

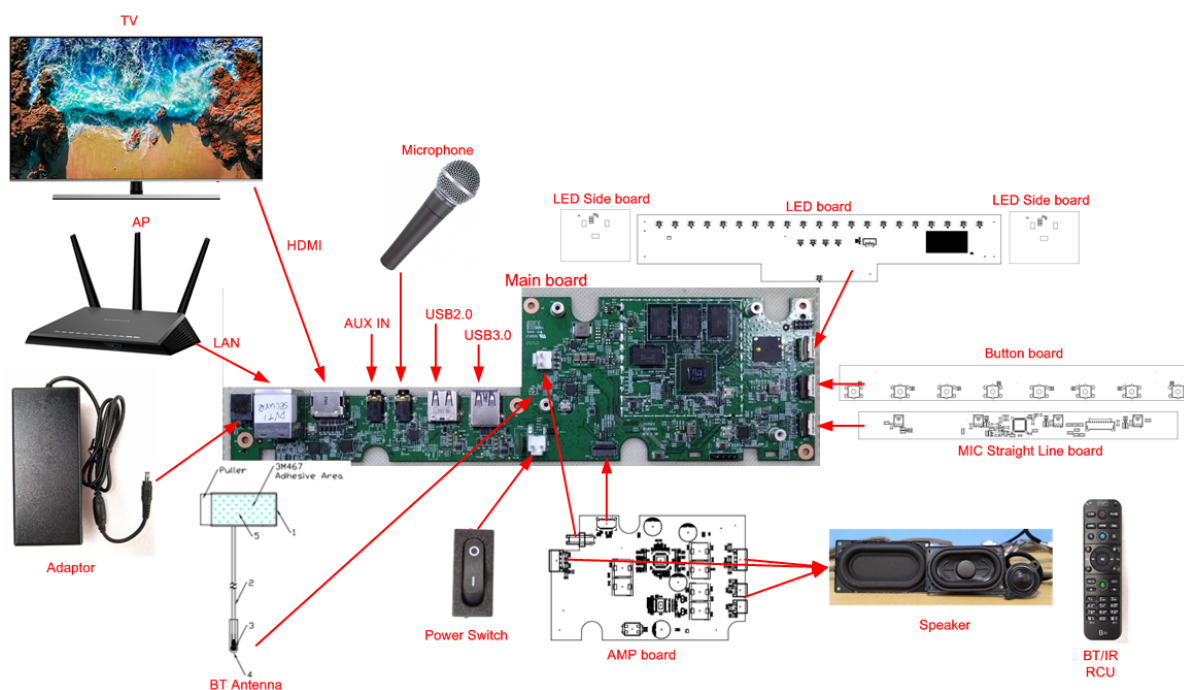
Hardware Unit Test Report

Set-Top Box BFX-UA300 V025

Ethernet RGMII Timing Test and LED status

Hardware version	FW version	Sample No.	eMMC Flash P/N
V025	19.522.41	S/N: YUX07V6- 2154002568-02S2N	DDR: 1. H5AN8G6NCJR-VKC 2. H5AN4G6NBJR-VKC eMMC: KLM8G1GETF-B041

1. Ethernet RGMII timing test structure



Note: Ethernet cable needs 1Gb for requirement.

2. Test equipment

1. BFX-UA300 EVT board V025, AMP board V015, LED/LED side board/MIC board/Button board V025
2. TV: 4K TV: ENVISION P2271WHL
3. AC Source: APG-1005N: 220Vac @60Hz
4. AC Adaptor: ANY2405D-NIM: AC:220Vac @60Hz; DC: 24V/5A
5. Power meter with accumulator: Yokogawa WT210
6. AP D-Link 10/100, Netgear: R8500
7. Oscilloscope: Tektronix TDS5032B
8. DMM
9. E-loader: Chroma 6312(replace USB HDD)
10. Current probe: TCPA300

3. Test environment

1. Test place: FXN CNSBG Building 1F office
2. Test DUT name: BFX-UA300EVT main board V025 and LED/LED side board V025
3. Test environment condition: temperature: 25 deg-C, humidity: 65
4. Test date: 2021/1/19
5. Test result: See section 5&6 for test results.
6. Test setup picture (Power architecture block and reality environment picture)

Criteria:

No any LED color different and abnormal brightness.

Command:

MDC/MDIO: signal from MAC is keeping sending, no command is required.

RGMII RX/TX command:

```
iperf3 -c IP_address -t 3600
```

Note: use iperf Rx/Tx to measurement the signal.

4. Ethernet RGMII Specification

10.6.1. MDC/MDIO Timing

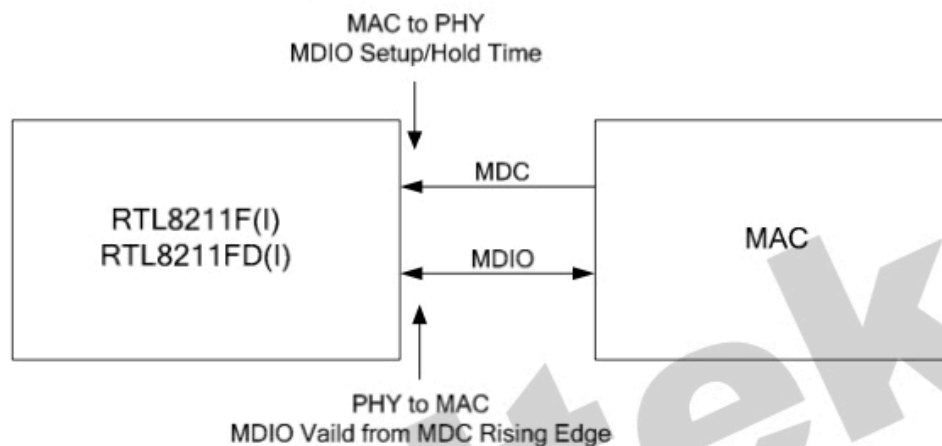


Figure 12. MDC/MDIO Setup, Hold Time, and Valid from MDC Rising Edge Time Definitions

