TELEDYNE LECROY
Everywhere**you**look™

File | Vertical | Timebase | Trigger | Display | Cursors | Measure | Math | Analysis | Utilities | Support

Flashba... | Undo

Label = 273   SDI = 0   273   Data = 0x0300   Failure(0)   0x01

Raw = 2   Raw = 7   Raw = 3

Measure	P1:MsgToVal(Decode1)	P2:BusLoad(Decode1)	P3:DeltaMessages(...	P4:---	P5:---	P6:---	P7:---	P8:---
value	0.0 V	7.9 %	365.027406 µs					
mean	60.3 V	7.9 %	4.02 ms					
min	0.0 V	7.9 %	364.887400 µs					
max	255.0 V	7.9 %	48.246113253 ms					
sdev	103.0 V	—	10.78 ms					
num	494	1	493					
status	✓	✓	✓					

A...	Time	O	Label	SDI	Data	S...	P	Msg	Status
258	33.07 ms	1	145	0	0x00060	0	1	145	
259	33.44 ms	2	272	0	0x00000	0	0	272	
260	33.80 ms	2	273	0	0x00300	0	1	273	
261	34.17 ms	2	274	0	0x00400	0	1	274	
262	40.07 ms	0	50	0	0x742bf	0	1	50	

Z4	zoom(M4)	M4		Tbase	-1.64 ms	Trigger	C1 DC
	2.10 V/div		3.44 V/div		1.00 ms/div	Stop	-890 mV
	34.6 µs/div		200 ms/div	2.5 MS	250 MS/s	CAN FD	

Instruction Manual

Trigger, Decode,
Measure/Graph,
Eye Diagrams

for Avionics Protocols:
MIL-STD-1553
ARINC-429

Avionics Protocols TDME Instruction Manual

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Contents

About This Manual

Teledyne LeCroy offers a wide array of toolsets for decoding and debugging serial data streams. These toolsets may be purchased as optional software packages, or are provided standard with some oscilloscopes.

This manual explains the basic procedures for using serial data decoder and trigger software options. There are also sections pertaining to the measure and graphing capabilities and eye diagram tests.

This manual is presented with the assumption that:

- You have purchased and installed one of the serial data products described in this manual.

- You have a basic understanding of the serial data standard physical and protocol layer specifications, and know how these standards are used in embedded controllers.

- You have a basic understanding of how to use an oscilloscope, and specifically the Teledyne LeCroy oscilloscope on which the option is installed. Only features directly related to serial data triggering and decoding are explained in this manual.

Teledyne LeCroy is constantly expanding coverage of serial data standards and updating software. Some capabilities described in this documentation may only be available with the latest version of our firmware. You can download the free firmware update from:

teledynelecroy.com/support/softwaredownload

While some of the images in this manual may not exactly match what is on your oscilloscope display—or may show an example taken from another standard—be assured that the functionality is identical, as much functionality is shared. Product-specific exceptions will be noted in the text.

About the Options

Decode

Teledyne LeCroy decoders apply software algorithms to extract serial data information from physical layer waveforms measured on your oscilloscope. The extracted information is displayed over the actual physical layer waveforms, color-coded to provide fast, intuitive understanding of the relationship between message frames and other, time synchronous events.

Trigger

Trigger *and* decode (-TD) options enable you to trigger the oscilloscope acquisition upon finding specific message frames, data patterns, or errors in serial data streams. Conditional filtering at different levels enables you to target the trigger to a single message or a range of matching data.

Measure/Graph and Eye Diagrams

The installation of any -DME or -TDME option adds a set of measurements designed for serial data analysis and protocol-specific eye diagram tests to the standard trigger and decoder capabilities. See Measuring for instructions on using the measure and graphing capabilities. See Eye Diagram Tests for instructions on using the eye diagram tests.

About the MIL-STD-1553 Options

MIL-STD-1553 is a military standard published by the United States Department of Defense that defines the mechanical, electrical, and functional characteristics of a serial data bus.

A MIL-STD-1553 multiplex data bus system consists of a Bus Controller (BC) controlling multiple Remote Terminals (RT) all connected together by a data bus providing a single data path between the bus controller and all the associated remote terminals. Messages consist of one or more 16-bit words (command, data, or status). The 16 bits comprising each word are transmitted using Manchester code.

The MIL-1553 TD and TDME options decode MIL-STD-1553 signals and enable trigger on:

- Transfer type

- Word command type, data patterns, or status

- Protocol errors

- Timing characteristics, such as Inter-Message Gap time or Response Time

About the ARINC-429 Options

ARINC-429 is a data transfer standard for aircraft avionics, used as an alternative to MIL-STD-1553. It uses a self-clocking, self-synchronizing data bus protocol, with Tx and Rx on separate ports. Self-clocking is done at the receiver end, thus eliminating the need to transmit clocking data. The transmitter constantly transmits either 32-bit data words or the NULL state. Data words are 32 bits in length, and most messages consist of a single data word.

The ARINC-429bus D Symbolic and DME Symbolic options feature three Viewing Modes:

- The first two Modes group the bits in a pre-determined way following the basic ARINC-429 specification.

- The third Mode, called "User Defined", empowers engineers to completely customize the grouping of the raw bits into meaningful Data Types recommended by the ARINC 429 specification, such as Binary (signed and unsigned), BCD and Enumerated. The definition of the Data Types is specified for each Label separately and is conveniently stored in a User Label Definition File (ULDF). Each instrument emitting information in ARINC 429 can have its own ULDF files. The ULDF file for a given instrument, or instrument model, can easily be exchanged between parties working on or with the same instruments, such as the manufacturer, testers, integrators or certification authorities.

Serial Decode

The algorithms described here at a high level are used by all Teledyne LeCroy serial decoders sold for oscilloscopes. They differ slightly between serial data signals that have a clock embedded in data and those with separate clock and data signals.

Bit-level Decoding

The first software algorithm examines the embedded clock for each message based on a default or user- specified vertical threshold level. Once the clock signal is extracted or known, the algorithm examines the corresponding data signal at the predetermined vertical level to determine whether a data bit is high or low. The default vertical level is set to 50% and is determined from a measurement of peak amplitude of the signals acquired by the oscilloscope. For most decoders, it can also be set to an absolute voltage level, if desired. The algorithm intelligently applies a hysteresis to the rising and falling edge of the serial data signal to minimize the chance of perturbations or ringing on the edge affecting the data bit decoding.

> **Note:** Although the decoding algorithm is based on a clock extraction software algorithm using a vertical level, the results returned are the same as those from a traditional protocol analyzer using sampling point-based decode.

Logical Decoding

After determining individual data bit values, another algorithm performs a decoding of the serial data message after separation of the underlying data bits into logical groups specific to the protocol (Header/ID, Address Labels, Data Length Codes, Data, CRC, Parity Bits, Start Bits, Stop Bits, Delimiters, Idle Segments, etc.).

Message Decoding

Finally, another algorithm applies a color overlay with annotations to the decoded waveform to mark the transitions in the signal. Decoded message data is displayed in tabular form below the grid. Various compaction schemes are utilized to show the data during a long acquisition (many hundreds or thousands of serial data messages) or a short acquisition (one serial data message acquisition). In the case of the longest acquisition, only the most important information is highlighted, whereas in the case of the shortest acquisition, all information is displayed with additional highlighting of the complete message frame.

User Interaction

Your interaction with the software in many ways mirrors the order of the algorithms. You will:

- Assign a protocol/encoding scheme, an input source, and a clock source (if necessary) to one of the four decoder panels using the Serial Data and Decode Setup dialogs.

- Complete the remaining dialogs required by the protocol/encoding scheme.

- Work with the decoded waveform, result table, and measurements to analyze the decoding.

Decoding Workflow

We recommend the following workflow for effective decoding:

1. Connect your data and strobe/clock lines (if used) to the oscilloscope.

2. Set up the decoder using the lowest level decoding mode available (e.g., Bits).

3. Acquire a sufficient burst of relevant data. The data burst should be reasonably well centered on screen, in both directions, with generous idle segments on both sides.

    > **Note:** See Failure to Decode for more information about the required acquisition settings. A burst might contain at most 100000 transitions, or 32000 bits/1000 words, whichever occurs first. This is more a safety limit for software engineering reasons than a limit based on any protocol. We recommend starting with much smaller bursts.

