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# **PROFIBUS-DP SLAVE COMMUNICATIONS INTERFACE**

**For 584S/590/620**

Product Manual

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## Chapter 1 Product Code

The Profibus Option may either be purchased with a drive, or separately.

With 584S:

**584S**/XXXX/XXX/XXXX/XX/XXX/**PR00**/XXX/XX/XXX/XXX

With 590:

**590**/XXXX/X/X/X/X/X/**2**/XXXX/XXX/XXX/XXX/X/XX/XX/XX/XX/XXX

With 620:

**6204/1**

Without Drive:

AH389918U001

## Chapter 2 Product Features

PROFIBUS-DP (DIN 19245 - 3) compliance tested.

Connection using shielded twisted -pair.

Auto-Baud search 9.6/19.2/93.75/187.5/500/1500kBaud.

Maximum of 12 Process Data parameters, selected from any of the Drives' parameters.

Process Data parameters selected by PROFIBUS-DP-Master.

Demand Data protocol to provide random access to any parameter within the Drive.

LEDs to indicate board and communications status.

Suitable for use with:

584S	software V5.1 onwards
590	software V4.2 onwards
620	software V3.6 onwards

## **Chapter 3      Installation**

### **584S and 590**

The PROFIBUS-DP-SLAVE Option Board is fitted on the site at the bottom right-hand corner of the Drive Control Board. Note that this option board is fitted instead of the Serial Link Option Board.

### **620**

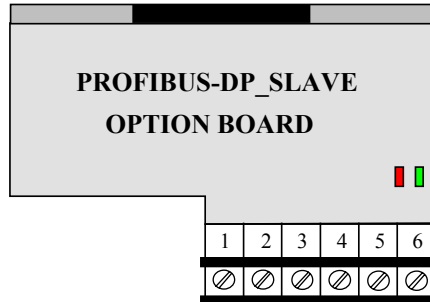
The 6204/1 PROFIBUS-DP-SLAVE Option Module is mounted on a terminal rail externally from the drive and in a separate enclosure.

| WARNING - DO NOT INSTALL OR REMOVE THE OPTION BOARD WITH |  
| THE DRIVE POWERED. |

## Chapter 4 Connection

### 584S and 590

The 6-pin Phoenix connector is used to connect to the Profibus network.

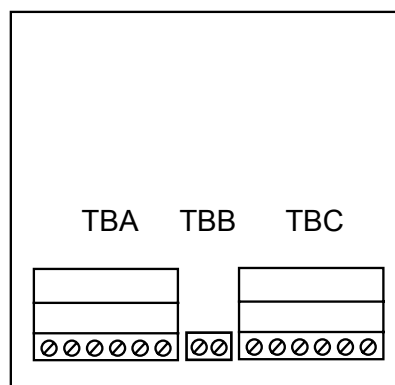


### TERMINALS

Pin	Reference	Meaning
1	0Vext	Signal reference for Profibus
2	+5VDCext	+5VDCext/50mA supply for Profibus
3	B-B'	Receive/Transmit-Data-P
4	A-A'	Receive/Transmit-Data-N
5	RTS	For connecting repeater
6	0Vext	As pin 1

### 620

The 6204/1 has three terminal blocks - TBA, TBB and TBC. TBA is for making connections to the drive; TBB is for making ground connections and TBC is for making connections to the Profibus communications network.





## Chapter 4 Connection

### Terminal Block TBA - Drive Connection

Terminal no.	Reference	Description
1	RXA	Receive data A from drive
2	RXB	Receive data B from drive
3	TXB	Transmit data B to drive
4	TXA	Transmit data A to drive
5	0V	Power supply return
6	VCC	Power supply input

### Terminal Block TBB - Ground Connection

Terminal no.	Reference	Description
1	GND	EMC ground
2	GND	Profibus cable screen

### Terminal Block TBC - Profibus Connection

Terminal no.	Reference	Description
1	0Vext	Signal reference for Profibus
2	+5VDCext	+5VDCext / 50mA supply for Profibus
3	B-B'	Receive / Transmit - Data - P
4	A-A'	Receive / Transmit - Data - N
5	RTS	For connecting repeater
6	0Vext	Signal reference for Profibus

