Automotive Ethernet PHY Linking
The Missing Link!

Joint Presentation Intrepid & Keysight

Log, Computer, Analyze and repeat, that's development

INTREPID
CONTROL SYSTEMS
www.intrepidcs.com

PHY Register Status Monitoring – Read/Write

36 Entries to allow, Start/Stop/Write functions
Reading status is Polled
Write is sent once

PHY Register R/W Access – Product List

Ability to Read and Write PHY registers in each mode below

RAD-Pluto

Ethernet ports:
- 4x 100BASE-T1 ports
- 1x 1000BASE-T ports

2x CAN FD channels with termination
1x LIN channel

Gateway Ethernet to CAN

Media Converter T to T1 or USB to T1

Daisy Chaining

April 30, 2019

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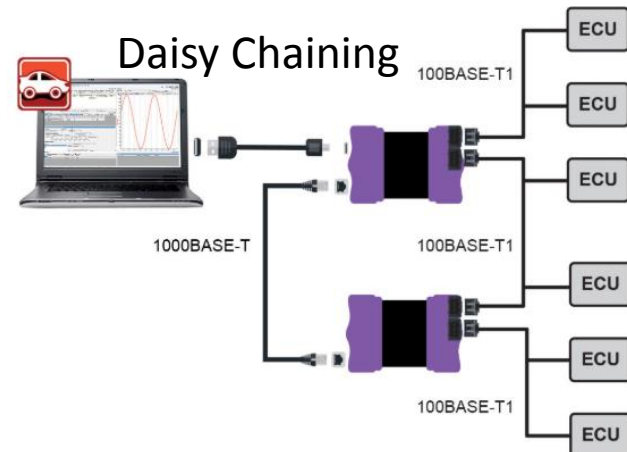
PHY Register R/W Access – Product List

Ability to Read and Write PHY registers in each mode below

RAD-SuperMoon

Ethernet ports:
  1x 100 or 1000BASE-T1 port
  1x 1000BASE-T ports PoE capable
  1x USB Type-C
Media / Speed Converter or Active TAP

Speed Converter
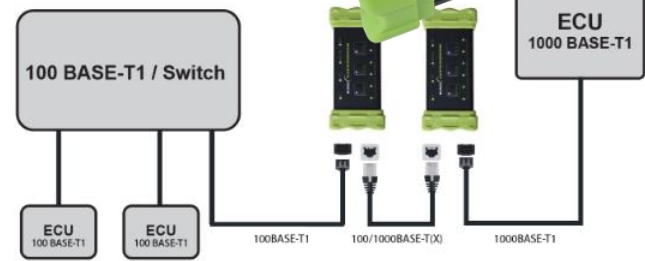
100BaseT1 to 1000BaseT1

Media Converter T to T1 or USB to T1

Active TAP
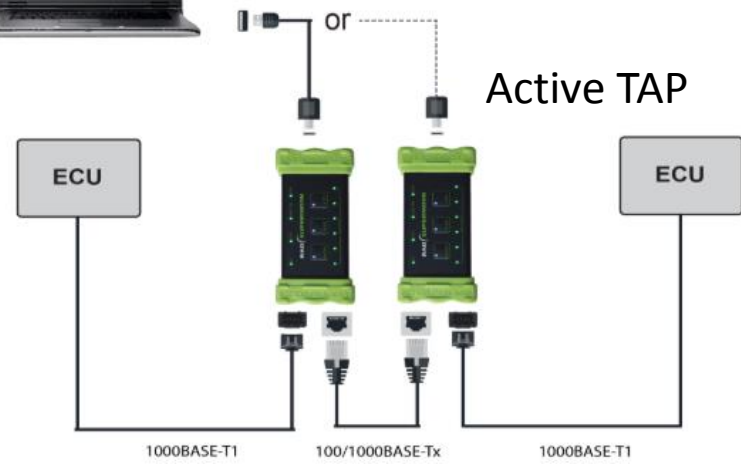
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PHY Register R/W Access – Product List

