megacon

IsoBase / IsoBox

Profibus DP protocol

IsoBase / IsoBox PROFIBUS DP-V0
This manual describes the communication protocol for profibus interface.
Interface typw implemented: DP-V0 slave.

PROFIBUS
Profibus-DP is a multi-master systems. In the networks it's possible to have up to 126 devices on the same bus.
In profibus-DP networks, the interchange of data between peripheral modules and the master is made automatically by the profibus controller, which 'virtualise' the data exchange memory of the DP devices in the memory of the master.
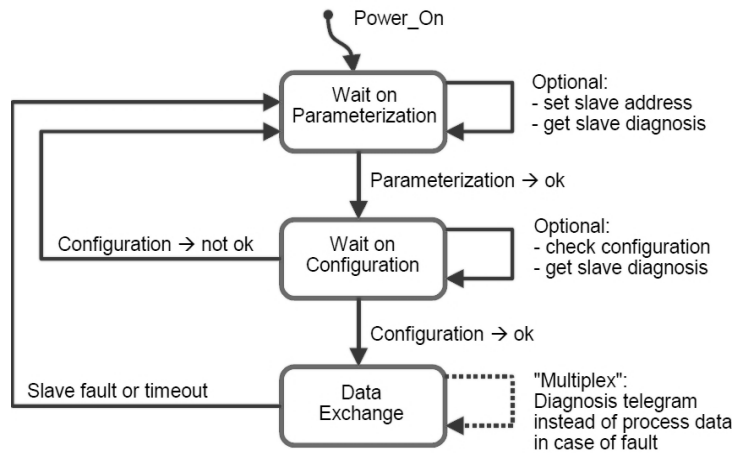
Baudrate supported
The IsoBase/IsoBox supported the following communication baud rate:
9,6 kbit/s, 19.2 kbit/s, 45,45 kbit/s, 93,75 kbit/s, 187.5 kbit/s, 500 kbit/s, 1.5 Mbit/s, 3 Mbit/s
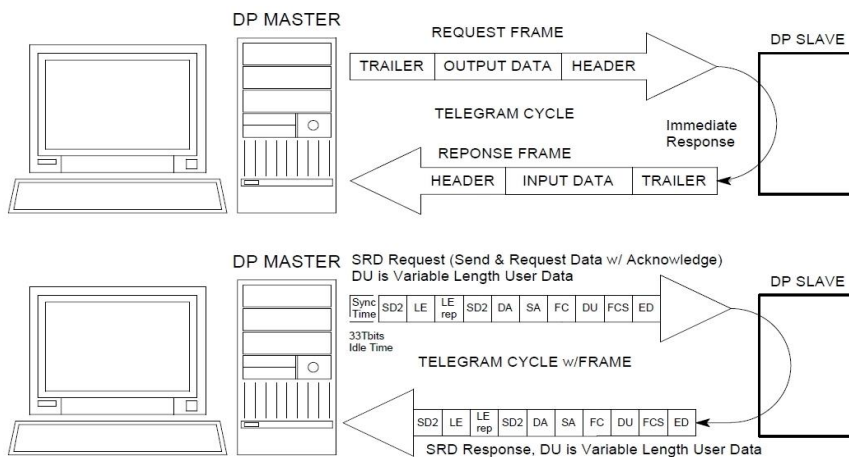The instrument detected the baud rate network **automatically**.

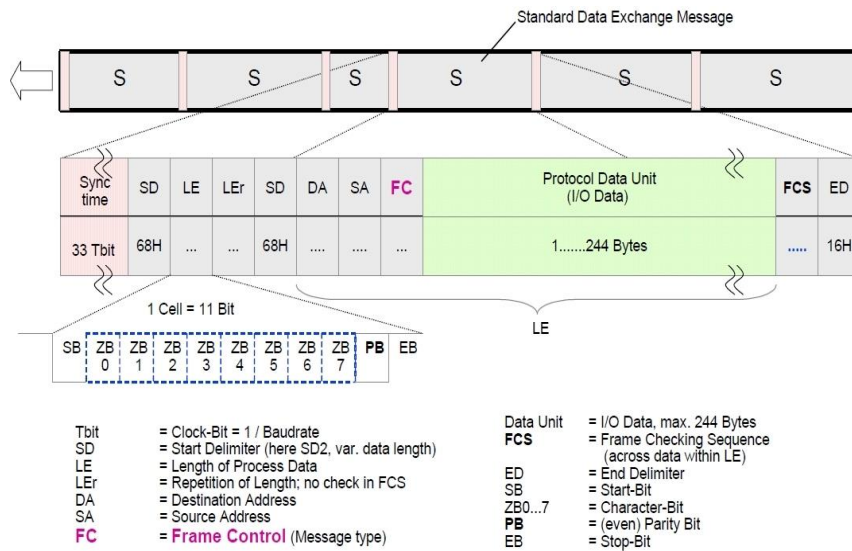## Example of profibus parameterization and configuration sequence:

Data exchange handshake from Master to IsoBase/IsoBox:

1) The Master place in output memory the indexes (or indexes + values);
2) Data are transferred from output memory of the master to input memory of the slave;
3) IsoBase/IsoBox read the indexes send by the master and write on its output memory area the data (measures) requested;
4) Measures are transferred from output data of the IsoBase/IsoBox to profibus master input memory area;
5) The application program, present in the master profibus, read the data from input memory and show the measures to the user
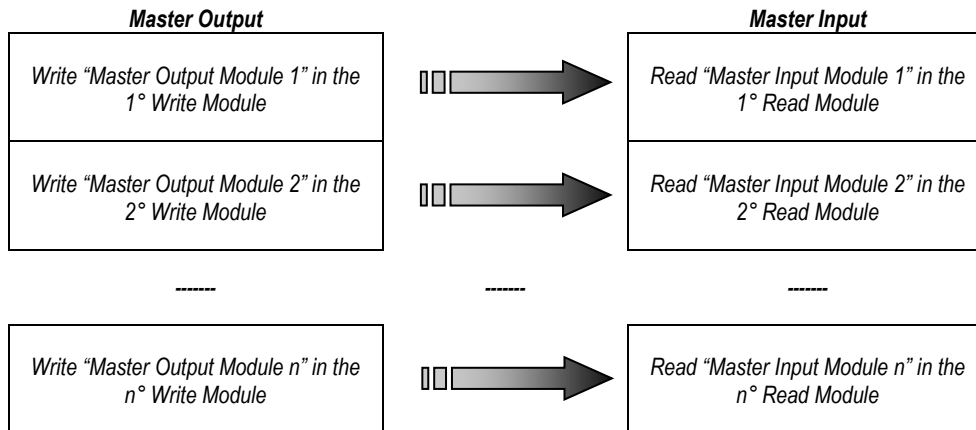

Format message - data exchange

Standard Data Exchange Message

Sync time	SD	LE	LEr	SD	DA	SA	FC	Protocol Data Unit (I/O Data)	FCS	ED
33 Tbit	68H	...	...	68H	....	....	...	1.......244 Bytes	.....	16H

1 Cell = 11 Bit

SB	ZB 0	ZB 1	ZB 2	ZB 3	ZB 4	ZB 5	ZB 6	ZB 7	PB	EB

Tbit	= Clock-Bit = 1 / Baudrate	Data Unit	= I/O Data, max. 244 Bytes
SD	= Start Delimiter (here SD2, var. data length)	**FCS**	= Frame Checking Sequence (across data within LE)
LE	= Length of Process Data	ED	= End Delimiter
LEr	= Repetition of Length; no check in FCS	SB	= Start-Bit
DA	= Destination Address	ZB0...7	= Character-Bit
SA	= Source Address	**PB**	= (even) Parity Bit
FC	= **Frame Control** (Message type)	EB	= Stop-Bit

Communication structure ISOBASE/ISOBOX:

The communication with the instrument is projected "in Module". The input (master) module is 4 byte long and the output (master) module is 6 byte long. Each "write" module allow to send one index (see Read Commands Table) corresponding at the measure that it must read from master module (input). If it sent the index value in the *first master* output module the read value will be return in the *first master input module*, if it sent the index value in the *second master output module* the read value will be return in the *second master input module*, etc.

Comunication Structure Example

Master Output		*Master Input*
Write "Master Output Module 1" in the 1° Write Module	→	Read "Master Input Module 1" in the 1° Read Module
Write "Master Output Module 2" in the 2° Write Module	→	Read "Master Input Module 2" in the 2° Read Module
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Write "Master Output Module n" in the n° Write Module	→	Read "Master Input Module n" in the n° Read Module

This structure allow to change in "real time" order and type of measure to read from ISOBASE/ISOBOX instrument.
Each *Master Input Module* is formed by **4 Byte / 2 Word** (it's possible to read max 28 module at the same time) and the *Master Output Module* is format by **6 Byte / 3 Word** (it's possible to write max 28 module at the same time).

