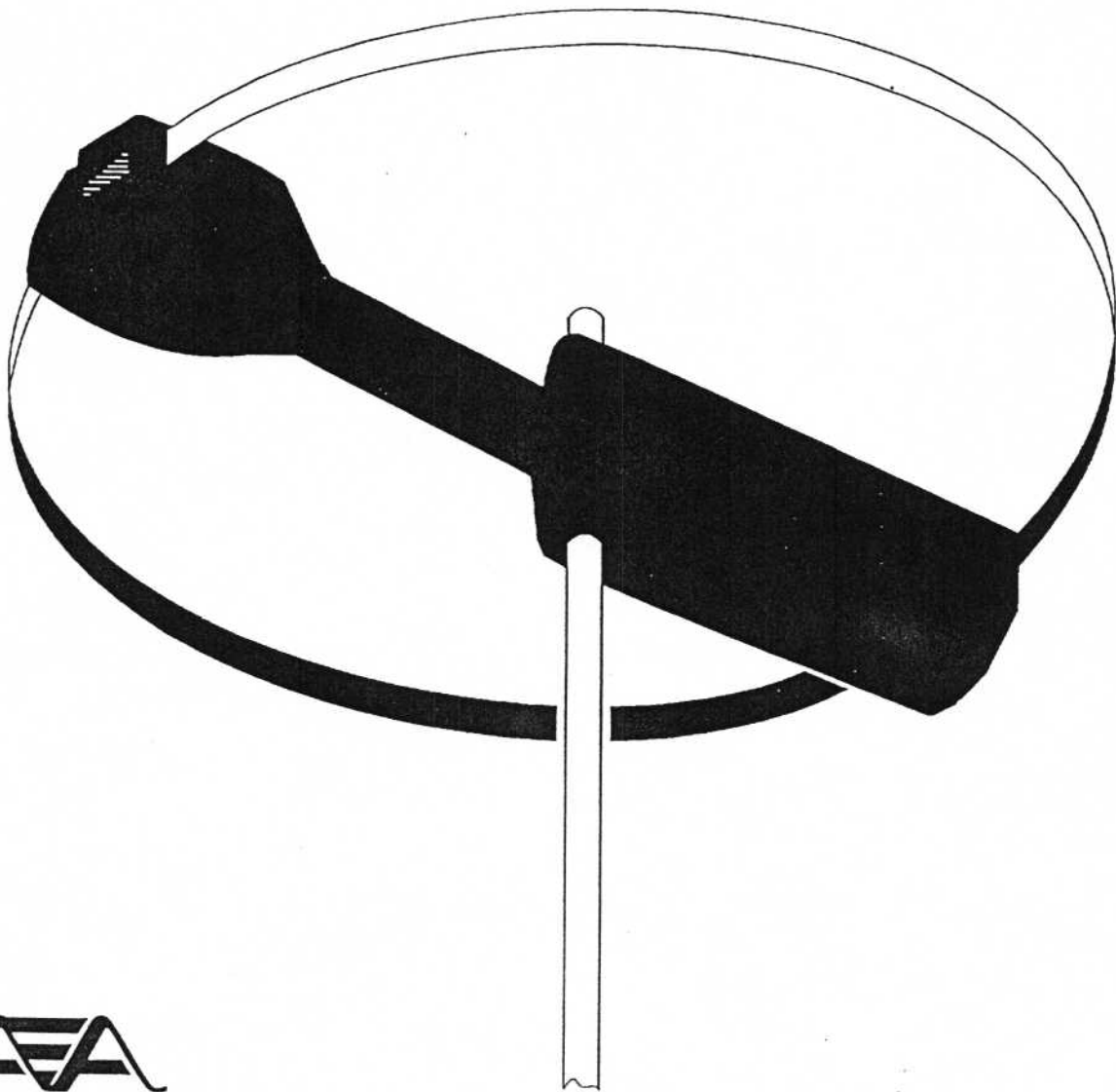


***IsoLoop™ 10-30 HF Antenna
LC-2 Loop Controller***

Operating Manual



Advanced Electronic Applications, Inc.

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1. HELPFUL HINTS

The following was sent in by John Pollock, KA7MCX, regarding some of his experiences with the IsoLoop 14-30 antenna. You may want to read this section now, as it might provide you with some insight as you set up and operate the antenna for the first time. We also recommend re-reading this section after you complete the installation and have operated the IsoLoop a few times, as some of the terms and ideas used will be more familiar at that time.

Why was I one of the first to buy the original IsoLoop? Many times the first few days thereafter I seriously pondered that question. The darn thing wasn't working, the instructions were less than clear, and I was hearing lots of "told you so's" from friends. I was on the verge of returning my IsoLoop for something more conventional, but decided instead to call the folks at AEA who had had the gall to put this weird product on the market.

A phone call to AEA's Customer Service made a big difference. From then on, the more I used my 'Loop, the better it seemed to play. Some of the mistakes I had been making were due to my inability to understand the instructions, others were due to plain old operator incompetence. All were, in retrospect, dumb! But as most of them could still apply to the new (and greatly improved) 10-30 IsoLoop, I'll list a few hard learned experiences that just may help someone else.

Coax. After I assembled my original 'Loop, I climbed to the roof and connected it to an unused piece of RG-8. Results were disappointing; finally bought some new, lighter coax and things suddenly got much better. Heavy coax does not appear to be essential and fresh coax is well worth the small investment.

Tuners. I first used my 'Loop with a Kenwood TS-440S. As this rig has the optional internal automatic tuner, it was in this position when I connected the coax. Not knowing whether to fist tune the 'Loop or the 440, I tried both methods — with horrible results. After one of the phone calls, I set the AT-TUNE switch to OFF, and the difference was dramatic! And it certainly made things more simple when I later used the 'Loop with a TS-680S — meant I didn't have the cost and bother of an external tuner.

Frequency Modulation. I have a few of the ten meter repeaters programmed into memory channels, as it can be interesting to hear FM signals from the other side of the country, or even across the Pacific. The first time I tried to use the 'Loop on the of these, it wouldn't tune — until I switched the mode from FM to USB. Once tuned, I switched back to FM and worked repeaters on several frequencies. Moral: tune in SSB, CW or AM modes, not FM. [White noise will not "peak" in FM mode!]

