INSTRUCTION MANUAL

SOMMER MULTI-BAND ANTENNA

XP70 Series Beam

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GENERAL INSTRUCTIONS

The Sommer XP70 series antenna can be easily assembled by following the assembly steps carefully.

Each element to be attached to the double-tube boom is **color coded** as to its location.

Each of the center element support brackets has been **preassembled** to simplify assembly.

The length of each element tube and the spacings between the elements along the boom are clearly shown in the Figures.

All bolts, screws, washers, nuts, clamps and other hardware are stainless steel for long life, and freedom from corrosion. Before installing nuts on the bolts, place a drop of light oil (such as 3-IN-1) on the threads. Make certain that lockwashers are used on all bolts and screws, and that all screws and nuts are "snug". Do not over tighten!

Before raising the antenna, make a double check of all element clamps. You may save having to lower the antenna to readjust an element length!

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INTRODUCTION

This instruction manual covers the Sommer Models XP704, XP705, XP706, XP707 and XP708. The last number is the number of amateur bands covered by that model. The first set of steps are those that are common to all models and will produce the model XP704.

XP704 does not include Element-1C (BLUE-RED). Additional steps for the other models follow.

XP70(4-8) ANTENNA ASSEMBLY

The following steps should be performed using the Figure A during each step, and the detailed instructions as noted. The stainless steel bolts require a 1/2" or # 13 metric wrench, and the small nuts require a 7/16" or # 11 metric wrench. A 1/4" screwdriver is also required. A steel tape measure is recommended for setting spacings and lengths.

All Models

STEP 1:

If your boom came in sections, please assemble these first as shown in the FIG BOOM ASSEMBLY. Place a drop of oil on all bolts and tighten the nuts/lockwashers of the boom couplings securely.

Now place the two boom tubes on edge on a flat surface, spaced about 1" (25 mm) apart. Even up the ends. Place several blocks or a pair of saw horses under the boom tubes to facilitate mounting of the elements.

STEP 2:

Select the YELLOW LOG-Element center support bracket, and the two 1" D. (25 mm D.) tubes having the yellow bands. Insert the non-slotted ends in the slotted ends of the 1 3/8" (30mm) D. tubes of the LOG-element mounted on the support bracket. Adjust the length of each 1" tube as shown in Figure A.

Select the pair of T-match tubes. Insert one end of each T-match line through the hole of the respective outer blue Lexan® insulators as shown in Figure B. Attach the outer ends of the T-match tubes to the 1" tubes by use of the two premounted clamps. Adjust the position of the clamps to provide a spacing of about 1

1/8" (28 mm) between the inner ends at the center of the T-match.

STEP 3:

Place the YELLOW LOG-assembly on the boom tubes at one end, spaced about 1/4" to 1/2" (1-2 cm) from the ends. See FIG. C. (This will be the REAR end of the antenna.) Make sure that the boom tubes seat in the two support bracket notches. Select the U-channel having the "W" stub line attached. After oiling the bracket bolt threads, insert the three bolts through the U-channel from the bottom of the boom and through the support bracket. See FIG. D. Place the lockwashers and nuts on the upper ends of the bolts and tighten uniformly.

STEP 4:

Attach the "W" stub tuning line stub to the YELLOW LOG-Elements by means of the screws adjacent the blue insulators as shown in FIG.C.

Attach the open end of the first set of phasing lines to the center of the YELLOW LOG-T-match lines with the phasing lines toward the front end of the boom.

STEP 5:

a) Place the element support bracket having the YELLOW-GREEN LOG-Elements on the boom tubes adjacent the crossed ends of the first phasing lines with the T-match facing the front end of the boom. Install the lower U-channel with the three bolts as in step 3 above, leaving the bolts slightly loose so that the position of the bracket can be adjusted. Adjust the position of the support bracket along the boom so that the center-to-center spacing from YELLOW LOG-Elements is 71" $\pm$ 1/2" (180 cm $\pm$ 1 cm) and tighten the support bracket bolts.

b) Loosen the clamps on the phasing lines and connect the crossed ends of the lines to the YELLOW-GREEN LOG-Elements with the screws provided. Tighten the clamps.

c) Attach the second phasing line to the YELLOW-GREEN LOG-T-match with the lines and cross connections toward the front end of the boom.

d) Repeat step (a) above for the GREEN LOG-Element, adjusting the center-to-center spacing from the YELLOW-LOG-Element to 71" (180 cm) and tighten the support bracket bolts.

e) Repeat step (b) above, connecting the second phasing lines to the T-Match of the GREEN-LOG-Element.

f) Repeat step (c) above for the third phasing lines.

STEP 6:

Refer to FIG. E which shows details of the group of elements EL-1A, EL-1B and the BLACK LOG-Element. (EL-1C is not used in the XP704 model.)

Place the element support bracket having the BLACK LOG-Elements on the boom tubes adjacent the crossed ends of the second phasing lines with the T-match facing toward the front end of the boom as shown in FIG. E (TOP VIEW). Install the U-channel with the three bolts as in the previous steps, and adjust the spacing from the GREEN LOG-Element to 71" ± 1/2" (180 cm ± 1cm). Tighten the nuts on the two outer bolts, leaving the nut on the center bolt loose.

Connect the cross connection straps of the second phasing line to the screws of the inner ends of the BLACK LOG-Element tubes.

Loosely mount BLUE EL-1B to the boom spaced about 15" (38 cm) from the BLACK-LOG-Element. Install the EL-1B feed lines between the BLACK-LOG-Elements T-match terminals and the screws on the EL-1B tubes. Please bend the feed lines - do not shorten them ! Tighten the element support bracket bolts.

STEP 7:

Referring to FIG. E (SIDE VIEW) place the cast aluminum bracket on the boom, spaced about 7" (18 cm) from EL-1B. Install a U-channel on the aluminum bracket, aligning the bolt holes, and place BLUE-BLACK EL-1A center element in the U-channel. Install the two bolts through the lower U-channel and through the top channel and element tube. Adjust the spacing from EL-1B to 7" (18 cm) and tighten the nuts.

STEP 8:

Place the balun in front of the LOG-1-T-match. See FIG. F + E. Attach the two leads from the top of the balun to the point at LOG-1 where its T-match connections meet with the feed lines coming from EL-1B (and EL-1C if your antenna is equipped with the 17 m band).

Attach the terminal from the bottom of the balun to the LOG-1 U-channel. A hole is predrilled there and screws are premounted. Place the terminal between the two stainless steel washers.

Your balun as well as the inner conductor of the coax feedline are now DC-grounded via boom - mast - ground.

Connect your coax cable by soldering it to the piece of Teflon coax cable coming out from the bottom of the balun. See FIG.

Seal the connection with PVC tape to make it waterproof.

Connectors/plugs tend to take on humidity. As our experience shows, the result is that they often burn. You will save yourself a lot of trouble by using the above described method to connect your cable to the balun.

However, should you choose to use a connector, please avoid driving your antenna mistakenly on 80 meters - the high mismatch at the balun will burn the coax connector.

BE SURE TO READ CAREFULLY THE ENCLOSED INFORMATION SHEET ABOUT USING THE PROPER COAXIAL CABLE. Using an inferior cable can seriously affect the tuning and performance of the antenna!

Note: The baluns Teflon coax cable is good for 10 kW output continuous at 10 MHz.

STEP 9:

Mount the RED-YELLOW Element on the boom. This element is DC-grounded to the boom. See FIG. A for distances.

Repeat the above step for the RED-RED ELement, placing it ahead of the GREEN-YELLOW LOG-Element.

Repeat the above step for the RED-Element, placing it ahead of the GREEN-LOG-Element.

* If your antenna includes 40 meters, the RED-YELLOW ELement is insulated and mounted on a cast aluminum center support bracket. See STEP 14.

STEP 10:

Select the telescoping 1" (25 mm) 3/4" (20 mm) 5/8" (15 mm) and 1/2" (12 mm) element tubes. Insert the 1" tubes in the 1-1/2" (30 mm) center tube for each LOG-Element and the EL-1B element, and set to the lengths shown in FIG. A.

The ELEMENTS-1A - 2A - 3A use 3/4" (20 mm) center tubes.

Insert the 5/8" and 1/2". Insert the remainder of the tubes to obtain approximately the element lengths shown in FIG. A. Select the correct size clamps, place a drop of oil on the clamp screws and install at each joint. Before tightening the clamps, adjust the overall half-element lengths as shown in FIG. A, measuring from the center of the boom. The overall lengths may be ± 1/2". In adjusting the smaller tubes, be sure to provide sufficient overlap with the next-larger tube. Tighten all clamps securely.

Note: The use of "conductive pastes" is not recommended.

STEP 11:

Refer to FIG. G-1 which shows details of the phasing line support. Elements EL-2A, EL-3A and EL-4A are each shipped with a support clamp installed at the center of the tube. A Lexan support of insulating material is attached to the tube. Push the phasing lines through the holes.

Refer to FIG. G-2 which shows details of the phasing line support attached to the elements EL-2A, EL-3A and EL-4A. These element are grounded to the boom and mounted in U-channels. The phasing line support is shipped attached to the elments U-channels. Push the phasing tubes through the holes.

Note that EL-2A, EL-3A and EL-4A are grounded to the boom in the XP704 model.