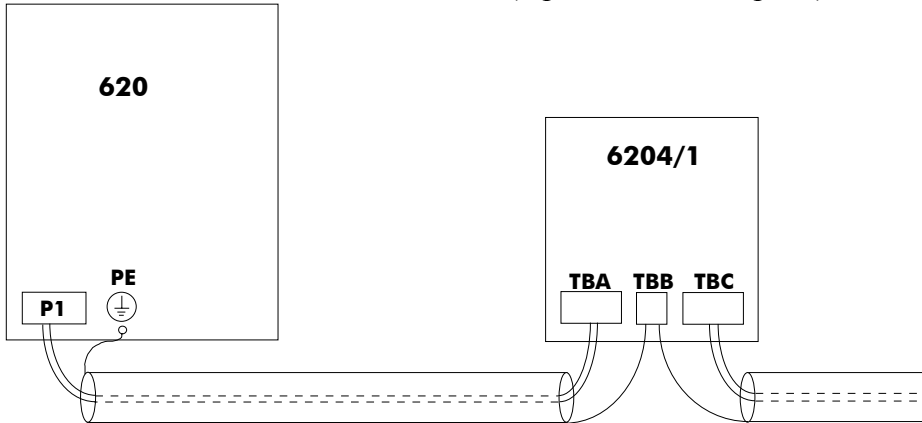
### Connection

Signal Name	620 Terminal Number	Profibus Module Terminal Number	
TX-	TBG.1	TBA.1	} pair 1
TX+	TBG.2	TBA.2	
RX-	TBG.3	TBA.3	} pair 2
RX+	TBG.4	TBA.4	
0V	TBB.1 or TBE.1	TBA.5	} pair 3
+24V	TBB.9 or TBE.9	TBA.6	

These connections should be made with twisted pairs as shown, each less than 1 metre in length.

## SCREENING and grounding

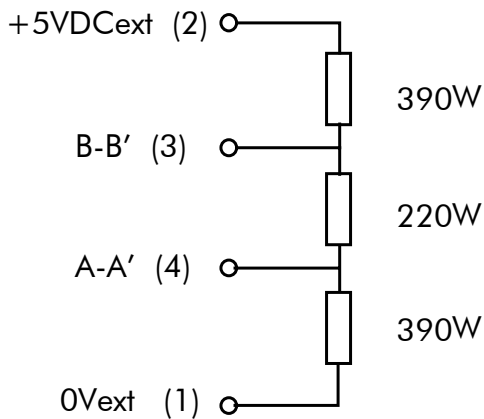
Connect cable screens as shown below (repeat for all wire pairs):-



## BUS TERMINATION

### 584S and 590

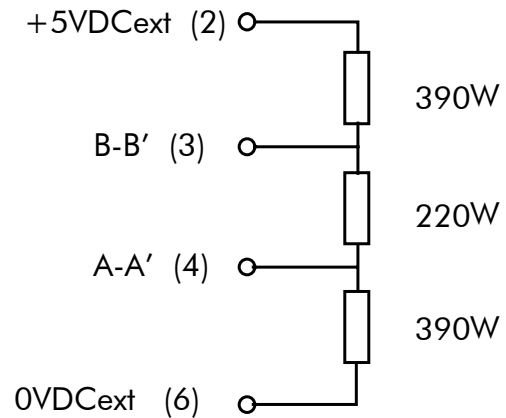
The 0Vext (1) and +5VDCext (2) terminals are provided to allow the connection of terminating resistors.



All resistors± 5%, min. 1/4 W

### 620

The 0VDCext (6) and +5VDCext (2) terminals are provided to allow the connection of terminating resistors.



All resistors± 5%, min. 1/4 W

## REPEATER

Terminal 5 provides a TTL level signal that can be connected to a repeater. Most repeaters automatically switch between transmitting and receiving, so do not need this connection. The pin is high while transmitting.

