COTSWORKS[®]

SHORING

Lightning Stick

3

Software User's Guide





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INING STICK

Document Number 942-10001-03



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3. Introduction

Lightning Stick software greatly simplifies the media converter diagnostics capabilities and initialization in a graphical user interface. The dashboard panel allows for an easy glance at link status with categories of the data path control and diagnostics arranged in logical tabs. Fiber diagnostics can be tracked and monitored on a visual chart recorder graph. Both fiber and copper PHY and port control functions are monitored and consourable. Advanced teatures and monitoring include compilation of good/bad packet county passing through the converter, a virtual cable tester that identifies possible foults and distance to fault on the copper port, a log table of user activity and converter events, and control register data dumps to/from a file.

File To	ols He	lp								
Dashboar	d			Fiber SP			Ca	nner CE		
002D7A	99		Ŧ	1Gb/s	FULL	DPLX	10	ib/s FL	LL DPLX	
			Disconnect	Fiber Up 0	otime 1:00:5	9	Coj	pper Up 0:0	time 1:13	
Fiber XCVR	Chart	Fiber Port Ctrl	Copper PHY	Copper Port	Ctrl	Stats	VCT	Log	Advanced	DD
Readings					Ala	ms/War	nings			
Vendor	Name		COTSWORKS		Ten L A	nperature arm	e (-128 to L Warr) 128C) hing	H Waming	H Alam
Transc	eiver Part	#	RJ5GSXDDPL	XLCRM	-70		-65	_	110	120
Transceiver Serial #		al #	A007AFJL		Volt L A	age (Oto arm	6.55V) L Warr	ning	H Warning	H Alarm
Wavel	ength (nm)	850		2.7		2.97		3.63	3.9
Tempe	rature (°C)	1	35.938		TX	Bias (Oto arm	o I3ImA L Warr) hing	H Waming	H Alarm
Supply	Voltage (V)	3.242		1		2		40	50
			3.5.T	100	Sec.					

Lightning Stick GUI

4. Relevant Documents

- 1. Lightning Stick Data Sheet document number 944-00046-xx, found at: <u>https://www.cotsworks.com/lightning-stick</u>
- 2. Lightning Stick Software document number 972-00003-xx, found at: <u>https://www.cotsworks.com/lightning-stick</u>

5. Lightning Stick Hardware: Connections

Lightning Stick is a media converter with one RJ-45 copper Ethernet connector, 1 LC full-duplex fiber connector and a micro-USB connector. The Ethernet port is capable of handling any duplex 10/100/1000Mbps Ethernet connection via RJ-45 connector. The Fiber port is capable of 100/1000Mbps speeds via LC fiber connection (simplex or duplex, depending on transceiver type. Multimode or single mode fiber, depending on transceiver type.)The micro-USB connector provides power to Lightning Stick as well as the interface to a PC running Lightning Stick Software. Power can also be applied to a 0.1" center 2-pin connector on the Lightning Stick board in OEM versions (without the case).





 Figure 2: LS Optical (left) and Electrical (right) connections

- Connect the micro-USB end of the USB cord to the Lightning Stick
 - Connect the other end (standard USB) to PC USB port or a USB hub connected to the PC
- Connect the Ethernet cable to the RJ-45 (copper) port on the Lightning Stick
 Connect the other end of the Ethernet cable to the Ethernet interface on board.
- Connect the appropriate fiber (multimode or single mode, wavelength dependent) to the Lightning stick to whatever device you are connecting to – switch, converter, test equipment, other Lightning stick.

NOTE: Even without the Lightning Stick Software running, the hardware should connect at the appropriate data rate and mode for the interfaces connected.

6. Lightning Stick Hardware LED Indicators

The Lightning Stick has indicator LEDs on both the fiber and copper interfaces, allowing the user to verify power, operation, and link activity on both media.

Interface	LED Indicator	Operation	Status Indicator	Color	ID
		OFF	No Link (copper)		
RJ-45	Link/Activity/Speed ON Link (copper)		Link (copper)	Green	LED0
		BLINK	Rate indicates link speed		
		OFF	No Link (copper)		
RJ-45	Link/Type/Activity	ON	1G or 10G link (copper)	Yellow	LED1
		BLINK	Activity		
Fileer	Device	OFF	LS not powered	Vollow	
Fiber	Power	BLINK	LS Powered On	reliow	
		OFF	No Link (fiber)		
Fiber	Link/Activity	ON	1G or 10G link (fiber)	Yellow	LED11
		BLINK	Activity		





Figure 3: Lightning Stick Module LEDs

7. Lightning Stick Software Installation

The latest version of Lightning Stick software should be downloaded from: https://www.cotsworks.com/lightning-stick

- Verify that PC has administrative rights for software installation.
- Double click on setup.exe file to run software



The InstallShield Wizard will install the Lightning Stick Software



Setup Parameters are verified and installation begins



Default Directory is "C:\Program Files (x86)\Cotsworks\Lightning Stick\" Directory can be changed from default at this point if desired



When the Wizard is completed, the software is ready for use

NOTE: Software uses native Windows drivers and requires no driver installation

1 Lightning Stick Software Running The Software



The Installation Software will create a desktop shortcut to the Lightning Stick Software. Click the icon and the software will launch. The following sections of this manual detail the features of the software, starting with the layout and how to connect to the Lightning Stick hardware via the dashboard.

