Video fader for home movie buffs

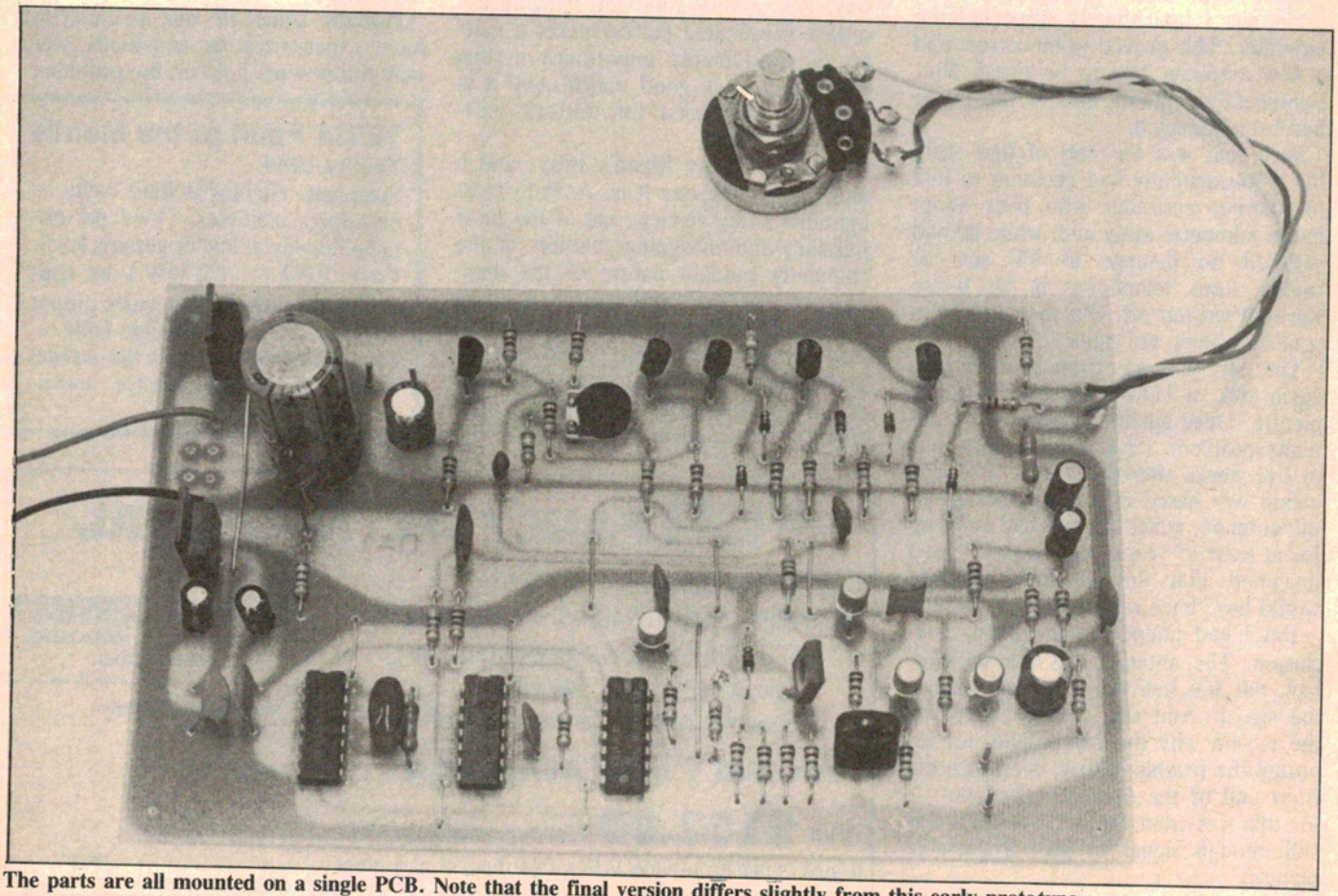
Add a touch of professionalism to your video movies with this simple Video Fader circuit. It enables you to fade a scene to black (and back again) without loss of picture lock (sync) or colour.

