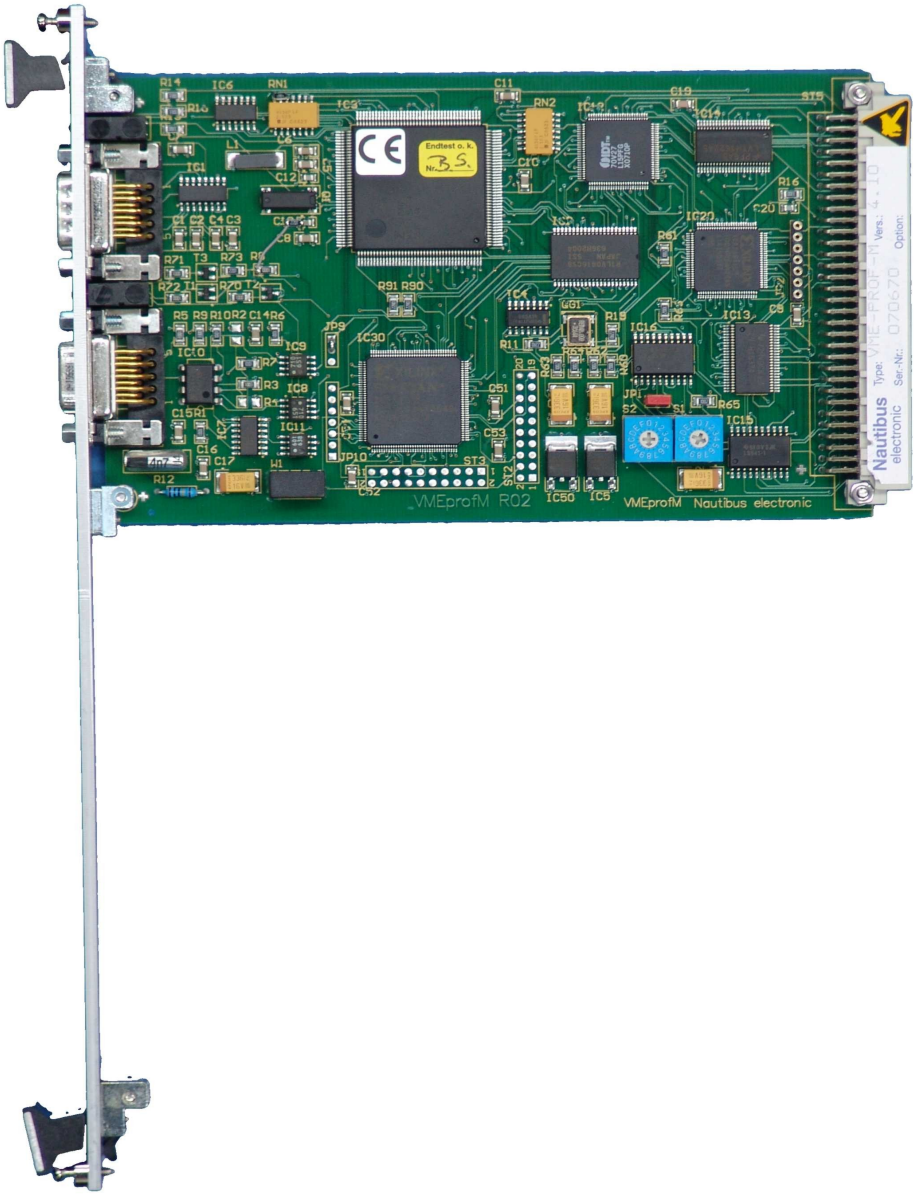
Nautibus electronic GmbH



VME-PROF-M

Technical Manual - Date 2.4.2008

Nautibus electronic GmbH

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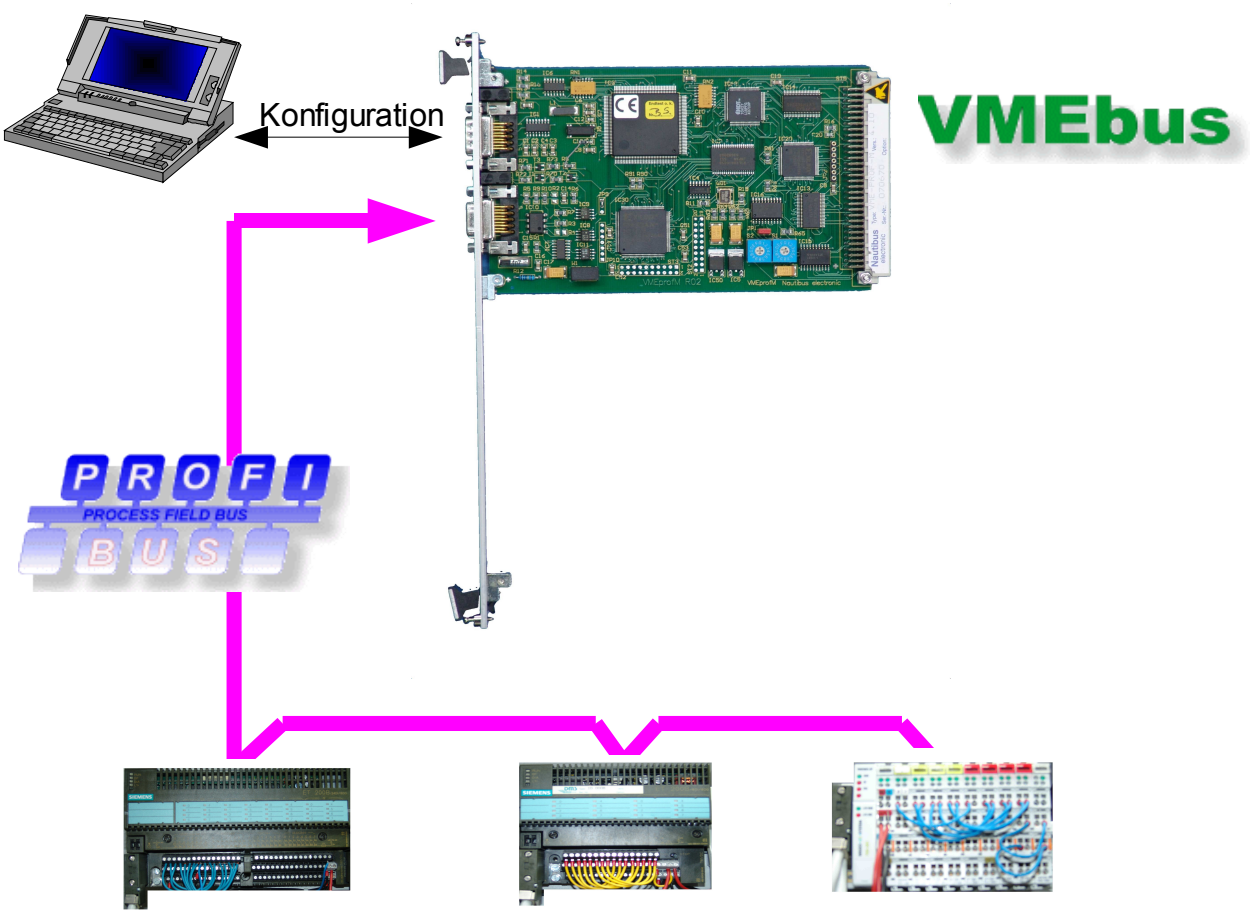
1 System configuration

The following pictures show a typical system configuration with the VME-PROF-M in a VMEbus system to connect Profibus I/O modules. A PC is connected via RS 232 com port for configuration purpose.



