

## OPERATING INSTRUCTIONS FOR AMECO 6-METER CONVERTER MODEL CB-6

The Ameco 6-meter Converter, Model CB-6, is a crystal-controlled, broadband Converter. When used in conjunction with a receiver, it will provide reception of the 6-meter amateur band - 50 Mc. to 54 Mc. The converter uses a 6ES8 cascode r-f amplifier and a 6U8A mixer-oscillator.

The circuitry used, together with considerable internal shielding and by-passing, provide high sensitivity to the desired signals and maximum rejection of spurious, undesired signals. A novel feature of this unit is that the output frequency may be changed by simply changing the crystal and the tap on the output coil. This feature prevents the converter from becoming obsolete when the receiver is changed to a different type.

### POWER REQUIREMENTS

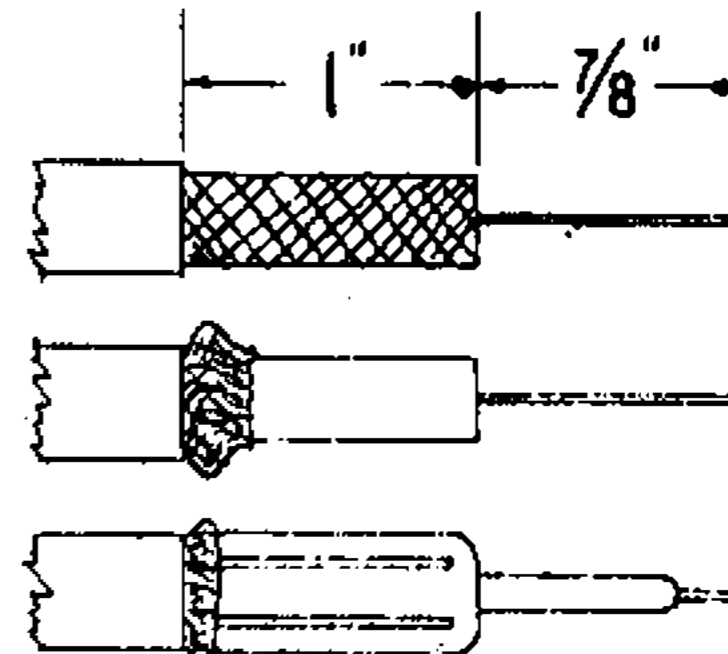
The converter requires 6.3 V. AC at .815A for the filaments and 100 to 150 V. DC at 16 Ma. for the plates and screen. This power may be obtained from the receiver or from the Ameco Power Supply, Model PS-1. The receiver should be a good quality commercial receiver. Do not attempt to take power from an AC-DC receiver. If the Ameco Power Supply, Model PS-1 is used, merely plug the power supply into the converter. The socket of the power supply mates with the plug of the converter. The power supply socket is wired to apply the correct voltages to the converter. In the event that power for the converter is taken from the receiver or some other source, wire the socket that will mate with the converter plug so that the receiver chassis is connected to pin 2, 6.3 volt filament to pin 7 and B+ (150 V.) to pin 8. (See the schematic at the end of the instructions).

If the receiver B+ is over 150 volts, add a resistor in series with the B+ lead. With 250 volts B+, use a 6000 ohm, 5 or 10 watt resistor; with 200 volts, use a 3000 ohm, 2 watt carbon resistor. Use ohms law and the power formula to figure out the resistor specifications for other voltages.

### CABLE REQUIREMENTS

The connections to the input and output of the converter should be made with 50 ohm coaxial cable (RG8/U or RG58/U) terminated with auto radio antenna plugs (Ameco #AP-1 or Cinch #1320). The cable is connected to the plug in the manner shown:

- Remove outer vinyl covering for 1-7/8".
- Strip braid and inner insulation off center conductor for 7/8".
- Push braid back to form a bead all around.
- Insert center conductor through pin until braid is against end of plug.
- Bend center conductor to hold plug in place.
- Roll braid between fingers to roll it over the end of the plug for about 1/16".
- Solder the braid to the four tabs of the plug.
- Solder the center conductor to the pin and cut off excess wire.



The coaxial cable from the output of the converter to the receiver can be up to a maximum of about three feet. If some undesirable IF signals are getting through, the chances are that it is due to the long ground wire (at the antenna terminal strip) inside most receivers. A short jumper wire (1 or 2 inches) between the converter chassis and the receiver chassis will usually correct this.

