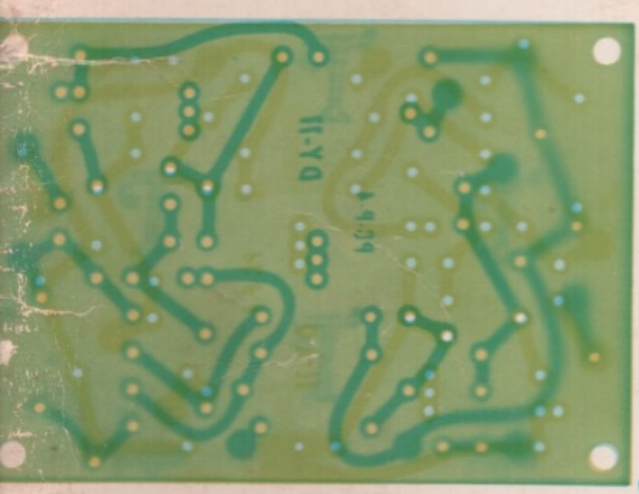
SCOTT SOLID-STATE
STEREO AMPLIFIER

LK-60

FULL COLOR
CONSTRUCTION BOOK



D—LK—60—2

HERMON SCOTT, *Audio Pioneer*

"Hermon Hosmer Scott is a soft-spoken man, with a down-East accent to which he is entitled. . . . We have been gratefully aware of him since 1947. He is the man who took the grit out of Grieg and the scratch out of Scriabin by inventing the Dynaural Noise Suppressor. . . . Scott has received many engineering citations, some for truly basic work in electronic measurement . . . yet he is honored and heeded most by his friends on the grounds of ethics and esthetics. This . . . is reflected in the clear reliability of his products. Scott . . . is terribly irritated by imperfections of any kind. He does not see why an amplifier or a tone arm should be ugly any more than a cello is. To this we owe a revolution since it was Scott who in 1953 gave us the Model 99 amplifier which did not need to be hidden. . . . Everyone now follows this precedent, but it was Scott who established it, and the Scott musical gear still looks best of any."

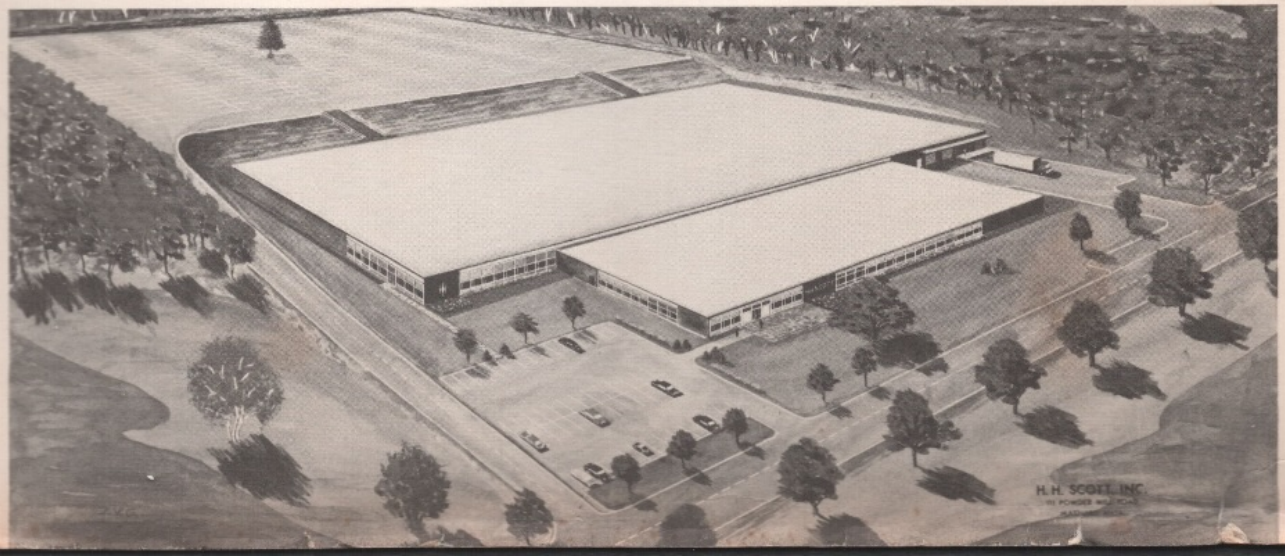
JOHN M. CONLY, *Atlantic Monthly*

Hermon Hosmer Scott received B.S. and M.S. degrees from M.I.T. Inventor of the RC Oscillator, RC tuned circuits and filters, the Dynaural Noise Suppressor and other devices, he has many U.S. and foreign patents. His technical leadership was recognized by election to Fellow in the Institute of Electrical and Electronic Engineers, Acoustical Society of America, and Audio Engineering Society, and by numerous awards, including the Potts Medal. He is the author of many technical papers and articles.

IMPORTANT FIRSTS . . . by H. H. Scott

- First high fidelity AM/FM tuner using wide band AM design.
- First successfully to use wide-band circuitry in high fidelity FM tuners.
- First integrated high fidelity amplifier.
- First to market an FM multiplex stereo tuner and adaptor employing the FCC-approved transmission system.
- First low, flat high fidelity amplifier.
- First usable multiplex output on tuner.
- First stereo balancing circuitry.
- First dynaural interstation noise suppressor.
- First wide-range consoles without acoustic feedback.
- First silicon transistor IF tuner.
- First Professional-quality transistor kits.
- First Solid State relay-less automatic mono-stereo switching that is free from false indication from noise between stations.

The H. H. Scott plant in Maynard, Massachusetts



Scott LT-112 Solid State FM MPX Tuner Kit

A superb companion piece to your recently completed LK-60 Solid State Stereo Amplifier Kit is the LT-112 Solid State FM MPX Tuner Kit.

This outstanding Kit comes supplied with four prewired, pretested subassemblies, assuring you of outstanding performance from the minute you turn the tuner on.

Here are some of the comments by leading testing laboratories on the factory-wired 312 from which the LT-112 was developed:

It is one of the finest tuners Scott makes. And that means it is one of the finest tuners anywhere.

The limiters must be quite unusual judging by the extremely effective performance they provide.

—AUDIO, July 1964

As a fringe-area tuner, the 312 did magnificently. Not only is it as sensitive as any tuner I've come across, but its limiting curve is such that full limiting seems to take place with signals just a hair above the minimum strength needed for marginal quieting.

An undeniably "hot" tuner that will pull in distant FM stations with ease.

In places where stations were crowded closely on the dial, the Scott's excellent selectivity kept them neatly apart with hardly a trace of audible interference.

To sum up, the Scott 312 has remarkable sensitivity, good stereo separation, and excellent overall audio quality. It can be recommended particularly to fringe-area dwellers who don't want to spend a year's income or thereabouts on other tuners of comparable capability.—*John Milder*

—RADIO-ELECTRONICS, March 1965

The 312 has excellent tuning feel; and last, but not least, the sound quality of the 312 is, to our ears, the best Scott has ever produced. Altogether, a product to be proud of.

The front face of the Scott 312 shows the distinctive new styling which was introduced just last year in Scott tuners. This includes a large and easy-to-read slide rule dial; a tuning meter just to the left of it; a large knob to the right for tuning; and two small knobs for function and mode selection. The function selector permits choice of OFF, NORMAL, SUB-CHANNEL FILTER, and STEREO NOISE FILTER positions. The other knob permits selection of mono or automatic stereo operation. A stereo indicator light is located just below the center of the slide rule dial, and just to the right of the indicator light is a jack which permits tape recording from the front panel. To this latter we say HEAR! HEAR!—finally. We've often wondered why somebody hasn't made life easier for the tape recordist.

—AUDIO, July 1964

In addition to the previously mentioned controls, a 3-position meter switch allows the meter to be used either for alignment, signal strength, or as a highly sensitive zero center tuning meter.

The Scott LK-60 Solid State
Stereo Amplifier Kit

Your new Scottkit represents an exceptional achievement. It was developed by the same engineering team responsible for revolutionizing the hifi component industry through the introduction of new concepts in circuitry, design and styling. It is the culmination of years of research and planning. When you have completed your Scottkit, you can be sure it is the equal of superb H. H. Scott factory-wired components. The quality of your finished kit is assured because: The same conservatively rated, factory-tested parts are specified for Scottkits as for Scott factory-wired components. Kits utilize time-tested Scott circuitry, redesigned to assure perfect performance after just a few hours of instructive work at home.

The Scott full-size, full-color instruction book is designed to make kit-building fool-proof. You can automatically correct any errors you may make.

Before a new Scottkit is marketed, it is completely pretested.

1. Instruction book drafts are hand colored for an evaluation run by many statistically selected consumers. This consumer panel consists of doctors, businessmen, office and factory workers, housewives, engineers, students . . . many of whom have never built a kit before. Each builder notes any suggested changes in the instruction book draft, and returns the draft with the completed kit to the Scott Engineering Department.

2. Each of the completed kits is carefully tested and evaluated. Typical figures from the *consumer*-built units are used for determining specifications.

3. All instruction book drafts are thoroughly examined for notes by the consumer panel, and worthwhile changes are included in the finished book.

This careful evaluation and testing means your Scottkit will be easy to build and give you many years of trouble-free service. Relax . . . have fun . . . you are about to build a superb piece of high fidelity equipment.