QSO's. It seemed natural to tune across the bands until I heard an interesting QSO in progress, then to tune the 'Loop on the received signal(s). I soon learned that this was a tough way to do it because

SSB signals cause the "S" meter to bounce so much that it is almost impossible to identify the "hot spot" while tuning across it. Much better to find a nearby frequency and tune on the "white noise"; even better to find an RTTY signal or a heterodyne where the "S" meter will have little or no fluctuations. **[Also, turn the AGC switch to "FAST" position to you can see the fast peak on the "S" meter while tuning.]**

Audio. The IsoLoop is something the engineers call a "high Q" design. I now understand that means it is very efficient, but only within a very narrow frequency range. The motor driven capacitor lets you move that one spot over several bands; learning to find that "hot spot" quickly is the key to really enjoying a 'Loop. My technique when changing bands is to first turn up the transceiver's audio much higher than normal, then run the motor switch at full speed in one direction. The higher the gain, the easier it is to hear that very quick burst of noise the first time the 'Loop tunes through it. Then change to the slowest speed and run the motor in the opposite direction, while carefully watching the "S" meter. Now turn the gain down to a comfortable level. Tweak the motor a click or two at the slowest speed as you tune up or down a band. It should not be necessary to adjust the audio level if you pay attention to that "S" meter.

Direction. Soon after learning how to use it, I used the 'Loop in the CQWW; I wondered if it might be possible to work DXCC during the contest weekend. (Turned out it was - 116 countries in less than 24 hours operating time!) Each time I changed bands, I would carefully note which direction the motor switch was working as I would "hunt & pounce" up a given band. When I later returned to the previous band, I would tweak the switch the same direction as I tuned up that band. Sometimes it would work, sometimes it wouldn't. Finally figured out that each time that giant capacitor inside the 'Loop makes one complete revolution, it tunes through any given frequency twice; once in each direction.

[This is important to understand. If you hold down one direction button on the LC-2, the IsoLoop's tuned or resonant frequency will go up to the end of the range and then back down, or vice versa. It will not go up to 30 MHz and then start over again at 10 MHz.]

I soon learned to listed carefully the first time I moved the VFO after tuning the 'Loop - to nudge the motor just a bit in each direction until I was sure "which way was up".

Bandwidth. During that contest, I learned that on ten meters I could often move as much as forty to fifty kHz before retuning the IsoLoop. When ten **[the 10 meter band; 28 to 29.7 MHz]** shut for the night and I moved to twenty **[the 20 meter band; 14.0 to 14.35 MHz]**, I was not doing as well. Eventually I figured out that the lower the frequency, the narrower the "hot spot" and the more frequently it was necessary to retune. I now tend to tune every 30-40 kHz on ten meters but every 10 kHz when on twenty meters. I also discovered the fun to be had on the twelve and seventeen meter bands - I tune the 'Loop near the center of either the CW or SSB portion, and seldom find it necessary to retune as I listen across these narrow bands. And

the 'Loop compares favorably with many of the stations on these bands, not nearly so many giant monobanders and legal limit amps to compete against.

Mobile. My primary objective when purchasing the IsoLoop was to have convenient low band capabilities on my TS-680S when the six meter band went dead while I was miles from nowhere during some VHF contest. I had in mind some quick and simple mounting system that would not get in the way of my VHF/UHF beams. Discovered that a small roof tripod could be easily snapped on and off my vehicle's luggage rack, and that the 'Loop seemed to work well with only a five-foot mast. I finished a few test QSO's from my driveway, and the tripod looked solid, so I left it in place while taking the YL on a grocery run. Six bags later, I had worked three continents from the parking lot, and it would be nearly three months before I removed the tripod! I ran a few A/B comparisons with my previous set of mobile whips; soon I learned that the IsoLoop was hearing and being heard much better. Horizontal polarization may have had something to do with that, but the difference was dramatic while driving among the city's skyscrapers. A "freeway flutter" essentially disappeared, perhaps due to less flexible antenna configuration. Hint: That less-than-flexible configuration can be unforgiving on tree-lined side streets and country lanes. Drive verrrrrry(!) slowly under such circumstances.

Listening. Because it is omni-directional (when in a horizontal configuration) the IsoLoop can be a superb listening antenna, on the Short Wave bands as well as amateur bands. But tuning quickly across several bands requires patience and skill. I sometimes use a random wire with an A/B switch to "check the band" or to look for interesting signals between the bands. As soon as I find action on an interesting band, I switch to the 'Loop and tune for maximum signal strength. I've also learned that my six-meter antenna can sometimes work for spotting, finding interesting signals to work with the IsoLoop.

If you have hints or suggestions about the IsoLoop (or any of our products) that may help others enjoy it more, please write to us! In the case of the IsoLoop, there are so many different configurations and ways it can be used, we can't possibly try them all here. So, let us know what you're doing with *your* 'Loop!

2. FEATURES

The IsoLoop is a tuned loop antenna and consists of a band of aluminum (acting as a radiating inductor) with a stepping-motor-driven tuning capacitor mounted in series with the band. The LC combination is made to resonate at the chosen operating frequency. The loop has very high Q and the bandwidth is quite narrow, resulting in attenuation of any harmonics from the user's transmitter, or strong local signals from any adjacent transmitter.

Tuning is accomplished by controlling the stepping motor from a small remote control box called the LC-2 Loop Controller. It allows forward/reverse direction and speed control of the motor. An audio level indicator consisting of an array of 4 LEDs coupled with a sensitivity control pot allows easy visual tuning of the loop at resonance. A frequency indicator helps speed tuning by showing the current resonant frequency.

The IsoLoop is small in size, and is excellent in limited-space applications such as apartments or attics. It may be easily carried to remote locations.

Figure 1 shows that the IsoLoop may be mounted in either the horizontal (1b and c) or vertical (1a) plane. Vertical mounting allows the antenna pattern to be rotated with a rotator to "null" interfering signals. When mounted in the horizontal plane, the pattern is omni-directional. Ground radials are not necessary and the impedance is approximately 50 ohms when tuned to a chosen frequency — an additional antenna tuner is not necessary.

The IsoLoop design results in the loop antenna being *isolated* or decoupled from the feedline so the feedline does not become part of the radiating structure and distort the pattern. (This is the source of the "IsoLoop" name.) Another benefit is that the operator does not have RF in his operating environment — his (and the neighbor's) equipment is less likely to be interfered with.

