Assembly and Operation of the "OXFORD" Portable Receiver

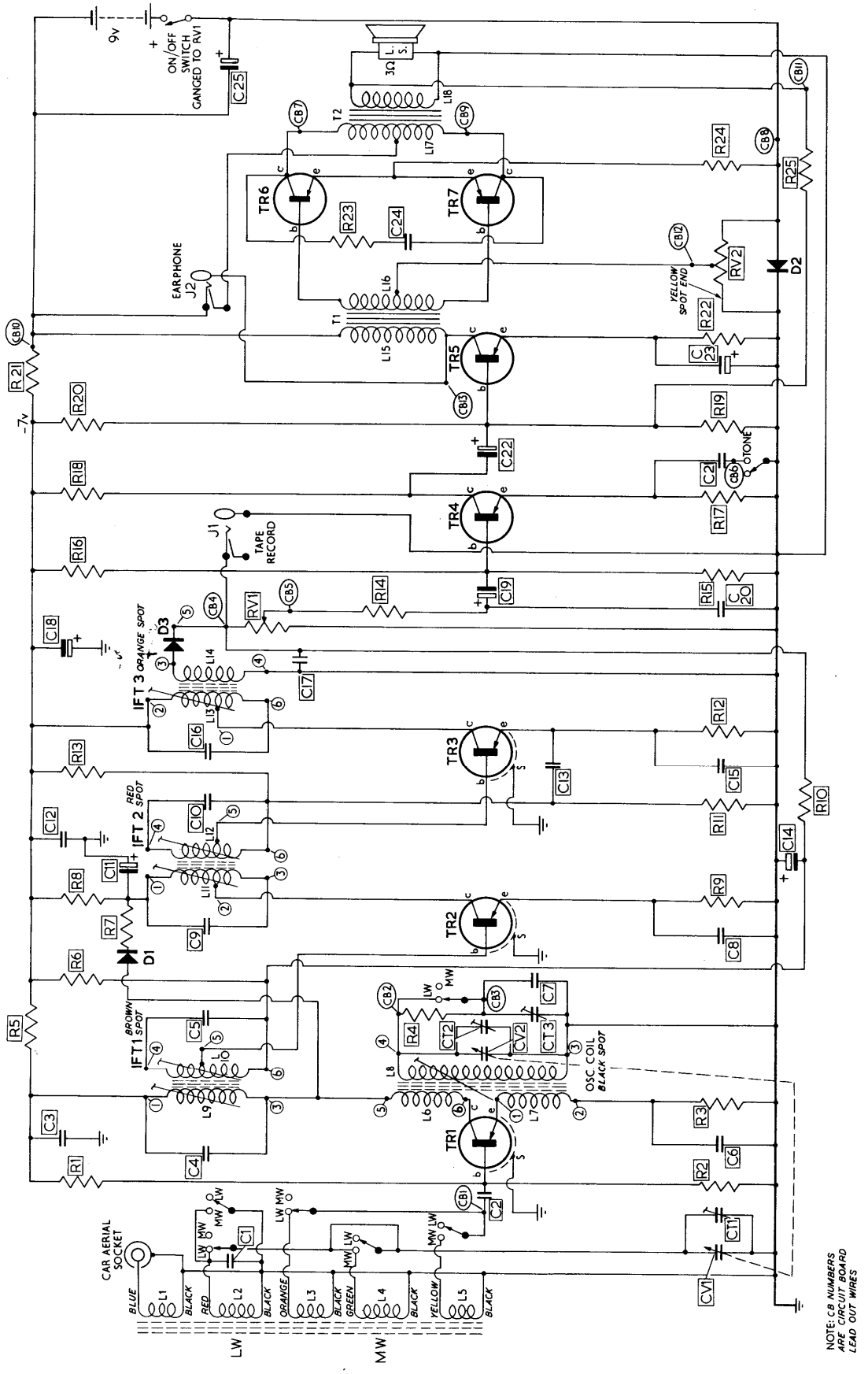
MODEL UXR-2

SPECIFICATION

Tuning Range:	Medium wave, 555 to 192 metres (540 to 1560 Kc/s) Long wave, 1800 to 1000 metres (167 to 300 Kc/s)
Loudspeaker:	7" x 4" high flux, 3Ω impedance
Power Output:	500 mW (RMS) at 1 Kc/s
Battery:	9 volt, Ever Ready PP9 or Drydex DT9 (or equivalent)
Battery Life:	300-500 hours
Transistors, Diodes:	3 - AF117 Mix/Osc and IF amplifier 1 - OC71 AF amplifier 1 - OC81D driver 2 - OC81 audio output (matched pair) 1 - AA129 temp. compensating diode 1 - OA90 detector diode 1 - OA81 AGC diode (or equivalent types to above)

Sensitivity (50 mW output 30% modulation):	Sensitivity	Signal to Noise Ratio
Medium Wave at 1000 Kc/s	19 μV/m	3 dB
	200 μV/m	20 dB
Long Wave at 200 Kc/s	56 μV/m	3 dB
	500 μV/m	20 dB
Selectivity:	**Bandwidth (6 dB points)**	**Attenuation (± 9 Kc/s)**
Weak Signal	± 3.7 Kc/s	44 dB
Strong Signal	± 3.0 Kc/s	38 dB

AVC Range (for 6 dB change in audio output):	62 dB
Size:	11" wide x 8" high x 3.7/8" deep
Net Weight:	6 lb. with battery
Shipping Weight:	7½ lb. (less battery)


HEATHKIT TRANSISTOR PORTABLE Model UXR-2. OXFORD
9v
ON/OFF SWITCH GANGED TO RV1
3Ω L.S.
EAR PHONE J2
J1 TAPE RECORD
-7v
TONE
YELLOW SPOT END
I.F. TRANSFORMERS
COLOUR CODE
CODE - BLACK
OSC. COIL
IFT 3 ORANGE SPOT
IFT 2 RED SPOT
IFT 1 BROWN SPOT
OSC. COIL BLACK SPOT
CAR AERIAL SOCKET
BLUE
BLACK
RED
ORANGE
GREEN
YELLOW
LW
MW
NOTE: CB NUMBERS ARE CIRCUIT BOARD LEAD OUT WIRES

INTRODUCTION

The Model UXR-2 is a long and medium waveband receiver and has been designed for those who require a luxury transistor portable. It is ideal for use in the home as a domestic receiver, in a car where it can easily be stowed under the dashboard or as a personal portable receiver.

The elegant cabinet is made of solid leather and the control knobs etc. are trimmed with polished brass.

Latest circuit techniques have been used and the quality of sound reproduction is excellent, due in part to a special 7" x 4" loudspeaker specially produced to our specification.

A junction diode is used in the output stage to reduce cross-over distortion at low ambient temperatures and also effectively increases battery life.

Some of the star features include 'slide-rule' type tuning scale with slow motion drive, three push-buttons for long, medium wave and tone, car aerial socket, output socket for tape recorder, output socket for personal earpiece, printed circuit board construction, double tuned IF transformers for higher sensitivity and 7 transistors plus 3 diodes.

CIRCUIT DESCRIPTION

This circuit description is provided to give the novice, as well as the technical kit builder, a better understanding of what is happening in the different stages of the receiver. By tracing through the Circuit Diagram on Page 2 (and loose leaf) when reading the Circuit Description, you can be even better acquainted.

The 'Introduction to Transistors' and the 'Glossary of Radio Terms' given on Pages 33 to 37 will help to explain some of the terms used.

Radio signals transmitted by broadcasting stations are picked up by the ferrite rod aerial on which coils are wound for medium wave (L2, L3) and long wave (L4, L5). The desired station is tuned by one section of the variable capacitor CV1 and the inductance L2 (MW) or L4 (LW), the desired signal is then coupled by L3 (MW) or L5 (LW) to the base of transistor TR1. Variable capacitors CV1 and CV2 are ganged together and CV2 tunes with L8 which forms the local oscillator circuit. Thus, when tuning into a station with the ganged variable capacitor, heterodyne action takes place and develops a 470 Kc/s difference frequency which is known as the intermediate frequency (IF). CT3 is switched across L3 during long wave operation to lower the oscillator frequency to maintain the 470 Kc/s difference frequency.

The IF frequency of 470 Kc/s is tuned and coupled by IF transformer IFT1, IFT2 and IFT3 and amplified by transistors TR2 and TR3 to the detector circuit consisting of diode D3, capacitor C17 and RV1 which forms the diode load as well as being the volume control.

In the process of detection, a DC voltage is developed and is used to provide AVC. This voltage is filtered by resistor R10 and capacitor C14 and is applied to the base return of the IF amplifier TR2, this controls the amplification of this stage over normal signal levels.

Further AVC action is provided by diode D1 which damps the tuned circuit of L9 in IFT1 when very strong signals are present. This is possible since a diode will not conduct unless the voltage at the cathode becomes more negative than the voltage on it's anode. In this application it works very much like a switch in that it is only 'on' when it conducts, which is when a high AVC voltage is present.

The demodulated audio signal is taken from the slider of the volume control RV1. Turning the control clockwise increases the signal via C19 to the base of TR4, the audio amplifier. At the emitter of this stage a capacitor C21 provides treble boost when the TONE button is depressed.

The signal is then coupled from the collector of TR4 through C22 to the base of TR5, the driver stage. At the collector of this stage signals are correctly phased by the driver transformer T1 and coupled to the base of TR6 and TR7, the output stages. These are operated in class B for maximum battery economy, as the current taken is almost directly proportional to the sound output level.

Transistors TR6 and TR7 are transformer coupled by T2 to the loudspeaker to provide proper matching. Negative feedback is used to improve the frequency response and reduce harmonic distortion, this is formed by R25 which is connected from the secondary winding of the output transformer to the base of the driver stage TR5.

In order to reduce cross-over distortion it is necessary to have a small forward bias voltage at the base of the output transistors. This is produced and stabilised by the junction diode D2 and set by the variable resistor RV2.

Capacitor C25 is used to help prevent the battery voltage falling on high current peaks.

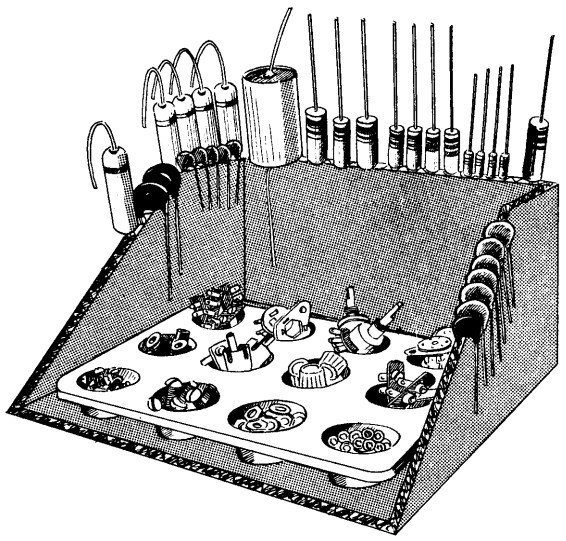
Capacitor C18 and resistor R21 provide the necessary isolation between the output and other stages to ensure stability of operation.

Power is supplied by a single 9 volt battery especially designed for transistor receivers. The positive (+) terminal of the battery is connected to the emitters of the output stage via the ON/OFF switch and the junction of stabilising resistors R24 and RV2, D2.

RESISTOR AND CAPACITOR VALUES

Diodes and capacitors marked thus * form part of the I.F. transformer assembly.

R1	33 KΩ		R22	1 KΩ		C8	.1 μF		CV1	387 pF	
R2	6.8 KΩ		R23	100Ω		C9*	270 pF		CV2	174 pF	
R3	1 KΩ		R24	4.7Ω		C10*	270 pF		CT1	20 pF	
R4	150 KΩ		R25	39 KΩ		C11	2 μF		CT2	20 pF	
R5	100Ω					C12	.05 μF		CT3	40-110 pF	
R6	56 KΩ					C13	.025 μF				
R7	680Ω					C14	8 μF				
R8	2.2 KΩ					C15	.025 μF		D1	OA81	
R9	680Ω		RV1	5 KΩ log		C16*	250 pF		D2	AA129	
R10	8.2 KΩ		RV2	200Ω		C17*	.01 μF		D3*	OA90	
R11	4.7 KΩ					C18	200 μF		TR1	AF117	
R12	1 KΩ					C19	.5 μF		TR2	AF117	
R13	22 KΩ					C20	.05 μF		TR3	AF117	
R14	3.9 KΩ					C21	.1 μF		TR4	OC71	
R15	15 KΩ		C1	47 pF		C22	.5 μF		TR5	OC81D	
R16	82 KΩ		C2	.025 μF		C23	100 μF		TR6	OC81	
R17	1 KΩ		C3	.1 μF		C24	.25 μF		TR7	OC81	
R18	3.9 KΩ		C4*	560 pF		C25	200 μF				
R19	8.2 KΩ		C5*	560 pF							
R20	39 KΩ		C6	.025 μF							
R21	560Ω		C7	270 pF							



This illustration shows how resistors and capacitors may be placed in the cut edge of a corrugated cardboard carton until they are needed. Their values can be written on the cardboard next to each component.

PRELIMINARY NOTES AND INSTRUCTIONS

The Step-by-Step instructions given in this manual should be followed implicitly to ensure a minimum of difficulty during construction and a completely satisfactory result, including many years of accurate, trouble-free service from the finished instrument.

UNPACK THE KIT CAREFULLY, EXAMINE EACH PART AND CHECK IT AGAINST THE PARTS LIST. In so doing, you will become acquainted with the parts. You will find it helpful to refer to the component identification sheet and also to the general details printed on the inside covers of the manual. If a shortage is found, attach the inspection slip to your claim and notify us promptly.

Lay out all the parts so that they are readily available in convenient categories. Refer to the general information inside the covers of this manual for instructions on how to identify components.

Moulded egg containers make handy trays for holding small parts. Resistors and capacitors may be placed in the edge of a corrugated cardboard box until they are needed.

Unless otherwise stated, use lockwashers under all nuts, and also between controls and the chassis. When shake-proof solder tags are mounted under nuts, the use of lockwashers is unnecessary.

Resistors and capacitors have a tolerance rating of $\pm$ 10% unless otherwise stated. Therefore a 100 KΩ resistor may test anywhere between 90 and 110 KΩ. Frequently capacitors show an even greater variation such as -50% to +100%. This Heathkit accommodates such variations.

Unless otherwise stated all wire used is insulated. Bare wire is only used where lead lengths are short and there is no possibility of a short circuit. Wherever there is a possibility of the bare wire leads of resistors or capacitors, etc., shorting to other parts or to chassis, such leads must be covered with insulated sleeving.

To facilitate describing the location of parts, all valveholders, controls, tagstrips, etc., have been lettered or numbered. Where necessary all such coding is clearly shown in the illustrations. When instructions say, for example, "wire to socket G3", refer to the proper figure and connect a wire to tag 3 of socket G.

Valveholders illustrated in the manual are always shown with their tags numbered in a clockwise sequence, from the blank tag position or keyway, when viewed from underneath.

All resistors may be wired either way round.

All capacitors, excepting electrolytic capacitors, may be wired either way round unless otherwise stated.

Carefully letter and number tagstrips, valveholders, transformers, etc. A wax pencil is ideal for this purpose.

When mounting resistors and capacitors make sure that the value can be read when in position.

Observe polarity on all electrolytic capacitors, i.e. RED = POSITIVE = +.

A circuit description is included in this manual so that those with some knowledge of electronics will be able to obtain a clearer picture of the actual functioning of this instrument. It is not expected that those with little experience will understand the description completely, but it should be of help in the event that they desire to become more familiar with the circuit operation and thus learn more from building the kit than just the placing of parts and the wiring.

Read this manual right through before starting actual construction. In this way, you will become familiar with the general step-by-step procedure used. Study the pictorials and diagrams to get acquainted with the circuit layout and location of parts. When actually assembling and wiring, READ THROUGH THE WHOLE OF EACH STEP so that no point will be missed.

A tick (✓) should be made in the space provided at the beginning of each instruction immediately it has been completed. This is most important as it will avoid omissions or errors, especially whenever work is interrupted in the course of construction. Some Kit-builders have found it helpful in addition to mark each lead in the pictorial in coloured pencil as it is completed.

Successful instrument construction requires close observance of the step-by-step procedure outlined in this manual. For your convenience, some illustrations may appear in large size folded sheets. It is suggested that these sheets be fastened to the wall over your work area for reference purposes during instrument construction.

The Company reserves the right to make such circuit modification and/or component substitutions as may be found desirable, indication being by "Advice of Change" included in the kit.

NOTE: Daystrom Ltd. will not accept any responsibility or liability for any damage or personal injury sustained during the building, testing, or operation of this instrument.

ALL GUARANTEES ARE VOIDED AND WE WILL NOT REPAIR OR SERVICE INSTRUMENTS IN WHICH ACID CORE SOLDER OR PASTE FLUXES HAVE BEEN USED. WHEN IN DOUBT ABOUT SOLDER, IT IS RECOMMENDED THAT ONLY "60/40" RESIN CORE RADIO SOLDER BE PURCHASED.

PROPER SOLDERING PROCEDURE

Only a small percentage of Heathkit purchasers find it necessary to return an instrument for factory service. Of these, by far the largest proportion function improperly due to poor or improper soldering.

Correct soldering technique is extremely important. Good soldered joints are essential if the performance engineered into the kit is to be fully realised. If you are a beginner with no experience in soldering, half an hour's practice with odd lengths of wire and a valveholder, etc., will be invaluable.

Highest quality resin-cored solder is essential for efficiently securing this kit's wiring and components. The resin core acts as a flux or cleaning agent during the soldering operation.

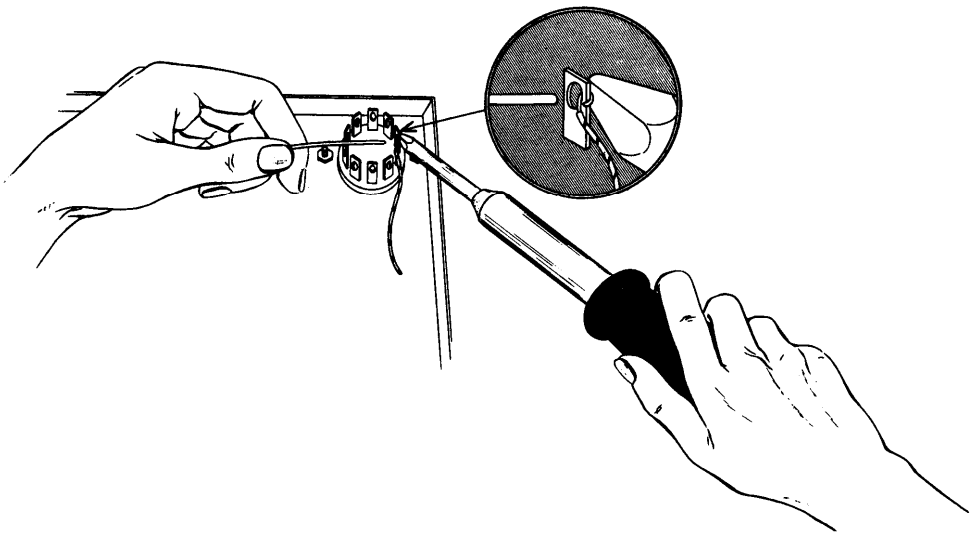
NO SEPARATE FLUX OR PASTE OF ANY KIND SHOULD BE USED. We specifically caution against the use of so-called "non-corrosive" pastes or liquids. Such compounds, although not corrosive at room temperature, will form residues when heated. These residues are deposited on surrounding surfaces and attract moisture. The resulting compounds are not only corrosive but actually destroy the insulation value of non-conductors. Dust and dirt will tend to accumulate on these "bridges" and eventually will cause erratic or degraded performance of the instrument.