Table of Contents

Technical Specifications for the LK-60

Tape Output	
Rated Voltage Output to Tape Recorder	0.5 v
Minimum Recommended Load Resistance	200K ohms
Preamplifier	
Inputs	
Tape Head – Input Impedance	47K ohms
Signal for Rated Output	2 mv
S/N Ratio	52 db
Phono – Input Impedance (All Switch Positions)	47K ohms
Signal for Rated Output (Adjustable By Switch)	3, 5, 9 mv
S/N Ratio	55 db
High Level Inputs – Input Impedance	50K ohms
Signal for Rated Output	.5 v
S/N Ratio	75 db
Frequency Response in Flat Position	20–20 KC ± 1.0 db
Treble Controls Measured at 10,000 cps, Boost and Cut	10 db ± 2 db
Bass Controls Measured at 30 cps, Boost and Cut	12 db ± 2 db
Scratch Filter	–4 db/octave: –3 db @ 5K cps
Rumble Filter	–10 db @ 50 cps ± 2 db
Loudness Compensation (maximum)	+9 db @ 50 cps
Loudness Compensation	+2.5 db @ 10K cps
Amplifiers	
*Music Power (IHF)	40 w each channel
*Steady State (rms)	30 w each channel
Total Harmonic Distortion	0.8%
Frequency Response	20–20,000 cps ± 1 db
Power band width at rated distortion (IHF Method)	20–20,000 cps
Damping Factor	20
Range of Line Voltage and Frequency	105–120 v, 50–60 cps
Power Consumption – 117 v at 60 cps (stand-by)	25 w

*Specification for 8 ohm load.

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HiFi Dictionary

AC, ac (alternating current): an electric current which alternates between a maximum in one direction (+) and a maximum in the other (−), passing through zero in between. The complete reversal and return to the starting value is called one cycle. Also applied to an alternating voltage, thus: "a c voltage." The number of cycles in one second is the frequency, in cycles per second, abbreviated "cps." See sine wave.

acoustics (architectural): those characteristics of a concert hall or room which modify the sound produced by a source and affect the quality of the sound reaching one's ears.

AF (audio frequency): a frequency between 20 and 20,000 cycles per second.

AGC (automatic gain control): a circuit that provides a relatively constant signal level output regardless of the variations in input level.

alignment: adjusting the values of the components of a tuner (such as capacitors, inductors) for optimum performance.

AM (amplitude modulation): the method of transmission in which a signal of constant frequency (the carrier) is varied in amplitude in accordance with the signal (voice or music).

ampere: the practical unit of electric current. One ampere is produced by one volt acting across a resistance of one ohm.

amplifier: a device that increases the strength of electrical signals.

amplitude: a measure of the strength of a wave.

attenuation: reduction in amplitude of a wave. Attenuating a sound reduces its intensity.

balance: to make equal in strength, or symmetrical with respect to a reference point.

bias: a d c voltage in the input circuit of tube, transistor, or diode that determines the d c current through the device.

cable: a bundle of insulated wires. Also, one or more wires within a sheath.

capacitor (condenser): a device that is capable of storing electrical charge, consisting of two conductive surfaces separated by an insulating material – the di-electric. A capacitor blocks direct current but passes alternating current. The value of a capacitor is called its capacitance; it is expressed in decimal parts of a farad. See "Frequently Used Prefixes."

class A amplifier: a vacuum tube or transistor amplifier stage in which the bias value is chosen for plate or collector current flow throughout a full cycle of the signal. The average current flow with no signal applied is equal to the current flow with signal. This type of amplifier is normally used in preamplifier stages. As a power stage, its efficiency is low.

class B amplifier: an amplifier stage consisting of two tubes or two transistors in which the bias value is chosen for approximately zero plate or collector current when no signal is applied. Current flows during approximately half of the cycle in each device. The average current greatly increases with signal. This type of amplifier is normally used in power output stages; its efficiency is high.

coaxial cable: a cable with one (or more) insulated conductors completely surrounded by a cylindrical shield (see Cable). The shield reduces pickup of hum and noise.

converter: the section of a tuner that converts the incoming RF signal to a signal of fixed lower frequency, known as the intermediate frequency (abbreviated IF). Includes the oscillator and the converter device itself.

continuous power output, rms: the maximum power output capability of an amplifier over an extended period of time without exceeding rated distortion rather than on a short burst, as in music power. The standard test frequency is 1000 cps.

carrrier frequency: the frequency of the original unmodulated radio wave produced by a radio station.

capture ratio: a measure of the ability of an FM tuner to suppress the weaker of two signals of identical frequency, permitting the stronger signal alone to be heard.

cross-modulation: interference of one station by another stronger station, resulting from the interaction of their signals within the tuner. The ability of the tuner's front end to handle weak and strong signals. Expressed in dB, a higher number is usually more desirable.

crossover distortion: in a Class B push-pull amplifier, one output transistor (or tube) produces the positive part of the signal, and the other transistor the negative half. Crossover distortion occurs when the transfer from one transistor to the other does not take place smoothly. This form of distortion is particularly important because of its effect at low listening levels.

current: the movement of electrons through a conductor (see ampere).

cycle: (see AC).

damping: the ability of the amplifier to maintain control over the speaker. High damping assists a speaker in cleanly reproducing transients.

dB, db (decibel): a unit of measurement for the power gain or loss in signal strength, expressed in logarithmic form. Specifically, dB gain or loss $= \log_{10} \frac{\text{power output}}{\text{power input}}$

In terms of voltage or current, for a given impedance, dB gain or loss $= 20 \log_{10} \frac{\text{voltage or current output}}{\text{voltage or current input}}$.

dc, DC (direct current): a current that flows continuously in one direction.

de-emphasis: (see equalization).

detector: the section of a tuner that converts the modulated carrier to an audio output.

diode: device that conducts electricity in one direction only.

distortion: any unwanted change in the waveform of a signal.

efficiency: the ratio of the output power of a device to its input power, usually expressed in per cent.

equalization: modification of the frequency response of a device in a desired manner to achieve a specific result, such as reduction of background noise.

feedback: involves feeding a small part of the output of an amplifier back to the input. If the signal is fed back so as to cause a reduction in gain, it is called negative feedback. It provides a reduction in distortion.

filter: a circuit designed to pass certain ranges of frequency while restricting the passage of others.

flutter: rapid fluctuations in speed caused by mechanical deficiencies in turntables or tape recorders, resulting in variations in pitch.

FM (frequency modulation): the method of transmission in which a signal of constant amplitude (the carrier) is varied in frequency in accordance with the signal (voice or music).

frequencies: (see AC).

front end: the term used to describe the section of the tuner that selects the desired station, amplifies it and converts it to the IF frequency. Includes an RF amplifier and a converter.

fuse: a protective device that disconnects the circuit when the current exceeds a certain level.

gain: increase in signal strength. Usually expressed in decibels (db).

ground: a connection, intentional or accidental, between an electric circuit and the earth or a chassis serving in place of the earth.

harmonic distortion: the unwanted generation of additional signal components that are multiples of the fundamental frequency of the signal.

hum: a low-pitched, undesired sound usually caused by improper filtering of the AC power supply, or poor shielding of the same circuit. Hum is composed of the power line frequency and its harmonics.

IF (intermediate frequency): (see converter). It is easier to build a tuned amplifier (selective) for a fixed frequency than one that is adjustable over a range of frequencies. The intermediate frequency is produced in the converter. See converter.

IM (intermodulation distortion): the generation of unwanted signals by the interaction of two or more signals of different frequencies. IM products are usually not multiples of the frequencies of the input signals; that is, not harmonically related to them.

impedance: the property of a circuit that determines the amount of flow of alternating current where a given voltage is applied. It is measured in ohms.

insulator: a part that does not conduct electricity.

insulation: non-conductive material used to prevent the flow of electricity to undesired areas.

jack: an electrical receptacle into which a plug is inserted to complete an electric circuit.

lead: a wire that connects two or more points in a circuit (pronounced "lēd").

limiter: an amplifier stage in an FM tuner that removes variations in the amplitude of the signal caused by atmospheric disturbances and man-made interference, which would otherwise cause noisy reception.

mixer: (see converter).

modulation: see AM and FM. The process of superimposing, music or voice on carrier frequency.

monophonic (sometimes known as monaural reproduction): a transmission system combining all input signals in a single channel in such a manner that all reproduced sounds seem to emanate from the same location.

multiplex (mpx): a technique whereby two independent stereo signals are transmitted by a single FM station and then separated at the receiver for stereophonic reproduction.

music power (IHF standard): maximum power output of an amplifier that can be obtained without exceeding rated distortion measured over a time interval short enough so that power supply voltages have not changed from their no-signal values. These conditions are representative of the situation that occurs when music is being reproduced. Standard test frequency is 1000 cps.

network: a combination of electrical components designed for a specific function.

nuvistor: a trade name for a sub-miniature highly dependable vacuum tube in a metal envelope.

ohm: the unit of resistance (see resistance).

oscillation: generation of an AC signal.

peak power: the maximum instantaneous power output capability of an amplifier. Twice the continuous or steady-state power.

phase: the time lag between two signals of identical frequency expressed in terms of parts of a complete cycle. Two ac signals are in phase when they reach their maximums simultaneously. They are out of phase when one signal reaches its maximum in one direction as the other signal reaches a maximum in the opposite direction.

potentiometer (abbreviated "pot"): a rotary control that introduces a variable amount of resistance into a circuit. Example: a volume or loudness control.

power: the time rate at which work is performed or energy expended. The power rating of an amplifier expresses the amount of energy it can provide per unit time, (to drive a loudspeaker). Power is expressed in watts. Watts = amperes times volts.

power bandwidth: the lowest frequency and the highest frequency for which the harmonic distortion measured at one-half rated continuous power output is equal to the rated harmonic distortion.

printed circuit: an insulating board to which a layer of copper has been laminated and then etched, leaving conducting areas and lines that take the place of conventional wires to interconnect components like resistors and capacitors mounted on the board.

regeneration: (see feedback). Regeneration denotes positive feedback.

resistance: the property of a conductor that determines the current flow resulting from the application of a given voltage. The unit of resistance is the ohm (ohms = volts ÷ amperes).

resistor: a device designed to restrict the flow of current. Resistors are made both fixed in value and adjustable (potentiometer).

