**Introduction**

The Virtual Sector Generator (VSG) sits between a 5.25" hard-sectored floppy controller and the drives to allow transparent and interchangeable use of soft or hard sectored media. The board is jumper selectable to work with 10 sector or 16 sector controllers. The VSG is powered by a standard 9 volt battery and automatically powers itself on and off with the host computer. A battery lasts a year or more of typical use.

Since 16 sector media – and especially 10 sector media – is getting difficult to find, this is a great way to breathe new life into systems using controllers from North Star, Heathkit, Micropolis, Vector Graphic, and MITS/Altair.

Shown below is a typical configuration with the VSG connected in between the controller (in the computer) and the drives.
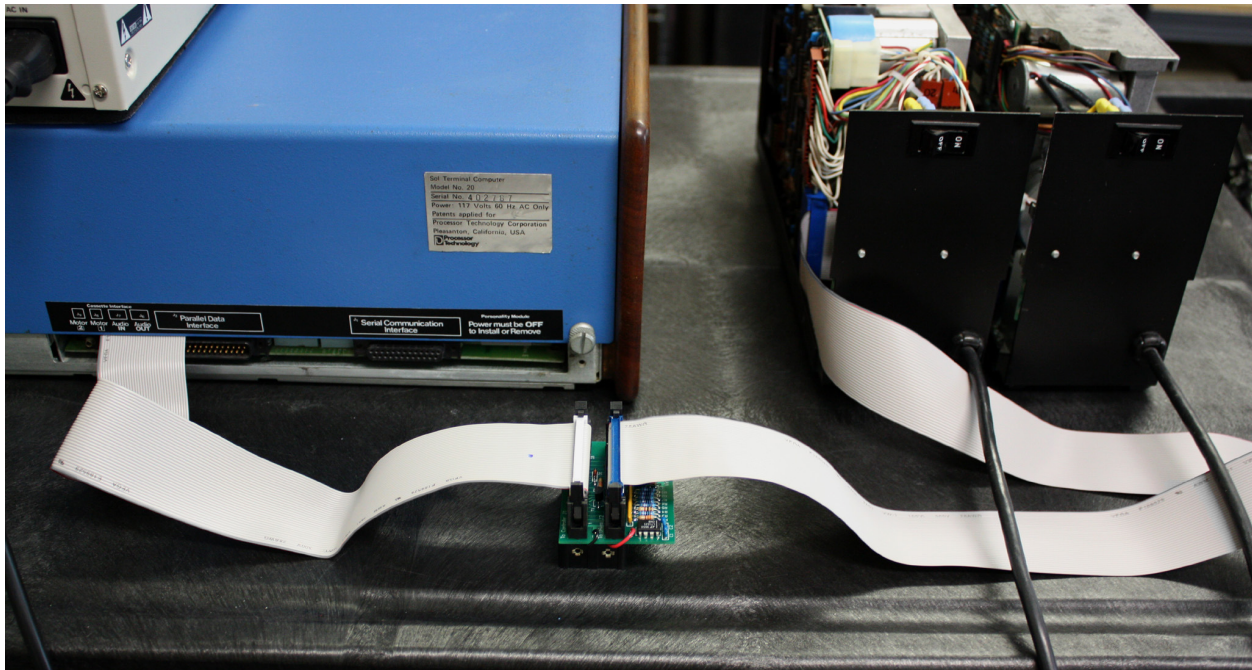
The VSG passes all signals between the controller and the drive except for index/sector pulses. Pulses from the drives are received by the VSG and the VSG generates the index/sector pulses that are seen by the controller. This arrangement is required to handle specific timing requirements expected by the controllers and software during the first revolution after a drive is selected.

For each of the three standard drive selects, the VSG maintains a running average of the last four revolution times so that the timing of virtual sector pulses matches each drive's rotational rate. A fourth drive select is not supported as its pin assignment on the 34 pin cable is not consistent between drive and controller manufacturers.

Limitations

Belt driven drives can have significant variation in rotation time on consecutive revolutions (Instantaneous Speed Variation, ISV). Even though the VSG syncs to the average speed of the drive, a given revolu-

tion will vary from nominal by an amount that cannot be predicted by the VSG. If the ISV exceeds 1ms or so, drive operation will not be reliable with soft sectored media.