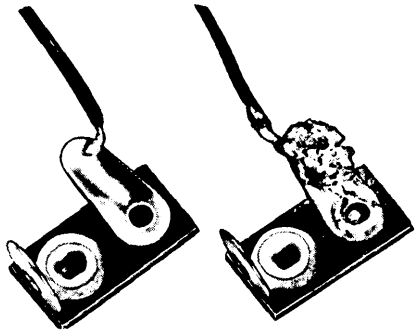
IMPORTANT

IN THE "STEP-BY-STEP" PROCEDURE the abbreviation "NS" indicates that the connection should not yet be soldered, for other wires will be added. At a later stage the letter "S" indicates that the connection must now be soldered. Note that a number appears after each solder (S) instruction. This number indicates the number of leads connected to the terminal in question. For example, if the instructions read, "Connect one lead of a 47 KΩ resistor to tag 1 (S-2)", it will be understood that there should be two leads connected to the terminal at the time it is soldered. This additional check will help to avoid errors.

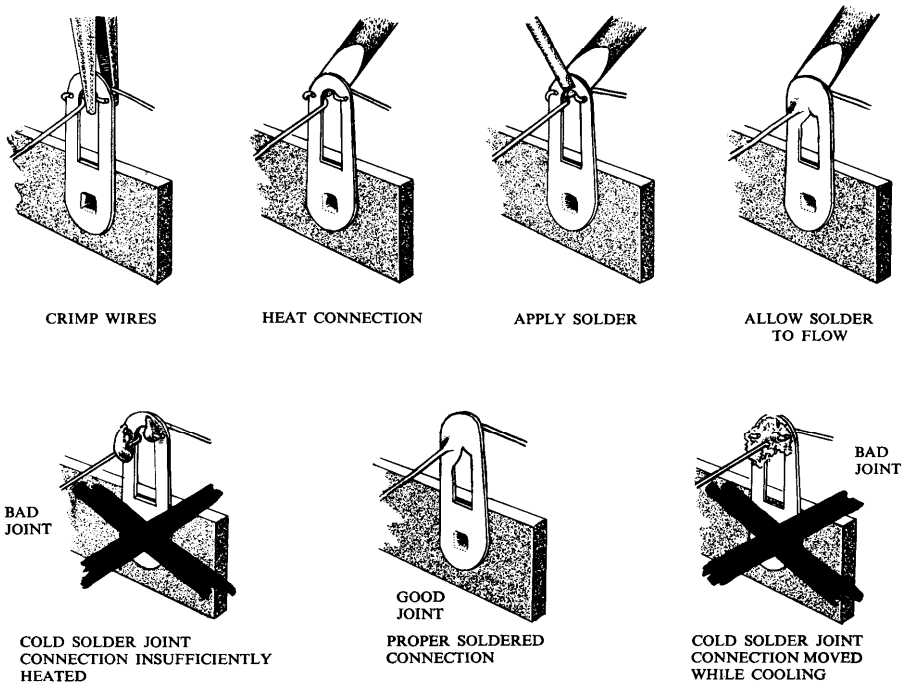
SPECIAL NOTE: Where a wire is passed through a tag to other parts of the circuit, this will be regarded as two connections (S-2).

When two or more connections are made to the same solder tag a common mistake is to neglect to solder the connections on the bottom. Make sure all the wires are soldered.





If the tags are bright and clean and wires free of wax, frayed insulation and other foreign substances, no difficulty will be experienced in soldering. Crimp or otherwise secure the wire (or wires) to the terminal, so a good mechanical joint is made without relying on solder for physical strength.



Typical good and bad soldered joints are shown above.

A poor soldered joint will usually be indicated by its appearance. The solder will stand up in a blob on top of the connection, with no evidence of flowing out caused by actual "wetting" of the contact. A crystalline or grainy texture on the solder surface caused by movement of the joint before it solidifies is another evidence of a "cold" connection and possible "dry" joint. In either event, reheat the joint until the solder flows smoothly over the entire junction, cooling to a smooth, bright appearance.

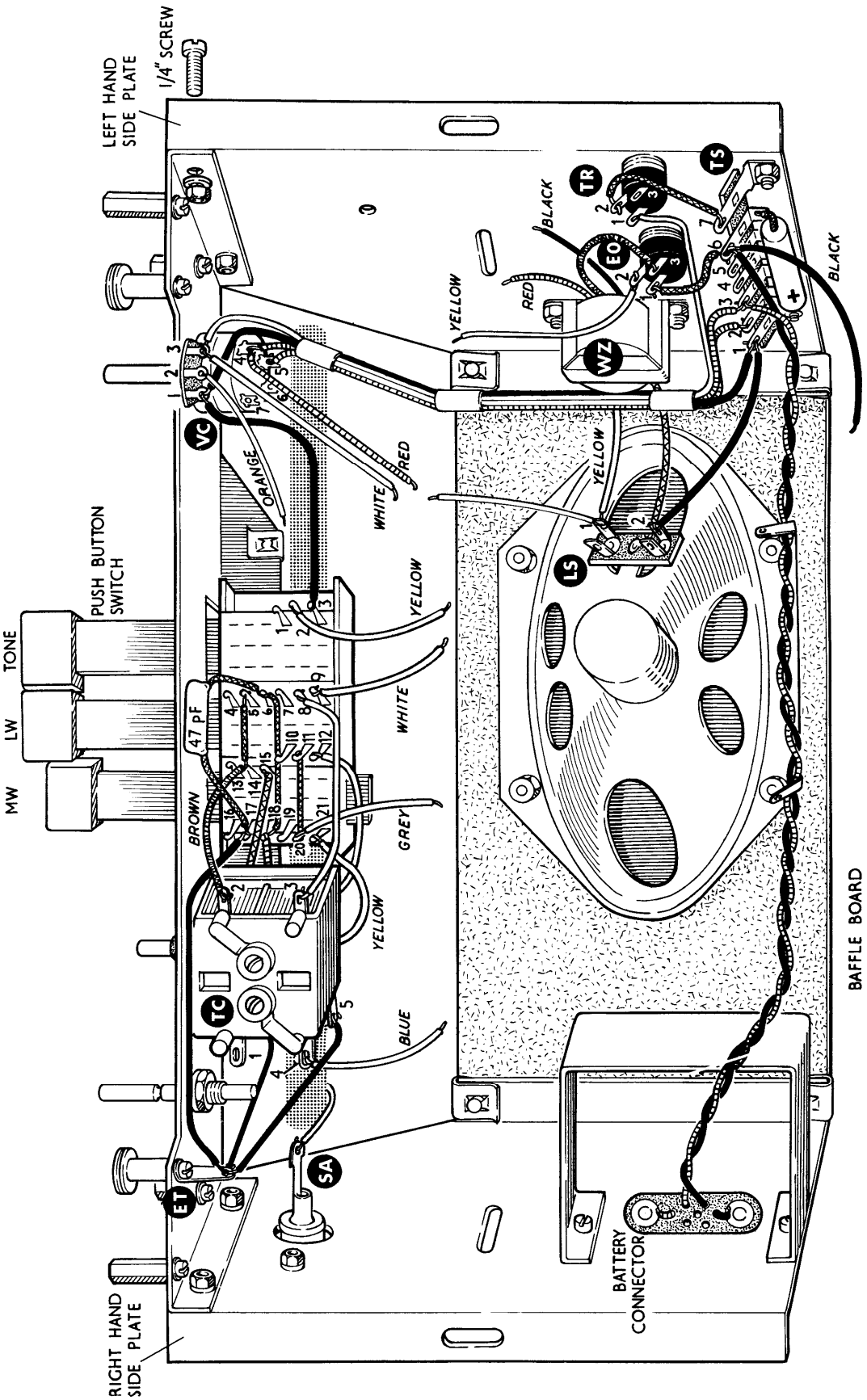
To make a good soldered joint, the clean tip of the hot soldering iron should be placed against the joint to be soldered so that the flat tag is heated sufficiently to melt the solder. Resin core solder is then placed against both the tag and the tip of the iron and should immediately flow over the joint. See illustrations. Use only enough solder to cover the wires at the junction; it is not necessary to fill the entire hole in the tag with solder. Do not allow excess solder to flow into valveholder contacts, ruining the sockets, or to creep into switch sockets and destroy their spring action. Position the work so that gravity tends to keep the solder where you want it.

A clean, well-tinned soldering iron is also important to obtain consistently perfect connections. For most wiring, a 25 to 50 watt iron, or the equivalent in a soldering gun, is very satisfactory. Keep the iron hot and its tip and the connections to be soldered bright and clean. Always place the solder on the heated "work" and then place the bit on top of the solder until it flows readily and "wets" the joint being made. Do not take the solder on to the bit and then try to bring it to the work directly from the soldering iron. Whenever possible a joint should be secured mechanically by squeezing tight with pliers prior to soldering it. The hot soldering bit should frequently be scraped clean with a knife, steel wool or a file, or wiped clean quickly be means of a rag or steel wool.

Do not apply too much solder to the soldered joint. Do not apply the solder to the iron only, expecting that it will roll down onto the connection. Try to follow the instructions and illustrations as closely as possible.

Do not bend a lead more than once around a connecting point before soldering, so that if it should have to come off due to a mistake or for maintenance it will be much easier to remove.

Follow these instructions and use reasonable care during assembly of the kit. This will ensure the deserved satisfaction of having the instrument operate perfectly the first time it is switched on.



PICTORIAL 1 (REAR VIEW)

STEP-BY-STEP ASSEMBLY INSTRUCTIONS

The following instructions are presented in a simple and logical step-by-step sequence to enable you to complete your kit with the least possible confusion. Be sure to read each step all the way through before you start to do it. When each step is completed, tick it off in the space provided.

We suggest that you do the following before any work is started:-

1. Attach the large loose leaf Pictorials to the wall above your work space.
2. Read through the entire assembly and wiring instructions.
3. Lay out all parts so that they are readily available.

CHASSIS ASSEMBLY

( ) If there is an amendment sheet to this manual, make sure that you have made the alterations at the appropriate places.

Refer to Pictorial 1 and Figure 1 for the following steps:

( ) Mount the battery bracket to the R.H. side place and secure at hole locations X and Y with 4BA x $\frac{1}{4}$" screws, lockwashers and nuts.

( ) Mount the aerial socket at location SA on two 3/8" long spacers and secure with two 6BA x $\frac{3}{4}$" screws, lockwashers and nuts.

( ) Clip on a 4BA speednut with the flat face on the outside at locations A and B.

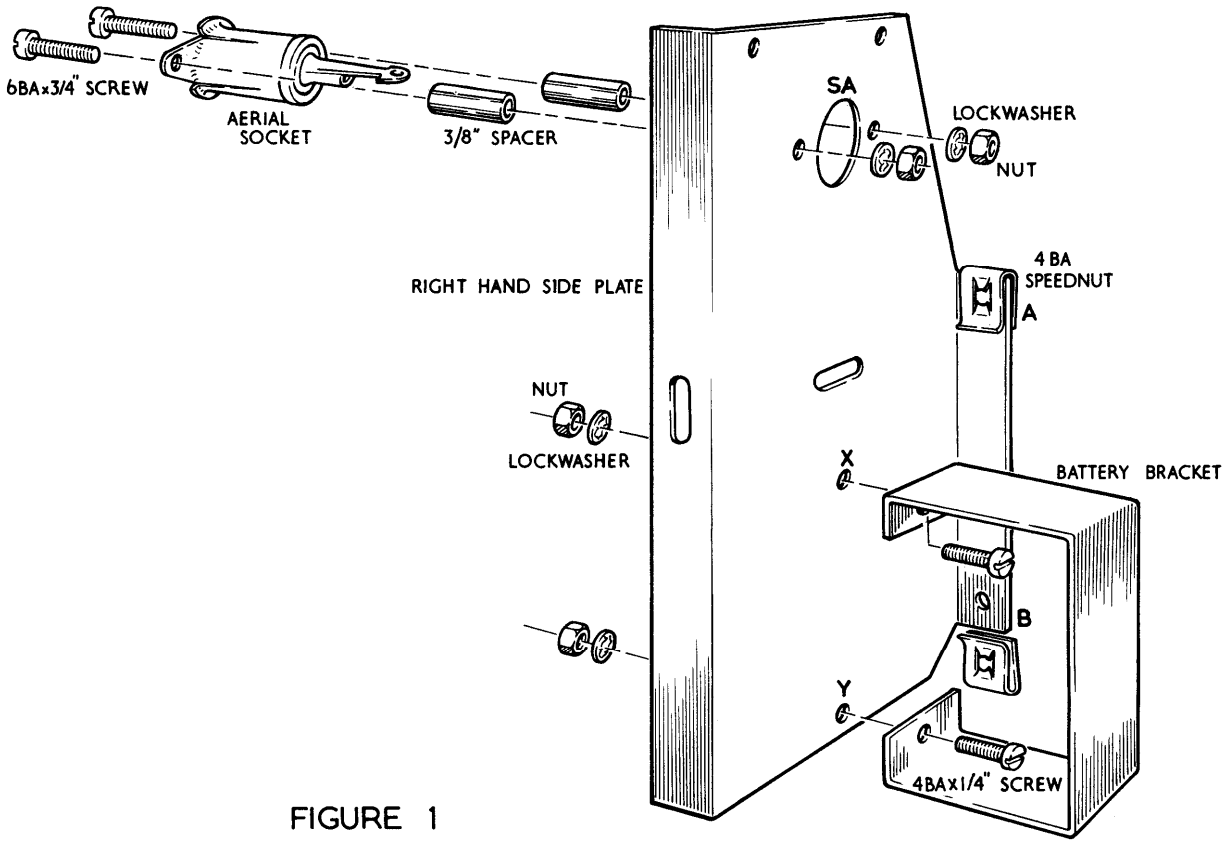


FIGURE 1

Refer to Figure 2 for the following steps:

( ) Clip on a 4BA speednut (with the flat face on the outside) at locations C and D.

( ) With the RED, BROWN and BLACK wires facing the rear flange, mount the output transformer at location WZ with two 4BA x $\frac{1}{4}$" screws, lockwashers and nuts.

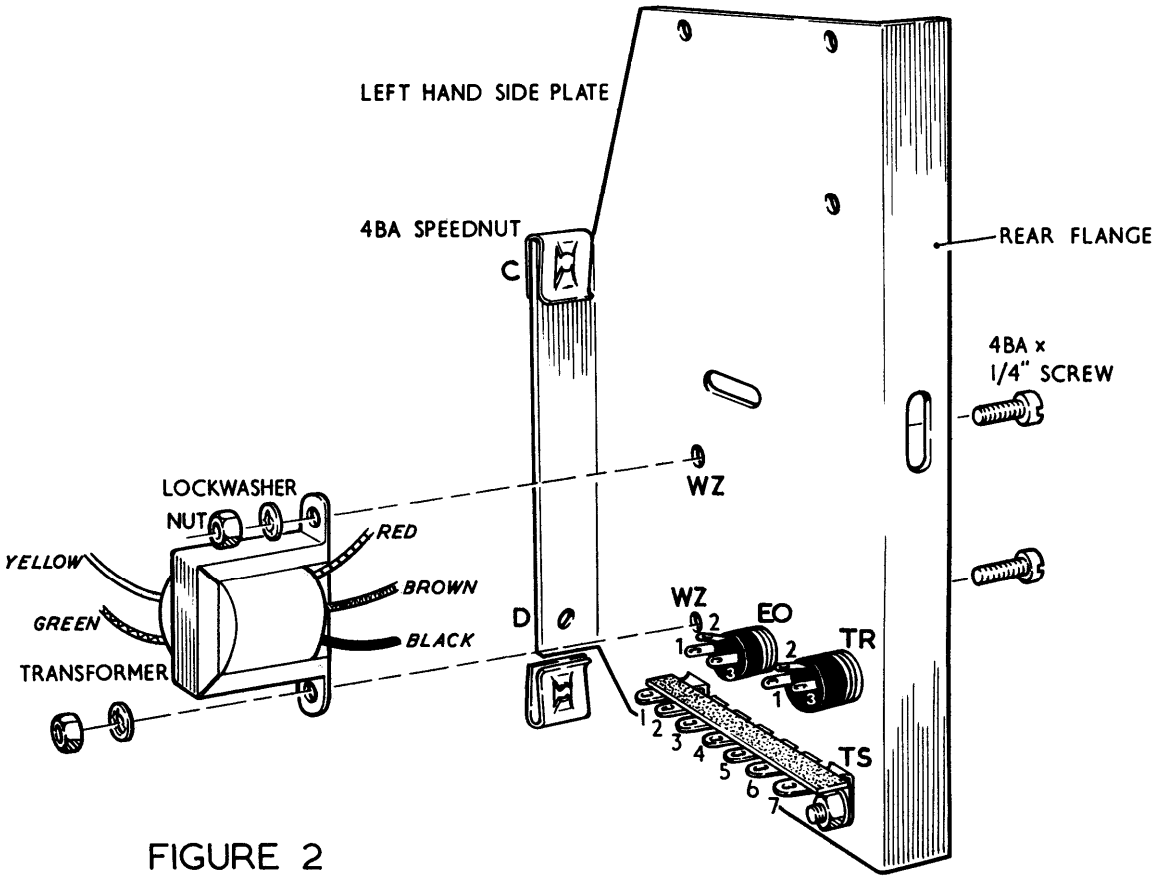


FIGURE 2

( ) Take the two jack sockets and remove the washers and nuts.

( ) Mount a jack socket at locations EO and TR with tag 2 positioned at the top as shown. Secure using the washers and nuts previously removed.

( ) Mount the tagstrip at location TS with two 4BA x $\frac{1}{4}$" screws, lockwashers and nuts.

Refer to Figure 3 for the following steps:

( ) Mount a pulley wheel at hole location AP, secure with a 4BA x $\frac{1}{4}$" screw and 4BA solder tag under the screw head.

( ) Mount a pulley wheel at hole location BP and secure with a lockwasher and 4BA x $\frac{1}{4}$" screw.

( ) Mount a 6BA x 11/16" long pillar at hole locations CX, DX, EX and FX, securing with 6BA x $\frac{1}{4}$" screws with lockwashers under the screw heads.

( ) Place a 3/8" lockwasher on the bush of the drive shaft, insert this end through hole location SD and secure with 3/8" flat washer and locknut.

( ) Insert the shaft of the 5 KΩ potentiometer (Part No. 19-518) through hole location VC, rotate until the locking tag engages with the small hole and secure with a 3/8" lockwasher and locknut.

( ) Clip on a 6BA speednut with the flat face on the outside at hole locations FA and FB.

( ) Insert a $\frac{1}{4}$" rubber grommet in the three small holes around hole location TC.

( ) Insert the shaft of the tuning capacitor through hole location TC and secure with 4BA shoulder screws inserted through each grommet into the threaded holes of the capacitor frame.