RF (radio frequency): frequencies above the audible range (above 20,000 cycles). Specifically, those frequencies used to transmit radio (or TV) signals.

rumble: low-frequency noise mechanically generated in turntables and transmitted to the phono cartridge.

semi-conductor: a material, in crystalline form, used in diodes and transistors, that permits the flow of current to be controlled in degree and direction.

sensitivity: expresses the ability of an FM tuner to receive weak signals and still be able to suppress background noise. Rating is in terms of microvolts of signal required for a given number of db of quieting (suppression of noise). The IHF usable sensitivity rating takes into account hum and distortion as well as noise, which makes it a more meaningful figure. It is specified in microvolts for 30 db level difference between signal and the sum of noise, hum, and distortion.

sensitivity: in an audio amplifier, the sensitivity is a measure of the power output corresponding to a given input. It is usually expressed in inverse form by specifying the input voltage required to obtain rated power output.

separation: stereo is accomplished by the use of two separate signal channels, right and left. If combination occurs, the stereo effect is reduced. Separation is expressed in terms of the db difference between the signal in one channel and the amount that leaks into the other channel.

signal-to-noise ratio (s/n ratio): the ratio of desired program signal strength to the undesired background noise, expressed in db. The greater the s/n ratio, the less noise will be audible during quiet passages.

sine wave: a smooth curve that varies periodically with time, going to a maximum in one direction, returning to zero, going to a maximum in the other direction and then returning to zero again.

solid state: referring to the use of semi-conductors (diodes and transistors) as opposed to tubes.

spaghetti: cloth or plastic tubing designed to slide over uninsulated wire to prevent short circuits.

stability: the ability of a circuit to maintain its normal operating characteristics despite some change in operating conditions, such as temperature. It also refers to an audio amplifier's ability to operate without oscillating (producing an internally generated output signal) when loads of varying characteristics are connected, or the output circuit left open. Speakers have impedances that are not pure resistance and may act like capacitors over part of the frequency range and inductances at other frequencies.

stereophonic: program material (or the equipment designed for its use) providing reproduction in which the spatial location of the original source is conveyed to the listener through the use of separate right and left channels. Stereo provides the listener with a feeling of space and reality similar to that heard in the concert hall.

subsonic: frequencies below the normal range of human hearing (below 20 cycles).

supersonic: frequencies above the normal range of human hearing (above 15,000-20,000 cycles).

spurious response: the appearance of a station on the dial at points other than where it belongs. Expressed in dB, a higher number is usually more desirable.

terminal: a device providing convenient means for connection of a wire.

transformer: a device for changing voltage (and current) from one value to another without changing the electric energy. A power transformer changes line voltage to the values needed by the various circuits in an amplifier or tuner.

transient: a momentary, as opposed to a continuous, signal. Voice and music consist of a succession of transients — signals that change from instant to instant.

transistor: semi-conductive device in which the flow of electrons from one connection to another is controlled by varying the current or voltage applied to a third connection. Capable of amplifying a signal voltage or current, and of generating oscillations (ac).

tube: (vacuum tube) a glass or metal enclosed device in which controlled conduction occurs by means of a flow of electrons across a vacuum from one electrode (the cathode) to the other (anode). The control electrode is called a grid. Tubes are used for amplification and oscillation.

voltage: electromotive force, the equivalent of force or pressure in a mechanical system. The electromotive force required to push one ampere of current through one ohm of resistance is one volt.

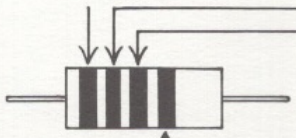
Resistor Color Code

The color bands around the body of most resistors indicate the value of the resistance. The two bands close to end of the resistor body give the first two digits of the value, the third band represents the multiplier, and the fourth band (sometimes omitted) gives the tolerance.

The size of the resistor gives an indication of the power rating (watts). A resistor rated at ½ watt has a diameter of ⅛", a one-watt resistor is ¼" in diameter, and a two watt resistor is 5/16". Precision resistors do not necessarily conform to this rating system.

COLOR CODE

Color	1st digit	2nd digit	Multiplier
black	0	0	1
brown	1	1	10
red	2	2	100
orange	3	3	1000
yellow	4	4	10,000
green	5	5	100,000
blue	6	6	1,000,000
violet	7	7	10,000,000
gray	8	8	100,000,000
white	9	9	1,000,000,000
gold			.1
silver			.01



Tolerance: Gold ± 5%
Silver ± 10%
No band ± 20%

Example:
Yellow (4)
Violet (7)
Red (100)
Gold (5%)

Resistance 47 x 100 = 4700 ohms (4.7K)
Tolerance: plus or minus 5%

FREQUENTLY USED PREFIXES IN ELECTRONICS

Symbol	Prefix	Multiplying Factor
$\mu\mu$ or mm*	micro-micro	10^{-12}
p	pico	10^{-12}
μ or m*	micro	1/1,000,000 (10^{-6})
m	milli	1/1000 (10^{-3})
K	kilo	1000 (10^{3})
M	mega	1,000,000 (10^{6})

* *For capacitors only. Example: 1 mfd = 1 microfarad.*

Section 1 — Getting Started

First, unpack the kit from the KIT-PAK® container. You should take care not to mislay any small items or packages. If you wish, you can work right inside the KIT-PAK®. 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. You will find the KIT-PAK® cover an ideal rest for the instruction book.

1.1 Tools Required

A small screwdriver is provided with the kit. In addition, you will need a pair of long nose pliers, a regular size screwdriver (3/16" wide blade), a pair of wire cutters, and a soldering iron. The soldering iron should have a rating between 35 and 55 watts and must have a small tip. It is extremely dangerous to use any iron of greater wattage as too much heat can damage the printed circuit boards. You will find a ¼" hexagonal nut driver very useful for installing sheet metal screws.

1.2 Basic Electrical Assembly Procedure

Each switch, terminal strip, printed circuit board, etc., has a code number (S1, T1, PC1). Every pin or terminal on these parts and sub-assemblies is also numbered (Pin 1, Pin 2, etc.). For example, the instructions may call for a wire or component to be connected to S5-3. This means that you are to connect a wire to Pin 3 of S5. Another example: P1-2 means Pin 2 of P1.

There is a specific pictorial diagram which shows the actual connections in full color for each group of step-by-step instructions. Using the color pictorials and occasionally referring to the top and bottom view photographs (Section 1.8), will enable you to easily construct a kit equal to a factory-wired unit.

The parts and wires to be used are packed in transparent envelopes. For each wiring group of instructions, open the specified envelope and spread the contents out on your work table. The envelope number which appears in the wiring instructions will also appear on a card inside the transparent envelope. As the step-by-step instructions are followed, you will gradually use all the parts and wires in the transparent envelopes. Parts for more than one series of steps will sometimes be included in a single transparent envelope.

As each step is completed, place a check beside the step number so that you will not lose your place if you are interrupted.

The many wires used in the kit are of the proper length and have been stripped back. If, for example, a 10" black wire is called for, select the black wires from the transparent envelope and with the ruler located on the inside cover of the kit box, select the correct 10" wire. This is important, for if you use the wrong wire you may find that later on in the course of construction a wire will be too short.

1.3 Soldering And Wiring Instructions

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

Soldering Instructions:

a. Before using the soldering iron, the tip must be tinned as follows: First heat up the iron. When the tip is hot, wipe it gently with a cloth till bright and shiny and apply a generous amount of solder. Remove any excess solder with the cloth. Repeat the process for all sides of the tip.

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

c. The wires should be mechanically secure before soldering. Make a single turn around the contact and then pinch the wire tightly with the long nose pliers. If the wire is too large to be bent, position the wire so that a good solder connection can still be made by holding the wire against the terminal when soldering.

d. Wires on resistors, capacitors, and similar components are generally longer than required to make the indicated connections; cut off this excess wire while adding the part to the chassis. The wires should be long enough to reach their destination, allowing a little left over (approximately ¼") to make a good mechanical joint.

e. Place a flat side of the soldering iron tip against the joint to be soldered until it is heated.

f. Hold the end of the solder against the junction

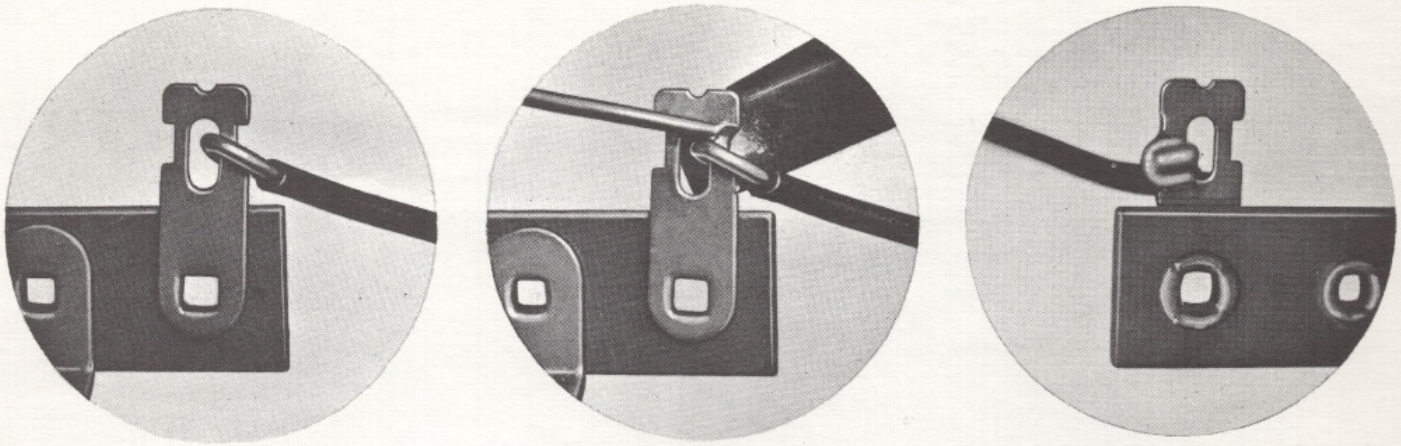


FIGURE A HOW TO SOLDER

of the tip of the iron and the terminal. This solder will immediately melt and quickly transfer more heat to the terminal, allowing the solder to flow around the joint. At this instant the joint must be hot enough to melt the solder by itself without the aid of the iron. Use only enough solder to flow smoothly over the joint.

g. As soon as the joint is covered with solder, remove the solder and then a second later, the iron. Do not allow the wire to move until the joint has hardened (about 5 seconds). A good solder joint is bright and shiny. After the solder hardens, check the joint for rigidity. If it is not firm and tight, reheat the joint and permit the solder already present to flow again. Usually a little more solder will have to be added.

h. When soldering diodes, it is advisable to use no more heat than necessary. Excessive heat can damage these components. Use a paper clip or an alligator clip as a heat absorber (sink) to protect the diodes.

i. The printed circuit boards may be supplied with either turret terminals (pins), bifurcated terminal-eyelets (a hollow slotted pin), or eyelets (metal-rimmed holes).

