1. Toning and Signal Detect

P1394b connectivity management requires the intermittent transmission of a tone and a signal detect function.

1.1 Connection tone

The PHY constant TONE_FREQUENCY is specified as between 48MHz and 64MHz, to allow ready derivation from either BASE_RATE or BASE-RATE * 10/8.

Each port has a PHY variable `pmd_tone_on` which is used by the connectivity management state machine to control the transmission of the tone by the port. When `pmd_tone_on` is TRUE, the port shall transmit a clock signal as specified in table 1-1. Note that, to allow for lowest power, a more relaxed specification permits the tone to be generated during the start-up phase of an internal oscillator (e.g. PLL).

Table 1-1—Connection Tone

Parameter	Units	Min	Max
Initial tone frequency (`pmd_tone_on` set TRUE within last 100 µsec)	MHz		TONE_FREQUENCY
Frequency	MHz	TONE_FREQUENCY	
Duty cycle	%	40	60
Electrical Parameters	As per 5.2 Transmitter Electrical Specifications		

1.2 PMD signal detect function

Each port has a PHY variable `signal_detect` which is used to indicate to the connectivity management state machine whether or not a valid input signal is being received. It is continuously monitored by appropriate code in the connectivity management state machine.

The Signal Detect function shall set `signal_detect` to TRUE when the PMD circuitry receives a valid electrical signal. `signal_detect` shall be set to FALSE when the received differential amplitude is below 80 mV (the No Signal condition). Under all other conditions, the state of `signal_detect` is unspecified. These conditions are specified in Table 1-2

Table 1-2—`signal_detect` value definition

Receive conditions	`signal_detect` value
V*input* Receiver < 80 mV differential amplitude[a] (No Signal)	FALSE
Receiving a tone or encoded 8B/10B characters at a frequency within the operating range of the port[b] AND Minimum differential sensitivity < V *input* Receiver <Maximum differential input[c] (Valid signal)	TRUE
Other conditions Examples 1) Receiving neither a tone nor a non-8B/10B encoded data stream 2) Other end of the link undergoing power-on-reset (POR) transients 3) 80 mV differential amplitude< V *input* Receiver < Minimum differential sensitivity 4) One of the differential lines is open	Unspecified

a. This implies that the link is open, or the transmitter on the other end of the link is OFF (see Table xxx for definition of OFF transmitter). See below for discussion on the No Signal budget.

b. This implies the transmitter on the other end of the link must be transmitting encoded 8B/10B characters from the port or is toning, and is functioning normally.

c. This implies that the transmitter on the other end of the link is operating within specifications and the link is within specifications

Under all valid operating conditions there shall be no false positive TRUE indications. Though unspecified, this implies that there must be adequate margin between the `signal_detect` trip point and the inherent noise level of the receiver due to cross talk, power supply noise, etc. Under all valid operating conditions, an incoming signal at or above the minimum receive threshold (200 mV differential amplitude) shall not indicate FALSE. Though unspecified, this implies that there must be adequate margin between the `signal_detect` trip point and the receiver minimum differential sensitivity.

The parameters for the response times are defined in figure 1-1 and specified in Table 1-3

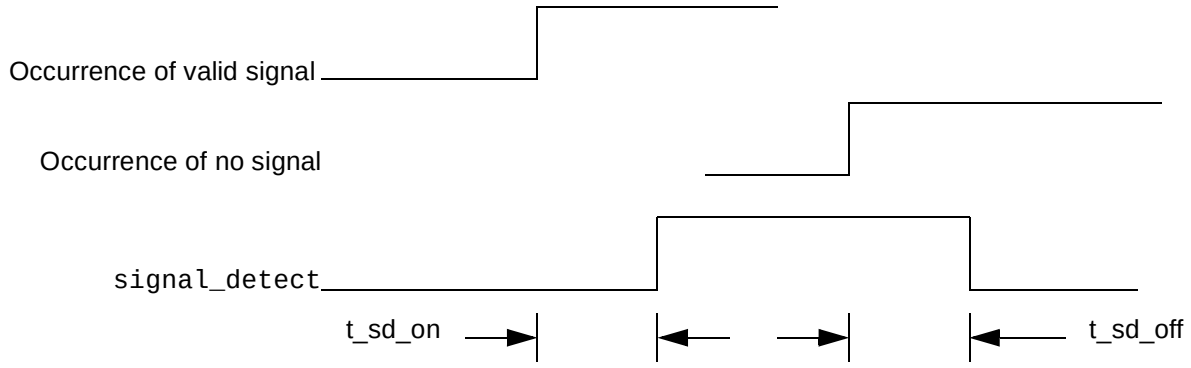

Figure 1-1—`signal_detect` timing parameters

Table 1-3—`signal_detect` timing

Symbol	Parameter	Unit	Min	Max
t_sd_on	Delay from valid signal to assertion of `signal_detect`	µsec		100
t_sd_off	Delay from no signal to negation of `signal_detect`	µsec		100

The Signal Detect mechanism shall be designed such that the value of signal_detect does not rapidly change state with small variations in received power. This may be accomplished by an implementation dependent detection circuit that may use one or more of the following mechanisms:-

a) signal level measurement hysteresis
b) signal level measurement averaging over a sufficient period to remove pattern dependent amplitude variations
c) analysis of the preferred state of the detection circuitry
d) other appropriate mechanisms

Examples of a No Signal condition are when the link is unplugged or the transmitter to which it is attached is turned off. However, small levels of signal may be present under these conditions from various sources. The No Signal level is based on the budget given in Table 1-4.

Table 1-4—No Signal budget

Parameter	unit	Value
Off transmitter	mV	20
NEXT via connector and cable (5% of 800mV)	mV	40
Noise	mV	15
Margin	mV	5
Total	mV	80

