

# HEATHKIT<sup>®</sup> MANUAL

*for the*

## **FET/TRANSISTOR TESTER**

**Model IT-3120**

595-1989-04



**HEATH COMPANY • BENTON HARBOR, MICHIGAN**

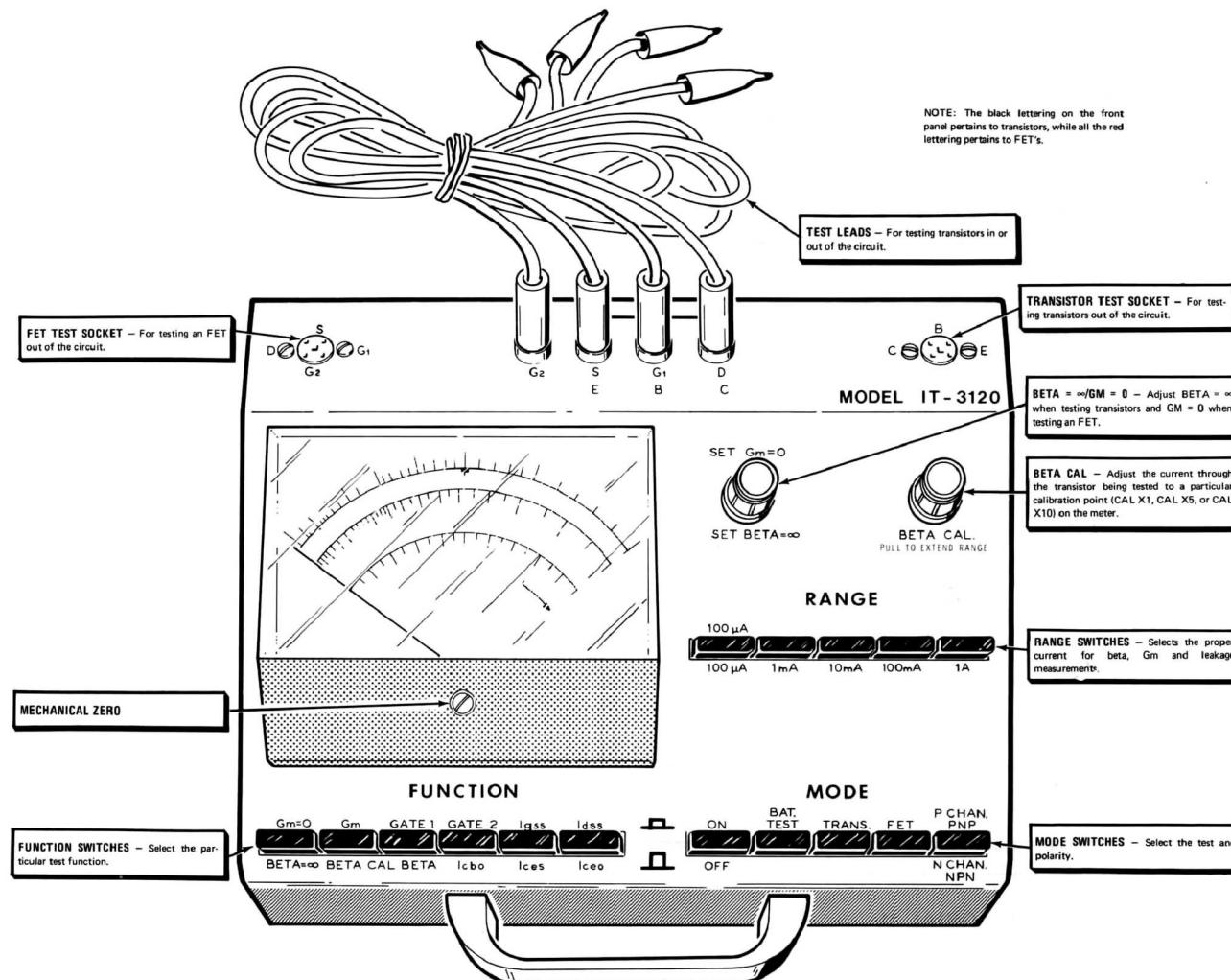
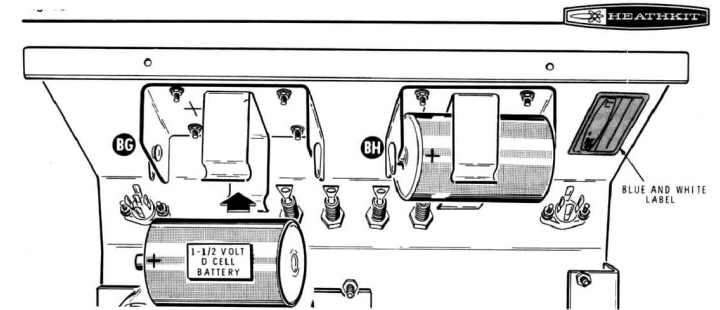
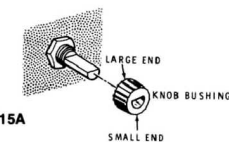


Figure 1



Refer to Pictorial 14 for the following steps.