Using the VME-PROF-M enables you to use cost-saving Profibus I/O modules to replace expensive VMEbus I/O boards. A further advance is the easier installation in the rack and in the factory floor, also service and storage of replacement parts is easier.

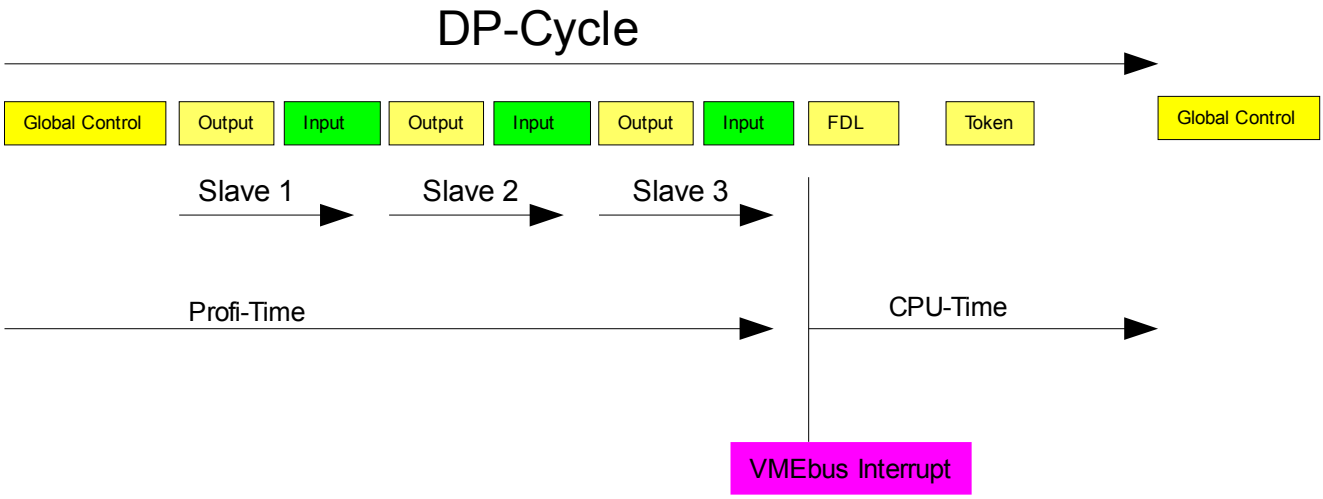
Because of the time synchronous DP-V2 data transfer the VME-PROF-M is also an ideal solution for connecting drives.

2 Profibus basic concepts

The Profibus is an European standard field bus system specified in EN 50170. The VME-PROF-M works with the Profibus DP protocol. Profibus-DP is a communication protocol for a controller connected with a group of decentral I/O devices.

2.1 DP-Cycle

The PLC controller (the Profibus Master) exchanges data with the I/O devices in a cycle way. Data are send to all slaves one after the other. The master sends output data to the slave and the slave responds with its input data. After this it is going on to the next slave. When all slaves have been used the cycle begins from the start. This whole cycle is called DP-cycle.



The VME-PROF-M starts every DP-cycle with a „Global Control Telegram“. This can be used for synchronization the slaves. At the end of the slave data exchange a VMEbus interrupt could be generated. From this time on the VMEbus CPU can use the Dualport-RAM of the VME-PROF-M for reading and writing new data. The VME-PROF-M uses this time slot for management services on the Profibus (GAP Update and Token passing to other masters).

The DP cycle can run free (DP-V0) or can run in a fixed timing (DP-V2). We recommend to use always a fixed cycle time. The VME-PROF-M controls the cycle in this case with a hardware timer at microseconds precision.

2.2 Slave user data and configuration

The Masters sends an output data telegram with a maximum length of 244 Bytes. The slave responds with an input data telegram also with a maximum length of 244 Bytes. The actual data length depends on the slave requirements. Profibus-DP supports modular slave stations. This includes a buscoupler and more different I/O modules. The actual slave configuration is described in configuration bytes. The master checks the agreement of the actual configuration and the configuration bytes at start-up. Only when the agreement is O.K. The slave goes in working mode.

A simple slave for example could have the following configuration:

1 analog input module with 4 channels each 16 Bits = 4 input words = 8 Byte

1 digital input module with 8 channels each 1 Bit = 1 Byte input

1 digital output module with 8 channels each 1 Bit = 1 Byte output

Together we have 1 Byte output and 9 Byte input what is totally 10 Byte user data.

2.3 Baudrate and length of bus cables

The Profibus works with a fixed baud rate controlled by the master. The slaves automatically switch to this baudrate. The Baudrate can be selected for matching to the slowest slave and the length of the bus cable.

The following table shows the possible cable length on different baud rates for a standard confirm bus cable Type A:

Baudrate kbit/sec	19.2	93.75	187.5	500	1500	3000	6000	12000
Max Length m	1200	1200	1000	400	200	100	100	100
Stub lines m	6	6	6	6	0	0	0	0
Bit time ysec	52	10,6	5,3	2	0,66	0,33	0,167	0,083
Byte time ysec	572	116,6	58,3	22	7,3	3,6	1,8	0,9

2.4 Profibus data transfer times

With the sum of all user data from the slave devices and the baud rate you can calculate the Profibus data transfer time.

The Global Control Telegram contains 13 Bytes data and 3 Idle Bytes.

For the protocol frame and the timing each slave requires 25 Bytes.

→ Profi_time = Byte_time * (15 + 25 * Number_of_slaves + Sum_Number_of_User_bytes)

Example : 1,5 MB/sec → Byte_time = 7,3 ysec

5 Slaves each 10 Byte User_data

Profi_time = 7,3 * (15 + 25 * 5 + 5 * 10)

= 7,3 * 190 = 1387 ysec

For the setup of the DP cycle you should add 30% for safety.

So 2 ms is a useful value. Then you have 0,6 ms for the CPU time.

If the CPU time is not enough or other masters (diagnostic equipment) use the bus, the time has to be increased for reaching a robust operation.

3 Set-up of VME-PROF-M

For setting up a VME-PROF-M you need

a PC with Windows XP and the DPKonfig software

1 free com Port (RS-232)

1 Zero-Modem RS 232 cable with Dsub connectors (Pin 2 and 3 crossed over)

the GSD files of all installed Slave devices

and of course the VMEbus system.

For start-up the VME-PROF-M you don't need any software on the VMEbus CPU at this time.

3.1 Installation of the VME-Prof-M

The VME-PROF-M needs a 64 kByte address space in the VME standard address room. The start address is set by HEX switches S1 and S2.

S2 is the MSD (A23..A20) and S 1 the LSD (A19..A16).

Example: address 0x85000 set S2 on 8 and S1 on 5

Please set the run jumper, so VME-PROF-M starts immediately after the Reset. Please switch the VMEbus system off before you start mounting the VME-PROF-M. Please use both screws on the front panel to make sure the grounding.

3.2 Connecting the PC

Please install the DPKonfig software on your PC. You have to start Setup.exe in the directory Disk1 of the installation CD by double clicking. At the end of the installation procedure you have to copy the DPKonfig.exe from the CD in your directory C:\DMS\CMDS.

Now connect the COM1 or the COM2 port of your PC with the cable to the X1 connector of the VME-PROF-M. Please do not connect the Profibus at this time.

Switch on the VMEbus system.

Start the DPKonfig on your PC and select the point “VME-Profi” on COM1 or COM2 from the menu.