by COLIN DAWSON

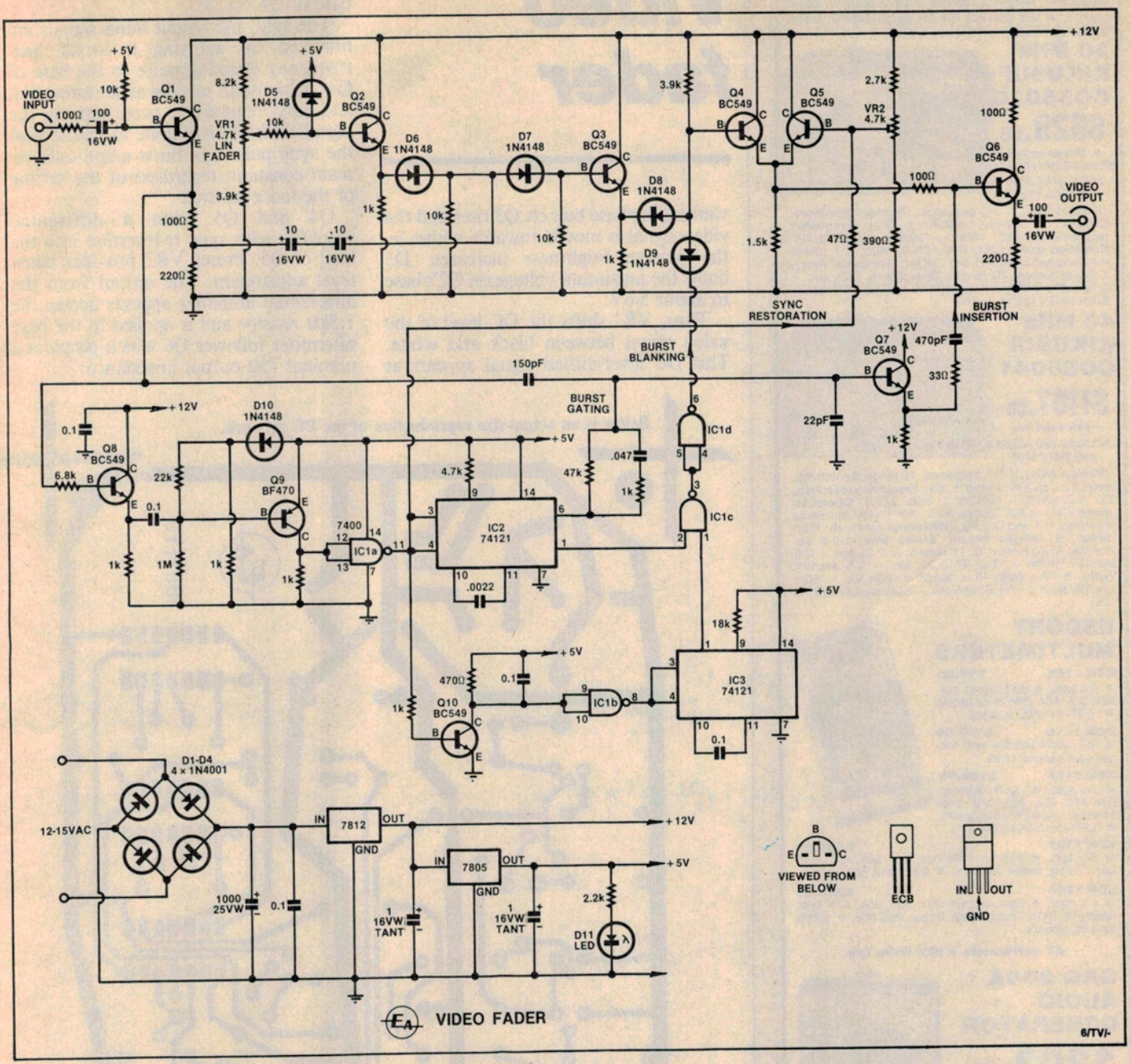
There's no doubt that home movies have been revolutionised by the advent of portable video equipment. Even the size disadvantage of electronic video gear is steadily disappearing — the new 8mm video camera from Sony, for example, is not much larger than a typical Super 8 camera.

Electronic video, of course, has the tremendous advantage of instant replay. Additionally, once you get the video home, it's quite a simple matter to duplicate and edit the recorded material.

Unfortunately, the range of effects available for electronic home movies is rather limited unless you have the budget of a television network. That's where this project comes in. It can be built for around $20 and will allow you to fade smoothly from one scene to



The parts are all mounted on a single PCB. Note that the final version differs slightly from this early prototype.



The input video signal is processed by an attenuator, a sync separator and a colour burst blanking/insertion circuit.

another, as well as simulating night time scenes.

