Acute®
PC-based T&M Instruments

LTPI Analyzer Solution

Contents

Overview

Supported models:

BF6264B	BF7264B	BF7264B+	BF7264B Pro
	●	●	●

The BF7264B/B+/Pro has two USB ports on the front panel.

In addition to the original logic-analyzer and bus-analyzer functions, the LTPI analyzer function is added.

BF7264B / BF7264B+ / BF7264B Pro series

LTPI solution specifications:

1. **BF7264B / B+ / Pro, 32Gb RAM, with the LTPI TX / RX Way Stations (Slot B plus the two front-panel USB ports)**
2. **Supports LTPI (LVDS Tunneling Protocol & Interface) as defined in OCP DC-SCM 2.0, including SDR and DDR transfer modes**
3. **Analyzes LTPI links up to 1.2Gbps**
4. **Real-time frame decode: comma (K28.5 / K28.6 / K28.7) alignment, frame type / subtype classification, CRC-8 check with error marking**
5. **Frame Report lists Tx / Rx frames with full field decode in table form**
6. **Tunneled Report reconstructs the channel contents: complete I2C transactions (Start / address / R/W / ACK / data / Stop), GPIO bit changes and UART bytes, with Combined / Separate view modes**
7. **Statistics by Tx / Rx / Error with click-to-jump to the corresponding frame**
8. **Waveform view shows the four LTPI channels together with the decoded result**
9. **LTPI trigger: CRC error, symbol error or disparity error, or a Tx / Rx data pattern up to 16 bytes; the comma character is selectable on the settings page**

10. OEM / Vendor custom fields via AqLTPI_Vendor.csv (field name, bit range, enumerations, engineering-unit scaling)

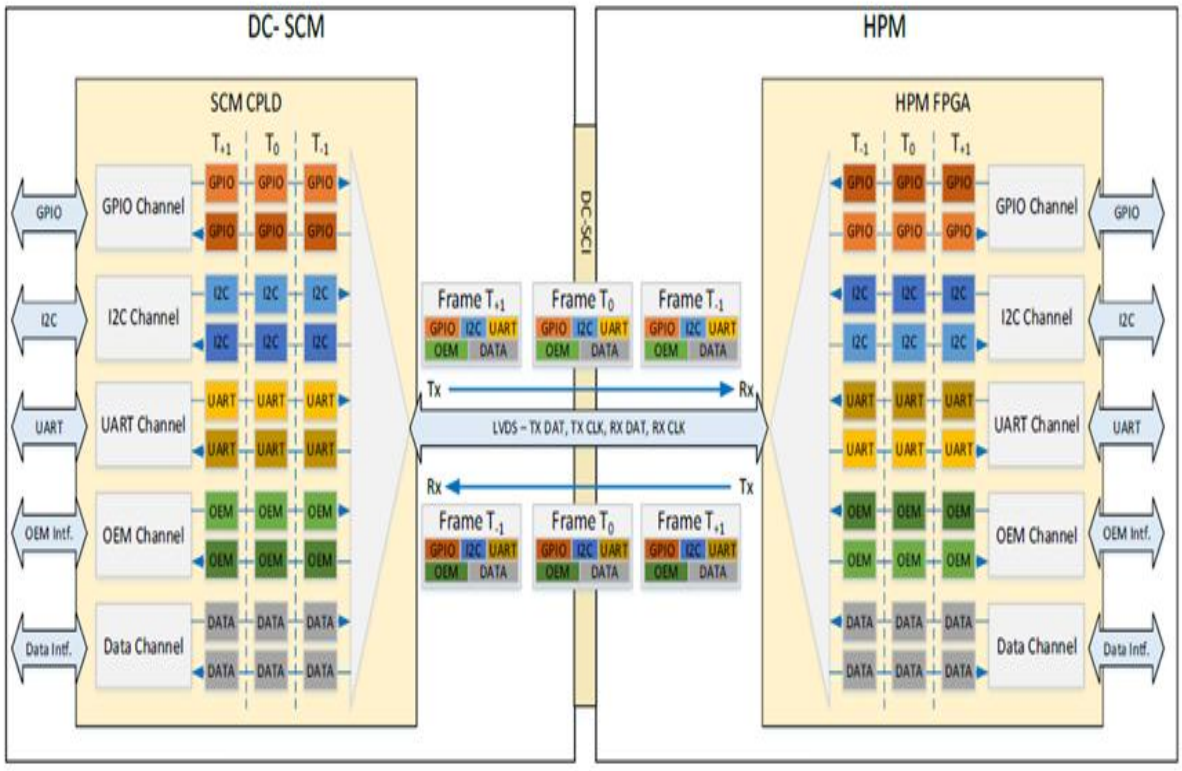
11. 32Gb RAM with disk streaming for long captures

