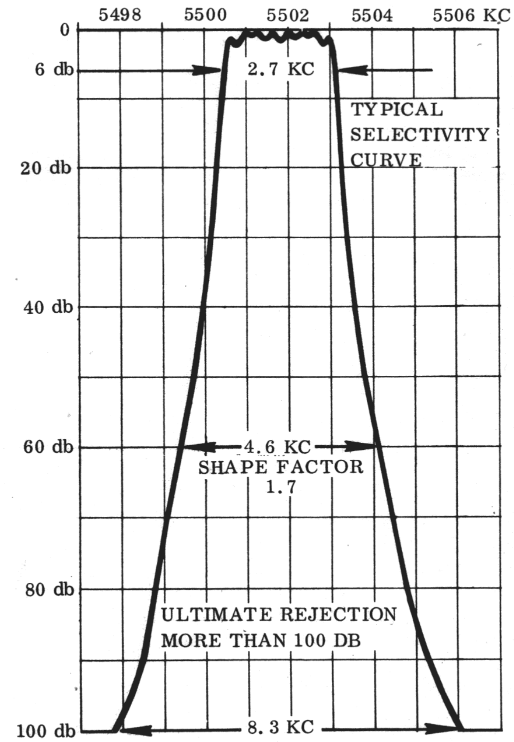


FIGURE 3. CRYSTAL FILTER CHARACTERISTICS

GENERAL

The installation of the Swan Cygnet is not at all difficult and it involves only the placement of the transceiver in its operational area (fixed or mobile), connection of power (either 117 volts ac, or 12 volts dc), and the connection of an antenna. The following paragraphs are therefore devoted to the installation requirements involving microphones, fixed and mobile operation, and recommended antenna types. Before actual installation, be sure to check for possible shipment damage. Remove the cabinet, (three screws on each side), and check to make sure that all tubes are firmly in place.

FIXED INSTALLATION

Locate the Cygnet in an area which is well ventilated and which provides complete operational freedom of the front panel controls. Connect the ac power cord to the 12 pin Jones connector on the back. If the Cygnet is a 117 volt model, plug the power cord into a standard 117 volt, 50-60 cycle outlet having a capacity of at least 10 amps. If the Cygnet is an Export model, it should first be set to the proper voltage tap: 208, 220, or 240 volts, 50-60 cycles. Remove the cabinet, and locate the terminal strip near the top of the power transformer. There are 3 terminal lugs, and a decal indicates the voltage tap for each. Connection has been made to the 220 volt tap at the factory. If your supply voltage is 208 or 240, unsolder the red colored wire and move it accordingly.

Connect an antenna to the Cygnet which is suitable for the band which is to be used. Refer to the antenna section of this manual for other information.

FIXED ANTENNAS

A standard PL239 coax connector plug will fit the Cygnet's antenna jack, and 50 or 75 ohm coax cable to the antenna is recommended. RG58 or RG 59 is satisfactory for runs up to 50 feet. For longer runs the larger RG8 or RG11 produces less line loss, particularly on 10 meters.

Any of the common antenna systems designed for use on the amateur high frequency bands will work well with the Cygnet. However, the amateur should consider an antenna system which best fits his operational requirements. For example, a rotatable beam antenna is usually best suited on the 20, 15 and 10 meter bands for DX operation, and an inverted "V" or a similar antenna is usually best suited for 80 and 40 meters. Methods for constructing antennas and antenna tuners are described in detail in the ARRL Antenna Handbook and similar publications. It is recommended that these publications be consulted during the design of any antenna system.

MOBILE INSTALLATION

Many different methods of mobile installation are possible, and it is expected that hams will find methods which are best suited for their installation requirements. Swan Electronics has available a Mobile Mounting Kit which is suitable for under-the-dash installations. Figure 4 shows the recommended mounting methods using this kit.

A 12 pin Jones connector is supplied with the Cygnet for dc operation. This connector has been prewired with two leads; a red wire for +12 to 14 volts dc, and a black wire for negative ground. Longer leads are not supplied since the length and wire gauge will vary with different installations. It is recommended that the leads run directly to the battery, but if this is impossible for the particular installation, connection under the dash to a 12 volt line may be used. For lead lengths up to about 5 feet, use 10 gauge wire. Splice them to the short wires coming from the Jones connector. Solder and tape well. For lead lengths of 5 to 10 feet use 8 gauge wire.