MDC/MDIO Timing – Management Port

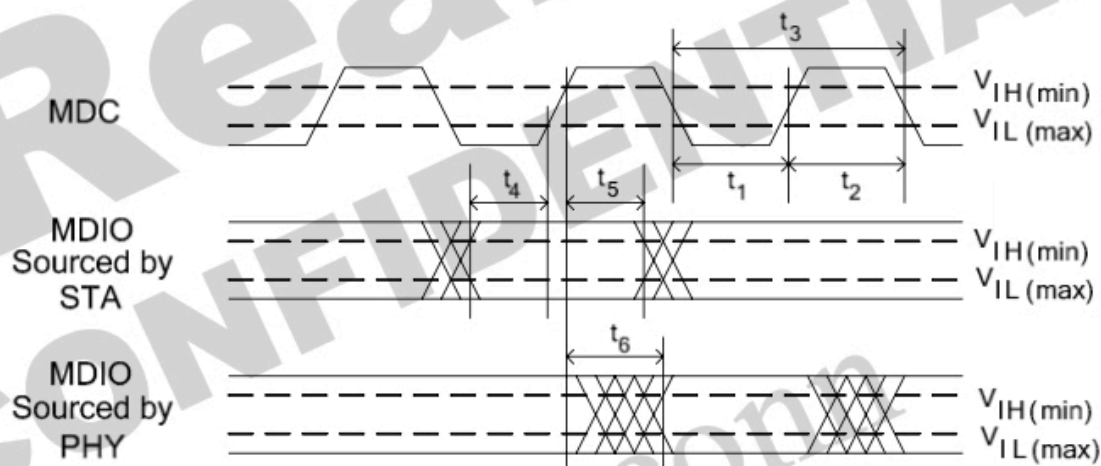


Figure 13. MDC/MDIO Management Timing Parameters

Table 59. MDC/MDIO Management Timing Parameters

Symbol	Description	Minimum	Maximum	Unit
t_1	MDC High Pulse Width	32	-	ns
t_2	MDC Low Pulse Width	32	-	ns
t_3	MDC Period	80	-	ns
t_4	MDIO Setup to MDC Rising Edge	10	-	ns
t_5	MDIO Hold Time from MDC Rising Edge	10	-	ns
t_6	MDIO Valid from MDC Rising Edge	0	300	ns

Note: $V_{IH}=1.4V$, $V_{IL}=0.4V$

10.6.2. RGMII Timing Modes

Timing for this interface will be such that the clock and data are generated simultaneously by the source of the signals and therefore skew between the clock and data is critical to proper operation.

Figure 14 shows the effect of adding an additional delay to TXC via the PC board (upper side) or by transmitter internally (lower side) when in RGMII mode.

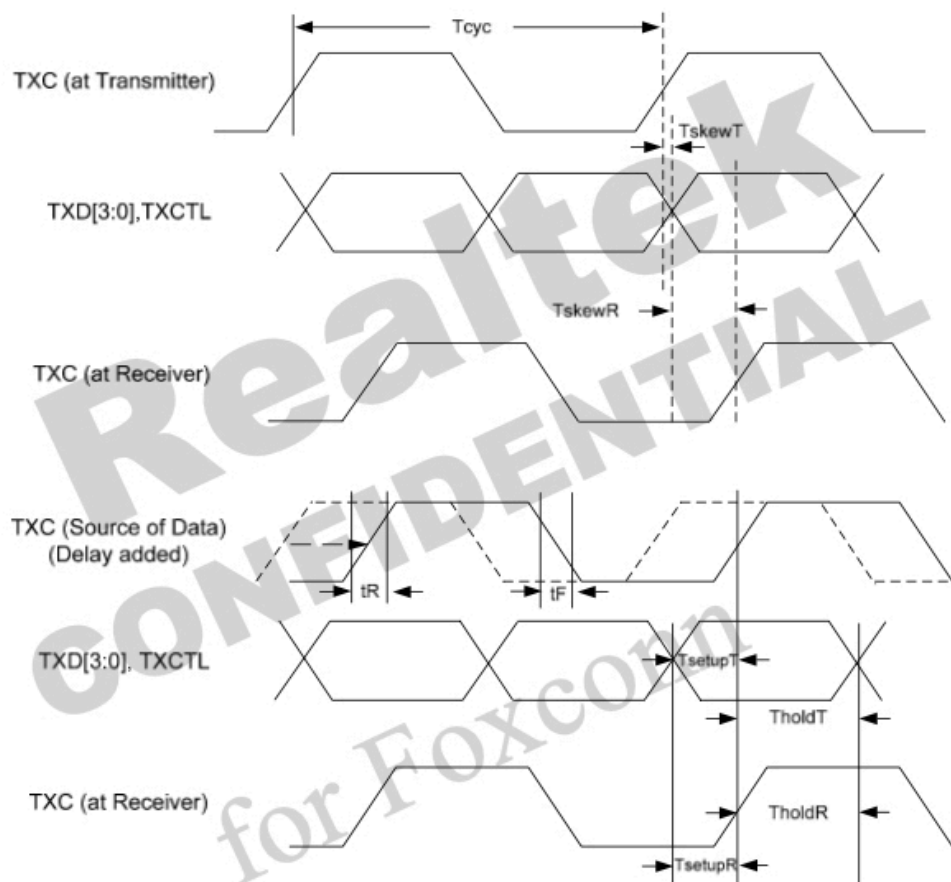


Figure 14. RGMII Timing Modes (For TXC)

Figure 15 shows the effect of adding an additional delay to RXC via the PC board (upper side) or by transmitter internally (lower side) when in RGMII mode.

