

# ECAT\_DMotion Software Guide

English

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## CONTACT US

If you have any questions, please feel free to contact us via email at:

[service@icpdas.com](mailto:service@icpdas.com); [service.icpdas@gmail.com](mailto:service.icpdas@gmail.com)

## SUPPORT

ECAT-2091S

ECAT-2092T

ECAT-2093

ECAT-2094S

ECAT-2094P

ECAT-2094DS

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# 1. Introduction

The main purpose of the ECAT\_DMotion utility is to configure and test the EtherCAT motion control slaves provided by ICPDAS.

The following slaves are supported by the utility:

- Stepper motor drives:
  - ECAT-2091S
  - ECAT-2094S
  - ECAT-2094P
  - ECAT-2094DS
- Encoder modules:
  - ECAT-2092T
  - ECAT-2093

## 2. ECAT\_DMotion Installation

Double click the “ECATDM\_Utility\_Win\_setup\_1.0.0.exe” installation file to install the utility.

Utility installation path:

*C:\icpdas\ECATDMotion\Utility\ECAT\_DMotion.exe*

## 3. Module connection

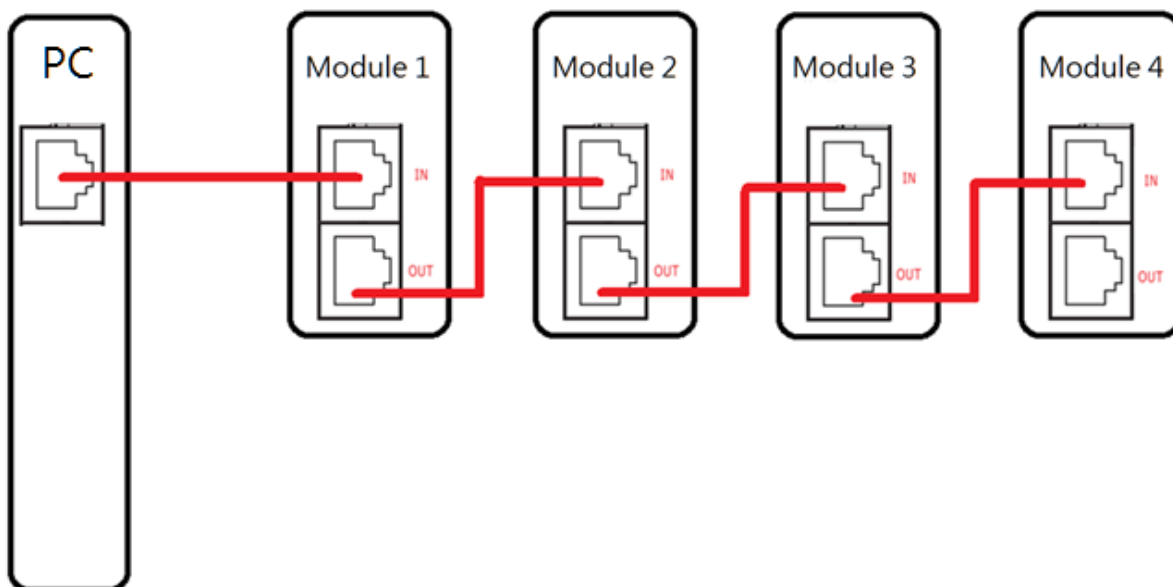
### 3.1.1. Connection

Each EtherCAT slave has at least two communication ports: an input port (IN) and an output port (OUT).

In order to use the ECAT\_DMotion Utility it is necessary to connect the Windows PC to the EtherCAT slaves:

1. Connect the PC Ethernet port to the IN port of the first EtherCAT slave module using a standard Ethernet cable;
2. The OUT port of the first slave module has to be connected to the IN of the second module, and so on.

