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**Modbus industrial automation network specification -- Part 2:
Modbus protocol implementation guide over serial link
(English Translation)**

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1 Scope

Modbus is an application-layer message transport protocol at Layer 7 of the OSI model, providing client/server communication between devices connected to different types of buses or networks. It also standardizes the protocol over serial links to facilitate the exchange of

Modbus requests between a master and one or more slaves.

The goal of this Part is to propose a Modbus protocol over serial links for system designers to use when implementing a serial link-based Modbus protocol.

This Part will facilitate interoperability between devices using the Modbus protocol.

This Part also supplements GB/T 19582.1-2008, as shown in Figure 1.

Clause 9 defines different implementation levels of "Modbus Serial Link". The specifications for each level are all the requirements that a device must comply to be considered within that level.

Figure 1 - Overview of Modbus protocol text

2 Protocol Overview

This Part describes the Modbus protocol over serial links. The Modbus protocol over serial link is a master-slave protocol. It resides at Layer 2 of the OSI model.

A master-slave system has a master node (master) that issues explicit commands to a slave node (slave) and processes the responses. Slaves do not actively transmit data or communicate with other slaves unless they receive a request from the master.

At the physical layer, Modbus systems over serial links can use different physical interfaces (RS485, RS232). The most commonly used physical interface is the TIA/EIA-485 (RS485) two-wire interface. As an additional option, the RS485 four-wire interface can also be used.

When only short-range point-to-point communication is required, the TIA/EIA-232-E (RS232) serial interface can also be used as the physical interface for the Modbus system (see Clause 7).

Figure 2 shows a general representation of the Modbus serial communication stack corresponding to the 7-layer OSI model.

Figure 2 - Modbus protocol and ISO/OSI model

The Modbus application layer message transport protocol, located at Layer 7 of the OSI model, provides client/server communication between devices connected to a bus or network. On a

Modbus serial link, the master of the serial bus acts as the client; and the slave acts as the server.

3 Conventions

In this Part, the following terms are used to define the importance of each specific requirement.

--- "Must"/"Required"

All requirements containing the word "must" are mandatory. The word "must" or the adjective "required" indicates that the item is an absolute requirement for execution.

These terms are underlined.

--- "Shall"/"Recommended"

All recommendations containing "shall" or the adjective "recommended" are desired functions. These recommendations shall be used as guide when selecting different implementation options. Under certain conditions, there may be reasonable grounds to ignore these items; however, their full meaning shall be understood; and various situations shall be carefully considered before selecting different processes. These terms are underlined.

--- "Can"/"optional"

The word "can" or the adjective "optional" indicates that the item is truly optional. For example, one designer can choose to include the item due to specific market needs or to enhance product functionality, while another designer can choose to omit it.

4 Consistency

If an implementation does not meet one or more of the mandatory requirements in the implementation level, then that implementation is not consistent.

If an implementation meets all the mandatory requirements and all the recommended requirements in the implementation level, then that implementation is called "unconditionally consistent."

If an implementation meets all the mandatory requirements but not all the recommended requirements in the implementation level, then that implementation is called "conditionally consistent."

5 Terms and Abbreviations

The following specific terms, symbols, and abbreviations are defined in this Part.

2W (2-Wire). The two-wire configuration defined in the Clause of "Electrical Interfaces", or

one of the interfaces therein.

4W (4-Wire). The four-wire configuration defined in the Clause of "Electrical Interfaces", or one of the interfaces therein.

AUI. Attachment Unit Interface.

AWG. American Wire Gauge. Standard method for expressing wire diameter (see Bibliography

[3]).

Common. The common for signals in the EIA/TIA standard. In 2-wire or 4-wire RS485 Modbus networks, it is the common for signals and optional power.

DCE. Data Communication Equipment. A Modbus device that implements an RS232 data circuit terminal unit, e.g., a programmable logic controller adapter.

Device. The same as Modbus device definition.

Driver. Generator or transmitter.

DTE. Data Terminal Equipment. A Modbus device that implements an RS232 data terminal unit, e.g., a programmable terminal or a PC.

ITr. Interface on truck. Physical bus interface on the trunk side.

IDv. Interface on Derivation. Physical bus interface on the device side (or splitter or device branch).

LT. Line Termination.

Modbus Device. Device that implements Modbus over serial link and conform to its technical specifications.

RS232.EIA/TIA-232 standard.

RS485.EIA/TIA-485 standard.

RS485-Modbus. Two-wire or four-wire networks that comply with their technical specifications.

Transceiver [Translator Note. Here it shall be Transceiver]. Transmitter and receiver (or driver and receiver)

6.1 Modbus master/slave protocol principle

The Modbus protocol over serial link is a master-slave protocol. At any given time, there can only be one master and one or more (up to 247 slave(s) on the bus. Modbus communication is always initiated by the master. The slave(s) will not send data if it does not receive a request from the master. Slaves cannot communicate with each other. The