
IsoLoop™ HF Antenna 14/30
IsoLoop™ Loop Controller LC-1

Assembly / Operating Manual



Part Number 040-801
April 1990
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FOREWORD

Congratulations on your purchase of the AEA IsoLoop™ antenna. It will provide you surprising performance in a compact and lightweight package.

To fully enjoy the benefits of the IsoLoop, please read this manual carefully before operating the antenna. If you have questions, I encourage you to contact an AEA authorized dealer or one of our technical support representatives at:

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P.O. Box 2160, 2006-196th Street
Lynnwood, WA 98036-0918
Tel: (206)775-7373
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Electronic Bulletin Board: (206)672-8989

73,

C. Mike Lamb, N7ML
President
Advanced Electronic Applications, Inc.

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1. FEATURES

The IsoLoop is a tuned loop antenna and consists of a rectangular loop of aluminum tubing with a stepping motor-driven tuning capacitor mounted in series with the loop. 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-1 Loop Controller. It allows forward/reverse and speed control of the motor.

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

The IsoLoop may be mounted in either the horizontal or vertical plane, the latter allowing the pattern to be rotated with a rotator to allow nulling interfering signals. See Figure 1.

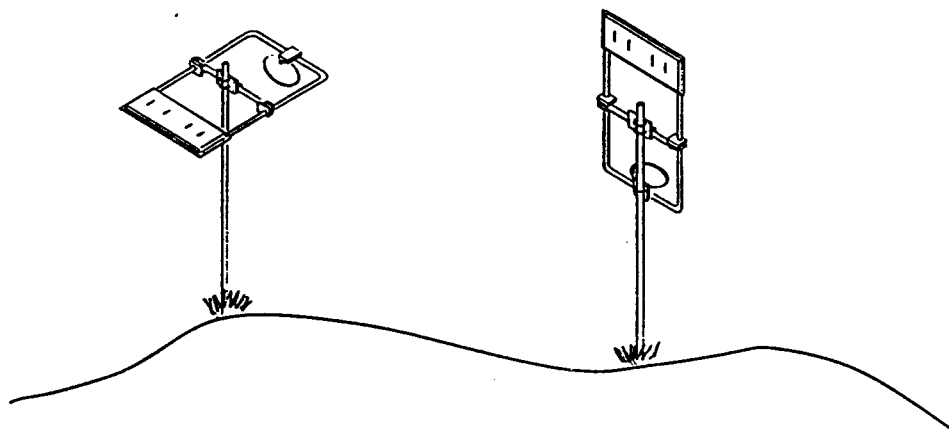


Figure 1 Horizontal and Vertical Plane Mounting

When mounted in the horizontal plane, the pattern is omni-directional. Ground radials are not necessary and the impedance is approximately 50 ohms - an additional antenna tuner is not necessary. See Figure 1.

The IsoLoop design results in the 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.

2. THEORY OF OPERATION

The IsoLoop antenna consists of a series radiating LC 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 band.

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 work as well as a dipole in free-space, but then most of us are not able to mount a dipole high enough to achieve free-space performance.

3. SPECIFICATIONS

Frequency Coverage	14 to 30 MHz
Nominal Impedance	50 ohms
Power Rating	150 watts
VSWR	Less than 1.4:1 (no nearby objects)
Temperature Range	0 to 50 degrees Centigrade operating *, -50 to 60 degrees Centigrade storage
Dimensions	32 inches square
Max. Mast Outside Diameter	1-1/4 inches
Shipping Weight	12 pounds
Coax Connector	UHF (SO-239)
Gain	Approximately that of a dipole

*Because the IsoLoop is such an extremely high-Q antenna, its performance will be degraded by accumulations of snow. Also, freezing weather preceded by heavy moisture may result in temporary inoperation of the tuning mechanism.

4. ASSEMBLY INSTRUCTIONS

Loosen the screw (5) at each end of the fiberglass Center Bar (4) and insert the Motor Section (6) and Coupling Loop (1) tubes as shown in Figure 2. Do not loosen the screws so much that the assembly comes apart. Tighten the screws after fully seating the Coupling Loop and Motor Section tubes.

