

EMM-dc-PF-S Communication Protocol

EMM-dc MULTIMETER PROFIBUS DP-V0

This manual describes the communication protocol for the EMM-dc-PF-S profibus interface. This interface implement the DP-V0 slave in profibus DP network.



PROFIBUS AND EMM-dc-PF-S


Profibus-DP is a multi-master system. 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.

EMM-dc-PF-S Address Setting

Entry to menu:   see on the display **Set Up**


Press  up to see **Id Adr**

Press  for **Increase** the address or  for **Decrease** the address

Press  for confirm address id

EMM-PF-S Version and Revision

Entry to menu:   see on the display **Set Up**

Press  up to see **Profibus**. In this page it possible to read EMM-dc-PF-S version and revision.

See EMM User Manual for more info.

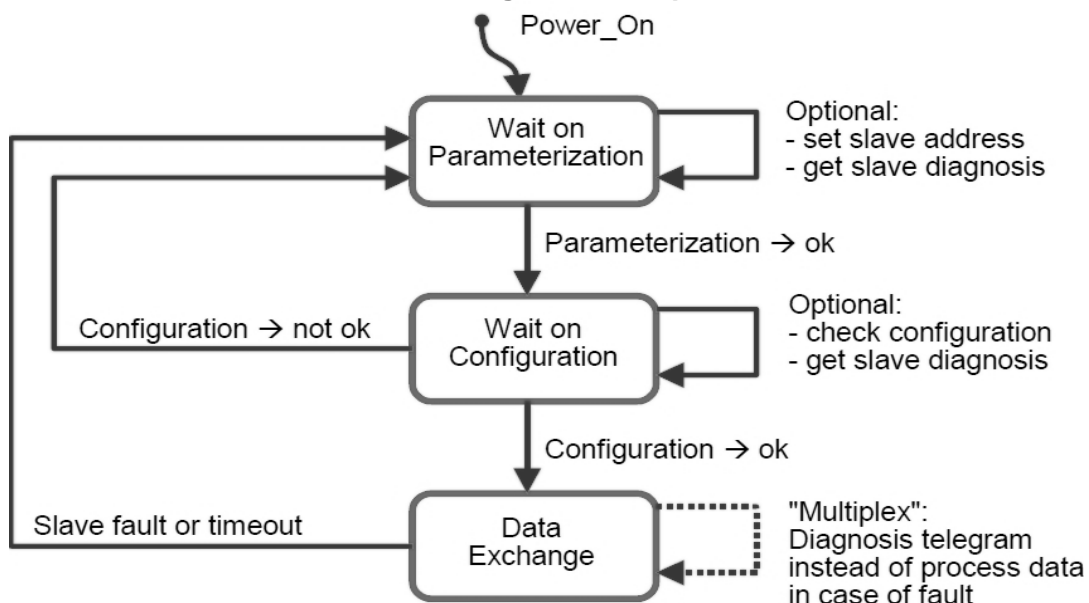
EMM-dc-PF-S Baudrate Supported

The EMM-dc-PF-S 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
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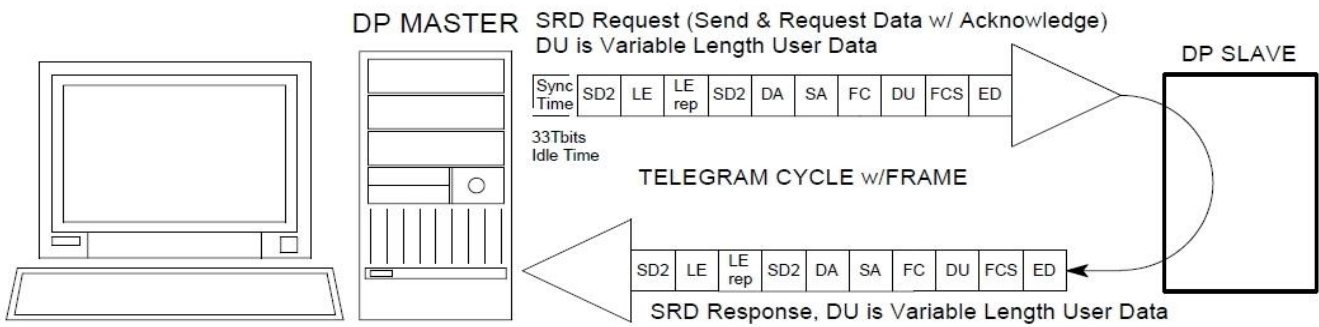
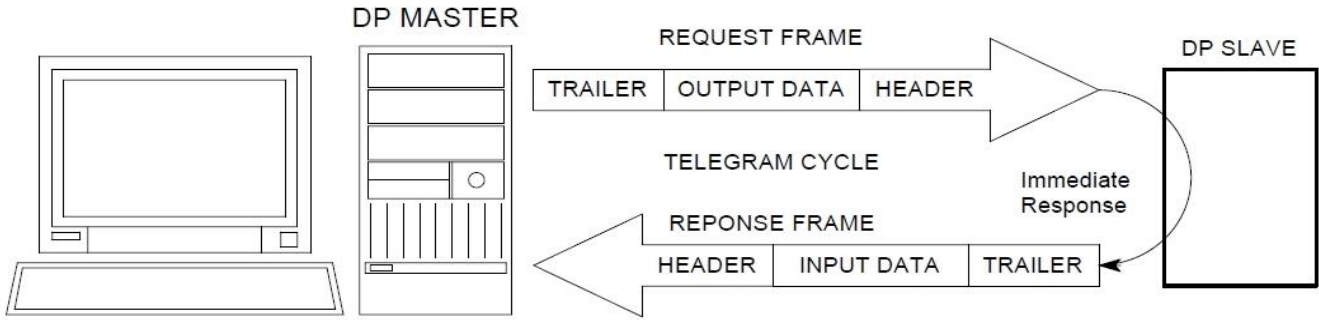
The EMM-dc-PF-S detect the baud rate network **automatically**.

Example of Profibus Parameterization and Configuration Sequence:

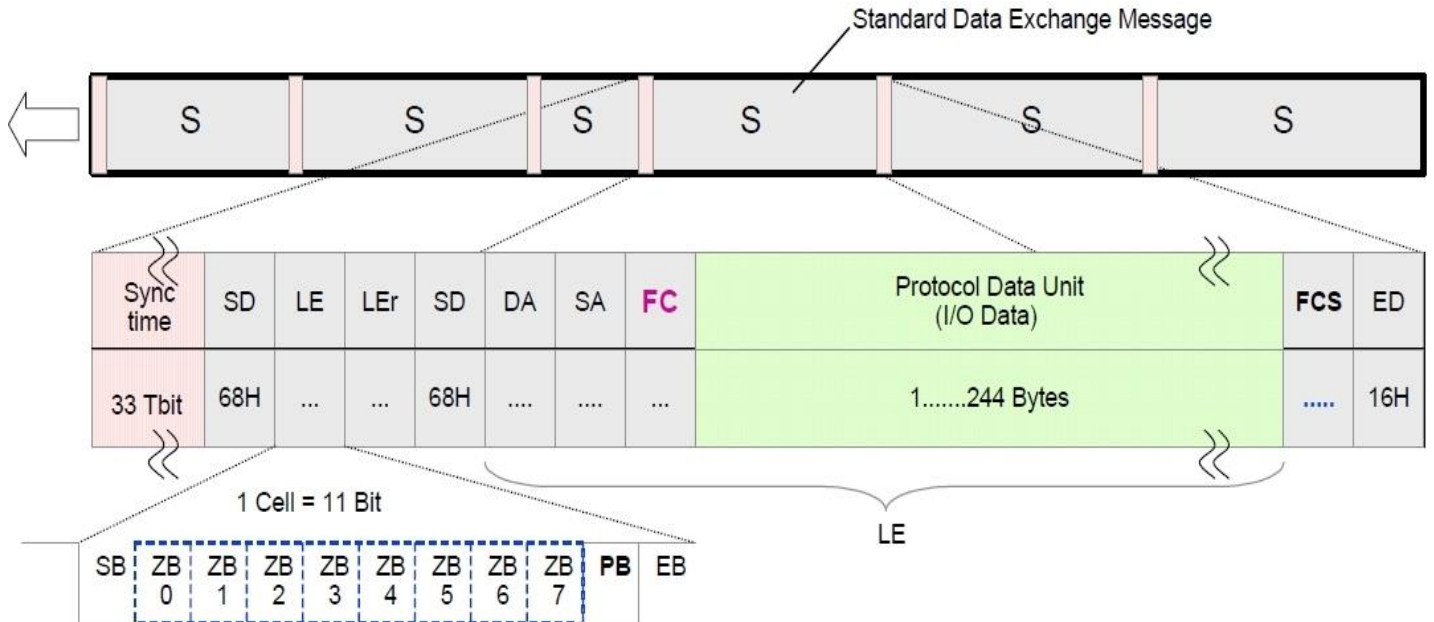


Data exchange handshake from Master to EMM-dc-PF-S:

- 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 EMM-dc-PF-S slave.
- 3) EMM-PF-S 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 EMM-dc-PF-S 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

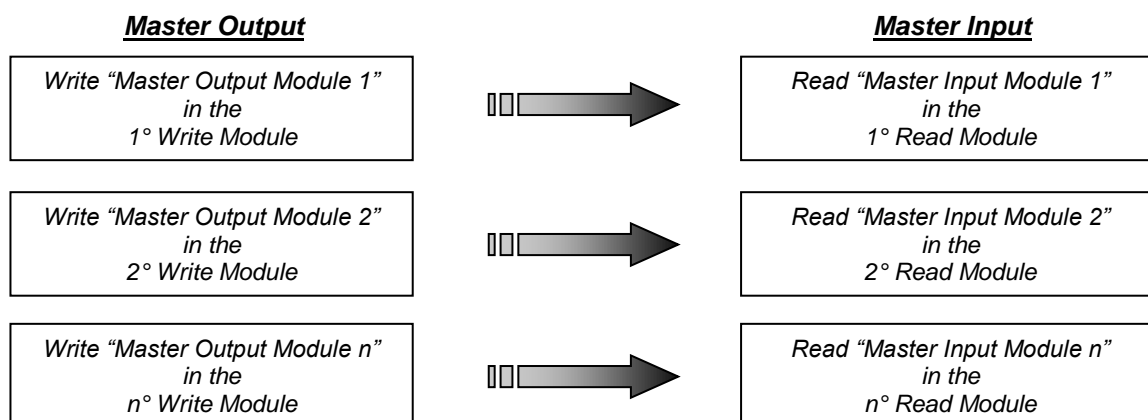


Tbit = Clock-Bit = 1 / Baudrate
 SD = Start Delimiter (here SD2, var. data length)
 LE = Length of Process Data
 LEr = Repetition of Length; no check in FCS
 DA = Destination Address
 SA = Source Address
FC = **Frame Control** (Message type)

Data Unit = I/O Data, max. 244 Bytes
FCS = Frame Checking Sequence (across data within LE)
 ED = End Delimiter
 SB = Start-Bit
 ZB0...7 = Character-Bit
PB = (even) Parity Bit
 EB = Stop-Bit

Communication Structure EMM-dc-PF-S:

The communication with the instrument is projected “in Module”. The input (master) module is 4 bytes long and the output (master) module is 6 bytes 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.



Communication Structure Example

This structure allow to change in “real time” order and type of measure to read from EMM-dc-PF-S instrument. Each *Master Input Module* is formed by **4 Byte / 2 Word** (it’s possible to read max 28 modules at the same time) and the *Master Output Module* is format by **6 Byte / 3 Word** (it’s possible to write max 28 modules at the same time).

WARNING: Before read the measures (Master Input Module), the Master must send the indexes corresponding (Master Output Module). If you don’t send any indexes the EMM-dc-PF-S will be return the first 28 measures.

WARNING: If it sends a only wrong Index or Parameter the instrument won’t return any value until all Indexes and Parameters will be corrected. The EMM-dc-PF-S will produce a Diagnostic Message for notify the error presence.