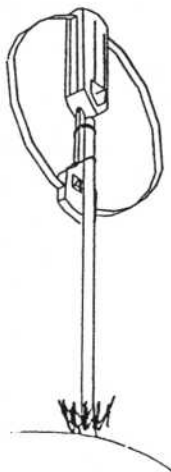


Fig. 1a

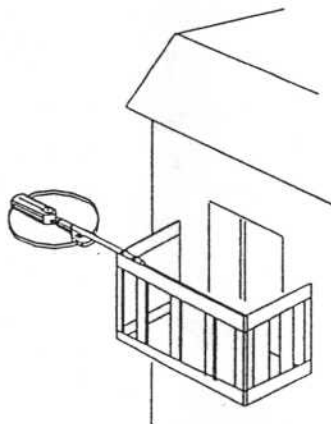


Fig. 1b

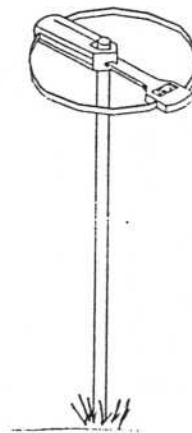


Fig. 1c

3. THEORY OF OPERATION

The IsoLoop antenna consists of a radiating LC series combination and resonates at the chosen operating frequency. It is inductively coupled to a shielded primary loop which is driven by the feedline from the radio. The main loop has very high Q and the bandwidth is quite narrow — approximately 10-100 kHz depending on the operating frequency.

The IsoLoop is an antenna where bandwidth has been traded off for efficiency, and as such, the gain of the antenna is comparable to that of a dipole. It works much better than a dipole at heights lower than a half-wave, and works much better indoors. It does not have quite the gain of a dipole in free-space, but most of us are not able to mount a dipole high enough to achieve free-space performance.

4. SPECIFICATIONS

Frequency Coverage	10 to 30 MHz
Nominal Impedance (tuned)	50 ohms
Power Rating	150 watts
VSWR	Less than 1.4:1 (no nearby objects)
Temperature Range	0 to 150° Fahrenheit operating -50 to 150° Fahrenheit storage
Dimensions	35" round, 38.8" housing
Max. Mast Outside Diameter	2"
Shipping Weight	25 pounds
Coax Connector	UHF (SO-239)
Gain	Approximately that of a dipole

5. UNPACKING INSTRUCTIONS

CAUTION: the aluminum band has been slightly compressed to fit snugly in the shipping carton. Carefully and slowly pull the assembly from the carton, keeping it at arm's length in the event it may try to spring back into its original shape. Remove all packing tape, then gently bend the band to a circular shape, if necessary (*note that the antenna's performance will not be significantly affected if the loop is out of round*). Be sure to keep the box and all packing materials.

Remove the packing tape from the control cable, then temporarily route the loose end to a location within a few feet of a 110 VAC electrical outlet.

Remove the LC-2 controller from its box.

Remove the AC-1 power transformer from its carton. Insert the end of the power cable into the outlet on the rear of the LC-2 marked "12 VDC". Then plug the AC-1 transformer into the AC outlet.

Turn the right hand circular switch on the front of the LC-1. You will feel a click as the power is switched on and you will also notice one or more LEDs will light.

Press one of the arrow keys. You should hear the motor turning inside your IsoLoop. Press the other arrow key to be sure the motor is turning in both directions.

Check the packing list on page 14 to verify that all additional parts are present; your IsoLoop is now ready for mounting.

6. MOUNTING THE ISOLOOP

Give careful consideration to the location you select for mounting your IsoLoop. The sketches on page 2 show some of the more conventional mounting arrangements, but use your imagination and ingenuity to determine one that will be best for your particular installation. You may wish to make a temporary installation initially in a location that is conveniently accessible, until you have had a chance to test its operation an the air. A step ladder or stool may be used as a temporary support.

As with most other antennas, mounting your IsoLoop may require you to make some choices relative to strength, safety, aesthetics, cost, etc.; here are some suggestions:

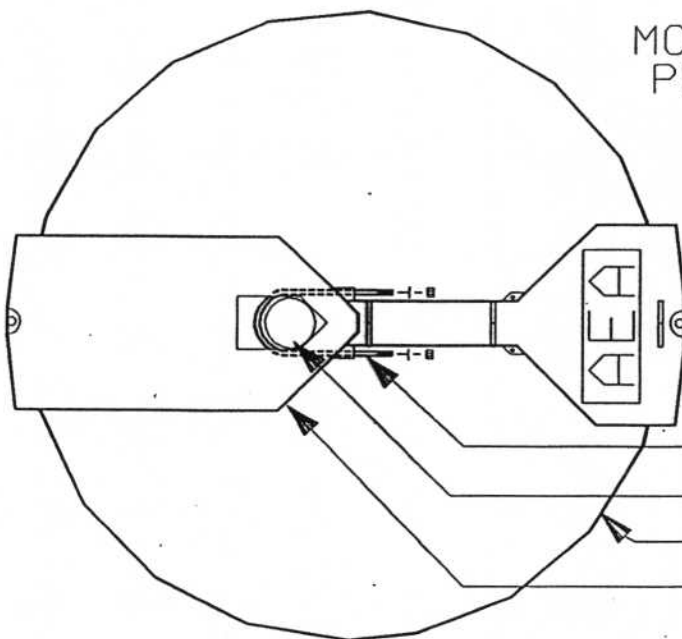
Mount your IsoLoop as high above the ground, your roof, other structures, etc. as is practical. Your IsoLoop will perform quite efficiently on a ten or fifteen foot mast, but additional height will usually improve performance.

Be sure the mast is secure. If it is more than twenty feet high, you may wish to consider guying it, depending on the highest wind speeds that may occur at your location. Think for a moment about where the IsoLoop could end up if the mast were to collapse under a "worst case" situation; could it damage a window? a skylight? an awning? Could it fall across power lines? telephone lines? cable TV lines? Keep your coax cable runs as short as practical. This may mean mounting your IsoLoop on that portion of your roof directly above your transceiver even if the other end of the roof is more accessible. Mount your IsoLoop as far as possible from other antennas, towers, masts, guy wires, utility lines, etc. When practical, mount it away from other non-conductive objects such as chimneys, trees, signs, flagpoles, etc.; these can attenuate signals on certain frequencies, particularly when they are wet or covered with ice or snow.

Take a moment to think about the visual impact of your IsoLoop on your neighbors' views. Even though the IsoLoop is one of the most aesthetically attractive antennas around, your non-ham neighbors may not see it that way. Will the rising or setting sun reflect from the loop directly into their picture windows? Will moving it a bit in one direction or another make it less visible? It might be worth a short visit to your neighbor(s) prior to mounting your IsoLoop; take along a magazine or catalog showing some massive beams, explain how you were thinking of them when you chose to put up this small, attractive antenna instead.