Lightning Stick Software Dashboard

The Dashboard is located in the upper section of the program window. This area is visible at all times as various tabs are viewed in the software.

The upper left area of the crishboard is a drop down menu which lists all Lightning Stark Modules (by serial number) that are connected to the computer or hub.

002D7A83	→ Hiber SPD/DPLX	Copper SPD/DPL
	Fiber Uptime	Copper Uptime
Con	nect	

Figure 4: LS Dashboard Disconnected

When the Lightning Stick software is disconnected from the device, the Fiber and Copper port boxes will be yellow, and the action button will read CONNECT, indicating that the device can be connected to the software. Selecting one of the devices and clicking the CONNECT button will initialize the connection to the Lightning stick

	002D7A83	*	Initializing	Initializing
		Disconnect	Fiber Uptime	Copper Uptime
			Figure 5: LS	Dashboard Intializing
One initialized, the	e dashboard will in	dicate connection by	having the fiber a	and copper port
kes turn green an <mark>SCO</mark> NNECT		nneation speed and t	y e The button w	vill then read
	Dashboard		Fiber SPD/DPLX	Copper SPD/DPLX
	002D7A83	*	1Gb/s FULL DPLX	10Mb/s FULL DPLX
		Disconnect	Fiber Uptime 2:34:13	Copper Uptime 0:00:00
			Figure	3:1 S Dashboard Active
			i igai o	

9. LS Software Tabs Overview and Features

9.1 Fiber Transceiver Tab Overview

The digital diagnostic information for the optical transceiver is displayed in this tab

- This tab lists all static data and dynamic variables available from the fiber transceiver installed in the Lightning Stick module
- The receiver status is reported
- The transmitter can be disabled via hardware or software
- High and Low warning and alarm levels for selected dynamic variables are read and can be modified in the Alarms/Warnings section.
- The dynamic variables reported in the readings tab can be plotted in the Chart Section
- Alerts can be toggled, and the handling of the alerts can be modified

iber XCVR	Chart	Fiber Port Ctrl	Copper PHY	Copper Port	Ctrl	Stats	VCT	Log	Advanced	DD
Readings					Ala	rms/War	nings			
Vendor	Name		COTSWORKS		Ter L A	nperatur Iarm	e (-128 to L Wan	o 128C) ning	H Waming	H Alarm
Transce	Transceiver Fart #		RJ5GSXDDPLXLCRM		-70		-65		110	120
Transce	eiver Seria	al #	A007AFJV		Vol L A	tage (Oto larm	6.55V) L Wan	ning	H Waming	H Alarm
Wavele	ength (nm)	850		2.7		2.97		3.63	3.9
Temper	rature (°C)	1	37.438		TX L A	Bias (Ot Jarm	o 131mA L Wan	() hing	H Waming	H Alam
Supply	Voltage (v)	3.247 7.198		1		2		40	50
TX Bias	s Current ((mA)			TX Power (0 to 6.55mW)					
TX Out	out Powe	r (dBm)	-3 3068		LA	lam	L Wan	ning	H Warning	H Alarm
		(00)	0.0000		0.0	7	0.09		0.63	0.8
RX Opt	ical Powe	r (dBm)	-4.1908		RX	Power	(0 to 6.5	5mW)	in the second second	
Signal (Detect Ou	itput	ON		LA	lam	L Wan	ning	H Warning	H Alarm
TV Dia	abla Dia		Eashlad		0.0	02	0.003		0.8	1
	H/W Dis	able	LIQUICU		Fini	shed				
	S/W Dis	able DBM	REA			SET		SA	WE	READ

Figure 7: Fiber Transceiver Tab

9.1.1 Fiber Transcevier Tab Readings Section

9.1.1.1 Fiber Transceiver Tab: Static Values

The following parameters are STATIC values that are read from the EEPROM. They are meant for identification and classification purposes in regards to the installed transceiver.

Vendor N	lame
----------	------

Manufacturer Name of Transceiver Installed.

Vendor Name	COTSWORKS
Transceiver Part #	RJ5GSXDDPLXLCRM
Transceiver Serial #	A007AFJU
Wavelength (nm)	850

Transceiver Part

The permanently installed transceiver part number
For pluggable transceivers, this allows the user to identify what transceiver is installed.

Transceiver Serial

• The serial number of the transceiver installed in the Lightning Stick **NOTE:** This is NOT the serial number of the Lightning Stick device.

Wavelength

Transmitter wavelength (LED or laser) in nanometers (nm).

