



INDUSTRIAL CONTROL COMMUNICATIONS, INC.

PROFIBUS DP-V1 Slave Driver Manual

TABLE OF CONTENTS

1	PROFIBUS DP-V1 Slave	2
1.1	Overview	2
1.2	Cyclic Data Exchange	2
1.3	Acyclic Data Exchange	3
1.4	PROFIBUS Settings	4
1.5	Cyclic Data Settings	4

1 PROFIBUS DP-V1 Slave

1.1 Overview

The gateway supports a PROFIBUS DP-V1 slave driver on the PROFIBUS port. Some notes of interest are:

- The cyclic I/O data sizes may be changed dynamically during the initial communication stages according to the module configuration requested by the PROFIBUS master.
- Both DP-V1 class 1 and class 2 acyclic communications are supported.
- The entire internal database is directly addressable via acyclic data requests.
- The following DP features are supported:
 - Auto Baud Rate
 - Freeze Mode
 - Sync Mode
 - Fail Safe Mode
- Supports up to 368 bytes of combined input and output cyclic data.

1.2 Cyclic Data Exchange

The driver supports up to 368 bytes of combined input and output cyclic data. The size of the exchanged data is determined by the specific module(s) selected by the master from the GSD file. If the configuration received during the initial communication stages is accepted, the driver will automatically adjust its internal data sizes to match that of the requested configuration. Note that the driver may take slightly longer than normal to connect to the network if it must change its data sizes in order to support the requested modules. When this occurs, both the PROFIBUS OP and ST LEDs will turn off for several seconds while the driver reconfigures itself. Both LEDs will become solid green when the driver has successfully reconfigured the data sizes and connected to the network.

Note that the driver can only accept a maximum of 16 configuration bytes. This means, for instance, that if you wish to have 17 words (34 bytes) of output data and you select 17 “Output 1 Word” modules, then this configuration will not be accepted. Instead, select one “Output 16 Words” and one “Output 1 Word” module, as this constitutes only two total configuration bytes. Keep in mind that one configuration byte can define usage for only up to 16 input, output or input/output words contained in a single module. For example, the “Output 32 Words” module uses two configuration bytes. Similarly, the “Input/Output 32 Words” module also uses two configuration bytes. It is recommended to use the “Input/Output Word” modules whenever possible to minimize the total number of configuration bytes.

The starting database address mapping for both input and output data is defined using the Configuration Studio (refer to section 1.5.) The designated starting address, combined with the size derived from the selected module(s), defines a block of data for transmission or reception. Because only the input and output data block’s starting addresses may be defined on the gateway, care must be taken during configuration to ensure that any data intended to be

cyclically exchanged on the PROFIBUS network is mapped within the referenced input or output data blocks.

1.3 Acyclic Data Exchange

The driver supports acyclic data exchange as per DP-V1 using either MS1 or MS2 communication. The entire internal database may be accessed and modified via a slot number and an index, both of which are determined based on the type of access desired. The available access types are byte, word (2 bytes), and double word (4 bytes). Byte accesses must use a size of 1, word accesses must use a size of 2, and double word accesses must use a size of 4: any other access/size combination may result in undefined behavior.

For any given database address, the slot number is determined by Equation 1, Equation 2, or Equation 3 (depending on the access type):

Byte Access (size = 1):

$$\text{slot number} = \left\lfloor \frac{\text{address}}{255} \right\rfloor \quad \text{Equation 1}$$

Word Access (size = 2):

$$\text{slot number} = \left\lfloor \frac{\text{address} + 4096}{255} \right\rfloor \quad \text{Equation 2}$$

Double Word Access (size = 4):

$$\text{slot number} = \left\lfloor \frac{\text{address} + 8192}{255} \right\rfloor \quad \text{Equation 3}$$

Where the bracket symbols “ $\lfloor \]$ ” indicate the “floor” function, which means that any fractional result (or “remainder”) is to be discarded, with only the integer value being retained.

Similarly, the index can be determined by Equation 4, Equation 5, or Equation 6 (depending on the access type):

Byte Access (size = 1):

$$\text{index} = \text{address} \% 255 \quad \text{Equation 4}$$

Word Access (size = 2):

$$\text{index} = (\text{address} + 4096) \% 255 \quad \text{Equation 5}$$

Double Word Access (size = 4):

$$\text{index} = (\text{address} + 8192) \% 255 \quad \text{Equation 6}$$

Where “%” is the modulus operator, which means that any fractional result (or “remainder”) is to be retained, with the integer value being discarded (i.e. it is the opposite of the “floor” function).

For clarity, let’s use the above equations in a calculation example. Say, for instance, we wish to access one byte at address 2846 in the internal database. We must therefore use Equation 1

and Equation 4 to calculate the slot and index, respectively. From these equations, we can determine that the slot number is 11, as $\lfloor 11.1608 \rfloor = \lfloor 11 \text{ r}41 \rfloor = 11$ and the index is 41, as $\text{mod}(11 \text{ r}41) = 41$. Therefore, reading slot number 11, index 41 will return the byte stored at database address 2846.

Using the same example, if we wish to access one word starting at address 2846, we must use Equation 2 and Equation 5 to calculate the slot and index, respectively. From these equations, we can determine that the slot number is 27, as $\lfloor 27.2235 \rfloor = \lfloor 27 \text{ r}57 \rfloor = 27$ and the index is 57, as $\text{mod}(27 \text{ r}57) = 57$. Therefore, reading slot number 27, index 57 will return the word stored in the database starting at address 2846.

Again, using the same example, if we wish to access one double word starting at address 2846, we must use Equation 3 and Equation 6 to calculate the slot and index, respectively. From these equations, we can determine that the slot number is 43, as $\lfloor 43.2863 \rfloor = \lfloor 43 \text{ r}73 \rfloor = 43$ and the index is 73, as $\text{mod}(43 \text{ r}73) = 73$. Therefore, reading slot number 43, index 73 will return the double word stored in the database starting at address 2846.

1.4 PROFIBUS Settings

Baud Rate

Fixed at “Auto” (the driver automatically adjusts to the network baud rate).

Parity

Fixed at “Even”, according to the PROFIBUS specification.

Address

Specifies the PROFIBUS slave address assignment (0...125).

1.5 Cyclic Data Settings

Cyclic data support is automatically added to the PROFIBUS driver, and cannot be removed.

Input Data Start Address

Specifies the starting address in the internal database for the cyclic input data block. Because the input data size is dynamically selected by the master during initial connection time, care must be taken to ensure that the resultant input data block will not run past the end of the database.

Output Data Start Address

Specifies the starting address in the internal database for the cyclic output data block. Because the output data size is dynamically selected by the master during initial connection time, care must be taken to ensure that the resultant output data block will not run past the end of the database.



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