

# SDI-2



## SDI MASTER INSTRUCTION BOOK

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## SDI-2

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## 1.0 SHIPPING INSPECTION

Remove the unit from the shipping container and inspect for shipping damage. If any damage is found contact the shipping carrier for further instructions. The SDI-2 is shipped fully tested and ready for use. You should have the SDI-2 meter with a 9V battery in the battery compartment, (**Note the battery will not be attached to the snap-on battery clip for shipping reasons**). Open the slide-off lid then snap the battery connector onto the battery and replace the cover. The meter is now ready to use.

## 2.0 DESCRIPTION

The SDI-2 is a low cost pocket size, digital, hand-held, battery operated meter that measures HD (High Definition) video signals. Use it for fast and accurate set-up and verification of levels and slope-loss on any SDI (Serial Digital Interface) signal. This meter is a must-have for anyone working with HD CCTV cameras or any SDI video signals. Here is a list of the features.

- Measures power level calibrated in dBm, 0 dBm = 800 mVpp.
- Displays relative level in mVpp (Millivolts peak to peak).
- Measures equalization, cable-slope-loss on any type of cable.
- It uses easy one button testing with auto termination.
- All measurements are ground-loop isolated for accuracy.

Use this meter to measure your digital signal amplitudes at all points in your system. A low level or marginal signal can cause intermittent or poor overall performance in your system. All the output levels can be checked and verified for proper operating level.

Check unknown lengths of cable to insure safe minimum delivered operating levels. Check for maximum cable slope loss anywhere in your system. These measurements will point out losses that contribute to high Bit Error Rate and corruption of the data. You can use this measurement to balance the placement of data amplifiers or Re-clocking amplifiers on long cable runs to reduce Jitter and the Bit Error Rate induced by that Jitter. It is recommended that you insert a high pass filter in line ahead of the meter if you wish to use an SDI camera as a source signal. A high pass filter can be purchased with this unit or sold separately. The filter is called HPF-300 and is available from FM SYSTEMS, INC. at 800-235-6960.

The HPF-300 filter rolls off the low frequency energy and allows the measurement of high frequencies only which magnifies the measurement of high frequency response. It is the high frequency response of the cable that mostly effect the delivery of an SDI signal on long cable runs.

This meter is equipped with a female BNC connector to input the SDI signal. A battery compartment door allows easy access to the 9-Volt battery that powers the device. The comfort grip hand-held case is made of flame retardant ABS plastic with a flame rating of 94-5VA. The meter comes with an impact resistant rubber boot to protect it during daily use.

## 3.0 POWER ON TIMER

The meter is equipped with a power on timer to allow enough time to make the measurements and then turn off the meter to conserve the battery. Before the meter turns off it will indicate "POWER DOWN" and the LCD display. If you push the power on button during this time the meter will continue to operate for another time period. The display will flash once while the meter takes another battery check each time you continue the meter timeout by pushing the button.

## 4.0 LCD METER BACK LIGHTING

The meter is equipped with an LCD backlight to illuminate the meter in dark places. If you push the button and hold it the LCD display will be illuminated while you hold the button. If you release the button the illumination will stop. The backlight feature uses more battery power and if not needed should be avoided to conserve battery power. During backlight illumination the meter performs exactly the same way in all respects.

## 5.0 WHAT THIS METER MEASURES.

This meter is designed to measure SDI High Definition (SDI HD) digital signals, such as the 1.485 Gigabit signal format used to transmit the 1080p/24, 1080p23.98, 1080PsF/24, 1080PsF/23.98, 720p/60, 720p/59.94, 720p/50, 720p/30, 720p/29.97, 720p/25, 720p/24, 720p/23.98 video formats used in CCTV and Broadcast TV installations.

## 6.0 HOW TO MEASURE SIGNAL STRENGTH OF HD VIDEO SIGNALS

Disconnect the coaxial cable from the receiving data terminal. Connect the coaxial cable to be measured to the "SDI INPUT" coaxial connector on the SDI-2. Push the "ON" button of the meter to turn on the meter and observe the meter reading. The reading on the left hand side of the screen is in dBm and the reading on the right side of the screen reads out in millivolts peak-to-peak. The dBm reading can be a positive number if the signal is larger than 0, the standard full level signal. It will also read negative numbers indicating a loss or lower level than the standard 0 dBm. The millivolt reading is displayed as a reference and moves in one db steps. The millivolt peak to peak reading uses a floating decimal point to improve the readout.

A reading of 0.800 volts peak-to-peak indicates you are measuring the direct nominal output of a digital video source. As the HD signal traverses the coaxial cable, this voltage will be reduced with distance traveled. A cable that is commonly used by the Television Broadcast Industry is the Belden 1694A Precision Video Cable. When this cable is used, the signal strength of the highest frequency of interest in HD can be expected to drop 84.9 % percent for each 100 Meters of cable. Since signal strength is the sum of the amplitude of all of the harmonics, the actual signal strength to be expected at various lengths of cable is shown in the table below. RG59U cable will vary from these results.