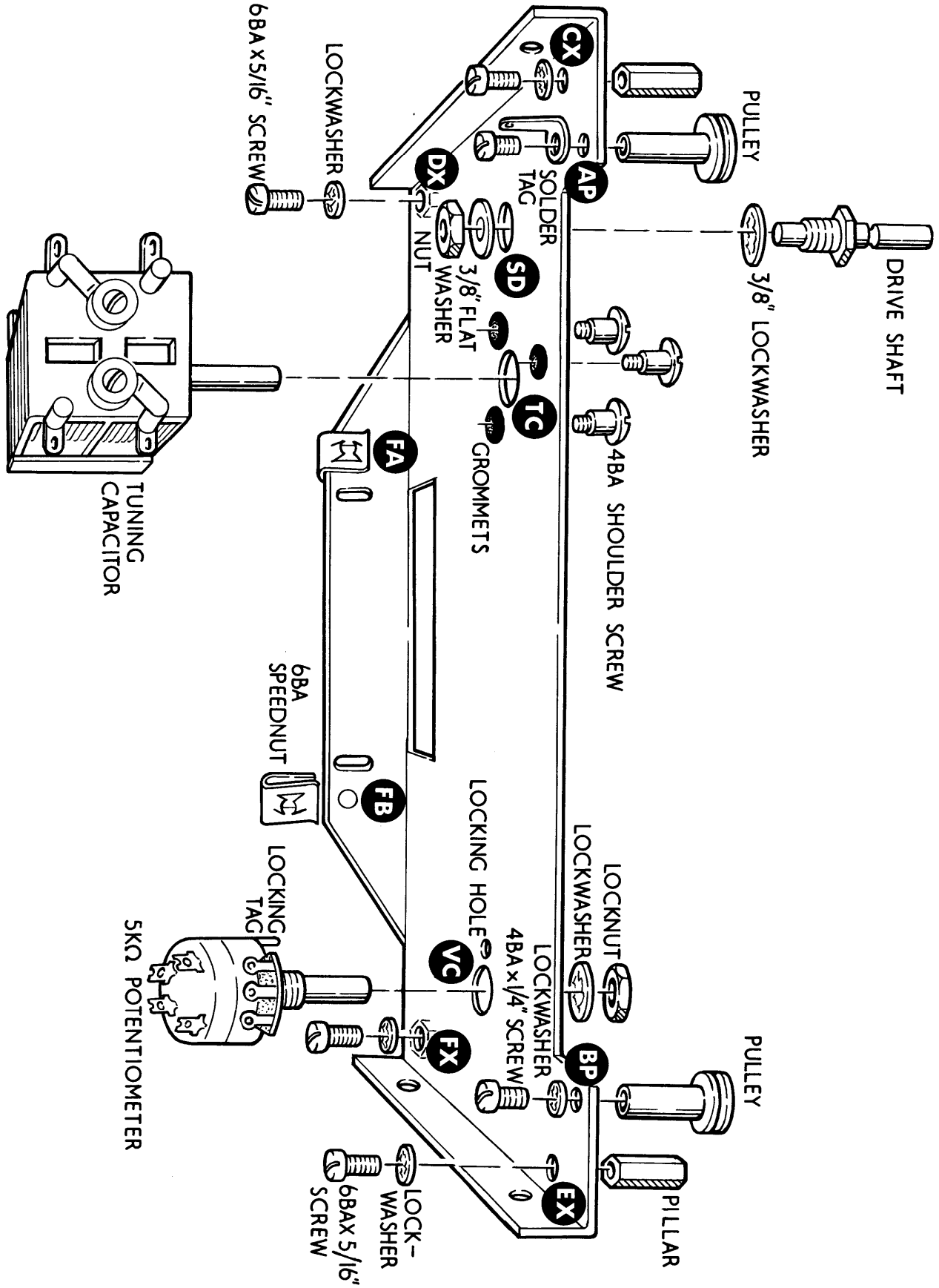

CX
AP
DX
SD
TC
FA
FB
VC
FX
BP
EX
6BA X5/16" SCREW
LOCKWASHER
SOLDER TAG
NUT
3/8" FLAT WASHER
GROMMETS
TUNING CAPACITOR
PULLEY
3/8" LOCKWASHER
DRIVE SHAFT
4BA SHOULDER SCREW
6BA SPEEDNUT
LOCKING TAG
5KΩ POTENTIOMETER
LOCKING HOLE
LOCKNUT
LOCKWASHER
4BA x 1/4" SCREW
PULLEY
LOCK-WASHER
6BA X 5/16" SCREW
PILLAR

FIGURE 3

Refer to Pictorials 1 and 2 for the following steps:

( ) Secure the left-hand side plate to the control panel with two 4BA x $\frac{1}{4}$" screws, lockwashers and nuts.

( ) Secure the right-hand side plate to the control panel with two 4BA x $\frac{1}{4}$" screws, lockwashers and nuts.

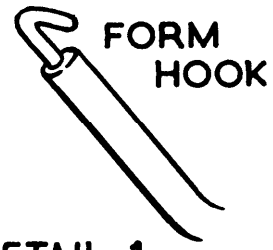
( ) Locate the baffle board and note that this is mounted with countersunk holes on the outside and the speaker aperture nearest the left-hand side as shown in Pictorial 2. Mount the baffle board on the 4BA speednuts fitted to the side plates and secure with 4BA x 3/8" countersunk head screws.

( ) Carefully mount the loudspeaker on the baffle board with its tags on the side as shown in Pictorial 1. Secure with two 4BA x 3/8" countersunk head screws, lockwashers and nuts in the top pair of holes and two 4BA x 3/8" countersunk head screws, solder tags and nuts in the bottom pair of holes.

NOTE: Great care must be taken to avoid damaging the cone of the loudspeaker and it is suggested that a piece of cardboard be temporarily placed over the front until the assembly is completed.

PRESS BUTTON SWITCH WIRING

Refer to Figure 4 for the following steps:



DETAIL 1

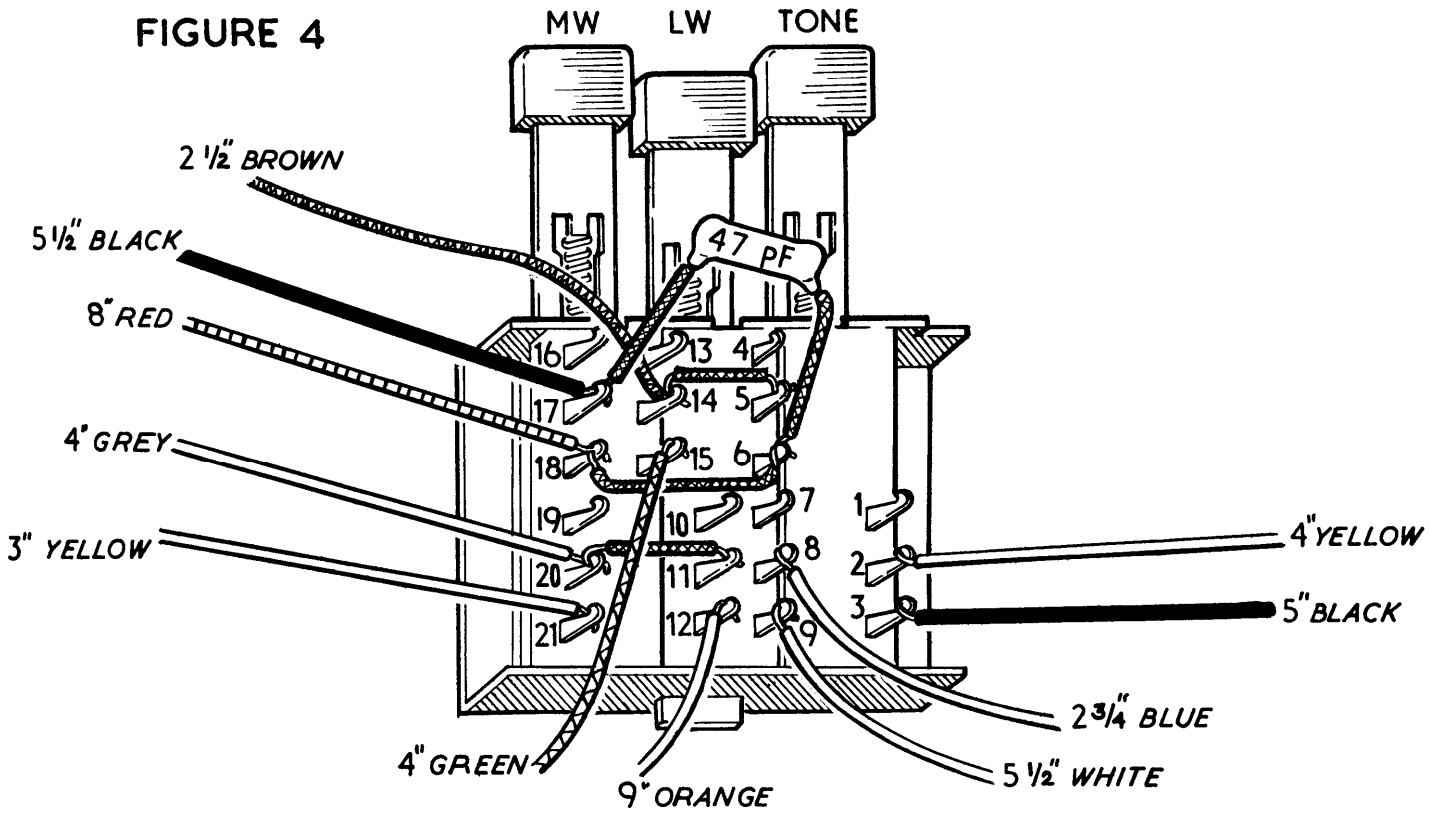
Wiring Notes:

To prepare the stated length of wire

(a) strip off the coloured insulation 3/16" from each end
(b) twist the wire strands tightly together
(c) form a hook on the ends as shown in Detail 1 and 'tin' the end with solder.

( ) Place the 3-button switch on your work space in the same relative position to that shown in Figure 4.

FIGURE 4



NOTE: (1) A rule is provided on Pictorial 1 (loose leaf) for you to measure wire lengths.
(2) Tags 1, 4, 7, 10, 13, 16 and 19 are not used.
(3) Use the thick gauge solder for the following connections.

( ) Connect one end of a 5" length of BLACK wire to TONE tag 3 (S-1).

( ) Connect one end of a 4" length of YELLOW wire to TONE tag 2 (S-1).

( ) Connect one end of a $2\frac{3}{4}$" length of BLUE wire to LW tag 8 (S-1).

( ) Connect one end of a $5\frac{1}{2}$" length of WHITE wire to LW tag 9 (S-1).

( ) Connect one end of a 4" length of GREEN wire to MW tag 15 (S-1).

( ) Using bare wire and $\frac{1}{2}$" length of sleeving, connect a link between LW tag 5 (S-1) and MW tag 14 (NS).

( ) Connect one end of a $2\frac{1}{2}$" length of BROWN wire to MW tag 14 (S-2).

( ) Using bare wire and $1\frac{1}{4}$" length of sleeving, connect a link between LW tag 6 (NS) and MW tag 18 (NS).

( ) Connect one end of an 8" length of RED wire to MW tag 18 (S-2).

( ) Connect one end of a $5\frac{1}{2}$" length of BLACK wire to MW tag 17 (NS).

( ) Using $\frac{1}{2}$" length of sleeving at each end, connect a 47 pF ceramic tubular capacitor between LW tag 6 (S-2) and MW tag 17 (S-2).

( ) Using bare wire and $\frac{1}{2}$" length of sleeving, connect a link between LW tag 11 (S-1) and MW tag 20 (NS).

( ) Connect one end of a 4" length of GREY wire to MW tag 20 (S-2).

( ) Connect one end of a 3" length of YELLOW wire to MW tag 21 (S-1).

( ) Connect one end of a 9" length of ORANGE wire to LW tag 12 (S-1).

( ) Carefully examine all soldered joints for poor connections or solder bridges between adjacent tags.

WIRING OF PRESS-BUTTON SWITCH TO ROD AERIAL

Refer to Pictorials 1 and 2 for the following steps:

( ) Mount the press-button switch as shown and secure with two 1/8" spacers and two 6BA x $\frac{1}{4}$" screws. Be sure that the spacers are used or the switch mechanism will be damaged.

( ) Position the ferrite rod aerial centrally to the chassis width with the MW coil (coded BLACK, YELLOW, GREEN) on the right-hand side. Adjust the plastic clips so that they are in line with the 6BA speednuts and secure with two 6BA x $\frac{1}{4}$" screws.

NOTE: All tags are colour coded on the ferrite rod aerial.

( ) Connect the YELLOW wire from MW tag 21 to MW coil YELLOW tag (S-1).

( ) Connect the GREEN wire from MW tag 15 to MW coil GREEN tag (S-1).

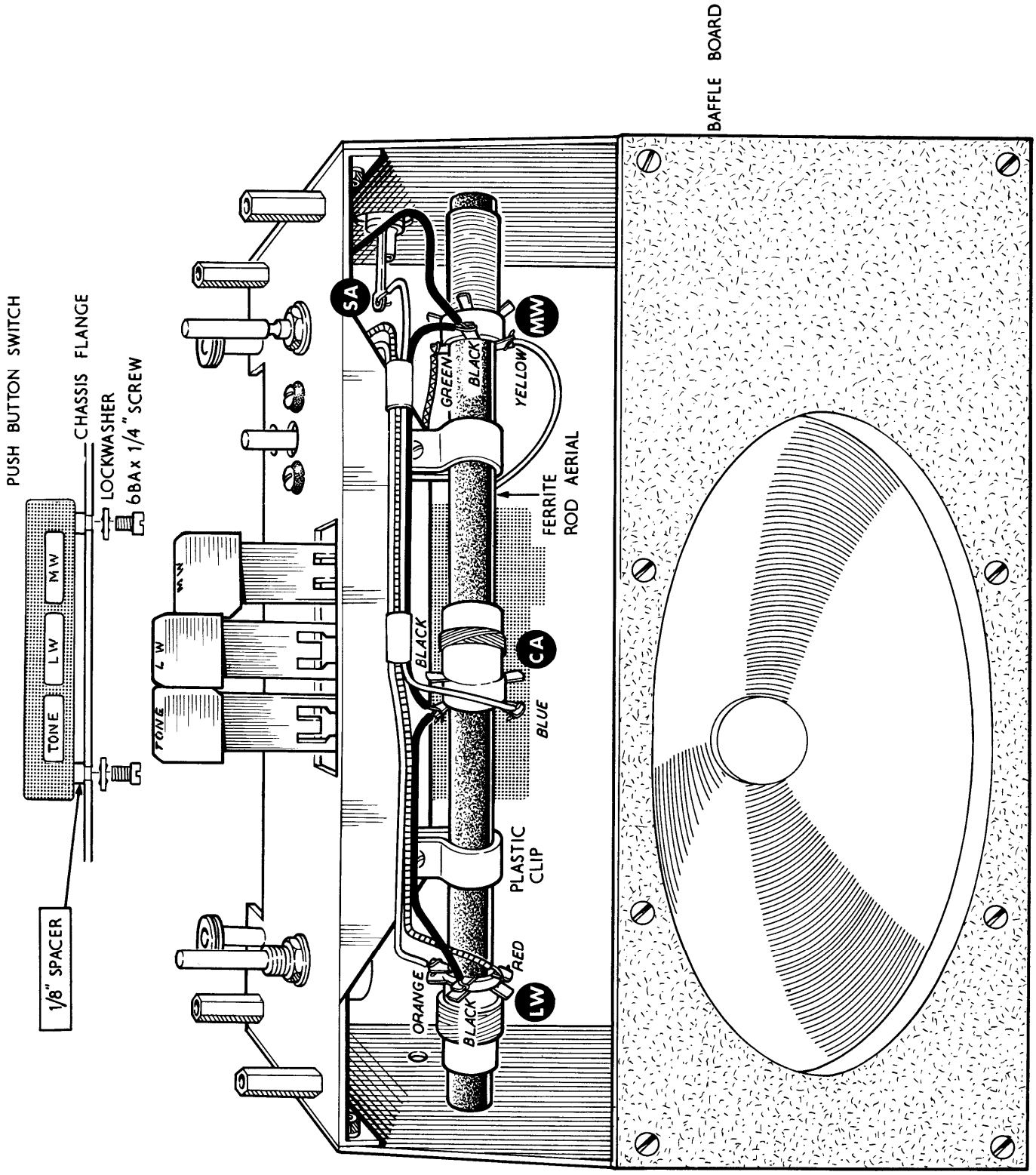
( ) Dress the RED and ORANGE wires from MW and LW switches along the front of the plastic clips.

( ) Connect the RED wire from MW tag 18 to LW coil RED tag (S-1).

( ) Connect the ORANGE wire from LW tag 12 to LW coil ORANGE tag (S-1).

( ) Connect a 4" length of BLACK wire from LW coil BLACK tag (S-1) to CA coil BLACK tag (NS).

( ) Connect a 4" length of BLACK wire from CA coil BLACK tag (S-2) to MW coil BLACK tag (NS).



PICTORIAL 2 (FRONT VIEW)

( ) Connect a 5" length of BLACK wire from MW coil BLACK tag (S-2) to 4BA solder tag ET (NS).

( ) Connect a 6" length of WHITE wire from CA coil BLUE tag (S-1) to aerial socket tag SA (S-1).

( ) Using the length of adhesive tape supplied, neatly tape the wires as shown.

PRESS BUTTON WIRING TO TUNING CAPACITOR AND VOLUME CONTROL

Refer to Pictorials 1 and 2 for the following steps:

( ) Connect the BLACK wire from MW tag 17 to solder tag ET (NS).

( ) Connect a 3" length of BLACK wire from solder tag ET (S-3), (be sure all wires are soldered) to TC tag 5 (S-1). See Detail 2 for this connection.

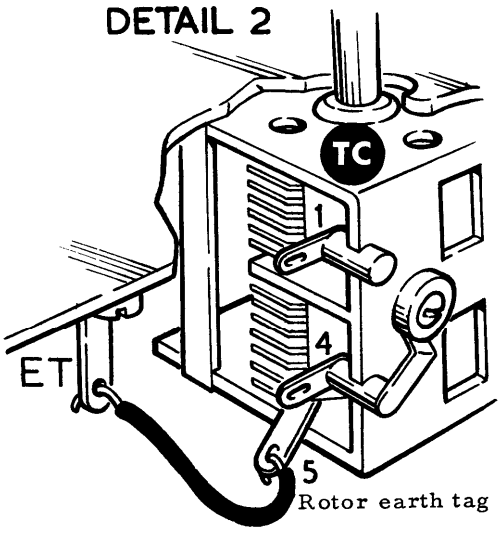
( ) Connect the BLUE wire from LW tag 8 to TC tag 3 (S-1).

( ) Connect the BROWN wire from MW tag 14 to TC tag 2 (S-1).

( ) Connect the BLACK wire from TONE tag 3 to VC tag 1 (NS).

( ) Connect one end of a $2\frac{1}{2}$" length of BLUE wire to TC tag 4 (S-1).