12. Search and Filter functions

Introduction

LTPI (LVDS Tunneling Protocol & Interface) is an interface protocol designed for transmitting low-speed signals between the HPM (Host Processor Module) and SCM (Server Control Module). It supports multiple channels such as GPIO, I2C/SMBus, and UART, utilizing time-division multiplexing (TDM) over LVDS links to achieve multi-channel transmission.

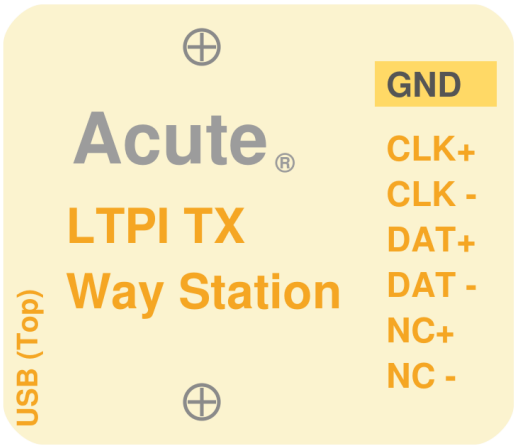
The GPIO channel includes both low-latency and normal-latency types. The I2C/SMBus channel handles single-controller communication links. The UART channel supports flow control. Additionally, an OEM channel is provided for proprietary interfaces, and a data channel supports memory image data transfers



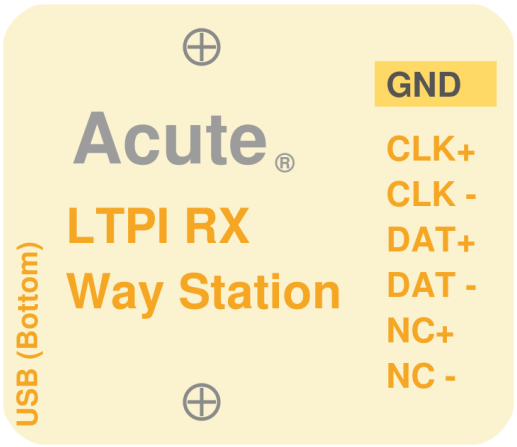
Connection

Slot B is the only probe slot on the instrument. The two USB ports on the front panel must also be connected to the Way Stations: the upper USB port goes to the LTPI TX (Top) Way Station and the lower USB port to the LTPI RX (Bottom) Way Station — they must not be

swapped. After connecting, check that one red and one green LED are lit on each of the two Way Stations.