In the message line you should see now; “VMEprofi on COM firmware version 8.0”

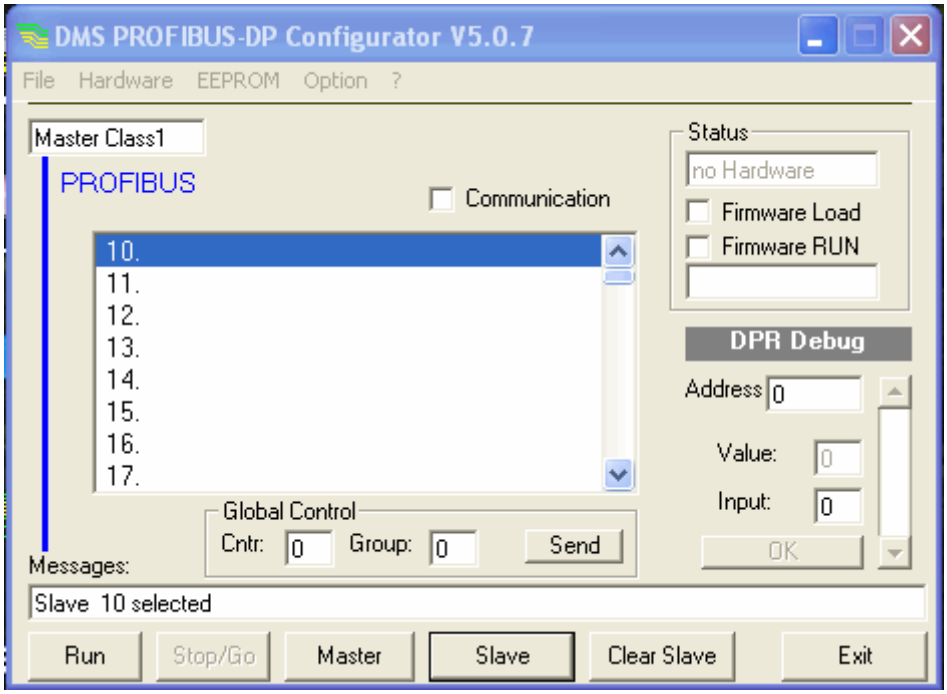
3.3 GSD files

For each slave device the manufacturer supplies a GSD file. For use with DPKonfig you should copy this file in the directory C:\DMS\GSD. The name conventions are also required. A GSD name starts with 4 letters – they came from the manufacturer name (SIEM for Siemens). Then follow 4 hex digits for the ident number of the slave. The file suffix has always to be GSD. Please rename the GSD file if its required.

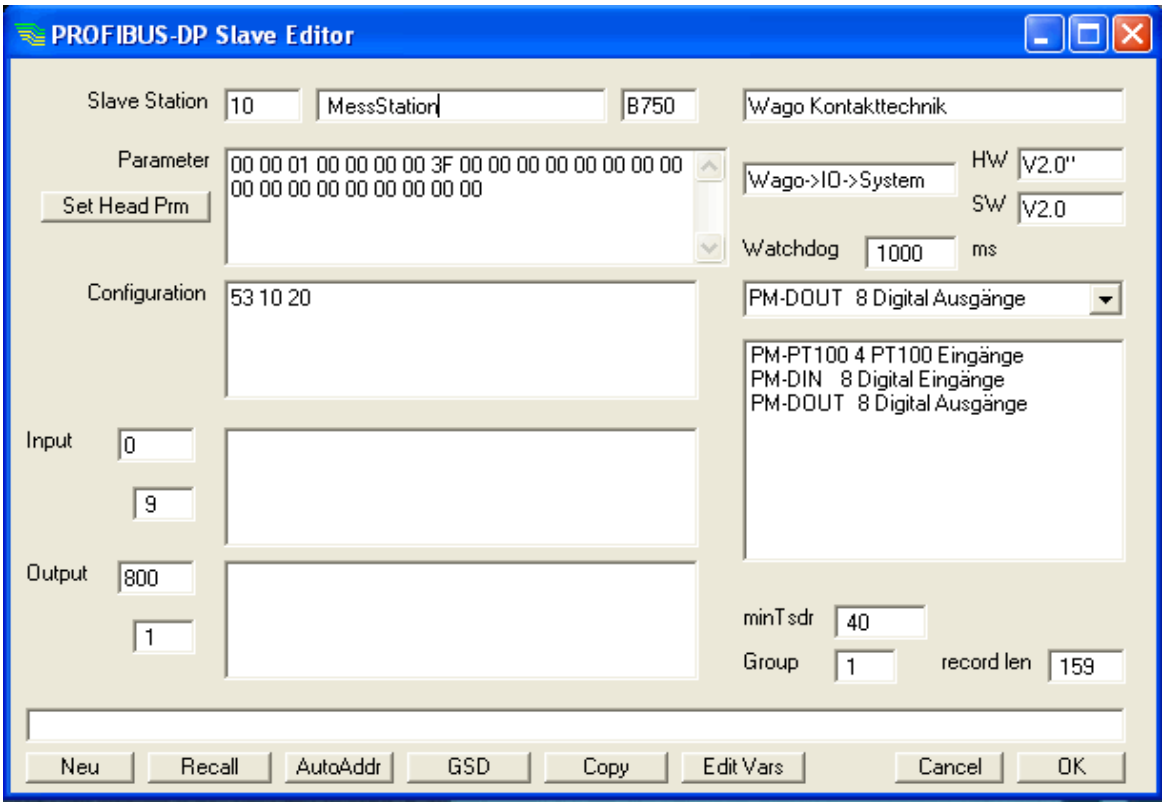
For example: SIEM000E.GSD

3.4 Setting up of Slave Parameters

Select in the main screen of DPKonfig a slave address – for example number 10.



Now click the “Slave” Button to open the Slave editor screen:



Please press the “New” button and then the “GSD” button. Now you can select the GSD file. For example WAGOB750.GSD.

The main data from the GSD file will be displayed now. On the top of the screen between station address and ID-number you can add a name for your station, for instance “MessStation).

By using the select box on the right side of the screen you get the installed modules, for example a 4 channel PT 100 input, a 8 channel digital input and a 8 channel digital output. Be sure to add the modules in the correct order. Your selection and the hardware has to be the same. It is useful to put modules with word data (16 Bit) first , so they have even addresses assigned in the Dual-Port-RAM.

For each module one configuration byte is generated.

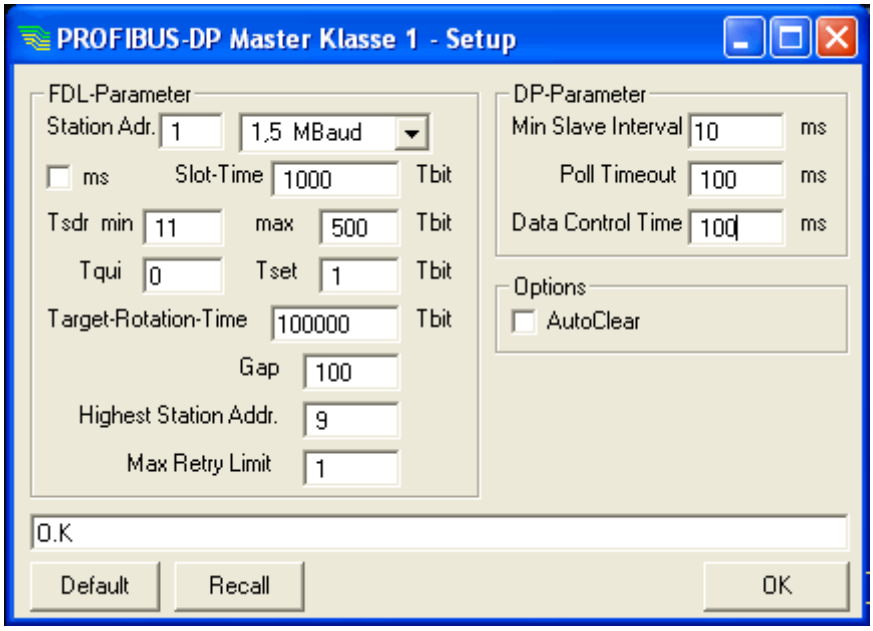
If you have entered all modules please press the Auto address button to generate the DP run address offsets. As a result you see on the left side in the example 9 Byte input data at DPR offset 0 and 1 Byte output data at DPR offset 0x800. Those are your 10 user bytes.

