

# DMT-31



## SDI VIDEO MARGIN TESTER

INSTRUCTION BOOK

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## DESCRIPTION

The DMT-31 is a precision attenuator used to test SDI video and other digital signal systems to ensure that they have an adequate digital signal level margin. Digital signal margin is the amount of signal level above the digital cliff that you have in your system to prevent a data or picture failure from occurring. All digital transmissions will give you a perfect picture signal until the coaxial cable loss reaches beyond the minimum allowable signal level and then you suddenly get no picture at all. This effect is called the “digital cliff”, because like walking off a cliff, everything is fine until you take the last step off the edge and then all is lost.

When you install an SDI video signal or any digital transmission particularly when the coaxial cable run is long, you need to know how close your system is to the digital cliff. Every piece of equipment you install has a slightly different transmission level output and more importantly every receiver has a different input sensitivity. It is a good practice to test the equipment together with their coaxial cable to make sure that they will work reliably together.

This test is easy to make, just temporarily insert the margin testers 4dB port in line with the signal to make a 4dB margin test. If you have at least 4dB of margin you can rest assured that the system will operate even when the coaxial cable loss varies with time and weather. If the video does not come on then your system margin is below 4dB. You can plug into the other ports one at a time to see exactly how much signal margin your system has. The DMT-31 will test 1, 2, 4, 8, and 16 dB directly. In combination with the four jumper cables supplied with the unit, you can insert any range of attenuation from 1 dB up to 31 dB in one dB steps by putting the attenuators in series using the jumpers.

This digital margin tester is a wideband precision attenuator used to insert additional loss into the digital signal path to determine how much loss margin your system has before a failure will occur. If the margin is below 4dB you should consider amplification to get more margin for safe operation of the system. In this way, you can be certain that the system you have installed is not near the digital cliff waiting for a small change in cable loss to cause signal failure.

Besides changes in the coaxial cable loss, the digital cameras and other equipment can be damaged by lightning, power surges or ground loops that degrade the output level of the equipment bringing it nearer to the digital cliff and causing intermittent operation of the system. These intermittent digital signals problems are hard to diagnose without knowing that the equipment output levels have dropped. If you are called to test an intermittent SDI signal and it is working when you get there, use this unit to introduce additional loss to bring the signal into fail mode. Use the unit to determine if the problem is level related or some other problem. Use this unit to test new and existing SDI signal installations and to trouble shoot any intermittent equipment operation.

## HOW TO CABLE THE DMT-31

Select the attenuation level you wish to test, start with 4dB and connect the Coaxial cable coming from the SDI video source to the BNC connector marked "4 dB". Next connect the coaxial cable going to the SDI receiver to the other BNC connector on the DMT-31 unit also marked "4 dB". This will test for a 4 dB margin in your system. Then check the system monitor for a good video image. If the video image is good and stable, then you have at least a 4 dB margin and your system can be assured of continuous operation with little chance of failure due to low level signals caused by changing cable loss.

If you wish to know what the maximum margin is, you can insert different attenuation values into the path of the SDI video and determine that. Use the four BNC patch cables supplied with the unit to introduce different amounts of loss into the SDI video path and see at what point the video image disappears on the monitor or becomes intermittent. In this way you can determine the maximum signal margin up to 31 dB. If you want to measure the signal margin above the 31 dB point you may purchase more than one unit and put them in series to achieve a higher measurement value. For accuracy, be sure not to kink or bend the coaxial jumper cables in too tight a radius as this will increase the attenuation in the system and give you a reduced margin reading.

## APPLICATIONS

This system can be used anywhere that a digital signal carried on 75 Ohm coaxial cable exists. Use this unit to measure every SDI cable run to guarantee robust operation. Also, this unit can be used to troubleshoot other intermittent data signals. Most intermittent data signals are caused by excessive loss in the transmission cable and if you get to the location and find the data signal is on and won't fail while you are there, you need a way to induce the failure mode so you can determine where the failure is occurring. Use this unit to determine if the failure is caused by low level signals or for some other cause. Insert this unit into the signal path and if the camera fails you will know it is because of excessive cable loss and not the equipment at each end of the cable.

