

# A New Way to Synchronize Video Cameras

Switching between non-synchronized CCTV cameras usually causes the picture to "roll" for several frames. This wipes out the very frames that are to be recorded. Many cameras are now equipped with synchronizing adjustments that can be used to synchronize the camera to the 60 cycle power line. One of the problems is that any given camera could be locked to either polarity of the power line, depending on which way the power plug or low voltage AC power wires are connected.

Furthermore the camera on most industrial AC power systems may be wired to any one of three phases, thus creating at least six different phase conditions. Not only that but reactive power loads can also cause additional AC power phase shifts. All of these possibilities mean that each camera must be "phased" to a "master camera". In the past this has been a very time consuming process, requiring considerable technical know-how and expensive test equipment.

The new VTM Video Timing Meter manufactured by F M Systems, Inc. enables installers to synchronize two or more cameras by connecting the two cameras to be tested to the connectors on the VTM, pressing a button, observing the digital display, and adjusting the synchronizing control of one camera until the digital display reads zero. The display actually indicates the number of TV lines one camera leads or lags the other. A positive number indicates leading by that number of lines and a negative number indicates lagging by that number of lines. Therefore, a zero reading indicates that the cameras are synchronized. This process is then repeated for each camera, using one camera as the master.



The VTM measurements may be made at the control hub where all the coaxial cables come together. The VTM is connected to the cable from the "master" camera and also to the cable from the camera to be synchronized. A portable radio or other communications system links the operator that observes the VTM with the operator that will adjust the camera to be synchronized. The operator at the VTM then "talks" the camera adjuster to the desired synchronous condition.

An alternative process requires only one technician and no radio. In this process the two coaxial cables at the hub are connected together with a BNC "barrel" and the cable at the camera to be adjusted is removed from the camera. The cable leading to the hub at the camera under adjustment is connected to one connector on the VTM. The camera is now connected to the VTM with a short patch cord. Since the VTM is now at the camera that is to be adjusted, the technician can now synchronize the camera by himself and without the need of a radio. While this process does not measure the phase at the hub site, it will not incur significant error as long as the cable runs do not exceed 20,000 feet in the loop between the cameras. Also note that this process requires that there be no video amplifier in the cable from the camera being adjusted (unless the direction of the video amp is also temporarily reversed).

A third method enables one technician to synchronize all cameras to the 60 cycle phase at the hub site. In this process, all coaxial cables coming into the hub site are connected to a VTG Video Timing Generator also manufactured by F M Systems, Inc. that transmits a common video sync signal to all cameras, then each camera is synchronized with the VTM at the camera location. Again, only one technician is needed and each camera is now synchronized to the power line phase at the hub site. The advantage of synchronizing to the hub site phase is that changes of phase at a chosen "master camera" will not throw off subsequent measurements.



As a practical matter, cameras may be synchronized in a matter of a minute or so per camera by technicians using the VTM. Minimal training is required to become proficient in the use of the VTM, and the cost of the VTM is far below that of oscilloscopes and specialized monitors that have been used in the past. In addition to using the VTM for initial set up, it is highly recommended to use it to do routine synchronization measurement at some regular intervals. The reason for this is that Electricians occasionally will reverse the phase of an AC line when balancing the load on a power panel.

This simply requires removing a circuit breaker and re-installing in onto the opposite phase. There will be no notice, and the camera is now 180 out of phase. In this condition it may or may not roll. Rolls then become intermittent. It is best to make routine synchronization tests to avoid this condition.

The VTM Video Timing Meter is hand-held (3 1/2" x7"x 1 1/2") and battery operated so that it can be carried in a pocket or tool kit and operated at the job site without requiring AC power connections. The VTM also has a "video present" indicator for each of the two video input connectors so that the technician can be certain that a video signal is actually present from each camera. The VTM can thus be used to verify that a video signal is actually present on a coaxial cable.

The push button power switch requires only momentary actuation to start measurements, and then the VTM will remain ON for about three minutes. This usually provides more than enough time to synchronize the camera, and then the automatic shut-off activates to conserve the battery. The VTM Video Timing Meter and the VVM Video Volt Meter together make a complete test set for CCTV cameras. The VVM measures video sync and white Level, while the VTM measures relative timing of CCTV cameras. Both meters are manufactured by F M Systems, Inc. located at 3877 South Main Street in Santa Ana, California 92707 and can be reached by phone at 800-235-6960 or by FAX at 714-979-0913.

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