Support Group Application Note
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Acorn

Connection of Monitors to Acorn Computers

This Application Note describes how various monitors may be connected to the Acorn family of machines, and how RISC OS machines may be suitably configured to use them. Information concerning MonitorTypes 4 and 5 (VGA and SVGA) are applicable to RISC OS 3.1 only.

Applicable Hardware :

- BBC Model B
- BBC Master Series
- Archimedes 300, 400, 540
- A3000
- R140, R200 series
- A3010
- A3020
- A4000
- A5000

Related Application Notes:

- 226 VIDC Screen Mode Parameters
- 247 Sharing Multiscan Monitors and TV Displays on a Single RISC OS Computer

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Video signals and Standards

Acorn RISC OS 3 systems are capable of connecting to displays conformant with several industry-standard video specifications; each of these distinguished by the value of the MonitorType variable held in battery-backed memory. The value assigned to this variable may be examined from the command line using **`*STATUS`**, and changed using **`*CONFIGURE MONITORTYPE`** <*number*>.

MonitorType 0: Televisions and TV Scan-Rate Monitors

Many TVs are now equipped with Peritel (SCART) input sockets. This type of socket was also fitted to the early Acorn AKF11 and AKF12 monitors, which are based on the Philips 8833 Mk II chassis. Before attempting to connect an Acorn computer to such an input, it is wise to check in the display's documentation whether the SCART input is compliant with the SENELEC standard; if the documentation is not specific, contact the manufacturer of the display. As a rule-of-thumb guide, the R, G and B signals should *not* be driven negative.

For machines other than the A3000, a standard passive SCART lead may be used; however, as the A3000 PSU is unable to provide the +12V required to switch during blanking (line flyback) under the SENELEC signal standard, an "active" cable (Acorn Product Code AKA77) is available via Acorn dealers. This cable contains a circuit module which ramps the +5V signal to the required +12V level.

In order to produce the composite sync required by the TV, the computer must be configured using

`*CONFIGURE SYNC 1`

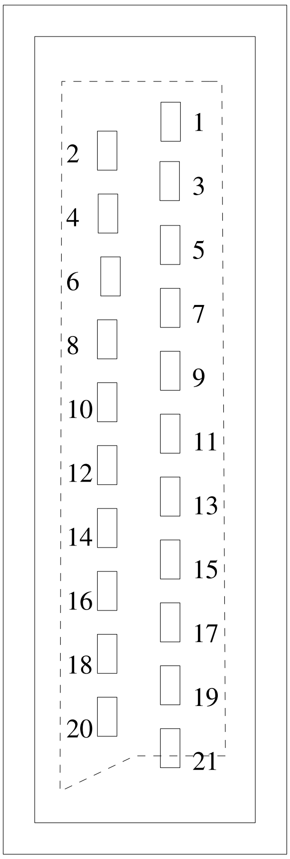
at the command line (press *F12* from the Desktop) followed by a *Ctrl-Break* to put the change into effect.

When connecting monitors which require composite sync, note that the machines in the Acorn range which are equipped with a 15 way D connector for video output supply the CSync signal on pin 14, not pin 13.
If the computer is equipped with both a D type "video out" connector and a UHF modulator, picture quality will generally be better when the "video out" is connected to the Peritel connector on the TV. The computer's video signal will appear in the TV frequency range designated "Channel 36" in the TV standards.

It is known that a small number of models of Teletext-equipped TV produce an indistinct picture when used with an A3010 via the UHF modulator; this problem may usually be resolved by switching the TV into Teletext mode, in order to force the TV to accept the alternative input.

In addition, it may be necessary, when using a TV with multiple input connectors, to make adjustments to the controls of the TV so that the input being used by the computer has first priority; consult your TV documentation if this is an issue.

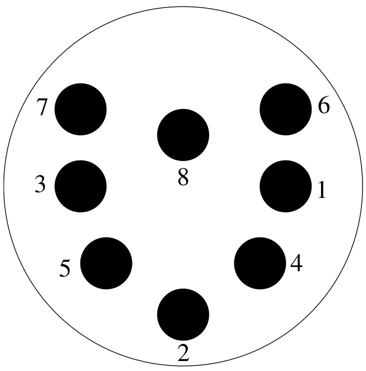
A list of Acorn TV scan-rate monitors (MonitorType 0) is given below, along with their pinouts:



Pin	Designation	Voltages and Impedances
1		
2	Audio input	0.5Vrms/> 10 k Ohm
3		
4	Earth conn. for audio	
5	Earth conn. B input	
6	Audio input	0.5V rms/> 10 k Ohm
7	B input	0.7V pp/ 75 Ohm
8		
9	Earth conn. G input	
10		
11	G input	0.7V pp/ 75 Ohm
12		
13	Earth conn. R input	
14		
15	R input	0.7V pp/75 Ohm
16		
17		
18		
19		
20	Composite sync input	0.2 - 1 V pp/ 75 Ohm
21	Screening plug	