For each slave you can set a watchdog time. In case of a bus or master failure the slave switches all ouputs to 0 – if this time is elapsed.

Press o.k. now and continue this process for all slaves.

3.5 Set up of the Master Parameter

Please press the “Master” button now to open the Master Window.



First set up the Baud rate. See capt. 1.3 (for instance 1,5 Mbaud).

With the DP parameter “MinSlaveInterval” you set up the DP cycle time (for example 10 ms).

It is recommended to take a big value on start and optimize it later. If you would take a too small value , the Profibus runs free without a fixed timing.

The Slot time is the time window for a slave which sends no answers. This time should be set with the same time as a correct answering slave is using. The time could be entered in bit times and could be displayed in milliseconds by clicking the check box “ms”.

With the parameter data control time the monitoring time for the slave communication can be set. The value should be greater than 2 * DP cycle and less than 0,5 * Watchdog time of the slave.

If a slave does not receive data within this time window it is reported as a failure. The life bit of this slave in the Dual-Port-RAM is cleared to report the failure to the main CPU in the VMEbus system.

When the option “Autoclear” is selected the VME-PROF-M also sets the outputs of all other slaves to Zero and goes in the operating mode “clear”.

For all other parameters you can use the default values – changing is only required in multi-master-systems or if you are using repeaters.

Close the master window with the OK button.

3.6 Save the set-up

Save your configuration by using the File menu and the command “Store” on the hard disk in a DP1 file. With the command “Print” you can print out a documentation of your configuration.

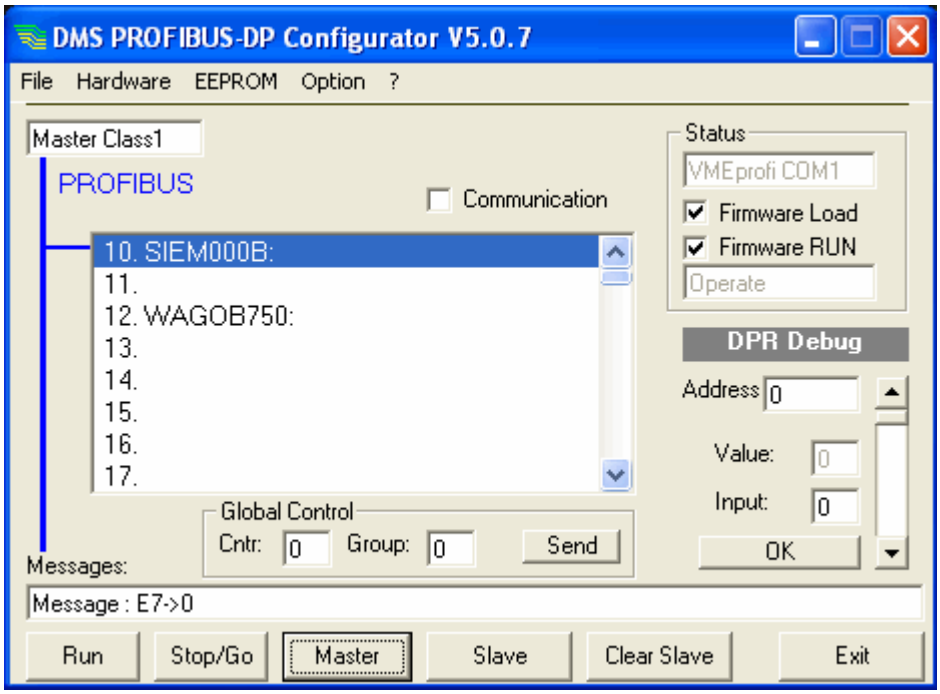
3.7 Test of the Configuration

By Pressing the button “Run” you can transfer your configuration into the VME-PROF-M. After the transfer the VME-PROF-M starts operating. The red LED over the Profibus connector switches off and the yellow LED starts lighting.

Attention: Danger!

Before you can connect the Profibus cable be sure that your plant cannot be damaged through false output data.

Is the Profibus connected now, the green LED shows the “receive data”. The slaves now will be initialized and when the configuration is correct and equal to the real hardware the slave enters the data exchange phase. The DPKonfig now shows you a bus connection line.

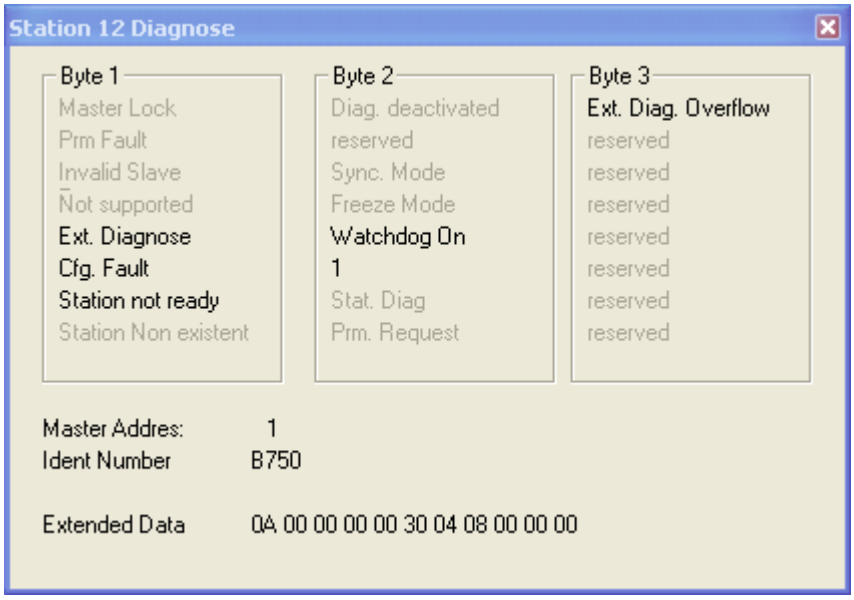


Shown on the picture: Slave 10 is ready

Slave 12 has a problem. By Clicking in the Main Window it will be selected and its diagnostic could be read out. The message “0 diagnostic bytes” tells you that the slave is not connected to the bus or it has no operating power or its address is switched to a wrong number.

Our slave 12 shows 17 diagnostic bytes. With a click on the right mouse button you can open a diagnostic window to interpret the Profibus diagnostics.

You can see that the reason is “Cfg. Fault”.



3.8 Saving the Configuration in the VME-PROF-M

Please do not forget to save the tested version of your configuration on your hard disk (see capt. 3.6).

