PRICE 10/6

Assembling and Using Your...

Heathkit
DAYSTROM

SIGNAL GENERATOR

MODEL RF-IU

DAYSTROM LIMITED
A Subsidiary of the Daystrom Group,
Manufacturers of the world's finest
Electronic Equipment in Kit Form.
GLOUCESTER, ENGLAND

COLOUR CODE FOR FIXED RESISTORS - (B.S.1852-1952)
COLOUR BAND MARKING

FIG 1. { COLOURED BAND MARKING PREFERRED }

THIS EXAMPLE SHOWS A GRADE 1. RESISTANCE OF 6,800 Ω ± 5%

BLUE (6)
GREY (8)
RED (X 10²)
GOLD (± 5%)
SALMON PINK (GRADE 1.)
THIS MAY BE GENERAL BODY COLOUR

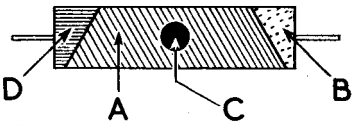


FIG 2. BODY, TIP & SPOT MARKING

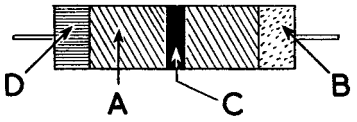
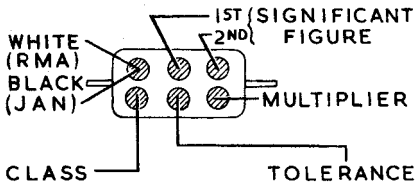


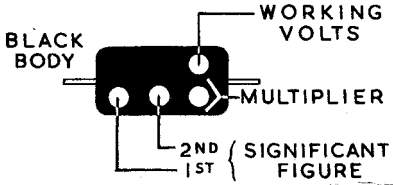
FIG 3. BODY TIP & CENTRAL BAND MARKING

AMERICAN "RMA", "JAN" & COMMERCIAL CODING FOR MOULDED MICA CAPACITORS

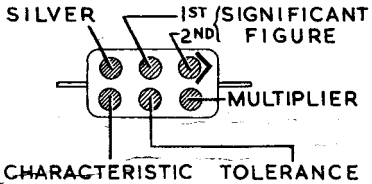
CURRENT STANDARD CODE



MOULDED FLAT CAPACITOR COMMERCIAL CODE



JAN. CODE CAPACITOR



COLOUR CODE FOR RESISTORS AND CAPACITORS

Colour	Value in Ohms of pF for Cols. A, B & C.				COL. D. (TOLERANCE RATING)			CAPACITORS COL. E. TEMP. COEFFICIENT per 10^6 per °C.
	COL. A. 1st Figure	COL. B. 2nd Figure	COL. C. (MULTIPLIER) Resistors ohms	Capacitors pF	Resistors	Ceramic Capacitors Up to 10 pF	Over 10 pF	
BLACK	-	0	1	1	-	2 pF	± 20%	0
BROWN	1	1	10	10	± 1%	0.1 pF	± 1%	-30
RED	2	2	100	100	± 2%	-	± 2%	-80
ORANGE	3	3	1,000	1,000		-	± 2.5%	-150
YELLOW	4	4	10,000	10,000		-	-	-220
GREEN	5	5	100,000	-		0.5 pF	± 5%	-330
BLUE	6	6	1,000,000	-		-	-	-470
VIOLET	7	7	10,000,000	-		-	-	-750
GREY	8	8	100,000,000	.01		0.25 pF	-	+30
WHITE	9	9	1,000,000,000	.1		1 pF	± 10%	+100
SILVER			.01	-	± 10%	-	-	
GOLD			.1	-	± 5%	-	-	
SALMON								
PINK			-	-	-	-	-	
NO "D" COLOUR			-	-	-	-	-	

The Colour coding should be read from left to right, in order, starting from the end and finishing near the middle.

Standard ± tolerances for resistors are:- Wire-wound: 1%, 2%, 5%, 10%. Composition, Grade 1: 1%, 2%, 5%. Grade 2: 5%, 10%, 20%. (20% is indicated by 4th (or 'D') colour). Grade 1: ("high-stability") composition resistors are distinguished by a salmon-pink fifth ring or body colour. (Reference: B.S. 1852: 1952 B.S.I.).

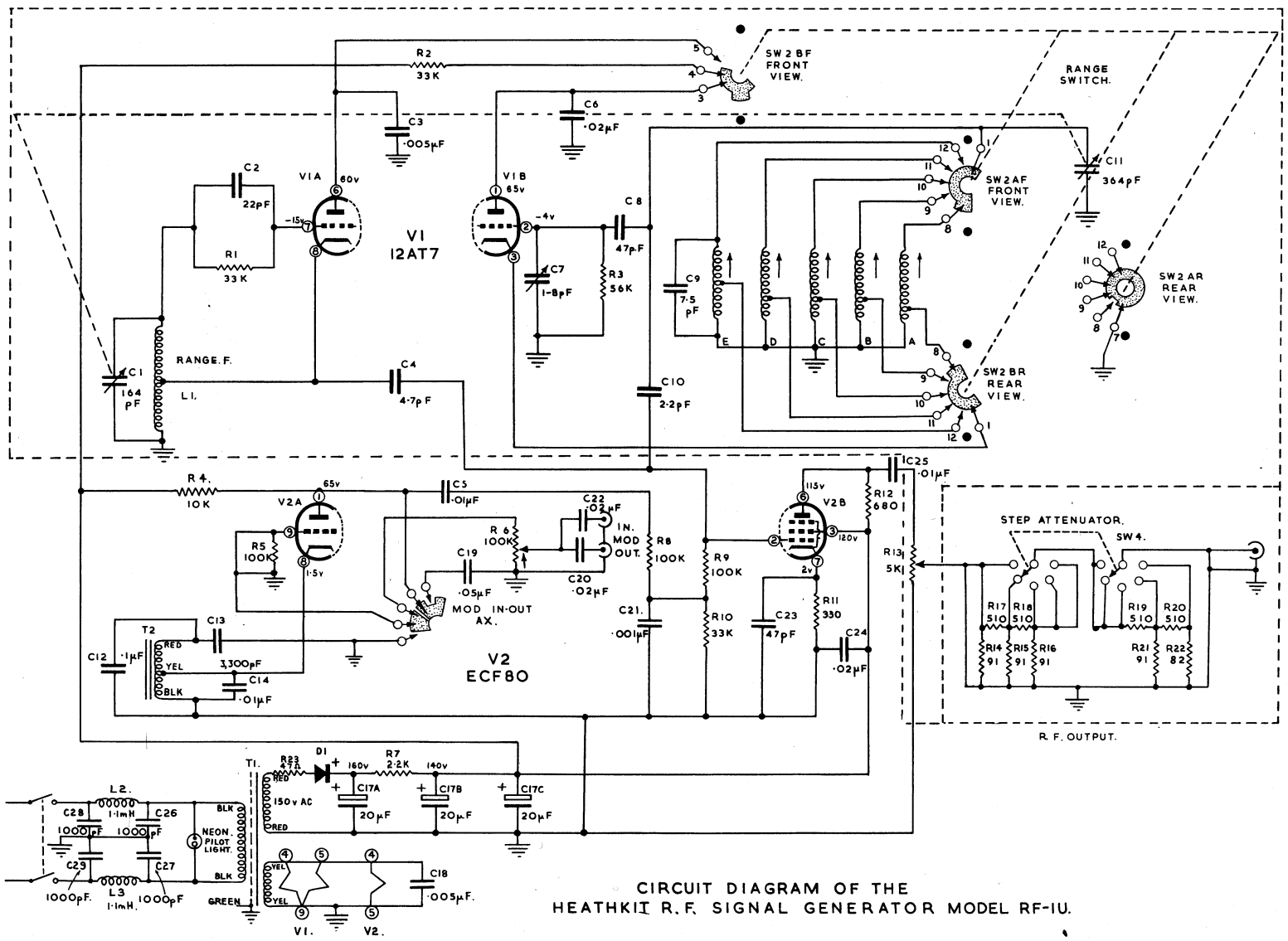
N. B. High-Stability Resistors supplied with this kit are not as a rule colour coded but enamelled in one colour on which the value in Ohms is printed in figures. Capacitors supplied in this kit usually have their capacity clearly marked in figures. Some Capacitors coded as above also have additional "voltage rating" coding.

Assembly and Operation of the HEATHKIT SIGNAL GENERATOR

MODEL RF-1U

SPECIFICATIONS

Frequency Range:	
Range A	100 Kc/s to 300 Kc/s
Range B	300 Kc/s to 1 Mc/s
Range C	1 Mc/s to 3 Mc/s
Range D	3 Mc/s to 10 Mc/s
Range E	10 Mc/s to 30 Mc/s
Range F	30 Mc/s to 100 Mc/s
Calibrated Harmonics	100 Mc/s to 200 Mc/s
Accuracy:	± 2% of dial calibration
Output:	
Impedance	75Ω
Voltage	Up to 100 mV on all ranges
Modulation:	
Internal	Approximately 400 cycles, 30% depth (nominal)
External	Approximately 3 volts across 50 KΩ for 30%
Audio Output	Approximately 9 volts across 1 megohm
Valve Complement:	V1 - 12AT7 - RF oscillator V2 - ECF80 - modulator and RF output
Power Requirements:	230-250 volts 50/60 cycles AC 15 watts
Cabinet Dimensions:	9½" wide x 6½" high x 5" deep
Net Weight:	8 lbs.
Shipping Weight:	10 lbs.



CIRCUIT DIAGRAM OF THE
HEATHKIT R.F. SIGNAL GENERATOR MODEL RF-1U.

INTRODUCTION

The Heathkit RF (radio frequency) Signal Generator Model RF-1U has been designed to provide the service technician, ham and experimenter, with an accurate and stable source of RF signals. A pre-assembled range switch and coil assembly, aligned to factory precision standards, eliminates the necessity of having costly equipment to calibrate the finished kit. To ensure that the maximum performance that is available in this kit be realised, it is suggested that the builder take a few minutes now to read the CIRCUIT DESCRIPTION and PRELIMINARY NOTES AND INSTRUCTIONS.

CIRCUIT DESCRIPTION

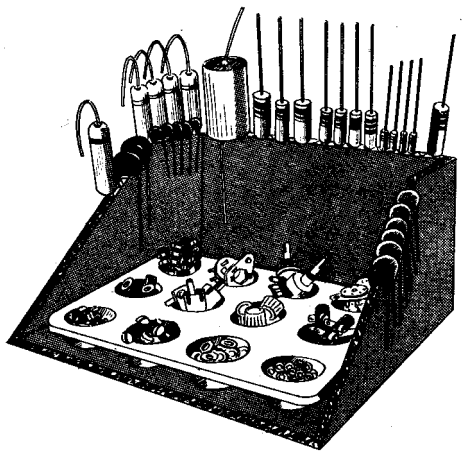
The RF oscillator for ranges A, B, C, D and E consists of one-half of a 12AT7 valve (V1B), and the tuning capacitor C11 and the five adjustable Hartley oscillator coils. These coils are supplied as a pre-aligned range switch assembly (SW2). The cathode of the valve is connected to the tap of the coils through switch SW2-BR. Because one end of each coil is earthed, the current from the cathode will excite the coil at resonance. The feedback necessary to maintain oscillation is coupled from the "hot" end of the coil through switch SW2-AF and then through capacitor C8 to the valve grid. Switch SW2-AR shorts out the unused coils to prevent any undesirable suckouts.

