

3964R Compact

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A standardized serial point to point protocol, commonly used between two PLC (programmable logic controller, in German SPS). It is a Master/Master protocol, which means: Both can manipulate the data of its partner SPS without prompting. A priority model rules the communication in case of a conflict. The data transfer takes place via full-duplex mode.

Protocol procedure

The protocol comes in two variants, 3964 without a checksum (only parity is used for data integrity) and 3964R with a CRC checksum. Additionally the actual data transfer can be initiated with or without a special S5 header. The raw procedure for a faultless transmission is pictured in the following table:

	Sender		Receiver	
QVZ ↓	STX 02H	→		
		←	DLE 10H	↓ ZVZ
	(S5 Header 3DH)	→		↓ ZVZ
	Data	→		↓ ZVZ
	DLE 10H	→		↓ ZVZ
	ETX 03H	→		↓ ZVZ
QVZ ↓	(BCC, only 3964R)	→		↓ ZVZ
		←	DLE 10H	

DLE : positive acknowledge (hex 10)
ETX : end character (hex 03) in connection with DLE
NAK : negative acknowledge (hex 15)
STX : start character (hex 02)
QVZ : max. acknowledge time (default 550ms)
ZVZ : max. time between consecutive bytes (default 220ms)
BCC : checksum, only in couple mode
S5 : optional S5 Header character (hex 3D)

Step by step

- **Initialization** A communication always starts with sending a connection request STX by the sender.
- **Positive acknowledge** The receiver has to answer with a DLE within the QVZ time. Afterwards the sender switches into the sending mode.
- **No or negative acknowledge** If the receiver responds with a NAK, any other character except for the DLE or expires the QVZ time, the sender repeats the request again for a specified count (EWTIM).
- **Data transfer** In case of a correct acknowledge the sender is going to transmit the data. Each data block may (but must not) contain a leading S5 header (hex 3D) and must end with the DLE ETX sequence. The time between every data byte has to be less than the specified ZVZ.
- **Special case 10H (DLE)** An occurring DLE within the data has to be doubled to distinguish between a raw 10H data byte and the special DLE character.
- **BCC** Block check character, calculated as the exclusive OR link of all data bytes including the ending DLE ETX. The BCC has to be calculated after the doubling of 10H data bytes.
- **Confirmation** The recipient confirms the correct reception with a concluding DLE which has to be transmitted within the QVZ time.

Initialization conflict

This happens when both participants try to start a communication at about the same time. An initiation (a sent STX) is responded with a STX instead of a

DLE or NAK. In this case the sender with the lower priority (specified in its parameters) postpone its request and answers with the DLE. After the successful data exchange the suspended task is restarted again with a new connection request. An example:

