

## Graphics Card I/O Ports and Interfaces

Graphics cards today are responsible for much more than simple text output to monitor. Their duties now include heavy-duty 2D and 3D rendering as well as video processing. The output devices they support include not only CRT monitors, but TVs, video recorders, LCDs and HDTV sets as well. To do this, graphics cards are often equipped with a combination of I/O ports/interfaces.

### D-Sub output port



This 15-pin D-Sub output port is a very common sight. It is responsible for connection to CRT monitors and LCD monitors that support analog input. Digital signals must go through RAMDAC conversion before being sent through the D-Sub port as it is capable of only analog input.

### S-Video output port



Current graphics processors are equipped with integrated video encoders to provide them with direct video output capabilities. If you didn't already know, in the past users were required to purchase add-on video encoders in order to realize video output.

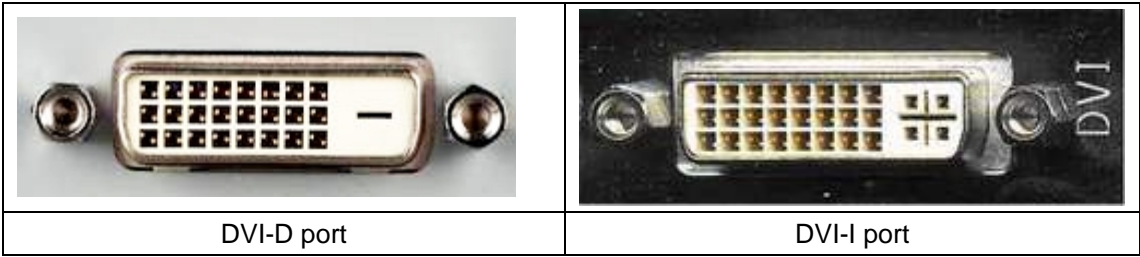
On the video output front, nothing is more common than the 5-pin S-Video (Separate video) port. During output, it separates the luminance (Y) and color (C) signals in order to avoid possible interference between the two to enhance signal quality.

### DVI output port

The once unownable LCD has finally entered the home of the everyday man. While LCDs operate on digital signals, some older graphics cards output only analog signals through the analog D-Sub port, causing compatibility problems to arise. To sidestep this problem, many LCDs are equipped with integrated ADC (Analog to Digital Converter).

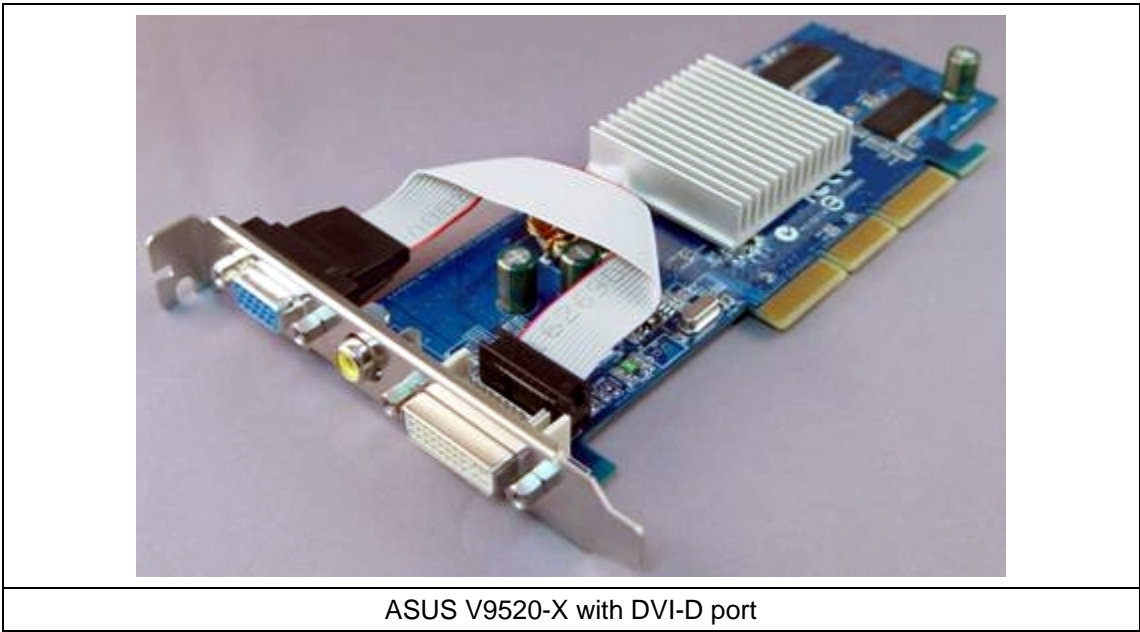
This means, according to what has been said in the D-Sub section, that a digital signal is converted to analog and then reconverted from analog to digital again. It is a taxing process that does not produce the best end results.