## CARE AND MAINTENANCE

There is no routine maintenance or calibration required with this equipment. There are no controls that require adjustment inside the box. The box is not designed to be opened.

## MORE INFORMATION

SDI video has been around for some time now and there are some new installation techniques and tricks of the trade for the installer to use. The advantages of using SDI digital video are obvious.

Higher definition digital video is available, the cable slope loss will not degrade the video image, and when you connect the coaxial cables you get a picture that is as sharp and clear as the camera can produce. That is of course, if you get a picture at all.

SDI video does have its limitations and when you reach those limits you will get a total failure of the system to deliver any kind of a picture at all. Unlike the old analog cameras that would give you a dull washed out picture when the signal level was too low, SDI video will give you a perfect picture until the cable loss reaches beyond the minimum allowable signal and then you suddenly get no picture at all or intermittent operation. This effect is called the digital cliff, because like walking off a cliff, everything is great till you take the last step off the edge and then all is lost.

VIDEO MARGIN is the amount of signal level above the digital cliff that you have in your system to prevent a failure from occurring. The question is how much margin is there in your SDI video system, how close are you to falling off the cliff, and how can you measure it?

First let's look at what causes this loss of the digital signal. Signal level loss and high frequency roll-off in the coaxial cable also called "cable slope loss" are the main causes of most failure. Reactive loss is the predominant loss of signal level in coaxial cable and is caused by the distributed inductance of the cable conductors and the distributed capacitance between the center conductor and outer shield with a small additional loss due to the loop resistance of the conductors. The insulating material effects cable loss the most and the uniformity of manufacture of the cable.

Small changes or irregularities in the manufacturing process and non-uniform insulation thickness on the cable can cause a long cable to have unusually high loss. Coaxial cable loss is also affected by the temperature and humidity, not to mention water infiltration into the cables outer jacket and inner cable insulation. This loss will directly affect the maximum distance you can go with a coaxial cable and it can change with time. Temperature effects are a daily change in the loss of the coaxial cable. It is the temperature changes that cause "Suck Out", that is when the cables center conductor moves in and out because the copper shield expands and contracts a different amount than the center conductor. However, humidity and water intrusion is a lasting slowly progressive loss that will take the system down over time.

Because the HD-SDI signal has a data rate of 1.485 Gbit that reaches frequencies upward of 743MHz the diameter of the insulation must be very closely controlled over the entire length of the cable. Some manufactures control these parameters better than others, so if you find a good manufactured cable stick to using that brand for repeatable results. The manner in which the cable is handled and installed will also have a great effect on cable loss and over all system integrity.

When installing coaxial cable try not to stretch the cable when pulling it into conduit, this permanently changes the wire diameter and insulation thickness damaging the cable and creating greater loss in the cable. Also twisting, kinking, or bending the cable in a radius sharper than 20 times its diameter will create additional loss in the cable.

So now that you have installed your SDI system, how do you test for the margin? What you need to know is how much additional loss your systems can take before it fails and how close are you to having a failure? You will want to know if you are on the edge of the digital cliff before you finish the job so you can walk away with confidence that the system will continue to operate when cable losses change slightly.

The easiest way to test for this margin is to use the DMT-31 SDI VIDEO MARGIN TESTER to insert a know amount of loss in steps into the signal path and see how much additional loss the system can stand and still deliver a picture. This loss is measured on a dB scale, and you should have at least 4 dB margin for a safe operating system. A loss of 4dB is the equivalent of a 37% drop in the operating level of the system. By using the other loss steps on the DMT-31 you can determine if you have enough margin to reliably operate the system under all conditions. This unit will insert up to 31 dB of attenuation in 1 dB steps so you can precisely determine your system margin to guarantee reliable operation.

The DMT-31 is a low cost inline attenuator for testing SDI video margin equipped with BNC connectors to fit your coaxial cables. Simply loop your SDI video signal through the unit starting with the highest attenuation and when the system displays a picture you will know the amount of margin your system has and then you will know with confidence how much additional loss the system can withstand. Most importantly you will know that your system is not sitting at the edge of the digital cliff waiting to fall off. Measuring this margin is a must do for all installations to give you the security of knowing your system can withstanding additional loss and still operate properly. You can also use the unit to perform periotic testing to insure you maintain your margin of operating safety.



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