Ability to Read and Write PHY registers in each mode below

RAD-Moon2
Ethernet ports:
- 1x 100 or 1000BASE-T1 port
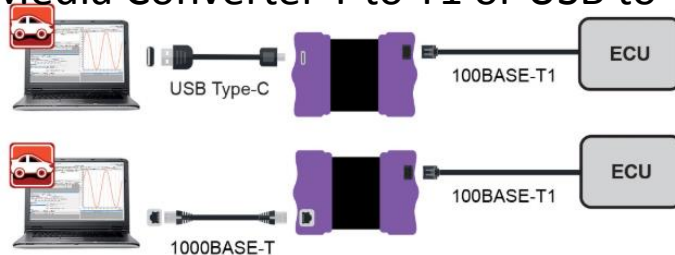- 1x 1000BASE-T port
- 1x USB Type-C
- 1x Signal Quality LEDs

RAD-Moon
Ethernet ports:
- 1x 100BASE-T1 port
- 1x 1000BASE-T port
- 1x USB Type

Media Converter T to T1 or USB to T1

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Polling LINK Status – Ethernet ports
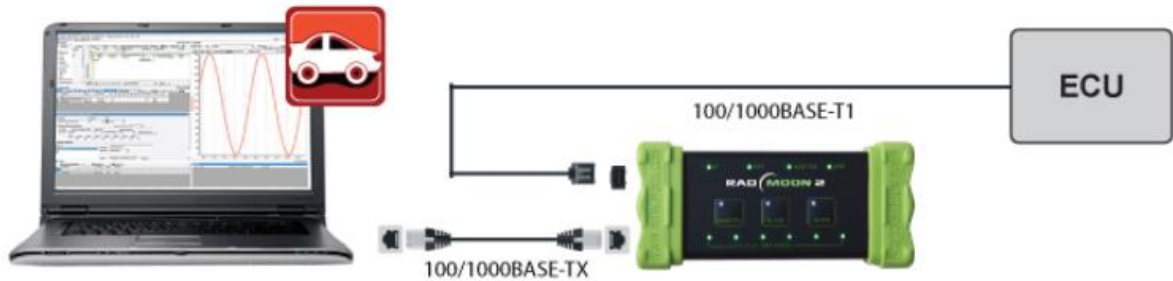
LINK Status provides:

Reports all ethernet PHY ethernet status for LINK State

Time stamp of when LINK is DOWN

Time stamp of when LINK comes back alive (example below 600ms)

Delta time between messages

PHY Status   Filter ID: 0x163   Global Time Stamp

	Line	Time (abs/...)	Tx	Er	Description	ArbId/Header	Len	DataBytes	Network	Node	ChangeCnt	Times...
Filter						163						
	1				OP (BR) Ethernet - Link status changed	163	4	00 01 01 01	neoVI			2019/04/26 21:38:56:769773
	Network				= OP_ETH2 [1]							
	Link Status				= Down [0] ▲							
	2	599.040 ms			OP (BR) Ethernet - Link status changed	163	4	01 01 01 01	neoVI			2019/04/26 21:38:57:368813
	Network				= OP_ETH2 [1]							
	Link Status				= Up [1] ▲							

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Polling LINK Status – Ethernet ports on RX msg

Msg2Msg Relative time

PHY Status

Filter using comma multiple networks

Network		N.
OP (BR) ETH02,neo		

	Line	Time (ab…	1	E	Description			
Filter								
	74	100.993 ms			OP (BR) ETH02 00:FC:70:00			
	75	101.002 ms			OP (BR) ETH2 00:FC:70:00:00:0C to 00:FC…Intrepid_00:00:0C		Intrepid_00:00:0B	
	76	89.203 ms			OP (BR) Ethernet - Link status changed			
	Network					=	OP_ETH2 [1]	
	Link Status					=	Down [0]	
	77	3.033537 s			OP (BR) Ethernet - Link status changed			
	Network					=	OP_ETH2 [1]	
	Link Status					=	Up [1]	
	78	8.159 ms			OP (BR) ETH02 00:FC:70:00:00:0C to 00:FC…Intrepid_00:00:0C		Intrepid_00:00:0B	
	79	100.994 ms			OP (BR) ETH02 00:FC:70:00:00:0C to 00:FC…Intrepid_00:00:0C		Intrepid_00:00:0B	

TECH DAY

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Ethernet Ports – Low Latency TAP / Converter