6.25x5.4cm



6.25x5.4cm

There are two Way Stations, one TX and one RX, each 6.25 × 5.4 cm. Both carry the same panel pins, from top to bottom: GND, CLK+, CLK−, DAT+, DAT−, NC+, NC−:

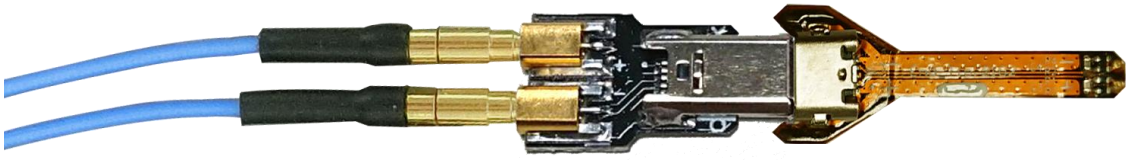
Pin	LTPI TX Way Station	LTPI RX Way Station
GND	Ground	Ground
CLK+ / CLK−	Tx CLK differential pair	Rx CLK differential pair
DAT+ / DAT−	Tx DATA differential pair	Rx DATA differential pair
NC+ / NC−	Reserved, not used	Reserved, not used

Soldering

Connect the End-tip to the target with jumper wires; the wires must be shorter than 5mm to keep the signal quality.

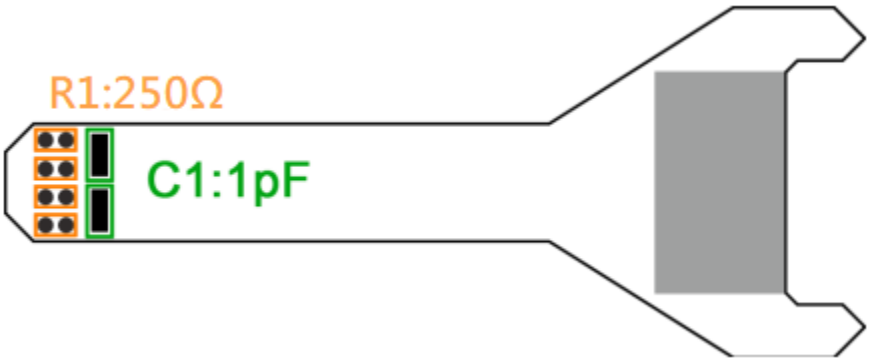
If the wires cannot be kept under 5mm, solder a 100Ω resistor at the signal source first and run the jumper from behind that resistor to the End-tip; the wire may then be up to about 3cm long.

Step 1: mate the SMPM-SMPM cable with the End-tip first — listen for the click.



Step 2: then solder the jumper wires, so that plugging the SMPM cable in afterwards cannot disturb them.

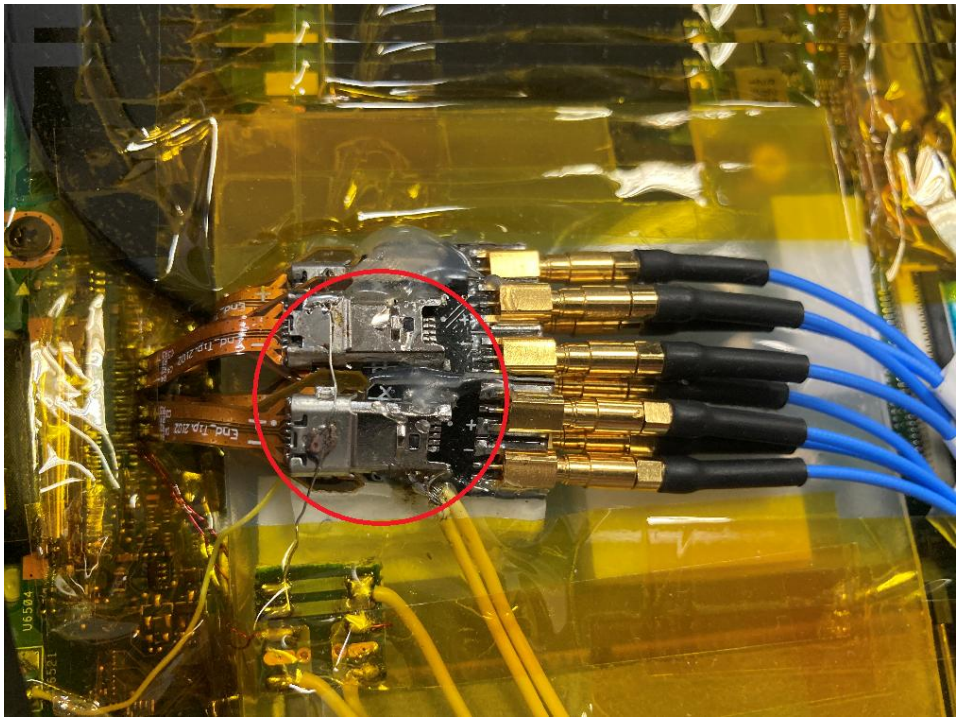
Note: the End-tip carries R1 = 250Ω and C1 = 1pF; both can be replaced if they are damaged while soldering.



