ASSEMBLING AND USING YOUR

Heathkit

Signal Tracer

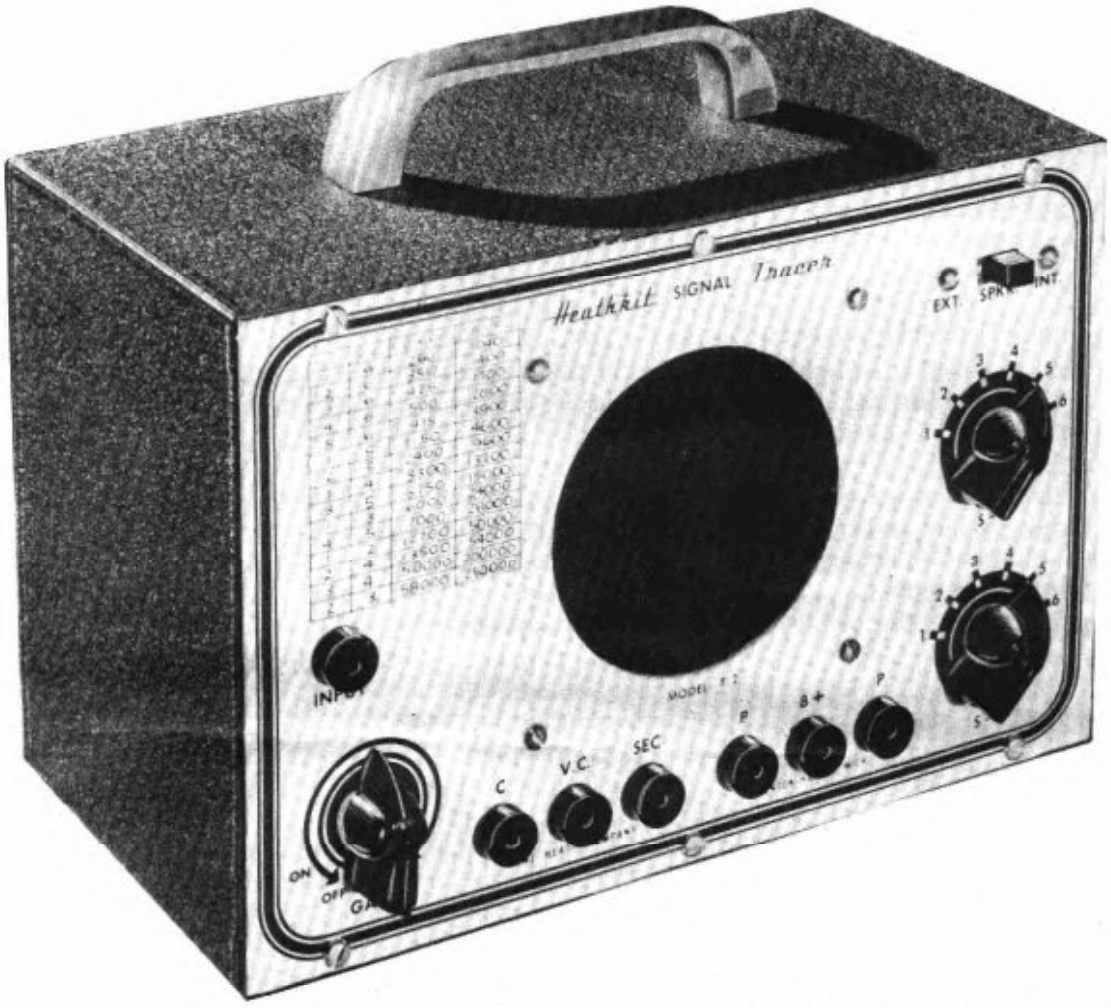
Model T-2

THE HEATH COMPANY
BENTON HARBOR, MICH.

595-7

PRICE $1.00

HEATHKIT MODEL T2 SIGNAL TRACER



Size: 9" wide x 6" high x 5" deep

USES

Traces signal from antenna to speaker--Enables quick determination of defective stage.
Locates intermittents
May be used on F. M. and T. V. Receivers
Checks record players and record changers
Checks microphones
Test speaker allows checking of receiver speaker by substitution
Universal output transformer allows servicing of sets without output transformer and speaker--
Determines correct impedance match for unknown speakers, tubes, etc.

