

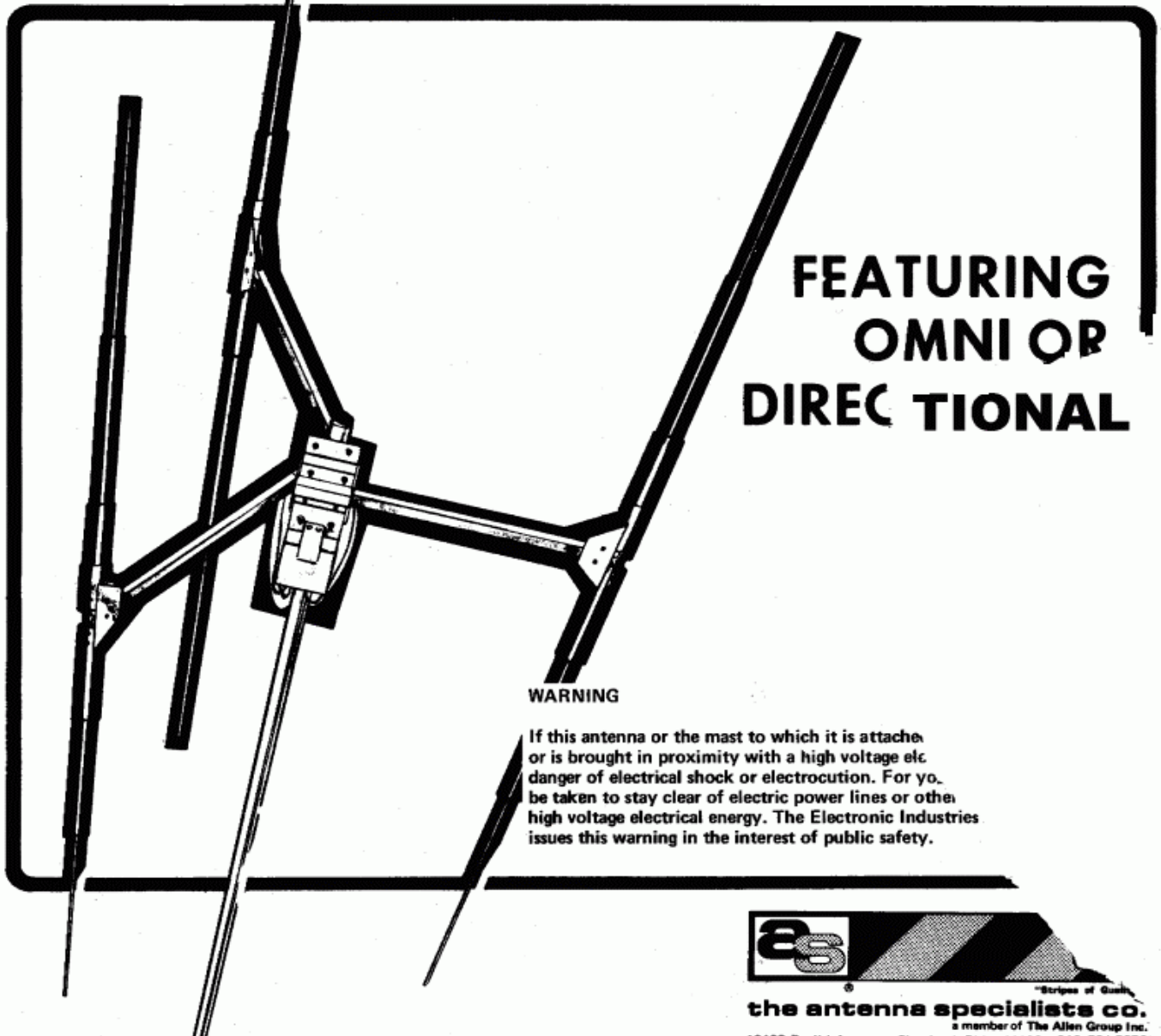
*The*

# SUPER SCANNER

27 MHz Citizens Radio Base Station Antenna

MODEL  
MS119

## instruction manual

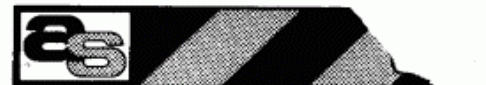


FEATURING  
OMNI OR  
DIRECTIONAL

**WARNING**

If this antenna or the mast to which it is attached or is brought in proximity with a high voltage electric danger of electrical shock or electrocution. For your safety, be taken to stay clear of electric power lines or other high voltage electrical energy. The Electronic Industries issues this warning in the interest of public safety.

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**the antenna specialists co.**

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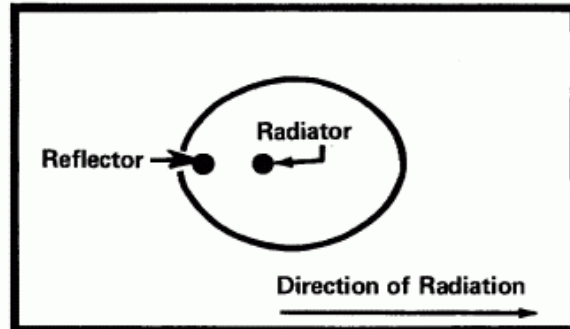
12435 Euclid Avenue - Cleveland, Ohio 44106 - 216 791-7878

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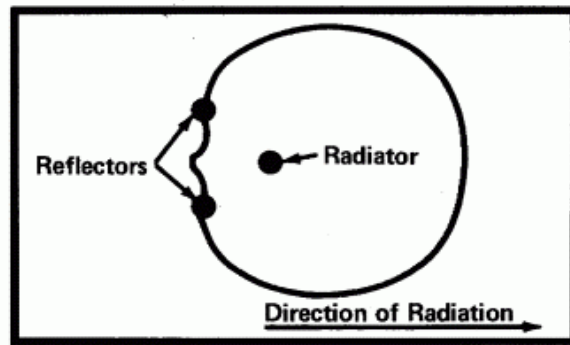
# THE "SCANNER" PRINCIPLE

The "SCANNER" is a multi-element directional antenna system especially developed to be electrically rotatable for a full  $360^{\circ}$  in three  $120^{\circ}$  steps. This accomplishes the same results ordinarily requiring mechanical rotation to point the gain pattern in a desired direction.

