LOW - CAPACITY PROBE CONSTRUCTION

Unpack the kit and check each part against the following parts list.

PARTS LIST

Stock #	Description	Amt.	Stock #	Description	Amt.	Stock #	Description	Amt.
89507	probe shell (L-C)	1	42019	rubber washer	1	10401	res., 33 MΩ	1
89511	nose-piece	1	51500	alligator clip	1	29506	trimmer cap., 6-30mmf	1
89512	probe tip	1	58403	co-axial cable	1	89514	trimmer ring	1
54506	term. board (L-C)	1	58002	stranded wire	pc	46001	1/4" grommet	1
47001	spring	1	58000	hook-up wire	pc			

NOTE: When ordering replacement parts, please include the stock number of the part and the description given in the parts list.

Follow the step-by-step assembly and wiring procedure that follows closely and carefully for best results. IMPORTANT: USE THE BEST GRADE OF ROSIN CORE SOLDER ONLY, preferably one containing the new activated fluxes such as Kester "Resin-Five", Ersin "Multicore" or similar types. UNDER NO CONDITION USE ACID CORE SOLDER OR ACID FLUX since acid flux can cause serious corrosion. If for any reason it is necessary to resolder a joint, be sure to use new solder.

Construction is begun by mounting the parts on the terminal board as shown in Figs. 3 and 4. First, install the trimmer capacitor on side A of the board (Fig. 3--same side solder lug is on) as shown in Fig. 1. To do this, hold the top and bottom plates of the trimmer in the board as indicated and then slide the retaining terminal clip in place to secure the assembly*. Bend the terminal lugs away from each other on side B of the board. Then press fit the probe tip into the rectangular notch at one end of the board as shown in Fig. 2.