9.1.1.2 Fiber Transceiver Tab: Dynamic Values

The following parameters are DYNAMIC values that are collected from the transceiver as electrical values and calculated based on EEPROM-based calibration values.

Supply Voltage (V) 3.248 TX Bias Current (mA) 7.328	_
TX Bias Current (mA) 7.328	
TX Output Power (dBm) -3.3536	
RX Optical Power (dBm) LO	

Temperature

This value is the temperature read from the fiber transceiver controller IC within the housing of the transceiver.

- This value is given in degrees Celsius
- The value should be within the operating range of the transceiver based on the specifications of the device.

Supply voltage

- The supply voltage (Vcc) of the fiber transceiver
 - SFP/SFF/RJ transceivers all operate using a Vcc of 3.3V.

Tx Bias Current

- The current draw for the transmitter, given in mA
 - Data rate and Transmitter type dependent see data sheet.

Tx Output power

Optical (transmitted output) power of the transmitter.

Rx Optical power

Optical (received input) power of the receiver.

9.1.1.3 Fiber Transceiver Tab: Optical Power Units

TX Output Power and RX Optical Power can be displayed in mW or dBm.

TX Output Power (dBm)	-5.5129
RX Optical Power (dBm)	-30
Signal Detect Output	OFF
TX Disable Pin	Enabled
H/W Disable	BM READ
TX Output Power (mW)	0.281
RX Optical Power (mW)	0.001
Signal Detect Output	OFF
TX Dischle Din	Enabled
H/W Disable	_

Figure 10: dBm/MW Toggle

Clicking **DBM** or **MW** next to **READ** will toggle between the two representations

- This will also update the units displayed in the Readings Table
- It is not necessary to click READ to see the value of the TX/RX values when toggling units

NOTE:

The EEPROM of the transceiver reports optical power in mW. However, optical network designers typically work with dBm, so both units are available for use.

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9.1.1.4 Fiber Transceiver Tab: Signal Detect/Tx Disable

In normal operation, the Signal Detect Output displays "ON" to designate that a signal is detected.



In normal o	peration, t	he TX Di	sable Pin is "Enabled" when the laser is on, indicating that the transmitter is enabled	and
transmitting	light.		When no signal is detected, polight or low light	
Signal Detect Output	OFF		received), the Signal Detect Output displays "OFF" to	
TX Disable Pin	Enabled		indicate that either there is an issue with the connection	
H/W Disable	MW	READ	to the other end of the link.	
			The Lightning Stick software allows the user to disable	
Signal Detect Output	ON		the transmitter, both via hardware or software. Toggle	
TX Disable Pin	H/W		the check box to select.	
✓ H/W Disable S/W Disable	DBM	READ	Here, H/W Disable selection is shown	
			(Click READ after toggle)	
Signal Detect Output	ON			
TX Disable Pin	S/W		Here, S/W Disable selection is shown.	
H/W Disable ✓ S/W Disable	DBM	READ	(Click READ after toggle)	
Figure	2. SD Off	; HW,SW	, DIS ruggedfiberontics com	

Alarms/Warnings Section

The high and low warning and alarm levels are set and read in this window.

Alarms/Wa	mings		
Temperatur L Alarm	re (-128 to 1280 L Warning	:) H Waming	H Alarm
-70	-65	110	120
Voltage (0 t L Alarm	to 6.55V) L Warning	H Warning	H Alarm
2.7	2.97	3.63	3.9
TX Bias (0) L Alarm	to 131mA) L Waming	H Waming	H Alam
1	2		50
TX Power (L Alarm	(0 to 6.55mW) L Warning	H Warning	H Alarm
0.07	07 0.09		0.8
RX Power L Alarm	(0 to 6.55mW) L Warning	H Waming	H Alarm
0.002	.002 0.003		1
Finished			
SET	S	AVE	READ

Figure 13: Alarm Warnings Settings Table

Any value typed in each field will be written to the fiber transceiver when SET button is pressed.

Verification of the values within these fields is obtained by clicking the READ button to access the memory map's stored values.

The range of values for each parameter is given in parentheses after the parameter name.



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9.1.3 Chart Tab Chart Settings

The software allows plotting of the dynamic variables behavior over time.

Fiber XCVR Chart	Fiber Port Ctrl Copper PHY	Copper Port Ctrl Stats VCT	Log Advanced DD		
1 - Alarm High			Warning	High	
Alarm Low			Warning	Low	Figure 14: Chart Tab
START Chart Settings	STOP	CLEAR OPTIO	NS		
HIDE	Refresh Rate (Range) 2 Seconds Scroll Rate Default (1/4) Alert Behavior Normal Operation	 Temperature (°C) Voltage (0 to 6.55V) TX Bias (0 to 131mA) TX Power (0 to 6.55mW) RX Power (0 to 6.55mW) 	Aarm High Warning High Warning Low Alarm Low		



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Alert Behavior

Normal Operation

9.1	3 Fiber	Alert B	eiver chavior	Tab: Setting	Chart JS	Sect	ion
	If the warning/a the behavior.	larm values a	are exceeded	d, the user o	an define ho	v to deal wi	th

If the warning/aland condition persists, an alert window will continue to appea warning of the condition.

