

Heathkit of the Month:
by Bob Eckweiler, AF6C



The HD-1250 Solid-State Dip Meter (and Its Predecessors)

Introduction:

The Dip Meter, known as the **Grid Dip Oscillator (GDO)** in the days of vacuum tubes, has always been a practical piece of test equipment for the ham who builds, tinkers or constructs antennas. With such popularity it is a product Heathkit produced in various forms over a long part of the company's existence.



Heathkit GD-1B

The Heathkit GD-1/1A/1B Grid Dip Meter:

The first Heath Grid Meter appeared in the October 1952 Heathkit Flyer and was designated

the GD-1. The GD-1 is a handheld unit that plugs into an AC wall socket. The front of the unit has a meter, a phone plug and a **SENSitivity** control with an **OFF/ON** switch. Also on the front is a scale for the capacitor which is turned by a thumb knob that extends out of the case on each side. On the back side is a switch that selects either **OSCILLATOR** (GDO) mode or **DIODE** (absorption wave meter - **AWM**) mode.

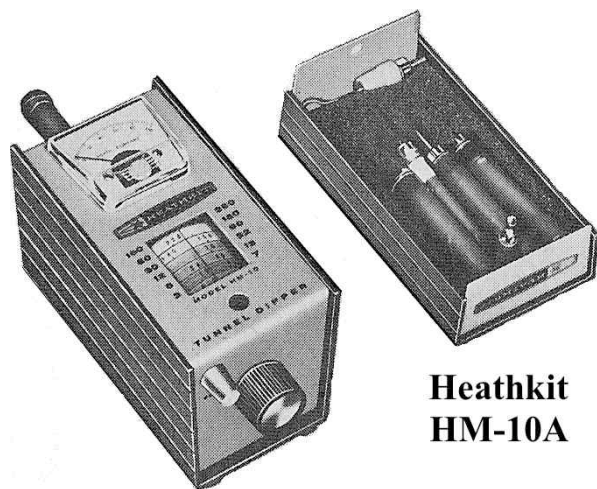
The GD-1 was short-lived, being replaced by an improved GD-1A in 1953, and then the GD-1B later that year, each offering circuit improvements. All three versions are very close in appearance and cover the same frequency range of 2 MHz to 250 MHz using five plug-in coils. Later in the production Heath offered the 341-A low frequency coil set. The set contains two additional coils to cover the lower frequencies of 350 KHz to 2 MHz. The 341-A includes a calibration chart that relies on the "Logging" scale of the GD-1 series tuning knob. In 1956 the GD-1B sold for \$19.50 (the same price as the original GD-1 cost in 1952) and the LF 341-A coil set sold for an additional \$3.00. A European version of the GD-1, the GD-1U was also produced; it was designed to run off of 220 VAC. The GD-1B remained in production until 1960, when the growth of solid-state devices necessitated a design change.

The Heathkit HM-10 Tunnel Dipper:

As a replacement for the GD-1 series, Heath came out with the HM-10 *Tunnel Dipper* in 1961, followed shortly in 1962 by the HM-10A. The *Tunnel Dipper* uses a then revolutionary new semiconductor device called the tunnel diode. This is a specially designed diode that has, over a narrow range, a negative resistance. That is, over part of the diode's range, as the current increases the voltage across the diode decreases. This phenomenon allows the diode to act as an oscillator when in the proper circuit. The tunnel diode oscillator is followed by three stages of transistor amplifiers to drive a 0-1 milliamper meter. The tunnel diode has one problem; being sensitive to temperature, it

won't operate in cold temperatures below freezing. This is a minor disadvantage because the *Tunnel Dipper* runs off a single AA battery and you aren't tethered to AC power when

NEMA 1604 9-volt battery. It covers 1.6 MHz to 250 MHz utilizing seven color-coded plug-in coils. The two pound dip meter measures 2" x 2-5/16" x 5-7/8" H x W x L excluding the plug-in coil.