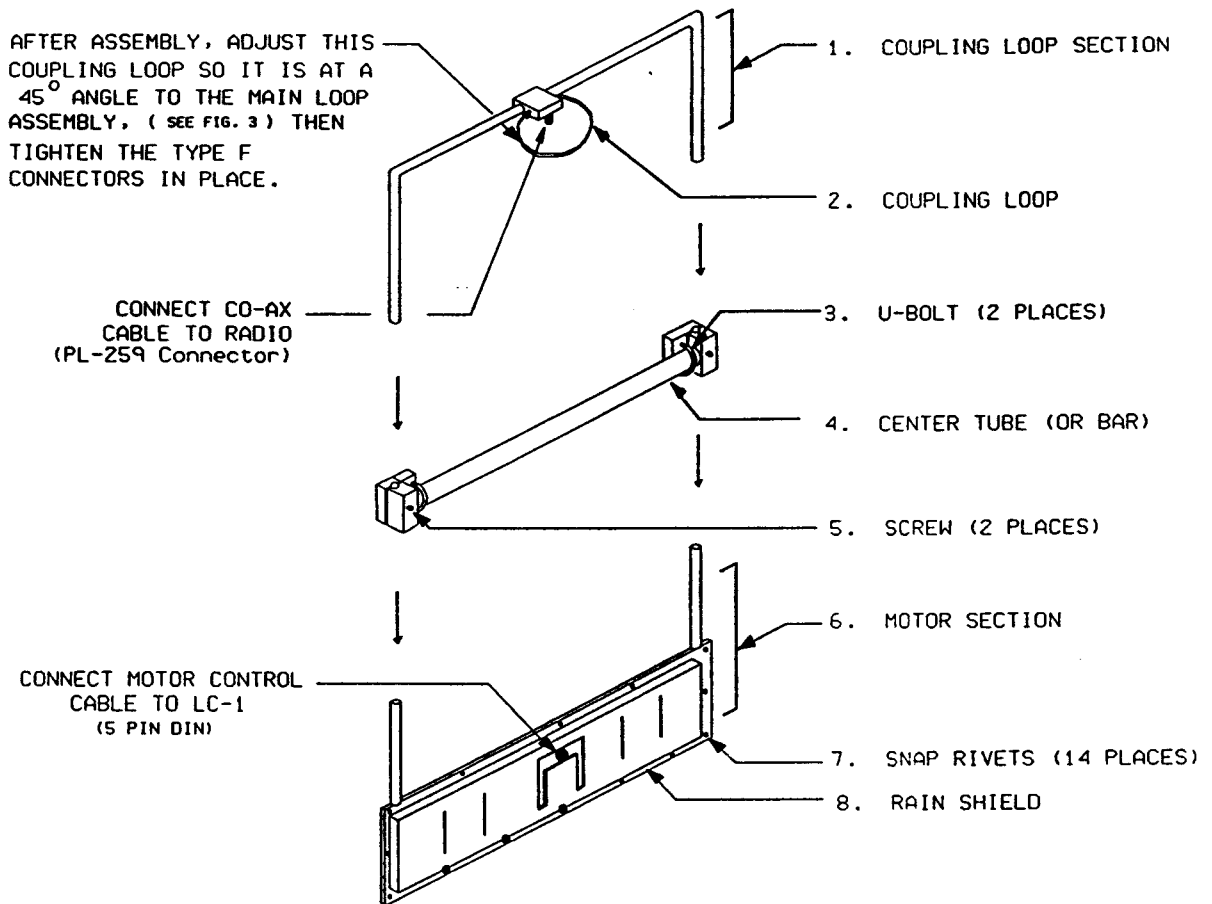
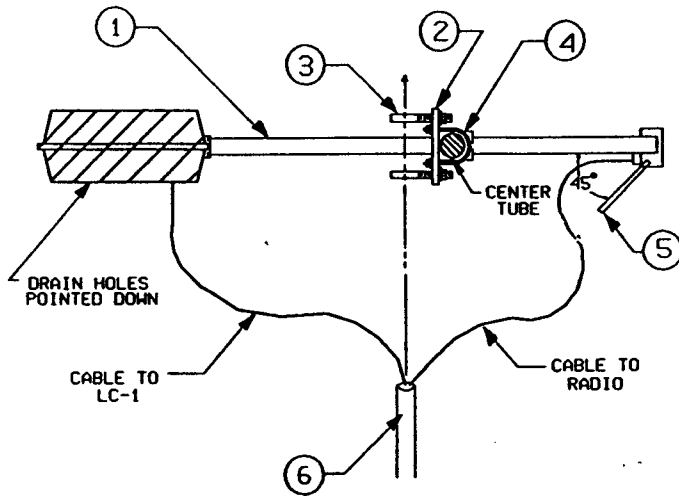


Figure 2 Assembly of IsoLoop

It would be a good idea to coat the outside of any of the plastic parts on the IsoLoop with a good "ignition wire sealant" like Krylon™ spray to extend the ultra-violet protection from sunlight.