STEP 12:

Your XP704 antenna is now completely assembled. If you have additional bands, proceed to Steps 13 through 15 to install the remainder of the elements.

The next step is to attach the mast clamp. Referring to FIG. H, a top view and a side view are provided. Rest the antenna boom on a saw horse, or other support at the approximate center of gravity. When you find the best balance point, mark this point. Oil the six boom clamp bolts. Assemble the four cast aluminum boom clamps with the four outer bolts. Mount the two aluminum angle brackets between the pair of boom clamps with two bolts as shown in FIG. H on the boom, measuring carefully to center the assembly about the balance point. Thighten the clamp bolts securely. When ready to install the antenna on its mast, oil the four mast clamp bolts. Install the mast clamps as shown, using the two U-channels and bolts. Position the boom along the mast as desired and tighten the bolts.

Installation of 17 Meter Element for XP-70(5,6,7)

STEP 13:

Loosely mount BLUE-RED ELement to the boom spaced about 6.5" (16,5cm) ahead of BLACK LOG-1 element as shown in FIG. E. Install the EL-1C feedlines between the LOG-1 T-match terminals and the screws on the EL-1C tubes as shown in the side view of FIG. E. Note: Please bend the feedline to its proper length - do not

shorten it !
Tighten the element support bracket bolts.

Installation of 40 Meter Compensator Coil XP-70(5,6,7)

STEP 14:

In STEP 9, you should have installed a RED-YELLOW Element having an insulator to insulate the element from the boom. This permits the element to work as a " C " on 40 meters.

Attach the 40 meter compensating coil to one of the T-match tubes of the YELLOW LOG-Element as shown in FIG. A-1.

Connect the other end of the coil to the RED-YELLOW ELement by the adjustable tubes as shown in FIG. F.

As will be described later, the coil can be tuned by stretching or shortening its length by means of the adjustable tubes.

Installation of 30 Meter Tuning System XP-70(5,6,7)

STEP 15:

Refer to FIG. J. Install the 30 m tuning unit to the flat aluminum straps forming the W-stub line by means of the flat connection straps and clamps. Before tightening the clamps adjust the spacing of the clamps from the U-channel as shown in FIG. J.

Install the 30 m system in a distance of about 12 " $\pm$ 2 " (30 cm $\pm$ 5 cm) from the YELLOW element.

The 30 m band can be tuned in about 9 - 15 ft (3 - 5 m) height by moving the 30 m system up und down the W-line. Moving it closer to the YELLOW element brings the frequency down - moving it in the opposite direction brings the frequency up.

Installation of the Guy Line

STEP 16:

As shown in the side view of FIG. H, attach the guy bracket at the top of the mast extending at right angles to the boom. Referring to FIG. I, pass and center the non-conducting guy line through the guy tube. Pass one end under the LOG-1 mounting bracket, over the boom, under the bracket, and back through the guy tube. Pass the other

end of the guy line around the LOG-4 mounting bracket and back through the guy tube. Pull the two ends tight and tie in a square knot. The loose ends may be taped to the guys.

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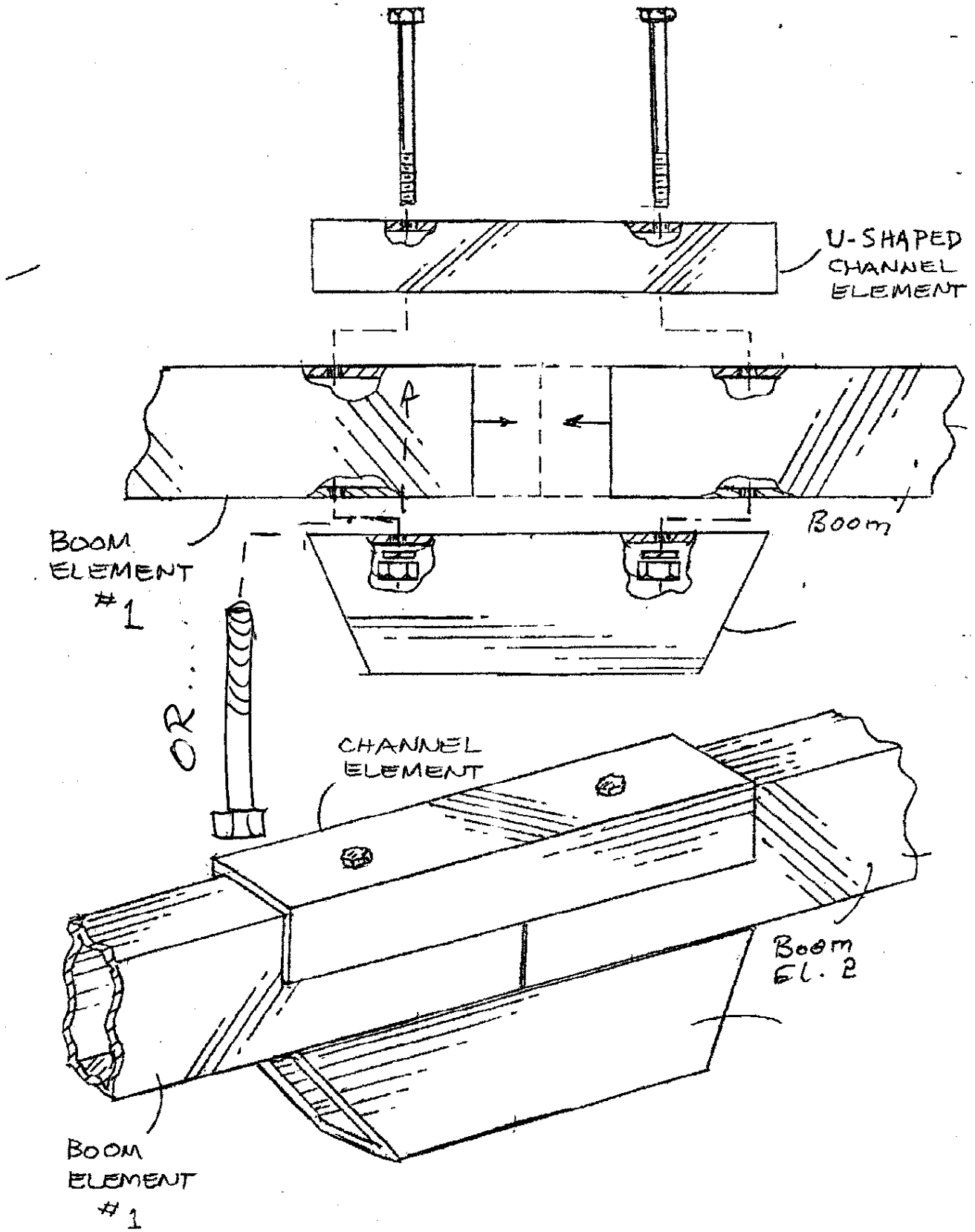