DETAIL 2



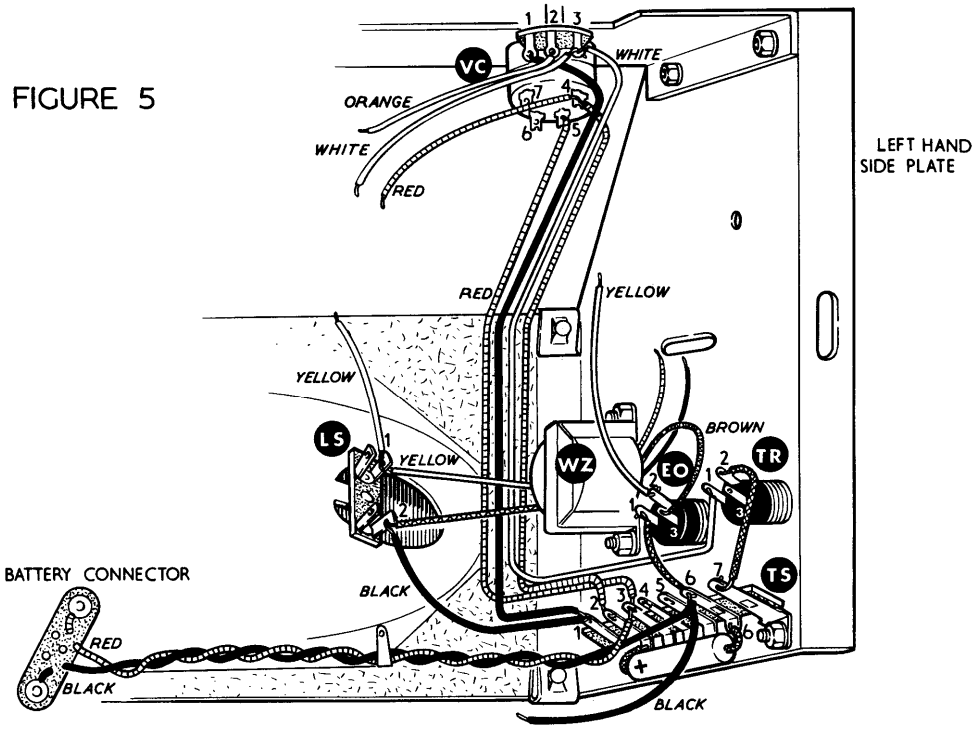
SUPPLY AND OUTPUT SOCKET WIRING

Refer to Pictorial 1 and Figure 5 for the following steps:

( ) Using bare wire and sleeving, connect a link between TS tag 7 (S-1) and TR tag 2 (S-1).

( ) Connect an 8" length of WHITE wire from TR tag 1 (S-1) to VC tag 3 (NS).

FIGURE 5



( ) Connect one end of a 5" length of WHITE wire to VC tag 3 (S-2).

( ) Connect one end of a $4\frac{1}{2}$" length of ORANGE wire to VC tag 2 (S-1).

( ) Connect the YELLOW wire from transformer WZ to LS tag 1 (NS).

( ) Connect one end of a 3" length of YELLOW wire to LS tag 1 (S-2).

( ) Using bare wire and sleeving, connect a link between EO tag 1 (S-1) and TS tag 6 (NS).

( ) Connect one end of a 4" length of YELLOW wire to EO tag 2 (S-1).

( ) Connect the GREEN wire from transformer WZ to LS tag 2 (NS).

( ) Connect the BROWN wire from transformer WZ to EO tag 3 (S-1).

( ) Connect a 3" length of BLACK wire from LS tag 2 (S-2) to TS tag 1 (NS).

( ) Connect a 7" length of BLACK wire from TS tag 1 (S-2) to VC tag 1 (S-2).

( ) Connect a 7" length of RED wire from VC tag 5 (S-1) to TS tag 3 (NS).

( ) Connect one end of a 4" length of RED wire to VC tag 4 (NS).

( ) Connect a 7" length of RED wire from VC tag 4 (S-2) to TS tag 2 (S-1).

( ) Connect the RED lead of the battery connector to TS tag 3 (S-2).

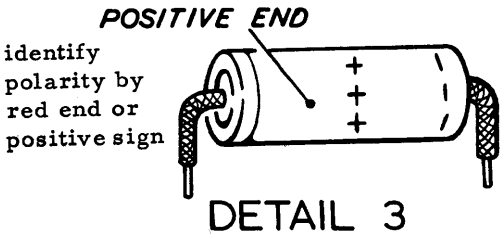
( ) Connect the BLACK lead of the battery connector to TS tag 6 (NS).

( ) Connect one end of a 4" length of BLACK wire to TS tag 6 (S-3). Be sure all three wires are soldered.

( ) Tape the wires between VC and TS as shown.

( ) Dress the battery connector leads along the bottom edge of the loudspeaker and clamp in position by carefully bending back the 4BA tags.

( ) Cut the wire ends of a 200 μF electrolytic capacitor to $\frac{3}{4}$" and, using $\frac{1}{2}$" length of sleeving at each end, connect the positive end (+) (see Detail 3) to the bottom tag of TS2 (S-1). Connect the other end to the bottom tag of TS6 (S-1).



DETAIL 3

Lay the chassis aside until required later.

CIRCUIT BOARD ASSEMBLY (STAGE 1)

Refer to Pictorial 3 for the following steps:

Before proceeding with stage 1 of the circuit board assembly, carefully read Page 17 and the following notes.

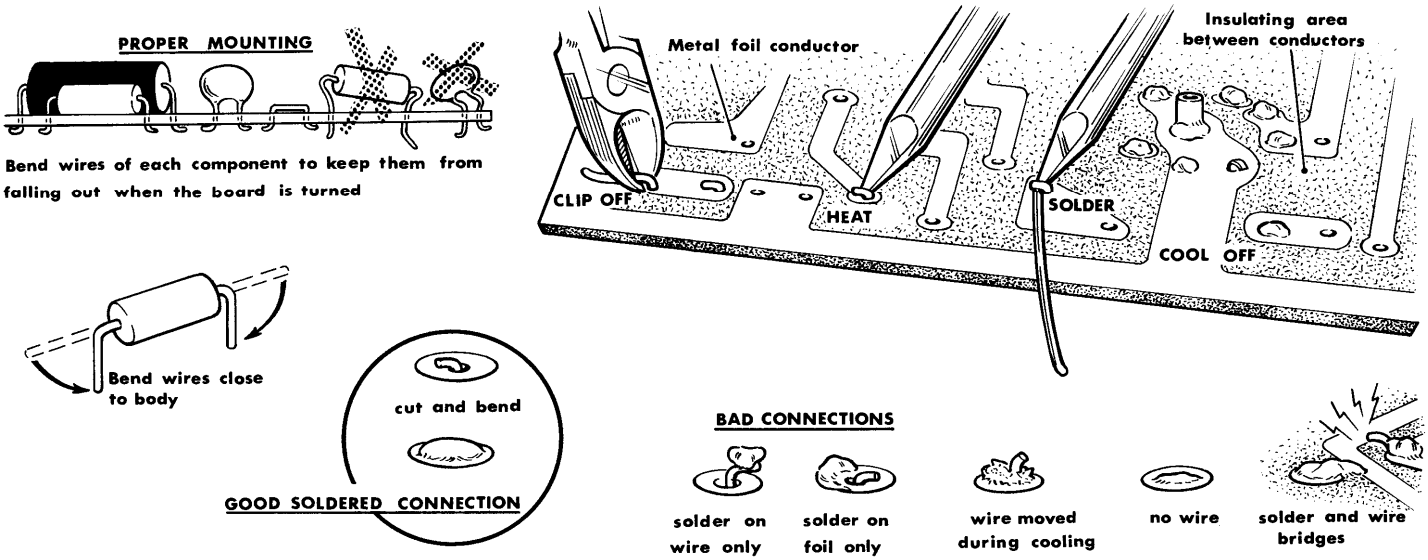
1. The resistors and capacitors supplied usually have their wire ends tinned with solder and should be lightly scraped before inserting them in the circuit board to ensure that they are clean. Use a pen knife for this operation.

2. The disc capacitors supplied may be colour coded as shown in Figure 6 or actually marked with the capacity value.

3. Use the thin gauge solder for all circuit board connections.

4. The electrolytic capacitors must be connected with their positive (+) ends to the positive sign on the circuit board. Figure 7 shows how the positive end is marked.

Continue with the steps shown on Pictorial 3.



CIRCUIT BOARD WIRING AND SOLDERING

Before attempting any work on the circuit board, read the following instructions carefully and study the figures shown. The observation of a few basic precautions will ensure proper operation of the unit when first switched on.

Proper mounting of components on the board is essential for good performance. A good general rule to follow is that all components on the board should be mounted tightly to the board, unless instructions state otherwise. All wires should be kept as short as possible to minimize the effects of stray capacity in the wiring. Proper and improper methods of mounting are illustrated in the accompanying Figures. Tubular capacitors and resistors will fit properly if their wires are bent as shown. Disc capacitors will generally fit in place with no lead preparation other than determining that the leads are straight. Components with tags normally require no preparation unless the tags are bent, in which case they can be straightened with a pair of pliers. Parts should be inserted as instructed, and the leads bent outward to retain in position. Each lead is then cut about 1/8" from the board and dressed flat against the foil, making sure that it does not extend beyond the conductor area.

The technique of soldering leads to a circuit board is quite simple. Position the tip of the soldering iron so that it firmly contacts both the circuit board foil and the wire or tag to be soldered as shown. Then the solder should immediately be placed between the iron and the joint to be soldered. Hold the tip of the iron in place until the solder has "wetted" both the component lead and the foil pattern on the board. Apply more solder if necessary and allow it to flow smoothly over both surfaces and when this is achieved, quickly remove the iron. Sufficient solder must be used to surround and adhere to a component lead on all sides but the possibility of an unwanted bridge between adjacent conductor areas whether by solder or an excessively long component lead must not be overlooked. It is important that no movement should occur during cooling off, otherwise a "cold joint" will occur which will sooner or later give trouble.

A soldering iron of 20 to 30 watts is ideal and in general such irons cannot damage the board due to overheating. If however, a higher wattage iron is used, it is important to remove it as soon as a satisfactory flow of solder is achieved.

After soldering a group of components each and every joint must be carefully examined to ensure that no joint is overlooked and by comparing with the figures above, that no solder bridges, dry, cold or otherwise imperfect joints have been made. This is very important as a higher percentage of failures occur for these reasons than for any others.

If solder is accidentally bridged across insulating areas between conductors, it can be cleaned off by heating the connection carefully and quickly wiping the solder away with a soft cloth. Holes which become plugged can be cleared by heating the area immediately over the hole while gently pushing the lead of a resistor through the hole from the opposite side, and withdrawing the lead before the solder rehardens. Do not force the wire through; too much pressure before the solder has time to soften may separate the foil from the board. In cases where foil becomes damaged, a break in the foil can be rejoined with a small piece of bare wire soldered across the gap, or between the foil and the lead of a component.

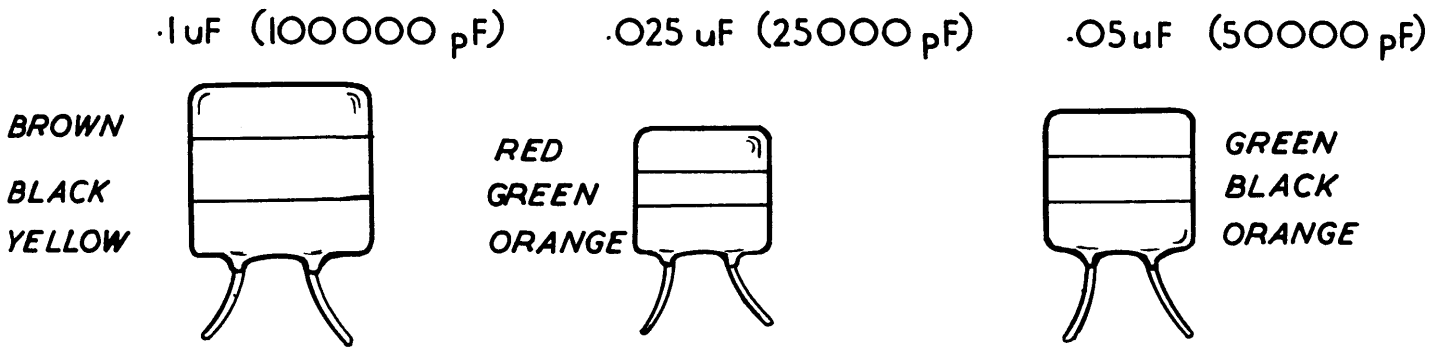


FIGURE 6

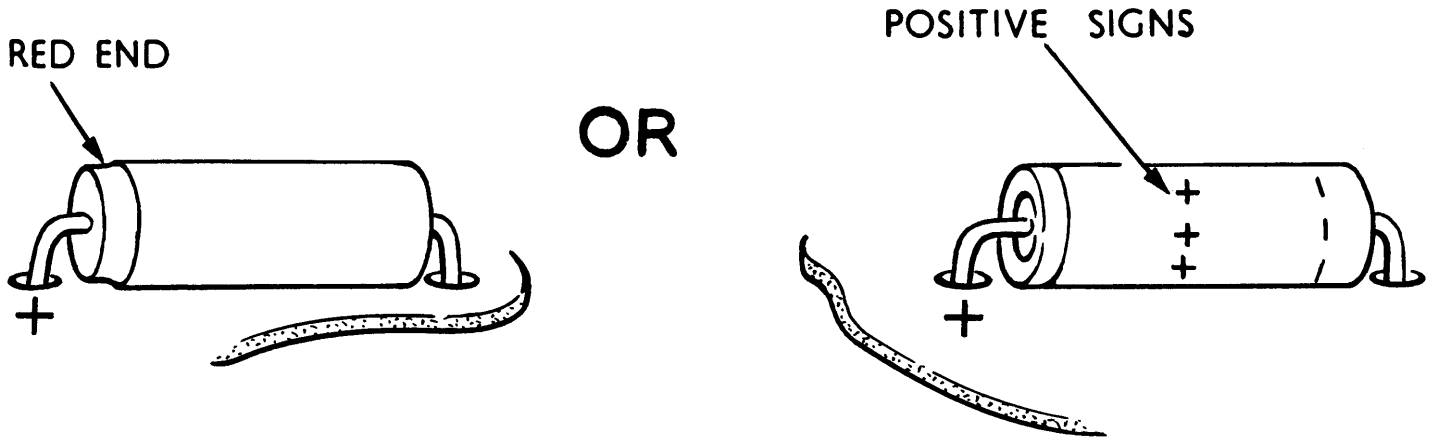
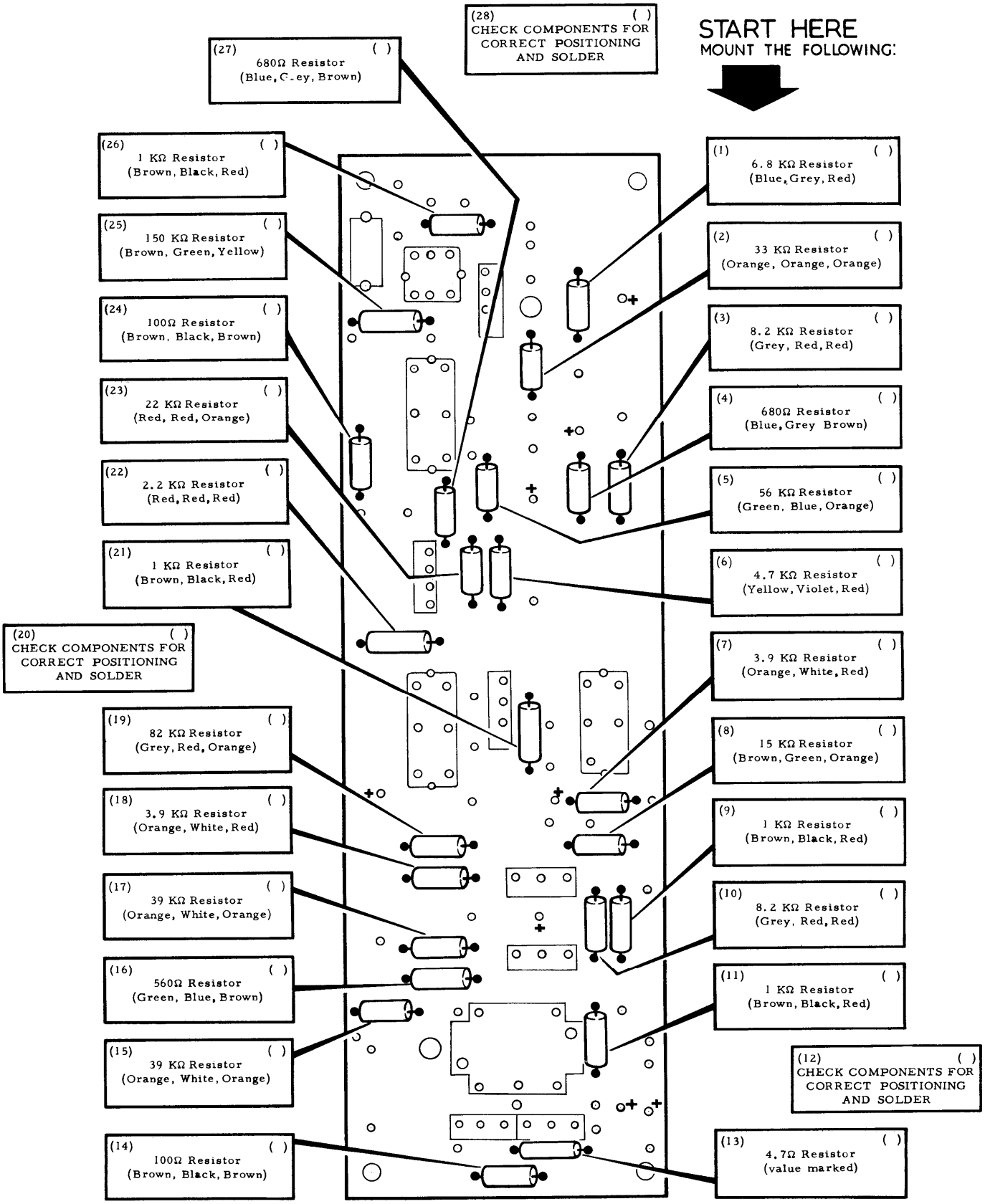
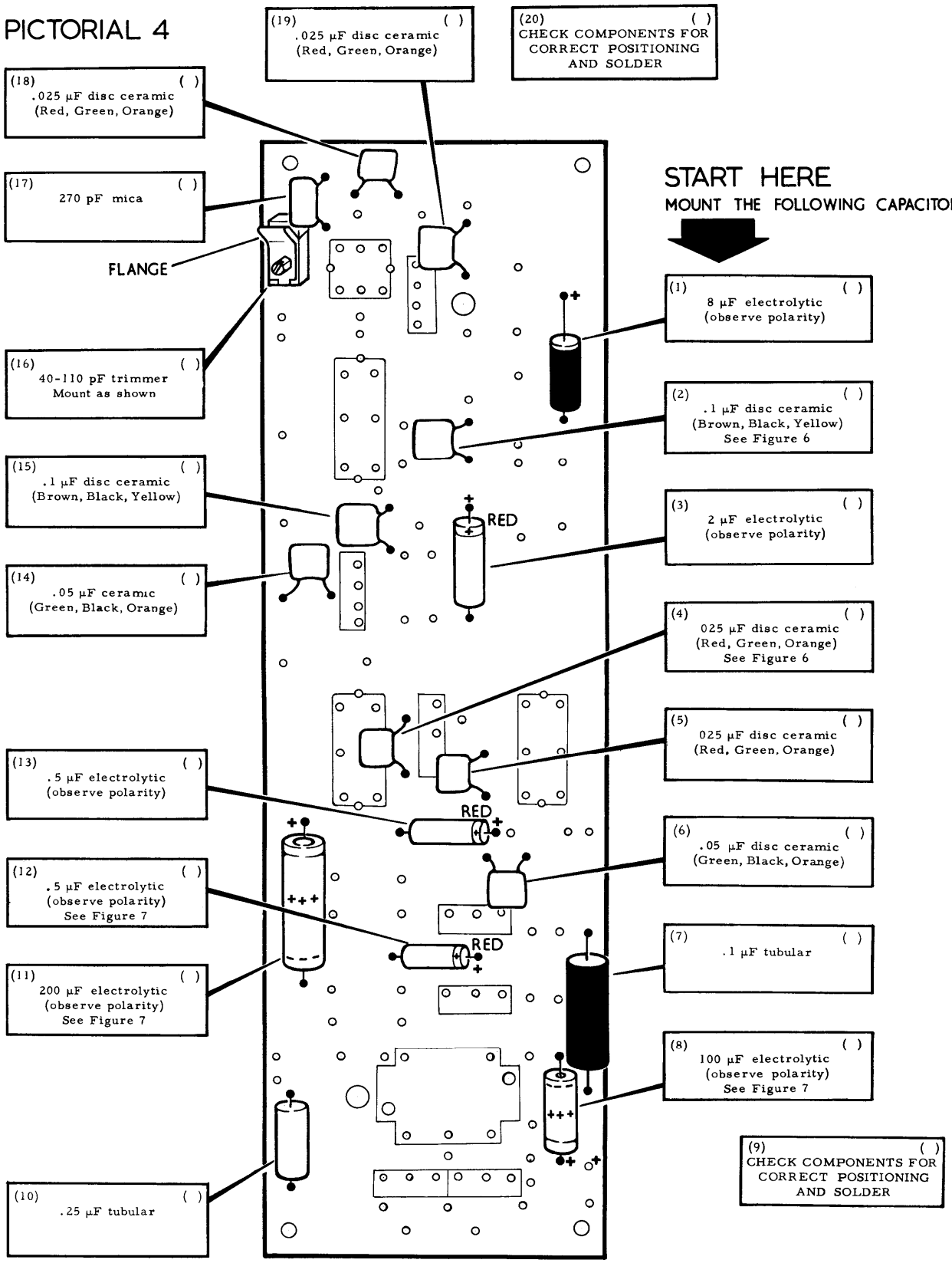