Open the hardware pack, and assemble the Large Bracket (2) for either horizontal or vertical mounting. See Figure 3.



**HORIZONTAL MOUNT
CUT AWAY SIDE VIEW**

- 1. LOOP ASSEMBLY
- * 2. LARGE BRACKET
- 3. LARGE U-BOLT (2 PLACES)
- 4. SMALL U-BOLT (2 PLACES)
- 5. COUPLING LOOP
- 6. MAST (STANDARD TV MAST USER SUPPLIES)

* NOTE: FOR HORIZONTAL MOUNT THIS LARGE BRACKET IS PERPENDICULAR TO THE MAIN LOOP ASSEMBLY.

**VERTICAL MOUNT
CUT AWAY SIDE VIEW**

- 1. LOOP ASSEMBLY
- * 2. LARGE BRACKET
- 3. LARGE U-BOLT (3 PLACES)
- 4. SMALL U-BOLT (2 PLACES)
- 5. COUPLING LOOP
- 6. MAST (STANDARD TV MAST USER SUPPLIES)
- 7. SMALL BRACKET
- 8. 1/4" BOLT
- 9. 1/4" LOCK WASHER

* NOTE: FOR VERTICAL MOUNT THIS LARGE BRACKET IS PARALLEL TO MAIN LOOP ASSEMBLY.

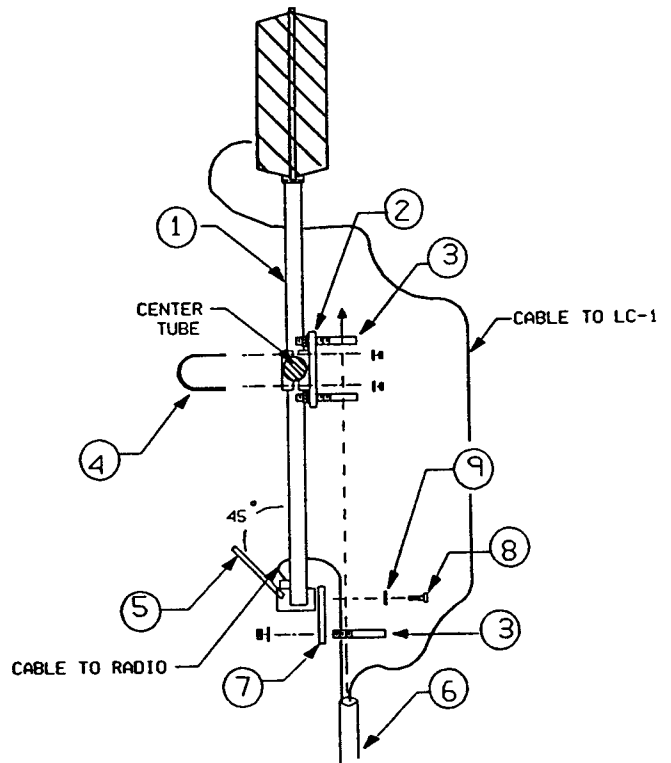


Figure 3 Horizontal and Vertical Mounting Details

5. MOUNTING THE ISOLOOP

After you have followed the assembly instructions of the IsoLoop, you need to select a site to install the antenna. You may wish to first mount the IsoLoop antenna on a temporary mast (before you mount it somewhere less accessible) in order to familiarize yourself with its operation.

CAUTION CAUTION CAUTION

The Center Bar of the IsoLoop is fiberglass and is tubular in cross section. Be very careful not to over-tighten the U-Bolts securing it to the supplied mounting plate as **YOU WILL CRACK IT**. Use just enough tightening torque on the U-Bolt nuts to keep the plane of the antenna from changing as you try to rotate it by tugging on the end of the loop. Try to tug **ONLY** as hard as you think the wind might "tug" on it later. If the Center Bar is rectangular in cross section, it secures to the mounting plate (angle bracket) with screws and this caution is not pertinent.

Use the supplied larger U-Bolts to fasten the mounting plate to the mast in whatever orientation you choose.