FIG. BOOM ASSEMBLY

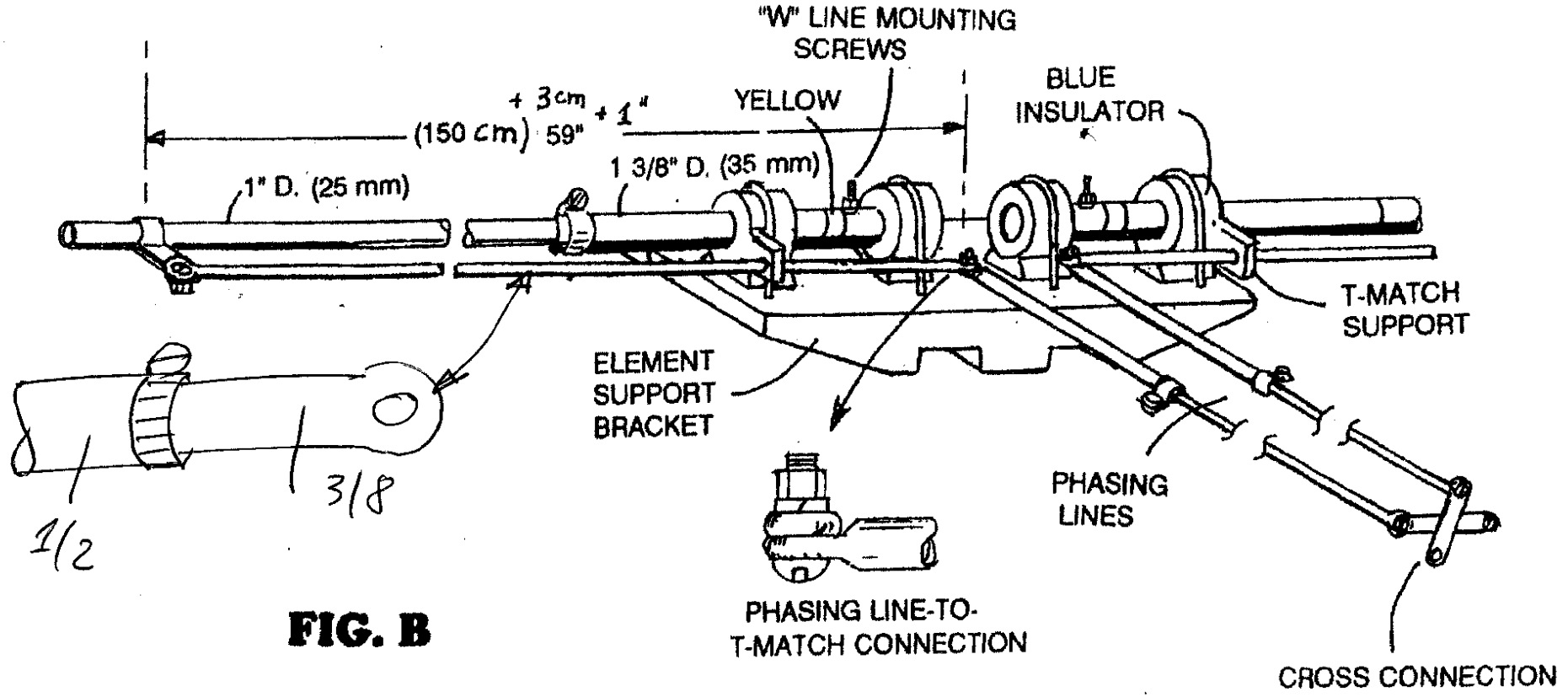


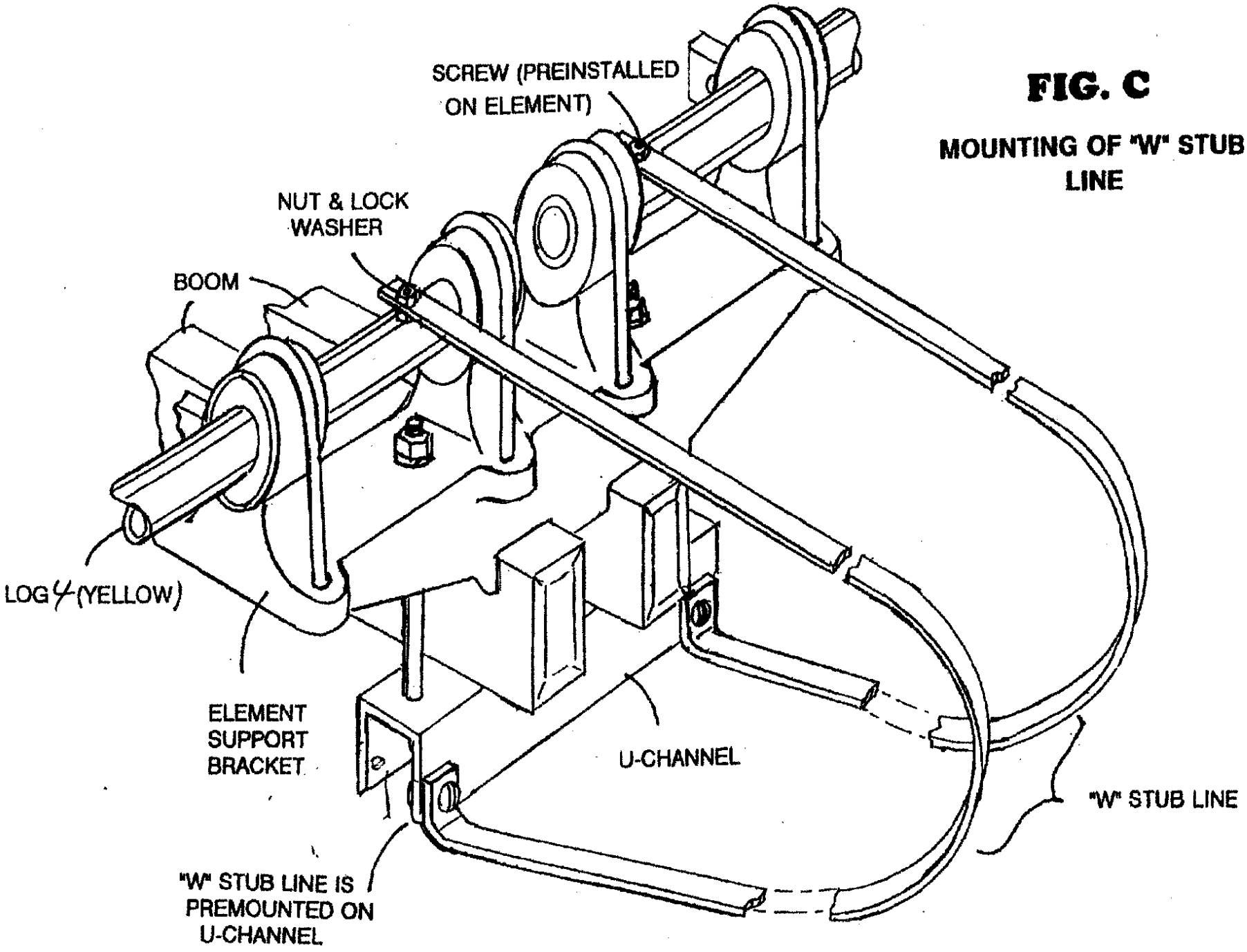
FIG. B

MOUNTING T-MATCH & PHASING LINE TO YELLOW LOG 9 ELEMENT

(Not to scale)

FIG. C

MOUNTING OF "W" STUB LINE



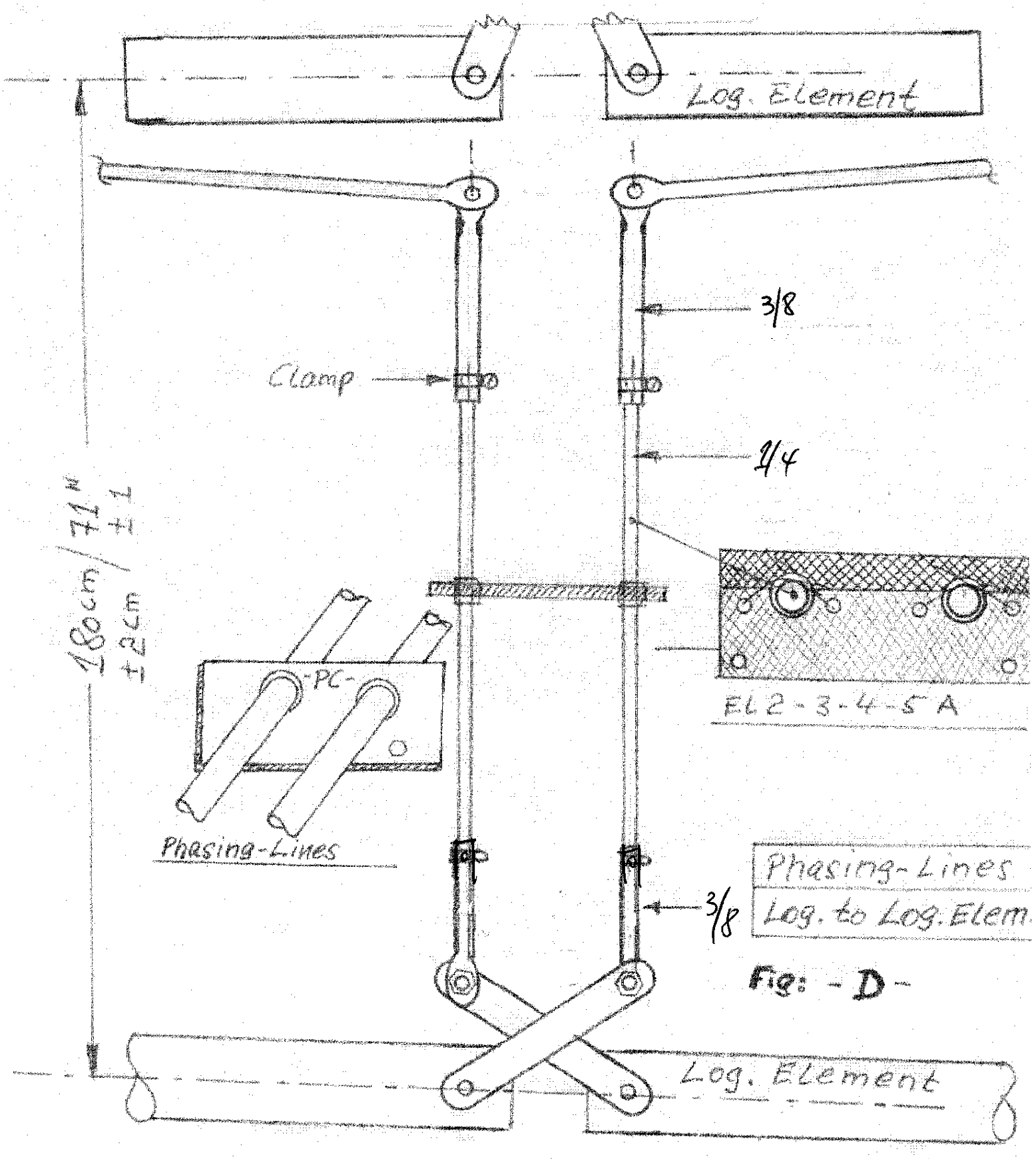
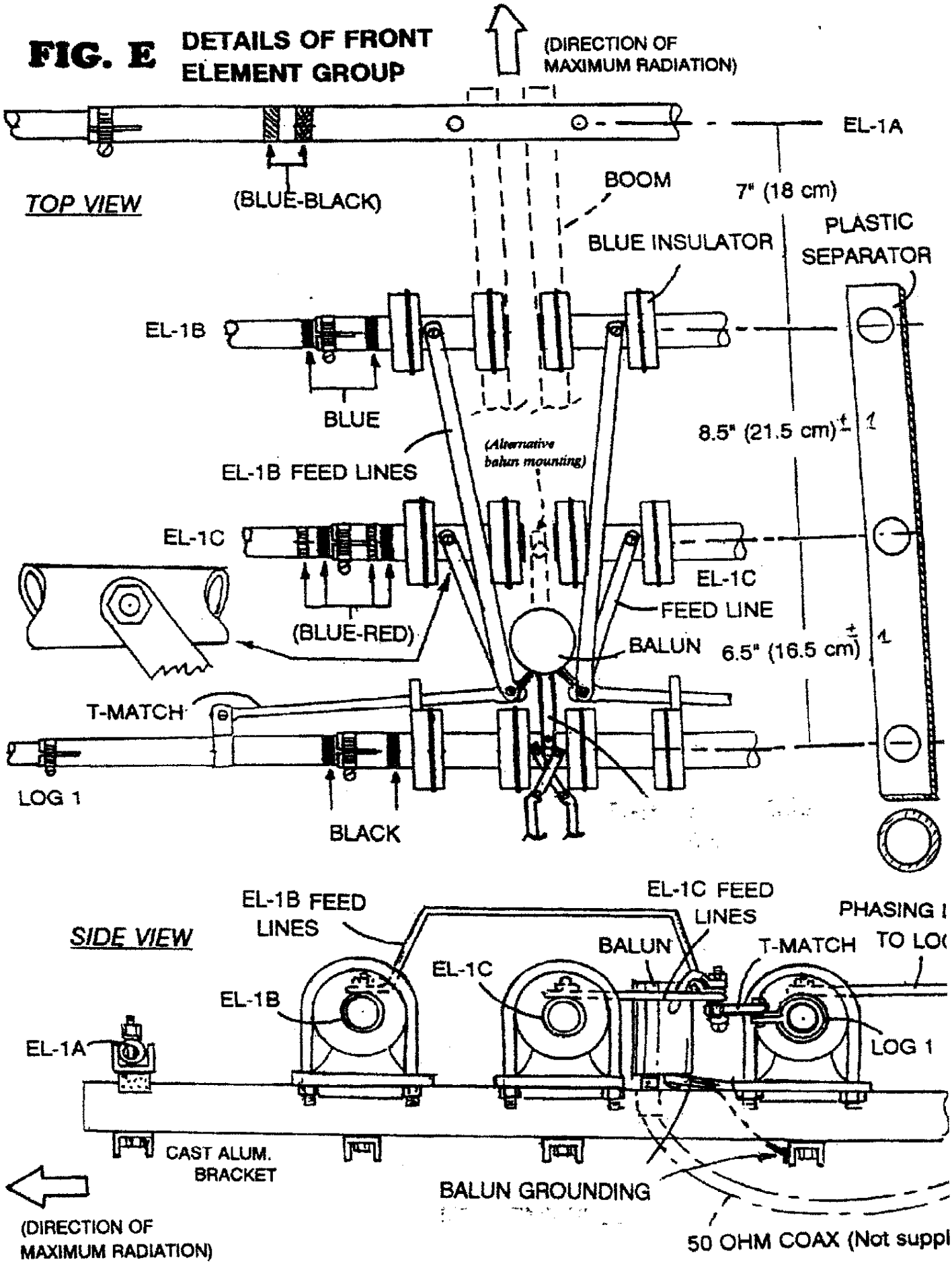