**Warning:** Do not use USB network adapter, Ethernet Switch or Hub to connect the PC to the EtherCAT slaves.



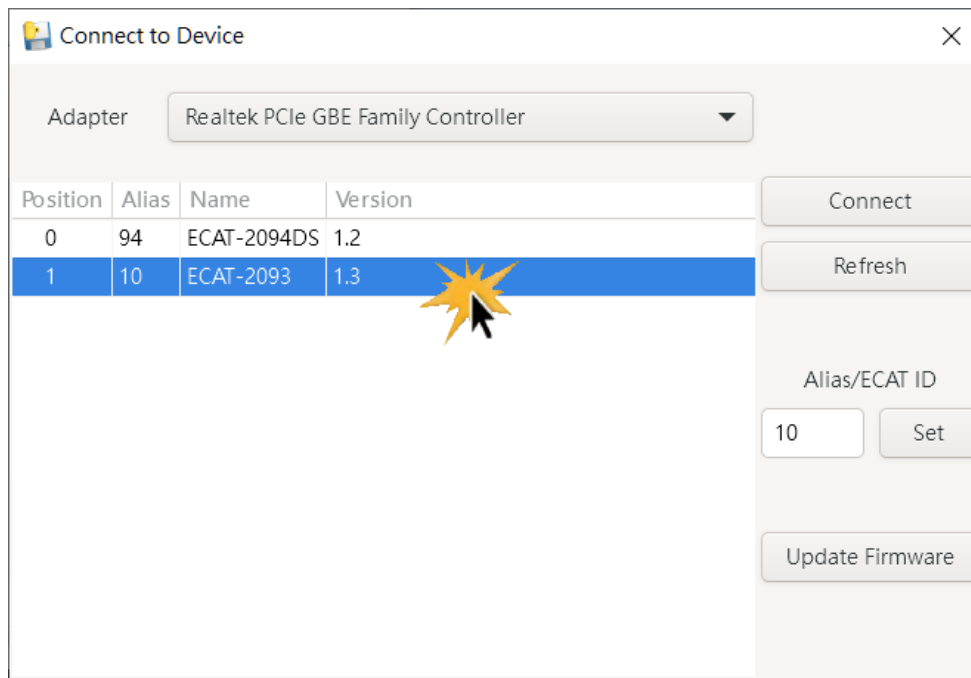
## 4. Operation

Start the utility by double clicking the *ECAT\_DMotion.exe* execution file.

### 4.0. Connect

#### 4.0.1. Select connection with devices

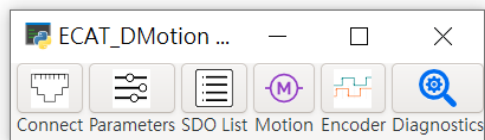
A connection windows pops up after the Utility started which list all the online motion control slaves. If not slaves are displayed then select the adapter device to which the slaves are connected. Select one of the slaves you like to configure or control and press the “Connect” button to establish a connection with the slave.


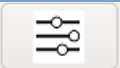






Item	Description
Connect	Connect to selected device
Refresh	Refresh EtherCAT device list
Alias/ECAT ID	EtherCAT Alias
Update Firmware	Update Firmware via FoE

## 4.1. Main Screen

User can open the function window in this main screen.






Item	Description
 Connect	Connect to selected device, Alias/ ECAT ID Setting, Update Firmware via FoE
 Parameters	Device parameters setting
 SDO List	Service Data Objects list
 Motion	Operate Motors
 Encoder	Operate Encoders
 Diagnostics	Communication diagnostics

## 4.2. Parameters

### 4.2.1. Device parameters setting




Double-click an object to edit its value.

All parameters of this window can be saved to non-volatile memory of the device.

 Save
  Load
  EEPROM

0%

Index	Name	Flags	Current Value	Default Value	Type
▼ 8000	ENC Settings Ch.0		>11<	>11<	DT8000
8000:01	A signal polarity	RW	1:"Active high"	0x01(1)	DT0803
8000:02	B signal polarity	RW	1:"Active high"	0x01(1)	DT0803
8000:03	C signal polarity	RW	1:"Active high"	0x01(1)	DT0803
8000:09	Counting mode	RW	3:"Quadrant counting mode"	0x03(3)	DT0801
8000:0A	Low pass filter	RW	0:"4MHz AB Phase: 6MH	0x00(0)	DT0802
8000:0B	Latch encoder channel	RW	0:"Default channel"	0x00(0)	DT0804
▶ 8010	ENC Settings Ch.1		>11<	>11<	DT8010
▶ 8020	ENC Settings Ch.2		>11<	>11<	DT8020

Item	Description
 Save	Save parameters to a file
 Load	Load parameters to a file
 EEPROM	Save parameters to non-volatile memory of the device Note: If device parameters are set, the device does not automatically store the data to its non-volatile memory, therefore the data will be lost once the device is powered off.

