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# MODEL LT 111 FM STEREO TUNER

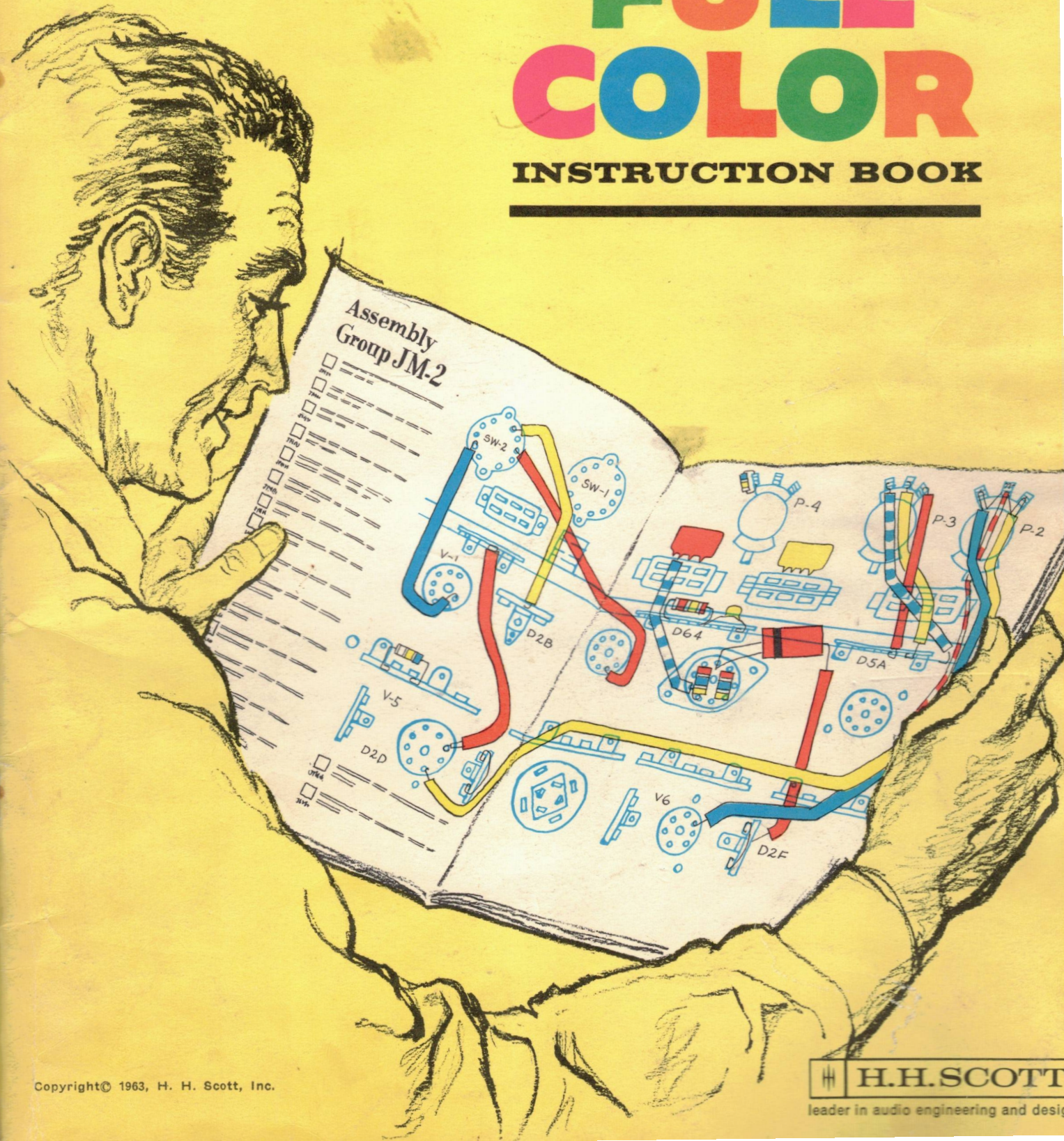
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H. H. SCOTT

# FULL COLOR

## INSTRUCTION BOOK

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# NOTES ON H. H. SCOTT TUNERS

## WHAT IS THE FUNCTION OF A TUNER?

A tuner takes a radio signal from the air and converts it to an audio signal of sufficient strength to drive a power amplifier.

## HOW IS THIS DONE?

### FRONT END / IF's / LIMITER / DETECTOR / AUDIO

The station you want is selected in the front end and amplified by the RF amplifier. At this point, however, the signal is still not strong enough and must be further amplified. It is a principle of engineering that better performance will result if an amplifier is designed to operate over a very narrow band of radio frequencies and does not have to be tuned every time the frequency is changed. It is also easier to build an amplifier to handle frequencies lower than the FM band. Because of these facts, the tuner takes the radio signal, no matter what station it is set to, and converts that signal to a new, lower frequency which remains the same regardless of the station you are hearing.

This process is called "conversion" and is handled in the tuner's converter. This new frequency is called the intermediate frequency, or "IF". The amplifiers that are tuned to that IF frequency are called IF amplifiers.

Here is how the signal for the radio station to which you are tuned is converted to the intermediate frequency:

It is a phenomenon of nature that when two frequencies are mixed together, resultant frequencies are created that are the difference and sum of the original frequencies. This principle is used in producing the IF frequency in the tuner. The IF frequency is the *difference* frequency. What actually happens is that the incoming radio signal is mixed with a signal generated in the tuner itself. The section of the tuner which produces this signal is called the "local oscillator", which is designed so that its frequency is always a fixed amount different from the incoming station. To do this, the frequency of the oscillator is changed every time the station is changed. The difference frequency produced in the mixer is in turn amplified in the IF amplifiers.

The next step in an FM tuner is called "limiting". Here, any undesired disturbances which affect the *amplitude* of the signal are removed in

order to make the tuner a true FM tuner. In this way, the tuner will be sensitive only to changes in frequency, not amplitude. Obviously, an AM tuner does not contain a limiter.

After limiting, we are ready to remove the audio signal from its carrier. This is done in the detector. There are two basic types of detectors — Foster-Seeley and the ratio detector. The ratio detector has the added advantage of providing extra limiting, and it is this type of detector which is used in H. H. Scott's FM tuners.

The final stage of the FM tuner is one of equalization and amplification of the audio signal. Just as on a record, the transmitted signal is equalized differently from the original signal to improve the signal-to-noise ratio. Equalization is not necessary in AM tuners, as the signal is transmitted "flat".

One of the most important overall criteria of the tuner is its sensitivity, which is a measure of its ability to receive weak signals. Sensitivity can be expressed as the amount of signal required on the antenna terminals to give a certain ratio of audio output to background noise. The sensitivity of a typical H. H. Scott tuner could be stated as 0.75 microvolts for 20 db of quieting. This means that the background noise will be at least 20 db below the audio signal.

This definition of sensitivity does not take into consideration the *quality* of the audio signal. Therefore, it is not a really accurate guide to the performance of a tuner. After all, what is the use of hearing a weak signal when it is so badly distorted that it is virtually unlistenable. The Institute of High Fidelity Manufacturers (IHFM) has devised a new method of measuring sensitivity which is known as "Usable Sensitivity." This indicates the amount of signal required on the antenna terminals to obtain less than 3% of total hum, noise, and distortion (-30db). This is a much more severe criterion. Measurements made by this strict standard assure you that H. H. Scott tuners like the LT-111 are the most sensitive on the market.

Now that we have discussed the basic theory of tuner operation, we have to again look at the individual parts of the tuner to see what characteristics separate a good tuner from a bad one — in particular, we will discuss H. H. Scott design concepts for each stage of the tuner as compared with conventional tuners.

## FRONT END

The "front end" consists of the RF amplifier, local oscillator, and the mixer. It is the part of the tuner that is actually tuned when you select a station. There are several important reasons why the H. H. Scott front ends give superior results:

1. Use of carefully selected low noise RF tube.
2. Copper-plating on the front end and its silver-plated components reduces circuit losses to a minimum and provides for maximum gain.
3. Prealignment of the front end subassembly which assures optimum uniformity in performance from each front end.

One of the basic problems inherent in front end design is drift. FM works on such high frequencies that even the slightest change of value of one of the electronic components can cause the tuner to go off station. The conventional way of keeping a tuner on station is to provide an auxiliary circuit called "Automatic Frequency Control" or AFC. AFC has certain inherent drawbacks:

1. The AFC circuit itself usually adds distortion to the received signal.
2. AFC attenuates low frequency response.
3. AFC tends to pull to strong stations — this is a disadvantage when you want to receive a weak station next to a strong station. Of course, if you defeat the AFC, you will receive the weak station, but the tuner will drift without the AFC.

To overcome these limitations of AFC, the H. H. Scott engineering department designed a completely new front end that did not require AFC. Part of the new design was careful attention to the local oscillator so that as the tuner heated up, changes in the values of the electronic components could be compensated for by special temperature compensated components.

Another important characteristic of the front end is its ability to reduce interference known as cross-modulation. Cross-modulation simply means that you get a station at many different places on the dial in addition to the *one* place it should be. This is, of course, an undesirable characteristic because strong stations can appear at a point along the dial where a weaker station is desired. In the design of H. H. Scott tuners, this cross-modulation characteristic is practically eliminated by our special design.

A final point about our front ends is that they are carefully shielded on both top and bottom, in conformity with FCC specifications, in order that

the local oscillator will not interfere with nearby television sets. This shielding also reduces the cross-modulation just discussed.

## IF STAGE

(In your LT-111, this includes T1, T2, T3, V1(6AU6), V2(6HS6), and the associated circuitry).

The ideal IF amplifier would:

1. Amplify only the station to which you are tuned and completely reject any other signals that might be passed by the tuner's front end to the IF amplifiers: This is referred to as "Selectivity." Even the best designed front end will sometimes pass stations other than the one the tuner is set to, so the IF's must be able to reject the undesired stations.
2. It will amplify, without distortion, soft *and* loud signals.
3. If the station is not exactly tuned in, the IF will still pass the desired station without distortion.

The selectivity of a tuner is defined as its ability to separate stations that are very close together. It is determined primarily by the shape of the IF amplifier characteristic. The more nearly perpendicular the IF curve sides, the more perfectly the tuner can separate adjacent signals. If the sides are at an angle rather than perpendicular, they will not separate nearby stations nearly as well. H. H. Scott has the most selective IF characteristics in the entire tuner industry.

On H. H. Scott tuners, the desired signal, whether weak or strong, will be amplified with virtually no distortion while nearby stations are virtually totally discarded.

The amount of distortion in receiving a very weak signal is determined primarily by the shape of the top of the IF characteristic. The more rectangular the curve over the bandwidth of the station, the lower the distortion. It is often a trick of less expensive tuner manufacturers to give tremendous amplification to the signal in the IF amplifiers — the result, however, is very high distortion and an IF characteristic that is very pointed. In comparison with competing tuners which often have peaked characteristics, the H. H. Scott tuners have far flatter characteristics. The wider IF response of H. H. Scott tuners is part of its pioneering wide-band FM circuit design, with all its inherent advantages.

Because of the Wide-Band IF characteristics exclusive to H. H. Scott tuners you are able to align your LT-111 using a much simplified Ez-A-Lign system. This would not work with conventional narrow band tuners.

## THE LIMITER

(A 6AU6 and associated circuitry does the limiting in your LT-111).

The ideal limiter is able to remove amplitude or height changes in the signal very rapidly. The faster it can do this, the more likelihood that all such variations will be removed. H. H. Scott limiters are wide-band . . . 2 MC. The wider the band the faster the limiting action, and the H. H. Scott tuners have the widest band limiters in use today . . . therefore, the fastest. The result is superior rejection of any man-made or electrical interference in H. H. Scott tuners.

## THE DETECTOR

(The detector stage of your LT-111 constitutes T4, the two diodes, and associated components.)

As stated before, the function of the detector is to remove the audio signal from the radio frequency carrier. The perfect detector would not disturb the audio signal in any way — it would be removed from the carrier intact. A measure of the ability of the tuner's detector to do this perfectly is the frequency bandwidth of the detector — the wider and more linear this bandwidth, the more nearly perfect job it can do. Normal detectors are made with frequency bandwidths ranging from 250 to 500 kilocycles. The LT-111 utilizes a 1 megacycle detector, two times the width of most other tuners.

H. H. Scott uses ratio detectors which have the advantage of providing additional limiting. The wide-band detector is the heart of H. H. Scott's wide-band design. To a great extent, this wide-band detector accounts for the low-distortion performance of our tuners on weak signals, the freedom from drift, and the ease of tuning.

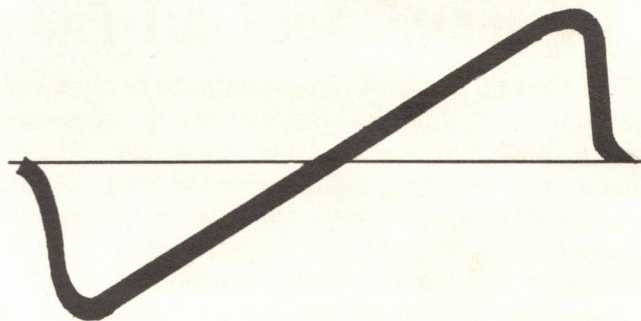
The H. H. Scott wide-band detector also gives the most favorable "capture ratio" in the industry today. It is characteristic of FM reception that if there are two signals on the same frequency, the weaker signal will be completely rejected as long as it is a specified amount weaker than the other

signal. This "specified amount" is known as the "capture ratio". Since it is desirable to suppress as much interference as possible, the ideal tuner would have a capture ratio such that interference, only slightly weaker than the signal itself, would be completely rejected. The wide-band detector and wide IF's improve the capture ratio of H. H. Scott tuners.

After the audio signal has been removed from its carrier in the detector, it is equalized and amplified in the audio section of the FM tuner. At this point, the quality of the audio signal in H. H. Scott's tuners is far superior to that of ordinary narrow band tuners.

One of the reasons that H. H. Scott tuners offer high sensitivity with low distortion is that the circuit losses on H. H. Scott tuners are less. The front-end losses are less in the LT-111 because the front end is copper-plated. Copper has the best conductivity of any metal except silver. Other tuners usually use cadmium plated steel and cadmium is a very poor conductor (it is considerably less expensive). In dealing with RF frequencies, the conductivity of the chassis surface becomes all important. Poor conductors mean high circuit losses.

As you can see, H. H. Scott utilizes many exciting new principles in tuner design. No expense is spared in parts or construction. There can never be *any* compromise with quality. When you buy an H. H. Scott product you know it is the finest.



# INSTRUCTIONS FOR THE MODEL LT-111 WIDEBAND FM MULTIPLEX STEREO TUNER

The LT-111 is a wideband FM stereo multiplex tuner employing a copper-plated front end, the same wideband detector and IF transformers, the same quality features that have given H. H. Scott tuners a reputation as the best in the industry. The LT-111 is extremely sensitive, and its extended frequency response and distortion-free performance set it apart from conventional narrow band tuners. Conservatively designed, this tuner will bring you years of listening pleasure. For those interested in more complete information about tuners in general and H. H. Scott tuner design in particular, refer to the Notes on H. H. Scott Tuners.

**IMPORTANT:** *Every effort has been made to insure that this kit, when assembled, will perform perfectly. In order to achieve this result, you must read all of the instructions carefully and follow them precisely. Let us repeat . . . READ ALL INSTRUCTIONS CAREFULLY . . . FOLLOW THEM EXACTLY.*

## UNPACKING YOUR KIT-PAK

There are no particular precautions to be observed in unpacking your kit, but you should take care not to mislay any small items or packages. If you desire you can work right inside the kit package. It will help protect your work table. When you want to stop working for a few hours, just close the cover and put the whole kit away out of sight of the wife . . . out of reach of the kids. You will find the Kit-Pak cover an ideal rest for the instruction book and Part-Charts.

Mounted on the chassis is the copper-plated front end. During the course of assembly you will be instructed to make certain connections to this preassembled unit. Outside of those specified do not make any adjustments, bend any coils, or turn any slugs. This unit has been completely tested and prealigned in our laboratory, and any uncalled for changes will adversely affect the performance of the tuner. A single edged razor or knife would be helpful for opening the skin packaged components.

## CHECK THE PARTS

On page 5 of this manual is a descriptive list of the parts included. Before beginning the assembly it is recommended that you check all the parts with this list. It will insure that there are no missing parts, and will help you become familiar with the various items. If you should accidentally damage or misplace any parts, write to the LABORATORY KIT SERVICE DEPARTMENT at the factory immediately.

A four foot length of insulated wire has been supplied. It can be used to replace any missing wires or ones accidentally damaged. Simply cut off the length required (a convenient ruler is printed on the inside cover) and strip off 1/4" of insulation at each end.

**Occasionally we may make minor substitution of parts. Such substitutions are carefully checked and the parts supplied will work as satisfactorily as those specified in the manual. These changes will be obvious and are mentioned here only to prevent confusion in checking the parts list. For example, .005  $\mu$ f capacitors are used interchangeably with .0047  $\mu$ f capacitors. This will also be true as regards the body colors of parts in relation to the colors shown in the booklet.**

# LT-111 PARTS LIST

## MECHANICAL AND HARDWARE PARTS

1	A-BC-8	Bottom Cover
5	A-CL-IF	Transformer Clips
4	A-FT-1	Feet (Plastic)
1	E-CS-17	Control Shield
1	E-LT-AT	Alignment Tool
1	E-LT-AV-R	Solder Pack
1	E-LT-SD	Screw Driver
1	EM-3	IF Shield
3	EV-7MA-1	Tube Shields
1	FSB-1/2	Fuse
2	H-MS-440 x 7/16 F	Machine Screws (Flat Head)
1	H-N-3/8 x 1/2 B	Hex Nut (Brass)
2	H-NC-440	Speed Clips (Spring Clip)
4	H-NP-632-T	Pal Nuts
10	H-SMS-6 x 1/4 HW	Sheet Metal Screws
4	H-SMS-6 x 5/8 HWA	Sheet Metal Screws
1	H-SS-832 x 3/16	Set Screw
1	KN-P-17-PT	Knob (Large)
1	KN-P-8	Knob (Small)
1	LT-111-M1	Main Chassis
1	N-D-FM-4	Tuning Dial
1	N-LT-111-1	Panel
1	V-PL-12	Pilot Light
1	XF-3AG	Fuse Post
1	Z-FM-4	Tuning Section (Front End)



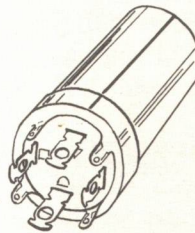
H-N-3/8 x 1/2  
HEX NUT



SPRING CLIP FASTENER



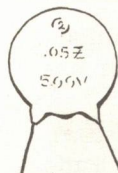
H-SMS-6 x 1/4 HW  
SHEET METAL SCREW



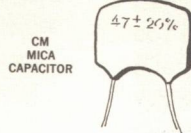
CEC  
ELECTROLYTIC  
CAPACITOR

## ELECTRICAL COMPONENTS

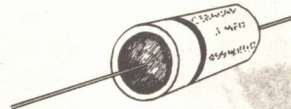
1	CEC-4 x 40/250	Electrolytic Capacitor
1	RCV-10K-PH	Potentiometer (P2)
1	RCV-100K-PH	Potentiometer (P1)
1	SRW-44-9-1	Rotary Switch (SW-1)
1	TR-6-2-1 or TR-7-1-1	Power Transformer
1	TRV-.02T	Multiplex Transformer (T-501)
1	TRV-.038TT	Multiplex Transformer (T-502)
1	TRV-10.7DN	Detector Transformer (T4)
2	TRV-10.7IF	IF Transformers (T2, T3)
2	6AG11	Tubes (V501, V502)
2	6AU6	Tubes (V1, V3)
1	6HS6	Tube (V2)
1	6HU6	Tube (V5)
1	6M11	Tube (V201)
1	6X4	Tube (V4)
2	CC-.0022	Ceramic Capacitors
4	CC-.0015	Ceramic Capacitors
7	CC-.005	Ceramic Capacitors
2	CC-.001	Ceramic Capacitors
10	CC-.02	Ceramic Capacitors
2	CC-.01/10 KV	Ceramic Capacitors
1	CC-.68	Ceramic Capacitor
3	CC-.22	Ceramic Capacitors
1	CC-3.3	Ceramic Capacitor
1	CC-4.7	Ceramic Capacitor
2	CC-6.8	Ceramic Capacitors
2	CC-270	Ceramic Capacitors
2	CC-680	Ceramic Capacitors
2	CC-5 NPO	Ceramic Capacitors
1	CC-22 NPO	Ceramic Capacitor
1	CC-33 NPO	Ceramic Capacitor
1	CET-5/25	Electrolytic Capacitor
1	CET-25/25	Electrolytic Capacitor



CC  
CERAMIC  
CAPACITOR



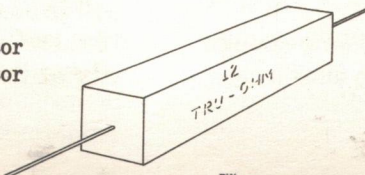
CM  
MICA  
CAPACITOR



CPM  
MOLDED TUBULAR  
CAPACITOR

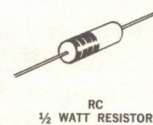


L-RFC-1  
CHOKE

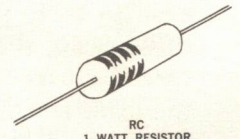


RW  
WIRE WOUND  
RESISTOR

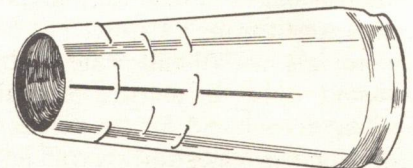
2	CM15-100	Mica Capacitors
1	CM15-120	Mica Capacitor
1	CM19-220	Mica Capacitor
2	CM19-330	Mica Capacitors
2	CM20-1000	Mica Capacitors
2	CM20-1500	Mica Capacitors
1	CM20-4700	Mica Capacitor
3	CPM-1	Tubular Capacitors
1	CPM-.25/200	Tubular Capacitor
3	D-GM-1	Diodes
4	D-GM-2	Diodes
2	LV-.05	Coils
2	L-RFC-.05	Coils
2	L-RFC-1	Chokes
2	RC21-68 ohm	1/2 Watt Resistors
1	RC21-100 ohm	1/2 Watt Resistor
1	RC21-220 ohm	1/2 Watt Resistor
1	RC21-470 ohm	1/2 Watt Resistor
1	RC21-820 ohm	1/2 Watt Resistor
2	RC21-1K	1/2 Watt Resistors
1	RC21-1.8K	1/2 Watt Resistor
1	RC21-2.2K	1/2 Watt Resistor
1	RC21-2.7K	1/2 Watt Resistor
3	RC21-10K	1/2 Watt Resistors
1	RC21-15K	1/2 Watt Resistor
2	RC21-22K	1/2 Watt Resistors
4	RC21-33K	1/2 Watt Resistors
6	RC21-47K	1/2 Watt Resistors
7	RC21-68K	1/2 Watt Resistors
8	RC21-100K	1/2 Watt Resistors
1	RC21-150K	1/2 Watt Resistor
2	RC21-220K	1/2 Watt Resistors
1	RC21-330K	1/2 Watt Resistor
3	RC21-470K	1/2 Watt Resistors
1	RC21-560K	1/2 Watt Resistor
1	RC21-680K	1/2 Watt Resistor
1	RC21-820K	1/2 Watt Resistor
3	RC21-1M	1/2 Watt Resistors
2	RC21-3.3M	1/2 Watt Resistors
3	RC21-22M	1/2 Watt Resistors
2	RC31-330 ohm	1 Watt Resistors
1	RC31-1K	1 Watt Resistor
1	RC31-22K	1 Watt Resistor
1	RW4-1.7 ohm	Wire Wound Resistor



RC  
1/2 WATT RESISTOR



RC  
1 WATT RESISTOR



EV-9MA-1  
TUBE SHIELD

## TOOLS REQUIRED

An alignment tool and a small screwdriver are provided. In addition, you will need a pair of long nose pliers, a regular size screwdriver, a pair of wire cutters, and a soldering iron or gun. A 35 watt (or more) pencil type soldering iron is actually the easiest to use. The iron should be supplied with a small tip. If a soldering gun is used, it should also have a small tip, and should be used carefully because of the enormous heat it supplies.