Grounding

The instrument and the system under test must share a ground: connect the GND port of both Way Stations to the ground of the target.

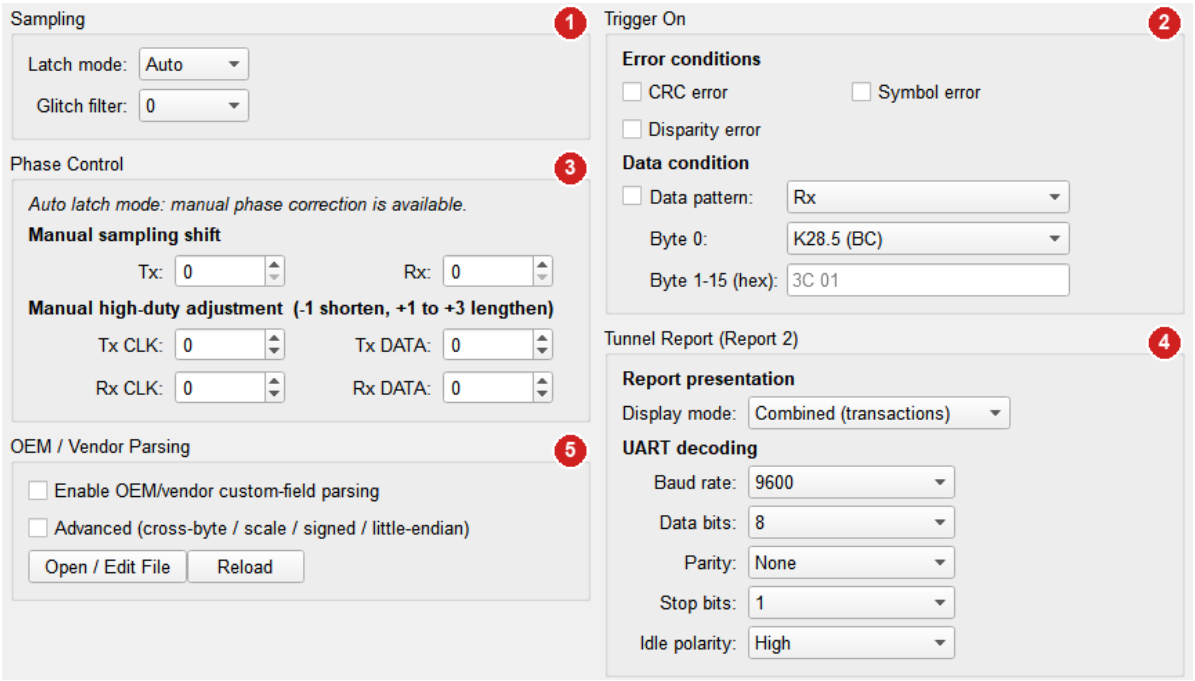
If the signal quality is poor or the interference is high, grounding every End-tip works best (the red circle below).



Settings

The protocol settings page configures LTPI sampling, phase, reporting and trigger conditions.