4. Stop the acquisition, then run the decoder.

5. Use the various decoder tools to verify that transitions are being correctly decoded. Tune the decoder settings as needed.

6. Once you know you are correctly decoding transitions in one mode, continue making small acquisitions of five to eight bursts and running the decoder in higher level modes (e.g., Words). The decoder settings you verify on a few bursts will be reused when handling many packets.

7. Run the decoder on acquisitions of the desired length.

When you are satisfied the decoder is working properly, you can disable/enable the decoder as desired without having to repeat this set up and tuning process, provided the basic signal characteristics do not change.

Decoder Setup

Use the Decode Setup dialog and its protocol-related subdialogs to preset decoders for future use. Each decoder can use different (or the same) protocols and data sources, or have other variations, giving you maximum flexibility to compare different signals or view the same signal from multiple perspectives.

> **Tip:** After completing setup for one decoder, you can quickly start setup for the other decoders by using the buttons at the left of the Decode Setup dialog to change the Decode # .

1. Touch the **Front Panel Serial Decode button** (if available on your oscilloscope), or choose **Analysis > Serial Decode** from the oscilloscope menu bar. Open the **Decode Setup** dialog.

2. Select the **data source (Src 1)** to be decoded and the **Protocol** to decode.

3. If required by the protocol, also select the **Strobe** or **Clock** source. (These controls will simply not appear if not relevant.)

4. Define the bit- and protocol-level decoding on the subdialogs next to the Decode Setup dialog.

MIL-STD-1553 Decoder Settings

Basic Subdialog

Choose a **Table Mode** to optimize the result table for decoding Words or Transfers. Transfers adds columns for Resp(onse), Data, and IMG bits.

Select to view **Address** bits in Decimal or Hex(adecimal) format.

Select to view **Data** bits in Decimal, Hex(adecimal), or Binary format.

Enter the Response Time Limits in **From** and **To**.

Enter the Inter Message Gap **Miminum** time.

Levels Subdialog

Enter the vertical **Level High** and **Level Low** used to determine the edge crossings of the MIL-STD-1553 signal. This value will be used to determine the bit-level decoding. Level is normally set as a percentage of amplitude, and defaults to 50%. It can alternatively be set as an absolute voltage by changing the **Level Type** to absolute. If your initial decoding indicates that there are a number of error frames, make sure that the level is set to a reasonable value.

> **Note:** Choose High and Low values carefully, as they are applied across all amplitudes. For example: a transaction contains 20 V amplitude on the bus controller word and 2 V on the remote terminal reply words, a ratio of 10:2. The level has to be adjusted to decode the lowest amplitude words (2 V) with a gain of, say, 1 V/div and the high amplitude words (20 V), which are overflow but are still decoded.

ARINC-429 Decoder Settings

Basic Subdialog
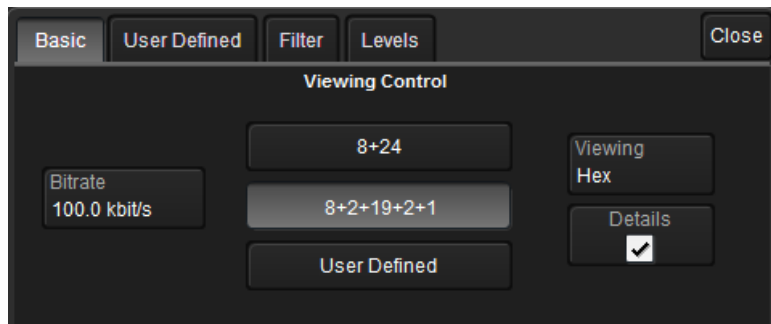
Enter the **Bitrate** of the bus to which you are connected as precisely as you know it. The value should be correct within 5%. A mismatched bit rate will cause various confusing side effects on the decoding, so it is best to take time to correctly adjust this fundamental value.

Under **Viewing Control** (viewing mode), select the Word format to apply: **8+24**, **8+2+19+2+1**, or **User Defined** in a custom label file. See Label File Format for instructions on preparing the file. Go to the User Defined tab to load the file.

In **Viewing**, choose to view/enter bits in Binary, Hex(adecimal), or Decimal format.

Check **Details** to see a Label's octal digits annotated (in all viewing modes). In 8+24 viewing mode, you will also see the grouping of bits into digits. BCD digits are marked on the decoded waveform, showing the correlation between the bit states and the n-bit BCD value.
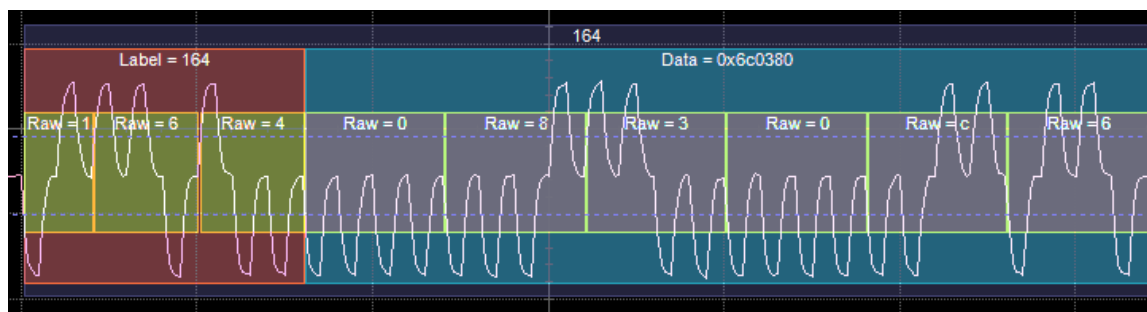
> **Note:** In the example above, the Label digits are interpreted using the most significant bit first, whereas the Data digits are interpreted least significant bit first.
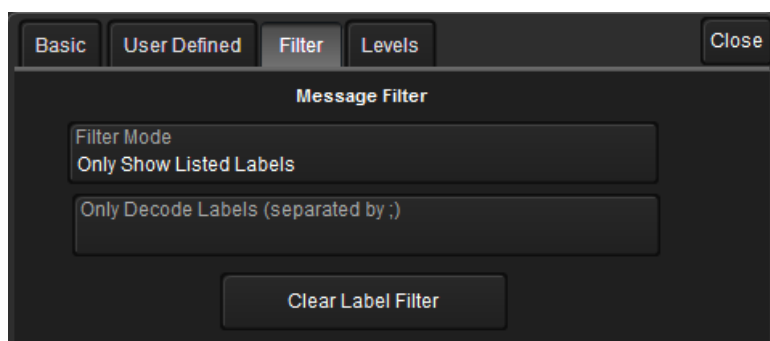
User Defined Subdialog

If you have chosen to use a custom symbolic label file, **Browse** to the file, then touch **Load** on the User Defined subdialog.

Touch **Clear** to remove labels loaded from the previous file before choosing a new file.
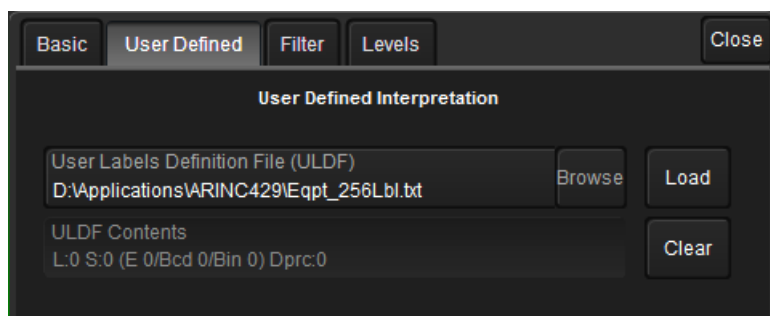
Filter Subdialog

Use the **Filter** subdialog to include or exclude certain tokens from the ARINC-429 decode.

Choose a **Filter Mode** of Only Show Selected Labels (include) or Show All Labels Except Those Listed (exclude).

In the following field, enter the list of Labels to include or exclude, separated by semi-colons.

Clear Label Filter resets the label list.