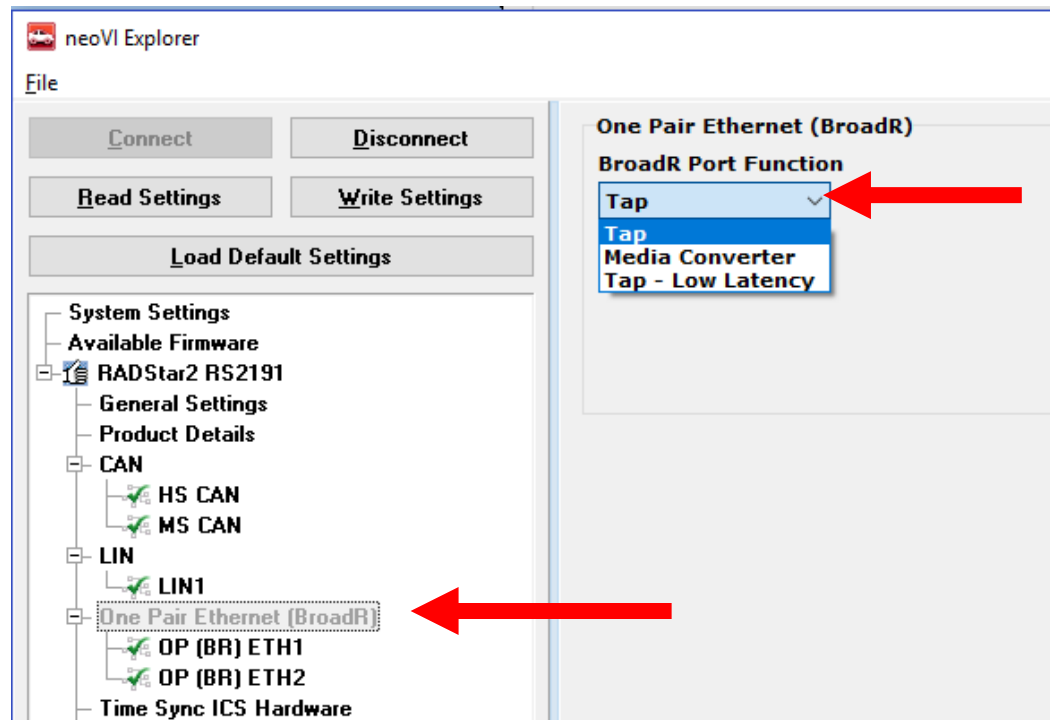Setting up the Ethernet Port Role:

Media Converter

Transform from 2 wire to Classical RJ45

Tap

Used in-line as Pairs

Low Latency

Cut through mode

Ethernet Ports – LINK Mode: Master/Slave/Auto

Setting up the PHYsical Layer port role:
   Master / Slave / Automatic can be selected