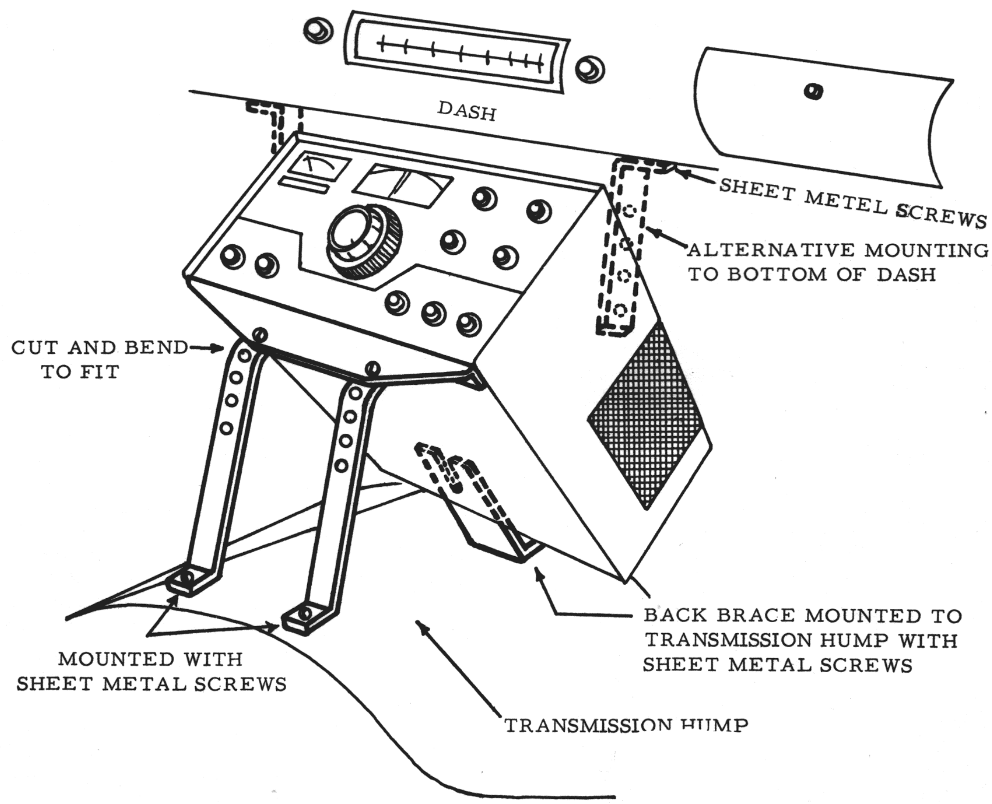
IMPORTANT

> A 30 ampere fuse must be connected in series with the positive lead. This fuse should be located close to the battery end of the lead. The fuse holder may be either an in-line type, or an insulated block type. This fuse is available from your dealer.

MOBILE ANTENNAS

Mobile antenna installations are quite critical since the antenna represents a number of compromises when used on the high frequency bands. Many amateurs lose the efficiency of their mobile antennas through improper tuning. Points to remember about the mobile antenna are:

1. The "Q" of the antenna loading coil should be as high as possible. There are several commercial models available which use high "Q" coils, including the Swan Models 45 and 55 mobile antennas. (Contact your Swan distributor or Swan Electronics for details.)
2. The loading coil must be capable of handling the power of the Model 270 without over hea ing. In TUNE position, the power output of the transceiver may exceed 150 watts. Wid spaced, heavy wire loading coils are essent
3. The SWR bridge is a useful instrument, but unfortunately it is quite often misunderstooc and over rated in importance. Basically, tl SWR bridge will indicate how closely the an-



