Make Your Own Shutter Tester

Use your personal computer and this simple circuit to test your shutter

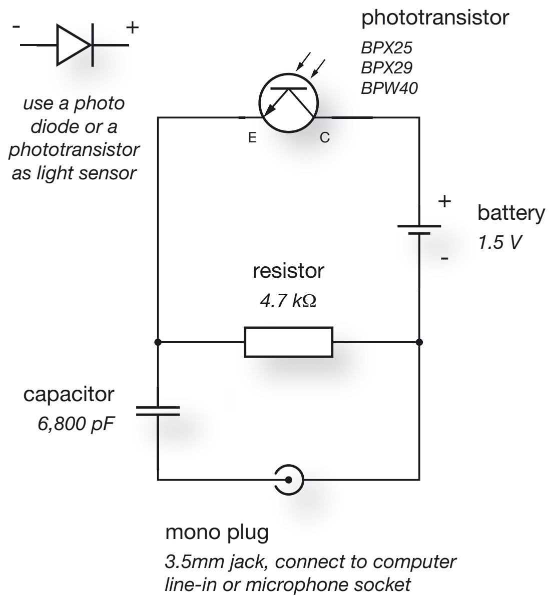


fig.1 The circuit for the self-made shutter tester contains only simple electronic components. Either a photo diode or a phototransistor can be used as a light sensor. A capacitor is included to protect highly sensitive microphone input circuitry. If the shutter tester is used with a less sensitive line-in socket, the capacitor may be bypassed to give a stronger signal.

At the time of this writing, we cannot find an affordable shutter-speed tester available on the market. After investigating a number of alternatives, however, we can report on an elegant and simple solution to make your own.

Before diving in, it is worth noting that this method relies upon the shutter working regardless whether the camera body is open or closed. Obviously, this excludes all digital cameras and some modern film cameras, which restrict shutter operation while the film back is open or removed. All other roll-film cameras and large-format lenses can have their shutters measured with this useful self-made device.

The concept is deceptively simple. A light-detecting sensor is placed behind the camera body or lens, facing a light source placed in front of it. A convenient source of light is a battery-powered torch or an ordinary desk lamp. The circuit in fig.1 produces a small voltage pulse when the light, falling on the sensor, changes abruptly. This voltage pulse is recorded through the microphone or line-in socket of a personal computer with the aid of an audio-capture program. The program must be able to record a high-frequency signal and display the 'audio' waveform on a timeline. Most PC sound cards are supplied with such software, and an internet search finds several freeware or shareware audio-capture programs.

Light Sensor

The circuit in fig.1 relies on a reverse biased photo diode or transistor as a light sensor, which change their resistance corresponding to a change in incident light. Compared to traditional light-dependent resistors, photo diodes and transistors react virtually instantaneously. The voltage at the junction of the sensor and resistor changes with light level, and the change is transmitted via the capacitor to the microphone input. The capacitor blocks any DC voltages and lets just the transients pass. A positive pulse occurs when the light level increases and a negative pulse when the light is reduced. The component values are not overly critical and are easily obtained from a hobby electronics store. To make the assembly more robust, it is mounted in a small plastic box, preferably black, with the sensor mounted behind a small hole (fig.2).

Setup

Conducting the test with a camera body, the self-made shutter tester is carefully positioned, facing the film rails but without touching the delicate shutter blades.

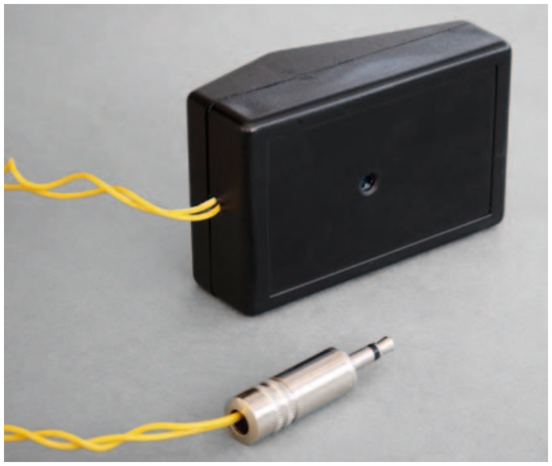


fig.2 The self-made shutter tester is connected to the microphone or line-in socket of a personal computer.

A few rubber bands or some tape will safely hold the tester in place. Depending on whether one is checking a leaf or a focal-plane shutter, the lens is attached, and set to a working aperture, or removed from the camera body altogether. The light source is placed in front of the camera, facing lens or lens opening (fig.3). The camera or lens shutter is wound, and the 3.5mm jack of the shutter tester is connected to the microphone or line-in socket of the computer.

Run the capture software and start a new 'recording'. Immediately press the shutter and stop the recording after the shutter closes. Several seconds of recording will have occurred, so you must use the editing tools in the software to find and extract the two pulses. Now, expand the timeline to see them clearly and use the selection cursors to measure the time between the pulses, halfway up the positive pulse and halfway down the negative pulse, as shown in fig.4.

