# ATLAS TX-110

## TRANSMITTER MODULE

# INSTALLATION and OPERATION MANUAL

AMERICAN MADE AND GUARANTEED BY:

ATLAS RADIO INC.

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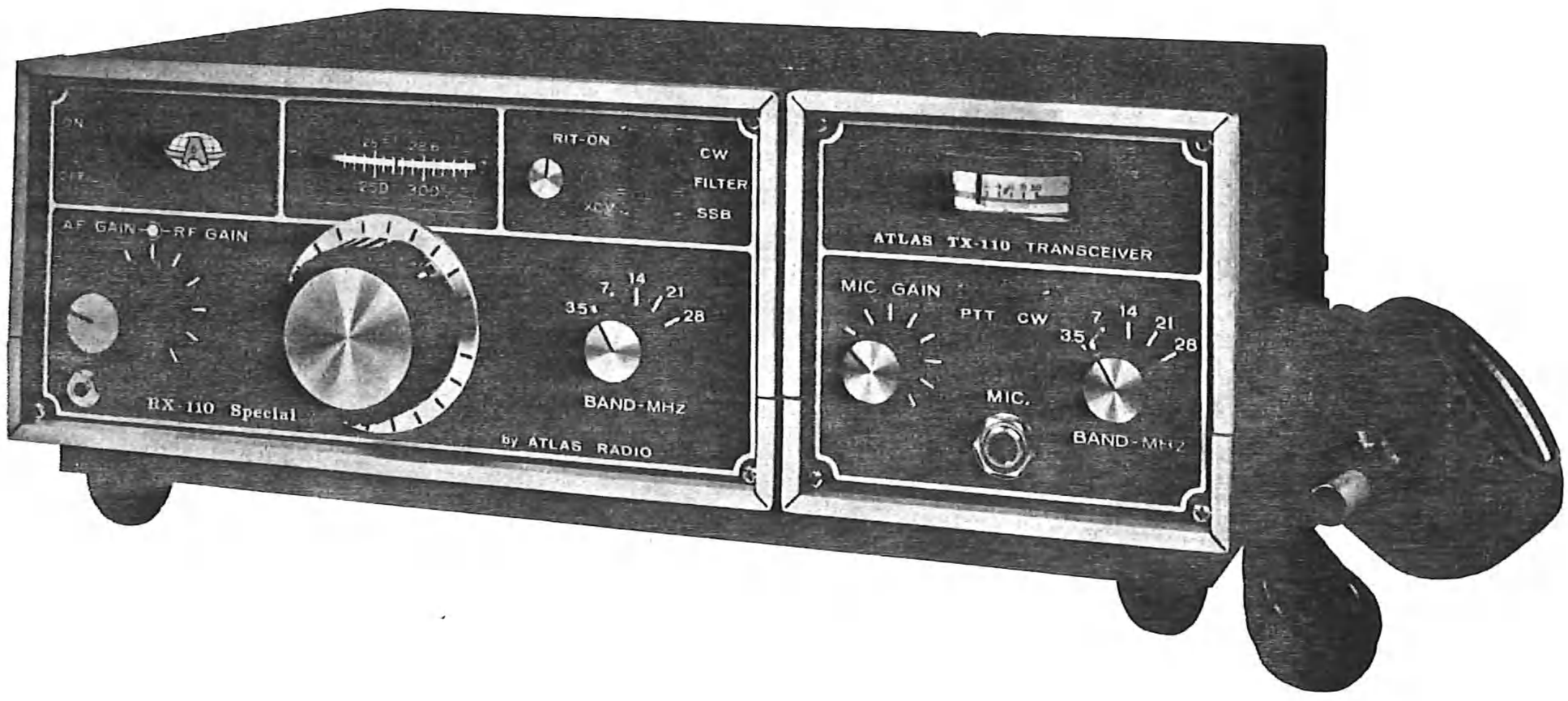



# INTRODUCTION

Your Atlas TX-110 transmitter module, when connected to the Atlas RX-110 receiver, is designed to be used on CW and SSB in 5 amateur bands, 10 through 80 meters.

Combined with the RX-110, the TX-110 represents a brand new concept in receiver/transceiver design. For the first time you have a high performance receiver which can be converted into a transceiver by simply plugging in the Atlas TX-110 transmitter module. You have a choice of 20 watts input on 3.5, 7, and 14 MHz bands, 15 watts input on 21 and 28 MHz bands with the TX-110-L or 250 watts input on 3.5, 7 and 14 MHz bands, 200 watts imput on 21 MHz band, and 150 watts input on 28 MHz band with the TX-110-H.

You'll find that the TX-110, in addition to being an excellent high performance transmitter, is also well built with high quality components, and a high level of craftsmanship and quality control. If you ever need repair or servicing, you'll find that the people in our customer service department are dedicated to making Atlas owners a satisfied customer.

# TX-110 SPECIFICATIONS

NOTE: The TX-110 combines with the Atlas RX-110 receiver to form a 5 band transceiver. The TX-110 is not a transmitter by itself, since it is dependent on certain portions of the RX-110 before it will function as a transmitter. LOW POWER MODEL, TX-110-L (Driver stage only) runs 20 watts input on 3.5, 7 and 14 MHz bands, 15 watts input on 21 and 28 MHz bands. HIGH POWER MODEL, TX-110-H (Includes push-pull Power Amplifier, model PA-200 installed internally). 250 watts input on 3.5, 7 and 14 MHz bands, 200 watts on 21 bands, and 150 watts on 28 MHz bands.

NOTE 1: The PA-200 Power Amplifier may be factory installed inside the TX-110-L Transmit Module at a later date.

NOTE 2: Power specifications are made with nominal supply voltage of 115 volts AC or 14 volts DC.

FREQUENCY COVERAGE: Same as RX-110 receiver.

BROAD BAND DESIGN: No transmitter tuning.

HARMONIC AND SPURIOUS INPUT: Exceeds FCC requirements of 40 db down by wide margin. Typically better than 50 db.

CARRIER SUPPRESSION: More than 40 db; typically 60 db down.

UNWANTED SIDEBAND: More than 50 db; typically 60 db down.

THIRD ORDER DISTORTION: Approximately 30 db below peak power.

MODES OF OPERATION: CW transmit with semi-break-in keying as a standard feature. Sidetone is provided to the RX-110 audio, for monitoring of CW keying. CW transmit frequency is offset from receive frequency by 800 Hertz. SSB voice transmission, lower sideband on 3.5, 7 MHz bands, upper sideband on 14, 21 and 28 MHz.

CW KEYING CIRCUIT: 12 volts @ 125 ma. positive to chassis ground. Requires 2 circuit 1/4 in. phone plug (not supplied).

MICROPHONE: High impedence dynamic or crystal, with PTT (Press-to-talk) switch or button. Requires 3 circuit 1/4 in. phone plug (not supplied).

METERING: Front panel meter indicates relative power output. Varies with antenna load, and frequency. Pin jacks on rear panel of TX-110 may be used to measure collector current to the driver stage (0-2 Ampere Range). Ammeter accessory, model TX-2A, is available from Atlas Dealer, or Atlas Radio, Inc. Standard 1/4 in. jack on rear panel of PS-110 (Separate AC supply for 250 watt amplifier) may be used to measure collector current to 250 watt amplifier (0-25 Ampere Range).

CONNECTOR CABLES extend from rear of Transmitter Module, and plug into rear of RX-110 receiver, making all necessary connections for transceiver operation.

