

memorandum



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To INCITS T10 Committee From Michael Banther, HP Subject ADT-2 Negotiable Time-Outs

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Revision History

Revision 0 – Initial document.

Related documents

Automation/Drive Interface – Transport Protocol – 2 (ADT-2), T10/1742-D, revision 0, 14 March 2005.

Background

During the development of ADT, the ADI working group sought to find a formula for the acknowledgment time-out that would suit all of the known connection strategies used between existing automation devices and DT devices. Short time-out values favor time-division multiplexing connections between one automation device and several DT devices. Longer time-out values favor continuous connections between one automation device and one DT device or event-driven multiplexing connections between one automation device and several DT devices.

Experience has shown that the acknowledgment time-out formula chosen for ADT does not provide the flexibility desired by automation device developers. HP proposes replacing certain constants in the existing formula with negotiable parameters to allow run-time customization to the acknowledgment time-out value chosen.

Changes to the ADT-2 draft standard

3.1.22 link parameters: The parameters affecting the physical operation of the link, including but not limited to maximum ACK offset, maximum payload size, ~~and~~ baud rate, ~~time-out coefficient,~~ and ~~time-out constant.~~

3.1.41 starting parameters: For the maximum ACK offset, maximum payload size, and baud rate parameters, the maximum values of which the port is capable. For the time-out coefficient and time-out constant parameters, the minimum values which the port requires. For all other link parameters, ~~The maximum values-of link parameters-~~ of which the port is capable.

4.2 Default operating parameters

The default operating parameters for a port are as follows:

- a) The baud rate shall be set to 9 600;
- b) the ACK offset shall be set to 1; ~~and~~
- c) the Maximum Payload size shall be 256 bytes-;
- d) ~~the time-out coefficient shall be 2 bytes; and~~
- e) ~~the time-out constant shall be 0.1 seconds.~~



4.6.1.2.2 Acknowledgement IU time-out

The sender of a frame, other than an acknowledgement IU, shall time-out the resulting acknowledgement. It shall be considered an error condition if a corresponding acknowledgement IU is not received within the time-out period. The time-out period shall start after the EOF of the frame has been sent. When operating with a maximum ACK offset greater than one, a port may start the time-out period for a frame that has completed transmission after the acknowledgement IU for a previously sent frame has been received. The minimum acknowledgement IU time-out period shall be calculated using the formula in figure 9.

$$\text{Timeout}_{\text{ACK}} = (\text{Timeout}_{\text{COEFF}} * \text{Period} * \text{Size}_{\text{MAX}} * 2) + (\text{Period} * (\text{Size}_{\text{MAX}} + \text{Offset}_{\text{MAX}} * \text{Size}_{\text{NAK}} * 2)) + \text{Timeout}_{\text{CONST}} \text{ seconds}$$

EDITORIAL NOTE: Without the strikeouts, the formula reads

$$\text{Timeout}_{\text{ACK}} = (\text{Timeout}_{\text{COEFF}} * \text{Period}) * (\text{Size}_{\text{MAX}} + \text{Offset}_{\text{MAX}} * \text{Size}_{\text{NAK}}) + \text{Timeout}_{\text{CONST}} \text{ seconds.}$$

Where:

$\text{Timeout}_{\text{ACK}}$ is the minimum time-out period in seconds.

$\text{Timeout}_{\text{COEFF}}$ is the time-out coefficient, in bytes, negotiated with the Port Login process (see 6.5.4).

Period is the time per byte calculated as (10 / Baud Rate) and is expressed in seconds per byte.

Size_{MAX} is the maximum payload size negotiated with the Port Login process, plus SOF, EOF, ADT Header, and checksum bytes (see 6.1).

$\text{Offset}_{\text{MAX}}$ is the maximum ACK offset negotiated with the Port Login process (see 4.4).

Size_{NAK} is the size in bytes of the NAK IU including SOF, EOF, and checksum bytes (see 6.5.3.3).

$\text{Timeout}_{\text{CONST}}$ is the constant portion of the time-out, in seconds^o, negotiated with the Port Login process (see 6.5.4).

For example, at 9 600 Baud with a time-out coefficient of 2, a negotiated Maximum Payload Size of 1 024, a Maximum ACK Offset of 2 and a constant time-out portion of 0,1, the minimum timeout period would be approximately 2,28 seconds.

^o The Port Login IU timeout constant parameter specifies $\text{Timeout}_{\text{CONST}}$ in milliseconds (see 6.5.4).

Figure 9 – Minimum acknowledgement time-out period



6.5.4 Port login information unit

Table 15 defines the payload of the Port Login IU.