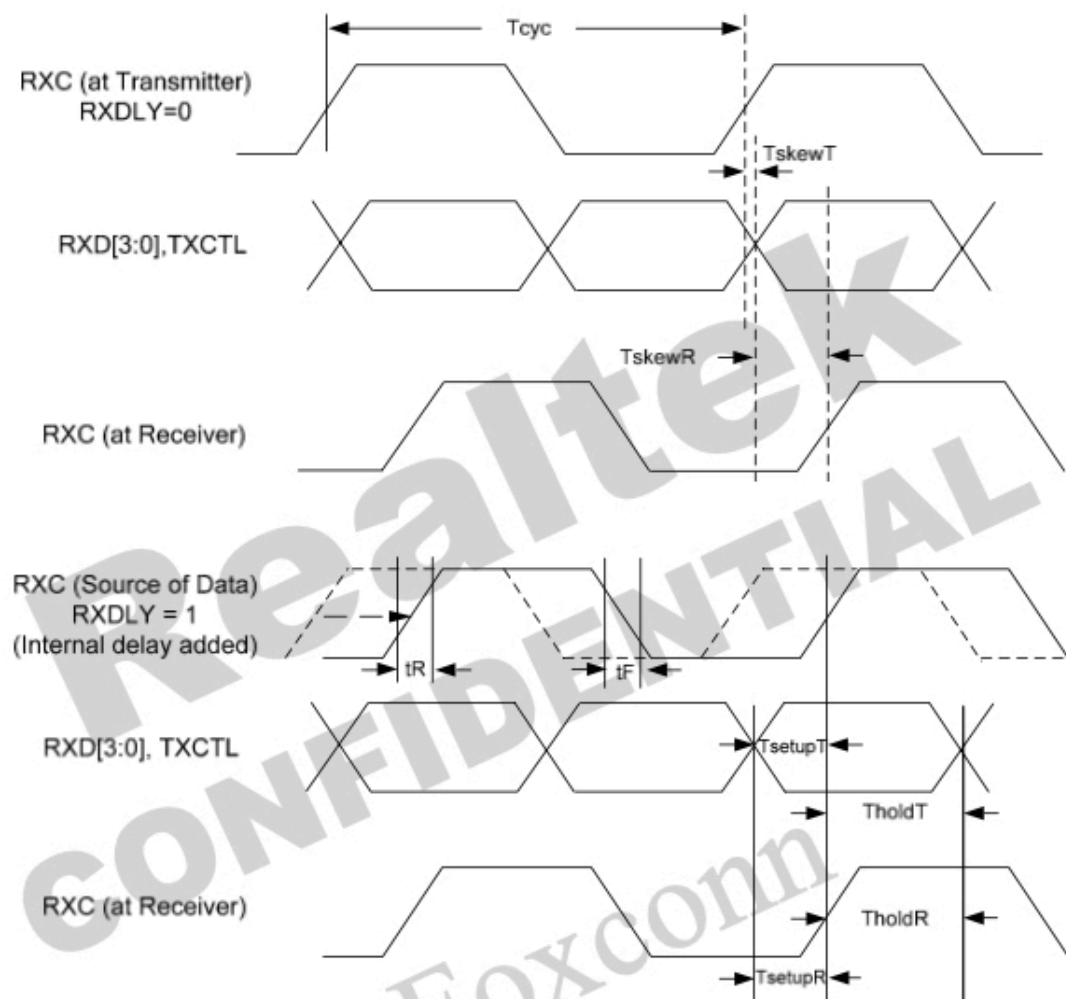


Figure 15. RGMII Timing Modes (For RXC)

Table 60. RGMII Timing Parameters

Symbol	Description	Min	Typical	Max	Units
Tcyc *	Clock Cycle Duration (1000Mbps)	7.2	8	8.8	ns
	Clock Cycle Duration (100Mbps)	36	40	44	ns
	Clock Cycle Duration (10Mbps)	360	400	440	ns
Duty_G	Duty Cycle for 1000	45	50	55	%
Duty_T	Duty Cycle for 10/100	40	50	60	%
tR	TXC/RXC Rise Time (20%~80%)	-	-	0.75	ns
tF	TXC/RXC Fall Time (20%~80%)	-	-	0.75	ns
TsetupT	Data to Clock Output Setup Time at transmitter (with delay integrated at transmitter)	1.2	2	-	ns
TholdT	Clock to Data Output Hold Time at transmitter (with delay integrated at transmitter)	1.2	2	-	ns
TsetupR	Data to Clock Input Setup Time at receiver (with delay integrated at transmitter)	1.0	2	-	ns
TholdR	Clock to Data Input Hold Time at receiver (with delay integrated at transmitter)	1.0	2	-	ns
TskewT **	Data to Clock Output Skew Time at transmitter (without delay integrated)	-0.5	0	0.5	ns
TskewR **	Data to Clock Input Skew Time at receiver (with PCB delay integrated) This implies that PC board design will require clocks to be routed such that an additional trace delay of greater than 1.5ns and less than 2.0ns will be added to the associated clock signal.	1	1.8	2.6	ns

**Note: Duty cycle may be stretched/shrunk during speed changes or while transitioning to a received packet's clock domain as long as minimum duty cycle is not violated and stretching occurs for no more than three Tcyc of the lowest speed transitioned between.*

***Note: For 10/100Mbps, the max value of Skew Time is unspecified.*

5. Test Result and picture

The test setup environment for RGMII.



Management Data Timing

Test Item		Specification			Result	Unit	Pass / Fail
Symbol	Parameter	Min.	Typ.	Max.			
T1	MDC high pulse width	32	--	--	216	ns	Pass
T2	MDC low pulse width	32	--	--	208	ns	Pass
T3	MDC Period	80	--	--	424	ns	Pass
T4	MDIO setup to MDC rising edge	10			212	ns	Pass
T5	MDIO hold time from MDC rising edge	10			212	ns	Pass
T6	MDIO valid from MDC rising edge	0		300	194	ns	Pass

Note: D4 is the longest trace, D0 is the shortest trace

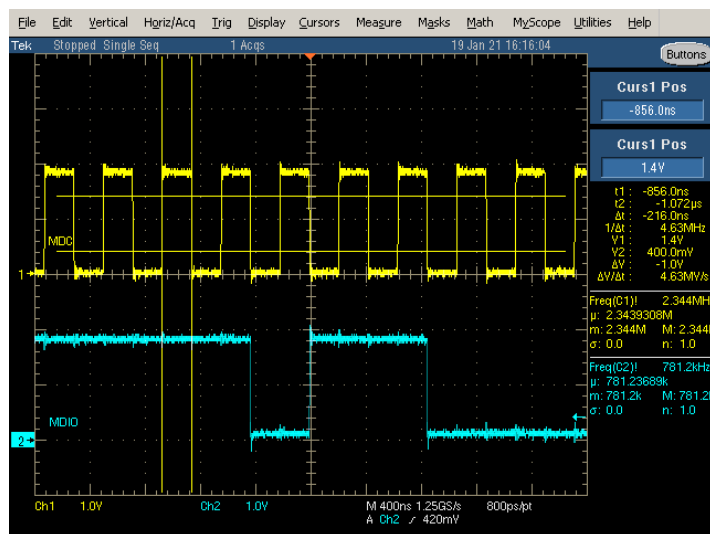
RGMII Receive Timing

Test Item		Specification			Result	Unit	Pass / Fail
Symbol	Parameter	Min.	Typ.	Max.			
Tcyc	Clock Cycle Duration (1000Mbps)	7.2	8	8.8	8	ns	Pass
Tcyc	Clock Cycle Duration (100Mbps)	36	40	44	40	ns	Pass
Duty_G	Duty Cycle for 1000	45	50	55	50	%	Pass
Duty_T	Duty Cycle for 10/100	40	50	60	50	%	Pass
tR_tx	TXC Rise time(20%~80%)	--	--	0.75	0.72	ns	Pass
tR_rx	RXC Rise time(20%~80%)	--	--	0.75	0.72	ns	Pass
tF_tx	TXC Fall time(20%~80%)	--	--	0.75	0.72	ns	Pass
tF_rx	RXC Fall time(20%~80%)	--	--	0.75	0.72	ns	Pass
TsetupT	Data to Clock Output setup time at transmitter	1.2	2	--	2	ns	Pass
TholdT	Clock to data output hold time at transmitter	1.2	2	--	2	ns	Pass
TsetupR	Data to Clock input setup time at receiver	1.0	2	--	1.80	ns	Pass
TholdR	Clock to data input hold time at receiver	1.0	2	--	3.6	ns	Pass
TskewT	Data to clock output skew time at transmitter	-0.5	0	0.5	0.12	ns	Pass
TskewR	Data to clock input skew time at receiver	1	1.8	2.6	1.8	ns	Pass

