GBS-8219 RGB to VGA Converter

by Charles Hett, January 2016

For a long time I have been seeking a suitable scan converter to allow the display of Z-100 RGB video on a more modern VGA capable display. The old CRT RGB digital interface monitors for the Z-100 are becoming unreliable and unavailable. LCD displays are readily available, cheap used, and use less power and have less weight.

A scan converter is needed because the Z-100 horizontal scan rate is about 15.2 kHz where the VGA rate is about 31kHz. Analog and Digital interfaces also come into play. I think I have found a suitable converter at an acceptable (but not exactly cheap) price. It is the GBS-8219 VGA scan converter.

Search

I searched for any DIY articles about building scan converters, but all I found used obsolete parts in their design and would probably be difficult to build and get to work. So I abandoned the idea of building my own.

I found the Ambery 15KHz RGB CGA to VGA RGBHV Converter Scaler, AV-1M, at www.ambery.com for $89.00 (+ $10.50 for cable) (Prices still good as of January 2016). There was no specification for TTL digital input voltages (only 0.7v 75 ohm) so I thought that it might not work with Z100.

I also found a few of the cheap (about $30) adapters that were available on eBay. However, they did not advertise a TTL interface either.

In 2014 I found the GBS-8219 converter. The internet information on this unit said all the right things – separate H/V or composite H/V sync, 15 kHz frequency, digital TTL input, could handle interlace, and could adjust horizontal and vertical height.

It was available on Amazon.com for $225, but several different vendors on eBay had it for much less. So I paid about $150 for one and received it less than two weeks after ordering – shipped from China. The price varied considerably depending on the seller and time.

The package arrived in excellent condition and included:

- The converter
- 1 each 9 pin D male and female connector
- Cable with 9 pin D male connector attached (for connecting the computer to the adapter). You have to add the appropriate sex 9 pin D connector on the other end.
- 12VDC power adapter
- Instruction manual

Installation

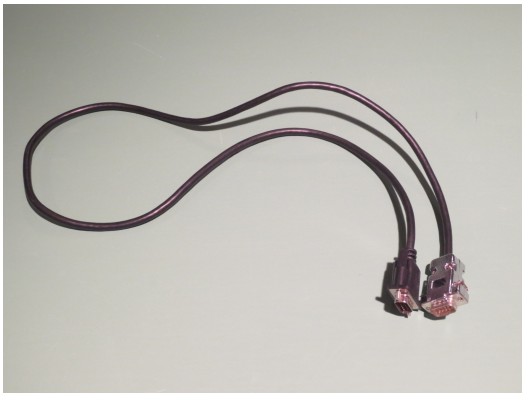
The GBS-2819 has a row of BNC connectors and a RUN light on the right side and female 9-pin and 15-pin connectors, power socket, and three menu buttons on the left side.

Note: BNC connectors are not used with the Z-100.

After checking the Z-100 color monitor jack pin assignments, I determined that a straight through 9-pin D connector cable was required with male pins on both ends. I attempted to install the male connector on the provided 9-pin cable, but this did not go well.

The insulation on the cable wires was very thin and melted easily when soldered. The connector insulation melted at a very low temperature. Also, the shield of the provided cable was aluminum and not solderable.

After a couple of attempts, I was able to complete the cable assembly. I tucked the shield under the backshell strain relief to make that connection.



If you don't have good tools and a steady hand, I recommend that you use a commercially made 9-pin to 15-pin cable. What you would need is a male-to-male cable wired pin-for-pin for this application.

From there it is a simple matter of connecting the 9-pin cable from the Z-100 video connector to the adapter.

I tried the 9-pin cable that I had been using with my CRT color monitor. But, I had to use a gender changer adapter to end up with a cable that had male connectors on both ends. The cable is wired pin-for-pin and end-to-end, so this arrangement worked fine also.

Choice of VGA monitor

My first system turn on was with a 17” Dell E171FPb LCD SVGA monitor with 4:3 aspect ratio and a resolution of 1280 x 1024.

I also tried a 15.1" Zenith L15V26C LCD 4:3 aspect ratio television that had a PC input. The resolution was stated as 1024 x 768. It worked with the converter, but not quite as well as the Dell monitor, possibly because of the lower resolution.

I also tried it on my Toshiba 32" 16:9 high defination television, but could not find a suitable combination of settings that gave a totally acceptable picture. The converter horizontal and vertical menu settings were not adequate to do the job. It did “work”, however, with this big display and was quite impressive in some respects. Maybe with more time, I could have found a good setting.

Go with what you have or can get cheaply, but I don’t recommend going larger than 17”. While a high definition monitor or TV with a VGA interface would work, it isn’t necessary and probably won’t visibly improve things.

Because of the relatively low resolution of the Z-100 video system, I think this is a case of smaller is better for the monitor.

I also recommend trying to locate an LCD monitor. In addition to the smaller space used, using an LCD monitor with the converter, you don’t see the raster lines between rows of pixels in graphics mode like you do on a CRT. It is just a solid field of color. Very cool.

To connect the VGA monitor just plug it in to the 15-pin output connector on the adapter. No VGA cable is provided with the adapter.

Power

The product comes with a wall wart style power supply rated at 12vdc, 1a. I believe it is a switching type. It connects to the adapter with a standard connector.

I suggest plugging the Z-100, the monitor and the adapter into a power strip and simultaneously powering all three devices simultaneously. I found that extraneous pixels would be displayed beyond the desired display area if the computer were turned on first before the converter and there was no way to clear them short of re-powering the adapter. Even that did not always work.

While turning on the converter first is OK, because the converter does not have its own power switch, it is easier to use the power strip to turn on everything. Also, while some say that power strip on/off switches aren’t meant to be switched with a load applied, power strips are easier to replace than on/off switches in the Z-100s and monitors.

