



Tria-Link Monitor

Application Note 146

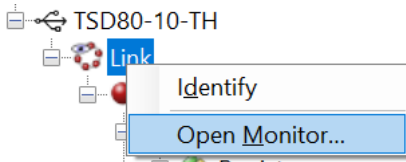
The *Tria-Link Monitor* is a tool embedded in the *TAM System Explorer* to debug the *Tria-Link* fieldbus.

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1 Introduction

The *Tria-Link Monitor* is exclusively available for the *Tria-Link* fieldbus. It is part of the *TAM System Explorer*. To start the tool **right-click** the **Tria-Link** node and select **Open monitor...**



Note It is recommended to use the tool while connected to the *Tria-Link* as an *Observer* to debug a running machine. Refer to 5, Chapter 7, for further information.

2 Displayed Information

The *Tria-Link Monitor* displays a table with all devices in the *Tria-Link* ring.

2.1 Station

Order Code and SN of the participants in the *Tria-Link*.

If the link is observed by USB, the device where USB is connected will show up twice. One of the two entries is the USB observer.

2.2 Order

The values index the order of the participants in the *Tria-Link*.

This column is only visible in the debug build. It is calculated from the absolute difference of the two values in the local bus register 2: phase count ring 1+2 (1 incr = 10ns). The participants are sorted according to this value in the *Monitor*. This is useful to make an exact statement in case of cable breaks.

2.3 Address

The values are the unique number within the *Tria-Link* used for communication.

In a TwinCAT system, these addresses are used for identification. In such setups, the address is made persistent on the device.

When several stations have the same address, communication with these devices will be severely impacted. There will be only one entry in the *Monitor*, but it's undefined from where its values are read. Initializing the link will remedy this situation.

2.4 Publishers, Subscribers

The values show to which channels are in use.

Channels enable drive-to-drive data exchange [1] and are set up in the General.Parameters.TriaLink registers.

All publishers should be matched by at least one subscriber. While an unsatisfied subscriber will cause



an error on that device, unmatched publishers will go unnoticed. An unmatched publisher indicates a configuration error which itself might be the cause for a dependent function not to work as intended.

2.5 Stream

Stream1 and Stream2 count direction-dependent erroneous path planner data.

Most common cause are problems with the higher-level controller, such as jitter or CNC task exceeds.

2.6 PPM

The values show the difference of the quartz clock to the reference clock.

PPM denotes *Parts per Million*. The reference is always the TL card (*Bus Master*) and should have the value 0.

2.7 CRC

CRC1 and CRC2 count direction-dependent erroneous packets.

Tria-Link packets are marked with a *CRC* when sent to the ring.

2.8 Frame

Frame1 and Frame2 count direction-dependent faulty frames.

A *Frame* is the unit circulating with 10kHz on the *Tria-Link*. There are two *Frames* per clock, one in each direction. A *Frame* consists of 33 *Tria-Link* packets, plus timestamp with its own *CRC*. The middle of the timestamps of receipt of *Frame1* and *Frame2* is used to synchronize the participants.

2.9 Gap

Gap1 and Gap2 count direction-dependent missing/invalid Ethernet IPGs*.

A *Gap* represents the *Interpacket Gap*. In short, *IPG* is a pause between two *Frames*.

2.10 RxErr

RxErr1 and RxErr2 count direction-dependent defective/lost packets.