To set things straight, many graphics processors feature integrated TMDS (Transition Minimized Differential Signaling) transmitter for direct digital output to LCD monitor through the DVI port. This way a pure, unadulterated digital signal is ensured all the way from the graphics card to the LCD screen.



DVI ports that comply with the DVI1.0 standard include the DVI-I, DVI-D and DVI-A types. Among them, the DVI-I port is capable of supporting both digital and analog output. The DVI-D, on the other hand supports pure digital output, while the DVI-A port supports pure analog output.

The DVI port most often seen on graphics cards is the DVI-I port, which, direct connection to LCD DVI port aside, will also support a DVI to D-Sub converter in order to support analog output. The DVI-D port is rather rare, but can be found on the ASUS V9520-X and V9400-X (both X series cards).



**RCA output port**



Also known as the AV or composite video connector, the RCA port is seen on home electronic devices including television sets and video cassette recorders. AV output is separated into one video and two audio signals (left and right channel). The yellow connector is often responsible for the video signal.

For connection to AV devices, older graphics cards often featured the RCA port. As the graphics card is responsible for only video, there was only ever the yellow RCA port to be found.

Nowadays, the RCA port has been replaced by the S-Video port. With the help of an adapter, an S-Video port can also be converted to RCA (video) output.

### D Connector



The rise in HDTV popularity has meant a growing number of HDTV ready sets appearing in our homes. This D here obviously stands for Digital. The D-shaped connector hails from Japan and is used for direct transfer of digital video signals.

There are currently an entire series of D connectors in use, as can be seen below:

	Part number	Resolution	Horizontal frequency	Vertical frequency	Scanning method
D1	SDTV480I	720x480	15.75KHz	30Hz	Interlaced
D2	SDTV480P	720x480	31.5KHz	60Hz	Progressive
D3	HDTV1080I	1920x1080	33.75KHz	30Hz	Interlaced
D4	HDTV720P	1280x720	45KHz	60Hz	Progressive
D5	HDTV1080P	1920x1080	67.5KHz	60Hz	Progressive

A very limited number of graphics cards feature D connectors - one of them is this ASUS EAX600XT/HTVD card.

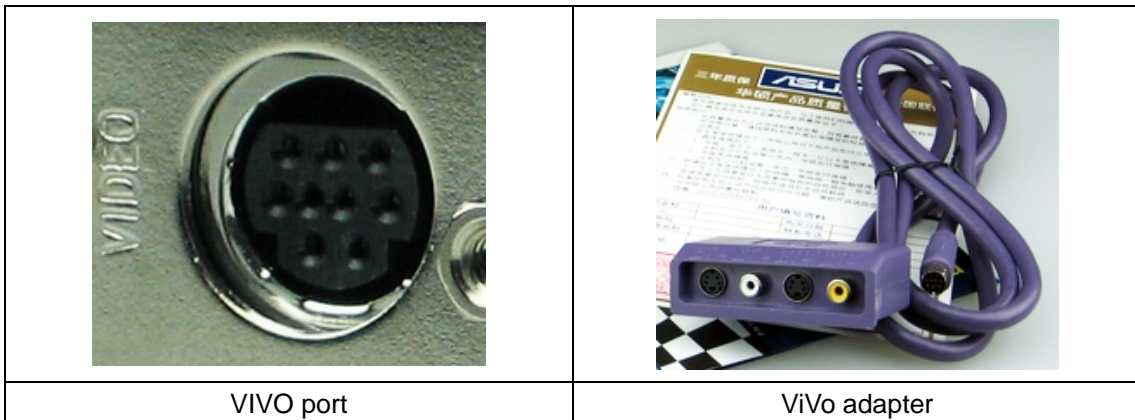


### Video Input/VIVO port

In the past, certain high-end graphics card products provided video input ports such as