Log. Element
3/8
Clamp
3/4
180 cm / 71 in
+1
+2 cm
-PC-
EL 2-3-4-5 A
Phasing-Lines
3/8
Phasing-Lines
Log. to Log. Elem.
Log. Element

Fig: - D -

FIG. E DETAILS OF FRONT ELEMENT GROUP



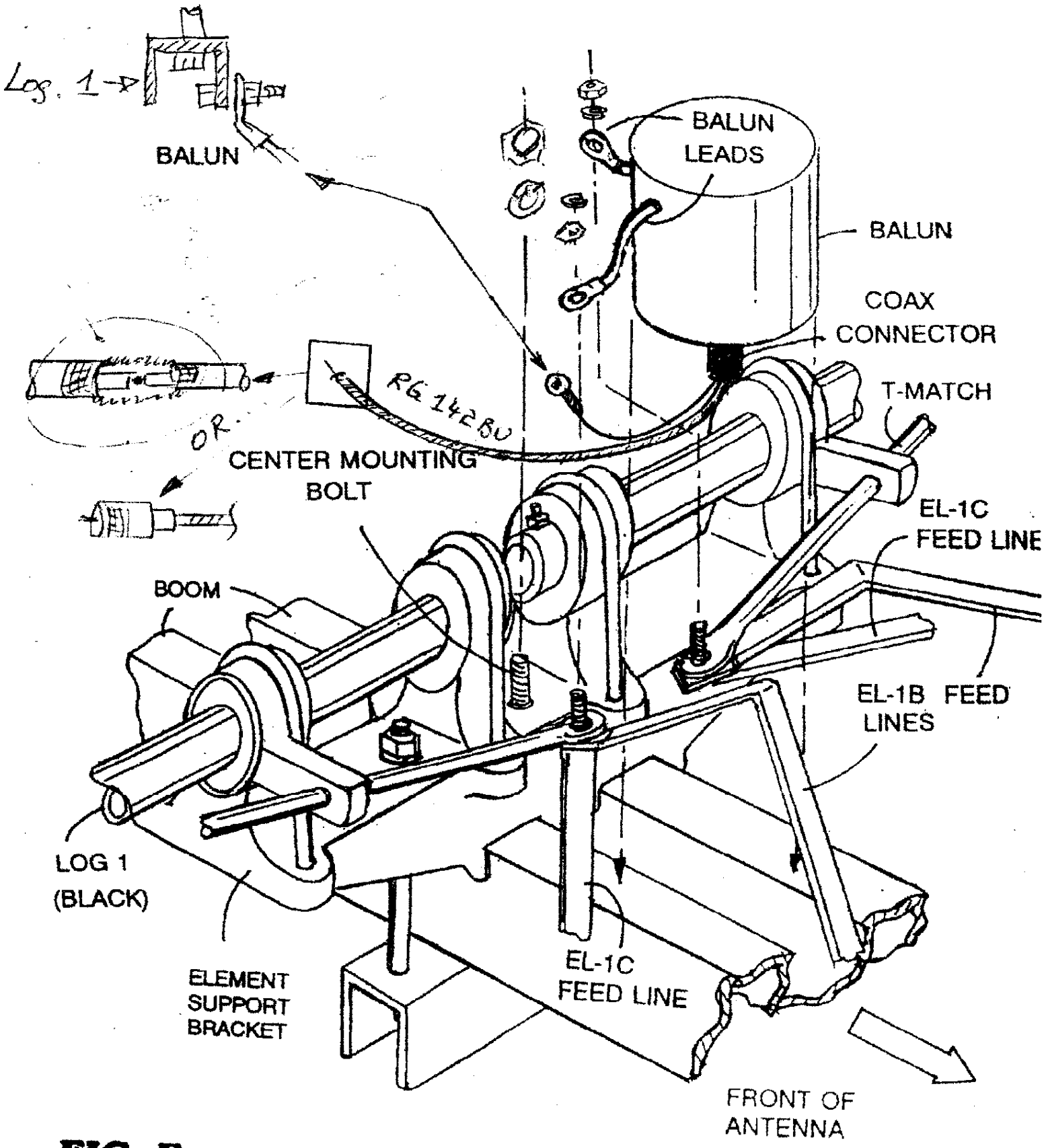
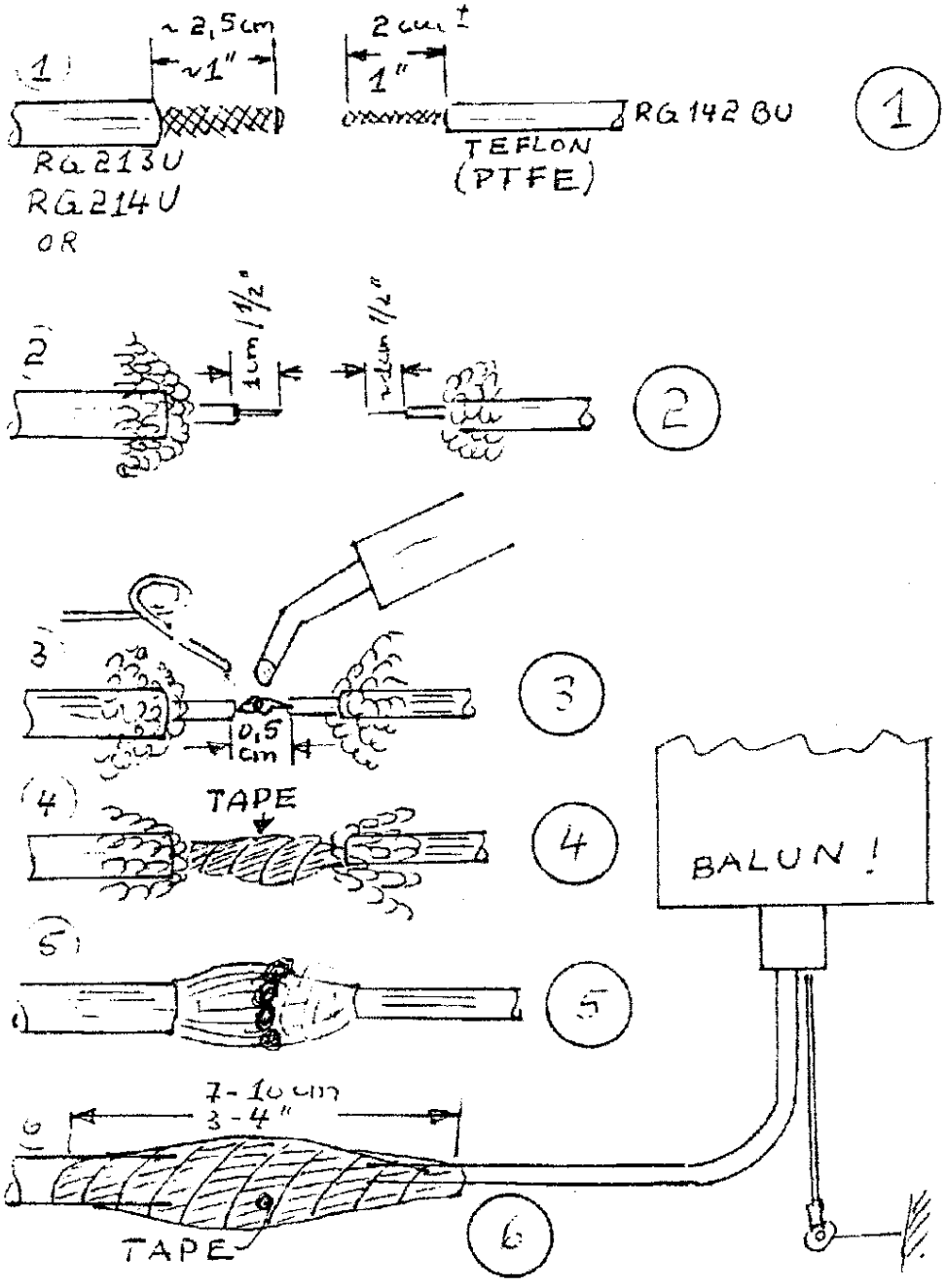