CIRCUIT

Crystal diode test prod--6SH7 Hi gain Amplifier
6K6 output tube--6X5 rectifier--4" P. M. Speaker
Universal output transformer
Operates from Audio frequencies to approx. 200 Mc.
Safe for AC-DC receivers--105-120 VAC transformer operated

ASSEMBLING THE HEATHKIT MODEL T-2 SIGNAL TRACER

The construction of the Heathkit Signal Tracer is not difficult but consideration should be given the fact that a test instrument will be useful for many years and care taken in construction will be repaid many times. Test equipment is the best assistant available in service and research work and it deserves the most careful workmanship possible. Thoroughly study and familiarize yourself with the instructions, pictorial diagrams and circuit. Do not rush the construction. Make a good mechanical joint of each connection, then solder it with best quality rosin core radio type solder. (DO NOT USE FLUXES OR ACID CORE SOLDER.) Hold each joint rigid while solder cools and then test by attempting to pull joint loose.

Most difficulty in construction results from poor soldering (and use of wrong solder) and reversed connections (remember that in working on the bottom of the chassis and rear of panel that all locations are reversed).

Check the parts carefully against the parts list. Identify each part (using the charts on covers of instruction manual). Be sure to check the packing to avoid throwing away any of the small parts. Mark the values of condensers and resistors on the schematic diagram beside the part number

From time to time, small changes in parts will be made by the Heath Company. All parts supplied will work just as well as the part for which it was substituted. 47,000 ohms resistors (which is the new radio manufacturer's rating for 50,000 ohms) may be substituted for 50,000 ohms or a one watt resistor may be substituted for one-half watt, etc. All substitutions will be of equal or better quality than the original and will be made in order that a minimum delay will occur in filling your order.

The newer types of insulated resistors have a higher wattage rating. The $\frac{1}{4}$ watt size is now rated at $\frac{1}{2}$ watt and these are used in this kit. Bolts and nuts are counted mechanically and if a few are missing please secure locally.

Resistors, condensers and potentiometers have a normal tolerance rating of plus or minus 20% unless marked otherwise Therefore, a 1 megohm unit may test between 800,000 and 1,200,000 and be satisfactory. Heathkit circuits are designed to accommodate these variations. Socket connections are numbered on the bottom of the sockets. Sockets are fastened into the chassis with the wavy metal rings which fit into the groove in the side of the socket. To install, hold one end of the ring in the groove and the balance of the ring is then forced over the socket and into the groove with a screw driver.

Note the direction of the keyways in the sockets from the pictorial diagram.

Begin the construction by mounting the sockets, power transformer, output transformer and bathtub condenser, adding solder lugs where indicated. Note: Solder wires to output transformer lugs #1, #3, and #5 before mounting. Wire the power supply section first followed by the filaments and ground connections. The resistors and molded condensers are now added. Assemble the panel by mounting the several jacks. The jacks are held in place by the special washer with sharp points which is forced over the body of the jack. Mount the speaker grill and speaker and the upper selector switch. The panel is held to the chassis by the gain control potentiometer and the lower rotary selector switch. Complete the wiring by making all connections from the panel to the chassis. Install the line cord. Assemble the prod as shown on the circuit diagram. Remove enough of the shielding on the cable to prevent shorting of the crystal. Solder the short ground BRAID to the shield. The cable with crystal attached is inserted into the prod (having first removed the cap from the solderless tip of the test prod) and the lead from the crystal pulled through the hole in the prod tip. This lead is wrapped around the groove in prod tip and the cap replaced locking it in place. To avoid strain on the crystal lead, it is suggested that several match sticks be pressed into the prod beside the shielded lead making the cable tight in the prod. Install the phone plug on the other end of the cable as shown.

Upon completion of the wiring, recheck all connections A suggested way is to follow each con-

nection in the instrument and mark if on the circuit dingram with a colored pencil. In this manner, any coanections overlooked or incorrect will be disclosed. If wiring is in order, insert tubes and connect to 110V 60 cycle AC. After warm up period, ndvance the gain control and touch prod tip. If loud hum is heard in the speaker (providing switches are set in correct position), the tracer is in proper operating order.