## Chapter 5 Drive Set-Up

### 584S and 590

There are three parameters associated with the Profibus Option. These are:

PROTOCOL  
OPTION ADDRESS  
OPTION VERSION

All parameters are in the SERIAL LINKS::MAIN PORT (P1) menu of the MMI.

#### PROTOCOL

The PROTOCOL parameter must be set to OPTION.

Note - when set to OPTION, the BAUD RATE parameter is ignored.

#### OPTION ADDRESS

The OPTION ADDRESS parameter is used to specify the PROFIBUS-DP-SLAVE address for the Drive.

Valid PROFIBUS addresses are in the range 0 to 125.

If the OPTION ADDRESS parameter is changed, the Drive must be powered off then on before the Drive will respond to the new address.

#### OPTION VERSION

The OPTION VERSION parameter is a diagnostic which shows the version number of the PROFIBUS board. If no board is fitted, 0.00 is displayed.

### 620

Note if using the 620 COM the Profibus card should be connected to P1.

There are four parameters associated with the Profibus Option. These are:

SERIAL LINKS

PORT P3

P3 MODE

P3 BAUD RATE

EI ASCII

OPTION ADDRESS

OPTION VERSION

PORT P1 (620 COM)

P1 MODE

P1 BAUD RATE

### **P3/P1 mode**

P3 MODE can be found in the SERIAL LINKS:: menu. It must be set to FIELD BUS.

### **P3/P1 Baud Rate**

BAUD RATE can be found in the SERIAL LINKS:: menu. 9600 baud is recommended. Other rates can be selected, but performance of the Profibus link may suffer.

### **OPTION ADDRESS**

The OPTION ADDRESS parameter is used to specify the PROFIBUS-DP-SLAVE address for the Drive. It can be found in the SERIAL LINKS::EI ASCII menu.

Valid PROFIBUS addresses are in the range 1 to 125.

If the OPTION ADDRESS parameter is changed, the Drive must be powered off and then on before the Drive will respond to the new address.

### **OPTION VERSION**

OPTION VERSION is a diagnostic which shows the version number of the PROFIBUS board. It can be found in the SERIAL LINKS::EI ASCII menu. If no board is fitted, 0.00 is displayed.

## Chapter 6 Configuration

### 584S and 590

All configuration, other than setting the PROTOCOL and OPTION ADDRESS within the Drive, is done via the Profibus-DP-Master. During the start-up phase, the Profibus-DP-Master will check that the Profibus-DP-Slave at the requested address is of the required type. If it is, Configuration Data and User Parameter Data are downloaded.

### 620

All configuration, other than setting the P3 MODE, BAUD RATE and OPTION ADDRESS within the Drive, is done via the Profibus-DP-Master. During the start-up phase, the Profibus-DP-Master will check that the Profibus-DP-Slave at the requested address is of the required type. If it is, Configuration Data and User Parameter Data are downloaded.

### IDENTIFICATION NUMBER (IDENT\_NUMBER)

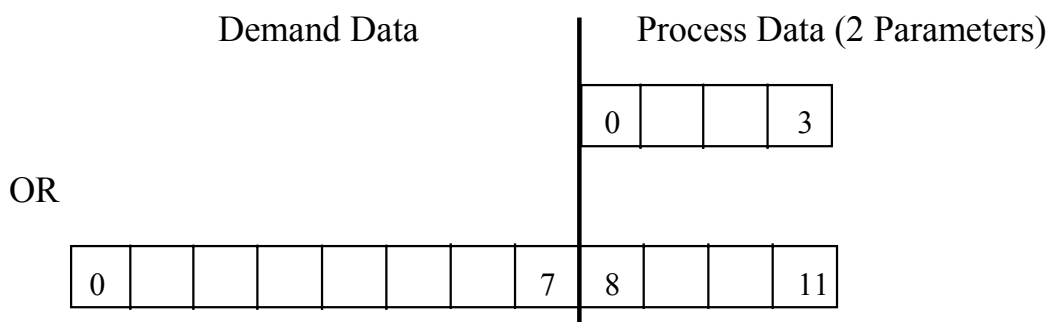
The registered Identification Number for this option board is:

0x0533 (1331 decimal)

### CONFIGURATION DATA (CFG\_DATA)

The Configuration Data (Cfg\_Data) is used to specify the number of parameters that are to be read and written as part of the cyclic Data Exchange.