*WARNING: Before read the measures (*Master Input Module*), the Master must send the indexes corresponding (*Master Output Module).*

WARNING: If it sent a only wrong Index or Parameter the instrument won't return any value until all Indexes and Parameters will be corrected. The ISOBASE/ISOBOX will produce a Diagnostic Message for notify the error presence.

Send example:

n° Master Output Module	Index Value	Measure to Read	n° Master Input Module	Measure Value
1	0x0401	CURRENT 1	1	Long Value (4 byte)
2	0x0402	CURRENT 2	2	Long Value (4 byte)
3	0x0403	CURRENT 3	3	Long Value (4 byte)
4	0x0404	CURRENT 4	4	Long Value (4 byte)

This is the Master Outputs Structure for Read the measures:

N° Master Output Module	N° Measure	Measure	Used Byte
Index 1	0x0401	CURRENT 1	1° - 2° Byte
Parameter 1.1	----	Not used	3° - 4° Byte
Parameter 1.2	----	Not used	5° - 6° Byte
Index 2	0x0402	CURRENT 2	7° - 8° Byte
Parameter 2.1	----	Not used	9° - 10° Byte
Parameter 2.2	----	Not used	11° - 12° Byte

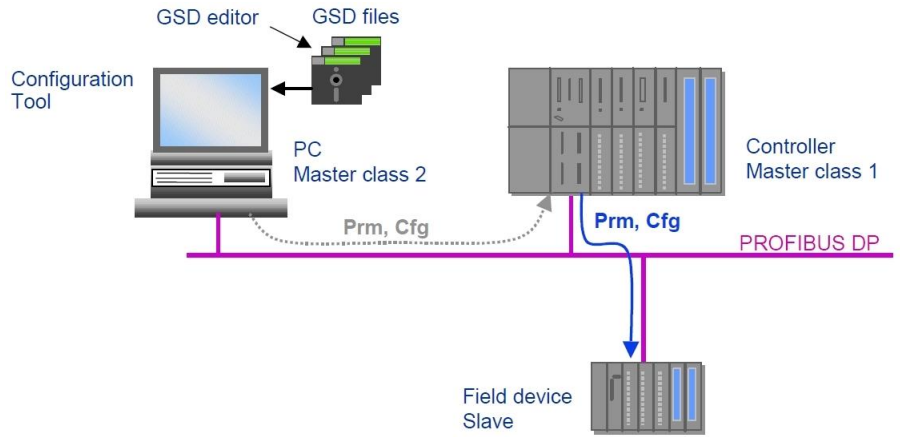*WARNING: It is necessary to send at least 3 words (index1+parameter1.1+parameter1.2).*

WARNING: The read or write operation must be completed without interruption by other parts of the program.

GSD file

The GSD files supplied with the ISOBASE/ISOBOX instrument:

GSD Name: ISOBASE-ISOBOX-PF-S
N° Input Byte: 112 Byte
N° Master Input Module: 28
N° Output Byte: 168 Bytes
N° Master Output Module: 28
N° Tot Module: 56

The GSD file designed for improve the input/output space and speed on profibus master, because it is possible to insert from 1 to 28 modules for input and from 1 to 28 modules to output.

Configuration Steps ISOBASE/ISOBOX:

1) Load GSD file;
2) Set profibus node ID (with frontal panel keys → see instruction manual);
3) Send index value from the output master space (each module is format by 6 bytes);
4) Receive in the input master space the measure value (4 bytes);
5) Repeat point 3 and 4 for each module insert in the hardware configuration;

In the master program:

1) Load GSD File;
2) Setting the ISOBASE/ISOBOX Node Id in you project (Node ID on the instrument is setting with frontal panel);
3) Insert the Module that it necessary for application (if not insert automatically from program during loading gsd file);
4) Write the module index (corresponding at the measure that must read) in the master output space;
5) Receive in the master the measure value (first module if you send the first module in master output);
6) Repeat point 4 and 5 for all modules;

For example see the following figure (Master Output – **DB2** *Step 7*):

Indirizzo	Nome	Tipo	Valore iniziale	Valore attuale
0.0	index1	WORD	W#16#401	W#16#0401
2.0	Parameter_1_1	WORD	W#16#0	W#16#0000
4.0	Parameter_1_2	WORD	W#16#0	W#16#0000
6.0	index2	WORD	W#16#402	W#16#0402
8.0	Parameter_2_1	WORD	W#16#0	W#16#0000
10.0	Parameter_2_2	WORD	W#16#0	W#16#0000
12.0	index3	WORD	W#16#403	W#16#0403
14.0	Parameter_3_1	WORD	W#16#0	W#16#0000
16.0	Parameter_3_2	WORD	W#16#0	W#16#0000
18.0	index4	WORD	W#16#404	W#16#0404
20.0	Parameter_4_1	WORD	W#16#0	W#16#0000
22.0	Parameter_4_2	WORD	W#16#0	W#16#0000

For each measure to read it's necessary to send the corresponding index (the first 2 bytes for each module). In this example are read the first nine measures, but it's possible to read any measure (max 28) in any order. In this way it's possible to read the measures in the Master input space (**DB1** *Step 7*).