FIG. F DETAILS OF BALUN MOUNTING

(Not to scale)

CONNECTION BALUN TO FEEDLINE

or Tuning-Transformer / Feeder-Transformer
(T-25, T-33, T-50 only)



1. Remove the jackets of both cables. See FIG. 1
2. Push the shield back as FIG. 2 shows and remove the inner conductors insulation.
3. Connect the wires of the inner conductor together and solder the connection. FIG. 3
4. Wrap PVC tape around the inner conductor as FIG. 4 shows.
5. Connect both shields and solder. FIG. 5
6. Wrap with plenty of tape! FIG. 6

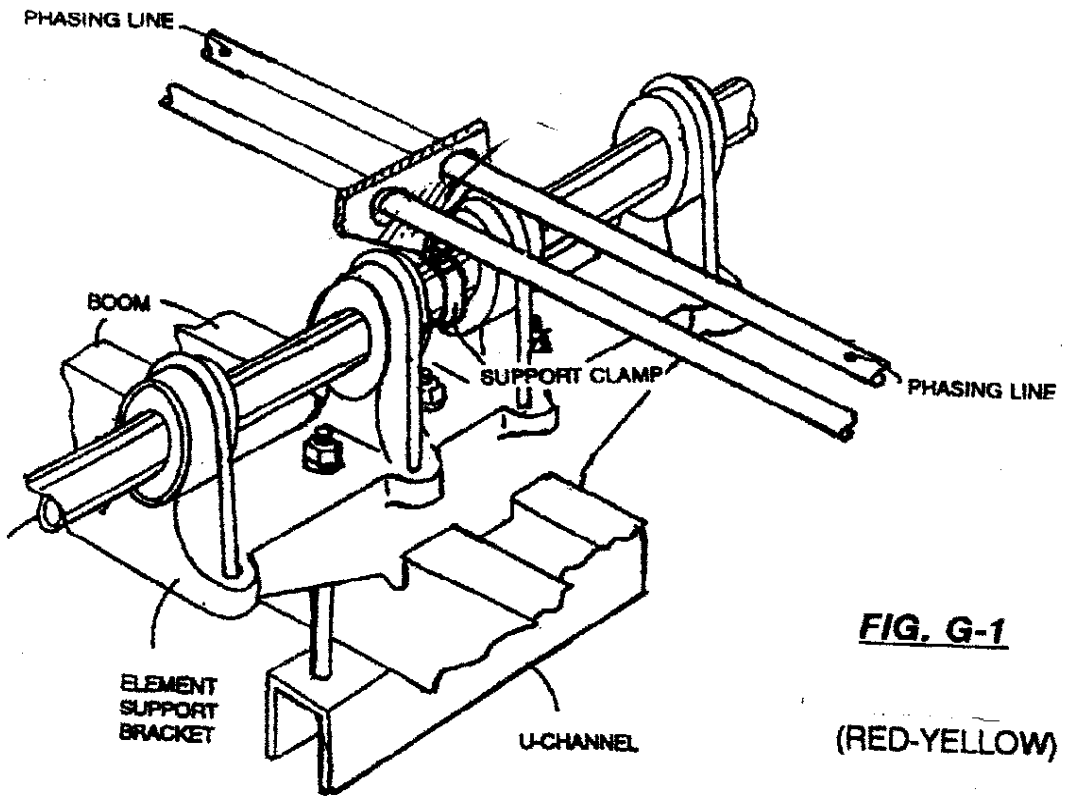


FIG. G-1

(RED-YELLOW)

