Camso Protocol Documentation

Release 1.0.0

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DOCUMENT VERSIONS

Table 1 - Document Revisions

Revision	Release Date	What was changed
1.0	1/10/2020	Specification for I-7580 Transport Protocol

PROTOCOL VERSIONS

Table 2 - Protocol Versions

Version	Release Date	What's New
1.0	1/10/2020	1. Software code was entirely rewritten.

DESCRIPTION

Camso Transport Protocol (hereinafter referred to as the Protocol) is designed for data transfer from System to I-7580 Profinet converter over serial ports. According to OSI classification, the Protocol is a transport layer protocol. The protocol ensures reliable delivery of data up to 4153343 bytes.

PROTOCOL PARAMETERS

Table 3 - Protocol Parameters

Parameter	Value
OSI level	OSI transport level
Packet loss handling	The sender performs re-sending of packets, if necessary, ensuring data redundancy.
Maximum data packet size	504 bytes, including 504 data bytes and 10 service bytes.
Maximum size of related data items for transmission	4153343 bytes.
Adaptability to data channel rate	The packets should be sent at an interval consistent with the channel capacity.

DATA EXCHANGE PRINCIPLE

The Protocol specifies only one type of **DATA** packets - packets for data transmission. The principle of data exchange by means of the Protocol is the following: the data array for transmission is split into sections of fixed length (494 bytes) with the exception of the last section, which contains the remaining data. The data of each section are packed in a packet (10 service bytes are added to the data). The packets generated with a maximum size of 504 bytes are sent in series via the serial port. The receiver, once another data package is received, will copy its contents to the clipboard. To ensure reliable data delivery, the sender can resend packets. The number of resending actions is determined by the sender (determined by the user). The protocol allows splitting the transmitted data into separate virtual channels (up to 256 channels - logical ports) for sending several types of data content through one serial port with their splitting on the receiving side. Figure 1 shows the principle of information exchange using the I-7580 Transport Protocol.