Table 15 – Port Login IU payload contents

Bit	7	6	5	4	3	2	1	0
0	ACCEPT	Reserved				Vendor Specific		
1	MAJOR REVISION			MINOR REVISION				
2	Reserved							
3	AOE	Reserved				MAXIMUM ACK OFFSET		
4	(MSB)	MAXIMUM PAYLOAD SIZE						(LSB)
5								
6	(MSB)	BAUD RATE						(LSB)
7								
8	Reserved							
9	Reserved				TIMEOUT COEFFICIENT			
10	(MSB)	TIMEOUT CONSTANT						(LSB)
11								

The BAUD RATE field indicates the speed that the port's physical interface shall run after completion of negotiation. The BAUD RATE field contains the desired nominal Baud rate divided by 100. All ports shall default to operating at 9600 Baud at power-up and following error conditions that require re-establishment of the operating parameters (see 4.6.2). If a port receives a Port Login IU containing a baud rate value less than 9 600 it shall respond with a NAK IU with a status code of NEGOTIATION ERROR (see table 14) and transition to N1:Negotiating to initiate a new login exchange.

The TIMEOUT COEFFICIENT field specifies the value of the coefficient portion of the minimum acknowledgement IU time-out period, $Timeout_{COEFF}$, in bytes (see 4.6.1.2.2). A port may use this parameter to account for its per-symbol processing overhead.

The TIMEOUT CONSTANT field specifies the value of the constant portion of the minimum acknowledgement IU time-out period, $Timeout_{CONST}$, in milliseconds (see 4.6.1.2.2). A port may use this parameter to account for its per-IU processing overhead.



Annex C (informative)

Link Negotiation Examples

C.1 Introduction

For this example, the automation device port has the following capabilities:

- a) support for the INCITS approved revision of this standard;
- b) support for up to 3 frames of ACK offset;
- c) support for frame payload sizes up to 1 024 bytes;
- d) supports Baud rates of 115K, 38,4K, 19,2K, and 9 600; ~~end~~
- e) [requires two periods per symbol plus 50 milliseconds to process an IU; and](#)
- f) always responds to a Port Login Exchange initiated by a DT device port with a Port Login exchange initiated by the automation device port (see 4.3.3.2)

The DT device port has the following capabilities:

- a) support for the INCITS approved revision of this standard as well as draft revision 9.
- b) support for up to 2 frames of ACK offset;
- c) support for frame payload sizes up to 512 bytes; ~~end~~
- d) supports Baud rates of 57,6K, 19,2K, and 9 600-; ~~and~~
- e) [requires two periods per symbol plus 75 milliseconds to process an IU.](#)

C.3 DT device initiates a login after power-up

Table C.2 – Field values for initial Port Login IU from the DT device

Field	Value	Description
X_ORIGIN	1	DT device originated.
EXCHANGE ID	0	New exchange.
ACCEPT	0	Is zero on the first IU of an exchange.
MAJOR REVISION	1 2	ADT revision 1 2.
MINOR REVISION	0	Approved revision.
AOE	1	Abort other exchanges.
MAXIMUM ACK OFFSET	2	Maximum ACK offset that this port supports.
MAXIMUM PAYLOAD SIZE	512	Maximum payload size that this port supports.
BAUD RATE	576	Maximum baud rate that this port supports.
TIMEOUT COEFFICIENT	2	Symbol periods per symbol this port requires.
TIMEOUT CONSTANT	75	Milliseconds this port requires per IU.



Table C.3 – Field values for second Port Login IU from the DT device

Field	Value	Description
X_ORIGIN	1	DT device originated.
EXCHANGE ID	1	New exchange.
ACCEPT	0	Is zero on the first IU of an exchange.
MAJOR REVISION	+2	ADT revision +2.
MINOR REVISION	0	Approved revision.
AOE	1	Abort other exchanges.
MAXIMUM ACK OFFSET	2	Maximum ACK offset that this port supports.
MAXIMUM PAYLOAD SIZE	512	Maximum payload size that this port supports.
BAUD RATE	576	Maximum baud rate that this port supports.
TIMEOUT COEFFICIENT	2	Symbol periods per symbol this port requires.
TIMEOUT CONSTANT	75	Milliseconds this port requires per IU.