## SIMPLIFIED SOLDERING AND WIRING INSTRUCTIONS

All the solder needed to assemble the unit is supplied. If for any reason additional solder is needed, make sure that you obtain 60/40 ROSIN CORE SOLDER. Under no circumstances should you use Acid Core solder. All guarantees are voided if Acid Core solder is used.

### HERE'S HOW TO SOLDER JOINTS CORRECTLY:

1. Before using the soldering iron or gun, the tip must be tinned for ease of use. First heat up the iron. Then when the tip is hot, wipe with a cloth till bright and shiny, and apply a generous amount of solder. Remove any excess. Repeat this process for all sides of the tip.

2. Make sure that all leads (wires) and terminals to be soldered are completely clean. Do not use fluxes or paste of any sort.

3. The leads should be mechanically secure before soldering. This does not mean wrapping leads around the contacts several times. It means a single turn around the contact which is then pinched tightly with the long nose pliers. If the wire is too large for bending, position the wire so that a good solder connection can still be made. (See Figure 2.)

4. Leads on resistors, capacitors, and similar components are generally much longer than they need to be to make the indicated connections. In these cases, the excess leads should be cut off before the part is added to the chassis. In general, the leads should be long enough to reach their termination allowing for a little left over to make a good mechanical joint. A very handy way of gauging the length of lead to trim off is to super-impose the capacitor or resistor right on the pictorial. The pictorials are all full scale, so by placing the component over its picture and allowing about  $\frac{1}{4}$ " extra on each end for the mechanical joint, you can shorten the leads quickly and accurately.

Sometimes a lead will not seem quite long enough to reach the desired mounting point. In such a case,

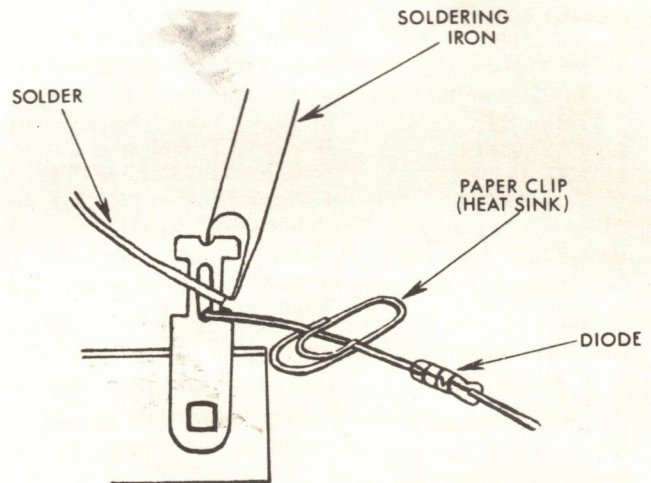
the terminal lug can be bent slightly to make the connection possible.

5. Place a flat side of the soldering iron tip against the joint to be soldered until it is heated sufficiently to melt the solder.

6. Place the solder against the heated terminal (with the soldering iron still in contact) and it will immediately flow over the joint. Use only enough solder to thoroughly wet the joint. Too much solder may cause short circuits. The soldering iron does not actually come into contact with the solder, only with the joint. It is the heated joint that melts the solder.

7. As soon as sufficient solder has flowed, remove the solder tube and then a second later, the iron. Use care not to move the leads until the joint has hardened (about 5 seconds). A good solder joint should appear to be bright and shiny. Check the joint for rigidity. If it is not firm and tight, reheat the joint and permit the solder *already present* to flow again. Sometimes a little more solder will have to be added.

8. When soldering certain of the components, such as diodes, it is advisable to use no more heat than is necessary. Excessive heat can damage these components. Use a paper clip or one of the alligator clips as a heat sink to protect the diodes.



9. There will be some terminals that have been previously soldered onto which additional wires will be attached. To make this type of connection, simply attach the wire to the terminal with a good mechanical joint, and resolder. By simply heating the connection, the solder already on the terminal will probably be enough to also hold the new wire. If there is any doubt in your mind as to the security of the connection, add more solder.

10. Keep the soldering iron clean and bright by occasionally wiping with a rag. The iron does not have to be cooled for this purpose.

If you have never done any soldering before, it would be an excellent idea to practice on scraps of wires before beginning.

11. THE FACTORY WIRED PARTS OF YOUR LT-111 CAN ACT AS A GUIDE TO WHAT GOOD SOLDERING LOOKS LIKE.

12. THE BOTTOM VIEW PICTURE OF THE COMPLETED TUNER (FIGURE 1) WILL BE VERY HELPFUL AS A GUIDE TO THE CONSTRUCTION OF YOUR TUNER.

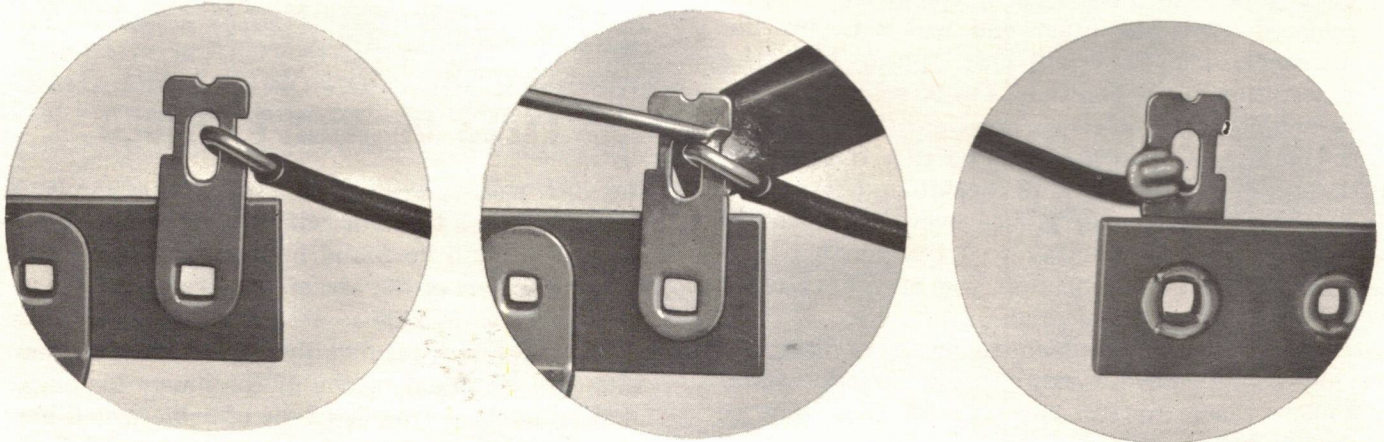


Figure 2

## BASIC ELECTRICAL ASSEMBLY PROCEDURE

Every terminal, tube, transformer, etc. has a code number (i.e. T1, V2, and so forth). You will note that each tube socket, transformer base, and opening on the top of the LT-111 chassis, is identified with a similar code number. Become familiar with the location of these identifying numbers, so that when you install the parts, you will have a clear idea of the proper location.

Every pin on each of the terminals, or tube sockets is also numbered (i.e. pin 1, pin 2, and so forth). The instructions will call for a wire to be connected to pin 3, V4, for example. With the instructions will be a pictorial, clearly showing in full color the connection to be made and its location. With this information you should experience no difficulty in assembling the kit correctly.

A series of Part-Charts are provided with all the necessary resistors and capacitors mounted. Each chart applies to a particular page of the electrical assembly instructions.

For example — in the instructions that follow you will find a page marked "Assembly Group B-7." The "B" indicates that this is part of the electrical assembly. The "7" means that this is the seventh page of instructions for electrical assembly. Arrange the Part-Charts, you will find a Part-Chart B-7. Take this out and keep it next to you when working on this page. The first step on the page is called B7-1 and refers to a CET-5/25 capacitor. The first part on the Part-Chart is a CET-5/25 capacitor. The pictorial shows exactly where this part goes. The part is mounted as directed and the step is checked off as completed.

The many wires used in the tuner kit are packed in a small plastic sleeve. For example — Assembly Group B-1 involves connecting a group of wires of different colors and lengths. Open the bundle of wires and spread them out near you.

The first step, B 1-1, calls for a 20" White wire. From the White wires select the ones of the approximate length and hold them up to the ruler printed on the inside cover of the Kit-Pack. Once you have the correct one, you may proceed as above.

IT IS IMPORTANT TO POSITION THE WIRES OR COMPONENTS IN THE SAME POSITION AS SHOWN IN THE PICTORIAL. BE AS NEAT AS POSSIBLE AS THIS WILL GREATLY CUT DOWN ON MISTAKES, SHORTS, AND OTHER DIFFICULTIES. NEATNESS WILL ALSO ALLOW YOU TO MORE EASILY CHECK YOUR WIRING.

If the symbol (S-) appears in the instructions after any connection, it means that the particular connection with all other wires on the same pin, should be soldered. After the "S" will appear a number. This number indicates exactly how many leads or wires are supposed to be connected to the terminal or pin in question. For example: connect an Orange wire to pin 2, V6 (S-3). The soldering number (S-3) will always be printed in red, so it can be found quickly. It indicates that there should be 3 wires or leads (including the Orange one) connected to pin 2, V6, and that all three of them

are to be soldered. This provides an additional check for wiring errors.

Do not solder any connection that is not marked with an (S-). Other connections are still to be made to this pin before it can be soldered. Frequently one end of a lead or component will be soldered while the other end will not (for the moment). The (S-) will only appear after the description of the end that is to be soldered. **After completing the soldering, cross out the (S-) symbol with your pencil indicating that it has been done. This is in addition to checking off each step.** In this way you can glance over the assembly instructions and spot any (S-) that has not been crossed out, indicating that you may have overlooked a joint to be soldered.

The instructions which follow have been arranged in a logical order to insure perfect results. Follow them exactly, checking off each step as completed.

For easy reference keep this instruction manual on the inside of the top cover of your KIT-PAK. **IMPORTANT:** Mounted on the chassis of your LT-111 is a prewired and prealigned front end (the copper-plated section). This sub-assembly

includes many parts that have been carefully positioned to provide precise performance. It also includes many preset adjustments which have been made with special laboratory equipment. **DO NOT TURN OR MOVE ANYTHING ON THIS SECTION UNLESS SPECIFICALLY TOLD TO BY THE INSTRUCTION BOOK. FAILURE TO OBSERVE THIS WARNING CAN MEAN SERIOUS DETERIORATION OF PERFORMANCE.**

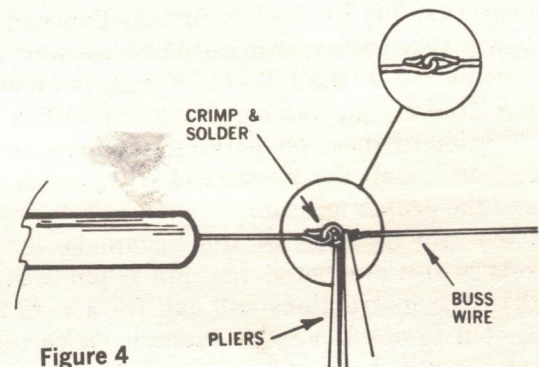
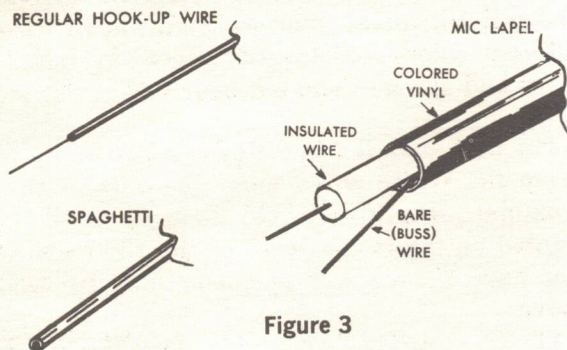
## TYPES OF WIRE PROVIDED

**Regular hook-up wire** — These are the standard insulated wires that you will be using most of the time. They will be found in bundles for the different portions of the assembly procedure.

**Buss wire** — This is a term used to describe short pieces of uninsulated wire. A bundle of buss wire will be found in one of the hardware bags.

**Mic Lapel** — This is a type of cable which has one insulated length and one uninsulated length of buss wire inside. The cable itself has a brightly colored outside insulation.

**Spaghetti** — A common name to describe hollow black insulation material. This tubing is slipped over bare wires to provide protection.



## WHAT TO DO IF YOU MAKE A MISTAKE

No matter how careful you may be, it is still possible to break something accidentally or to cut a lead too short. We might add that if you work when tired, try to do too much, too fast, then the possibility of mishap increases greatly. Nevertheless, it is easy to correct most common errors.

1. **Cutting a wire or lead too short** — If you cut the wire from one of the components too short you can easily correct it by taking a small piece of uninsulated wire (buss wire) and splicing it on as shown in (Figure 4). If a wire supplied is damaged, you can cut off a replacement from the 4 feet of spare wire supplied.

2. **Breaking a terminal strip** — The terminal strips are quite sturdy and will withstand a great

deal of handling. Nevertheless, if you are extremely rough, a terminal pin can be broken off. If this happens, make all connections to the small hole below the broken pin. Be careful to avoid having any of the bare wires touch the chassis. If the phenolic material cracks but does not break off, you can continue on as the wires themselves will keep the broken piece in place.

In the unlikely circumstance that the entire terminal strip breaks off, it is necessary to replace it. Write to the Parts Department at the factory for a replacement. Drill out the rivet holding the broken strip, using a number 28 drill. Mount the replacement with a regular 6-32 x 1/4" machine screw, lockwasher, and nut.

# DO NOT PROCEED UNLESS YOU HAVE READ ALL THE INSTRUCTIONS.

## MECHANICAL ASSEMBLY

READ EACH STEP COMPLETELY BEFORE PERFORMING THE OPERATION SPECIFIED. CHECK OFF EACH STEP AS YOU COMPLETE IT.



A1-1

Position the chassis upside down with the rear toward you. Mount the Fuse post in the D shaped hole on the rear apron of the chassis. The hole is marked "1/2A SLO-BLO". The Fuse post can be identified by the word "Fuse" printed on the cap. Mount the post with a large hex nut and lock washer as shown in (Figure 5) with the side terminal facing up as shown. Make nut snug but do not overtighten. After assembly bend the side (facing up) terminal up slightly to simplify connections. Unscrew the cap of the Fuse post and insert the fuse provided into the cap. Insert the fuse and cap into the hole and rotate cap clockwise to fasten securely.



A1-2

Insert Potentiometer (Pot) P1 (RCV-100K-PH) into the hole marked from the inside of the chassis. For correct positioning line up the locating lug on the pot with the small hole next to P1. Push the pot into the hole with your thumb, applying sufficient pressure for the prongs near the top of the pot to pass through the hole, spring open, and lock in place firmly. (See Figure 6.)



A1-3

Insert Potentiometer P2 (RCV-10K-PH) into the hole marked P2. (See Figure 6.)

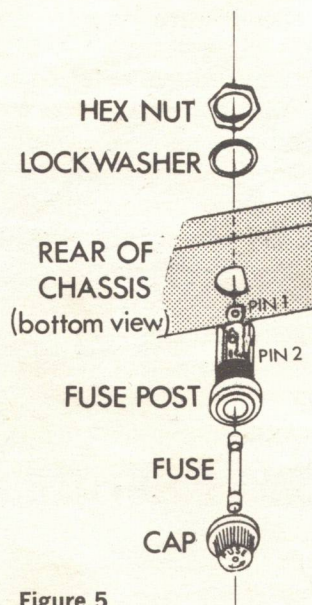


Figure 5

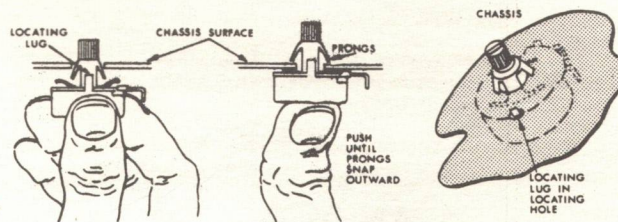


Figure 6



A1-4

There are five transformer cans to be mounted on the chassis. Except for two of the cans, they are all different, so be sure to install them in the correct places. On the side of each can is an identification number. On the bottom of each can are several terminals. Beside each terminal is a number molded into the plastic. THESE BOTTOM NUMBERS ARE TO BE COMPLETELY DISREGARDED. When making wire connections to the pins, follow the number system shown in the booklet. Also, on the bottom of the cans is a green position-orientation mark.

Insert T4 (TRV-10.7DN) in the slots marked T4 on the top of the chassis. (See Figure 7.) Position it so that the green dot on the base of the can is as shown on chart A-1. Hold the can in place with one hand. Working under the chassis with the other hand, slip the special brass clip that will hold the can in place into the remaining two slots. Push one side of the clip

hard, either with your finger or the small screwdriver supplied, until it snaps into the "Y" shaped hole on the side of the can. Then repeat with the other side of the clip. When completed, the can should be firmly in place. Compare the appearance with that of T1 which is on the preassembled front end. Be careful during this operation not to damage the pins on the bottom of the can.

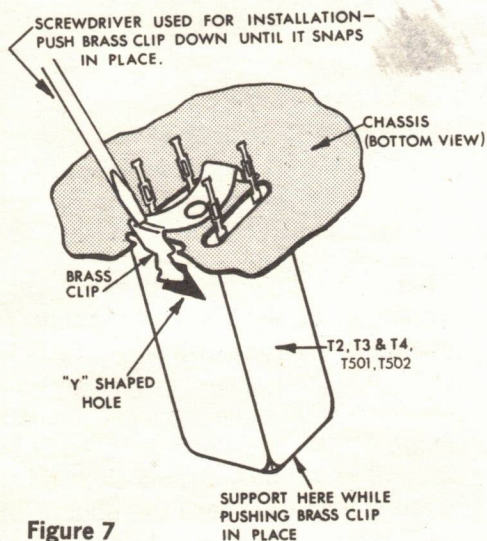


Figure 7

- Repeat the above procedure for T3, using either one of the TRV-10.7IF cans. Check positioning of the green dot.
- A1-5**  Repeat for T2, using the remaining TRV-10.7IF can. Check positioning of green dot.
- A1-6**  Repeat for T501 (TRV-.02T). Check positioning of green dot.
- A1-7**  Repeat for T502 (TRV-.038TT). Check positioning of green dot.
- A1-8**  Now position C1 (CEC 4X40/250) in the slots marked C1, so that the little identification marks on the base (a triangle, square, and semicircle) agree with those shown on chart A-1. With your long-nosed pliers, grasp the outer mounting tabs firmly and twist them one quarter turn each. This will seat C1 firmly. (See Figure 8.)
- A1-9**  Insert the preassembled coil L502 (LV-.05) and CM-120 capacitor into the hole marked L502, from the inside of the chassis. For correct positioning, line up the locating lug on the coil with the small hole next to the larger mounting hole. Check chart A-1 to see that the terminal lugs

on the sides of the coil are in the correct position. Push the coil into the hole with your thumb, applying sufficient pressure for the prongs near the top of the coil to pass through the hole, spring open, and lock in place firmly; as done with the pots. (See Figure 9.) *This assembly has been factory aligned. DO NOT turn the slug down inside of the coil.* To prevent this from happening accidentally, place a piece of tape across the top of the coil after the coil is installed.