FIGURE 7


START HERE
MOUNT THE FOLLOWING:
(28) ( ) CHECK COMPONENTS FOR CORRECT POSITIONING AND SOLDER
(27) ( ) 680Ω Resistor (Blue, Grey, Brown)
(26) ( ) 1 KΩ Resistor (Brown, Black, Red)
(25) ( ) 150 KΩ Resistor (Brown, Green, Yellow)
(24) ( ) 100Ω Resistor (Brown, Black, Brown)
(23) ( ) 22 KΩ Resistor (Red, Red, Orange)
(22) ( ) 2.2 KΩ Resistor (Red, Red, Red)
(21) ( ) 1 KΩ Resistor (Brown, Black, Red)
(20) ( ) CHECK COMPONENTS FOR CORRECT POSITIONING AND SOLDER
(19) ( ) 82 KΩ Resistor (Grey, Red, Orange)
(18) ( ) 3.9 KΩ Resistor (Orange, White, Red)
(17) ( ) 39 KΩ Resistor (Orange, White, Orange)
(16) ( ) 560Ω Resistor (Green, Blue, Brown)
(15) ( ) 39 KΩ Resistor (Orange, White, Orange)
(14) ( ) 100Ω Resistor (Brown, Black, Brown)
(1) ( ) 6.8 KΩ Resistor (Blue, Grey, Red)
(2) ( ) 33 KΩ Resistor (Orange, Orange, Orange)
(3) ( ) 8.2 KΩ Resistor (Grey, Red, Red)
(4) ( ) 680Ω Resistor (Blue, Grey Brown)
(5) ( ) 56 KΩ Resistor (Green, Blue, Orange)
(6) ( ) 4.7 KΩ Resistor (Yellow, Violet, Red)
(7) ( ) 3.9 KΩ Resistor (Orange, White, Red)
(8) ( ) 15 KΩ Resistor (Brown, Green, Orange)
(9) ( ) 1 KΩ Resistor (Brown, Black, Red)
(10) ( ) 8.2 KΩ Resistor (Grey, Red, Red)
(11) ( ) 1 KΩ Resistor (Brown, Black, Red)
(12) ( ) CHECK COMPONENTS FOR CORRECT POSITIONING AND SOLDER
(13) ( ) 4.7Ω Resistor (value marked)

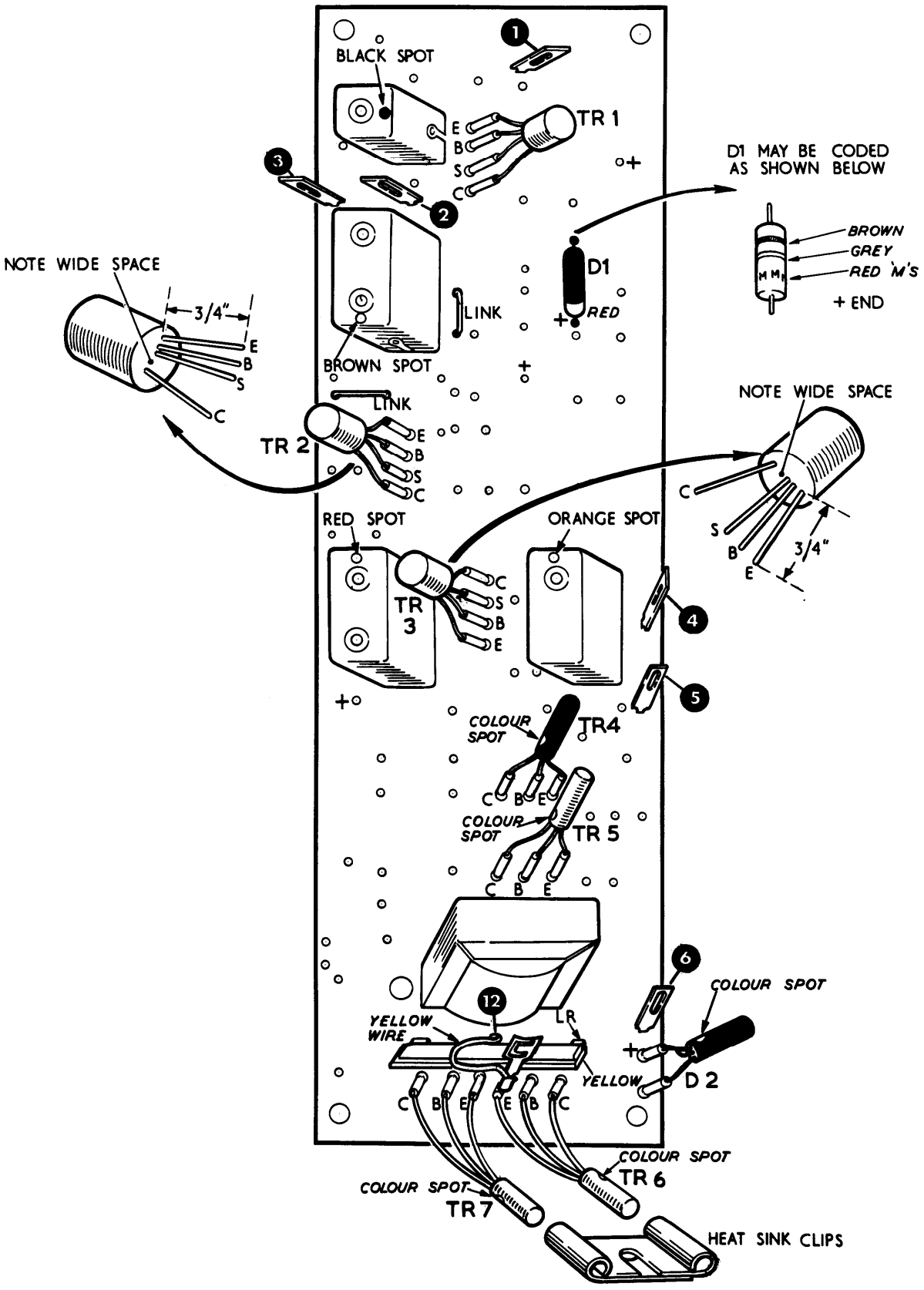
PICTORIAL 3

PICTORIAL 4



CIRCUIT BOARD ASSEMBLY (STAGE 2)

Continue with the steps as shown on Pictorial 4.


BLACK SPOT
TR 1
E
B
S
C
D1 MAY BE CODED AS SHOWN BELOW
BROWN
GREY
RED M'S
+ END
D1
RED
LINK
NOTE WIDE SPACE
3/4"
BROWN SPOT
LINK
TR 2
NOTE WIDE SPACE
RED SPOT
ORANGE SPOT
TR 3
3/4"
COLOUR SPOT
TR4
COLOUR SPOT
TR 5
YELLOW WIRE
YELLOW
COLOUR SPOT
D 2
COLOUR SPOT
TR 6
COLOUR SPOT
TR 7
HEAT SINK CLIPS

PICTORIAL 5

CIRCUIT BOARD ASSEMBLY (STAGE 3)

Refer to Pictorial 5 for the following steps:

( ) Insert spills in the circuit board at transistor locations TR1, TR2, TR3, TR4, TR5, TR6, TR7 and diode D2 (total: 26 spills). Squeeze spills after inserting as shown in Figure 8 to prevent them falling out when soldering.

( ) Solder the 26 spill locations on the foil side of the circuit board.

( ) Insert and solder a printed circuit solder tag at hole locations 1, 2, 3, 4, 5 and 6.

( ) Insert and solder the wire ends of the OA81 diode at location D1 with RED positive to + sign on circuit board. Use a pair of pliers as a heat shunt as shown in Figure 10. NOTE: The diode may be colour coded as shown.

( ) Take the 200Ω pre-set resistor and note that this must be connected to the circuit board the correct way round. See Figure 9.

( ) Mount the 200Ω pre-set resistor with the coded YELLOW tag end connected to circuit board reference LR. Solder each tag.

( ) Connect one end of a 2" length of YELLOW wire from CB12 (S-1) to the top slider tag (S-1), see Figure 9.

IMPORTANT NOTE: When locating the following coil and transformers in the circuit board, be sure that they are inserted the correct way round. The coloured spot marked on the top of the aluminium can and also at the tag base must coincide with the correct colour location marked on the circuit board.

( ) Insert the BLACK spot, oscillator coil, solder all pins and tags.

( ) Insert the BROWN spot, 1st IF transformer, solder all pins and tags.

( ) Insert the RED spot, 2nd IF transformer, solder all pins and tags.

( ) Insert the ORANGE spot, 3rd IF transformer, solder all pins and tags.

( ) Insert the driver transformer T1, solder the five small tags and two large shroud tags. Cut off surplus wire from the five small tags only.

( ) Using bare wire, connect and solder two links as shown near the BROWN spot IF transformer.

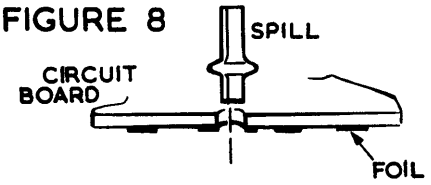
Mounting Transistors:

( ) Carefully shorten the four wire ends of the AF117 transistors (TR1, TR2, TR3) to $\frac{3}{4}$" as shown.

Method of Mounting:

Insert the transistor wire ends in line, in the top of each spill, then solder each wire and spill using a pair of pliers as a heat shunt as shown in Figure 10. Be sure they are positioned the correct way round before soldering.

FIGURE 8



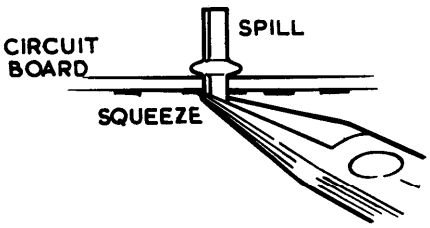
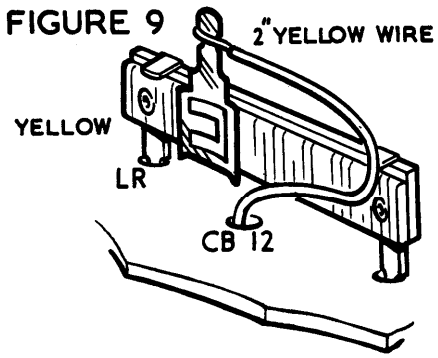


FIGURE 9



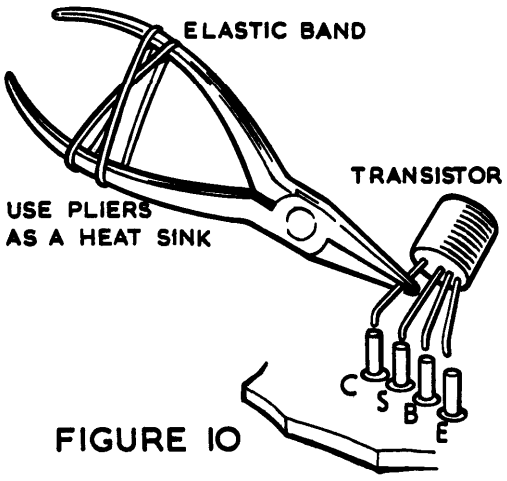
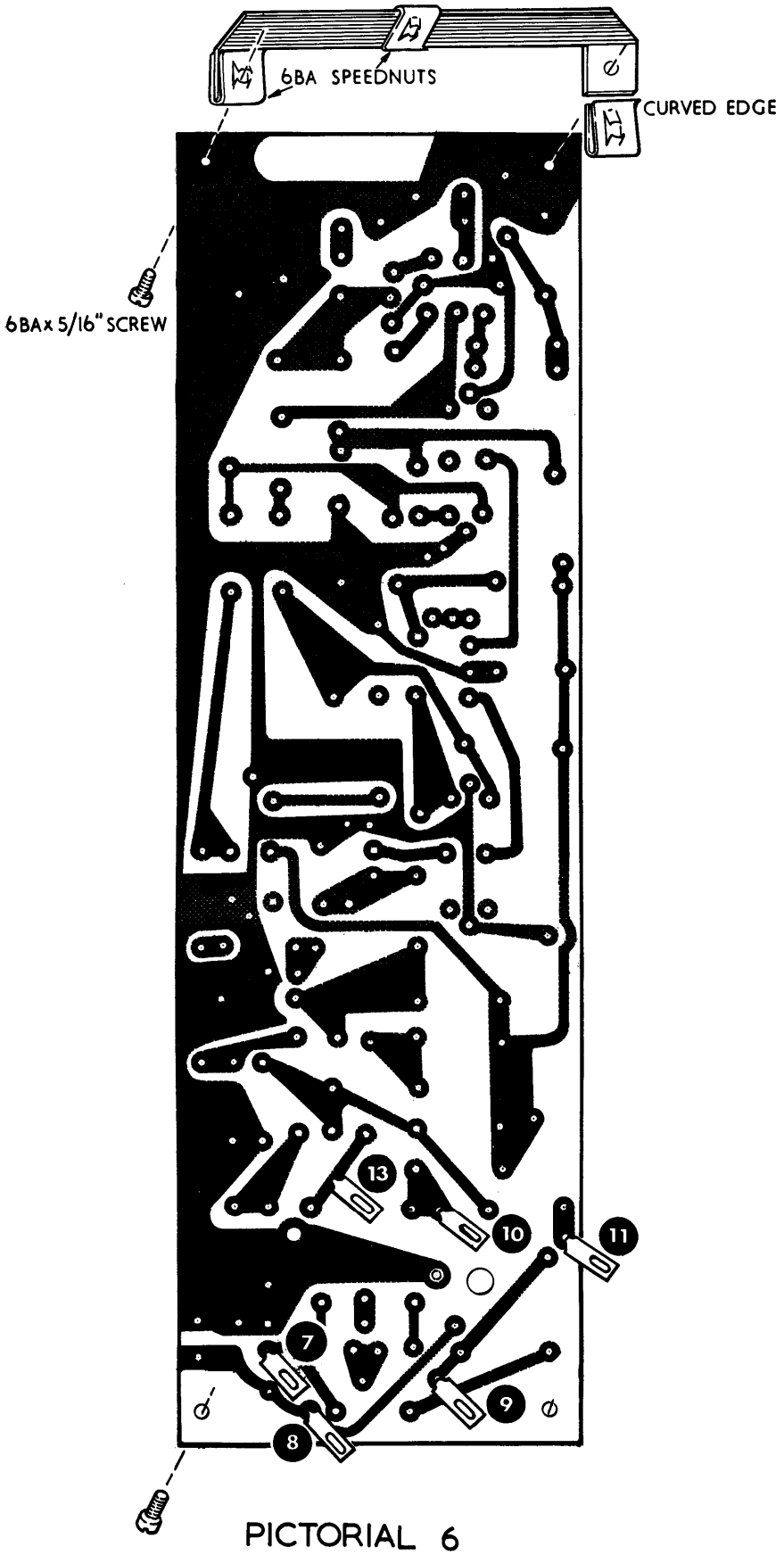


FIGURE 10



PICTORIAL 6

( ) Insert and solder the AF117 transistors in locations TR1, TR2 and TR3. The wire furthest from the other three is the collector, marked C on the circuit board.

( ) Cut the wire ends of the OC71 and OC81D (BLUE spot on top) transistors to 5/8" long.

( ) Insert and solder the OC71 transistor (TR4) with the wire nearest the RED spot connected to spill C.

( ) Insert and solder the OC81D transistor (TR5) with the wire nearest the RED spot connected to spill C.

( ) Take the matched pair of OC81 transistors (TR6 and TR7) and fit a 1¼" length of sleeving over each wire. Slightly bend the protruding wire ends to prevent the sleeving slipping off.

( ) Insert and solder an OC81 transistor at locations TR6 and TR7 with the wire nearest the RED spot connected to spill C.

( ) Insert and solder the AA129 diode at location D2 with the wire nearest the RED spot connected to the spill marked +.

NOTE: The clips used in the following step will be a tight fit on the transistors. This is necessary to provide maximum heat dissipation when working. The clips will fit more easily if the inside is smeared with petroleum jelly.

( ) Position the clips as shown and push on flush with the end of the transistor.

CIRCUIT BOARD ASSEMBLY (STAGE 4)

Refer to Pictorials 5 and 6 for the following steps:

( ) On the foil side of board insert and solder a printed circuit solder tag in hole locations 7, 8, 9, 10, 11 and 13. The hole number reference will be found printed on the component side.

( ) Take the two circuit board mounting brackets and clip on three 6BA speednuts to each bracket with the flat sides as shown.

