PRICE 10/6

Assembling and Using Your...

Heathkit
DAYSTROM

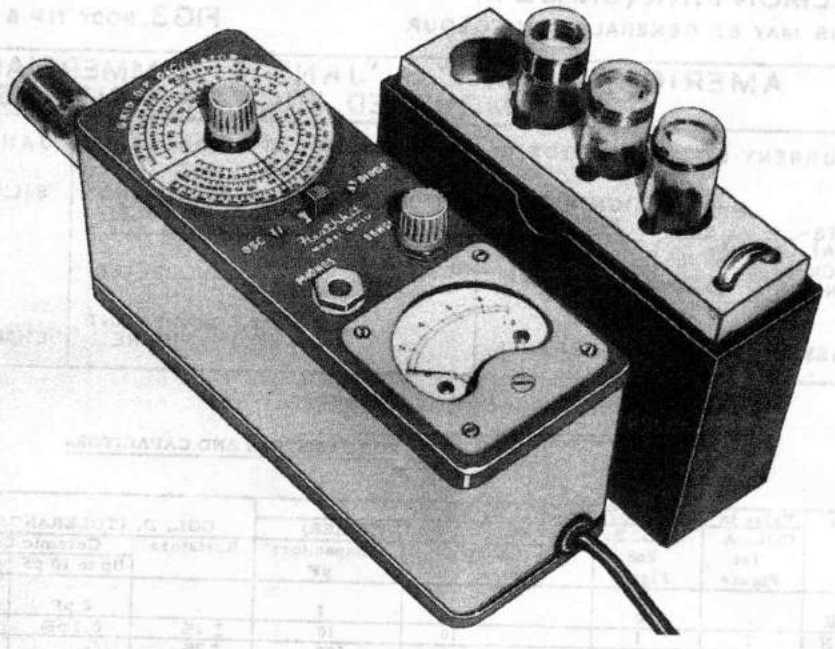
GRID DIP METER

MODEL GD-IU

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

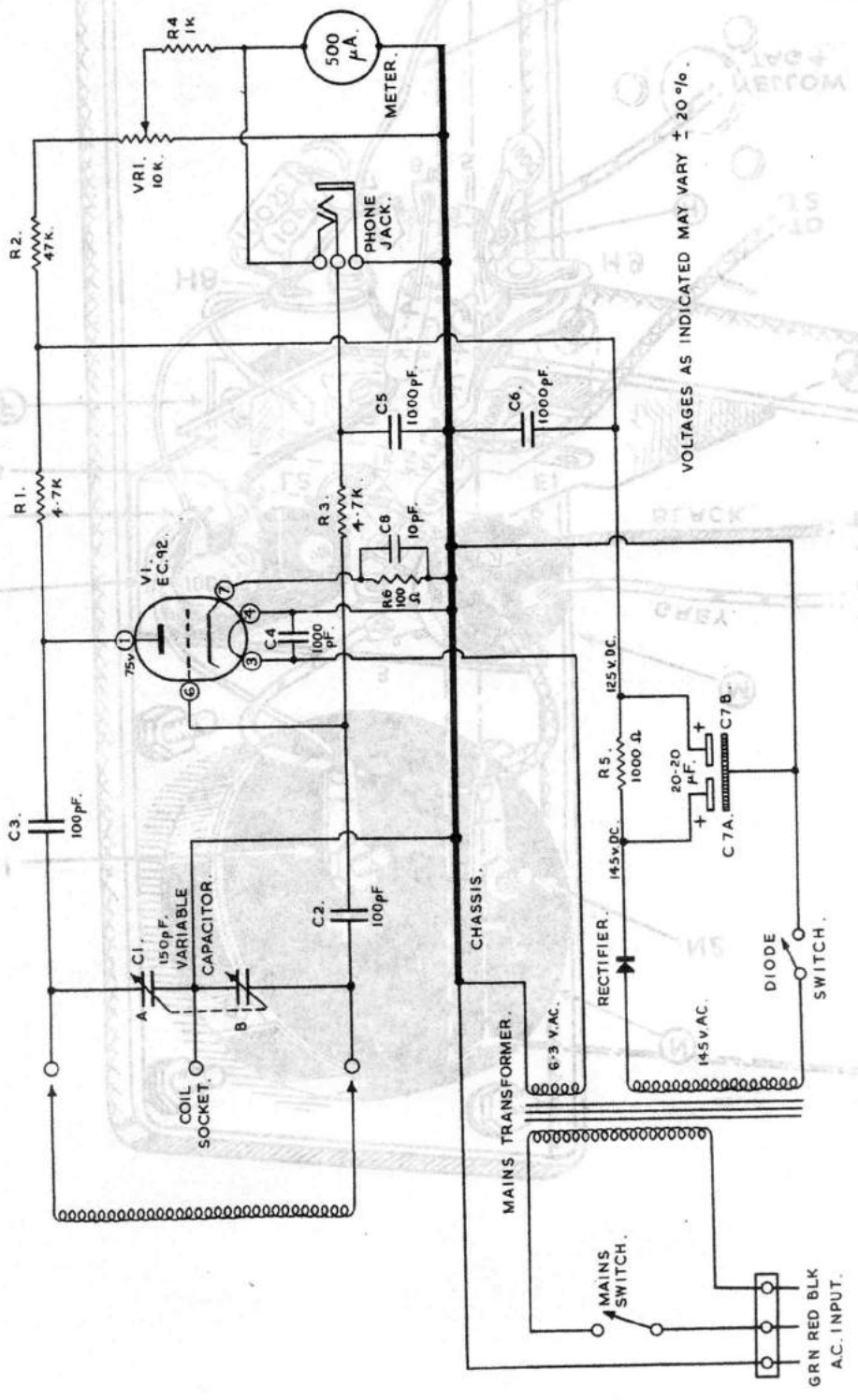
Assembly and Operation of the HEATHKIT GRID DIP METER

MODEL GD-1U



SPECIFICATIONS

Frequency Range:	1.8 to 250 Mc using five coils. Additional coils available; extending frequency to 350 kc.
Meter Movement:	500 μA F.S.D.
Power Requirements:	230 volt, 5 watts, 50/60 cycles
Power Supply:	Transformer operated selenium rectifier
Dimensions:	7½" long x 2½" wide x 3¼" deep
Shipping Weight:	4½ lbs.
Net Weight:	2½ lbs.



'HEATHKIT' GRID DIP METER. MODEL GD-1U. CIRCUIT DIAGRAM.

INTRODUCTION

The Heathkit Grid Dip Meter model GD-1U is a very useful instrument. As well as determining resonant frequencies, it is also capable of performing the various tests required in the design, adjustment, and operation of high frequency radio and television equipment. Being basically a variable high frequency oscillator, it can be used as a signal generator or marker generator. As a grid dip meter, it can be used to determine the resonant frequency of a tuned circuit, methods are outlined for using this information to determine unknown values of inductance, capacity, or Q. When used as a diode detector, it checks the frequency of other high frequency RF sources (providing the RF energy is at least .5 of a volt). Switched to an oscillating detector, used in conjunction with a pair of headphones, it is even more sensitive for checking the frequency of other oscillators.

OPERATION OF THE GRID DIP METER

A good understanding of the operation of the grid dip meter will aid materially in the proper use of the instrument.

The grid dip meter is a high frequency oscillator operating in the range from 1.8 Mc to over 250 Mc. Useful range may be extended down to 350 kc with additional coil set 341-U. A microammeter is inserted in the grid circuit of the oscillator valve. Whenever the oscillator is coupled to a load or resonant frequency, a noticeable reduction in grid current takes place. This reduction in grid current is termed the "grid dip".

The most common load which will absorb energy from the oscillator is a resonant circuit tuned to the same frequency as the oscillator. The grid dip meter can be changed to a wave meter by setting the bottom switch to the "diode" position. When used as a wave meter, the valve acts as a diode detector. As the instrument is tuned to the frequency of nearby RF sources, the diode current reading on the meter will increase. (The sensitivity control must be advanced to maximum, initially.) Thus the GD-1U can be used to determine the frequency of other oscillating circuits providing there is sufficient RF energy within the oscillator circuit under test.

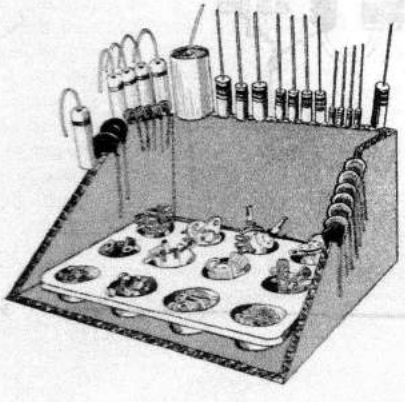
Plugging a pair of headphones into the phone jack and setting the DIODE-OSC. switch to OSCILLATOR position, converts the GD-1U to an oscillating detector. This arrangement can also be used to determine the frequency of other oscillating currents. As the GD-1U is tuned to the frequency of another nearby RF source, a whistle or beat note is heard in the phones. When the GD-1U is adjusted to the lowest beat note (zero beat), the frequency read on the dial scale is the same as the frequency of the other oscillating circuit. (At high frequencies, only a "click" will be heard.)

USING THE GRID DIP METER

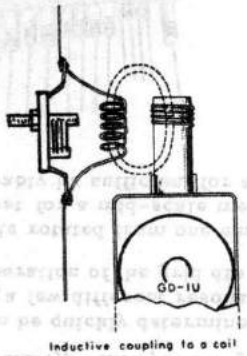
The basic use of the Grid Dip Meter is the coupling of the instrument to the test circuit. It is possible to couple the test circuit either inductively or capacitively. Inductive coupling is usually most convenient. Capacity coupling is necessary in some instances, such as in the case of coaxial lines where shielding complicates the situation. For the most accurate reading the coupling between the grid dip meter and the test circuit should be as loose as possible (wide spacing between the two units), while yet being able to obtain a readable dip.

The relative Q of a circuit can be quickly determined by noting the sharpness of the dip. A broad dip in indicative of a low Q circuit. Assembling a few different resonant circuits and determining their resonant frequency will familiarise the builder with the operation of the grid dip meter.

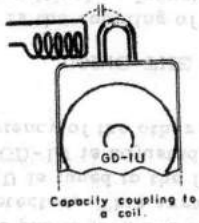
It will be found that as the dial is rotated from one end of the band to the other, that the meter reading also changes. If the sensitivity control is set for a mid-scale meter reading when the dial is at approximately the middle of the band, the adjustment will probably be sufficient for any frequency setting within the band.



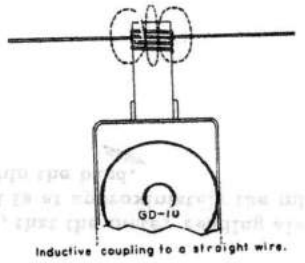
This illustration shows how resistors and capacitors may be placed in the cut edge of a corrugated cardboard carton until they are needed. Their values can be written on the cardboard next to each component.