With a single radiator and reflector system, the pattern appears as shown at right.



By using two reflectors and one radiator, the pattern is extended and a greater gain, in the direction of radiation, results. See pattern at right.



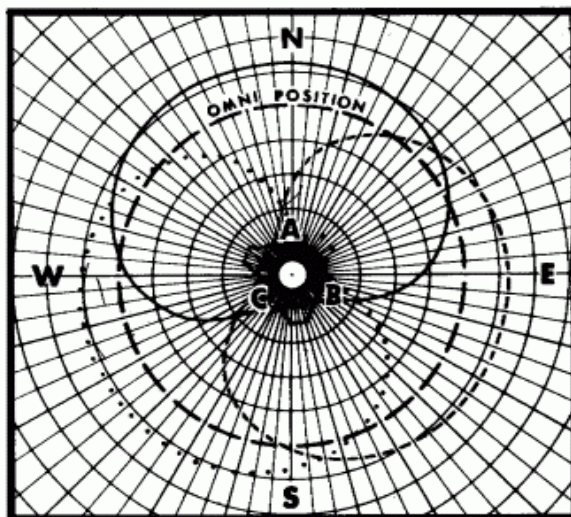
As shown in the illustrations above, both systems require a mechanical means for rotating the systems in order to change the direction of "greatest gain". This objective is reached by the "SCANNER" through an electrical system of rotation.

The system consists of three elements, mounted  $120^{\circ}$  apart around a circle whose center is a triangular mounting bracket. Coaxial cables of predetermined fixed lengths connect each element to a relay switching mechanism.

This switching mechanism is a relay assembly whose function is to switch the cables in such manner that one element becomes a radiator and the other two become reflectors. This produces the desired results as shown in the drawing at the right and the description that follows:

With "A" radiating, "B" and "C" become reflectors and the direction of radiation is North. With "B" radiating, "A" and "C" are the reflectors and the direction of radiation is Southeast. With "C" radiating, "A" and "B" are the reflectors and the direction of radiation is shifted Southwest.

The direction of radiation and the gain pattern is thus rotated ELECTRICALLY in three  $120^{\circ}$  steps.



An OMNI-DIRECTIONAL POSITION is also provided on the Super Scanner. In this position, all the lights are on indicating that all three elements plus a matching network or shorted 'OMNI-' stub cable are connected giving a stand-by monitor position resulting in a properly matched antenna suitable for receiving and transmitting.

A RELAY BOX, containing the relays which accomplish this electrical rotation, is mounted on the triangular mounting bracket. The relay assembly consists of three relays and color coded coaxial cables extending out of the Relay Box and connecting to matching color coded elements. A coaxial SO-239 connector is provided for the feed cable (not furnished) which connects with the transceiver. A terminal strip lettered A,B,C & D is provided to match a similar strip on the Control Box. The method of assembly and installation is covered in the "Installation Instructions" found in this manual. Four-conductor (coded) weatherproof cable is required (not supplied) to connect the terminal strips A,B,C & D, matching same on Control Box. This proper matching is essential. Some versions do not have a terminal "C". In such case, disregard any reference for terminal "C" on RELAY and CONTROL BOXES; only a 3-conductor control cable is required.

The coaxial cables connected to the relay assembly (Relay Box) act in dual capacities. When a coaxial cable is switched to one element as a feed line, the other two are disconnected from the transceiver antenna cable and act as stubs and enable the other two elements, which now act as reflectors, to be of proper electrical length to do their reflecting job efficiently. These lengths must NOT be altered. Some versions have a fourth cable shorted at the end and covered with a plastic cap; this tuned matching stub must NOT be altered either.

The CONTROL BOX, located at the radio operator's position, has a rotary control switch that determines the direction of radiation; indication is provided by three lights which can be labelled corresponding to the proper directions, determined by orientation at the antenna in installation. Directional labels are provided, in the hardware kit, that can be applied near the corresponding lights. For the OMNI/MONITOR/STAND-BY feature, the control is placed in the position to light all the lights.

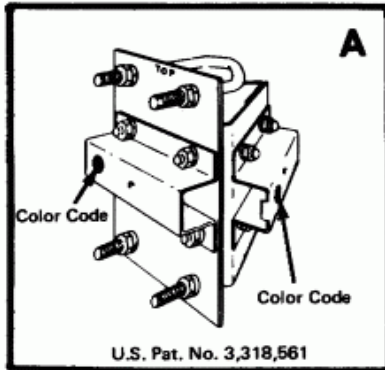
The operator selects each 120° segment by rotating the switch to the light indicating the desired direction. To locate the direction of a received signal, rotate the switch for best signal reception while the distant station is transmitting. After an exchange of transmissions, the switch may be returned to the Monitor position for omni-directional stand-by. OFF positions are provided at the ends of the switch segments; in these positions, the antenna is in the OMNI position and can be used, but all lights are extinguished. The circuitry of the control box is protected by automatic current limiting of the plug-in transformer on the power cord.