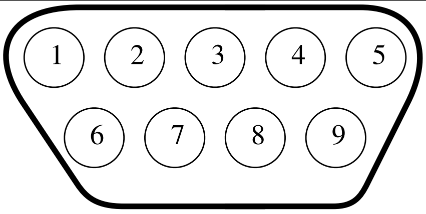
Figure 1: Acorn AKF11 / AKF12 Pinout (standard SCART Peritel)

The AKF11 and AKF12 also have digital (RGB TTL) signal inputs, so a BBC Master or Model B may be connected:



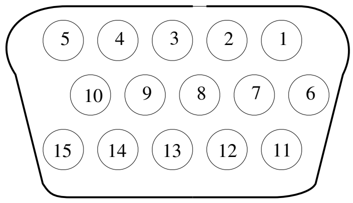
Pin
1 Status Computer
2 Red
3 Green
4 Blue
5 Intensity
6 Earth
7 Composite Sync
8 Open

Figure 2: AKF11 / AKF12 RGB TTL pinout



Pin	Signal
1	0V
2	Not connected
3	Red
4	Green
5	Blue
6	Not connected
7	Composite sync
8	Not connected
9	Not connected

Figure 3: AKF17 pinout

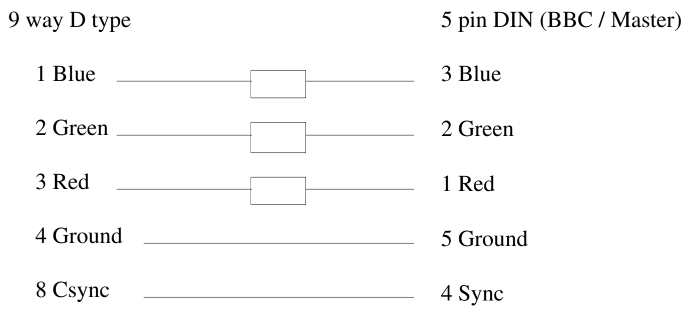


Pin	Signal
1	Red
2	Green
3	Blue
4	ID (Bit 2); Not connected
5	Test (0V)
6	R return (0V)
7	G return (0V)
8	B return (0V)
9	+5V
10	0V
11	ID (Bit 0); Not connected
12	ID (Bit 1); Not connected
13	Hsync
14	Composite sync
15	ID (Bit 3); Not connected

Figure 4: AKF30 / AKF40 pinout

NB. The AKF17 pinout above is the pinout of the connector actually on the rear of the monitor, and NOT of the end of the patch lead which connects it to the computer.

It is also possible to connect a Model B or Master to an AKF17 / 30 / 40; however, some series resistors need to be fitted to bring the line level down fom 1.66V to the 1.4V acceptable by the monitor. 120 Ohm, 0.25W, 5% tolerance resistors in each of the R, G and B lines should reduce the level to about 1.0V.
This lead can be ordered from an Acorn dealer as product code ANG17.



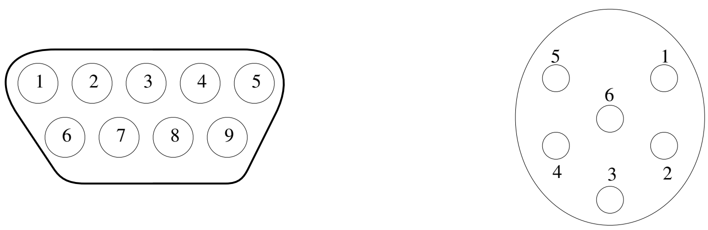


Figure 5: Wiring Diagram to connect Model B / Master to AKF17

MonitorType 1: Multiscan

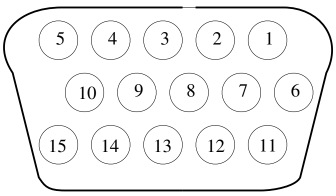
Multiscan monitors such as the AKF50 and AKF52 are capable of displaying screen modes with a range of horizontal and vertical scan frequencies; the Acorn range of machines comprising the Archimedes 540, R200 Series, A5000, A4000, A3020 and A3010 are capable of producing output with horizontal scan frequency between 15kHz and 61kHz (see Application Note 226). Generally, multiscan monitors require the horizontal and vertical sync signals to be supplied by the computer separately, which may be achieved using

```
*CONFIGURE SYNC 0
```

followed by a *Ctrl-Break.*

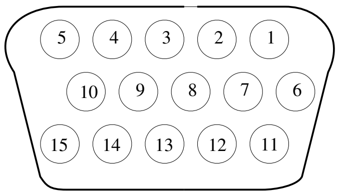
In the case of monitors which require a cable terminating in separate R, G, B, Horizontal and Vertical Syncs, these may be obtained from Videk.

Most multiscan monitors will not be able to display the full range of screen modes; however, Acorn's AKF50 and AKF52 can, with the exception of Mode 23. Acorn's newest Multiscan monitor, the AKF85, as supplied optionally with the Risc PC, can support all the same modes as the AKF50 and AKF52, in addition to all the extended definitions provided by the Risc PC. These high-specification monitors may display some of the lower-resolution screen modes in a "letterbox" format; however, they can be adjusted (or in the case of the AKF85, programmed) to alter the aspect ratio of the displayed screen so that the effect is minimised.