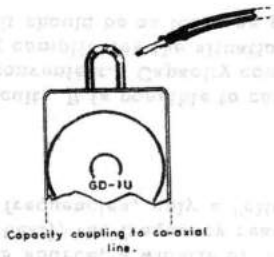
A



B



C



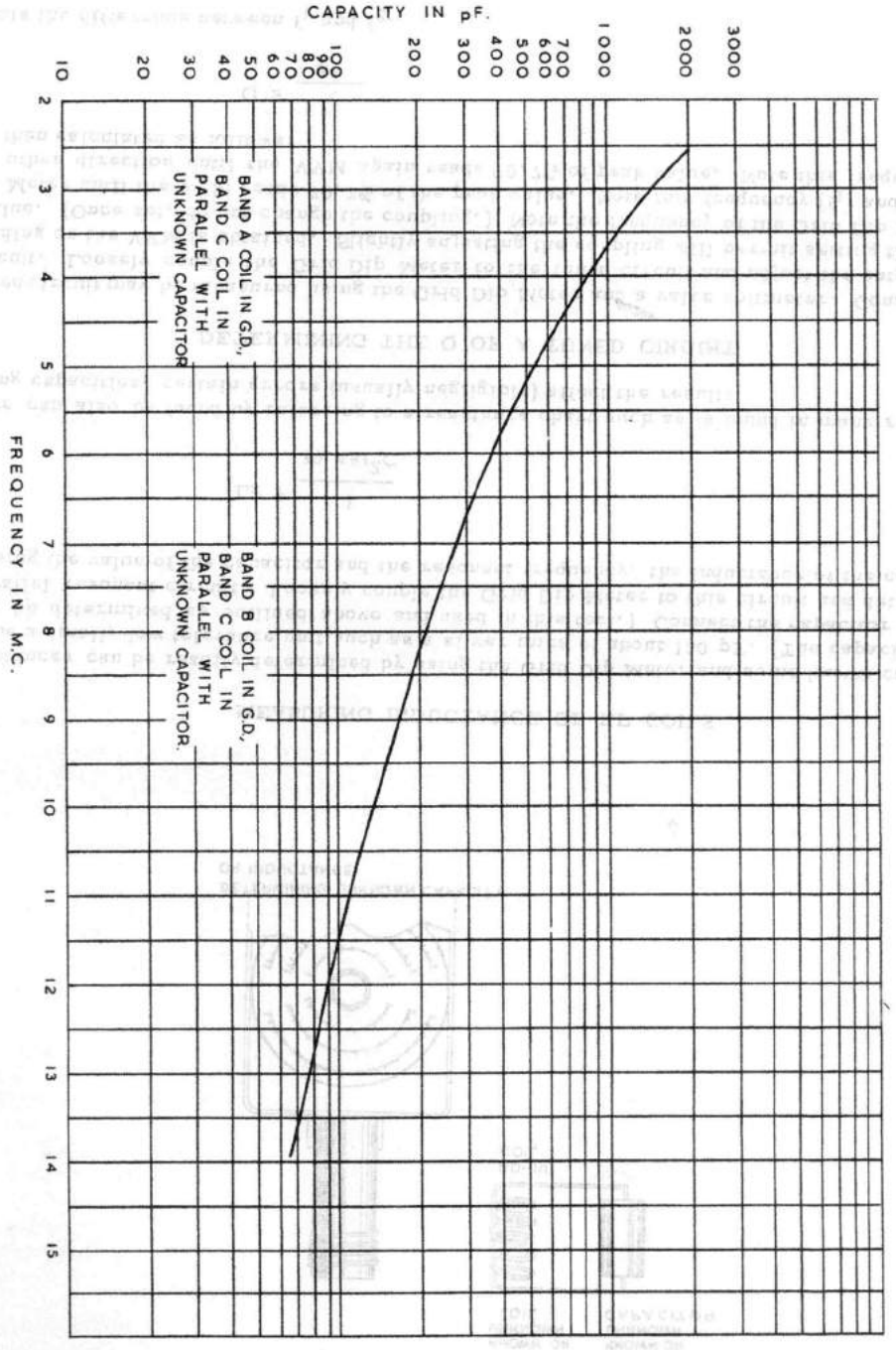
D

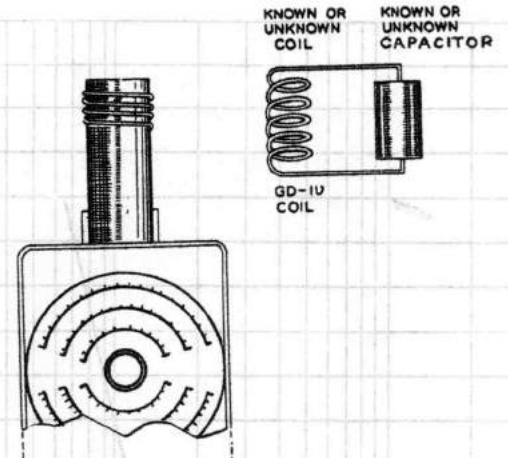
DETERMINING AN UNKNOWN CAPACITY

Unknown values of capacity between 70 and 2,000 pF can readily be measured with the grid dip meter. The unknown capacitor should be placed parallel with the 14-37 Mc coil, (coil C), the coil and capacitor thus forming a parallel tuned circuit.

Depending upon the suspected value of the unknown capacitor (see graph on Page 5), the 2-5 or 5-14 Mc coil, designated as A or B, should be plugged into the instrument. Set the DIODE-OSC. switch to OSCILLATOR position. Couple quite closely the coil of the parallel resonant circuit containing the unknown capacitor and tune the GD-1U through the frequency range. When the dip has been detected, reduce the coupling so that the dip shows up over a very narrow frequency band. At maximum dip, read the frequency indicated on the dial and from the graph, read the value of the unknown capacitor. A glance at the graph will reveal that capacitors under 65 pF are not covered. To determine values in this range, an extra capacitor of about 100 pF should be used. If it is not a precision capacitor, its value can be determined by the method outlined above. Once its value is known, it should be connected in parallel with the unknown capacitor and the 14-37 Mc coil "C". Using this method, the total capacity of this test circuit is determined. The value of the unknown capacitor is the difference between the total capacity in the test circuit and the value of the known added capacitor.

When measuring an unknown capacity, certain errors must be considered. Among these are capacity in the coil, capacity caused by nearby metallic objects, and shift of resonant frequency by inductance within the capacitor. For most applications these may be neglected.


CAPACITY IN pF.
10
20
30
40
50
60
70
80
90
100
200
300
400
500
600
700
1000
2000
3000
2
3
4
5
6
7
8
9
10
11
12
13
14
15
FREQUENCY IN M.C.
BAND A COIL IN G.D., BAND C COIL IN PARALLEL WITH UNKNOWN CAPACITOR
BAND B COIL IN G.D., BAND C COIL IN PARALLEL WITH UNKNOWN CAPACITOR.



DETERMINING UNKNOWN CAPACITY OR INDUCTANCE.

MEASURING INDUCTANCE OF RF COILS

Unknown inductances can be readily determined by using the Grid Dip Meter and some known capacitor. The capacitor should be a small, low tolerance unit such as a silver mica of about 100 pF. (The capacity of some unknown capacitor may be determined as outlined above and used in this test.) Connect the capacitor across the inductor forming a parallel resonant circuit. Loosely couple the Grid Dip Meter to this circuit and determine its resonant frequency. Using the value of the capacitor and the resonant frequency, the inductance of the coil can be computed as follows:

$$Lx = \frac{1}{39.48f^2C}$$

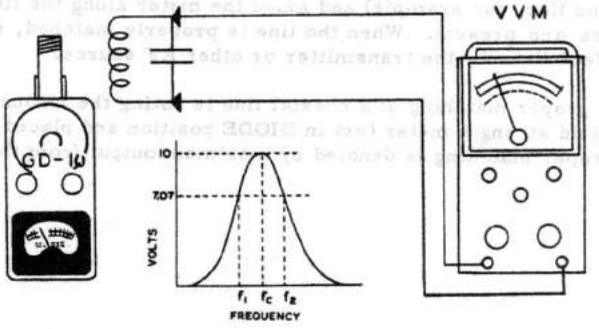
The inductance can also be found by referring to a reactance chart such as is found in many radio handbooks. As when measuring capacities, certain errors (usually negligible) affect the results.

DETERMINING THE Q OF A TUNED CIRCUIT

The Q of a tuned circuit may be measured using the Grid Dip Meter and a valve voltmeter. Connect the VVM across the tuned circuit. Loosely couple the Grid Dip Meter to the tuned circuit and adjust the output frequency until a maximum reading on the VVM is obtained. Slightly adjusting the coupling will permit setting the VVM reading to a convenient value. (Once set, do not change the coupling.) Note the frequency of the Grid Dip Meter, (f_c). Retune the Grid Dip Meter until the VVM reads 70.7% of the peak value. Note this frequency (f_1) and retune the Grid Dip Meter in the other direction until the VVM again reads 70.7% of peak value. Note this frequency (f_2). The Q of the circuit is then calculated as follows:

$$Q = \frac{f_c}{\blacktriangle f}$$

where $\blacktriangle f$ equals the difference between f_1 and f_2.



Measuring "Q" of a tuned circuit.

CAUTION: BE VERY CAREFUL WHEN USING THE GRID DIP METER NEAR HIGH VOLTAGE CIRCUITS. IT IS POSSIBLE FOR THE OPERATOR TO RECEIVE A SEVERE OR DEADLY SHOCK IF THE METER OR COIL SHOULD TOUCH A HIGH VOLTAGE CIRCUIT.

PRETUNING A TRANSMITTER

The GD-1U provides an excellent means of preadjusting a transmitter prior to applying voltage. Each of the various tuning circuits throughout the transmitter can be set to its approximate operating frequency. Thus, when the power is applied, only a slight adjustment is needed to finish the job.

NEUTRALISATION

The grid dip meter is very useful when neutralising a transmitter. Set the slide switch to the DIODE position so that the instrument can be used as a tuned detector. Remove the anode voltage (filament should be on) from the stage of the transmitter to be neutralised and apply power to the driver stage.

Using the GD-1U as a detector, couple its coil to the output of the stage being adjusted. Adjust the GD-1U for maximum meter indication and then adjust the neutralising control for a minimum meter reading. It will probably be necessary to readjust the output circuit to proper frequency and then repeat the neutralising adjustment. As the neutralisation is being accomplished, it may be necessary to couple the GD-1U more closely to the output circuit.

Another method is to couple the grid dip meter to the input of the stage to be neutralised and adjust to the maximum dip. (All plate voltages in the transmitter should be turned off.) Set the neutralising control so that no deflection of the GD-1U meter is seen when the output circuit of the stage is rotated through the operating frequency.

LOCATING PARASITIC OSCILLATIONS

Parasitic oscillations are easily located by applying power to the transmitter and checking the various stages for oscillations other than those intended. (Use the grid dip meter as an oscillating detector.) Once the frequency of the parasitic oscillation is known, the power to the transmitter may be turned off and the unwanted resonant circuits located. (Using the GD-1U as a grid dip meter, check circuit wiring, chokes, etc. for unwanted resonant frequencies.)

ANTENNA ADJUSTMENTS

The Grid Dip Meter provides a means of adjusting antennas without creating interference. Loose coupling is usually sufficient although the proper type should be used, that is, capacity coupling to a voltage maximum point or inductive coupling to a current maximum.

When the GD-1U is coupled to the end of an antenna, a slight change takes place in its "effective" length. This change may be up to approximately 3% with the resonant frequency appearing lower than is actually the case. There is no change when the meter is coupled to the middle part of the antenna. Proper matching of open wire lines to the antenna can be determined by using the GD-1U in the DIODE position as a detector of the standing waves present on the line. Arrange to hold the coupling of the GD-1U to the line constant (by holding a small piece of insulator between

the coil and the line, for example) and move the meter along the line. If the meter indication varies considerably, standing waves are present. When the line is properly matched, no standing waves can be detected. Power must be fed to the feed lines by the transmitter or other RF source.

The check for proper matching of a coaxial line is noting the amount of power delivered to the antenna. The GD-1U is used as a field strength meter (set in DIODE position and placed near the antenna where the change in output can be noted). Proper matching is denoted by maximum output from the antenna.

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. If a shortage is found, attach the inspection slip to your claim and notify us promptly. Screws, nuts and washers are counted mechanically and if a few are missing, please obtain them locally if at all possible.

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.

Use lockwashers under all screws and nuts, and also between controls and the chassis. When shakeproof solder tags are mounted under nuts, the use of lockwashers is unnecessary.

Resistors and capacitors have a tolerance rating of ± 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, tag strips, 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 rotary switch tags are numbered clockwise when viewed from the rear of the wafer, i.e. the end remote from the knob.

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 tag strips, 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.

