Heathkit of the Month:
by Bob Eckweiler, AF6C

STEREO HI-FI EQUIPMENT
Heathkit SK-107
Stereo Synthesizer.

Introduction:
The SK-107 Stereo Synthesizer (Figure 1) is a small kit that has a monaural input and left and right stereo outputs. It creates pseudo-stereo sound from the monaural input. The gain of the synthesizer is unity, and it plugs between a monaural source, such as an AM tuner, or perhaps one of those 50's RCA changers that play the old 45 records with the big center hole (Figure 2). The synthesizer adds depth and separation to the monaural audio, and actually does enhance the music, though it is in no way true stereo.

In the late eighties Heathkit started selling small "starter kits", many with the their model number starting with the "SK" prefix and numbers starting at 101. By early 1989 Heathkit featured ten such kits in their catalog and another one appeared in the spring of that year (See table I). Heathkit also sold "SK" prefixed kits starting at 200 in their computer lineup (See HOM #52).

The SK-107 is based on the Philips TDA3810 spatial, stereo and pseudo-stereo sound integrated circuit. This chip was introduced in 1985 and, to the best of my knowledge, Heathkit introduced the SK-107 in 1987 or 1988. The earliest catalog I have that shows the low cost SK-107 is the winter 1989 catalog (#215). At that time it sold for $16.95. The price increased to $19.95 in the spring 1989 catalog (#216), and remained there until Heathkit shutdown all their kit activities except for their educational products. The SK-107 came less a cabinet which sold separately. The cabinet, model# SK-99, sold for $6.95. The SK-107 is powered by either an internal 9-volt battery, or their PS-2350 Battery Eliminator ($7.95).

Figure 1: Heathkit SK-107 Stereo Synthesizer, less optional SK-99 cabinet.

Heathkit also sold a "Starter's Kit Manual" for $10 (Part# SK-100) This manual covers starter kits SK-101 through SK 111, each in its own lesson, and teaches the principles behind each kit. It is independent of the regular manual that comes with the kit. I have yet to get my hands on a copy.

Figure 3 shows the SK-107 stereo synthesizer listing from the spring 1989 catalog. Figure 4 show the optional cabinet that is available and fits the SK-107 as well as the SK-104-H 1-watt audio amplifier.

Figure 2: Classic RCA 45 RPM Record Changer

Original Starter Kits - Winter 1989	
SK-	**Starter Kit Description**
101	DC Power Supply (9 or 14 V)
102	Code Practice Oscillator
103	Small Appliance Motor Controller
104-H	1-Watt Audio Amplifier
105-H	Fish Caller
106-H	FM Wireless Microphone
107	Stereo Synthesizer
108	Intercom System
109	Sound Flasher
110	Hands Free Speaker Phone
111	Sound Activated Switch *
*** introduced in Spring 1989**	
Table I: Heath "Starter Kits"	

The SK-107 Stereo Synthesizer:
Heathkit's stereo synthesizer is a small chassis measuring, less its optional cabinet, 2-3/16 H x 3-1/2" W x 3" D, less protrusions. It weights 12 oz. The front of the SK-107 is simple with just two slide switches and an LED indicator. The slide switch on the right, marked **ON OFF** is for power. The left slide switch selects the mode; either **MONO** or **STEREO** may be selected. The **STEREO** LED lights when the function switch is in the STEREO position.

The rear of the SK-107 has four circuit board mounted jacks. From left to right they are an external power jack (1/8" mini-phone jack), right stereo out jack, left stereo out jack and mono input jack (all RCA phono-type).

All the components, except the two slide switches and one resistor, mount on the circuit board. This really simplifies construction. All the "starter kits" are rated at skill level one, meaning they are simple kits, easily assembled in less than eight-hours and prior kit-building experience is not needed.

Figure 5 shows a top view of the stereo synthesizer. Power is provided by a standard 9-volt NEDA 1604 battery that mounts, by metal clip, to the circuit board. The heart of the kit is the 18-pin TDA3810 DIP integrated circuit (left of center) that mounts in a socket. Four of the capacitors are electrolytic capacitors; two perform operations internal to the chip, and the

Figure 3: SK-107 Listing from the Spring 1989 Heathkit Catalog #216

Figure 4: SK-99 Optional Cabinet
Heathkit Catalog #216

other two couple the chip to the stereo output jacks. The remaining nine capacitors are radial lead mylar types. The resistors are all standard 1/4 -watt types except for R5 which is 1%.