Picture of MDC timing

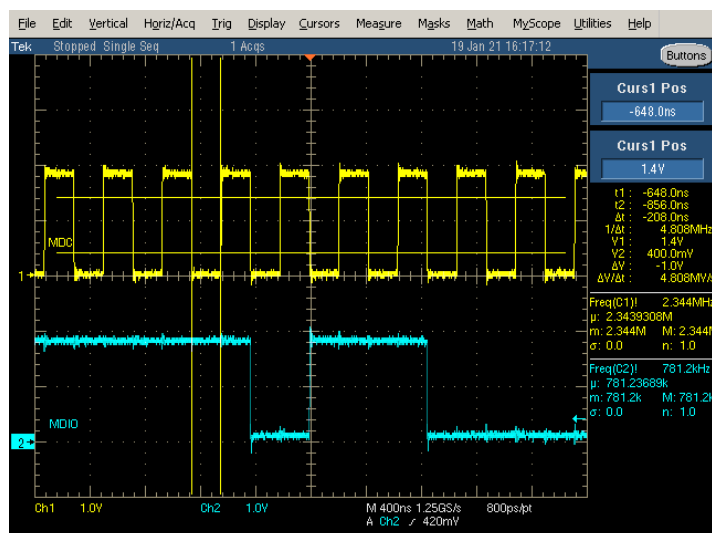
MDC-MDC high pulse width

Test Item		Specification			Result	Unit	Pass / Fail
Symbol	Parameter	Min.	Typ.	Max.			
T1	MDC high pulse width	32	--	--	216	ns	Pass



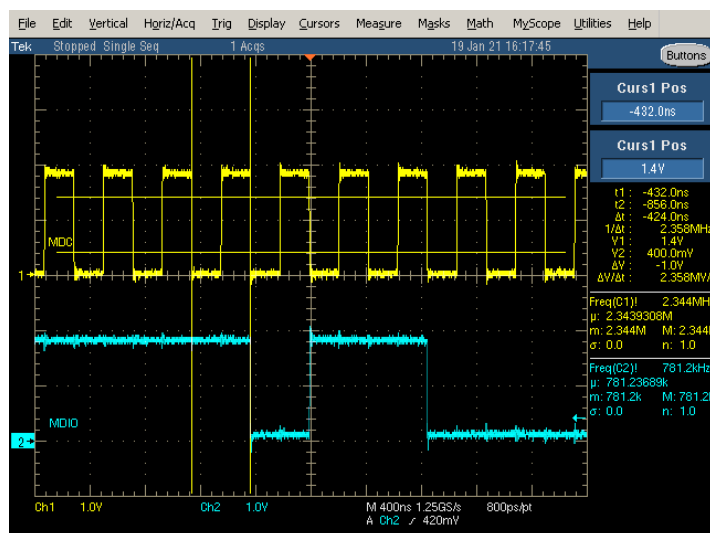
MDC-MDC low pulse width

Test Item		Specification			Result	Unit	Pass / Fail
Symbol	Parameter	Min.	Typ.	Max.			
T2	MDC low pulse width	32	--	--	208	ns	Pass

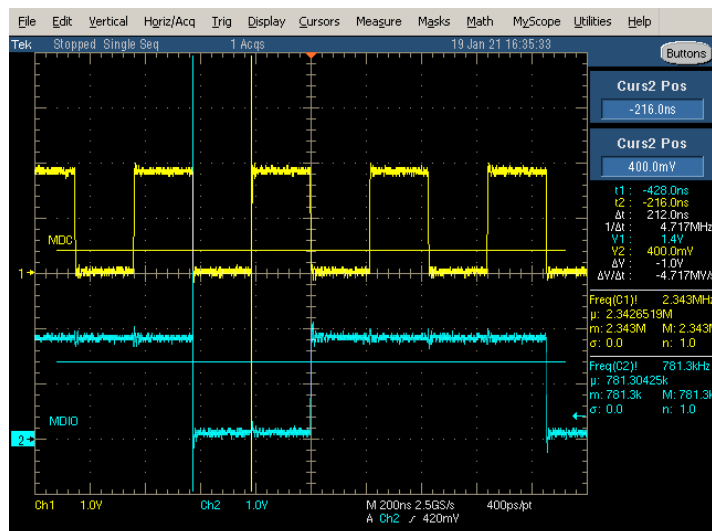


MDC – MDC period

Test Item		Specification			Result	Unit	Pass / Fail
Symbol	Parameter	Min.	Typ.	Max.			
T3	MDC period	80	--	--	424	ns	Pass

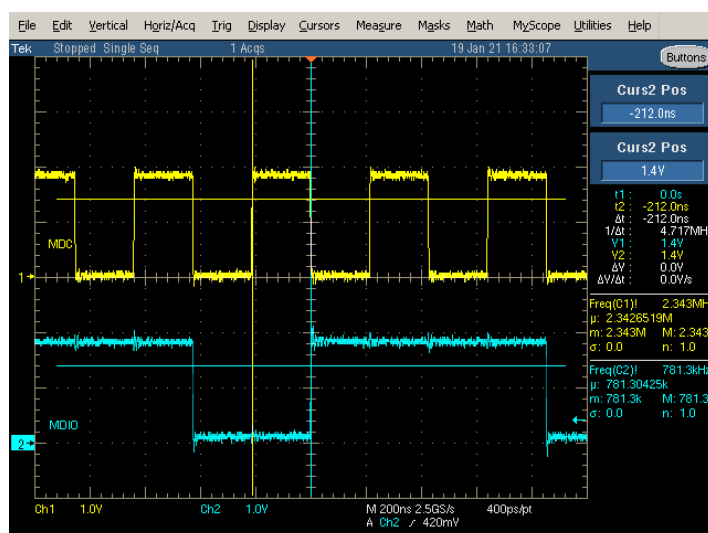
**MDC – MDIO setup to MDC rising edge**

Test Item		Specification			Result	Unit	Pass / Fail
Symbol	Parameter	Min.	Typ.	Max.			
T4	MDIO setup to MDC rising edge	10	--	--	212	ns	Pass