Almost all of the belt driven drives I have tested work well with the VSG (several each of Shugart SA-400, SA-460, Tandon TM-100-x, Micropolis 1015-x, Pertec FD-200). Drives that don't work reliably with the VSG cannot be linked to a particular brand or model of drive. Instead, if a given drive has acceptable ISV, it will tend to stay that way and work well with soft sectored media. Similarly, if a given drive has excessive ISV, it will tend to remain problematic with soft sectored media and the VSG.

Direct drive motors, typically found in half-height 5.25" drives, tend to be very stable, and therefore, work very well with the VSG and soft sectored media. Fully compatible 48 tpi 360K drives like the Teac 55BV series are readily available on eBay. Some 96 tpi drives like the Teac 55-GFR can be strapped to work with the older hard sector controllers (e.g., 300 rpm vs 360 rpm, SD/DD versus HD). The media is written at 96 tpi and won't work in a 48 tpi drive, but the media can exchange between 96 tpi drives.

If a belt-driven drive is not reliable with the VSG, a few simple maintenance steps may help:

1) Remove the belt and thoroughly clean the hub pulley and motor pulley surface which contacts the belt. Use alcohol or other solvent as required. The goal is to remove small bumps and irregularities that result in instantaneous speed variations. Use water to ensure no solvent remains on the pulley surfaces that could get on the belt.

2) Use a damp lint-free cloth and clean the belt. After the belt is dry, blow off any towel lint that does remain with compressed air.

3) With the belt removed and nowhere near, carefully inject a bit of WD-40 into the motor shaft and hub shaft area and spin each to try and work some lubrication into the moving surfaces and bearings. Avoid over-spray with a section of paper towel placed on the opposite side of the axle from where you're spraying.

Installation

With power off to the computer and the drives, connect a ribbon cable from the controller (computer) to the "To Controller" connector on the VSG. Connect the ribbon cable from the drives to the "To Drives" connector. Install a 9 volt battery in the VSG and place the VSG, battery side down, on the table. Be sure nothing metal can touch the exposed pins on the bottom side of the board.

For use with 16 sector controllers (e.g., Micropolis, Vector Graphic, Altair), install a jumper across pins 4 and 6 on J3 (pins are marked with "16"). For use with 10 sector controllers (e.g., North Star, Heathkit), no jumper is required. After installation or removal of the jumper, remove and re-install the battery to "reboot" the VSG.

Operation

The VSG powers on whenever the host computer is turned on. The VSG attempts power off after about nine minutes of inactivity. If the computer is off at that point, the VSG powers off. Otherwise, if the computer is still on, the VSG remains on.

At this point, presence of the VSG is transparent to the drives, the controller, software, and the operator. You can interchangeably use hard or soft sectored media at will. Soft sectored DSDD media will work with most any combination of controllers and drives. Do *not* use High-density (HD) media.

Kit Assembly

Kit assembly assumes some level of experience with soldering and part identification. The hi-res pictures on the following page can be magnified as needed on a computer or tablet to see details. Note that the 10K resistors included in the kit are typically a tan body and 5% tolerance as opposed to the blue body 1% resistors shown in the picture.

For easiest assembly, place and solder the parts in the order shown in this table:

Virtual Sector Generator Assembly

Step	Description	Qty	Designator	Comment
1	3.3K	2	R1,R2	Or-Or-Rd
2	10K	6	R3,R5-R9	Br-Bk-Or
3	1K	1	R4	Br-Bk-Rd
4	1N4148	1	D1	
5	14p IC Socket	1	U2	
6	LT1121CN8	1	U1	
7	10K x 8	1	RP1	Note Pin 1
8	1.0uf	2	C1,C2	Blue
9	0.1uf	1	C3	Yellow
10	2N4401	1	T1	
11	2x3 Header	1	J3	
12	PIC16F1824	1	U2	In Socket
13	2x17 Header	2	J1, J2	Note Notch
14	9v Holder	1	+ and -	See Picture

Mount the 9 volt battery holder to the back side of the board covering the 34 pin header pins as shown in the picture. Press down firmly so the pins work their way into the foam tape. Solder the red lead to "+" and the black lead to "-".