USE OF SIGNAL TRACER

The gain control determines the sensitivity of the instrument and allows the signal being followed to be adjusted to a suitable volume

The slide switch O94 should be in the internal position. The selector switches should be in positions 4 and 5 to properly match the 6K6 tube in this instrument.

To trace a receiver, set the dial of receiver under test to known local station or preferably a signal from a test oscillator. Turn gain control full on, connect grouad clip of tracer prod to B-. (On AC-DC radios, a small potential may exist which may be eliminated by reversing either the plug on radio or tracer or both.) Note: B- nnd chansis may not be at the same potential in some AC-DC receivers. Hum and distortion may be minimized by placing a condenser of a few MMF in series with the test prod. A reduction in signal strength due to detuning is to be expected when checking receivers having relatively large inductances and small capacities in the tuned circuits.

Start at the antenna coil and touch the prod tip to first the secondary, continuing through the RF, and IF coils (always to the high or plate and grid sides of the coils) continuing through the audio section by connecting progressively to the grid and plate of each section at tube socket. When the signal stops, the difficulty lies in the stnge just preceding. To illustrate--if the signal appears at the plate or primary coanection of a coil but not at the secoadary or grid of the coil, the fault is between the plate and grid. The gain of each siage is indicated by the amount the gain control of the tracer must be rednced to maintain equal volume. Power supply filters may be checked by touching the prod to each section and noting the reduction in hnm (no reduction iadicates defective filter coadenser). Distortion, noise or hum may be followed throngh a radio in the same manner and isolated. The Heathkit Signal Tracer may be used for many other trouble shooting purposes which appear desirable to the user. The crystal diode in the probe is in effect a crystal detector which will respond to any freqnency up to 200 megacycles.

The setector switches make 30 different impedance ratios available which make the instrument a valuable test speaker. To use as a test speaker for receivers or amplifiers with output transformers, connect to jacks C (common or grounded side) and VC (voice coil) with slide switch to "external." To use as a test speaker for receivers or amplifiers without an output transformer, coucect to jacks "P" and "B+" (for singie ended ontput) or "P" "B+" and "P" (for push pull output) with slide switch in internal position, and adjnst the selector switches for proper matching to the inbes using the chart on the panel. A mismatch of 30 percent will not adversely affect operation. When used as a test speaker, be sure the power is turned off turning the gain control all the way counter clockwise till the switch clicks

The transformer can be used as a matching transformer only, by connecting the amplifier or receiver as above nnd "C" and "SEC" terminals to an external speaker. The slide switch should then be in the external position

To use the tracer as an audio amplifier or small public address system, connect either a phonograph pickup or high impedance crystal microphone to the input terminals and use either the internal speaker or a remote external speaker. For visual signal tracing, insert the AC test prod from a vacuum tnbe voltmeter into the "P" connection. Coanect the GND coanection of the tracer to the common or GND coanection of the VTVM. The VTVM shonld be set on the correct AC scale. Signal levels and gain per stage may be read directly in volts or db. In checking intermittents, the tracer and VTVM may be left at a known setting and will indicate any change instantly. The "P" coanection may also be connectad to an oscilloscope for visual tracing.

IN CASE YOU HAVE DIFFICULTIES

1. Recheck entire wiring. Most cases of trouble result from incorrect or reversed wiring.

2. Check all voitnges at the sockets. Measurements given below were taken with an 11 megohm input resistance Heathkit VTVM. A normal variation of + or - 15% are to be expected. All are measured between chassis nnd socket pin.

	6SH7	6K6	6X5
Pin 1	0	0	0
2	5-6½VAC.	0	0
3	0	250 to 280V.	200-240VAC.
4	0 (No Signal)	250 to 280V.	Not Used
5	0	0	200-240VAC.
6	25-35V	Not Used	Used as Tie Point
7	0	5 to 6½VAC.	5 to 6½VAC.
8	90-120V. No Signal	13 to 18V.	260 to 300V.

3 Check phone ping nnd test prod for shorts to shieiding.

4. If oscillation is evident, try reversing the brown and blue leads form the output transformer, as shown in the pictorial diagram.

