

MMC



Modulation Measurement System

The MMC Modulation Measurement System unit is a panel that provides for easy access to the base-band video and video and audio I.F. loops on a TV modulator. While most TV modulators have some provisions, such as L.E.D. indicators or meters to help set depth of video modulation and audio deviation, often these readings only indicate relative performance and are not consistent from unit to unit on all of the channels. What is really needed is one set of test instruments that can be applied to all of the channels in a system to assure that all of the channels in the cable system are set to the same video depth of modulation and audio loudness.

Depth of video modulation can be measured with a spectrum analyzer, but the process is tedious, difficult to train head-end technicians to perform, take a long time to perform, and are only as accurate as the skill of the operator permits.

Audio modulation is currently not measured at all in most head-ends. The modulation control is most often set "by ear" by comparing the relative volume against the volume of an off-air station as perceived by the operator by simply listening to the programs.

Most TV modulators have the modulation controls on the front panel, while the coaxial connectors needed to actually measure video depth of modulation and audio carrier deviation are located at the rear of the equipment rack. The Modulation Measurement Center (MMC) brings these test points to the front of the rack so the operator can measure these parameters on the same side of the rack that the adjustment controls are located. Without the MMC, two operators would be needed, one to read the instruments and the other to turn the controls. Each MMC panel is 1.75" high and can service up to six TV modulators. The MMC does not produce heat and does not obscure airflow between TV modulators, so it can replace a spacer panel. Connecting cables are placed between the TV modulators and the MMC. Three test points from each TV modulator are connected to the MMC as follows:

1. VIDEO INPUT LEVEL

The base-band video input to the TV modulator is routed through a monitor test point on the MMC so that the video peak-to-peak input voltage can be measured at the front of the rack using the Video Volt Meter (VVM). The meter is digital and is accurate to 1%.

2. VIDEO DEPTH OF MODULATION

A 20dB directional tap is connected into the 45.75 MHz video I.F. loop (between the I.F. output and scrambler, if used). The -20dB tap output is connected to the MMC so that the Video Modulation Meter (VMM) can measure the depth of modulation at the front of the rack. The meter is digital, reading in percent modulation and is accurate to better than 1%.

3. AUDIO MODULATION MEASUREMENT

A 20dB directional tap is connected into the 41.25 MHz TV audio I.F. loop (between the I.F. output and scrambler, if used). The 20dB tap output is connected the MMC, so that the Audio Modulation Meter (AMM) can measure the loudness of the TV audio modulation at the front of the rack. This meter is digital and accurate to better than ± 0.2 dB over at 60dB range.

In practice the VVM would measure the actual peak-to-peak input voltage at the same time that the VMM is measuring the depth of modulation so that the video modulation control can be very accurately set in a matter of less than one minute per TV modulator.

The VVM measures sync amplitude and white amplitude separately as well as overall peak-to-peak level. This enables the VVM to adjust the sync to white ratio on VideoCiphers. The measurement is made at the video input of the TV modulator (VIDEO test point on the MMC). Adjust the VideoCipher video level control to obtain a 40 I.R.E. unit reading on the VVM, then without moving the VVM, adjust the satellite receiver video output to read 100 I.R.E. units on the VVM. This sets the white to sync ratio very accurately.

Audio loudness can be made equal on all channels by first measuring each off-air channel at the sound I.F. tap using the AMM, averaging these measurements, then adjusting each TV modulator to this level. This process enables the head-end operator to set every channel to the same volume level, since the AMM measurement is in true RMS. The AMM holds the highest modulation level so that peak loudness is registered.

The AMM not only measures audio deviation loudness, but can also measure base-band audio in balanced or unbalanced audio circuits. It is calibrated in dBm with a .7746 volt RMS sine wave equalizing 0dBm on the scale (0dBm = .7746 volts RMS in a 600 ohm line). Each MMC test panel serves six TV modulators or off-air I.F. converters.