The SCART Connector (Syndicat des Constructeurs d'Appareils Radiorécepteurs et Téléviseurs connector).

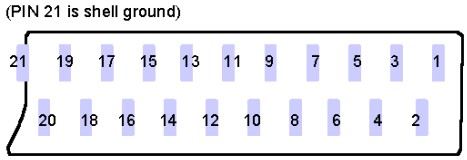
This was always intended just to interconnect a home television system much in the same way that HiFi systems were interconnected. Nowadays, that still enables us to use a TV as a high quality RGB monitor, independent of the television system used.

Today the SCART connector is also known as Pertitel connector or Euroconnector, and if you are really keen, a formal description can be found in the CENELEC EN 50 049-1:1989 standard or in the IEC 60933-1 standard.

Different pin-configurations exist, and which configuration or configurations are appropriate for you depends on the video device used. Sometimes you can choose between configurations1[1] by changing a software setting or a switch.

Two status signals on pins 8 and 16 can be used to electrically define which video signals are active, and a video device can use these status signals to automatically switch between internal or external audio/video signals. The actual voltage levels on these pins have been enhanced over the years for extra functions such as for carrying low-level data, and the tables below hopefully represent the latest versions.

Viewing the Pins:-



RGB Connection:-

Output connector		Input connector	
1	Audio right out	2	Audio right in
3	Audio left (or mono) out	6	Audio left (or mono) in
4	Audio return	4	Audio return
7	Blue out	7	Blue in
5	Blue return	5	Blue return
11	Green out	11	Green in
9	Green return	9	Green return
15	Red out	15	Red in
13	Red return	13	Red return
16	RGB status out	16	RGB status in
14	RGB status return	14	RGB status return
19	Sync (composite video) out	20	Sync (composite video) in
17	Sync return	18	Sync return

21	Shield	21	Shield

- Pins 10 (V sync) and 12 (H sync) are sometimes used in addition for SVGA applications, and adding the sync onto the Green channel (RGsB) is also not unknown.

- Y, Pr, Pb connections are sometimes used as an alternative to the RGB connections with Green =Y, Red =Pr, Blue =Pb. (The terms YUV or YCrCb are sometimes interchanged with YPrPb, but really YUV should only apply to composite encoding, whilst YCrCb is only in digital form).

- Component video was adopted late for the US market as the US never adopted SCART connectors. They often use Phono plugs carrying YPrPb,

- Note that the RGB and YPrPb connections on a SCART are not directional, so that these leads can be used for input or output purposes provided that no audio or sync etc are involved.

S-Video Connection

Output connector		Input connector	
1	Audio right out	2	Audio right in
3	Audio left (or mono) out	6	Audio left (or mono) in
4	Audio return	4	Audio return
15	Chrominance out	15	Chrominance in
13	Chrominance return	13	Chrominance return
8	Video status out	8	Video status in
19	Luminance out	20	Luminance in
17	Luminance return	18	Luminance return
21	Shield	21	Shield

Composite Video Connection

Output connector		Input connector	
1	Audio right out	2	Audio right in
3	Audio left (or mono) out	6	Audio left (or mono) in
4	Audio return	4	Audio return
8	Video status out	8	Video status in
19	Composite video out	20	Composite video in
17	Composite video return	18	Composite video return
21	Shield	21	Shield

(Composite) Decoder Connection

Receiver connector		Decoder connector	
1	Audio right out	2	Audio right in
2	Audio right in	1	Audio right out
3	Audio left out	6	Audio left in
6	Audio left in	3	Audio left out
4	Audio return	4	Audio return
8	Video status in	8	Video status out
19	Baseband out (scrambled)	20	Baseband in
17	Baseband out return	18	Baseband in return
20	Composite video in (unscrambled)	19	Composite video out
18	Composite video in return	17	Composite video out return
21	Shield	21	Shield

EasyLink Connection (additional)

Television connector		Video recorder connector	
10	I/O Control Bus	10	I/O Control Bus

(EasyLink is a data system that enables bi-directional communication between a television set and a video recorder. This way a video recorder can, for example, copy the channel settings of the television set).