## **PRE-INSTALLATION HINTS:**

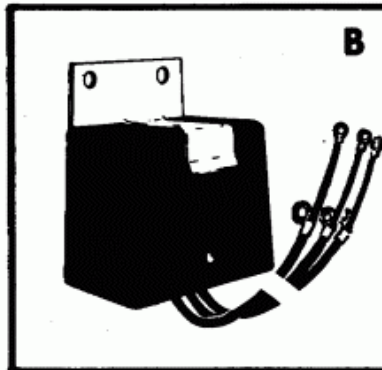
It is important that the installer read the following pages; suggestions and methods given will assure easiest, most efficient installation. The use of a silicone grease which protects without interfering with electrical contacts, on threaded parts of the antenna, will help in keeping joints corrosion free and facilitate future disassembly of the antenna.

Besides the usual hand tools, other items needed to complete the installation are listed on page 6 of this manual.

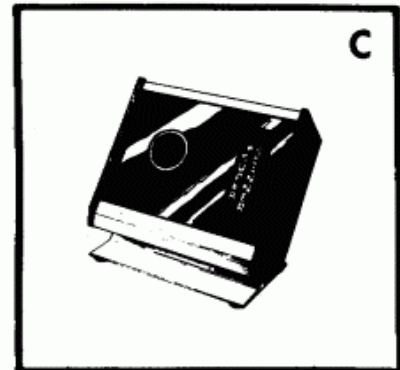
**CONTENTS OF CARTON** (Letters "A", "B", etc. identify parts as used on Assembly Drawings)



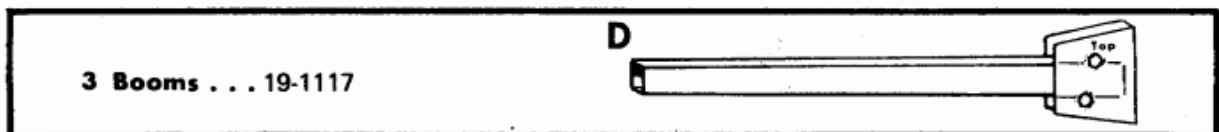
1 Triangular Mounting Bracket Kit  
...19-1116-1



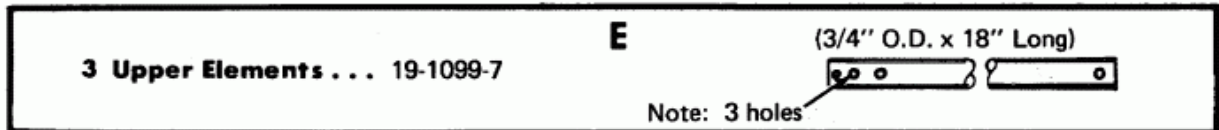
1 Relay Box..... 19-1920



1 Control Box..... 19-2425

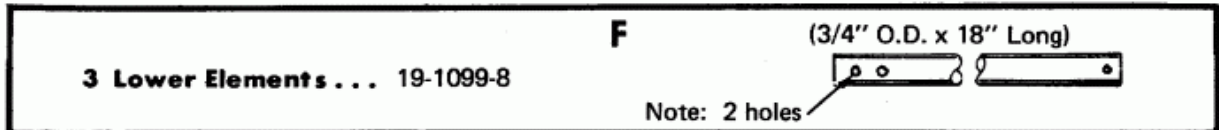


3 Booms . . . 19-1117



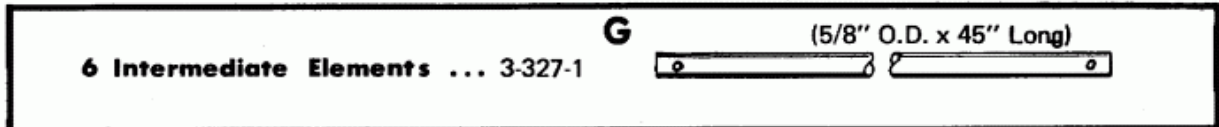
3 Upper Elements . . . 19-1099-7

Note: 3 holes

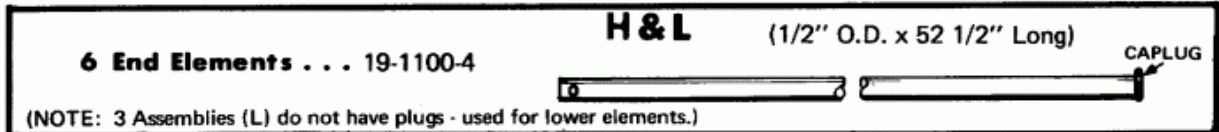


3 Lower Elements . . . 19-1099-8

Note: 2 holes

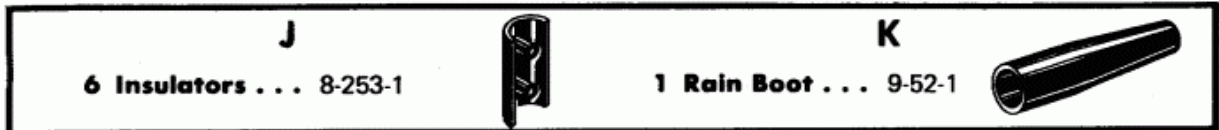


6 Intermediate Elements . . . 3-327-1



6 End Elements . . . 19-1100-4

(NOTE: 3 Assemblies (L) do not have plugs - used for lower elements.)



6 Insulators . . . 8-253-1



1 Rain Boot . . . 9-52-1

**1 Hardware Kit (misc. parts)... 19-1130**

- 26 Sheet-metal screws
- 3 Self tapping screws # 8-32x1/2" long
- 3 Internal tooth # 8 washers
- 3 Internal tooth 1/4" washers
- 12 Hex head machine screws 1/4-20x1-1/2" long

- 12 1/4" split lockwashers
- 12 Hex nuts, 1/4-20
- 6 Insulators - (FIG. J)
- 1 Rain boot for coax cable - (FIG. K)
- 1 Strip of pressure sensitive directional Labels

The following parts are not furnished but are required. They may easily be obtained from your dealer.