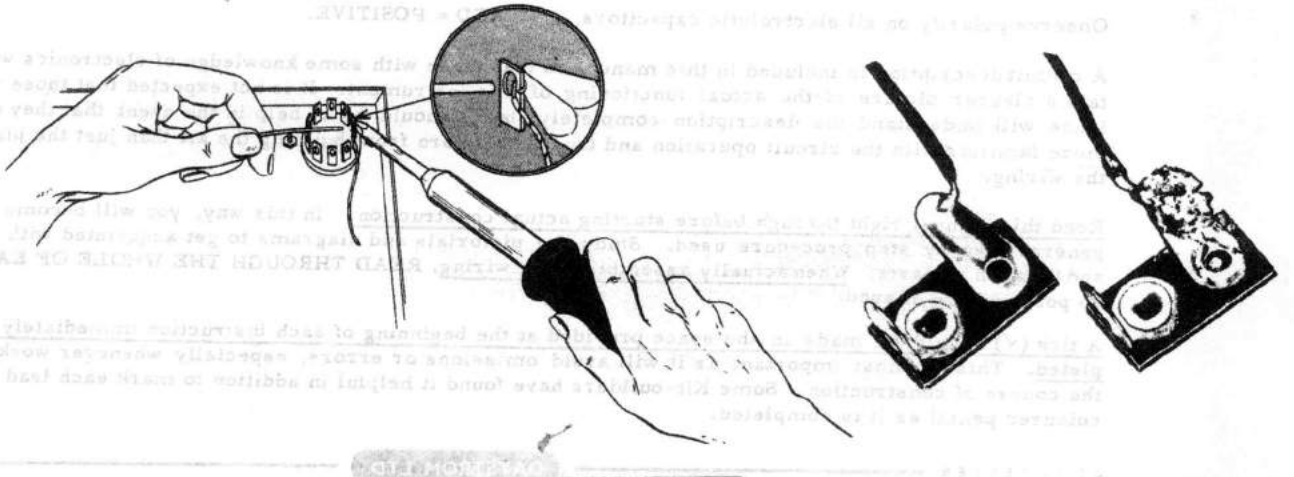
Highest quality resin-cored solder is essential for efficiently securing this kit's wiring and components. The resin core acts as a flux or cleaning agent during the soldering operation.

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.

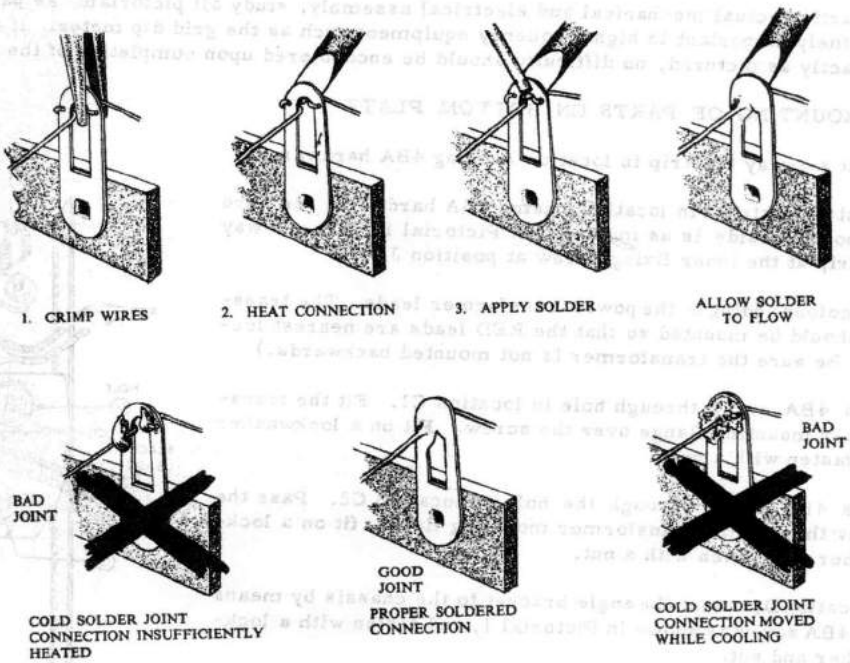
IMPORTANT

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.

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. Don't 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. Don't 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 by means of a rag or steel wool.

Don't apply too much solder to the soldered joint. Don't 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.

Don't 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

Before starting actual mechanical and electrical assembly, study all pictorials, as parts placement and lead dress are extremely important in high frequency equipment such as the grid dip meter. If all wires and components are placed exactly as pictured, no difficulty should be encountered upon completion of the instrument.

MOUNTING OF PARTS ON BOTTOM PLATE

( ) Mount a 3-way tagstrip in location A using 4BA hardware.

( ) Mount the rectifier in location B using 4BA hardware. Be sure the positive side is as indicated in Pictorial 1. Fix a 1-way tagstrip at the inner fixing screw at position J.

(Note the colour coding of the power transformer leads. The transformer should be mounted so that the RED leads are nearest location A. Be sure the transformer is not mounted backwards.)

( ) Fit a 4BA screw through hole in location C1. Fit the transformer mounting flange over the screw. Fit on a lockwasher and fasten with a nut.

( ) Fit a 4BA screw through the hole in location C2. Pass the screw through the transformer mounting flange, fit on a lockwasher and fasten with a nut.

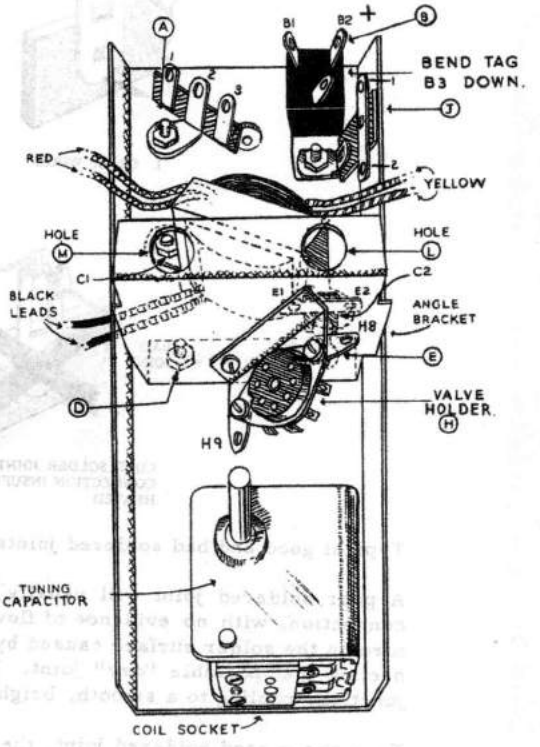
( ) In location D, mount the angle bracket to the chassis by means of a 4BA screw as shown in Pictorial 1, and fasten with a lockwasher and nut.

( ) In location E, fit a 4BA screw through the hole in the bottom plate. Pass it through the hole in the angle bracket, fit a 1-way tagstrip over the screw and fasten with a lockwasher and nut.

( ) In location M, temporarily mount the sensitivity control (with ON-OFF switch on the back). See Pictorial 3 for proper placement of the tags, and Figure 6 for mounting procedure.

( ) Mount the valveholder to the valveholder mounting bracket using 6BA hardware. Fix a solder tag under each nut as shown in Figure 1.

( ) Fasten the valveholder mounting bracket to the angle bracket using 4BA hardware, as in Pictorial 1.



PICTORIAL-1.

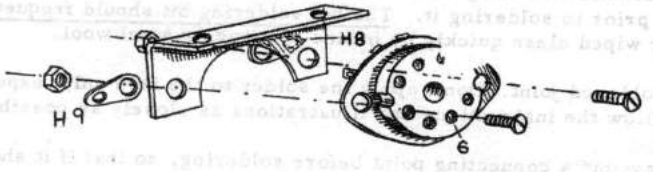
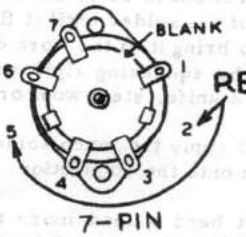


FIGURE-1.



TAGS REMOVED.

7-PIN V/HOLDER

FIG-2

TUNING CAPACITOR SUB-ASSEMBLY

CAUTION: This component should be handled with great care. Fully mesh the rotor plates in the stator plates before continuing.

For the following refer to Figure 3.

( ) Tin with solder, rotor and stator solder tags of the tuning capacitor. Tin with solder the three tags of the coil socket. Do not allow the solder to run down into the socket as this will prevent the coil being properly inserted later.

( ) Bend the two outside tags of the coil socket so that they will make contact with the capacitor stator tags when mounted.

( ) Connect a $1\frac{3}{4}$" length of bare wire to a 4BA solder tag (S-1) and lay aside.

( ) Connect another $1\frac{3}{4}$" length of bare wire to a second 4BA solder tag (S-1) and lay aside.

( ) Mount these two tags to the bottom of the capacitor frame, one on the inside and one on the outside, using 4BA hardware. NOTE: The inside tag faces towards the coil socket and the outer tag faces away from the coil socket. Ensure inner tag does not touch stator plates.

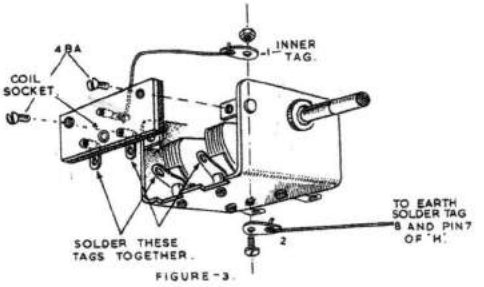


FIGURE-3.

( ) Mount the coil socket to the capacitor using 4BA x $\frac{1}{4}$" binderhead screws as shown in Figure 3. If necessary slightly adjust mounting brackets in order to avoid distortion which could affect slow-motion drive.

( ) Solder together the tags of the coil socket and the tuning capacitor.

( ) Mount the tuning capacitor on the bottom plate using 4BA x $\frac{1}{4}$" screws. Use a lockwasher between the screw heads and bottom plate.

( ) Connect the bare wire on the inside of the capacitor frame to the centre tag of the coil socket (S-1).

(The 3-prong coil socket supplied with the GD-1U is designed for use with the accessory 341-U Coil Kit.)

WIRING

For this section refer to Pictorial 2.

( ) Connect one BLACK lead of the mains transformer to tag A1 (NS).

( ) Connect the other BLACK lead to either tag of the OFF-ON switch located to the rear of the sensitivity control (S-1).

( ) Connect either RED wire of the mains transformer to tag B1 (S-1).

( ) Connect one YELLOW lead of the mains transformer to tag 4 of the valveholder (NS). See Pictorials 3 and 4.

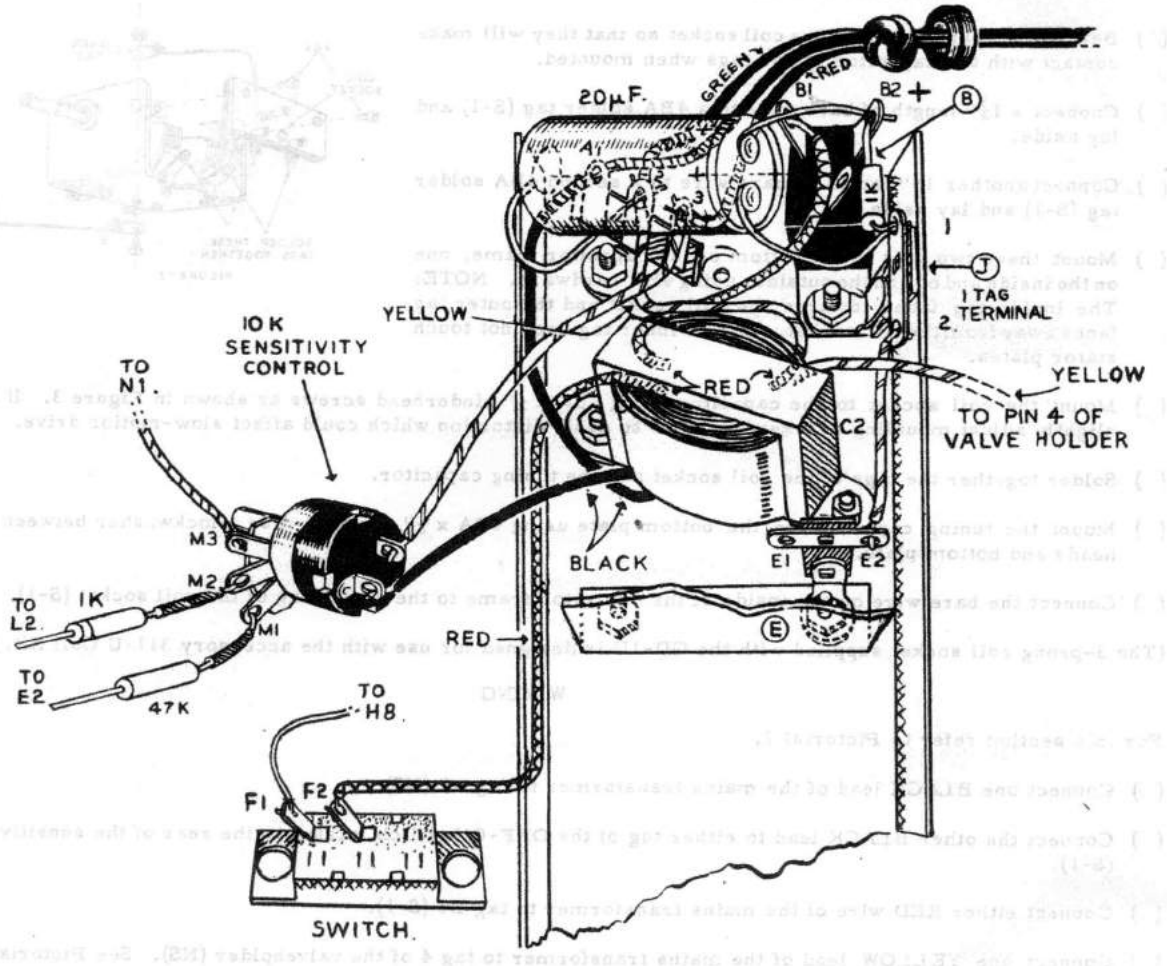
When soldering to miniature valveholders, use care to prevent solder from flowing into the socket tag holes. This could prevent insertion of the valve pins and cause possible damage to the valve.