5. If residual hnm level is too high, try reversing the two black primary leads from the power transformer.

SERVICE

In event continued operational difficulties of the completed instrument are experienced, may we remiad you that the Heath Company has provided a technical consnltation service. Every effort will be made to assist you through correspoadeace. May we emphasize that in all correspondence this instrnment should be referred to as the Model T-2 Signal Tracer.

The facilities of the Heath Company Service Department are also available. Your instrument may be returned for inspection, repair and calibration for a asrvice charge of $3.00 pins the cost of any additioanl materiai that may be required. This service policy applies only to completed instruments coastructed in accordance with the instructions as stated in the manual. Instruments that are not completed or iastruments that are modified will not be accepted for repair. Instruments showing evidence of acid core solder or paste fluxes will be retarned not repaired.

The Heath Company is willing to offer its utmost cooperation to assist you in obtaining proper operation of your instrument. The repair service is available until one year from the date of purchase.

NOTE: Before returning this nnit, be sure all parts are securely mounted. Attach a tag to the instrument giving anme, nddress and trouble experienced. Pack in a rugged container, preferably wood, using at least three inches of shredded newspapar or excelsior on all sides. Do not ship in original carton only as this carton is not considered adequate for safe shipment of the completed instrument. Ship by prepaid express, if possible. Return shipment will be made by express collect. Note that a carrier cannot be held liable for damage in transit if packing, in his opinion, is insufficient.

Prices are subject to change without notice. The Heath Company reserves the right to change the design without incurring liability for equipment previously supplied.

WARRANTY

The Heath Compasy limits its warranty on any part supplied with any Heathkit (except tubes, meters, and rectifiers, where the original manufacturer's guarantee only applies) to the replacement within three (3) months of said part which, when returned with prior parmission, pustpaid, was, in the judgment of the Hanth Company, defective at the time of sale.

The assembler is urged to follow the instructioan exactly as provided. The Heath Company assumes no responsibility or liability for any damages or injuries sustained in the assembly of the device or in the oparation of the completed instrument.