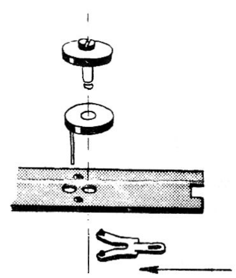

Fig. 1

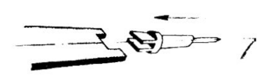

Fig. 2

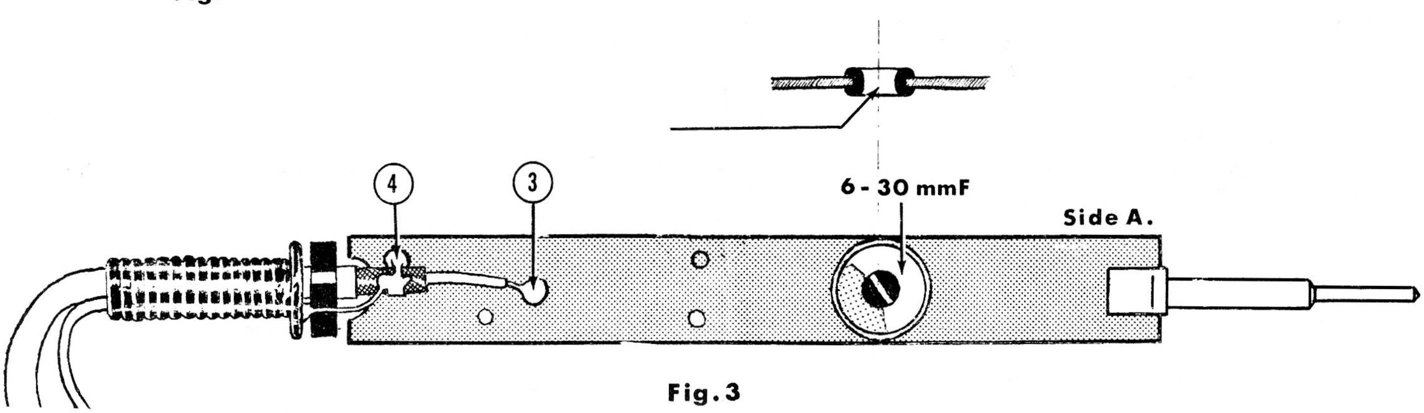

Fig. 3

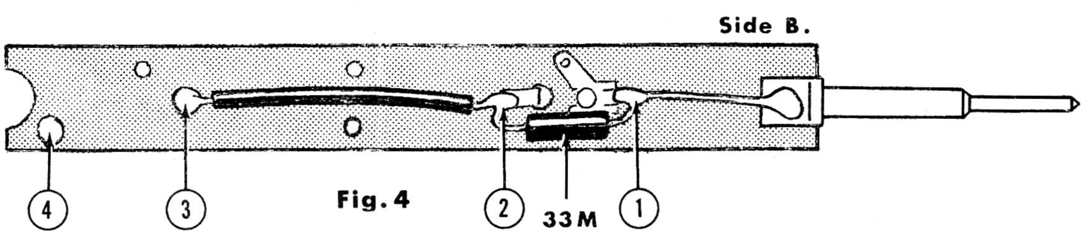

Fig. 4

NOTE: The trimmer capacitor as found in the kit has been pre-assembled to a small bakelite board to permit factory testing. Before proceeding with assembly to the probe terminal board as instructed, the trimmer capacitor must be disassembled by sliding out the retaining terminal clip. Discard the small board.

On side B of the board (Fig. 4), solder one end of a bare wire jumper to the flat shank of the probe tip and connect the other end to the retaining terminal clip of the trimmer (terminal 1). Then connect the 33 MΩ resistor** between terminal 1 and terminal 2 (other trimmer capacitor terminal). On side B also, connect a hook-up wire jumper between terminal 2 of the trimmer and terminal 3 on the board. Solder trimmer terminals 1 & 2 and then lay terminal board aside.

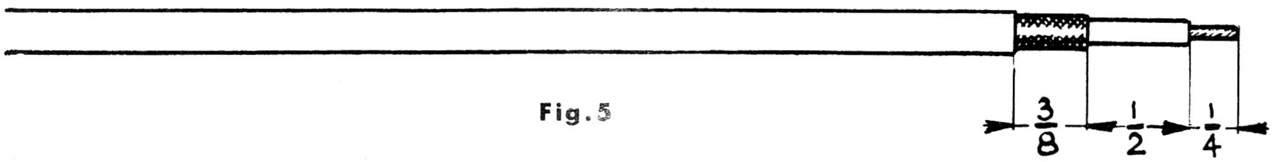

Fig. 5

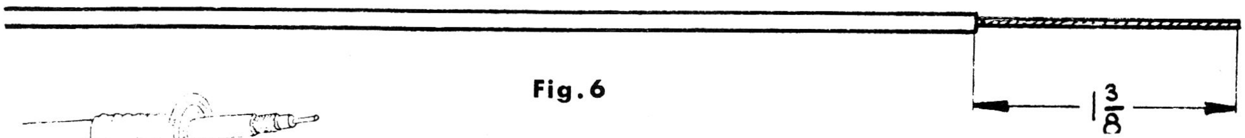

Fig. 6

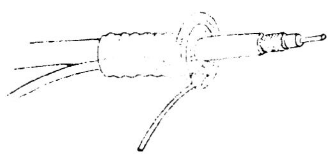

Fig. 7

Fig. 8

Strip the co-axial cable and the ground lead (stranded wire) as shown in Figs. 5 and 6. Position the ground lead in the spring as shown in Fig. 7, and solder it to the spring, as shown, at the point indicated in the drawing. Then insert the co-axial cable in the spring as shown in Fig. 7. Push the rubber washer over the stripped end of the co-axial cable on to the outside insulation and position it as shown in Fig. 3. Next position the stripped end of the co-axial cable so that the end of the outside insulation rests inside the semi-circular notch in the end of the terminal board and the outside braid lays across the solder lug. (Check to see that the inner co-axial conductor reaches eyelet 3.) Then bend the solder lug over to grip the cable braid (Fig. 8 is a profile view) and solder the connection, keeping in mind that overheating will soften the inner co-axial insulation with the consequent danger of a short. Bring the stripped end of the ground lead (extending from the solder point on the spring) around the outside of the rubber washer and insert it in eyelet 4 (Fig. 3), after which solder eyelet 4. Insert the inner conductor of the co-axial cable in eyelet 3 (Fig. 3), after which solder eyelet 3. Next, Place the trimmer ring around the body of the trimmer. This insulating ring prevents accidental shorting between the trimmer and the probe shell.