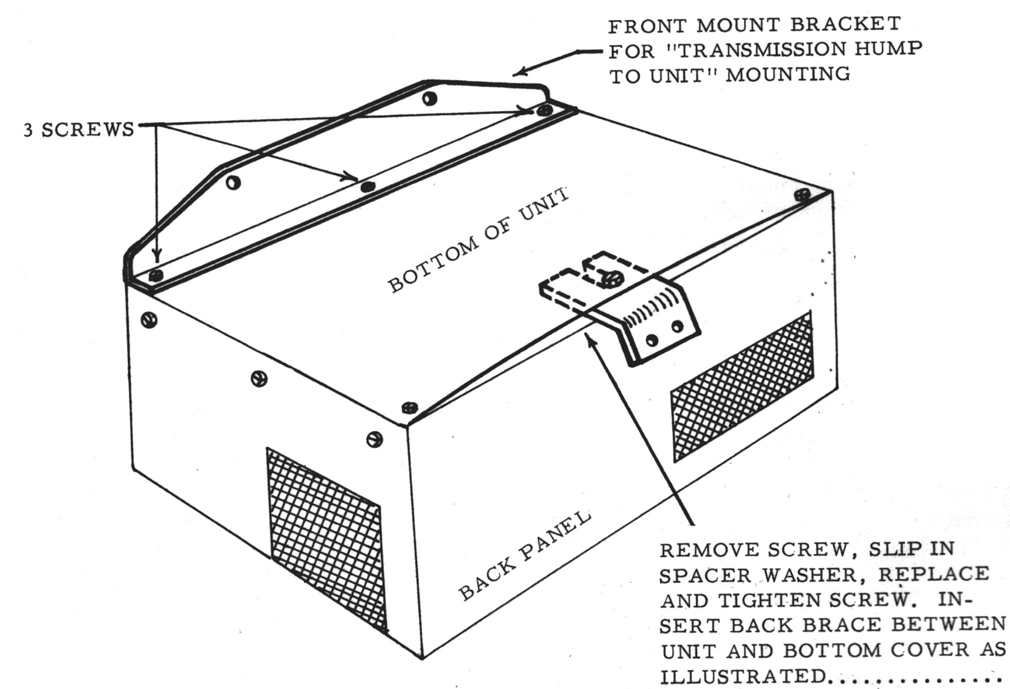


FIGURE 4. MOBILE INSTALLATION MOUNTING DETAILS

tenna load impedance matches the transmission line. With long transmission lines, such as will be used in many fixed station installations, it is desirable to keep the impedance match fairly close in order to limit power loss. This is particularly true at the higher frequencies. The longer the line, and the higher the frequency, the more important SWR becomes. However, in mobile installations the transmission line seldom exceeds 20 feet in length, and an SWR of even 4 to 1 adds very little to power loss. The only time SWR will indicate a low figure is when the antenna presents a load close to 50 ohms, but many mobile antennas will have a base impedance as low as 15 or 20 ohms at their resonant frequency. In such a case, SWR will indicate 3 or 4 to 1, and yet the system will be radiating efficiently.

4. The really important factor in your mobile antenna is that it should be carefully tuned to resonance at the desired frequency. The fallacy in using an SWR bridge lies in the fact that it is sometimes possible to reduce the SWR reading by detuning the antenna. Field strength may actually be reduced in an effort to bring SWR down. Since field strength is the primary goal, we recommend a Field Strength Meter for antenna tuning.

5. For antenna adjustments, the Swan 270 may be loaded lightly to about 100 ma. cathode current instead of the usual 200-300 ma. This will limit tube dissipation during adjustments, and will also held reduce interference on the frequency. In any case, do not leave the transmitter on for very long at one time. Turn it on just long enough to tune and load, and get a field strength reading.

Start out with the antenna whip at about the center of its adjustment range. Set the VFO to the desired operating frequency and then adjust P. A. TUNE for dip, and P. A. LOAD for 100 ma. Then observe the field strength reading. The Field Strength Meter may be set on top of the dash, on the hood, or at an elevated location some distance from the car.

Change the whip length a half inch, or so, at a time, retune the P. A. for 100 ma loading each time, and check field strength. Continue this procedure until the point of maximum field strength is found. This adjustment will be most critical on 75 meters, somewhat less critical on 40, until on 10 meters the adjustment will be quite broad. After tuning the antenna to resonance, load the P. A. to full power.

MICROPHONE

The microphone input is designed for high impedance microphones only. The choice of microphone is important for good speech quality, and should be given serious consideration. The crystal lattice filter in the transceiver provides all the restriction necessary on audio response, and further restriction in the microphone is not required. It is more important to have a microphone with a smooth, flat response throughout the speech range. The microphone plug must be a standard 1/4 inch diameter three contact type. The tip connection is for push-to-talk relay control, the ring connector is the microphone terminal, and the sleeve is the common chassis ground. The microphone manufacturer's instructions should be followed in connecting the microphone cable to the plug. Either a hand-held or desk type microphone with push-to-talk control will provide a suitable installation.