The procedure for soldering to the turret terminals is the same as given above in "c."

There are two methods for soldering to the bifurcated terminal-eyelets; the method used is dependent upon the side of the printed circuit board to which the wire is to be attached. If the wire is to be attached to the side of the board on which the components are located, the soldering is accomplished in the same manner as outlined above in this section. Mechanically attaching the wire to the bifurcated terminal-eyelet may be done by either wrapping the wire around the pin (as given above) or by dropping the wire in the slot and pinching the sides of the pin together. If the wire is to be attached to the etched side of the board (opposite side from the parts), then the wire is soldered into the hole of the bifurcated terminal-eyelet by the same method illustrated in the following paragraph for eyelets (tack soldering).

"Tack soldering" is somewhat different from the normal soldering procedure. It essentially consists of soldering a wire without mechanically attaching it first. The wire is held in place while soldering and the solder itself is used as both a mechanical and electrical connection. The procedure for "tack soldering" to eyelets is as follows:

1. The bare end of the wire going to the eyelet must be tinned by heating the end of the wire with the soldering iron and coating the wire with solder.
2. The soldering iron itself is tinned by placing a small amount of solder on the tip. It is not necessary for a big "glob" of solder to be left on the soldering iron. However, the iron should not be wiped completely clean.
3. Place the wire on the hole and apply the point of the soldering iron to the edge of the eyelet until the solder flows freely; push the wire in, then immediately remove the iron and hold the wire until the solder has hardened.

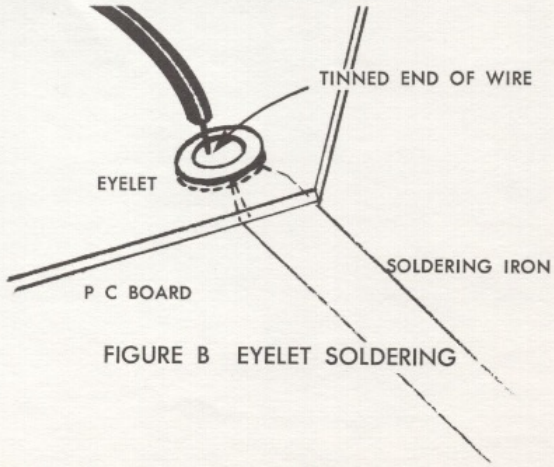


FIGURE B EYELET SOLDERING

j. In some cases additional wires have to be attached to some terminals that have been previously soldered. To do this, connect the wire to the terminal with a good mechanical joint, then heat the connection so that the solder already on that terminal will melt and hold the new wire. If you doubt the security of the connection, add a little more solder. Additional connections to eyelets and bifurcated terminal-eyelets are made in the same manner.

k. Keep the soldering iron clean and bright by an occasional gentle wipe with a cloth. 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. Some of the most common errors to avoid are insufficient solder to flow to the very bottom of large joints and not positioning the wires far enough away from each other to prevent shorts.

Be sure to place the wires or components in the same position as shown in the pictorial. Be as neat as possible: this will greatly cut down on mistakes, shorts and other difficulties. Neatness will also make it easier to check your wiring.

Wiring Instructions:

The symbol **(S)** after any connection, means that this connection and all other wires on the same pin should be soldered. A number will appear after the **(S)**. 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 T6-2 **(S3)**." The soldering number **(S3)** will always be in bold parenthesis so it can be found quickly. It indicates that there should be 3 wires or leads (including the orange one in this case) connected to Pin 2 of T6 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 point before it can be soldered. Frequently, one end of a wire 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 for assembling the kit have been arranged in a logical order to insure perfect results. Follow them exactly, checking off each step as completed.

1.4 Types of Wire

Regular hook-up wire: these are the standard insulated wires that you will be using most of the time. They will be found in transparent envelopes for the different portions of the assembly procedure. Buss wire is a term used to describe short pieces of uninsulated wire. A length of buss wire will be found in one of the transparent envelopes for the first steps.

Spaghetti: a hollow plastic insulating tubing. This tubing is slipped over bare wires to provide insulation.

Stranded wire: Wire composed of many small strands. When using stranded wire be careful to prevent a single strand from separating and accidentally shorting with an adjacent pin or terminal. To insure that this will not happen, carefully twist the strands starting from the insulation and work towards the end. When the strands are twisted tightly as shown in the illustration, check once again to be sure that no strands have separated.

Cable (ESS:) Hollow tubing with a black or white outer insulation and a spiral metal shield inside.

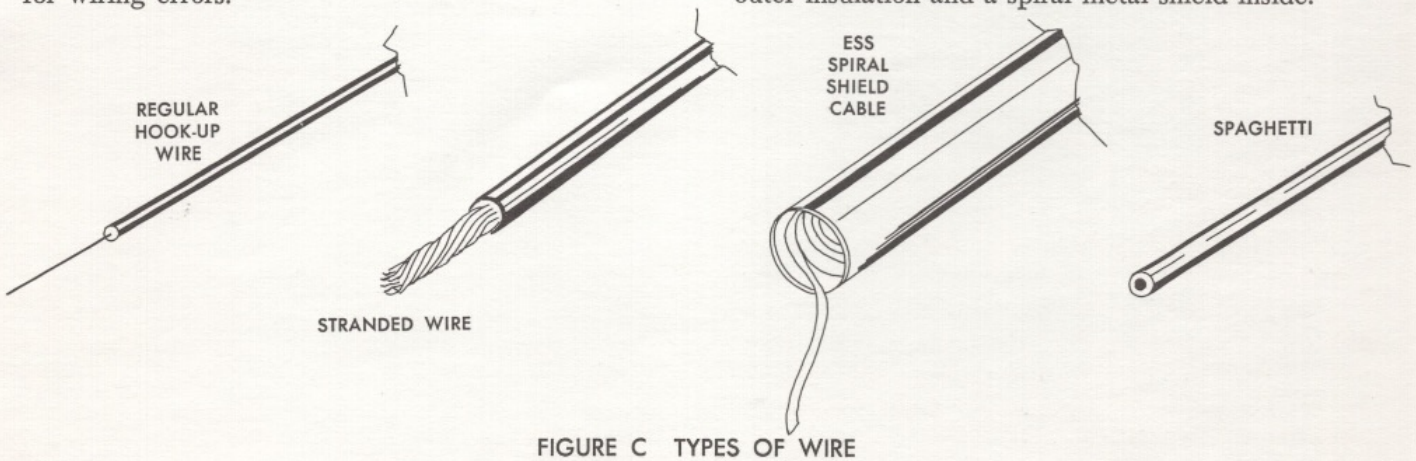


FIGURE C TYPES OF WIRE

VERY IMPORTANT

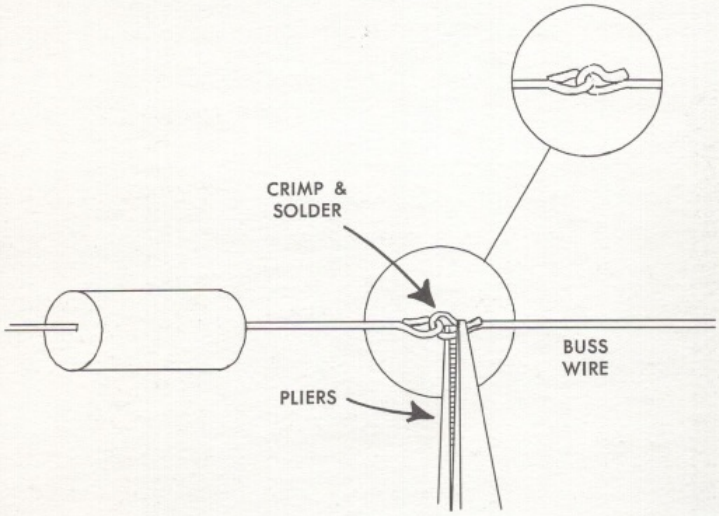


FIGURE D HOW TO SPLICE

1.5 What To Do If You Make A Mistake

No matter how careful you are, it is still possible that you may break something accidentally or cut a wire too short. If you work when tired or try to do too much too fast, the possibility of mishap increases greatly. Fortunately, it is easy to correct most errors.

a. Cutting a wire 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 buss wire and splicing it on as shown.

b. If a wire supplied is damaged: cut off a replacement from one of the four-foot pieces provided.

c. Breaking a terminal strip: the terminal strips are quite sturdy and will withstand a great deal of handling. If you are unlucky enough to break a terminal, make all connections to the small hole below the 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, as the wires themselves will keep the broken piece in place.

d. In the unlikely circumstance that the entire terminal strip breaks off, 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 binder head 6/32 x ¼ machine screw, lockwasher and nut.

1.6 The Double Check System

After finishing each sub-assembly, you will be referred to a DOUBLE CHECK SHEET to check over your work. This DOUBLE CHECK SHEET is most important in assuring error-free construction.