MOUNTING THE MAST PERPENDICULAR TO THE ISOLOOP

(AS SHOWN IN FIG. 1c)



VIEW FROM ABOVE

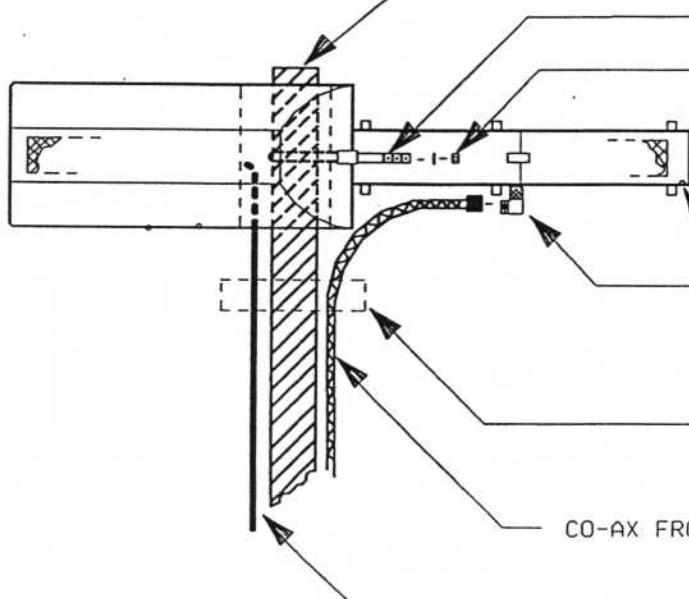
THE ISOLOOP IS SHIPPED WITH A U-BOLT MOUNTED IN THIS POSITION INSIDE THE SHELL.

MAST (USER SUPPLIED)

BAND

SHELL

PLACE THE MAST THROUGH THE U-BOLT SO THAT IT EXTENDS APPROXIMATELY 1 INCH ABOVE THE SHELL



SIDE VIEW

U-BOLT

TIGHTEN THE TWO NUTS, BRINGING THE MAST FIRMLY AGAINST BOTH EDGES OF THE SHELL.

DRAIN HOLES THIS SIDE

RIGHT ANGLE CO-AX ADAPTOR
NOTE: RIGHT ANGLE CO-AX ADAPTOR AND DRAIN HOLES MUST BE ON BOTTOM.

TAPE CO-AX AND CONTROL CABLE TO MAST EVERY FEW FEET STARTING WITH THIS POSITION.

CO-AX FROM RADIO

CONTROL CABLE TO LC-2

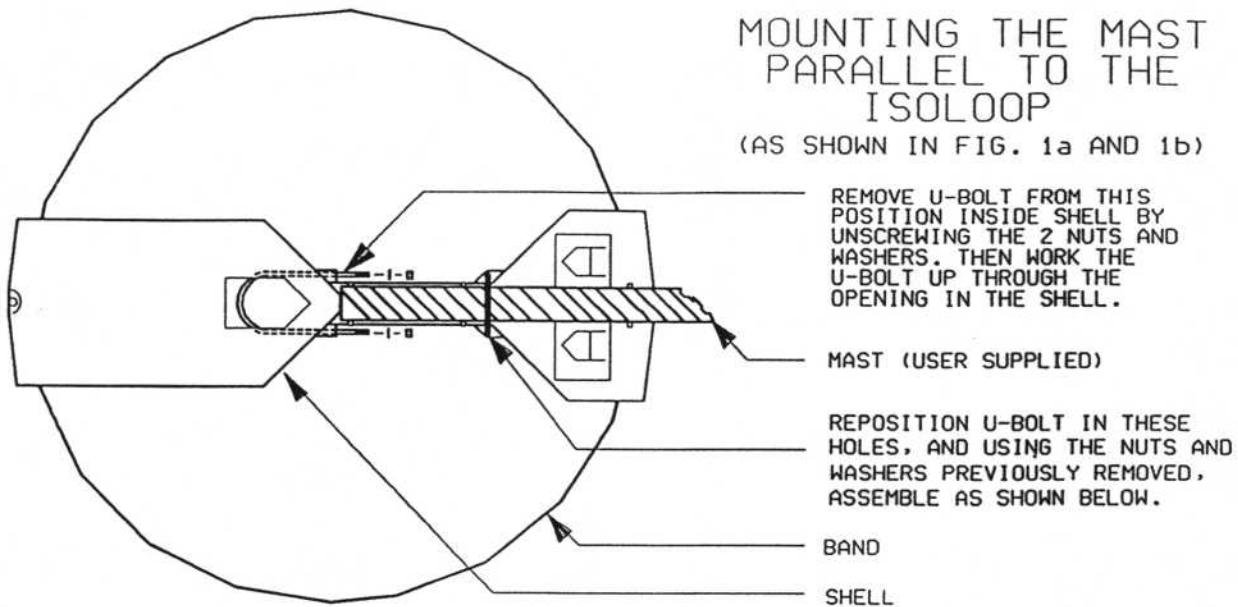
MAY BE TAPED TO OUTSIDE OF MAST AS SHOWN, OR LED DOWN INSIDE.

