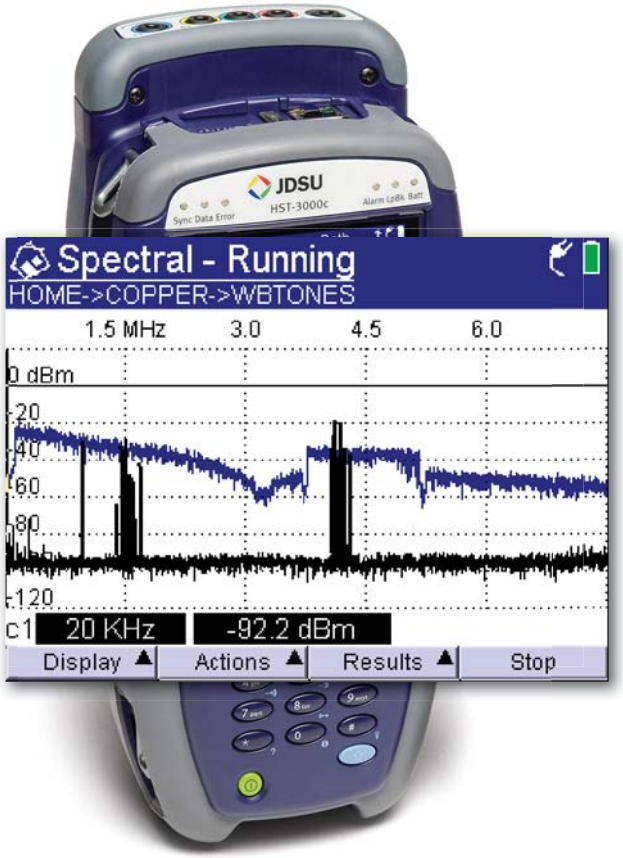
HST-3000 VDSL QUICK CARD

WIDEBAND IMPULSE NOISE



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Technical Assistance: 1-866-228-3762 TAC@jdsu.com

Wideband Testing - Wideband Noise

Wideband Testing Definitions

Before beginning description of the Wideband test feature found on the HST-3000 it is important the technician has a basic understanding of two main principles.

- Frequency
- Noise

Frequency: Many technicians are surprised to learn the XDSL signals while on the cable are a series of analog tones. This is an oversimplification of the technology but a very good explanation from a repair standpoint. XDSL technologies occupy groups or "spectrums" of frequency according to the technology.

For example, ADSL1 utilizes frequencies between roughly 20 kHz (20000 Hz) to 1.1 MHz (1.1000000 Hz). ADSL2+ doubles the frequency range to 2.2 MHz and VDSL2 is capable, depending on profile, of going to 30 MHz

Ideally, these spectrums of frequencies would travel from end to end on the circuit all at the same "loudness" or amplitude. However, in reality, frequency loses amplitude at a linear rate. **This means that as frequencies increase, they lose signal strength faster over the same distance.**

Consider the following table, which shows loss per kilometer for three frequencies, 1000 Hz, 300kHz, and 772kHz -- as the frequencies increased their corresponding amplitude decreases.

Table: 1 - Frequency vs Loss per Kilometer

Frequency	Loss per Kilometer
1000 Hz	1.27 dB
300,000 Hz	17.87 dB
772,000 Hz	22.56 dB

HST-3000 Test Interface

Connect dual tip & ring + ground leads to the mini-banana connectors on the top of the HST as shown below.