If you mount the antenna such that its plane is parallel to the ground, it will radiate a horizontally polarized signal with an omni-directional pattern.

See also Figure 4 for two methods of mounting in the horizontal plane. You may mount the mast horizontally to a balcony railing if you wish.

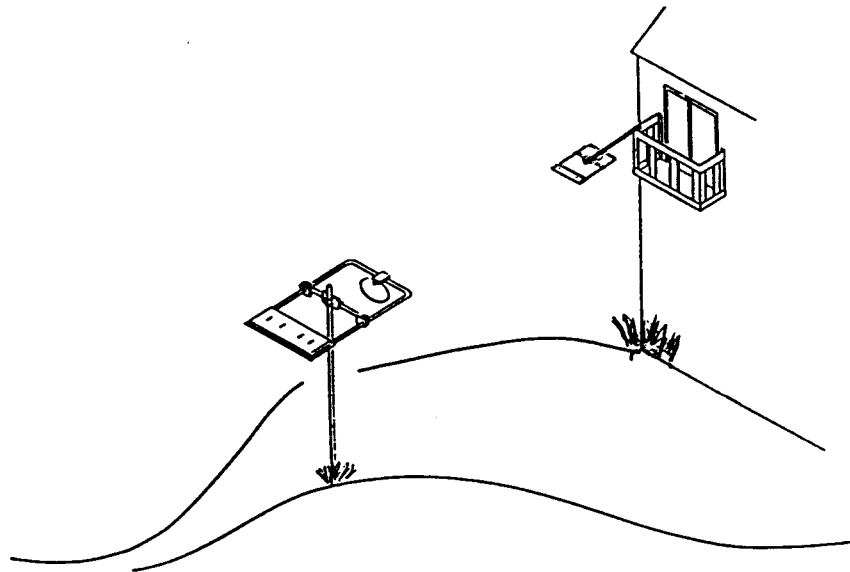


Figure 4 Alternate Horizontal Plane Mounting Methods

If you mount it such that its plane is perpendicular to the ground, 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 (see Figure 6a). 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. See Figure 5.

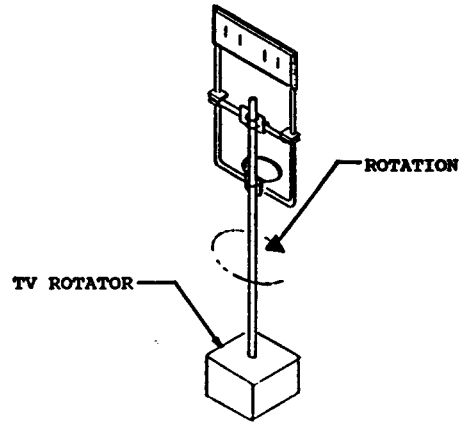


Figure 5 TV Rotator Usage for Vertical Plane Mounting

You may refer to the ARRL Radio Amateur's Handbook for description of antennas and some of the terms used above.