MAC Spoofing: Replace physical MAC with virtual MAC address

PHY Linking Subsystem Stages

OSI Reference - MAC and LLC start Layer start at Layer2
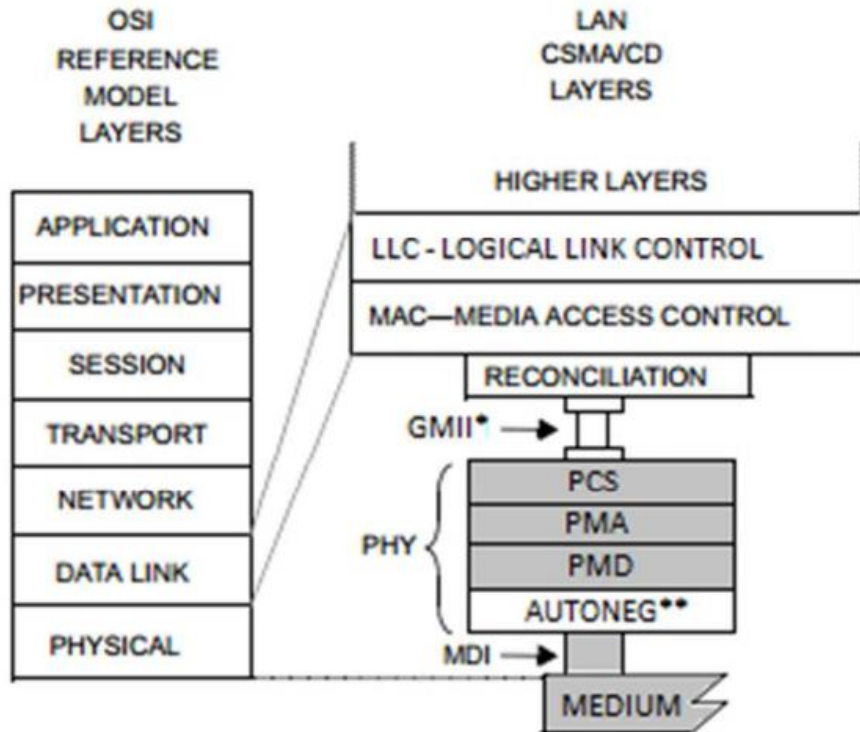
LLC – Logical Link Control
MAC – Media Access Control
PHY = PHYSICAL LAYER DEVICE
RS = RECONCILIATION LAYER
GMII = GIGABIT MEDIA INDEPENDENT INTERFACE
PCS = PHYSICAL CODING SUBLAYER
PMA = PHYSICAL MEDIUM ATTACHMENT
PMD = PHYSICAL MEDIUM DEPENDENT
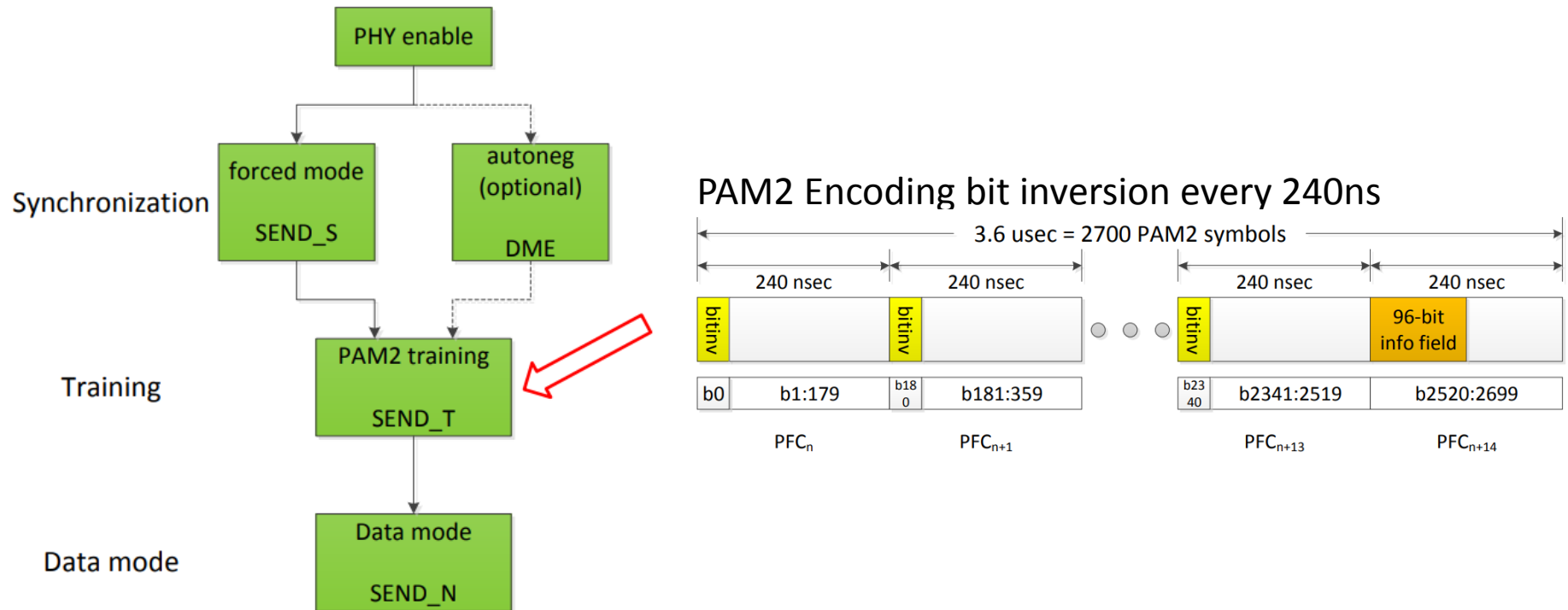AUTONEG = AUTO-NEGOTIATION
MDI = MEDIUM DEPENDENT INTERFACE

EEE – Energy efficient Ethernet
OAM – Operations administrations management

http://www.ieee802.org/3/bp/public/mar15/regev_3bp_01_0315.pdf

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PHY Linking States – Start up Sequence

Sync, training, data mode, can be seen on a oscilloscope

PAM2 Encoding bit inversion every 240ns

http://www.ieee802.org/3/bp/public/nov14/tu_3bp_02b_1114.pdf
https://www.dell.com/content/topics/global.aspx/power/en/ps1q01_hernan?c=us&l=en&cs=04

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