Plug in mini-banana connectors as shown

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Wideband Testing - Wideband Impulse Noise

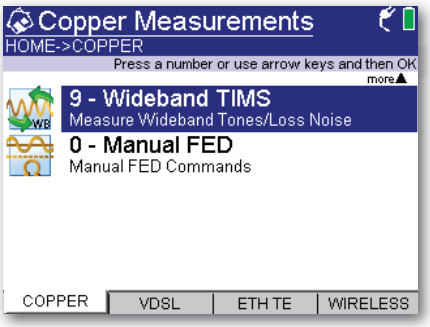
Purpose

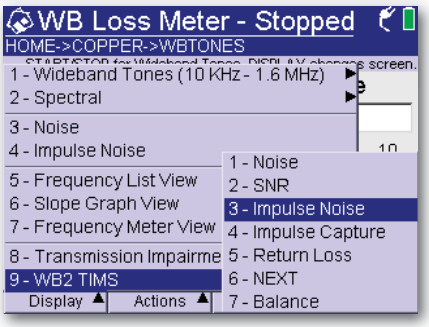
The purpose of this test is to identify the presence of intermittent wideband noise that could cause loss of synch or degrade the performance of the VDSL circuit. This is the same measurement provided in the VDSL Good Pair Check except that it is performed manually allowing for continuous analysis of noise level. If the VDSL Good Pair Check fails for Impulse Noise, it is recommended that the manual Impulse Noise test (below) be run for at least 15 minutes for further troubleshooting.

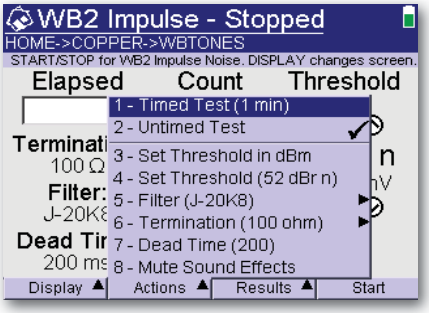
This test is typically run from the SAI / cross box towards the customer premises. Typically, this test is performed with the pair terminated to the same impendence that will be present when the VDSL2 circuit is installed (100 Ohms). Because impulse noise is intermittent in nature, this test is typically run over a period of time – again, usually at least 15 minutes or more if an Impulse Noise problem is suspected and requires further troubleshooting.

Procedure

1. Connect the Tip and Ring test leads from the HST-3000 to the desired pair. Connect the ground lead to a valid earth ground reference (connected to HST as shown in the figure on Page 1).
2. Press the Home navigation key, press the Copper soft key and then selected Wideband TIMS from the menu and press OK.
3. Press the Display soft key on the lower left of the display; select WB2 TIMS from the pop-up menu and then Impulse Noise from the cascaded menu as shown to the right.
4. The Wideband Noise measurement screen should now be displayed (Stopped indication shown at the top of the screen). Before starting the measurement, follow the next 3 steps.
5. For VDSL loops, the Filter should be J-20K8. To change the filter selection, press the Actions soft key, select Filter from the pop-up menu and choose J-20K8 from the cascaded menu.
6. For VDSL loops, the Termination should be 100 Ohms. To change the termination, press the Actions soft key, select Termination from the pop-up menu and choose 100 Ohms from the cascaded menu.
7. For VDSL loops, the Threshold should be 52 dBr n (-38 dBm). To raise or lower the Threshold, use the Up / Down arrow keys. To change from viewing the Threshold in dBr n to dBm (or visa versa), press the Action soft key and select Set Threshold in dBm (or dBr n as applicable). The equivalent Threshold in mV will always be displayed on the screen.







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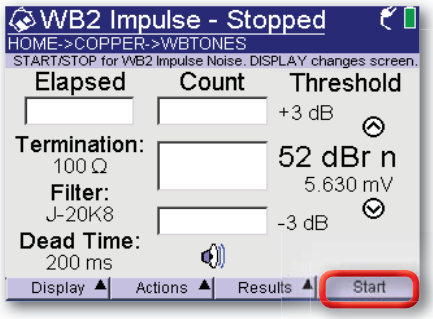
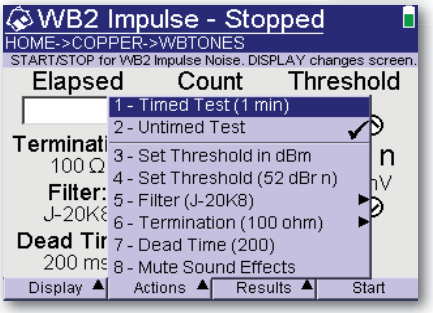
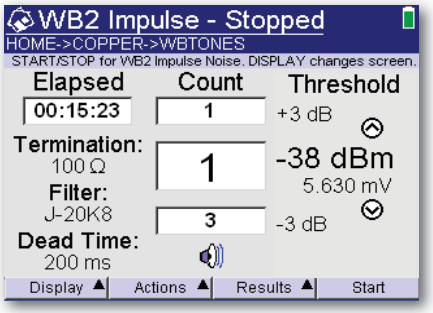
Wideband Testing - Wideband Impulse Noise