HARDWARE AND BRACKETS are supplied to physically join the TX-110 and RX-110, making them an integral unit.

SIZE AND WEIGHT: 4-1/8 in. (10.5 cm) wide, 3-3/4 in. (9.5 cm) cabinet height, 9-3/4 in. (24.8 cm) cabinet depth. Net weight: TX-110-L, Low Power Module, 3 lbs (1.4 Kg). Shipping weight: 4 lbs (2.1 Kg). Add 1 lb (0.5 Kg) for TX-110-H, High Power Module.

# INSTALLATION

## A. RX-110/TX-110 CONNECTIONS (refer to Figure 1)

The TX-110 transmitter module is shipped with two brackets for physically attaching it to the RX-110, if desired. When joining the two units together, it is necessary to turn them over, upside down, and unscrew the two front rubber feet from each unit. Lay the long 12" U-shaped bracket across the bottom of both units and replace only the outside rubber foot of each unit. It is not necessary to replace the two inside feet, but in their place install the two screws that held the feet in place. Locate the two 6-32 tapped holes on the rear panel of the RX-110 and TX-110. Secure the 4" L-shaped bracket between the two units with the 6-32 screws supplied. The RX/TX units can then be turned right side up. (Note that the units may be left unattached if desired.)

Remove the jumper plug on the back of the RX-110 and connect the multiwire cable from the TX-110 to the connector. The connectors are keyed to plug together only one way. Connect the coax with the phono plug from the TX-110 to the ANT connector on the RX-110. The RX-110 and TX-110 are now mechanically and electrically connected together and ready for operation as a transceiver.

THE GREATEST DANGER TO THE OUTPUT TRANSISTORS IS OVERHEATING. THE HEAT SINK IS DESIGNED TO COOL THE TRANSISTORS ADEQUATELY UNDER NORMAL OPERATING CONDITIONS. USE CARE WHEN INSTALLING THE TX-110 TRANSMITTER MODULE SO AS NOT TO RESTRICT AIR CIRCULATION BETWEEN THE TOP AND BOTTOM VENTILATING SLOTS ON THE TX-110 MODULE.

## B. FIXED OPERATION (Refer to Figure 2 and Figure 3).

The TX-110 is designed to operate on a power source of 14 volts DC. When connected to the RX-110 receiver, DC power is delivered to the transmitter via the built in AC supply in the receiver which provides the 14 volts low current and 9 volts regulated source for all the circuits of the low power model, TX-110-L.

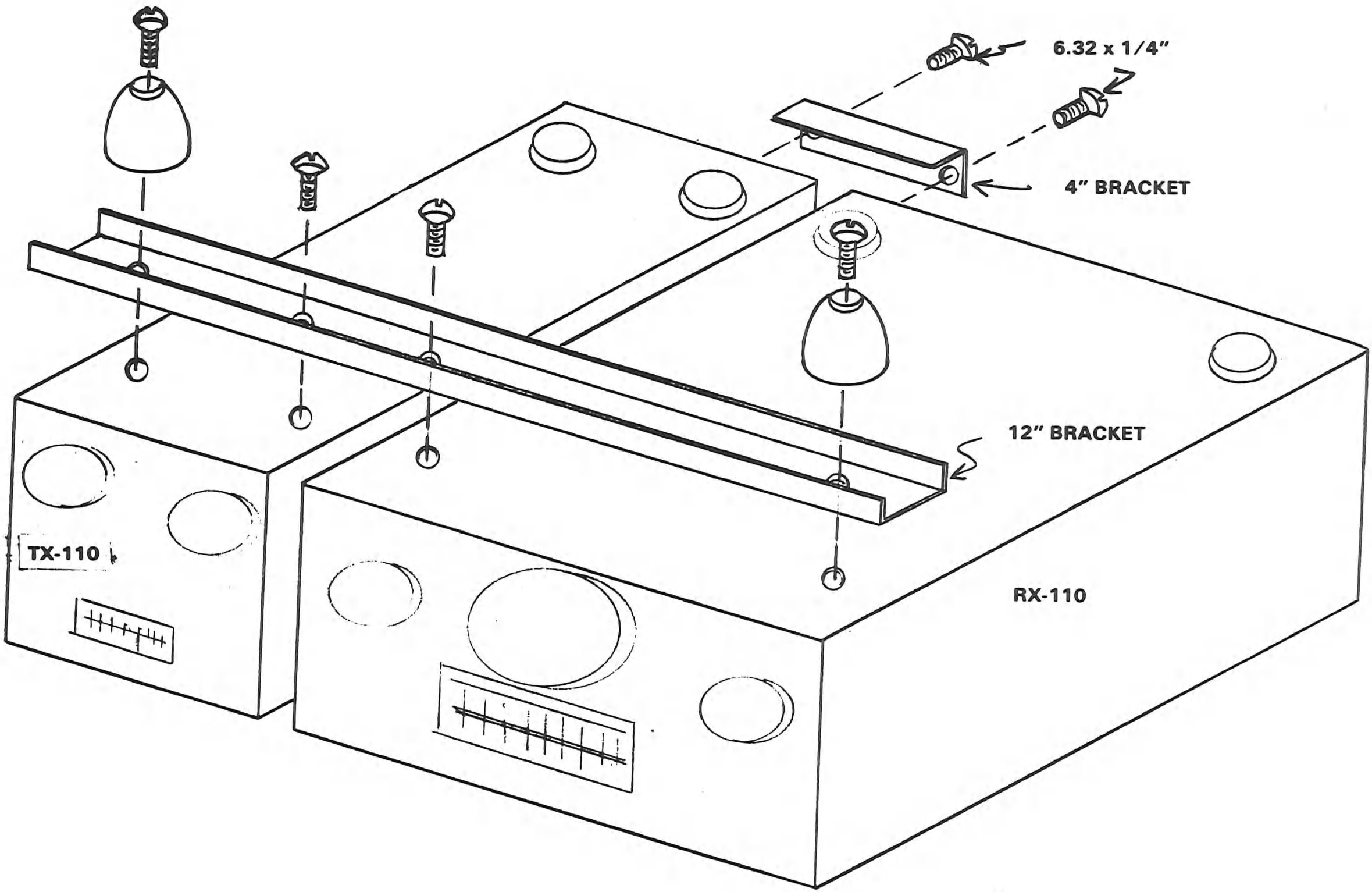
When using the TX-110-H 250 watt model, the 14 volt low current circuits and 9 volt regulated source are provided by the RX-110 receiver AC supply, just as in the TX-110-L. Voltage for the 250 watt power amplifier, model PA-200, is supplied from the separate PS-110-H high current AC supply. The high current DC from the PS-110-H is connected to the RX-110 through its DC connector, and then routed through the 12 pin connector plug to the TX-110-H transmitter module.

An AC receptacle is provided on the rear panel of the PS-110-H power supply and allows for plugging in of the RX-110 AC line. The AC ON-OFF switch of the PS-110-H then also controls AC power to the RX-110 receiver. The power switch on the RX-110 can then be left on at all times if desired.