( ) Mount a bracket at each end with two 6BA x ¼" screws. DO NOT FULLY TIGHTEN.

MOUNTING AND WIRING CIRCUIT BOARD TO CHASSIS

Refer to Pictorial 7 for the following steps:

( ) Slide the circuit board in position and align the 6BA speednuts with the slot on each side plate. Start a 6BA x ¼" screw in each end but do not fully tighten.

( ) Tighten the four 6BA screws in the brackets. The circuit board should now be free to partially rotate, this will allow easy access when making the following connections.

( ) Connect the GREY wire from MW tag 20 to circuit board CB tag 1 (S-1).

( ) Connect the BLUE wire from TC tag 4 to CB tag 2 (S-1).

( ) Connect the WHITE wire from LW tag 9 to CB tag 3 (S-1). Ensure this wire is routed as shown.

NOTE: Make the following connections from the front of the receiver.

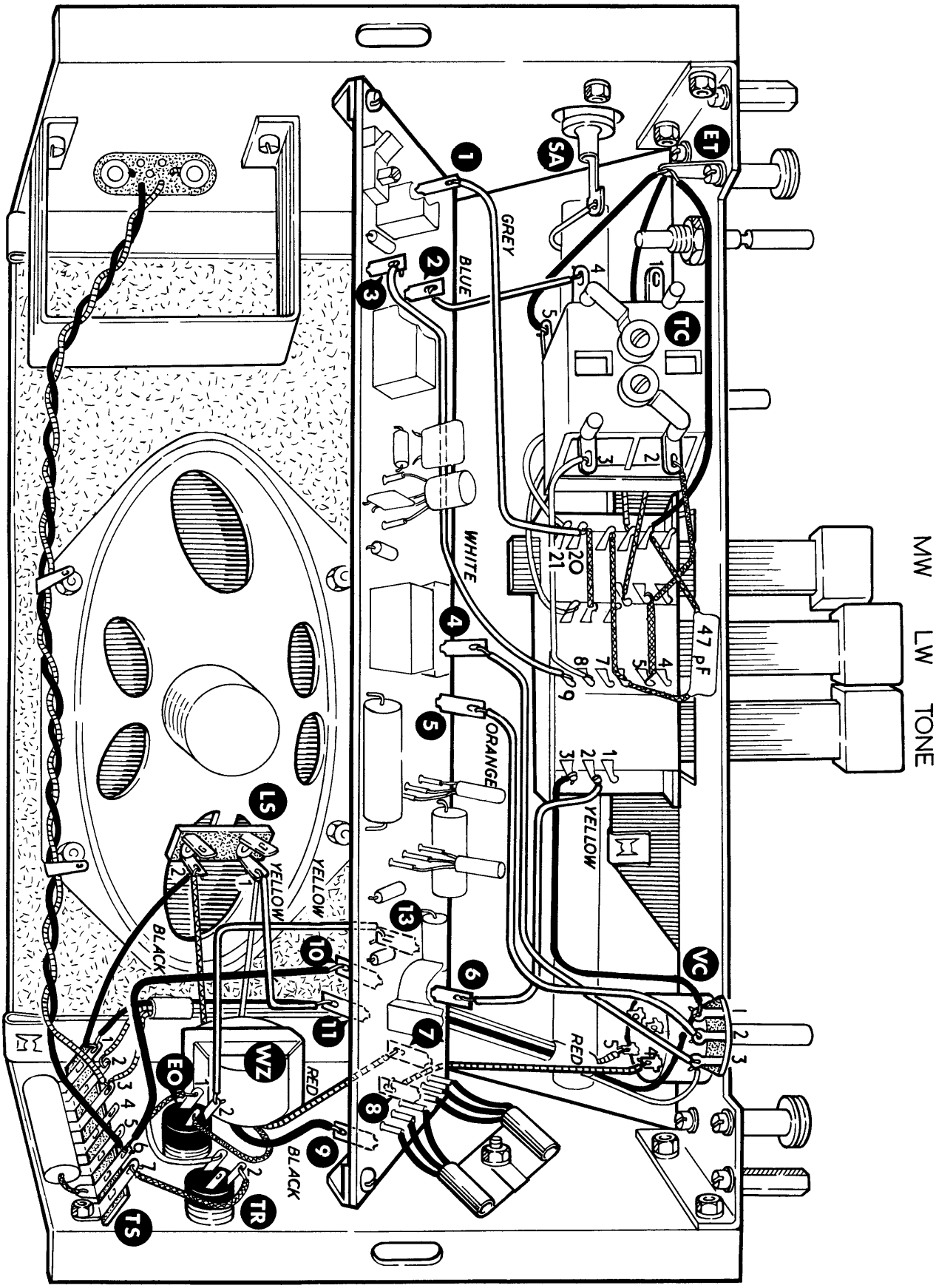
( ) Connect the ORANGE wire from VC tag 2 to CB tag 5 (S-1).

( ) Connect the WHITE wire from VC tag 3 to CB tag 4 (S-1).

( ) Connect the YELLOW wire from TONE tag 2 to CB tag 6 (S-1).

NOTE: The following six wires are connected to the solder tags previously soldered on the metal foil side of the circuit board.

( ) Connect the RED wire from transformer WZ to CB tag 7 (S-1).



PICTORIAL 7 (FINAL ASSEMBLY)

( ) Connect the BLACK wire from transformer WZ to CB tag 9 (S-1).

( ) Connect the YELLOW wire from socket EO tag 2 to CB tag 13 (S-1).

( ) Connect the RED wire from VC tag 4 to CB tag 8 (S-1).

( ) Connect the BLACK wire from TS tag 6 to CB tag 10 (S-1).

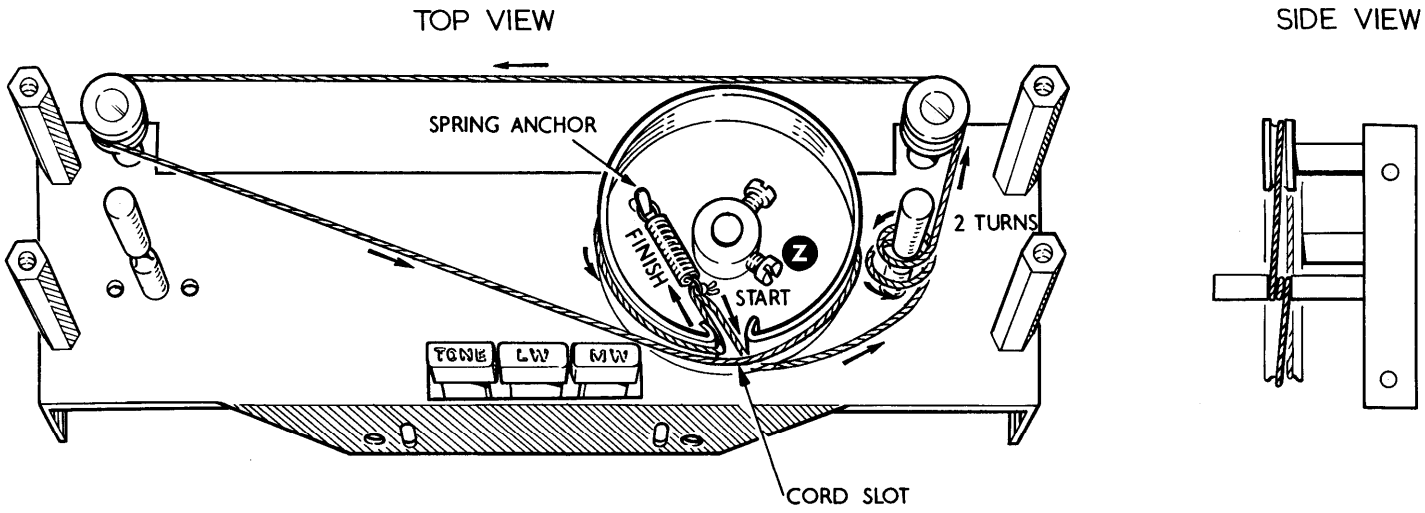
( ) Connect the YELLOW wire from LS tag 1 to CB tag 11 (S-1).

( ) Check the connections made in the last five steps.

( ) Secure the transistor heat sink clips to the left-hand side plate with a 6BA x $\frac{1}{4}$" screw, lockwasher and nut.

DIAL CORD ASSEMBLY

Refer to Pictorial 8 for the following steps:



PICTORIAL 8

( ) Turn the shaft of the tuning capacitor fully anti-clockwise (vanes out of mesh) retain this position and fit the dial drum with the cord slot as shown. Tighten the 4BA screws.

( ) Take the dial cord and tie temporarily to the drum locking screw at location Z leaving approximately 3" free.

( ) Fit the dial cord in the following sequence:-

(1) Route the dial cord in the direction of arrows with two turns around the groove of the drive shaft.

(2) Whilst maintaining tension of the free end, remove the other end from the screw.

(3) Now insert both ends through the correct end of the dial spring, (see Figure 11) and tie a double knot approximately 3/8" from the cord slot.

(4) Hook the other end of spring on the anchor tag on the drum.

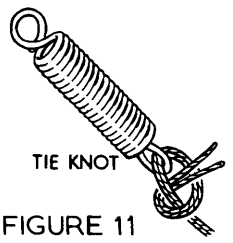
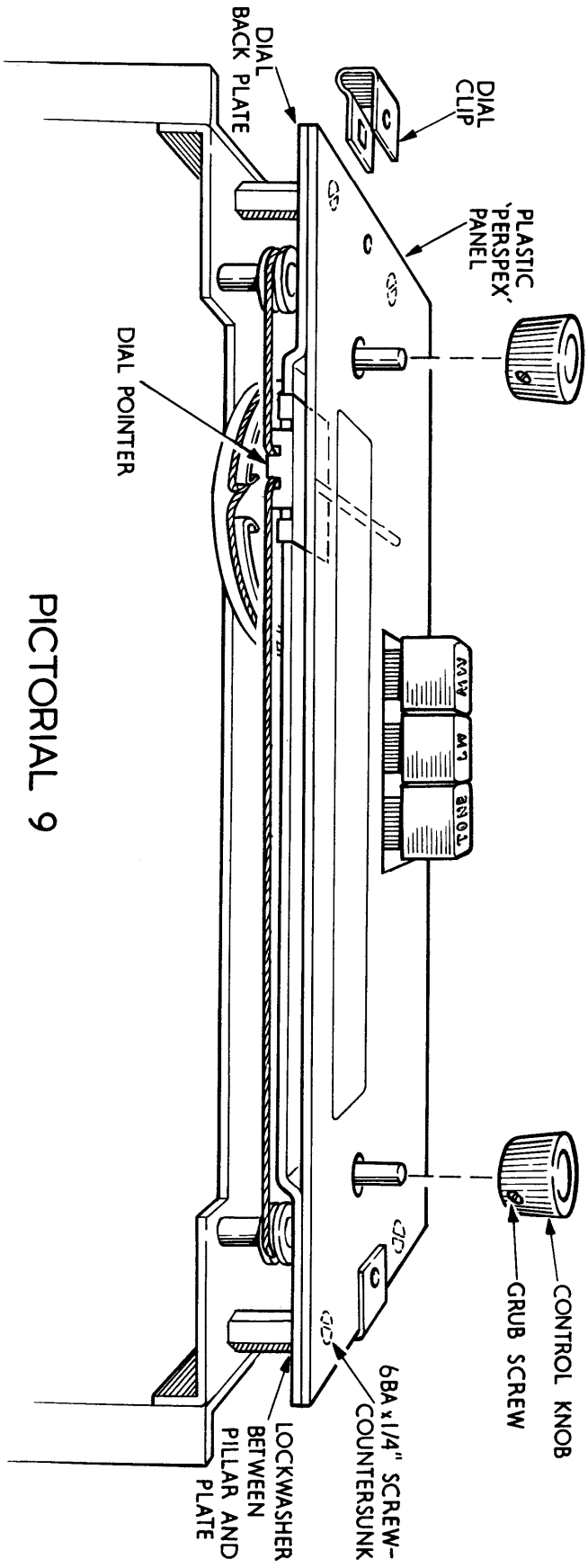


FIGURE 11

( ) Turn the drive shaft clockwise approximately 7 turns. This should close the vanes of the tuning capacitor.


DIAL BACK PLATE
DIAL CLIP
PLASTIC 'PERSPEX' PANEL
DIAL POINTER
MW
LW
GRAM
CONTROL KNOB
GRUB SCREW
6BA x 1/4" SCREW-COUNTERSUNK
LOCKWASHER BETWEEN PILLAR AND PLATE

PICTORIAL 9

DIAL ASSEMBLY

Refer to Pictorial 9 for the following steps:

( ) Place the dial back plate (painted face uppermost) on the 6BA pillars. Secure with four 6BA x $\frac{1}{4}$" countersunk head screws with lockwashers placed between pillars and plate.

( ) Place the 'perspex' dial on the back plate and secure with a dial clip at each end as shown.

( ) With the tuning capacitor's vanes fully closed, set the dial pointer to 555 metres (medium wave scale) and loop the dial cord in the slots as shown in Figure 12.

( ) Temporarily fit a control knob on the tuning and volume control shafts and tighten the grub screws.

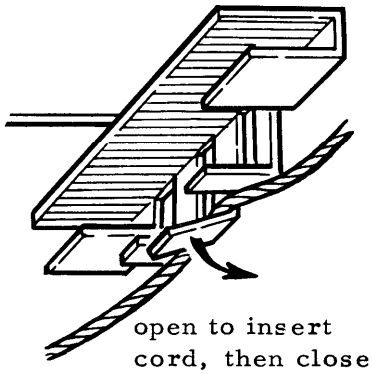


FIGURE 12

PREPARATION OF LEATHER CASE

Refer to Pictorial 10 for the following steps:

( ) If necessary, straighten the ten wire tabs on the metal dial trim.

( ) Insert the wire tabs of the dial trim through the small holes on the top of the case and bend the wire tabs flat against the inside.

( ) Clip on a 4BA speednut to the chassis mounting brackets attached to the inside of the case.

Before fitting the chassis to case, proceed to the section INITIAL ADJUSTMENT AND TEST.

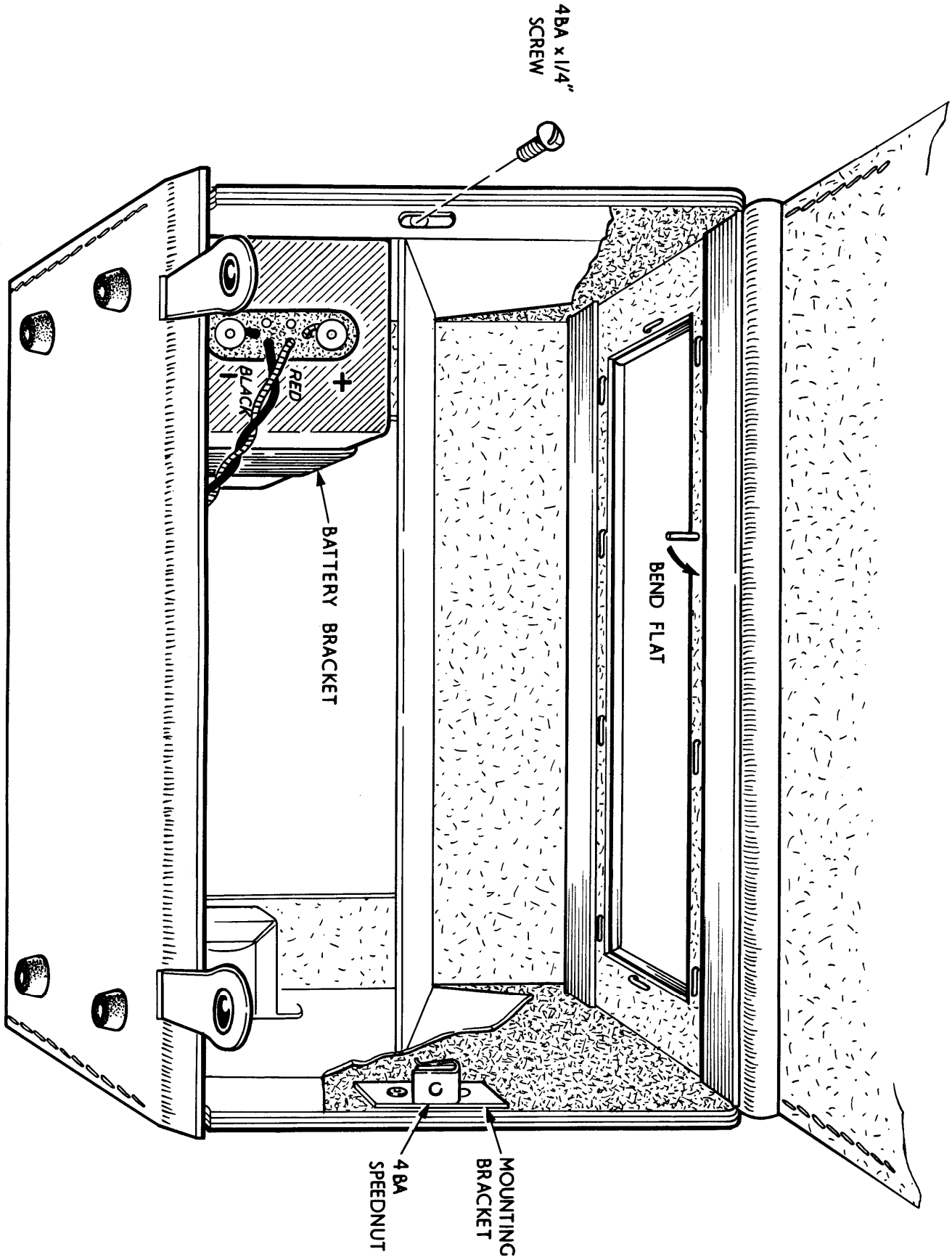
IMPORTANT NOTE: In the unfortunate event of your UXR-2 being stolen, it is of assistance to the police that the receiver can be positively identified. We would suggest therefore that you record the serial number of the licence plate which is attached to the chassis of the receiver. As it is possible however, to remove the licence plate, we would suggest that you also make some additional identification mark.

( ) Remove the control knobs.

( ) Lay the leather case front face down on your work bench. Open the back flap and carefully lower the completed chassis in the case, first allowing the knob shafts to enter the dial aperture.