The coil for range F is mounted directly on the tuning capacitor and is permanently connected to the other half of the 12AT7 oscillator valve (V1A). This arrangement eliminates the stray capacities that would be involved in switching and thus provides a more desirable LC ratio. Range switching is accomplished by switching the HT to the anode of V1A through switch SW2-BF.

The triode section of an ECF80 (V2A) is used for the audio oscillator. A Hartley oscillator is also used in this circuit but, of course, the coil is of the iron core type because of the low frequency involved. The modulation in-out switch AX connects either the anode or the grid through R6 to the modulation socket. This arrangement enables the audio output to be amplitude controlled, and also controls the level of external modulation applied to the grid of V2A.

RF signals are coupled to the grid of the ECF80 output valve (V2B) through capacitors C4 and C10. Modulation is coupled to the grid through capacitor C5, resistors R8 and R9. These components, along with resistor R10, establish the modulation level. The modulated RF signal is then coupled from the anode of V2B through capacitor C25, fine attenuator R13 and the step attenuator SW4 to the RF output socket.

The power for the RF-1U is supplied through transformer T1. A conservatively rated selenium diode (D1) is used in a half-wave rectifier circuit to supply HT for the generator. C17 is a 20 µF + 20 µF + 20 µF electrolytic capacitor, two sections of which are parallel connected to provide extra smoothing.



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.

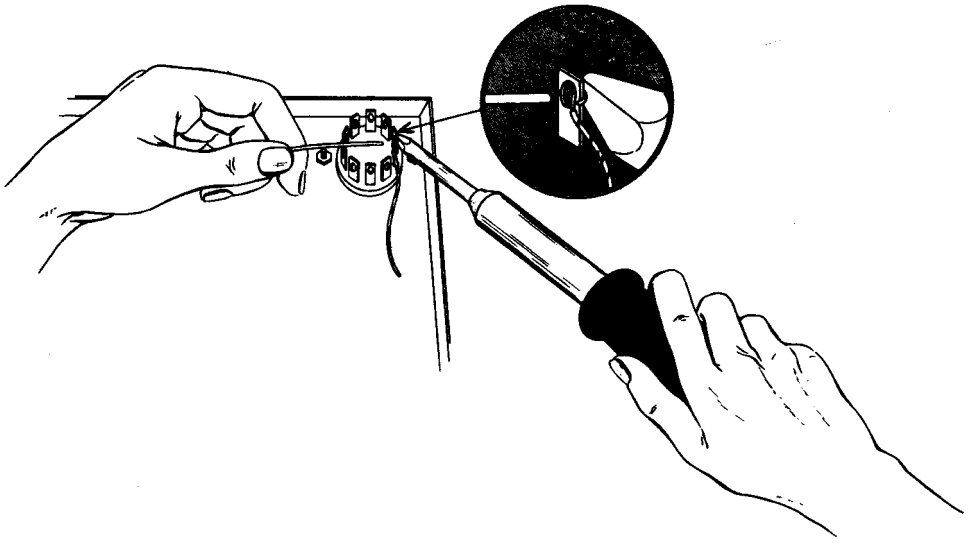
NO SEPARATE FLUX OR PASTE OF ANY KIND SHOULD BE USED. We specifically caution against the use of so-called "non-corrosive" pastes or liquids. Such compounds, although not corrosive at room temperature, will form residues when heated. These residues are deposited on surrounding surfaces and attract moisture. 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.

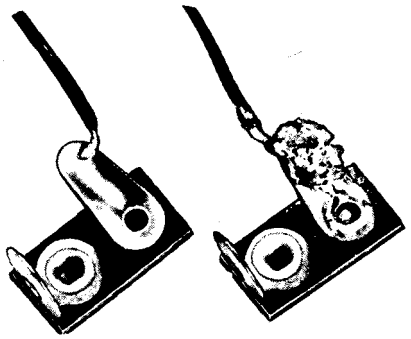
IMPORTANT

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.

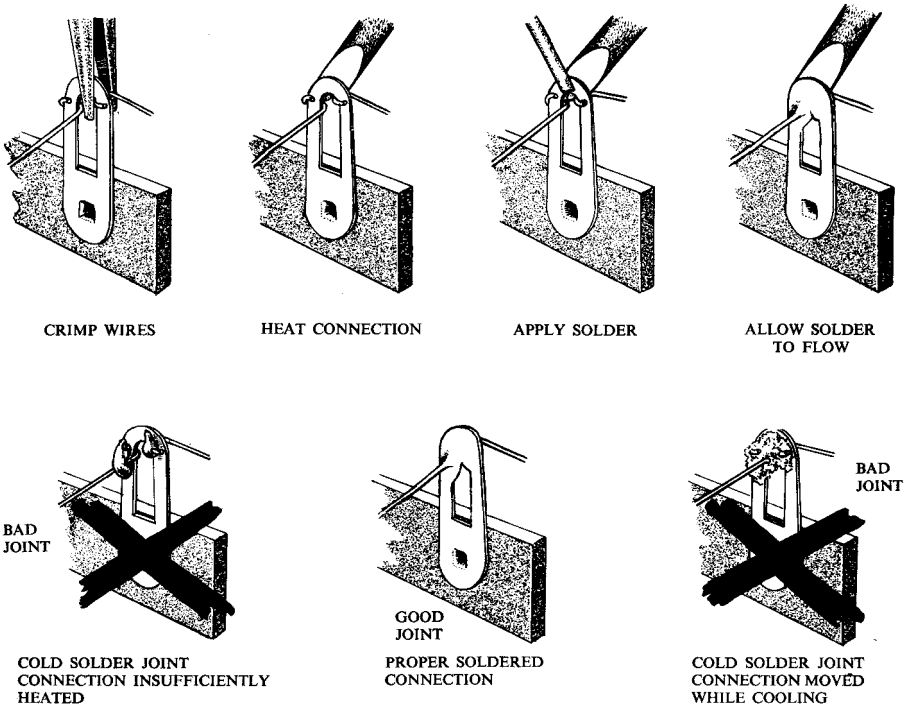
SPECIAL NOTE: Where a wire is passed through a tag to other parts of the circuit, this will be regarded as two connections (S-2).

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.

STEP-BY-STEP ASSEMBLY INSTRUCTIONS

NOTE: Because of the high frequencies involved in this instrument it is imperative that all mounting hardware be tightened securely. A loose earth tag, for example, could cause an intermittent frequency change that would be extremely difficult to locate.

( ) Make sure if there is an amendment sheet to this Manual, that you have made the alterations at the appropriate places.

The above illustration should be referred to when selecting mounting hardware.

MOUNTING OF COMPONENTS - SEE PICTORIAL 1

( ) Lay the chassis upside down on your workspace in the same relative position as in the Pictorial.

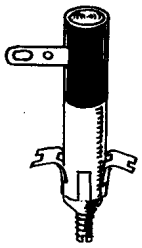
( ) Insert $\frac{1}{4}$" rubber grommets in holes GA, GB, GC, GD, GI and 3/8" rubber grommets in holes GE, GF, GG and GH.

( ) At position A, mount the 9-pin non-skirted valveholder from above the chassis. Position the tags as in the Pictorial. Mount a 4-way tagstrip under each nut (these tagstrips have an earthing tag) using 6BA x 5/16" screws, lockwashers and nuts.

( ) Select a 6BA solder tag and using a pair of pliers, make a right-angled bend about 3/8" from the end of the tag.

( ) Mount a 9-pin skirted valveholder at position B using the 6BA solder tag previously prepared, position the tags and the solder tag ST1 as shown in the Pictorial.

( ) Select the 1 - 8 pF trimmer and mount at hole TR. Place the threaded shaft through the hole and press gently into the hole until the two locating ears click into place on the top of the chassis. Having secured the trimmer, rotate the brass sleeve until the tag points towards the valveholder.

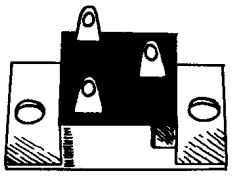

1-8pF TRIMMER.

( ) Mount the mains transformer at T1 passing two RED and two YELLOW leads through grommet GD and the two BLACK and one GREEN lead through grommet GC. Use 4BA x $\frac{1}{4}$" screws, lockwashers and nuts.

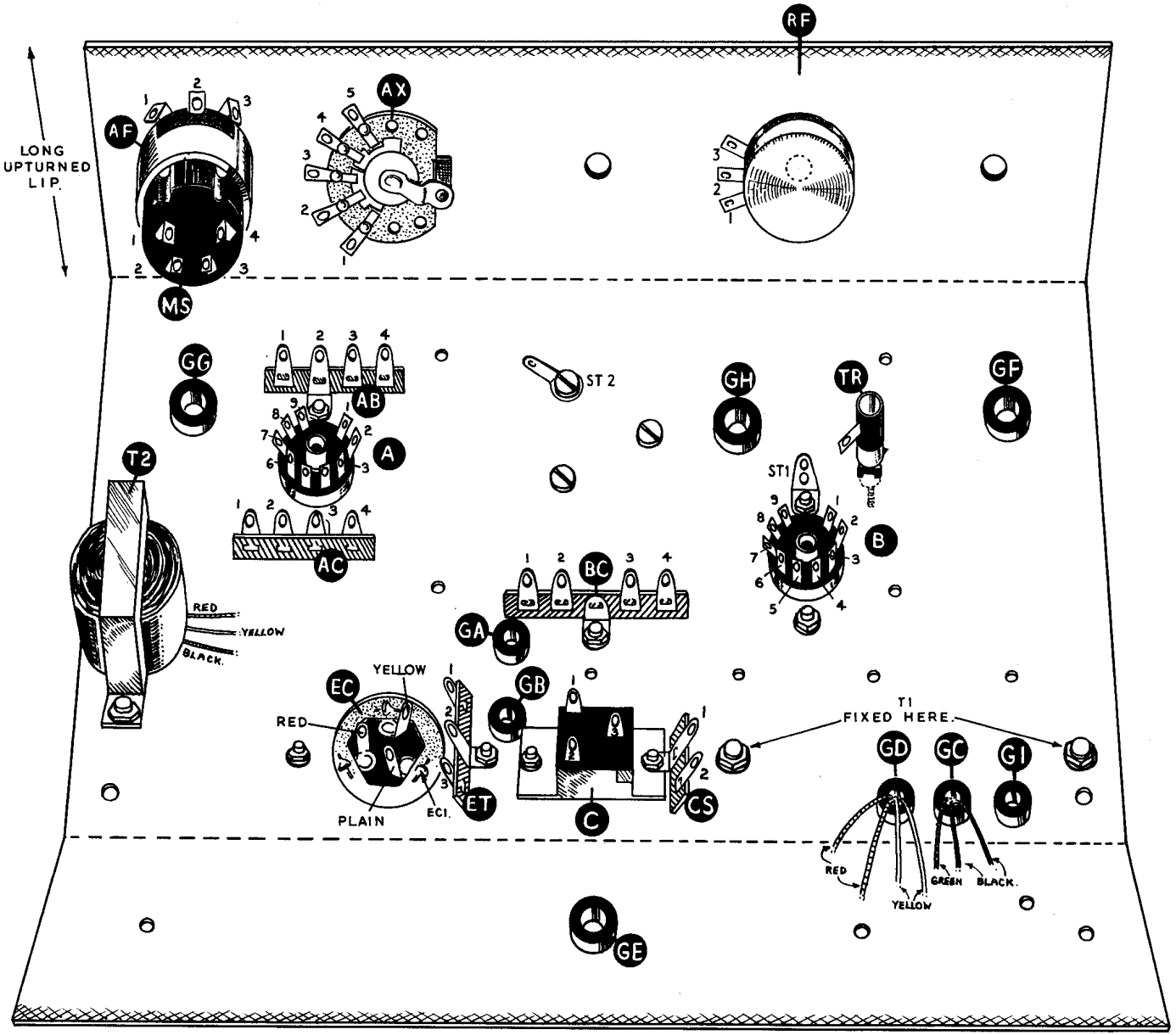
( ) Mount the electrolytic capacitor mounting wafer at EC, fit a 3-way tagstrip under one nut as in the pictorial. Use 6BA x 5/16" screws, lockwashers and nuts.