The functional groups are:



1. Sampling: the latch mode (SDR / DDR / Auto detect) and the glitch filter width (0-3).

2. Trigger On: the analyzer-side trigger conditions. CRC error, symbol error and disparity error can be selected, or a data-pattern match can be enabled (lane Tx / Rx, the Byte 0 comma character K28.5 / K28.6 / K28.7, and a hex pattern for bytes 1-15).

3. Phase Control: phase compensation. The Tx / Rx sampling point can be shifted (wave shift, 16 steps, 0-15) and the high-duty of each signal fine-tuned (-1 to shorten, +1 to +3 to lengthen). In SDR / DDR the firmware adjusts the phase automatically; manual values are only needed in Auto mode.

4. Tunnel Report (Report 2): the Tunneled Report presentation (Combined, one row per transaction / Separate, one row per event) and the UART decode parameters: baud rate, data bits, parity, stop bits and idle polarity.

5. OEM / Vendor Parsing: OEM custom-field parsing. Parsing can be enabled, the advanced tier switched on (cross-byte / scaling / signed / little-endian), and the AqLTPI_Vendor.csv definition file opened or reloaded directly.

Analysis Functions

Frame Report

Lists Tx / Rx frames in time order with frame type, subtype, CRC check result and full field decode; clicking a row shows the 16 raw bytes and a field-by-field breakdown in the detail pane.

Timestamp (h:m:s.ms.us.ns dur)	Dir	Frame	Subtype	Data(h)	CRC	Information
0:00:00.000.000.000	Tx	K28.5	Link Detect (00)	BC 00 10 00 00 00 00 00...	OK	V1.0 SPEED=0X00 100MHz SDR
0:00:00.000.000.160	Rx	K28.5	Link Detect (00)	BC 00 10 00 00 00 00 00...	OK	V1.0 SPEED=0X00 100MHz SDR
0:00:00.000.001.280	Tx	K28.5	Link Speed (01)	BC 01 10 81 00 00 00 00...	OK	V1.0 SPEED=0X81 100MHz SDR
0:00:00.000.001.440	Rx	K28.5	Link Speed (01)	BC 01 10 81 00 00 00 00...	OK	V1.0 SPEED=0X81 100MHz SDR
0:00:00.000.002.560	Tx	K28.6	Advertise (00)	DC 00 01 02 03 00 00 00...	OK	PLATFORM=0X0102 CAP=0X03
0:00:00.000.002.720	Rx	K28.6	Advertise (00)	DC 00 01 02 03 00 00 00...	OK	PLATFORM=0X0102 CAP=0X03
0:00:00.000.003.840	Tx	K28.6	Configure (01)	DC 01 03 00 00 00 00 00...	OK	CAP=0X03
0:00:00.000.004.000	Rx	K28.6	Accept (02)	DC 02 03 00 00 00 00 00...	OK	CAP=0X03
0:00:00.000.005.120	Tx	K28.7	Default IO (00)	FC 00 01 00 00 00 00 00...	OK	FRMCNT=1 LLGPIO=0X0000 100MHz SDR
0:00:00.000.005.280	Rx	K28.7	Default IO (00)	FC 00 01 00 00 00 00 00...	OK	FRMCNT=1 LLGPIO=0X0000 100MHz SDR
0:00:00.000.006.400	Tx	K28.7	Default IO (00)	FC 00 02 80 00 00 00 00...	OK	FRMCNT=2 LLGPIO=0X0080 100MHz SDR
0:00:00.000.006.560	Rx	K28.7	Default IO (00)	FC 00 02 08 00 04 00 00...	OK	FRMCNT=2 LLGPIO=0X0008 100MHz SDR
0:00:00.000.007.680	Rx	K28.7	Default IO (00)	FC 00 03 08 00 04 00 00...	Error	FRMCNT=3 LLGPIO=0X0008 100MHz SDR
0:00:00.000.008.800	Tx	K28.7	Default Data (01)	FC 01 04 00 01 00 00 00...	OK	CMD=MEMORY READ TAG=0X01 ADDR=0X00001000

Tunneled Report

Reconstructs the tunneled channels: complete I2C transactions on channels 0–5 (Start / address / R/W / ACK / data / Stop), GPIO bit changes (both low-latency LL and normal-latency NL classes), and UART byte reconstruction on channels 0–1 including RTS / CTS flow-control events; offers Combined (merged with the Frame Report) and Separate views.