Levels Subdialog

Enter the high and low voltage **Level**(s) that will cross words of all amplitudes on the BPRZ signal. Level is usually set as a percentage of amplitude but may alternatively be set as an absolute voltage value by changing the **Level Type** setting.
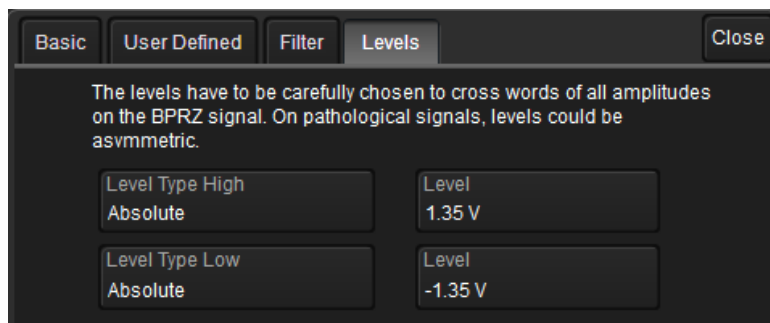
Label File Format

Label files (ULDF files) are Comma Separated Value (CSV) files containing the following tokens in the order shown. You can use any neutral text editor to create/modify your Label file, as long as it does not add extraneous characters or remove characters.

> **Note:** All unused tokens must be present to correctly parse the line. However, unused tokens can be left empty or contain a visual separator, such as "---" or "unused".

ULDF files support commented lines starting with // as the normal C++ convention. Comments can also be added at the end of the line, but not in the middle of the token list.

There is no limitation as to how many signals can be defined for a given label. Signals can be defined to be overlapping, which is an error in most cases that is easily corrected by editing the SigBits and Offset Fields.

Position	Field Name	Content Type	Range	Used by Decoder Algorithm?
1	Label	Decimal	0 to 377, label in which the signal resides	Yes
2	EquipmentID	Text	Free text	No
3	Name	Text	Free text, name of the signal	Yes
4	Units	Text	Free text	Yes, for binaries (signed and unsigned) and BCD signals only
5	Min	Text	Free text	No
6	Max	Text	Free text	No
7	SigBits	Decimal	1-32, number of bits spanned by the signal within the ARINC word. SigBits and Offset define the position and size of the annotation on the decoder overlay.	Yes, by all sub-types
8	PosSense	Text	Free text	No
9	Resolution	Decimal	-max double to +max double	Yes, for binaries (signed and unsigned) and BCD signals only
10	MinTransit	Text	Free text	No
11	MaxTransit	Text	Free text	No
12	LabelType1	Keyword	Label_Discrete is the only usable value	Yes
13	Offset	Decimal	0-31, zero-based offset in bits from bit 0 at the beginning of the message	Yes
14	DetailsList	Special format	SignedBinary, for example: Enum: On|Off Enum: Disengaged|Engaged Enum: Off|Low|Medium|Full BCD: 3|4 BCD: 2|4|4|4	Yes, additional information for BCD and Enumerated Discretes

Failure to Decode

Three conditions in particular may cause a decoder to fail, in which case a failure message will appear in the first row the the summary result table, instead of in the message bar as usual:

- **Under sampled**. If the sampling rate (SR) is insufficient to resolve the signal adequately based on the bit rate (BR) setup or clock frequency, the message "Under Sampled" will appear. The minimum SR:BR ratio required is 4:1. It is suggested that you use a slightly higher SR:BR ratio if possible, and use significantly higher SR:BR ratios if you want to also view perturbations or other anomalies on your serial data analog signal.

- **Too short acquisition**. If the acquisition window is to short to allow any meaningfull decoding, the message "Too Short Acquisition" will appear. The minimum number of bits required varies from one protocol to another, but is usually between 5 and 50.

- **Too small amplitude**. If the signal's amplitude is too small with respect to the full ADC range, the message "Decrease V/Div" will appear. The required amplitude to allow decoding is usually one vertical division.

In each case, the decoding is turned off to protect you from incorrect data. Adjust your acquisition settings accordingly, then re-enable the decoder.

> **Note:** It is possible that several conditions are present, but you will only see the first relevant message in the table. If you continue to experience failures, try adjusting the other settings.

Serial Decode Dialog

To first set up a decoder, go to the Decode Setup dialog. Once decoders have been configured, use the Serial Decode dialog to quickly turn on/off a decoder or make minor modifications to the settings.

To turn on decoders:

1. Touch the **Front Panel Serial Decode button** (if available on your oscilloscope), or choose **Analysis > Serial Decode** from the oscilloscope menu bar to access the Serial Decode dialog.

2. On the same row as the **Decode #**, check **On** to enable the decoder.

   As long as On is checked (and there is a valid acquisition), a result table and decoded waveform appear. The number of rows of data displayed will depend on the **Table#Rows** setting (on the Decode Setup dialog).

3. Optionally, modify the:

   - **Protocol** associated with the decoder.

   - **Data (Source)** to be decoded.

4. Check Link To Trigger **On** to tie this decoder setup to a serial trigger setup.

To turn off decoders: deselect the On boxes individually, or touch **Turn All Off**.

Reading Waveform Annotations

When a decoder is enabled, an annotated waveform appears on the oscilloscope display, allowing you to quickly read the results of the decoding. A colored overlay marks significant bit-sequences in the source signal. The overlay contains annotations corresponding to the Header/ID, Address, Labels, Data Length Codes, Data, CRC, Parity Bits, Start Bits, Stop Bits, Delimiters, Idle segments, etc. Annotations are customized to the protocol or encoding scheme.

The amount of information shown on an annotation is affected by the width of the rectangles in the overlay, which is determined by the magnification (scale) of the trace and the length of the acquisition. Zooming a portion of the decoder trace will reveal the detailed annotations.

MIL-STD-1553 Waveform Annotations

Annotation	Overlay Color (1)	Text (2)
Message	Charcoal (behind words)	<transfer type>
Word	Navy Blue (behind other fields)	<type> Word
Sync Bits	Grey	Sync = <value>
RT Address and SubAddress Bits	Brick Red	RT Address = <value> SubAddMode = <value>
Receive/Transmit Bit	Purple	< R	T >
Data Count Bits	Green	DataCount = <value>
Parity Bits	Royal Blue	<value>
Payload Data Bytes and Single-bit Condition Codes	Aqua Blue	Data = <value>
Reserved Bits	Yellow	Res = <value>
Response Time Check and Inter-Message Gap	Teal	# = <value> ** = <value>
Protocol Error	Bright Red (behind other fields)	Error=<type>

1. Combined overlays affect the appearance of colors.
2. Text in brackets < > is variable. The amount of text shown depends on your zoom factors.
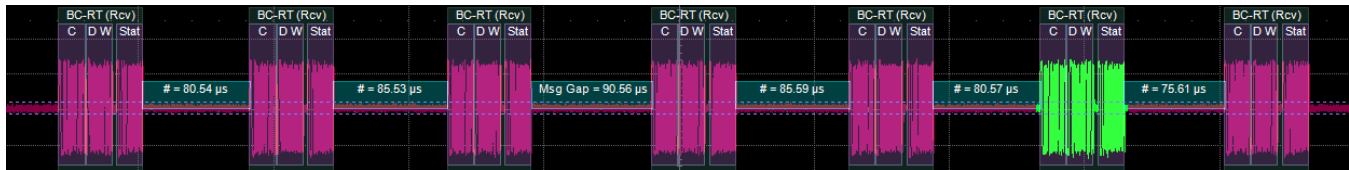
Initial decoding. At this resolution, little information appears on the overlay.
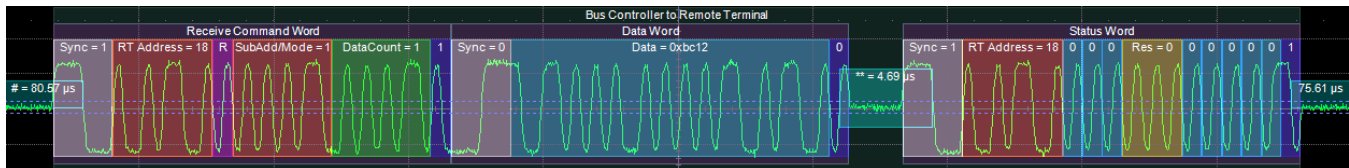
Zoom of single index showing annotation details.

Word and Transfer Level Error Codes

Word and Transfer Level errors are indicated by a 3-character code on the overlay.

Note: Lowercase codes indicate Word errors, while uppercase codes indicate Transfer errors.

