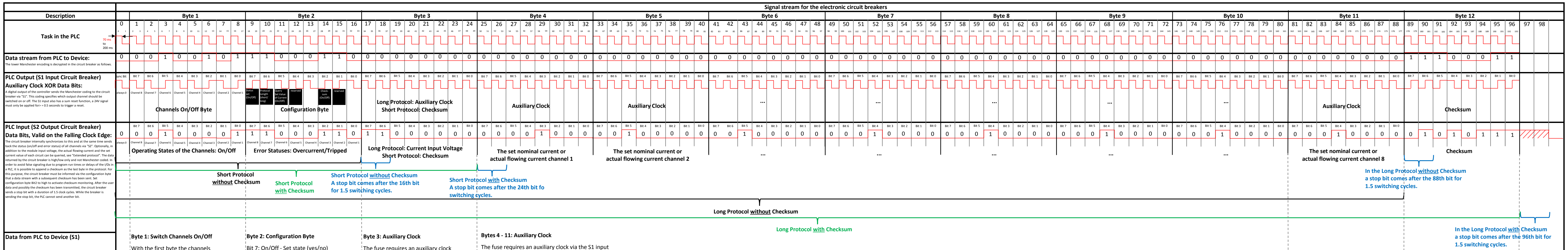
Protocol description 2-wire-interface for electronic circuit breakers 787-166x-series


Description
Signal stream for the electronic circuit breakers
Byte 1
Byte 2
Byte 3
Byte 4
Byte 5
Byte 6
Byte 7
Byte 8
Byte 9
Byte 10
Byte 11
Byte 12
Task in the PLC
70 ms to 200 ms
Data stream from PLC to Device:
The lower Manchester encoding is decrypted in the circuit breaker as follows.
PLC Output (S1 Input Circuit Breaker)
Auxiliary Clock XOR Data Bits:
A digital output of the controller sends the Manchester coding to the circuit breaker via "S1". This coding specifies which output channel should be switched on or off. The S1 input also has a sum reset function, a 24V signal must only be applied for> = 0.5 seconds to trigger a reset.
Sync Bit
always 0
Status set (On/Off)
Protocol Length (short/long)
Query Set Value of Current (On/Off)
reserved
Check-sum (On/Off)
Channels On/Off Byte
Configuration Byte
Long Protocol: Auxiliary Clock
Short Protocol: Checksum
Auxiliary Clock
Checksum
PLC Input (S2 Output Circuit Breaker)
Data Bits, Valid on the Falling Clock Edge:
The circuit breaker internally synchronizes to this and at the same time sends back the status (on/off and error status) of all channels via "S2". Optionally, in addition to the module input voltage, the actual flowing current and the set current value of each circuit can be queried, see "Extended protocol". The data returned by the circuit breaker is high/low only and not Manchester coded. In order to avoid false signaling due to program run times or delays of the I/Os in a PLC, it is possible to append a checksum as the last byte in the protocol. For this purpose, the circuit breaker must be informed via the configuration byte that a data stream with a subsequent checksum has been sent. Set configuration byte Bit2 to high to activate checksum monitoring. After the user data and possibly the checksum has been transmitted, the circuit breaker sends a stop bit with a duration of 1.5 clock cycles. While the breaker is sending the stop bit, the PLC cannot send another bit.
Operating States of the Channels: On/Off
Error Statuses: Overcurrent/Tripped
Long Protocol: Current Input Voltage
Short Protocol: Checksum
The set nominal current or actual flowing current channel 1
The set nominal current or actual flowing current channel 2
The set nominal current or actual flowing current channel 8
Short Protocol without Checksum
Short Protocol with Checksum
Short Protocol without Checksum A stop bit comes after the 16th bit for 1.5 switching cycles.
Short Protocol with Checksum A stop bit comes after the 24th bit fo switching cycles.
In the Long Protocol without Checksum a stop bit comes after the 88th bit for 1.5 switching cycles.
Long Protocol without Checksum
Long Protocol with Checksum
In the Long Protocol with Checksum a stop bit comes after the 96th bit for 1.5 switching cycles.

Data from PLC to Device (S1)

Byte 1: Switch Channels On/Off

With the first byte the channels can be switched on (HIGH) or switched off (LOW). For this, the *the state-setting bit (Bit 7)* must be set in the configuration byte.

Byte 2: Configuration Byte

Bit 7: On/Off - Set state (yes/no)
HIGH: The On/Off state of the channel that was activated/deactivated in the previous byte is used.
LOW: The On/Off - state of the channel that was activated/deactivated in the previous byte is not used.

Bit 6: Protocol Length (short/long)
HIGH: Long Protocol 89 bits + 90th Stop Bit.
LOW: short Protocol 17 bits + 18th Stop Bit.

Bit 5: Query current setting values (yes/no)
HIGH: The set nominal current at the channels is transferred from the fuse.
LOW: The actual flowing current at the channels is transferred from the fuse.

Byte 3: Auxiliary Clock

The fuse requires an auxiliary clock via the S1 input as long as the fuse transmits data via the S2 output to the PLC.

Bytes 4 - 11: Auxiliary Clock

The fuse requires an auxiliary clock via the S1 input as long as the fuse transmits data via the S2 output to the PLC.

Data from the Device to the PLC (S2)

Byte 1: On/Off Operating States
HIGH: Switched Channel
LOW: Disconnected Channel

Byte 2: Channel States Overcurrent/Tripped

HIGH: Channel n is in the overcurrent or tripped state.
LOW: Channel n is not in the overcurrent or tripped state.

Byte 3: Current Input Voltage

The actual input voltage is in an Int8_t data type (Range: 0 to 255). This transferred value must be converted to a physical value in the PLC.

12V-Variant:
$$U_{in} = \left(\frac{transferred\ value}{25} + 8\right)$$
24V-Variant:
$$U_{in} = \left(\frac{transferred\ value}{16} + 16\right)$$
48V-Variant:
$$U_{in} = \left(\frac{transferred\ value}{8} + 32\right)$$

Byte 4 - 11: The Set Nominal Current at Channel n

The set nominal current is only output if query current setting value (Bit 5) was set to HIGH in the configuration byte (Byte 2)!
The positions of the current selector switches are shown on channel n at the lower 3 bits.

Example: The current selector switch is set to 0 (corresponds to 1A).

Bytes 4 - 11: The Actual Flowing Current at Channel n

The actual flowing current is only output if the query current setting value (Bit 5) was set to LOW in the configuration byte (Byte 2)!
The actual flowing current at channel n is sent in an Int8_t data type (Range: 0 to 255). This transferred value must be converted to a physical value in the PLC with the formula:
$$I_N = \frac{transferred\ value}{16}$$
Example:
$$I_N = \frac{16}{16} = 1A$$

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