



780 HANDHELD TEST INSTRUMENT CASE STUDY

Diagnosing HDMI Interoperability Problems in a Retail Store

Network Setup: There was a satellite set top box (STB) connected to multiple displays on the shop floor of a business. The STB was connected to the displays over HDMI 2x CAT5 extenders with distribution amplifiers (splitters). The network setup is depicted in the illustration below.

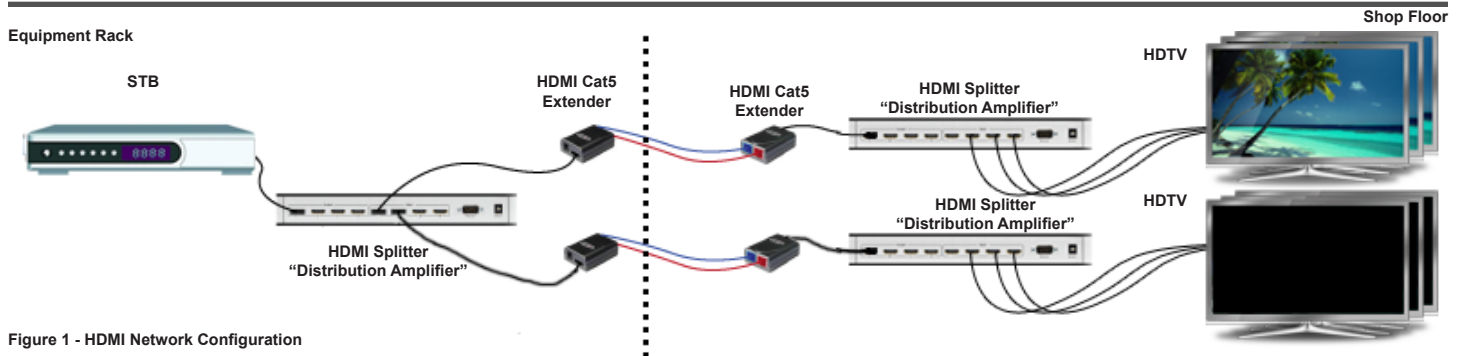


Figure 1 - HDMI Network Configuration

Symptom: Several HDTVs were not working at all. Some were flashing intermittently. Intermittent flashing is indicative of a physical layer problem related to dielectric loss. If the flashing were periodic, this would indicate that the problem was related to HDCP.

Diagnostic Procedure (Test #1): The Quantum Data 780 Handheld Test Instrument was used to verify the signal path from the upstream side of the distribution amp (splitter) on the shop floor to each of the non working HDTV displays. A video pattern test was run with a variety of resolutions first with HDCP disable and then repeated with HDCP enabled. A cable test was run on all cables and a repeater test was run on the splitters.