## 4.3. SDO List

### 4.3.1. Device Service Data Objects list

Double-click an object to edit its value.

SDO List					
Index	Name	Flags	Current Value	Default Value	Type
1000	Device type	RO	0x00020000(131072)	0x00020000(131072)	UDINT
1001	Error register	RO	0x00(0)	0x00(0)	USINT
1008	Device name	RO		ECAT-2093	STRING(9)
1009	Hardware version	RO		1.4	STRING(3)
100A	Software version	RO		1.3	STRING(3)
▶ 1018	Identity		>4<	>4<	DT1018
▶ 10F1	Error Settings		>2<	>2<	DT10F1
▶ 1600	ENC Control Ch.0		>5<	>5<	DT1600
▶ 1610	ENC Control Ch.1		>5<	>5<	DT1610
▶ 1620	ENC Control Ch.2		>5<	>5<	DT1620
▶ 1A00	ENC Status Ch.0		>11<	>11<	DT1A00
▶ 1A01	ENC VEL Status Ch.0		>12<	>12<	DT1A01
▶ 1A10	ENC Status Ch.1		>11<	>11<	DT1A10
▶ 1A11	ENC VEL Status Ch.1		>12<	>12<	DT1A11
▶ 1A20	ENC Status Ch.2		>11<	>11<	DT1A20



## 4.4. Motion

### 4.4.1. Operate Motors

Motion

AxisNo: X

Servo On Servo Off

Velocity (pulse/s): 51200 MoveAbs MoveRel

Position (pulse): 51200 Jog+ Jog-

Clear Error Clear Position

Acc (pulse/s<sup>2</sup>): 512000

Dec (pulse/s<sup>2</sup>): 512000 Stop

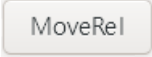
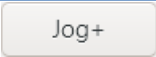


Method SpeedSw SpeedZr Acc Dec Home



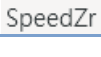


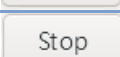

17 51200 5120 51200 51200 Stop








Status Position Velocity Ready Busy Error NOT POT


Disabled 0 0

Item	Description
AxisNo X	Axis number
Servo On	Servo ON
Servo Off	Servo Off
Clear Error	Clear Error
Clear Position	Clear Position
Velocity (pulse/s):	Tartget Velocity
Position (pulse):	Tartget Position
Acc (pulse/s <sup>2</sup> ):	Tartget acceleration
Dec (pulse/s <sup>2</sup> ):	Tartget deceleration
MoveAbs	Move to target position

	Moves the input Pulse in the positive or negative direction according to the sign of the position
	Moves in the positive direction according to the target velocity
	Moves in the negative direction according to the target velocity
	Stop motion

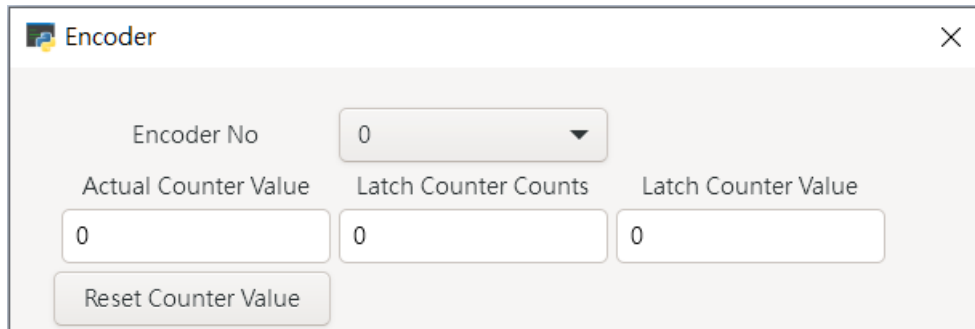
Item	Description
	Homing method
	Speed during search for Home switch
	Speed during search for z phase signal
	Homing Acceleration
	Homing Deceleration
	Start homing
	Stop homing

Item	Description
	Axis state
	Axis position
	Axis velocity
Ready 	Axis is standstill, and no motion command active
Busy 	Axis is moving
Error 	Axis is stopped because of error
NOT 	Negative limit switch

POT 	Positive limit switch
--	-----------------------

## 4.5. Encoder

### 4.5.1. Operate Encoders (ECAT-2093)



The image shows a software window titled "Encoder" with a close button (X) in the top right corner. Inside the window, there are four input fields and one button. The first field is "Encoder No" with a dropdown menu showing "0". Below it are three fields: "Actual Counter Value" showing "0", "Latch Counter Counts" showing "0", and "Latch Counter Value" showing "0". At the bottom left is a button labeled "Reset Counter Value".

