

Heathkit of the Month:
by Bob Eckweiler, AF6C



The Heath GD-1003 Electronic Air Purifier

Introduction:

This month we're going to review one of the more unusual products from Heathkit, its first Electronic Air Purifier, the GD-1003. Heathkit offered several air purifier models from the mid-seventies until the late eighties in three different styles: office, in-furnace and portable.

Heath's Family of Air Purifiers:

The first air purifier produced by Heathkit was the portable GD-1003. It was introduced near the end of 1973 and received a full-page description in the 1973 Christmas catalog (#800/78). Originally it cost \$139.95. Sometime in the late 1970s the GD-1003 was replaced by the fancier GD-1247 which sold for \$189.95. By Christmas of 1981 the GD-1247 was itself replaced by the GD-1297, which was continued until 1988. It was introduced at \$229.95 and rose to \$289.95 by the spring of 1984. In 1985 the price dropped back to \$249.95.

Heathkit produced two air purifier kits that integrated into the home furnace. These came in two pieces, an electrostatic filter unit that replaced the regular furnace filter and a separate power supply and control unit. The GD-1196 integrated air purifier first appeared in the fall of 1976. Originally the GD-1196 sold for \$179.95. The filter unit came in four sizes, and replacement electrostatic filters were available for \$99.95 in case you moved or changed to a different size furnace. Sometime in 1981 the GD-1196 was discontinued. No in-furnace filter was mentioned in the 1981 Christmas catalog. A new model, the GD-2196 appeared in the spring of 1982. It sold as two separate items; the \$169.95 GD-2196 Power Supply and the

GD-2196-x filter unit for \$99.95. The dash number varied with the filter size.

Heathkit also dabbed in an office air purifier, the GD-1298. this smaller desk or shelf-top filter was introduced in the spring of 1984 for \$199.95. This item evidently did not sell very well because in the fall of 1985 the price dropped to \$99.95.



Top: The 1976 GD-1196 'In-furnace'.
Bottom: The original GD-1003 'Portable'

Electronic Filter Operation:

A two-stage electronic air filter operates using high voltage on the order of 6 to 8 kilovolts. Usually the fan draws air through a pre-filter or screen first to remove large particles. Then the air passes into the first part of the electronic filter; here it passes between ionizing wires that

are at a high positive voltage. Particles like dust and smoke acquire a strong positive charge as they pass through this stage. Next the air enters the second stage and passes through the collecting cell made up of numerous parallel metal plates. Alternate plates are at a positive voltage of about half the ionizing voltage, while the remaining plates are at ground potential. As the positively ionized particles pass between the collecting plates, they are repelled by the positive plates and attracted to the grounded plates where they are collected. The air is then often passed through an activated charcoal filter to remove any remaining odors.

Electronic Air Cleaner eliminates 99% of airborne pollen, 94% of all airborne particles in any room



- Easy to assemble -- absolutely no soldering!
- For rooms to 25' x 30'
- Adjusts to "quick-clean" a room
- Portable -- use anywhere you need it!
- Room-sized unit works for pennies a day

\$189⁹⁵

Heathkit GD-1247 Portable

Quick Look - GD-1247 Portable Filter:

The original GD-1003 filter looks a lot like an air filter should – a low rectangular box with grills and a handle. The later GD-1247 looks more like a piece of furniture. It measures 26-1/2" H x 17-1/4 W x 13-1/2" D and weighs about 55 pounds. The cabinet is made of particle board covered with Southern Pecan vinyl wood finish. The filter is recommended for rooms up to 25' x 30', and has a variable speed fan that adjusts from around 100 to 250 cubic feet per minute (CFM). One feature of this kit mentioned in the catalog is that it requires no soldering. Instead, push-on terminals are used. Accessories for the GD-1247 were the deluxe caster set (GDA-1247-1 \$8.95), and a replacement activated charcoal filter (GDA-1247-2 \$5.95).



Heathkit GD-1297 Portable

Quick Look - GD-1297 Portable Filter:

There is little different between the GD-1297 and the earlier GD-1247 except for the style of the cabinet. The size is identical but the weight is higher at 58 pounds. The controls have been removed from the front and the front looks like a speaker. The new style still has the Southern Pecan vinyl finish. The fan is now a three-speed squirrel-cage type. This one-evening kit also requires no soldering; the power supply, filter and fan control are pre-built. Accessories for the GD-1297 included the deluxe caster set (GDA-1297-1 \$13.95) which was dropped shortly after the kit was released; the casters were incorporated into the kit at no extra cost. The replacement active charcoal filter (GDA-1297-2 – \$6.95 to \$9.95) also fit the earlier GD-1247.