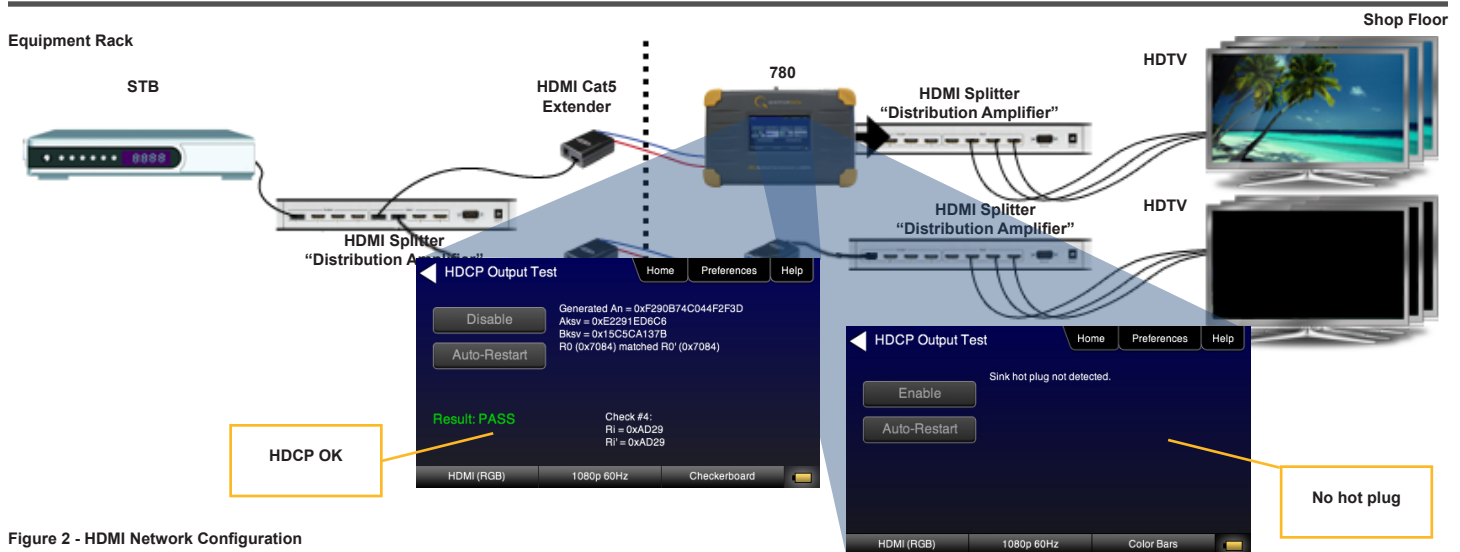


Figure 2 - HDMI Network Configuration

Results (Test #1): The results were mixed with some of the paths showing failure and others showing that the signal path was good. In some cases the results were dependent on the resolution. When testing with 480p60, an image was rendered through the signal path. When 1080i was used, often the problem of intermittent flashing exhibited itself. But the results did not appear to depend on HDCP. In the cases of intermittent failure, it was determined that the cable runs were too long to pass the higher resolutions. These cables were replaced.

In signal paths where there was no video at all, it was determined that either some of the ports on the splitter were bad or the cables were bad. These problems were related to improper hot plug. When tested at the input side of the distribution amp, the tests often indicated too low of a hot plug signal at the source; in this case the 780 was acting as a source. The ports on the splitter that showed a failure were not used.

Diagnostic Procedure (Test #2): The Quantum Data 780 Handheld Test Instrument was then used to verify the signal path from the STB (it replaced the STB as a “known-good” source). The test was run with a variety of resolutions first with HDCP disabled and then repeated with HDCP disabled.

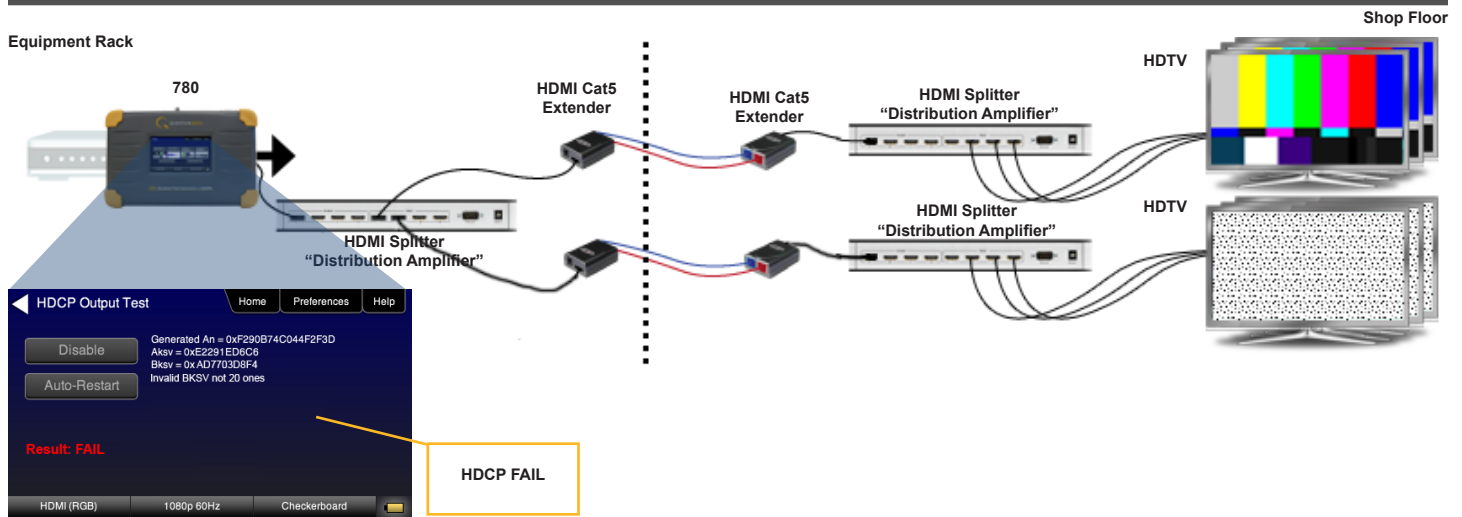


Figure 3 - HDMI Network Configuration

Results (Test #2): The results were again mixed with some of the paths showing failure and others showing that the signal path was good. The results were not dependent on the resolution. However, the results did correlate with HDCP. Therefore an HDCP authentication problem was a possible cause and specifically errors on the DDC bus used to carry the HDCP transactions were suspected. Additional testing was required to determine the root cause.

