INSTRUCTIONS FOR THE ISOTRON 20, 11 OR 10

(Isotron 10 and 11 are completely assembled)

1. Mount the aluminum plate (1) on the end of the coil as in fig. 1, pg. 4. (Applies to Isotron 20 only.) Remove the second nut, then replace it to secure the plate. Mount the U-bolt assembly as illustrated on pg.11.

2. For best performance the antenna should be mounted as much in the clear as possible and as high as possible. A coaxial feedline of 50-75 ohms should be connected to the coaxial connector (3). The coax should be taped or secured with stand-offs down the metal mast. A neat run should go to your radio.

Grounding the bottom of the metal mast is important for outdoor installation. Ground wires should never be run up the mast or to the antenna itself. Indoor installations need not be grounded. See page 8 for more information.

PLEASE NOTE: Lengths of coax that are an exact 1/4 wavelength should be avoided. This length would have the velocity factor considered for your type of coax. This is only for the first 1/4 wavelength. Adding a few feet of coax to avoid this length is fine.

3. Note the jumper (4) in fig 2. This jumper grounds the counterpoise (2). Start with the counterpoise (2) about 1 inch below parallel to the coil. The jumper will be explained later.

4. There is only one frequency adjustment for this antenna. If a higher resonant point frequency (point of lowest SWR) is desired, then rotate the counterpoise (2) away from the coil a few degrees at a time. For a lower resonant point frequency move the counterpoise closer to the coil or plate (1). Be sure the plate (1) and counterpoise (2) do not touch. See Pg. 5 titled FINDING THE RESONANT POINT if you need more help.

5. (4) in fig. 2 (pg. 4) is for impedance matching of the antenna. Normally with it connected gives the proper match needed and a 1:1 SWR will occur at your resonant point. If the SWR is too high at the resonant point then the jumper may be removed to raise the impedance value of the antenna. If this situation occurs it is easiest to do the adjustment with a Noise Bridge or equivalent to avoid guessing if your impedance is low or high. A capacitor of 100 pf or less may be jumpered in if a point between the two values is desired. (capacitor not supplied) This complication of impedance value is the exception rather than the rule. A determination of your resonant point should be known before attempting to adjust your impedance value.

NOTE: A tuner or matching device should never be in the line during the tune-up. However a Tuning Device is highly recommended for the solid state radios during normal operation.

WARRANTY

Bilal Company warrants this equipment against defects in material and workmanship for a period of one year from the date of purchase.

This warranty is limited to replacing or repairing the defective parts and is not valid if the equipment has been tampered with, misused or damaged.

NOTE: Do not ship to the factory without prior authorization. First write or describe the difficulty. Many times we can diagnose and correct problems by mail.

FINDING THE RESONANT POINT

1.Locating the resonant point or the frequency that the SWR is lowest is the major part of the tune up. The following steps is a reliable technique for locating the resonant point.

2. IF YOUR SWR IS OVER 3:1, IT IS A RESONANT POINT ADJUSTMENT THAT NEEDS TO BE MADE.

3.You will need a SWR meter. You will also need to hear the receiver from the antenna location.

4. Connect the antenna to your transceiver by means of a suitable length of coax. NEAT RUNS AND INSTALLATIONS ARE VERY IMPORTANT.

5. Tune your receiver near a frequency desired.

6. Listen to a Signal at this frequency.

7. Bring your hand toward the top plate of the antenna.

8. Carefully listen. If the signal increases at some point while your hand is approaching the Top Plate, then the resonant point is higher than the frequency you are set at.

9.You will need to make the necessary adjustments to lower the resonant point of the antenna. (Rotating or adding hardware.)

10. If the Signal decreases only while bringing your hand toward the Top Plate, then the antenna is resonant at a lower frequency than the receiver is tuned.

11. If the antenna resonant point is low, it is best to start at the lowest frequency available to you. Check it again with your hand . This technique for determining the resonance is very reliable. It is not necessary to spend a lot of time guessing where the antenna is resonant. Continue this procedure through the following steps as a reliable resonant point check.

12. If the test shows the antenna is resonant lower than you desire or below the band, then tune your receiver to the lowest frequency available to you. Check the SWR as in the next step.