( ) Next mount the 20 + 20 + 20 µF electrolytic capacitor by positioning the coloured tags as shown and passing the mounting prongs through the holes in the mounting wafer and twisting the prongs about a $\frac{1}{4}$" of a turn.

( ) At T2, mount the modulation transformer, (Part No. 51-44), position the transformer as shown. On top of the chassis, mount a 1-way tagstrip under the screw head at position BD, see Pictorial. Use 4BA x $\frac{1}{4}$" screws, lockwashers and nuts.


SELENIUM RECTIFIER

( ) At position C, mount the selenium rectifier, position the tags as shown and mount a 2-way tagstrip under one nut as shown. Use 4BA x $\frac{1}{4}$" screws, lockwashers and nuts.


RF
LONG UPTURNED LIP.
AF
MS
AX
GG
AB
A
AC
ST 2
GH
TR
GF
ST1
B
T2
RED
YELLOW
BLACK.
BC
GA
EC
YELLOW
RED
PLAIN
ECI.
GB
ET
C
CS
T1 FIXED HERE.
GD
GC
GI
RED
YELLOW
GREEN
BLACK.
GE

PICTORIAL-1.

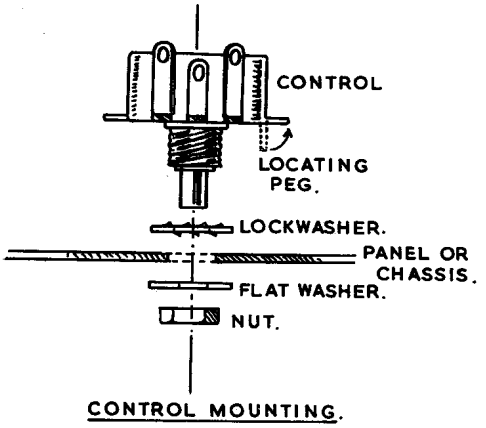
( ) Select the 100 KΩ lin potentiometer. This control has a double-pole mains switch on the rear, bend the locating peg down as shown in Figure 1 and mount at position AF on the front apron. Use the hardware supplied with the control. Do not mount this control securely as yet because it will be used to secure the front panel at a later stage.

( ) Mount the AF IN-OUT 2-position switch at AX. Again use the hardware supplied with the control. Cut off the locating peg before mounting switch.

( ) At position RF mount the 5 KΩ lin control using the mounting hardware supplied and bending the locating peg down and position with the tags as shown.

( ) At position BC mount a 4-way tagstrip using a 4BA x $\frac{1}{4}$" screw, lockwasher and nut. Position as shown in the Pictorial.

( ) On top of the chassis, mount the tuning capacitor at location TC using 4BA x 1/8" screws and lockwashers. Place a 4BA solder tag ST2 under the screw head as shown.



CONTROL MOUNTING.

FIGURE - 1

CHASSIS WIRING - PICTORIAL 2

Mains Transformer Wiring.

Refer to the wires coming from grommets GC and GD. In each case cut the wires to length before making the connections. Where a varnish insulation has been included on the inner wire, remove the varnish insulation completely before attempting to solder the connections.

( ) Connect one RED wire, one YELLOW wire and the GREEN wire to tagstrip CS1 (S-3).

( ) Connect the other RED wire to CS2 (NS).

( ) Connect a 47Ω resistor (YELLOW, VIOLET, BLACK) from CS2 (S-2) to the selenium rectifier C tag 2 (S-1).

( ) Connect the other YELLOW wire to ET1 (NS).

( ) Using sleeving, connect a wire from ET3 (NS) to EC PLAIN tag (NS) and through to EC RED tag (NS). Now solder EC PLAIN tag.

( ) Connect a wire from C1 (NS) to EC YELLOW tag (S-1).

( ) Connect a bare wire from EC1 (S-1) (EC1 is one of the capacitor mounting prongs) to ET2 (NS).

( ) Connect a 2.2 KΩ 1 watt resistor (RED, RED, RED) from C1 (S-2) to ET3 (NS).

( ) Connect a wire from ET1 (NS) to valveholder A tag 4 (S-1).

( ) Connect a $5\frac{1}{2}$" length of wire to ET1 (NS), pass the free end of the wire through grommet GB and across the chassis to grommet GA, pass the wire through GA and connect to valveholder B tag 5 (NS) and through to tag 4 (NS). Now solder both tags.

( ) Connect a 5,000 pF disc ceramic capacitor from ET1 (S-4) to ET2 (S-2).

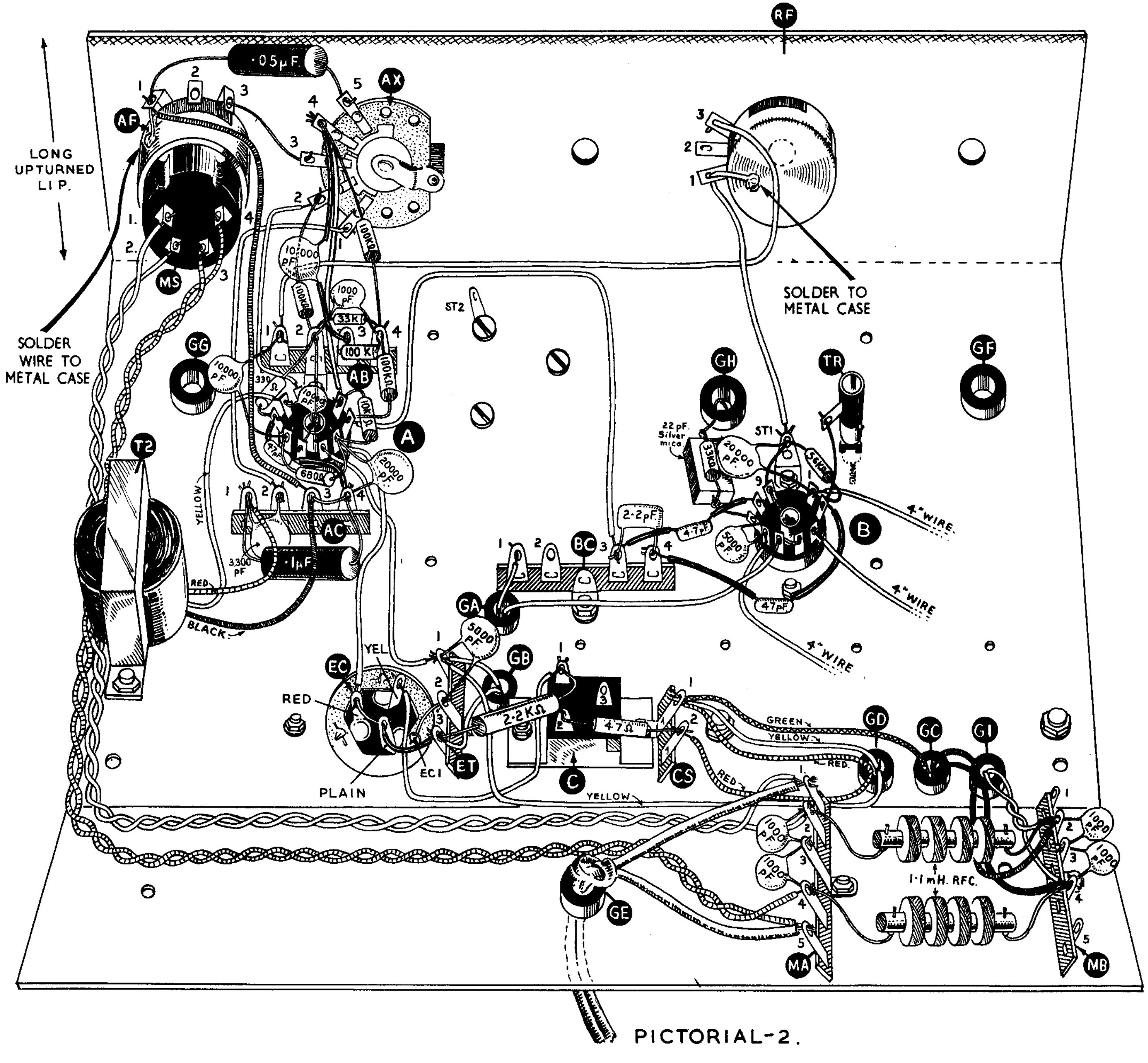
( ) Connect a $3\frac{1}{2}$" length of connecting wire from ET3 (S-3) passing the free end through grommets GB and GA as in the previous step and connect to tagstrip BC1 (NS).

At valveholder B, connect as follows:

( ) Connect a 20,000 pF disc ceramic capacitor from B tag 1 (NS) to solder tag ST1 (NS).

( ) Connect a bare wire link from ST1 (NS) through tag 9 (S-1) to the valveholder centre spigot (NS).

( ) Connect a bare wire from the tag at trimmer TR (S-1) to B tag 2 (NS).



PICTORIAL-2.

( ) Connect a 56 KΩ resistor (GREEN, BLUE, ORANGE) from valveholder B tag 2 (NS) to ST1 (NS).

( ) Using sleeving on both leads, connect a 47 pF capacitor from BC4 to B tag 2 (S-3).

( ) Connect a 4" wire to B tag 3 (S-1). Leave the other end free. This will be connected later.

( ) Connect a 5,000 pF capacitor from the valveholder B centre post (S-2) to B tag 6 (NS).

( ) Select a 22 pF silver mica capacitor and a 33 KΩ resistor (ORANGE, ORANGE, ORANGE) and fit the 33 KΩ resistor as shown in Figure 2.

( ) Bend one lead of this assembly down sharply from the body of the capacitor, pass this lead through grommet GH, connect the other lead to B tag 7 (S-1).

( ) Connect one end of a 4" length of wire to B tag 6 (S-2).

( ) Select the 4.7 pF N750 capacitor (may be colour coded VIOLET, YELLOW, VIOLET, WHITE, BROWN) and using sleeving on both leads, connect from B tag 8 (NS) to BC tag 3 (NS).