Code	Error Type
par	Parity word
ADD	Add mismatch transfer
RTI	Response time transfer
WCO	Word count transfer
IMG	Inter-message gap transfer
CTG	Non-contiguous transfer

ARINC-429 Waveform Annotations

Annotation	Overlay Color (1)	Text (2) (3)
Frame ID	Navy Blue (behind other fields)	<value>
Label	Brick Red	Label = <value>
Raw Bits	Yellow (on top of Label)	Raw = <value>
Source-Destination ID	Olive Green	SDI = <value>
Payload Data	Aqua Blue	Data = <value>
Functional Test and Failure	Bright Green	FuncTest = <value> Fail (0)
Parity Bits	Royal Blue	<value>
Protocol Error	Bright Red (behind other fields)	Error=<type>

1. Combined overlays affect the appearance of colors.
2. Text in brackets < > is variable. The amount of text shown depends on your zoom factors.
3. Data values are shown in symbolic or hexadecimal depending on your decoder selection.
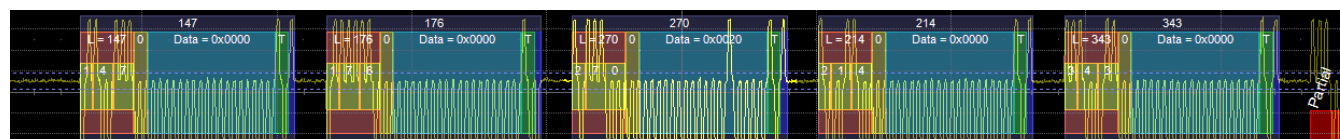
Initial decoding.
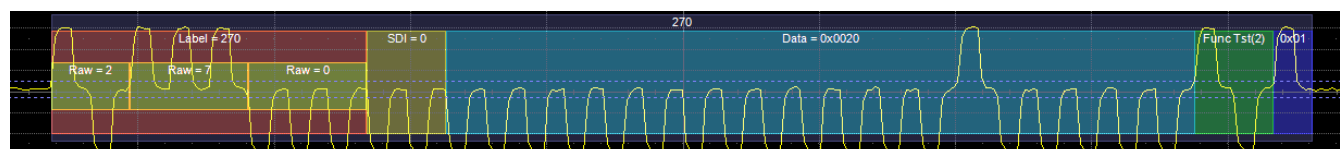
Zoom of single index showing annotation details.

Serial Decode Result Table

By default, a table summarizing the decoder results appears below the grids whenever a decoder is enabled. The result table provides a view of data as decoded during the most recent acquisition, even when the number of bursts are too many to allow legible annotation on the waveform trace.

The table is displayed only when the **View Decode** checkbox is marked on the Decode Setup Dialog *and* a source signal has been decoded using that protocol.

You can export result table data to a .CSV file.

Table Rows

Each row of the table represents one index of data found within the acquisition. Exactly what this represents depends on the protocol and how you have chosen to "packetize" the data stream when configuring the decoder (frame, message, packet, etc.).

> **Note:** For some decoders, it is even possible to turn off packetization, in which case all the decoded data appears on one row of the table.

See Using the Result Table for more information about how to interact with the table rows to view the decoding. Swipe the table up/down or use the scrollbar at the far right to navigate the table.

When multiple decoders are run at once, the index rows are combined in a summary table, ordered according to their acquisition time. The Protocol column is colorized to show which input source resulted in that index.

You can change the number of rows displayed on the table at one time. The default is five rows.

Table Columns

When a single decoder is enabled, the result table shows the protocol-specific details of the decoding. This **detailed result table** may be customized to show only those columns you want displayed.

Enabling two or more decoders switches the display to a combined table. A top-level **summary result table** (which cannot be changed) shows these columns of data for every decoding:

Column	Extracted or Computed Data
Index	Number of the line in the table
Time	Time elapsed from start of acquisition to start of message
Protocol	Protocol being decoded
Message	Message identifier bits
Data	Data payload
CRC	Cyclic Redundancy Check sequence bits
Status	Any decoder messages; content may vary by protocol

Index	Time	Protocol	Message	Data
▷ 281	-65.0107 ms	ARINC429	14	0x006ab
▷ 282	-64.6508 ms	ARINC429	324	0x05a84
▷ 283	-63.8517 ms	ARINC429	101	0x0d068
▷ 284	-63.4867 ms	ARINC429	103	0x00204
▷ 285	-63.1216 ms	ARINC429	104	0x00be0
▷ 286	-62.7566 ms	ARINC429	102	0x03f10

Example summary result table, with results from two decoders combined on one table.

When you select the Index number from the summary result table, the detailed results for that index drops-in below it.

Index	Time	Protocol	Message			Data			
◢ 281	-65.0107 ms	ARINC429	14			0x006ab			
		O	Label	SDI	Data		S...	P	Msg
		0	14	0	0x006ab		0	0	14
▷ 282	-64.6508 ms	ARINC429	324			0x05a84			
▷ 283	-63.8517 ms	ARINC429	101			0x0d068			
▷ 284	-63.4867 ms	ARINC429	103			0x00204			

Example summary result table showing drop-in detailed result table.

MIL-STD-1553 Result Table

> **Note:** Only a subset of these columns is shown in Word Table Mode.

Column	Extracted or Computed Data
Index (always shown)	Number of the line in the table
Time	Time elapsed from start of acquisition (trigger) to start of message
Type	Word type (CW, DW, SW) or Transfer Type (see Mil 1553 specification for the list of 10 Transfer Types), depending on the Table Mode
Summary	Summary of the Transfer, with RT address(es) and number of Words or Mode Code, depending on the Transfer Type
Sync	Sync Pulse Polarity
RTAddress	Remote terminal address
t/r	Transmit or Receive bit
SubAddress	Location of data
Count	Data count bit
ModeCode	Mode Command code
ResponseTime	Response latency of RT for all transfers using a handshake
RTAddressAck	Remote terminal acknowledge code
MsgErr	Message Error flag
Instr	Instrumentation flag
SRQ	Service Request flag
Reserved	Reserve bits (3)
BcastRec	Broadcast command received
Busy	Busy bit
SubSystFlg	Sub-system flag
DynBusAcc	Dynamic bus control accept
TermFlg	Terminal flag
Data	Data payload bytes
IMG	Inter-Message Gap time
Status	Information regarding message errors, etc.
Attributes	Attribute flags

MI...	Time	Type	Summary	Re...	Data	IMG	Status
1	-459 µs	BC-RT (Rcv)	RT 13: 1 DW	4.69 µs	0x0016		
2	-317 µs	BC-RT (Rcv)	RT 14: 1 DW	4.61 µs	0x0000	80.5 µs	
3	-171 µs	BC-RT (Rcv)	RT 15: 1 DW	4.67 µs	0x0016	85.5 µs	
4	-19.9 µs	BC-RT (Rcv)	RT 16: 1 DW	4.63 µs	0x0016	90.6 µs	

Section of typical MIL-STD-1553 detailed result table.

ARINC-429 Result Table

Column	Extracted or Computed Data
Index (always shown)	Number of the line in the table
Time	Time elapsed from start of acquisition (trigger) to start of message frame
OctalDigits	Octal Digits constituting the Label
Label	Identifier showing data type and parameter association, typically shown as octal numbers
SDI	Source-Destination Identifier
Data	Data payload bits 11-29
SSM	Sign-Status Matrix
Parity	Value of the parity bit for this message
Msg	Message Title derived from the ULDF file
Symbols	Information contents of the message resulting from symbolic information in the ULDF file
Status	Information regarding message errors, etc.

A....	Time	O	Label	SDI	Data	S...	P	Msg	Status
1	-9.90 µs	1	147	0	0x00000	2	1	147	
2	355.1 µs	1	176	0	0x00000	2	0	176	
3	720.1 µs	2	270	0	0x00020	2	1	270	
4	1.085 ms	2	214	0	0x00000	2	1	214	
5	1.450 ms	3	343	0	0x00000	2	1	343	
6	1.815 ms							Partial words can not decode	Partial

Section of typical ARINC-429 detailed result table.

Using the Result Table

Besides displaying the decoded serial data, the result table helps you to inspect the acquisition.