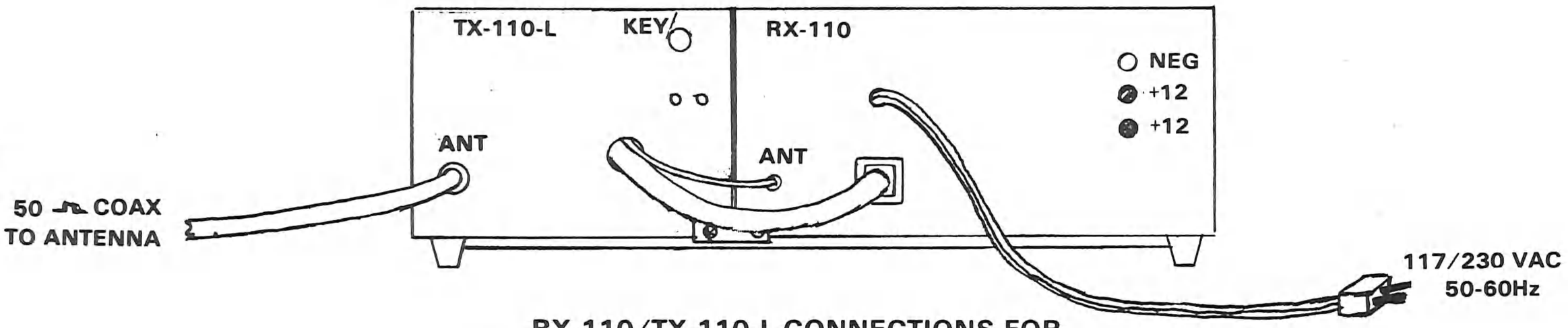
By changing internal fuses in the PS-110-H, the power supply is capable of operating on 100-130 VAC or 200-260 VAC. Because of this, **CAUTION MUST BE USED WHEN PLUGGING THE RX-110 INTO THE AC RECEPTACLE ON THE REAR PANEL OF THE POWER SUPPLY. AC VOLTAGE OF THE RX-110 MUST MATCH THE AC VOLTAGE USED FOR THE PS-110. IN OTHER WORDS, IF THE PS-110-H IS FUSED FOR 230 VAC OPERATION, DON'T PLUG THE RX-110 INTO THE REAR AC RECEPTACLE UNLESS IT IS A 230 VOLT MODEL.** The AC receptacle can also be used for other accessories such as a clock or light, providing current drain does not exceed 3 amps.

## C. MOBILE AND PORTABLE (Refer to Figure 2 and Figure 3).

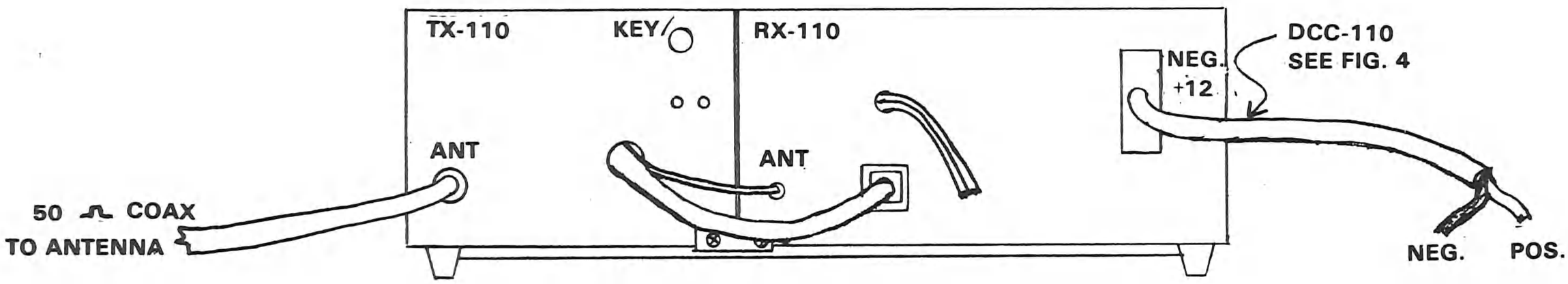
1. **DCC-110**. For mobile or portable operation DC power is delivered to the TX-110 the same way as in fixed operation, via the RX-110 receiver. DC power can be delivered to the RX-110 receiver via the DCC-110 cable available from Atlas dealers. The DC cable is designed with built-in polarity and fuse protection, and is recommended when using battery power. Included with the cable is all necessary hardware. The DCC-110 cable can be used with both low and high power transmitter modules. A 25 amp circuit breaker is supplied with the TX-110-H (250 watt version) and should be connected in series with the battery lead next to the battery.