This behavior can be modified in the ALERT BEHAVIOR drop down

- Normal Operation will allow a pop-up window to appear persistently as long as the warning/alarm thresh old has been crossed.
- Show Once will not allow a pop-up window to repeat a warning/alarm once acknowledged.
- Disable will not allow any alert window to appear.

9.1.3.1 Fiber Transceiver Tab: Chart Section **Chart Recorder Window**

When the dynamic variable of interest is selected, the user can enable the plotting of the parameter over time, based on the selections made in the Chart Settings Section (See Section 9.1.6).



To start plotting the performance of the selected parameter, click START.

To stop the plot but keep it viewable, click STOP.

To clear the plot, click CLEAR.



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9.2 Fiber Port Control Tab

Features of the Marvell Ethernet controller used in the Lightning Stick allow for flexible control and advanced monitoring of Ethernet traffic. The options and policy for handling traffic for the fiber port are presented on the Fiber Port Control tab.

adings		Settings
Fiber Speed	1Gb/s	Speed
Fiber Duplex	FULL DUPLEX	1Gbps 👻
Fiber Link Status	LINK UP	Duplex Mode
Fiber Remote Fault	NO FAULT	Full Duplex 👻
Link Partner Remote Fault	NO FAULT	Loopback
PHY Interface	1000BASE-X	No Loopback 👻
Controller Revision	1	Max Jumbo Frame Size
Port State	FORWARDING	10240 👻
Max Jumbo Frame Size	10240	Egress Rate Limiting
Egress Rate Limiting	NO LIMITING	No Limiting 👻
Total Packets on RX	4535296	Noise Filtering
Noise Filtering Enabled	DISABLED	Disabled 👻
	READ	DEFAULTS SET SAVE

Figure 17: Fiber Port Control Tab

The readable parameters are listed in the left-hand column of the Fiber Port Control to bunder the Readings Section, and are updated after clicking **READ**.

.2.1 Fiber Port Control Tab Readings Section

The following sections provide descriptions of the 'Readings' parameters in the order they are listed.

Fiber Speed

- Lightning Stick is capable of supporting and will report either 100 or 1Gb/s Ethernet speed over fiber.
- The copper port is independently capable of 10/100/1Gb/s data

Readings

Fiber Speed	1Gb/s
Fiber Duplex	FULL DUPLEX
Fiber Link Status	LINK UP
Fiber Remote Fault	NO FAULT
Link Partner Remote Fault	NO FAULT
PHY Interface	1000BASE-X
Controller Revision	1

Figure 18: Fiber Port Readings (A)

Fiber Duplex

- Lightning Stick is capable of supporting half-duplex at 100Mbps
- Full duplex at 100/1000Mbps speeds on the fiber port.

Fiber Link Status

Reports the link status between it and its link partner as either 'UP' and working or 'DOWN'.

Fiber Remote Fault

If a remote fault condition is detected, Lightning Stick will report a remote fault condition.

Link Partner Remote Fault

Will list if its link partner is reporting a remote fault status.

PHY Interface

The PHY interface supported is reported.



The Lightning Stick Software will report one of the fiber port states as described in Table 1.

Port State	Description
Disabled	Frames are not allowed to enter (ingress) or leave (egress) a Disabled port. Learning does not take place on Disabled ports.
Blocking/Listening	Only management frames are allowed to enter or leave a blocked port. All other frames are dropped. Learning is disabled on blocked ports.
Learning	Only management frames are allowed to enter or leave a Learning port. All other frame types are dropped but learning takes place on all good non- management frames.
Forwarding	Normal operation. All frames are allowed to enter and leave a Forwarding port. Learning takes place on all good non-management frames.

Table 1: Fiber Port States

9.2.1 Fiber Port Control Tab Port Controls

Max Jumbo Frame Size	10240	
Egress Rate Limiting	NO LIMITING	
Total Packets on RX	6566912	 Figure 19: Fiber Port Readings (B)
Noise Filtering Enabled	DISABLED	

Max Jumbo Frame Size Tx and Rx frames with defined maximum byte counts can be allowed to be received or transmitted.	Settings: 1522 bytes 2048 bytes 10240 bytes	
Egress Rate Limiting The data bit rate leaving the fiber port can be controlled or left unlimited.	Settings: No Limiting 12 Mbps 80 Mbps 1 Mbps 15 Mbps 150 Mbps 5 Mbps 24 Mbps 240 Mbps	
Total packets on Rx	8 Mbps 50 Mbps 500 Mbps	

A running total of packets received over the fiber port are counted and updated after clicking **REAP**.