The Data Exchange either consists of just Process Data or Demand Data and Process Data. Process Data is the fixed set of parameters that are to be transferred each cycle. Demand Data is 8 reserved bytes (octets) to support a messaging system, allowing random access to any parameter within the drive. This is described in the following chapter.



To enable the Demand Data feature, the first byte of Cfg\_Data is set to 0x73 (115 decimal). The number of Inputs and Outputs in the Process Data is defined by setting bytes to either 0x50 (80 decimal) or 0x60 (96 decimal).

Index (No Demand Data)	Index (With Demand Data)	Identifier Byte (Hexadecimal)	Action
-	0	0x73	Enable Demand Data
0	1	0x50	Read 1st Parameter
		0x60	Write 1st Parameter
1	2	0x50	Read 2nd Parameter
		0x60	Write 2nd Parameter
etc	etc	etc	etc
11	12	0x50	Read 12th Parameter
		0x60	Write 12th Parameter

For example:

Index	Data	Meaning
0	0x50	1st Parameter Input (No Demand Data)
1	0x50	2nd Parameter Input
2	0x60	3rd Parameter Output
3	0x60	4th Parameter Output

The supported Identifier Byte formats are defined by the Profibus Standard to have the following meaning:

Identifier	Input/Output	Length	Format	Consistency
0x50	Input	1	Word	None
0x60	Output	1	Word	None
0x73	In and Out	4	Word	None

Note - all parameter values are transferred as Words (2 octets).

### **USER PARAMETER DATA (USR\_PRM\_DATA)**

The User\_Prm\_Data is used to specify the Tag numbers of the parameters that are to be read or written as Process Data. Each parameter is represented by 2 bytes in the User\_Prm\_Data, these specify the Tag number in High-Byte/Low-Byte order.

The User\_Prm\_Data must always be 24 Bytes long. If less than 12 parameters are to be included in the Process Data then the terminating Tag number must be 0 (Zero).

The number of Tags must match the number of Inputs and Output that are declared to be in the Process Data by the Cfg\_data.

Chapter 6 Product Code

Index	Data	Parameter
0	High-Byte	1st
1	Low-Byte	
2	High-Byte	2nd
3	Low-Byte	
4	High-Byte	3rd
5	Low-Byte	
etc	etc	etc
22	High-Byte	12th
23	Low-Byte	

For example:

Index	Data (Hexadecimal)	Parameter
0	0x00	Tag Number 55
1	0x37	
2	0x00	Tag Number 56
3	0x38	
4	0x01	Tag Number 288
5	0x20	
6	0x00	Terminate
7	0x00	