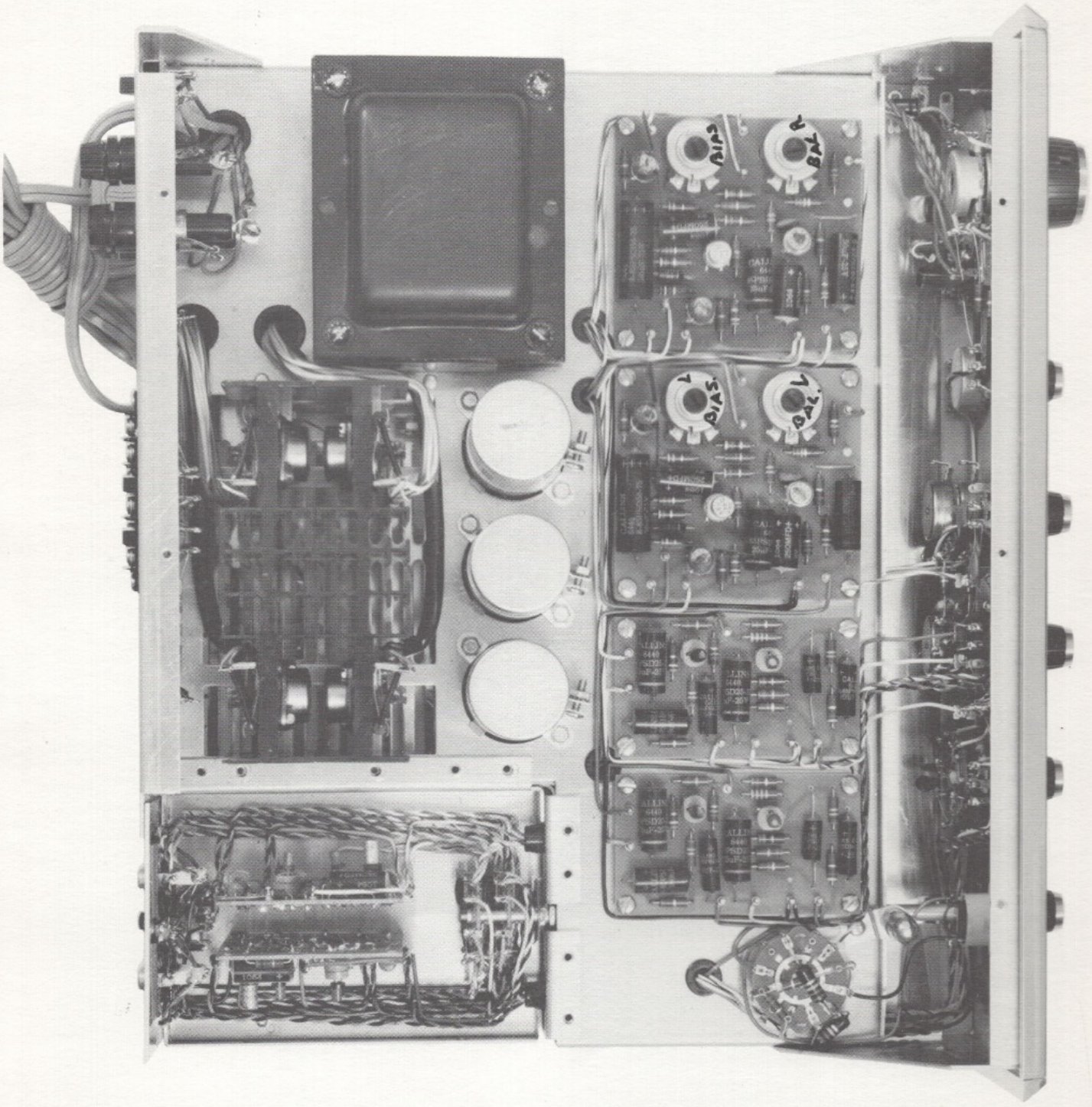
In our extensive evaluation tests we have had kits built by people with a wide variety of experience. Most of the kits worked perfectly upon completion. Of these people, virtually all of the successful builders took the time to follow this Double Check System, and most of them reported catching small errors. In those units that did not work, we discovered the malfunction could, in most cases, be traced directly to skipping the double check, carelessness, and working when overtired. Simple miswiring errors or short circuits prevented proper operation of the kit. Stop for a moment, RELAX, and be sure to check over your work.

An easy method of doing this has been provided. Ask a friend or another member of the family to help you. Have them look over charts AF-1, AR-1, etc. On these diagrams, 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 wires on each pin and terminal, your assistant can check your count against the chart. When you count the wires going to Pin 1 of P1, 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 kit is checked over.

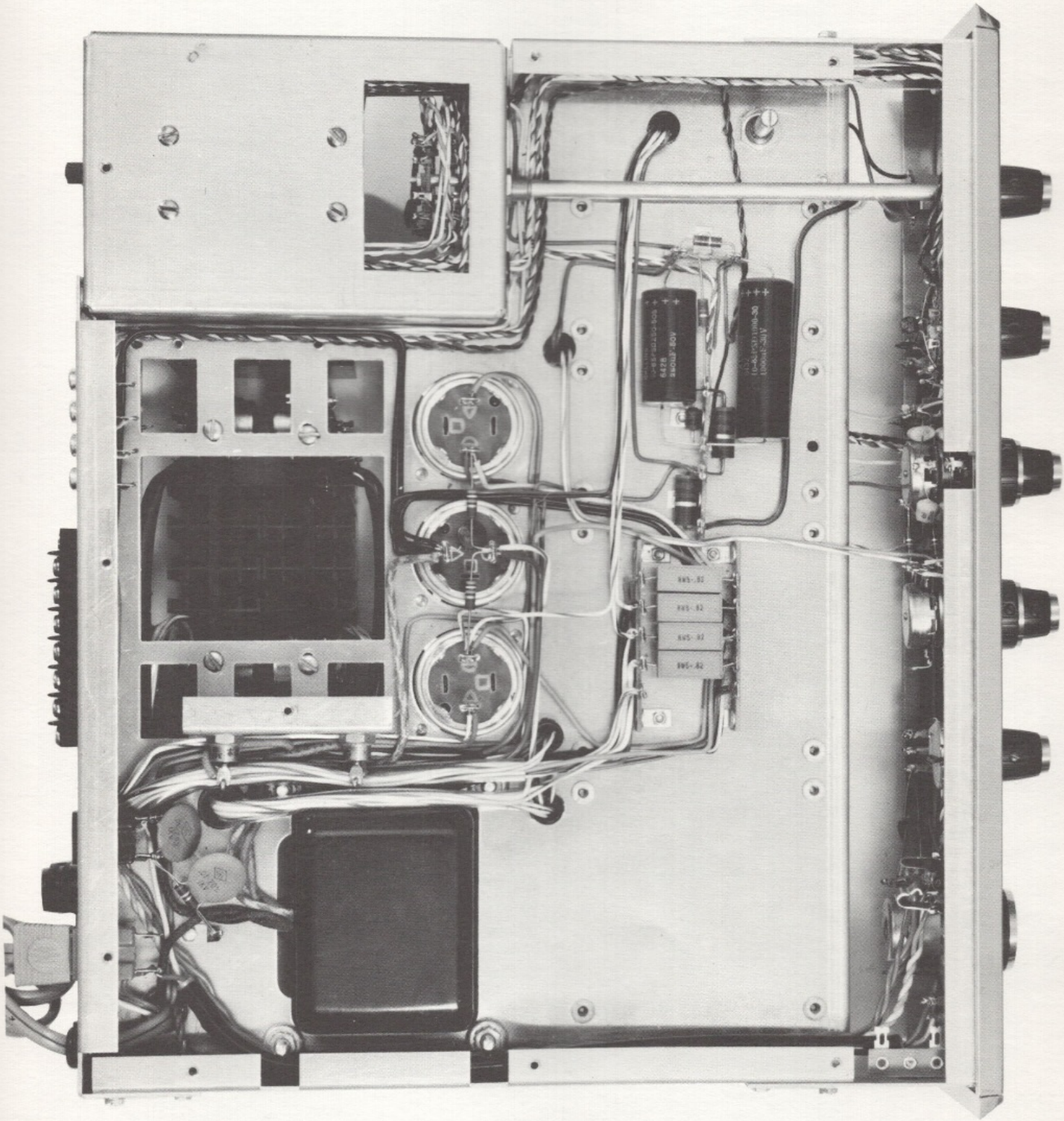
WHILE YOU ARE COUNTING THE WIRES, YOU CAN ALSO BE CHECKING FOR SHORT CIRCUITS AND PROPER SOLDERING. It would be very handy if you had a tool with a small, sharp point (like an ice pick) to probe the connections and make certain they are soldered properly. A pencil with a sharp point can also be used. Even the most meticulous worker can make a mistake or have a poorly soldered joint. LOOK SHARP! Move every cable and wire a little to insure that it is not 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 D on splicing a piece of buss wire. This will work quite well and eliminate the need for purchasing a replacement. Make sure that you correctly measure the length of the pre-cut pre-stripped wires. This is important, for if you use the wrong wire, you may find that later on in the construction a wire will be too short.

Section 1.7 — Photographs of Wired Kit



Section 1.7 — Photographs of Wired Kit



Section 2 — LK-60 Parts List

This parts list is broken down to cover each plastic envelope. The plastic envelopes are arranged in their order of use. Each plastic envelope contains the parts for a given Assembly Group of construction.

Check off each part just before each Assembly Group is used. Do not open any plastic envelope until you reach the appropriate step. This will eliminate the possibility of losing some of the small parts.

If you should accidentally damage or misplace any parts, write to the LABORATORY KIT SERVICE DEPARTMENT at the factory immediately. Extra four feet lengths of blue insulated wire and black insulated wire have been supplied with the first step. They 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 ¼" of insulation at each end, being careful not to knick the wire. If you have to replace a twisted pair, first evenly twist the correct length of blue and black wires together and then cut them.