NOTE: SUPPLIED WORM CLAMP IS NOT USED FOR THIS CONFIGURATION

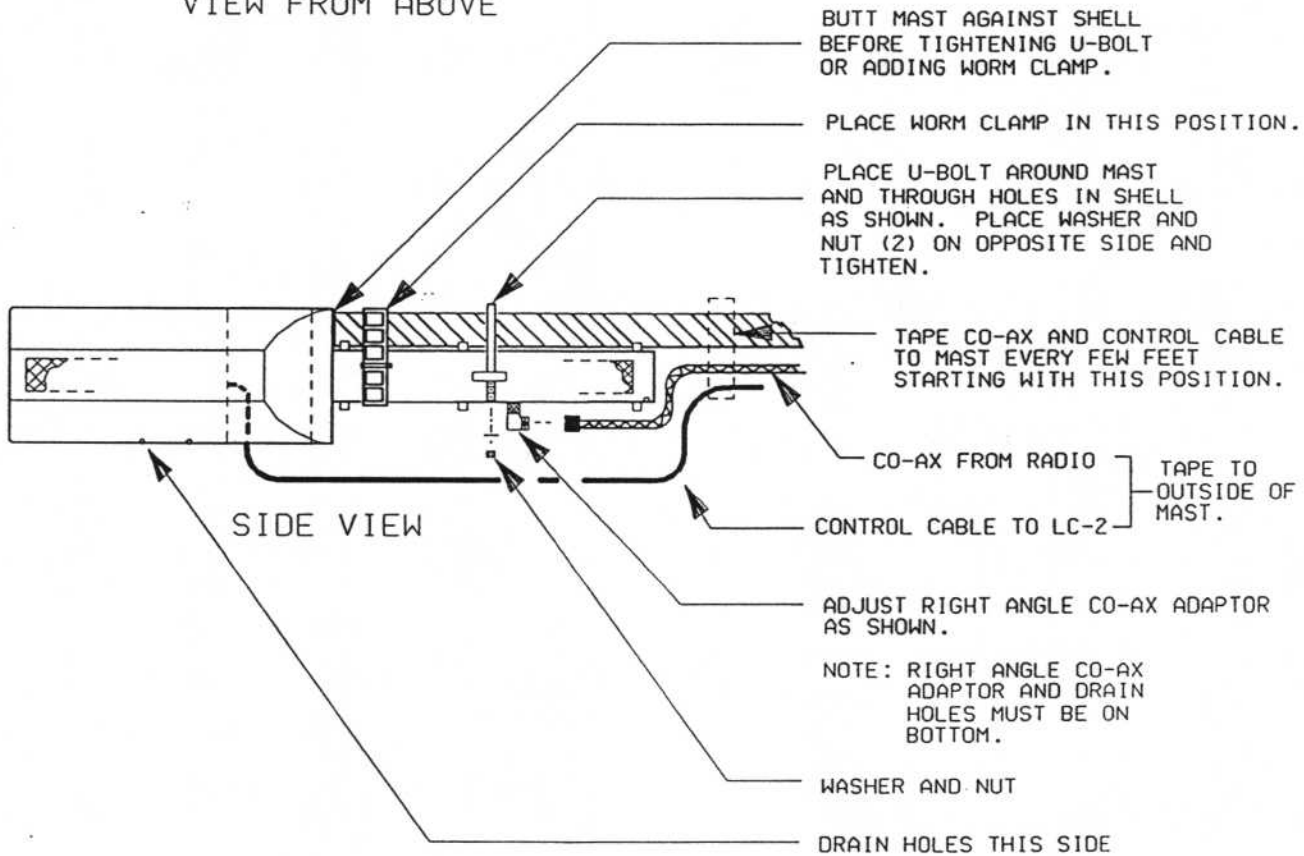
Fig. 2

MOUNTING THE MAST PARALLEL TO THE ISOLOOP

(AS SHOWN IN FIG. 1a AND 1b)



VIEW FROM ABOVE



SIDE VIEW

Fig. 3

Call your local building department to be certain you will not be violating any ordinances, and that you will not require any building permits. You might wish to ask about any rules applying to a "small television-type" antenna; this sounds much less intimidating than an "amateur radio" antenna and very few communities have unreasonably restrictive regulations regarding "television" antennas. Check your property deed, condominium agreement, rental agreement, etc. Find out if there are any restrictions before you install your IsoLoop; if someone calls these to your attention after it is installed it is quite likely they will be carefully watching if you move it to an alternate location. Consider the trade-offs of a concealed (inside an attic or beneath a balcony roof) installation vs. the potential for disgruntled landlords or neighbors.

There are two basic ways the IsoLoop can be mounted to the mast. The result is either horizontal or vertical polarization. If you mount the antenna such that its plane is parallel to the ground as in figures 1b and 1c, it will radiate a horizontally polarized signal with an omni-directional pattern, and a rotor is not necessary. You may mount the mast horizontally to a balcony railing as shown in figure 1b if you wish.

If you mount the antenna with its plane perpendicular to the ground as in figure 1a, it will radiate a vertically polarized, figure-eight pattern (looking down on the antenna) with maximum radiation being in the same plane as the antenna loop. You may use a small TV rotator in this case in order to null out received noise or interference sources that are in a direction perpendicular to the plane of the antenna loop. You may refer to the ARRL Radio Amateur's Handbook for description of antennas and some of the terms used above.

7. HOOK-UP

Install 50 ohm coaxial cable (RG-8, RG-8X or RG-58) between the IsoLoop and your transceiver. (As the IsoLoop is a very efficient, high Q antenna, best results will be achieved by installing new coaxial cable rather than using an existing one.) Use PL-259 connectors at the IsoLoop end. Refer to the ARRL Radio Amateur's Handbook for proper techniques for installing a PL-259, as this step is critical to proper operation of the IsoLoop antenna. The coax connector on the IsoLoop should be rotated so that the coax can be taped neatly to or run down the inside of the mast. Use the enclosed packet of COAX SEAL™ to waterproof the PL-259 connector and right-angle adaptor. Be sure to follow the instructions on the package.

Attach the motor control cable to the LC-2 Loop Controller which should be located adjacent to your radio.

Run the RF (coax) and control cables as close to the antenna shell as possible. Either run them down the inside of the mast or tape them securely to the mast every few feet. If 50' of control cable is not long enough, you may purchase a 50' extension either from us or from your favorite authorized dealer. Call (206) 774-1722 if you wish to order direct.

CAUTION — CAUTION — CAUTION

Because of the doughnut shaped pattern of the IsoLoop, there is a minimum field point in the center of the loop where the mast is mounted. It is VERY IMPORTANT that you follow the above directions as to the "dress" of the two cables. If they are allowed to simply "hang" vertically from the ends of the loop, they will pick up significant energy on the outside of the cable and distort the pattern and carry RF into your radio operating environment. For best results, the cables need to be kept as close as possible to the body of the antenna and mast, otherwise, your VSWR may be higher than it should.

The LC-2 controller has a signal strength indicator in the form of four LEDs on the front panel. This feature can help make tuning the antenna much easier by helping you determine when signal strength is maximum. To use this feature, you will need to run an audio signal to the LC-2 as follows: Hook up the supplied audio cable from your receiver's EXTERNAL SPEAKER output to either of the AUDIO jacks on the LC-2. Wire a 2-conductor cable to a monitor speaker using the 2-conductor jack included in the hardware package. Connect this cable to the other AUDIO jack on the LC-2. See figure 4.