Quick Look - GD-1298 Office Filter:

For use in the office, Heathkit made a smaller air purifier. The GD-1298 measures 5-1/8" H x 21-1/4 W x 10-5/8 and weighs about 19 pounds. It was designed for rooms up to 15' x 20'. The variable fan passes air through the filter at speeds up to 100 CFM. A washable foam pre-filter is used before the electrostatic filter, and an activated charcoal filter after it. The power supply produces 6,400 volts of ionizing

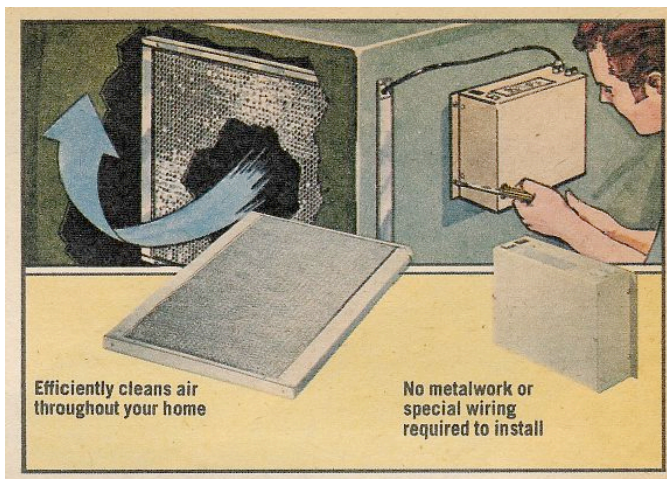
voltage for the electrostatic filter. Following the tradition of the later portable units, no soldering was required for assembly.



Heathkit GD-1298 Office

Quick Look - GD-1196 In-Furnace Filter:

There were actually four GD-1196 models identified by a -1 to -4 suffix. The dash number signified the filter size: -1 is 20" x 25" (1000 CFM), -2 is 20" x 20" (800 CFM), -3 is 16" x 25" (800 CFM), and -4 is 16" x 20" (640 CFM). Each filter is 2" thick. The power supply for each model is identical and is included with each kit; it's size is 12" x 8" x 4", with a power requirement of 25 watts. Power for the filter is taken from the power to the furnace/air conditioner motor. Should the furnace motor run on 240 VAC Heathkit also sold the accessory GDA-1196-5 Air Flow Switch that allows the filter to be controlled without being powered by the fan motor.



Heathkit Ad of the GD-2196 In-Furnace

Quick Look - GD-2196 In-Furnace Filter:

The later GD-2196 air filter cleaner was designed to operate in furnaces and air-conditioners that use thinner 1" thick filters. These filter units were sold as separate items. The GD-2196 (originally \$169.95, dropped after six months to \$149.95) was only the power supply and controller unit. The separate filter sold for \$99.95 Two sizes were available: The GDA-2196-1 is 20" x 25" (1000 CFM), and the GDA-2196-3 is 16" x 25" (800CFM)

The GD-1003 Portable Electronic Air Purifier:

The first electronic air-cleaner by Heathkit was a portable models. It carried the designation of GD-1003 and was listed as a "two-evening kit", referring to the typical assembly time. Unlike the later models, you had to heat up the soldering iron to assemble this kit. The GD-1003 measures 13-1/2 W x 15" H x 17-3/4 D and weighs a hefty 46 pounds. The cabinet is metal with a vinyl wood finish. A gold anodized trim plate and end screens adorn the box. It has none of the stylish look of the later portable air purifiers, but does look very functional.

Inside the GD-1003 is a power supply that produces limited current voltages at 4000 and 8000 VDC. A heavy, well insulated transformer feeds a voltage doubler circuit producing the two voltages. The two HV diode rectifiers are selenium, and the HV bleeder resistor is 200 Meg-ohms. These components are long cylinders because of the high voltages they must handle. Two filter capacitors are in series to smooth the rectified voltages. One of the capacitors is a 0.15 μ f 6.5 KV tubular capacitor. The other capacitor is the collecting cell itself; its large and multiple plates make up a good high-voltage capacitor.

The air is driven by an axial five-bladed fan. The fan motor has two speeds producing flows of 165 CFM on **High** and 110 CFM on **Low**. Speed is selected by a three position rocker switch, with the center position being **Off**. A neon power light indicates when the unit is running. The lower fan speed is achieved by

switching a choke in series with the motor. Power consumption is specified as 55 watts on high speed and 40 watts on low speed.

If you've ever built a Heathkit you are familiar with their famous, well designed and standardized manuals. While they have evolved over the years, their quality has always excelled. While the GD-1003 manual still fits this image, it does vary in significant ways. First its size is a whopping 11" x 14". Second, the separate two color "exploded parts drawing" opens to 21" x 27". Also, there is no complete schematic drawing of the unit. Instead, the manual contains a wiring diagram as one might see on the back of a kitchen or laundry appliance. In the "Theory of Operation" section there are brief partial schematics that describe the operation of the power supply section of the unit. Figure one is a schematic I put together of the GD-1003 Electronic Air Purifier. As you can see by it, there isn't much to this device.