To complete the construction, pass the free ends of the co-axial cable and the ground lead through the probe shell from the threaded end. Then grasp the probe tip with one hand, and with the other hand move the shell down over the probe body (use a rocking motion and do not force) until the large end of the spring is flush against the rolled-over end of the shell. Position the small hole in the shell directly over the head of the trimmer adjusting screw and insert the 1/4" rubber grommet. Then pass the plastic nose-piece over the probe tip and screw it into the shell (see Fig. 9). At the opposite end of the cable, strip away 3" of outer insulation and 2 1/2" of the outer braid. Cut off 3 1/2" of stranded wire and strip off 1/2" of insulation from one end. Wrap the stripped end around the exposed cable braid and solder, being careful not to overheat the cable. Finally solder a spade lug to the opposite end of this lead and to the inner conductor of the co-axial cable (see Fig. 9). Now proceed with the adjustment instructions given in the instruction sheet.

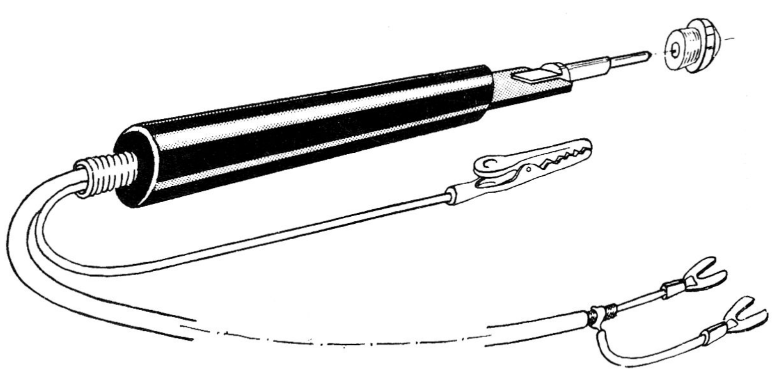

Fig. 9

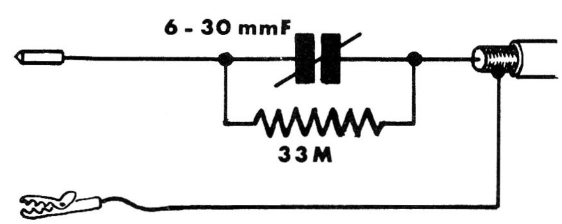

Fig. 10

** Refer to "Low-Capacity Probe Adjustment" in your instruction sheet before performing this step.

EICO ELECTRONIC INSTRUMENT CO.

LOW-CAPACITY PROBE ADJUSTMENT

The low-capacity probe, of necessity, attenuates the signal by a factor as great as the factor by which it multiplies the oscilloscopes input resistance. The resistor supplied in the probe is 33 MΩ; therefore, if the input resistance of the scope is 3.3 MΩ (EICO Model 470), the attenuation factor is 33/3.3 = 10. If the input resistance of your scope is 2.2 MΩ, the attenuation factor is 33/2.2 = 15, and if the input resistance of your scope is 1 MΩ, the attenuation factor is 33/1 = 33. An attenuation factor of 10 is considered to give the best compromise on the factors of input impedance and attenuation, besides being most convenient when a scope calibrator is used. It is therefore recommended that a resistor of value ten times greater than the input resistance of your oscilloscope's vertical amplifier be substituted for the resistor supplied in the probe (unless, of course, your scope's input resistance is 3.3 MΩ such as EICO Model 470). There is no objection to using other resistor values to obtain any desired attenuation factor, but it should be kept in mind that perfect frequency compensation will generally not be possible if the attenuation factor greatly exceeds 15.