- A — Four-conductor control cable, each wire not lighter than No. 20-gauge (color-coded or otherwise identified) to connect from Relay Box to Control Box terminal strips. Antenna rotor flat cable may be used. For runs longer than 150 feet, use heavier gauge cable. Cable must be long enough to reach between Relay Box and Control Box. Some versions of the RELAY BOX, having no "C" terminal, only require a 3-conductor cable. Four or more conductor cable may be used; merely disregard any reference to terminal "C" on either box.
- B — RG-58/U cable with PL-259 on each end to connect Relay Box to transceiver. Cable length must be sufficient to reach between Relay Box and transceiver. RG-8/U may be used. Be sure to put rain boot (supplied) over antenna end of cable before PL-259 is attached.
- C — A mast is required. The mast may be galvanized 1-1/2" water pipe whose Outside Diameter less than 2". Heavy wall aluminum tubing whose outside diameter is approximately 2" may be used. The "U"-bolts will accept masts whose diameter varies between 1-1/2" and 2".
- D — If guy wires are to be used, they must be broken by insulators into 7 ft. lengths or less. Nylon rope or other non-metallic guy line of equal strength needs no insulators and is satisfactory. Guy wires are to be attached to the mast, not the elements.

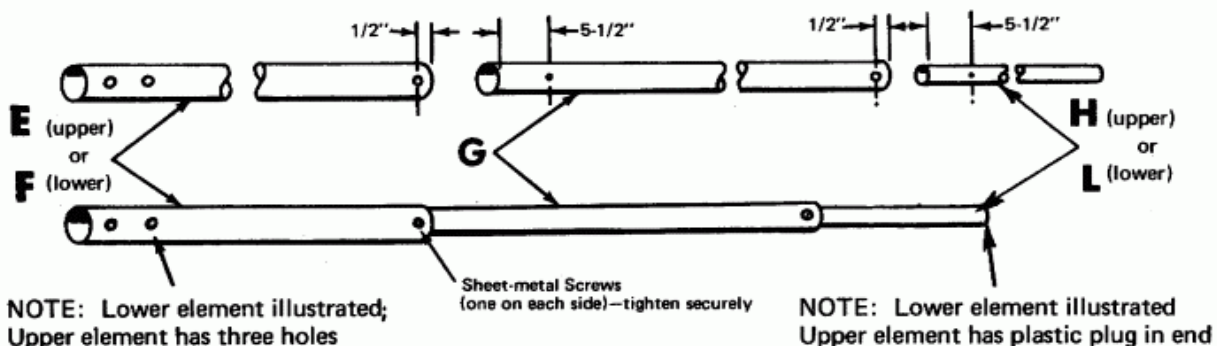
## INSTRUCTIONS FOR ASSEMBLY AND MOUNTING OF THE "SCANNER"

(The letter designations on illustrations refer to items in Contents of Carton Listing)

- 1 Before starting assembly, check all items in carton against items listed in the illustrated table of contents. No difficulty will be encountered if careful attention is paid to the instructions that follow. Sort out all items, keeping identical items together.

### 2 VERTICAL ELEMENTS

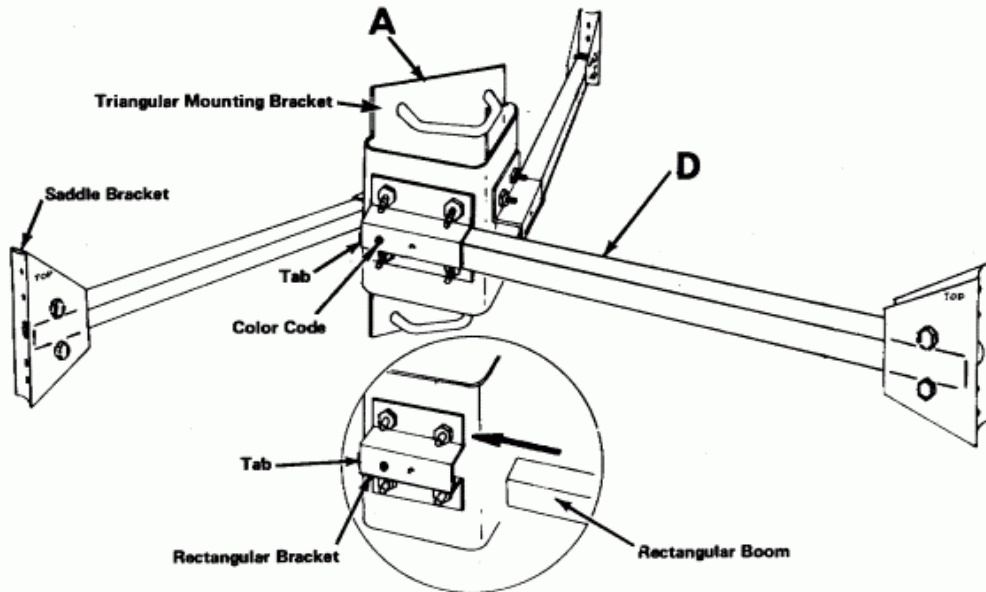
Assemble upper and lower vertical elements as illustrated below.



When completed, there will be three upper and three lower vertical assemblies. Lower element assemblies (F) have two holes in 3/4" diameter end tube -- upper assemblies (E) have three. Upper Assemblies have plastic plug in smallest tube.