- In the same manner insert coil L501 (LV-.05) into the hole marked L501. Refer to chart A-1 for proper orientation of the solder lugs.

**A1-11**

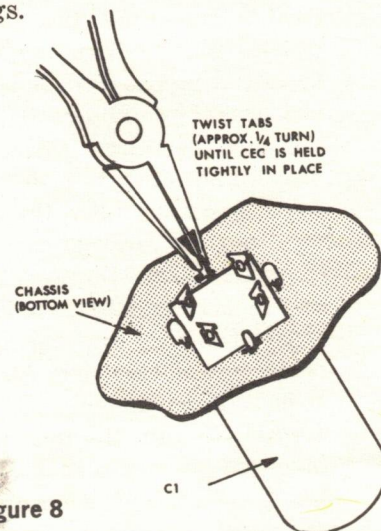


Figure 8

- Install switch SW-1 (SRW44-9-1) in the hole on the front apron of the chassis marked SW-1. For correct positioning, line up the locating lug with the small hole next to SW-1. Thread on a brass hex nut to keep the switch in place. Tighten the nut only enough to securely hold the switch. (See Figure 10.)

**A1-12**

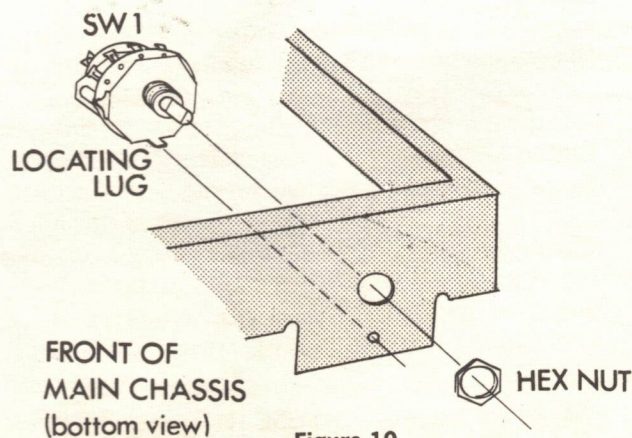


Figure 10

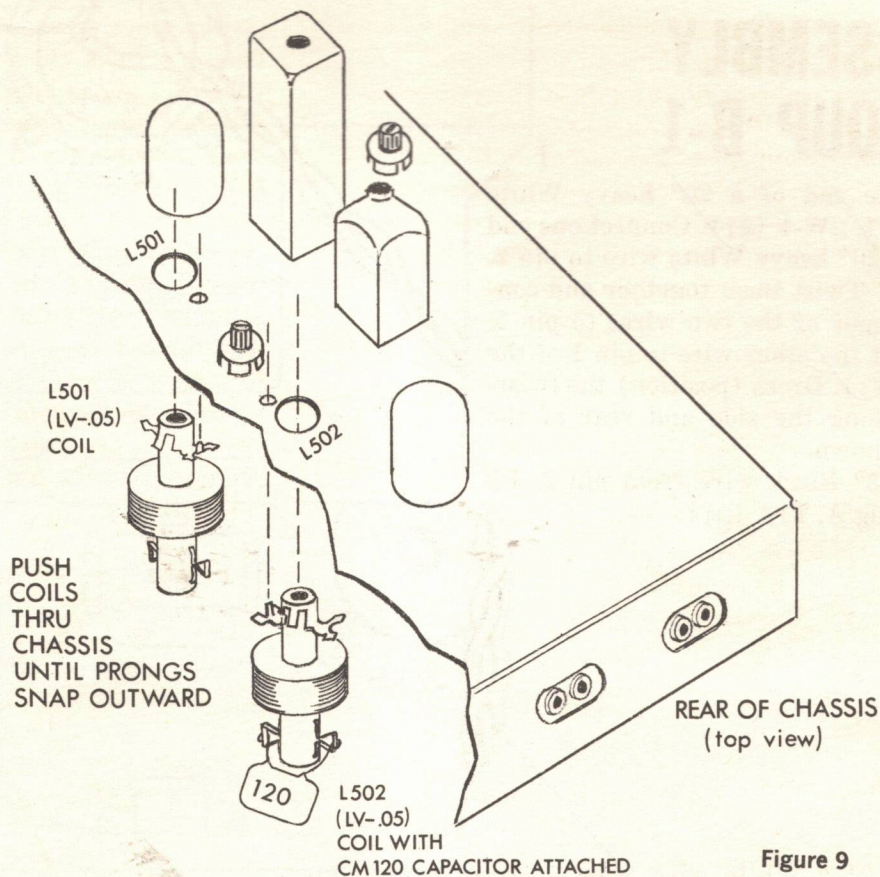


Figure 9

## ELECTRICAL ASSEMBLY

### INTRODUCTORY NOTES

To obtain the really fine performance this tuner is capable of, ALL LEAD LENGTHS FROM COMPONENTS (RESISTORS AND CAPACITORS) **MUST** BE AS SHORT AS POSSIBLE. Follow the diagrams closely. A careful inspection of the pre-assembled front end will give you many hints as to the proper approach for mounting and trimming the parts. KEEP ALL LARGE PARTS, CERAMIC (CC) CAPACITORS, AND INSULATED WIRES AS CLOSE TO THE CHASSIS AS POSSIBLE. Bare wires, of course, should not touch the chassis, unless instructions indicate otherwise.

The biggest source of mishaps, next to poorly soldered joints, are short circuits. A short circuit occurs when two uninsulated wires that are not supposed to, accidentally touch each other. It can also happen when a wire going towards one pin accidentally touches another pin nearby. The main body of a resistor or a capacitor is fully insulated so it does not matter if this part touches something. It is only the bare wires on the ends that you have to watch for. As the number of parts in the tuner starts to increase, you will realize how possible it is for short circuits to occur.

Extra quantities of black insulation material (spaghetti) have been supplied. Whenever you suspect that a short circuit may occur (either to the chassis, to another bare wire, or to another pin), slide a small piece of spaghetti over the bare wires in question. If you position the parts exactly as shown in the pictorials, you will not need to use spaghetti very frequently. However, it is better to be on the safe side if you have any doubts.

Check off each step as soon as it is completed. Do not forget to check off the (S-) symbols. ABOVE ALL, DO A NEAT, CLEAN JOB. NEAT WORK WILL DO AWAY WITH ALL SORTS OF PROBLEMS.

**GO SLOWLY, READ COMPLETELY AND CAREFULLY**

**HAVE FUN**

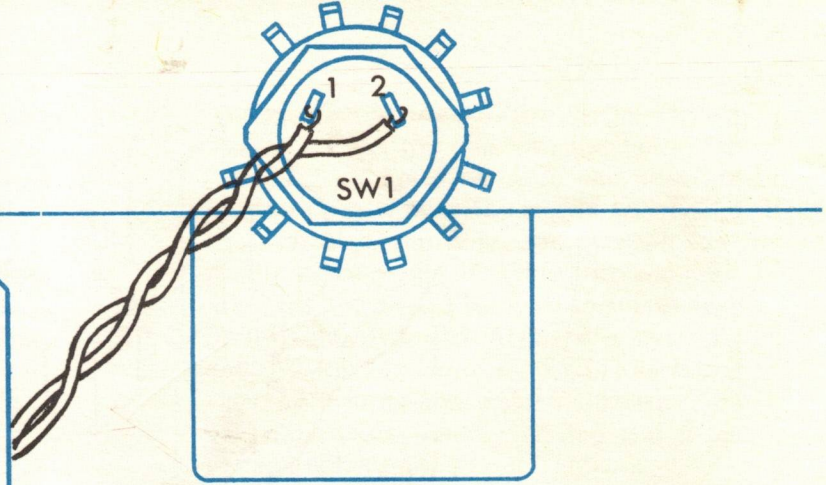


# ASSEMBLY GROUP B-1



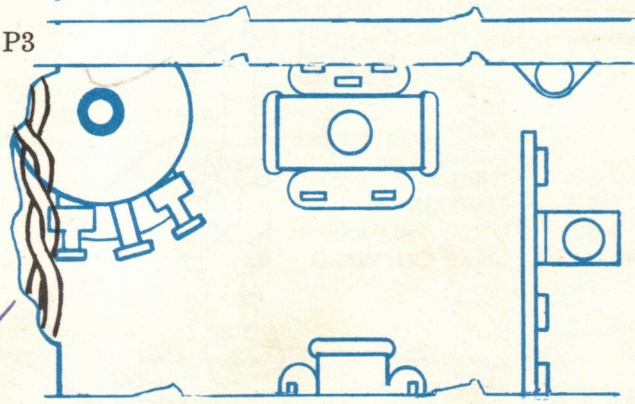
B1-1

Connect one end of a 20" heavy White wire to pin 1, SW-1 (S1). Connect one end of another 20" heavy White wire to pin 2, SW-1 (S1). Twist them together and connect the longer of the two wires to pin 5, V4. Connect the other wire to pin 1 of the fuse post (S1). Dress (position) the twisted wires along the side and rear of the chassis as shown.



B1-2

Connect a 3" Black wire from pin 2, P3 to ground lug A, T1A (S1).



B1-3

Connect a 2 1/2" White wire from pin 3, C1 to pin 7, V4 (S1).



B1-4

Connect a 2 1/4" Black wire from pin 7, C1 to pin 3, V4.



B1-5

Connect one of the Tan line cord wires to pin 5, V4 (S2). Connect the other line cord wire to pin 1, T1A.

The following wires are from the power transformer (TR6-2-1 or TR7-1-1)



B1-6

Connect the Yellow/Red wire to pin 7, C1 (S2).



B1-7

Twist the two Red wires together and connect one to pin 1, V4 (S1).

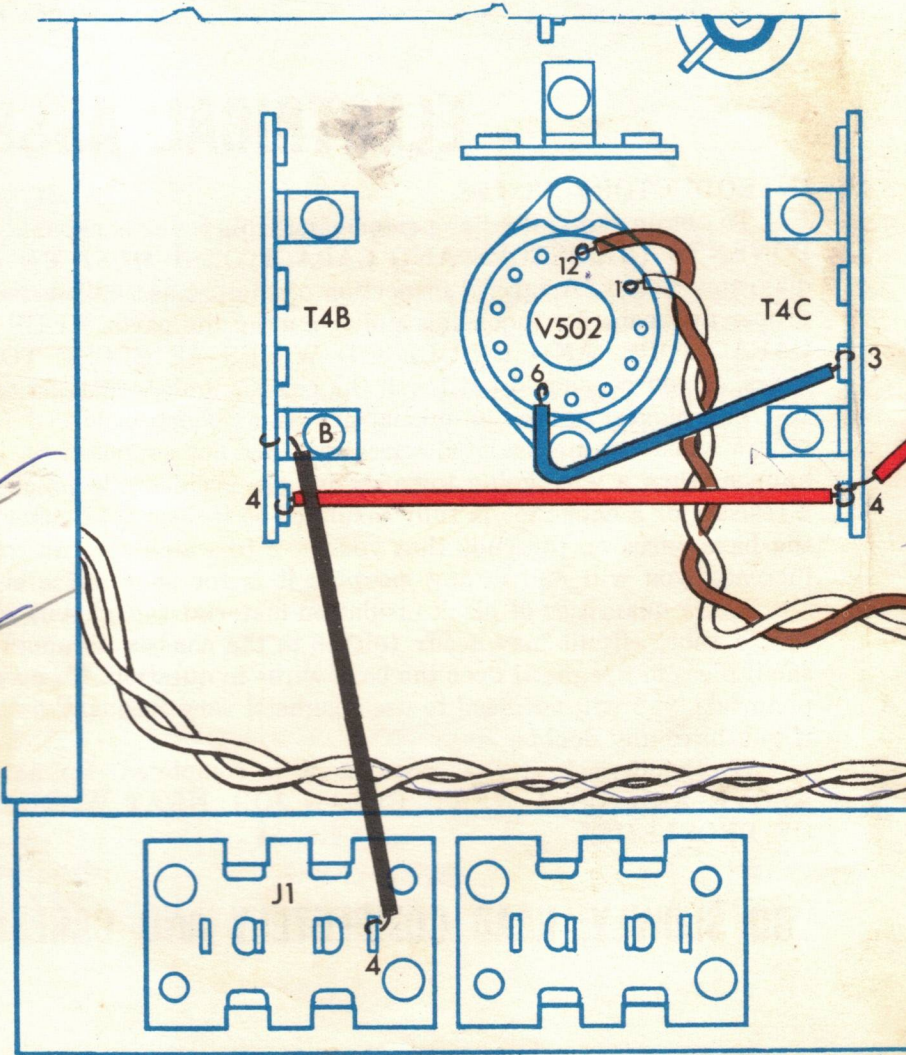
Connect the other Red wire to pin 6, V4 (S1).



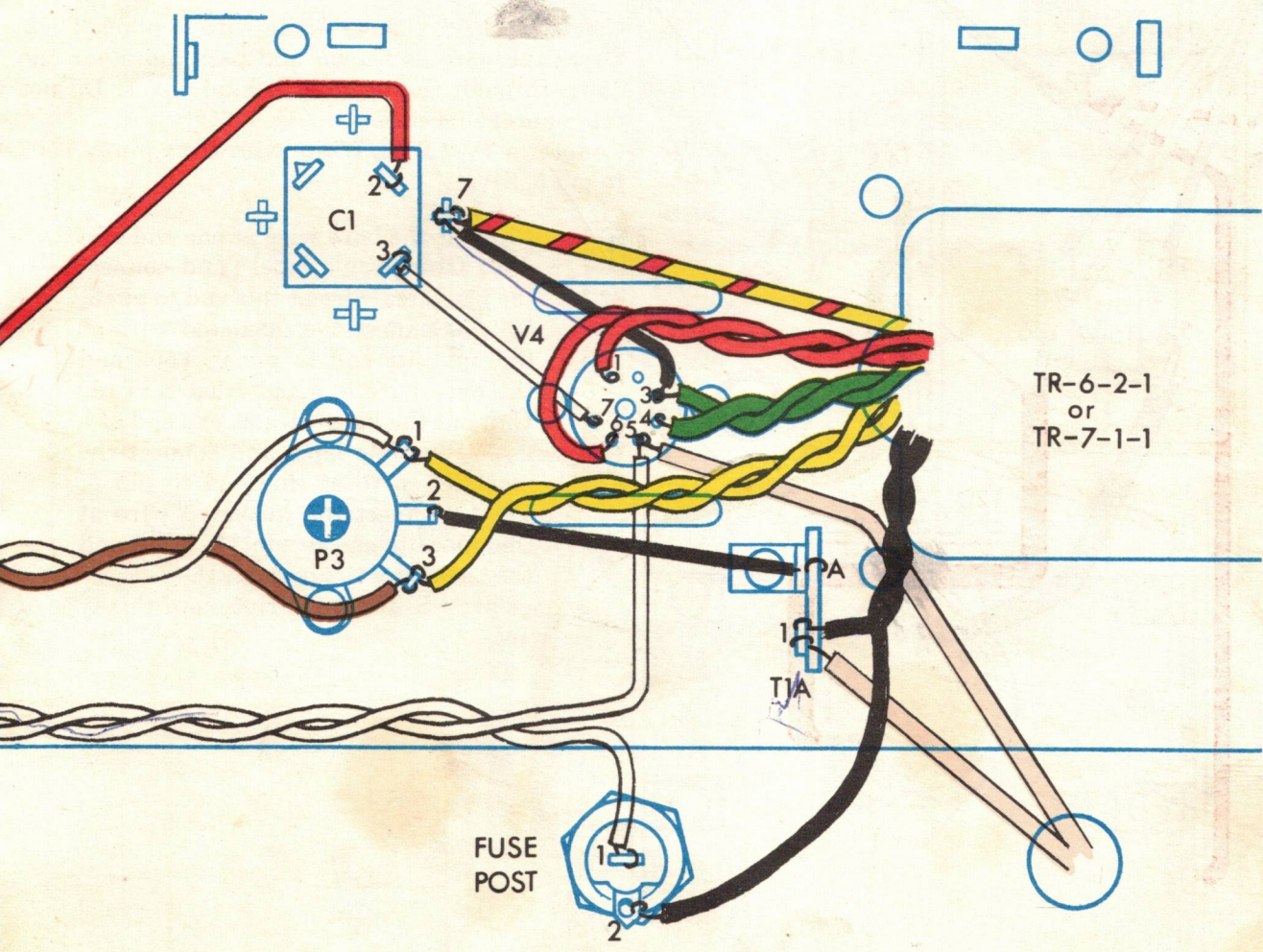
B1-8

Twist the two Green wires together and connect one to pin 3, V4 (S2).

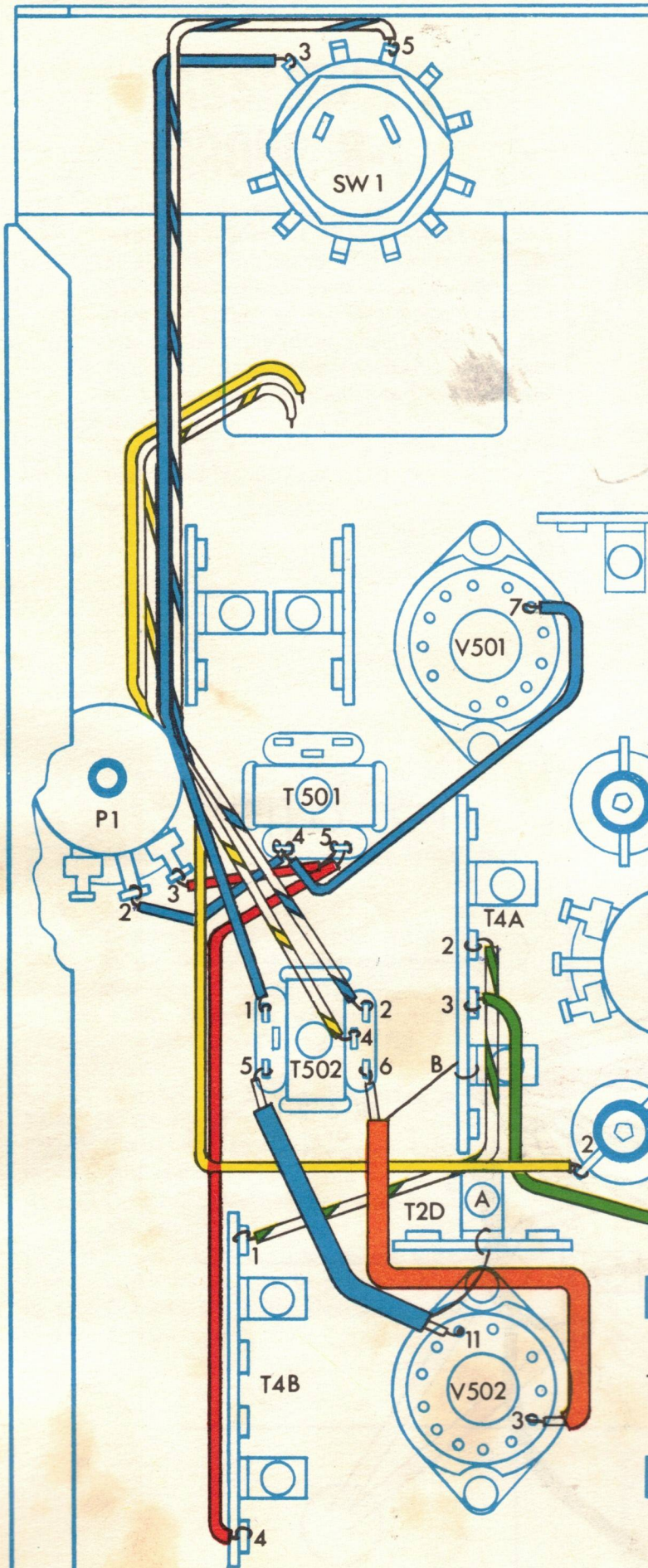
Connect the other Green wire to pin 4, V4.



- Twist the two Yellow wires together and connect one to pin 1, P3. Connect the other Yellow wire to pin 3, P3.
- B1-9**  Twist the two Black wires together and connect one to pin 1, T1A. Connect the other Black wire to pin 2 (side) of the fuse post.
- B1-10**  Connect a 7" White wire to pin 1, V502 (84). Connect a 7" Brown wire to pin 12, V-502 (81). Twist the wires together and dress around T4C as shown. Connect the White wire to pin 1, P3 (82). Connect the Brown wire to pin 3, P3 (83).
- Connect a 5½" Red wire from pin 2, C1 to pin 4, T4C.
- B1-12**  Connect a 4¼" Red wire from pin 4, T4C to pin 4, T4B.
- B1-13**  Connect a 2½" Blue wire from pin 3, T4C to pin 6, V502.
- B1-14**  Connect a 3¼" Black wire from pin 4, J1 to lug B, T4B.
- B1-15**



# ASSEMBLY GROUP B-2



- B2-1 Connect a 6" Red wire from pin 4, T4B to pin 5, T501.
- B2-2 Connect a 2" Red wire from pin 5, T501 to pin 3, P1 (81).
- B2-3 Connect a 4" Green/White wire from pin 1, T4B to pin 2, T4A.
- B2-4 Connect a 3½" Green wire from pin 1, T4C to pin 3, T4A.
- B2-5 Connect a 2" Blue wire from pin 2, P1 (81) to pin 4, T501.
- B2-6 Connect a 4" Blue wire from pin 4, T501 to pin 7, V501 (81).
- B2-7 Connect an 8¾" Yellow wire to pin 2, L502. Dress the wire as shown and pass the other end down through the opening behind SW-1. Do not yet connect this end.
- B2-8 Connect a 5¾" Blue wire from pin 1, T502 to pin 3, SW-1.
- B2-9 Connect a 6½" Yellow/White wire to pin 4, T502. Dress the wire as shown and pass the other end down through the opening behind SW-1. Do not yet connect this end.
- B2-10 Connect a 7½" Blue/White wire from pin 2, T502 to pin 5, SW-1.
- B2-11 Clip out the bare wire at one end of a 4¼" Orange mic lapel\* and connect the insulated wire at this end to pin 3, V502. Connect the insulated wire at the opposite end to pin 6, T502 and the bare wire to ground lug B, T4A.
- B2-12 Clip out the bare wire at one end of a 2¾" Blue mic lapel and connect the insulated wire at this end to pin 5, T502. Connect the insulated wire at the opposite end to pin 11, V502 and the bare wire to lug A, T2D.