**RX-110/TX-110 BRACKET ASSEMBLY**
**FIG. 1**

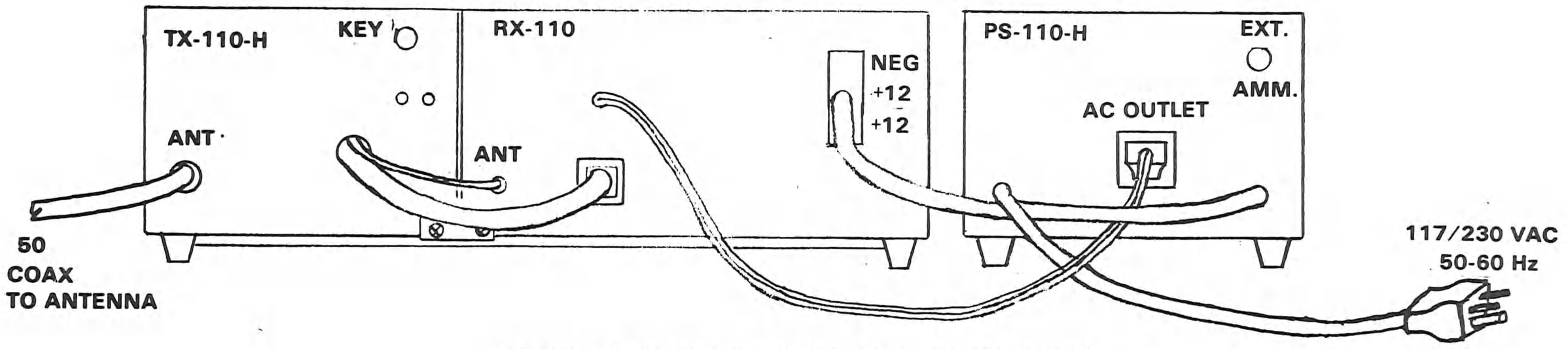



**RX-110/TX-110-L CONNECTIONS FOR LOW POWER OPERATION WITH 117 or 230 VAC**

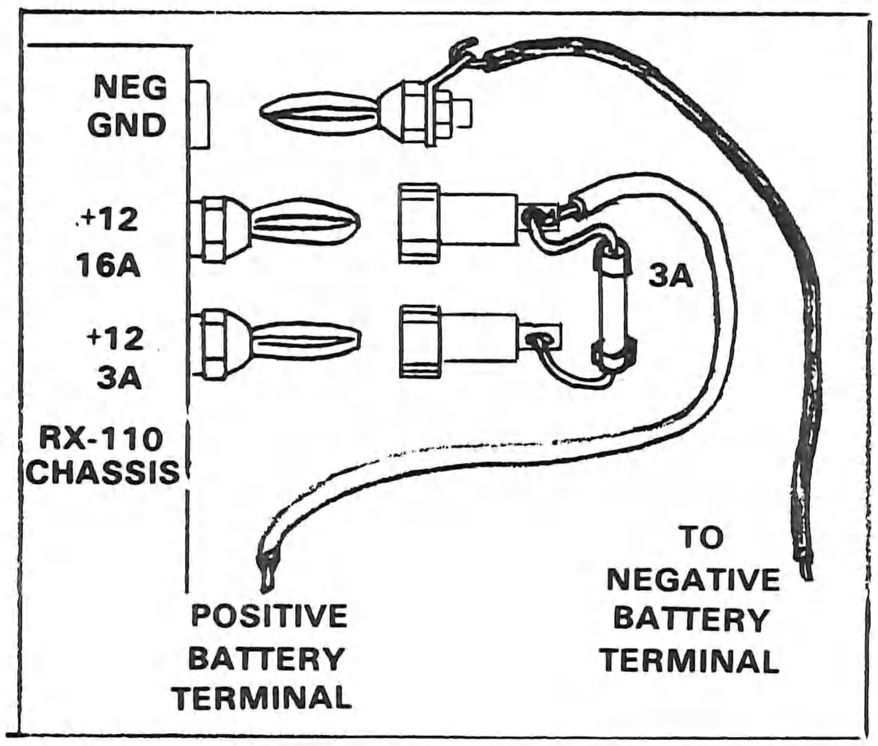



**RX-110/TX-110 CONNECTIONS FOR LOW AND HIGH POWER OPERATION WITH 14 VOLTS DC**

**FIG. 2**




**RX-110/TX-110-H/PS-110-H CONNECTIONS FOR HIGH POWER OPERATION WITH 117 or 230 VAC**




**ALTERNATE DC CONNECTIONS**

FIG. 3

2. **Alternate DC Connections.** In the event you do not use the DCC-110 cable for the RX-110/TX-110 DC installation, connections can be made to the two banana plugs on the rear panel of the RX-110 for the positive battery lead. It is recommended that a 3 amp fuse be connected between the two banana plugs. Then connect the battery lead to the upper banana plug marked +12 to 14 VDC, 16 amps. The wire should be of No. 10 or 12 gauge. A 25 amp circuit breaker is supplied with the TX-110-H (250 watt version) and should be connected in series with the battery lead *close to the battery*. Figure 3 illustrates alternate DC connections to the RX-110/TX-110.

3. **Mobile Mounting Kit (MM-110).** The mobile mounting kit is a plug-in unit designed for easy plug-in and removal of the RX-110/TX-110 combination. All DC power connections are made to the MM-110 and all necessary hook-up cables, including the DC battery cable with circuit breaker and hardware are part of the kit.

## D. ANTENNAS

1. **Fixed.** On 10, 15, and 20 meters a dipole and most beam antennas will work well across the entire band. On 40 meters a typical dipole tuned for the phone band center will match quite well across the entire band. The 3.5 to 4.0 MHz frequency range is considered to be two bands. 3.5 to 3.8 MHz is the 80 meter band and 3.8 to 4.0 MHz is the 75 meter band. The typical dipole will have a bandwidth of about 100 KHz for SWR of 1.5:1 or less. Because of the difficulty in having more than one antenna of length required for the 3.5 to 4.0 MHz range it is recommended that the antenna be tuned for the frequency that is likely to be used most often. Efficiency and power output will quickly drop off as you tune away from resonance.

The dipole is the basic shortwave receiving and transmitting antenna. Its length is equal to about one-half the wavelength of the desired operating frequency. (The symbol for wavelength is $\lambda$). It is usually made of wire and supported at the ends by insulators. The radiation and capture pattern of the horizontal antenna is bi-directional, perpendicular to the plane of the antenna.

50 ohm coax cable feed line is connected at the center, with the coax shield to one side, and the coax center conductor to the other side. The total length of a wire dipole may be computed from the following formula:

$$\text{Length in Feet} = \frac{468}{\text{Frequency MHZ}}$$

EXAMPLE: Desired operating frequency is 14.3 MHz. The length of the halfwave dipole is:

$$\text{length} = \frac{468}{14.3}$$ or 32.7 feet end to end.

Novices will be interested to know that a 40 meter dipole cut to the 7100 KHz makes a very good antenna on the 15 meter novice band.

When space limitations restrict construction of lengthy horizontal antennas, a general coverage vertical antenna may be desired. Vertical antennas receive and transmit in all directions. They are usually a quarter wavelength in height and require horizontal "radials," preferably each being one quarter wavelength in length, spread equally around the vertical radiator. The length of a quarter wave element is:

$$\text{Length in feet} = \frac{234}{\text{Frequency MHZ}}$$

EXAMPLE: Desired operating frequency is 14.3 MHz. Vertical length is

$$\text{Length} = \frac{234}{14.3}$$ or 16.3 feet. The 50 ohm coaxial cable is fed directly to the antenna. The coax shield is connected to the radial or ground system, and the center conductor is connected to the vertical radiator.

Multi-band vertical and horizontal antennas are also available for amateur band use. Band selection is made possible by the resonant circuits known as "traps" placed along its length. Once the antenna has been installed there is no need for adjustments when bands are switched.

Directional beam type antennas are also available. Because of size limitations, this type of antenna is normally restricted to 10, 15, and 20 meter use only. This antenna is of the dipole type, but with additional elements added to increase both transmitting and receiving gain. The multi-element beam antenna is highly efficient for long distant communications. You will usually see these antennas mounted on high towers.

NOTE: Most of these types of antennas and books and magazines describing different kinds of antenna systems are available at most amateur radio dealers.

2. **Mobile.** The mobile antenna generally requires more critical adjustment than the home station antenna. This is because it operates over a more narrow bandwidth, and must therefore be adjusted very accurately for resonance. Also, the base impedance is seldom very close to 52 ohms. With tube type transmitters the Pi matching network will adjust to fairly low impedances, but with a broadband solid state amplifier, such as used in all Atlas Transceivers, a close impedance match is necessary in order to operate at full power. Various claims about impedances are made by manufacturers of mobile antennas, but unfortunately our tests on all the most popular brands indicate that your chances of coming up with a close match are less than 1 in 10. Average base impedance is 18 to 23 ohms. Therefore, some method of transforming the antenna base impedance to 52 ohms is required. A matching transformer, model MT-1, is available from your Atlas dealer and is designed to provide a proper impedance match between the HF (High Frequency) mobile antenna and the 50 to 53.5 ohm coaxial feedline. With the MT-1 transformer a tap selection will be found which will provide SWR readings of 1.4:1 or less when using the common type mobile antennas, such as those manufactured by Nutronics, Swan and HyGain. (Note: The MT-1 transformer will probably not be required when the mobile antenna is installed on a motor home, or on a boat. Ground area on these installations increases radiation resistance to where it is very close to 50 ohms.)

3. **Transmission Line Match.** Proper impedance match between the coaxial feedline and the antenna system is much more important with the broadband solid state amplifier than with tube type transmitters. The SWR should be as low as possible in order to permit full power operation. The greater the SWR reading means a greater amount of reflected power, resulting in poor efficiency of the transmitter and antenna system.

4. **Antenna Tuner.** An antenna tuner or transmatch can be a very useful device to compensate for antenna mismatch. Older tube type transmitters usually have some type of Pi network tuning system that will compensate for mismatched antennas. Today's solid state or broadbanded transmitters require a 50 ohm impedance match with the antennas, and if it is not possible to "TUNE" the antenna to this impedance, an antenna tuner is recommended. Obviously, the best solution is to tune the antenna system or otherwise correct the impedance mismatch at the antenna.

If an antenna tuner is to be used read the following notes very carefully.

## ANTENNA TUNER
## OPERATING NOTES WHEN USED WITH SOLID STATE TRANSMITTERS.
## VERY IMPORTANT. DO NOT FAIL TO READ.

**IF YOU ARE USING AN ANTENNA TUNER BETWEEN YOUR TRANSMITTER AND ANTENNA SYSTEM, READ THE FOLLOWING NOTES CAREFULLY.** The highly reactive loads which can be created by misadjustment of some antenna tuners may cause spurious oscillation.