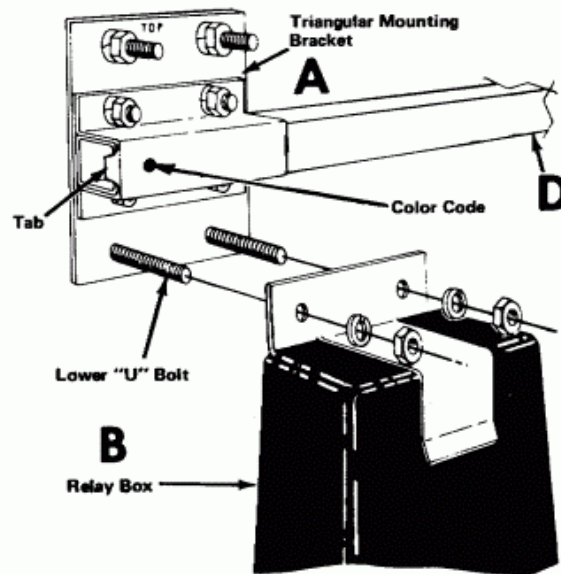
### 3 TRIANGULAR MOUNTING BRACKET AND RECTANGULAR BOOMS

Loosen the four nuts clamping rectangular bracket to mounting bracket. Insert rectangular boom into bracket, making sure saddle bracket is vertical (stamped "TOP"). Insert booms fully and tighten nuts securely. Completed assembly will appear as below.



### 4 RELAY BOX MOUNTING

The Relay Box mounts on the triangular mounting bracket, as shown at the right. It must be mounted in the position shown.

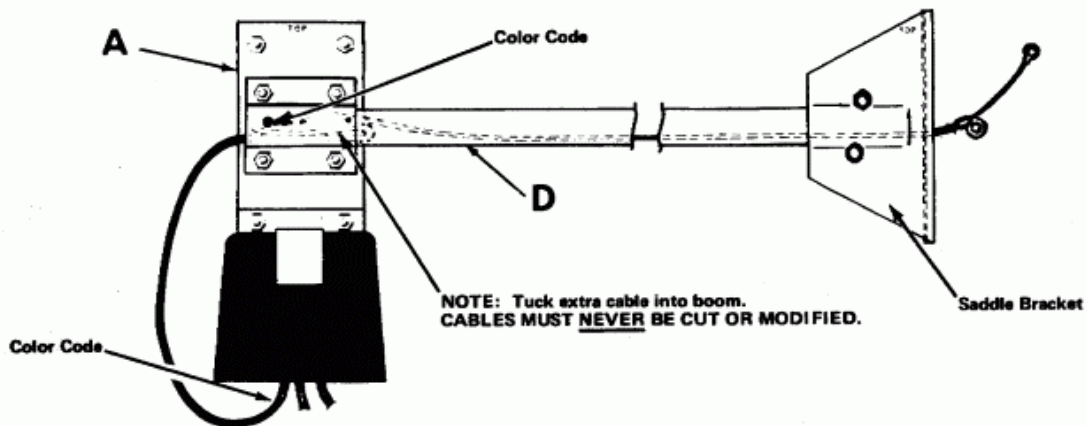


**Do Not tighten the hex nuts holding Relay Box at this time.**

## 5 THREADING OF RELAY BOX CABLES

Thread the three color coded Relay Box cables through the rectangular booms as shown. Particular care must be taken to match colors: The white coded cable through the white color coded boom, the orange through the orange and the red through the red. See below. If there is a fourth cable ('OMNI-' stub, supplied on some models), let it hang vertically down the mounting mast. It will be secured later; DO NOT remove the plastic cap from the end of the 'OMNI-' stub.

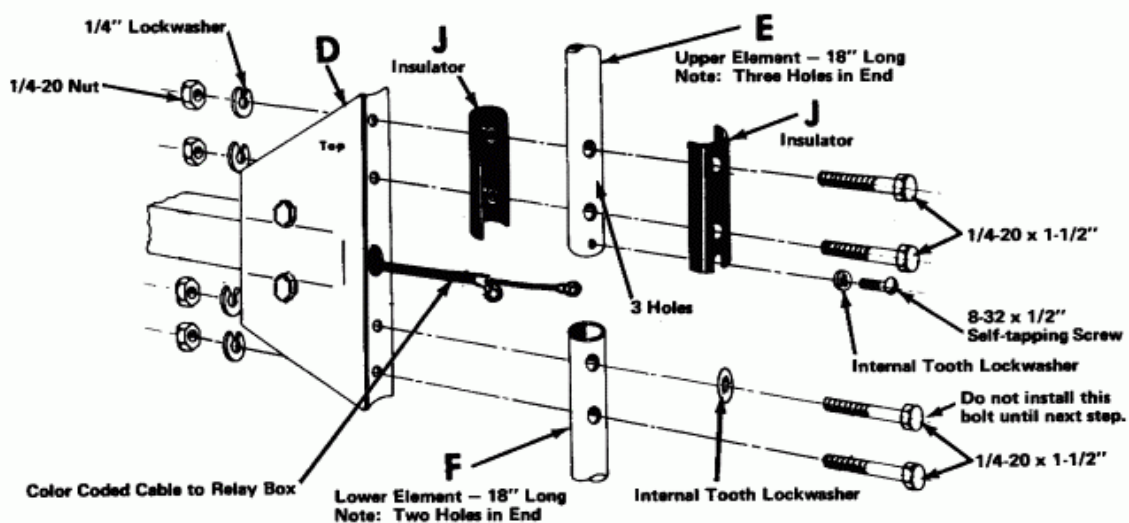
The cables may be readily pushed through the rectangular boom, with the aid of the straightened coat hanger or short piece of wire if necessary, from the saddle bracket end. The cables may be taped to the coat hanger or wire and pulled through the boom and saddle bracket, if desired.




THE CABLES FROM THE RELAY BOX MUST NEVER BE CUT! The three cables, when threaded through the booms, must match in color with the rectangular brackets. Failure to match colors will result in improper operation.

