

CM-1UTP CAMERA MASTER UTP ADAPTOR

INSTRUCTION BOOK
CM-1UTP.ISB



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FORWARD

In the past, measuring video picture quality of CCTV signals being transmitted over UTP (unshielded twisted pair) wires has been very difficult. Without some way to measure actual video transmission results, there is no way to objectively evaluate system performance, especially in terms of picture definition and the relative performance of the various types of equipment available to implement UTP video transmission.

VIDEO STANDARDS

It is helpful to be aware of the standards for video waveforms and the parameters that are used in professional video measurement to measure them.

All professional video measurement is made in terms of I.R.E. UNITS. The I.R.E. UNIT gets its name from the I N S T I T U T E of R A D I O E N G I N E E R S that developed the standard "I.R.E. UNIT" for video measurement used in the United States, Canada and elsewhere.

The sync pulse is 40 I.R.E. units, the peak picture amplitude is 100 I.R.E. units and so a standard one volt black and white peak-to-peak video signal is 140 I.R.E. units (40 SYNC + 100 LUMINANCE [WHITE] = 140).

Color video adds a 40 I.R.E. 3.58MHz Colorburst signal on to the Back-Porch just after the sync pulse, as well as CHROMINANCE in the picture itself and when transmitting 100% saturated colors, causes the picture amplitude to increase from 100 I.R.E. units to 120 I.R.E. units. This in turn makes a saturated color (maximum color brightness) picture content to be 120 I.R.E. units, which when added to the 40 I.R.E. of sync, causes the total video signal to be $40 + 120 = 160$ I.R.E. units.

Since 140 I.R.E. units equal 1 Volt peak-to-peak, then a 160 I.R.E. picture signal would equal $160/140 = 1.143$ Volts. Since a sync pulse on a 1 Volt peak-to-peak signal is 40 I.R.E. units and peak-to-peak video is 140 I.R.E. units, the sync pulse voltage is $40/140$ Volts = .2857 Volts, a not very easily measured quantity, thus the use of more easily managed I.R.E. units. Note that both color signals and black and white signals will measure 100 I.R.E. units because the 3.58 MHz color information is filtered out in the I.R.E. measurement device. Note that an ordinary Oscilloscope has no such filter and will read a higher picture amplitude than any I.R.E. reading meter.

The important bit of information here is that color pictures have a maximum peak-to-peak output of 1.143 Volts peak-to-peak instead of 1 Volt peak-to-peak. When combined with the nominal "hot" output of many CCTV cameras of 1.3 Volts peak-to-peak, then it can be seen that actual peak-to-peak voltages of CCTV cameras can reach $1.3 \times 1.143 = 1.486$ Volts.

VIDEO STANDARDS (cont.)

This can considerably exceed the maximum input permissible on Digital Transmission systems and some corrective action must be applied prior to entering any digital transmission system.

The battery operated and hand held CM-1 Camera Master, with the CM-1 UTP adapter can measure sync pulse, picture amplitude, overall composite sync and picture, focus and color burst amplitude in I.R.E. units, in both 75 Ohm unbalanced cable (coax) and in 105 Ohm balanced UTP (Unshielded Twisted Pair).

COAXIAL CABLE vs UTP WIRE CABLE

Note that the peak-to-peak voltage standard is the same on coax or UTP cable and that measurements in I.R.E. units will be the same amplitude on the CM-1 Camera Master. Note that a Coaxial Cable has a 75 Ohm impedance and is unbalanced (the shield is grounded). A UTP Wire Cable has a 105 Ohm impedance and is balanced (no ground on either side). This type of connection requires correct polarity for an accurate reading.

MEASUREMENT

Where a color camera or color video Test Generator is available as a signal source, an accurate measurement of the transmission performance of a coaxial or a UTP cable can be made using the CM-1 Camera Master and the CM-1 UTP adapter.

First measure Sync amplitude and Color Burst amplitude at the color camera with the CM-1 (no adaptor). Record these results for further reference. Then mount the adaptor to the CM-1.

MOUNTING THE CM1-UTP ADAPTOR

Position the CM-1 facing toward you with its BNC (female) connectors facing upward. Place the CM1-UTP adaptor above the connectors with the BNC (male) connectors facing down and front switch facing toward you. Line up the BNC connectors to mate. Rotate the BNC (male) connectors so that the notches align with the BNC (female) connectors. Push the adaptor onto the meter and rotate the collars on the BNC (male) connectors to lock into place. To remove the adaptor simple reverse this process.

UTP WIRE CABLE MEASUREMENT

Next, connect the "sender" or UTP converter to the color camera and connect the balanced output of the "sender" to the balanced input of the CM-1 UTP adapter (while it is in place attached to the CM-1 Camera Master). BE SURE THAT SENDER AND CM-1UTP ARE CORRECTLY MOUNTED (+ to +, and - to -).

UTP WIRE CABLE MEASUREMENT (cont.)

Read the Sync amplitude and Colorburst amplitude. Be sure that the adapter switch is on "terminated" and read the Sync amplitude and Colorburst amplitude. Compare the measurements with the previous ones at the 75 Ohm coax side. There should be very little loss (reduction in measurement). Any reduction in measurement will only add to the loss created by the twisted pair cable (see table for TWISTED PAIR LOSS). Note that "passive" senders will have some small loss if not defective, but may contribute substantial loss (particularly at Colorburst) if defective.

Now connect the UTP cable to the "Sender" and move the CM-1 UTP adapter and CM-1 Camera Master to the far end of the Twisted Pair. Insure that the wire connected to the + input of the CM-1 UTP adaptor is also the same wire that is attached the + output of the "Sender". A reversal will result in incorrect reading. Again read and record the Sync and Colorburst amplitude. Compare these readings with the first set of readings and look up the cable loss in the TWISTED PAIR LOSS table. When using the CM1-UTP as an End of Line device always TERMINATE the video with the adapters switch in the "TERMINATED" position.

Now remove the CM-1 UTP adaptor from the CM-1, connect the UTP cable to the Balanced-to-unbalanced converter (possibly a "sender" hooked up in reverse) and measure and record the Sync and Colorburst again. Compare video and Colorburst loss overall. This is the quality performance of the system.

Note that the CM-1 and CM-1 UTP adapter can be used at any intermediate "punch blocks" in the UTP cable system to help to locate shorts or opens in the cable pairs. At intermediate locations always switch OFF the built-in termination (BRIDGING) and be sure that both ends of the cable are connected to senders and are properly terminated. The TWISTED PAIR LOSS table will aid in evaluating trouble conditions and assessing whether active equalizers are necessary to provide a quality system. Contact me at FM SYSTEMS at 800-235-6960 for help in using or interpreting measurement results that you obtain.

CABLE LOSS COMPENSATION

When cable loss or Colorburst loss is excessive, consider utilizing active senders with appropriate cable pre-equalization or active "Receivers" with built-in high frequency equalization. with appropriate pre and post equalizers it is possible to completely compensate UTP cables of 4000' or longer. Call and ask about our GB60-UTP.