4 MODBUS PROTOCOL

Information.

- The COMMANDER 200 operates as a Modbus, Remote Terminal Unit (RTU) slave.
- Parity checking – used to detect transmission errors in individual characters.
- Cyclic redundancy checking – used to detect errors in the master messages and slave responses.
- Non-volatile memory save command.

4.1 Introduction to Modbus Protocol

Modbus communication is based on a master and a slave arrangement. The master sends a message to one slave at a time and waits for a reply.

The slave cannot accept a new message until the existing message is processed and a reply sent to the master (maximum response time 250 milliseconds). The slave monitors the elapsed time between receipt of characters. If the elapsed time without a new character is 3$^{1}/_{2}$ character times, the slave assumes the next character received is the start of a new message.

To allow the master to differentiate between more than one slave in a system, each slave is given a unique identity address (between 1 and 99).

A broadcast address (address zero) can be used to access all slave devices with one command. This is limited to write messages only and there is no slave acknowledgment.

Note. Modbus RTU requires 1 start bit, 8 data bits, 1 parity bit (optional) and 1 or 2 stop bits.

4.1.1 Non-volatile Memory Limitations

Caution. If the number of write cycles to any particular non-volatile memory register exceeds 10^4 cycles, the data stored may not be retained.

Any changes made to a parameter via the serial link, e.g. Control Set Point value, are stored in a non-volatile memory register assigned to that parameter.

The number of write cycles to a particular register can be reduced by disabling non-volatile memory access when making changes to parameters which do not need to be retained following a power-down. This is done using the **Non-volatile Save State** (NV) – see Section 8.6.1, General Parameters.

When the **Non-volatile Save State** is set to ‘Enable’, any parameter changes made via the serial link are written to non-volatile memory and are retained on power-down. If the **Non-volatile Save State** is set to ‘Disable’, parameter changes made via the serial link are not retained on power down.

The **Non-volatile Save State** must be adjusted only when necessary and must be reset to the required state each time the instrument is powered down, replaced with another instrument or the host computer is powered down.

4.2 Modbus Function Codes

The function code field instructs the addressed slaves which function to perform. Table 4.1 shows the function codes, their meaning, and the action they initiate.

Modbus Function Code	Modbus Mesage Name	MODCELL 2050 Definition
01	Read Coil Status	Read up to 16 consecutive discrete (boolean) points from a specific starting point. The COMMANDER 200 returns zeros for points which do not contain defined data and NAKs* any request for point numbers greater than 200.
03	Read Holding Register	Read up to 8 consecutive registers from a specific starting register. The COMMANDER 200 returns zeros for points which do not contain defined data and NAKs* any request for point numbers greater than 250.
05	Force Single Coil	Write one discrete (boolean) point. The COMMANDER 200 NAKs* this if the point is not currently writeable.
06	Preset Single Register	Write one register. The COMMANDER 200 naks if the register is not currently writeable. This function code also applies to any currently applicable limits t the value before storage in the database.
08	Loop Back Diagnostic Test	Echo the message, only ‘Return of Query’ is supported.
16	Preset Multiple Registers	Write up to 8 consecutive registers from a specified starting register. The COMMANDER 200 naks if any of the registers are not currently writeable, but still carries out all the writes which are still valid, applying any current applicable limits to the value before storage in the database. This function code is only available if ‘write ot non-volatile memory’ is disabled – see coil number 181.

*NAK = Negative Acknowledgment

Table 4.1 Modbus Function Codes