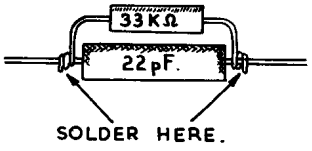


FIGURE-2

( ) Connect a 2.2 pF capacitor from BC4 (NS) to BC3 (NS). (This capacitor may be colour coded WHITE, RED, RED, WHITE, GREEN.)

( ) Connect a 4" length of wire to valveholder B tag 1 (S-2). Leave the other end free.

( ) Connect a $7\frac{1}{2}$" length of wire from BC3 (S-3), route as in the Pictorial and connect the other end to valveholder A tag 2 (NS).

( ) Connect a 4" length of wire to BC4 (S-3), pass the free end through grommet GH and connect to tag 1 (NS) of the tuning capacitor.

( ) Connect a length of wire from EC RED tag (S-2) to valveholder A tag 3 (NS).

( ) Connect a 10 KΩ 1 watt resistor (BROWN, BLACK, ORANGE) from A tag 3 (NS) to A tag 1 (NS).

( ) Connect a 680Ω resistor (BLUE, GREY, BROWN) from A tag 3 (NS) to A tag 6 (NS).

( ) Connect a 10,000 pF capacitor from A tag 6 (S-2) to AB tag 1 (NS).

( ) Connect a 20,000 pF capacitor from A tag 3 (S-4) to AC tag 4 (NS) and link across to AC tag 3 (NS).

( ) Pass a bare wire link from AB tag 2 (NS) through the valveholder centre spigot to A tag 5 (S-1).

( ) Connect a 330Ω resistor (ORANGE, ORANGE, BROWN) from A tag 7 (NS) to AB tag 2 (NS).

( ) Cut the YELLOW lead from transformer T2 to length and connect to A tag 8 (NS).

( ) Connect a 10,000 pF capacitor from A tag 8 (S-2) to A centre spigot (S-3).

( ) Using sleeving, connect a 47 pF capacitor from A tag 7 (S-2) to AC tag 4 (NS).

( ) Connect a length of wire from A tag 9 (S-1) to switch AX tag 2 (NS).

( ) Connect a 100 KΩ resistor (BROWN, BLACK, YELLOW) from AX tag 2 (S-2) to AB tag 2 (NS).

( ) Connect another 100 KΩ resistor (BROWN, BLACK, YELLOW) from AB tag 4 (NS) to valveholder A tag 2 (S-2).

( ) Connect a length of wire from AX tag 1 (S-1) to AC tag 2 (NS).

( ) Connect a 3,300 pF capacitor (may be colour coded ORANGE, ORANGE, RED) from AC tag 2 (S-2) to AC tag 1 (NS).

( ) Cut the RED lead from transformer T2 to length and connect to AC tag 1 (NS).

( ) Cut the BLACK lead from T2 to length and connect to AC3 (NS).

( ) Select a .1 μF capacitor and connect from AC tag 1 (S-3) to AC4 (NS).

( ) Connect a length of connecting wire from valveholder A tag 1 (S-2) to switch AX tag 4 (NS).

( ) Connect a 100 KΩ resistor (BROWN, BLACK, YELLOW) between tagstrip AB tag 3 (NS) and AB tag 4 (NS).

( ) Connect a 33 KΩ resistor (ORANGE, ORANGE, ORANGE) from AB2 (NS) to AB4 (NS).

( ) Connect a 1,000 pF capacitor from AB tag 4 (S-4) to AB tag 2 (S-5).

( ) Connect a bare wire link between AF tag 3 (S-1) and AX tag 3 (S-1).

( ) Connect a 10,000 pF capacitor between AX tag 4 (S-2) and AB tag 3 (S-2).

( ) Connect a .05 μF tubular capacitor from AX tag 5 (S-1) and pass the other lead through AF tag 1 (NS) to the metal case of the potentiometer (S-1). NOTE: It may be necessary to remove a patch of plating to effect a good joint.

( ) Connect a length of wire from AF tag 1 (S-2) to AC tag 3 (S-3). Now solder AC4 (S-4).

( ) Connect a length of wire from AB tag 1 (S-2) to control RF tag 3 (S-1). Route as in the Pictorial.

( ) Connect a $4\frac{1}{2}$" length of wire from solder tag ST1 (S-4) through RF1 (S-2) and solder to the body of the control.

( ) Refer to the rear apron of the chassis and mount the two 5-way tagstrips at position MA and MB. Use 6BA x $\frac{1}{4}$" countersunk head screws, lockwashers and nuts.

( ) Twist together two 25" lengths of wire and cut this twisted pair to make two $12\frac{1}{2}$" lengths.

( ) Strip all four ends of one $12\frac{1}{2}$" length and connect between switch MS (located at the rear of control AF) tags 1 (S-1) and 2 (S-1), and tagstrip MA tags 1 (NS) and 2 (NS).

( ) Strip all four ends of the other $12\frac{1}{2}$" length and connect between MS tags 3 (S-1) and 4 (S-1) and tagstrip MA tags 4 (NS) and 5 (NS).

( ) Cut the two BLACK leads from transformer T1 to length and connect to tagstrip MB tags 2 (NS) and 4 (NS).

( ) Select the mains lead and separate the two leads for a length of about 2" at one end. Pass this end through grommet GE and tie a simple knot about $2\frac{1}{2}$" from the end. Connect one lead to MA tag 1 (S-2) and the other lead to tag 5 (S-2).

( ) Connect a 1.1 mH choke between MA tag 2 (NS) and MB tag 2 (NS).

( ) Connect the other 1.1 mH choke between MA tag 4 (NS) and MB tag 4 (NS).

( ) Connect a 1,000 pF capacitor from MA tag 2 (S-3) to MA tag 3 (NS).

( ) Connect another 1,000 pF capacitor from MA tag 3 (S-2) to MA tag 4 (S-3).

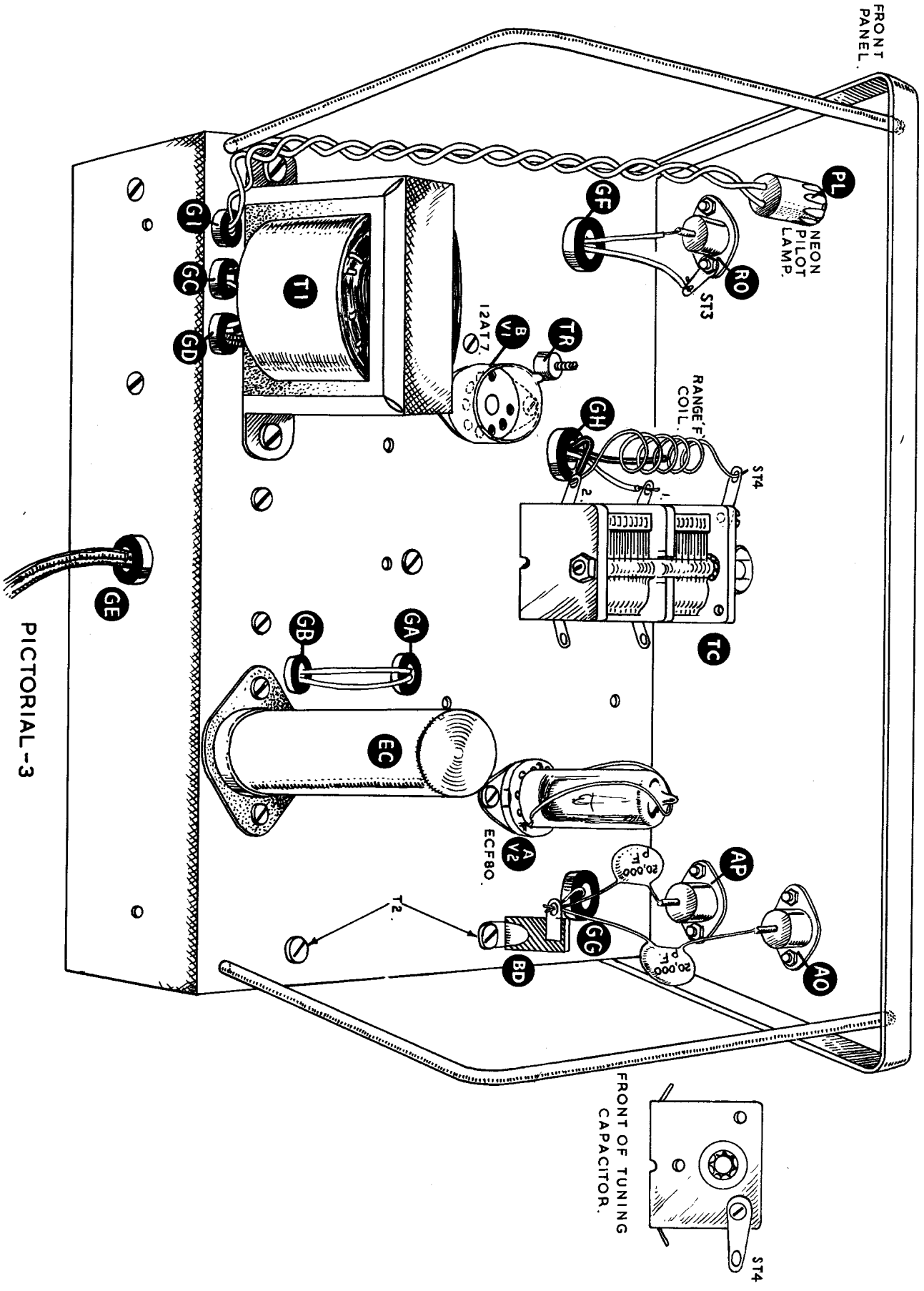
( ) Connect a third 1,000 pF capacitor from MB tag 2 (NS) to MB tag 3 (NS).

( ) Connect a fourth 1,000 pF capacitor from MB tag 3 (S-2) to MB tag 4 (NS).

FRONT PANEL ASSEMBLY - PICTORIAL 3

( ) Take the front panel and mount the three coaxial sockets at AO, AP and RO. The sockets mount inside the front panel. Use 6BA x 5/16" chrome plated instrument head screws, lockwashers and nuts, include a 6BA solder tag at ST3 as shown.

( ) Mount the neon indicating lamp at PL. First clean the paint from around the inside of the hole and push the indicating lamp into the hole from the printed side of the panel. Push the lamp until it is firmly seated with chrome surround up hard against the panel.


FRONT PANEL.
PL
NEON PILOT LAMP.
GF
RO
ST3
G1
GC
GD
T1
B V1 12AT7.
TR
RANGE 'F' COIL.
GH
ST4
2
1
GE
TC
GB
GA
EC
A V2 ECF80.
20,000 pF
AP
T2.
GC
BD
AO
FRONT OF TUNING CAPACITOR.
ST4

PICTORIAL-3

( ) Mount a 4BA solder tag on the tuning capacitor at position ST4 using a 4BA x 1/8" cheesehead screw. See inset on Pictorial 3 for correct positioning of the solder tag.

( ) Connect the free end of 22 pF/33 KΩ assembly to tag 2 (NS) of the tuning capacitor.

( ) Mount the range F coil between the solder tag ST4 (S-1) and tag 2 (S-2) of the tuning capacitor. See Pictorial 3 for positioning of the coil, note that a wire has been soldered about two turns from one end of the coil. This end is the one connected to solder tag TT.