Item	Description
Encoder No	Encoder channel number
Actual Counter Value	The encoder counter value
Latch Counter Counts	Latched counter counts
Latch Counter Value	The latched counter value
Reset Counter Value	Reset counter value

### 4.5.2. Operate Encoders (ECAT-2092T)

#### Encoder counter

Item	Description
Encoder No	Encoder channel number
Actual Counter Value	The encoder counter value
Latch Counter Value	The latched counter value
Ext Latch Counter Value(R)	Latched encoder position triggered by the rising edge of "I" signal
Ext Latch Counter Value(F)	Latched encoder position triggered by falling edge of "I" signal
Reset Counter Value	Reset counter value

#### Equidistant position compare output trigger function

Item	Description
First Pos	The first compare position
Interval	The next compare position will be automatically calculated by adding the interval value to the current

	compare position
Dir.	Set the autoincremental direction for the compare value
Equid Compare	Enable the equidistant position compare output trigger function

### Array position compare output trigger function

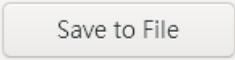
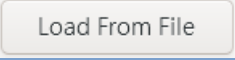
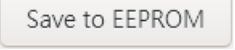
Item	Description
Array Settings	Position Compare Array Settings
End Index	The number of compare positions to be used for the compare process
Array Compare	Enable the array position compare output trigger function

Item	Description
Next Compare Position	Indicates the next compare position at which an output will be triggered

Position Compare Array Settings; double-click an object to edit its value.

Compare Array Setting			
Index	Compare Position	DO Trigger	
0	33	1	
1	100	1	
2	150	1	
3	200	1	
4	250	1	
5	300	1	
6	350	1	
7	400	1	
8	450	1	
9	555	1	
10	0	0	
11	0	0	
12	0	0	

Save to File  
Load From File  
Save to EEPROM

Item	Description
	Save parameters to a file
	Load parameters to a file
	<p>Save parameters to non-volatile memory of the device</p> <p>Note: If device parameters are set, the device does not automatically store the data to its non-volatile memory, therefore the data will be lost once the device is powered off.</p>

4.5.3. Operate Encoders(ECAT-2074A/ ECAT-2072A)

Encoder

Data

Configuration

Encoder No

0

Get

Set

Set to all channel

BISS

MultiTurn

74565

19

bits +

Singleturn

0

bits +

nError

1

1 bits +

nWarning

1

1 bits +

CRC polynomial

67

bits =

27 bits

SSI

MultiTurn

12

bits +

Singleturn

13

bits +

n bits

Count for transmission errors

CRC error

0

not ready

0

Clear

Item	Description
Encoder No <div>0</div>	Encoder channel number
<div>Get</div> <div>Set</div> <div>Set to all channel</div>	Update Configuration

BiSS Mode

Item	Description
<div>BISS</div>	BiSS Mode
<div>MultiTurn<div>74565</div><div>19</div><div>bits +</div></div>	MultiTurn Value Number of bits for Multiturn
<div>Singleturn<div>0</div><div>0</div><div>bits +</div></div>	SingleTurn Value Number of bits for SingleTurn
<div>nError<div>1</div><div>1 bits +</div></div>	Error bit 0: Error 1: Normal



<div> <div>nWarning</div> <div>1</div> <div>1 bits +</div> </div>	Warning bit 0: Warning 1: Normal
<div> <div>CRC polynomial</div> <div>67 - +</div> <div>6 bits =</div> </div>	CRC polynomial

## SSI Mode

Item	Description
<div> <div><input checked="" type="radio"/> SSI</div> </div>	SSI Mode
<div> <div>MultiTurn</div> <div>74565</div> <div>19 - + bits +</div> </div>	MultiTurn Value Number of bits for Multiturn
<div> <div>Singleturn</div> <div>0</div> <div>0 - + bits +</div> </div>	SingleTurn Value Number of bits for SingleTurn

## Error counts

Item	Description
<div> <div>CRC error</div> <div>0</div> </div>	CRC error counts
<div> <div>not ready</div> <div>0</div> </div>	Not ready counts
<div> <div>Clear</div> </div>	Clear error counts