SIGNAL STRENGTH OF HDTV SIGNALS		
<u>FEET OF CABLE</u>	<u>METERS OF CABLE</u>	<u>MILLIVOLTS</u>
0	0	800
164	50	408
328	100	249
492	150	167
656	200	123
820	250	99

The signal strength of the data generators is supposed to be 800 millivolts at the output, but it may vary as much as +/- 10% from this value, so expect that the meter reading may vary at least that much when estimating the cable length using the signal strength that is measured. For greater accuracy you can measure the source level, record that number and subtract that number from the end of line measurement to get an exact measure of the loss of the cable.

## 7.0 MEASURE THE FREQUENCY RESPONSE EQUALIZATION ON HD SIGNALS.

Coaxial cable losses are greatest at the highest frequencies and lower at low frequencies and all frequencies must arrive at the data receiving location at nearly the same amplitude, therefore the signal must be "equalized" prior to delivery to the data terminal if the amplitude discrepancy between the highest and lowest frequencies is too great. The SDI-2 when used with a high pass filter can measure this differential signal amplitude and you can read the differential amplitude between the high and low frequency amplitudes in dB. This reading is the total amount of equalization that must be provided by in-line equalizers to reduce data errors to a minimum. Failure to provide these equalizers will increase the number of data errors and program outages.

To make this measurement, disconnect the receiving end of the coaxial cable from the receiving data receiver and connect the cable to the "SDI INPUT" coaxial connector on the SDI-2. Push the power "ON" button and read the cable loss in decibels. This is the total amount of low frequency equalization that must be applied between the end of the cable and the data receiver input to obtain optimum data transmission and to reduce data errors. Then insert the HPF-300 in line with the SDI-2 meter and measure the high frequency losses introduced by the cable length. By subtracting the Zero cable length loss from your measurement you can determine the amount of loss in dB introduced by the cable run.

Occasionally a data source may be encountered that is transmitting at a higher level than the standard 800 millivolts. In this case the equalization measurement made near the data source may indicate a positive decibel equalization reading. This does not constitute an error it merely indicates that a level exists in excess of 0.800 Volts at that point in the cable. Farther away, down the cable, the reading will become negative again to indicate the amount of equalization to be provided.

Any signal that is above the maximum level or below the minimum level of measurement will cause the display to indicate an "OUT OF RANGE HIGH" or "OUT OF RANGE LOW" indication on the LCD display.

## 8.0 CARE AND MAINTENANCE

The SDI-2 is a precision measuring instrument and should be treated accordingly. While it can withstand ordinary everyday indoor use, it should not be left outside in the rain or otherwise mistreated. It is not waterproof. The battery should be removed if it is placed into storage to prevent leakage of corrosive fluids from batteries as they discharge and age.

Replace non-rechargeable batteries at least once a year even if ordinary use does not discharge the battery because old batteries may leak and cause corrosion damage. No routine maintenance or test procedures are required other than battery replacement. Attempts at field repair or adjustment will void the warranty. If the SDI-2 fails to operate properly, even after battery replacement, or does not read a known SDI signal correctly, call the factory at 1-800-235-6960 for a Return Authorization Number and return it to the factory for repair.

## 9.0 BATTERIES

One alkaline 9 Volt "transistor" battery is used. When the unit is powered up a built-in service routine checks the battery voltage and determines if the battery has enough power to operate the device. When the battery is getting low the display will give the message "LOW BATTERY" and display the voltage, then it will proceed to take measurements. When you are at the end of the battery life, the display will indicate "REPLACE BATTERY" and then shut down because the battery does not have enough power to take correct readings.

The battery is located in the case, under the digital meter, with access provided by a sliding plastic cover plate. Slide in the direction of the arrow to open. When replacing the cover, place it flat into the grooves so that both ends engage and slide the lid closed.

## 10.0 AUXILIARY EQUIPMENT

The HPF-300 is an inline filter that enables the measurement of cable slope loss at the high frequencies only to prevent the low frequency energy from overpowering the measurement. This filter introduces loss at the low frequency end of the spectrum so that the installer can test cable slope loss of any type of cable using an SDI camera as a signal source.



The MC1 is a Protective Carry Case to house and protect the SDI-2 meter while it is being transported. This is a very rugged ABS cases with a foam lined interior suitable for transporting the meter safely.

## 11.0 HELP

Abbreviated instructions are printed on the front of the SDI-2 and a phone number to call if you have any questions. Call the number when ever you have a question about this meter or any other problem. Our Engineers would like to help you with any technical question or problem you might have. Give us a call.