Zoom & Search

Touching any cell of the table opens a zoom centered around the part of the waveform corresponding to the index. The Z*x* dialog opens to allow you to rescale the zoom, or to Search the acquisition. This is a quick way to navigate to events of interest in the acquisition.

> 💡 **Tip:** When in combined table mode, touch any data cell *other than* Index and Protocol to zoom.

The table rows corresponding to the zoomed area are highlighted, as is the zoomed area of the source waveform; the highlight color reflects the zoom that it relates to (Z1 yellow, Z2 pink, etc.). As you adjust the scale of the zoom, the highlighted area may expand to several rows of the table, or fade to indicate that only a part of that Index is shown in the zoom.

When there are multiple decoders running, each can have its own zoom of the decoding highlighted on the combined table at the same time.

> 📄 **Note:** The zoom number is no longer tied to the decoder number. The software tries to match the numbers, but if it cannot it uses the next empty zoom slot.

Index	Time	Protocol	Message	Data		CRC	Status
▷ 281	-65.0107 ms	ARINC429	14	0x006ab			
▷ 282	-64.6508 ms	ARINC429	324	0x05a84			
▷ 283	-63.8517 ms	ARINC429	101	0x0d068			
▷ 284	-63.4867 ms	ARINC429	103	0x00204			
▷ 285	-63.1216 ms	ARINC429	104	0x00be0			
▷ 286	-62.7566 ms	ARINC429	102	0x03f10			

Example multi-decoder table, both zoomed indexes highlighted.

View Details

When viewing a combined table, touch the **Index number** in the first column to drop-in the detailed decoding of that record. Touch the Index cell again to hide the details.

If there is more data than can be displayed in a cell, the cell is marked with a white triangle in the lower-right corner. Touch this to open a pop-up showing the full decoding.

Data
2a 2a 2a 2a 2a 2a 2a 2a 2a 2a 2a 2a 2a 2a 2a 2a 2a 2a 2a 2a 2a 2a 2a 2a 2a 2a 2a 2a 2a 2a… ◢

Navigate

In single table mode, touch the **Index column header** (top, left-most cell of the table) to open the Decode Setup dialog. This is especially helpful for adjusting the decoder during initial tuning.

When in combined table mode, the Index column header cell opens the Serial Decode dialog, where you can enable/disable all the decoders. Touch the **Protocol** cell to open the Decode Setup dialog for the decoder that produced that index of data.

Customizing the Result Table

Follow these steps to change what data appears on the detailed result table:

1. Press the Front Panel **Serial Decode button** or choose **Analysis > Serial Decode**, then open the **Decode Setup tab**.

2. Touch the **Configure Table** button.

3. On the **View Columns** pop-up dialog, mark the columns you want to appear and clear those you wish to remove. Only those columns selected will appear on the oscilloscope display.

   > **Note:** If a selected column is not relevant to the decoding selections, the column will not appear in the table.

   To return to the preset display, touch **Default**.

4. Touch the **Close** button when finished.

On some decoders, you may also use the View Columns pop-up to set a **Bit Rate Tolerance** percentage. When implemented, the tolerance is used to flag out-of-tolerance messages (messages outside the user-defined bitrate +- tolerance) by colorizing in red the Bitrate shown in the table.

You may customize the size of the result table by changing the **Table # Rows** setting on the Decode Setup dialog. Keep in mind that the deeper the table, the more compressed the waveform display on the grid, especially if there are also measurements turned on.

Exporting Result Table Data

You can manually export the detailed result table data to a .CSV file:

1. Press the Front Panel **Serial Decode button**, or choose **Analysis > Serial Decode**, then open the **Decode Setup tab**.

2. Optionally, touch **Browse** and enter a new **File Name** and output folder.

3. Touch the **Export Table** button.

Export files are by default created in the D:\Applications\<protocol> folder, although you can choose any other folder on the oscilloscope or any external drive connected to a host USB port. The data will overwrite the last export file saved in the protocol directory, unless you enter a new filename.

> **Note:** When a combined table is exported, a combined file is saved in D:\Applications\Serial Decode. Separate files for each decoder are saved in D:\Applications\<protocol>.

In addition, the oscilloscope Save Table feature will automatically create tabular data files with each acquisition trigger. The file names are automatically incremented so that data is not lost. Choose **File > Save Table** from the oscilloscope menu bar and select **Decodex** as the source. Make other file format and storage selections as you wish.

Searching Decoded Waveforms

Touching the Action toolbar **Search button** button on the Decode Setup dialog creates a 10:1 zoom of the center of the decoder source trace and opens the Search subdialog.

Touching the **any cell** of the result table similarly creates a zoom and opens Search, but of only that part of the waveform corresponding to the index (plus any padding).

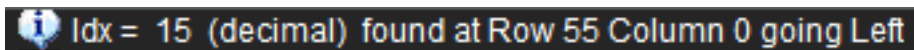**Tip:** In combined table mode, touch any cell *other than* Index and Protocol to create the zoom.

Basic Search

On the Search subdialog, select what type of data element to **Search for**. These basic criteria vary by protocol, but generally correspond to the columns of data displayed on the detailed decoder result table.

Optionally:

- Check **Use Value** and enter the **Value** to find in that column. If you do not enter a Value, Search goes to the beginning of the next data element of that type found in the acquisition.

- Enter a **Left/Right Pad**, the percentage of horizontal division around matching data to display on the zoom.

- Check **Show Frame** to mark on the overlay the frame in which the event was found.

After entering the Search criteria, use the **Prev** and **Next** buttons to navigate to the matching data in the table, simultaneously shifting the zoom to the portion of the waveform that corresponds to the match.

The touch screen message bar shows details about the table row and column where the matching data was found.

Advanced Search

Advanced Search allows you to create complex criteria by using Boolean AND/OR logic to combine up-to-three different searches. On the Advanced dialog, choose the **Col(umns) to Search 1 - 3** and the **Value** to find just as you would a basic search, then choose the **Operator(s)** that represent the relationship between them.

Serial Trigger

TD options provide advanced serial data triggering in addition to decoding. Serial data triggering is implemented directly within the hardware of the oscilloscope acquisition system. The serial data trigger scrutinises the data stream in real time to recognise "on-the-fly" the user-defined serial data conditions. When the desired pattern is recognised, the oscilloscope takes a real-time acquisition of all input signals as configured in the instrument's acquisition settings. This allows decode and analysis of the signal being triggered on, as well as concomittant data streams and analog signals.

The serial trigger supports fairly simple conditions, such as "trigger at the begining of any packet," but the conditions can be made more restrictive depending on the protocol and the available filters, such as "trigger on packets with ID = 0x456". The most complex triggers incorporate a double condition on the ID and data, for example "trigger on packets with ID = 0x456 and when data in position 27 exceeds 1000".

The trigger and decode systems are independant, although they are seamlessly coordinated in the user interface and the architecture. It is therefore possible to trigger without decoding and decode without triggering.

Requirements

Serial trigger options require the appropriate hardware (please consult support), an installed option key, and the latest firmware release.

Restrictions

The serial trigger only operates on one protocol at a time. It is therefore impossible to express a condition such as "trigger on CAN frames with ID = 0x456 followed by LIN packet with Adress 0xEBC."

Linking Trigger to Decoder

A quick way to set up a serial trigger is to link it to a decoder by checking the **Link to Trigger** ("On") box on the Serial Decode dialog. Linking decoder to trigger allows you to configure the trigger with the exact same values that are used for decoding the signal (in particular the bit rate), saving the extra effort needed to re-enter values on the serial trigger set up dialogs.

While the decoder and the trigger have distincts sets of controls, when the link is active, a change to the bit rate in the decoder will immediately propagate to the trigger and vice-versa.

MIL-STD-1553 Trigger Setup

To access the serial trigger dialogs:

- Touch the Trigger descriptor box or choose **Trigger > Trigger Setup** from the Menu Bar.

- Touch the **Serial** Type button, and the **MIL 1553** Standard button.

Then, working from left to right, make the desired selections from the MIL1553 dialog.

Source Setup

Select the **DATA** source channel.

Adjust the vertical level **Threshold High** and **Low**. MIL-STD-1553 is a tri-level signal and requires two voltage threshold settings to enable the oscilloscope to distinguish between 1 and 0. If you've linked this trigger to a MIL-STD-1553 decoder, these values are initially pulled from that setup.