Simply reducing the amplitude of the whole video signal would produce fading, but loss of sync would also occur long before the picture had faded to black. A video fader circuit must therefore maintain the sync pulse at full amplitude while attenuating the video information. It is also preferable that the circuit maintain the colour burst signal to prevent loss of colour at low levels.

The circuit presented here first appeared in the May 1985 issue of *Television* (UK). It preserves both the sync pulse and colour burst signals at full amplitude. Only the brightness information is affected by the attenuator.

Circuit description

Not surprisingly, the circuit has three main sections with the input video signal processed by an attenuator, a sync separator and a colour burst separator. Prior to the output, the sync pulse and colour burst signals are re-inserted into the "faded" video signal.

The input video signal is fed to emitter follower Q1 which acts as a buffer with a nominal input impedance of 75Ω. The signal appearing at Q1's emitter is split into two paths. The full amplitude signal is fed to the sync separator circuit (Q9) via buffer stage Q8, while a reduced amplitude version is fed via two 10μF capacitors and D7 to the base of Q3.

VR1, in conjunction with Q2, D6 and D7, sets the DC bias on emitter follower Q3. When VR1 is at the bottom end of its travel, Q3 is off and the video signal is effectively pulled to black. As VR1 is ad-

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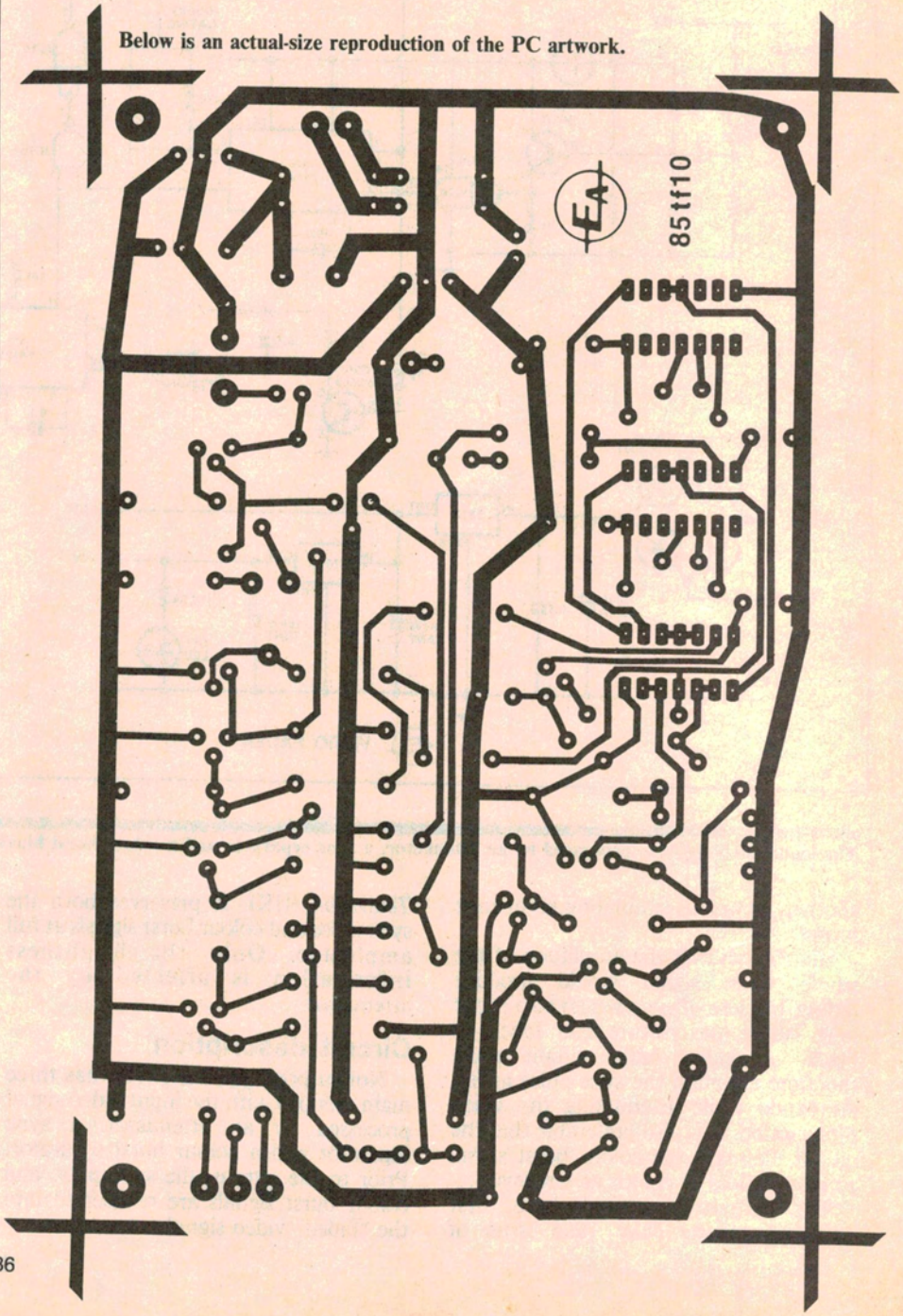
vanced, the base bias on Q3 rises and the video signal is moved towards white; ie, the picture brightness increases. D5 limits the maximum voltage on Q2's base to about 5.6V.