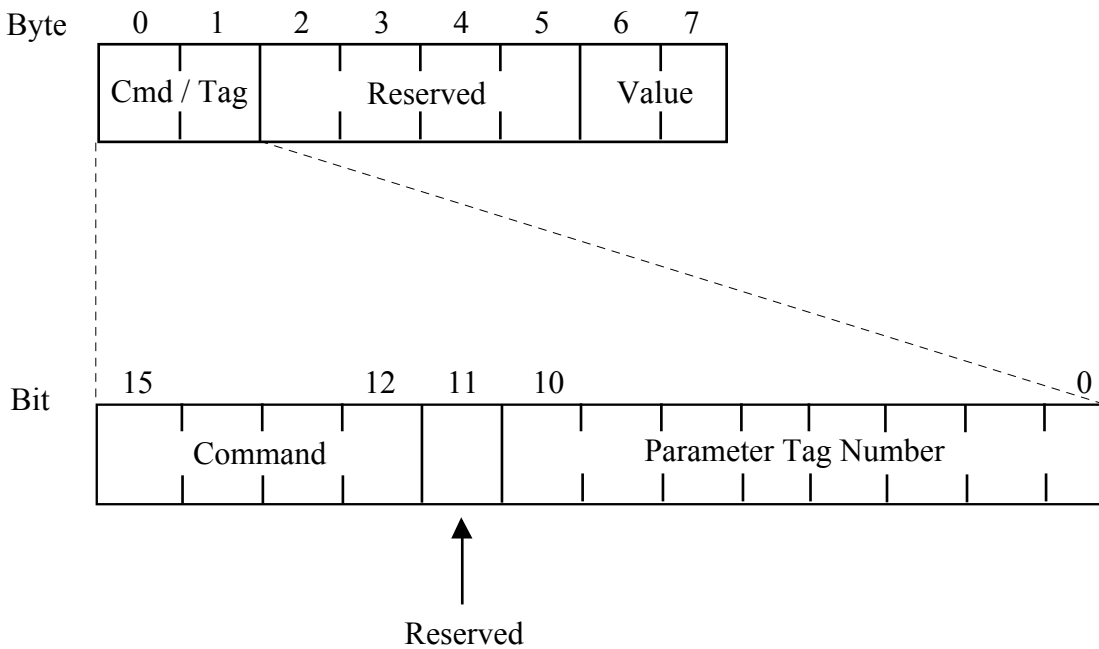


## Chapter 7 Demand Data Protocol

Demand Data is a sub-protocol using the first 8 bytes (octets) in both the request and response message of the cyclic Data Exchange. It allows random read/write access to any parameter within the Drive. It is enabled by the Profibus-DP- Master setting the first byte of the Cfg\_Data to 0x73. (See Chapter 6, Configuration.)

The sub-protocol consists of 3 parts:

- Command
- Parameter reference (Tag Number)
- Parameter value or error code



### Command

The command field in the request message selects the required operation. This is either None, Read or Write.

The command field in the response message either confirms that no operation has been requested, indicates that a Read or Write request has been completed successfully or indicates that a Read or Write request has failed.

Valid values for the command field are:

Command	Request (Master to Slave)	Response (Slave to Master)
0	No Command	Acknowledge No Command
1	Read Request	Acknowledge Transfer
2	Write Request	--
7	--	Reject Request

The valid Request/Response command pairs are:

Request Command	Response Command
0	0
1	1 or 7
2	1 or 7

### Parameter Tag Number

The Parameter Tag Number is the unique reference to a parameter within the Drive. These are listed in the 590, 584S and 620 Product Manuals.

### Value / Error Code

The Value/Error Code field is used to receive a Read value, send a Write value or receive an error code.

The Value is a signed or unsigned 16-bit integer. The scaling for each parameter is described in the Product Manual for the host Drive.

If the Response Command is 7, i.e. the request has been rejected, this field contains the error code. These are:

Error Code	Meaning
0	Invalid Tag Number
1	Read Only Parameter
2	Value Under/Over-Range

## Chapter 8 Performance

The Eurotherm implementation of Profibus for existing products uses an internal (serial) communications link between the Profibus Communications Interface processor and the main Drive processor. This introduces additional delays in the reading and writing of parameters. The refresh rate between the processors are summarised in this section. These delays are independent from the Profibus communications cycle time which is controlled by the Profibus Master.

The refresh rate of parameters depends upon the number of parameters being read and written using the cyclic Data Exchange. For each parameter being read or written the refresh cycle is extended by 8ms for 590, 15ms for 584S and 25ms for 620. If a Demand Data command is active, the refresh cycle time is extended by an additional 16ms for 590 and 620, 30ms for 584S.