( ) Connect the other YELLOW lead to solder tag A2 (NS).

( ) Run an insulated wire from tag A3 (NS) to the other tag of the OFF-ON switch (on the back of the sensitivity control) (S-1).

( ) Tie a knot in the mains cable at a point $2\frac{1}{2}$" from one end.

( ) Strip back the outer cover a distance of 1" at the knotted end and trim the insulation $\frac{1}{4}$" from the end of each wire.


20μF.
GREEN
RED
B1
B2 +
B
A
1K
1
J
1 TAG TERMINAL
2
YELLOW
10K SENSITIVITY CONTROL
TO N1.
RED
YELLOW
TO PIN 4 OF VALVE HOLDER
C2
M3
M2
M1
TO L2.
1K
TO E2
47K
BLACK
E1
E2
E
RED
TO H8.
F1
F2
SWITCH.

PICTORIAL-2.

( ) Connect the cable, BLACK to A1 (S-2), GREEN to A2 (NS) and RED to A3 (S-2).

( ) Connect a 1 KΩ $\frac{1}{2}$ watt resistor (BROWN, BLACK, RED) between B2 (NS) and tag J1 (NS).

( ) Connect the wire coming from the RED tag of the dual 20 μF capacitor to B2 (S-2). (Use sleeving.)

( ) Connect the wire coming from the YELLOW tag of the dual 20 μF capacitor to tag J1 (S-2). (Use sleeving.)

( ) Connect the negative lead of this capacitor to tag A2 (S-3). (Use sleeving.)

( ) Connect a 5" length of wire between solder tag A2 (S-4) and M3 on the sensitivity control (NS).

( ) Cut a length of insulated wire to 2". Strip both ends and connect one end to M3 on the sensitivity control (S-2). Leave the other end free at this time.

( ) Locate a 1 KΩ resistor (BROWN, BLACK, RED). Cut each lead to $\frac{3}{4}$" in length. Slip a $\frac{1}{2}$" piece of insulated sleeving over each of the leads. Connect one end of the resistor to M2 (S-1) and leave the other end free at this time.

( ) Clip the leads of a 47 KΩ resistor (YELLOW, VIOLET, ORANGE) to approximately $1\frac{1}{4}$".

( ) Slip sleeving over each of these leads, leaving approximately $\frac{1}{4}$" of bare wire at the end of each lead. Now attach one lead of this resistor to M1 (S-1).

( ) Connect the other end of this resistor to tag E2 (NS). See Pictorial 4.

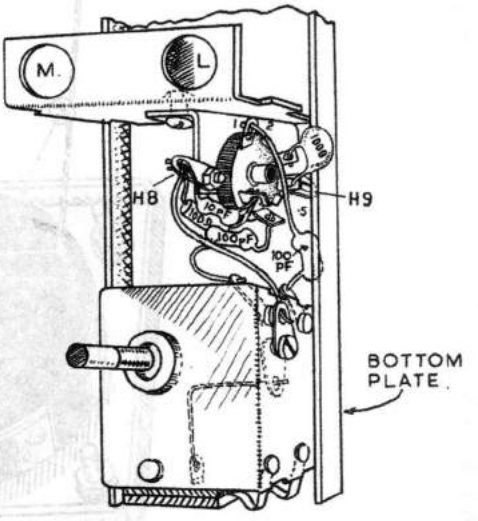


FIGURE - 4

NOTE: The usefulness of this instrument at frequencies above 100 Mc/s largely depends on the correct positioning of the components and their short connections, soldering, etc.

( ) Connect one lead of a 1000 pF disc capacitor through valveholder H tag 3 (S-1) to earth solder tag 9 (NS).

( ) Connect the other lead of this capacitor to valveholder H tag 4 (S-2).

( ) Cut one lead of a 1000 pF capacitor to $1\frac{1}{2}$" long and the other lead to $\frac{1}{2}$" long. Connect the short end to tag E2 (NS). Cover the long lead with sleeving and connect to earth solder tag H9 (S-2).

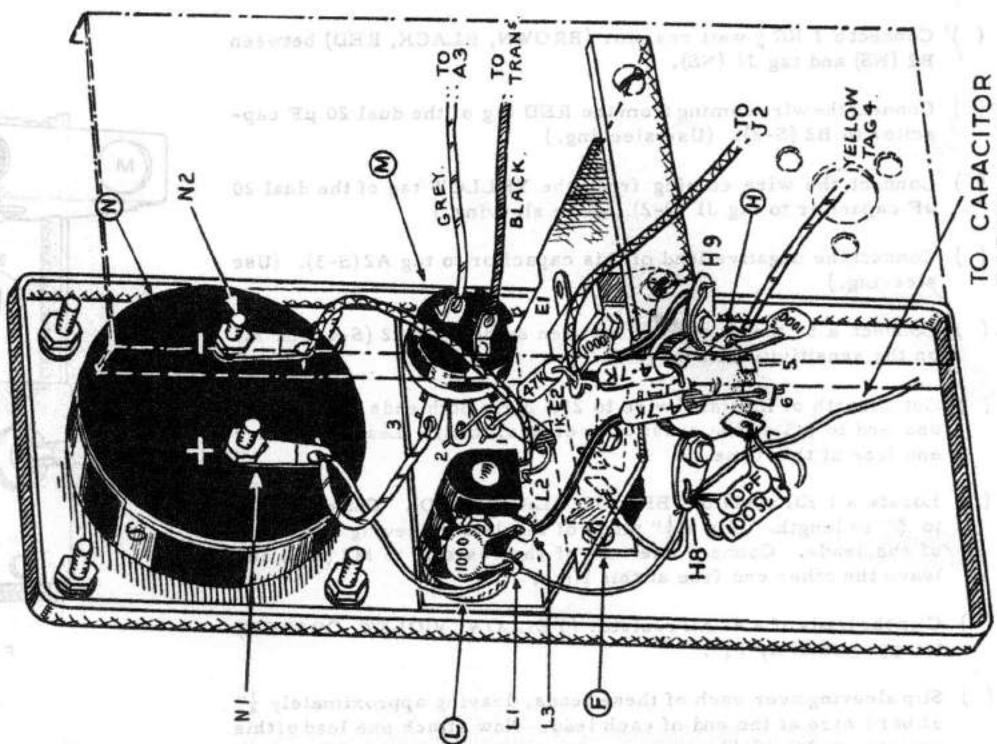
( ) Cut one lead of a 4.7 KΩ resistor (YELLOW, VIOLET, RED) to 1" long and the other lead to $\frac{1}{4}$" long. Connect the short end to valveholder H tag 1 (NS). Cover the other end with sleeving and connect to tag E2 of the 1-way tagstrip (NS).

( ) Connect a $1\frac{3}{4}$" length of wire from E2 (S-4) to J2 (S-1). See Pictorial 2.

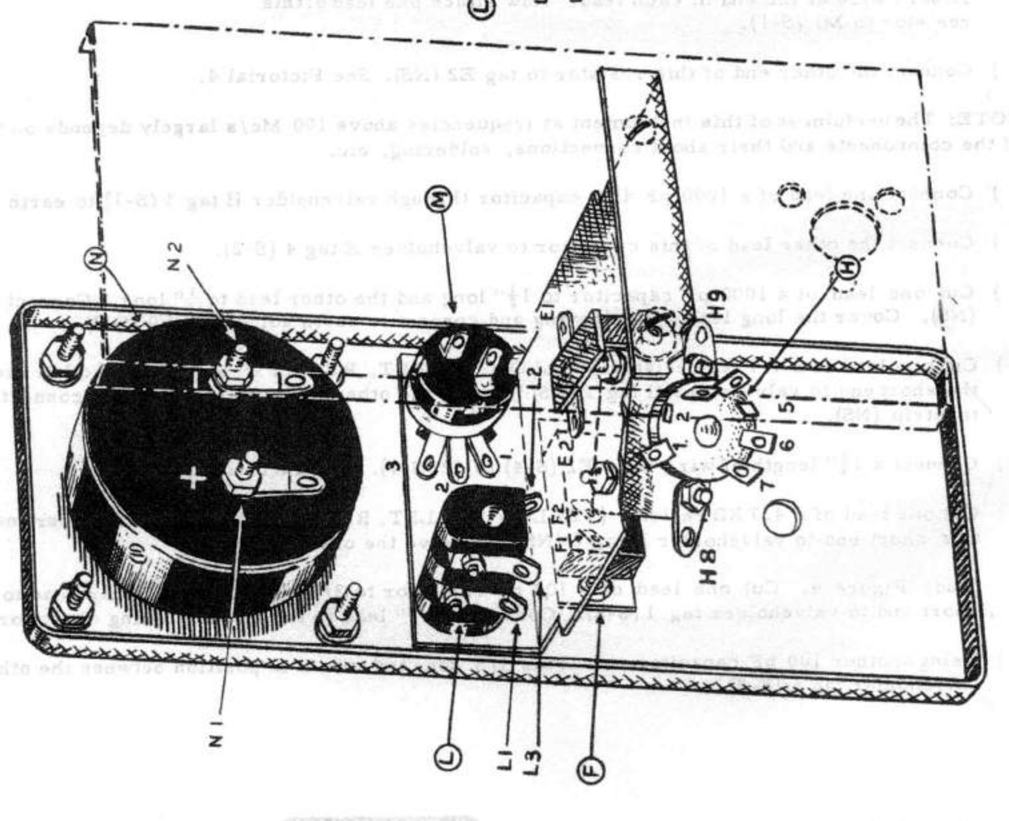
( ) Cut one lead of a 4.7 KΩ resistor (YELLOW, VIOLET, RED) to $1\frac{1}{2}$" long and the other lead to $\frac{1}{4}$" long. Connect this short end to valveholder H tag 6 (NS) and leave the other end free.

( ) Study Figure 4. Cut one lead of a 100 pF capacitor to 3/8" long and the other lead to $\frac{3}{4}$" long. Connect this short end to valveholder tag 1 (S-2). Connect the $\frac{3}{4}$" lead to the nearest tuning capacitor stator tag (S-1).

( ) Using another 100 pF capacitor, cut leads 3/8" long and mount in position between the other stator tag (S-1) and valveholder tag 6 (S-2).



PICTORIAL-4.



PICTORIAL-3.