Thus, VR1 shifts the DC level of the video signal between black and white. This DC level-shifted signal appears at the emitter of Q3 and is applied to the base of Q4 via D8.

The sync and colour burst signals are removed by applying a broad line-frequency blanking pulse to the base of Q4. As we shall see, the sync restoration and burst re-insertion occur later in the signal chain. This is done to ensure that the sync pulse and burst amplitudes remain constant, regardless of the setting of the fader control.

Q4 and Q5 form a differential amplifier with sync re-insertion into the base of Q5. Preset VR2 provides black level adjustment. The output from the differential amplifier appears across the 1.5kΩ resistor and is applied to the base of emitter follower Q6 which provides a nominal 75Ω output impedance.

Below is an actual-size reproduction of the PC artwork.



The colour burst signal is simply re-inserted into the base of Q6.

So much for the video signal path. Let's now take a look at the sync separator and burst blanking circuitry.

The video signal appearing at the emitter of Q1 is buffered by Q8 which, in turn, drives sync separator stage Q9. The output of Q9 consists of a train of positive-going line and field sync pulses and these are inverted by NAND gate IC1a and applied to the base of Q5 via a 47Ω resistor.

IC1a also drives monostable multivibrator IC2 and transistor Q10. IC2 operates on the leading edge of the sync pulses and provides the burst blanking signal via IC1c and IC1d. It also provides a burst gating signal to Q7 via the shaping network on its pin 6 output.

This means that Q7 passes the colour burst signal present at the emitter of Q1 to the base of Q6 when it is gated on (ie, at the end of each line sync pulse).

Monostable IC3 produces the field blanking pulses. Compared to IC2, this monostable has a relatively long time-constant and is triggered by field sync pulses derived from integrator Q10 and inverter IC1b. IC1c NANDs the outputs of IC2 and IC3, with IC1d providing inversion for correct logic sense.

Thus, when either or both the pin 1 outputs of IC2 and IC3 are low, pin 6 of IC1d is also low and the base of Q4 is pulled low via D9 to blank the signal.

Power for the circuit is derived from a 12-15V AC plugpack transformer which feeds a bridge rectifier. This drives two 3-terminal regulators to give regulated +12V and +5V supply rails. LED D11 provides power on/off indication.

Construction

The parts are all accommodated on a single PCB measuring 161 × 112mm and coded 85tf10. Note that the board shown in the photograph is a prototype — the power supply section is slightly different in the final version.

No special procedure need be followed when assembling the board although it is a good idea to install the wire links and resistors first. This done, the capacitors and semiconductors can be installed. Note carefully the orientation of all polarised components (diodes, transistors, ICs, regulators and electrolytic capacitors).

Provided they are mounted close to the board, the input and output RCA sockets can be connected using short pieces of tinned copper wire. Note, however, that shielded cable should be used if the sockets are mounted away from the PC board.

Although we have not mounted the video fader in a project box, this would be the recommended procedure. Several of the popular project boxes would be suitable.

To test the circuit, set the fader control fully anti-clockwise (normal) and connect the video output of a VCR or camera to the fader input. The fader output can be connected to the video input of an editing VCR or to the video input of a TV receiver.

Assuming that the TV receiver is displaying an image, try adjusting the fader control. A substantial change in brightness should result, but don't worry if the circuit won't initially fade to black. The black level may need adjusting and trimpot VR2 is used for this purpose.