Indirizzo	Nome	Tipo	Valore iniziale	Valore attuale
0.0	M1	DWORD	DW#16#0	DW#16#00000000
4.0	M2	DWORD	DW#16#0	DW#16#00000000
8.0	M3	DWORD	DW#16#0	DW#16#00000000
12.0	M4	DWORD	DW#16#0	DW#16#00000000
16.0	M5	DWORD	DW#16#0	DW#16#00000000

Index group measures

INPUT WARNING LEVEL	0x01xx
INPUT ALARM LEVEL	0x02xx
INPUT DELAY	0x03xx
INPUT CURRENT	0x04xx
INPUT MAX	0x05xx
INPUT MIN	0x06xx
INPUT STATE	0x07xx
INPUT MEMORY	0x08xx
INPUT TOTAL EVENT COUNT	0x09xx
INPUT NEW EVENT COUNT	0x0Axx
INPUT LABELS 8 CHARS	0x0Bxx
INPUT TRMS NO FILTER	0x0Cxx
INPUT TRMS WITH FILTER	0x0Dxx
INPUT THD	0x0Exx
FILTER ACTIVE	0x0Fxx
CT CONNECT	0x10xx

XX: progressive index MEASURE 1 to 128

DIAGNOSTIC

The ISOBASE/ISOBOX is able to generate, in case of errors, some diagnostics, automatically. These diagnostics can be sent to the Master profibus through a standard mechanism expected from the profibus protocol.

Format Message – Slave Diagnosis

ED	FCS	S-SAP	D-SAP	FC	SA (2⁷=1)	DA (2⁷=1)	SD	LEr	LE	SD	Sync time	
16H	.....	3EH (62)	3CH (60)	...	....	....	68H	...	...	68H	33 Tbit	

Sync time	SD	LE	LEr	SD	DA (2⁷=1)	SA (2⁷=1)	FC	D-SAP	S-SAP	Protocol Data Unit (Diagnosis Information)	FCS	ED
33 Tbit	68H	...	...	68H	....	...	...	3CH (60)	3EH (62)	1.......242 Bytes	.....	16H

DSAP = Destination Service Access Point
SSAP = Source Service Access Point

Diagnostics generation mechanism

In the polling normal cycle, done by a Master station, there is not the request of the diagnostics message. It is the slave that informs the master that a diagnostics variation is occurred and that this message has to be asked.

When there is a diagnostics variation (appears or disappears), during the formatting of the answer message from a normal data request, the ISOBASE/ISOBOX set the field FC (Frame Control).

The ISOBASE/ISOBOX generates a diagnostic message with this format (6+12 Byte long):

Default Profibus Diagnostic Data-Unit:

1° Byte	2° Byte	3° Byte	4° Byte	5° Byte	6° Byte
Station Status 1	Station Status 2	Station Status 3	Diag. Master Add	Ident Number High	Ident Number Low

Specific Profibus Diagnostic:

7° Byte	8° Byte	9° Byte	10° Byte	11° Byte	12° Byte
N° Byte Instrument Diag	Status High 31-24 bit	Status High 23-16 bit	Status High 15-8 bit	Status High 7-0 bit	Status Low 31-24 bit

13° Byte	14° Byte	15° Byte	16° Byte	17° Byte	18° Byte
Status Low 23-16 bit	Status Low 15-8 bit	Status Low 7-0 bit	In/out error	Module	N° Error

The Master could receive the following error:
- Internal Communication break   31° bit = 1 in Status Low
- Communication fail   30° bit = 1 in Status Low
- Illegal index   29° bit = 1 in Status Low
- Illegal data   28° bit = 1 in Status Low

EXTERNAL DIAGNOSTIC – LED

Data Exchange 1	Data Exchange 2	Parameterized	Instrument Status
Blinking	Blinking	Fixed ON	Parameterized and communication
Fixed	Blinking	Fixed ON	Parameterized but not receive a query
Blinking one led at time			Not parameterized

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