Type

Choose one of the major trigger types of **Transfer**, **Word**, **Error**, or **Timing**.

The remaining options on the dialog will change to offer different trigger sub-types and condition settings. Because these options vary significantly, the remainder of this section will describe each trigger type separately.
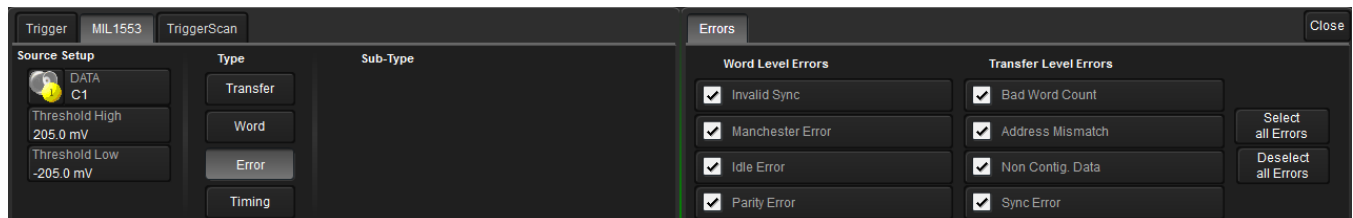
Timing Trigger

Timing triggers can be set on the sub-type of either **Response Time** or **Inter-Message Gap** time.

On the subdialog, set the timing condition upon which to trigger.
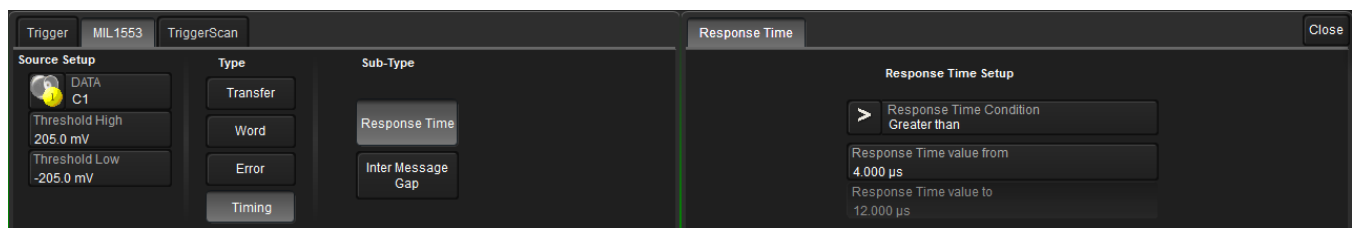
Error Trigger

The oscilloscope can be set to trigger on finding a various types of MIL-STD-1553 protocol errors. Just check all desired error types on the Errors subdialog.

Word Trigger

Word triggers fire upon finding a match to the trigger conditions in **Command**, **Data**, or **Status** Word frames. The **All** sub-type will trigger upon the start of any Word.

Under **Setup Format**, choose to enter the Word conditions in either Binary or Hex(adecimal) format.

> **Note:** In all condition statements, "X" may be used as a wild card in place of bit values where you don't care what value appears.

Command Word Trigger

On the Command subdialog:

- Create condition statements describing the **RT Address**(es) and/or **Sub Address**(es) that will be examined by the trigger. If you don't care about addresses, enter the condition "= XX".

- Create a condition statement describing the Command Mode Code upon which to trigger. For example, entering "= 0" fires the trigger upon finding Mode Code 0, Dynamic Bus Control, whereas entering "> 2" fires upon finding any code number higher than Mode Code 2, Transmit Status Word.


Data Word Trigger

On the Data subdialog, create a condition statement describing the data pattern upon which to fire the trigger. The data pattern can be further refined by defining a window, with the **Start Bit** and **#Data Bits**.

Status Word Trigger

On the Status subdialog:

- Create a condition statement describing the **RT Address**(es) that will be examined by the trigger.

- For each of the **Status Word** bits, enter the value upon which to trigger. Leave X where you "don't care" what the value is.
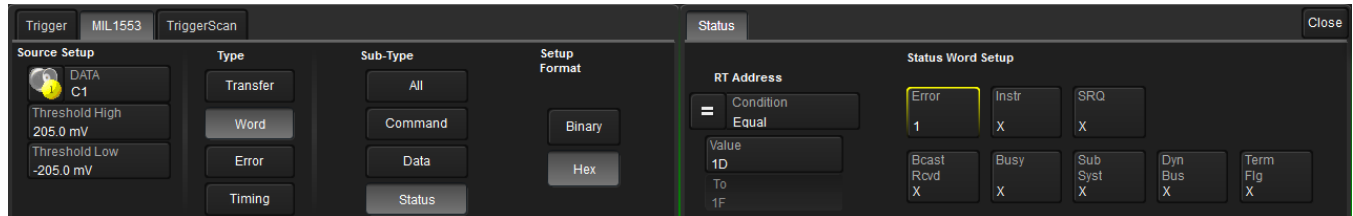
Transfer Triggers

Transfer triggers allow you to set complex conditions upon any combination of Command, Data, or Status Words that may occur during one of the MIL-STD-1553 Transfer types. (It is assumed here that you are familiar with the Transfer types specified by MIL-STD-1553B.)

First, choose trigger type **Transfer** and the **Transfer Type**. A list of possible combinations (e.g., BC-RT (Rcv), Mode Command) appear on the Transfer Type pop-up menu.

Transfer Types

The possible trigger conditions are presented on subdialogs according to the structure of the transfer. For example, if the selected Transfer has only one type of Word, only one corresponding Word subdialog will appear for entering the trigger condition. Conversely, if the Transfer has a structure with a Command Word and a Data Word, two subdialogs will appear. The logical binding is an AND condition. The trigger occurs when both the condition described on dialog 1 AND the condition on dialog 2 are met on the same Transfer. This logic extends to whatever number of conditions are specified.

Refer to the Command, Data, and Status Word Trigger procedures above for instructions on using each type of dialog to create a condition statement.

All		Triggers on any Transfer Type, without exercising conditions on the contents.
BC–RT (Rcv)		
RT–BC (Xmit)		
RT–RT		

Cmd	TxCmd1 TxStat1	Mode Command
Cmd (Xmit)	TxCmd1 DW TxStat1	Mode Command with Data from RT
Cmd (Rcv)	RxCmd2 DW RxStat2	Mode Command with Data to RT
BC–RT (S)	RxCmd2 DW	Mode Command with Data Broadcast
RT–RT(S)	TxCmd1 RxCmd2 DW TxStat1	Mode Command with Data Broadcast
Cmd(S)	TxCmd1	Mode Command Broadcast
Cmd(S) (Rcv)	RxCmd2 DW	Mode Command with Data Broadcast

Example: Triggering on an RT−BC Transfer

The image below is a composite of trigger setup dialogs. The set of right-hand subdialogs matches the selected Transfer Type of RT to BC: 1 TxCmd, 1 Data and 1 TxStatus.

The condition specifies that a trigger should occur when RT address=4 AND Data Word is position 32 = 0006. This exact event has been detected where the trigger position indicators (small pink and yellow triangles) appear on the waveform decoding. Note that the trigger position indicator is placed chronologically *after* the occurrence of DW=0006. This reflects the fact that the trigger, if it occurs, can only be emitted after all the conditions have been met.

The following image shows the trigger that would occur if the Data Word condition were changed so that the DW value was 0002 instead of 0006.

This trigger occurs on the same Transfer Type (RT–BC) for the same RT Address (RT=4) at the same Bit Offset (32), but for a DW Value of 0002. The trigger position indicator is now observed after DW = 0002, which in fact lies in another Transfer (the zoom Z1 is positioned differently on C2 then it was in the first image).

Using the Decoder with the Trigger

A key feature of Teledyne LeCroy trigger and decode options is the integration of the decoder functionality with the trigger. While you may not be interested in the decoded data per se, using the decoded waveform can help with understanding and tuning the trigger.

Stop and Look

Decoding with repetitive triggers can be very dynamic. Stop the acquisition and use the decoder tools such as Search, or oscilloscope tools such as TriggerScan, to inspect the waveform for events of interest. Touch and drag the paused trace to show time pre- or post-trigger.

Optimize the Grid

The initial decoding may be very compressed and impossible to read. Try the following:

- Increase the height of the trace by *decreasing* the gain setting (V/Div) of the decoder source channel. This causes the trace to occupy more of the available grid.