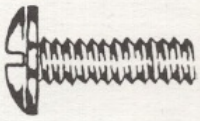
Env. #1 — **Rear Chassis Group 1**

1	XF-3AG	Fuse Post (Power)
2	XF-HJM	Fuse Post (Output)
2	RC21-33K	33,000 ohm ½w resistor (orange, orange, orange)
2	RW5-12	12 ohm 5w resistor wire wound
2	RW5-470	470 ohm 5w resistor wire wound
2	CPM-.25/200	.25mfd capacitor, tubular
1	15" IT-18	Spaghetti (insulation)
14	Wires	
2	Spare wires, blue & black	
2	Buss wires, #22 (small) & #18 (large)	

H-N-⅜ x ½B
HEX NUT

Env. #2 — **Front Chassis Mechanical Assembly**

1	RCVD-100KT-3B	Loudness Control (P1)
1	J3-ST-6	Phone Jack (J1)
1	RCV-50KST-3B	Balance Control (P2)
2	RCVCC-100KT	Bass & Treble Controls (P3 & P4)
7	H-N-⅜ x ½B	Brass Hex Nut
1	A-CL-22	Meter Clip
1	H-MS-632 x ¼B	Machine Screw
1	H-NK-632	Kep Nut
1	1-TO-P	1" Black Tubing
1	H-B-⅜ x ¼	Brass Bushing
1	H-LW-⅜L	Lockwasher



H-MS-632
MACHINE SCREW

H-NK-632
KEP NUT

Env. #3 — **Front Chassis Group 1**

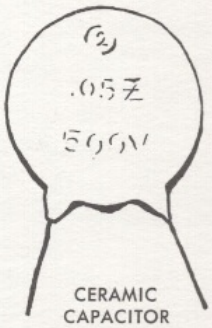
4	CMM-68nf/250v (068/250v)	68nfd Capacitor, Mylar
2	CC-.0027 (2700)	.0027mfd capacitor, Ceramic
2	RC21-12K	12,000 ohm ½w resistor (brown-red-orange)
12	Wires	
2	CC-330	330 pfd ceramic capacitor

Env. #4 — **Front Chassis Group 2**

1	ESS-3/16v	Spiral Shielded Cable (ESS)
2	I-NS-8	Nylon Sleeves
1	CC-.01/1KV	.01mfd capacitor, high voltage, Ceramic

I-NS-8
NYLON SLEEVE

2	RC31-220	220 ohm lw resistor (red-red-brown)
6	RC21-10K	10,000 ohm ½w resistor (brown-black-orange)
2	CC-.0047 (4700)	.0047mfd capacitor, Ceramic
2	CMM-68nf/250v (.068/250v)	68nfd capacitor, Mylar
2	CC-.0082 (8200)	.0082mfd capacitor, Ceramic
4	Wires	



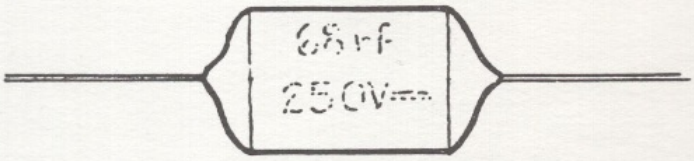
CERAMIC CAPACITOR

Env. #5 **Front Chassis Group 3**

2	RC21-6.8K	6800 ohm ½w resistor (blue-grey-red)
2	CC-180	180pfd capacitor, Ceramic
14	Wires	

Env. #6 **Heat Sink #1**

12	Wires	
1	Clear tube	
1	Black tube	



MYLAR CAPACITOR

Env. #7 **Heat Sink #2**

10	Wires	
1	Clear tube	
1	Black tube	

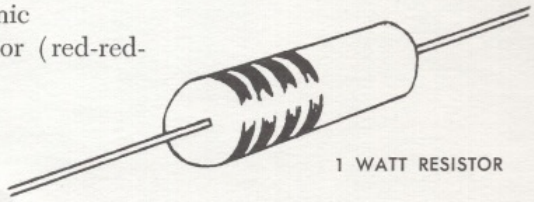
Env. #8 **S9 Input Switch (SRW 64-2) Groups 1 & 2**

2	RC21-12K	12,000 ohm ½w resistor (brown-red-orange)
2	CC-.0012 (1200)	.0012mfd capacitor, Ceramic
20	Wires	


½ WATT RESISTOR

Env. #9 **Preamp Chassis Group 1**

2	A-SB-375-3	Plastic grommets
2	RC21-390	390 ohm ½w resistor (orange-white-brown)
2	RC21-1K	1000 ohm ½w resistor (brown-black-red)
4	CC-.005	.005mfd capacitor, Ceramic
4	RC21-2.2M	2,200,000 ohm ½w resistor (red-red-green)
4	Wires	
1	HN-⅜ x ½B	Brass hex nut


1 WATT RESISTOR

Env. #10 **Preamp Chassis Group 2**

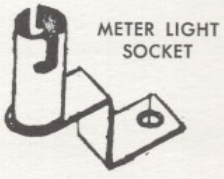
8	Wires	
4	H-MS-632 x ¼B	Machine screws


METER LIGHT SHIELD

Env. #11 **Main Chassis Mechanical Assembly**

1	X-PL-U6	Meter light socket
4	H-NK-632	Kep Nut
1	H-MS-632 x ¼B	Machine screw
1	V-PL-1819	Meter light bulb, 28v, 35ma
1	EP-1	Meter light shield


METER LIGHT BULB

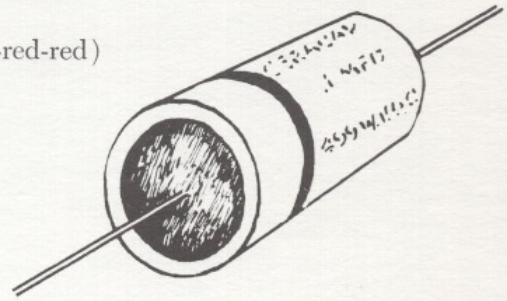

METER LIGHT SOCKET

37	H-SMS-6 x ¼ HW	Sheet metal screws (4 extra)
1	H-SMS-6 x ¼ HWB	Bronze sheet metal screw
3	A-CL-38	CEC can bracket
3	H-MS-632 x ½B	Machine screw
1	H-N-⅜ x ½B	Brass Hex Nut
1	A-SB-375-3	Plastic grommet (small)
3	A-SB-437-4	Plastic grommet (medium)
3	A-SB-625-8	Plastic grommet (large)

PLASTIC GROMMET

Env. #12 Main Chassis Groups 1 & 2 & 2B

1	DZ-27	Zener diode (D1), 27v
2	RC41-1.5K	1500 ohm 2w resistor (brown-green-red)
1	RC21-150	150 ohm ½w resistor (brown-green-brown)
1	CETM-250/50	250mfd capacitor, Tubular
1	CETM-1000/30	1000mfd capacitor, Tubular
1	RC21-8.2K	8200 ohm ½w resistor (grey-red-red)
3	Wires	



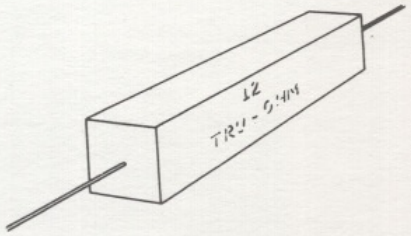
TUBULAR CAPACITOR

Env. #13 Main Chassis Groups 3 & 4

20	H-MS-632 x ¼B	Machine screw
1	CC-.005	.005mfd capacitor, Ceramic
13	Wires	

Env. #14 Main Chassis Groups 5 & 6

2	CC-.01/1KV	.01mfd capacitor, high voltage, Ceramic
1	RC21-820K	820,000 ohm ½w resistor (grey-red-yellow)
2	RC21-39K	39,000 ohm ½w resistor (orange-white-orange)
4	RW5-.82	.82 ohm 5w resistor wire wound
2	RC21-1.8K	1800 ohm ½w resistor (brown-grey-red)
2	RP-150K-2%	150,000 ohm ½w resistor (brown-green-yellow) precision
10	Wires	



WIRE WOUND RESISTOR

Env. #15 Final Mechanical Assembly

4	A-FT-1	Plastic feet
4	H-SMS-6 x ½ HW	Sheet metal screw (long)
10	H-SMS-6 x ¼ HW	Sheet metal screw
10	H-SMS-6 x ⅜ BBS	Black sheet metal screws
4	H-MS-632 x ¼B	Machine screws (spare)
6	H-N-⅜ x ½B	Hex Nut
2	F-SB-1 ¼	1 ¼ amp Slo-Blo fuse (1 spare)
4	F-AGX-2	2 amp instrument fuse (2 spares)
7	Labels	
8	H-T-SL + H-T-SLB	Spade Lugs for speaker wires

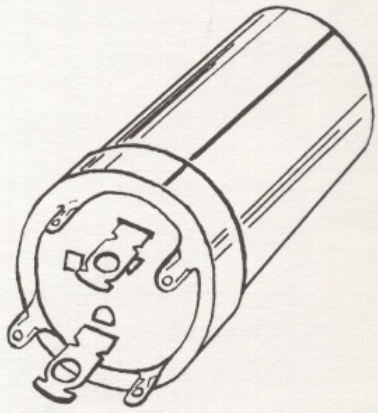
H-SMS-6 x ¼HW
SHEET METAL SCREW

Panel Assembly

1	N-LK-60-1	Panel
2	KN-P-6CTT	Knob (Bass, Treble) small
3	KN-P-6LTT	Knob (Balance, Selector Input)
2	KN-P-8CT	Knob (Bass, Treble) large
1	KN-P-10PTT	Knob (Loudness)

Parts Packed in "KIT-PAK"®

1	M-SS-6	Meter (M1)
2	A-HS-3	Heat sink assemblies
2	*Z-PC-D4	Driver PC Board (PC4 & PC3)
2	*Z-PC-P4	Preamp PC Board (PC1 & PC2)
2	*Z-PC-T1	Tone Control PC Board (PC5 & PC6)
1	SRW-52-1	Meter Test Switch
1	SRW-64-2	Preamp Switch (S9) Input
1	SRW-27-3	Selector Switch
2	CEC-2000/65	Electrolytic Capacitor
1	CEC-1000/75	Electrolytic Capacitor
1	A-MC-9	Main chassis
1	A-MC-10	Front chassis
1	LK-60-M3	Rear chassis
1	A-MC-12	Preamp chassis
1	A-BC-20	Preamp cover
1	A-BC-21	Bottom cover
1	A-BC-22	Top cover
1	E-LT-AV-R	50gms of solder & its holder
1	E-LT-SD	Screw driver
1	V-L15w	Light bulb, 15w, 120v (not included in units with 110/220v transformers)



CEC CAN ELECTROLYTIC CAPACITOR

*Assembly Number	Blank PC Board Number
Z-PC-D4	PC-D3
Z-PC-T1	PC-T1
Z-PC-P4	PC-P4

If it is necessary to order a replacement PC Board be sure to specify the Assembly Number. The PC Board Number is the PC Board minus components.