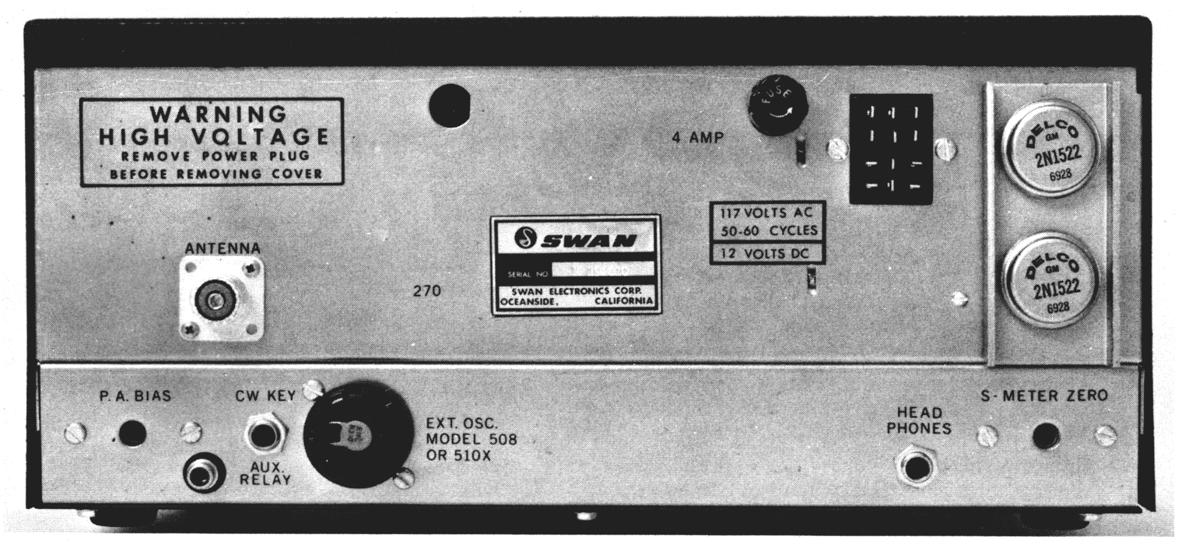


FIGURE 5. SWAN CYGNET MODEL 270 REAR VIEW

CONTROL FUNCTIONS

ON-OFF SWITCH (On RF Gain Knob)	Turns power supply on and off.
CAL-REC-CW Calibrate	All voltages are applied to receiver. Grounds cathode of V12.
Receive	All voltages are applied to receiver.
CW-Tune	Transmitting circuits are energized. C1501 is disconnected from ground shifting carrier frequency into filter passband. Carrier is fully inserted. P. A. cathode resistor is switched in, reducing input power.
MIC. GAIN	Controls potentiometer R1404 in the grid of V14A and controls amount of audio to the balanced modulator.
CAR. BALANCE	Controls potentiometer R1307 in the balanced modulator deflection plate circuit, and permits nulling out the carrier.
RF GAIN	Controls variable resistor R505, common in the grids of Receiver Mixer V6, RF Amplifier, V7 and V8 IF Amplifiers.
AF GAIN	Controls potentiometer R1101 in grid circuit of V11 AF Output, and controls audio volume.
MAIN TUNING	Controls C1612 in frequency determining tank circuit of VFO.
DRIVER	Controls C2A and C2B in plate tanks of transmitter mixer and driver.
PA TUNE	Controls C408 in pi-network to tune final power amplifier plate to resonance.
PA LOAD	Controls C411 in pi-network to match impedance of output load. Tunes input to Receiver RF Amplifier.
MAIN BANDSWITCH	Switches tank coils and associated capacitors in VFO, VFO Amplifier, Driver and Transmit Mixer.
SIDEBAND SELECTOR	Selects upper or lower sideband.

PRE-OPERATION ADJUSTMENTS

Before connecting any cables to the Swan 270 perform the following steps:

1. Rotate the PA BIAS control on the rear chassis apron fully counter clockwise.
2. Rotate the CAL-REC-TUNE-CW to REC.
3. Rotate the RF Gain Control counter clockwise to operate the power switch to OFF.

CONNECTIONS

1. Connect wire from earth ground to ground stud provided on rear of chassis. This is not essential, but is recommended.
2. Connect a 50 to 75 ohm antenna feed-line to the coaxial connector on rear panel.
3. Connect the power supply cable to the Jones connector on the rear panel.
4. Connect the power supply cable to the proper voltage source.

WARNING

DANGEROUS HIGH VOLTAGE IS PRESENT ON THE PLATE OF THE POWER AMPLIFIER WHENEVER THE POWER SUPPLY IS ENERGIZED.