**A. ALWAYS USE AN SWR BRIDGE BETWEEN THE TRANSMITTER AND THE TUNER.** Some tuners have a bridge built in. If yours does not, install a separate one.

**B. ALWAYS TUNE WITH MINIMUM REQUIRED POWER!** Set the Sensitivity, or "SET" control on the bridge to maximum, full clockwise. Then use the transmitter drive control for setting the meter on the bridge to full scale. NOTE: This must be done with the bridge in "FWD," "FORWARD," or "SET" position.

**C. NEVER ADJUST THE ANTENNA TUNER WITH THE TRANSMITTER RUNNING AT HIGHER POWER LEVELS.** Most antenna tuners can be adjusted to produce highly reactive conditions. At the higher power levels, this may be hazardous to the final amplifier devices, whether tubes or transistors. *Evidence of such misuse may void your warranty!*

D. Most tuners come with instructions, but some are rather inadequate. Generally they have "Transmitter" and an "Antenna" control, plus an "inductance" switch. Begin tuning with these controls at their midrange. Read the SWR, and then rotate the inductance switch to the position that gives the lowest reading. Then turn the transmitter and antenna controls to reduce the SWR to the lowest possible reading. You should reach an SWR of 1.5 quite easily. If not, there is a serious problem with the antenna.

E. Once you have found the correct settings for each band, make up a chart. Use this chart as a reference each time you change bands, so that you can quickly set the controls to their approximate positions, and then quickly fine tune them.

F. If the procedures above are followed regularly, your P.A. finals will enjoy a long and trouble free life.

# OPERATION

NOTE: The TX-110 combines with the Atlas RX-110 receiver to form a 5 band transceiver. The TX-110 is not a transmitter by itself, since it is dependent on certain portions of the RX-110 before it will function as a transmitter. Connections to the RX-110 are outlined in Section II of the RX-110 manual.

**CAUTION: CARE MUST BE TAKEN WHEN OPERATING NEAR BAND EDGES WITH THE TX-110 TRANSCEIVER. ALTHOUGH DIAL ACCURACY IS QUITE GOOD ON THE RX-110 RECEIVER SOME TYPE OF ACCURATE FREQUENCY MEASUREMENT IS RECOMMENDED AND REQUIRED BY FCC REGULATIONS. A CALIBRATED EXTERNAL RECEIVER CAN BE USED OR POSSIBLY A LOCAL HAM FRIEND CAN LISTEN TO YOUR TRANSMIT FREQUENCY AND RELAY YOUR OPERATING FREQUENCY TO YOU. WHATEVER METHOD IS USED, IT IS RECOMMENDED THAT PERIODIC MEASUREMENTS BE MADE TO INSURE PROPER OPERATION WITHIN BAND EDGES OF EACH OPERATING RANGE.**

## A. FRONT PANEL CONTROLS (Refer to Figure 4).

1. **MIC. GAIN.** Modulation level is adjusted with the MIC. GAIN. control. When the transceiver is coupled into a proper 52 ohm load, voice peaks will be reaching about 16 amps or greater on the high power TX-110-H and about 1.6 amps or greater on the low power TX-110-L.

a. **SSB OPERATION.** The front panel meter indicates relative output only and not transmitter collector current (amps). In order to set MIC. GAIN. for correct modulation level it will be necessary to plug a CW key into key jack on rear panel, switch SSB-CW on front panel to CW, insert full MIC. GAIN. (full clockwise position), key the transmitter and observe meter reading. CAUTION: DO NOT HOLD KEY DOWN AT FULL POWER FOR MORE THAN 5 TO 10 SECONDS. Switch back to SSB (PTT on earlier models) on front panel, turn MIC. GAIN. full counter clockwise, and insert microphone into MIC. jack. While speaking into the microphone, slowly advance MIC. GAIN. until meter averages about 1/3 to 1/2 of the maximum CW reading. Do not exceed this level because it will cause over modulation, distortion, and also overdrive the power transistors.

b. **CW OPERATION.** Do not operate at full MIC. GAIN. (carrier insertion) on 80, 40, or 20 meters. On these bands it is possible to run in excess of the 250 watt power rating. Observe the maximum output reading that can be reached at full power. (Do not hold at full power for longer than 5 to 10 seconds.) The back the MIC. GAIN down to about 3/4 of the maximum reading.

c. **EXTERNAL AMMETER.** To use an external ammeter for reading of collector current on the TX-110-L low power transmitter module it is only necessary to locate the two tip jacks on the rear panel of the transmitter module and install the leads from the ammeter into these tip jacks, observing proper polarity. An external ammeter accessory, Model TX-2A, is available from your Atlas dealer and provides accurate collector current readings for both the TX-110-L and TX-110-H transmitter modules. If another ammeter is available for use with the TX-110-L, it may be used by removing the shunt that is connected across the two tip jacks.

When using the TX-110-H high power transmitter module, the PS-110-H power supply is required to supply the high current needed for the PA-200 power amplifier. A standard 2 circuit 1/4" phone jack is provided on the rear panel of the PS-110-H and can be used for installing the Atlas TX-2A ammeter. If another ammeter is available for use with the TX-110-H, it may be used by removing the shunt which is connected across the meter jack in the power supply.

When using an ammeter, adjust MIC. GAIN. control for average readings of 6 to 8 amps on the high power TX-110-H and .6 to .8 amps on the low power TX-110-L in the SSB mode. Operate CW with MIC. GAIN. (carrier insertion) set for no more than 20 amps when using the PS-110-H supply.

2. **MIC.** The microphone may be either a dynamic or crystal type. A low impedance MIC will work, but will require higher setting of the MIC. GAIN. control, and may require closer speaking. If a dynamic MIC. is used, it should preferably be the high impedance type. The choice of