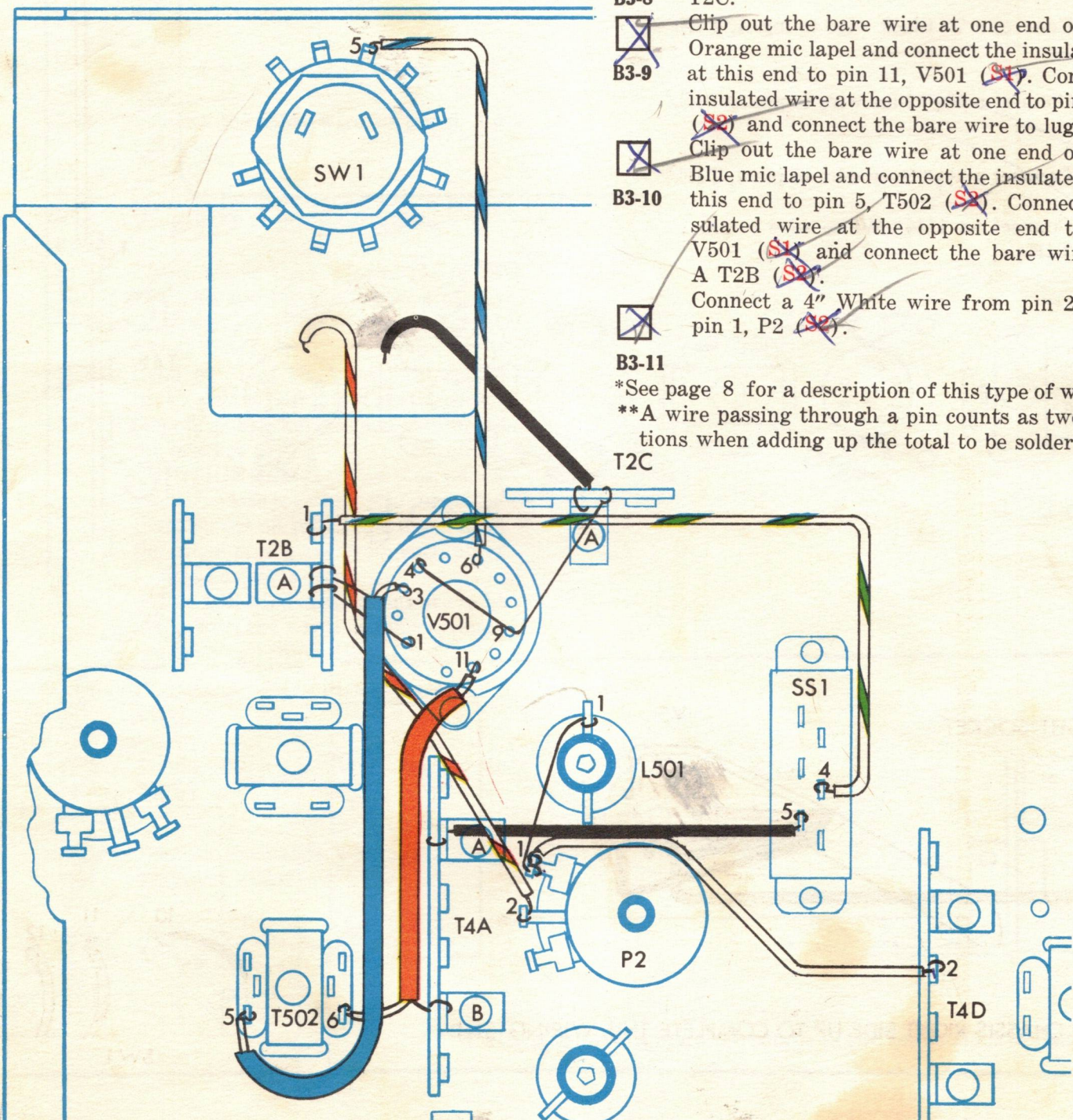
\*See page 8 for a description of this type of wire.

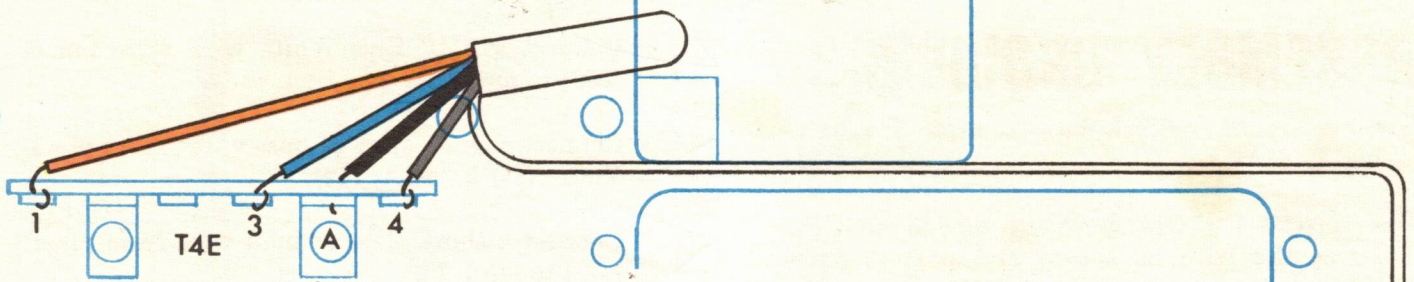
# ASSEMBLY GROUP B-3

- B3-1** Connect a 3½" Black wire from pin 5, SS-1 to lug A, T4A.
- B3-2** Connect a 6½" Orange/White wire to pin 2, P2. Dress the wire as shown and pass it down through the opening behind SW-1. Do not yet connect this end.
- B3-3** Connect a 3¼" Black wire to lug A, T2C. Dress the wire as shown and pass the other end through the opening behind SW-1. Do not yet connect this end.

- B3-4** Connect a 3¼" Blue/White wire from pin 6, V501 to pin 5, SW-1.
- B3-5** Connect a short piece of buss wire\* from pin 1, V501 (~~S1~~) to lug A, T2B.
- B3-6** Connect a short piece of buss wire from pin 1, L501 to pin 1, P2.
- B3-7** Connect a 6½" Green/White wire from pin 4, SS-1 to pin 1, T2B.
- B3-8** Connect a short piece of buss wire from pin 4, V501 (~~S1~~) thru pin 9, V501 (~~S2~~)\*\* to lug A, T2C.
- B3-9** Clip out the bare wire at one end of a 3¼" Orange mic lapel and connect the insulated wire at this end to pin 11, V501 (~~S1~~). Connect the insulated wire at the opposite end to pin 6, T502 (~~S2~~) and connect the bare wire to lug B, T4A.
- B3-10** Clip out the bare wire at one end of a 5½" Blue mic lapel and connect the insulated wire at this end to pin 5, T502 (~~S1~~). Connect the insulated wire at the opposite end to pin 3, V501 (~~S1~~) and connect the bare wire to lug A T2B (~~S2~~).
- B3-11** Connect a 4" White wire from pin 2, T4D to pin 1, P2 (~~S2~~).

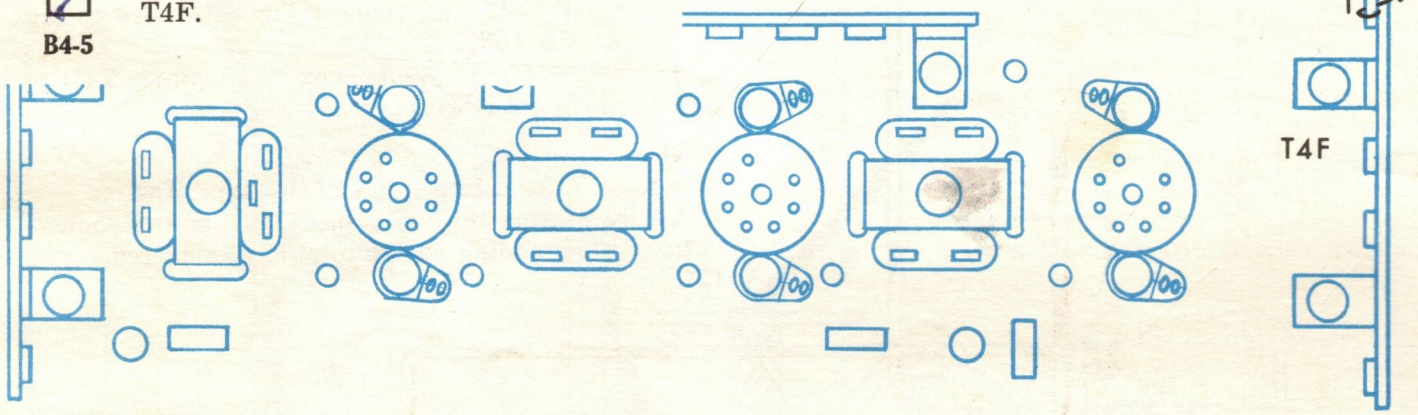
\*See page 8 for a description of this type of wire.  
 \*\*A wire passing through a pin counts as two connections when adding up the total to be soldered.





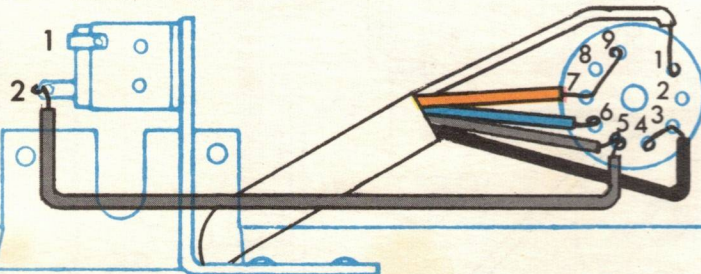
## ASSEMBLY GROUP B-4

- B4-1** Connect a 7" Orange wire to pin 1, T4E.
- B4-2** Connect a 7" Black wire to lug A, T4E.
- B4-3** Connect a 6 $\frac{3}{4}$ " Blue wire to pin 3, T4E.
- B4-4** Connect a 5 $\frac{1}{2}$ " Grey wire to pin 4, T4E.
- B4-5** Connect an 11 $\frac{1}{2}$ " White wire to pin 1, T4F.

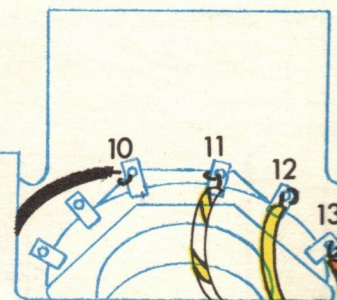


### PILOT LIGHT SOCKET

V5



TURN CHASSIS RIGHT SIDE UP TO COMPLETE THIS WIRING STEP



SW 1

B4-6 Group the five wires together and slide a 3" piece of large insulating tubing (spaghetti)\* down over the wires. Pass the wires through the opening in the chassis in front of the front end (tuning section) and pull the wires snug. Position the insulating tubing so that half of its length is above the chassis and the other half below the chassis opening.

B4-7 Take out tube socket V5 from the hardware bag and connect the White wire coming thru the piece of large insulation to pin 1, V5 (S1).

B4-8 Connect the Black wire thru pin 3, V5 (S2)\*\* to pin 4, V5 (S1).

B4-9 Connect the Grey wire to pin 5, V5.

B4-10 Connect the Blue wire to pin 6, V5 (S1).

B4-11 Connect the Orange wire thru pin 7, V5 (S2)\*\* to pin 9, V5 (S1).

B4-12 Connect a 5" Grey wire to pin 5, V5 (S2). Connect the other end of the Grey wire to pin 2 of the pilot light socket (S1).

B4-13 Bend pin 1 of the pilot light socket backwards so that it touches the socket mounting bracket. Solder the pin to the bracket (S1).

NOTICE: Because the pins on V5 are very close together, it is suggested that you cut off pins 2 and 8 and bend the other pins away from each other so that no shorts occur.

The following connections are to be made with the wires coming through the opening behind SW-1.

B4-14 Connect the Black wire to pin 10, SW-1.

B4-15 Connect the Yellow/White wire to pin 11, SW-1 (S1).

B4-16 Connect the Yellow wire to pin 12, SW-1 (S1).

B4-17 Connect the Orange/White wire to pin 13, SW-1 (S1).

\*See page 8 for a description of this item.

\*\*A wire passing through a pin counts as two connections to that pin.

# ASSEMBLY GROUP B-5

Using a screwdriver, carefully remove the screws which hold the front end bottom cover in place and remove the cover from the tuner. **THE PARTS LOCATED UNDER THE COVER HAVE BEEN CAREFULLY INSTRUMENT ALIGNED AND CARE MUST BE TAKEN TO NOT REARRANGE ANY OF THE COMPONENTS OR OTHERWISE ALTER THE POSITIONS OF CRITICAL PARTS. (SEE FIGURE 11)**

**B5-1** Connect an 8" White wire from pin 3, T4F to pin 1, T3A (S5). This pin and several others on the prewired front end have been previously soldered. Once the mechanical wire connection has been made, it will probably only require a very small amount of solder to make the joint secure. Let the solder already on the joint melt before adding more.

**B5-2** Connect a 17" Green wire from pin 3, SS-1 (S1) to pin 1, TF4.

**B5-3** Connect the White wire attached to T1 to pin 3, T4F.

**B5-4** Connect a 4 1/4" White wire from pin 5, T5A to pin 3, T4F. *Substituted Russ wire w/ black spg.*

**B5-5** Connect a 4 1/4" Blue wire from pin 4, T5A to pin 2, T4F.

**B5-6** Connect a 5 1/2" Grey wire from pin 1, T2C to pin 4, T4E.

**B5-7** Connect a 5 1/4" Grey wire from pin 4 T4E to pin 3, T3A (S2). *2???*

**B5-8** Connect a 6 1/2" Grey wire from pin 4, V4 to pin 3, V1.

**B5-9** Connect an 11" Grey/White wire to pin 4, T4E (S4). Connect an 8 1/4" Black/White wire to lug B, T4E. Twist the wires together and connect the Grey/White wire to pin 4, V4 (S3). Connect the Black/White wire to pin 5, C1 (S4). Connect an 8 1/2" Blue/White wire from pin 4, C1 to pin 2, T4E.

**B5-10** Connect the Green wire attached to T1 to pin 1, V1 (S4).

**B5-11** Because in the final assembly the IF strip control shield must be placed in a certain position, it is important that the next two Red wires be positioned *exactly* as shown in the diagram.

**B5-12** Connect an 8 1/4" Red wire from pin 1, T5A to pin 1, C1.

**B5-13** Connect the short Red wire attached to the front end to pin 1, T5A.

**B5-14** Identify the end of the heavy Black antenna cable having the buss wire soldered to the stranded wire. At this end connect the insulated wire to pin 2, TB1 (S1). Connect the buss wire thru lug L7 (S2)\* to pin 1, TB1 (S1). At the other end connect the insulated wire to pin 2, T3A (S2). Connect the stranded wire to lug A (top), T3A (S3). Dress the antenna cable along the side of the chassis as shown.

\*A wire passing through a pin counts as two connections to that pin.

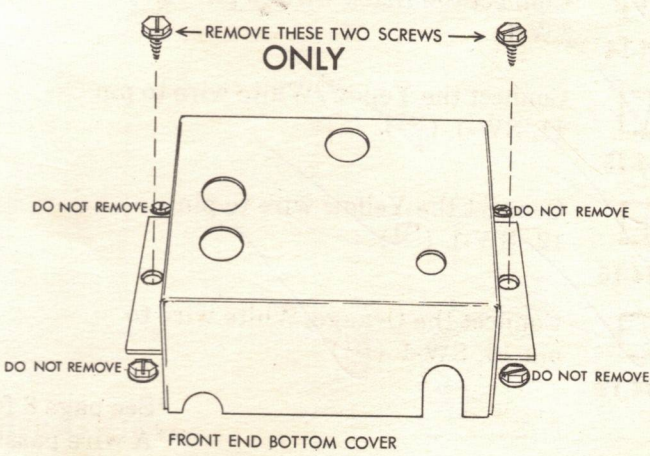
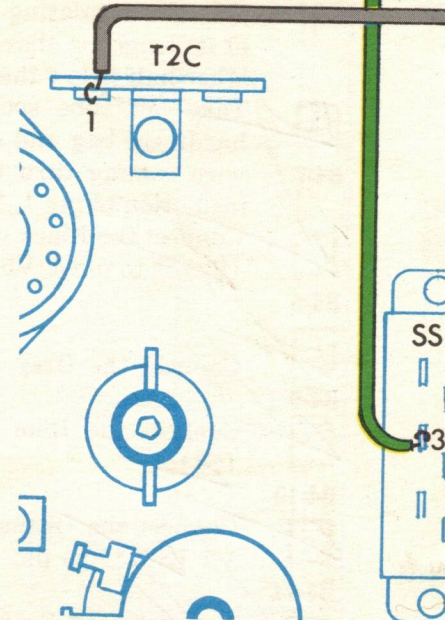
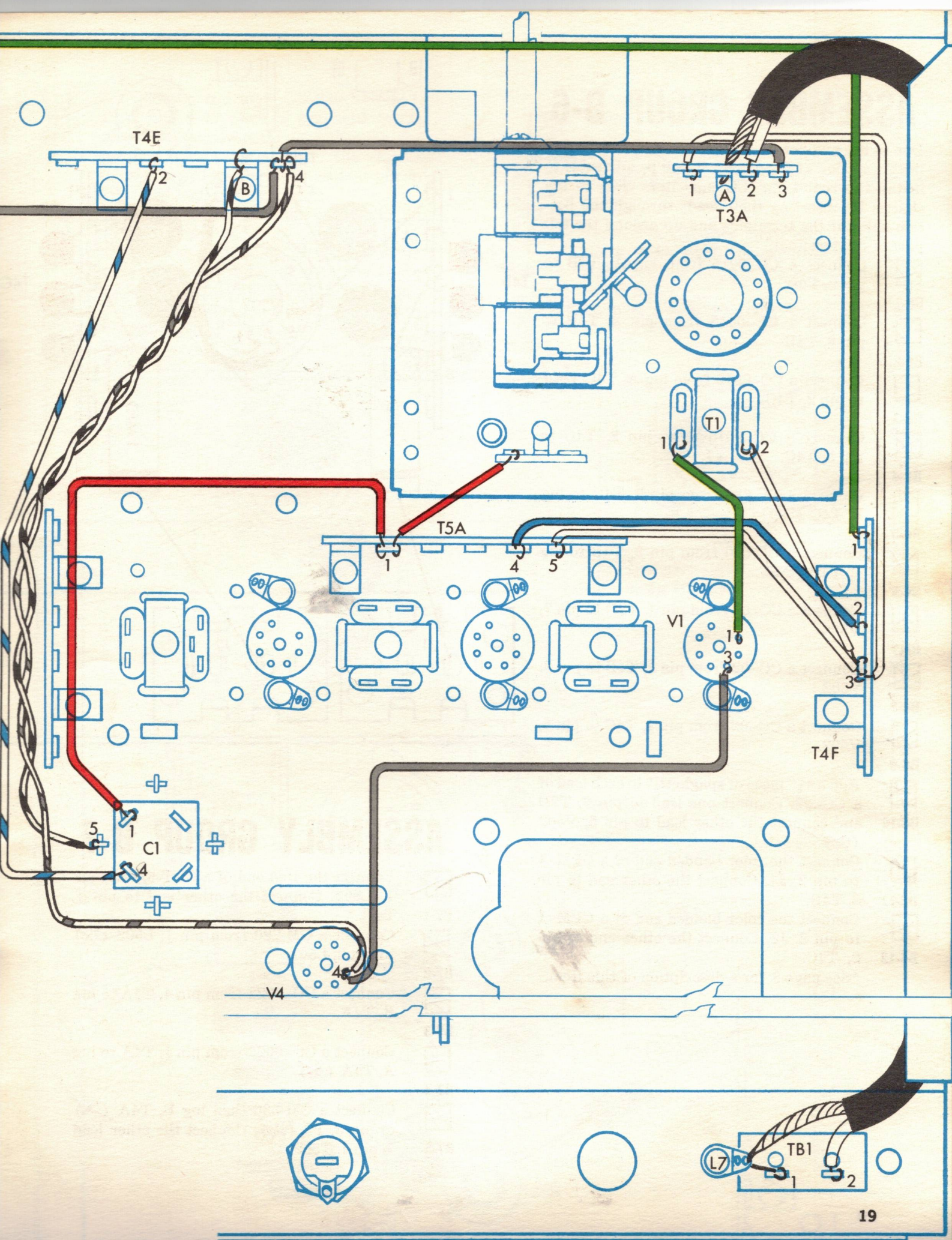


Figure 11



T4E

T3A

T5A

V1

T4F

C1

V4

TB1

L7

# ASSEMBLY GROUP B-6

Due to the number of parts which will be installed in this section of the Tuner, it will be advisable to install the round, flat CC capacitors close to the chassis by inserting their leads through the bottom holes of the terminals and up around the tall part of the terminal.