- Change your Display settings to turn off unnecessary grids. The Auto Grid feature automatically closes unused grids. On many oscilloscopes, you can manually move traces to consolidate grids.

- Close setup dialogs.

Use Zoom

The default trigger point is at zero (center), marked by a small triangle of the same color as the input channel at the bottom of the grid. Zoom small areas around the trigger point. The zoom will automatically expand to fit the width of the screen on a new grid. This will help you to see that your trigger is occurring on the bits you specified.

If you drag a trace too far left or right of the trigger point, the message decoding may disappear from the grid. You can prevent "losing" the decode by creating a zoom of whatever portion of the decode interests you. The zoom trace will not disappear when dragged and will show much more detail.

Saving Trigger Data

The message decoding and the result table are dynamic and will continue to change as long as there are new trigger events. As there may be many trigger events in long acquisitions or repetitive waveforms, it can be difficult (if not impossible) to actually read the results on screen unless you stop the acquisition. You can preserve data concurrent with the trigger by using the **AutoSave** feature.

- AutoSave Waveform creates a .trc file that copies the waveform at each trigger point. These files can be recalled to the oscilloscope for later viewing. Choose **File > Save Waveform** and an Auto Save setting of **Wrap** (overwrite when drive full) or **Fill** (stop when drive full). The files are saved in D:\Waveforms.

- AutoSave Table creates a .csv file of the result table data at each trigger point. Choose **File > Save Table** and an Auto Save setting of **Wrap** or **Fill**. The files are saved in D:\Tables.

⚠️ **Caution:** If you have frequent triggers, it is possible you will eventually run out of hard drive space. Choose Wrap only if you're not concerned about files persisting on the instrument. If you choose Fill, plan to periodically delete or move files out of the directory.

Measure/Graph

The installation of the Measure/Graph package (included with any -DME or -TDME option) adds a set of measurements and plots designed for serial data analysis to the oscilloscope's standard measurement capabilities. Measurements can be quickly applied without having to leave the waveform or tabular views of the decoding.

> **Note:** This functionality was formerly offered as part of -TDM options and the PROTObus MAG software option. The features described in this section should be present If you have either of these installed on your oscilloscope.

Serial Data Measurements

These measurements designed for debugging serial data streams can be applied to the decoded waveform. Measurements appear in a tabular readout below the grid (the same as for any other measurements) and are in addition to the result table that shows the decoded data. You can set up as many measurements as your oscilloscope has parameter locations.

> **Note:** Measurements appear in the Serial Decode sub-menu of the Measure Setup menu and may have slightly different names. The measurements are the same.

Measurement	Description
AnalogToMsg	Computes time from crossing threshold on an analog signal to start of first message that meets conditions. If the message condition precedes the analog condition, no measurement is performed.
BusLoad	Computes the load of user-defined messages on the bus (as a percent).
DeltaMsg	Computes time difference between two messages on a single decoded line.
MsgBitrate	Computes the bitrate of user-specified messages on decoded traces.
MsgToAnalog	Computes time from start of first message that meets conditions to crossing threshold on an analog signal. If the analog condition precedes the message condition, no measurement is performed.
MsgToMsg	Computes time difference from start of first message that meets conditions to start of next message.
MsgToValue	Extracts and converts a specific portion of the data/payload in the message and displays it as an analog value.
NumMessages	Computes the total number of messages in the decoding that meet conditions.
Time@Msg	Computes time from trigger to start of each message that meets conditions.

Graphing Measurements

The Measure/Graph package include simplified methods for plotting measurement values as:

- **Histogram** - a bar chart of the number of data points that fall into statistically significant intervals or bins. Bar height relates to the frequency at which data points fall into each interval/bin. Histogram is helpful to understand the modality of a parameter and to debug excessive variation.

- **Trend** - a plot of the evolution of a parameter over time. The graph's vertical axis is the value of the parameter; its horizontal axis is the order in which the values were acquired. Trending data can be accumulated over many acquisitions. It is analogous to a chart recorder.

- **Track** - a time-correlated accumulation of values for a single acquisition. Tracks are time synchronous and clear with each new acquisition. Track can be used to plot data values and compare them to a corresponding analog signal, or to observe changes in timing. A parameter tracked over a long acquisition could provide information about the modulation of the parameter.

These plots effectively perform a digital-to-analog conversion that can be viewed right next to the decoded waveform.

To graph a measurement, just select the plot type from the Measure/Graph dialog when setting up the measurement. All plots are created as Math functions that open along side the deocoding in a separate grid.

Measure/Graph Setup Dialog

Use the Measure/Graph Setup dialog, which appears behind the Decode Setup dialog when measurements are supported, to apply serial data measurement parameters and simultaneously graph the results.
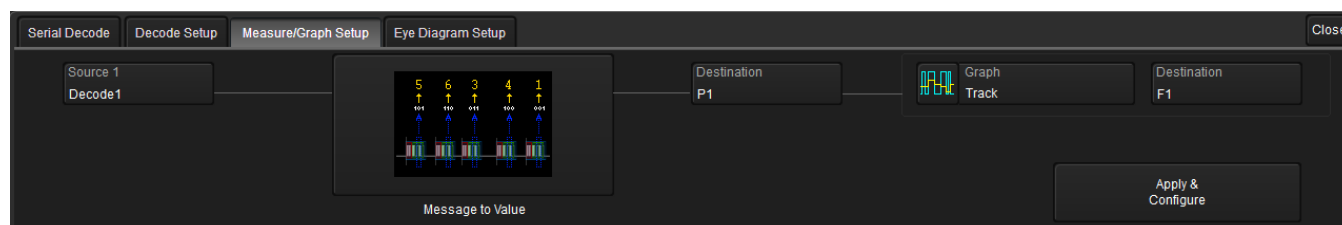
1. Select the **Measurement** to apply and the **Destination** parameter location (P*x*) in which to open it.

2. The active decoder is preselected in **Source 1**, indicating the measurement will be applied to the decoder results; change it if necessary. If the measurement requires it, also select an appropriate Source 2 (e.g., an analog waveform for comparison).

3. Optionally:

   - Touch Graph to select a plot type. Also select a **Destination** function (F*x*) for the plot.

   - Touch **Apply & Configure** to set a measurement filter or gate.

Filtering Serial Decode Measurements

For certain protocols, measurements can be filtered to include only the specified frame types, IDs, or data patterns. As with all traces, you can set a gate to restrict measurements to a horizontal range of the grid corresponding to a specific time segment of the acquisition.

> **Note:** Not all measurements support all filter types.

After creating a measurement on the Measure/Graph Setup dialog, touch **Apply&Configure**. The touch screen display will switch to the standard Measure setup dialogs for the parameter you selected.

Set filter conditions on the right-hand subdialogs that appear next to the P*x* dialogs.

Frame ID Filter

This filter restricts the measurement to only frames with a specific ID value. Settings on this dialog may change depending on the protocol.

1. On the Main subdialog, in **Filter** choose ID or ID+Data.

2. Open the **ID tab** that appears and choose to enter the ID value in **Binary** or **Hex**(adecimal) format.
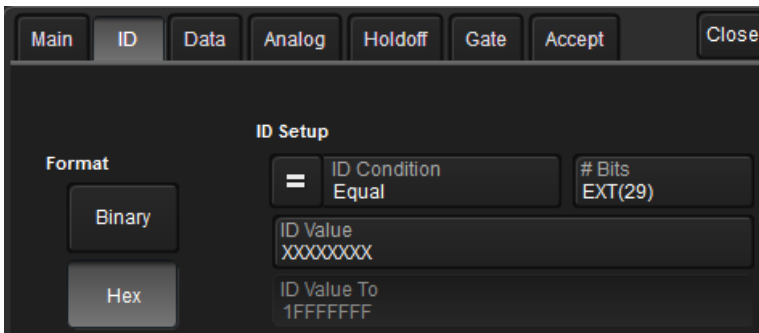
3. Using the **ID Condition** and **ID Value** controls, create a condition statement that describes the IDs you want included in the measurement. To set a range of values, also enter the **ID Value To**.

> **Tip:** On the value entry pop-up: use the arrow keys to position the cursor; use Back to clear the previous character (like Backspace); use Clear to clear all characters.