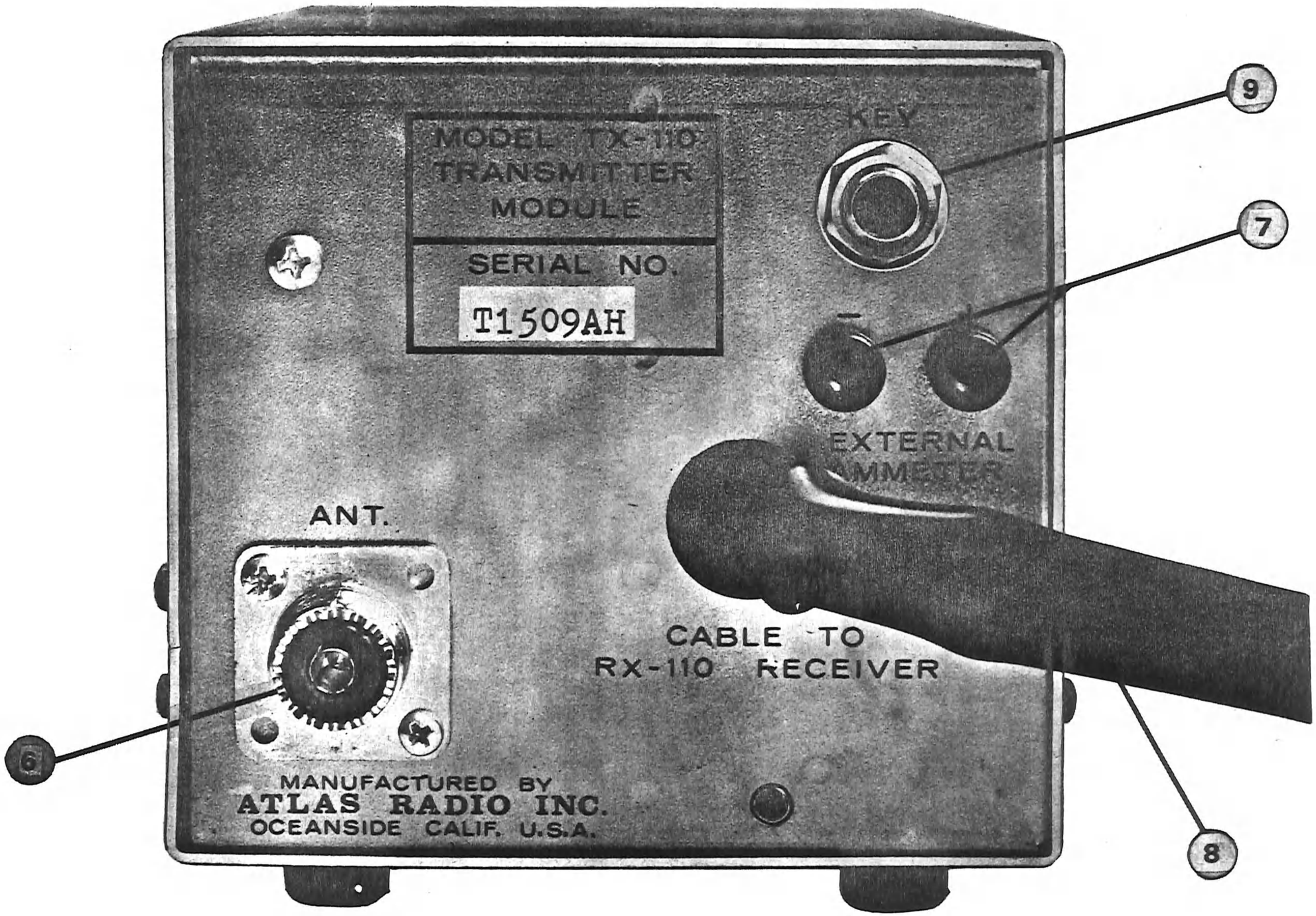



**FIG. 5**
**REAR VIEW**

microphones is important for good speech quality, and deserves careful consideration. Select a high quality MIC with smooth response from 300 to 3000 Hz or more. The Atlas 404C hand MIC and the Atlas 444 desk MIC are excellent choices. The plug required for the MIC connector is a standard 1/4 inch diameter 3 conductor type. The tip connection is the keying circuit for push-to-talk (PTT), the ring connection is for the shielded MIC lead, and the sleeve or barrel is the common ground terminal.

3. **Band Selector.** Numbers read in MegaHertz for the respective amateur bands: 3.5 for the 80 meter (3.5-3.8 MHz) and 75 meter band (3.8-4.0 MHz), 7 for 40 meters, 14 for 20 meters, 21 for 15 meters, and 28 for the first MegaHertz portion of 10 meters (28 to 29 MHz). Bandswitch position on the TX-110 must correspond to the bandswitch position on the RX-110 for proper transceiver operation.

4. **SSB-CW.** Selects mode of operation desired. With switch in the SSB position voice transmission is on the normally used sideband; lower sideband on 80 and 40 meters, and upper sideband on 20, 15, and 10 meters. Moving to the CW position automatically switches the transmitter to the CW transmit mode. A 1.4 inch diameter key jack is provided on the rear panel for insertion of a CW key.

5. **Meter.** Reads relative power output on scale of 0 to 10. (Varies between sets.)

## B. REAR PANEL CONTROLS (Refer to Figure 5).

6. **Antenna.** An SO-239 connector connects the transceiver to the antenna system. The RX-110 receiver is automatically connected to the antenna by relays in the TX-110.

7. **External Ammeter.** Tip jacks are provided for use of the Atlas Model TX-2A external ammeter with the low power transmitter module (TX-110-L). When using the high power transmitter module (TX-110-H), provisions for the external Atlas ammeter are provided on the PS-110-H power supply which is necessary when using the high power (250 watt) transmitter module.

8. **RX-110 Connector Cable.** 12 pin plug connects to rear of RX-110 receiver and provides for all functions necessary for transceiver operation. Small coax cable plugs into antenna phono jack on rear panel of RX-110.

9. **Key Jack.** A jack is provided for insertion of a standard 1.4 inch diameter, 2 conductor phone plug. Connect the CW key to the plug with a 2 conductor cable. The sleeve connection goes to chassis ground. Keying potential is less than 10 volts, positive, and draws less than 10 milliamperes. Most of the electronics keyers presently on the market will work satisfactorily.

10. **Sidetone.** The sidetone volume trimpot is located on the PC-610 Board directly behind the TX-110 front panel. If adjustment is necessary on early models, the bottom cabinet will have to be removed and the sidetone volume level can then be set with a small screwdriver. Later models have an adjustment hole through the bottom cabinet.

# TX-110 CIRCUIT DESIGN

Refer to the block diagram, schematic, parts list, and RX-110 schematic following the circuit description.

The TX-110 alone is not a complete transmitter, since it requires the following circuits from the RX-110 or RX-110-s:

1. The BFO (Carrier Oscillator)
2. Balanced Modulator
3. Crystal Filter
4. I. F. Amplifier
5. Diode Ring Mixer
6. VFO
7. Bandpass Filters.

The transmit audio input from the MicAmp, Q601, is coupled through terminal 6 of the connector plug to balanced modulator, D311-D314, of the RX-110 receiver. The carrier oscillator injection is coupled through C320 into the balanced modulator. The output of the balanced modulator is a double-sideband, suppressed carrier signal. Output is then fed through the crystal ladder filter resulting in suppression of the unwanted sideband. The resultant single sideband signal is fed to I.F. Amplifier, Q315. The signal is coupled through D317 to the Diode Ring Mixer. The VFO injection signal is coupled to the center tap of the trifilar transformer, T112. This heterodyning action of the mixer produces the RF transmit frequency which is coupled through the bandpass filters.

The output is then fed through the coax from the RX-110 antenna connector to the antenna relay in the TX-110 module.

The signal is then coupled to the Pre-Amp, Q501. Output is coupled through amplifier Q502 to the driver, Q503. For TX-110-L low power models, output is then coupled directly to the low pass filters. For TX-110-H high power models, output from Q503 is coupled to Q561 and Q562, the power amplifiers. Output is then coupled to the low pass filters. These filters are selected by the bandswitch and reduce harmonic output to meet FCC requirements.

