5 Physical Layer

5.1 Electrical characteristics

5.1.1 Electrical characteristics overview

5.1.2 ADT compliance points

An ADT compliance point is a defined point in the ADT physical interconnection.   At an ADT compliance point, a compliant device shall meet the ADT interoperability specifications. ADT compliance points always occur at separable connectors. Table n lists the ADT compliance points.

Table n. ADT Compliance points

Compliance point	Description
I_t	Initiator port connector; transmit serial port
I_r	Initiator port connector; receive serial port
T_t	Target port connector; transmit serial port
T_r	Target port connector; receive serial port

5.1.3 Cabling

All ADI connections shall have a length less than or equal to 25m.

Note: the connection specifications below assume cable with a R < 400 Ω/km, Z_0 = 100 Ω (nominal), and C = 50 pF/m (nominal).

5.1.4 Sense connection

A Sense connection is a complete uni-directional signal path from one ADI device to a second ADI device. A Sense connection includes:

    a)   A current generator connected to the output compliance point of one ADI device,

    b)   A transmission medium from the output compliance point of one ADI device to the input compliance point of a second ADI device, and

    c)   A current detector connected to the input compliance point of the second ADI device.

Table n describes the electrical characteristics of a Sense connection at the output compliance point.

Table n. Sense connection output characteristics

Current	Voltage
I_{OH} < 100 μA	$0,7V_{dd}^a < V_{OH} < 3,6$ V
-100 μA < I_{OL}	$V_{OL} < 0,4$ V; $V_{OL} < 0,2V_{dd}^a$
a. V_{dd} is the positive supply voltage at the receiving end.	

5.1.5 Signal connection

A Signal connection is a complete uni-directional signal path from one ADI device to a second ADI device. A Signal connection includes:

    a)   A signal generator connected to the output compliance point of one ADI device,

b) A transmission medium from the output compliance point of one ADI device to the input compliance point of a second ADI device, and

c) A signal receiver connected to the input compliance point of the second ADI device.

A signal connection shall use single ended signalling. An ADI device shall include termination for Signal connection inputs.

Single ended signals always exist in one of two states: true (i.e., asserted) or false (i.e., negated). The device that asserts a signal shall actively drive the signal to the true state. A device that negates a signal shall refrain from driving the signal to either state. A non-driven signal goes to the false state because the bias of the terminator pulls the signal false.

Table n describes the electrical characteristics of a Signal connection at the output compliance point.

Table n. Signal connection output characteristics

Signal State	Current	Voltage
Asserted	$-12\text{mA} < I_{OL}$	$V_{OL} < 0,4$ V; $V_{OL} < 0,2 V_{dd}$[a]
Negated		$V_{OH} \leq 3,6$ V
a. V_{dd} is the positive supply voltage at the receiving end.		

Table n describes the electrical characteristics of a Signal connection at the input compliance point.

Table n. Signal connection input characteristics

Signal State	Current	Voltage
Asserted	-12 mA $< I_{IL}$ @ 0 V	$V_{IL} < 0,3 V_{dd}$[a]
Negated		$0,7 V_{dd}$[a] $< V_{IH} \leq 3,6$ V
		400 mV $< V_{hysteresis}$
a. V_{dd} is the positive supply voltage at the receiving end.		

Table n describes the timing characteristics of a Signal connection.

Table n. Signal connection timing characteristics

Duration	$1,5$ μs $< t_L$	$1,5$ μs $< t_H$
Transition: $0,3$ V_{dd}[a] to $0,7$ V_{dd} with a connection capacitance of 1250 pF.	$t_r < 500$ ns	$t_f < 500$ ns
a. V_{dd} is the positive supply voltage at the receiving end.		

5.1.6 Transmit-receive connection

A Transmit-Receive (Tx-Rx) connection is a complete simplex signal path from one ADI device to a second ADI device. A Tx-Rx connection includes:

a) A signal generator connected to the output compliance point of one ADI device,

b) A pair of transmission media from the output compliance point of one ADI device to the input compliance point of a second ADI device, and

c) A signal receiver connected to the input compliance point of the second ADI device.

A Tx-Rx connection shall conform to TIA/EIA-422-B as measured at the associated compliance points.

A Tx-Rx connection shall support 9600 baud and may support the Modulation Rates listed in Table n.

Table n. Optional Tx-Rx Modulation Rates

Modulation Rate (baud)	19 200	38 400	57 600	76 800	115 200	153 600

A Tx-Rx connection shall use Non-return to Zero (NRZ) encoding of data bits to signaling elements. Hence, the data-signaling rate (in bps) equals the modulation rate (in baud).

A Tx-Rx connection shall transmit data bytes asynchronously adding one start bit, zero parity bits, and one stop bit to each data byte as depicted in Figure n.

Figure n. Asynchronous Transmission Format

start	b_0	b_1	b_2	b_3	b_4	b_5	b_6	b_7	stop
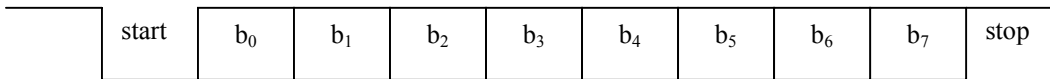
5.2 Bus composition

5.2.1 Bus composition overview

5.2.2 Connection definition

Table n defines the connections that make up the ADT bus. With the exception of $Sense_i$ and $Sense_t$, this standard defines the behaviour of these connections only when an initiator port asserts $Sense_i$ and a target port asserts $Sense_t$.

Table n – ADT bus connections

Connection name	O/M	Connection type	Connection definition
$Attention_i$	O	Signal	A target port may use this connection to signal an attention request to the initiator port. [If included for legacy only, reduce description. If included for use by standard, describe in greater detail.]
$Reset_t$	O	Signal	An initiator port may use this connection to signal a reset request to the target port. A target shall treat the receipt of a signal on this connection as a port logout (See 6.5.5).
$Sense_a$	O	Sense	A Vendor Unique sense connection. This standard does not define the use of this connection.
$Sense_i$	M	Sense	A target port uses this connection to sense the presence or absence of an initiator port on the ADT bus. When present, the initiator port will source a persistent active signal on this connection.
$Sense_t$	M	Sense	An initiator port uses this connection to sense the presence or absence of a target port on the ADT bus. When present, the target port will source a persistent active signal on this connection.
Tx_i-Rx_t	M	Tx-Rx	An initiator port uses this connection to send serialized data. A target port receives serialized data on this connection.
Tx_t-Rx_i	M	Tx-Rx	A target port uses this connection to send serialized data. An initiator port receives serialized data on this connection.