Signal Levels (from analogue tuners a range of -3dB to +10dB should be allowed)

Signal	AC level	DC level	Impedance
Red, green, blue	Peak to blanking: 0...0.7 V	0...2 V	75 Ohm
Sync	Peak to peak: 0...0.3 V	0...2 V	75 Ohm
Composite video	White to sync: 0...1.0 V	0...2 V	75 Ohm
Chrominance (C)	0...0.3 V	0...2 V	75 Ohm
Chrominance (CrCb)	+ or- 0.35V	0...2 V	75 Ohm
Luminance (Y)	0...1.0 V including sync	0...2 V	75 Ohm

MAC	Black to white: 0...1.0 V	0...2 V	75 Ohm
Audio in	0.2...2.0 V (nominal: 0.5 V)		>=10 kOhm
Audio out	Nominal: 0.5 V (maximum: 2.0 V)		<=1 kOhm
Video status	Low data rate communication: 0.0...2.0 V (e.g. remote control; Easylink)	Internal: 0.0...2.0 V External (16:9): 4.5...7.0 V External (4:3): 9.5...12.0 V	In: Z_R>=10 kOhm Out: Z_R<=1kOhm
RGB status		Internal: 0.0...0.4 V External: 1.0...3.0 V	75 Ohm

- Note that RGB status uses a 75 ohm load, whereas Video status is essentially high impedance. This is because RGB status was originally used for cutting RGB text into analogue pictures, and so fast switch times were needed.

Yes, but what use is a SCART plug within professional Video and TV systems?

A professional Serial Digital Interface (SDI) Monitor costs upwards of £1000. It consists of a high quality CRT and driver circuit, along with a digital decoder that provides Red, Green and Blue signals from the digital video input. The SDI signal in turn arrives on an ordinary looking piece of video coax cable, terminated in an ordinary looking BNC connector. Indeed it is just this ordinariness that makes the Serial Digital Interface so useful, as you can use old analogue cables, and changing cables in studio centres often costs more than changing the technical equipment.

Now the modern telly is a remarkably good device, slight chromaticity (colour rendering) errors being the only obvious outward differences to those professional monitors. So why not use the SCART connection to turn it into a high quality RGB monitor? All you need is a digital SCART adapter, such as the BPR JEM. Once you have one of those, (and the reverse one to turn your DVD, Video etc into a SDI digital video source), you have the core of an affordable professional TV Studio.

OK, so what is this SDI?

To see where the SDI came from, we need to look back to the 1980's when all those different TV systems were starting to prove a headache to the professional programme makers and the (newly international) professional equipment manufacturers as well. The US television system had a line scan frequency which had been altered to be a sub multiple of 4.5 MHz, (or 2.25 MHz) whilst the 625 line system already had a line frequency related to 2.25 MHz. Digital sampling of the high-resolution luminance part of either signal at 13.5MHz could then give an excellent luminance resolution for *both systems*, and the two derived colour parts of the picture could be sampled separately at a lesser rate, as the colour part is not perceived as sharply as the luminance . The result was independent of colour system, as it used the fundamental colour components1[2], and it became known internationally as "CCIR 601"1[3] standard, although only the sampling and filtering was really covered in this Standard. The sample rates given, were quite near to four times the NTSC subcarrier sample rate which had previously been used for composite signal encoding. As a result this sampling structure (13.5, 6.75, 6.75) became known as "4.2.2" sampling.

As first proposed, the digital component standard used a parallel nine twisted pair cable and connector system. Eight signal bits and a clock line were used, and when 10 bit video coding was proposed, it was time to look at a serial connection format.

The serial format became the ITU-R 656 Standard, and it had the great advantage in that it could use the existing 75-ohm video coax cable and BNC connectors.

What else can I do with SDI?

Because the 601/656 SDI system maintain the timings of the analogue system, the time gaps between lines and fields that had been allowed for "flyback" time in the 1930's, were still in place. That time amounts to around 25% of the entire data rate, so would it surprise you to learn that in this "spare" space you can carry 16 tracks of embedded audio? What is more, the audio can be in 24 bit 48k sampled form along with lots of data. That makes quite a handsome 16 track distribution system using simple video coax, doesn't it? Forget the pictures.

Anyone interested in the audio use of the SDI stream, may like to look at some of Broadcast Project Research's Multichannel Audio products on http://www.bpr.org.uk/

1[1] Such as choosing composite or S-video outputs on a DVD.

1[2] And is therefore called a component television system, rather than a combined (composite) system such as NTSC, PAL, or SECAM.

1[3] Now known as ITU-R BT601 standard