

APPLICATION PART

- Each slave MUST have an unique address (from 1 to 247) so that it can be addressed independently from other nodes.
- No response is returned to broadcast requests sent by the master.
- The broadcast requests are necessarily writing commands.
- All devices MUST accept the broadcast for writing function.
- The address 0 is reserved to identify a broadcast exchange.
- The Address 0 is reserved as the broadcast address. All slave nodes MUST recognize the broadcast address.
- In unicast the Response time out MUST be set long enough for any slave to process the request and return the response, in broadcast the Turnaround delay MUST be long enough for any slave to process only the request and be able to receive a new one.
- Therefore the Turnaround delay should be shorter than the Response time-out. Typically the Response time-out is from 1s to several second at 9600 bps; and the Turnaround delay is from 100 ms to 200ms.

SERIAL LINE PART

- The transmission mode (and serial port parameters) MUST be the same for all devices on a MODBUS Serial Line.
- All devices MUST implement the RTU Mode. The ASCII transmission mode is an option
- Default setup MUST be the RTU mode.
- Even parity is required, other modes (odd parity, no parity) may also be used. In order to ensure a maximum compatibility with other products, it is recommended to support also No parity mode.
- The default parity mode MUST be even parity.
- Partial messages MUST be detected and errors MUST be set as a result.
- In RTU mode, message frames are separated by a silent interval of at least 3.5 character times.
- For baud rates greater than 19200 Bps, fixed values for the 2 timers should be used: it is recommended to use a value of 750 μ s for the inter-character time-out (t1.5) and a value of 1.750ms for inter-frame delay (t3.5).
- Frame checking (LRC or CRC) MUST be applied to the entire message.
- Parity checking (even or odd) should be applied to each character.
- In RTU mode, messages include an error-checking field that is based on a Cyclical Redundancy Checking (CRC) method.
- The CRC field checks the contents of the entire message.
- It is applied regardless of any parity checking method used for the individual characters of the message.

PHYSICAL

- A new MODBUS solution over serial line should implement an electrical interface in accordance with **EIA/TIA-485** standard.
- Every implemented baud rate MUST be respected better than 1% in transmission situation, and MUST accept an error of 2% in reception situation.
- For two wire **RS485**; a third conductor MUST also interconnect all the devices of the bus : the common.
- For two wire **RS485** D0, D1, and Common circuit names MUST be used in the documentation related to the device and the Tap (User Guide, Cabling Guide, ...) to facilitate interoperability.
- **RS232** MODBUS should only be used for short length (typically less than 20m) point to point interconnection.
- **RS232** MODBUS The EIA/TIA-232 standard MUST be respected.
- **RS232** MODBUS Documentation of the device MUST indicate :
⇒ if the device MUST be considered as a DCE either as a DTE,
⇒ how optional circuits MUST work if such is the case.
- For two wire **RS485** The end to end length of the trunk cable MUST be limited. The maximum length depends on the baud rate, the cable (Gauge, Capacitance or Characteristic Impedance), the number of loads on the daisy chain, and the network configuration (2-wire or 4-wire).
- For two wire **RS485**; For a maximum 9600 Baud Rate and AWG26 (or wider) gauge, the maximum length is 1000m. In the specific case (4 Wire cabling used as a 2 Wire cabling system) the maximum length MUST be divided by two.
- For two wire **RS485**; The derivations MUST be short, never more than 20m. If a multi-port tap is used with n derivations, each one MUST respect a maximum length of 40m divided by n.
- The « Common » circuit (Signal and optional Power Supply Common) must be connected directly to protective ground, preferably at one point only for the entire bus. Generally this point is to choose on the master device or on its Tap.
- A reflection in a transmission line is the result of an impedance discontinuity that a traveling wave sees as it propagates down the line.
- To minimize the reflections from the end of the RS485-cable it is required to place a Line Termination near each of the 2 Ends of the Bus.

- It is important that the line be terminated at both ends since the propagation is bi-directional, but it is not allowed to place more than 2
- LT on one passive D0-D1 balanced pair . Never place any LT on a derivation cable.