Diagnostic Procedure (Test #3): The Quantum Data 780 Handheld Test Instrument was then used to verify the signal path from HDTV displays on the shop floor (it replaced the HDTVs as a “known-good” sink). The HDCP transactions were monitored on the 780 using the Auxiliary Channel Analyzer feature.

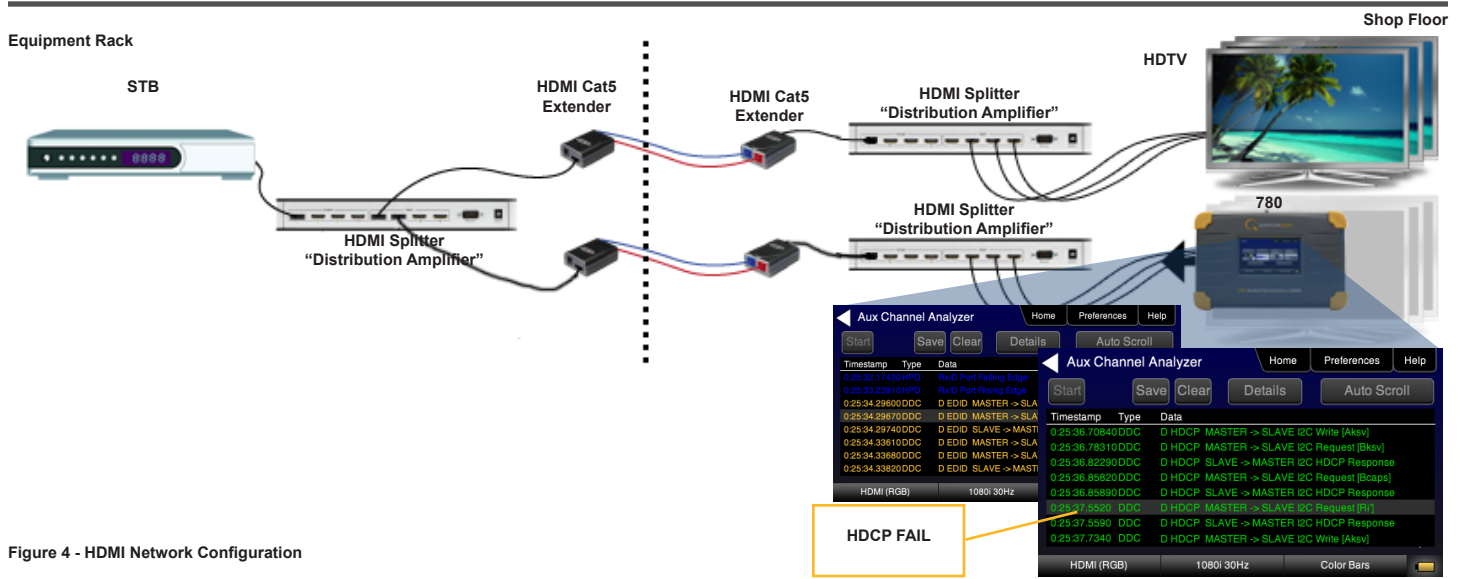


Figure 4 - HDMI Network Configuration

Results (Test #3): The results showed that the DDC bus was dropping out and losing packets of data on the HDCP transactions. The HDMI over CAT5 extenders were rated to 1080i at 40m, the CAT5 run was measured with a TDR meter at 39 meters. The extenders units were replaced with new units rated to 100m and the test was rerun. It was then seen that the system was not losing any HDCP transactions. The root cause of the problem was related to HDCP transaction failures due to errors on the DDC bus.

Summary: The net result of the diagnostic tests was that the engineers on site had spent an entire day swapping displays, splitters and cables but were still not able to resolve the interoperability issues. Using the 780 the problems were identified in about an hour: The following is a summary of what the 780 was able to determine:

- Accurately diagnose two (2) faulty ports on the splitters
- Identified two (2) cables that were too long to reliably carry 1080i HDMI.
- Demonstrated that the satellite STB was operating properly.
- Determined the root cause of the intermittent drop out.
- Verified that the CAT5 extenders were not performing properly.