Timestamp (h:m:s.ms.us.ns dur)	Channel	Dir	Event	Decoded Value	Status / Details
0:00:00.000.012.480	I2C0	C->T	Write	S | 0X50 W | [A3 5C] | P	OK | ACK | 2 data bytes | STOP | 4 ACK events
0:00:00.000.019.200	I2C0	T->C	Read	S | 0X50 R | [1A 2B 3C] | P	OK | NACK(end, normal) | 3 data bytes | STOP
0:00:00.000.024.960	I2C1	C->T	Write	S | 0X6E W | P	ERROR | NACK at address | 0 data bytes | STOP
0:00:00.000.031.360	I2C2	C->T	Write	S | 0X24 W | [00 01 02 03] | Sr	OK | ACK | 4 data bytes | Repeated START
0:00:00.000.006.400	GPIO	Tx	GPIO Change	LL 0X0000 -> 0X0080 | NL[2] 0X0000 -> 0X0000	OK | Frame #2 | LL: bit7↑
0:00:00.000.006.560	GPIO	Rx	GPIO Change	LL 0X0080 -> 0X0008 | NL[2] 0X0000 -> 0X0004	OK | Frame #2 | LL: bit3↑ bit7↓ | NL: bit2↑
0:00:00.000.038.400	UART0	Tx	Data Burst	HEX [48 65 6C 6C 6F] | ASCII "Hello"	OK | 5 bytes | 9600 baud 8N1
0:00:00.000.044.800	UART0	Rx	Flow Control	High	OK | RTS/CTS | 9600 baud 8N1
0:00:00.000.051.200	UART1	Rx	Data Burst	HEX [4F 4B 0D 0A] | ASCII "OK.."	OK | 4 bytes | 9600 baud 8N1
0:00:00.000.057.600	UART1	Tx	Data Byte	0x41 'A'	ERROR | Parity ERR | 9600 baud 8N1

Statistics

Accumulates frame counts by Tx / Rx / Error with per-type and per-subtype breakdown; errors are further classified as CRC, Symbol, Disparity and Incomplete; clicking an entry jumps to the corresponding frame.

Item	Count	Error
Tx	7	0
K28.5	2	0
Link Detect (00)	1	0
Link Speed (01)	1	0
K28.6	2	0
Advertise (00)	1	0
Configure (01)	1	0
K28.7	3	0
Default IO (00)	2	0
Default Data (01)	1	0
Rx	6	0
K28.5	2	0
Link Detect (00)	1	0
Link Speed (01)	1	0
K28.6	2	0
Advertise (00)	1	0
Accept (02)	1	0
K28.7	2	0
Default IO (00)	2	0
Error	1	1
CRC Error	1	1
Default IO (00)	1	1