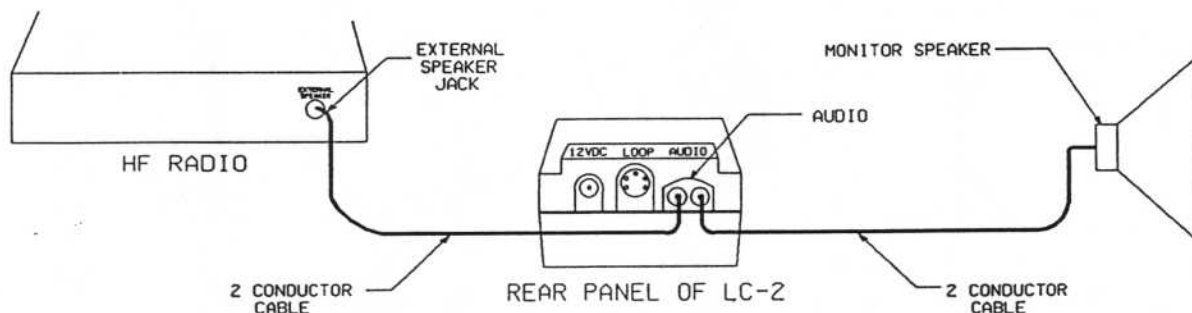


Fig. 4

8. FOR YOUR HEALTH AND SAFETY

Presently, there is not significant data on the hazards of long-term exposure to signals transmitted in the 10 to 30 MHz range. Some scientists do have concern and are studying the problem. It is always good practice to place any transmitting antenna as far away from humans as practical — you should try to maintain at least a 10 foot spacing.

CAUTION — CAUTION — CAUTION

Locate the IsoLoop so that NOTHING, especially living beings can come in physical contact with it under any transmit conditions. RF arcing and burns may result if the antenna is touched when transmitting, particularly at high power conditions.

The IsoLoop is a very high-Q device and as a result the RF circulating currents and the RF voltages may be quite high. DO NOT TOUCH THE ANTENNA WHILE TRANSMITTING !!!

9. LC-2 CALIBRATION

The LC-2's frequency indicator must be calibrated initially for proper operation. Perform the following procedure.

1. Tune your receiver to the 21 MHz band. Be sure that the LC-2 sensitivity control (SENS) is **not** fully to the right (counter-clockwise). A switch detent at full right (CCW rotation) disconnects one of the antenna stepper motor windings and prevents rotation of the motor. If the controller is not illuminated, move the speed (SPEED) control to the left (clockwise) to activate the power switch.
2. Tune the antenna using the LC-2 controller for maximum receiver noise (or signal) output. Now set the sensitivity control full right (CCW) until the switch clicks to the OFF position. Operate the LC-2 direction control(s) until the dial indicates 21.
3. Operate the sensitivity control to the left (CW) until the switch clicks on.
4. Tune your receiver to either the 28 MHz or 14 MHz band. Tune the antenna with the LC-2 for maximum noise or signal, ignoring the frequency wheel indication. If, once tuned, the dial indication is correct for the band (or very close to it), the calibration is complete.

If the dial is showing the wrong band, again move the sensitivity switch to the right until the switch clicks. Operate the LC-2 directional control that moves the frequency wheel initially away from the 21 MHz band until the frequency you have chosen again appears in the window. The frequency indication will have to continue past the end of the antenna frequency range (either 10 MHz or 30 MHz) and back to your chosen band. You may pass 21 MHz. Now operate the sensitivity switch to the left (clockwise). The calibration is complete.

10. OPERATION

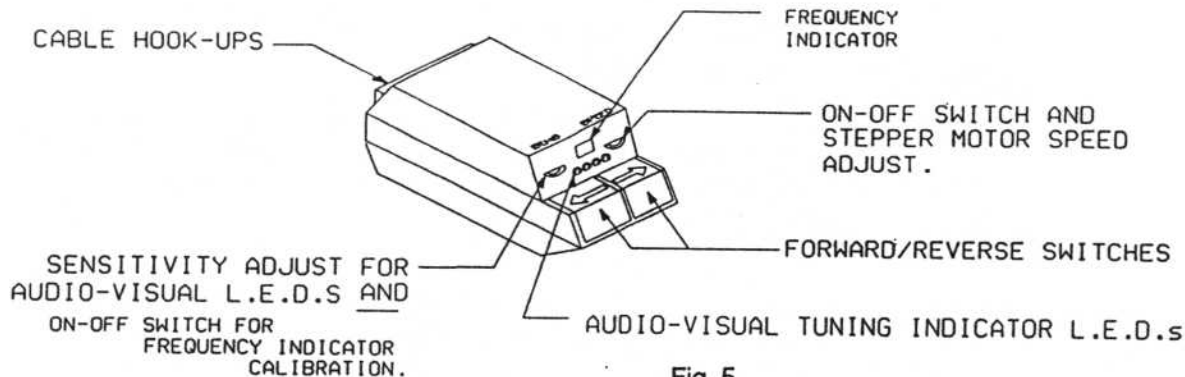


Fig. 5

DO NOT USE AN ANTENNA TUNER WITH THE ISOLOOP. ALSO, IF YOUR TRANSCEIVER HAS A BUILT IN OR AUTOMATIC TUNER, TURN THAT FUNCTION OFF BEFORE USING THE ISOLOOP.

Turn your transceiver on and tune the receiver to a frequency in the 10 to 30 MHz range.

Turn the SPEED control of the LC-2 to the inside (see Figure 5). As the switch clicks, the pilot light should flash. Just beyond the switch click is the high speed position. Further rotation to the left or inside will decrease the speed of the stepper motor. The relative speed of the stepper motor is indicated by the rate at which the pilot light flashes.

There are basically two ways to tune your IsoLoop antenna: By maximum signal on receive (as indicated by noise level from your receiver's speaker or by the number of LEDs lit on the LC-2) and by minimum SWR on transmit (as indicated by either lowest SWR or highest forward power). Depending on your transceiver, one of these methods may be more effective than the other; it is likely, however, that you will use the received signal to rough tune and the SWR to fine tune.

Start with the SPEED control just to the left of the switch click. Press and hold either of the arrow keys until the frequency indicator displays the correct frequency.

With the volume control in your receiver turned up so you can hear receiver noise, press one of the arrow keys. You will notice an increased noise level as the antenna tunes through resonance. The LED array on the front of the LC-2 will light during resonance as well. The noise will peak and subside very quickly.

- The sensitivity of the LEDs can be adjusted by turning the "SENS" knob on the left side. Just beyond the switch click is maximum sensitivity. Further rotation to the right will decrease sensitivity to audio noise. Set this control to about 50% rotation for the initial tests, then readjust it for normal operation: Set the control so that the fourth LED just comes on with the highest "S" meter reading. The setting will vary when you change the audio gain level on the receiver.