13. SWR should be check at the lowest power that the meter will read. The sensitivity control should be all the way up and the meter calibrated by the gain on the exciter.

14. Note the SWR at the lowest frequency. Then move up 25 khz and check the SWR again. Continue to do this until you can see a pattern.

15. If the SWR increases as you move up frequency, then the resonant point is below the band or minimum frequency. Adjusting the counterpoise (2) away from the end plate (1) will raise it.

16. The object is to locate a minimum SWR by graphing as described in step 15.

17. If you have a general coverage receiver you can listen at a lower frequency and check the antenna with your hand as described.

18. Once your resonant point is located in your operating area, your SWR will make a noticeable dip (below 3:1). Unless your environment interaction is very strong, this normally produces a low and acceptable SWR.

19. If you are using a Noise Bridge, it should be located near the antenna for tune up.

20. Impedance may be adjusted if necessary after completion with the resonant point. If your SWR is under 3:1, but is not under 2:1 or better then the impedance value of the antenna can be adjusted. This is described on page 8.

COMPENSATION FOR VARIATION IN LOCATION

The antenna-to-ground capacitance of your ISOTRON antenna depends on its location with respect to other objects and to the ground itself, and how and where it is mounted. Antenna-to-ground capacitance affects resonant frequency and feed-point impedance of your antenna.

For example, if the ISOTRON is mounted on a tower, somewhere near the middle, its resonant frequency and impedance value will be lower than if the antenna is mounted in the clear. By insulating the antenna from the tower, you can increase its feedpoint impedance and raise its resonant frequency. Different locations on the tower will produce different values, and it may be necessary to compensate differences by tuning your ISOTRON.

If the feedpoint impedance and resonant frequency become higher than desired, then it is possible to decrease them by connecting a capacitor of about 100pf or less between the antenna and the tower (see pg. 11). Another words the lowest impedance would be directly grounding the antenna to the mast. A point in between can be obtained by the use of a capacitor as described. This technique will apply on most mountings where the feedline is longer than 1/8 wavelength. If the feedline is shorter, then the impedance value is determined by the ground of the radio and cannot be varied.

It is important to know what the value of the impedance will be at resonance, and what the resonant frequency of the antenna is. An impedance bridge (Noise Bridge) is a very good way to make these measurements, and can be a valuable investment for the radio operator.

If a Bridge is not available, then a little guess work will tell the story. Once you located the resonant point and put it where you want, your SWR should be no higher than 3:1 at a low power reading. The antenna should be grounded when determining resonant point. Release the grounding wire (12). Check the SWR. The resonant point may move up a little and will have to be relocated.

Attic and top-of-building mounting where your ISOTRON cannot be easily grounded, could produce a feedpoint impedance of as much as 200 ohms. It is desireable to ground your antenna to a good earth ground, but if this is not possible, then the next best thing is to use the ground in your electrical system. This is attached to your outlets where the third prong would insert on some appliances. The ground wire should be attached to the bottom of the mast only where the antennas are mounted.

Please note that the shield of the coax is not considered to be the same ground as the grounded components of the antenna, such as mast or bottom plate.

One factor to consider is the environment interaction when transmitting at various power levels. The instructions call for tuning at a minimum power level. Tight or highly conductive surroundings (metal sidings, machinery, etc.) will show an increase in SWR from the low power to the high power setting. This can be compensated for by relocating the antenna. If this is not practical a tuner can clean this up. (See the page on USE OF A TUNER)

SIDE TOWER MOUNTING

The antennas should be offset from the tower. This can easily be done with a 5 or 10 foot mast mounted across the legs of the tower. The Isotrons can be mounted horizontally on the mast. A light nylon cord could be attached to the mast an back to the tower at a 30 to 45 degree angle to keep the mast from drooping.

GROUNDING

There is much confusion about grounding antennas. The Isotrons do not use a ground for performance. Grounding offers a change in impedance value as well as protection against static discharge. All outdoor installations should be grounded.

The ONLY way to ground the Isotrons is by connecting the ground wire to the bottom of the mast the antenna is mounted on.

NEVER run a ground wire up to the antenna. The wire will interact with the feedline and drastically change the tuning. Avoid running ground wires parallel to the feedline if possible.

Do not use plumbing as a ground.