Now use the menu EEPROM to put the configuration in the EEPROM of the VME-PROF-M. The EEPROM stores the configuration also if power goes off. From this time on the VME-PROF-M starts after reset with this configuration.

Click on the EEPROM menu at first “Stop” and then “Burn”. The message “programming ok” is shown on success. You are also able to read back a configuration from the EEPROM.

3.9 Replacement in service case

If there is the need to change a VME-PROF-M in a plant, you have to re-install the configuration in the new VME-PROF-M. For this purpose use your saved DP1 file. If possible you also can read the configuration from the old VME-PROF-M with the EEPROM menu. The GSD files of the slaves are not needed.

Menu File ->Load xxx.DP1

Menu Hardware ->VMEprofi->Com1/2

Menu EEPROM → Burn

4 VMEbus integration

When the VME-PROF-M is configured ready with the DPKonfig and the configuration data are stored in the EEPROM, the VME-PROF-M can start automatically the Profibus system. The integration into the VME system is now very easy and you do not need much software. An important question is the data consistency by getting data from the Dual-Port-RAM. There are three possibilities discussed in capt. 4.3, 4.4 and 4.5.

4.1 Reset and Enable

In a plant the Profibus should only be started after enabling by the VMEbus CPU. The Run Jumper on the VME-PROF-M has to be removed.

After the VMEbus Reset the red Sys-Fail-LED is on and the Profibus stops. Enabling is done by writing 0x08 into the control register (DPR offset 0x000E). The Profibus now starts – the red LED is off.

```
printf ("Start program for VME-PROF-M \n") ;
printf ("---------------------------- \n\n") ;

/* Set Pointer to VMEbus base */
p = (byte*) 0x870000  ;

DP = (VS_Typ*) p ;                          /* DPR of the VME-PROFI     */
Profi = (ProfiDPR_Typ*) (p + 0x1000) ;  /* Pointer to PROFIBUS data */
IRQflag = (wort*) (p + 0xFFFC) ;        /* Pointer to IRQ Flag Register */

/* Request the accessment rights from the Operating system  */
if ( (err = _os9_id(&pid,&sink,&sink,&sink)) )
      printf("Error _os9_id() %X\n",err);
if ((err = _os_permit ((void*)p,0x10000,0x777,pid)))
```

```
    printf("Error _os_permit() %X \n",err);

/* print Board-Ident */
printf (" Manufactor-Ident ...: %c%c%c\n", DP->ID1,DP->ID2,DP->ID3 );
printf (" Board-Ident .......: %3d\n", DP->BoardID );
printf (" Board-Version .....: %3X\n", DP->BoardED );

/* Init of the VME-PROFI */
printf ("Init VME-PROFI : \n") ;
DP->Control = 0x00 ;  /* Reset VME-PROF-M */
WaitMS (100) ;
DP->Error  = 1 ;     /* Pre-value, will be cleared from the VME-PROF-M */
DP->Comand = 1;      /* Pre-value, will be cleared from the VME-PROF-M */

DP->Control = 0x08 ; /* 08 = enable  VME-Prof-M */
```

4.2 Operating supervision

The VME-PROF-M has to Live counters:

Live (DPR Offset 0x040E is incremented when the locale CPU in the VME-PROF-M is running.

Proficycle (DPR Offset 0x2FEC) counts the DP-Cycles.

The Bit field DPM1Live contains one bit for each Slaveaddress. This bit is set when the data exchange is o.k.

```
/* DP_StationRun shows the status of the slave station
   The station address must be passed.
   Return value: 1 if the slave is present at the bus and data are
                   transfered (slave is running)
                 0 not running                                  */

short DP_StationRun ( byte a )
{
byte n , b ;
   n = a >> 3 ;
   b = 1 << (a & 7) ;
   if (Profi->DPM1Live[n] & b) return 1   ;
                          else  return 0 ;
}
```

4.3 Data exchange without consistence

Data access to bytes or words (16 bit) with even addresses will be always consistent. This will be done by the Dual-Port-RAM arbitration. For Profibus systems with simple I/O modules (digital, analog I/O) no extra data consistence solutions are required if the configuration assigns word data to even

addresses. In most cases this could be done by installing the analog modules at first (close to the buscoupler).

4.4 Data access with consistence solution

By access on data of more than 16 Bit are additionally procedures required to grant data consistence.

The VME-PROF-M has 2 semaphores.

Profi->OutDataState has to be incremented from the user program before it writes data.

In Profi->OutDataLastWrite the Slaveaddress has to be written. After writing the user data Profi->OutDataState has to be incremented once more. This procedure should run as fast as possible and may not be interrupted from other interrupt procedures or task changes.
In fact the VME-PROF-M is blocked for this time.

```
/* Profi_WriteDaten copies the output data of a slave station from the
   memory (pointer *OutDaten) into the DPR.
   The station address must be passed to ensure data consitency.
   Offset is the station's Outputoffset within the DPR
   Anzahl is the output data length / bytes
                                                                    */

void Profi_WriteDaten (byte Station, wort Offset, wort Anzahl, byte *OutDaten )
{
wort n ;
   Profi->OutDataState ++ ;
   Profi->OutDataLastWrite = Station ;
   for (n=0;n<Anzahl;n++) Profi->DPM1io[Offset+n] = OutDaten[n] ;
   Profi->OutDataState ++ ;
}
```

By reading data the user program first saves Profi->InDataState. Then the user data could be read. After reading, the program has to be checked, whether there was a change in Profi->InDataState.

If this is the case and it is the actual slave you have to repeat the reading procedure.

```
/* Profi_ReadDaten copies the input data of a slave station from the DPR
   into the memory  (pointer *InDaten)
   The station address must be passed to ensure data consitency.
   Offset is the station's Inputoffset within the DPR
   Anzahl is the input data length / bytes
*/

void Profi_ReadDaten (byte Station, wort Offset, wort Anzahl, byte *InDaten )
{
wort n ;
byte old, lastStation, diff ;
```

```
Loop:
   old = Profi->InDataState ;
   for (n=0;n<Anzahl;n++) InDaten[n] = Profi->DPM1io[Offset+n] ;
   lastStation = Profi->InDataLastWrite ;
   diff = Profi->InDataState - old ;
   if (old & 1)
     { /* ungerade */
      if (diff > 1) goto Loop;
      if (Station == lastStation) goto Loop ;
     }
   else
     { /* gerade */
      if (diff > 2) goto Loop ;
      if ((diff == 1) && (Station == lastStation)) goto Loop ;
     }
}
```

4.5 Interrupt Operating (starting from Software Version 8.0)

Operating with interrupts is the best solution. The VME-PROF-M has to be configured for time synchronous operation (MinSlaveInterval=DP-cycle). The VME-PROF-M generates a VMEbus interrupt after completing the data exchange with all slaves.

In the interrupt service routine there is a defined time slot for the VMEbus CPU to access the data in the Dual-Port-RAM. No data consistence problems exist.

Initializing in the main program – Example Vector 95 Level 2 :

```
n = irqinst ( ProfiIRQ , 95, 2) ; /* Install IRQ Service for OS-9 */
DP->Vector = 95 ;                 /* Set VME-PROF-M Vertor Register */
DP->Control = 0x08 + 2 ;          /* Enable IRQ Level 2 */
```

The data processing is done in an interrupt service routine which is called from the VME-PROF-M in a fixed time interval (DP-cycle) periodically. On every time when the interrupt service routine is called, actual slave input data are in the Dual-Port-RAM. The interrupt routine can read the data and start a high prior task for processing or can do all needed processing.