## PARTS LIST

### PC-510 Driver Board

| | |
|---|---|
| C510, 504, 505, 517, 519 | .01 mf 100V 20% Disc |
| C503 | 2200 pf FS 10% Disc |
| C502, 506, 509, 512, 514, 518, 522, 523 | .1 mf 50V 10% Disc |
| C507, 511 | 22 mf 25V Electrolytic |
| C513 | 2.2 mf 16V Tantalum |
| C515 | 200 pf 5% DM-19 Sil. Mica |
| C516, 520, 524 | 15 mf 20V Tantalum |
| C521 | 110 pf 5% DM-19 Sil. Mica |
| C525 | 1300 pf 5% DM-19 Sil. Mica |
| D502 | IN4005 Sil. Diode |
| R502 | 3.3K 5% 1/4 Watt |
| R503 | 1K 5% 1/4 Watt |
| R504 | 10 5% 1/4 Watt |
| R505, 510 | 180 5% 1/4 Watt |
| R501, 506, 517, 518 | 47 5% 1/4 Watt |
| R507 | 2.7K 5% 1/4 Watt |
| R508 | 220 5% 1/4 Watt |
| R509 | 4.7 5% 1/4 Watt |
| R511 | 3.3 5% 1/4 Watt |
| R512 | 680 5% 1/4 Watt |
| R513 | 50 Trimpot Gain Adj. |
| R514, 520 | 150 1% 1 Watt |
| R519 | 470 5% 1/4 Watt |
| R515 | 150 5% 1/4 Watt |
| R516 | 10 5% 1 watt P/O Parasitic Choke |
| L501, 502 | 1.4 uh RF Choke |
| L503 | 33 uh RF Choke |
| L504 | 15 uh RF Choke |
| L505 | Parasitic Ch. on 10 ohm Res. |
| T501 | Bifilar Toroid |
| T502 | Driver Input XFMR |
| T503 | Driver Output XFMR (Balun) |
| Q501 | MPS6514 Transistor |
| Q502 | 2N3866 Transistor |
| Q503 | CD2545 Transistor |
| D501 | SI05 Si. Diode |
| RL-501 | SPDT Reed Relay 12 VDC |

## PC-610 Audio/VOX Board

| | |
|---|---|
| C601 | 2.2 mf 16V Tantalum |
| C602, 612, 613, 614 | .01 mf 100V 20% Disc |
| C603, 608, 616, 620 | 47 mf 16V Electrolytic |
| C604 | .0033 mf 500V 20% Disc |
| C605, 618, 606 | .1 mf 12V 20% Disc |
| C607, 619 | .001 mf 100V 20% Disc |
| C609 | 100 mf 16V Electrolytic |
| C610, 611, 615 | .1 mf 50V 20% Disc |
| C617 | 22 mf 25V Electrolytic |
| R601, 634 | 470 5% 1/4 Watt |
| R602, 610, 612, 615, 621, 624 614, 628, 630, 628 | 10K 5% 1/4 Watt |
| R603, 611 | 180 5% 1/4 Watt |
| R604 | 270 5% 1/4 Watt |
| R605 | 680K 5% 1/4 Watt |
| R606 | 100K 5% 1/4 Watt |
| R607 | 2 Meg 5% 1/4 Watt |
| R608 | 47K 5% 1/4 Watt |
| R619, 620, 626, 635 | 4.7K 5% 1/4 Watt |
| R618 | 22K 5% 1/4 Watt |
| R609, 627 | 2.2K 5% 1/4 Watt |
| R613, 623 | 3.3K 5% 1/4 Watt |
| R616 | 270K 5% 1/4 Watt |
| R617 | 10K Trimpot Side Tone Adj. |
| R622, 625 | 33K 5% 1/4 Watt |
| L601 | 200 uh RF Choke |
| D601, 603 | IN4149 Sil. Diode |
| D602 | IN4735 Zener Diode 6.2V |
| D604 | IN4005 Sil. Diode |
| Q601 | MPS6514 Transistor |
| Q602 | MPSA12 Transistor |
| Q603 | MPS.VO1 Transistor |
| Q604 | CA3086 Integrated Ckt. |
| R632 | 68K 5% 1/4 Watt |

## PC-560, Model PA-200 Power Amplifier

| | |
|---|---|
| C565 | .1 mf 100V Mylar |
| C566 | 1000 mf 25V Electrolytic Cap |
| C567, 568 | .01 mf 100V 20% Disc |
| C569, 570 | .1 mf 50V 20% Disc |
| C571, 572 | 82 pf FS 10% Disc |
| R561, 562 | 150 5% 1 Watt |
| R563, 564, 565 | 10 5% 1 Watt |
| R566, 568 | 470 5% 1/4 Watt |
| R567 | 1K Trimpot Bias Adj. |
| R569, 570 | 3.3 5% 1/4 Watt |
| R569, 570, 572, 573 | 15 5% 2 Watt |
| R571 | 10 5% 2 Watt |
| T561 | Toroid Input XMFR |
| T562 | Toroid Output XMFR |
| L562, 561 | 1.4 uh RF Choke |
| L563 | Parasitic Choke |
| L564 | Toroid Choke |
| D561, 562 | SI-05 Silicon Diode |
| Q561, 562 | CD2545 Transistor |
| Q563 | 2N5490 Transistor |

## PC-710/715 Low Pass Filter Boards

| | |
|---|---|
| C701, 704 | 820 pf 5% DM-19 Sil. Mica |
| C702 | 1100 pf 5% DM-19 Sil. Mica |
| C703, 707 | 680 pf 5% DM-19 Sil. Mica |
| C712, 713, 714 | 220 pf 5% DM-19 Sil. Mica |
| C705 | 330 pf 5% DM-19 Sil. Mica |
| C709, 706 | 430 pf 5% DM-19 Sil. Mica |
| C716, 720, 708 | 100 pf 5% DM-19 Sil. Mica |
| C715 | 50 pf NPO 5% Disc |
| C710 | 120 pf 5% DM-19 Sil. Mica |
| C717, 711 | 150 pf 5% DM-19 Sil. Mica |
| C718, 719 | 180 pf 5% DM-19 Sil. Mica |
| L702, 703 | 1.8 uh Toroid |
| L703, 704 | .95 uh Toroid |
| L705, 706 | .48 uh Toroid |
| L707, 708 | .32 uh Toroid |
| L709, 710 | .24 uh Toroid |

## PC-660 Relay Board

| | |
|---|---|
| C661 | 4.7 pf N220 5% Disc |
| C664, 665, 666, 667, 668 | .01 mf 100v 20% Disc |
| R661 | 68K 5% 1/4 Watt |
| C662 | .1 mf 12V 20% Disc |
| C669 | 180 pf Disc (TX-110-H only) |
| L661, 662 | 15 uh RF Choke |
| D661, 662 | IN270 Ger. Diode |
| D663 | IN4005 Sil. Diode |
| D664 | IN4149 Sil. Diode |
| RL-661 | 3P2T Relay 12VDC |

## TX-110 Chassis Assembly

| | |
|---|---|
| P4 | Coax Plug to RX-110 Ant. Connector |
| P5 | RX-110 Connector |
| P6, P9 | Coax Jumper for TX-110-L |
| P6, P8 | Connector Plugs for PA-200 Amp |
| J5 | Driver Output Jack |
| J6 | Low Pass Input Jack |
| C1 | 4000 mf 25V Electrolytic Cap |
| R1 | 470 5% 1/4 Watt |
| J7 | Antenna Jack |
| J8 | Key Jack |
| J9 | Microphone Jack |
| J10, J11 | Ammeter Jacks |
| S4 | DPDT Slide Switch PTT/CW |

BAND PASS FILTERS
TX
RX
MIXER
TX
RX
I.F. AMP.
RX
RX
TX
FILTER
5595 KHz
I.F. AMP.
RX
TX
PROD. DET.
RX
A.F. AMP. AGC AMP.
RX
A.F. OUT
RX
IN 4149
2N 3866
MC 1350
40-673
LM 3900
A.F. GAIN
LM 380
PHONES
SPKR
16VDC
TX
TX CONTROL
3.5
7
14
21
28
BANDSWITCH
VFO
FREQ. TUNING
MPS 6514
TX GATE
IN 270
BAL. MOD.
MPS 6514
CAR. OSC. (BFO)
PWR SUPPLY
9VDC
100-130 VAC (200-260 EXPORT) 50-60 Hz
TX
RX-110 RECEIVER
TX-110 TRANSMIT MODULE
MIC. AMP.
MPS 6514
MIC GAIN
CA 3086
TONE OSC. VOX
MIC.
KEY
RL 1
MPS 6514
PRE-AMP
2N 3866
AMP
CD 2545
DRIVER
MRF 454
MRF 454
OPTIONAL AMPLIFIER
RL2
PS-110-H
HI AMP PWR SUPPLY
LOW PASS FILTERS
COAX ANT.
BANDSWITCH
3.5
7
14
21
28

ATLAS TX-110 TRANSCEIVER BLOCK DIAGRAM

# TX-110 ALIGNMENT

## INTRODUCTION

The following procedures are shown in approximate order performed during the factory alignment of the transceiver. The following equipment is recommended for complete alignment.