### ANTENNA REQUIREMENTS

Any type of 6-meter antenna may be used with this converter. A rotatable beam is best; however, a quarter wave whip, a ground plane, a halo or other type may be used. While the input and output impedance is not critical, it is nominally 50 ohms and 50 ohm coaxial cable should be used between the antenna and the converter. If the antenna terminates at 300 ohms and 300 ohm transmission line is used, then a matching balun\* should be used between the line and the converter.

### ALIGNMENT PROCEDURE WITHOUT INSTRUMENTS

- A. Put the tubes and shields in place and connect the power supply to the converter.
- B. Connect the output of the converter to the antenna terminals of the receiver with coaxial cable.
- C. Tune the receiver approximately 1.3 Mc. up the band. (For example, if a 7-11 Mc. output is used, tune the receiver to 8.3 Mc.).
- D. Connect the antenna temporarily to the mixer grid (terminal C of transformer A-7595-C).

\*The Ameco Model VB-1 Balun is recommended for this purpose. It matches a 300 ohm balanced line to a 50 to 75 ohm unbalanced converter input.

- E. Use a .100" hexagonal plastic or nylon tool to tune the r-f transformers. Transformers A-7594-B and A-7595-C are double tuned. Each has 2 coils and 2 cores. The primary coil and core are closest to the chassis. The secondary coil and core are at the top of the transformers. "Transformer" A-7596-C is actually a single coil with several taps. It has a single core.
- F. Tune the output transformer A-7596-C, for maximum noise or signal strength. Start with the core at the top. This transformer tunes very broadly for most output IF frequencies.
- G. Tune the oscillator coil, CS-1, for a change in noise, starting with the core high up in the coil. The noise will build up slowly, then stop suddenly as the core is turned clockwise. Note the position of the sudden drop, then back the core off 1/2 to 3/4 of a turn from that position. Check this adjustment by removing the crystal several times. The noise should drop with the crystal out, increase with the crystal in. If not, a small adjustment (1/4 turn) of the CS-1 core will correct it.
- H. Reconnect the antenna to terminal D of the r-f transformer, A-7594-B.
- I. Tune the lower and upper cores (primary and secondary, respectively) in transformer A-7595-C for maximum noise. If no peak can be heard, run the top core up to the top and the bottom core down to the bottom; then turn the top core 5 turns down and the bottom core 5 turns up. Retune both for maximum noise.
- J. Remove the antenna from terminal D of transformer A-7594-B and connect it to the regular antenna jack (marked "ANT").
- K. Tune the cores of transformer A-7594-B, using the same procedure as in step I above.
- L. Make a loading unit consisting of a 1000 to 2200 ohm, 1/2 watt carbon resistor in series with a .001 ceramic or mica condenser. Use very short leads. Mount this loading unit at the end of a plastic rod to keep the fingers away from the circuit being tuned.
- M. With the loading unit between terminal B of A-7595-C and ground (capacitor of loading unit should always go to ground) tune the top core of A-7595-C for maximum output. Reconnect the loading unit to terminal C on A-7595-C and tune the bottom core of A-7595-C for maximum output. Reconnect the loading unit to terminal A on A-7594-B and tune the top core of A-7594-B for maximum output. Reconnect the loading unit to terminal D of A-7594-B and tune the bottom core for maximum output. Remove the loading unit. Repeat Steps G and M.
- N. If it is impossible to hear any noise in performing Steps G through L above, use a short piece of wire (up to 2 feet) for an antenna and connect it to the antenna jack of the converter. Turn the transmitter on. Set the transmitter to a frequency 1.3 Mc. up the band and retune the converter in the manner given in Steps G through M. A doorbell or buzzer may also be used as a source of noise for alignment. In most cases, no connection between the bell and the converter is needed as the wiring in the house acts as an antenna for the bell or buzzer.
- O. The converter is now ready for use over the 50-54 Mc. band.
- P. If activity is of interest in only a small portion of the band, tune to the center of that part instead of to 1.3 Mc. up the band, as described above.