After hearing the noise peak, turn the SPEED control to a lower speed and alternate pressing the arrow keys until you arrive at the peak noise point. If you wish to transmit, use lowest possible power and adjust for minimum SWR.

You should be able to realize 1.2 – 1.5:1 VSWR if the antenna is in "free space" - i.e. not in an attic or near a house wall where the VSWR might become 2:1 or worse. However, the net effect of a non-perfect VSWR is to cause some of the power to be lost in the cable. You will find that antenna performance (measured by the ability to hear and be heard), is not very sensitive to VSWR differences — it is much more sensitive to correct tuning. In addition, your transceiver may not "like" the reflected power associated with a high VSWR.

If you have to locate the antenna near metallic objects, you may want to adjust the primary loop closer or farther from the aluminum band for minimum SWR on your favorite frequency. The primary loop is the length of coax located in the small part of the antenna shell, and its position can be adjusted by first separating the two halves of the antenna shell, then moving the primary loop to a different notch.

11. TROUBLESHOOTING AND SERVICE

LOOP CONTROLLER DIAGNOSIS

If the dial light does not light when power is applied, take the cover off the LC-2 and examine the fuse. Replace with a one amp fuse if necessary.

Before applying power after replacing the fuse, check to see if the power cable is polarized properly. The center pin on the power connector should be connected to +12 VDC. The included AC-1 power supply is wired properly.

If the LC-2 power indicator lights, but you do not get any indication that the motor is turning the tuning capacitor in the antenna (as indicated by a series of audible pulsations in the antenna or changes in the receiver noise level), then you will need to take the housing apart to expose the tuning capacitor assembly.

Remove the three 1/4" clamp screws and remove the top half of the housing. (The lower half has drain holes).

Operate the arrow keys on the LC-2 and see that the center part of the tuning capacitor slowly rotates. If the motor doesn't turn, check the continuity of the loop controller cable. If the motor turns, but the capacitor doesn't, the gear may be jammed, loose, or slipping.

RETURN TO FACTORY PROCEDURE

If the IsoLoop must be sent in for repair, we will give you a Return Merchandise Authorization (RMA) number over the telephone. Including this number with your returned items allows us to better track your unit with our computer, so we can tell you its exact status at any moment.

Send your equipment by UPS to our street address — not the post office box number. The street address is:

AEA, Inc.
2006 196th St. SW
Lynnwood, WA 98036
USA

We will need your STREET address for UPS return — be sure to send it.

UPS Brown takes seven to ten working days each way, depending on distance and Blue takes two to three days. Red is an overnight service and is expensive. Send the antenna in a way that it can be traced if we cannot verify receipt of shipment. We suggest UPS or insured postal shipment.

If the antenna is still under the original owner's warranty, AEA will pay the cost of the return shipment. The current policy is that it will be returned UPS Brown if received Brown or by US Mail; returned UPS Blue, if received Blue or by any overnight or express service; or returned as the owner states in his letter if he furnishes the return cost for the method he selects.

If the IsoLoop is out of warranty, it will be returned by UPS Brown COD unless: 1) It was received UPS Blue/Red in which case it will go back UPS Blue COD cash, or 2) If you designate billing to VISA or MASTERCARD, or 3) you enclose personal check endorsed not to exceed \$100, or 4) you specify some other method of return.

Typically, we will service the product in about five working days if we have all the facts. If we must call you, it may take longer. PLEASE, if you send the IsoLoop, include a letter stating the problem and where you can be reached during our business hours. If you can be reached by phone in the evening on the East Coast, let us know the number. Our flat rate for non-warranty service on the IsoLoop is \$70, including shipping. AEA is not responsible for damage such as caused by lightning, non-professional alterations, poor storage/handling, etc. See page 12.

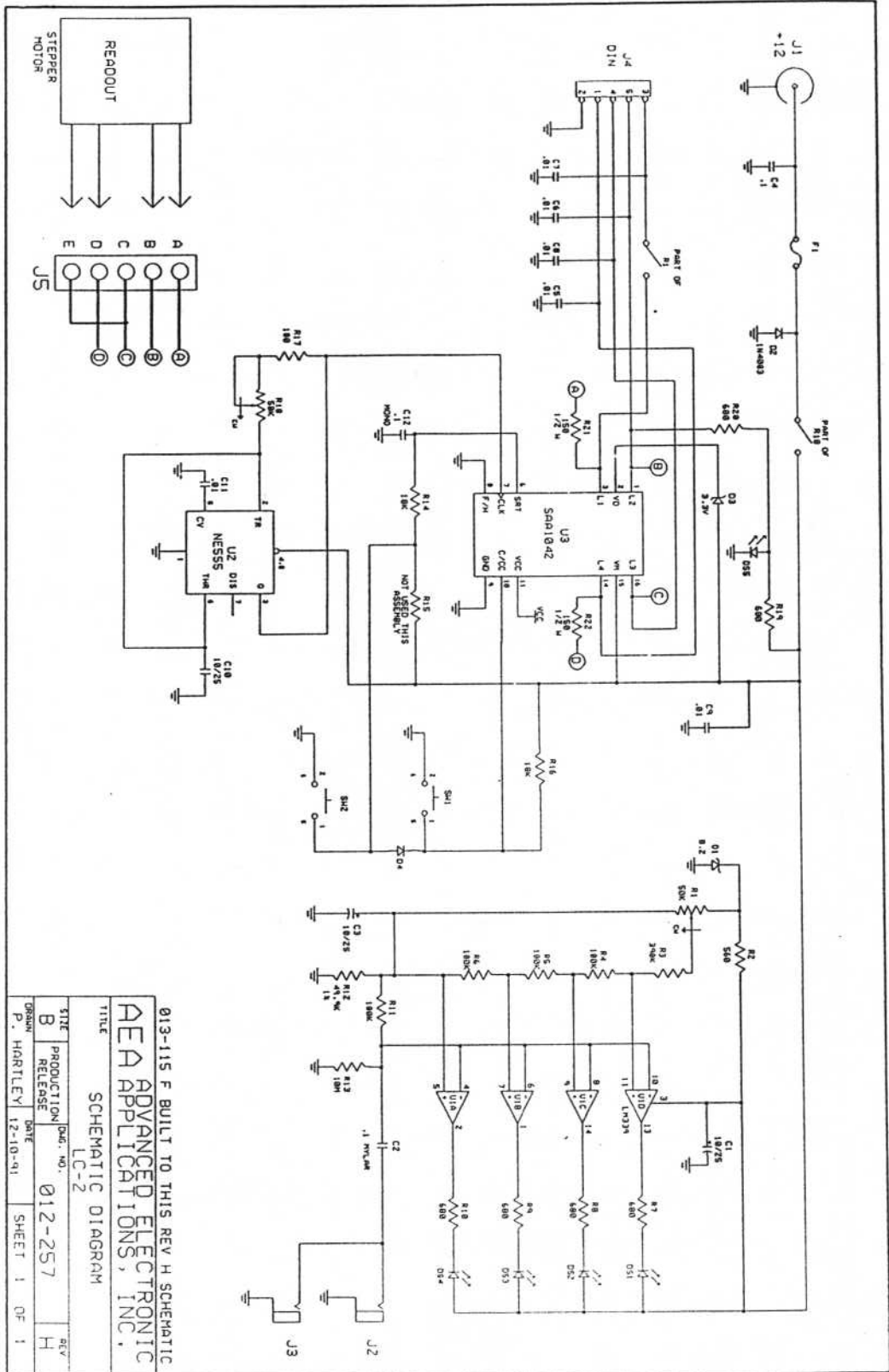
Should your warranty card not be on file at AEA, you need to send proof of the purchase date to receive warranty service. Typically a copy of your bill of sale from an AEA dealer will suffice.