RECEIVE OPERATION

1. Rotate the RF GAIN Control clockwise to about the 3 o'clock position. The power switch will operate applying voltage to the transceiver.
2. Wait approximately one minute to allow the tube filaments to reach operating temperature. During this period, perform the following steps:

   (a) Rotate BANDSWITCH to desired band.
   (b) Rotate MIC. GAIN fully counter-clockwise.
   (c) Rotate CAR. BAL. control to the mid-scale position.
   (d) Set PA TUNE control to mid-position.
   (e) Set DRIVER control to mid-position.
   (f) Set PA LOAD to mid-position.
   (g) Set tuning dial to desired operating frequency.
   (h) Set AF GAIN control to approximately 10 o'clock position.

3. Carefully adjust the DRIVER and the PA TUNE controls for maximum receiver noise.

NOTE:

The DRIVER control resonates the transmitter driver stages and the receiver RF amplifier plate circuit. The PA TUNE and PA LOAD controls adjust the input and output capacitors in the transmitter power amplifier final plate circuit, as well as the receiver RF amplifier grid circuit. Proper adjustment of these controls in the receive position will result in approximately resonant conditions in the transmitter stages.

RECEIVER TUNING

Precise tuning of a single sideband signal is very important. Do not be satisfied to merely tune until the voice can be understood, but take the extra care of setting the dial to the exact spot where the voice sounds natural. Above all, avoid the habit of tuning so that the voice is pitched higher than normal. This is an unfortunate habit practiced by quite a number of operators. The following points help to explain the effects of mistuning:

1. If you tune so the received voice is higher than normal pitch, you will then transmit off frequency, and your voice will sound lower than normal pitch to the other station. He will probably retune his dial to make you sound right. If you keep this up, you'll gradually waltz one another across the band. If both of you are mistuning to an unnatural higher pitch, you'll waltz across the band twice as fast. (And someone will no doubt be accused of frequency drift).

2. Mistuning results in serious harmonic distortion on the voice, and should be quite noticeable to the average ear. Some will claim that if they don't know how the other person's voice actually sounds, they can't tune him in properly, but this is not true. With a little practice, it will be fairly easy to tell. Some voices are relatively rich in harmonics, and are easier to tune in than a person with a "flat" voice. Also, a transmitter, which is being operated properly with low distortion will be easier to tune in than one which is being over-driven and is generating excessive distortion. There is no mistaking when you have a station tuned right on the nose. It will sound just like "AM", so to speak. Mainly, avoid the habit of tuning so everyone sounds higher than normal pitch, or like Donald Duck. This is incorrect, unnecessary, and sounds terrible.

3. A vernier control for receive frequency, sometimes referred to as "incremental tuning", is not available on the Swan 270. Such a device is not necessary if proper tuning habits are exercised.

4. Your Swan 270 will automatically transmit on exactly the same frequency as the one to which you are listening. There is no adjustment for making them the same, since by using the same oscillator for both send and receive, it happens automatically. If separation of receive and transmit frequency control is desired, the Model 508 or 510X VFO unit may be used.

TRANSMITTER TUNING

NOTE:

The sideband selector switch should be in the "NORM" position during tune up, with the meter switch set to PA CATH.

CAUTION:

THE MODEL 270 WILL TUNE OUTSIDE THE AMATEUR BANDS. CARE MUST BE EXERCISED NOT TO TRANSMIT ON THESE FREQUENCIES.

Step 1. Switch the Microphone Switch to transmit mode, and observe the cathode current reading on the meter.

Step 2. Quickly rotate the CAR. BAL. control until the meter reads minimum. This will occur with the control near 12 o'clock. If the control has no effect at this time, do not be concerned.

Step 3. Next, adjust the P. A. BIAS control on the back of the chassis until the meter reads 40 ma. as indicated by the Delta symbol on the meter scale.

Step 4. If this is the first time the Transceiver is being tuned to this band, set the LOAD to 11 o'clock. After experience in tuning up, the control may be set to whatever position has been found optimum on each band. Now, with the transceiver still in transmit mode, in rapid succession:

(a) Turn the CAR. BAL. control clockwise approximately 30 degrees, or one "hour" in position.

(b) Rotate the DRIVER control for maximum meter reading.

(c) Rotate the P. A. TUNE control for minimum meter reading, or "dip".

(d) Readjust CAR. BAL. control for minimum reading.