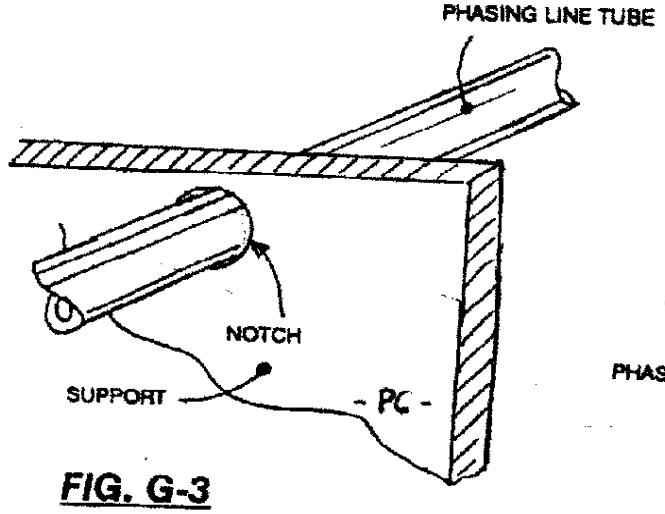


FIG. G-3

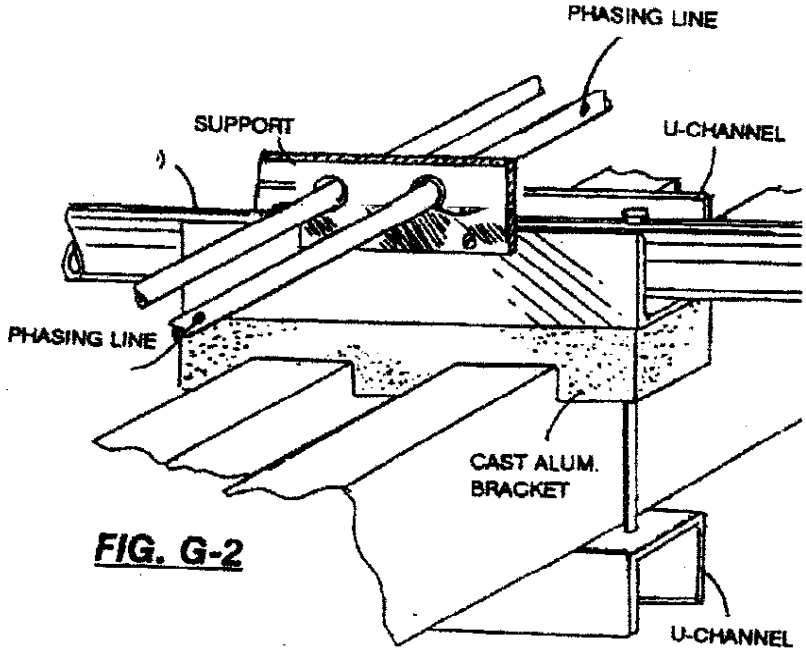
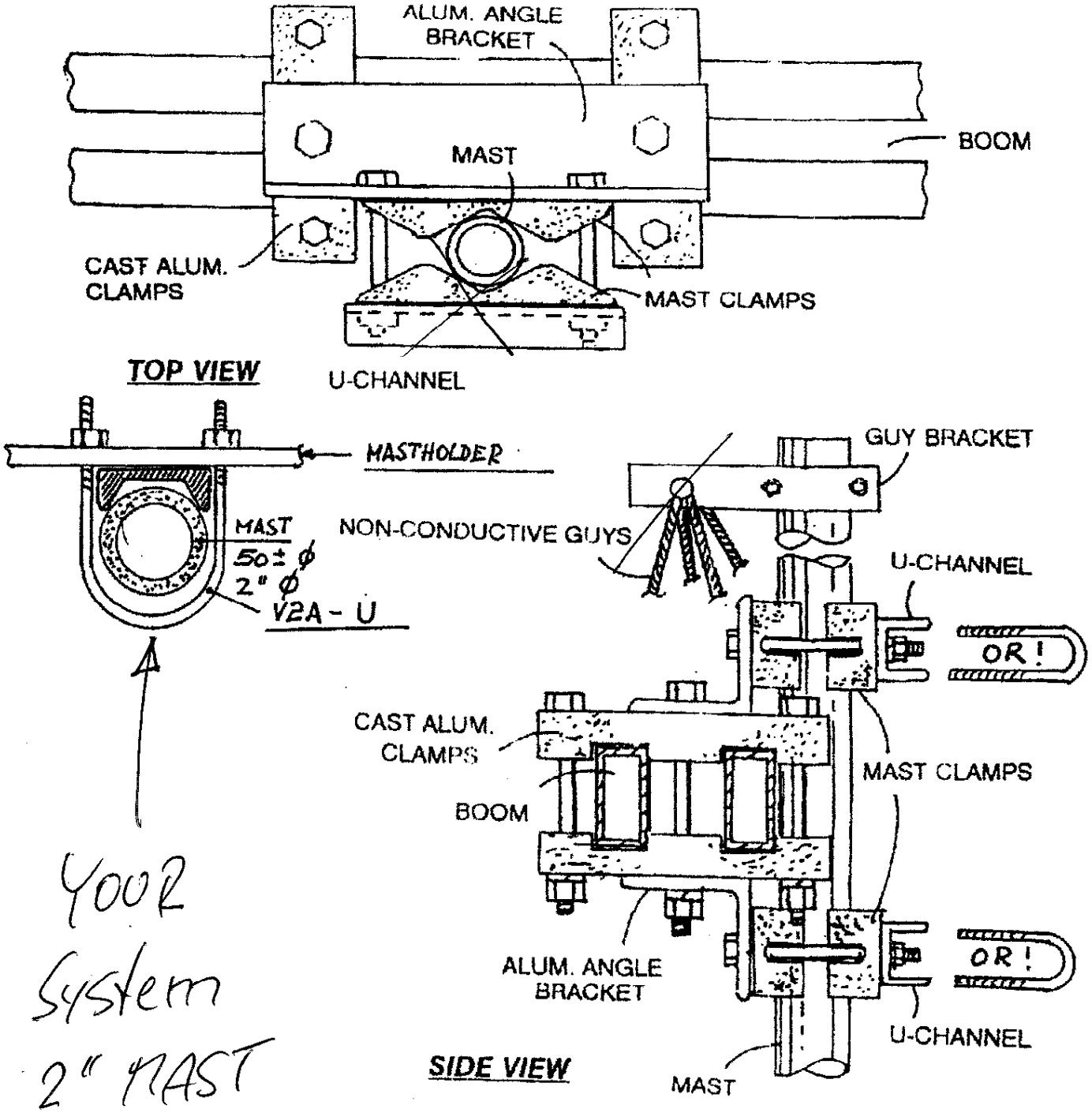


FIG. G-2

FIG. G DETAILS OF PHASING LINE SUPPORTS

(Not to scale)

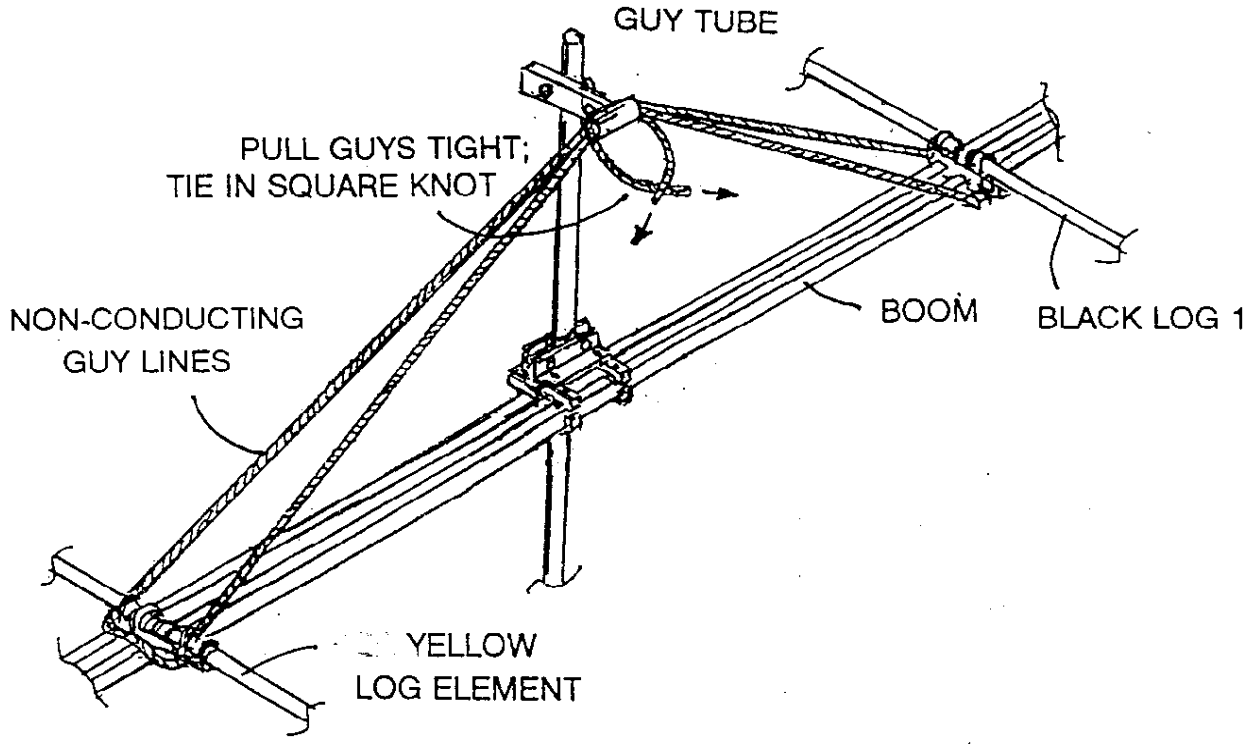


YOUR System 2" MAST OR 50mm ϕ

FIG. H DETAILS OF MAST CLAMP

(Guy bracket and non-conductive guys are used only on 20 and 26 ft. booms.)

FIG. I GUY LINE ARRANGEMENT FOR XP70() AND XP80()