The warranty is for the original owner only and is not transferable.

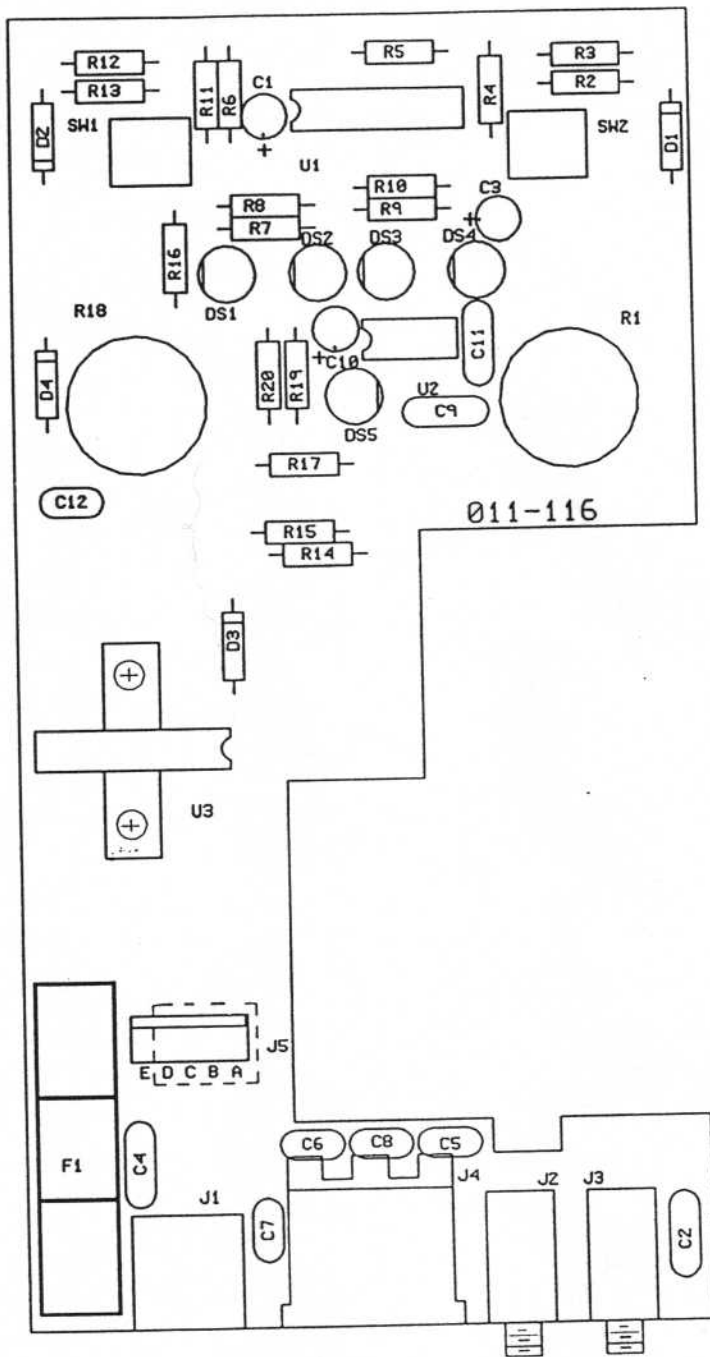
12. PACKING LIST

IsoLoop 10-30 Antenna with U-Bolt, nuts & washers; 50' LC-2 Control Cable
LC-2
AC-1 Power Supply
Worm Clamp
Coax-Seal® Hand-Moldable Plastic
2-Conductor Audio Cable
Warranty Card

13. LC-2 SCHEMATIC DIAGRAM



14. LC-2 PARTS PICTORIAL



15. WARRANTY

LIMITED WARRANTY

ADVANCED ELECTRONIC APPLICATIONS, INC. warrants to the original purchaser that this product shall be free from defects in material or workmanship for one year from the date of original purchase. In order to obtain warranty service: 1) Complete and mail the warranty registration card within 10 days to Advanced Electronic Applications, Inc., and 2) Send written notification to the address below or telephone as soon as possible after discovering a possible defect:

Advanced Electronic Applications, Inc.
Attention: Service Department
2006-196th St. S.W.
Lynnwood, WA 98036
(206) 775-7373

The written notification must include a copy of the invoice. Include a description of the defective part or condition, with details of the electrical connections to associated equipment and list such equipment. Please enclose your name, phone number, and address. Shipping charges for any parts or units submitted for replacement under this warranty must be paid by the purchaser.

Correct maintenance, repair and use are important to insure proper performance from this product. Carefully read the Instruction Manual. This warranty does not apply to any defect AEA determines is caused by 1) Improper maintenance or repair, including the installation of parts or accessories that do not conform to the quality and specification of the original parts; 2) Misuse, abuse, neglect, or improper installation; 3) Accidental or intentional damage. The field installation of circuits according to the explicit instructions of AEA will not nullify this warranty.

All implied warranties, if any, terminate one year from the date of original purchase. AEA is not responsible for damage to other equipment or property or any other consequential damages. Some states do not allow limitations of how long an implied warranty lasts or do not allow the exclusion of incidental or consequential damages, therefore, the above limitations and exclusions may not apply to you.

This warranty gives specific legal rights. You may also have other rights which vary from state to state.

part # 040-065
September 1992
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