### ALIGNMENT WITH INSTRUMENTS

#### INSTRUMENTS REQUIRED:

1. Sensitive voltmeter or vacuum tube voltmeter.
  2. Signal generator with 50 ohm output.
  3. Receiver with S meter or use voltmeter as output meter.
  4. Loading unit. See Step L above.
- AA. Connect the converter to the receiver. Turn on the converter, receiver and the instruments and let them warm up.
  - BB. Tune the receiver 1.3 Mc. up from the low end of the band. (If the output IF of the converter is 7-11 Mc., tune the receiver and signal generator to 8.3 Mc.).
  - CC. See Step E.
  - DD. Connect the signal generator ground to the chassis of the converter. Feed a low level signal at the I. F. (8.3 Mc. as above) to terminal C of the r-f transformer A-7595-C, and tune the output transformer A-7596-C for maximum output as read on the S-meter or output meter. The tuning of A-7596-C will be broad for most IF frequencies.
  - EE. Connect the positive lead of a voltmeter to ground. Connect the negative lead (through a 100,000 ohm carbon resistor on the probe tip) to the terminal of the crystal socket, S-180 that is connected to the tube socket. Starting with the core high up in the coil, tune the oscillator coil, CS-1, clockwise until a peak meter reading of over 5 volts is obtained. Then, turn the core 1/4 of a turn counterclockwise from this peak. The oscillator is now operating. Check this by removing the crystal several times. The voltage should return to normal every time the crystal is inserted. If it doesn't, a small adjustment of the oscillator coil core will correct it. Note that if top core in A-7595-C is off tune, it may reduce oscillator voltage considerably.
  - FF. Connect the signal generator to the antenna jack, S-190-A. Feed a 51.3 Mc. signal at low level into the converter. Tune the r-f transformers, A-7594-B and A-7595-C, as follows:

With the loading unit between terminal B of A-7595-B and ground (capacitor of loading unit should always go to ground) tune the top core of A-7595-B for maximum output. Reconnect the loading unit to terminal C on A-7595-B and tune the bottom core of A-7595-B for maximum output. Reconnect the loading unit to terminal A on A-7594-B and tune the top core of A-7594-B for maximum output. Reconnect the loading unit to terminal D of A-7594-B and tune the bottom core for maximum output. Repeat EE and FF. Remove the loading unit and disconnect the instruments. The converter is now ready for use.

- GG. If activity is of interest in only a small portion of the band, tune to the center of that part of the band instead of 1.3 Mc. up the band as described above.

### 12 VOLT OPERATION

If it is desired to use 12 volts instead of 6.3 volts for the filaments of the converter, the following changes must be made:

1. At the 6ES8 tube socket - add a 75 ohm, 1 or 2 watt resistor from pin 4 to ground (the chassis).
2. At the 6U8A tube socket - unsolder pin 5 from the shield. Shift the wire coming from the power plug to pin 4, from pin 4 to pin 5. Add insulating tape or sleeve, if necessary.

### SELECTING THE OUTPUT IF FREQUENCY

This converter may be adjusted so that it will provide any output frequency between .5 Mc. and 35 Mc. This feature of the converter will prevent it from becoming obsolete should the receiver be changed to a different type.

If there is a choice as to what output frequency to use, it is recommended that a low output IF be used, preferably 7-11 Mc. This is because most receivers perform best in this range. Their oscillator stability (drift), image and spurious rejection become progressively poorer as the frequency goes up.

On receivers covering ham bands only, the 28-30 Mc. band gives the most coverage for use with a 6-meter converter.

The following information specifically explains how to set up the converter, Model CB-6, so as to provide the various output frequencies:

- A. FOR 7-11 Mc. IF OUTPUT - Use a 43 Mc. crystal. Tune oscillator coil as per alignment instructions. Remove any jumper wire from pin B of the output r-f transformer (A-7596-C) to any other pin of this transformer. See Fig. 2. The only thing going to pin B should be the 5000 mmfd. condenser coming from the center terminal of the output jack. Tune the output transformer as per alignment instructions. There should be a 0.1 mmfd. condenser between pin 1 of the 6U8A and pin C of A-7595-C. A-7595-C pin D must be grounded to chassis.  
50 Mc. will come in at 7 Mc. on the receiver dial, 52 Mc. will come in at 9 Mc. and 54 Mc. will come in at 11 Mc.
- B. FOR 10-14 Mc. IF OUTPUT - Use a 40 Mc. crystal. Tune the oscillator coil as per alignment instructions. Remove any jumper wire from pin B of the output r-f transformer (A-7596-C) to any other pin of this transformer. See Fig. 2. Place a jumper wire between pin B and pin A of the output r-f transformer (A-7596-C). Tune the output transformer as per alignment instructions. There should be no condenser between pin 1 of the 6U8A and pin C of A-7595-C. The only lead from pin D of A-7595-C should be one going to pin 1 of S-180. 50 Mc. will come in at 10 Mc. on the receiver dial, 52 Mc. will come in at 12 Mc. and 54 Mc. will come in at 14 Mc.
- C. FOR 14-18 Mc. IF OUTPUT - Use a 36 Mc. crystal. Tune the oscillator coil as per alignment instructions. Remove any jumper wire from pin B of the output r-f transformer (A-7596-C) to any other pin of this transformer. See Fig. 2. Place a jumper wire from pin B to pin F of the output transformer (A-7596-C). Tune the output transformer as per alignment instructions. There should be no condenser between pin 1 of the 6U8A and pin C of A-7595-C. The only lead from pin D of A-7595-C should go to pin 1 of S-180. 50 Mc. will come in at 14 Mc. on the receiver dial, 52 Mc. will come in at 16 Mc. and 54 Mc. will come in at 18 Mc.
- D. FOR 28-30 Mc. IF OUTPUT - Use a 22 Mc. crystal. Add a 22 mmfd. NPO ceramic or silver mica condenser across the oscillator coil and tune the oscillator coil, CS-1, as per alignment procedure. Remove any jumper wire from pin B of the output r-f transformer (A-7596-C) to any other pin of this transformer. See Fig. 2. Place a jumper connection from B to E of the output transformer A-7596-C. Tune the output transformer as per the alignment procedure. Tuning the output coil at this frequency is more critical than the lower frequencies. 50 Mc. will come in at 28 Mc. on the receiver dial, 51 Mc. will come in at 29 Mc. and 52 Mc. will come in at 30 Mc. There should be no condenser between pin 1 of the 6U8A tube and pin C of the A-7595-C r-f transformer. The only lead from pin D of the A-7595-C r-f transformer should be one going to pin 1 of S-180.
- E. FOR 30.5-34.5 Mc. IF OUTPUT (NC-300, 303, SX-101A Receivers) - Use a 19.5 Mc. crystal. Add a 50 mmfd. NPO ceramic or silver mica condenser across the oscillator coil, CS-1. From this point on, the procedure is the same as for D above - 28-30 Mc. IF output. Also remove the 10 mmfd. on S-171B pin 6, 100 mmfd. and 330 ohm on S-190B, lift one end of 4.7K from A-7596-C pin C and solder

it to pin B. If no satisfactory peak can be had, shift jumper to B and F. The receiver dials are calibrated for 50-54 Mc.

- F. FOR .6-1.6 Mc. IF OUTPUT (Broadcast Band) - Use a 49.4 Mc. crystal. Remove the 5 mmfd. condenser from the oscillator coil, CS-1. Tune the oscillator coil as per the alignment instructions. Remove any jumper wire from pin B of the output r-f transformer (A-7596-C) to any other pin of this transformer. See Fig. 2. The only thing going to pin B should be the 5000 mmfd. condenser coming from the center terminal of the output jack. There is no need to tune T3 as it will not tune at this frequency. Remove the 330 ohm resistor and the 100 mmfd. condenser from the output jack. There should be a 0.1 mmfd. condenser between pin 1 of the 6U8A and pin C of A-7595-C. The only lead from pin D of A-7595-C should be a lead going to chassis point "P". 50 Mc. will come in at 600 kc. on the receiver dial, 50.5 Mc. will come in at 1100 kc. and 51 Mc. will come in at 1600 kc.

