# Composite-VGA encoder/decoder eases display upgrade

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An older computer system fed RGB video and composite-synchronization signals through four 75Ω coaxial cables to an RGB color monitor 150 feet away. To upgrade it, the replacement VGA video cards could directly drive the 75Ω loads that the VGA monitors' internal terminations presented.

However, the VGA standard uses separate horizontal and vertical positive-going synchronization signals. Adding an extra coaxial cable to the original cables to carry the separate synchronization signals presented a difficult and expensive proposition. An obvious solution would be to combine the separate synchronization signals into a composite format.
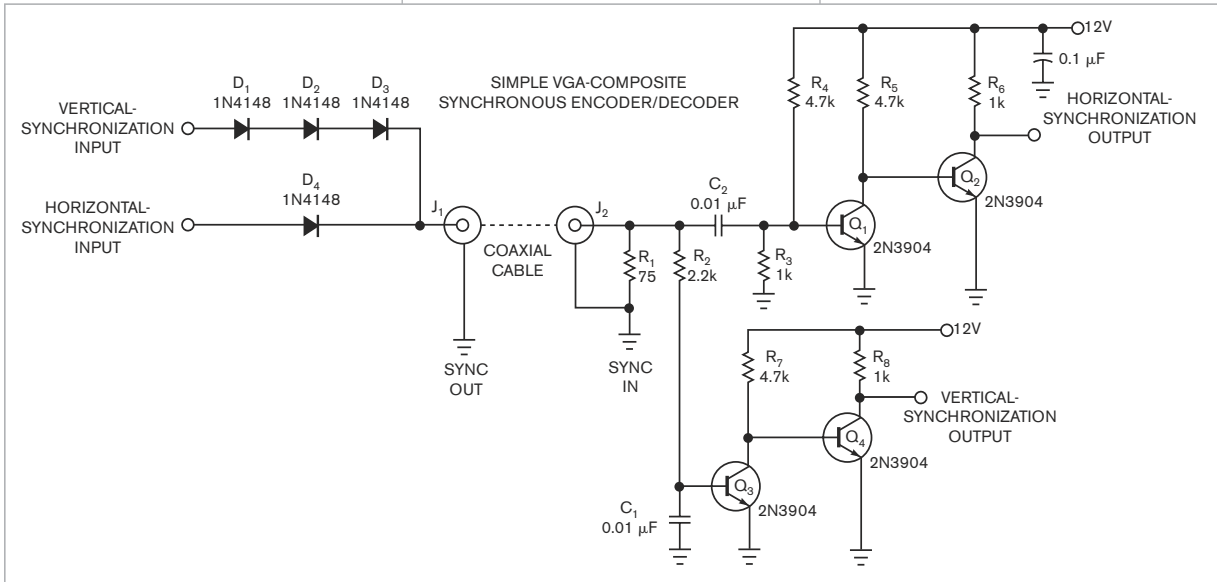


Figure 1 The synchronization-pulse combiner and recovery circuits comprise readily available and inexpensive components.

The combiner circuit in **Figure 1** offers simplicity, low cost, and rapid assembly from readily available spare parts.

In operation, two 1N4148 diodes, $D_1$ and $D_2$, attenuate the VGA signal's 5V logic-level vertical-synchronization pulses by 1.4V, and diodes $D_3$ and $D_4$ form a diode-logical-OR gate to combine the vertical- and horizontal-synchronization pulses. The resultant output signal comprises an approximately 4.3V horizontal-synchronization signal superimposed on a 2.9V vertical-synchronization signal.

At the receiving end, a capacitively coupled highpass filter extracts the horizontal-synchronization signal, and a simple RC (resistor-capacitor) lowpass circuit removes horizontal-synchronization pulses from the directly coupled vertical-synchronization signal. Transistors $Q_1$ and $Q_2$ amplify the recovered horizontal-synchronization pulses, and transistors $Q_3$ and $Q_4$ amplify the vertical-synchronization pulses. The circuit's resulting outputs consist of clean synchronization pulses that closely approximate those of the original and provide extremely stable synchronization pulses for a VGA monitor operating at 640×480-pixel resolution (**Figure 2**).**EDN**



Figure 2 Applying the diode-gated composite-synchronization waveform to a 75Ω load results in clean synchronization pulses.