S-Video and RCA to cater to users with video input requirements. Contemporary graphics cards, however, already have a video output port (S-Video or RCA) on the bracket. To avoid congestion, common mainstream practice is to integrate video input and output capabilities in a single port.

The ViVo port, as it is known, is generally found on high-end products and takes on the form of a 9-pin S-Video port (left), which can be also used in conjunction with a ViVo adapter to offer a complete set of video and out ports (right).

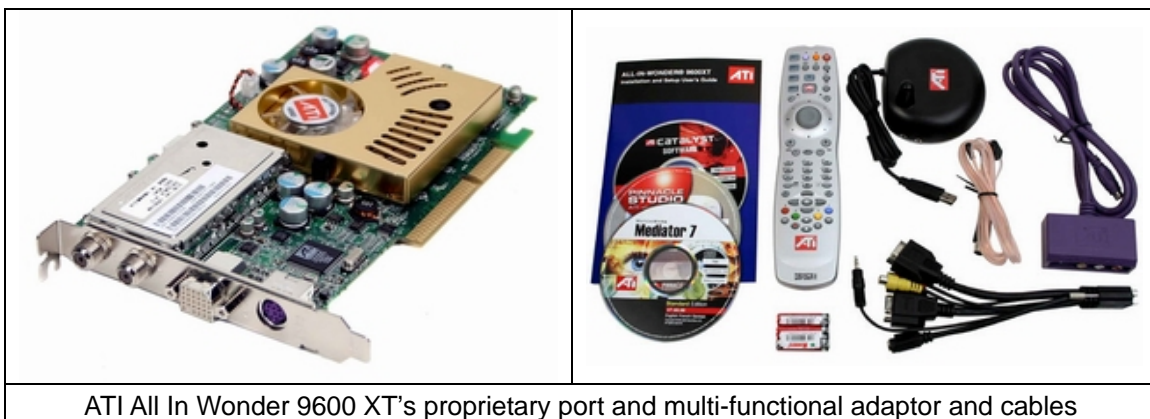


### Modular Input and Output Block Connectors



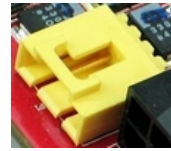
The appearance of graphics processors capable of optimized decoding of HDTV format media has allowed HDTV output to become standard feature. Generally speaking, this takes the form of a 9-pin S-Video port aided by an adapter with component output to support various HDTV media including 720p, 720i, and 1080i and so on. This type of adapter will also provide RCA and S-Video output expansion.

Certain all-in-one cards adopt own to meet some special video input/output requirements, as witnessed in the ATI All In Wonder card below. It too, makes use of a modular input and output block connector solution to provide all functional ports, however. In addition, the card is built with a TV tuner, so it rightly features a set of RF connectors as well.



### **Extra Information**

Some interfaces are not found on the graphics card bracket, but on the PCB next to the card's power connector instead (right). This makes it convenient in cases where the user wishes to have the video input/output ports located at the a PC's front interface panel. Such cards include the RADEON X800 XT PE and RADEON X850 XT PE.



### **Closing**

The graphics card interface has developed from the first simplistic VGA port to the varied multi-function ports of today owing to the increasing number of integrated functions constantly being added to graphics card products. Therefore, we can expect to see an even greater variety of graphics card I/O ports, and therefore a greater number of supported output devices in the future.

The standard complement of ports to be expected from contemporary graphics cards are a D-Sub VGA port, a DVI-I port, plus a single S-Video output port.