For example, this is the Master Outputs Structure for Read the measures.

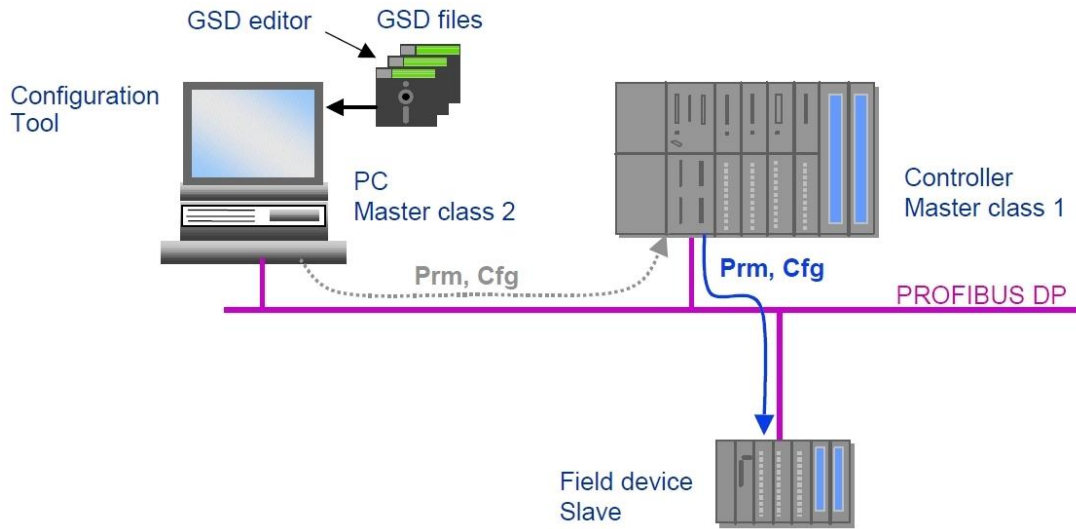
N° Master Output Module	N° Measure	Measure	Used Byte
Zero Module	None	Write 0x0000	1° - 2° Byte
Index 1	0x0003	LINE CURRENT L ₁	3° - 4° Byte
Parameter 1.1	xxxx	Not Necessary	5° - 6° Byte
Parameter 1.2	xxxx	Not Necessary	7° - 8° Byte
Index 2	0x0004	LINE CURRENT L ₂	9° - 10° Byte
Parameter 2.1	xxxx	Not Necessary	11° - 12° Byte
Parameter 2.2	xxxx	Not Necessary	13° - 14° Byte

WARNING: It is necessary to send at least 4 words (zero module+index1+parameter1.1+parameter1.2).

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

GSD File

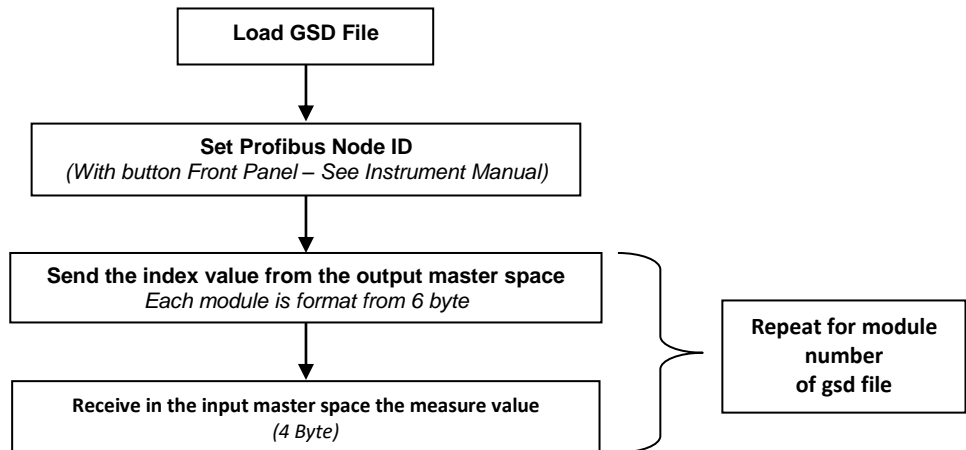
The GSD files supplied with the EMM-dc-PF-S instrument:



GSD Name	N° Input Byte	N° Master Input Module	N° Output Byte	N Master Output Module	N° Tot Module
EMMPFS	114 Byte	28	170 Byte	28	57

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

Flow Chart Configuration EMM-dc-PF-S



In the Master Program:

- 1) Load GSD File.
- 2) Setting the EMM-dc-PF-S Node Id in your project (Node ID on the instrument is setting with frontal panel).
- 3) Insert the Module that is necessary for application (if not inserted automatically from program during loading gsd file).
- 4) Write the module index (corresponding to the measure that must be 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 File):

Indirizzo	Nome	Tipo	Valore iniziale	Valore attuale	Commento
0.0	0000	WORD	W#16#0	W#16#0000	
2.0	index1	WORD	W#16#1	W#16#0001	
4.0	Parameter_1_1	WORD	W#16#0	W#16#0000	
6.0	Parameter_1_2	WORD	W#16#0	W#16#0000	
8.0	index2	WORD	W#16#2	W#16#0002	
10.0	Parameter_2_1	WORD	W#16#0	W#16#0000	
12.0	Parameter_2_2	WORD	W#16#0	W#16#0000	
14.0	index3	WORD	W#16#3	W#16#0003	
16.0	Parameter_3_1	WORD	W#16#0	W#16#0000	
18.0	Parameter_3_2	WORD	W#16#0	W#16#0000	
20.0	index4	WORD	W#16#4	W#16#0004	
22.0	Parameter_4_1	WORD	W#16#0	W#16#0000	
24.0	Parameter_4_2	WORD	W#16#0	W#16#0000	
26.0	index5	WORD	W#16#5	W#16#0005	
28.0	Parameter_5_1	WORD	W#16#0	W#16#0000	
30.0	Parameter_5_2	WORD	W#16#0	W#16#0000	

Fig.1: File **DB2** (Step7)

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 File).

Indirizzo	Nome	Tipo	Valore iniziale	Valore attuale	Commento
0.0	0000	WORD	W#16#0	W#16#0000	
2.0	M1	DWORD	DW#16#0	DW#16#00000000	
6.0	M2	DWORD	DW#16#0	DW#16#00000000	
10.0	M3	DWORD	DW#16#0	DW#16#00000000	
14.0	M4	DWORD	DW#16#0	DW#16#00000000	
18.0	M5	DWORD	DW#16#0	DW#16#00000000	

Fig.2: File **DB1** (Step7)

Index Measures Table

EMM-dc-PF-S Indexes corresponding at the measures:

- READ REGISTERS -

<i>Index [Hex]</i>	<i>Index [Dec]</i>	<i>EMM 4dc</i>	<i>EMM 4d2c</i>	<i>Description</i>	<i>M. U.</i>	<i>Type</i>
0x0001	1	X	X	PHASE VOLTAGE V _L	[V*10]	(Signed)
0x0002	2	X	X	PHASE VOLTAGE V _L	[V*10]	(Signed)
0x0003	3	X	X	LINE CURRENT L ₁	[mA]	(Signed)
0x0004	4	X	X	LINE CURRENT L ₂	[mA]	(Signed)
0x0005	5	X	not present	LINE POWER L ₁	[W*10]	(Signed)
0x0006	6	X	not present	LINE POWER L ₂	[W*10]	(Signed)
0x0007	7	X	not present	CURRENT SUM L ₁ +L ₂	[mA]	(Signed)
0x0008	8	X	not present	POWER SUM L ₁ +L ₂	[W*10]	(Signed)
0x0009	9	X	not present	LINE POSITIVE / IMPORTED ENERGY L ₁	[100*Wh]	(Signed)
0x000A	10	X	not present	LINE NEGATIVE / EXPORTED ENERGY L ₁	[100*Wh]	(Signed)
0x000B	11	X	not present	LINE POSITIVE / IMPORTED ENERGY L ₂	[100*Wh]	(Signed)
0x000C	12	X	not present	LINE NEGATIVE / EXPORTED ENERGY L ₂	[100*Wh]	(Signed)
0x000D	13	X	not present	LINE POSITIVE / IMPORTED ENERGY SUM L ₁ +L ₂	[100*Wh]	(Signed)
0x000E	14	X	not present	LINE NEGATIVE / EXPORTED ENERGY SUM L ₁ +L ₂	[100*Wh]	(Signed)
0x000F	15	X	X	TEMPERATURE	[°C]	(Unsigned)
0x0010	16	X	X	HOURS COUNTER	[hr*10]	(Unsigned)
0x0011	17	X	X	MAX INSTANTANEOUS VOLTAGE V _L	[V*10]	(Signed)
0x0012	18	X	X	MAX INSTANTANEOUS VOLTAGE V _L	[V*10]	(Signed)
0x0013	19	X	X	MAX INSTANTANEOUS CURRENT L ₁	[mA]	(Signed)
0x0014	20	X	not present	MAX INSTANTANEOUS POWER L ₁	[W*10]	(Signed)
0x0015	21	X	X	MAX INSTANTANEOUS CURRENT L ₂	[mA]	(Signed)
0x0016	22	X	not present	MAX INSTANTANEOUS POWER L ₂	[W*10]	(Signed)
0x0017	23	X	not present	MAX INSTANTANEOUS CURRENT L ₁ +L ₂	[mA]	(Signed)
0x0018	24	X	not present	MAX INSTANTANEOUS POWER L ₁ +L ₂	[W*10]	(Signed)
0x0019	25	X	X	MAX AVG CURRENT L ₁	[mA]	(Signed)
0x001A	26	X	not present	MAX AVG POWER L ₁	[W*10]	(Signed)
0x001B	27	X	X	MAX AVG CURRENT L ₂	[mA]	(Signed)
0x001C	28	X	not present	MAX AVG POWER L ₂	[W*10]	(Signed)
0x001D	29	X	X	MAX AVG CURRENT L ₁ +L ₂	[mA]	(Signed)
0x001E	30	X	not present	MAX AVG POWER L ₁ +L ₂	[W*10]	(Signed)
0x001F	31	X	X	LAST AVG MAX INSTANTANEOUS CURRENT L ₁	[mA]	(Signed)
0x0020	32	X	not present	LAST AVG MAX INSTANTANEOUS POWER L ₁	[W*10]	(Signed)
0x0021	33	X	X	LAST AVG MAX INSTANTANEOUS CURRENT L ₂	[mA]	(Signed)
0x0022	34	X	not present	LAST AVG MAX INSTANTANEOUS POWER L ₂	[W*10]	(Signed)
0x0023	35	X	not present	LAST AVG MAX INSTANTANEOUS CURRENT L ₁ +L ₂	[mA]	(Signed)
0x0024	36	X	not present	LAST AVG POWER L ₁ +L ₂	[W*10]	(Signed)
0x0025	37	X	X	MAX PEAK TEMPERATURE	[°C]	(Unsigned)
0x0026	38	X	X	MAX AVG TEMPERATURE	[°C]	(Unsigned)
0x0027	39	X	X	LAST AVG TEMPERATURE	[°C]	(Unsigned)