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Settings:

Disabled 100BASE-FX 1000BASE-X Both

oise Filtering

An unconnected optical receiver will send full swing noise into the PHY. This random noise CAN look like a real signal. Can falsely cause the PCS to link up.

Enable hoise Filtering to reduce the probability of false link up. When the state machine is enabled, there will be a small <u>delay in link up time</u>.

.2.2 Fiber Port Control Tab Settings Section

Configurable options of the fiber port are listed on the right side 'Settings' folumn of the Fiber Port Control tab.

A number of options can be selected in each parameter's drop-down window. They can be modified and will persist until a power cycle by clicking the "SET" buton. They are written to the Lightning Stick controller and will remain as the settings for that parameter after a power cycle by clicking the 'SAVE' button. The "DEFAULT" button will return the parameters to their factory-default settings.

ettings	
Speed	
1Gbps	•
Duplex Mode	
Full Duplex	•
Loopback	
No Loopback	•
Max Jumbo Frame Size	
10240	-
Egress Rate Limiting	
No Limiting	•
Noise Filtering	

Fiber Speed

The user can force a fiber port speed or allow for auto-negotiation Options:

- Auto-Detect
- 100Mbps
- 1Gb/s

Duplex Mode

The fiber port is capable of supporting:

- Half-duplex at 100Mbps
- Full duplex at 100/1Gb/s

Loopback

the fiber port:

- nternal Bus
- External (physical fiber

Figure 20: Fiber Port Settings



9.2.2 Fiber Port Control Tab Settings Section

Internal bus loopback

- The transmitter data presented on TXD of the internal bus is looped back to RXD of the internal bus
- Note: Link is broken when loopback is enabled
- Loopback speed operates at the existing data rate

SERDES loopback

- Loops back symbols through the PCS
- Tx and Rx can be asynchronous

(
MAC	Media Access Controller	
SERDES	Serializer/Deserializer	
PCS	Physical Coding Sub layer – 8b/10b	
РМА	Physical Medium Attachment – sync & negotiation	
PMD	Physical Medium Dependent Sub layer – laser driver interface	

Figure 21: SERDES loopback data path

External Loopback

- This mode allows to self-link at 16 bps and allows the actual external loopback.
- The MAC should see the same packets it sent.

9.2.2.2 Fiber Port Control Tab **Port Controls**

Max Jumbo France SizeSettings:Tx and Rx frames with defined maximum byte counts can be allowed to be received or transmitted.1522 byte 2048 byte = 10240 byte	es es tes
---	-----------------

Egress Rate Limiting

The data bit rate leaving the fiber port can be controlled or left unlimited.

Settings:

- No Limiting
- 1 Mbps 5 Mbps
- 8 Mbps

- 80 Mbps
- 150 Mbps
- 240 Mbps
- 500 Mbps

Noise Filtering

An unconnected optical receiver will send full swing noise into the PHY. This random noise can look like a real signal. Can falsely cause the PCS to link up. Enable Noise Filtering to reduce the probability of false link up. When the state machine is enabled, there will be a small delay in link up tim

Settings:

- Disabled
 - 100BASE-FX 1000BASE-X

12 Mbps

15 Mbps

24 Mbps

50 Mbps



9.3 Copper PHY Tab

The options on the copper port PHY are presented on the Copper PHY tab.

Readings		Settings
Link Status	UP	Reset
PHY Speed Detection	1Gb/s	Normal Operation 💌
PHY Duplex	FULL DUPLEX	PHY Loopback Mode
Auto-Negotiation Complete	COMPLETE	Normal Operation 💌
Jabber Detect	NOT DETECTED	PHY TX Disable
Remote Fault	NO FAULT	0 - Disable not asserted
Link Partner Remote Fault	NO FAULT	Energy Detect
Link Partner Ability		Off 🔹
PHY Energy Detect	ENERGY DETECT+TM	
	READ	DEFAULTS SET SAVE

The readable parameters are listed in the left-hand column of the Copper PHY tab under the Readings Section, and are updated after clicking **READ**.

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Readings

Link Status

9.3.1 Copper PHY Tab Readings Section

The foll wing section provide descriptions of the 'Readings' parameters in the order they are listed.

Link Status (Copper)

Reports link status between Lightning Stick and its link

Reports the maximum speed detected for a link to occur

between it and its link partner.

An Ethernet speed of 10/100 or 1000Mbps Ethernet data rate will be reported.

PHY Duplex

Supports half-duplex at 10 and 100Mbps and full duplex at all speeds on the copper port

Auto-negotiation Complete

Auto-Negotiation provides a method to establish a common speed, duplex and flow control during a link session.

- Upon successful Auto-Negotiation, the
- 'COMPLETE' status is displayed.
- Can be disabled by forcing a set speed and duplex mode in the Copper Port Control window.

Jabber Detect

In networks, a jabber is any device that is handling

It e network and in most cases can look like a device that is always sending.

A jabber can have a longer than maximum frame length,

Remote Fault

Link Partner Remote Fault

Link Partner Ability

The link partner's fastest broadcasted speed and duplex displayed.