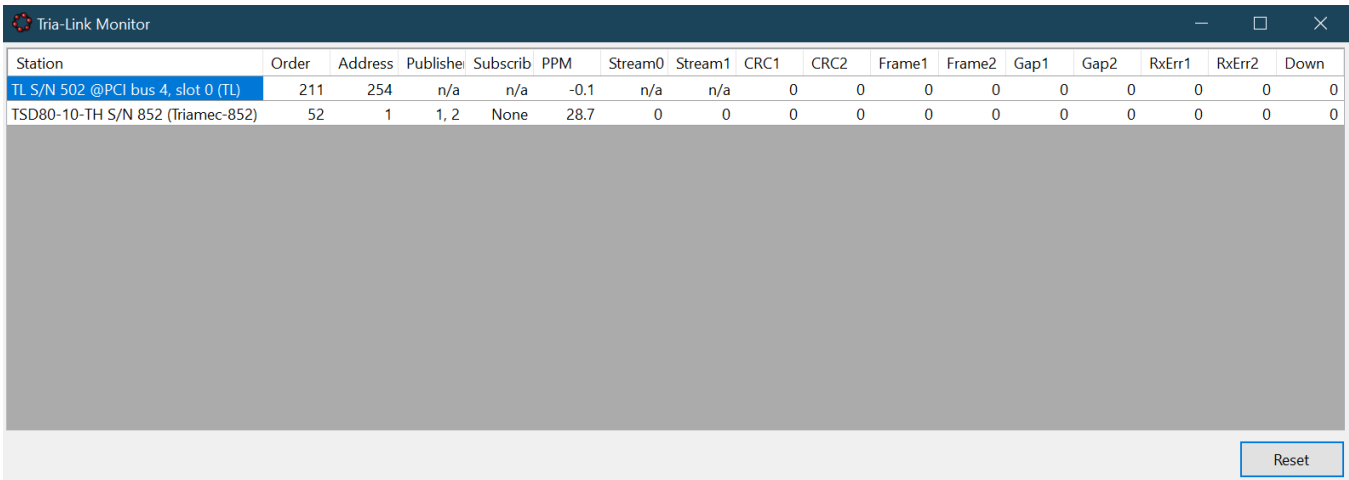
These counters are directly forwarded from the *MII* of Ethernet. A packet that gets corrupted on the *physical* counts up the *MII Error*. *RxErr* values indicate electrical problems (cable or EMC).

2.11 Down

Down increments if a participant had to be resynchronized to the link.

Usually in this case all participants are resynchronized and therefore the whole column counts up.

3 Interpretation



| Station | Order | Address | Publishe | Subscrib | PPM | Stream0 | Stream1 | CRC1 | CRC2 | Frame1 | Frame2 | Gap1 | Gap2 | RxErr1 | RxErr2 | Down |
|------------------------------------|-------|---------|----------|----------|------|---------|---------|------|------|--------|--------|------|------|--------|--------|------|
| TL S/N 502 @PCI bus 4, slot 0 (TL) | 211 | 254 | n/a | n/a | -0.1 | n/a | n/a | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TSD80-10-TH S/N 852 (Triamec-852) | 52 | 1 | 1, 2 | None | 28.7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

The counters gain importance from left to right. While the *Monitor* is open, each increment is also logged. This allows a temporal analysis.

We start on the far right:

1. *Down* counter may already be at 1 when the link was rebuilt for the test (e.g. machine reboot).
2. If *Down* continues to increment without user action, there are serious problems.
 - ◆ Possibly defective devices in the ring.
 - Serious electrical problems (cable break, etc.).
 - Customer program provokes recurring ring boot.
3. *RxErr* values:
 - ◆ increment regularly → cable or EMC
 - ◆ count abruptly, irregularly → cable or EMC
 - ◆ count only when motors enabled → suspect EMC, grounding problems
 - ◆ count up in pairs of two participants → suspect cable issues in between the two participants
4. values further left are often consequential errors of *RxErr*.
5. check *PPM* (exclude crystal problems):
 - ◆ Nominal hardware is tuned to <25 *PPM*.
 - ◆ Differences >50 *PPM* to reference are suspicious.

3.1 Additional Information

- Column index suffix refer to the running direction of packets on the ring.
All columns with suffix 1 represent one direction.
- All columns with suffix 2 represent the opposite direction.
- The direction with respect to the order of the participants (or also physical direction) is unknown.
- The maximum value in all counters is 255, whereas *PPM* is not a counter.

References

- [1] “Drive-to-Drive Data Exchange with Tria-Link”, AN142_TriaLink-DriveToDriveDataExchange_EP001.pdf, Triamec Motion AG, 2022
- [2] “Servo Drive Setup Guide”, ServoDrive-SetupGuide_EP018.pdf, Triamec Motion AG, 2022.

Revision History

| Version | Date | Editor | Comment |
|---------|------------|--------|---|
| 001 | 2022-09-30 | sm | Document creation |
| 002 | 2022-10-26 | chm | Add address and channel information to the Monitor, chose a more general name |
| 003 | 2022-11-30 | sm | Add recommendation note on how to connect to the link. |
| | | | |

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