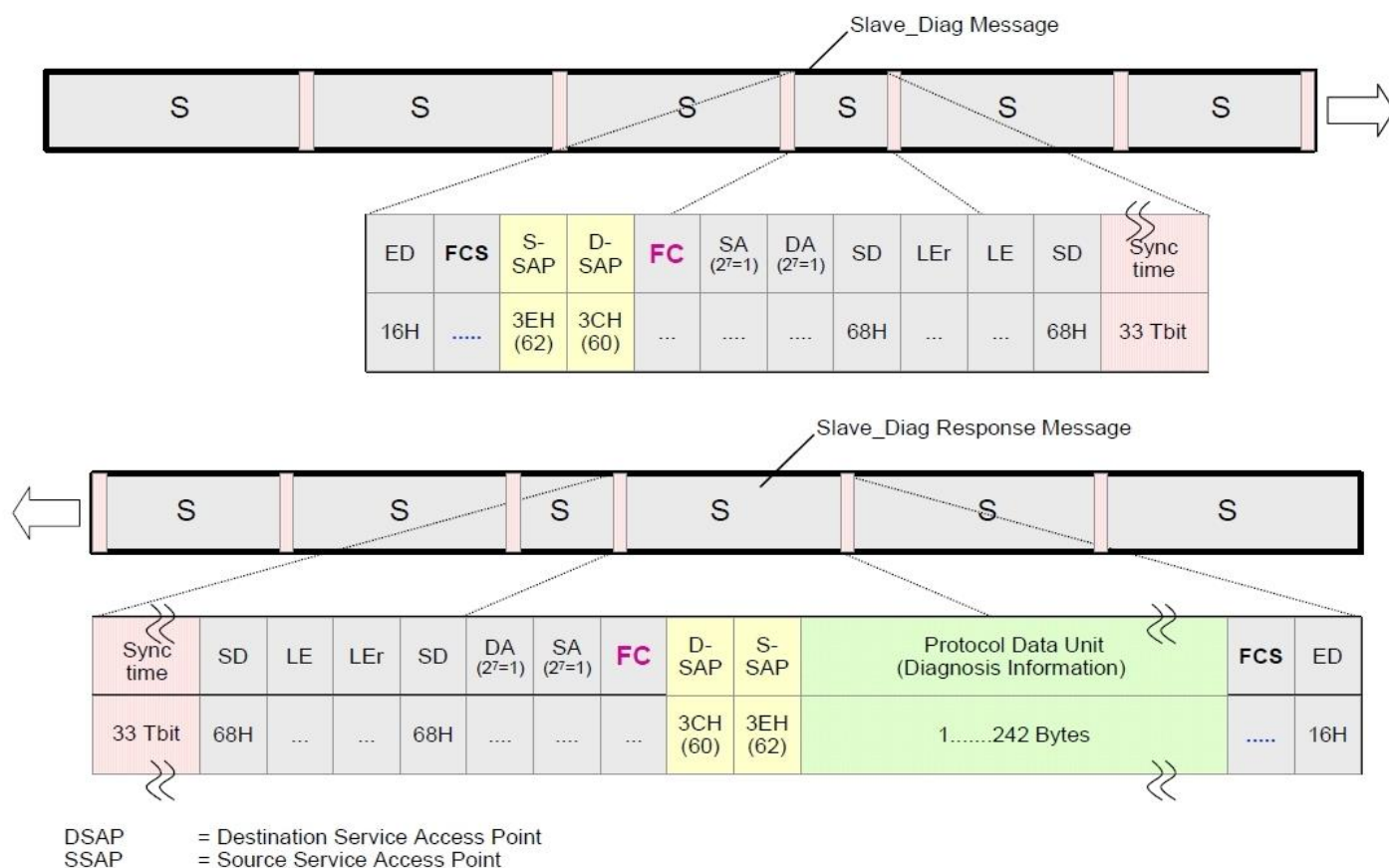
STATUS READ COMMANDS

<i>Index [Hex]</i>	<i>Index [Dec]</i>	<i>Description</i>	<i>Read</i>	<i>M. U.</i>	<i>Type</i>
0x07D0	2000	STATUS LOW	Read	[-]	[-]
0x07D1	2001	STATUS HIGH	Read	[-]	[-]

DIAGNOSTIC

The EMM-PF-S is able to generate, in case of errors, some diagnostics, automatically. These diagnostics can be send to the Master profibus through a standard mechanism expected from the profibus protocol.

Format Message – Slave Diagnosis



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 EMM-dc-PF-S set the field FC (Frame Control).

The EMM-dc-PF-S 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

EMM-dc-PF-S Read Software Revision (on the frontal panel)

Entry to menu:    see on the display **Set Up**

Press  until see **Profibus Rev**

Wait a second and can see the version and revision of the instrument.



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