Circuit Description (Schematic: Fig. 6) :
With only one active component, the integrated circuit (IC), a circuit description is mostly a description of the chip's operation. A data sheet for the TDA3810 is available on the web at:

http://www.digchip.com/datasheets/parts/datasheet/364/TDA3810.php

This IC performs three modes of operation: spatial, stereo and pseudo-stereo. The spatial mode is not used in the Heathkit SK-107. The stereo and pseudo-stereo modes are used. Pins 11 and 12 on the IC set the chip's mode. If pin 11 is LOW (at or near ground potential), regardless of the state of pin 12, the IC operates in the stereo mode. To operate in the spatial mode both pins 11 and 12 must be HIGH; however pin 12 is connected directly to ground (LOW) preventing this mode. When pin 11 is HIGH and pin 12 is LOW, the IC operates in the pseudo-stereo mode. In this mode, certain frequency ranges are shifted between the left and right channel. Low, high and bandpass filtering is governed by the interconnections and RC networks between the various pins. Figure 6 is a schematic of the Heath SK-107.

The monaural signal from the mono input RCA phono jack is fed to both the left and right channel inputs of the IC (pins 2 and 17 respectively) through a coupling capacitor. If MONO is selected on the front panel, the chip is actually in the stereo mode. But, since the chip's stereo inputs are connected together, the input is routed to both outputs resulting in mono audio at the two output jacks.

However, if STEREO is selected on the front panel then the pseudo-stereo mode of the IC is selected. Here the audio is run through low-pass, bandpass and high-pass filters causing the left and right channels to respond to different frequency ranges of the audio. While in no way true stereo, it gives your ears a false sense of direction and depth to the audio coming from the two channels.

When the IC is operating in the pseudo-stereo mode a current driver outputs 12 ma to pin 8 to light the external STEREO LED on the front panel of the SK-107.

Testing the Stereo Synthesizer:
The SK-107 was recently hooked up to a pair of reasonable quality UMax stereo computer speakers. The input was connected to one channel of cassette tape desk. A couple of old 45 RPM records, that I had recorded on cassette many years ago were played through this system. The cassettes are monaural, both channels being identical. I listened to the 50's oldie music first with the front panel switch in MONO and later in STEREO. In MONO the music sounded like the original recording, including some pops and other record noise. When I switched to STEREO the pops and noises were still there, but sometimes only noticeable in one channel. However the music did seem to come alive more than in the original recording. I need to try and record some of the 45 records with the SK-107 between the record player and the cassette recorder. Or perhaps I can put the record player audio directly into the computer and remove the pops and other old record noises. And then I imagine I might find a program that does pseudo-stereo in that same process. Still, I have to say the SK-107

adds a fair amount of listening enjoyment to those old recordings.

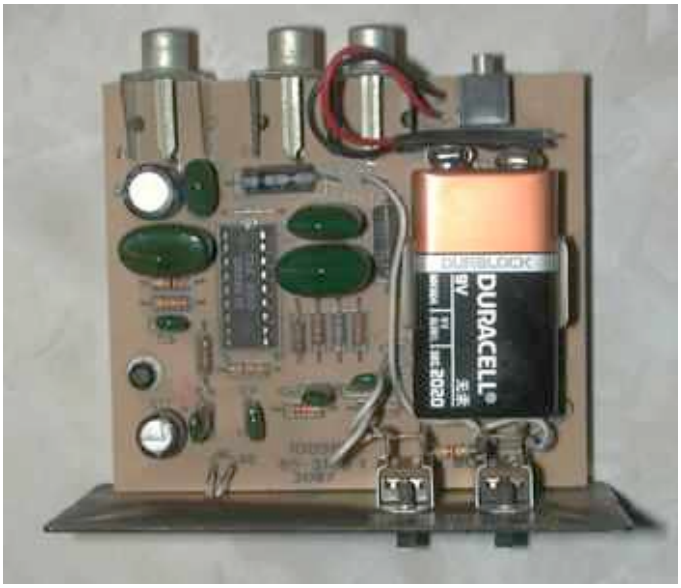

Figure 5: Top View of the Heathkit SK-107

Acknowledgements:
I have to thank Mark Bender - KD6NOT who originally built this kit (impeccable soldering, his trademark), and passed it along when he was cleaning out his ham-shack. I'd also like to thank Dale Jehning who provided me with much needed information, and also to Walter Heilsnis - WB2VSJ who led me to the data sheet for the TDA3810.