Setup and menu

Configuring the Z-100 Video Logic Board Jumpers

First, I suggest trying the setup without changing any jumpers. It turns out that the jumper settings I ended up with was the default shown in Pictorial 4-1 in the Video Logic Board section of the Z-100 Technical Manual. The jumpers of concern are:

J301	Sets '-' polarity of vertical sync (The converter works either way)
J302	**H** polarity of horizontal sync for external RGB (converter works either way)
J303	**V** (The converter requires this)
J304	**VC** polarity of sync selected by J303 (converter works either way)

Adapter setup

Menu operation

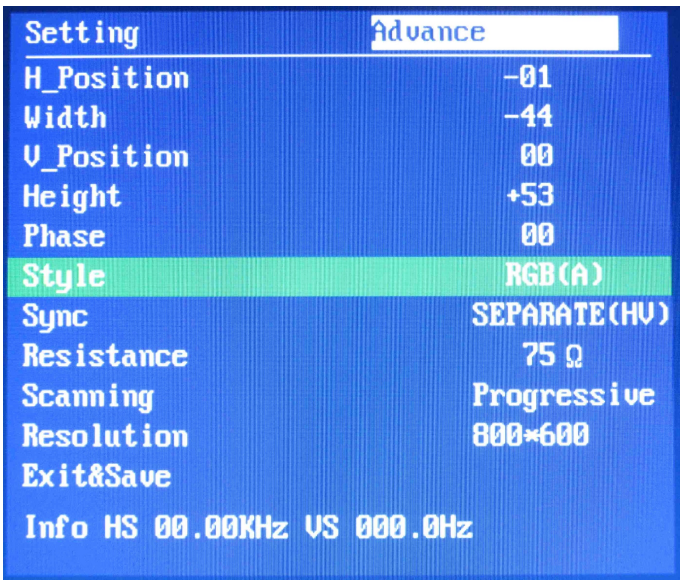
To access the menu, press the Menu button. The menu will be displayed with the H_Position line selected and the value displayed in white. To access a different line, press the Up or Down buttons to advance to the desired line.

To change the selected value, press the Menu button while on that line and the selected value will be displayed in red. Then press the Up or Down buttons to select the desired value. When the value has been selected, press the Menu button again. The selected value will now be displayed in white and you can go to the next value for selection.

When all values are selected, you can go down to the Exit&Save line and press the Menu button to exit and save the selections. If no buttons are pressed for about 15 seconds, the selections will be saved automatically and the menu will be exited and extinguished.

Menu settings

The values I have chosen are displayed in the table on the next page. These settings yield a horizontal width of about 10.5" and a vertical height of about 8.0" on my Dell monitor which is pretty close to an aspect ratio of 4:3. The top margin is about 0.8" and the display is approximately centered horizontally with left and right margins of about 1.4".



I tried interlaced operation, setting the Z100 and the converter for interlaced mode but the results were not satisfactory – too much flicker and poor looking characters.

How I Chose the Values

To start with, just boot the Z100 and use the basic boot screen to get things working. You can also use the Color Bar entry to test that the colors are wired correctly.

Now you can begin the serious adjustment of the display.

It turns out that, due to aliasing effects, selections are fairly critical and some iteration may be needed to get the best looking characters. Some trade-off may also be needed between an exact aspect ratio for properly displayed graphics objects such as circles and crisp characters.

I chose to optimize for good looking characters. If proper aspect graphics is important, you could temporarily re-adjust vertical and/or horizontal height to get what you want at the expense of slightly poorer characters.

I found that I obtained the best displayed characters if I selected values somewhat less than the maximum available on the display.

Menu Line	My selections	Range
H_Position	-01	-99 +99
Width	-44	-99 +99
V_Position	0	0 +99
Height	+53	0 +99
Phase	00	-16 +15
Style	RGB(A)	RGB(A), RGB(D), YUV It seems odd that RGB(D) doesn't work*
Sync	Separate(HV)	Separate, Composite, SOG (Sync on Green)
Resistance	75ohm	750 ohm
Scanning	Progressive	Progressive or Interlaced
Resolution	800*600	640*480 or 800*600
ExitSave exits the menu		Note that the menu also displays the horizontal and vertical scan input frequencies.

*Selecting RGB(A) forces resistance to 75 ohm. Can be overridden.
Selecting RGB(D) forces resistance to 750 ohm. Can be overridden.

To aid in making the selections, you can use a program such as the crosshatch BASIC program described in Z100 Lifeline #42. I added four lines to draw a CIRCLE the height of, and centered on, the crosshatch.

```
10 'crosshatch
20 CLS
25 X=315
26 Y=112
27 Z=225
28 CIRCLE (X,Y),Z
30 FOR I=0 TO 640 STEP 30
40 LINE (I,0)-(I,240),7
50 NEXT I
60 FOR I=0 TO 250 STEP 15
70 LINE (0,I)-(630,I),7
80 NEXT I
90 GOTO 90
100 END
```

When run, you should get a circle display. Then adjust the display height and width to get a perfectly round circle.

After making that adjustment, exit BASIC and simply type a string of upper case 'M's and lower case 'm's that span the entire display and repeat over several lines, filling a large portion of the display with characters.

Using the converter menu again, adjust the display settings for optimum character appearance keeping in mind that you will be affecting the graphic geometry if you change the height or width. A difference of one number on horizontal or vertical size or position can make a difference in the quality of the characters but it can also goof up the graphics geometry. Play with it until you are satisfied that you have obtained the best overall performance.

I close with a photo of the Jayhawk from my school to show you how he looks on an LCD screen. Good luck!