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PHY Speed Detection 10Mb/s PHY Duplex FULL DUPLEX Auto-Negotiation Complete NOT COMPLETE Jabber Detect NOT DETECTED Remote Fault NO FAULT Link Partner Remote Fault NO FAULT Link Partner Ability PHY Energy Detect OFF

UP

9.3.1.1 Copper PHY Tab

Energy Detect

Lightning stick is capable of power savings by implementing Energy Detect on its copper port. There are two modes of Energy Detect.

In Mode 1 (Energy Detect):

- If Lightning Stick detects energy on the Receive line, it will attempt Auto-Negotiation for 5 seconds.
- If at the end of 5 seconds, the Auto-Negotiation is not completed, the PHY will stop attempting to
- Auto-Negotiate and go back to monitoring the Rx energy.
- In Mode 2 (Energy Detect + TM):
 - Lightning Stick sends out an NLP (Normal Link Pulse) once every second in an attempt to wake up the connected link partner.
- If Lightning Stick is in Mode 1, it cannot wake up a connected device.
 - Therefore, the connected device must be in Mode 2 to complete a link between two nodes.

9.3.2 Copper PHY Tab

Settings Section

Settings
Reset
Normal Operation
PHY Loopback Mode
Normal Operation 👻
PHY TX Disable
0 - Disable not asserted
Energy Detect
Off 🔹

Figure 24: Copper PHY Settings

Reset

- Normal: Auto-Negotiation occurs on a port reset or if Auto-Negotiation is specified in the PHY speed.
- S/W Reset must occur for modified speed and dupley medee to take affect
- duplex modes to take effect.
 - A software reset on the copper port does not affect the fiber port.

PHY Loopback mode

When PHY loopback is activated, the data

internally. Link is broken when loopback is enabled.

Copper Transmitter Disable

A power savings feature allowing manual control of enabling or disabling copper transmitter.

- 0: Disable NOT Assert
- 1: Disable Asserted

Energy Detec

The Power Down modes, Mode 1 and Mode described in the Energy Detect section.





4 Copper Port Control Tab

10a. The readable parameters are listed in the off-hand column of the Copper Port Control window under 'Readings' and are updated after clicking on the 'READ' button. Below are descriptions of the 'Readings' parameters in the order they are listed.

Readings		Settings
Controller Temperature	65C	Speed
Copper Speed	1Gb/s	1Gbps 👻
Copper Duplex	FULL DUPLEX	Duplex Mode
Copper Link Status	LINK UP	Full Duplex 👻
PHY Interface	PHY	Loopback Mode
Controller Revision	1	No Loopback 🔹
Port State	FORWARDING	Max Jumbo Frame Size
Max Jumbo Frame Size	10240	10240 🗸
Egress Rate Limiting	NO LIMITING	Egress Rate Limiting
Total Packets on RX	2372608	No Limiting 🗸
Link Partner Remote Fault	NO FAULT	
Copper Remote Fault	NO FAULT	

READ

SET SAVE

Figure 25: Copper Port Control Tab

DEFAULTS



9.4.1 Copper Port Control Tab:

Readings Section

Readings	
Controller Temperature	60C
Copper Speed	10Mb/s
Copper Duplex	FULL DUPLEX
Copper Link Status	LINK UP
PHY Interface	PHY
Controller Revision	1

Figure 26: Copper Port Readings (A)

Controller Temperature

Temperature of the Ethernet controller in °C

Copper Speed

- Lightning Stick is capable of supporting and will report either 10, 100 or 1000Mbps Ethernet speed over copper.
- The fiber port is independently capable of 100 or 1000Mbps data rates.

Copper Duplex

- Lightning Stick is capable of supporting half-duplex at 10 and 100Mbps
- Full duplex at 10, 100, or 1000Mbps speeds on the copper port.

Copper Link Status

Reports the link status between it and its link partner as either 'UP' and working or 'DOWN' and not working.

PHY Interface

The PHY interface supported is reported.

Controller Revision

The controller die revision as reported by Marvell.

9.4.1.1 Copper Port Control Tab:

Port State

Port State	FORWARDING	
The Lightning Stick Softw	vare will report one of the copper port states as described in Table 2	
Port State	Description	
Disabled	Frames are not allowed to enter (ingress) or leave (egress) a Disabled port. Learning does not take place on Disabled ports.	
Blocking/Listening	Only management frames are allowed to enter or leave a blocked port. All other frames are dropped. Learning is disabled on blocked ports.	
Learning	Only management frames are allowed to enter or leave a Learning port. All other frame types are dropped but learning takes place on all good non-management frames.	
Forwarding	Normal operation. All frames are allowed to enter and leave a Forwarding port. Learning takes place on all good non-management frames.	
	Table 2: Conver Port States	

9.4.1.2 Copper Port Control Tab: Port Controls

Max Jumbo Frame Size Egress Rate Limiting Total Packets on RX Link Partner Remote Fault Copper Remote Fault

10240 NO LIMITING 7418880 NO FAULT NO FAULT

Figure 27: Copper Port Readings (B)

Max Jumbo Frame Size

Tx and Rx frames with defined maximum byte counts can be allowed to be received or transmitted.