( ) Note that a wire has been soldered to the coil. Using sleeving, pass this wire through grommet GH and connect to valveholder B tag 8 (S-2). Dress this wire away from the coil and as near to the chassis as possible.

( ) Remove the 3/8" nuts and flat washers from controls AF, AX and RF.

( ) Mount the front panel to the chassis by passing the threaded bushes through the corresponding holes on the front panel. Ensure that all holes are correctly aligned before tightening the controls, using the nuts and flat washers provided.

( ) Fit the dial pointer to the tuning capacitor shaft as shown in Figure 3, Page 18. Line up the engraved line on the dial pointer with the horizontal line at the low frequency end of the scale. Check that there is sufficient clearance between the front panel and the dial pointer over the full extent of its rotation, adjusting the capacitor in its mounting slots if necessary.

NOTE:- When soldering connections to the coaxial sockets, take great care not to use too much heat as this will melt the insulating surround.

( ) Having mounted the front panel, twist the leads from PL and pass them through grommet G1.

( ) Connect a 20,000 pF capacitor from AO (S-1) to 1-way tagstrip BD (NS).

( ) Connect another 20,000 pF capacitor from AP (S-1) to BD (NS).

( ) Cut a 5" length of connecting wire and connect to BD (S-3), pass the free end through grommet GG and under the chassis and connect to AF tag 2 (S-1).

( ) Now connect either of the leads from PL which are coming through G1 to MB tag 2 (S-4).

( ) Connect the other lead to MB tag 4 (S-4).

FINAL ASSEMBLY AND WIRING - PICTORIAL 4

( ) Select the pre-assembled range switch and mount at RS. Position carefully with reference to the Pictorial. Ensure that there is clearance between the range A coil and the chassis.

( ) Connect the copper braiding from the coil pack to the solder tag ST2 (S-1) situated under the tuning capacitor fixing screw.

( ) Connect a wire from RS tag 12 (S-1) through grommet GH to the tuning capacitor tag 1 (S-2). Route this wire along the front of the range switch.

( ) Connect the free end of the wire previously connected to valveholder B tag 6 to RS rear wafer tag 3 (S-1).

( ) Connect the free end of the wire previously connected to B tag 3 to RS rear wafer tag 4 (S-1).

( ) Connect the free end of the wire previously connected to B tag 1 to RS rear wafer tag 1 (S-1).

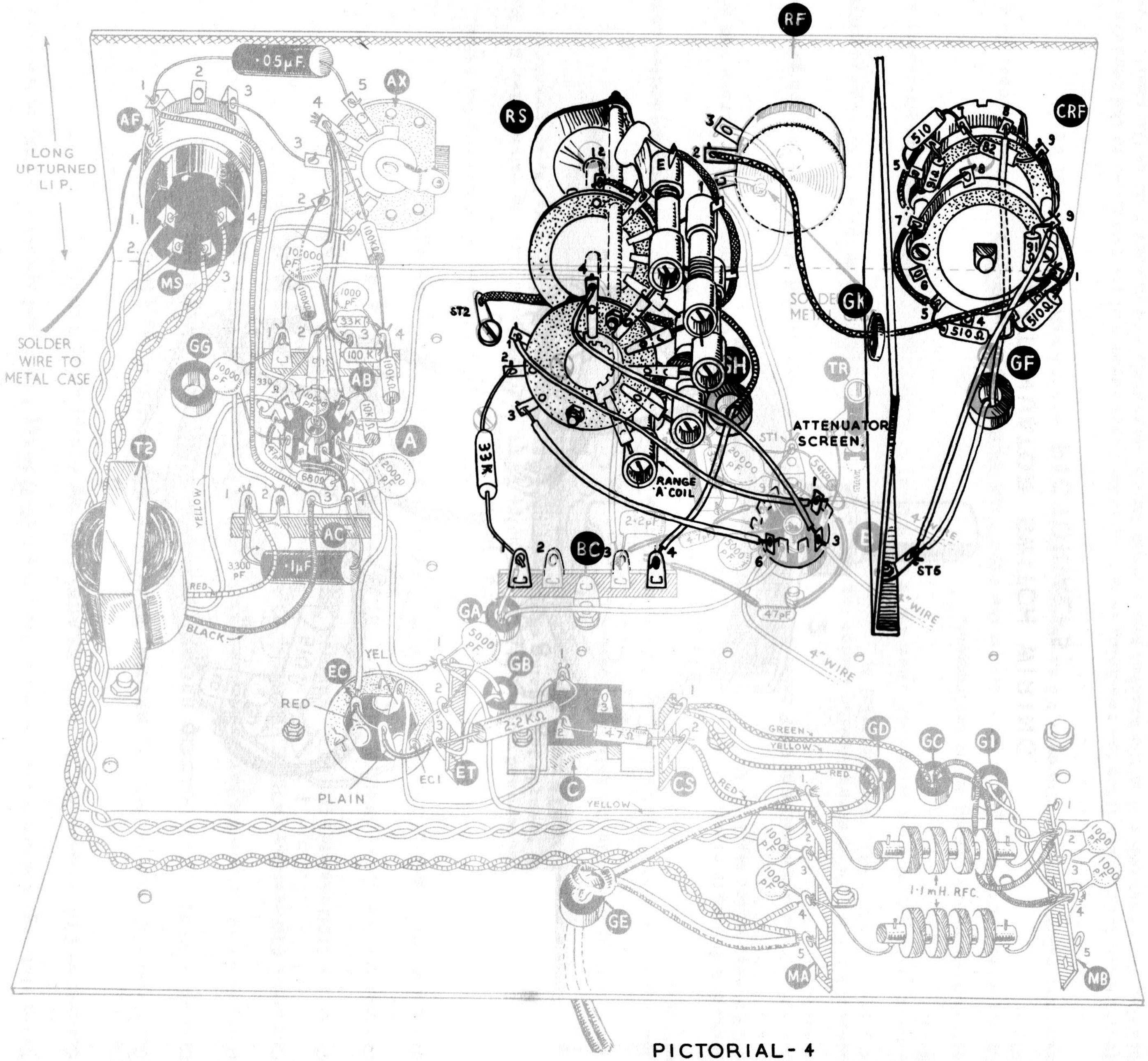
( ) Connect a 33 KΩ resistor (ORANGE, ORANGE, ORANGE) between BC tag 1 (S-2) and RS rear wafer tag 2 (S-1).

ATTENUATOR SWITCH WIRING - PICTORIAL 5

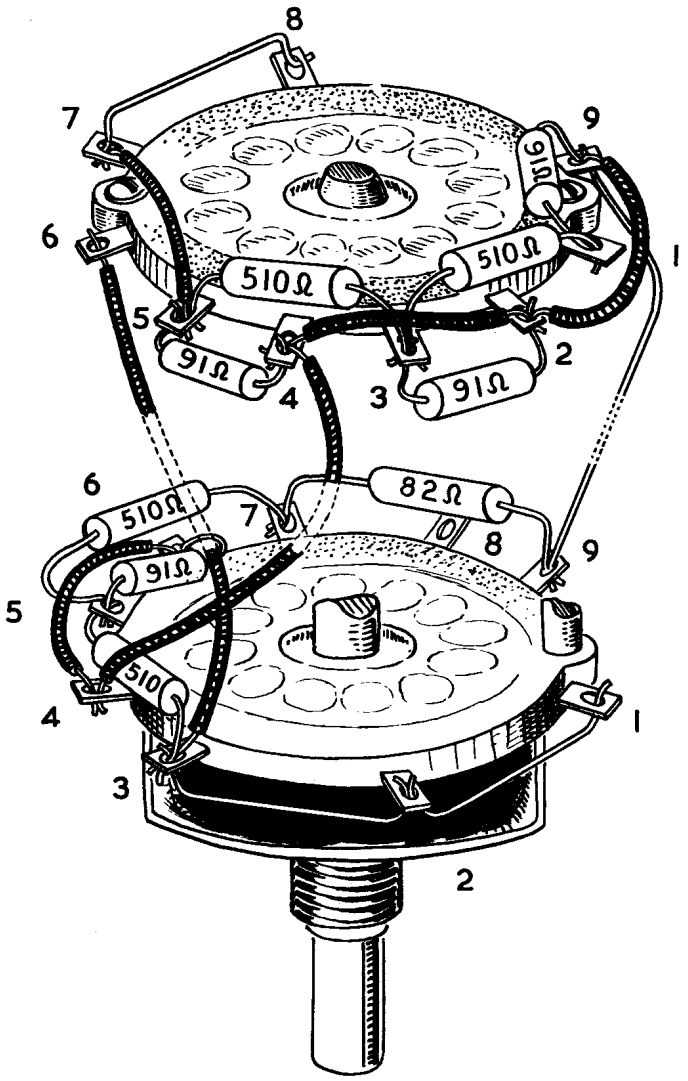
NOTE: All resistors used will be $\frac{1}{4}$ watt 5%.

Front wafer.

( ) Run a bare wire from tag 1 (S-1) to tag 2 (S-2), to tag 3 (NS) and, using sleeving, across to rear wafer tag 6 (S-1).



PICTORIAL - 4



ATTENUATOR SWITCH WIRING.
PICTORIAL-5.

( ) Connect a 510Ω resistor (GREEN, BROWN, BROWN) from tag 3 (S-3) to tag 5 (NS).

( ) Connect a 91Ω resistor (WHITE, BROWN, BLACK) from tag 5 (NS) to tag 6 (NS).

( ) Connect a 510Ω resistor (GREEN, BROWN, BROWN) from tag 5 (S-3) to tag 7 (NS).

( ) Using sleeving, connect a bare wire link from tag 6 (S-2) to tag 4 (S-2) and across to 4 (NS) on the rear wafer.

( ) Connect an 82Ω resistor (GREY, RED, BLACK) from tag 7 (S-2) to tag 9 (NS).

Rear wafer.

( ) Connect a 91Ω resistor (WHITE, BROWN, BLACK) from tag 9 (NS) to tag 1 (NS).

( ) Connect a 510Ω resistor (GREEN, BROWN, BROWN) from tag 1 (NS) to tag 3 (NS).

( ) Using sleeving, connect a bare wire link from tag 4 (NS) through tag 2 (NS) to tag 9 (NS).

( ) Connect a 91Ω resistor (WHITE, BROWN, BLACK) from tag 3 (NS) to tag 2 (S-3).

( ) Connect a 510Ω resistor (GREEN, BROWN, BROWN) from tag 3 (S-3) to tag 5 (NS).

( ) Connect a 91Ω resistor (WHITE, BROWN, BLACK) from tag 5 (NS) to tag 4 (S-3).

( ) Using sleeving, connect a bare wire from tag 5 (S-3) through tag 7 (S-2) to tag 8 (S-1).

( ) Connect a bare wire link from rear wafer tag 9 (NS) to front wafer tag 9 (S-2). Temporarily lay aside.

( ) Select the attenuator screen and mount using the two holes which are positioned close to valveholder B. Position with the lip pointing towards the outside edge of the chassis. Use 6BA x 5/16" screws, lockwashers and nuts and include a solder tag ST5 under the inner nut. See Pictorial 4.