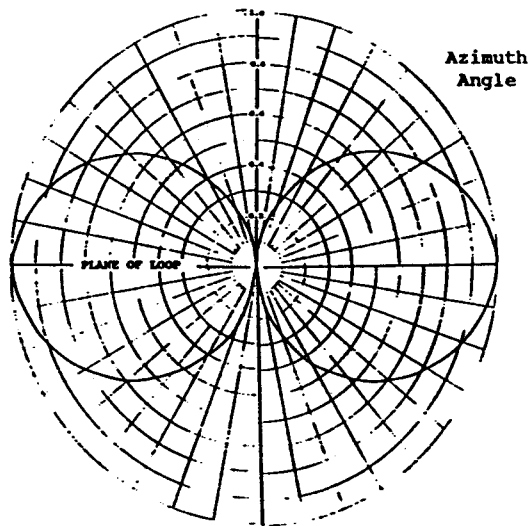


Figure 6a E Field Pattern for Vertical Plane Mounting

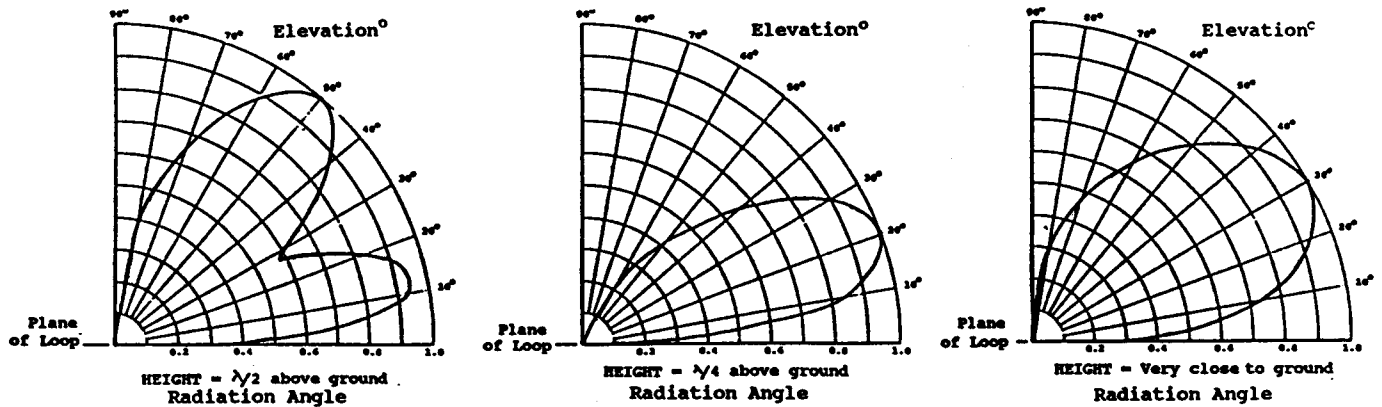


Figure 6b Field Patterns for Horizontal Plane Mounting

6. HOOK-UP

Purchase and install 50 ohm coaxial cable (RG-8 or RG-58) between the IsoLoop and your transceiver. 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.

Run the cable directly to the top of the supporting mast, and preferably down the center of the mast. If you run it down the outside of the mast, tape it securely to the mast top and every few feet. SEE THE CAUTION ON THE NEXT PAGE.

You should also use good quality waterproofing (such as COAX SEAL™) to waterproof the PL-259 connector.

Purchase a 50 (ILC-50) or 100 (ILC-100) foot assembled LC-1 cable from AEA, (or make your own cable using a four conductor cable, preferably with a shield).

Two five-pin DIN connectors are included with the IsoLoop in the event you make your own cable. Wire the cable as shown in Section 12.

Install the motor control cable between the antenna and the LC-1 Loop Controller which should be adjacent to your radio. Run the cable inside the mast directly to the top. SEE THE CAUTION BELOW.

You should also use good quality waterproofing (such as COAX SEAL™) to waterproof the DIN connector.

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.

Plug the included AEA 12 VDC Model AC-1 wall transformer into a wall outlet and connect the coaxial power connector to the LC-1 Loop Controller. (Antennas shipped to the "Export Market" do not include an AC-1.) The motor and the LC-1 will draw about 0.5 ampere worst case at 12 VDC. The center pin of the LC-1 coaxial power connector is positive voltage.

7. BIOLOGICAL CAUTIONS

Presently, there is not significant data on the hazards of long-term exposure to signals transmitted in the 14 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 living beings **MAY NOT** 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. You may draw an arc from the antenna if you touch it while transmitting - **PLEASE DON'T !**

8. OPERATION

Turn your transceiver on and tune the receiver to a frequency in the 14 to 29.7 MHz range.

Turn the **SPEED** control fully clockwise (fastest). With the volume control in your receiver turned up so you can hear receiver noise, press the **FORWARD/REVERSE** switch to the **FORWARD** position. You will notice an increased noise level as the tuning goes through resonance. The noise will peak quickly and subside.

After hearing the noise peak, turn the speed control to a lower speed and alternate between REVERSE and FORWARD switch positions until you arrive at the peak noise point. If you wish to transmit, just adjust for minimum SWR.

If you have a favorite band, (after slightly loosening the F connectors) the coupling loop may be rotated for lowest VSWR. The 45 degree position is the best position for full frequency coverage when the antenna is clear of nearby objects (see the drawing in Figure 3). This positioning will be affected by the immediate environment of the antenna.

The coupling loop if rotated in such a way that it is in the same plane as the main loop, and is also inside the main loop, will exhibit minimum VSWR at the 10 meter end of the band. If it is rotated to where its plane is orthogonal to the main loop plane, it will result in minimum VSWR at the 20 meter end of the band. The compromise setting will be halfway between at 45 degrees, as described above.