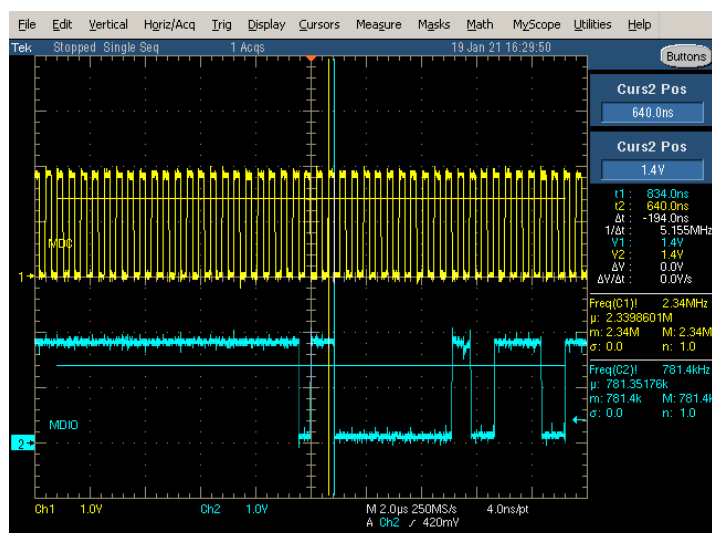


MDC – MDIO hold time from MDC rising edge

Test Item		Specification			Result	Unit	Pass / Fail
Symbol	Parameter	Min.	Typ.	Max.			
T5	MDIO hold time from MDC rising edge	10	--	--	212	ns	Pass

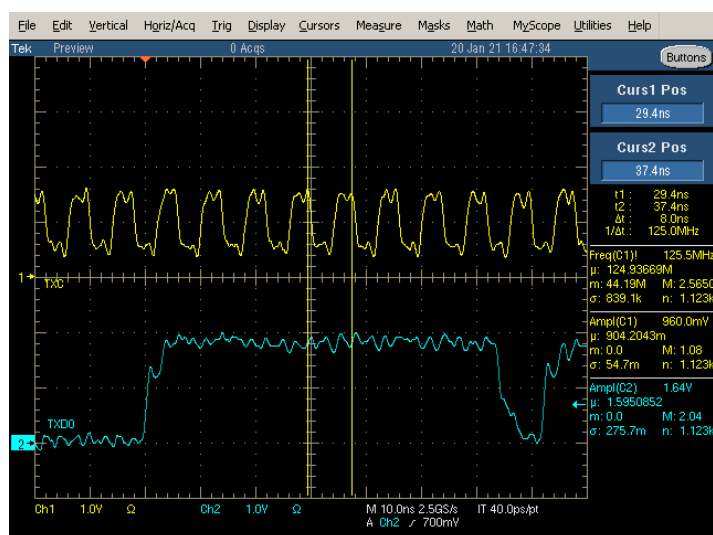
**MDC – MDIO valid from MDC rising edge**

Test Item		Specification			Result	Unit	Pass / Fail
Symbol	Parameter	Min.	Typ.	Max.			
T6	MDIO valid from MDC rising edge	0	--	300	194	ns	Pass

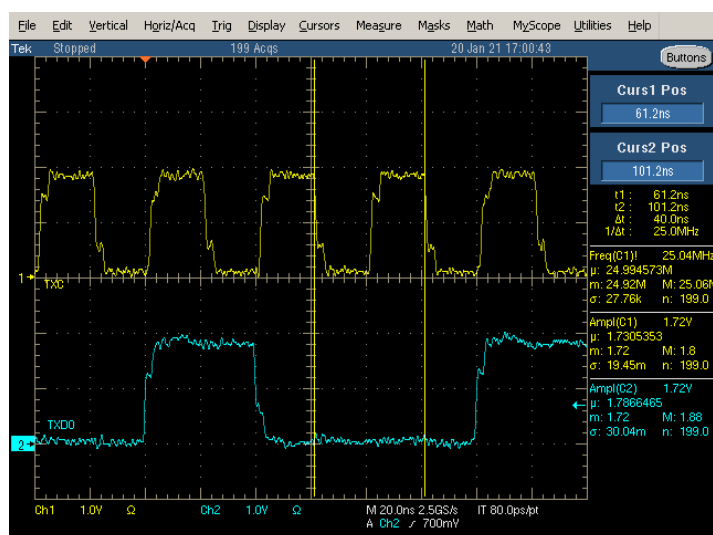


RGMII Tcyc Timing (1000Mbps)

Test Item		Specification			Result	Unit	Pass / Fail
Symbol	Parameter	Min.	Typ.	Max.			
Tcyc	Clock Cycle Duration (1000Mbps)	7.2	8	8.8	8	ns	Pass

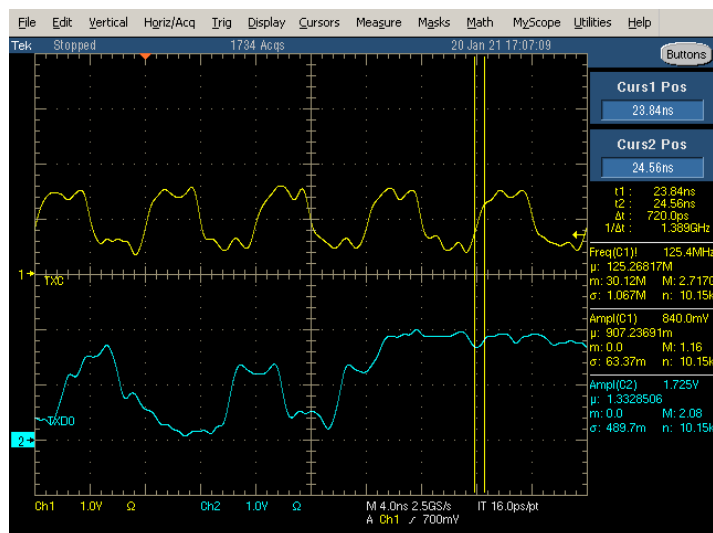
**RMII Tcyc Timing (100Mbps)**

Test Item		Specification			Result	Unit	Pass / Fail
Symbol	Parameter	Min.	Typ.	Max.			
Tcyc	Clock Cycle Duration 100Mbps	36	40	44	40	ns	Pass

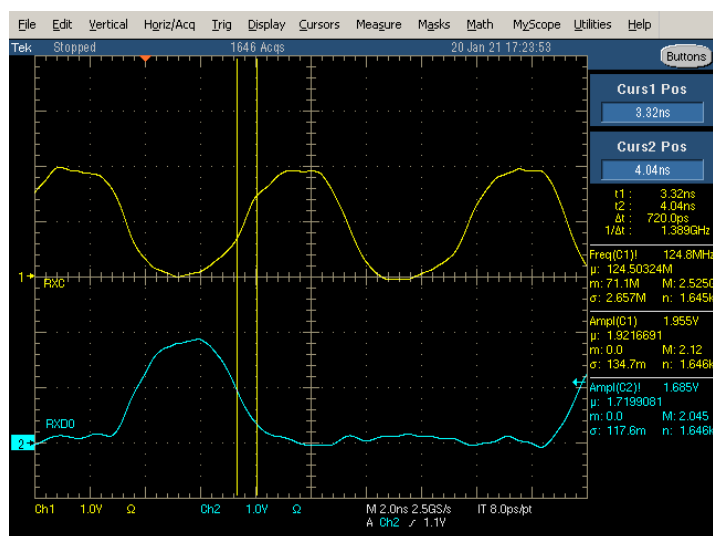


RGMII TXC Rise time

Test Item		Specification			Result	Unit	Pass / Fail
Symbol	Parameter	Min.	Typ.	Max.			
tR_tx	TXC Rise time(20%~80%)	--	--	0.75	0.72	ns	Pass