( ) Mount a $\frac{1}{4}$" grommet in the hole in screen.

( ) Now mount the previously assembled 2-wafer attenuator switch at position CRF. Position the switch correctly according to the Pictorial.

( ) Connect a 5" length of wire to RF tag 2 (S-1), pass the free end through the grommet in the screen and connect to CRF rear wafer tag 1 (S-3).

( ) Connect a 5" length of wire to CRF front wafer tag 8 (S-1). Pass the free end of the wire through grommet GF to socket RO (S-1).

( ) Connect a $3\frac{1}{2}$" length of wire from the solder tag ST3 (S-1). Pass the free end of the wire through grommet GF to solder tag ST5 (NS). See Pictorial 3.

( ) Connect a length of wire from CRF rear wafer tag 9 (S-4) to solder tag ST5 mounted on the attenuator screen (S-2).

This now completes the wiring of the instrument.

( ) Taking care not to damage the pins, insert the 12AT7 and ECF80 valves in their respective places. See Pictorial.

( ) Instal the valve retaining clip over V2 as shown in Pictorial 3, and the valve screen over V1.

( ) Mount the two L brackets using the two holes in the top front panel edges and the two holes in the corners of the chassis. Note that one end of the bracket has a countersunk entry, this end mounts next to the panel. Use 6BA instrument head screws at the panel and 6BA binderhead screws at the chassis. See Pictorial 3.

( ) Mount the handle to the cabinet using 4BA x $\frac{1}{4}$" screws and lockwashers.

( ) Mount the five skirted knobs and ensure that each knob lines up with the panel printing.

( ) Fit the four rubber feet to the cabinet referring to Figure 4.

( ) Prepare the coaxial cable as shown in Figure 5.

This completes the assembly of your RF-1U. Before switching on however, turn the instrument upside down and vigorously shake it to remove any wire clippings or solder splashes which may be loose inside. Also make a check for any solder "bridges" or wiring errors which may be apparent. A few minutes spent checking for errors of this kind may save component damage when switching on.

Connect to an AC outlet of 230-250v, 50-60 cycles. DO NOT under any circumstances connect to a DC outlet as serious component damage will occur.

When switching on, the valve heaters should glow RED. If they do not glow, a check of the heater wiring is suggested. If possible, with a suitable meter, make a check of voltages existing at the various valve tags referring to the voltages given in the circuit diagram. Any discrepancy should be investigated before proceeding with alignment checks.

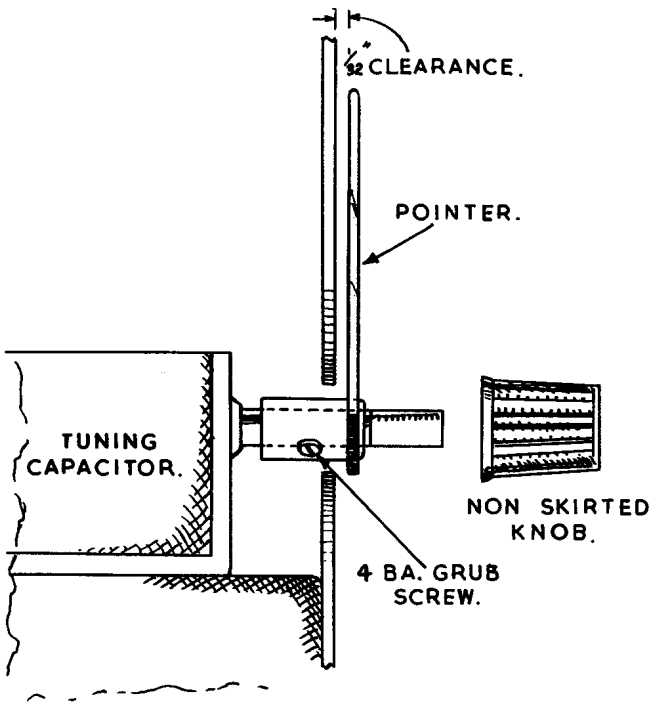


FIGURE - 3

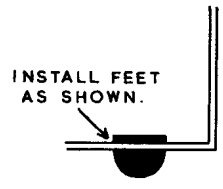


FIG- 4

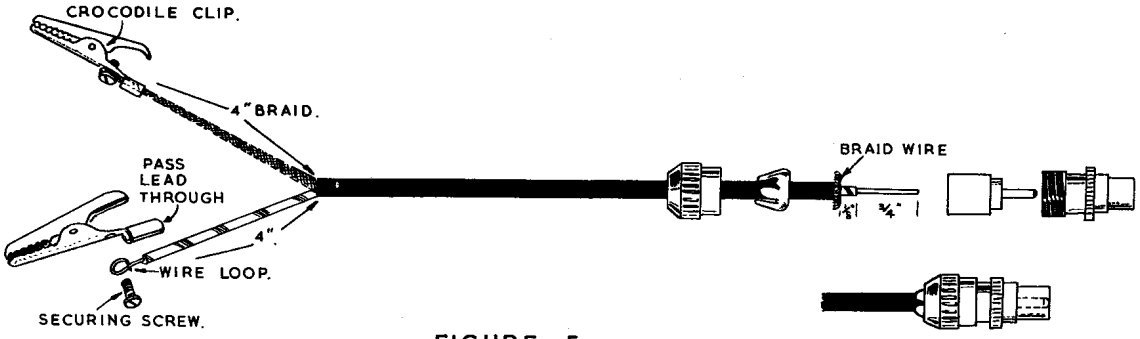


FIGURE- 5

CALIBRATING THE RF-1U

The only equipment needed for calibration is an AM and an FM radio. Before proceeding with the following steps, turn on both the RF-1U and the radios and allow approximately ten minutes warm-up time.

1. ( ) Carefully tune the AM radio to a station of known frequency in the medium wave band. The frequency of the chosen station should preferably be one that falls on a range B dial calibration point, such as 800 Kc/s or 1000 Kc/s. If no station is available, the Light programme at 200 Kc/s (range A) will be suitable.

2. ( ) Adjust the trimmer capacitor TR so that the top of the threaded portion is approximately 3/8" above the chassis, it has been found that this setting gives optimum accuracy.

3. ( ) Set the range switch of the generator to range B, the modulation switch to EXT. MOD., and the coarse and fine attenuators to their maximum clockwise rotation.

4. ( ) Connect the output cable to the RF output socket. Place the end of the cable in close proximity to the loop or aerial lead of the radio, but not directly connected to the radio.

5. ( ) Turn the tuning control of the RF-1U until a squeal is heard in the radio receiver. Adjust the tuning for the lowest pitched squeal, or preferably a point where there is a slow popping, with an increasing squeal on either side of this setting. The slow popping, or its complete cessation is known as "zero beat". The pointer should now indicate a frequency very close to the frequency of the station to which the receiver is tuned.

6. ( ) Reset the tuning of the generator so that the pointer indicates the same frequency as that of the broadcasting station. Now adjust the trimmer capacitor TR to re-establish the zero beat.

7. ( ) Tune the FM radio to a station around 90 Mc/s.

8. ( ) Connect the output cable to the FM aerial terminals.

9. ( ) Turn the generator to range F and turn the modulation switch to INT. MOD./AF OUT.

10. ( ) Adjust the tuning of the RF-1U to the frequency to which the receiver is tuned. It will be noted that as the generator is tuned through the frequency, that the audio modulation will be louder on both sides of the centre frequency. This is normal and is due to the fact that the generator is amplitude modulated and has very little frequency modulation. The point where the audio tone is at a minimum is the correct position.

11. ( ) If, in Step 10, the RF-1U dial indicated a frequency higher than the station frequency, gently squeeze the turns of the range F coil together until the dial indicates the correct frequency. If the dial indicates a lower frequency, the coil turns should be spread apart slightly.

This concludes the general calibration of the instrument. IMPORTANT: The cores of the coils for ranges A, B, C, D and E have been individually adjusted before despatch from the factory to precision standards. We strongly recommend that these cores are not touched unless there is definite evidence of misalignment.

If it is desired to check the accuracy of each range and the operator has the necessary equipment and is familiar with alignment procedures, we would suggest the following equipment:-

1. A laboratory generator with an accuracy of at least 1% or, as an alternative, a communications type receiver fitted with a crystal calibrator.

2. An oscilloscope to indicate zero beat.

Before alignment it will be necessary to slacken the mounting nuts of the range switch and re-position the switch so that the cores are accessible.

After adjustment, restore the switch to its correct position.

ACCURACY.

Any signal generator is designed as a convenient and controlled source of modulated or unmodulated signals. No ordinary signal generator is designed as a frequency standard, the accuracy of more expensive generators is generally 1%, however, the accuracy of the Heathkit RF-1U is $\pm$ 2% of the dial calibration which is quite satisfactory for service work and alignment. In receiver alignment the frequency at which a particular adjustment is made is not very critical, but the adjustment itself for maximum receiver output is frequently critical. For calibration of home built receivers or equipment, various B.B.C. stations on the long or medium waveband or V.H.F. bands may be selected to provide calibration points on the dial.

However, when checking the accuracy of your RF-1U, always select stations of known frequency (frequencies of B.B.C. stations can be found in a copy of the Radio Times or the programme section of some daily papers). Do not use the dial calibration of the receiver as an indication of the generator frequency, unless it is a communications type receiver equipped with crystal calibration facilities.

After checking that the generator functions correctly and that its calibration is satisfactory, fit the RF screen as shown in Figure 6. The screen covers valveholder B, the coil pack and the attenuator circuits. Ensure that no lead or components are trapped between the chassis and the screen. Use 6BA x 5/16" screws, lockwashers and nuts and tighten all the screws securely.

Having fitted the RF screen, fit the RF-1U in its cabinet using two 3/8" sheet metal screws.

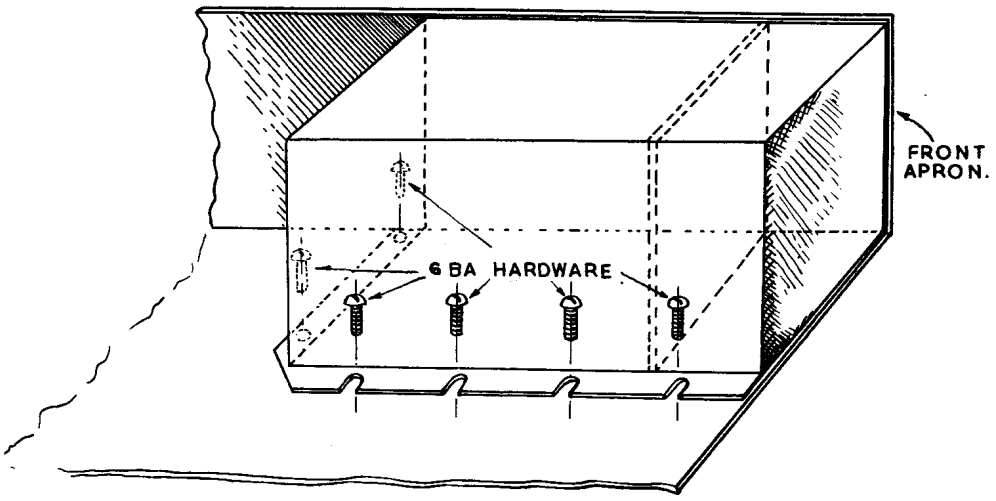


FIGURE - 6

IN CASE OF DIFFICULTY

1. Recheck the wiring. Trace each lead in coloured pencil on the pictorial as it is checked. It is frequently helpful to have a friend check your work. Someone who is not familiar with the unit may notice something consistently overlooked by the constructor.