The the end of the CPU time slot is the latest time for new output data to be written in the Dual-Port-RAM. The VMEbus CPU now can process other jobs while the VME-PROF-M transfers the I/O-data to the slaves.

```
/* ----------- Interupt Service ---------------------- */
int ProfiIRQ (void)
{
   if (*IRQflag)
     {
       *IRQflag = 0 ;              /* Cler IRQ flag */
```

```
        Wert = Profi->DPM1io[0] ;    /* Input Byte read */
        Wert++ ;                     /* if Inputs and Outputs on the Slave
                                        are conected the Count demo runs */
        Profi->DPM1io[0x800] = Wert ; /* Output Byte write */
      return 1 ;
      }
  return 0 ;
}
```

The actual consumed time for the Profibus data transfer (T-profi) can be read from the Dual-Port-RAM variable Profi>ProfiCTime. The CPU time window you can calculate: Tcpu=Dpzyklus-Tprofi.

Dpzyklus is set up from the master parameter “MinSlaveInterval”.

4.6 Profibus Diagnosis

If required diagnostic messages from slave stations can be treated.

In the bit field DPM1Diag is one Bit for each slave, which has a diagnostic message.

```
/* DP_StationDia shows the if diagnostic data are available for this slave
   The station address must be passed.
   Return value: 1 diagnostic data available
                 0 no diagnostic data                              */

short DP_StationDia ( byte a )
{
byte n , b ;
   n = a >> 3 ;
   b = 1 << (a & 7) ;
   if (Profi->DPM1Diag[n] & b) return 1   ;
                          else  return 0 ;
}
```

If a diagnostic message exists, it can be read with the “GetDiagnose” service.

Please see the software example:

4.7 Bus Stop and Watchdog

A VMEbus Reset or Writing the Control Register (DPR Offset 0x000E) to Zero sets the VME-PROF-M on Reset (Halt). No more Profibus telegrams are send or received.

For the slaves this looks like a Profibus failure or a broken cable. Each slave sets its outputs zu 0 (after the watchdog time is elapsed).

The watchdog time was configured in the slave menu of the DPKonfig.

4.8 Bus Management Commands

The VME-PROF-M has a command interface in the Dual-Port-RAM for Profibus management services. The most users do not need this because VME-PROf-M does automatically the Profibus initialization via EEPROM parameters.

The following services are implementend:

Set operating mode -> Offline Stop Clear Operate

LoadMasterParameter

LoadSlaveParameter

GetDiagnose

GlobalControl -> Freeze, UnFreeze, Sync, UnSync

For application examples please see the demo program in capt. 6

4.9 Configuration via VMEbus

In some plants it is required to hold all configuration data on a single data base. For those applications it is possible to store the configuration file that was generated by the DPKonfig in the file system of the main CPU. The EEPROM of the VME-PROF-M has to be erased for being empty. A program running on the main CPU now can control the start-up phase of the Profibus with a xx.DP1 data over the DP-RAM of the VME-PROF-M.

A sample application you can find in the procedure DPrun of the ProfM.c example capt.6.

5 Tables and additional information

5.1 Technical Specifications

VMEbus:	A24, D16 Slave
Memory:	64KB Dualport-RAM 128 KB RAM 512 KB Bootblock Flash EPROM
Interface:	1 * RS485 PROFIBUS, galvanic separated, 12 MBit/sec with PROFIBUS-FPGA 1 * serial RS232
Processor:	32-Bit
Protocol:	PROFIBUS DP-Master 1 (EN 50170)
Dimension:	VME-PROF-M 6HE-4TE (3HE board with 6HE frontplate) VME-PROF-M3 3HE-4TE (single euro format, 160 x 100 mm)
Power:	+5V: typ. 700 mA +5V Standby not needed +12V and -12V not needed
Temperature	
Operating:	0 ... +50 °C
Storage:	-25 ... +70 °C

5.2 Known errors of the VME-PROF-M Firmware

Limitation for all versions:
Configuration with a Profibus Class 2 master is not possible

Errors in version 7.2
Only Single-Master operation possible.
DP-Variable ProfiCtime is not valid

Errors in version 8.0
No errors known

5.3 Status-LED´s

6 LED´s on the front panel show the operating mode:

1. LED-Row (VMEbus Status)

green	(**A** activ)	VMEbus access to the VME-PROF-M
yellow	(**I** Interrupt)	The VME-PROF-M generates a VMEbus-IRQ
red	(**F** Fail)	The VME-PROF-M is not yet enabled

2. LED-Row (PROFIBUS Status)

green	(**R** RxData)	The VME-PROF-M receives Data from the PROFIBUS
yellow	(**T** TxData)	The VME-PROF-M sends on the PROFIBUS
red	(**F** Fail)	Off:: The PROFIBUS-Controller runs
		On: The VME-PROF-M has stopped (halt) not enabled no Busparameters

5.4 PROFIBUS-Connector X2

The connector X 2 is a norm conform Profibus connector.
All signals are potential isolated from the VME system.

Connector X2	**I/O - Signal**
Pin 1	n.c.
Pin 2	n.c.
Pin 3	Daten B (RxD/TxD-P)
Pin 4	CNTR (Repeater control signal TTL)
Pin 5	GND
Pin 6	Termination-Power
Pin 7	n.c.
Pin 8	Daten A (RxD/TxD-N)
Pin 9	n.c.
Connector Case	Shield

5.5 PC-Connector X 1

On the connector X1 you find a RS232 Com-Port for the connection of the PC. The Pin-out is PC-conform. Only the signals RxD,TxD and GND are used. The port uses the following parameters:
9600 Baud, 1Stop Bit, No-Parity, Terminal Emulation ANSIVT100.
You need a Null-Modem-cable with 2 female 9-pin connectors (Pin 5 connected, Pin 2 and 3 crossed over).

Note:
There is no potential separation on this port.
The port is only used for test and configuration purpose.

Pin	RS232
1	-
2	RXD Receive data
3	TXD Transmit data
4	-
5	GND
6	-
7	Do no connect
8	Do not connect
9	-

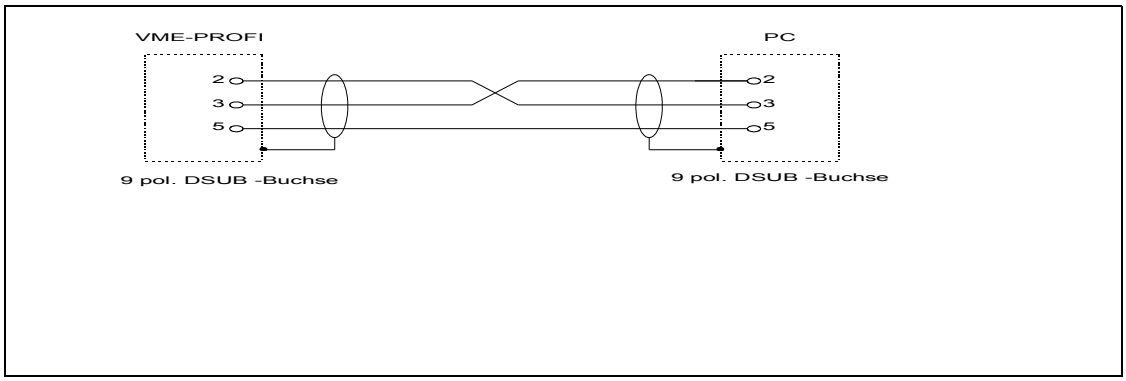


Figure 1: Cable connection VME-PROFI X1 - PC (VT100 Terminal)

WARNING

The configuration of input/output bytes to the dualport RAM addresses can be changed from the DPKonfig. That could cause wrong settings of output bytes or reading wrong input bytes.
Additionally output bytes can be set directly.