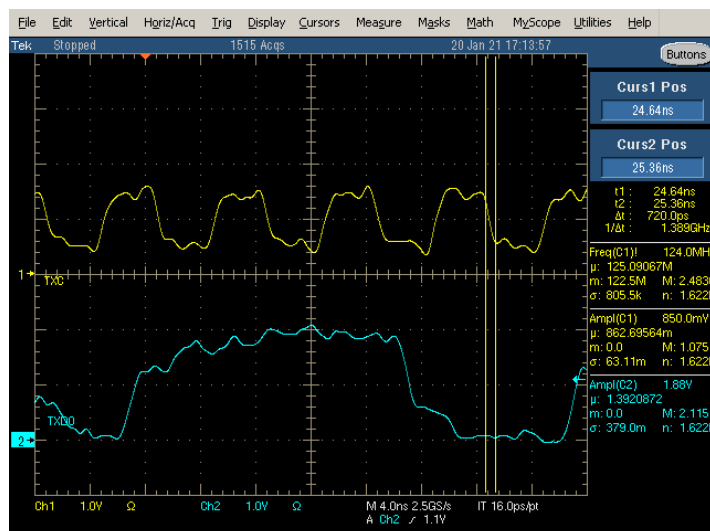
**RGMII RXC Rise time**

Test Item		Specification			Result	Unit	Pass / Fail
Symbol	Parameter	Min.	Typ.	Max.			
tR_rx	RXC Rise time(20%~80%)	--	--	0.75	0.72	ns	Pass

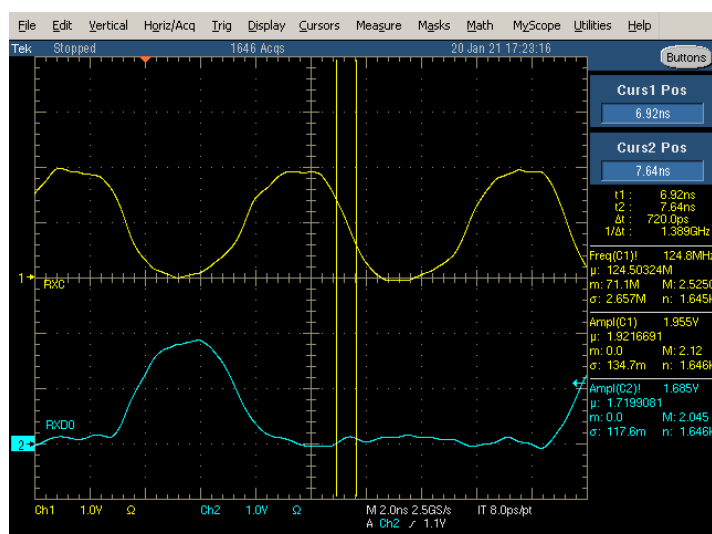


RGMII TXC Fall time

Test Item		Specification			Result	Unit	Pass / Fail
Symbol	Parameter	Min.	Typ.	Max.			
tF_tx	TXC Fall time(20%~80%)	--	--	0.75	0.72	ns	Pass

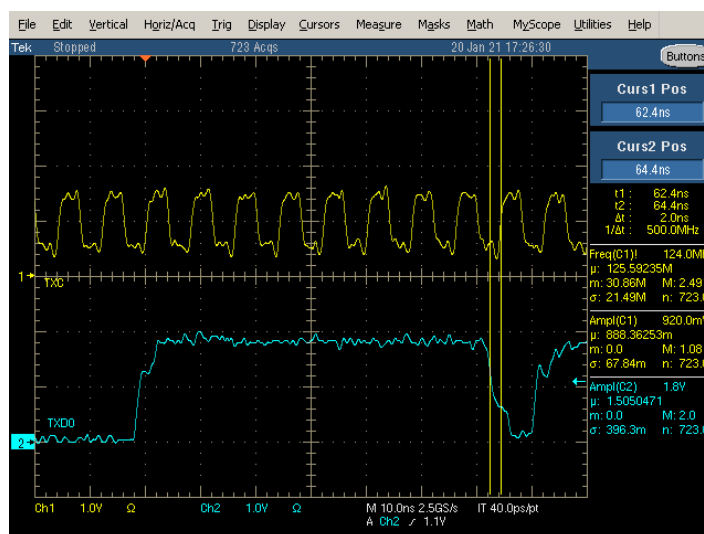
**RGMII RXC Fall time**

Test Item		Specification			Result	Unit	Pass / Fail
Symbol	Parameter	Min.	Typ.	Max.			
tF_rx	RXC Fall time(20%~80%)	--	--	0.75	0.72	ns	Pass

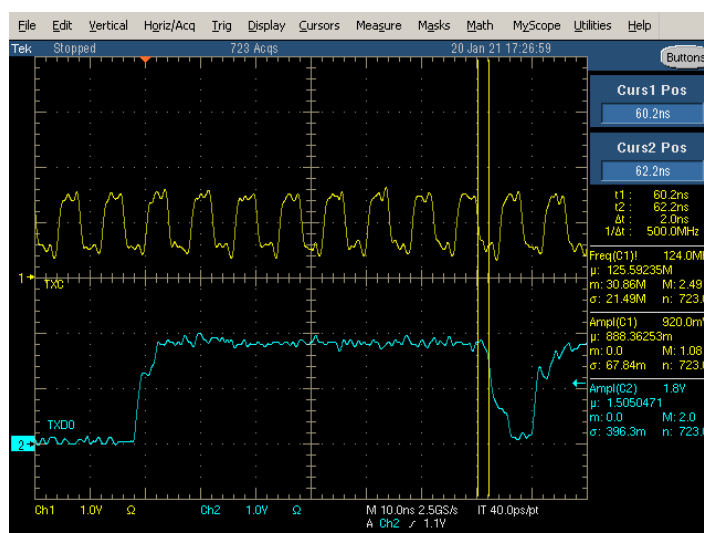


RGMII Data to Clock Output setup time at transmitter

Test Item		Specification			Result	Unit	Pass / Fail
Symbol	Parameter	Min.	Typ.	Max.			
TsetupT	Data to Clock Output setup time at transmitter	1.2	2	--	2	ns	Pass