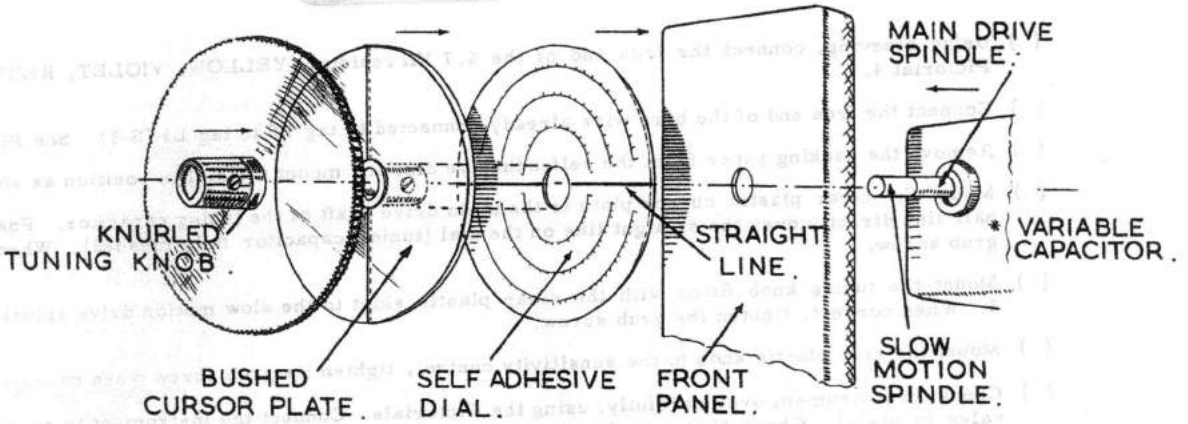


FIGURE - 5

( ) Pass a $2\frac{1}{2}$" length of bare wire through the earth solder tag 8 (NS) at valveholder H. When an equal length of wire protrudes from the tag at either side, bend it back so as to hold it in position temporarily until soldered.

( ) Connect a 100Ω resistor (BROWN, BLACK, BROWN) together with a 10 pF capacitor (may be coded VIOLET, BROWN, BLACK, BLACK, BROWN) between H8 (NS) and valveholder tag 7 (S-2). Keep leads as short as possible.

( ) See Pictorials 3 and 4. Connect a 1000 pF disc capacitor between phone jack L, tags L1 (NS) and L3 (NS), press the capacitor close to the side of the jack as shown.

( ) Before mounting the phone jack, connect the end of the 1 KΩ resistor coming from the sensitivity control M tag M2 to phone jack L, tag L2 (NS). Do not mount the jack yet.

( ) Connect a $3\frac{1}{2}$" length of insulated wire to L2 (S-2), leave the other end free at this time.

( ) Mount the slide switch to the front panel using 6BA chrome instrument head screws and nuts. See Pictorial 3, note that the two switch tags face to the left. Do not use lockwashers.

( ) If not already fitted, fix one solder tag to each meter terminal using the nuts already fitted to the meter.

( ) Mount the meter to the front panel using 6BA chrome instrument head screws, lockwashers and nuts. Do not overtighten. NOTE: Mount the meter with the + ve terminal as shown.

( ) Remove the nut and flat washer from the front of the sensitivity control and mount the front panel as shown in Pictorial 3 to the angle bracket.

( ) Fit the phone jack nut to the outside of the front panel. Slip the two washers supplied with this component over the collar on the inside of the panel. Hold the threaded end of the jack to the rear of the nut and tighten the nut. Do not overtighten. Position as in Pictorial 3.

( ) Connect the wire coming from M3 of the sensitivity control to solder tag N1 of the meter (NS). See Pictorial 4.

( ) Connect a bare wire from N1 (S-2) to L1 (NS).

( ) Connect the wire coming from L2 of the phone jack to tag N2 of the meter (S-1).

( ) Connect the bare wire coming from earth solder tag 8 of valveholder H to the outer tag of the slide switch F1 (S-1) as shown in Pictorial 3 and 4.

( ) Connect the RED wire coming from the mains transformer to the inner tag of the slide switch F2 (S-1). See Pictorial 2.

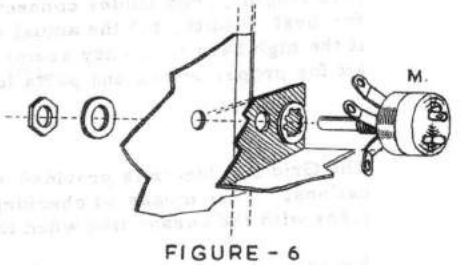


FIGURE - 6

( ) Using sleeving, connect the free end of the 4.7 KΩ resistor (YELLOW, VIOLET, RED) to tag L3 (S-2). See Pictorial 4.

( ) Connect the free end of the bare wire already connected to tag H8 to tag L1 (S-3). See Pictorial 4.

( ) Remove the backing paper from the self-adhesive dial and mount the dial in position as shown in Figure 5.

( ) Mount the clear plastic cursor plate to the main drive shaft of the tuning capacitor. Position with the cursor hair line directly over the straight line on the dial (tuning capacitor fully meshed). When correct, tighten the grub screw.

( ) Mount the tuning knob fitted with the clear plastic skirt to the slow motion drive spindle as shown in Figure 5. When correct, tighten the grub screw.

( ) Mount the grey plastic knob to the sensitivity control, tighten its grub screw when correct.

( ) Check the instrument over carefully, using the Pictorials. Connect the instrument to an AC supply (without the valve in place). Check that 6 to 7 volts AC is present between valveholder H pins 3 and 4. Check that more than 100 volts DC is present between pins 3 and 5 of valveholder H.

IMPORTANT NOTICE

A MINIATURE VALVE CAN EASILY BE DAMAGED WHEN PLUGGING IT INTO ITS HOLDER. USE EXTREME CARE WHEN INSTALLING THE EC92 VALVE. WE DO NOT GUARANTEE OR REPLACE MINIATURE VALVES BROKEN DURING INSTALLATION.

( ) If the above test is satisfactory, insert the valve and one of the lower frequency coils. Check with a communications receiver or wavemeter/frequency meter that the GD-1U is radiating RF at the frequency indicated by the calibration dial.

( ) Fit the grommet to the slot in the cabinet shell.

( ) Fit the four rubber feet to back panel. Pass the mains lead through the cabinet shell and grommet and mount cabinet and rear panel to the front panel assembly. Secure with two 4BA x $\frac{1}{4}$" binder head screws.

Congratulations! Your GD-1U is now complete. Remember when using the instrument, an RF carrier wave can be transmitted several miles, causing possible interference to television and radio receivers over a wide area.

SPECIAL NOTE: When the instrument is first turned on (set to OSC. position) the meter will indicate below zero. Upon warming up, the meter will read correctly. This fact is mentioned because the builder might conclude that the meter is connected incorrectly when he first turns the instrument on and sees the meter reading below zero.

ACCURACY

It should be remembered that the grid dip meter is neither designed nor intended to be used for applications requiring a high degree of accuracy. The grid dip meter is not in the same class as accurate signal generators, many of which can be used as secondary frequency standards. Calibration errors up to 5% can be expected. However, except for the specialised uses involving high accuracy, this instrument is invaluable in applications such as outlined in the manual as well as others too numerous to mention.

One factor concerning the accuracy of the highest band must be considered. At very high frequencies, the actual wiring of the kit comes into the picture. Such things as proper placement of components, correct lead dress, short lead lengths, good solder connections, etc. are all important. The manual shows how the kit should be constructed for best results, but the actual mechanics of construction are beyond the control of the manufacturer. Therefore, if the high band frequency seems greatly different from that of the other bands, check the actual construction of the kit for proper wiring and parts location as outlined in the pictorials and step-by-step instructions.

CALIBRATION

The Grid Dip Meter is provided with a ready-calibrated dial. This dial will be sufficiently accurate to most applications. If no means of checking frequency is available, the dial may be set so that the dial calibration line coincides with the cursor line when the tuning capacitor is completely meshed.

A more accurate adjustment of the ready-calibrated dial is possible if a short wave receiver or high frequency signal generator is available.

USING A RECEIVER: If the frequency settings on the receiver are known to be accurate, it is only necessary to tune in the Grid Dip Meter (set to OSC. position) on the receiver and set the GD-1U dial to the same frequency reading as the receiver dial.

If the dial calibrations on the receiver are not accurate, tune the receiver to some station whose frequency is known (the BBC or WWV for example) and then tune the Grid Dip Meter to this same frequency (set in OSC. position). Adjust the tuning dial on the GD-1U to read this same frequency.

COMPLETE CALIBRATION OF THE GD-1U

If the GD-1U is calibrated using a signal generator, first set the generator and then adjust the GD-1U to "zero beat" listening on a pair of headphones plugged into the GD-1U. For those who wish, the audio output may be fed to an audio amplifier and monitored on a loudspeaker, this may be found more convenient than attempting to detect "zero beats" at very low levels.

A blank dial is supplied with the kit for those who have the equipment available to individually calibrate their own GD-1U. This should be done before the self-adhesive backing paper is removed. Mount the dial temporarily, using two small strips of clear tape fixed at the dial ends to hold it in position during calibration. It will be found very difficult to write in the figures in this position, it is better to draw in the calibration lines only, noting the frequency at these points on a separate page. On completion, the dial should be removed and the figures printed on at the appropriate settings using a fine mapping pen and black waterproof ink.

The self-adhesive backing paper should now be removed and the dial fixed permanently in position.

The cursor plate can be located in its correct position by setting up a generator as a band edge marker.

IN CASE OF DIFFICULTY

1. Recheck the wiring very carefully. Tracing the leads on the pictorial wiring diagrams in coloured pencil as they are checked in the instrument will prevent overlooking some connections.
2. Compare valve pin voltages with those shown on the schematic diagram. Readings given were made using a valve voltmeter. Other type meters may give lower readings.
3. Test valve to be certain it is operating properly.
4. Write to Daystrom Limited describing operating characteristics and listing the voltages measured at the various points. (See "Service" information.)

POSSIBLE FAULTS

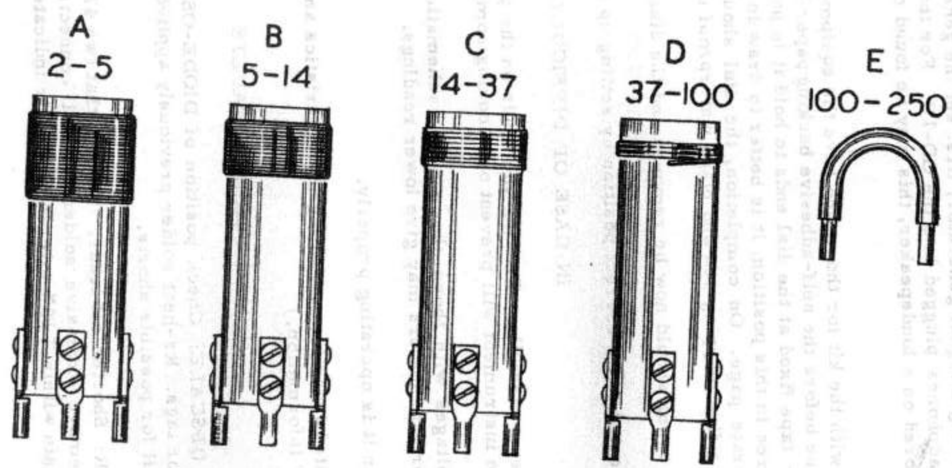
METER FAILS TO MOVE UPSCALE: Check position of DIODE-OSC. switch. Check solder joints between coil socket and variable capacitor tags. Re-heat solder previously applied to disc capacitors. Examine connections on tags 5 and 6 of valveholder H for possible shorts.

CALIBRATION NOT LINEAR: Shorten all leads. Be sure that two 4700Ω resistors are coupled close to pins 5 and 6 of the valveholder H. Remove excessive solder from all connections. Check value of all resistors in circuit, these resistors should remain within ± 10% tolerance of their indicated value. Examine the variable capacitor for possible warped plates.

NO METER INDICATION WHEN IN DIODE POSITION: Insufficient source of RF signal: The average RF signal generator, radio receiver or television set will give little or no indication when the GD-1U is in DIODE position.