B6-1 Connect a CC-.0015 from lug A, T4B to pin 2, T4B.

B6-2 Connect a CC-.0015 from pin 2, T4B to pin 3, T4B.

B6-3 Connect a CC-.0015 from lug A, T4C (~~S1~~) to pin 2, T4C.

B6-4 Connect a CC-.0015 from pin 2, T4C to pin 3, T4C.

B6-5 Connect a CC-680 from pin 3, T4C to lug B, T4C (~~S1~~).

B6-6 Connect a CC-680 from pin 3, T4B to lug B, T4B (~~S2~~).

B6-7 Connect a CC-.02 from pin 1, T2D to pin 7, V502.

B6-8 Connect a CC-.02 from pin 1, T4B to pin 8, V502.

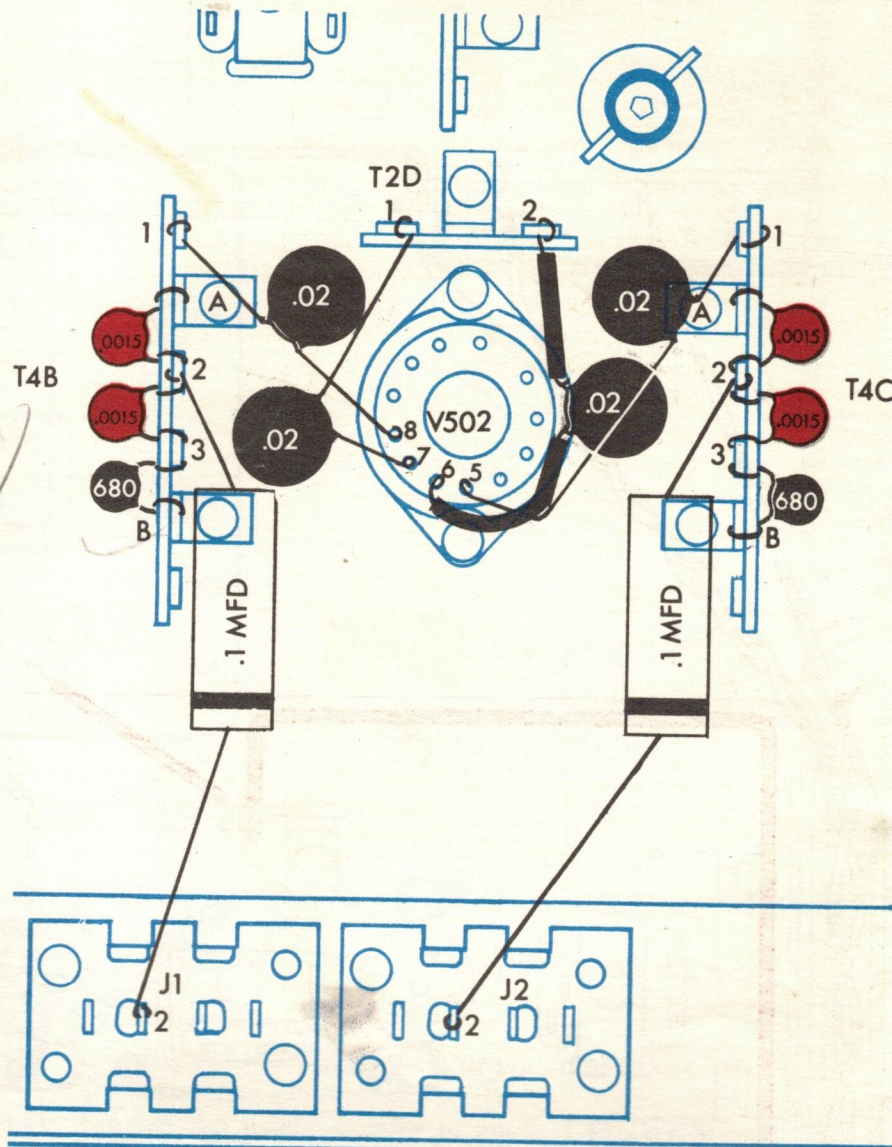
B6-9 Connect a CC-.02 from pin 1, T4C to pin 5, V502.

B6-10 Add a 3/4" piece of spaghetti\* to each lead of a CC-.02. Connect one lead to pin 2, T2D and connect the other lead to pin 6, V502 (~~S2~~).

B6-11 Connect the color banded end of a CPM-.1 to pin 2, J1. Connect the other end to pin 2, T4B.

B6-12 Connect the color banded end of a CPM-.1 to pin 2, J2. Connect the other end to pin 2, T4C.

\*See page 8 for a description of this item.



# ASSEMBLY GROUP B-7

B7-1 Connect the Red end of a CET-5/25 to pin 1, L502. Connect the other end to pin 1, T4D.

B7-2 Connect a CM-220 from pin 1, L502 (~~S8~~) to pin 2, L501.

B7-3 Connect a CC-.0022 from pin 4, T4A to lug B, T4A.

B7-4 Connect a CC-.0022 from pin 1, T4A to lug A, T4A (~~S2~~).

B7-5 Connect a CM-330 thru lug B, T4A (~~S8~~) to pin 3, P2 (~~S1~~). Connect the other lead to pin 4, T502.

**B7-6** Connect one end of a CM-330 to pin 1, T2A. Add a 1" piece of spaghetti to the other lead and feed the lead through the opening behind SW-1. Turn the chassis right-side up. Connect the lead to pin 8, SW-1 (**S1**).

**B7-7** Connect a CM-100 from pin 9, SW-1 to pin 10, SW-1 (**S2**).

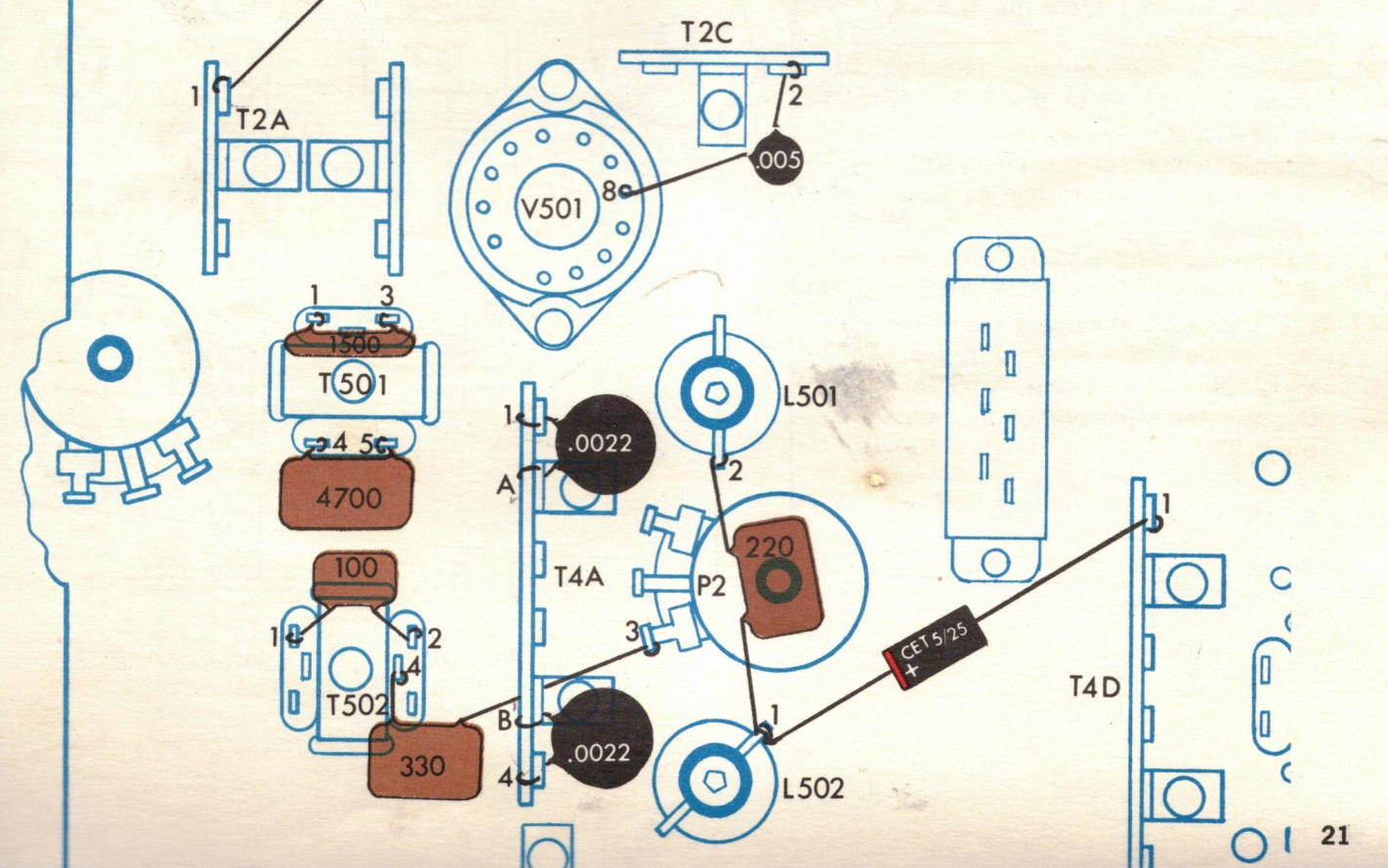
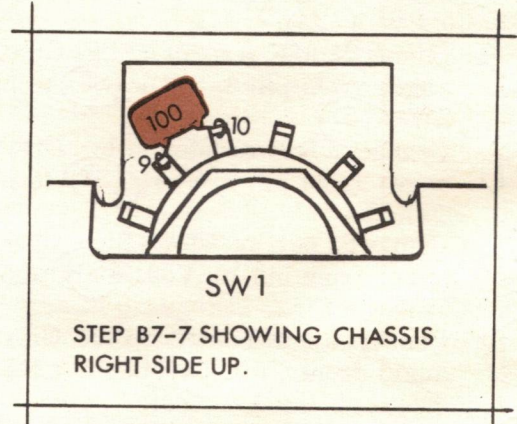
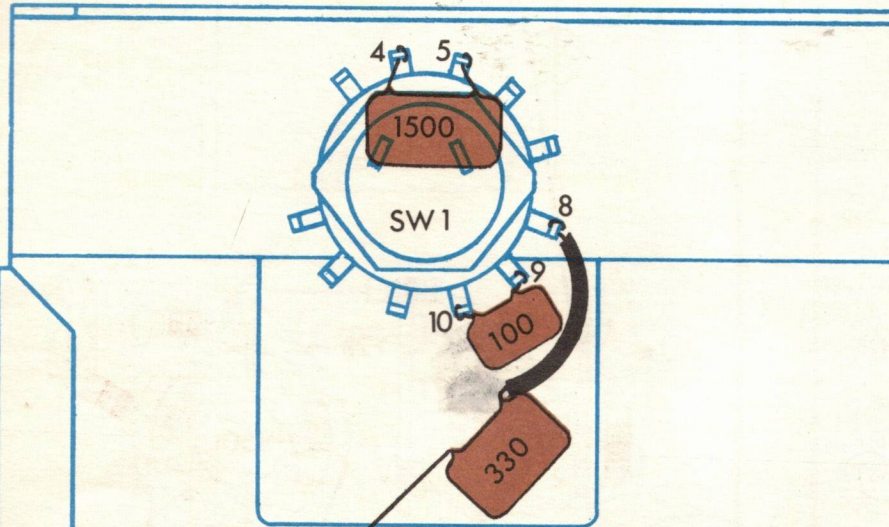
**B7-8** NOTE: The positioning of this capacitor looks somewhat different with the tuner turned right side up. Refer to the insert. Connect a CM-100 from pin 1, T502 to pin 2, T502 (**S2**).

**Turn the unit upside down.**  
 **B7-9** Connect a CM-4700 from pin 4, T501 (**S3**) to pin 5, T501.

**B7-10** Connect a CC-.005 from pin 8, V501 to pin 2, T2C.

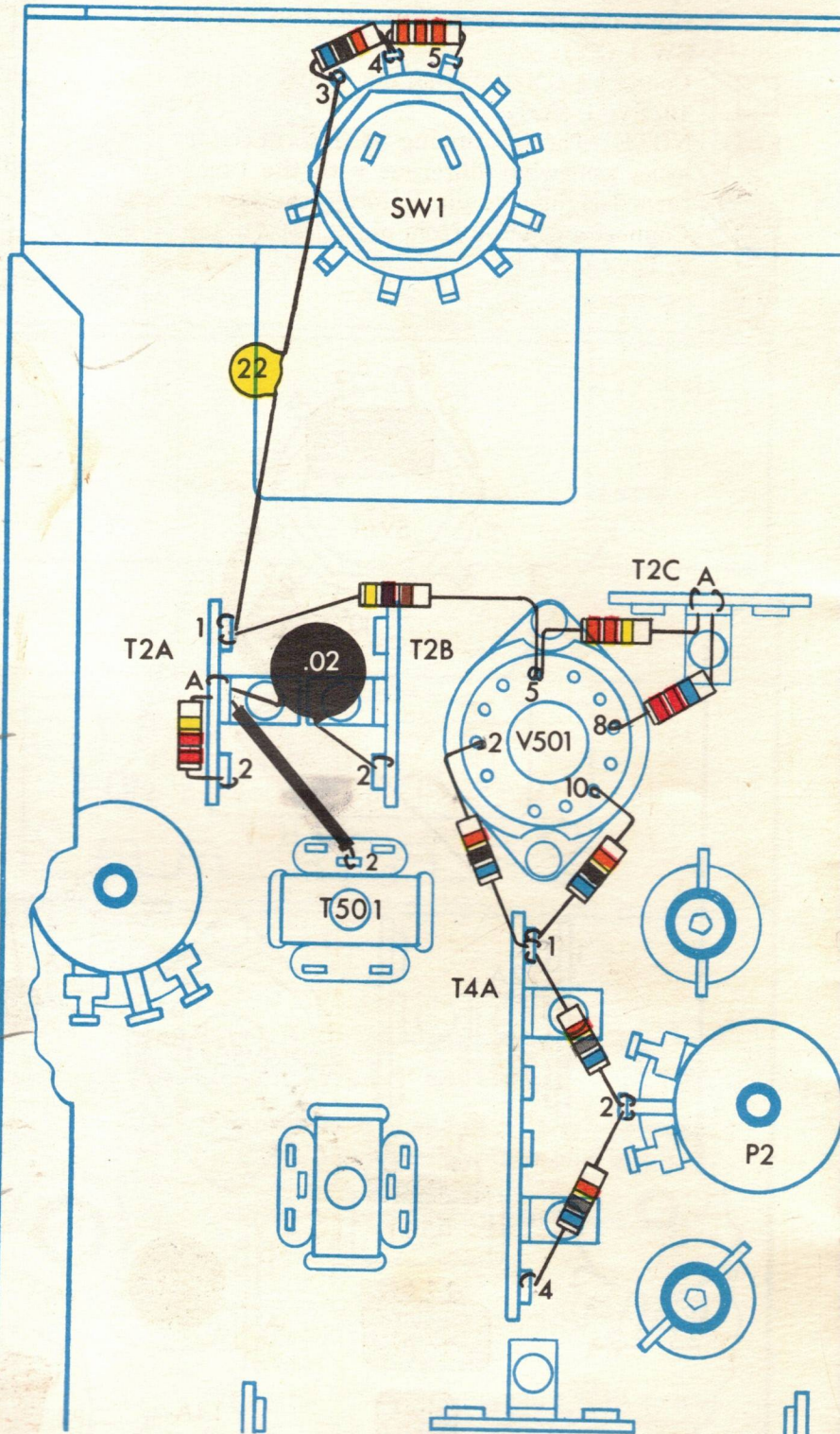
**B7-11** Connect a CM-1500 from pin 1, T501 to pin 3, T501. Dress the capacitor in an up-right position to clear the alignment hole in the can.

**B7-12** Connect a CM-1500 from pin 4, SW-1 to pin 5, SW-1.

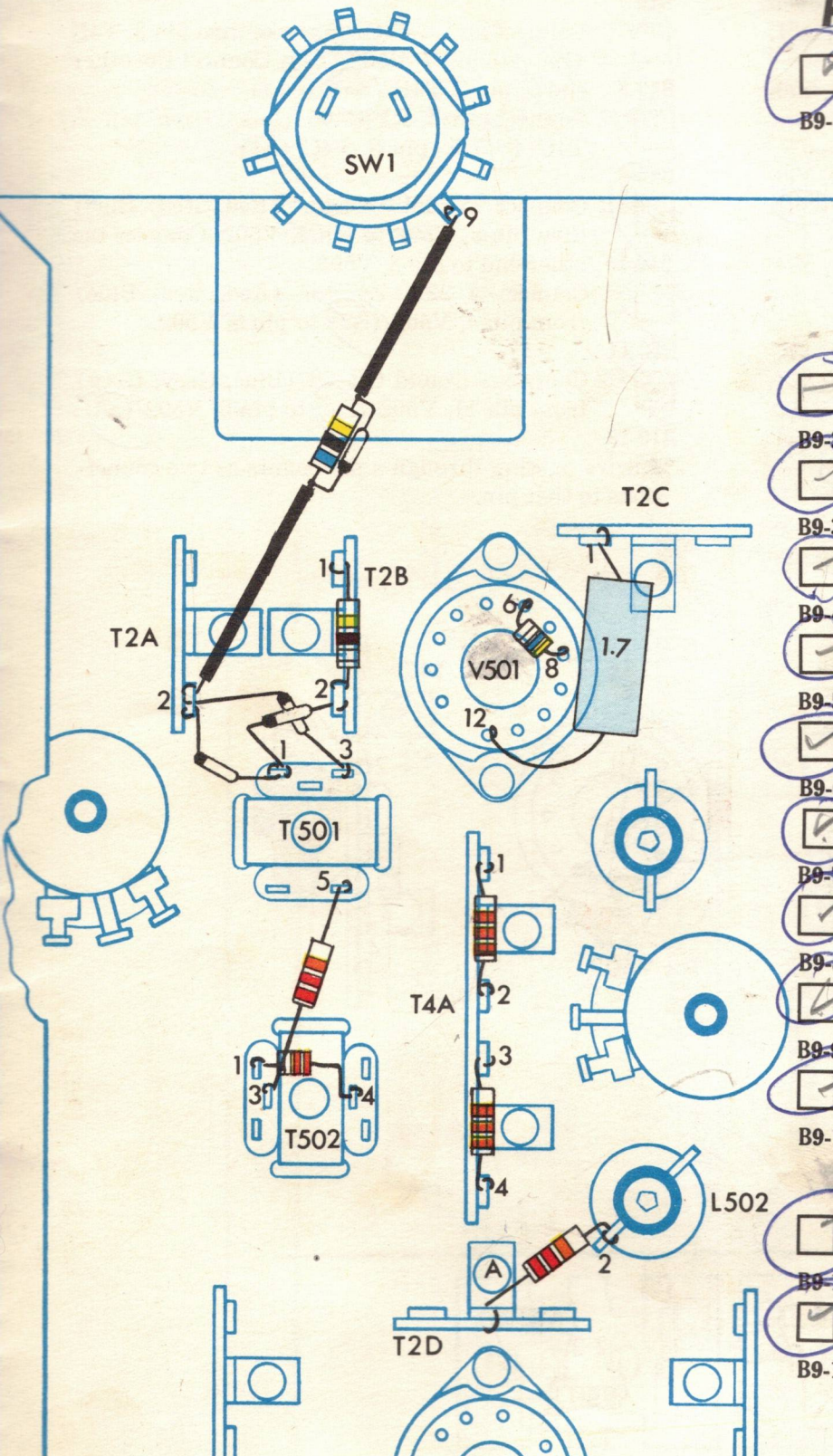


# ASSEMBLY GROUP B-8

- B8-1 Connect a CC-22 from pin 3, SW-1 to pin 1, T2A.
- B8-2 Connect a CC-.02 from pin 2, T2B to lug A, T2A.
- B8-3 Connect a 33K resistor (Orange, Orange, Orange) from pin 4, SW-1 to pin 5, SW-1 (S4).
- B8-4 Connect a 68K resistor (Blue, Grey, Orange) from pin 3, SW-1 (S8) to pin 4, SW-1 (S3).
- B8-5 Connect a 68K resistor (Blue, Grey, Orange) from pin 2, V501 (S1) to pin 1, T4A.
- B8-6 Connect a 68K resistor (Blue, Grey, Orange) from pin 10, V501 (S4) to pin 1, T4A.
- B8-7 Connect a 68K resistor (Blue, Grey, Orange) from pin 4, T4A to pin 2, P2 (S3).
- B8-8 Connect a 68K resistor (Blue, Grey, Orange) from pin 4, T4A to pin 2, P2 (S3).
- B8-9 Connect a 470 ohm resistor (Yellow, Purple, Brown) from pin 1, T2A (S3) to pin 5, V501.
- B8-10 Connect a 330K resistor (Orange, Orange, Yellow) from pin 5, V501 (S2) to lug A, T2C.
- B8-11 Connect a 22M resistor (Red, Red, Blue) from pin 8, V501 to lug A, T2C (S4).
- B8-12 Pass one end of a 220K resistor (Red, Red, Yellow) thru lug A, T2A. Slip a 1 1/8" piece of spaghetti over the wire and connect the wire to pin 2, T501 (S1). Now solder lug A, T2A (S3). Connect the other end of the resistor to pin 2, T2A.