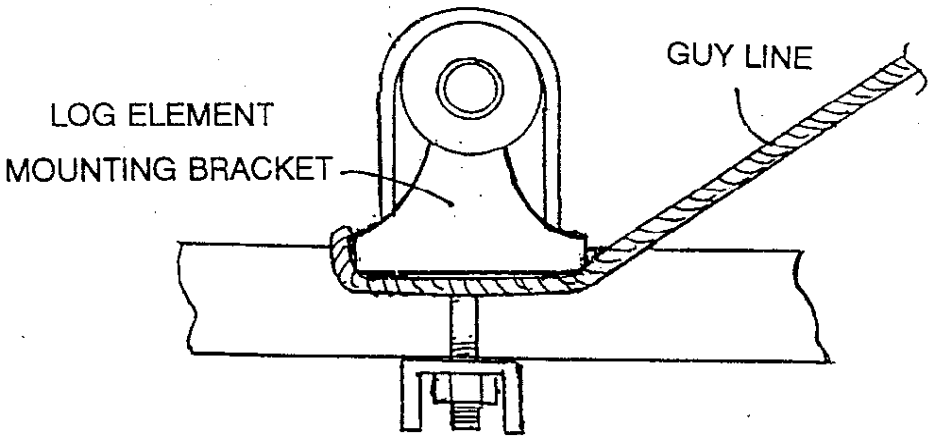
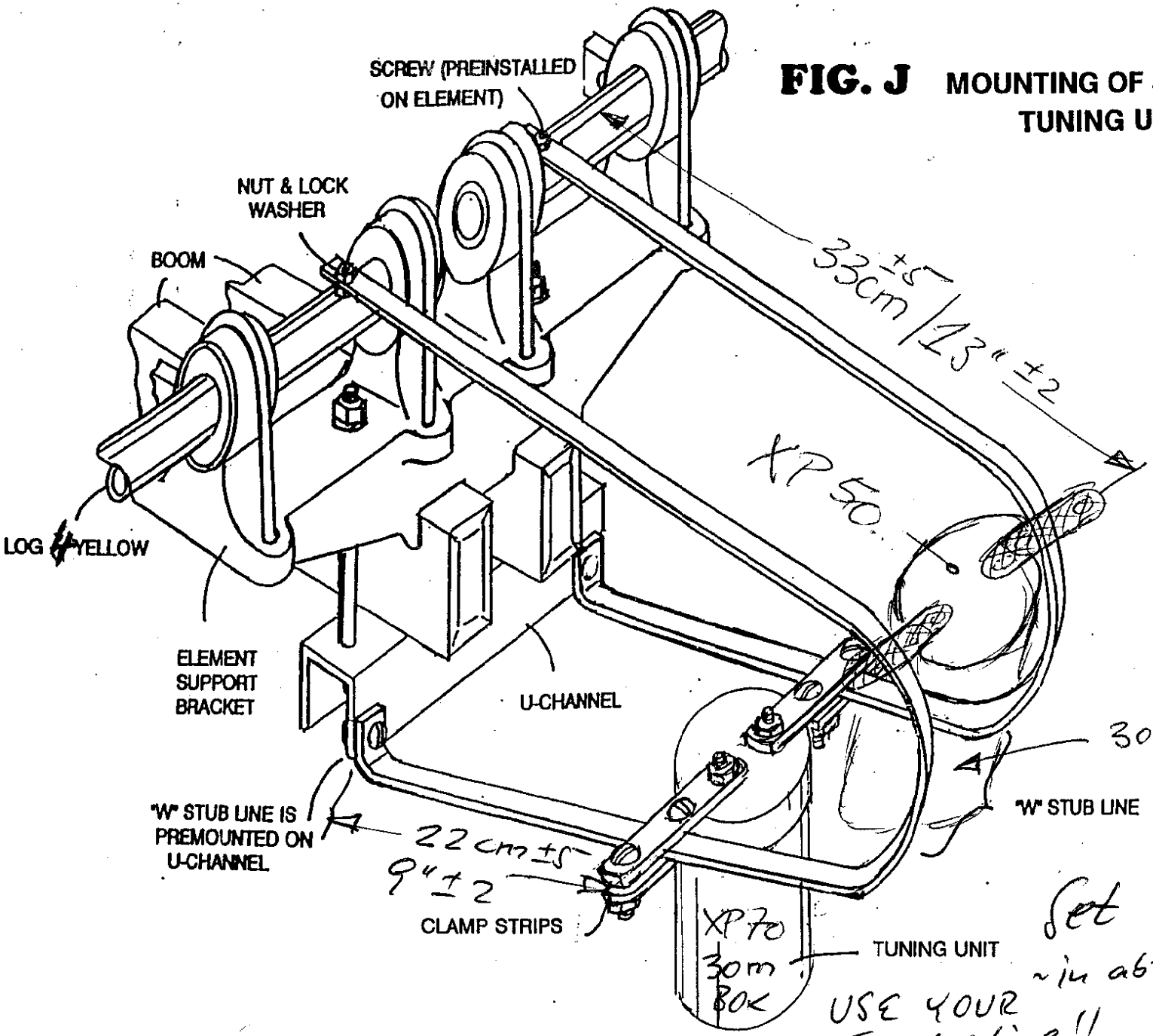


FIG. J MOUNTING OF 30 METER TUNING UNIT



Set to 7.100 ± 4kHz in abt
10 ft height for 1. Test. Typ. SWR 1.5..2.0 : 1

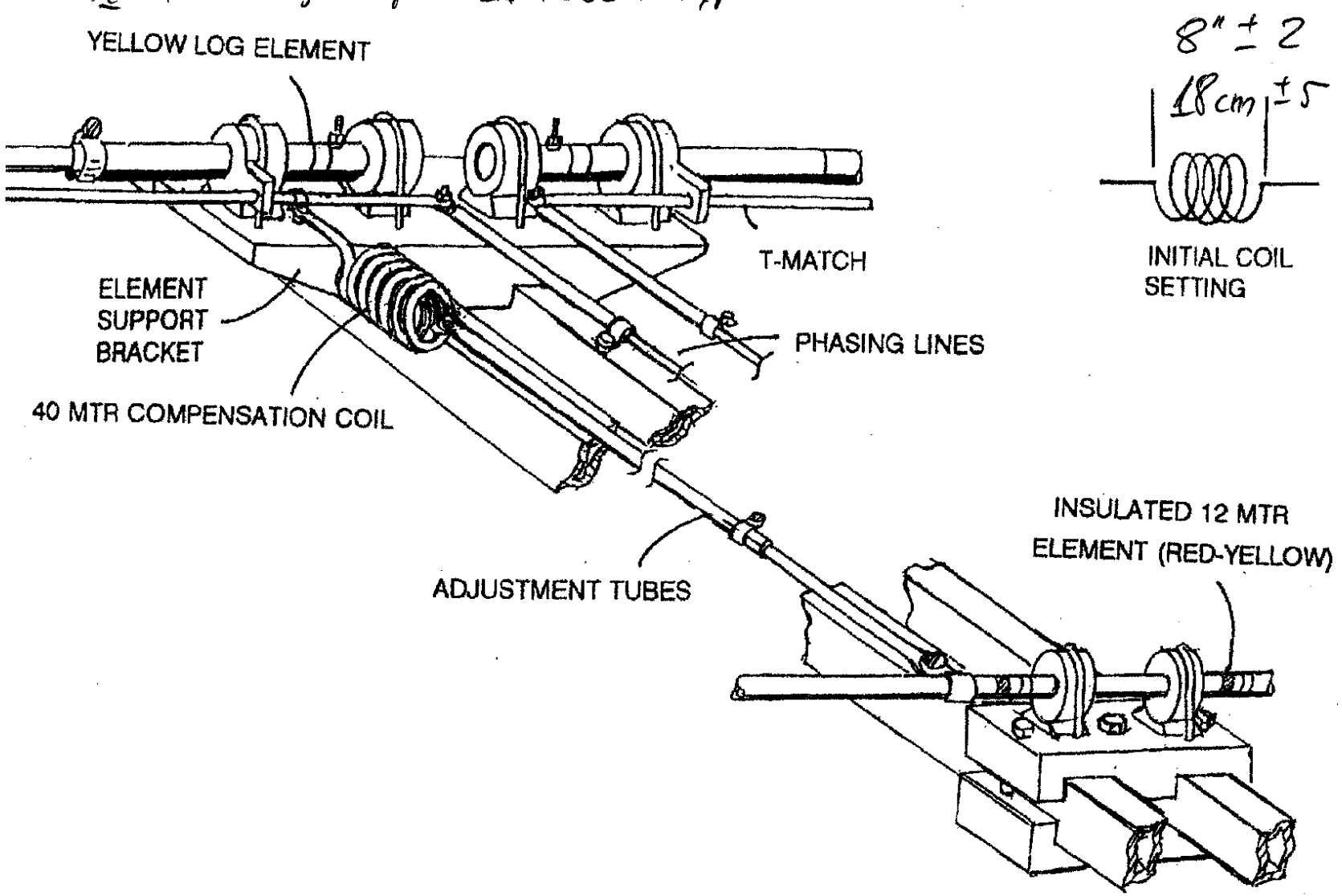


FIG. K DETAILS OF 40 METER COIL AND TUNING SYSTEM

INITIAL ADJUSTMENTS

The element lengths specified in the assembly instructions are designed for an antenna height of about 45 to 60 feet. However, as with any horizontal radiator, the feed impedance is affected by the height above actual ground. As you may note from the ARRL Handbook, the center impedance of a half wave dipole will change from a few ohms to over 100 ohms as it is raised to about 0.3 wavelengths above a perfect ground. Another factor is the environment of the antenna. All conductive and lossy materials within the near field of the antenna will have an effect on the feed impedance, and consequently, the VSWR. Other antennas, utility lines, metal structures, and trees can influence the antenna.

The Sommer antenna can be adjusted to optimize the VSWR for each band so as to place the minimum VSWR in your favorite portion of each band. After setting the element lengths to the specified nominal values, it is helpful to temporarily support the boom at a height at which you can reach the elements, and to connect your feed line. Check the VSWR for each band, and record the values at the band edges, and at the frequency of the minimum value. If any value is very high (over 3, for example), check the lengths of the elements for that band. They may have shifted, or not correctly adjusted. The adjustment of the 40 m band will be discussed later.