2. It is interesting to note that about 90% of the kits that are returned for repair are defective due to poor connections and soldering. Therefore, many troubles can be eliminated by reheating all connections to make sure that they are soldered as illustrated in the Figures found in the PROPER SOLDERING PROCEDURE section of this manual.

3. Check to be sure that all valves are in their proper locations. Make sure that all valves light up properly.

4. Check the values of the component parts. Be sure that the proper part has been wired into the circuit, as shown in the Pictorial diagram and as called out in the wiring instructions.

5. Check for bits of solder, wire ends or other foreign matter which may be lodged in the wiring, valve sockets or tagstrips.

6. If possible, check the valves with a valve tester or by substituting a known good valve of the same type.

7. If, after careful checks, the trouble is still not located and a voltmeter is available, check voltage readings against those found on the Schematic Diagram. NOTE: All voltage readings were taken with a Heathkit Valve Voltmeter. Voltages may vary 10% due to mains voltage variations.

8. A review of the circuit description will prove helpful in indicating where to look for trouble.

9. If the RF-1U fails to function on any one particular range, the coil for the range may be open circuited.

USING THE RF-1U

In order to realise the maximum usefulness of this instrument, the operator should thoroughly familiarise himself with the following information on operating procedures and alignment, etc.

The RF fine attenuator, coarse attenuator and RF output are self explanatory. An audio frequency is available at the AF OUT socket when the modulation switch is in the internal modulation position. When the switch is in the external modulation position, the internal modulation is turned off and the RF signal may be modulated by feeding an audio frequency signal into the AF IN socket. Approximately 3 volts is required for 30% modulation. The EXT/LEVEL control enables the user to control the level of external modulation and also the level of the audio output. This control turns the instrument off and on.

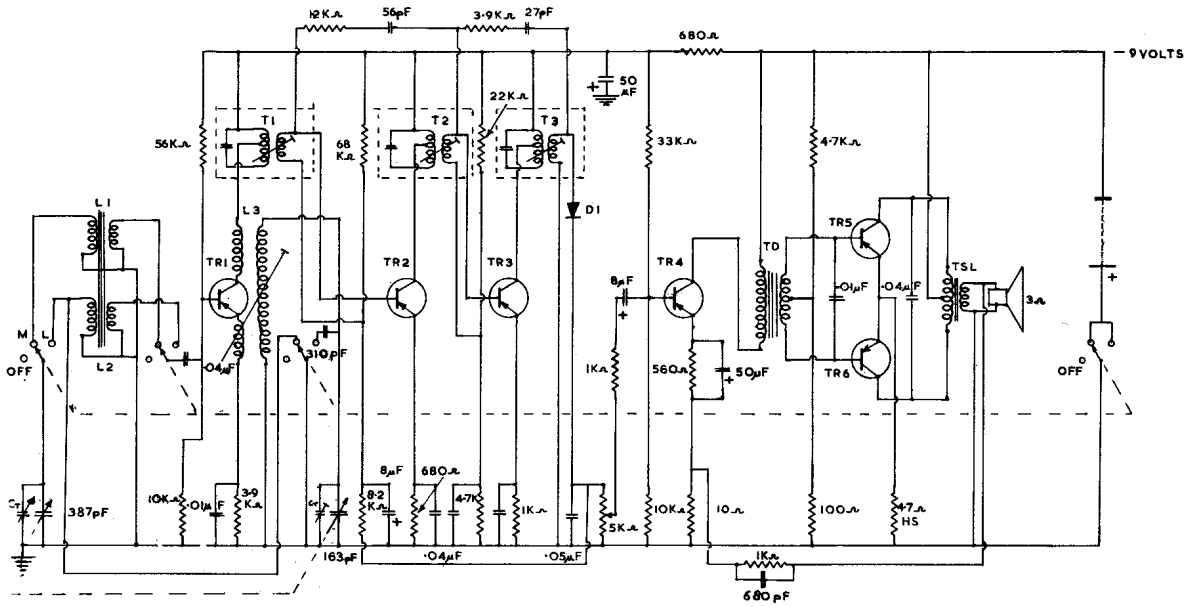


FIGURE - 7

ALIGNMENT OF AM TUNERS AND RECEIVERS

Modern AM receivers have in general become quite standard in intermediate frequency and the broadcast bands covered. An IF of 470 Kc/s is now used by most manufacturers although there are probably still some variations. However, the relevant manufacturers data will soon supply the required information for the complete IF and RF alignment of the receiver.

The RF-1U can be used to completely test and align a receiver. Always remember, however, to completely isolate the generator by including a capacitor in each lead of the output cable. The audio tone available at the AF OUT socket can be used to check the AF output circuits of the receiver for correct functioning.

Outlined below is an approximate guide for receiver alignment. It should be remembered, however, that the manufacturers service sheets should always be referred to.

Figure 7 shows the circuit diagram of a typical transistorised superhet. receiver, in this case the Heathkit UXR-1.

1. Turn the signal generator on and allow it to warm up for about a quarter of an hour to reach operating temperature.

2. While the speaker may be used as an indication of output it is much more desirable to use some other type of output indicator. This may be an AC meter connected directly across the speaker terminals or perhaps a valve voltmeter connected to measure AVC voltage.

3. Turn the tuning dial so that the tuning capacitors are completely open (this is the high frequency end of the dial).

4. Before connecting your RF-1U to any part of the circuit always include an isolating capacitor in each lead of the output cable.

5. For alignment of the IF transformers connect the 'hot' lead of the generator to the base of TR1.

6. With the generator set to 470 Kc/s and the MOD switch to INT. MOD. adjust generator output until the receiver output is below 50 milliwatts because at this low level the AVC is inoperative (of course this is irrelevant if you are using the AVC voltage as an indication).

7. Adjust the IF cores for maximum output, reducing the receiver output as alignment progresses to keep it below 50 milliwatts.

N.B. During RF alignment, it will be sufficient to couple the generator to the set by means of a loose coil wound around the ferrite.

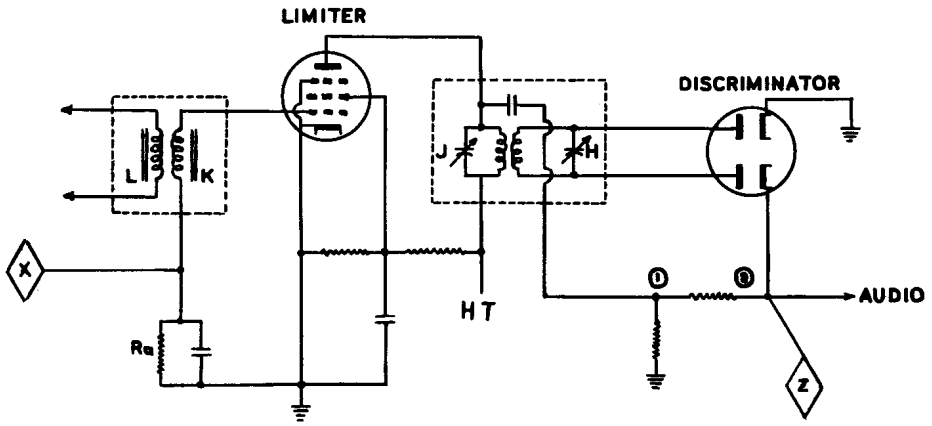


FIGURE-8

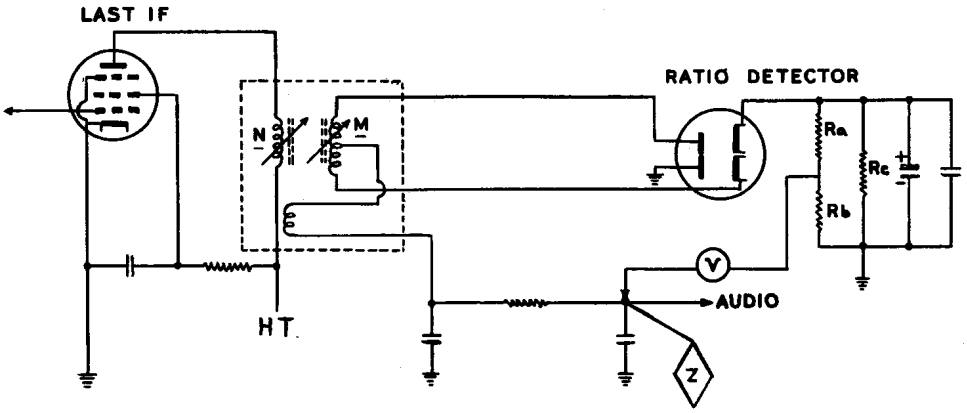
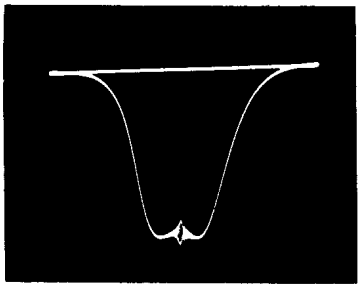
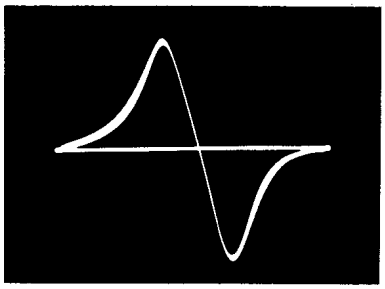


FIGURE-9



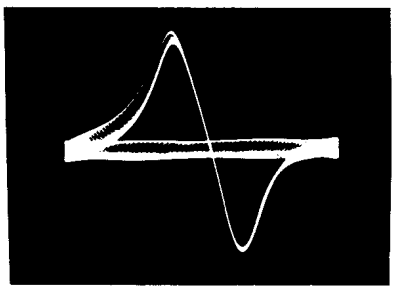
FIGURES-10A.

FM IF response with 10.7 Mc/s marker.



10B.

Ratio detector or discriminator response with 10.7 Mc/s marker at 0.



10C.

Ratio detector or discriminator response with 10.7 Mc/s marker not at 0. Note 400 cycle modulation.

( ) Set the generator to 1500 Kc/s and tune the receiver on the medium waveband until the generator signal can be heard or read on the output indicator. Adjust the oscillator trimmer and alternatively retune the capacitor until the signal appears at 1500 Kc/s on the receiver tuning scale.

( ) Retune the generator and receiver to 1400 Kc/s and tune the aerial trimmers for maximum output.

( ) Now tune both the receiver and generator to 600 Kc/s and adjust L3 core for maximum, alternately tune the capacitor with one hand and the oscillator core with the other until no further improvement can be made. On this receiver there is no 'padding' or 'tracking' capacitor in the aerial circuit but a certain degree of adjustment can be made by sliding the medium wave coil along the ferrite rod.

( ) In cases where adjustment is made at the low frequency end of the dial, it will be necessary to repeat the adjustments at the low frequency end and the high frequency end of the dial until no further adjustment is required.