The low-capacity probe frequency compensation may be adjusted in several ways. If a square wave generator is available, connect the spade lugs of the probe cable to the vertical input terminals of the oscilloscope and the probe tip and ground lead to the output terminals of the generator. Set the square wave generator at a frequency between 10,000 and 50,000 cps. (An oscilloscope should have flat response to a frequency ten times greater and ten times smaller than the fundamental frequency of a square wave in order to reproduce it with good fidelity.) Then use a screwdriver or an insulated alignment tool, if one is available, to adjust the probe trimmer (accessible through an opening in the shell) until the square wave is reproduced properly. Incorrect trimmer adjustment is indicated by a badly rounded or a badly peaked square wave. Another method to adjust the probe trimmer is to use the saw-tooth output of the oscilloscope multivibrator sweep generator. If the sawtooth is available at a front panel jack as in the EICO Model 470, this procedure is very easy. If it is not available, the oscilloscope chassis may be removed from the cabinet and an input grid of the horizontal output stage used as a take-off point. In either case set the scope for internal sweep and the sweep frequency to about 1000 cps. Connect the spade lugs of the probe cable to the vertical input terminals of the scope and place the probe tip at the sawtooth output jack or a grid of the horizontal output stage. Adjust the vertical and horizontal gain controls until a pattern that occupies about two-thirds of the screen is obtained. With the probe trimmer adjusted improperly, the trace will appear as in Fig. A or B. If this is the case, adjust the probe trimmer until the hook disappears and the trace appears as in Fig. C.

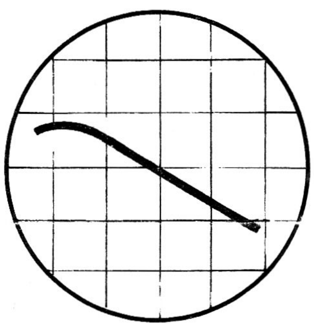

Fig. A - sawtooth exhibiting rounding

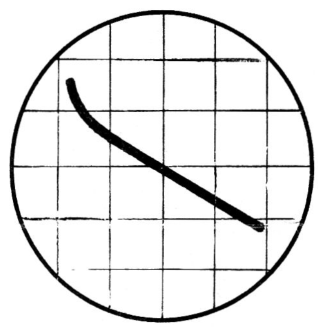

Fig. B - sawtooth exhibiting overpeaking

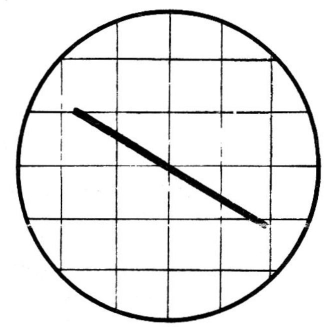

Fig. C - sawtooth exhibiting correct adjustment

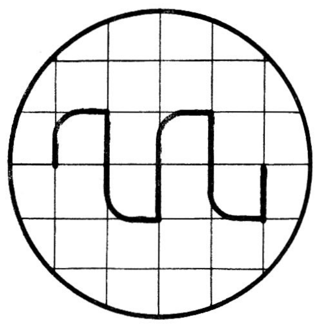

Fig. D - square wave exhibiting rounding

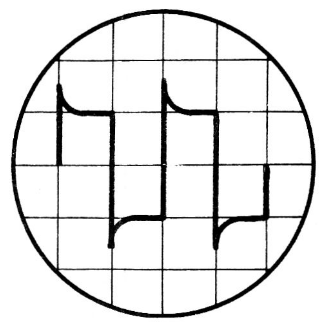

Fig. E - square wave exhibiting overpeaking

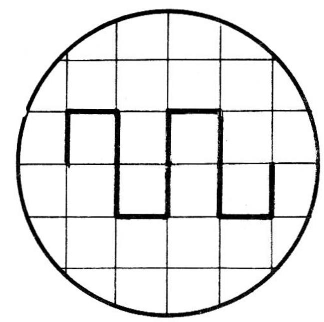

Fig. F - square wave exhibiting correct adjustment

To measure the value of the probe attenuation, connect a pair of jumpers between the vertical input terminals of the scope and a sine wave generator set at about 1000 cps. Adjust the peak-to-peak deflection to a convenient number of divisions on the scope graph screen. Without further adjustment of the generator or scope controls, disconnect the jumpers. Then connect the spade lugs of the probe cable to the vertical input terminals of the scope and the probe tip and ground lead to the generator output terminals. A smaller deflection will be obtained. Divide the number of vertical divisions occupied by the pattern when direct connections were used by the number of divisions occupied by the pattern when the probe is used. The value attained is the probe attenuation.

NOTES: 1) The statements and calculations regarding probe attenuation are good approximations when the attenuation factor is 10 or greater. 2) On some scopes, the waveforms shown above will be found transposed from left to right, or inverted, or both.