Number of Parameters	Cycle Time (ms)			Cycle Time (ms) Demand Data Active		
	590	584S	620	590	584S	620
1	8	15	25	24	15	41
2	16	30	50	32	30	66
3	24	45	75	40	45	91
4	32	60	100	48	60	116
5	40	75	125	56	75	141
6	48	90	150	64	90	166
7	56	105	175	72	105	191
8	64	120	200	80	120	216
9	72	135	225	88	135	241
10	80	150	250	96	150	266
11	88	165	275	104	165	291
12	96	180	300	112	180	316

## Chapter 9 Troubleshooting

### STATUS LEDS

The PROFIBUS option board has two LEDs to indicate status.

Red LED (Left)	Green LED (Right)	Meaning
Off	Flashing (2Hz)	Normal operation - Data being Exchanged with DP-Master
On	Flashing (1Hz)	External Communications Fault (see below) or Configuration fault
On 620 only flashing(2Hz)	Flashing (2Hz)	Internal Communications Fault (see below)
Off	Off	No power or major fault

### EXTERNAL COMMUNICATIONS FAULT

- Check the terminal connections. (See Chapter 4, Connection).
- Check that the Profibus-DP Master is communicating at 1.5Mbaud or less.
- Check that the OPTION ADDRESS parameter contains the correct Profibus-DP Slave address. (See Chapter 5, Drive Set-Up).
- Check that no other Profibus-DP Slave or Master has the same address.

### CONFIGURATION FAULT

- Check that the Usr\_Prm\_Data has been declared correctly in the Profibus-DP Master, (See Chapter 6, Configuration).
- Check that the Cfg\_Data has been declared correctly in the Profibus-DP Master. (See Chapter 6, Configuration).
- If possible, read the DP-Slave diagnostic information into the Profibus-DP Master. The station status bytes will probably indicate where the problem is.

### INTERNAL COMMUNICATIONS FAULT

- Check that the PROTOCOL parameter is set to OPTION. (See Chapter 5, Drive Set-Up).
- Check that the OPTION ADDRESS parameter is set to a value between 0 and 125

### 620 only

- Check the connections between the Profibus and the main Drive processor.

## APPENDIX A. Device Data Base (DDB) File

The Device Data Base File (EURO0533.GSD) for the 584S and 590 Eurotherm Profibus-DP Option is as follows:

```
.....  
#Profibus_DP  
Vendor_Name = "EUROTHERM"  
Model_Name = "584S/590"  
Revision = "Revision_1"  
Ident_Number = 0x0533  
Protocol_Ident = 0 ;PROFIBUS DP  
Station_Type = 0 ;DP-Slave  
FMS_supp = 0  
Hardware_Release = "HW_V2.0"  
Software_Release = "SW_V5.0"  
9.6_supp = 1  
19.2_supp = 1  
93.75_supp = 1  
187.5_supp = 1  
500_supp = 1  
1.5M_supp = 1  
MaxTsdr_9.6 = 60  
MaxTsdr_19.2 = 60  
MaxTsdr_93.75 = 60  
MaxTsdr_187.5 = 60  
MaxTsdr_500 = 100  
MaxTsdr_1.5M = 150  
Redundancy = 0  
Repeater_Ctrl_Sig = 2 ;TTL  
24V_Pins = 0  
Freeze_Mode_supp = 1  
Sync_Mode_supp = 1  
Auto_Baud_supp = 1  
Set_Slave_Add_supp = 0  
Min_Slave_Intervall = 20  
;User_Prm_Data  
User_Prm_data_Len = 0x18 ;maximum 12 values  
User_Prm_Data = 0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,\  
0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,\  
0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00  
;Diag_Data  
Max_Diag_Data_Len = 0x06  
;Exchange_Data  
Modular_Station = 1  
Max_Module = 0x0d  
Max_Input_Len = 0x20  
Max_Output_Len = 0x20  
Max_Data_Len = 0x0040  
Module = "Demand-Data" 0x73  
EndModule  
Module = "Process-Data-Input" 0x50  
EndModule  
Module = "Process-Data-Output" 0x60  
EndModule  
.....
```