Procedure (continued)

8. Press the **Start** soft key to begin the test the test will run continuously until the **Stop** soft key is pressed.
9. The measurement will count the number of hits against the Threshold recorded in the window directly to the left of the programmed threshold. It will also count the number of hits 3 dB above and 3 dB below the threshold.
10. If enabled, an audible "Beep" will sound with each hit counted. This feature can be turned on / off by pressing the **Action** soft key and selecting **Enable / Mute Sound Effects**. The status of this feature is shown by the speaker icon on the screen.
11. The elapsed time of the test is shown in the window in the upper left hand of the display.







Run for 15 minutes against a Threshold of 52 dBr n (-38 dBm), there should be ≤ 3 hits. If a greater number of hits occur, a problem exists.

The display of hits 3 dB above and below the programmed threshold assist in further diagnosis of the problem by giving additional clues as to the relative magnitude of the hits in reference to the programmed threshold. For example, if only 3 hits occurred against the 52 dBr n threshold but there was 1 hit at the 3 dB point above the threshold and a significant number of hits at the 3 dB below point, strong consideration should be given to assessing the pair as marginal and investigating further.

Unwanted impulse noise "spikes" typically come from external sources such as AC power equipment (transformers, generators, etc.) but plant related issues like pair imbalance or potential bonding & grounding problems are often the root causal factors behind unacceptably high levels of impulse noise. For further troubleshooting, the Impulse Capture and Spectral Analysis functions should be used.

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Understanding and Testing Impulse Noise

Impulse Noise can be defined as any burst of noise that exceeds the RMS (Root Mean Squared) level of the background noise by 12dB (4 times the voltage). A typical noise impulse is much larger than the data signal, and can destroy successive bits of data. More data is destroyed in a high speed data stream than a low speed one.

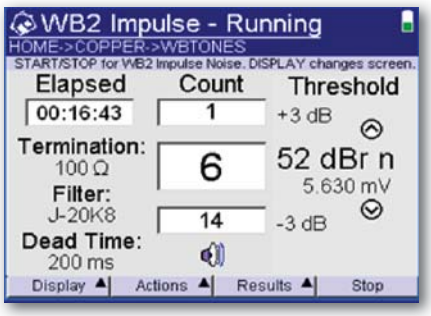
An impulse noise measurement is made by counting the number of impulses exceeding a preset threshold. Often it is desirable to measure the amplitude distribution of the noise impulses. This is done by counting the impulses exceeding three different thresholds.

Impulse Noise Thresholds can be measured with either a dBm or dBrn scale

- dBm measures absolute power
- 0 dBm equals 1 mW to the appropriate load
- If the dB power level is doubled the resulting
- reading on the dB scale goes up 3dB
- If the dB power level is halved the resulting
- reading goes down 3dB
- dBr n measures dB above reference noise:
- Reference noise 0 dBr n = -90 dBm
- Scale shows the relationship between dBm and dBrn

The HST-3000 WB2 SIM can measure Impulse Noise Thresholds by using either a dBm or a dBrn scale. Either scale is configured for a

- Center Threshold - **Metallic Standard is -38 dBm or 52 dBr n**
- +3/-3 dB above and below center Thresholds
- Termination - 100 or 135 Ohms - **Metallic Standard filter is 100 Ohms**
- Filter Types - G or J Filters - **Metallic Standard filter is J-20K8**



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