TDSCEM1
 Communications Eye-diagram Measurements Software

Features and Benefits

- Perform Automatic Eye Diagram Measurements of: % Crossing, Eye Height, Eye Width, Quality Factor, Extinction Ratio and Jitter.
- Provides More In-depth Understanding of Your Communication Signal Beyond Qualitative Pass/Fail Mask Testing
- Adds Additional Capability to Your TDS Communications Analyzer Package by Enabling Your TDS 500/700 Series Oscilloscope to Perform Automated Eye Diagram Measurements
- Optical Standards Measured Include:
  - SONET/SDH: OC1/STM0, OC3/STM1, OC12/STM4
  - Fibre Channel: FC133, FC266, FC531, FC1063
  - Gigabit Ethernet: 1.25 Gb/s
- With the Unique Autoset to Standard Mask Capability, You Do Not Need to Set Up the Vertical, Horizontal, Trigger or Filter Controls
- Set the Population Size for the Statistics Measurements
- Log the Measurement Results to a File for Future Analysis
- GPIB Control of Measurements for Use in ATE Applications
- Installs Inside the TDS Oscilloscope Requiring no External GPIB, RS-232 or PC

Applications

- Characterize the Quality of Your Optical Communications Signals with Accurate Eye Diagram Analysis

USER-INSTALLED, OSCILLOSCOPE RESIDENT EYE DIAGRAM MEASUREMENT PACKAGE

Option 2C, the Tektronix TDS Communication Signal Analyzer package, gives you the most comprehensive oscilloscope solutions for connecting to, capturing, and characterizing optical and electrical signals in high-speed communication designs. Based on the TDS 5000/7000 family of Digital Phosphor Oscilloscopes (DPOs), Option 2C and various measurement accessories tailor the oscilloscope for engineers debugging, characterizing, and verifying the compliance of communication systems to international standards.

TDSCEM1 adds additional capability to Option 2C by allowing communication customers to perform quantitative measurements on their eye diagrams in addition to qualitative mask testing. TDSCEM1 provides an extensive suite of additional measurements to support analysis and troubleshooting beyond simple pass-fail testing.

The following diagram and text describe the measurements performed:

- $T_{\text{cross1}}$ = time at which the first crossing occurs.
- $T_{\text{cross2}}$ = time at which the second crossing occurs.
- $P_{\text{top}}$ = mean of the most predominant peak in the histogram for box 1.
- $P_{\text{base}}$ = mean of the most predominant peak in the histogram for box 2.
- $P_{\text{cross}}$ = level at which the first crossing occurs.

$\text{Crossing} = \frac{100 \times (P_{\text{cross}} - P_{\text{base}})}{P_{\text{top}} - P_{\text{base}}}$

- $P_{\text{eye height}} = (P_{\text{top}} - 3\sigma_{\text{top}}) - (P_{\text{base}} + 3\sigma_{\text{base}})$
- $P_{\text{eye width}} = (T_{\text{cross2}} - 3\sigma_{\text{cross2}}) - (T_{\text{cross1}} + 3\sigma_{\text{cross1}})$
- $P_{\text{quality factor}} = \frac{P_{\text{top}} - P_{\text{base}}}{\sigma_{\text{top}} + \sigma_{\text{base}}}$

Applications

See Tektronix on the World Wide Web:
http://www.tektronix.com
EXTINCTION RATIO IS THE RATIO OF THE AVERAGE HIGH LOGIC LEVEL TO THE AVERAGE LOW LOGIC LEVEL. IN THE OPTION 2C EXTINCTION RATIO MEASUREMENT, THE \( P_{\text{top}} \) AND \( P_{\text{base}} \) LEVELS ARE DETERMINED BY USING ALL HIGH LOGIC LEVELS AND ALL LOW LOGIC LOW LEVELS. IN THE TDSCEM1 APPLICATION, THE \( P_{\text{top}} \) AND \( P_{\text{base}} \) LEVELS ARE DETERMINED BY USING THE MIDDLE 20% OF THE EYE OPENING. IN ADDITION, THE TDSCEM1 EXTINCTION RATIO MEASUREMENT ALLOWS THE USER TO DETERMINE THE STATISTICAL POPULATION SIZE BEFORE THE MEASUREMENT IS PERFORMED.

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\text{Ext ratio} = \frac{P_{\text{top}}}{P_{\text{base}}}
\]

\[
\text{Ext Ratio } \% = 100 \left( \frac{P_{\text{base}} - P_{\text{dark}}}{P_{\text{top}} - P_{\text{dark}}} \right)
\]

\[
\text{Ext Ratio } \text{dB} = 10 \log \left( \frac{P_{\text{top}} - P_{\text{dark}}}{P_{\text{base}} - P_{\text{dark}}} \right)
\]

JITTER IS THE TIME VARIATION OF THE SIGNAL ZERO CROSSING.

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\text{Jitter RMS} = \sigma
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\text{Jitter 6sigma} = 6\sigma
\]

\[
\text{Jitter PP} = \max - \min
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CUSTOMERS WHO WILL BENEFIT FROM TDSCEM1 ARE ELECTRONIC DESIGN ENGINEERS WORKING FOR COMMUNICATION EQUIPMENT MANUFACTURERS IN THE COMMUNICATIONS INDUSTRY WHO DEVELOP PRODUCTS WITH STANDARD COMMUNICATION INTERFACES. THESE ENGINEERS NEED TOOLS TO PROPERLY CHARACTERIZE THEIR DESIGNS AND VERIFY COMPLIANCE TO INDUSTRY STANDARDS. THESE STANDARDS INCLUDE SONET/SDH, FIBRE CHANNEL AND GIGABIT ETHERNET. CHARACTERIZATION OF THESE OPTICAL AND ELECTRICAL SIGNALS INCLUDE MASK TESTING AS WELL AS EYE DIAGRAM MEASUREMENTS.

TDSCEM1 COMES ON A SINGLE FLOPPY DISK, IS EASILY INSTALLED IN A TDS OSCILLOSCOPE, AND DOESN’T REQUIRE ANY EXTERNAL PROCESSING OR CONNECTIONS. AFTER INSTALLATION, THE APPLICATION IS ACCESSIBLE FROM THE OSCILLOSCOPE FRONT PANEL.

TEKTRONIX DIGITAL OSCILLOSCOPES SUPPORTED
TDS 500D, TDS 700D SERIES OSCILLOSCOPES WITH COMMUNICATION SIGNAL ANALYZER OPTION 2C AND A HARD DISK DRIVE (OPTION HD OR OPTION 2M).

ORDERING INFORMATION

TDSCEM1
Communications Eye-diagram Measurement Software for TDS 500/700 Oscilloscopes.

TDSCEM1 RECOMMENDED OPTIONS AND ACCESSORIES
AMT75 – 75 \( \Omega \) Adapter.
TDS Option 3C – (includes P6701B) Short-wavelength Fibre Channel Optical Reference Receiver.
TDS Option 4C – (includes P6703B) Long-wavelength SONET/SDH Optical Reference Receiver.
P6701B/P6703B – Optical-to-Electrical Converters.
P6723 – Optical Logic Probe.
OA5002/OA5012/OA5022/OA5032 – Optical Attenuators.

For further information, contact Tektronix:

Worldwide Web: For the most up-to-date product information visit our web site at: www.tektronix.com

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