The Device Data Base File (EURO0533.GSD) for the 584S and 590 Eurotherm Profibus-DP Option is as follows:

```
#Profibus_DP
Vendor_Name = "EUROTHERM"
Model_Name = "620"
Revision = "Revision_1"
Ident_Number = 0x0533
Protocol_Ident = 0           ;PROFIBUS DP
Station_Type = 0            ;DP-Slave
FMS_supp = 0
Hardware_Release = "HW_V2.3"
Software_Release = "SW_V4.0"
9.6_supp = 1
19.2_supp = 1
93.75_supp = 1
187.5_supp = 1
500_supp = 1
1.5M_supp = 1
MaxTsdr_9.6 = 60
MaxTsdr_19.2 = 60
MaxTsdr_93.75 = 60
MaxTsdr_187.5 = 60
MaxTsdr_500 = 100
MaxTsdr_1.5M = 150
Redundancy = 0
Repeater_Ctrl_Sig = 2       ;TTL
24V_Pins = 0
Freeze_Mode_supp = 1
Sync_Mode_supp = 1
Auto_Baud_supp = 1
Set_Slave_Add_supp = 0
Min_Slave_Intervall = 20
;User_Prm_Data
User_Prm_data_Len = 24      ;maximum 12 values
User_Prm_Data = 0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,\
                0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,\
                0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00
;Diag_Data
Min_Slave_Intervall = 20
;Exchange_Data
Modular_Station = 1
Max_Module = 13
Max_Input_Len = 32
Max_Output_Len = 32
Max_Data_Len = 40
Module = "DEMAND_DATA" 0x73
EndModule
Module = "PROZESS_DATA_LESEN" 0x50
EndModule
Module = "PROZESS_DATA_SCHREIBEN" 0x60
EndModule
.....
```

## APPENDIX B. Siemens COM ET200 Configuration File

The following data file is required when using the Siemens ET200 Parameterisation Software. It describes the Eurotherm Profibus-DP Slave Type.

The file has a different name depending upon the language required:

EU0533TE.200	- English Version
EU0533TD.200	- German Version
EU0533TF.200	- French Version
EU0533TS.200	- Spanish Version
EU0533TI.200	- Italian Version

Note - the field widths are critical, so ensure that the correct number of spaces are included before the terminator (;).

```
.....  
Typbeschreibungdatei DP-Normslave  
V4.0;  
EUROTHERM 584/590/620;  
EUROTHERM ;  
SONSTIGE ;  
ET200 ;  
DPS/CLASS1 ;  
1331 ;  
N;  
J;  
N;  
N;  
N;  
N;  
N;  
N;  
N;  
N;  
n;  
n;  
n;  
n;  
n;  
00020;  
0001011111;  
032;  
032;  
032;  
016;  
031;  
PV000;  
PSL000;  
KV000;  
SY;  
DKM000;  
.....
```

## APPENDIX C. Decimal To Hexadecimal Conversion

Some Profibus Master configuration tools require data to be entered in hexadecimal. The Tag numbers given in the 590, 584S and the 620 Product manuals are in decimal. The following table is provided for quick conversion.

