What's New
Qx Series V5.4

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Support for Full Range Colorimetry

The Qx Series now supports the detection and analysis of SMPTE Full Range video standards across all boot modes. The units use the definitions for Narrow, Full Protected and Full Range as defined in the recommendations SMPTE RP 2077 Full-Range Image Mapping and EBU R 103 Video Signal Tolerance in Digital Television Systems.

Features include:

- Updated Analyzer - Waveform instrument defaults to support the analysis of SMPTE RP 2077 Full Range video input signals or can be configured to Full Protected Range if required.

- Updated Analyzer - Video Standard (SDI & 2022-6) automatically detects Full Range from S352 Payload IDs

- Updated Analyzer - 2110 Format Setup detects Full Range when Range parameter set in SDP record of incoming video signal

- Generators configurable to generate Full Range / Narrow Range video (SDI and IP 2022-6 modes) or Full Range / Full Protected Range / Narrow Range (IP 2110 mode)

- Waveforms, Vectorscope and CIE Chart updated to analyze Full Range input signals.

Implementation of Full Range Colorimetry in the Qx Series

Digital Representation of Code Values
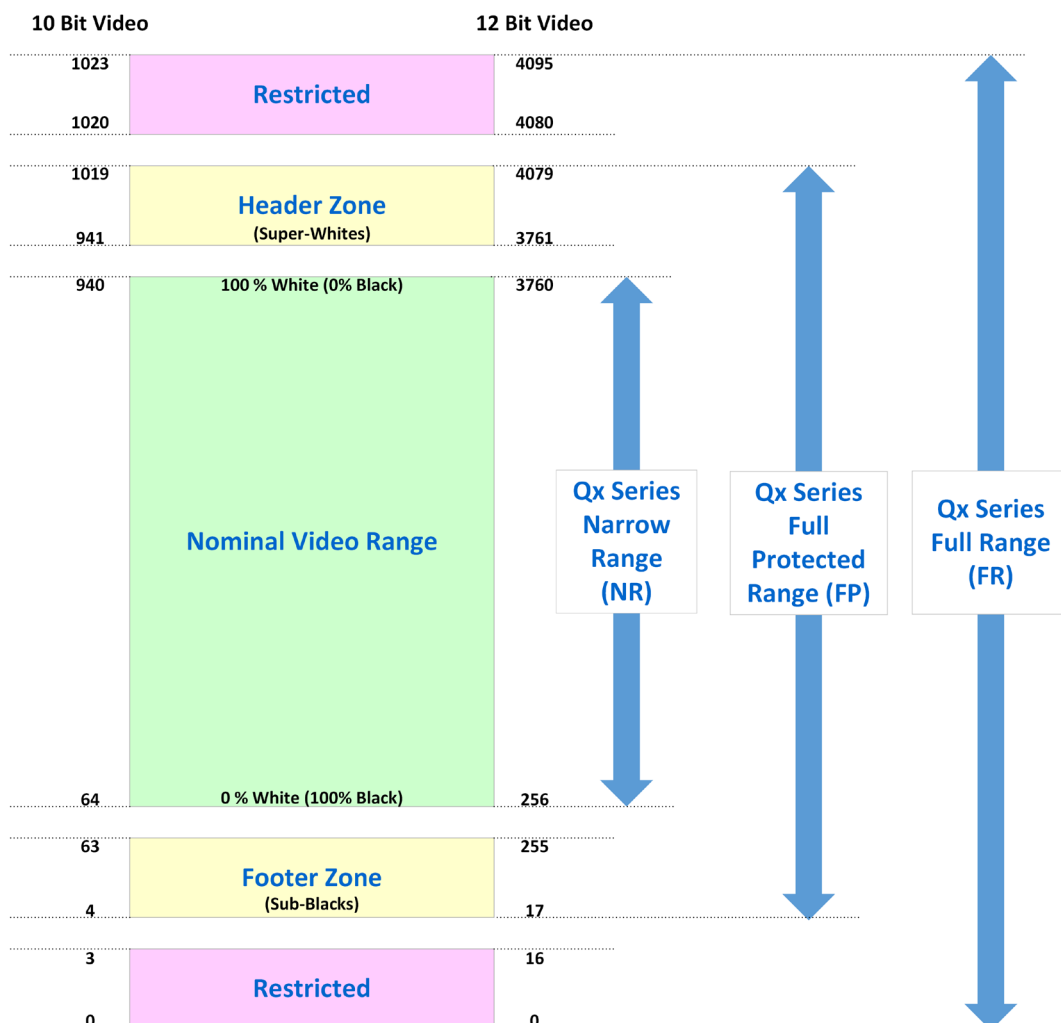
Full Range Analysis

The Qx Series supports the analysis of 10 or 12 bit video signals in all boot modes. For each RGB or YCbCr color channel in a 10 bit video signal there are 1024 possible values, from 0 to 1023. In the Qx Series, this represents the Full Range (FR).

SMPTE defines the first 4 bits (0 to 3) and last 4 bits (1020 to 1023) of a 10 bit video signal as reserved for signal processing requirements so these must not contain video data. This leaves the range of available bits for color display as 4 to 1019, where this specific range is referred to as the **Full Protected Range (FP)** in the Qx Series (for 10 bit video). In this range, 4 represents the darkest black of the sub-blacks and 1019 the brightest white of the super-whites at the bottom and top of the color scale respectively.

The nominal video range for a 10 bit video signal is the code range extending from 100% Black to 100% white, excluding the sub-blacks and super whites. For a 10 bit video signal this range is between bits 64 and 940 and is defined as **Narrow Range (NR)** in the Qx Series. In addition, EBU R 103 defines a header zone between the nominal video range and the restricted bits at the upper extent of the range and a footer zone between the nominal video range and the restricted bits at the lower extent of the range. The Qx Full Protected range includes both header and footer zones for 10 and 12 bit video signals. The header and footer zones, containing the superwhites and sub-blacks respectively, are intended as buffer zones in case color ranges exceed the upper or lower limits of the nominal video range.

Similarly, for a 12 bit video signal there are 4096 possible values giving a **Full Range (FR)** from 0 to 4095. In this case, the first and last 15 bits are reserved for signal processing so the Full Protected Range (FP) for a 12 bit video signal is 16 to 4079.

To summarize, the following table shows the Full, Full Protected and Narrow ranges as implemented in the Qx Series:

Range Type	Code Value Digital Representations				
	SDI & IP 2022-6		IP 2110-20		
	10-Bit Range	12-Bit Range	8-Bit Range	10-Bit Range	12-Bit Range
Full Range (FR)	N/A	N/A	255	1023	4095
Full Protected Range (FP)	1019	4079	254	1019	4079
Narrow Range (NR)	940	3760	235	940	3760
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Narrow Range (NR)	64	256	16	64	256
Full Protected Range (FP)	4	16	1	4	16
Full Range (FR)	N/A	N/A	0	0	0

Full Range Generation

From this software release, the unit can generate video standards with either a Full Range (FR), Full Protected (FP) Range, or Narrow Range (NR) bit depth in IP 2110 boot mode, and either Full Range (FR), or Narrow Range (NR) bit depth in IP 2022-6 and SDI boot modes.

Full Range Scales in Analyzer - Waveforms

The Analyzer - Waveform instrument now analyzes the video signal at Full Range by default but can be configured to use a Full Protected range scale, if required. The vertical scale adapts automatically to the change.