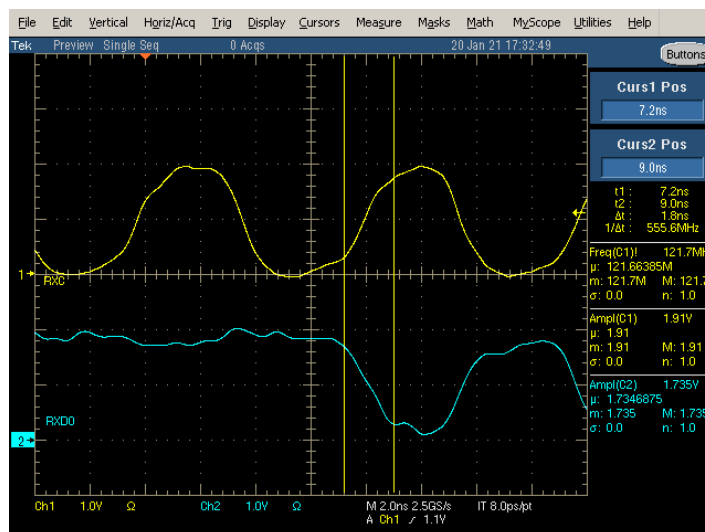
**RGMII Clock to data Output hold time at transmitter**

Test Item		Specification			Result	Unit	Pass / Fail
Symbol	Parameter	Min.	Typ.	Max.			
TholdT	Clock to data Output hold time at transmitter	1.2	2	--	2	ns	Pass

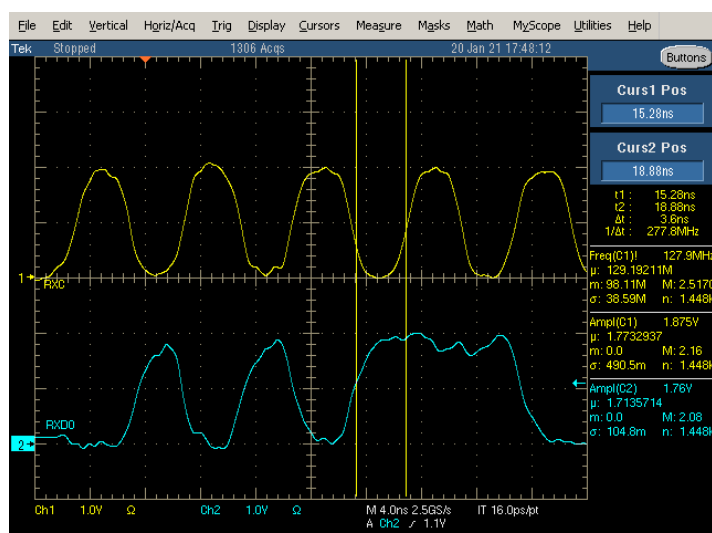


RGMII Data to Clock input setup time at receiver

Test Item		Specification			Result	Unit	Pass / Fail
Symbol	Parameter	Min.	Typ.	Max.			
TsetupR	Data to Clock input setup time at receiver	1.0	2	--	1.8	ns	Pass

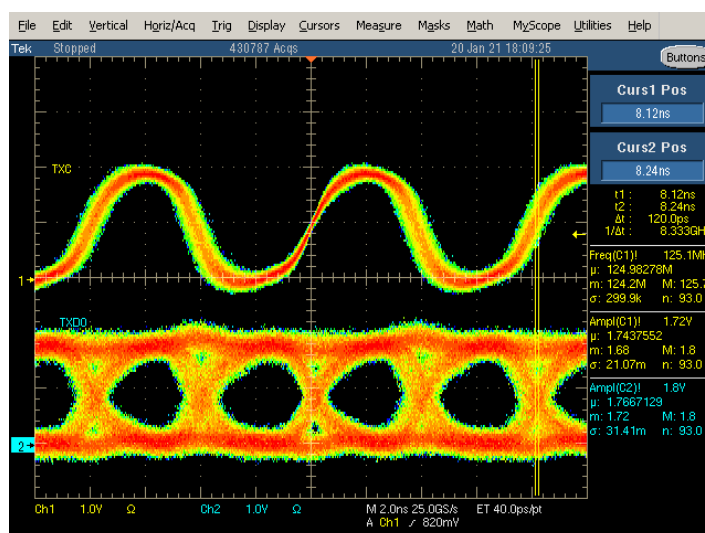
**RGMII Clock to data input hold time at receiver**

Test Item		Specification			Result	Unit	Pass / Fail
Symbol	Parameter	Min.	Typ.	Max.			
TholdR	Clock to data input hold time at receiver	1.0	2	--	3.6	ns	Pass

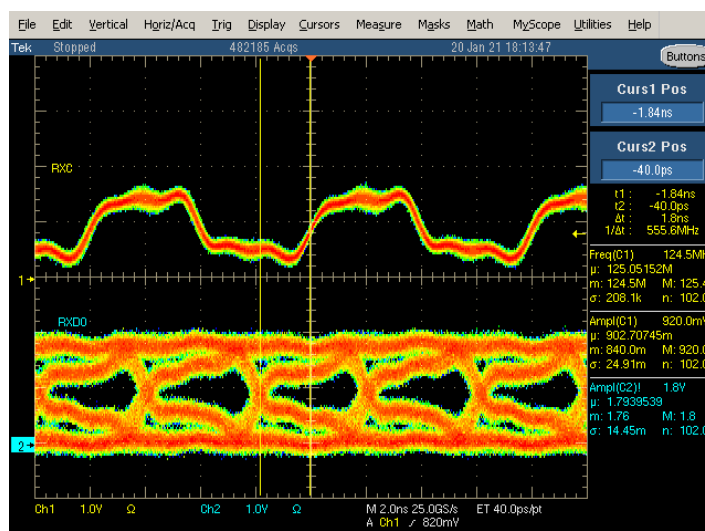


RGMI Data to clock output skew time at transmitter

Test Item		Specification			Result	Unit	Pass / Fail
Symbol	Parameter	Min.	Typ.	Max.			
TskewT	Data to clock output skew time at transmitter	-0.5	0	0.5	0.12	ns	Pass

**RGMI Data to clock input skew time at receiver**

Test Item		Specification			Result	Unit	Pass / Fail
Symbol	Parameter	Min.	Typ.	Max.			
TskewR	Data to clock input skew time at receiver	1	1.8	2.6	1.8	ns	Pass



6. LED status

LED function

Ethernet LED on RJ45 has 2 LED indicators, one is green LED and the other is orange LED.

Green LED: Link function, when Ethernet cable plugs onto RJ45, the Green LED blinks.

Orange LED: Active function, when RTL8211F gets data, the orange LED blinks irregularly.