73, from AF6C

This article originally appeared in the January 2016 issue of RF, the newsletter of the Orange County Amateur Radio Club - W6ZE.

Remember, if you are getting rid of any old Heathkit Manuals or Catalogs, please pass them along to me for my research.

Thanks - AF6C

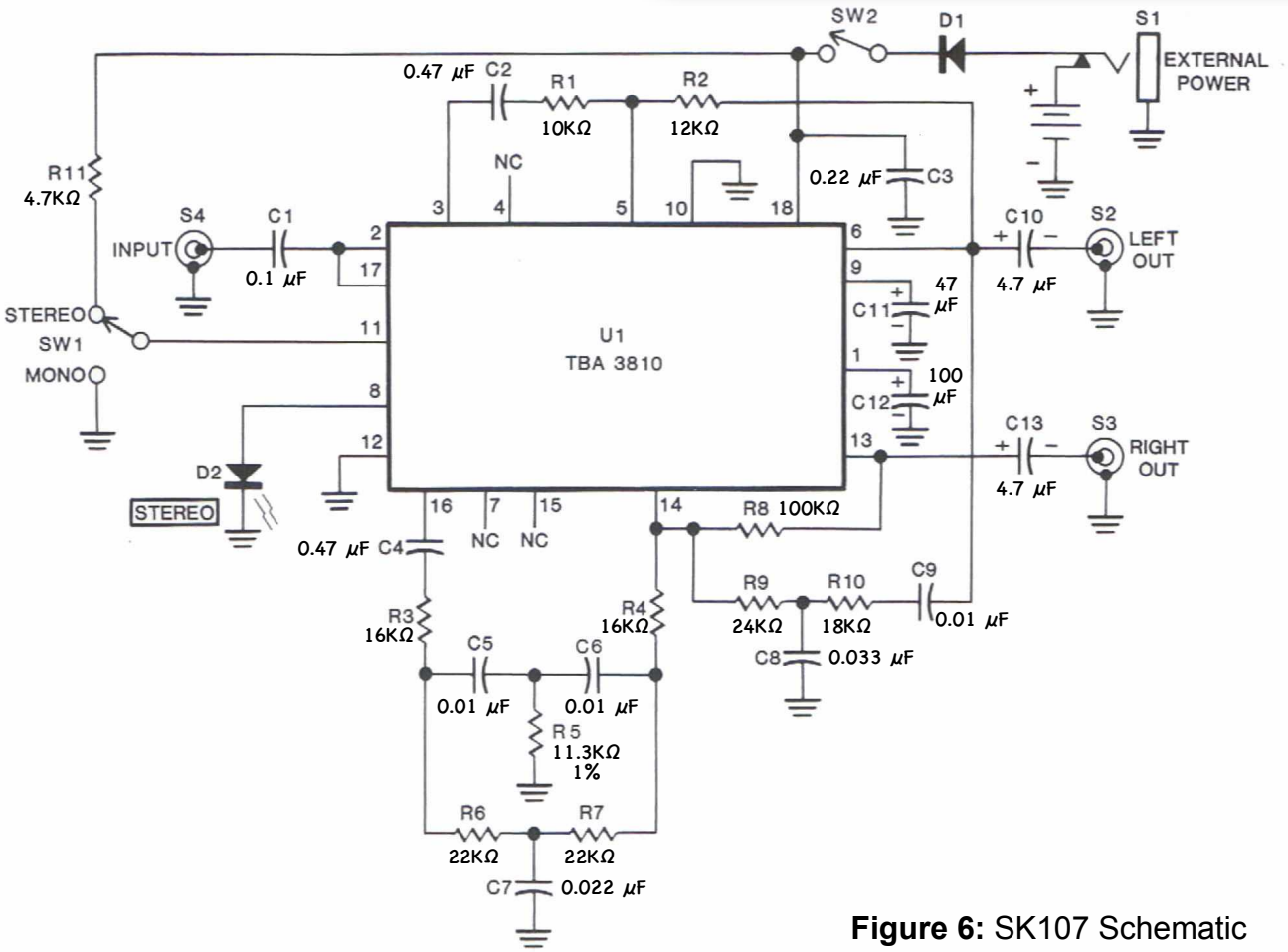

Figure 6: SK107 Schematic with component values.