## 6 VERTICAL ELEMENT ASSEMBLIES

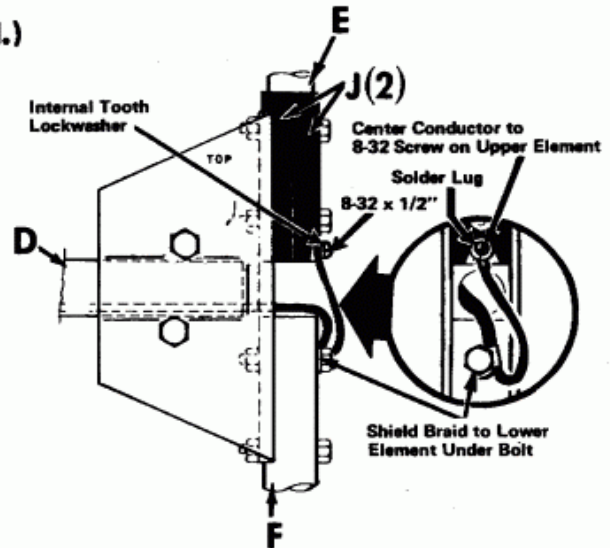
Assemble an upper and a lower vertical element assembly plus the parts indicated as shown below. CAUTION: EXCESSIVELY TIGHTENING THE 1/4-20 BOLTS MAY DAMAGE THE INSULATORS (J).



## 6 VERTICAL ELEMENT ASSEMBLIES (cont'd.)

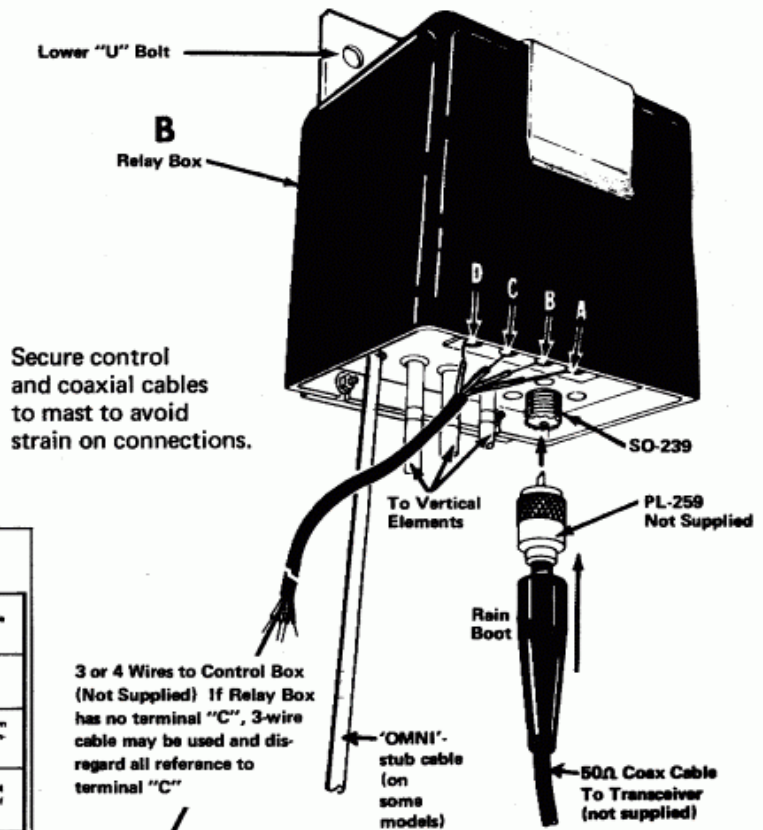
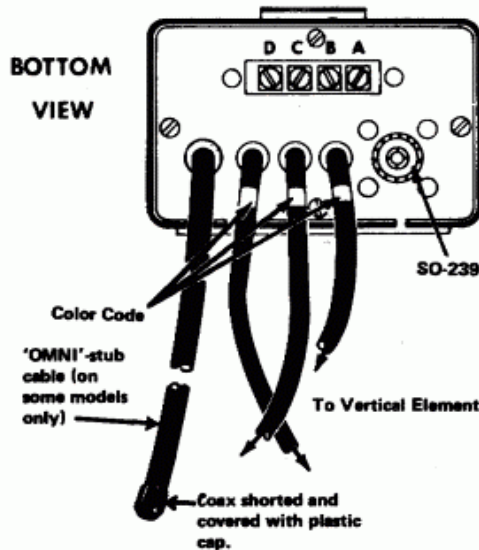
Completed assembly is shown at right. Fasten the center wire of the cable (with small terminal lug ) to upper assembly with an 8-32 self-tapping screw.

The shield braid terminates in a large terminal lug. Fasten it under head of the 1/4-20 bolt on lower element (F).








## 7 RELAY BOX CONNECTIONS

Fasten the Relay Box to the triangular mounting bracket assembly. Connect the cables for the transceiver and the Control Box at the Relay Box before the antenna is mounted on the mast. Be very sure that all strands of each control cable conductor are captured under their respective screw so that they cannot short to the cover plate, between terminals, screws or rivets. Use caution to avoid strain on terminal connections when mounting.



Secure control and coaxial cables to mast to avoid strain on connections.