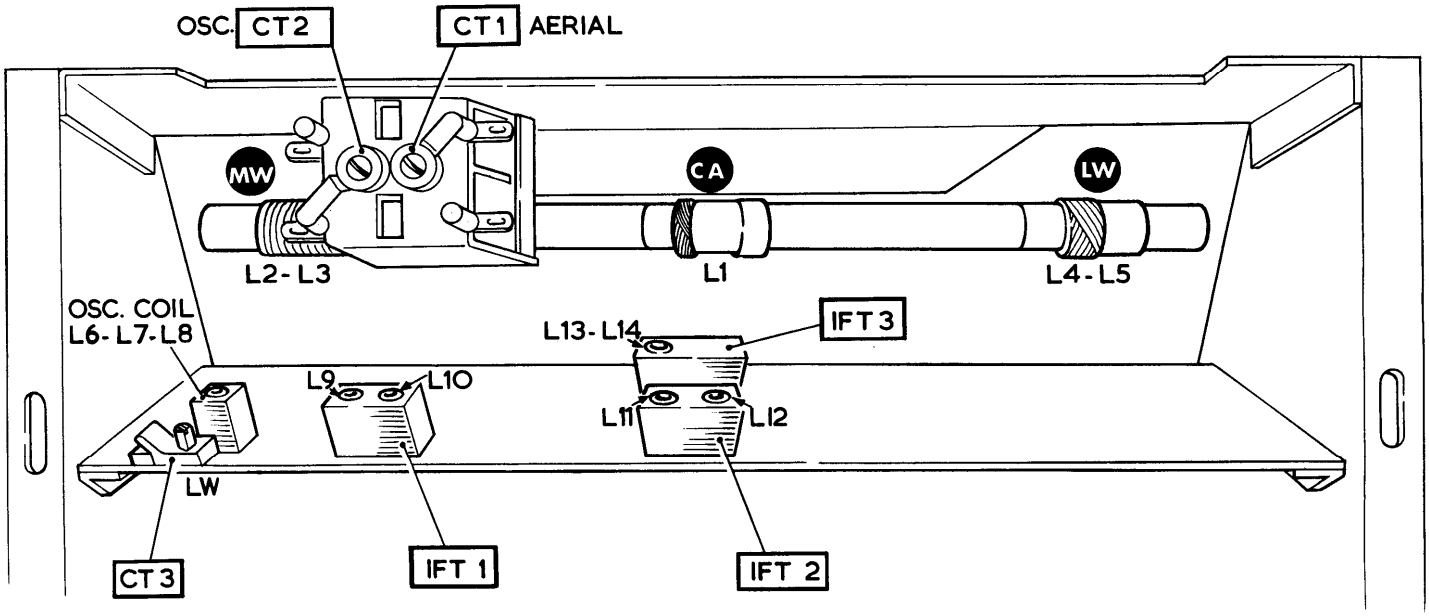
( ) Secure with a 4BA x $\frac{1}{4}$" screw inserted in the slot of each side plate.

( ) Replace the control knobs.



PICTORIAL 10

INITIAL ADJUSTMENT AND TEST



PICTORIAL 11

Refer to Pictorial 11 for the following steps:

The coils and transformers supplied are pre-aligned, however, the following adjustments may be required to obtain optimum performance.

( ) Turn the volume control to the fully anti-clockwise position i.e. receiver switched off and insert a 9 volt battery (Ever Ready PP9, Drydex DT9 or equivalent) in the battery bracket. Observe polarity and snap on the battery connector.

( ) Start with trimmers CT1, CT2 and CT3 in their fully clockwise or fully compressed positions. DO NOT overtighten CT1 and CT2 as this will break the ceramic washers. Unscrew as follows:- CT1 - $\frac{3}{4}$ of a turn, CT2 - $\frac{1}{2}$ a turn and CT3 - $\frac{1}{2}$ a turn.

( ) Press the MW (medium-wave) button and turn the volume control knob to the fully clockwise position.

( ) Traverse the dial pointer over the medium waveband by turning the tuning knob. It should be possible to 'tune in' at least a number of local stations. If no stations are heard, refer to the section IN CASE OF DIFFICULTY.

IF AMPLIFIER ALIGNMENT

The following procedure will adjust the IF amplifier circuits for maximum output. It should not be necessary to turn the cores by more than $\frac{1}{2}$ a turn in either direction.

( ) Tune to any weak station on the medium waveband near 200 metres.

( ) Using the trimmer tool provided, carefully adjust in the following sequence, the cores of IFT3 (L13 and L14), IFT2 (L11 and L12) and IFT1 (L9 and L10) for maximum output.

MW ALIGNMENT

The following procedure will adjust the RF circuits for maximum output and the local oscillator for correct dial alignment.

( ) Tune to a station of known wavelength near 500 metres (600 Kc/s) and note how far the dial pointer is from this wavelength as indicated on the dial.

( ) Move the dial pointer slightly towards the correct indicated wavelength by turning the tuning knob. Adjust the core of L8 until the same known station is heard again. The direction in which the core is turned depends on whether the known station is tuning higher or lower than the indicated wavelength. If higher, turn the core anti-clockwise, if lower, turn the core clockwise.

( ) Repeat the above step until the correct wavelength is indicated.

( ) With the receiver still tuned to the same station, slide the MW coil along the rod in the direction which gives maximum output.

( ) Tune to a weak station of known wavelength near 200 metres (1500 Kc/s) and note how far the dial pointer is from this wavelength.

( ) Move the dial pointer slightly towards the correct indicated wavelength by turning the tuning knob. Adjust trimmer CT2 until the same known station is heard again.

( ) Repeat the above step until the correct wavelength is indicated.

( ) With receiver tuned to the same station, adjust trimmer CT1 for maximum output.

( ) Repeat the last eight steps to obtain possible further improvement.

LW ALIGNMENT

( ) Press the LW button and tune to a station of known wavelength near 1500 metres (200 Kc/s) and note how far the dial pointer is from this wavelength.

( ) At the same time move the dial pointer and adjust the LW trimmer CT3 until the correct wavelength is indicated.

( ) Tune to a known station near 1800 metres (167 Kc/s) and slide the LW coil (L4/L5) along the rod in the direction which gives maximum output.

( ) Fully tighten the two screws securing the circuit board brackets to the side plates.

ALIGNMENT WITH TEST EQUIPMENT

The following procedure is provided for those who have the necessary test equipment i.e. R.F. Signal Generator, Power Output Meter or A.C. Voltmeter.

( ) Connect the leads of an output meter of 3 ohms impedance (switch out the internal resistance of the Output Meter) or the leads of an A.C. Voltmeter across the speaker tags.

( ) Inject a signal of 470 Kc/s (30% modulation, 400-1000 c/s) to the base of TR1 via a .1 μF capacitor.

( ) Adjust the cores of L13/L14, L11/L12 and L9/L10 for maximum output, in this sequence.

R.F. ALIGNMENT

( ) Connect a single wire loop (approximately 6" diameter) to the output leads of the signal generator and place this loop near to the ferrite rod aerial.

( ) Use the same procedure as that provided under MW and LW ALIGNMENT. Keep the output from the generator as low as possible to prevent AVC action masking the true peak.

NOTE: RV2 has been factory pre-set to give a total quiescent current (no signal) of between 11 and 13 mA at an ambient temperature at 20°C with a 9v battery.

IN CASE OF DIFFICULTY

Visual Check.

1. Recheck the wiring. It is frequently helpful to have a friend check your work. Someone who is not familiar with the receiver may notice a mistake or bad joint which has been consistently overlooked by the constructor.

2. Check that all transistors are connected the correct way round.

3. Check the values of component parts, particularly resistors and capacitors for correct values in the correct places.

4. Check for bits of solder or wire ends which may be lodged in the wiring.

5. Check the printed circuit board for solder bridges and poor solder connections.

6. If after careful visual checks, the trouble is still not located and a voltmeter is available, check the voltage readings against those provided in the Voltage Chart on Page 33.

FAULT FINDING CHART

CONDITION	POSSIBLE CAUSE
Receiver completely dead	1. Faulty battery. 2. ON/OFF switch faulty. 3. Transistors TR4 to TR7 faulty or incorrectly connected. 4. Open circuit winding on T1 or T2. 5. Open circuit earphone jack. 6. C19 or C22 open circuit.
Slight hiss from speaker, but no station received.	1. Open circuit windings in L2 to L14. 2. Transistors TR1, TR2 or TR3 faulty or incorrectly connected. 3. Rotor vanes shorted to stator vanes on VC1 or VC2.
Excessive distortion and/or low sensitivity.	1. Low battery voltage. 2. Improper alignment. 3. Faulty detector diode D3. 4. Polarity reversed or leaky electrolytic capacitor. 5. Faulty matched pair of output transistors TR6 and TR7.

POINT TO POINT DISTURBANCE TEST

If after making visual checks the receiver still does not perform properly, the following simple point to point checks can be used to locate the stage not functioning.

The procedure is to touch the blade of a small screwdriver to the base (b) and collector (c) leads of each transistor starting with TR5. One hand must touch the chassis and the other hand holding the screwdriver must actually touch the metal blade. There is no danger from an electric shock since the battery voltage is too low.

Switch the receiver on and turn the volume control fully clockwise. Touch the collector lead of TR5. A weak click should be heard from the loudspeaker. If not, it would indicate that TR6 or TR7 is faulty or a component in one or both of these stages is faulty.

If a click is heard at this point, proceed from collector to base of each transistor in the following sequence; TR4, TR3, TR2 and TR1. With a click at the collector but not at the base of any one transistor, it is more than likely that the transistor is faulty. However, if a click is heard at the base of one transistor but not heard at the collector of the preceding transistor, you should suspect that a component between the two transistors is faulty.

After locating in this manner the stage that fails to produce a click, carefully check all associated components for correct value and proper solder connections.

TRANSISTOR VOLTAGES

TRANSISTOR	Emitter	Base	Collector
TR1 AF117	1.1	1.2	6.7
TR2 AF117	0.8	1.0	4.8
TR3 AF117	1.0	1.1	6.8
TR4 OC71	0.9	0.9	4.0
TR5 OC81D	1.0	1.0	8.9
TR6 OC81	0.08	0.2	9.0
TR7 OC81	0.08	0.2	9.0

Test Conditions:
(1) All readings taken with a 20,000 ohms per volt meter with the positive lead connected directly to the battery positive. Voltages may vary ± 10% due to component tolerances.
(2) No signal input. Quiescent current 12 mA.

OPERATION

Operation of the UXR-2 Transistor Receiver is simple and conventional. Turn on the receiver, select the desired station and adjust the volume.

Because the antenna coil tends to give directional results, the receiver should be rotated to provide maximum volume of the desired station. In some instances this may prove helpful in reducing unwanted interference be careful positioning of the receiver. No pilot light is provided to indicate when the receiver is turned on because the light would consume about 10 times the power required by the receiver and severely reduce battery life. Make it a habit to turn off the receiver after use to obtain maximum battery economy.

Reception in cars, trains and aeroplanes is possible in most locations. It may be necessary to place the receiver near a window of the vehicle for best reception because the metal body will act as a shield against the reception of radio signals.

The batteries will normally provide 300 hours or more reception before requiring replacement. Signs of weak batteries are low volume, excessive distortion and failure to operate at some section of the dial.

It may be noticed that when tuning through a strong station on the LW band, an effect known as 'sideband splutter' may be heard. This will only be apparent with a new battery fitted, tone button depressed and with the volume control at or near maximum. This effect is normal and will not occur when the station is properly tuned.

ALWAYS REMOVE EXHAUSTED BATTERIES IMMEDIATELY. OLD BATTERIES MAY SWELL AND MAKE REMOVAL DIFFICULT, OR THEY MAY LEAK CHEMICAL COMPOUNDS THAT WOULD CORRODE THE CHASSIS. DO NOT STORE FOR EXTENDED PERIODS WITHOUT REMOVING THE BATTERIES. BE SURE TO OBSERVE BATTERY POLARITY WHEN REPLACING THE BATTERIES.

THE BATTERIES MUST BE INSTALLED EXACTLY AS SHOWN IN THE PICTORIAL. THE RECEIVER WILL NOT OPERATE AND POSSIBLE DAMAGE MAY RESULT THROUGH IMPROPER BATTERY POLARITY.

INTRODUCTION TO TRANSISTORS

Transistors have been one of the most important recent developments in the field of electronics. Although they have been available commercially for only a few years, they have already found application in every branch of the art. They can assume the duties of radio valves in many applications, and in such capacity they are employed in the Model UXR-2 Receiver.

Transistors possess many advantages over valves. Probably the one most apparent is their extremely small size, making possible the miniaturisation of equipment in which they are used. The Model UXR-2 Receiver does not take

full advantage of this fact, however, for several reasons. Firstly, the average kit constructor probably does not have the necessary facilities or experience to construct in confined spaces. Secondly, the size of the loudspeaker and space requirements of the battery, both desirable features as explained in the "Instrument Description" section, limit the minimum size of the cabinet. Thirdly, miniaturisation of all the components would only result in increased cost with no increase, and likely only a decrease, in the performance and economy of operation. Other advantages, however, make the use of transistors desirable as will be explained in the following paragraph.

Because of their small size, transistors possess very little mass or inertia. As a result they are not subject to the shock, vibration and microphonic faults of valves. Transistors do not contain a heater or filament, require no warm-up and consume no power which contributes nothing to useful audio output. Because no heat is generated within the cabinet, longer life can be expected from other components subject to deterioration from heat. Transistors operate on very low potential or voltage, measured in volts rather than tens or hundreds of volts as with valves. This makes battery operation very feasible and eliminates completely the shock hazard found in most valve equipment. Transistors have a very long life expectancy. Average life of transistors has not yet been definitely established simply due to lack of time to arrive at representative figures. Transistors have been in continuous operation for years without failure. Most failures are caused by improper use rather than by deficiencies in the basic design.

As with any good thing, there are also limitations to the capabilities of transistors. Primarily, these limitations involve power handling capabilities, high frequency limitations and extreme temperature limitations. None of these limitations are approached in their application in the UXR-2 Receiver. One precaution must be observed, however, the battery must be installed exactly as instructed or damage to the transistors may result. Also, it is essential never to remove or insert a transistor with the receiver turned "ON".

Because of their application in the UXR-2, it might be well to consider briefly the nature and construction of transistors. The material used in the fabrication of a transistor is a so-called semi-conductor. Germanium and silicon are two basic materials in common use today. All the transistors used in the UXR-2 are of the germanium type, although silicon transistors could be made to perform satisfactorily also. Stated simply, a transistor consists of a "sandwich" of various alloys of germanium. Three layers of the alloys form this sandwich. A connecting lead is attached to each of the layers and brought out for external connections.

It might be of interest to note here some of the production problems connected with the making of a transistor. The germanium must first be refined to an extremely high degree of purity. The rigid requirements would compare to allowing no more than one kernel of corn in several tons of wheat. The pure germanium is then "doped" with precisely controlled amounts of other elements to obtain the proper alloy necessary for transistor action. More will be said about the doping process later. The centre layer of "meat" of the sandwich may be only 1/1000 inch thick. This layer must be precisely located, and a wire attached. The entire process must be performed under "operating-room" clean conditions. Any contamination of the transistors may cause failure. The assembly is then hermetically sealed in a protective case, often with an inert compound to assist in conducting heat away from the assembly. Figure 13 shows a typical transistor assembly.

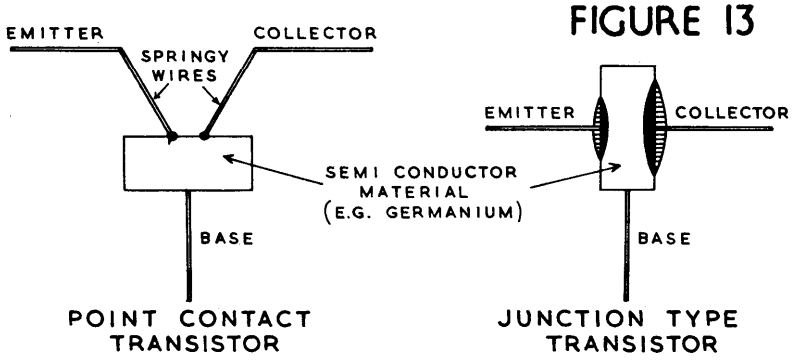
As mentioned before the germanium must be doped to obtain the characteristics needed for transistor action. Different materials are used to produce a "P" or "N" type germanium. "P" type germanium means that the pure metal has been modified so that there is an electron deficiency in the natural crystal structure, often referred to as a "hole". "N" type germanium means that an electron excess is created in the natural germanium crystal. Transistors are produced in both NPN and PNP configurations, the letters indicating the type of germanium in each layer. Symbols for P-N-P and N-P-N transistors are shown in the chart on Page 3 of the cover. All the transistors used in the UXR-2 are of the P-N-P type.

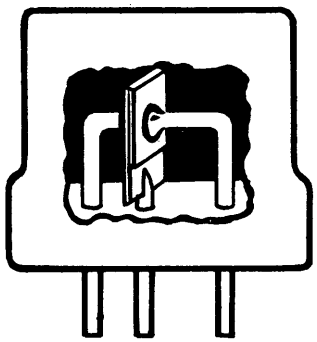
The middle layer of the sandwich is called the base. One outside layer is called the emitter and the other one the collector. The junction formed between the emitter and the base and between the collector and the base has a characteristic similar to that of a diode rectifier, in that the junction will conduct current much more readily in one direction than the other. When a voltage is applied across a junction with positive voltage applied to the "P" type region and negative voltage to the "N" type region a current consisting of two components will flow. Electrons will flow from the "N" region across the junction to the "P" region and holes will flow or migrate from the "P" region across the junction to the "N" region. If the polarity of the applied voltage is reversed, the electrons and the holes move away from the junction and, for practical purposes, no current will flow.

In most applications, transistors have operating voltages applied so that the base-emitter junction is "biased" in the forward or conducting direction and the base-collector junction is "biased" in the reverse or non-conducting direction. When connected in this manner, most of the current carriers flowing in the emitter circuit will diffuse across the base region and appear as current in the collector circuit. Since the emitter bias is usually a very low voltage, (being in the forward direction), and the collector bias is relatively high, (being in the reverse direction), the transistor is able to produce a power gain. This can readily be seen when you consider that power is the product of

voltage and current. Because the current flow is across a junction of a very small area, the power handling capabilities of a transistor are limited due to heating caused by the current flowing through the junction resistance.

FIGURE 13





GLOSSARY OF RADIO TERMS

While by no means complete, this glossary should assist those who are not familiar with radio terminology. The definitions apply to all radios in general but in many cases refer to the UXR-2 Received specifically. Further information may be obtained from books available at most public libraries.

AC	Alternating Current. An electrical current that reverses its direction of flow at regular intervals. House current makes 100 reversals every second. Two reversals are necessary to complete one cycle, hence 50 cycles. Much higher frequencies appear in radio circuitry, up to many millions of cycles per second.
AF	Audio Frequency. Those frequencies that fall within the range of the human ear, approximately 20 to 20,000 cycles per second. Remember that the ear can only hear mechanical vibrations in the air, not electrical currents.
AVC	Automatic Volume Control. Circuitry employed in a receiver to adjust the gain in opposite proportion to the strength of the received signal. Used to reduce the effects of fading signals, or "blasting" when tuning from a weak to a strong signal.
Amplifier	A circuit designed to increase the strength or amplitude of weak signals. Ideally the output signal is an exact magnified reproduction of the input signal.
Ampere	The unit of measurement of current flow. The number of electrons passing a point in one second.
Antenna (Aerial)	A system of conductors used to radiate or intercept radio signals.
Capacitor	A component consisting of conducting plates separated by an insulated material. Various materials and construction are used in capacitors. Deposited silver plates on ceramic for the disc capacitors, aluminium foil plates separated by a chemical oxide for the electrolytic capacitors and sheet aluminium separated by air for the variable tuning capacitor. Capacitors are used to pass AC while blocking DC and also to tune or "resonate" electrical circuits to a desired frequency.
Coil	A component consisting of wire or some other conductor wound in turns on a suitable former. The number of turns and the size, shape, and material used for the former are determined by the application. Coils are often used with capacitors to form "tuned" circuits.
Condenser	See Capacitor.
Conductor	Any material that permits easy passage of an electrical current.
Converter (Frequency Changer)	Circuitry designed to combine the signal from the radio station with a self-generated signal to produce a new signal at a different frequency. See Heterodyne.