You will notice that the antenna tuning will change by 15-20 kHz as a function of temperature or dew or rain. The effect of these variables will be slightly more at one end of the band coverage than the other. If you leave it set for long periods of time, you may wish to retune it slightly each time you use your station.

You should find the tuning quite stable as a function of vibration and wind.

You should be able to realize 1.2 to 1.5 to 1 VSWR if the antenna is in "free space" - i.e. not in an attic or near a house wall where it might become two to one 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. And your transceiver may not "like" the reflected power associated with a high VSWR.

9. TROUBLESHOOTING AND SERVICE

RETURN TO FACTORY PROCEDURE

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

If you send it by UPS, it must be sent to the 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 and send it.

UPS Surface (Brown Label) takes seven to eight days, 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 Brown, if received Brown or by US Mail; returned Blue, if received Blue or by overnight 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, or 2) If you designate billing to VISA or MASTERCARD, or 3) you enclose a BLANK personal check endorsed not to exceed \$—, 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. 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 currently \$50. Shipping is extra. AEA is not responsible for damage such as caused by lightning, nonprofessional alterations, poor storage/handling, etc.

Should your warranty card not be on file at AEA, you need to send the proof of 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.

COLD CLIMATE OPERATION

Because the IsoLoop is such an extremely high-Q antenna, its performance will be degraded by accumulations of snow. Also, freezing weather preceded by heavy moisture may result in temporary inoperation of the tuning mechanisms.

LOOP CONTROLLER DIAGNOSIS

If the Loop Controller LED does not light when power is applied, take the cover off the LC-1 and examine the fuse. Replace with a one amp fuse if necessary.

Before applying power after replacing the fuse, check the following:

Is the power cable polarized properly? The center pin on the power connector should be connected to +12 VDC. This should not be a problem if you are using an AEA model AC-1 wall supply (supplied in U.S. and Canadian markets only).

Is the motor control cable wired properly? Recheck the instructions, making sure you do not have any shorts between conductors or to the shell.

After you are satisfied there are no hook-up problems remaining, reapply power to the LC-1. If the LED power indicator does not light, then you will have to contact the factory or your country's distributor for instructions on how to proceed.

If the LC-1 power indicator lights, but you do not get any indication that the motor is turning the variable 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 Rain Shield apart to expose the antenna capacitor assembly.

It is possible that the antenna can be made temporarily inoperative by rough handling during shipping. This can cause the stepper-motor, drive belt or tension spring to disconnect. This can be confirmed by moving the antenna and hearing a loose object inside the rain shield.

To gain access to the tuning unit, remove the 14 black plastic snap rivets from the edges of the rain shield. See Figure 7. To do so, press on the smaller end of the rivet using a key or other small tool. The larger end of the rivet will move away from the rain shield material by a couple of millimeters leaving you room to grasp its edges with your thumb and forefinger and remove the entire two-piece rivet.