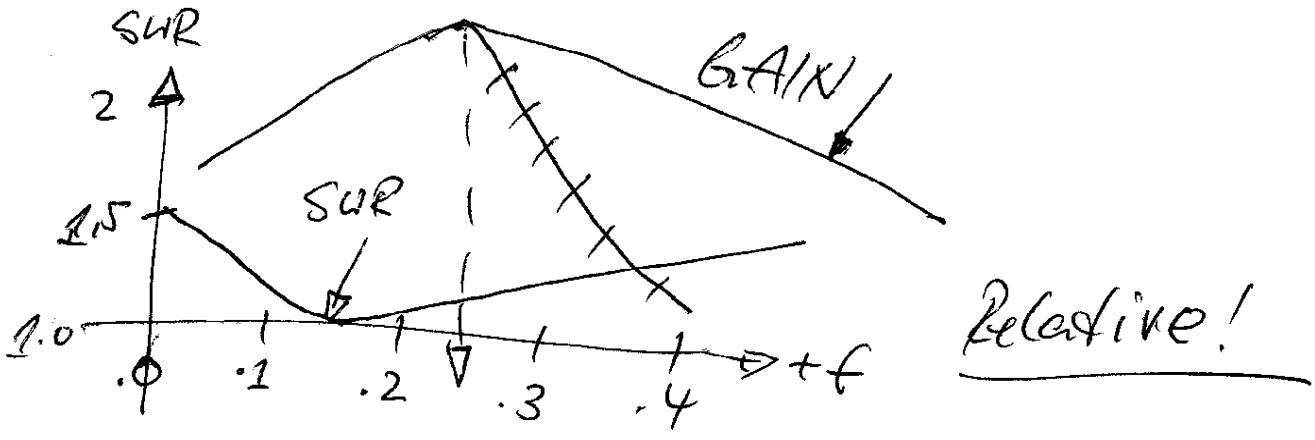
Best performance (maximum gain in band center) will be with the minimum SWR at the following frequencies:

14.000 ± 50 KHz 21.100..150 28.300..500 18.068 ± 24.890 ±

As with all well adjusted yagis, the maximum gain is found about 1-2% higher than the minimum SWR. (see also antenna literature)

If all values are reasonable, and you wish the minimums to be at different frequencies, this can be achieved by adjusting the lengths of the appropriate elements. A trial adjustment can be made using the following table. Lengthen or shorten the respective elements on each side according to the following chart:

B A N D	E L E M E N T	F O R ± 100 KHz
10 MTRS	EL-1A (BLUE-BLACK)	± 3/8" (1cm)
12 MTRS	EL-2A (RED)	± 5/8" (1,5cm)
15 MTRS	EL-1B (BLUE)	± 3/4" (2cm)
17 MTRS	EL-1C (BLUE-RED)	± 7/8" (2,5cm)
20 MTRS	LOG-1 (BLACK)	± 1 3/8" (3,5cm)



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Importance of your Transmission Line!

The Sommer antennas are designed to be fed by a 50 ohm unbalanced coaxial cable via a 1:1 balun. However, the selection of the line is of great importance to the best operation of your antenna. All so-called 50 ohm coax lines are not suitable, even though the seller may designate it as RG8/U! Unless it is stated that the line meets MIL SPEC, it may not. **A problem with many types of coax lines is that their characteristics change drastically with age, heat, and excessive bending of the cable. For example, a line that uses foam dielectric may be desirable for low loss, the center conductor can drift toward the copper braid, under heat and excessive bending. Cable may experience bending during rotation of the beam. These problems cause changes in VSWR over that when the cable was new.**

The preferred cable for use with Sommer antennas is RG213/U. This cable handles 3500 watts, has at least 97% copper braid shield, and uses polyethylene dielectric. The center conductor is 13 AWG stranded copper. The loss is about 1/2 dB at 10 MHz, and the jacket is non contaminating. If you experience any deterioration in VSWR or performance from the Sommer antenna, the feedline and if used - connectors are the first things to check.

The antennas can handle the following power limits:

30 m:

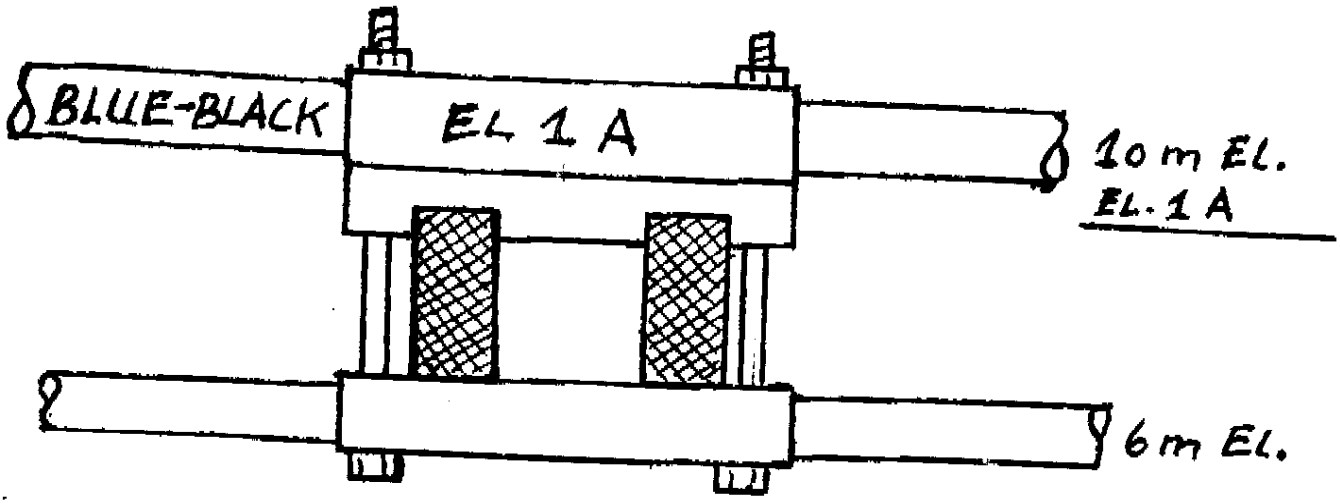
Legal power 300 W PEP out

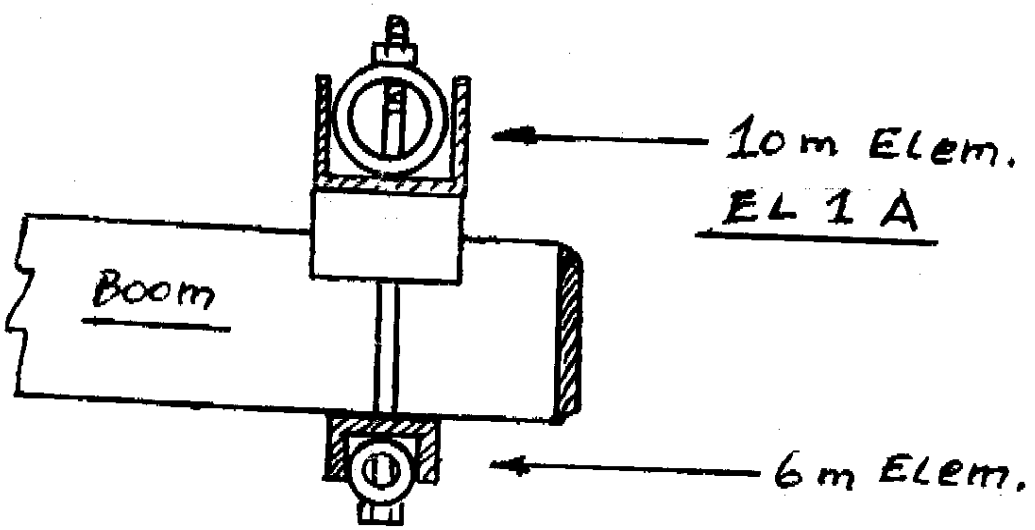
40 m:

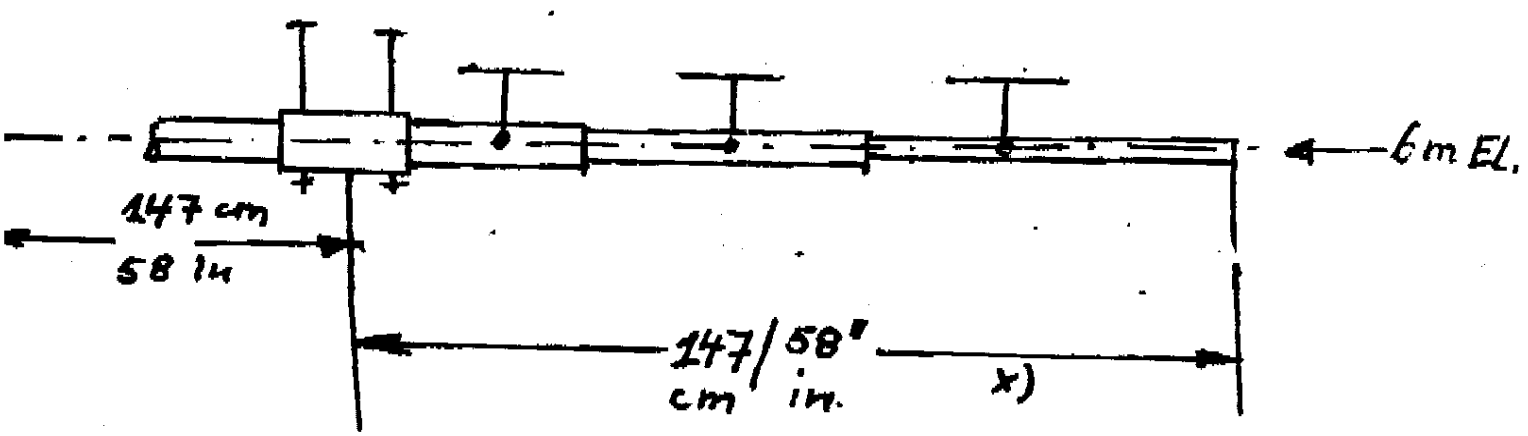
Legal power 1500 W PEP out

6-10-12-15-17-20 m:

Legal power or - if allowed up to 7 KW - but only if your cable connection feedline to balun is done as recommended - no plugs/connectors !







x) ± 1/2 in / ± 1 cm

6 m - Element
2.92 W4-DJ2 OT