Section 3 — Kit Construction

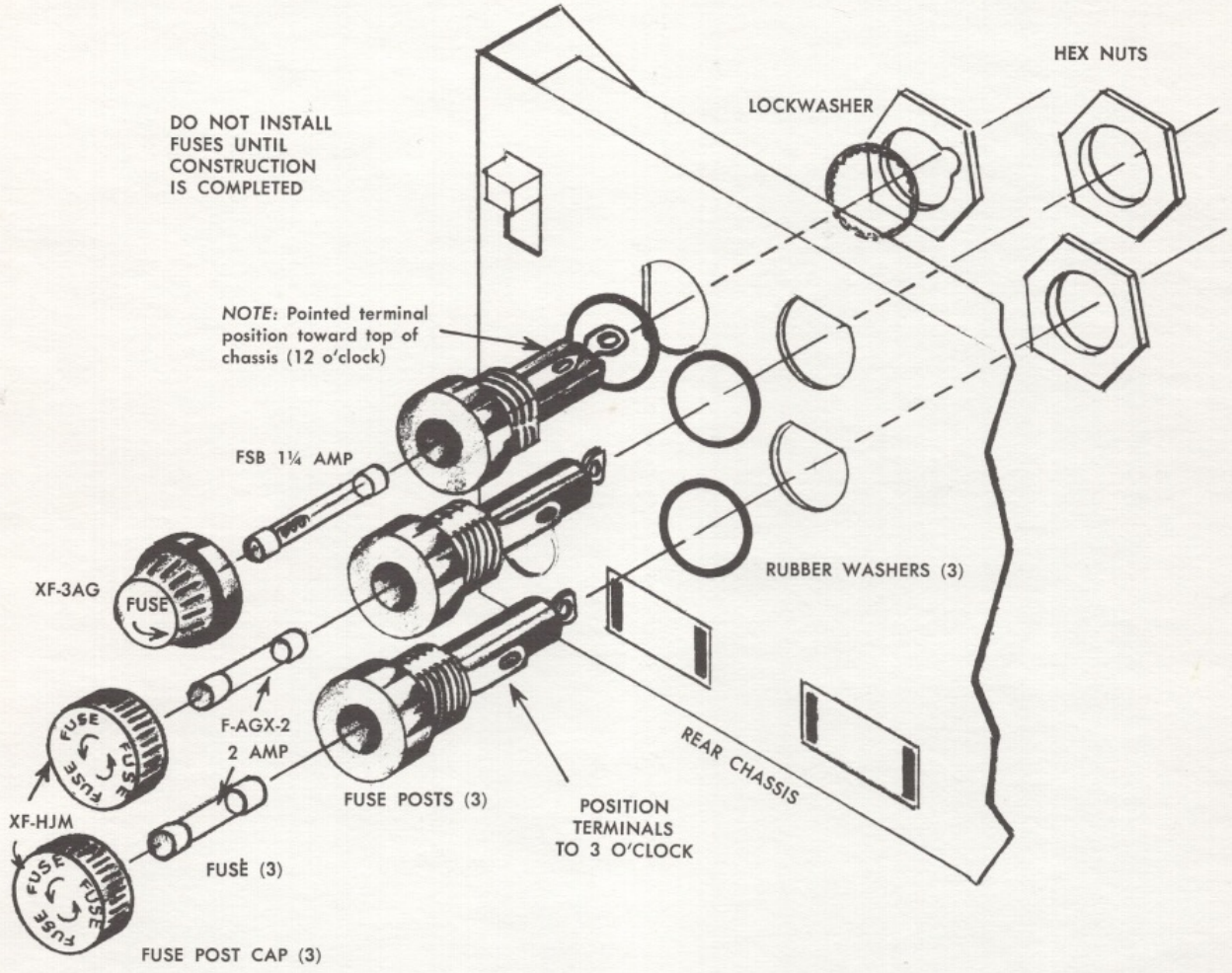


FIGURE 1

Having read "Getting Started," you are now ready to start building your kit. Proceed slowly, read carefully and enjoy yourself.

3.1 Rear Chassis

Mechanical Assembly Env. #1

Assemble the XF-3AG FUSE HOLDER (Power Fuse) to the rear chassis as shown in Figure 1 using the rubber washer, lockwasher, and hex nut as shown.

Install the two XF-HJM FUSE HOLDERS (output fuses) to the rear chassis using the rubber washers and hex nuts supplied with each fuse holder.

Rear Chassis Electrical Assembly Group 1

During this assembly group, you will be wiring the rear chassis of your LK-60. Make sure that all leads and wires are exactly as shown on the Group 1 diagram.

In numerous places throughout this booklet, reference will be made to "heavy" colored wire. This wire is identical to regular hookup wire (see Page 9), but it is thicker and of heavier weight. Use the "heavy" wire only where specified.

Note: When connecting "buss" wire in this step, it is much easier to hold the complete bundle of "buss" wire in one hand and feed the free end of the wire through the appropriate pins. The free end of the wire is then crimped around the last pin, and the wire is pulled tight and the other end of the wire can be clipped off and wrapped around the first pin. This is much easier than trying to work with a very small piece of wire.

In the main part of the construction manual some steps appear with heavy brackets. Example: Rear Chassis Assembly Group 1, Step 23. When these steps are reached during construction, you will be referred to Section 3.7 for the necessary wiring steps for 110/220v conversion units. For domestic 117v units the steps in brackets must be completed.

Connect:

1. A 1¼" light buss wire from S10-3 through S10-5 **(S2)*** to S10-4.
2. A 1¼" light buss wire from S11-12 through S11-8 **(S2)*** to S11-7.
3. A 33K resistor [orange-orange-orange] from S10-4 **(S2)** to S10-6.
4. A 33K resistor [orange-orange-orange] from S11-7 **(S2)** to S11-9.
5. A large 12 ohm wire wound resistor from S10-1 (this wire may be wrapped around the pin) to S10-3.
6. A large 12 ohm wire wound resistor from S11-10 (this wire may be wrapped around the pin) to S11-12.
7. A 12¼" heavy black wire to T5-3 **(S1)**.
8. A 12¾" heavy black wire to T5-4 **(S1)**.
9. A large 470 ohm wire wound resistor from T4-1 to S10-1.
10. A large 470 ohm wire wound resistor from T6-1 to S-11-10.
11. The banded end of a .25/200 tubular capacitor to T6-1, the other end to S11-10 **(S3)**.
12. The banded end of a .25/200 tubular capacitor to T4-1, the other end to S10-1 **(S3)**.
13. An 18¼" black wire to T4-1 **(S3)**.
14. A 16½" orange wire to S10-3 **(S3)**.
15. A 16¾" green wire to S10-6 **(S2)**.
16. An 18¾" green/white wire to S11-9 **(S2)**. (A green/white wire = a white wire with a green stripe.)
17. A 9¾" orange/white wire to S11-12 **(S3)**.
18. A 13¼" black/white wire to T6-1 **(S3)**.
19. A 1¼" light buss wire with ½" spaghetti (see Page 9) from S12-6 **(S1)** to S12-1. (Wrap lead around notch of Pin 1. Do not put through hole).
20. An 11¾" heavy green wire to F2-3 **(S1)**.
21. An 18¾" heavy blue wire to F1-1 **(S1)**.
22. A 2" heavy red wire from F3-6 to S12-3 **(S1)**.

On all units with 110/220v power transformers, the construction steps in brackets should be omitted – refer to construction steps in Section 3.7 for correct wiring. For domestic 117v units this step should be completed.