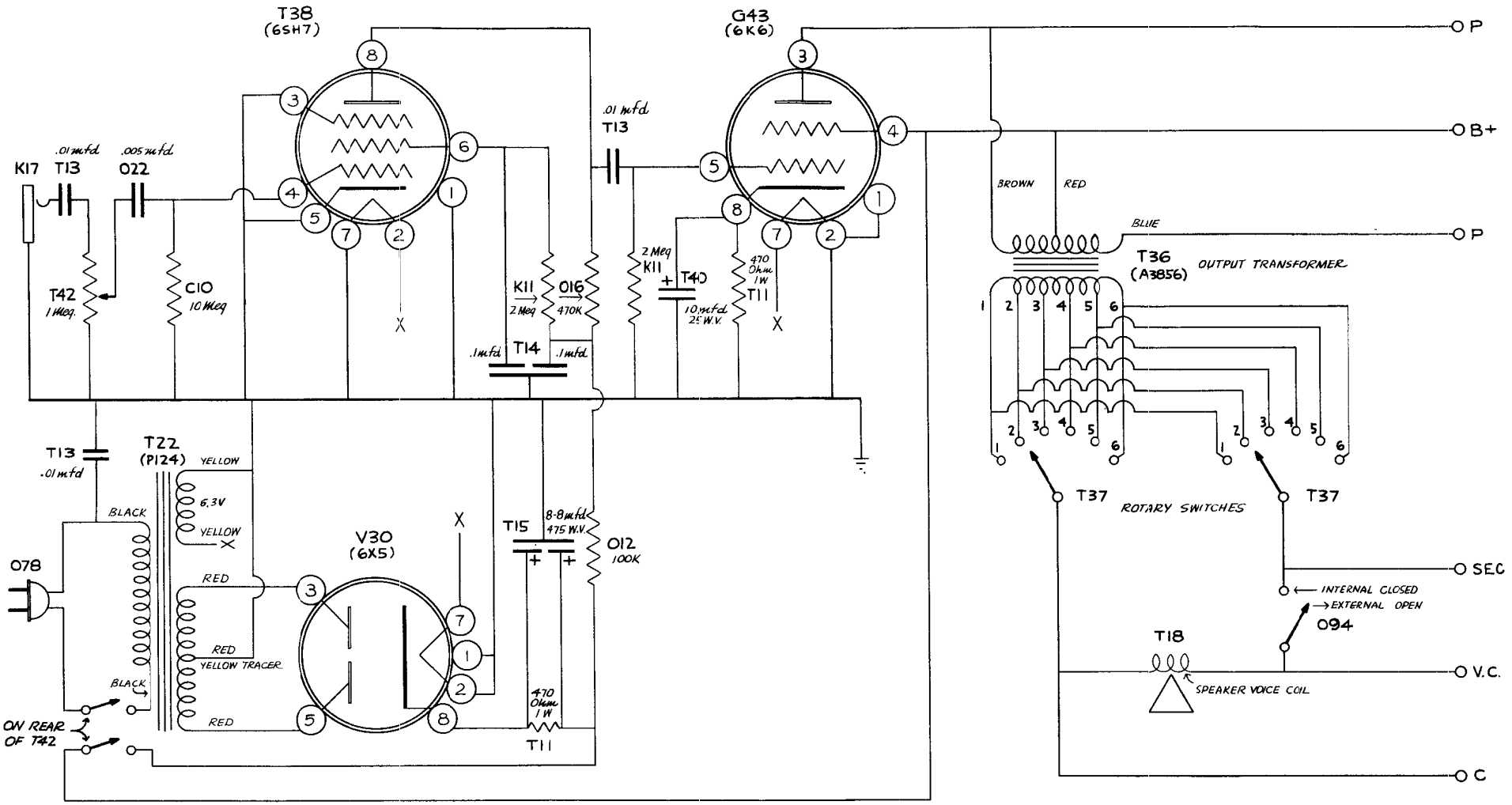
HEATH COMPANY
Benton Harbor, Michigan

T2 SIGNAL TRACER PARTS LIST

Part No.	Part Per Kit	Description
Resistors		
R12	1	100,000 Ohm
R16	1	470,000 Ohm
R11	2	2 Megohm
R10	1	10 Megohm
R11	2	470 Ohm 1 Watt
Condensers		
C22	1	.005 MFD Moulded Papar
C13	3	.01 MFD Condenser
C14	1	Dual .1 MFD 400V Bathtub
C15	1	Dual 8 MFD 475V Electrolytic
C40	1	10 MFD 25V Tubular
Control--Switches		
R42	1	1 Megohm Audio Tapar Control with DPST Switch
S37	2	Single Pole 6 Pos. Rotary Switches
S24	1	SPST Slide Switch
Tubes		
V43	1	6K6 Tube
V38	1	6SH7 Tube
V30	1	6X5 Tube
Knobs--Sockets--Terminal Strips		
K51	3	Pointer Knobs
S54	3	Octal Sockets
S43	3	Octal Socket Rings
TW37	1	3 Lug Terminal Strip
Miscellaneous		
J77B	1	Basana Jack (Black)
J77R	5	Banana Jack (Red)
J28	6	Banana Jack Insert
J17	1	Phone Jack
J41	1	Phone Plug
K44	6	Locking Ring for Jack
W42	1	Test Prod
G19	1	Speaker Grill
D21	1	Crystal Diode
W44	1	Alligator Clip
W28	4	$\frac{3}{8}$" Nickel Washers
W101	3	Control Lock Washers
H31	13	6-32 x $\frac{3}{8}$" Machine Screws
H30	2	10-24 x $\frac{3}{8}$" Handle Screws
H102	8	#6-$\frac{3}{8}$" Self Tapping Metal Screws
N22	13	#6-32 x $\frac{3}{8}$" Nuts
N33	4	$\frac{3}{8}$" Control Nuts
LTS72	13	#6 Lock Washers
W37	3	Solder Lugs
W35	2	$\frac{3}{8}$" Rubber Grommets
W34	4	Rubber Feet
W47	1	Length Shielded Test Lead Wire
WF17	1	Length Braid
W24	1	Roll Hook-up wire
W81	1	Length Spaghetti
W78	1	Line Cord
W79	1	Handle
G18	1	4" P.M. Speaker
T22	1	Power Transformer (P124)
T36	1	Output Transformer
T25A	1	Panel
T26A	1	Chassis
T32	1	Cabinet
T2	1	Instruction Manual