# ASSEMBLY GROUP B-9



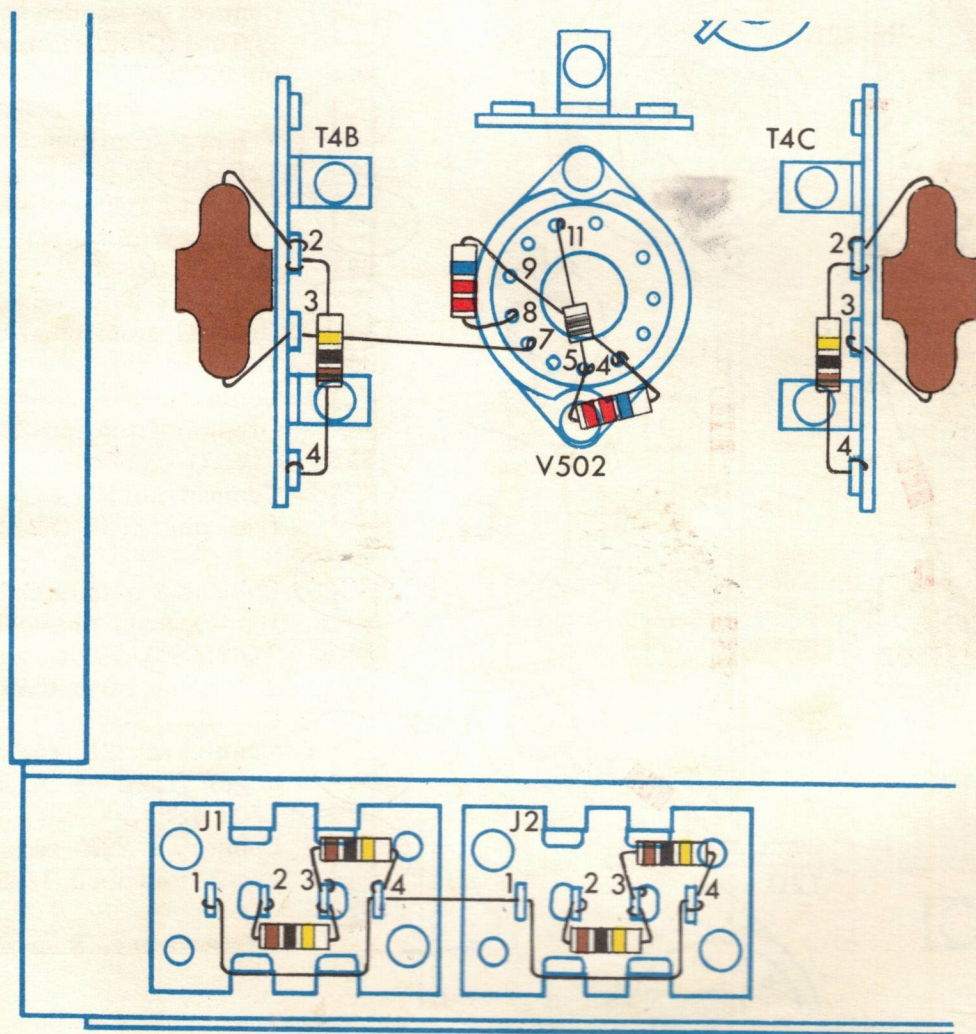
- B9-1 Add a 1" piece of spaghetti to each end of a preassembled 680K resistor (Blue, Grey, Yellow) and D1N99 diode (Black, White, White). Connect the end with the Black band of the diode to pin 2, T2A. Carefully dress the resistor and diode under the 470 ohm resistor connected to pin 1, T2A and feed the other end down through the opening behind SW-1. Turn the chassis over and connect the wire to pin 9, SW-1 (S2). **Turn the tuner again upside down.**
- B9-2 Connect the banded end of a D-GM-2 diode to pin 2, T2A. Connect the other end to pin 3, T501 (S2).
- B9-3 Connect the banded end of a D-GM-2 to pin 2, T2A (S4). Connect the other end to pin 1, T501.
- B9-4 Connect the banded end of a D-GM-2 to pin 1, T501 (S3). Connect the other end to pin 2, T2B.
- B9-5 Connect a 470K resistor (Yellow, Purple, Yellow) from pin 1, T2B (S2) to pin 2, T2B (S3).
- B9-6 Connect a round CC-4.7 capacitor (Yellow, Purple, White) from pin 6, V501 (S2) to pin 8, V501 (S3).
- B9-7 Connect a 33K resistor (Orange, Orange, Orange) from pin 1, T4A (S5) to pin 2, T4A.
- B9-8 Connect a 33K resistor (Orange, Orange, Orange) from pin 3, T4A to pin 4, T4A.
- B9-9 Connect an RW4-1.7 wirewound resistor from pin 1, T2C (S2) to pin 12, V501 (S1).
- B9-10 Connect a round CC-3.3 (Orange, Orange, White) from pin 1, T502 (S8) to pin 4, T502 (S8). Position the capacitor so that it does not cover the hole in the bottom of the can.
- B9-11 Connect a 22K resistor (Red, Red, Orange) from lug A, T2D (S2) to pin 2, L502 (S8).
- B9-12 Connect a 22K resistor (Red, Red, Orange) from pin 3, T502 to pin 5, T501 (S4).

\*Refer to page 8 on soldering diodes.

# ASSEMBLY GROUP B-10

- B10-1** Thread a short piece of buss wire thru pin 4 and pin 1, J2 and thru pin 4 and pin 1, J1. Position the wire so that it does not touch pins 2 and 3 of J1 and J2. Now solder pin 1, J1 (S1), and pin 1, J2 (S2).
- B10-2** Connect a 100K resistor (Brown, Black, Yellow) from pin 2, J1 (S2) to pin 3, J1.
- B10-3** Connect a 100K resistor (Brown, Black, Yellow) from pin 3, J1 (S2) to pin 4, J1 (S4).
- B10-4** Connect a 100K resistor (Brown, Black, Yellow) from pin 2, J2 (S2) to pin 3, J2.
- B10-5** Connect a 100K resistor (Brown, Black, Yellow) from pin 3, J2 (S2) to pin 4, J2 (S2).
- B10-6** Connect a 100K resistor (Brown, Black, Yellow) from pin 2, T4B to pin 4, T4B (S3).

- B10-7** Connect a 100K resistor (Brown, Black, Yellow) from pin 2, T4C to pin 4, T4C (S3).
  - B10-8** Connect an L-RF-C-.05 choke thru pin 3, T4B (S4) to pin 7, V502 (S2). Connect the other end to pin 2, T4B (S5).
  - B10-9** Connect an L-RF-C-.05 choke from pin 2, T4C (S5) to pin 3, T4C (S4).
  - B10-10** Connect a 22M resistor (Red, Red, Blue) thru pin 9, V502 to pin 4, V502. Connect the other end to pin 8, V502.
  - B10-11** Connect a 22M resistor (Red, Red, Blue) from pin 4, V502 (S2) to pin 5, V502.
  - B10-12** Connect a round CC-68 (Blue, Grey, Grey) from pin 11, V502 (S2) to pin 5, V502 (S3).
- \*A wire passing through a pin counts as two connections to that pin.



# ASSEMBLY GROUP B-11

B11-1 Connect a CC-22 (Red, Red, Grey) from pin 8, V502 (S3) to pin 3, V502 (S2).

B11-2 Connect the banded end of a CPM-25/200 thru lug A, T4B (S3) to pin 9, V502 (S3). Connect the other end to pin 3, T502 (S2).

B11-3 Connect a 1M resistor (Brown, Black, Green) from pin 1, T4B to pin 1, T2D.

B11-4 Connect a 1M resistor (Brown, Black, Green) from pin 1, T4C to pin 2, T2D.

B11-5 Connect a CC-5 NPO from pin 1, T4B (S4) to pin 1, T2D.

B11-6 Connect a CC-5 NPO from pin 1, T4C (S5) to pin 2, T2D.

B11-7 Connect a 3.3M resistor (Orange, Orange, Green) from pin 3, T4A to pin 1, T2D.

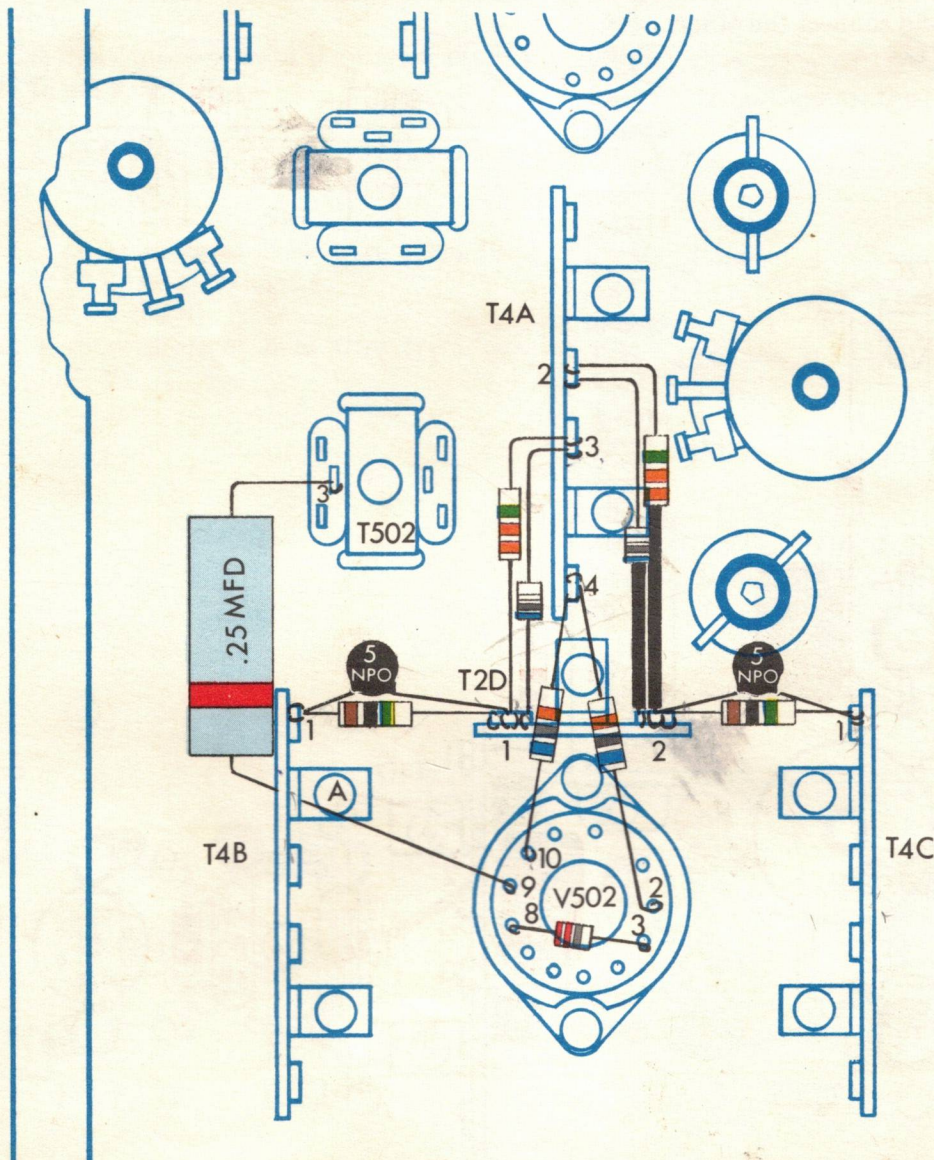
B11-8 Add a 1" piece of spaghetti to one end of a 3.3M resistor (Orange, Orange, Green) and connect this end to pin 2, T2D. Connect the other end to pin 2, T4A.

B11-9 Connect a round CC-6.8 (Blue, Grey, White) from pin 3, T4A (S4) to pin 1, T2D (S5).

B11-10 Add a 1" piece of spaghetti to one end of a CC-6.8 (Blue, Grey, White) and connect this end to pin 2, T2D (S5). Connect other end to pin 2, T4A (S4).

B11-11 Connect a 68K resistor (Blue, Grey, Orange) from pin 4, T4A to pin 10, V502 (S1).

B11-12 Connect a 68K resistor (Blue, Grey, Orange) from pin 4, T4A (S5) to pin 2, V502 (S1).



# ASSEMBLY GROUP B-12

B12-1 Connect a 47K resistor (Yellow, Purple, Orange) from pin 2, T2C (S2) to pin 2, L501.

B12-2 Connect a CM-1000 from pin 1, L501 (S2) to pin 2, L501 (S3).

B12-3 Connect a CM-1000 from pin 2, T4D to lug A, T4D.

B12-4 Connect a CC-270 from pin 1, T4D to lug A, T4D (S2).

B12-5 Connect a CC-270 from pin 3, T4D to lug B, T4D (S1).

B12-6 Add a short piece of spaghetti to one end of an 820 ohm resistor (Gray, Red, Brown) and connect this end to pin 2, T4D (S3). Position the resistor so that it does not block the hole in the bottom of detector can T4 and connect the other end to pin 3, T4 (S1).

B12-7 Connect a 10K resistor (Brown, Black, Orange) from pin 2, T4 to pin 5, T4.

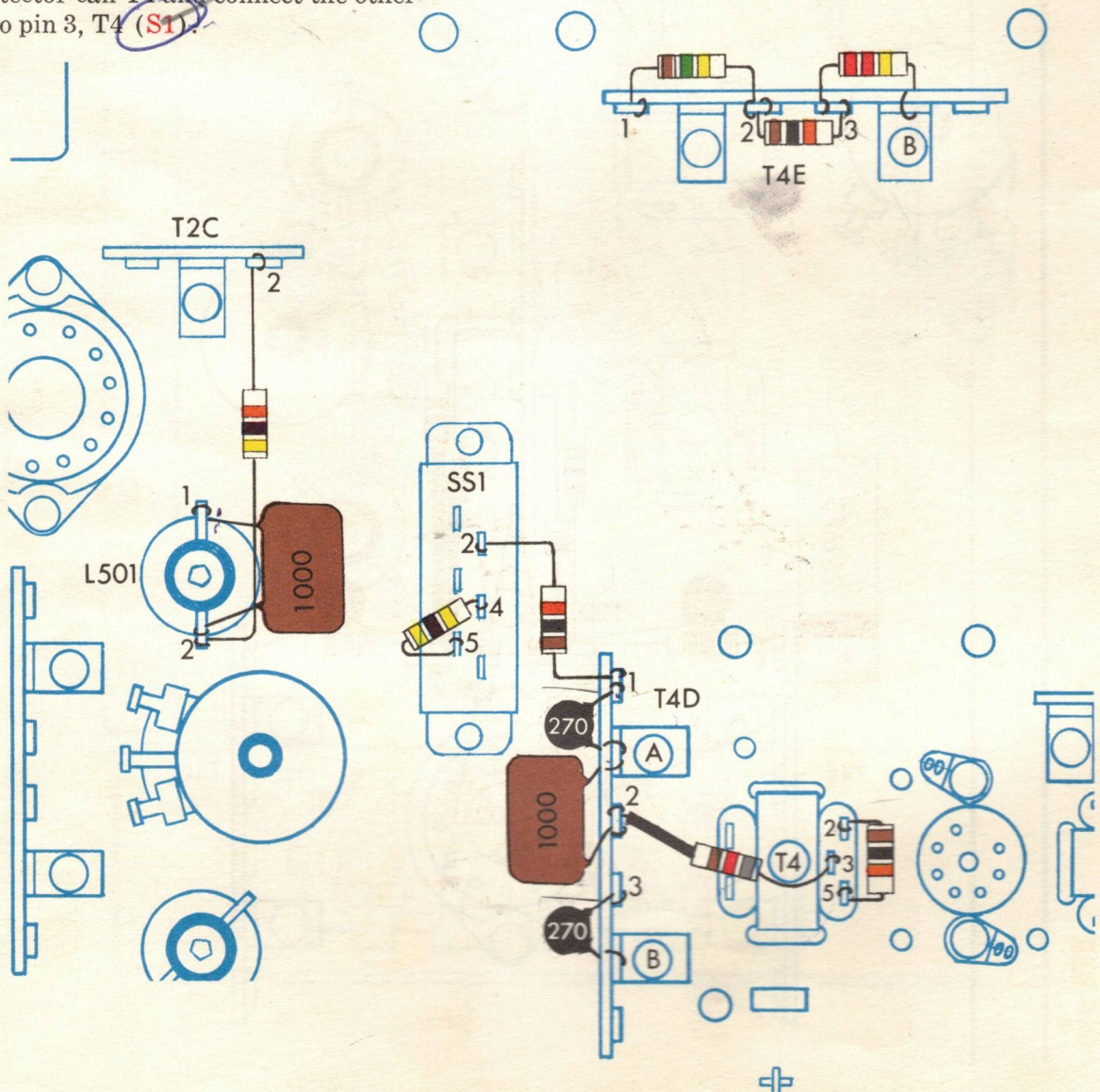
B12-8 Connect a 10K resistor (Brown, Black, Orange) from pin 2, SS-1 (S1) to pin 1, T4D.

B12-9 Connect a 10K resistor (Brown, Black, Orange) from pin 2, T4E to pin 3, T4E.

B12-10 Connect a 150K resistor (Brown, Green, Yellow) from pin 1, T4E (S2) to pin 2, T4E (S3).

B12-11 Connect a 220K resistor (Red, Red, Yellow) from pin 3, T4E (S3) to lug B, T4E (S3).

B12-12 Connect a 470K resistor (Yellow, Purple, Yellow) from pin 4, SS-1 (S2) to pin 5, SS-1 (S2).



# ASSEMBLY GROUP B-13

In the next few assembly groups there are many bare wires very close together. BE VERY CAREFUL NOT TO LET THEM TOUCH ONE ANOTHER.

Connect the banded end of a CET 25/25 to pin 1, T4D. Connect the other end to pin 4, T4D.

B13-1

Connect a 15K resistor (Brown, Green, Orange) from pin 1, T4D to pin 4, T4D.

B13-2

Connect a 2.7K resistor (Red, Purple, Red) from pin 3, T4D to pin 4, T4D.

B13-3

Connect a 1K resistor (Brown, Black, Red) from pin 6, SS-1 (S1) to pin 4, T4D (S4).

B13-4

Bend pins 2 and 4 on V1 inward until they make contact with the center post. Bend pins 2 and 3 on V2 into the center post. Bend pins 2 and 4 on V3 into the center post. (See Figure 12)

B13-5

Connect a short piece of buss wire from pin 5, T4 (S2) to pin 5, V3 (S1).

B13-6

Connect a short piece of buss wire from pin 4, T3 to pin 5, V2.

B13-7

Connect a short piece of buss wire from the center post of V2 (S3) to lug L4.

B13-8

Connect a short piece of buss wire from pin 4, T2 to pin 5, V1.

B13-9

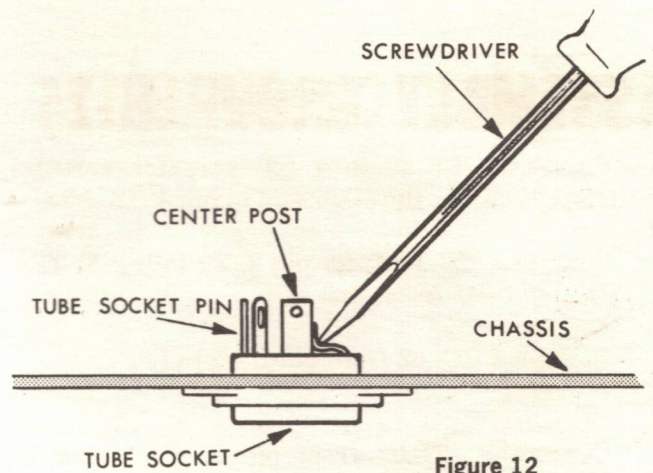


Figure 12

Connect a CC-.005 thru pin 2, T4 (S3) to pin 6, V3. Connect the other end to lug L1.

B13-10

Connect a CC-.005 from pin 3, V3 to L2.

B13-11

Connect a CC-.005 from pin 2, T3 to pin 6, V2.

B13-12

Connect a CC-.005 thru L4 (S8) to pin 3, T2 (S1). Connect the other end to pin 4, V2.

B13-13

Connect a CC-.005 from pin 2, T2 to pin 6, V1.

B13-14

Connect a CC-.005 thru L6 to center post V1 (S3). Connect the other end to pin 3, V1.