Never use DPKONFIG to control VME-PROF-M, if connected machines are running!!

5.6 VMEbus-Interface

The table below summarizes a number of VMEbus functions:

VMEbus-Function	Included	Remark
DTB Master Address Bus	-	no VMEbus-Master functions
Master Data Bus	-	" " " "
Slave Adress Bus	A24	24 Bit Adress Bus width
Slave Data Bus	D08, D16	8 and 16 Bit Data bus width
SSEQ	Np	Slave: Sequential Access
Interrupt-Handler	-	No Interrupt-Handler function
Interrupter	IH1, IH2, IH3, IH4, IH5, IH6	Programmable IRQ-Level

5.7 Dual-Port-RAM Address Map

Address (Hex) VMEbus-Standard base address +	Type	Name	Remark
$0000	Byte	Dummy0	Dummy
$0001	Byte	ID1	"D"
$0002	Byte	IRQSET	reserved
$0003	Byte	ID2	"M"
$0004	Byte	IRQEN	reserved
$0005	Byte	ID3	"S"
$0006	Byte	Dummy3	Dummy
$0007	Byte	BoardID	$0B
$0008	Byte	Dummy4	Dummy

$0009	Byte	BoardED	Board Vers. = <D7..D4>.<D3..D0>
$000A	Byte	Dummy5	Dummy
$000B	Byte	Mail	reserved
$000C	Byte	Dummy6	Dummy
$000D	Byte	Vector	reserved
$000E	Byte	Dummy7	Dummy
$000F	Byte	Control	Card-Control-Register By writing $08 into this register, the VME-PROFI will be enabled
$0010	Lword[252]		reserved
$0400	Byte	Command	reserved (0: load EEPROM config data)
$0401	Byte	Error	reserved
$0402	Word[6]	Prm	reserved
$040E	Word	Live	“live“ will be increased while the VME-PROFI is running
$0410	Byte[256]	ReadBuf	reserved
$0510	Byte[256]	WriteBuf	reserved
$0610 -$070F	Word[128]	DataBuf	reserved
$0710	char [7]	Software	„DPM1“ = DP-Master1 software
$0717	char	Version	SW-version = <D7..D4>.<D3..D0>
$0718 - $0FFF			reserved
$1000-$1FFF		DPM1io	4 KB I/O-range Default: inputs starting at $1000 outputs starting at $1800 The I/O-range can be arbitrary configured by the user
$2000-$200F	Byte[16]	DPM1Live	Bit-field variable, 1 Bit per Slave address (0 -127). The Bits are set, in the case, that the corresponding slave answered positive. Slave-Adr. 0 -> $2000 LSB (D0) Slave-Adr. 7 -> $2000 MSB (D7) Slave-Adr. 127 -> $200F MSB (D7)
$2010-$201F	Byte[16]	DPM1Diag	Bit-field variable, 1 Bit per Slave address. The bits are set, if diagnostic data for the corosponding slave are available Slave-Adr. 0 -> $2010 LSB (D0)

			Slave-Adr. 7 -> $2010 MSB (D7) Slave-Adr. 127 -> $201F MSB (D7)
$2020	Byte	Remote AccessFlag	reserved (Access flag for class2 Master)
$2021	Byte	InDataState	Flag for input consistency, increased before and after writing of the input data (read only)
$2022	Byte	InDataLastWrite	Slave address of the last written input data (read only)
$2023	Byte	OutDataState	Flag for output consistency, increased before and after writing of the output data (set by user)
$2024	Byte	OutDataLastWrite	Slave address of the last written output data (set by user)
$2025 - $2124	Byte[256]	DPM1Melde	Massage buffer (read only)
$2125 - $2224	Byte[256]	DPM1Comand	Command buffer (written by user)
$2225 - $2FE9	Byte[3525]	FMS	reserved for FMS-Services (4096-512-16-3766Bytes)]
$2FEA	Byte	Triggerflag	(set by user) 0x00: free running 0x10 or 0x20: Trigger single cycle
$2FEB	Byte	Triggersync	(read only) 0x00: free running 0x11 or 0x21: cycle in work 0x10 or 0x20: cycle ready
$2FEC -$2FED	Word	Proficycle	Cycle counter
$2FEE - $2FEF	Word	Profictime	Cycle time (µs)
$2FF0 - $2FFF	Byte[16]	kompat	reserved (only for VME-PROFI)
$3000	Byte	DPM1Usema	User Semaphore (written by user)
$3001 - $3006	Byte[6]	UserSema	reserved
$3007	Byte	Pstatus	reserved
$3008	Byte	DPM1Csema	Communication Semaphore (read only)
$3009 - $300E	Byte[6]	CommSema	reserved
$300F	Byte	Pcomand	Flag for firmware