1. VTVM (Vacuum Tube Voltmeter) Hewlett Packard Model 410B or equivalent
2. R.F. Signal Generator, Hewlett Packard Model 606B or equivalent
3. 150 watt Dummy Load/Wattmeter. Bird Model 43
4. Audio Generator, RCA Model WA-504B/44D or equivalent.

NOTE: Because the TX-110 transmitter module depends on functions of the RX-110 receiver, it must be connected to the receiver during any alignment procedures.

CAUTION: WHEN PERFORMING TRANSMITTER TEST, DO NOT HOLD IN TRANSMIT POSITION WITH FULL POWER OUTPUT FOR MORE THAN 5 TO 10 SECONDS. MOST TRANSMITTER TESTS CAN BE MADE WITH ONLY A SMALL AMOUNT OF OUTPUT POWER, AND SHOULD BE DONE SO. NORMALLY, 25% OF FULL OUTPUT POWER IS ENOUGH. HOWEVER, THE TRANSMITTER SHOULD NOT BE HELD IN TRANSMIT FOR MORE THAN 30 SECONDS AT THIS OUTPUT LEVEL.

THE GREATEST DANGER TO THE POWER OUTPUT TRANSISTORS IS OVERHEATING. THE BLACK ANODIZED HEAT SINK IS DESIGNED TO COOL THE TRANSISTORS ADEQUATELY UNDER NORMAL OPERATING CONDITIONS, BUT IT IS UP TO THE OPERATOR TO MAINTAIN NORMAL CONDITIONS AND NOT ABUSE THE EQUIPMENT.

NOTE: To avoid transmitting on an outside antenna during transmitter tests, connect a dummy load to the transceiver.

### 1. BIAS ADJUST.

It will be necessary to connect an external ammeter for adjusting the bias of the transmitter. Refer to Operation section of manual for external ammeter information.

**TX-110-H (High Power Model)**

Tune transceiver to 14.3 MHz. SSB/CW switch in SSB position (PTT position on early models), MIC. GAIN. full CCW. Plug microphone into MIC jack and depress MIC button into PTT mode. Observe ammeter reading."Idling current"should be about 1amp. If adjustment is needed, locate the large blue trimpot, R567, on PC-560 Power Amplifier board and adjust for correct bias setting.

**TX-110-L (Low Power Model)**

The low power transmitter version uses the driver stage as its "final" output and is biased with a 3.3 ohm fixed resistor, R511. Ammeter readings should be about 1/2 amp. If adjustment is necessary, the 3.3 ohm resistor will have to be replaced with either a higher or lower value, depending on the amount of change needed.

### 2. BANDPASS FILTER COILS

These coils are located in the RX-110 on PC-050 and are used in both receive and transmit. If adjustment of these coils is necessary it is recommended this be done in the transmit mode. If the coils are adjusted in the receive mode as outlined in the RX-110 manual they may not be "peaked" for transmit. This is because the coils tune broader in receive than in transmit. This is fine for receiving but may result in slight loss of output power in transmit. Remove the RX-110 top cabinet and then connect the TX-110. Connect dummy load and wattmeter into ANTENNA connector of TX-110. (IF wattmeter is unavailable, use an external ammeter.) SSB-CW switch in CW position. MIC. GAIN. full CCW. Bandswitches in proper positions. Insert CW key into jack on rear panel of TX-110. Locate bandpass coils that correspond to bandswitch positions. Key transmitter and insert MIC. GAIN. until wattmeter or ammeter reading begins to increase. Adjust the three bandpass coils for maximum output.

NOTE: Do not allow output to increase above about 1/4 of full rated output. On the TX-110-L this is about 2-3 watts and on the TX-110-H about 25 watts. When adjusting the bandpass coils and the output begins to go above these levels, simply decrease the amount of MIC. GAIN. If an ammeter is used instead of a wattmeter do not allow the readings to go above 5 amps on the TX-110-H and 3/4 amp on the TX-110-L.

### 3. CARRIER FREQUENCY ADJUST

Tune transceiver to 3.8 MHz. Connect A.F. Generator into MIC jack and dummy load/wattmeter into ANTENNA connector on rear panel of TX-110. Switch SSB-CW to SSB position. Set A.F. Generator to 1000 cycles. In order to key the transmitter it will be necessary to connect the tip of the MIC jack to ground. After keying the transmitter, increase MIC. GAIN. until wattmeter reads 40 watts with TX-110-H or 8 watts with TX-110-L. Sweep generator down to approximately 300 cycles. Locate carrier frequency adjust trimmer, item 17 page 23 of RX-110 manual, and adjust trimmer, if necessary, until wattmeter reads 10 watts on TX-110-H or 2 watts on TX-110-L.

### 4. CARRIER BALANCE ADJUST

Tune to 3.8 MHz. Connect monitor scope and/or dummy load/wattmeter. Wattmeter with low output scale can be used in place of monitor scope. SSB-CW switch in SSB position, MIC GAIN full CCW. Insert microphone into MIC jack and key transmitter. Locate carrier balance trimpot, item 16 page 23 of RX-110 manual, and adjust for minimum scope deflection, or wattmeter reading. If readings are negligible (no reading on a wattmeter scale of 0-5 or 0-10 watts) no further adjustment is needed. If more is needed locate the phase balance trimmer next to carrier balance trimpot and adjust for minimum reading. Re-adjust carrier and balance trimpot for minimum reading. Jockey the two adjustments until minimum reading is achieved.

### 5. METER ADJUST

The front panel meter indicates relative power output. This reading will vary with antenna loads, frequency, and high and low power models. The only adjustment available is for zero calibration and this can be done by moving the small black lever located on rear of meter. It will be necessary to remove top cabinet to make adjustment.

# ATLAS WARRANTY

THE ATLAS TX-110 IS GUARANTEED UNDER THE FOLLOWING SCHEDULE:

(1) All components are guaranteed for one (1) year from date of purchase.

(2) Workmanship is guaranteed unconditionally for one (1) year from date of original purchase.

(3) If factory service is required within 30 days Atlas will pay surface freight both ways. After 30 days customer pays shopping cost to the factory, and Atlas pays return freight. After 1 year, customer pays both ways, plus a nominal service charge.

(4) This warranty will be transferred to owners other than original purchaser, provided the new owner advises Atlas Radio in writing of his name, address, and date of purchase.

UNDER THE REGULATIONS OF THE MAGNUSON-MOSS WARRANTY ACT, THE ATLAS WARRANTY POLICY IS CLASSIFIED AS A LIMITED WARRANTY.