Pin	Signal
1	Red
2	Green
3	Blue
4	0V to Pin 10
5	0V
6	R return (0V)
7	G return (0V)
8	B return (0V)
9	Not connected
10	Digital ground
11	ID (Bit 0); 0V from Pin 10
12	ID (Bit 1); Not connected
13	Hsync
14	Vsync
15	ID (Bit 3); Not connected

Figure 6: AKF18 / AKF50 / AKF52 / AKF60 pinout



Pin	Signal
1	Red
2	Green (switchably to sync on Green)
3	Blue
4	Connected to Pin 10
5	Self Test (Not connected)
6	R return (0V)
7	G return (0V)
8	B return (0V)
9	No pin fitted
10	Logic ground
11	Connected to Pin 10
12	ID (Bit 1); Not connected
13	Hsync / Csync
14	Vsync
15	No pin fitted

Figure 7: AKF85 pinout

The AKF60 and AKF85 are compliant with the DPMS (Display Power Management System) VESA / EC standard, and may be switched into a low power consumption state by shutting off one of the sync signals. The facility to control DPMS is only available on the Acorn Risc PC range; please consult the manual supplied with your monitor for further details on the DPMS modes available.

MonitorType 2: High Resolution Mono

These monitors are designed for specialised use with CAD, DTP or UNIX applications, and are usually very large; they are only capable of being run in screen mode 23. Generally, they also require separate syncs.

MonitorType 3: VGA

VGA was developed as a display standard by IBM in 1986, and has a horizontal scan rate of roughly 31.5 kHz, with separate syncs. VGA monitors are capable of displaying a large subset of Acorn screen modes; see Application Note 226 for further details.

MonitorType 4: SVGA

SVGA and the related XGA are the current display standards for many IBM compatible desktop computers and compatibles. They also scan horizontally at 36 kHz, but have a larger number of pixels per scanned line than VGA. Again, SVGA monitors can display a large subset of Acorn screen modes, and Application Note 226 supplies the relevant list.

Monitor standards currently not supported without external hardware adaptors are the class of monitors which require their Sync signal to be mixed into part of the extreme frequency spectrum of the Green signal.

For further information on connector pinouts and cable wiring diagrams required to connect third party monitors to Acorn computers, refer to the relevant Appendix in the Welcome Guide supplied with the computer.

Monitor Connection Adaptors

Prior to the A5000, RISC OS machines were equipped with primarily a 9 pin D type video connector, although the Archimedes 400 series also had a pair of BNC connectors to supply high-resolution mono monitors. In the case of Acorn multiscan monitors such as the AKF50 and AKF52, the monitors are equipped with 15 pin D connectors. Adaptors to enable these monitors to be connected to earlier Archimedes, and for earlier monitors to be connected to current machines, may be obtained from Interconnections or Videk.

Interconnections Part number 12.01.15.MB.510M will enable a computer equipped with a 15 pin video output to be connected to a monitor with a 9 pin input.
Interconnections Part number 12.01.15.MB.510F will enable a computer equipped with a 9 pin video output to be connected to a monitor with a 15 pin input.

Should you require them, signal allocations for the computer video outputs are detailed in the Welcome Guide / Installation Manual accompanying the computer.

VIDC Enhancers

These devices are for use in earlier Archimedes machines, such as 300 and 400 series, the A3000 and the R140. In these machines, the video controller was clocked at 24MHz, and hence was only able to provide a sufficiently fast data stream to update a medium-resolution display. The Enhancers generally comprise a 36MHz crystal and a switching system to enable the VIDC to be driven at 36MHz and thus be able to handle high-resolution displays. From the Archimedes 540 onwards, this system was built in as a standard feature.

VIDC Enhancers are not supplied or recommended by Acorn, and their fitting involves soldering.

For those who decide to go ahead and fit an Enhancer, lack of software switching in the enhancer may cause the computer to power up in a mode which provides other than 24MHz to VIDC; this will result in the Power-on Self Test in RISC OS 3.1 reporting video errors. The VIDC test, along with the long RAM test which is carried out, may be disabled by setting bit 7 of byte &BC in battery-backed memory; the following BASIC program allows this to be done:

```
REM Set state of VIDCTest bit in CMOS

 SYS 6,161,188 TO ,,A%:       REM read the value
 SYS 6,162,188,(A% OR 1<<7):  REM write it back with bit 7 set
 END
```

In addition, this program may prove useful to users of VGA and SVGA monitors, which can be unsynchronised for several seconds when the machine is reset.

Useful Contacts

Interconnections Ltd
32 Guildford Road
Bisley
Woking
Surrey GU24 9AD

Tel: 0483 797418

Videk
Unit 10
Bowman Trading Estate
Westmorland Road
London NW9 9RW

Tel: 081 204 6690