Encoder ×

Data

Configuration

Encoder No: 0 ▼ Get Set Set to all channel

CRC invert: ☐ Disable ☒ Enable

Clock Frequency: 5 MHz ▼

Coding: ☒ Binary ☐ Gray code

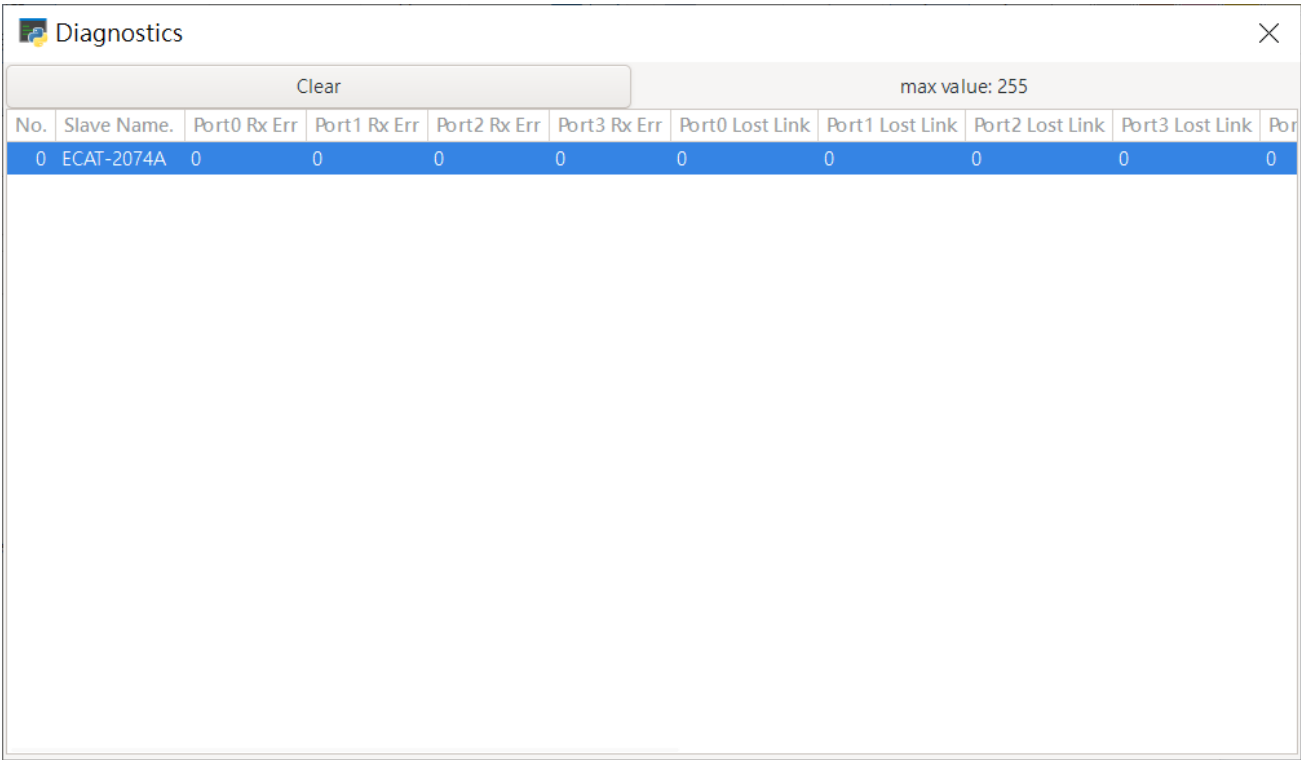
Latch Delay Time: 13 x10ns

Measured Delay Time: 13 x10ns

Item	Description
CRC invert: <input type="radio"/> Disable <input checked="" type="radio"/> Enable	CRC Invert
Clock Frequency: <span>5 MHz</span> <span>▼</span>	Transmission Pulse Frequency
Coding: <input checked="" type="radio"/> Binary <input type="radio"/> Gray code	Data Encoding Mode
Latch Delay Time: <span>13</span> <span>x10ns</span>	Measured Data Delay Time
Measured Delay Time: <span>13</span> <span>x10ns</span>	Latch Data Delay Time

# 4.6. EtherCAT Diagnostic

Each module have 4 ports. Generally speaking, the Ethercat Port of the module will only use two. Usually EtherCat in Port is port0, EtherCat out port is port1



Item	Description
<div>Clear</div>	Clear error counter
<div>max value: 255</div>	The maximum value 255 will stop counting

## Invalid frame(Rx)

## Invalid frame (CRC)

A change of RX/CRC Error Counters indicates that the hardware signal received was corrupted and that the carried data will be discarded.