Note: The ACTIVE LED do not define 10/100/1000 Mbps. Just any functional Ethernet cable plugged-in can work. The LINK LED defines 100M/1000M bps for indication. Please see figure 6-1~6-3.

LED condition

Plugged-in Ethernet cable to RJ45 connector from Ethernet Hub and checks green LED blinks or not.

Check orange LED blinks irregularly after plugged-in Ethernet cable to RJ45 connector, the Ethernet hub will send broadcast network package to device and the orange LED will blink.

Test Result.

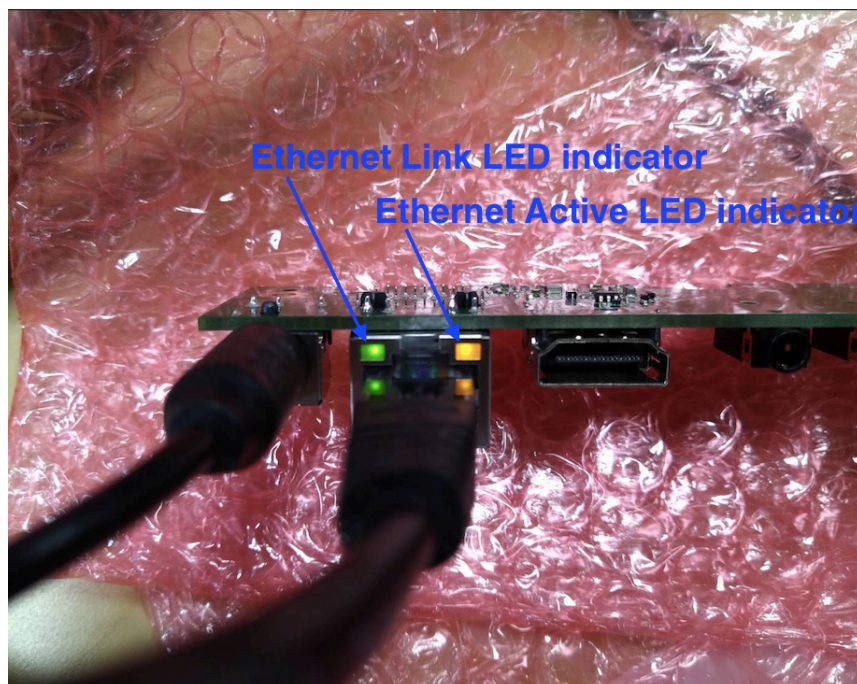


Figure 6-1 LINK LED

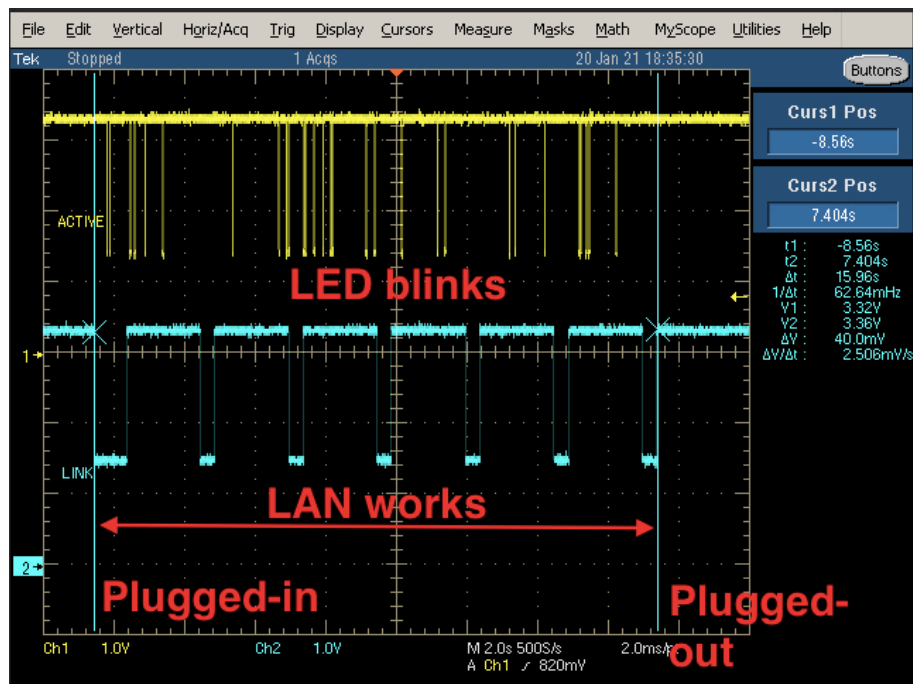


Figure 6-2 100M cable plugged-in of LINK/ACTIVE LEDs

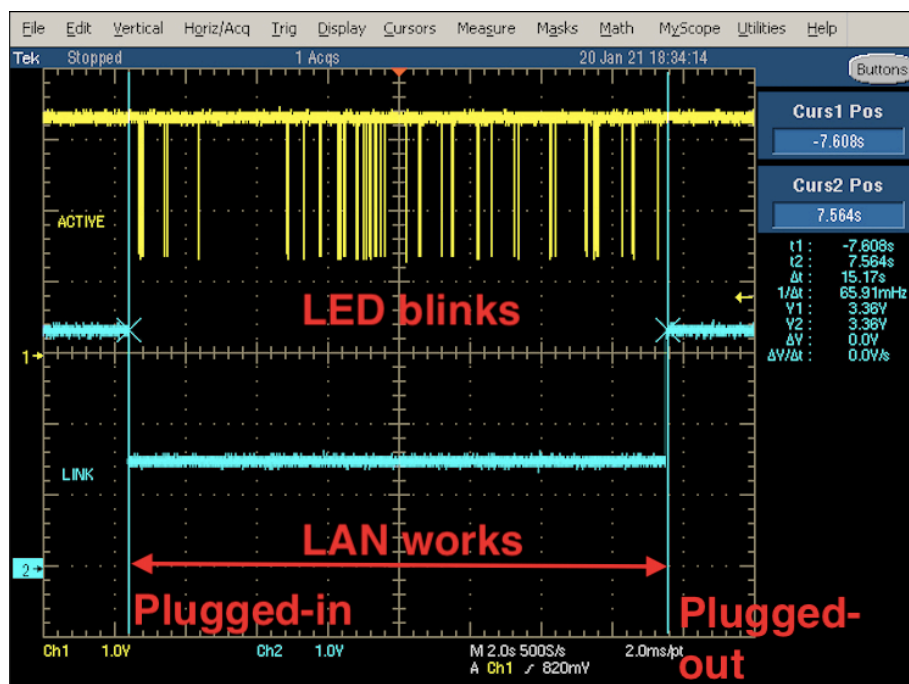


Figure 6-3 1000M cable plugged-in of LINK/ACTIVE LEDs

So the test results are pass. Both LEDs can work normally.