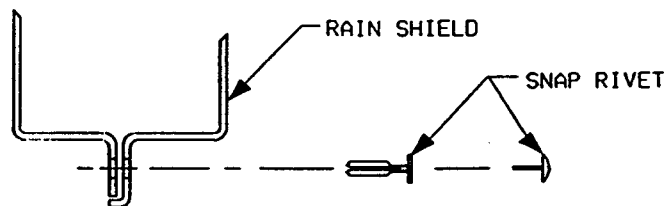


Figure 7 Snap Rivet Removal or Installation

CAUTION CAUTION CAUTION —

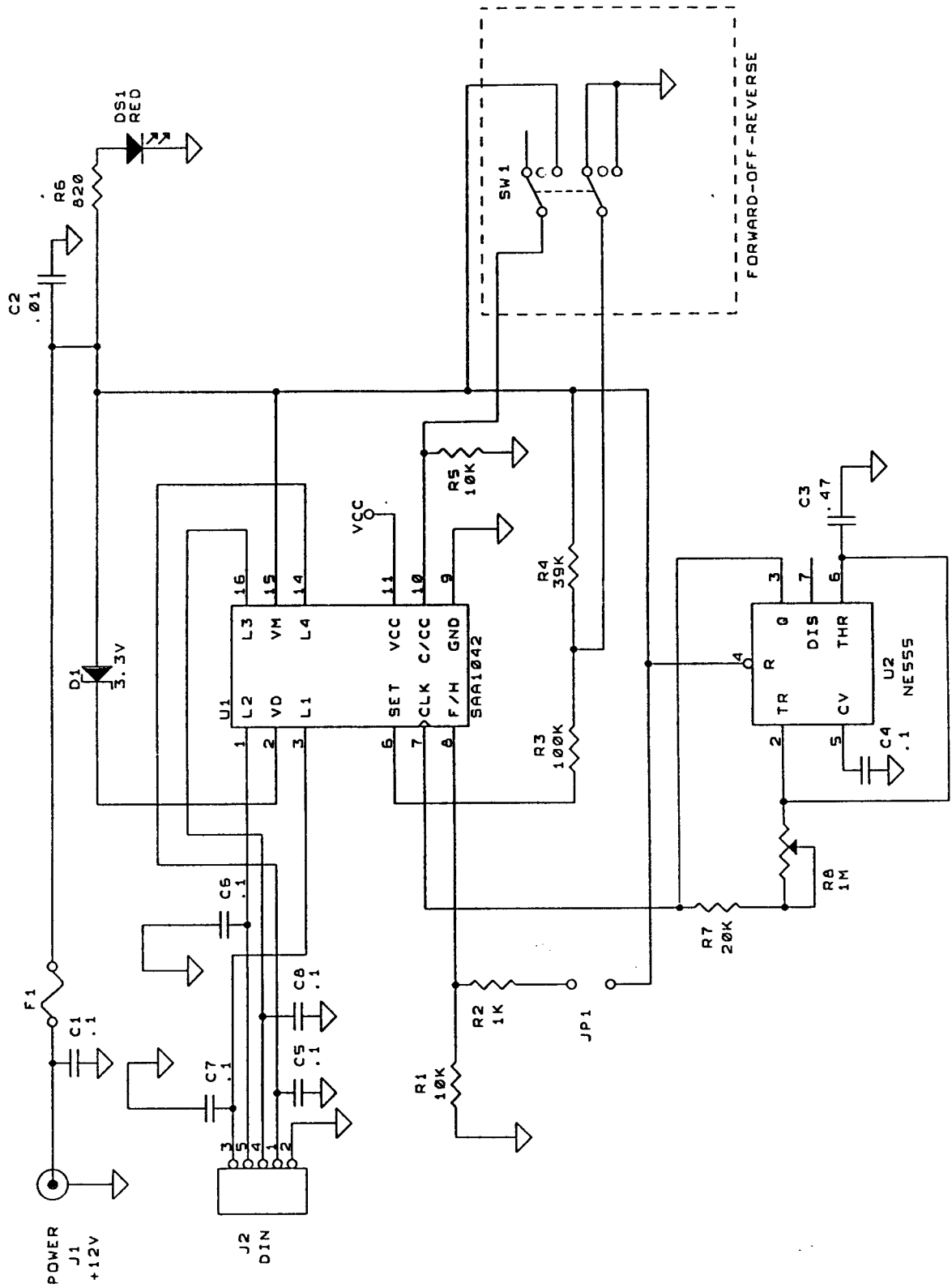
BE CAREFUL The removed rivet consists of two parts - make sure you do not lose either one as you will need to reinsert them on reassembly.

After removing the rivet, detach the top rain shield from the assembly and replace the drive belt. It goes over the large drive pulley and the motor drive shaft. Also, make sure the motor tension spring is connected properly.

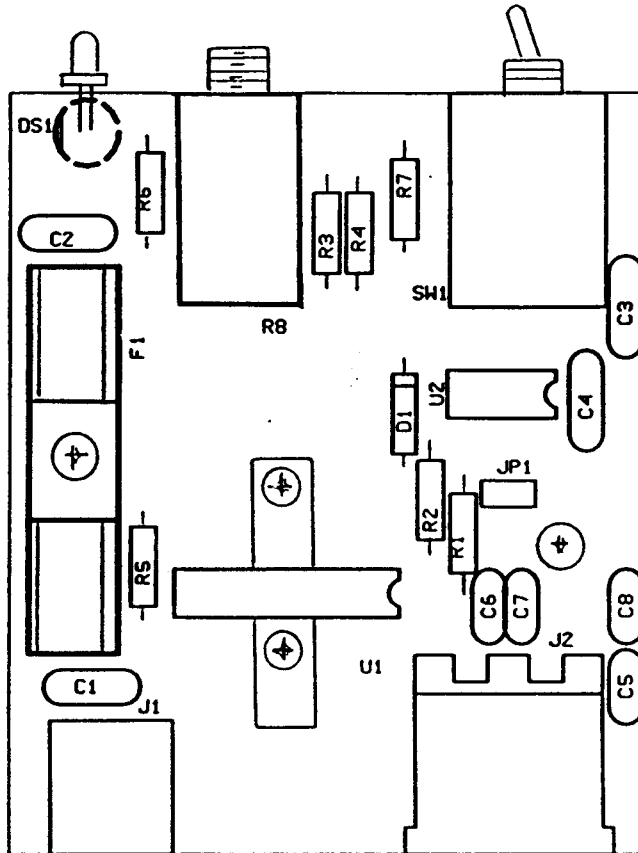
Before replacing the rain shield cover, and with the LC-1 and motor control cable installed, test the system to ensure the motor properly drives the tuning capacitor at various speeds and in both directions.