PARTS LIST

1 PCB, code 85tf10, 161 x 112mm
2 RCA sockets
1 project box to suit

Semiconductors

9 BC549 NPN transistors
1 BF470 PNP transistor
6 1N4148 diodes
4 1N4001 diodes
1 red LED
1 7400 TTL quad NAND gate
2 74121 TTL monostables
1 7812 12V regulator
1 7805 5V regulator

Capacitors

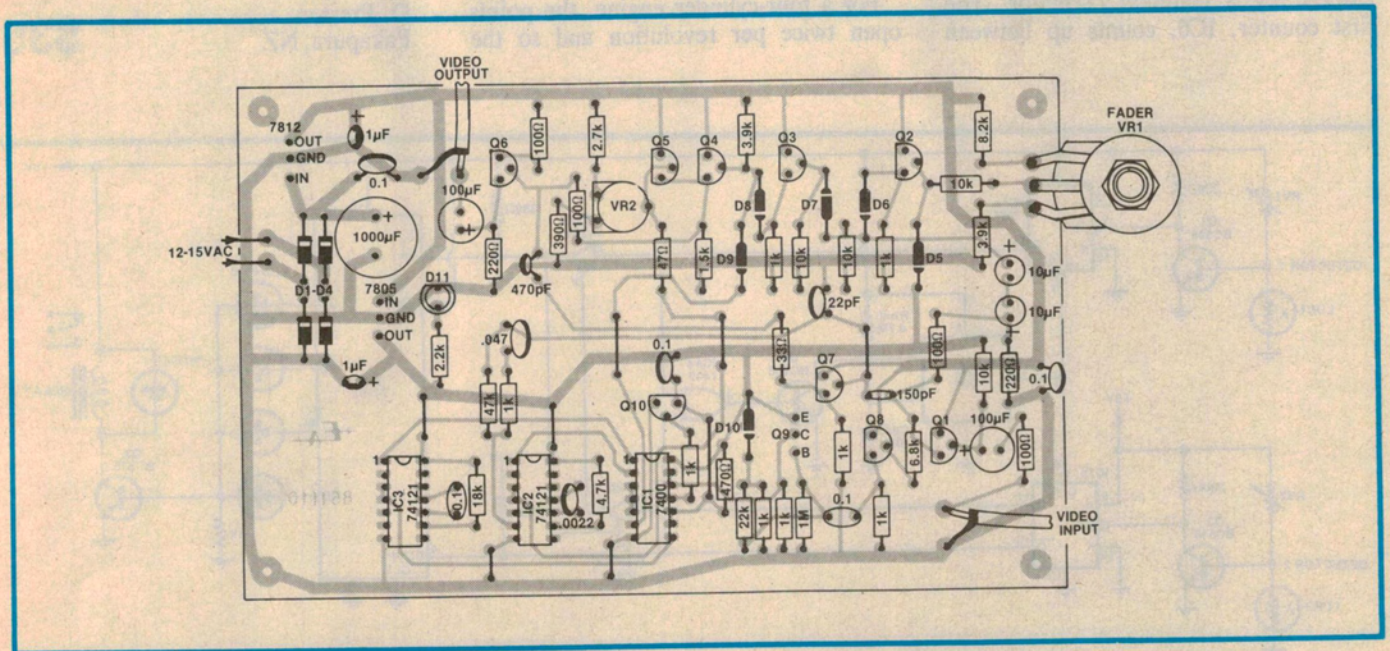
1 1000μF 25VW PC electrolytic
2 100μF 16VW PC electrolytics
2 10μF 16VW PC electrolytics
2 1μF 16VW tantalum
5 0.1μF ceramic
1 .047μF ceramic
1 .0022μF ceramic
1 470pF ceramic
1 150pF ceramic
1 22pF ceramic

Resistors (¼W, 5%)

1 x 1MΩ, 1 x 47kΩ, 1 x 22kΩ, 1 x 18kΩ, 4 x 10kΩ, 1 x 8.2kΩ, 1 x 6.8kΩ, 1 x 4.7kΩ, 2 x 3.9kΩ, 1 x 2.7kΩ, 1 x 2.2kΩ, 1 x 1.5kΩ, 8 x 1kΩ, 1 x 470Ω, 1 x 390Ω, 2 x 220Ω, 4 x 100Ω, 1 x 47Ω, 1 x 33Ω, 1 x 4.7kΩ, linear potentiometer, 1 x 4.7kΩ, horizontal trimpot (10mm)

Miscellaneous

Plugpack transformer (12-15V AC), shielded cable, hook-up wire, machine screws and nuts, etc.



This diagram shows the PC board as viewed from the component side. Take care when installing polarised components.