Table C.4 – Field values for initial Port Login IU from the automation device

Field	Value	Description
X_ORIGIN	0	Automation originated.
EXCHANGE ID	0	New exchange.
ACCEPT	0	Is zero on the first IU of an exchange.
MAJOR REVISION	+2	ADT revision +2.
MINOR REVISION	0	Approved revision.
AOE	1	Abort other exchanges.
MAXIMUM ACK OFFSET	3	Maximum ACK offset that this port supports.
MAXIMUM PAYLOAD SIZE	1 024	Maximum payload size that this port supports.
BAUD RATE	1 152	Maximum baud rate that this port supports.
TIMEOUT COEFFICIENT	2	Symbol periods per symbol this port requires.
TIMEOUT CONSTANT	50	Milliseconds this port requires per IU.

Table C.5 – Field values for first reply Port Login IU from the DT device

Field	Value	Description
X_ORIGIN	0	Automation originated.
EXCHANGE ID	0	Exchange ID assigned by the automation device.
ACCEPT	0	Zero indicates that at least one field value has changed.
MAJOR REVISION	+2	This value has stabilized.
MINOR REVISION	0	This value has stabilized.
AOE	1	This value has stabilized.
MAXIMUM ACK OFFSET	2	Maximum ACK offset that the DT device port supports.
MAXIMUM PAYLOAD SIZE	512	Maximum payload size that the DT device port supports.
BAUD RATE	576	Highest baud rate supported by the DT device port that is less than or equal to the value from the automation device.
TIMEOUT COEFFICIENT	2	This value has stabilized.
TIMEOUT CONSTANT	75	Milliseconds per IU that the DT device port requires.



Table C.6 – Field values for first reply Port Login IU from the automation device

Field	Value	Description
X_ORIGIN	0	Automation originated.
EXCHANGE ID	0	Exchange ID assigned by the automation device.
ACCEPT	0	Zero indicates that at least one field value has changed.
MAJOR REVISION	+2	This value has stabilized.
MINOR REVISION	0	This value has stabilized.
AOE	1	This value has stabilized.
MAXIMUM ACK OFFSET	2	The automation device port is able to support this value. This value has now stabilized.
MAXIMUM PAYLOAD SIZE	512	The automation device port is able to support this value. This value has now stabilized.
BAUD RATE	384	Highest baud rate supported by the automation device port that is less than or equal to the value from the DT device.
TIMEOUT COEFFICIENT	2	This value has stabilized.
TIMEOUT CONSTANT	75	The automation device port is able to support this value. This value has now stabilized.

Table C.7 – Field values for second reply Port Login IU from the DT device

Field	Value	Description
X_ORIGIN	0	Automation originated.
EXCHANGE ID	0	Exchange ID assigned by the automation device.
ACCEPT	0	Zero indicates that at least one field value has changed.
MAJOR REVISION	+2	This value has stabilized.
MINOR REVISION	0	This value has stabilized.
AOE	1	This value has stabilized.
MAXIMUM ACK OFFSET	2	This value has stabilized.
MAXIMUM PAYLOAD SIZE	512	This value has stabilized.
BAUD RATE	192	Highest baud rate supported by the DT device port that is less than or equal to the value from the automation device.
TIMEOUT COEFFICIENT	2	This value has stabilized.
TIMEOUT CONSTANT	75	This value has stabilized.

Table C.8 – Field values for final reply Port Login IU from the automation device

Field	Value	Description
X_ORIGIN	0	Automation originated.
EXCHANGE ID	0	Exchange ID assigned by the automation device.
ACCEPT	1	One indicates all of the values in the payload are acceptable and none have been changed.
MAJOR REVISION	+2	This value has stabilized.
MINOR REVISION	0	This value has stabilized.
AOE	1	This value has stabilized.
MAXIMUM ACK OFFSET	2	This value has stabilized.
MAXIMUM PAYLOAD SIZE	512	This value has stabilized.
BAUD RATE	192	This value has stabilized.
TIMEOUT COEFFICIENT	2	This value has stabilized.
TIMEOUT CONSTANT	75	This value has stabilized.



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Table C.9 – Field values for final reply Port Login IU from the DT device

Field	Value	Description
X_ORIGIN	0	Automation originated.
EXCHANGE ID	0	Exchange ID assigned by the automation device.
ACCEPT	1	One indicates all of the values in the payload are acceptable and none have been changed.
MAJOR REVISION	1 2	This value has stabilized.
MINOR REVISION	0	This value has stabilized.
AOE	1	This value has stabilized.
MAXIMUM ACK OFFSET	2	This value has stabilized.
MAXIMUM PAYLOAD SIZE	512	This value has stabilized.
BAUD RATE	192	This value has stabilized.
TIMEOUT COEFFICIENT	2	This value has stabilized.
TIMEOUT CONSTANT	75	This value has stabilized.