	0	1	2	3	4	5	6	7	8	9
0	0	1	2	3	4	5	6	7	8	9
10	A	B	C	D	E	F	10	11	12	13
20	14	15	16	17	18	19	1A	1B	1C	1D
30	1E	1F	20	21	22	23	24	25	26	27
40	28	29	2A	2B	2C	2D	2E	2F	30	31
50	32	33	34	35	36	37	38	39	3A	3B
60	3C	3D	3E	3F	40	41	42	43	44	45
70	46	47	48	49	4A	4B	4C	4D	4E	4F
80	50	51	52	53	54	55	56	57	58	59
90	5A	5B	5C	5D	5E	5F	60	61	62	63
100	64	65	66	67	68	69	6A	6B	6C	6D
110	6E	6F	70	71	72	73	74	75	76	77
120	78	79	7A	7B	7C	7D	7E	7F	80	81
130	82	83	84	85	86	87	88	89	8A	8B
140	8C	8D	8E	8F	90	91	92	93	94	95
150	96	97	98	99	9A	9B	9C	9D	9E	9F
160	A0	A1	A2	A3	A4	A5	A6	A7	A8	A9
170	AA	AB	AC	AD	AE	AF	B0	B1	B2	B3
180	B4	B5	B6	B7	B8	B9	BA	BB	BC	BD
190	BE	BF	C0	C1	C2	C3	C4	C5	C6	C7
200	C8	C9	CA	CB	CC	CD	CE	CF	D0	D1
210	D2	D3	D4	D5	D6	D7	D8	D9	DA	DB
220	DC	DD	DE	DF	E0	E1	E2	E3	E4	E5
230	E6	E7	E8	E9	EA	EB	EC	ED	EE	EF
240	F0	F1	F2	F3	F4	F5	F6	F7	F8	F9
250	FA	FB	FC	FD	FE	FF	100	101	102	103
260	104	105	106	107	108	109	10A	10B	10C	10D
270	10E	10F	110	111	112	113	114	115	116	117
280	118	119	11A	11B	11C	11D	11E	11F	120	121
290	122	123	124	125	126	127	128	129	12A	12B
300	12C	12D	12E	12F	130	131	132	133	134	135
310	136	137	138	139	13A	13B	13C	13D	13E	13F
320	140	141	142	143	144	145	146	147	148	149
330	14A	14B	14C	14D	14E	14F	150	151	152	153
340	154	155	156	157	158	159	15A	15B	15C	15D
350	15E	15F	160	161	162	163	164	165	166	167
360	168	169	16A	16B	16C	16D	16E	16F	170	171
370	172	173	174	175	176	177	178	179	17A	17B
380	17C	17D	17E	17F	180	181	182	183	184	185
390	186	187	188	189	18A	18B	18C	18D	18E	18F
400	190	191	192	193	194	195	196	197	198	199
410	19A	19B	19C	19D	19E	19F	1A0	1A1	1A2	1A3
420	1A4	1A5	1A6	1A7	1A8	1A9	1AA	1AB	1AC	1AD




## Chapter C. Decimal to Hexadecimal Conversion

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	0	1	2	3	4	5	6	7	8	9
430	1AE	1AF	1B0	1B1	1B2	1B3	1B4	1B5	1B6	1B7
440	1B8	1B9	1BA	1BB	1BC	1BD	1BE	1BF	1C0	1C1
450	1C2	1C3	1C4	1C5	1C6	1C7	1C8	1C9	1CA	1CB
460	1CC	1CD	1CE	1CF	1D0	1D1	1D2	1D3	1D4	1D5
470	1D6	1D7	1D8	1D9	1DA	1DB	1DC	1DD	1DE	1DF
480	1E0	1E1	1E2	1E3	1E4	1E5	1E6	1E7	1E8	1E9
490	1EA	1EB	1EC	1ED	1EE	1EF	1F0	1F1	1F2	1F3
500	1F4	1F5	1F6	1F7	1F8	1F9	1FA	1Fb	1FC	1FD
510	1FE	1FF	200	201	202	203	204	205	206	207
520	208	209	20A	20B	20C	20D	20E	20F	210	211
530	212	213	214	215	216	217	218	219	21A	21B
540	21C	21D	21E	21F	220	221	222	223	224	225
550	226	227	228	229	22A	22B	22C	22D	22E	22F



ISS.	MODIFICATION	ECN No.	DATE	DRAWN	CHK'D
1	Initial Issue of HA389815	10766	10/07/96	KWJ	AFL
2	Page 4-1 changed Pin 1 from "GNDext Protective ground for Profibus" to "0Vext Signal reference for Profibus" and Pin 6 from "GNDext" to "0Vext".	12004	27/08/97	FEP	SG
3	Added 6204/1 Profibus information from 620 Product manual HA463584 Issue 4.	13907	24.01.00	FEP	CM
FIRST USED ON		MODIFICATION RECORD Profibus-DP Slave Communications Interface Product Manual			
 <b>EUROTHERM DRIVES</b>		DRAWING NUMBER			SHT. 1
		ZZ389815			OF 1