HEATHKIT REPLACEABLE PARTS AVAILABLE

T15	Dual 8MFD Electrolytic Condeaner	$1.00 each
T40	10MFD 25V Tubular Condenser	.40 "
T37	Single Pole 6 Pos. Rotary Switch	.68 "
T42	1 Megohm Audio Taper Control - DPST Sw.	.92 "
T18	4" p.M. Speaker	2.75 "
T22	Power Transformer	3.90 "
T36	Output Transformer	1.60 "
T25A	Panel	.85 "
T32	Cabinet	2.55 "



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MODEL T-2 SIGNAL TRACER

☆ ☆ ☆

MEG. = 1,000,000 Ohms.....
K = 1,000 Ohms.....

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BENTON HARBOR, MICH

CONNECT POINTS MARKED
X ON TUBES TO SAME LETTER
MARKED ON TRANSFORMER.

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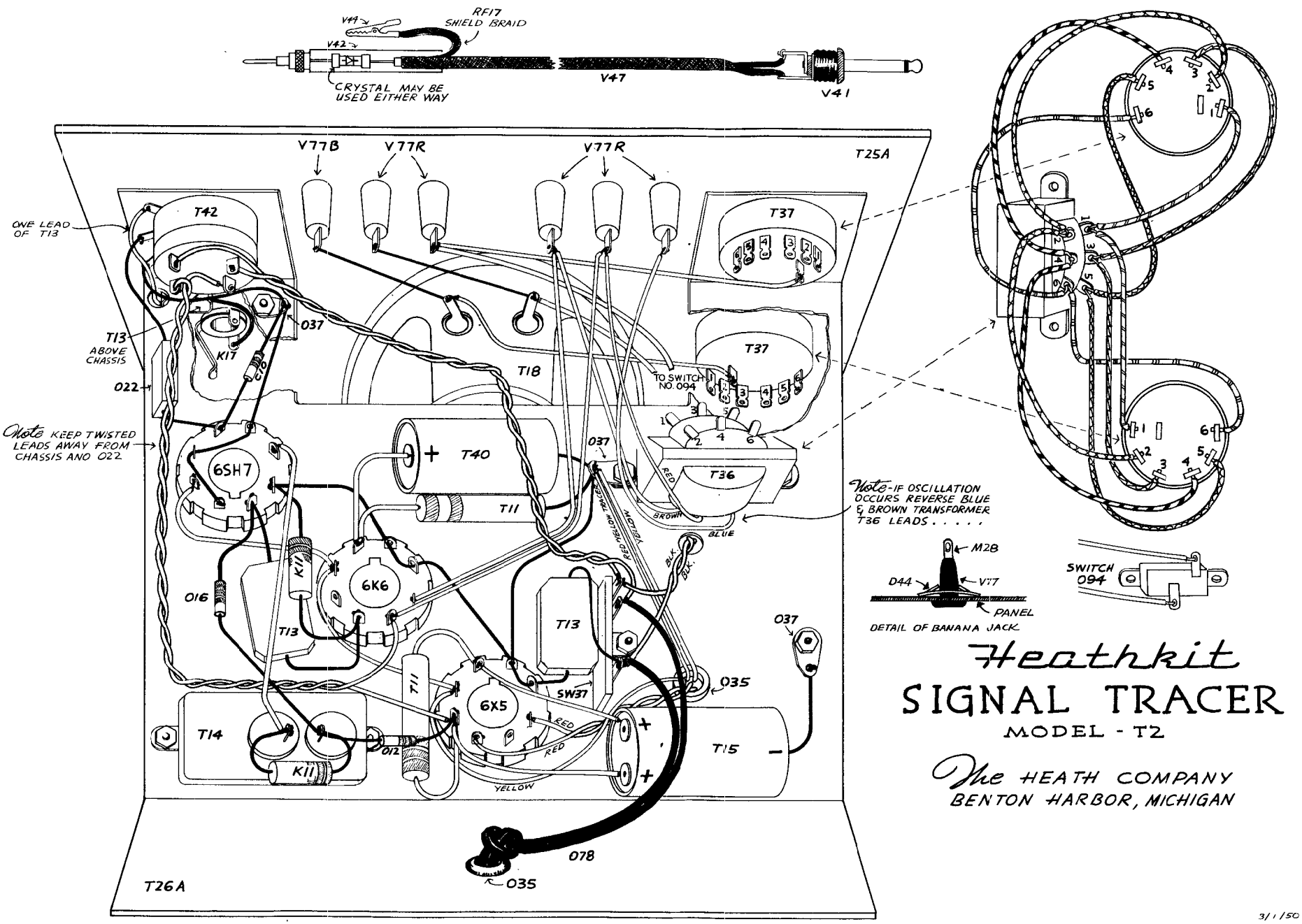
V49
RF17
SHIELD BRAID
V42
CRYSTAL MAY BE USED EITHER WAY
V47
V41
V77B
V77R
V77R
T25A
ONE LEAD OF T13
T42
T37
T13 ABOVE CHASSIS
037
K17
C78
T18
022
T37
TO SWITCH NO. 094
Note KEEP TWISTED LEADS AWAY FROM CHASSIS AND 022
6SH7
T40
037
T36
T11
RED
BROWN
BLUE
YELLOW
RED
BLK.
BRN.
Note-IF OSCILLATION OCCURS REVERSE BLUE & BROWN TRANSFORMER T36 LEADS . . . . .
K11
6K6
016
T13
T13
037
T11
6X5
SW37
035
T14
012
K11
RED
RED
YELLOW
T15
078
035
T26A
M28
D44
V17
PANEL
DETAIL OF BANANA JACK
SWITCH 094
Heathkit
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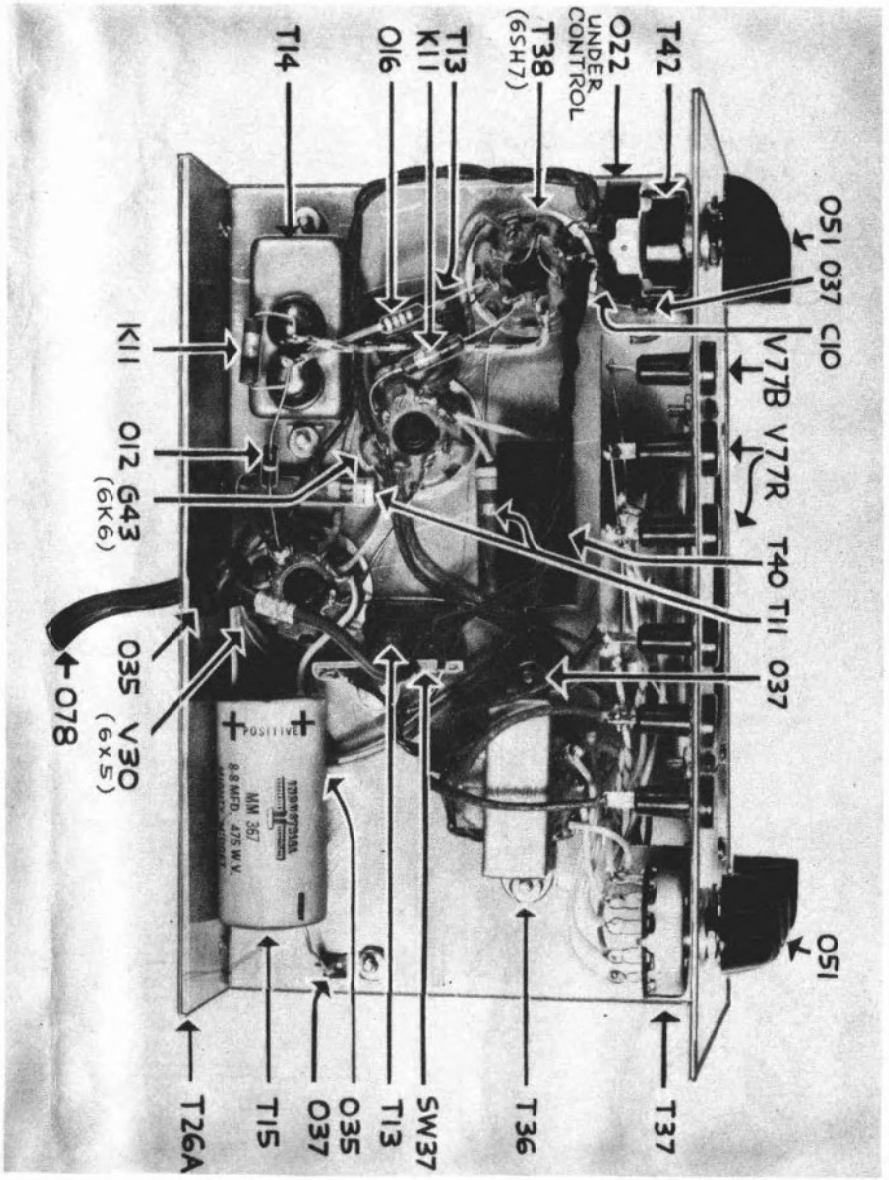