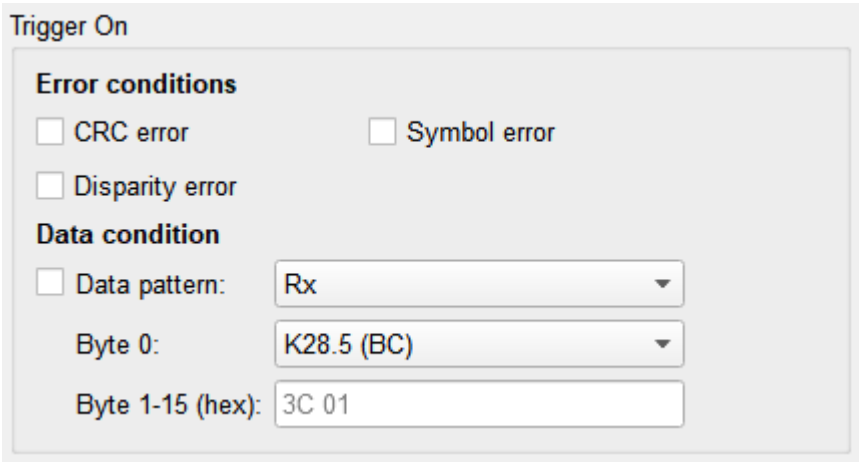
Waveform view

Shows the four LTPI channels together with the decoded result, correlating electrical behavior with protocol contents.

Trigger

The PA trigger is configured in the "Trigger On" group of the protocol settings page and acts as the trigger condition of the real-time capture:

- Error trigger: CRC error, symbol error, disparity error
- Data pattern: select the Tx or Rx lane, choose the comma character for byte 0 (K28.5 / K28.6 / K28.7) and enter a hex pattern for bytes 1–15



When a trigger condition is hit, the trigger position is marked in the report; in waveform view a trigger cursor is placed on the waveform as well.

OEM / Vendor Custom Fields

Reserved or vendor-specific fields can be described in AqLTPI_Vendor.csv — field name, bit range, enumerations and engineering-unit scaling — and the decoder presents them directly as custom fields, making proprietary protocol contents easy to analyze.

FAQ

1. **Which LTPI specification version is supported?**

   A: LTPI as defined in OCP DC-SCM 2.0.

2. **How do I connect to the target?**

   A: Slot B is the only probe slot, and the two front-panel USB ports must be connected to the Way Stations — the upper USB port to the LTPI TX (Top) Way Station and the lower one to the LTPI RX (Bottom) Way Station; they must not be swapped. After connecting, check that one red and one green LED are lit on each Way Station.

3. **Does probing affect the signal quality?**

   A: Any external instrument adds some loading. This solution uses End-tips with SMPM coaxial cables to keep the disturbance of the target low and the signal quality high.

4. **How is the target grounded?**

   A: The instrument and the system under test must share a ground: connect the GND port of both Way Stations to the ground of the target. If the signal quality is poor or the interference is high, grounding every End-tip works best.

5. **Can I view only the tunneled I/O (I2C / UART / GPIO)?**

   A: Yes — the Tunneled Report shows the channel contents separately, and the Filter limits the display to the channels you need.

6. **How are OEM / vendor-specific frames decoded?**

   A: Describe the fields in AqLTPI_Vendor.csv; the decoder presents them directly as custom fields.

7. **What is the difference between LA mode and analyzer mode?**

   A: LA mode captures waveforms and decodes offline (see the LTPI solution document); analyzer mode decodes in hardware in real time and supports protocol triggering.

8. **Which tunneled channels are supported?**

   A: I2C channels 0–5, UART channels 0–1 (including RTS / CTS flow control) and GPIO (low-latency LL and normal-latency NL).

9. **How should the latch mode be selected?**

   A: The default Auto detects SDR / DDR automatically; if the operating mode of the link is known it can also be fixed on the settings page.

10. **What is the OEM type in the Frame Report?**

    A: Frames that are reserved by the specification or vendor-defined are classified as OEM; their fields can be described in AqLTPI_Vendor.csv to make them readable.

Appendix: LTPI Frame Types

Frames are classified by their comma character and subtype byte:

Comma	Subtype	Type
0xBC (K28.5)	0x00	Link Detect
0xBC (K28.5)	0x01	Link Speed
0xDC (K28.6)	0x00	Advertise
0xDC (K28.6)	0x01	Configure
0xDC (K28.6)	0x02	Accept
0xFC (K28.7)	0x00	Default I/O
0xFC (K28.7)	0x01	Default Data

Other subtypes and vendor-defined contents are classified as OEM frames.