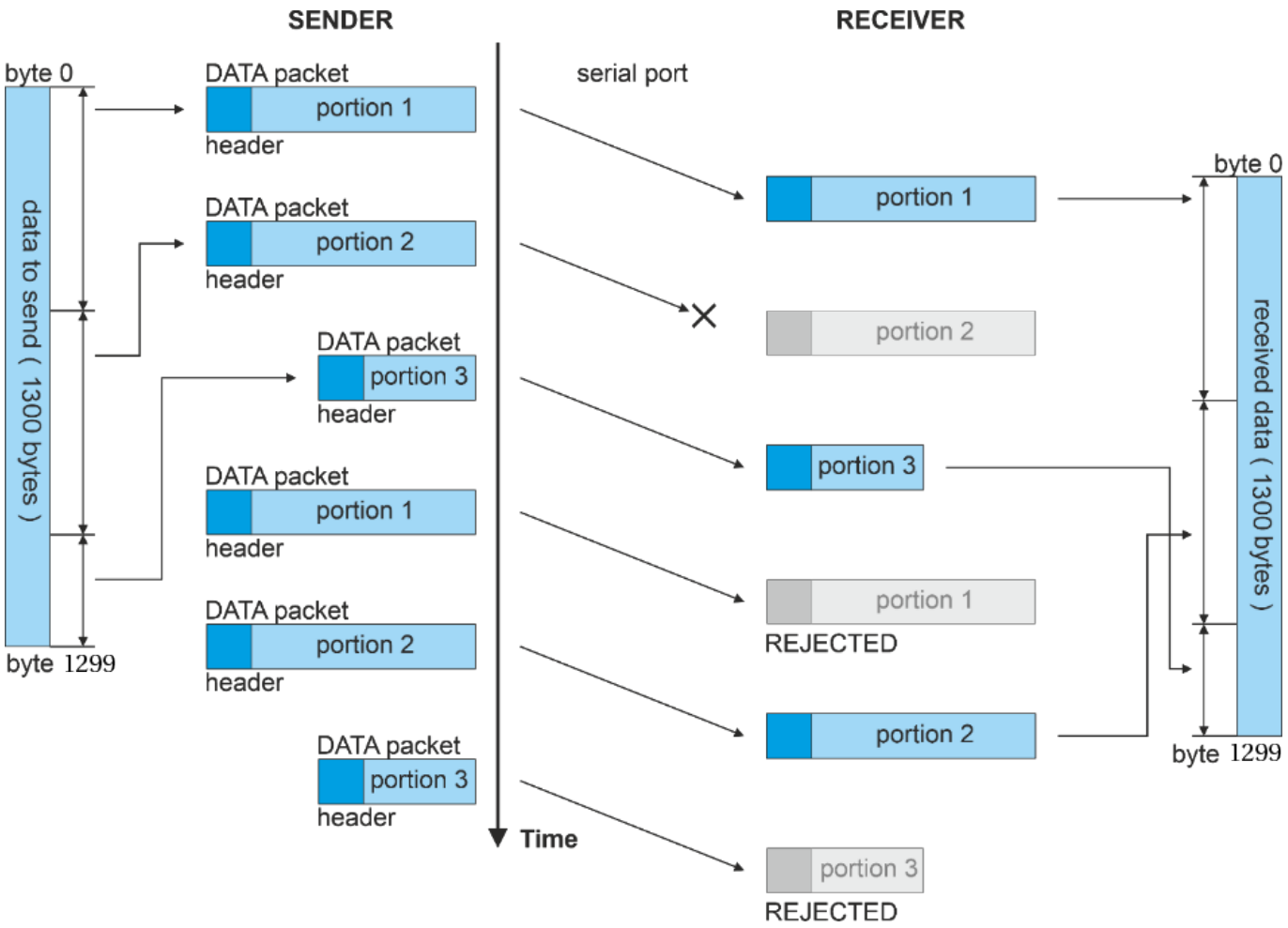

Figure 1 – Data Exchange Principle.

The Figure shows a simple data sending example. 1300 byte size was taken as an example. According to the protocol specification, the maximum size of the transmitted packet is 504 bytes including 494 bytes of data and 10 service bytes. In this example, the data volume will be divided into 3 fragments of 494 bytes, and 312 bytes for the last fragment. **Data is divided into sections in sequence starting with the first byte (that is a continuous single-dimension byte array)**. For each data section, DATA packets containing 10 bytes of service data (header) are generated. Packets are sent to the receiver in sequence.

The figure shows that a DATA packet is initially sent with the first portion of data. Then the second DATA packet is sent. Let us suppose the second packet was lost. The next packet received by the receiver contains the third portion of data. After receiving the DATA packet with the third portion of data, the receiver can check from the packet header about how many packets were transmitted and how many were received, thereby he can make sure that one of the transmitted packets was not delivered and the data has not yet been collected.

DATA PACKETS FORMAT

DATA packets have maximum length of 504 bytes and are intended for data sending. DATA packets have the following format.

Byte №	0	1	2	3	4	5	6	7	8	9	10	…	N
filed, hex	0xAA	0xA0 | buffer_ID	logic_port	packet_ID		max_packet_ID		packet_size		CRC	data[0]	…	data[n]

Table 4 - DATA Packet Fields.

Field	Value	Size	Description
Start byte	0xAA	1 byte	The start byte has a fixed value and is used to identify DATA packets in the serial port buffer.
Header	0xA0	1 byte	The packet header occupies the first 4 bits of the second byte of the packet. It has a fixed value.
buffer_ID	0 (0x00) to 15 (0x0F)	1 byte	Data buffer identifier. It occupies the last 4 bits of the second byte of the packet. The value of the data buffer identifier is generated as follows: Each related data item (e.g., data structure) is marked sequentially with its respective data buffer number from 0 (0x00) to 15 (0x0F). After 15 (0x0F) identifier, the numbering starts again (0x00).
packet_ID (big endian)	0 (0x0000) to 4095 (0x0FFF)	1 byte	Packet identifier. The data sent are divided into packets, each of which is assigned its own identifier in sequence from 0 (0x0000) to 4095 (0x0FFF). The identifier value is sent in big endian format.
max_packet_ID (big endian)	0 (0x0000) to 4095 (0x0FFF)	1 byte	Maximum packet identifier for the data being sent (last packet identifier). If the size of data being sent is less than 494 bytes, all data will be sent in one packet. This means that packet_ID and max_packet_ID fields will be identical and equal to 0 (0x0FFFF). The identifier value is sent in big endian format.
packet_size (big endian)	11 to 504	1 byte	Packet size. It can take values from 11 (0x000B - minimum packet size) to 504 (0x01F8 - maximum packet size). The packet size is transmitted in big endian format.
CRC	-		Header checksum. This is the low byte of the first 9 bytes of the DATA package: CRC = $(uint8\_t)$(byte0 + byte1 + byte2 + byte3 + byte4 + byte5 + byte6 + byte7 + byte8 + byte9)
data[n]	any		Data to send. Maximum size of data included in the packet is 494 bytes.