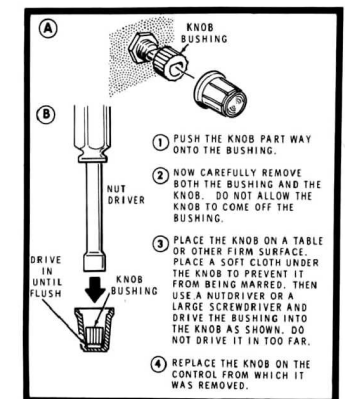
- (✓) Be sure the ON-OFF switch is in the OFF (out) position.
- (✓) Install D cells (1-1/2 volt battery) in the battery holders. Position the positive (+) end of each battery to the positive (+) terminal on each battery holder.
- (✓) Carefully peel away the backing paper from the blue and white identification label. Then press the label onto the inside of the front panel as shown. Be sure to refer to the numbers on this label in any communications you have with the Heath Company about this kit.



Refer to Pictorial 15 for the following steps.

Refer to Detail 15A and notice that the knob bushing is tapered. Be sure, in the next step, to place this bushing on the shaft with the small end facing out, or the knob will not slide onto it. (Roll the bushing on a flat surface if you are unsure about it; the bushing will gradually turn toward the small end.)

- (✓) Install a knob bushing on each of the front panel control shafts.



In the following step you will install knobs on the two control shafts. Perform this step carefully, since it is difficult to remove a bushing from a knob once it is fully inserted.

- (✓) Install knobs on each of the control shafts as shown in the Pictorial.

This completes the wiring of your Transistor Tester. Proceed to "Test and Adjustment."

## TEST AND ADJUSTMENT

Figure 1 shows the front panel of the Transistor Tester. Study the figure carefully to identify the function of each switch, control, jack, and socket.

If any trouble is encountered in the following steps, refer to the "In Case of Difficulty" section on Page 29.

- (✓) Be sure the ON-OFF switch is in the OFF (out) position.
- (✓) The meter needle should be on the extreme left mark on the scale as shown in Figure 1. If the pointer is not over this mark, slowly turn the Mechanical Zero screw, while you lightly tap the meter face with your finger to properly position the pointer.

### BATTERY TEST

- (✓) Press the following front panel pushbutton switches:  
10 mA  
BETA =  $\infty$   
BAT. TEST
- (✓) Be sure the PNP-NPN switch is in the NPN (out) position.
- (✓) Press the ON-OFF switch to the ON (in) position. The meter pointer should be within the BAT OK area on the meter. A new battery will cause the pointer to deflect off scale on the right side of the meter. This is normal.
- (✓) Press the PNP-NPN switch to the PNP (in) position. The meter pointer should be within the BAT OK area on the meter. A new battery will cause the pointer to deflect off scale on the right side of the meter.
- (✓) Release the ON-OFF switch to the OFF (out) position.

### ADJUSTMENT

- (✓) Connect the test leads to the appropriate front panel jacks.
- (✓) Connect the 166  $\Omega$ , 1%, precision resistor (brown-blue-blue-black) between the collector (black) test lead and the emitter (red) test lead.

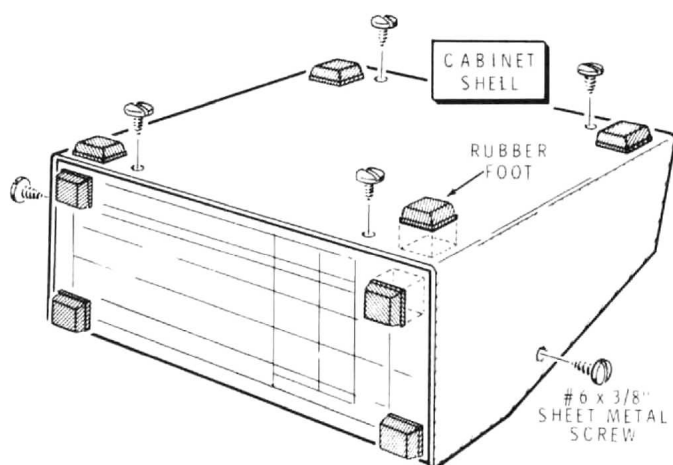
- (✓) Press the following front panel pushbutton switches:

TRANS  
Iceo  
10 mA

- (✓) Press the PNP-NPN switch to the PNP (in) position.
- (✓) Press the ON-OFF switch to the ON (in) position.
- (✓) Adjust the control on the circuit board to position the meter pointer at the 85 mark on the leakage scale.
- (✓) Release the PNP-NPN switch to the NPN (out) position. The meter reading should not change. If the reading is different, note the position of the pointer. (If the meter indication is greater than 90, or less than 80, replace the batteries.) Then readjust the control on the circuit board to place the pointer half way between the noted point and the 85 mark.
- (✓) Remove the resistor from the test leads. Tape this resistor to the inside of the front panel for future use.
- (✓) Release the ON-OFF switch to the OFF (out) position.
- (✓) Press the following front panel pushbutton switches:  
FET  
GM = 0  
100  $\mu$ A
- (✓) Press the P CHAN-N CHAN switch to the P CHAN (in) position.
- (✓) Press the ON-OFF switch to the ON (in) position.
- (✓) Rotate the SET Gm = 0 control. If the meter pointer can be positioned above and below the 0 mark (full scale) on the Gm scale, the FET circuitry is operating properly.
- (✓) Release the P CHAN-N CHAN switch to the IN CHAN (out) position and repeat the previous step.
- (✓) Release the ON-OFF switch to the OFF (out) position.

This completes the "Test and Adjustment" of your Transistor Tester. Proceed to "Final Assembly."

## FINAL ASSEMBLY



PICTORIAL 16

Refer to Pictorial 16 for the following steps.

- ( ) Install the cabinet shell on the front panel with #6 x 3/8" sheet metal screws.
- ( ) Remove the backing paper from the rubber feet and install them on the cabinet shell and the rear of the front panel as shown.

This completes the assembly of your Transistor Tester. Proceed to the "Operation" section.

## OPERATION

### GENERAL INFORMATION

The Transistor Tester measures the DC beta (gain) characteristics of transistors and the Gm (transconductance) characteristics of FET's (field effect transistors), characteristics that will even vary between transistors of the same type. These tests give you actual operating characteristics of a transistor and not merely a "bad" or "good" rating. Also, unijunction transistors, diodes, silicon controlled rectifiers, and triode AC switches can be easily tested.

Refer to Figure 1 for the locations and descriptions of the controls, switches, and connections on the Tester.

Transistors may either be plugged into the test sockets on the Transistor Tester or the test leads may be used. To use the test leads, connect the black test lead to the collector (C), the white test lead to the base (B), and the red test lead to the emitter (E) of the transistor being tested. When you test FET's (field effect transistors) or UJT's (unijunction transistors), connect the black test lead to the drain (D), the red test lead to the source (S), and the white test lead to the gate (G) of the device. If the transistor has two gates, connect the green test lead to the second gate (G).

Some transistors have a fourth lead connected to an internal shield. Leave this lead disconnected in the test procedure (bend it out of the way when you plug transistors into the transistor test socket).

**CAUTION:** Never connect the Transistor Tester, or test a device, while power is applied to the circuit. The Tester and/or the circuit could be damaged.

When devices are tested in-circuit, you may sometimes find it difficult to connect the test leads to the device because its leads are either too short or inaccessible. In such cases, you can usually connect each test lead to the lead of another component that is connected to the desired terminal on the device. To determine where you can connect the test leads on the circuit board, shine a light through the circuit board; this will let you trace each foil from the device to the other components. In cases where this is impractical, solder a short piece of wire to the printed circuit foil that is connected to the lead of the device; then connect the test lead to this wire.

The front panel lettering is in two colors, black and red. The black lettering calls out the controls used primarily when transistors are tested, while the red lettering calls out the controls relating to FET testing. Remember, when performing any of the following tests, if the TRANS switch is pressed in, refer to the black lettering; if the FET switch is pressed in, refer to the red lettering.

Proceed to the particular test procedure you wish to perform. Remember, it is a good idea to occasionally test the batteries before you use the Tester, especially if the Tester has not been used for some time.

### BATTERY TEST

Test the batteries as follows:

1. Release the NPN-PNP switch to the NPN (out) position to check one battery.