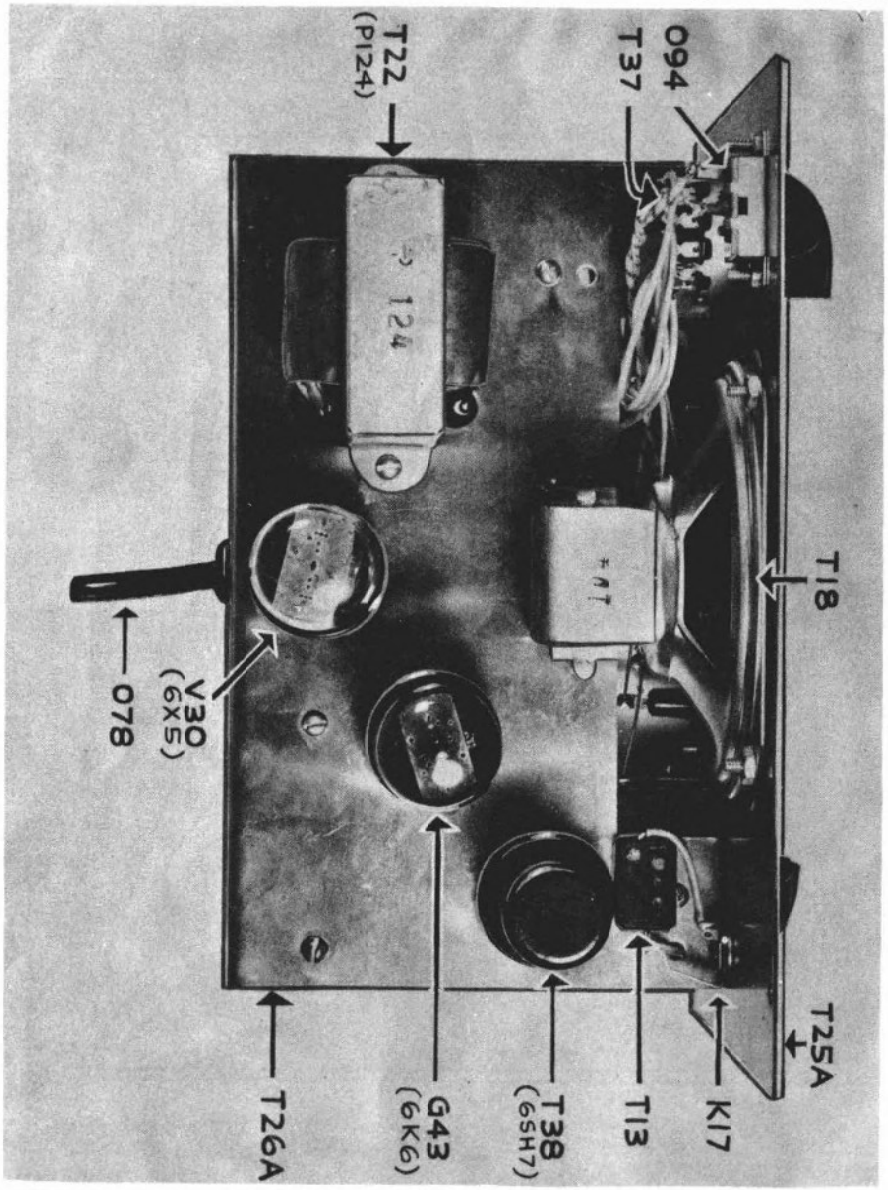

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