### Most likely reasons for signal corruption are:

- External EMC disturbances (usually sporadic counter increment)
- Damaged devices or interconnections (usually fast and systematic counter increment)

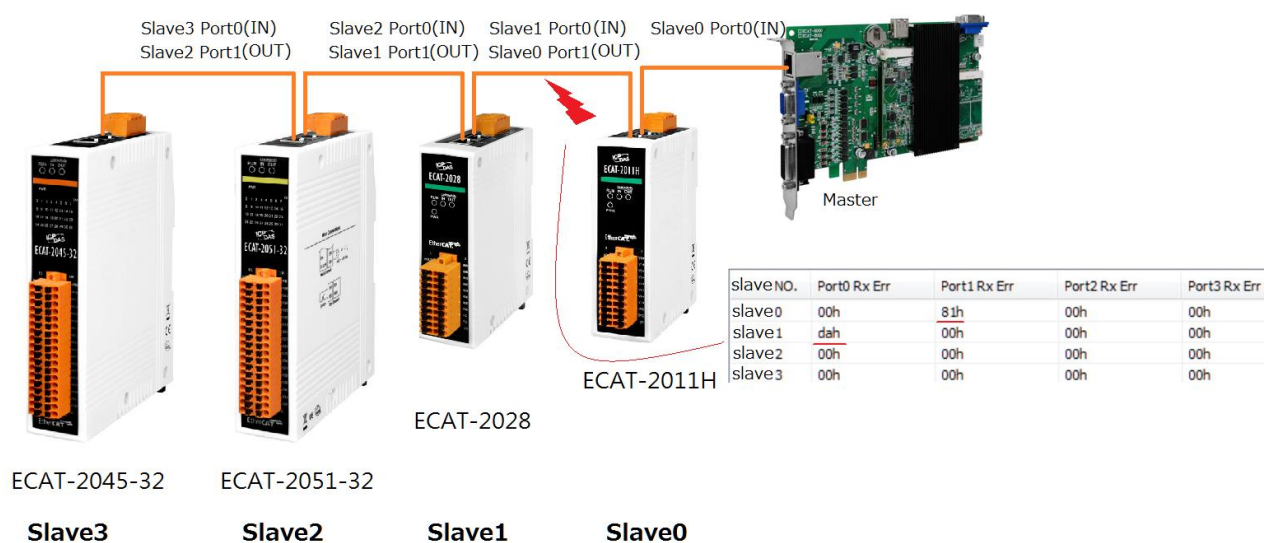
### RX Errors:

- Correspond to individual invalid symbols
- Can occur both within and outside frames (when occurring within frames, they represent usually also Frame Errors)

### CRC Errors:

- Correspond to frames whose overall bit sequence was corrupted
- Can occur only within frames

First port reporting RX/CRC Error Counter  $\neq 0$  → most likely problem location



### Check the following hardware aspects:

- Check cable between detected and previous SubDevice:
  - EtherCAT cable is routed near to power cables or noise sources
  - Self-made cable connectors have been badly implemented
  - Cable is not properly shielded
- Check detected and previous device:
  - Not suitable power-supply (for example, low LVDS current)
  - Devices don't share the same ground potential
- Try to replace/swap devices at two ends of the detected location, in order to check if errors are related to a specific device part.

As external EMC disturbances are asynchronous with the communication, both Rx and CRC Errors should be counted in this case (even if their ratio can vary).

Completely unbalanced counter values (many Physical Layer Errors with no Frame Errors, or many Frame Errors with no Physical Layer Errors) could instead indicate an internal device issue: replace the devices could be therefore the first suggested step in this case

---

[Link lost](#)

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An increment in a Lost Link Counter indicates an interruption in the hardware communication.

**Most likely reasons for link loss are:**

- Temporary or permanent device power-supply loss, or device reset.
- Damaged cables or connectors or poor/oxidized contacts
- EMC disturbances