A little experimentation may follow where it could be necessary to alter the 'microphone' gain or the light intensity to get the signal within the range of the audio hardware. If there is no signal, it may be that the photo diode or transistor is connected the wrong way around. Note that the line-in socket of a sound card is less sensitive than the microphone socket, and therefore, it may require a stronger illumination of the light sensor. To protect your computer hardware, always start with a low setting and slowly increase illumination, as required, to get a stronger signal.

For the example shown in fig.4, the freeware audio-capture program 'Audacity' was used on an Apple Macintosh. The screen shots show the different waveforms recorded by a microphone and a line-in socket for a 1/500-second shutter setting. In this test, the audio sample frequency was 44.1 kHz, and 78 samples were captured between the leading edge of the two pulses. This equates to an effective shutter speed of 78/44,100 or 1/565 second, which causes a slight underexposure but is still a good result for a mechanical shutter.

Make a separate recording for each shutter setting, calculate all effective shutter speeds and record them in a list. Optionally, also calculate the shutter-speed deviations and chart the resulting f/stop errors for the entire range (fig.5). As underexposure is more harmful to negative film than overexposure, slow shutters are better than fast shutters. This explains why the recommended acceptance criteria are more stringent towards fast shutter speeds. For all calculations, remember that the shutter speed markings on a camera or lens are rounded approximations. The true sequence is 1, 1/2, 1/4, 1/8, 1/16, 1/32, 1/64, 1/128, 1/256, 1/512 and 1/1024 of a second.

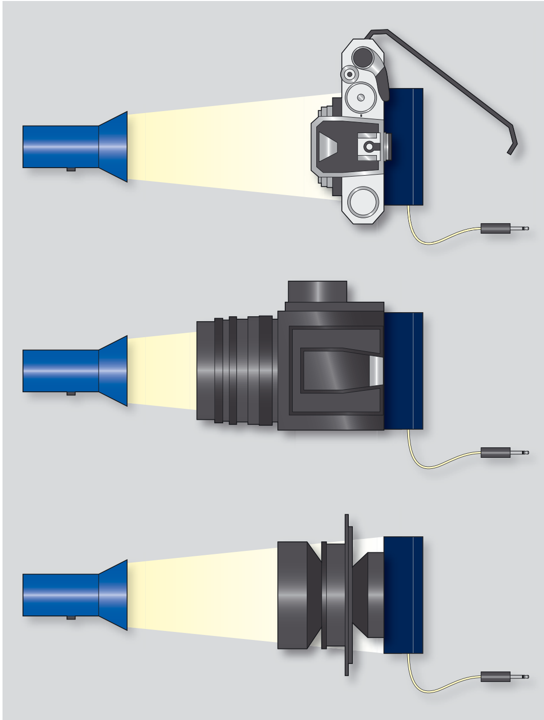


fig.3 Depending on the type of shutter to be tested, the shutter tester is positioned behind camera or lens, and a light source is placed in front of the camera.

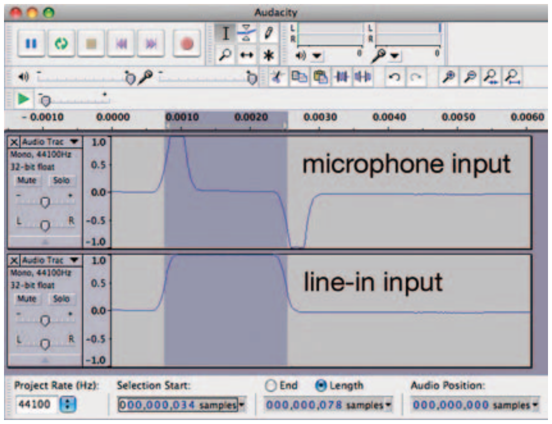
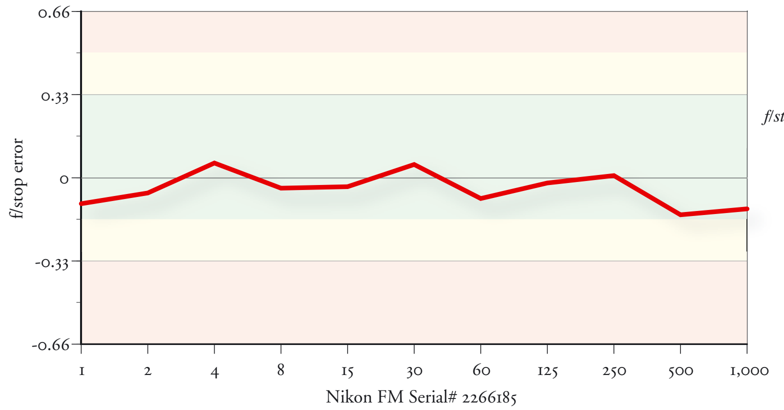


fig.4 Audio-capture software is used to measure the number of samples between two light pulses, which, in turn, equates to the effective shutter speed.



$$f/stop\ error = \frac{\log\left(\frac{actual\ time}{target\ time}\right)}{\log(2)}$$

fig.5 Shutter-speed deviations can be charted as f/stop errors. As underexposure (fast shutter) is more harmful to negative film than overexposure (slow shutter), the acceptance criteria are more stringent towards fast shutter speeds.