If the antennas are indoors and grounding is not available close by, then it may be best to leave the antenna ungrounded.

With indoor installations ground wires to the radio should be avoided. Most radios are grounded through the power supply.

THE USE OF A TUNER

The instructions provided basically discourage the use of a Tuner. This is for the purpose of initially tuning up the antenna only. However there are times when a tuner has its place.

With the increasing popularity of solid state transmitters a tuner is almost a must. Back in the days when tube finals were used the manufactures automatically provided the tuner. Since the solid state circuits have become popular, they have left the tuners out. This makes it a must for an antenna system to be very critically tuned so the exciter will not cut back its power. In many cases this is very impractical and the use of a tuner can be a good asset to your set up.

In tight locations or locations not favorable for an antenna installation, the impedance of the antenna may not adjust to the 50 ohms needed. An installation indoors with a very short feedline may keep the impedance lower than 50 ohms. The recommended adjustments may have little affect due to the short feedline. At the lowest the antenna will exhibit a 20 ohm impedance, giving a SWR of around 3:1. Please keep in mind that if your SWR is over 3:1 the problem is your resonant point, not impedance value. This can be corrected by following the instructions on resonant point.

If you find isolating the antenna from ground does little to raise the impedance due to your location, then the tuner can be used to match the exciter to the antenna. This will not sacrifice performance if done correctly.

Expanding bandwidth is another asset of the tuner. To avoid retuning the antenna for different parts of the band a tuner can be used to flatten the line and make it acceptable to the exciter.

In conclusion, tuners can be used if not abused in your installation. Under a conventional installation the Isotron will tune up directly, but many operators have to operate in less than ideal circumstances. The Isotron was intended for this challenge and we will be willing to help you with it.

POWER RATING

The power rating defined in the catalogue is OUTPUT POWER.

The Isotrons are intended to handle outdoors 1,000 watts PEP or 500 watts CW into the antenna. Indoors the rating is 500 watts PEP or 250 watts CW into the antenna.

YOU SHOULD MONITOR YOUR SWR AT ALL TIMES WHEN USING HIGH POWER.

IF THE SWR IS UNSTABLE OR SLOWLY INCREASES WHILE TRANSMITTING, CUT BACK YOUR POWER IMMEDIATELY UNTIL IT STABILIZES!

SINGLE FEEDLINE OPERATION

The Isotrons have been designed so they can be mounted back to back. As many as three can be mounted this way around a mast at the same height.

Electrically the antennas can be fed with one feedline by simply connecting them in parallel. Three antennas of any band you desire work well on one feedline. There is no limit to how many you can put on a single coax. However, the more you connect over three the more complicated the match becomes. An electrical diagram is shown below.

With antennas mounted back to back, a coaxial "T" is connected to the antenna of the highest band. This is done by either the male side of the "T" or by a short jumper from the female side. The remaining connection will jumper over to the next highest frequency antenna. If there is a third antenna, then the procedure is repeated again.

Tune up is the same for the resonant point as in the individual antennas.

Impedance value becomes the average of all of them. Therefore if you isolate one antenna from ground, you must isolate all of them. What you do with one antenna for impedance you do with all of them. You can see if you have over three it can get quite complex and the aid of a Noise Bridge will be a big help.

PERFORMANCE

What makes the Isotron Antennas perform?

Starting from the exciter, RF need to arrive at the antenna. This is done through your feedline. Next it needs to enter through the antenna. This is accomplished by ending the feedline with a radiating resonant circuit, the antenna. Contrary to popular opinion the impedance match has very little affect on performance of the antenna. A mismatch of up to 6:1 SWR will still provide performance that compares to a 1:1 SWR.

This is not to be confused with the exciter protection circuit that reduces power output, in some cases at a 1.5:1 SWR and higher. This can be overcome with the use of a tuner for those solid state exciters.

In most cases a 1:1 SWR can be achieved with the Isotrons. However, many are operating in very tight locations which may make it difficult to achieve the ideal match from the antenna. The antennas radiation will still be optimum as long as you adjust the resonant point. The resonant point can be adjusted in any location regardless of how tight the installation is. The radiation performance can easily be checked by a simple Field Strength test, either using a Field Strength meter or another local station close by.