B13-15

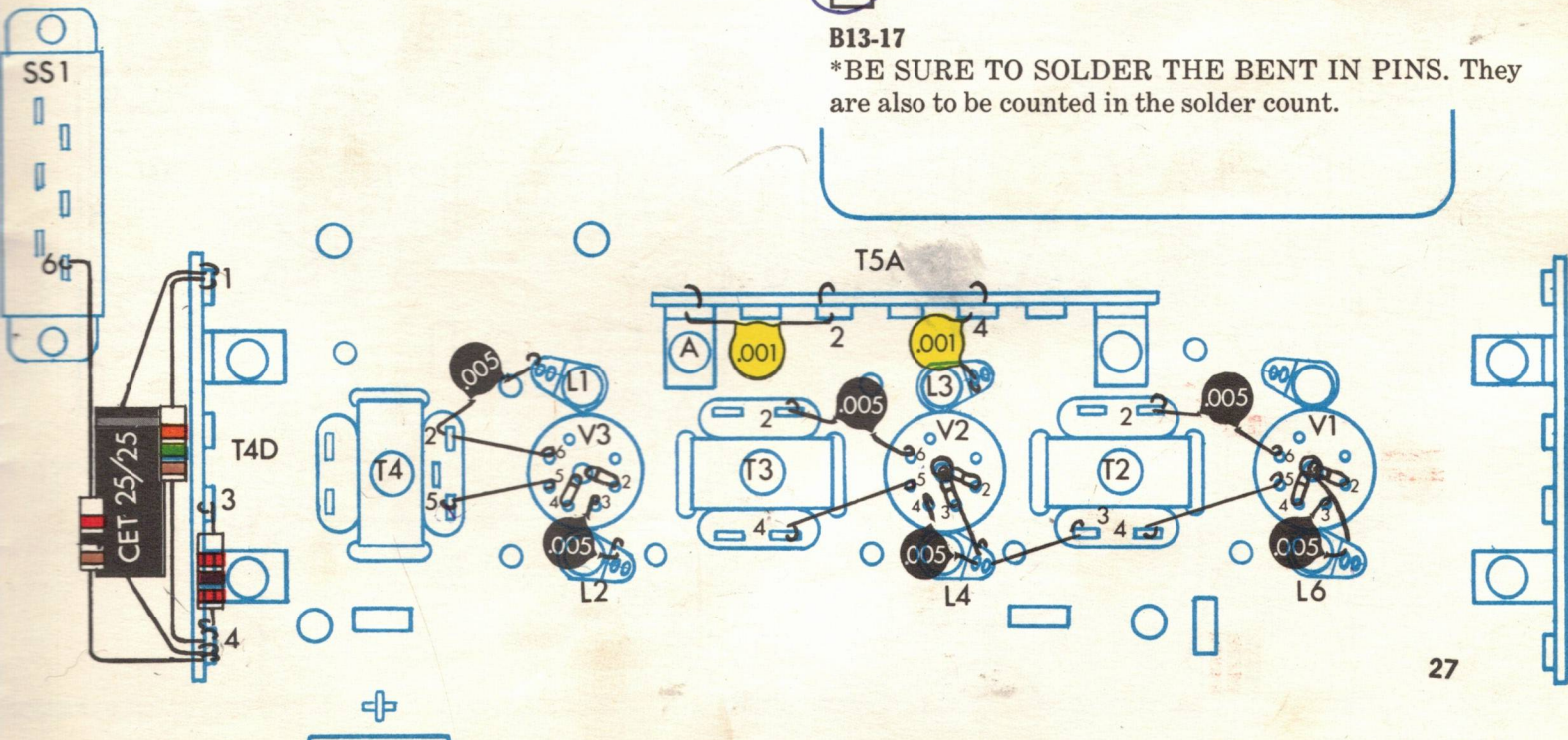
Connect a CC-.001 from lug A, T5A to pin 2, T5A.

B13-16

Connect a CC-.001 from pin 4, T5A to L3.

B13-17

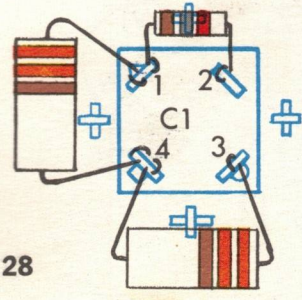
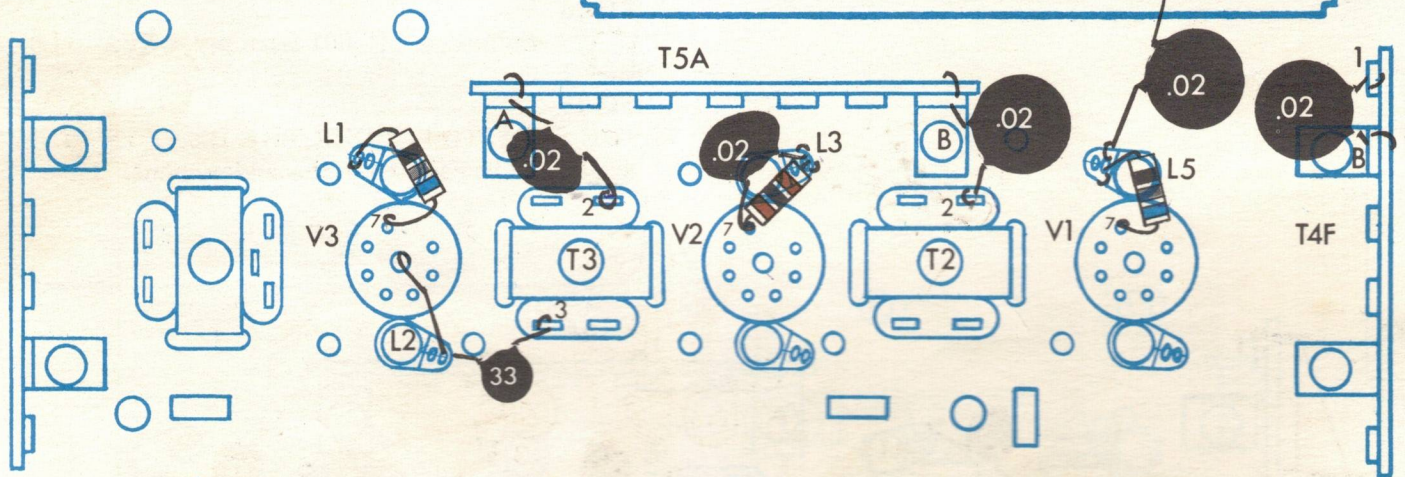
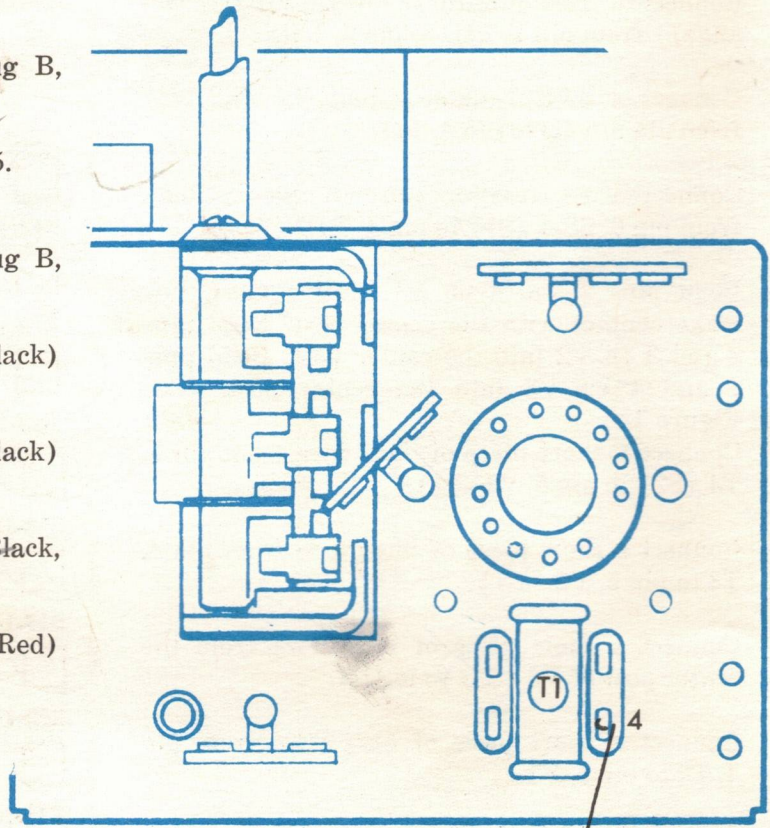
\*BE SURE TO SOLDER THE BENT IN PINS. They are also to be counted in the solder count.



# ASSEMBLY GROUP B-14

- B14-1** Connect a CC-33 thru L2 to center post V3 (S3). Connect the other end to pin 3, T3.
- B14-2** Connect a CC-.02 from pin 2, T3 to lug A, T5A (S2).
- B14-3** Connect a CC-.02 from pin 7, V2 to L3.
- B14-4** Connect a CC-.02 from pin 2, T2 to lug B, T5A (S1).
- B14-5** Connect a CC-.02 from pin 4, T1 (S2) to L5.
- B14-6** Connect a CC-.02 from pin 1, T4F to lug B, T4F.
- B14-7** Connect a 68 ohm resistor (Blue, Grey, Black) from pin 7, V1 (S1) to L5 (S2).
- B14-8** Connect a 68 ohm resistor (Blue, Grey, Black) from pin 7, V3 (S1) to L1 (S2).
- B14-9** Connect a 100 ohm resistor (Brown, Black, Brown) from pin 7, V2 (S2) to L3 (S3).
- B14-10** Connect a 1.8K resistor (Brown, Grey, Red) from pin 1, C1 to pin 2, C1 (S2).

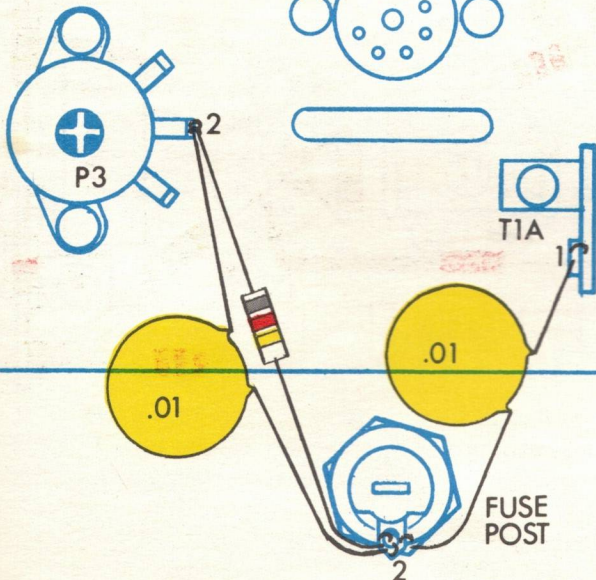
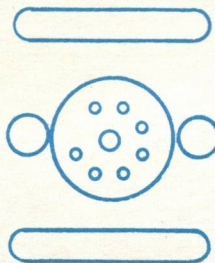
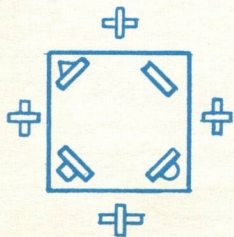
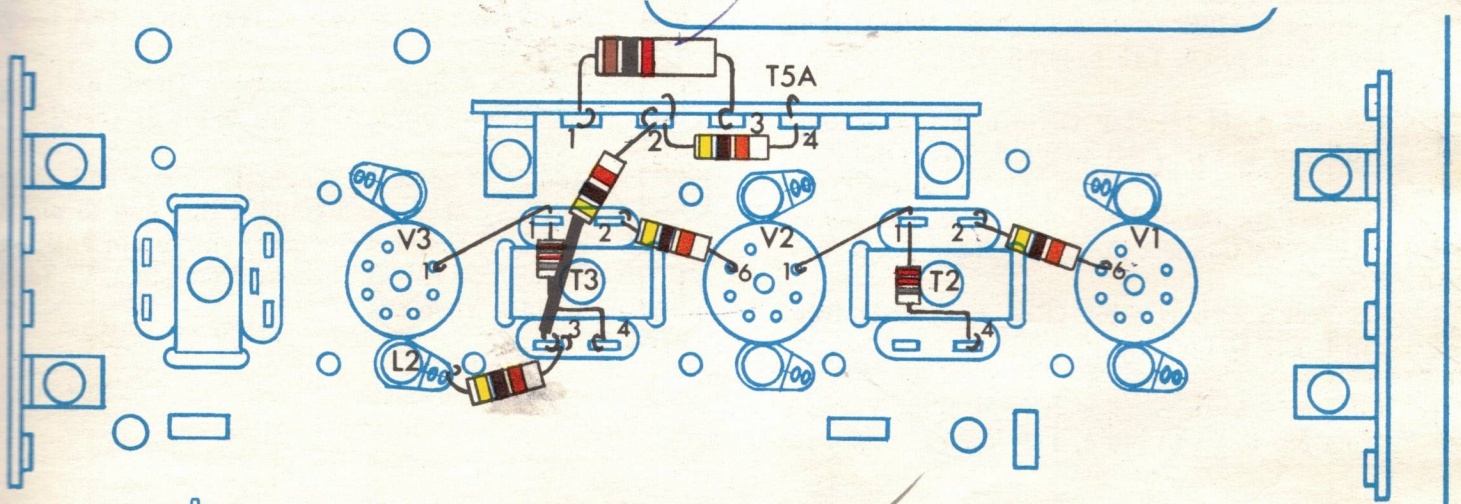
- B14-11** Connect a large 330 ohm resistor (Orange, Orange, Brown) from pin 1, C1 (S3) to pin 4, C1.
- B14-12** Connect a large 330 ohm resistor (Orange, Orange, Brown) from pin 4, C1 (S3) to pin 3, C1 (S2).



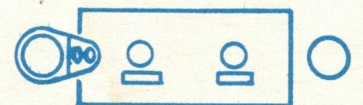
# ASSEMBLY GROUP B-15

- B15-1** Connect a CC-.22 (Red, Red, Grey) thru pin 1, T3 (S2) to pin 1, V3 (S1). Dress the capacitor so that it does not block the hole in the bottom of T3 and connect the other end to pin 4, T3 (S2).
- B15-2** Connect a CC-.22 (Red, Red, Grey) thru pin 1, T2 (S2) to pin 1, V2 (S1). Dress the capacitor so that it does not block the hole in the bottom of T2 and connect the other end to pin 4, T2 (S2).
- B15-3** Connect a 47K resistor (Yellow, Purple, Orange) from pin 2, T2 to pin 6, V1.

- B15-4** Connect a 47K resistor (Yellow, Purple, Orange) from pin 2, T5A to pin 4, T5A.
- B15-5** Add a short piece of spaghetti to one end of a 47K resistor (Yellow, Purple, Orange) and connect this end to pin 3, T3. Dress the resistor so that it does not block the hole in the bottom of T3 and connect the other end to pin 2, T5A (S3).



- B15-7** Connect a 47K resistor (Yellow, Purple, Orange) from pin 3, T3 (S3) to L2 (S4).
- B15-8** Connect a large 1K resistor (Brown, Black, Red) from pin 1, T5A to pin 3, T5A.
- B15-9** Connect a CC-.01 from pin 1, T1A (S3) to pin 2 of the fuse post.
- B15-10** Connect a CC-.01 from pin 2, P3 to pin 2 of the fuse post.
- B15-11** Connect an 820K resistor (Grey, Red, Yellow) from pin 2, P3 (S3) to pin 2 of the fuse post (S4).



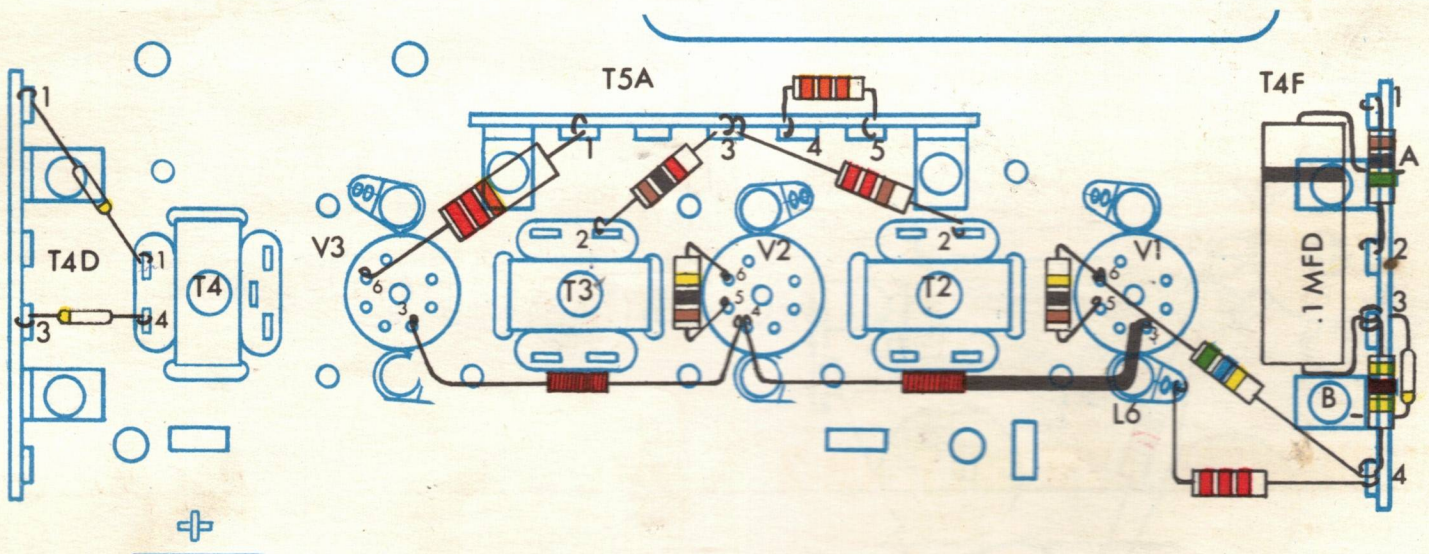
# ASSEMBLY GROUP B-16

In the next three steps, you will be installing diodes. It is suggested that you refresh your memory on the procedure for soldering these items by rereading the information given on page 6.

- B16-1 Connect the banded end of a D-GM-1 diode to pin 1, T4 (S1). Connect the other end to the bottom hole of pin 1, T4D (S6).
- B16-2 Connect the banded end of a D-GM-1 diode to the bottom hole of pin 3, T4D (S3). Connect the other end to pin 4, T4 (S1).
- B16-3 Connect the banded end of a D-GM-1 diode to lug B, T4F (S1). Connect the other end to the bottom hole of pin 3, T4F.
- B16-4 Connect a 470K resistor (Yellow, Purple, Yellow) from pin 4, T4F to pin 3, T4F.
- B16-5 Connect a 1M resistor (Brown, Black, Green) from pin 1, T4F (S4) to pin 2, T4F (S2).
- B16-6 Connect the banded end of a CPM-.1 to lug A, T4F (S2). Connect the other end to pin 3, T4F (S6).
- B16-7 Connect a 2.2K resistor (Red, Red, Red) from pin 4, T4F to L6 (S2).
- B16-8 Connect a 560K resistor (Green, Blue, Yellow) from pin 6, V1 to pin 4, T4F (S3).

# ASSEMBLY GROUP B-17

- B17-1 Connect a 100K resistor (Brown, Black, Yellow) from pin 5, V1 (S2) to pin 6, V1 (S4).
- B17-2 Connect a 100K resistor (Brown, Black, Yellow) from pin 5, V2 (S2) to pin 6, V2 (S3).
- B17-3 Connect a 1K resistor (Brown, Black, Red) from pin 2, T3 (S4) to pin 3, T5A.
- B17-4 Connect a 220 ohm resistor (Red, Red, Brown) from pin 3, T5A (S3) to pin 2, T2 (S4).
- B17-5 Connect a 33K resistor (Orange, Orange, Orange) from pin 4, T5A (S4) to pin 5, T5A (S2).
- B17-6 Connect a large 22K resistor (Red, Red, Orange) from pin 6, V3 (S2) to pin 1, T5A (S4).
- B17-7 Add a 1" piece of spaghetti to one end of an L-REC-1 choke and connect this end to pin 3, V1 (S3). Connect the other end to pin 4, V2.
- B17-8 Connect an L-REC-1 choke from pin 4, V2 (S3) to pin 3, V3 (S2).



# VERY IMPORTANT! THE DOUBLE CHECK SYSTEM

The main part of the electrical assembly is complete. IT IS TIME TO PAUSE FOR A MOMENT AND MAKE SURE THAT THERE ARE NO ERRORS, AND THAT EVERY JOINT HAS BEEN SOLDERED PROPERLY. It is quite understandable that at this stage of the assembly there will be a tremendous incentive to forge ahead quickly to finish the job. Unfortunately this attitude can cause you to overlook a small error that will lead to serious and expensive damage to your tuner. Stop for a moment, RELAX, and check over your work.

An easy method of doing this has been provided. Call in a friend or another member of the family. Have them look over Chart A-1. On this diagram of the underside of the chassis, a series of numbers have been placed next to each pin or terminal. These numbers indicate the number of wires and leads (including those from resistors or capacitors) that have been soldered to that pin. While you count off the number of leads on each pin and terminal, your assistant can check your count against the chart. When you count the leads going to pin 1 of V3, your helper will observe that this agrees with his chart and place a small check mark on it. This will be continued until the entire tuner is checked over. It will seldom take more than 10 minutes for this complete check.

**WHILE YOU ARE COUNTING THE WIRES, YOU CAN ALSO BE CHECKING FOR SHORT CIRCUITS AND PROPER SOLDERING.**

It would be very handy if you had a tool with a small sharp point (like an ice pick) to probe the connections and make certain they are soldered properly. A pencil with a sharp point can also be used. Even the most meticulous worker can make a mistake or have a poorly soldered joint. LOOK SHARP! Move every lead and wire a little bit to insure it is not accidentally causing a short circuit with some other wire or pin.

If a mistake is caught and it involves a component which is now too short to reach the correct pin, refer to (Figure 4) on splicing a piece of buss wire. This will work quite well and eliminate the need for purchasing a replacement.

## MECHANICAL ASSEMBLY AM-2

- AM2-1 With the tuner right side up, install tube EM 87/6HU6 in socket V5. Slide the tube into its holder with the rectangular white screen fac-

ing the front of the tuner. Slide the tube through the holder until it is centered. Make sure that none of the socket terminals are shorting together. (See Figure 13.)

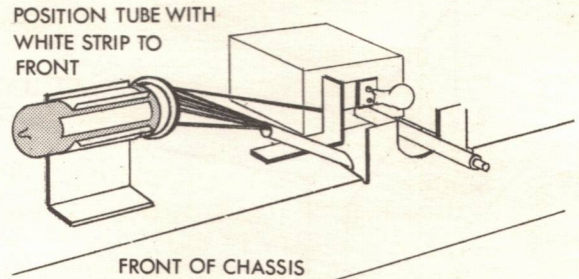


Figure 13

With the tuner upside down, install the IF shield as shown in (Figure 14). Screw the nuts onto the lugs from the top of the tuner, but do not overtighten. **CAUTION: MAKE SURE THAT NO WIRES OR PARTS ARE PINCHED OR CAUGHT UNDER THE SHIELD.**



AM2-2

Reinstall the front end bottom cover with the large square cutout facing the front of the tuner. Here again make sure that no wires are caught under any part of the cover.