Data Filter

This restricts measurements to only frames containing extracted data that matches the filter condition. It can be combined with a Frame ID filter by choosing ID+Data on the Main subdialog.

Use the same procedure as above to create a condition describing the **Data Value(s)** to include in the measurement. Use "X" as a wild card ("Don't Care") in any position where the value doesn't matter.

Optionally, enter a **Start Position** within the data field byte to begin seeking the pattern, and the **# Bits** in the data pattern. The remaining data fields positions will autofill with "X".

> **Note:** For MsgtoMsg measurements, the data condition is entered twice: first for the Start Message and then for the End Message. The measurement computes the time to find a match to each set of conditions.

Analog Filter

This filter applies only to parameters that measure the decoded serial data signal relative to an analog waveform: AnalogtoMsg and MsgtoAnalog. It allows you to set the crossing level and slope of the Analog waveform event that is to be used in the measurement. Level may be set as a percentage of amplitude (default), or as an absolute voltage level by changing **Level Is** to Absolute. You can also use **Find Level** to allow the oscilloscope to set the level to the mean top-base amplitude.

The optional **Hysteresis** setting imposes a limit above and below the measurement level, which precludes measurements of noise or other perturbations within this band. The width of the band is specified in milli-divisions.

Observe the following when using Hysteresis:

- Hysteresis must be larger than the maximum noise spike you wish to ignore.

- The largest usable hysteresis value must be less than the distance from the level to the closest extreme value of the waveform.

Value Conversion Filter

This filter applies only to the MsgtoValue parameter. It enables you to apply a value conversion to extracted data. The converted values appear in the result table.

1. Under Data to Extract, begin by entering the **Start position** and the **# Bits** to extract.

2. Choose the **Encoding** type if the signal uses encoding, otherwise leave it Unsigned.

3. Under Conversion, enter the **a. Coefficient** and **b. Term** that satisfy the formula:
   *Value = Coefficient * Raw Value + Term*.

4. Optionally, enter a **Unit** for the extracted decimal value.

Holdoff, Gate, and Accept

Certain measurements support holdoff, gating, or additional qualifiers (Accept). You will see the tab appear among the parameter subdialogs when the function is supported. When applied to serial data measurement, these functions work exactly as they do elsewhere in the oscilloscope:

- **Holdoff** specifies the amount of time or number of events to wait before starting the measurement.

- **Gate** specifies the Start Div and Stop Div that bound the portion of the acquisition to include in the measurement.

- **Accept** allows you to set qualifiers based on waveform state, either the measurement source or a second "gating" waveform, or to only accept measurement values that fall within pre-defined ranges.

See the oscilloscope *Operator's Manual* for more information.

Eye Diagram Tests

The -DME and -TDME options provide easy eye diagram setup and eye mask testing.

Eye diagrams are a key component of serial data analysis. They are used both quantitatively and qualitatively to understand the quality of the signal communications path. Signal integrity effects such as intersymbol interference, loss, crosstalk and EMI can be identified by viewing eye diagrams, such that the eye is typically viewed prior to performing any further analysis.

Each pixel in the eye takes on a color that indicates how frequently a signal has passed through the time and voltage specified for that pixel. The eye diagram shows all values a digital signal takes on during a bit period. A bit period (also referred to as unit interval, or UI) is defined by the data clock, whether explicit or extrapolated depending on the protocol.

Eye diagrams show the acquired signal that is currently being shown in the decoder. They are not persistent, as are eye diagrams generated in some other serial data analysis software, the eye will change from one acquisition to the next. Our recommended approach for using the eye diagrams is to:

- Make single shot acquisitions with decoder and eye diagram enabled to check that both are working correctly.

- Run a normal acquisition with Mask Testing and Stop On Failure enabled in the Mask Failure Locator, or with a Pass/Fail test set on one of the eye parameters.

## Eye Diagram Setup Dialog
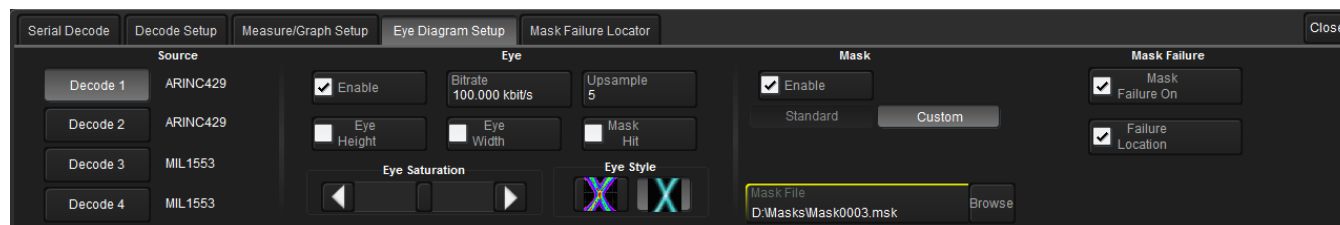
Create Eye Diagram

Open the **Eye Diagram Setup** dialog and select the **Decode** for which to create an eye diagram.

Under Eye, check **Enable** to display the eye diagram.

The **Bitrate** is automatically read from the decoder setup. This value is linked to the decoder bit rate setting, and changing it in either place will update both settings.

The **Upsample** factor increases the number of sample points used to compose the eye diagram. Increase from 1 to a higher number (e.g. 5) to fill in gaps. Gaps can occur when the bitrate is extremely close to a submultiple of the sampling rate, such that the sampling of the waveform does not move throughout the entire unit interval. Gaps can also occur when using a record length that does not sample a sufficiently large number of unit intervals.

The **Eye Style** may utilize color-graded or analog persistence:

- With **color-graded** persistence , pixels are given a color based on the pixel's relative population and the selected Eye Saturation. The color palette ranges from violet to red.

- With **analog** persistence , the color used mimicks the relative intensity that would be seen on an analog oscilloscope.

Use the **Eye Saturation** slider to adjust the color grading or intensity. Slide to the left to reduce the threshold required to reach saturation.

Choose to display the **Eye Height**, **Eye Width**, or **Mask Hit(s)** measurement parameters. These are added to the Measure table in the first open parameter slots.

Eye Mask Test

Under Mask, check **Enable** to turn on eye mask testing.

Select to use either a **Standard** or **Custom** mask, then either select the **Standard Mask** or **Browse** to and select your custom **Mask File**.

> **Tip:** Masks previously created on the instrument are stored in D:\Masks. For ease of selection, copy other .msk files to this location.

Check **Mask Failure On** to mark the parts of the eye diagram that fail the mask test. Mask violations appear as red failure indicators where the eye diagram intersects the mask.

Check **Failure Location** to display the Mask Failure Locator dialog.

Mask Failure Locator Dialog

Use this dialog to quickly search the acquisition for eye diagram mask test failures.
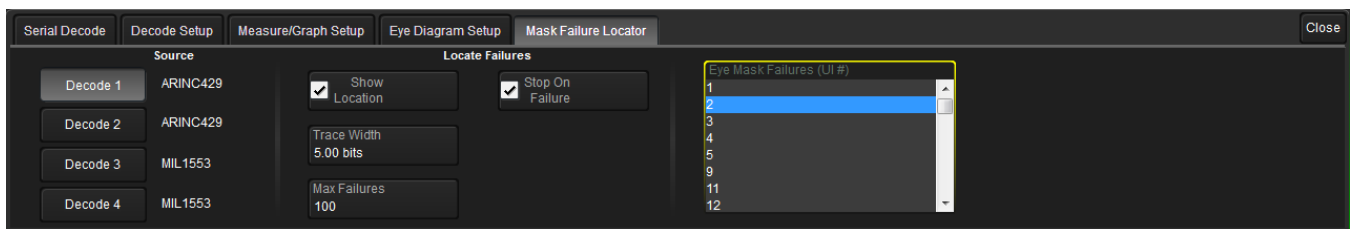
In **Trace Width,** enter the number of UIs surrounding the mask violation to display as "padding."

Check **Stop On Failure** to stop acquisition whenever an eye mask failure occurs.

Enter the **Max Failures** to retain in the Eye Mask Failure list.

Select from the **Eye Mask Failure** list to mark and zoom to the location of that failure. Yellow circles appear over the red failure indicators to show the location of the failure.

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