Settings:

- 1522 bytes
- 2048 bytes10240 bytes
- 10240 Dytes

Egress Rate Limiting

The data bit rate leaving the fiber port can be controlled or left unlimited.

Settings:

- No Limiting
 1 Mbps
 5 Mbps
 8 Mbps
- 12 Mbps15 Mbps24 Mbps

■ 50 Mbps

- 80 Mbps
- 150 Mbps
- 240 Mbps
- 500 Mbps

Total packets on Rx A ronning total of packets received over the fiber port are counted and updated aner clicking READ.

Link Partner Remote Fault

Will list if its link partner is reporting a remote fault status.

Copper Remote Fault

The remote fault condition is detected, Lightning Stick will report a remote fault condition.



9.4.2 Copper Port Control Tab: Settings Section

Configurable options of the copper port are listed on the right side 'Settings' column of the Fiber Port Control tab.

A number of options can be selected in each parameter's drop-down window. They are written to the Lightning Stick controller after clicking the 'SAVE' button.

Speed	
Speed	
1Gbps	•
Duplex Mode	
Full Duplex	
Loopback Mode	
No Loopback	
Max Jumbo Frame Size	
10240	
Egress Rate Limiting	
No Limiting	

Copper Speed

The user can force a copper port speed or allow for auto-negotiation Options:

- Auto-Negotiate
- 10Mbps
- 100Mbps
- 1Gb/s

Duplex Mode

The copper port is capable of supporting:

- Half-duplex at 10 or 100Mbps
- Full duplex at 10, 100, or 1Gb/s

Loopback

Two levels of loopback modes are supported on the copper port:

- MAC Interface Loopback
- LINE Loopback

Figure 28: Copper Port Settings

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4.2.1 Copper Port Control Tab: Loopback Modes

MAC Interface Loopback:

- The data received from the MAC is not transmitted out on the media interface
- The data is looped back and sent to the MAC.
- During loopback, Link is lost and packets will not be received.

LINE Loopback:

- Allows a link partner to send frames into the device to test transmit and receive data path.
- Frames entering the PHY from a link partner, before reaching the MAC interface pins, are looped back and sent out on the line.
- They are also sent to the MAC.
 - The packets received on the MAC are ignored during line loopback.
- This allows the link partner to receive its own frames.

	MAC Interface Loopback
MAC	Media Access Controller
SERDES	Serializer/Deserializer
PCS	8b/10b
РМА	Sync & negotiation
PMD	Copper interface
0000	Line Loopback

Figure 29: Copper Port Loopback

	Settings:	
Max Jumbo Frame Size	1522 bytes	
Tx and Rx frames with defined maximum tyte counts can be glowed to be received or transmitted.	2048 bytes 10240 bytes	
Egress Rate Limiting The data bit rate leaving the fiber port can	Settings: No Limiting 12 Mbps 80 Mb	
be controlled or le t unlimited.	1 Mbps 15 Mbps 150 M 5 Mbps 24 Mbps 240 M 8 Mbps 50 Mbps 500 M	lbps lbps lbps



9.5 Statistics Tab

Packet statistics are recorded in the port registers and updated in the Statistics table. Values can be updated by clicking on 'REFRESH' or at a specified refresh interval. The interval is set by entering a value (in seconds) and clicking 'SET'. Registers are cleared to 0 after clicking on 'CLEAR' button.

Fiber Transceiver Fil	iber Port Control	Copper PHY	Copper	Port Control	Statistics	VCT	Log	Advanced	
RX Packets				- TX Packets	i				_
Good Packets	12444	4		Total TX F	Packets		12444		
Unicast Packet	ts O			Unicast	Packets		0		
Broadcast Pack	kets 0			Broadca	ast Packets		0		
Multicast Packe	ets 90			Multicas	st Packets		90		
Total Bad Packet	ts O			Collision	IS		0		
Undersize Pack	kets 0			Deferre	đ		0		
Fragment Pack	kets 0			Single F	ackets		0		
Oversize Packe	ets 0			Multiple	Packets		0		
Jabber Detect	0			Excessi	ve		0		
Receive Errors	. 0			Late			0		
						CLEAR		REFRES	н
				Refresh Rat	:e (s):	5		SET	