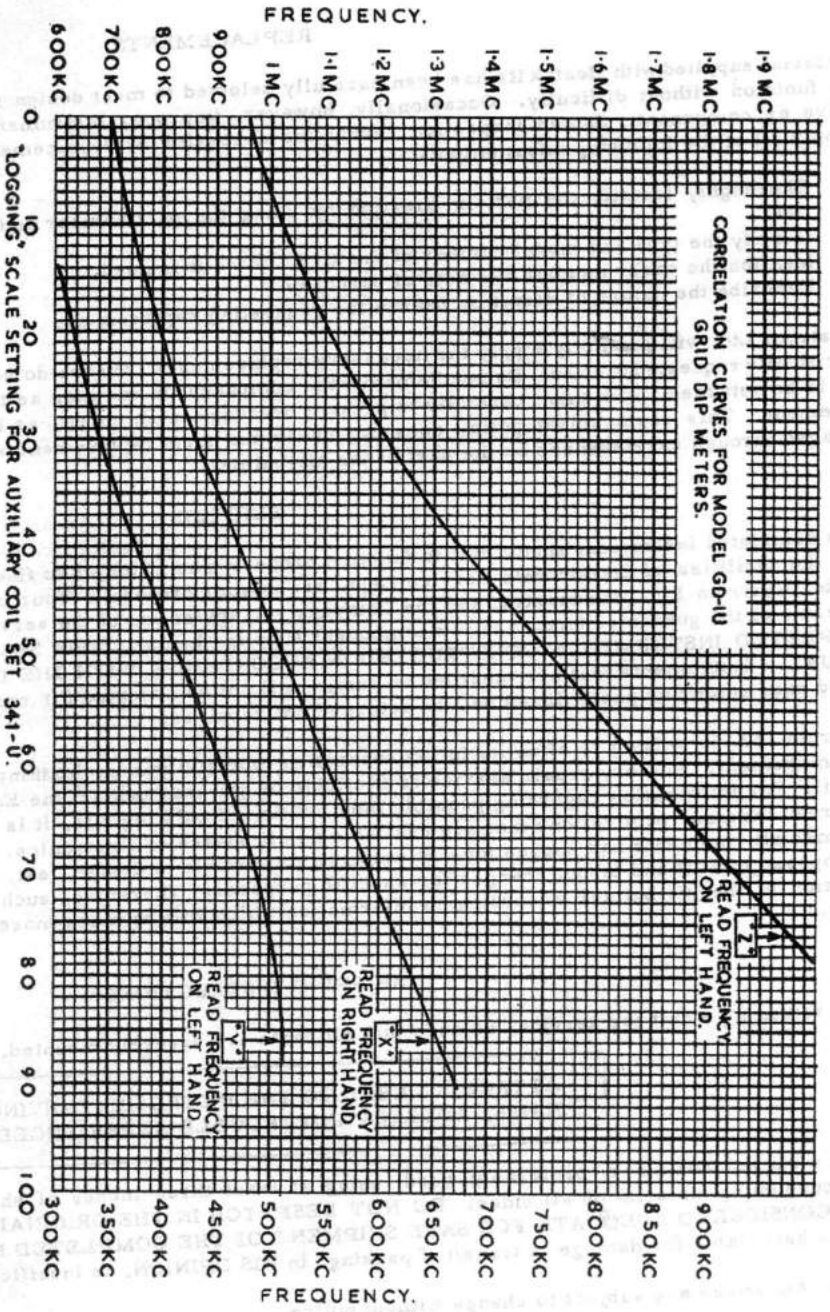
OPERATION OF THE SENSITIVITY CONTROL VERY CRITICAL: This indication is normal, due to the extremely high "Q" circuit, and sensitivity of the instrument.

METER FALLS BELOW ZERO: This is normal during warm-up period, or when the coil is removed while the instrument is in operation. Advance sensitivity control to maximum during warm-up.



IDENTIFYING CHARACTERISTICS OF COILS

COILS MAY BE SUPPLIED WITH EITHER TWO OR THREE MOUNTING PRONGS. THE ELECTRICAL CHARACTERISTICS WILL REMAIN UNCHANGED.


FREQUENCY.
1·9 MC
1·8 MC
1·7MC
1·6MC
1·5MC
1·4MC
1·3MC
1·2MC
1·1MC
1MC
900KC
800KC
700KC
600KC
CORRELATION CURVES FOR MODEL GD-1U GRID DIP METERS.
READ FREQUENCY ON LEFT HAND.
"Z"
"X"
READ FREQUENCY ON RIGHT HAND
"Y"
READ FREQUENCY ON LEFT HAND.
0 10 20 30 40 50 60 70 80 90 100
'LOGGING' SCALE SETTING FOR AUXILIARY COIL SET 341-U.
850 KC
900KC
750KC
800 KC
650 KC
700KC
600 KC
550KC
500KC
450 KC
400KC
350KC
300 KC
FREQUENCY.

REPLACEMENTS

Material supplied with Heathkits has been carefully selected to meet design requirements and ordinarily will fulfill its function without difficulty. Occasionally, however, improper instrument operation can be traced to a faulty valve or component. Should inspection reveal the necessity for replacement, write to Daystrom Ltd. and please 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 the kit in which it is used.
C. Mention the order number and date of purchase.
D. Describe the nature of defect or reason for requesting replacement.

Daystrom Ltd. will promptly supply the necessary replacements. 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. If valves are to be returned, pack them carefully to prevent breakage in shipment, as broken valves are not eligible for replacement. 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.

SERVICE

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 Dept. are at your disposal. Your instrument may be returned carriage paid to Daystrom Ltd., 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). THIS SERVICE POLICY APPLIES ONLY TO COMPLETED INSTRUMENTS CONSTRUCTED IN ACCORDANCE WITH THE INSTRUCTIONS AS STATED IN THIS MANUAL. Instruments that are modified in design will not be accepted for repair. Instruments showing evidence of acid core solder or paste fluxes will be returned not repaired.

Daystrom Ltd. is willing to offer its full co-operation to assist you in obtaining the specified performance level of your instrument. Factory repair service is available or you may contact the Engineering Consultation Department by mail. For information regarding possible modification of existing kits, it is suggested that you refer to any one or more of the many publications that are available on all phases of electronics. Although Daystrom Ltd. sincerely welcomes all comments and suggestions, it would be impossible to design, test, evaluate and assume responsibility for proposed circuit and layout changes for specific purposes. Therefore, such modifications must be made at the discretion of the kit builder according to information which will be much more readily available from some local source.

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 Ltd. 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 the instructions given in this Manual to ensure successful results. Daystrom Ltd. 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.

PARTS LIST

PART No.	PARTS Per Kit	DESCRIPTION
Resistors		
H-102C10	2	1 KΩ (Brown, Black, Red)
H-472C10	2	4.7 KΩ (Yellow, Violet, Red)
H-473C10	1	47 KΩ (Yellow, Violet, Orange)
H-101C10	1	100Ω (Brown, Black, Brown)
Capacitors		
21-520	2	100 pF (.0001 μF)
21-509	3	1000 pF (.001 μF)
25-525	1	20-20 μF, electrolytic
26-510	1	150 pF, 2-gang, variable
21-523	1	10 pF, ceramic tubular
Coils		
40-525	1	Band A
40-526	1	Band B
40-527	1	Band C
40-528	1	Band D
40-529	1	Band E
Controls, Switches, Valveholders, etc.		
19-507	1	10 KΩ, variable
60-506	1	Slide switch
434-530	1	7-pin valveholder, low capacity
434-531	1	Coil socket
Hardware		
250-513	15	4BA x ¼" binder head screw
250-531	6	6BA x 5/16" chrome instr. screw
250-501	2	6BA x ¼" binder head screw
252-3U	12	4BA nut
252-501	8	6BA nut
254-1U	14	4BA lockwasher
Hardware (cont'd.)		
254-501	6	6BA lockwasher
259-505	2	6BA solder tag, shakeproof
259-504	4	4BA solder tag, shakeproof
Metal Parts		
90-514	1	Cabinet shell
203-520	1	Front panel
203-521	1	Back panel
204-529	1	Valve bracket
204-530	1	Angle bracket
205-518	1	Bottom plate
Miscellaneous		
54-521	1	Mains transformer
57-503	1	Selenium rectifier
73-501	1	3/8" rubber grommet
89-504	1 length	Mains lead
261-502	4	Rubber feet
340-501	1 length	Bare wire
344-508	1 length	Connecting wire
331-501	1 length	Solder
346-501	1 length	Insulated sleeving
407-504	1	Moving coil meter, .5 mA F.S.D.
411-58	1	Valve, type EC92
431-1U	2	1-way tagstrip
431-10U	1	3-way tagstrip (including earth)
436-505	1	Phone jack
464-504	1	Calibration dial, printed
464-505	1	Calibration dial, blank
320-505	1	Cursor plate
462-507	1	Small knob
388-501	1	Coil box
462-508	1	Knurled tuning knob
595-530	1	Manual

GUARANTEE

Daystrom Limited guarantee subject to the following terms to repair or replace free of charge any defective parts of this Heathkit (with the exception of cathode ray tubes and valves referred to hereunder) 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 Heathkits 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.

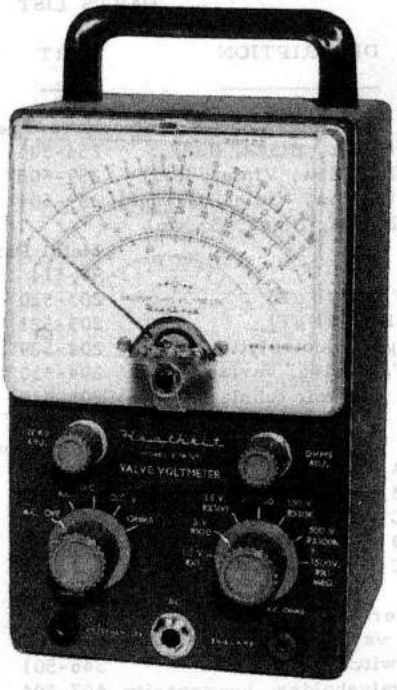
3. The purchaser shall comply with the Replacements Procedure laid down in the relevant Heathkit Manual.

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.

Note: The Cathode Ray Tubes and Valves forming part of the equipment are guaranteed by the respective manufacturers. It should be noted that their guarantee is given only in respect of faulty workmanship and/or material and does not cover misuse or consequential damage.

MODEL V-7A/UK

VALVE VOLTMETER



SPECIFICATIONS

Electronic D. C. Voltmeter:	
7 Ranges:	0-1.5, 5, 15, 50, 150, 500, 1500 volts full scale,
Input Resistance:	11 megohms (1 megohm in probe) on all ranges,
Sensitivity:	7, 333, 333 ohms per volt on 1.5 volt range
Circuit:	Balanced bridge (push-pull) using twin triode
Accuracy:	± 3% full scale
Electronic A. C. Voltmeter:	
7 R. M. S. Ranges:	0-1.5, 5, 15, 50, 150, 500, 1500 scales reading R. M. S. (.353 of peak to peak).
Frequency Response (5 v range):	± 1 db 42 cps to 7.2 Mc/s. (600 ohms source).
Accuracy:	± 5% full scale
7 Peak-to-peak Ranges:	**0-4, 14, 40, 140, 400, 1400, 4000**
Electronic Ohmmeter:	
7 Ranges:	Scale with 10 ohms centre x1, x10, x100, x1,000, x10K, x100K, x1MEG. Measures .1 ohm to 1000 megohms with internal battery
Meter	$4\frac{1}{2}$" 200 µA movement, Polystyrene case
Multipliers:	1% precision type
Circuit Board:	Printed circuit, etched process, .0625" British Standard E. 17148 High Grade Electrical Laminate, .0015 copper foil, gold plated.
Valves:	1 - 12AU7 twin triode meter bridge (ECC. 82)
	1 - 6AL5, twin diode full wave AC rectifier (EB. 91)
Battery:	1 - 1.5 volt torch cell (RAYOVAC type ILP, or similar)
Cabinet size:	7-3/8" high x 4-11/16" wide x 4-1/8" deep charcoal grey panel, feather grey cabinet
Kit Shipping Weight:	7 lbs.
Power Supply	200-250 V. A. C., 40-60 c. p. s. Consumption about 10 watts.