IMPORTANT - Tuning the P. A. TUNE for minimum, or "dip", is known as "resonating" the power amplifier plate circuit, and is very important to preserving P. A. tube life. If the transceiver is held in TRANS. or CW position for more than a few seconds while out of resonance and with some grid drive, the 6LQ6 tube may be severely damaged. For this reason, we repeat:

CAUTION

DO NOT HOLD THE TRANSCEIVER IN TRANSMIT OR CW POSITION FOR ANY LENGTH OF TIME WITHOUT IMMEDIATELY RESONATING THE P. A. TUNE CIRCUIT. THE DRIVER MUST BE PEAKED, AS IN (b) ABOVE, AND THIS REQUIRES SOME CARRIER INSERTED, AS DESCRIBED IN (a), SO IT CAN BE SEEN THAT THESE STEPS MUST BE PERFORMED QUICKLY. IF THE P. A. LOAD CONTROL IS TOO FAR CLOCKWISE, IT MAY NOT BE POSSIBLE TO FIND A "DIP" WITH THE P. A. TUNE CONTROL.

Step 5.

(a) Set the P. A. LOAD control to 11 o'clock or to the position determined by previous operating.

(b) Switch to TUNE - CW mode, quickly adjust P. A. TUNE for the "dip" in meter reading.

(c) Advance the P. A. LOAD control clockwise, in small steps, each time dipping P. A. TUNE again, until a shallow 10 percent dip in plate current is observed when tuning through resonance. In other words, if the meter reads 250 ma. with P. A. TUNE off resonance, it should dip to about 225 ma. at resonance. Adjust P. A. LOAD for this condition. We recommend setting the P. A. LOAD control in this manner rather than setting it for some specific meter reading, because the optimum loading point varies considerably, depending on frequency, tube condition, and supply line voltage. On the lower bands, it will not be unusual to have 300 ma. off resonance, in which case the P. A. LOAD control should be set for a dip to about 270 ma. On 10 meters the same Cygnet may read only 200 ma. off resonance, and so the P. A. LOAD control should be set for a dip to 180 ma. in this case.

NOTE:

Observe all the preceding cautions while tuning. Be sure to resonate the P. A. TUNE control quickly, except for the very brief moments when off-resonance meter reading is being observed. Always return to the "dip" quickly. Also, be sure to observe the 30-second time limit on tuning.

VOICE TRANSMISSION

After tuning up as outlined above, switch to REC. position. Press the microphone switch and then carefully set the CAR. BAL. control for minimum meter reading. While speaking into the mike, slowly rotate the MIC. GAIN control until occasional peak readings of 100 to 120 ma. are obtained. With most microphones, the MIC. GAIN control will be set between 9 and 12 o'clock, but it may vary considerably. The ALC circuit will help limit cathode current, but turning the MIC. GAIN up too high will still produce flat-topping and spurious signals, so it is important to hold it down. The meter is quite heavily damped, and its reading with average voice modulation may not look very impressive, but the voice peaks are going well over the 260 watt power rating of your Swan transceiver, and signal reports will verify this fact.

NOTE:

Transceiver will not modulate properly with Function Switch in CAL. position.

AM OPERATION (Single Sideband With Carrier)

(a) Tune transmitter to full output on single sideband as described above.

(b) Rotate MIC. GAIN control to minimum, full CCW.

(c) With Push-to-talk pressed, rotate CAR. BAL. control until cathode current is approximately 75 ma.

(d) While talking in a normal tone of voice into the microphone, increase MIC. GAIN setting until the meter kicks upward slightly. This setting will result in excellent AM transmission.

CW OPERATION

(a) Insert a CW Key in the Key Jack on back of the Transceiver.

(b) Close the key and tune the transmitter as outlined in Step 5. Power input will be approximately 180 watts.

(c) In CW operation it will be necessary to switch the Function control back to REC. for receiving and then to CW for transmitting.

(d) While receiving, the carrier oscillator frequency is located 300 cycles outside the passband of the crystal lattice filter, thus providing a single heterodyne note, or "single-signal" for CW reception. When transmitting in CW mode, the carrier frequency is moved approximately 800 cycles higher, placing it well inside the passband. This frequency shift is termed "Off-set CW transmit frequency," and avoids the problems encountered when the receive and transmit frequency are exactly the same. This is desirable for voice communication, of course, but when using the CW Keying mode the receiver must be tuned off frequency several hundred cycles in order to hear an audio beat. By providing this shift automatically, CW operation is greatly simplified.