Figure 30: Statistics Ta

Good Packets	2739	
Unicast Packets	0	Rx Packets Section
Broadcast Packets	0	Reports the following:
Multicast Packets	18	Good Packets Count
		Unicast Packets
Total Bad Packets	0	Multicast Packets
Undersize Packets	0	Total Bad Packets Count
Fragment Packets	0	 Fragment Packets
Oversize Packets	0	 Oversize Packets
Jabber Detect	0	Adder Detect Receiver Errors
Receive Errors	0	1
Figu	ure 31: Rx Statisti	ics
otal TX Packets	16566	
Unicast Packets	0	Tx Packets Section
Broadcast Packets	0	Reports the Following:
Multicast Packets	121	Total Packets Transmitted
		 Broadcast Packets
Collisions	0	 Multicast Packets Collisions
Deferred	0	Deferred
Single Packets	0	Single Packets
Multiple Packets	0	Excessive
Excessive	0	Late
Late	0	

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9.6 Virtual Cable Test Tab

Lightning Stick's Virtual Cable Tester (VCTTM) feature consists of two separate diagnostic tools to evaluate cable signal integrity. The first diagnostic is based on TDR (Time Domain Reflectometry) where a pulse is sent out on each pair and reflections are observed on all pairs. The other VCT diagnostic feature is based on Digital Signal Processing (DSP). This feature is available when there is a Gigabit link established. It can determine cable length, pair skew, polarity reversal and channel swap. 'INVALID' is displayed in these fields when VCT is attempted and no Gigabit link is established. TDR can be used for two functions. The first function is to detect cable faults. These faults include opens, shorts, cable impedance mismatch, bad connectors and termination mismatch. The second function of TDR is to determine the cable length to a fault when there is a link partner physically connected, but no link established.

			oopport of oorin	or ordistics	LUg	nuvanceu
Pair	Status	Distance t Fault	to Cable Length	Channel	Polarity	Pair Skew
1-2	PAIROK	0	0	INVALID	INVALID	INVALID
3-6	PAIR OK	0	0	INVALID	INVALID	INVALID
4-5	PAIR OK	0	0	INVALID	INVALID	INVALID
7-8	PAIR OK	0	0	INVALID	INVALID	INVALID

Figure 33: VCT Chart

VCTTest

VCT Test in Progress

Test Takes Approximately 15 Seconds to Complete



Figure 34: VCT In Progress Window

9.7 Log Tab

The log page tab shows all system reporting and user actions taken in the Lightning Stick software. A log of all activities that occur in software and hardware when the Lightning stick software is running. The log is in a tabular format, and lists the following information:

- Time and Date of each event
- Type of even
 - INFO
 - DEBUG
- Event 'location'
 - Tab name
 - Section of a tab, such as "chart"
 - The application
- The device
- Message
 - A verbose message detailing information about that event
- The columns of the log file can be sorted by clicking on the header value of each column
- The log file can be saved to a text file if desired.
- It is space delimited.

Date	Level	Location	Message
8/6/2014 8:47:01 AM	INFO	Chart	Chart: Chart refresh rate changed to 2 seconds
8/6/2014 8:47:01 AM	INFO	Chart	Chart alerts set to "Normal Operation"
8/6/2014 8:47:01 AM	INFO	Application	Application started
8/6/2014 8:48:01 AM	INFO	Application	Connected to Lightning Stick on port 002D7A83
8/6/2014 8:48:01 AM	INFO	Fiber Transceiver	Alarm and warning thresholds read
8/6/2014 8:48:08 AM	INFO	Fiber Transceiver	Alarm and warning thresholds read
8/6/2014 8:49:21 AM	ERROR	Packet Receive	Packet Handler: Error, unrecognized packet forma
8/6/2014 8:52:28 AM	ERROR	Packet Receive	Packet Handler: Error, unrecognized packet forma
8/6/2014 8:54:28 AM	ERROR	Packet Receive	Packet Handler: Error, unrecognized packet forma
8/6/2014 9:02:23 AM	ERROR	Packet Receive	Packet Handler: Error, unrecognized packet forma
8/6/2014 9:02:46 AM	INFO	Fiber Port Control	Fiber Port Control registers read
/	1		

Figure 35: Log Tak

9.8 Advanced Control Register Dump

This tab is for an advanced function of providing a register dump of all control registers in Lightning Stick. They are partitioned into the register dump of the digital diagnostics on the fiber transceiver; PHY and SERDES Control Registers of Page 01h and Page 0Fh; Switch Control Registers of Page 11h and 15h; and Global Registers of Pages 1Bh and 1Ch of the Marvell Controller chip.

USERS SHOULD NOT ATTEMPT TO WRITE TO THESE REGISTERS ('Load From File' or 'Load Into Flash' BUTTONS) UNLESS INTIMATELY FAMILIAR WITH MARVELL'S SWITCH ARCHITECTURE.

		Memory Maps
	PHY Control Registers	Switch Control Registers Global Registers
Address	Data	Current Map
Copper PHY		
0	0100	
1	794D	Load on Startup
2	0141	PHY Control Begisters
3	0EB1	
4	05E1	Global Bacistara
5	0000	
6	0004	
7	2001	Save To File
8	0000	
9	0E00	Load From File
10	0000	Load Into Bash

Figure 36: Advanced Tab

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