From this point radiation is at the mercy of the environment which will determine how well your signal is received by other stations. Height enhances your performance best. So do not sacrifice height if you have a choice. The Isotrons are designed to mount high with a light mast so you can take advantage of this feature.

INSTRUCTION MANUAL
FOR THE
ISOTRON 20, 11 OR 10

MANUFACTURED BY
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FLORISSANT, CO. 80816
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TABLE OF CONTENTS

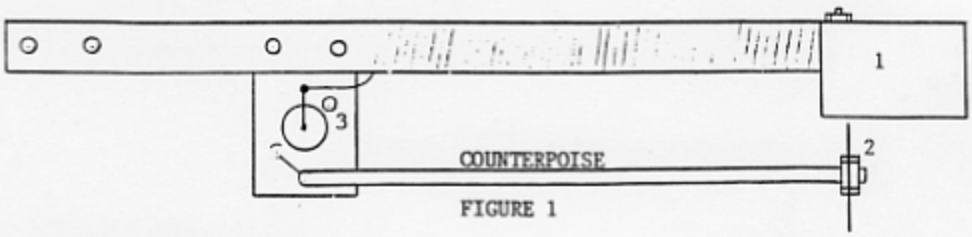


FIGURE 1

(#2 is not used with the Isotron 10 or 11.)

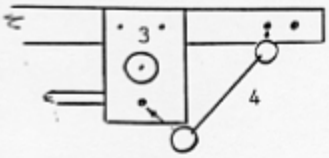
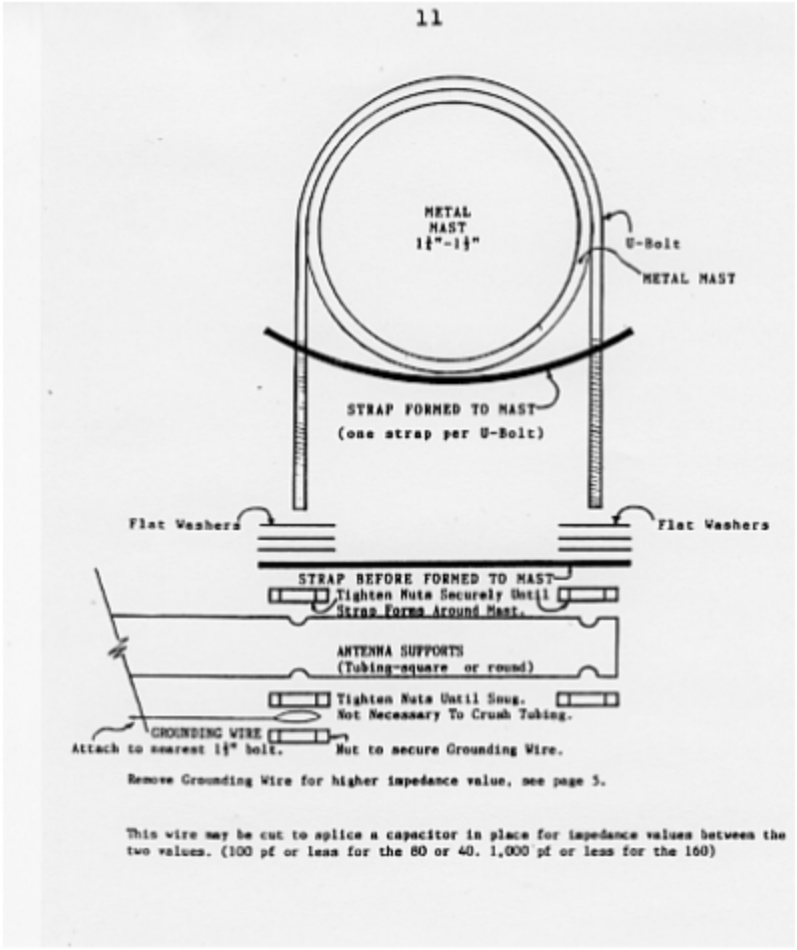


FIGURE 2



Remove Grounding Wire for higher impedance value, see page 5.

This wire may be cut to splice a capacitor in place for impedance values between the two values. (100 pf or less for the 80 or 40. 1,000 pf or less for the 160)

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CONFIGURATION OF THREE ANTENNAS ON ONE FEEDLINE CONNECTED IN PARALLEL.