The RF alignment procedure for multiband AM receivers is essentially the same as outlined above for a single band set. Each band is aligned separately, starting with the highest frequency and working toward the lowest. The technique outlined above should be used but with appropriate high and low frequency settings for each band.

ALIGNMENT OF FM TUNERS AND RECEIVERS

While the procedure of aligning the IF and then the oscillator and RF of an FM receiver is similar to that of an AM receiver, there are several important differences, the greatest one being that the ratio detector or discriminator must be aligned after the IF alignment. Due to the many varied IF bandwidths and types of IF transformer coupling that are used, it is imperative that the unskilled operator consult the receiver manufacturer's alignment notes before attempting FM alignment. While many FM receivers may be aligned with a standard AM generator by peaking the IF's to the required frequency (usually 10.7 Mc/s), as many others will have to be aligned using a sweep generator. Therefore, only a general procedure will be outlined here. The RF-1U may be used, no matter which procedure is recommended by the manufacturer, either as as AM generator or as an accurate marker generator during sweep alignment.

Most procedures call for the use of either a valve voltmeter or oscilloscope as an output indicator. The specified indicator is generally connected in series with an approximately 100 KΩ resistor to the grid return of the last limiter (point X in Figure 8). Output indications for both RF and IF alignment are obtained from this point. Oscilloscope connections for both a ratio detector and a discriminator are shown as point Z in accompanying Figures 8 and 9 respectively. When aligning the secondary of a ratio detector or discriminator, it is sometimes very difficult to see the 10.7 marker on the S curve because the 10.7 Mc/s point is at 0, or the crossover point. To facilitate alignment of the secondary, it is helpful to turn the modulation from the RF generator on and adjust the secondary for a minimum amount of 400 cycle signal on the S curve (see Figures 10B and 10C). A ratio detector or discriminator inherently has a certain amount of AM suppression. Therefore, when the 400 cycle AM modulation is at a minimum, the operator can be sure that the 10.7 marker is at 0 even though it may not be visible. This procedure is only effective when an AM signal generator such as the RF-1U, which has very little incidental FM, is used.

Siganl generator connections to the receiver vary with different procedures. Some procedures align each stage successively, starting with the last limiter stage and proceeding toward the mixer; in other procedures, the generator is connected directly to the mixer. A convenient method that can be used to connect the generator to the mixer stage without upsetting alignment is to connect the 'hot' lead of the generator to a loose coil wound around the mixer valve. For RF alignment, the generator is usually connected to the aerial terminals through a suitable matching pad.

SERVICING BY SIGNAL INJECTION

Another use of the generator is a method of servicing called signal injection. This procedure may prove very helpful in isolating defective stages in a receiver when other fault finding methods fail. The method involves the application of first, an audio signal to the grid of the audio output valve and then moving forward to the first audio amplifier. From there an audio modulated intermediate frequency signal should be fed into the grid of the last IF valve. Continue to move the signal injection point toward the aerial terminals (using the appropriate frequency) until the defective stage is located; this of course would be where there is no signal heard through the receiver. For example, if a clear tone is heard when the 'hot' generator lead is touched to point E in Figure 11, but not when it is touched to point F, we are reasonably sure that capacitor C1 is open. The accompanying Block Diagram may also help to illustrate this procedure. See Figure 12.

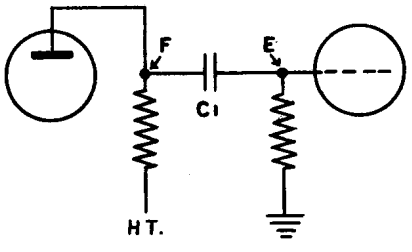


FIGURE-11

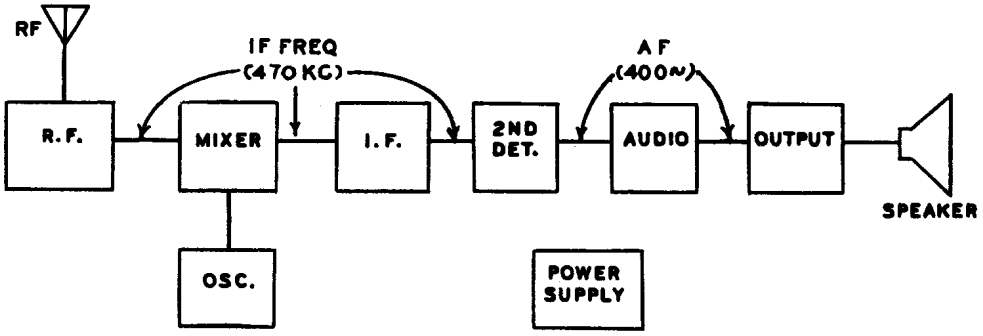
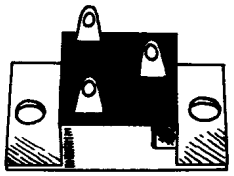
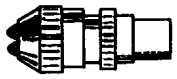


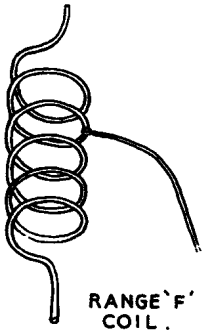
FIGURE- 12.



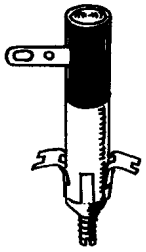
SELENIUM RECTIFIER



CO-AXIAL PLUG.



RANGE 'F' COIL.



1-8pF. TRIMMER.

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.

PARTS LIST

PART No.	PARTS Per Kit	DESCRIPTION
Resistors (¼ watt)		
Q-820C5	1	82Ω (Grey, Red, Black)
Q-910C5	4	91Ω (White, Brown, Black)
Q-511C5	4	510Ω (Green, Brown, Brown)
Resistors (½ watt)		
H-470C10	1	47Ω (Yellow, Violet, Black)
H-331C10	1	330Ω (Orange, Orange, Brown)
H-681C10	1	680Ω (Blue, Grey, Brown)
H-333C10	3	33 KΩ (Orange, Orange, Orange)
H-563C10	1	56 KΩ (Green, Blue, Orange)
H-104C10	3	100 KΩ (Brown, Black, Yellow)
Resistors (1 watt)		
1-222C10	1	2.2 KΩ (Red, Red, Red)
1-103C10	1	10 KΩ (Brown, Black, Orange)
Capacitors (all types)		
20-514	1	22 pF, silver mica
21-536	1	2.2 pF, ceramic
21-524	1	4.7 pF, N750 (Violet, Yellow, Violet White, Brown) tubular, ceramic
21-501	2	47 pF, tubular, ceramic
21-543	1	3,300 pF (Orange, Orange, Red) tubular, ceramic
21-509	5	1,000 pF (.001 μF) disc, ceramic
21-522	2	5,000 pF (.005 μF) disc, ceramic
21-511	3	10,000 pF (.01 μF) disc, ceramic
21-512	4	20,000 pF (.02 μF) disc, ceramic
23-504	1	.05 μF, 250 volt, tubular, paper
23-505	1	.1 μF, 250 volt, tubular, paper
25-519	1	20+20+20 μF, 350 volt, electrolytic
26-512	1	364-164 pF, variable
31-503	1	1-8 pF trimmer, variable
Controls, Switches, Transformers, Coils		
19-509	1	100 KΩ lin with D/P switch
10-531	1	5 KΩ lin, moulded track
63-524	1	Mod IN-OUT switch
63-525	1	Attenuator 2-wafer switch
51-44	1	Modulation transformer
54-522	1	Mains transformer
45-506	2	1.1 mH RF choke
40-542	1	Range F coil
100-518	1	Range switch and coil assembly comprising:-
20-52	1	7.5 pF silver mica capacitor
40-537	1	Range A coil
40-538	1	Range B coil
40-539	1	Range C coil
40-540	1	Range D coil
40-541	1	Range E coil
63-212	1	6-position range switch
Tagstrips, Coaxial Plugs, Sockets		
431-501	1	1-way tagstrip
431-16	1	2-way tagstrip with earth
431-10	1	3-way tagstrip

PART No.	PARTS Per Kit	DESCRIPTION
Tagstrips, Coaxial Plugs, Sockets		
431-12	2	4-way tagstrip (with earth tag)
431-502	1	4-way tagstrip (without earth tag)
431-509	2	5-way tagstrip (with earth tag)
438-504	1	Coaxial plug
432-505	3	Coaxial socket
Valves, Rectifiers, Indicating Lamp		
411-502	1	ECF80 valve
411-24	1	12AT7 (ECC81) valve
412-518	1	Neon indicating lamp, red
57-503	1	Selenium rectifier
Sheet Metal Parts		
200-524	1	Chassis, copper plated
206-517	1	RF screen, copper plated
206-518	1	Attenuator screen, copper plated
203-523	1	Front panel
90-508	1	Cabinet
204-507	2	L bracket, cadmium plated
Wire, Mains Lead, Sleeving, Solder		
340-501	1 length	22 swg. bare wire
343-503	1 length	Coaxial cable
344-506	1 length	Connecting wire
346-501	1 length	Sleeving
331-501	1 length	18 swg. solder
89-1	1 length	Mains lead
Hardware		
250-527	2	6BA x ¼" countersunk head screw
250-525	8	6BA x 5/16" instrument head chrome plated screw
250-502	14	6BA x 5/16" binderhead screw
250-530	4	4BA x 1/8" cheesehead screw
250-513	15	4BA x ¼" binderhead screw
254-501	16	6BA lockwasher
254-1	13	4BA lockwasher
252-501	16	6BA nut
252-3	13	4BA nut
259-504	2	4BA solder tag
259-505	3	6BA solder tag
250-8	2	3/8" sheet metal screw
Miscellaneous		
73-501	4	3/8" rubber grommet
73-504	6	¼" rubber grommet
211-4U	1	Handle
463-504	1	Dial pointer
462-18	1	Knob without skirt
462-19	5	Knob with skirt
481-501	1	Mounting wafer
261-502	4	Rubber feet
260-1	2	Crocodile clip
434-501	1	9-pin valveholder with skirt
434-502	1	9-pin valveholder without skirt
258-507	1	Valve retaining clip
206-501	1	Screening can
595-572	1	Manual

MODEL RF-1U

ERRATA

To facilitate your construction of this kit with the maximum of ease, will you kindly make the following changes to your Instruction Manual NOW. Thank you.

Page

2 Circuit Diagram — Amend voltages as follows

	1	2	3	4	5	6	7	8	9
V1	70	*8	-	6.3v a.c.		65	*4	-	0
V2	55	-	125	6.3v ac	0	120	2	1	-
	C17A: 160 v				C17B: 125 v				

* May vary widely.

Delete incorrect earth connections at:-
V2A pin 9, C13, input and output of step attenuator SW4.

9 Last step but one — Amend 'tag 9 (S-1)' to read 'tag 9 (S-2)'.

10 Pictorial 2 — Delete 100 KΩ resistor shown between AX tag 4 and AB tag 4.

11 Step 2 — After BC4 add "(NS)".

12 Step 11 — Amend 'AF tag 1 (S-2)' to read 'AF tag 1 (S-3)'.