The GD-1003 has a replaceable active charcoal filter as do the other units. Since Heath went out of the kit business, none of the active charcoal filters used in the Heath electronic air purifiers are known to be available anymore.

Ozone:

Ozone (O₃) is a byproduct of electrostatic air filters. It is produced by the corona discharge that occurs due to the high voltage in the filter. In small quantities ozone can create a refreshing atmosphere; think of the pleasant smell after a thunderstorm. However in concentrations of 0.01 parts per million (PPM) ozone can be smelled by most people. Concentrations of 0.1 to 1.0 PPM produces physiological human reactions such as respiratory and eye irritation, and headache. The GD-1003 specifications don't show any data for ozone production. However, some later models of the Heath filters were specified to produce less than 0.02 PPM of ozone. Ozone breaks down to oxygen over a period of thirty minutes. 2O₃ -> 3O₂. It can also be corrosive.

Observations:

The GD-1003 kit was easy to assemble. While soldering was required, many of the connections were made using push-on connectors. Operation is quite simple. The center-off rocker switch is set to either high or low, which varies the fan speed. The occasional sound of an electrostatic discharge can be heard when a large particle enters the unit. Otherwise the unit is quiet except for the sound of the fan which is quiet on low speed and not excessive on high speed. the smell of ozone can be noticeable during operation, but never objectionable. Still, it is never used it in a small closed room, especially a bedroom overnight.

Maintenance:

After a few weeks of use, depending on how dusty a room is, the filter's collection cell needs to be removed and cleaned. The amount of dirt and grime on the collection plates will show that the filter is doing its job. The manual recommends cleaning the collecting cell by immersing it repeatedly in a solution of water and dishwashing detergent. Finding a sink that can hold the filter is a challenge. You can use a spray bottle of dilute detergent, spraying it on the plates of the collecting cell, then hosing it off outside. It is important to be sure the cell is dry before reinstalling it back in the cabinet.

For safety, the unit should be unplugged before opening it to remove the collecting cell. An interlock switch adds extra protection, The collection plate assembly slides out easily for cleaning. All electronic contacts are made through beryllium-copper spring contacts so nothing has to be disconnected.

The other item of maintenance is the replaceable activated charcoal filter. This is no longer available that I could find. However the charcoal can be re-activated or replaced. the unit is still quite effective even if the charcoal activated post filter has lost much of its effectiveness. The fan is specified as lifetime lubricated and doesn't require Maintenance

My GD-1003:

I purchased a GD-1003 in late April of 1977 for use in the ham shack. It is still working to this day. With the California winds and occasionally open windows when in the shack, dust and grime had a way of creeping into the house and being attracted to the electronic devices. The GD-1003 helps keep the dust down to a manageable level.

Over thirty years old, my GD-1003 is still in use today.

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

This article originally appeared in the January 2009 issue of RF, the newsletter of the Orange County Amateur Radio Club - W6ZE.

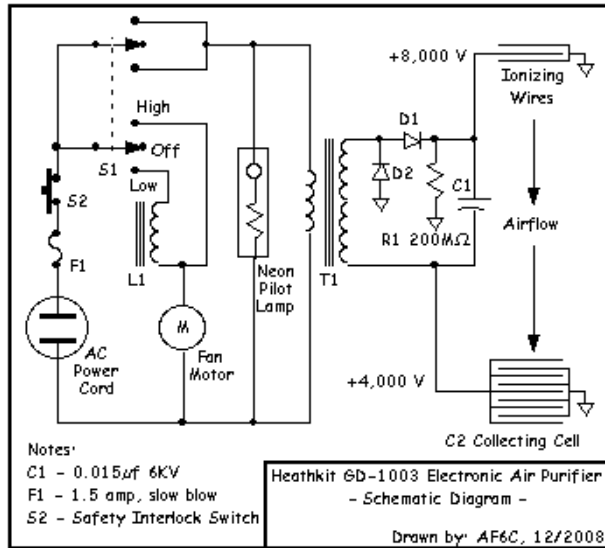


Figure one - GD1003 Schematic

In the late seventies and early eighties, the Orange Co. ARC SSB net was held on Thursday nights on fifteen meters. Net control location usually rotated between the shacks of Kei - W6NGO, Ken - W6HHC, and mine. Usually the three of us would get together for the net because there were numerous others who checked in. When the net was held at my shack the Heathkit GD-1003 also played a secondary role. Sitting there on the floor quietly cleaning the air near the visitors chairs, it also acted as a small table to hold our drinks. Sometimes soda, often beer and occasionally scotch sat on the operating air purifier as the net was run. To my knowledge nothing was ever spilled into the unit to challenge the path of those 8000 volts of electrons. The GD-2003 produces no radio noise.