AM2-3

Place a spring clip fastener over each of the holes on either side of the chassis cut out next to the tuning shaft. Slide the clips on from each side and be sure that the fasteners are mounted with the smooth side on the panel side of the chassis. Remove the nut from the Selector Switch (SW-1) and mount the panel over the shaft and up against the chassis. Thread the brass hex nut onto the selector switch, finger tight. (See Figure 15.)



AM2-4

Insert the two flathead machine screws (H-MS-440 x 7/16F) thru the pair of holes in the front panel and screw them firmly into the spring clip fasteners. Tighten the hex nut on the switch firmly being careful not to scratch the panel. (See Figure 15.)



AM2-5

Assemble the small knob on the Selector Switch shaft with the set screw towards the "flat" on the shaft. Tighten the set screw with the small screwdriver.



AM2-6

Install the Pilot Light in the socket above the tuning dial shaft.



AM2-7

Turn the tuning shaft of the Z-FM-4 (front end) full counterclockwise. Assemble the small headless set screw (H-SS-832 x 3/16) to the plastic tuning dial. Mount the dial on the tun-

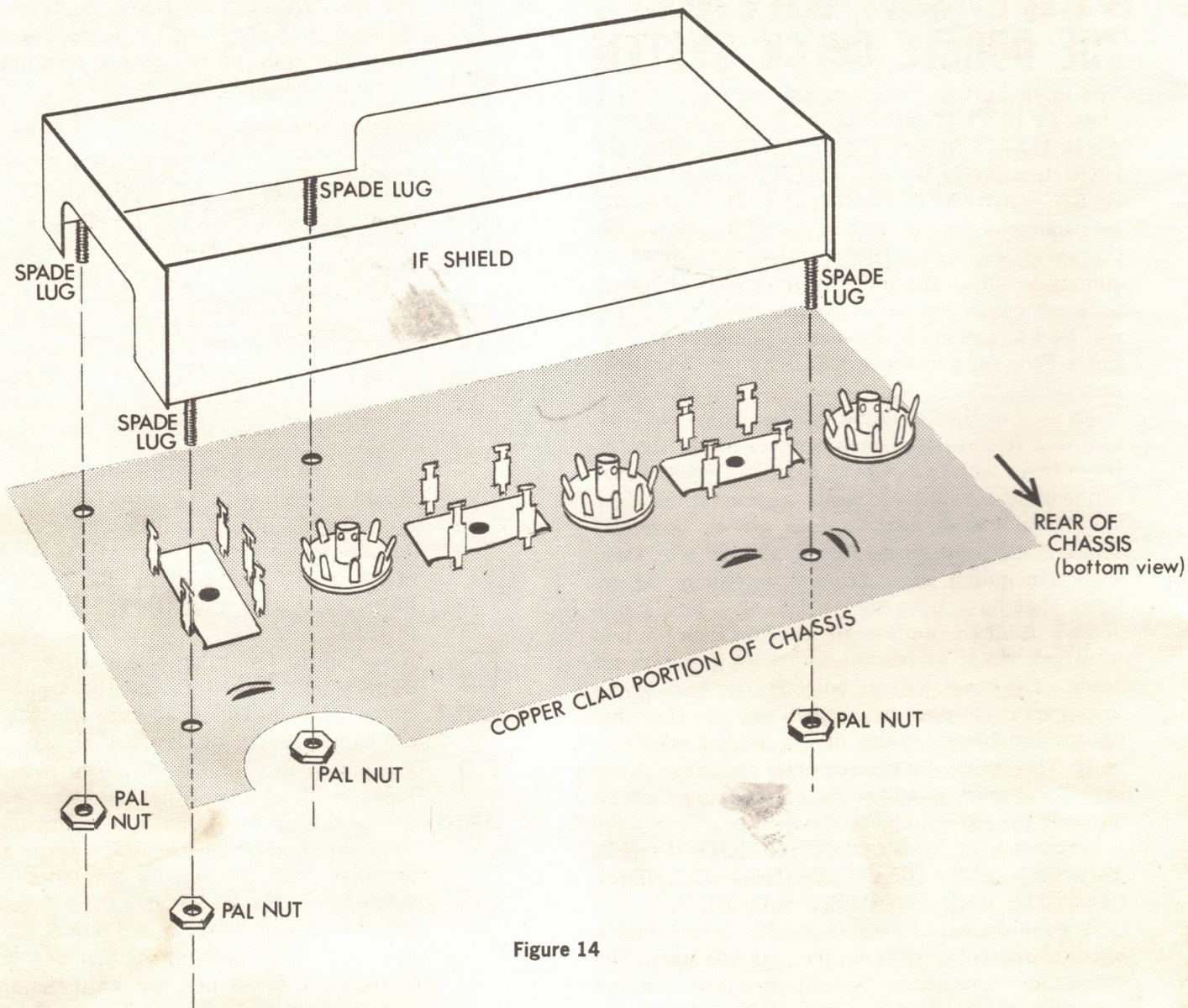


Figure 14

ing shaft so that the logging scale (the part with the numbers running 10 to 90) is exactly in the upper half. The front surface of the dial should be just slightly to the rear of the front tip of the outer brass dial shaft. Be sure that the dial does not scratch against the panel or pilot light. Tighten the set screw (do not over-tighten), and rotate the dial a few times to make sure that it is not rubbing against the panel or pilot light. If it is, loosen the set screw and pull the dial slightly away from the panel. Place the large brown dial knob on the shaft as close to the dial as it will go without undue forcing. Position the knob with the set screw opening on top and tighten the set screw.

- AM2-8 Position the Indicator tube (EM-87/6HU6) so that the white screen completely fills the Tuning Indicator window. Fine adjustment of the indicator will be made later on.
- AM2-9 Mount the large metal control shield (E-CS-17) as shown in (Figure 15), using four H-SMS-6X1¼ HW sheet metal screws.
- AM2-10 Insert the tubes into the proper tube sockets. The tubes are clearly marked and the chassis has the tube numbers identified as to location.
- AM2-11 Install the 3 tube shields on tubes V1, V2, and V3.

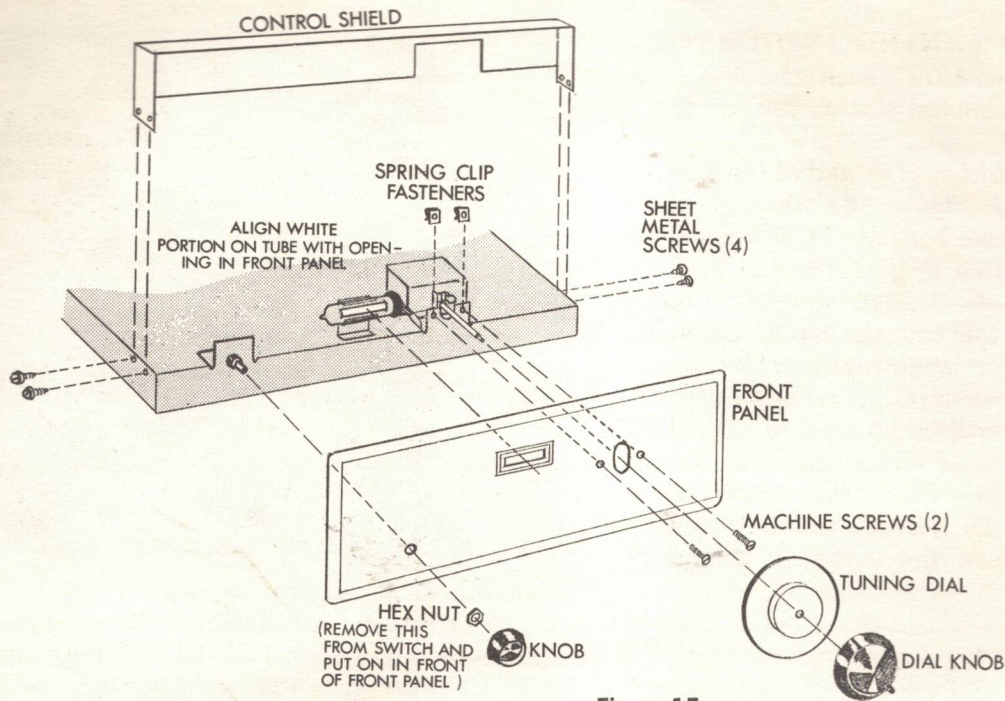


Figure 15

## ALIGNING THE TUNER

THE ADJUSTMENTS IN THE FOLLOWING PROCEDURE CONSTITUTE THE HEART OF THE TUNER'S OPERATION. FAILURE TO FOLLOW THE DIRECTIONS PRECISELY WILL RESULT IN POOR OPERATION OF THE UNIT. WORK SLOWLY AND CAREFULLY. READ EACH STEP THROUGH COMPLETELY BEFORE ACCOMPLISHING IT. BEFORE PROCEEDING, FAMILIARIZE YOURSELF WITH THE NAMES AND LOCATION OF ALL CONTROLS AND ADJUSTMENT POINTS ON THE TUNER.

- 1  Connect the dipole antenna to the antenna terminals on the rear of the tuner. Connect one of the leads to the G terminal and the other to the 300 ohm terminal. (See Figure 16). After the antenna has been screwed on securely, spread the antenna out on the table to its full "T" shape, or tape it on the wall. Make sure that no bare part of the antenna wire touches the chassis of the tuner.
- 2  Connect one of the shielded audio cables from the Left Channel output on the rear of the tuner to the Left Channel tuner input of the amplifier. Connect a loudspeaker to the Left Channel speaker terminals on the amplifier and make sure that all the amplifier controls are set prop-

erly for *STEREO* operation. (Refer to the Amplifier Instruction Manual). For the moment, leave the amplifier turned off.

- 3  Make sure that the tuner is turned off (the *SELECTOR* knob should be in the *OFF* position). Insert the tuner line cord into an A.C. wall outlet (**do not use D.C.**).
- 4  Turn the tuner on its side, as shown in (Figure 17). Turn the *SELECTOR* switch to the *Mono* position. This automatically turns the tuner on. Watch carefully for any signs of overheating or smoke, either under the chassis or on top. All the tubes and the Pilot bulb should light up normally and not show evidence of unnatural bright glowing. At the first sign of difficulty, turn off the tuner immediately. Refer to the section on "In Case of Difficulty". If everything seems to be in good order, turn the tuner off and install the bottom cover. Do not yet put in the screws, but align the cover so that the holes in it line up with the holes in T1, T2, T3 and T4. Turn the tuner back on by again positioning the *SELECTOR* switch to the *Mono* position. Now turn on the amplifier and set its volume control to approximately  $\frac{1}{2}$  volume.
- 5  a) Turn the *SEPARATION* control  $\frac{1}{2}$  turn ( $180^\circ$ ), starting from its extreme counter-clockwise stop.

- b) Slide the TUNING INDICATOR SWITCH to the A.G.C. position.
- c) Tune to the loudest station you can find on the dial.
- d) Insert the slotted (IF) end of the alignment tool (See Figure 18), through the bottom cover hole beneath T3 and engage it into the bottom slug of T3. Adjust the slug for loudest, clearest volume. Insert the alignment tool into the top of T3, and again adjust for loudest, clearest volume. Repeat this procedure, in the same order, for T2. There will be no need to turn the slugs through their entire travel as there is only one place where the volume will appear to be the loudest. As the volume gets louder, turn the amplifier loudness control down.

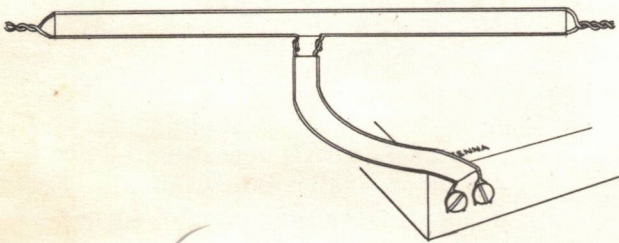


Figure 16

- 6
  - a) Observing the tuning eye (on the front panel), carefully retune the station for *maximum closure* of the green portions (where green "arms" come closest together).
  - b) Readjust T3 and T2 for maximum closure of the tuning eye in the same sequence as above. Repeat this procedure for T1. If the green portions of the tuning eye start to overlap, adjust for maximum overlap or retune the tuner to a weaker station, where no overlap occurs.
- 7
  - a) Slide the TUNING INDICATOR switch to the *Detector* position.
  - b) Tune to the *weakest* station you can find where you hear mostly FM hiss and very little music (or speech). Remove the antenna, if necessary, for this adjustment. Be sure to tune for maximum tuning eye closure.

HEXAGONAL  
END FOR  
DETECTOR  
TRANSFORMER

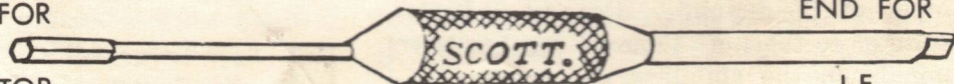


Figure 18

SLOTTED  
END FOR  
I.F.  
TRANSFORMER

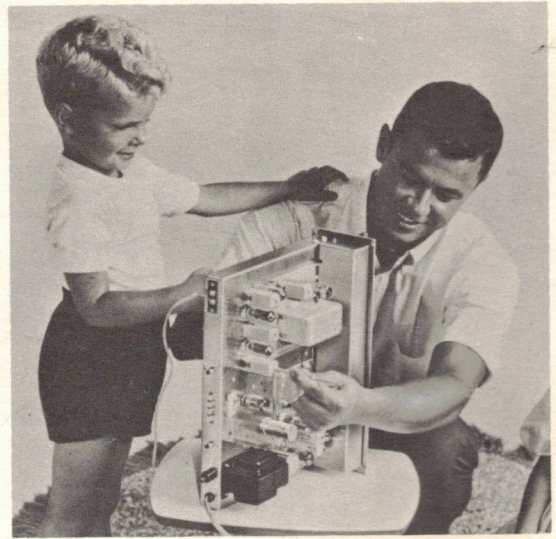


Figure 17

- c) Insert the hexagonal (Detector) end of the alignment tool (See Figure 18 and study Figure 19) down through the top of T4, and engage the bottom slug. THIS PROCEDURE IS EXTREMELY DELICATE AND MUST BE DONE WITH CAUTION AND VERY SLOWLY, AS NOT ONLY DAMAGE TO THE CAN MAY RESULT, BUT MISALIGNMENT OF BOTH THE TOP AND BOTTOM SLUGS COULD RESULT. Adjust the bottom slug for maximum tuning eye closure. Now engage the top slug of T4 and adjust for maximum tuning eye closure. If the station starts to come in stronger, retune to a weaker station and re-adjust T4 for maximum tuning eye closure.
  - d) Being carefully tuned for maximum tuning eye closure, use the slotted end of the alignment tool and adjust T3, bottom and then top, for maximum tuning eye closure. Repeat this procedure for T2 and then T1. Repeat steps 7c and 7d until no further improvement is seen on the tuning eye.
- This concludes the IF and Detector alignment. Before proceeding with the multiplex alignment, reconnect the antenna, slide the TUNING INDICATOR switch to the A.G.C. position and tune to several local stations. They should sound clear and un-

distorted, and the tuning eye should come close together on strong stations. If not, steps 5 through 7 must be repeated before proceeding to step 8.

Be certain that the amplifier is set up for *stereo* operation, even though only one channel is in use. (See Amplifier Instruction Book).

**CAUTION: L502 IS FACTORY ALIGNED — DO NOT ADJUST IT.**

**8**

a) Turn the PILOT LEVEL control to its maximum *clockwise* position.

b) Tune in, very carefully, the strongest, known *stereo* station (consult the local FM broadcast listing in your newspaper). Turn the SELECTOR switch to the *Stereo* position. A tone or whistle will be heard in the *background* of the music or speech. If it is not certain that the tone or whistle is heard, insert the Hex. end of the alignment tool into the top T502 and rotate it a turn or two — the change in tone will be easily distinguishable. If the tone is *not* heard, the station is not broadcasting stereo, and retuning to a stereo station must be done.

c) Insert the Hex. end of the alignment tool into the top of T502 and turn slowly until the background whistle changes to its *lowest* tone — at this lowest point, the tone will become inaudible. (At this point, the slug inside T502 should be at about the middle of the can). When this point is reached, carefully remove the alignment tool and turn the SELECTOR switch to the *Monitor* position. A steady tone should be heard (very similar to the CONELRAD Civil Defense test tone). If not, repeat step 8c.

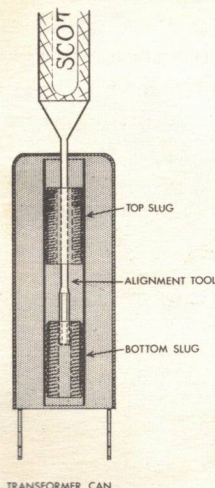


Figure 19

**9**



a) With the SELECTOR switch in the *Monitor* position, insert the Hex. end of the alignment tool into the top of L501 (Caution: Do not adjust L502), and adjust for maximum loudness of the steady tone.

b) Now insert the alignment tool through the top of T501 and engage the bottom slug (See Figure 19), and adjust for maximum loudness of the tone. Engage the top slug of T501 and again adjust for maximum loudness of the tone.

c) Repeat adjustments of L501 and T501 until maximum loudness is obtained.

**10**



a) Slide the TUNING INDICATOR switch to the *Pilot* position.

b) Turn the SELECTOR switch to *Stereo*.

c) Adjust the PILOT LEVEL control until only a hairline separation appears between the green arms of the tuning eye.

d) Now readjust L501 and T501 (bottom and top) for maximum closure of the tuning eye. If the tuning eye overlaps while adjusting, turn the Pilot Level control more to maintain the hairline separation between the green arms.

e) Repeat the adjustments of L501 and T501 until no further improvement is seen.

**11**



a) Insert the Hex. end of the alignment tool into the *TOP* of T501 and turn the tool  $\frac{1}{2}$  turn ( $180^\circ$ ) *counterclockwise*.

b) Now insert the Hex. end of the tool into the *TOP* of T4, and adjust for maximum closure of the tuning eye (this will be a very slight adjustment). Do *not* repeat this step — do only once.

**12**



Closely observe the tuning eye and adjust the Pilot Level control for an opening of approximately  $\frac{1}{16}$ " between the green arms. (See Figure 20).

**13**



a) Slide the TUNING INDICATOR switch to the *A.G.C.* position — its normal operating position.

b) Turn the SELECTOR switch to *Monitor*.

c) Tune completely off station (maximum opening of the tuning eye). Turn up the Bass control on the amplifier until you hear a low-pitched hum in the speaker. Adjust the LT-111 Hum Adj. control for the lowest hum level.

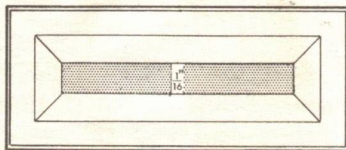


Figure 20

d) Turn the SELECTOR switch back to the *Mono* or *Stereo* position.

14



This completes alignment of the tuner.

**CAUTION** — Do not adjust or turn any of the adjustments further. Tune through the entire tuning band and listen keenly to several clear stations, both in *Mono* and *Stereo*. If any distortion is heard, or if maximum tuning indication does not correspond to the loudest, clearest music (or speech), or if stereo stations are garbled, complete realignment of the tuner will be necessary.

## FINAL ASSEMBLY, AM 3

Mount the bottom cover by sliding the two clips under the lip of the chassis towards the front of the tuner. Screw two H-SMS-6 x 1/4 HW sheet metal screws into the two inner holes on the bottom rear of the chassis.

If the tuner is not going to be used in one of the regular Scott metal or wooden cases, you will want to install the plastic feet now. These will be found in one of the small envelopes. Mount the four plastic feet with the four sheet metal screws provided.

If the tuner is to be custom mounted in a cabinet, instructions for doing this are on the mounting template provided.

## CONGRATULATIONS!

Now . . . sign your personal label "This kit was built by \_\_\_\_\_" . . . turn your tuner on . . . relax . . . and listen to one of the finest FM tuners ever made. For complete enjoyment of your tuner you will want to read the actual Operating Instructions.

## IN CASE OF DIFFICULTY

No matter how careful you are, a mistake is possible. Don't panic! First, make sure each tube is in the proper location. Then go back to the assembly notes and check off each step with the written instructions and the pictorials. Or if possible, have someone else do this for you. Often a fresh approach may disclose mistakes that you might be consistently overlooking. While checking for errors, carefully probe each and every wire, lead, component, and part to make sure there are no short circuits and poor solder joints.

In case the fuse has blown (the unit will not light up) it is very likely that there is a short circuit. Before replacing the fuse (instructions for this will be found in the service notes enclosed) search for the cause.

In case the unit lights up but does not operate properly, voltage readings are supplied on the schematic. If you can obtain a good vacuum tube voltmeter (VTVM) use the voltage readings for locating the portion of the circuit that is malfunctioning.

If none of the above suggestions help in curing the problem, you should write to our Laboratory Kit Service Dept. for prompt assistance. There is no charge for this help. The engineers in this department are thoroughly familiar with all aspects of the kit, and can probably localize the cause of your difficulty. However, you must be very explicit in describing your problem. Mention all the approaches you have undertaken to cure it. Describe all the symptoms and signs that may be involved. With complete information supplied, the possibilities of a cure through the mail are greatly increased.

**MODEL LT 111 FM STEREO TUNER**

**H. H. SCOTT**

**FULL  
COLOR**

**INSTRUCTION BOOK**