Replace the top rain shield cover using the original rivets.

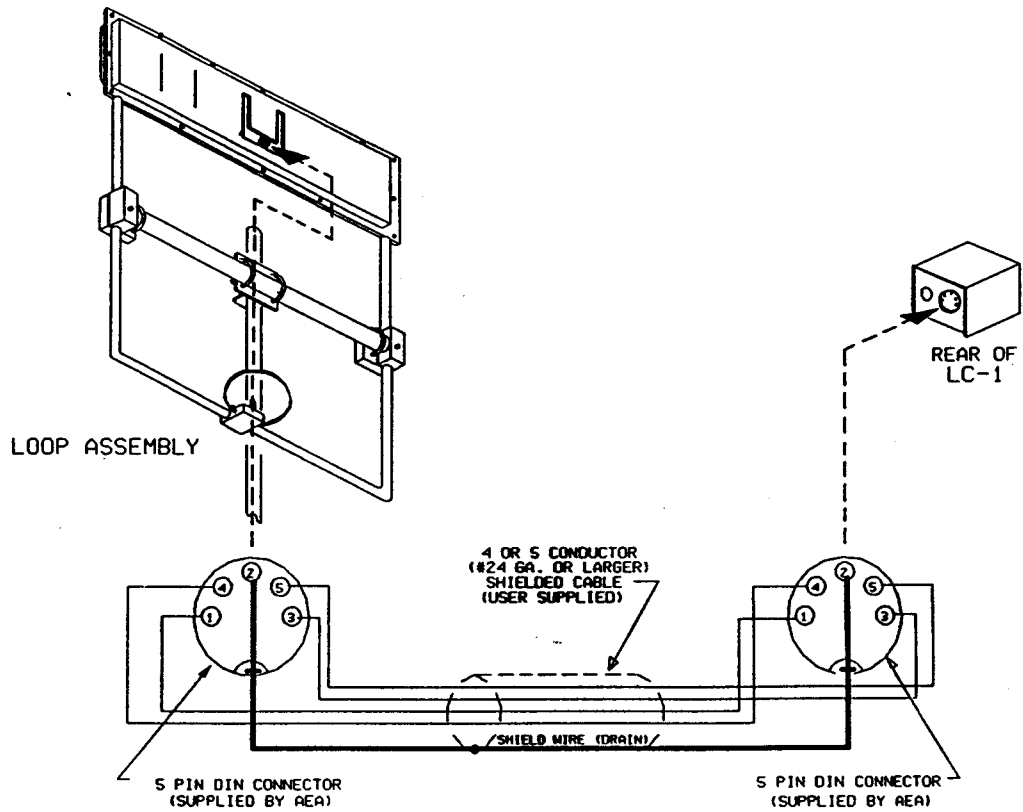
10. LC-1 SCHEMATIC DIAGRAM



11. LC-1 PARTS PICTORIAL



12. LC-1 CABLE DETAILS



13. 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 ninety days 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 Application, 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: Technical Support
2006 - 196th S.W.
Lynnwood, WA 98036
(206) 775-7373

The written notification must include a copy of the invoice. Include a description of the defect 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 or batteries according to the instructions in the manual will not nullify this warranty.

All implied warranties, if any, terminate ninety days from the date of original purchase. AEA is not responsible for damage to other equipment or property or any other consequential or incidental damage of any kind whether based on contract, negligence, or strict liability. Maximum liability shall not, in any case, exceed the purchase price of the unit.

The foregoing constitutes AEA's entire obligation with respect to this product. The original purchaser and any user or owner shall have no other remedy and no claim for incidental or 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.



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