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 (X10²)
GOLD (± 5%)
{ SALMON PINK (GRADE 1.)
THIS MAY BE GENERAL BODY COLOUR

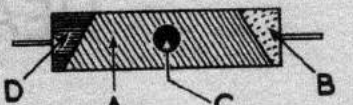
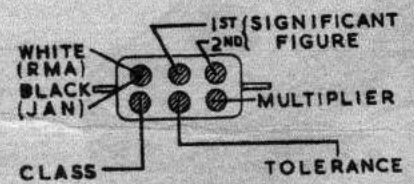


FIG 2. BODY, TIP & SPOT MARKING

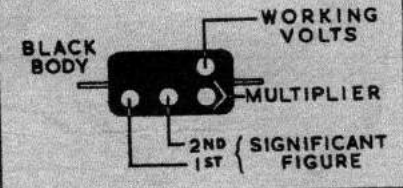
FIG 3. BODY TIP & CENTRAL BAND MARKING

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

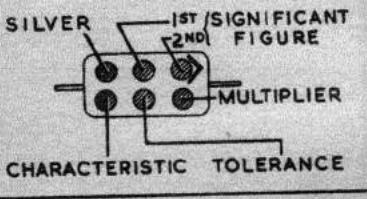
CURRENT STANDARD CODE



MOULDED FLAT CAPACITOR COMMERCIAL CODE



JAN. CODE CAPACITOR



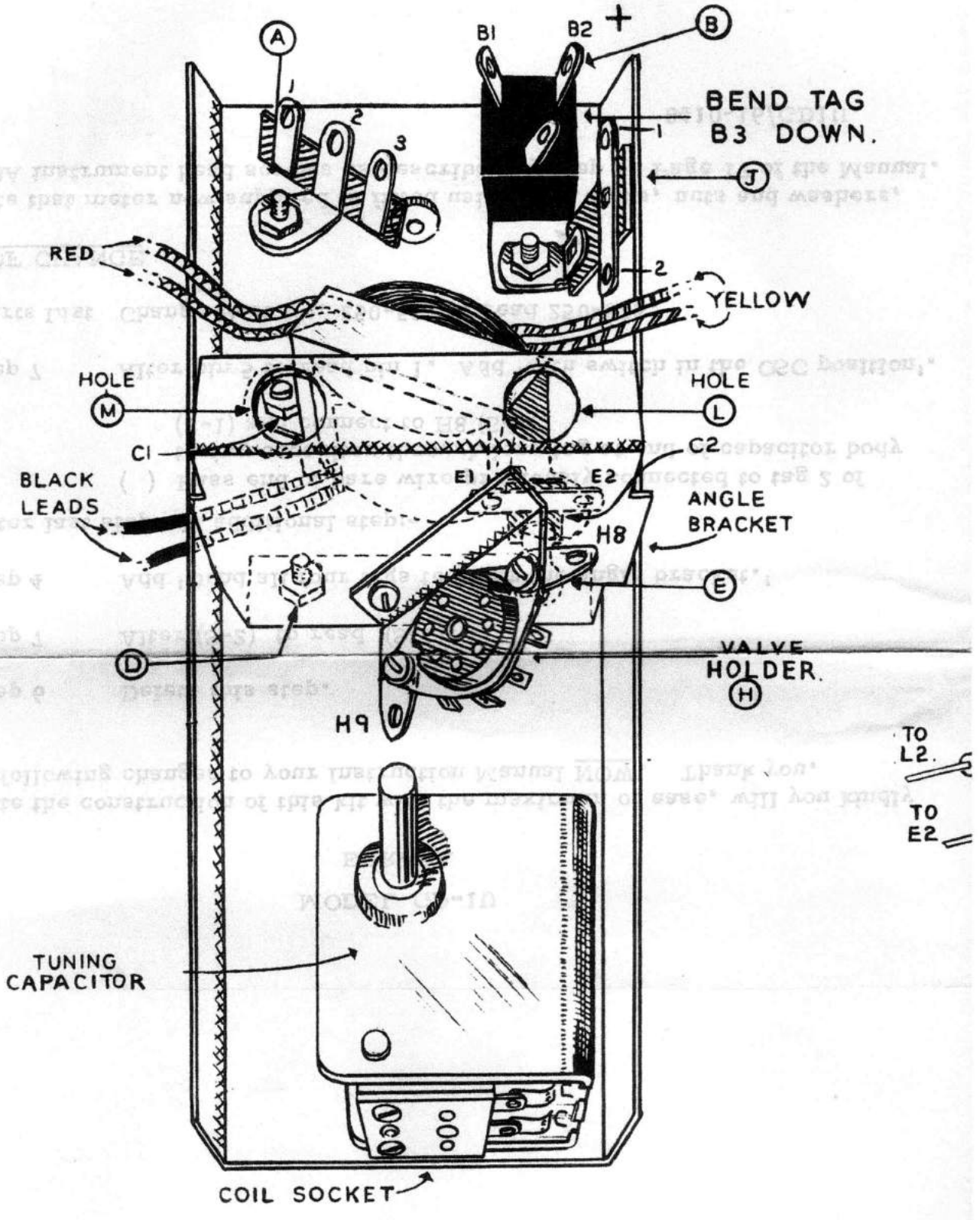
COLOUR CODE FOR RESISTORS AND CAPACITORS

Colour	Value in Ohms or 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			-	-	-	-	-	

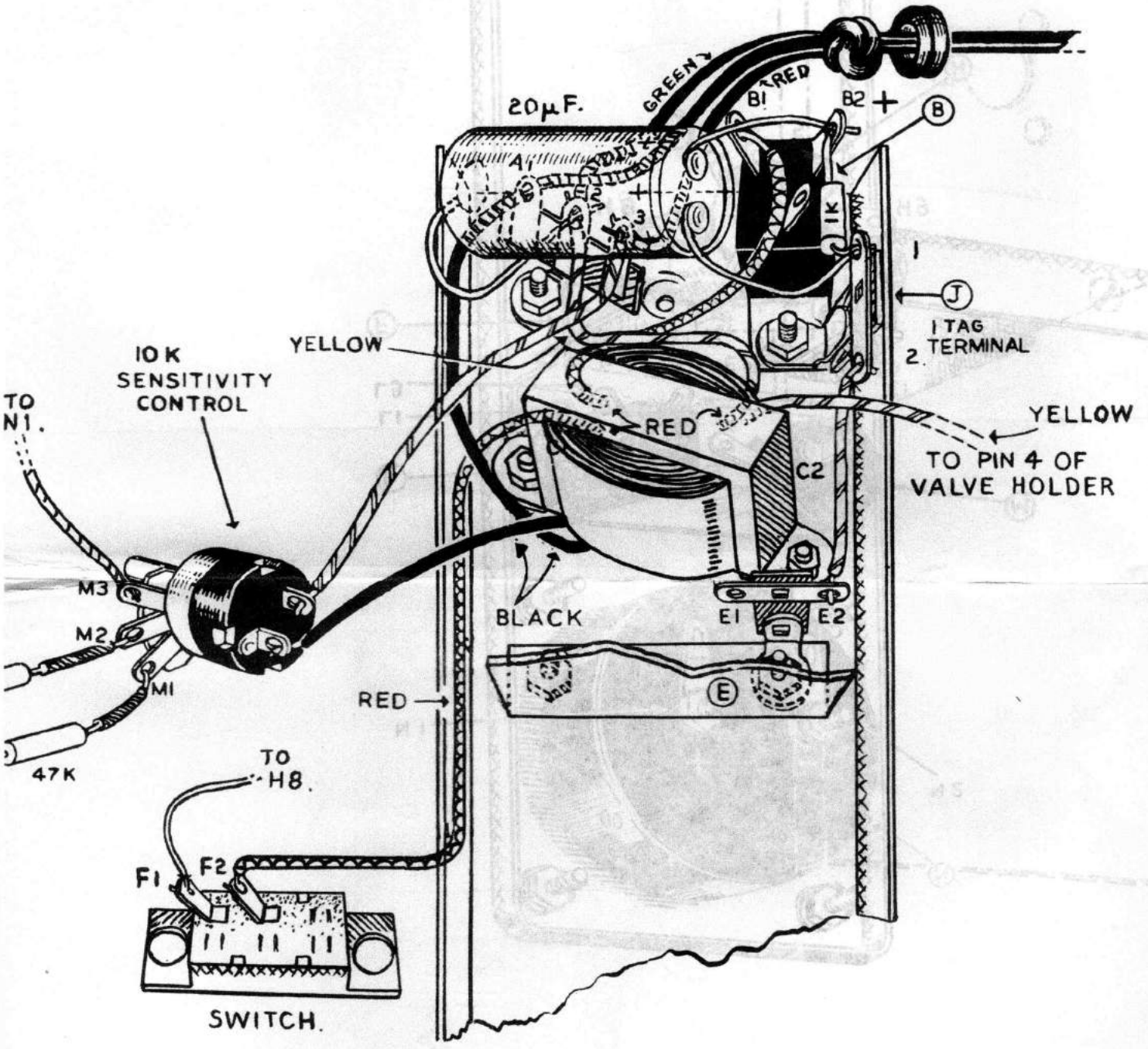
The Colour coding should be read from left to right, in order, starting from the end and finishing near the middle.

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.).

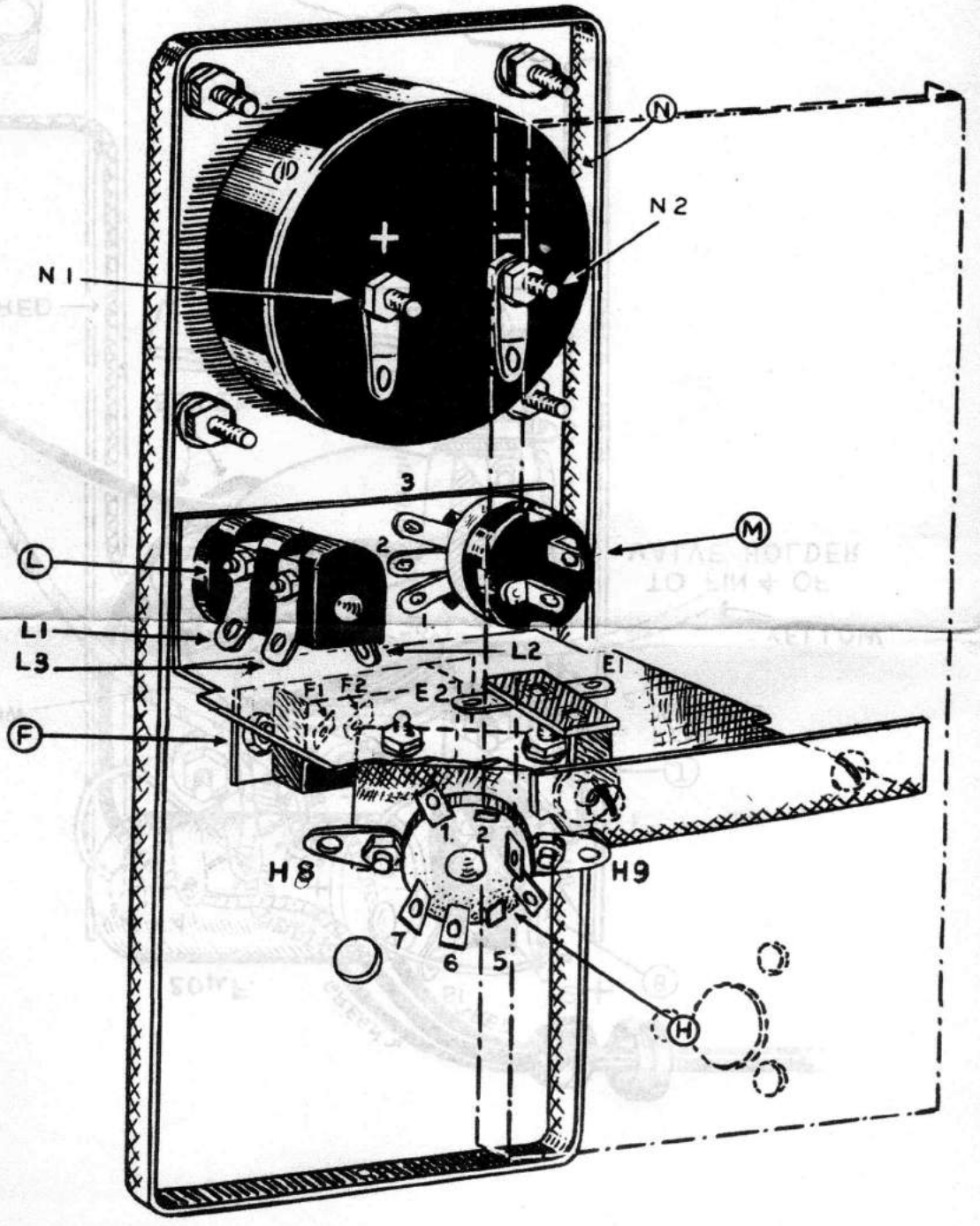
N.B. High-Stability Resistors supplied with this kit are not as a rule colour coded but enamelled in one colour on which the value in Ohms is printed in figures. Capacitors supplied in this kit usually have their capacity clearly marked in figures. Some Capacitors coded as above also have additional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