3 or 4 Wires to Control Box (Not Supplied) If Relay Box has no terminal "C", 3-wire cable may be used and disregard all reference to terminal "C"

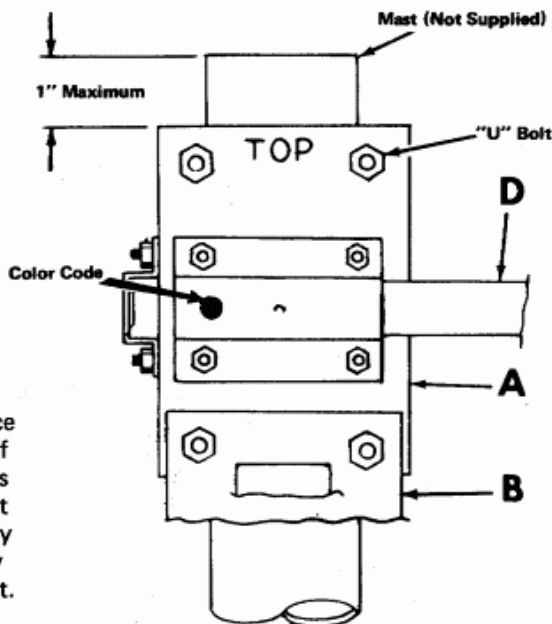
Assembly of Cable to PL-259 Plug & Adapter	
	Cut end of cable open. Remove vinyl jacket 3/4", slide coupling ring and adapter on cable.
	Fan braid slightly and fold back as shown.
	Position adapter to dimension shown. Press braid down over body of adapter and trim to 3/16". Save 1/8" of conductor. Tin exposed center conductor.
	Screw plug sub-assembly on adapter. Solder braid to shell through solder lugs. Use enough heat to create bond of braid to shell. Solder conductor to contact.
	For final assembly, screw coupling ring of plug sub-assembly.



## B MOUNTING & ORIENTING THE ANTENNA

### MOUNTING THE ANTENNA

The assembled antenna is now ready to be mounted on the mast. As explained before, the mast may be 1-1/2" iron water pipe (O.D. about 2"). It is necessary that the mast extend at least 10' above the structure on which it is mounted in order to make sure that the antenna lower vertical elements clear the mounting structure by at least one foot. It is best to have the mast grounded in accordance with local, state, or national codes.



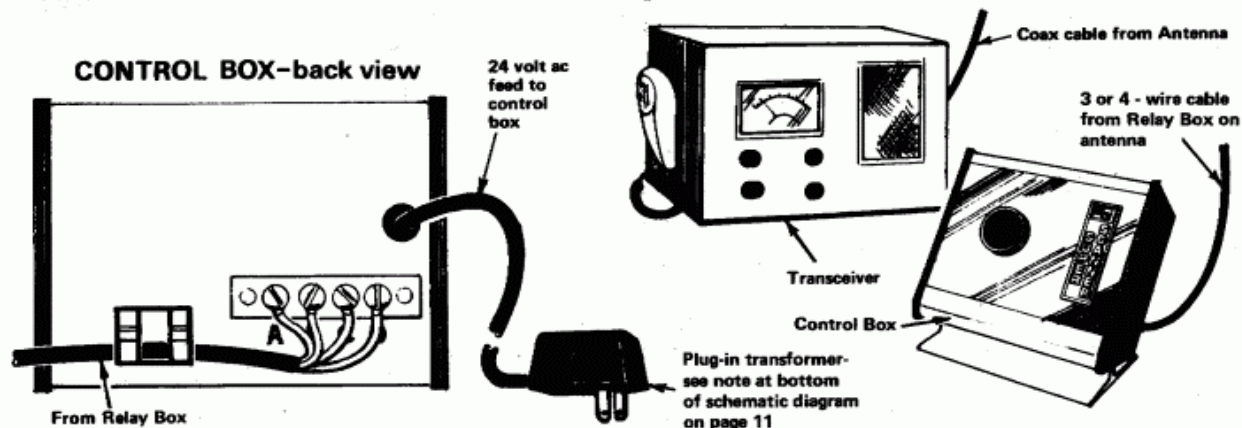
### ORIENTING THE ANTENNA

Slide the assembly over the mast allowing 1" clearance as shown in illustration. Point the orange coded portion of the antenna to the North (top light). Tighten all "U"-bolts securely. This will point the red coded assembly Southeast (lower right hand light) and the white coded assembly Southwest (lower left hand light). Obviously, you may choose any starting direction or color on mounting bracket.

Pressure sensitive labels for placement on the face of the Control Box (to indicate compass direction of each element) are provided for your convenience.

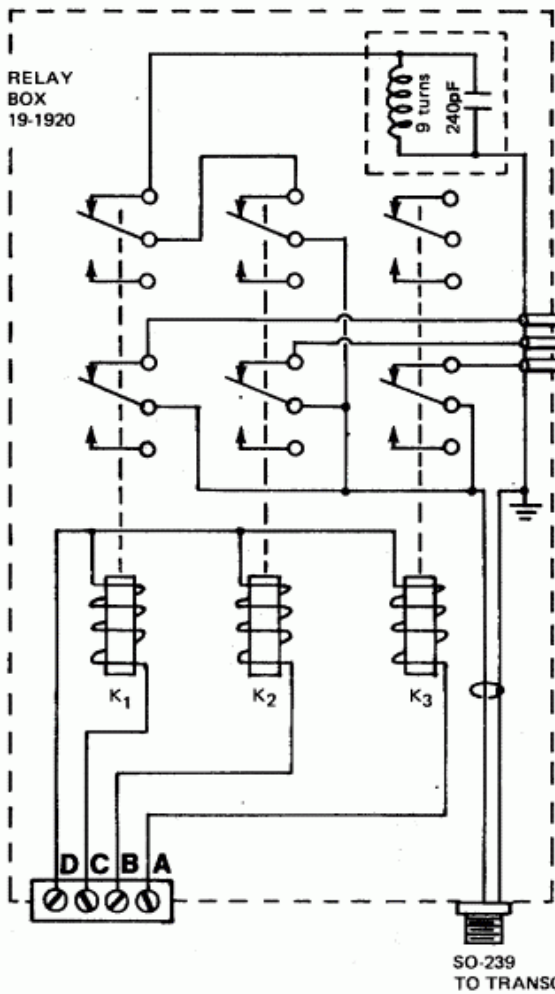
## C CONTROL BOX INSTALLATION

With the antenna mounted and oriented in the proper direction, connect the Relay Box cable to the Control Box and the coax cable to the transceiver as shown.