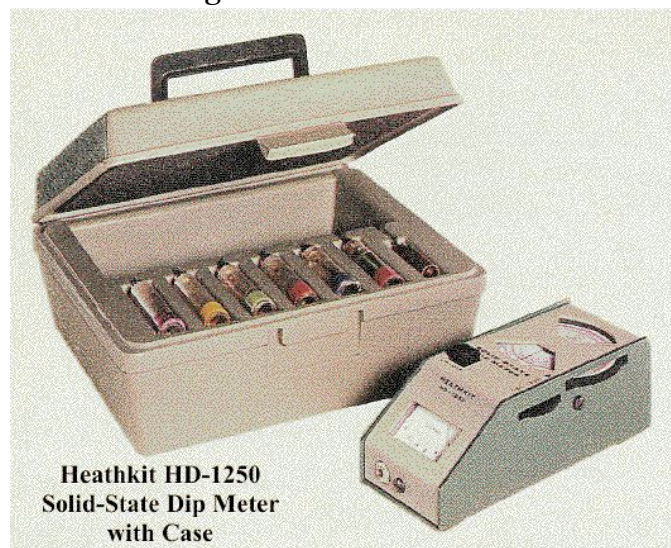
Heathkit
HM-10A

working on outside antennas and feedlines. The HM-10A covers 3 to 260 MHz using six color-coded coils. The tuning capacitor has a large vernier drum dial offering long dial scales for reading the operating frequency. The HM-10A case is made of rugged extruded aluminum and has a snap-on cover that protects the meter and controls, and also houses the six coils. The three position slide switch selects **OFF**, **OSCillator** or **DIODE**. The **DIODE** position allows HM-10 to be used as an absorption wave meter utilizing the meter for indication. This is the only Heath dip meter that doesn't have a headphone jack, so you can't listen to a modulated signal. In 1961 the Tunnel Dipper mail order price was \$34.95. It disappeared from the Heathkit catalog around 1970. The HM-10A *Tunnel Dipper* was replaced in 1975 by the HD-1250 *Solid-State Dip Meter*.

The Heathkit HD-1250 Solid-State Dip Meter:

The last of the Heathkit dip meters is the HD-1250. It was manufactured from 1975 through 1991. The HD-1250 uses a Motorola MRF502 high-frequency transistor for the oscillator, and an RCA 40673 MOSFET and two hot-carrier diodes for the detector. It has a phone jack for earphones; an item missing in from the *Tunnel Dipper*. The HD-1250 runs off a standard

In the oscillator mode the oscillator transistor runs as a Colpitts oscillator using a split tuning capacitor operated by a large circular thumb knob that protrudes through a slot on each side of the case, similar to the GD-1 series. Two plastic windows allow viewing the seven color-coded scales of the dial on the knob, corresponding to the seven coils; an eighth Logging scale is marked on the dial. A smaller **OSCillator LEVEL** adjusting knob also protrudes through the right side of the case. This control sets the voltage for the oscillator transistor and thus the strength of oscillation.



To operate the dip meter in the absorption wave meter mode you don't need to throw a switch as in the earlier units. Instead you decrease the **OSC LEVEL** until the meter reads zero. At that point the oscillator is not oscillating but acts as a Q-multiplier for the tuned coil and capacitor. In both oscillator and wave mode, the MOSFET detector is directly coupled to the tuned circuit. This is practical because of the extremely high impedance of the MOSFET transistor. The detector circuit amplifies the voltage on the tuned circuit and demodulates any AM modulation. The voltage is then fed either to the meter or to the headphone jack.

When the headphones are plugged in the meter is automatically disconnected. Since the meter has a sensitive 150 μ A movement, it is shorted by the ON/OFF pushbutton switch when in the OFF position. This dampens the meter movement and helps prevent damage from physical shock. The Heathkit Solid State Dip Meter comes with a injected plastic storage case. The case holds the GD-1250 unit and the seven plug-in coils. It also has some room for additional small accessories such as extension probe cables, and custom probes.

The manual that comes with the HD-1250 has an eleven page section on using the HD-1250 Solid-State Dip Meter. Even though the manual admits there are many other uses, it shows how to use the meter for quite a few measure-

ments or applications that are useful to a ham who builds or services radios or antennas. In 1976 the HD-1250 sold for \$59.95; by late 1989 the price had risen to \$129.95.

73, from AF6C



Remember if you come across any old Heathkit Manuals or Catalogs that you do not need, please pass them along to me.

Thanks - AF6C

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