A
B1
B2
+
B
BEND TAG
B3 DOWN.
1
2
3
J
RED
YELLOW
HOLE
M
HOLE
L
C1
C2
E1
E2
BLACK
LEADS
ANGLE
BRACKET
H8
E
D
VALVE
HOLDER.
H
H9
TO
L2.
TO
E2
TUNING
CAPACITOR
COIL SOCKET

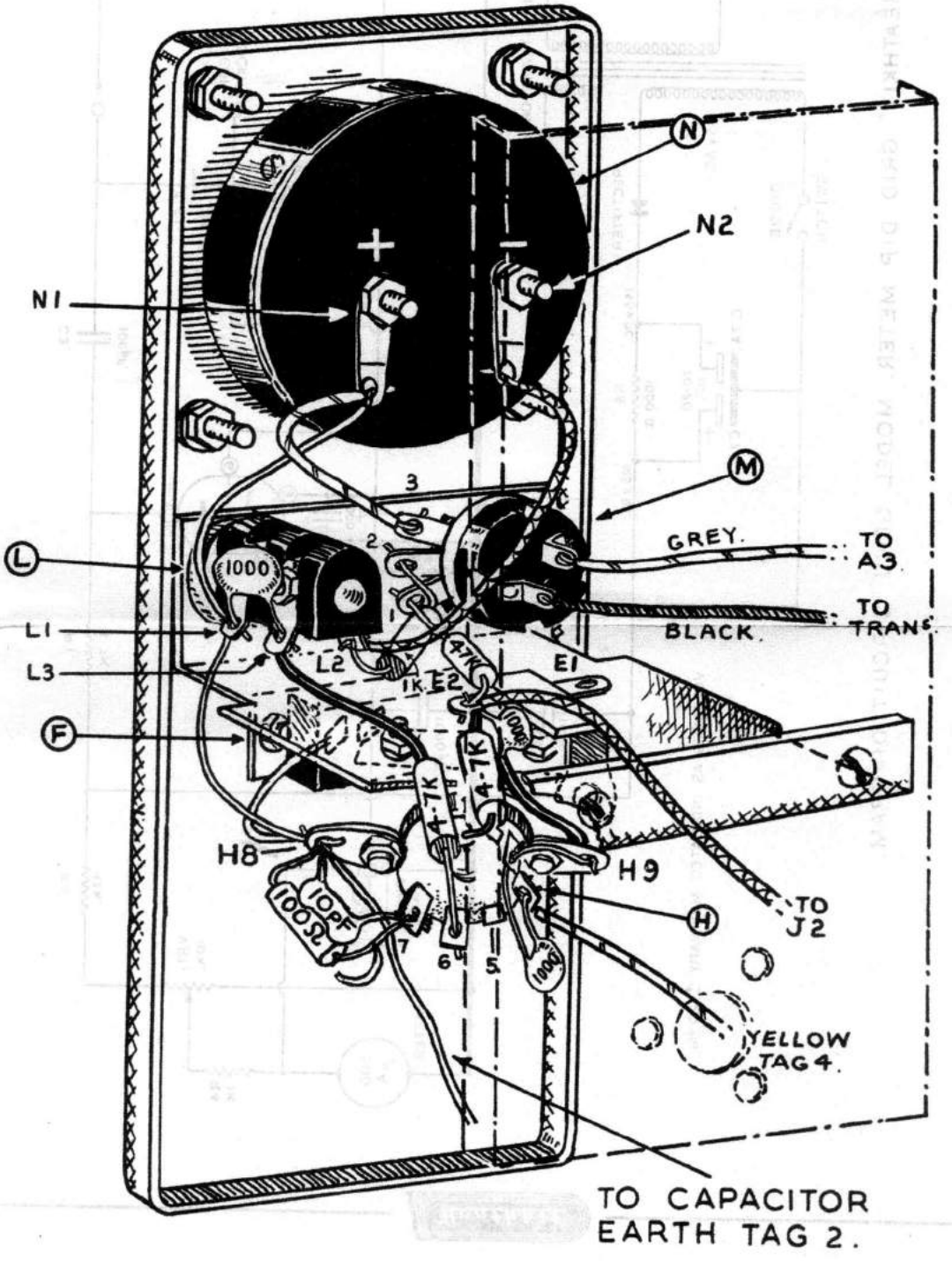
PICTORIAL-1.


20μF.
GREEN
RED
B1
B2 +
B
A1
1K
1
J
1 TAG
2. TERMINAL
YELLOW
10K
SENSITIVITY
CONTROL
TO
N1.
RED
C2
YELLOW
TO PIN 4 OF
VALVE HOLDER
M3
M2
M1
BLACK
E1
E2
E
RED
47K
TO
H8.
F1
F2
SWITCH.

PICTORIAL-2.



PICTORIAL-3.


N
N2
N1
M
GREY.
TO A3.
L
1000
BLACK.
TO TRANS.
L1
L3
L2
1K
E2
E1
47K
F
4-7K
4-7K
H8
H9
H
TO J2
100SL
10PF
100SL
YELLOW TAG 4.
TO CAPACITOR EARTH TAG 2.

PICTORIAL-4 .

MODEL GD-1U

ERRATA

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

Page		
15	Step 6	Delete this step.
15	Step 7	Alter (S-2) to read (S-1).
17	Step 4	Add 'Bend all four tags to clear the angle bracket.'
17	After last step add additional step:-	
		( ) Pass end of bare wire previously connected to tag 2 of tuning capacitor through long tag at end of capacitor body (S-1) and connect to H8 (S-4).
18	Step 7	Alter pin 5 to read pin 1. Add 'with switch in the OSC position'.
23	Parts List	Change Part No. 250-531 to read 250-525.

ADVICE OF CHANGE

Please note that meter now supplied is fitted using four studs, nuts and washers, and not 6BA instrument head screws as described by Step 8, Page 17 of the Manual.

8410-16/GD1U.

HELPFUL KIT BUILDING INFORMATION

Before attempting actual kit construction read the construction manual thoroughly to familiarise yourself with the general procedure. Note the relative location of pictorial inserts in respect of the progress of the assembly procedure outlined.
This information is offered primarily for the convenience of the novice kit builders and will be of definite assistance to those lacking thorough knowledge of good construction practices. Even the advanced electronic enthusiast may benefit by a brief review of this material before proceeding with kit construction. In the majority of cases, failure to observe basic instruction fundamentals is responsible for inability to obtain desired level of performance.

RECOMMENDED TOOLS

The successful construction of Heathkits does not require the use of specialised equipment and only basic tools are required. A good quality electric soldering iron is essential. The preferred size would be a 25-50 watt iron with a small tip. The use of long nose pliers and diagonal or side cutting pliers is recommended. A small screw driver will prove adequate and several additional assorted screw drivers will be helpful. Be sure to obtain a good supply of resin core type radio solder. Never use separate fluxes, paste or acid solder in electronic work.

ASSEMBLY

In the actual mechanical assembly of components to the chassis and panel, it is important that the procedure shown in the manual be carefully followed. Make sure that the valve holders are properly mounted in respect to keyway or pin numbering location. The same applies to transformer mountings so that the correct transformer colour coded wires will be available at the proper chassis opening. Make it a standard practice to use lockwashers under all 4BA and 2BA nuts. The only exception being in the use of soldering tags - the necessary locking feature is already incorporated in the design of the soldering tags. A control lock washer should always be used between the control and the chassis to prevent undesirable rotation in the panel. To improve instrument appearance and to prevent possible panel marring use a control flat nickel washer under each control nut.
When installing terminals that require the use of fibre insulating washers, it is good practice to slip the shouldered washer over the terminal stud before installing the mounting stud in the panel hole provided. Next, install a flat fibre washer and a soldering tag under the mounting nut. Be sure that the shouldered washer is properly centred in the panel to prevent possible shorting of the terminal.

WIRING

When following the wiring procedure make the leads as short and direct as possible. In filament wiring requiring the use of a twisted pair of wires allow sufficient slack in the wiring that will permit the twisted pair to be pushed against the chassis as closely as possible thereby affording relative isolation from adjacent parts and wiring.
When removing insulation from the end of connecting wire, it is seldom necessary to expose more than a quarter inch of the wire. Excessive insulation removal may cause a short circuit condition in respect of nearby wiring or terminals. In some instances, transformer leads of solid copper will have a brown baked enamel coating. After the transformer leads have been trimmed to a suitable length, it is necessary to scrape the enamel coating in order to expose the bright copper wire before making a terminal or soldered connection.
In mounting parts such as resistors or capacitors, trim off all excess lead lengths so that the parts may be installed in a direct point-to-point manner. When necessary use insulated sleeving over exposed wires that might short to nearby wiring. It is urgently recommended that the wiring and parts layout as shown in the construction manual be faithfully followed. In every instance the desirability of this arrangement was carefully determined following the construction of a series of laboratory models.

SOLDERING

Much of the performance of the kit instrument, particularly in respect of accuracy and stability, depend upon the degree of workmanship used in making soldered connections. Properly soldered connections are not at all difficult to make but it would be advisable to observe a few precautions. First of all before a connection is to be soldered, the connection itself should be clean and mechanically strong. Do not depend on solder alone to hold a connection together. The tip of the soldering iron should be bright, clean and free of excess solder. Use enough heat so that the solder flows thoroughly and smoothly into the joint. Avoid excessive use of solder and do not allow a flux flooding condition to occur which could conceivably cause a leakage path between adjacent terminals on switch assemblies and valve holders. This is particularly important in instruments such as the VVM, oscilloscope and generator kits. Excessive heat will also burn or damage the insulating material used in the manufacture of switch assemblies. Be sure to use only good quality resin core type solder.

AERIAL	CAPACITOR (VARIABLE)	SWITCH — SINGLE POLE (S.P.) SINGLE THROW (S.T.)	BATTERY
LOOP	RESISTOR	SWITCH — DOUBLE POLE (D.P.) DOUBLE THROW (D.T.)	FUSE OR
DIPOLE	RESISTOR (TAPPED)	SWITCH — TRIPLE POLE (T.P.) DOUBLE THROW (D.T.)	CRYSTAL
EARTH	RESISTOR (VARIABLE)	LOUDSPEAKER	TERMINAL & TERMINAL STRIP
INDUCTOR (COIL OR R.F. CHOKE)	POTENTIOMETER	RECTIFIER	WIRING BETWEEN LIKE LETTERS IS UNDERSTOOD → X, → Y; XY XY
R.F. COIL WITH ADJUSTABLE IRON DUST CORE	JACK (TWO CONDUCTOR)	MICROPHONE	MICRO (x 1/1,000,000) = μ
L.F. CHOKE (IRON CORED) WITH TAPPINGS	JACK (THREE CONDUCTOR)	TYPICAL TUBE SYMBOL: ANODE, SUPPRESSOR GRID, SCREEN GRID, CONTROL GRID, CATHODE, HEATER FILAMENT	MILLI (x 1/1000) = m
R F TRANSFORMER (AIR CORE)	WIRES CONNECTED		KILO (x .1000) = K
TRANSFORMER (R.F. OR I.F.) ADJUSTABLE IRON DUST CORE	WIRES CROSSING BUT NOT CONNECTED	TRANSISTOR (P.N.P. TYPE)	MEGA (x 1,000,000) = M
TRANSFORMER (MAINS OR L.F.) IRON CORE	A-AMMETER V-VOLTMETER mA-MILLIAMMETER μA-MICROAMMETER ETC.	TRANSISTOR (N.P.N. TYPE)	OMEGA (OHMS) = Ω
CAPACITOR	NEON LAMP STABILISER VALVE	SOCKET OUTLET — CO AXIAL	MICROFARAD = μF
CAPACITOR (ELECTROLYTIC)	LAMP PILOT OR ILLUMINATING	TWO PIN SOCKET AND TWO PIN PLUG	PICOFARAD = pF; MICRO, MICROFARAD = μμF

DAYSTROM LIMITED

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THE WORLDS LARGEST MANUFACTURERS
OF ELECTRONIC KITS

GLOUCESTER, ENGLAND

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