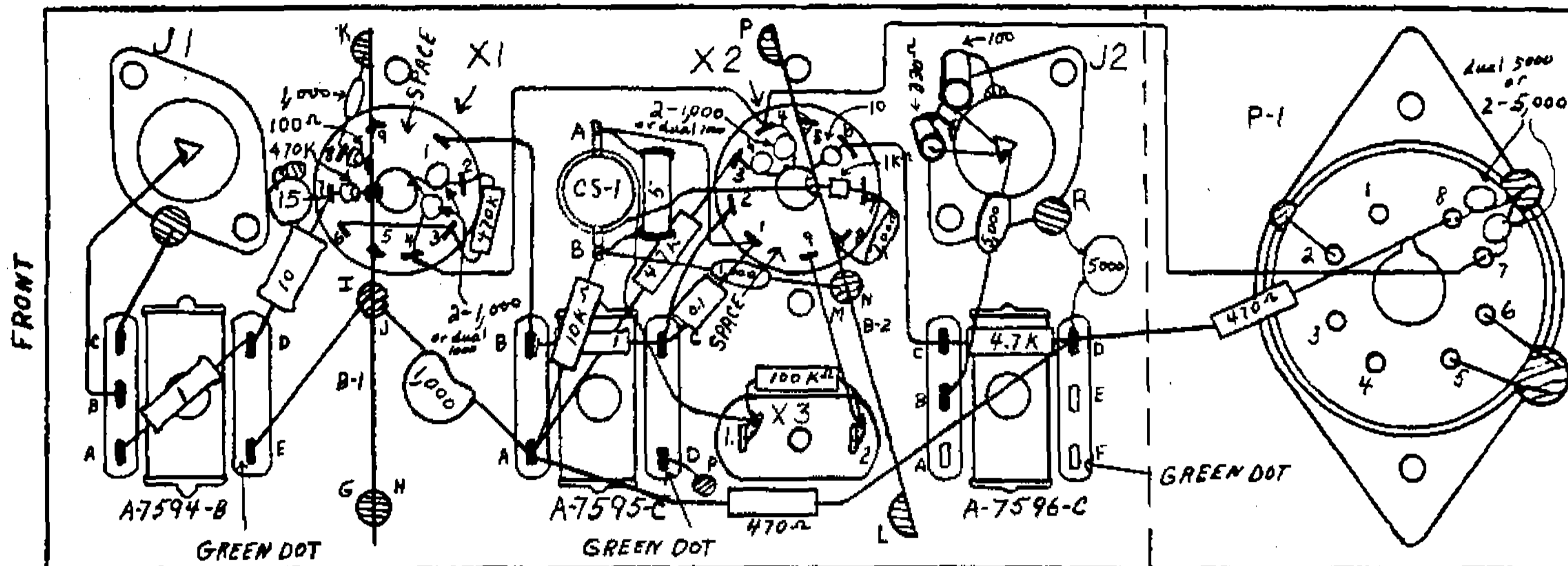


Fig. 1. Parts layout of CB-6 converter for 7 to 11 Mc. output as viewed from underside of chassis. For other outputs, see changes listed in section on "Selecting the Output IF Frequency".

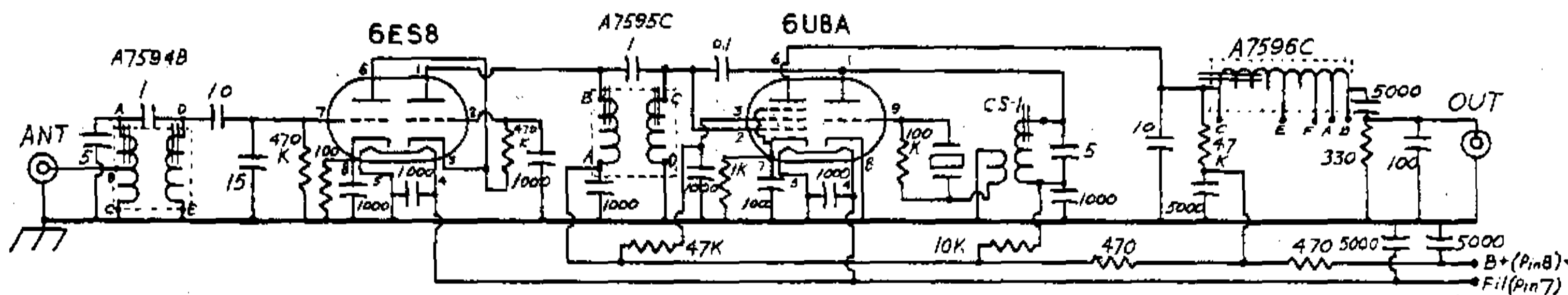


Fig. 2. Wiring schematic of 6 meter Converter, Model CB-6 for 7 to 11 Mc. output. Capacitances are in mmfd. and resistances are in ohms. For other outputs, see changes listed in section on "Selecting the Output IF Frequency".