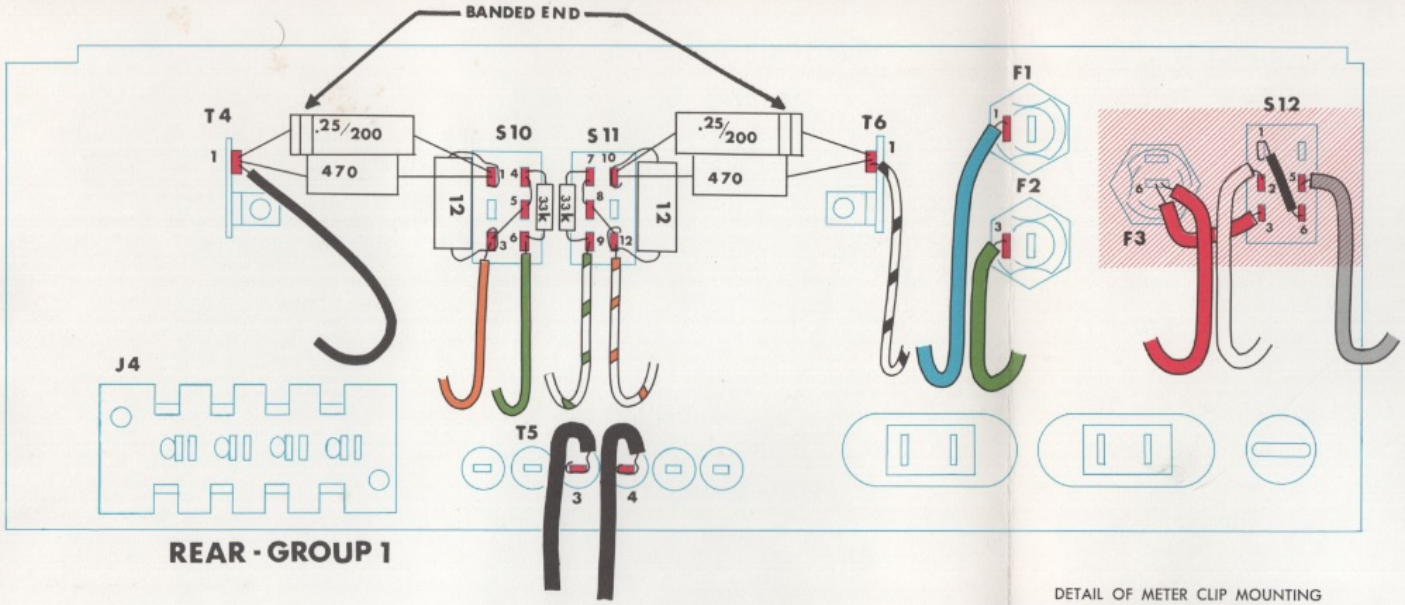
23. A 6" heavy red wire to F3-6. See step 1, Section 3.7.
24. A 5" heavy white wire to S12-2 **(S1)**.
25. A 4" heavy grey wire to S12-5 **(S1)**.

Pick up rear chassis and shake any loose clippings from the unit.

Check your work with double check sheet AR-1, which indicates the number of connections to each pin and whether or not it is soldered. Circled numbers mean that there will be future connections to that pin.

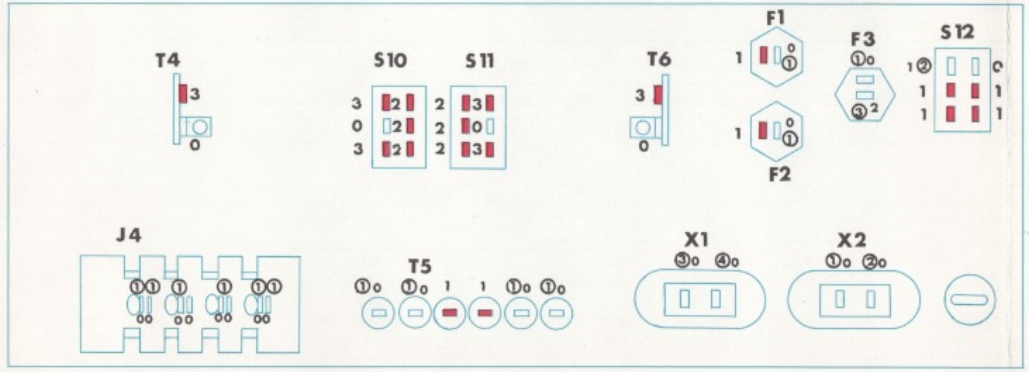
You have now completed most of the electrical assembly on the rear chassis of your LK-60. The rear chassis is used as a mechanical support for the protective fuses (output stage and power supply) and as a mechanical support for the output connections for the speakers.

* When a wire passes **through** a pin, it counts as two solder connections.



REAR - GROUP 1

AR-1



DETAIL OF METER CLIP MOUNTING

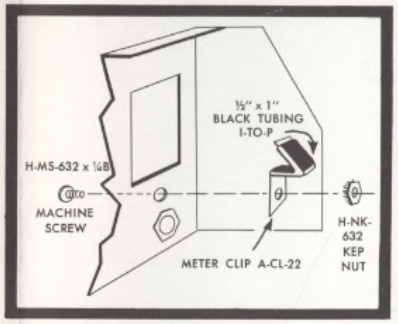


FIGURE 3

3.2 Front Chassis

Mechanical Assembly Env. #2

Install the switches and potentiometers on the front chassis as shown in Figure 2 using one H-N-⅜ x ½B HEX NUT for each switch or potentiometer.

Be sure that the correct switch is in the correct position. The "lugs" on the switch will lock the switch in position after the hex nut has been tightened. The part number (example: RCVD-100KT-3B) will be found stamped on the part P1.

1. P1 RCVD-100KT-3B (LOUDNESS)
2. J1 J3-ST-6 (PHONE JACK) with lockwasher
3. P2 RCV-50KST-3B (BALANCE)
4. P3 RCVCC-100K-T (TREBLE)
5. P4 RCVCC-100K-T (BASS)
6. S7 SRW-27-3 (SELECTOR)
7. The METER CLIP (A-CL-22) as shown in Figure 3 using one H-MS-632 x ¼B machine screw and one H-NK-632 "KEP NUT." Slide a piece of black tubing over the meter clip.
8. Install the Brass Bushing using one H-B-⅜ x ½B nut.

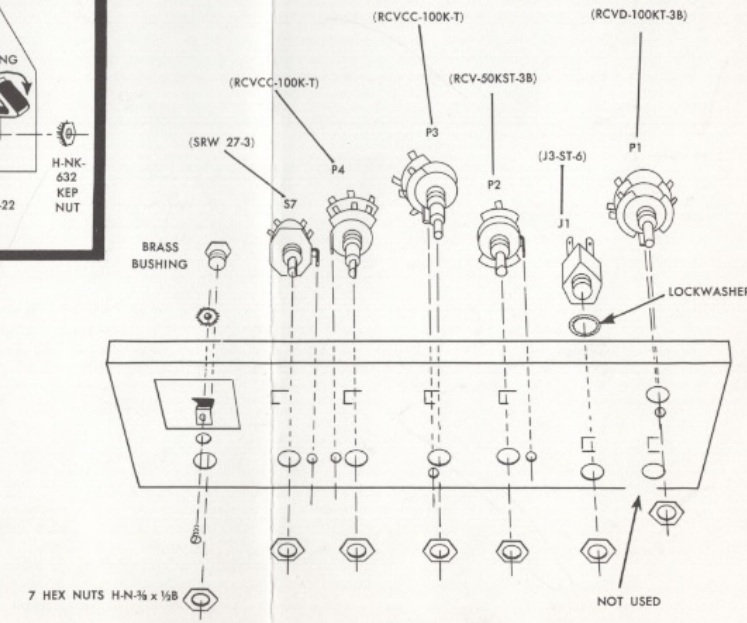


FIGURE 2

FRONT - GROUP 1

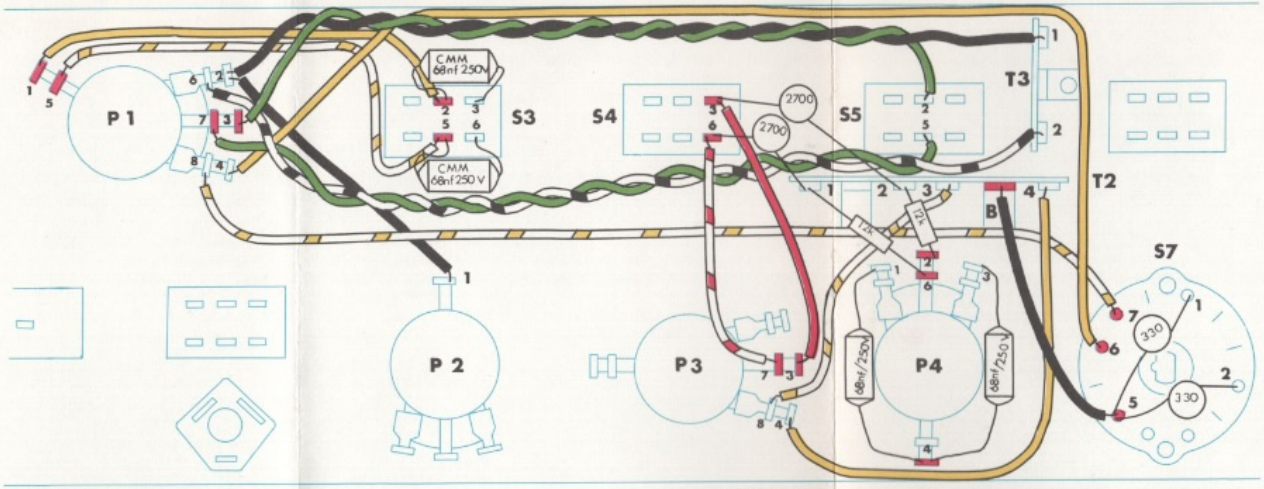
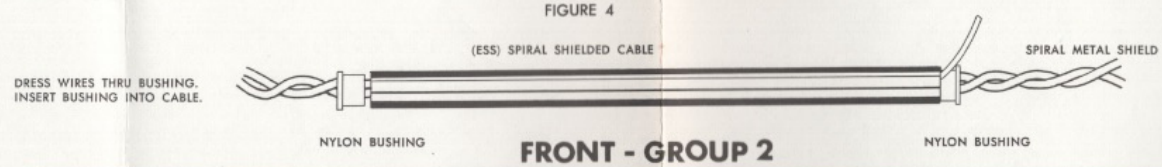


FIGURE 4



During the next three groups you will be working on the front chassis of your LK-60. Make sure that all wires coming from resistors and capacitors are cut as short as possible and that the mechanical joints on the switch terminals are as small as possible to avoid shorting between one pin and another.

The potentiometers P1, P3, and P4 have one deck nearest the aluminum chassis. This deck which is nearest the aluminum chassis is shown with the long pins on the diagrams, and this should be remembered when making connections to P1, P3, and P4.

The switch S7 has several pins that are double, such as pins 6 and 7. When making connections to these pins, make sure that the wire is attached and soldered to both pins.

FRONT - GROUP 2