The terminal strips on the Relay and Control Boxes must be wired so that 3 or 4 - wire cable (depending on number of terminals) connects "A" to "A", "B" to "B", "C" to "C" (if applicable) and "D" to "D". Be sure all strands of each control cable conductor are captured under their respective screw so they can not short to the case, other terminals or screws. See "THE SCANNER PRINCIPLE" on page 3 for operating features.

Your Super-Scanner-equipped base station is now ready for operation



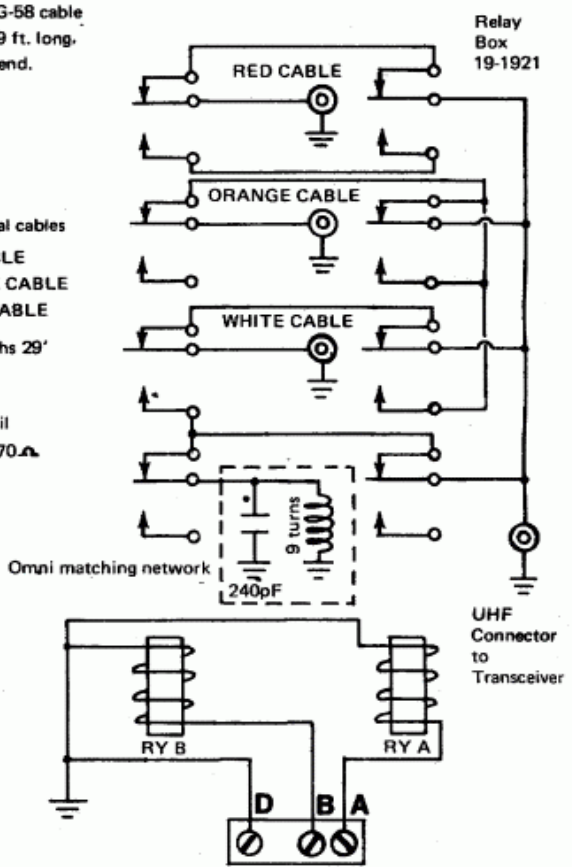
Omni matching network.  
On some models this may be a piece of RG-58 cable approximately 9 ft. long, shorted on one end.

RG-58/U coaxial cables  
RED CABLE  
ORANGE CABLE  
WHITE CABLE  
cable lengths 29'

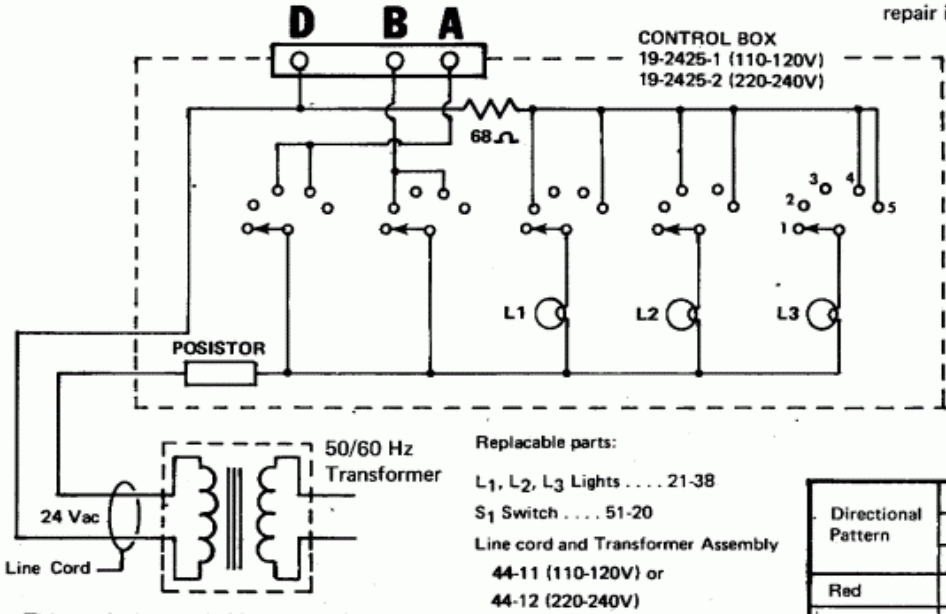
Relay Coil  
dc res  $\approx 170\Omega$

SO-239  
TO TRANSCEIVER

**SCHEMATIC DIAGRAM**



**WARNING:** Tampering with circuits in the control or relay box will void warranty! See your supplier if warranty repair is necessary.



Replacable parts:  
L<sub>1</sub>, L<sub>2</sub>, L<sub>3</sub> Lights . . . . 21-38  
S<sub>1</sub> Switch . . . . 51-20  
Line cord and Transformer Assembly  
44-11 (110-120V) or  
44-12 (220-240V)

This model is supplied in two versions; 110-120V and 220-240V. Check transformer nameplate for rating before applying power. A plug adapter may be supplied with 220-240V versions.

Directional Pattern	Relay Condition				
	P/N 19-1921 RY A	P/N 19-1920 RY B	K <sub>1</sub>	K <sub>2</sub>	K <sub>3</sub>
Red	On	On	Off	On	On
White	Off	On	On	On	Off
Orange	On	Off	On	Off	On
Omni	Off	Off	Off	Off	Off

# THE ASSEMBLED SCANNER