Table 5 – Payload in data[n] field of DATA Packet from the controller (PLC) to the computer (System).

Command name	Type	Size	Description
Calibration start	BOOL	1 byte	Starting the system calibration process
Zero positioning start	BOOL	1 byte	Returning the system to the starting position
Measuring start	BOOL	1 byte	Starting a measurement
Abort measure	BOOL	1 byte	To interrupt the measurement
Fault reset	BOOL	1 byte	Reset error
New data transfer	BOOL	1 byte	Availability of new data from the controller
Scan length	REAL	4 bytes	Length of the scan
Calibration diameter	REAL	4 bytes	Diameter of the calibration ring

Table 5 – Payload in data[n] field of DATA Packet from the computer (System) to the controller (PLC)

Command name	Type	Size	Description
Calibration running	BOOL	1 byte	The system is being calibrated
Calibration completed	BOOL	1 byte	Calibration is performed
Calibration error	BOOL	1 byte	Calibration error
Zero Positioning running	BOOL	1 byte	Returning to the starting position
Zero Positioning completed	BOOL	1 byte	Return to the starting position completed
Zero positioning error	BOOL	1 byte	Zero positioning error
Measuring Running	BOOL	1 byte	Measurement is in progress
Measuring error	BOOL	1 byte	Measurement error
Measuring completed	BOOL	1 byte	Measurement is complete
Measuring aborted	BOOL	1 byte	Measurement aborted
System in fault condition	BOOL	1 byte	The system is in a faulty state
Data Transfer read	BOOL	1 byte	The data transmitted from the controller is read
Measurements by height (Nh)	UINT	4 bytes	Number of measurement by height
Measurement height	REAL - ARRAY[Nh]	4 bytes	Height at which measured
Diameter	REAL - ARRAY[Nh]	4 bytes	Diameter
Circularity	REAL - ARRAY[Nh]	4 bytes	Circularity
Measurements by corner (Nc)	UINT	4 bytes	Number of measurement by corner
Angle	REAL - ARRAY[Nc]	4 bytes	The angle at which it is measured
Width top chamfer	REAL - ARRAY[Nc]	4 bytes	The width of the top chamfer
Width bottom chamfer	REAL - ARRAY[Nc]	4 bytes	The width of the bottom chamfer
Top corner	REAL - ARRAY[Nc]	4 bytes	The top corner
Bottom corner	REAL - ARRAY[Nc]	4 bytes	The bottom corner
Height measured part	REAL - ARRAY[Nc]	4 bytes	The height of the measured part.
Diameter Min	REAL	4 bytes	Minimum diameter
Diameter Max	REAL	4 bytes	Maximum diameter
Diameter Avg	REAL	4 bytes	Average diameter
Chamfer width Min	REAL	4 bytes	Minimum chamfer width
Chamfer width Max	REAL	4 bytes	Maximum chamfer width
Chamfer width Avg	REAL	4 bytes	The average width of the chamfer
Circularity Min	REAL	4 bytes	Minimum Circularity
Circularity Max	REAL	4 bytes	Maximum Circularity
Circularity Avg	REAL	4 bytes	The average of Circularity
Bevel angle of chamfers Min	REAL	4 bytes	Minimum bevel angle of chamfers
Bevel angle of chamfers Max	REAL	4 bytes	Maximum bevel angle of chamfers
Bevel angle of chamfers Avg	REAL	4 bytes	The average of bevel angle of chamfers