Current	Generally the movement of electrons through a conductor. In valves electron flow occurs in the vacuum. Movement of "holes" can constitute current flow in transistors.
DC	Direct Current. An electrical current that flows in one direction only.
Detector	A component used to extract the intelligence or desired information from a radio signal. In the UXR-2 this intelligence consists of the speech or music transmitted by the radio station.
Diode	A two element or two terminal device capable of passing an electrical current in one direction only. Used as a detector and also for reducing strong signal overload in the UXR-2
Earth	An electrical connection to the earth. Also the reference point for signals and operating voltages in electronic equipment, usually the chassis.
Frequency	Repetition rate of an alternating current or of the vibration of the loudspeaker cone. Measured in cycles per second.
Frequency Changer	See Converter.
Heterodyne	The result of combining signals of difference frequencies in order to obtain a signal of new frequency. Either the sum or the difference frequency of the two is generally the desired resulting frequency. Also known as "beat".
I.F.	Intermediate Frequency. The heterodyne or beat frequency produced by the converter in a superheterodyne receiver. Most of the amplification and selectivity of the radio signals is accomplished at this frequency. An I.F. of 470 Kc/s is employed by the UXR-2.
Inductance	The property of a coil to oppose any change in the magnitude of an electrical current flowing in it.
Insulator	Any material that does not permit an easy passage of an electrical current.
Kc/s	Kilocycle - 1,000 cycles.
Mc/s	Megacycle - 1,000,000 cycles, 1,000 kilocycles.
Megohm	1,000,000 ohms.
Microfarad	A unit of capacity. Refers to the electrical "size" of a capacitor.
Ohm	The unit of electrical resistance.
Oscillator	Circuitry designed to generate AC at some desired frequency when operated from a DC source. Usually some circuit element or elements are adjustable so that a desired frequency may be obtained.
R.F.	Radio Frequency. Those frequencies employed for transmission of radio signals, from 10 kilocycles to 100,000 megacycles by government regulation.
Resistor	A component designed to oppose the flow of current. The degree of opposition or resistance is measured in units called "ohms". Resistors are used to reduce current or voltage to a desired value, to provide isolation between circuits or to provide a load across which a useful signal may be developed. Resistors used in the UXR-2 are made of a carbon compound housed in an insulating protective sleeve. Wire leads sealed in each end provide electrical connection to the resistance materials.
Selectivity	The ability of a receiver to separate radio stations operating on adjacent channels.
Sensitivity	A figure that expresses the signal strength required at the receiver antenna to produce a specified amount of sound from the loudspeaker.
Superheterodyne	A radio circuit that heterodynes or converts an incoming signal of any frequency in its tuning range to a signal of constant frequency before amplification and detection. This is accomplished

by combining the incoming signal with one from a self-contained oscillator that is automatically tuned by the station selector. In the UXR-2 the oscillator signal is always 470 kilocycles higher in frequency than the incoming signal. The resultant signal therefore is 470 kilocycles, the intermediate frequency. Amplification of the radio signals may then be accomplished at a fixed frequency. This makes it possible to design maximum efficiency into the I.F. amplifiers. Improved selectivity and sensitivity are advantages of the superheterodyne circuit.

Transformer

A component designed to couple AC signals or energy from one circuit to another. Construction can vary widely depending on the application but generally consists of insulated coils of wire wound on a common core. The core may be of sheet iron for power or audio transformers, or powdered iron or air for I.F. and R.F. transformers. Transformers are employed for one or more of several reasons; they provide coupling of signals while isolating the DC operating voltages of the coupled circuits; they are capable of producing AC voltage "step-up" or "step-down"; they may be tuned to provide selective coupling of signals as the case of the I.F. transformers used in the UXR-2; they provide proper impedance matching between coupled circuits. The last application can be compared to the function of the transmission of your car. The transmission is designed to provide the most efficient match or coupling between the source of power, the engine, and the load, the rear wheels. In the UXR-2 a good example of this application is the audio output transformer which provides the proper match or coupling between the source of power - the output transistors, and the load, the loudspeaker.

SERVICE INFORMATION

SERVICE

If, after applying the information contained in this manual, you are still unable to obtain proper performance, it is suggested that you take advantage of the technical facilities which we make available to our customers.

The Technical Consultation Department is maintained for your benefit. This service is available to you at no charge. Its primary purpose is to provide assistance for those who encounter difficulty in the construction, operation or maintenance of HEATHKIT equipment.

Although the Technical Consultants are familiar with all details of this kit, the effectiveness of their advice will depend entirely upon the amount and the accuracy of the information furnished by you. Please use this outline:

1. Before writing, fully investigate each of the hints and suggestions listed in this manual under In Case of Difficulty. Possibly one of these will solve your problem.

2. When writing, clearly describe the nature of the trouble and mention all associated equipment. Specifically report operating procedures, switch positions, connections to other units and anything else that might help to isolate the cause of trouble.

3. Report fully on the results obtained when testing the unit initially and when following the suggestions under In Case of Difficulty. Be as specific as possible and include voltage readings if test equipment is available.

4. Identify the kit model number, invoice number and date of purchase, if available.

5. Print or type your name and address, preferably at the head of the letter.

With the preceding information, the consultant will know exactly what kit you have, what you would like him to do for you and the difficulty you wish to correct. The date of purchase tells him whether or not engineering changes have been made since it was sent to you. He will know what you have done in an effort to locate the cause of trouble and, thereby, avoid repetitious suggestions. In short, he will devote full time to the problem at hand, and through his familiarity with the kit, plus your accurate report, he will be able to give you a complete and helpful answer. If replacement parts are required, they will be sent to you, subject to the terms of the Guarantee.

HEATHKIT equipment purchased locally and returned to Daystrom Limited for service must be accompanied by your copy of the dated sales receipt from your authorised HEATHKIT dealer in order to be eligible for parts replacement under the terms of the Guarantee.

If the completed instrument should fail to function properly and attempts to find and cure the trouble prove ineffective, the facilities of Daystrom's Service Department are at your disposal. Your instrument may be returned carriage paid to Daystrom Limited, Gloucester, and the Company will advise you of the service charge where not covered within the terms of the Guarantee (i.e. a faulty component supplied by us).

For information regarding modification of HEATHKIT equipment for special applications, it is suggested that you refer to any one or more of the many publications that are available on all phases of electronics. They can be obtained at or through your local library, as well as at most electronic equipment stores. Although Daystrom Ltd. sincerely welcomes all comments and suggestions, it would be impossible to design, test, evaluate and assume responsibility for proposed circuit changes for special purposes. Therefore, such modifications must be made at the discretion of the kit builder, using information available from sources other than Daystrom Limited.

REPLACEMENTS

Material supplied with HEATHKIT products has been carefully selected to meet design requirements and ordinarily will fulfill its function without difficulty. Occasionally improper instrument operation can be traced to a faulty component. Should inspection reveal the necessity for replacement, write to Daystrom Limited and supply all of the following information.

A. Thoroughly identify the part in question by using the part number and description found in the manual Parts List.
B. Identify the type and model number of kit in which it is used.
C. Mention date of purchase.
D. Describe the nature of defect or reason for requesting replacement.

Daystrom Limited will promptly supply the necessary replacement. PLEASE DO NOT RETURN THE ORIGINAL COMPONENT UNTIL SPECIFICALLY REQUESTED TO DO SO. Do not dismantle the component in question as this will void the guarantee. This replacement policy does not cover the free replacement of parts that may have been broken or damaged through carelessness on the part of the kit builder.

SHIPPING INSTRUCTIONS

Before returning a unit for service, be sure that all parts are securely mounted.

ATTACH A LABEL TO THE INSTRUMENT GIVING
NAME, ADDRESS AND TROUBLE EXPERIENCED.

Pack in a rugged container, preferably wood, using at least three inches of shredded newspaper, wood wool or plastic cushioning material on all sides. DO NOT DESPATCH IN THE ORIGINAL KIT CARTON AS THIS CARTON IS NOT CONSIDERED ADEQUATE FOR SAFE SHIPMENT OF THE COMPLETED INSTRUMENT. Note that a carrier cannot be held liable for damage in transit if packing, in HIS OPINION, is insufficient.

PRICES: All prices are subject to change without notice.

MODIFICATIONS TO SPECIFICATIONS: Daystrom Limited reserves the right to discontinue instruments and to change specifications at any time without incurring any obligation to incorporate new features in instruments previously sold.

* * * * * * * * * * * * * * *

The Heathkit builder is again strongly urged to follow step-by-step instructions given in this Manual to ensure successful results. Daystrom Limited assumes no responsibility for any damages or injuries sustained in the assembly or handling of any of the parts of this kit or the completed instrument.

GUARANTEE

Daystrom Limited guarantee subject to the following terms to repair or replace free of charge any defective parts of this Heathkit which fail owing to faulty workmanship or material provided the defective parts are returned to Daystrom Limited within 12 months from date of purchase :-

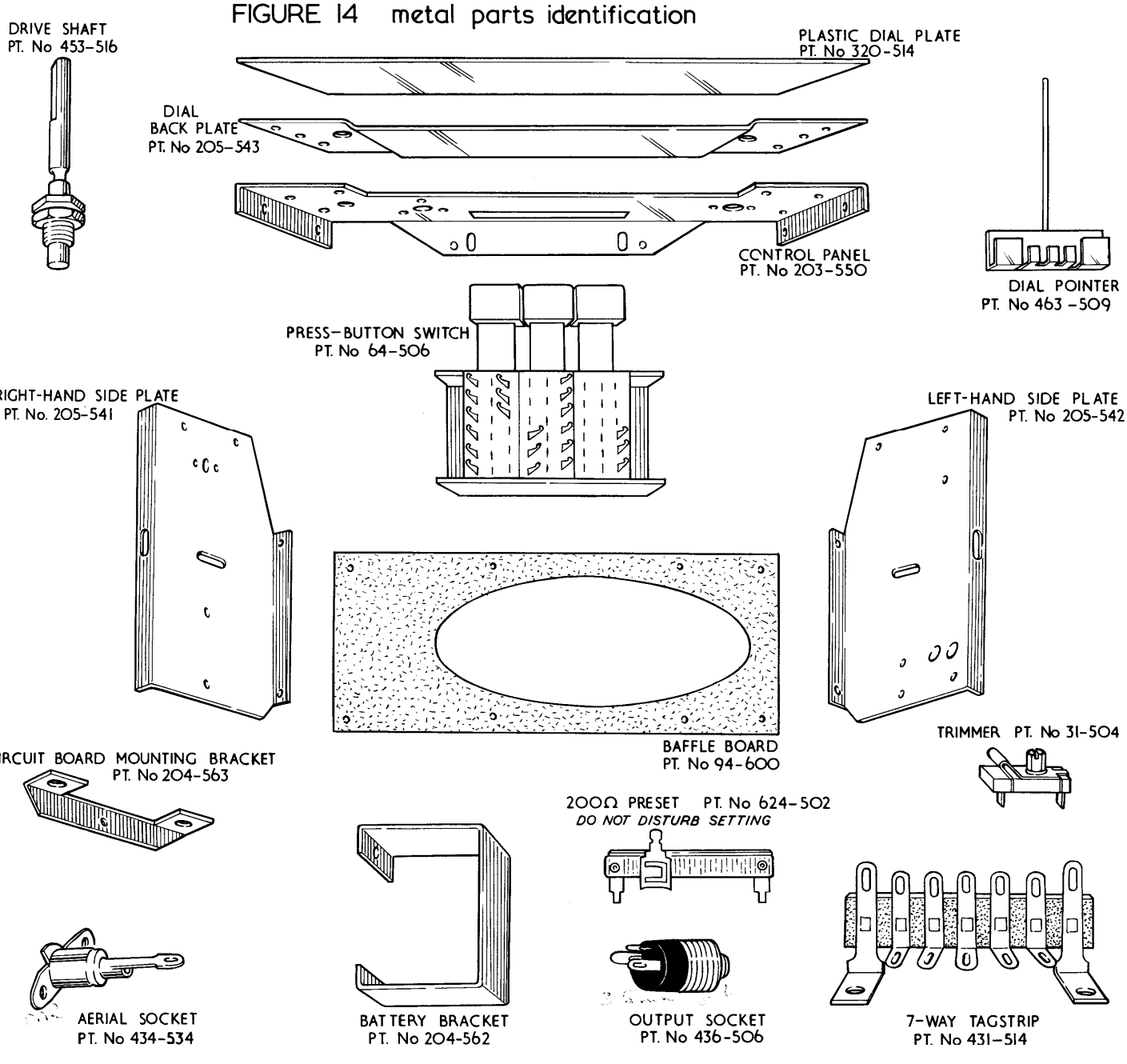
1. This guarantee is given to and for the benefit of the original buyer only, and is and shall be in lieu of, and there is hereby expressly excluded, all other guarantees conditions or warranties, whether express or implied, statutory or otherwise, as to quality or fitness for any purpose of the equipment, and in no event shall Daystrom Limited be liable for any loss of anticipated profits, damages, consequential or otherwise, injury, loss of time or other losses whatsoever incurred or sustained by the buyer in connection with the purchase, assembly or operation of Heathkit models or components thereof.

2. No replacement will be made of parts damaged by the buyer in the course of handling, assembling, testing or operating Heathkit equipment.

3. The purchaser shall comply with the Replacements Procedure laid down in the relevant Heathkit Manual.

4. Daystrom Limited will not replace, repair or service instruments or parts thereof in which acid core solder or paste fluxes have been used and in such event this guarantee shall be completely void.

FIGURE 14 metal parts identification



PARTS LIST

PART No.	PARTS Per Kit	DESCRIPTION
Resistors (½ watt, ± 10%)		
H-101C10	2	100Ω (Brown, Black, Brown)
H-561C10	1	560Ω (Green, Blue, Brown)
H-681C10	2	680Ω (Blue, Grey, Brown)
H-102C10	4	1 KΩ (Brown, Black, Red)
H-222C10	1	2.2 KΩ (Red, Red, Red)
H-392C10	2	3.9 KΩ (Orange, White, Red)
H-472C10	1	4.7 KΩ (Yellow, Violet, Red)
H-682C10	1	6.8 KΩ (Blue, Grey, Red)
H-822C10	2	8.2 KΩ (Grey, Red, Red)
H-153C10	1	15 KΩ (Brown, Green, Orange)
H-223C10	1	22 KΩ (Red, Red, Orange)
H-333C10	1	33 KΩ (Orange, Orange, Orange)
H-393C10	2	39 KΩ (Orange, White, Orange)
H-563C10	1	56 KΩ (Green, Blue, Orange)
H-154C10	1	150 KΩ (Brown, Green, Yellow)
H-823C10	1	82 KΩ (Grey, Red, Orange)
Resistors (¼ watt, 5%)		
2-510	1	4.7Ω (value marked)
Controls		
19-518	1	5 KΩ log potentiometer (volume control with switch)
624-502	1	200Ω pre-set control (do not disturb setting)
Capacitors (all types)		
20-567	1	270 pF silver mica ± 5%
23-505	1	0.1 µF paper tubular
23-525	1	0.25 µF paper tubular
21-540	4	0.025 µF disc ceramic (Red, Green, Orange)
21-531	2	0.05 µF disc ceramic (Green, Black, Orange)
21-532	2	0.1 µF disc ceramic (Brown, Black, Yellow)
25-541	2	0.5 µF electrolytic
25-542	1	2 µF electrolytic
25-504	1	8 µF electrolytic
25-544	1	100 µF electrolytic
25-545	2	200 µF electrolytic
21-501	1	47 pF ceramic tubular
26-524 532	1	Variable tuning capacitor
31-504	1	Trimmer capacitor 40-110 pF
Coils, Transformers		
40-587	1	Ferrite rod aerial assembly
40-588	1	Oscillator coil (black spot)
52-510	1	1st IF transformer (brown spot)
52-511	1	2nd IF transformer (red spot)
52-512	1	3rd IF transformer (Orange spot)
51-502	1	Driver transformer
51-503	1	Output transformer
Transistors, Diodes		
417-517	3	AF117 transistor
417-512	1	OC71 transistor

PART No.	PARTS Per Kit	DESCRIPTION
Transistors, Diodes		
417-503	1	OC81D transistor
417-504	2	OC81 transistor
56-501	1	OA81 diode
56-505	1	AA129 junction diode
Sheet Metal Parts		
205-541	1	Right-hand side plate
205-542	1	Left-hand side plate
205-543	1	Dial back plate
203-550	1	Control panel
204-562	1	Battery bracket
204-563	2	Circuit board mounting bracket
604-504	1	Dial trim
100-542	1	Dial drum assembly
463-509	1	Dial pointer
208-518	2	Dial clip
208-501	2	Heat sink clip for output transistor
Hardware		
250-501	15	6BA x ¼" screw
250-504	4	6BA x 5/16" c'sk head screw
250-518	2	6BA x ¾" screw
250-513	14	4BA x ¼" screw
250-535	8	4BA x 3/8" c'sk head screw
250-567	3	4BA shoulder screw
252-501	3	6BA nut
252-3U	12	4BA nut
252-522	8	6BA speed nut
252-527	6	4BA speed nut
254-501	12	6BA lockwasher
254-1U	12	4BA lockwasher
254-503	2	3/8" lockwasher
253-501	1	3/8" flat washer
259-504	3	4BA shakeproof solder tag
255-508	2	1/8" bore x 1/8" spacer
255-503	4	6BA x 11/16" pillar
100-541	2	Pulley wheel assy. on 7/16" pillar
432-510	12	Solder tag (circuit board)
255-506	2	5/32" bore x 3/8" spacer
432-503	26	Solder spills (for mounting transistors)
Wire, Solder, Sleeving		
344-510	1 length	Black flexible
344-511	1 length	Brown flexible
344-512	1 length	Red flexible
344-513	1 length	Orange flexible
344-514	1 length	Yellow flexible
344-515	1 length	Green flexible
344-516	1 length	Blue flexible
344-518	1 length	Grey flexible
344-519	1 length	White flexible
340-501	1 length	22 swg. bare wire
331-502	1 length	22 swg. solder (resin cored, thin)
331-501	1 length	18 swg. solder (resin cored, thick)
346-1	1 length	Insulating sleeving

PARTS LIST (cont'd.)

PART No.	PARTS Per Kit	DESCRIPTION
Miscellaneous (small parts)		
73-504	3	$\frac{1}{4}$" dia. rubber grommet
436-506	2	Output socket
432-514	1	Battery connector with leads
258-503	1	Spring (dial cord)
462-522	2	Control knob
453-516	1	Drive shaft assembly
349-501	1 length	Dial cord
434-534	1	Aerial socket
431-514	1	7-way tagstrip
490-501	1	IF trimming tool

PART No.	PARTS Per Kit	DESCRIPTION
Miscellaneous (large parts)		
93-504	1	Leather case
85-530	1	Printed circuit board
94-600	1	Speaker baffle board
401-501	1	7" x 4" speaker (3Ω impedance)
320-514	1	Plastic dial plate
64-506	1	Press-button switch
448-507	1	Adhesive tape on dowel
595-563	1	Instruction manual

SEE LOOSE SHEET AND FIGURE 14

FOR IDENTIFICATION OF PARTS