6 Example programs

6.1 ANSI-C example program

6.1.1 DPSTART.C

```
/* V M E - P R O F - M       D E M O
 Example program for the startup of the VME-PROF-M in
 the VMEbus configuration mode.
 */

#include <stdio.h>
#include <module.h>
#include <signal.h>
#include <types.h>
#include <time.h>
#include <math.h>
#include <process.h>
#include <errno.h>

#define VS_Base 0x800000

typedef unsigned char byte ;
typedef unsigned short wort ;
typedef unsigned int lwort ;

#include "VS.h"          /* Description of the VMEbus DPR structure    */
 /*                    DPR = Dualport RAM       */
#include "ProfM.h"      /* Description of the PROFIBUS data structure */

/* -------------- Prototypen ------------------- */
extern int   DpRun (byte *fp) ;
extern void  DispSlave ( byte*s);
extern void  Profi_ReadDaten (byte Station, wort Offset, wort Anzahl, byte
*InDaten ) ;
                                                    /* Anzahl = Number */
extern void  Profi_WriteDaten (byte Station, wort Offset, wort Anzahl, byte
*OutDaten ) ;
extern short DP_StationRun ( byte a ) ;
extern short DP_StationDia ( byte a ) ;
extern byte  GetDiagnose (byte Station) ;
extern byte  GlobalControl (byte RemAdr, byte GroupSel, byte Comand ) ;
extern void  DpStop (void) ;
extern void WaitMS ( int Time ) ;
```

```
/* ---------- Globale Variablen ------------------ */
VS_Typ *DP ;
byte Speicher[65*256] ;                /* Momory for 1 master-/bus-record
                                          and 64 slave-records                */
byte Wert ;
wort *IRQflag ;

extern volatile ProfiDPR_Typ * Profi ; /* Pointer to PROFIBUS area in DPR      */
extern byte MBuf[256] ;

/* ----------- Interupt Service ---------------------- */
int ProfiIRQ (void)
{
   if (*IRQflag)
     {
       *IRQflag = 0 ;              /* Cler IRQ flag */
         Wert = Profi->DPM1io[0] ;   /* Input Byte read */
         Wert++ ;                    /* if Inputs and Outputs on the Slave
                                        are conected the Count demo runs */
         Profi->DPM1io[0x800] = Wert ; /* Output Byte write */
       return 1 ;
       }
  return 0 ;
}

/* --------------- Main ---------------------------- */

int main (int argc , char **argv)
{
int err,ret;
u_int32 st ;
u_int16 sink ;
process_id pid ;
int s , count, cyc ;
byte *p ;
wort n;
FILE *fp ;
byte Buf[8] ;
byte ln ;
wort LastCycle ;
byte VMEkonfig = 0 ;


printf ("Start program for VME-PROF-M \n") ;
printf ("---------------------------- \n\n") ;

/* Set Pointer to VMEbus base */
p = (byte*) 0x870000  ;

DP = (VS_Typ*) p ;                          /* DPR of the VME-PROFI     */
Profi = (ProfiDPR_Typ*) (p + 0x1000) ;  /* Pointer to PROFIBUS data */
IRQflag = (wort*) (p + 0xFFFC) ;        /* Pointer to IRQ Flag Register */
```

```
/* Request the accessment rights from the Operating system  */
if ( (err = _os9_id(&pid,&sink,&sink,&sink)) )
      printf("Error _os9_id() %X\n",err);
if ((err = _os_permit ((void*)p,0x10000,0x777,pid)))
    printf("Error _os_permit() %X \n",err);

/* print Board-Ident */
printf (" Manufactor-Ident ...: %c%c%c\n", DP->ID1,DP->ID2,DP->ID3 );
printf (" Board-Ident ........: %3d\n", DP->BoardID );
printf (" Board-Version ......: %3X\n", DP->BoardED );

/* Init of the VME-PROFI */
printf ("Init VME-PROFI : \n") ;
DP->Control = 0x00 ;  /* Reset VME-PROF-M */
WaitMS (100) ;
DP->Error   = 1 ;     /* Pre-value, will be cleared from the VME-PROF-M */
DP->Comand = 1;       /* Pre-value, will be cleared from the VME-PROF-M */

DP->Control = 0x08 ; /* 08 = enable  VME-Prof-M */

printf (" Wait for Local-CPU Start ...\n");
n=1000;
while (DP->Comand && n--) WaitMS(10); /* wait until Comand cleared or timeout */

if (VMEkonfig)  /* configuration via VMEbus */
  {

   DP->Comand = 1;/* When the CPU starts , it clears the Comand flag (-> 0)
                  With Comand = 0 the Software will startup and reads all
                  commands from the internal EEPROM (locally stored
                  configuration).
                  If Comand is set to now to 1, no data will be red from the
                  EEPROM, therefore the board can be controlled through the
                  VMEbus service interface                                 */
   for (n=0;n<10;n++) if (DP->Error) WaitMS(1000) ;
   if (DP->Error)
    {  /* Timeout after 10 sec. */
     printf (" *** Error : Local CPU did not run!\n") ;
     DP->Control = 0x00 ;
    return (0) ;
    } ;
  WaitMS (2000) ; /* Startup time for VME-PROFI CPU  */
  printf (" Start \n") ;


  /* Loading of the configuration-file into the memory
   -------- A configuration-file can be generated with the program DPKONFIG
            runnung on a PC under  Windows 95 or NT. With DPKONFIG the file
            are build by reading the slaves GSD-files.
            A configuration file consists of:
                 a header 8 bytes
```

```
                a bus- / master record (incl. header with function code 24)
                one ore more slave-records (incl. header with function code 25)
                                                              ------------ */

   printf ("\nRead configuration file\n") ;
         /*  */
   fp = fopen ("AutoLoad.dp1","r") ;
   if (!fp) { printf (" Autoload.dp1 - File not found\n") ;
              return errno ;
            } ;
   /* the first 8 bytes are not needed          */
   for (n=0;n<8;n++) Speicher[n] = fgetc(fp) ;
   /* Reading Bus-/ Master-record (fixed length)*/
   p = &Speicher[0] ;
  for (n=0;n<256;n++) *p++ = fgetc(fp) ;

  /* now one or more slave-records (variable length) are following */
  while (!feof(fp))
     { /* reading up to the length byte */
       for (n=0;n<8;n++) Buf[n] = fgetc(fp) ;
       ln = Buf[7] ;
       if (Buf[0] == 0x25) /* 25 = service code for slave-record    */
         {
           printf ("Reading slave-record %3d - %d Byte\n",Buf[3],ln) ;
           /* copying of the first already red 8 bytes */
           for (n=0;n<8;n++) *p++ = Buf[n] ;
              /* Reading of the remainig record, plus one byte*/
           for (n=8;n<ln+1;n++) *p++ = fgetc(fp) ;
         } ;
     } ;         /* all slave records red */
     *p++ = 0 ; /* Setting of end mark */
   fclose (fp) ;

   /* Now the hole configuration data are in memory
   ---- DpStart transfers the data via the dualport RAM service interface
        to the communication processor */

   if (!DpRun (&Speicher[0])) printf (" PPROFIBUS started !\n") ;
   else
      { printf (" *** Error starting PROFIBUS DP\n") ;
        return (1) ;
      } ;
} ;



WaitMS (2000) ; /* Waiting for startup of the slaves */

      n = irqinst ( ProfiIRQ , 95, 2) ; /* Install IRQ Service for OS-9 */
      DP->Vector = 95 ;                 /* Set VME-PROF-M Vertor Register */
    DP->Control = 0x08 + 2 ;          /* Enable IRQ Level 2 */
```

```
  LastCycle = 0 ;
  n = 1000 ;
  while (n)
  {
     WaitMS(10) ;
       n-- ;
     if (Profi->ProfiCycle != LastCycle)
      {
         LastCycle = Profi->ProfiCycle ;
         printf ("\nCyC= %d  CyTime = %d",LastCycle,Profi->ProfiCTime) ;
       } ;
  };


/* Now PROFIBUS-services can be used and I/O- data can be transtfered */

/* Show stations */
printf ("\n Showing the stations \n") ;
DispSlave (&Speicher[0]) ;

/* additionally examples */
if  (DP_StationDia(10))
  {
   printf ("\nDiagnose from station 10 :") ;
   if (!GetDiagnose(10))
      for (n=0;n<MBuf[7];n++) printf (" %02X",MBuf[8+n]) ;
   printf ("\n") ;
   } ;

while (DP_StationRun(10))
 {
    Profi_ReadDaten  (10,0x000,2,&Buf[0]);
    Buf[0]++ ;
      Profi_WriteDaten (10,0x800,2,&Buf[0]) ;
 } ;

/* DpStop () ;
*/
    DP->Control = 0 ;
      n = irqinst ( ProfiIRQ , 95, -1) ;

return (0) ;
} /* END MAIN */
```

6.1.2 PROFM.C

```
/* ------------------------------------------------------------
 P R O F I B U S    I N T E R F A C E
 Example sub programs for VME-PROF-M boards
 ------------------------------------------------------------
*/
#include <stdio.h>
#include "DMStyp.h"
#include "Profm.h"

/* Prototypes ------------------- */
int   DpRun (byte *fp) ;
void  DispSlave ( byte*s);
void  Profi_ReadDaten (byte Station, wort Offset, wort Anzahl, byte *InDaten ) ;
void  Profi_WriteDaten (byte Station, wort Offset, wort Anzahl, byte *OutDaten ) ;
short DP_StationRun ( byte a ) ;
short DP_StationDia ( byte a ) ;
byte  GetDiagnose (byte Station) ;
byte  GlobalControl (byte RemAdr, byte GroupSel, byte Comand ) ;
void  DpStop (void) ;


/* Globale variables ------------ */

volatile ProfiDPR_Typ * Profi ;   /* Pointer to the PROFIBUS area within the DPR*/
byte KBuf[256] ;                  /* Buffer for commands  */
byte MBuf[256] ;                  /* Buffer for meassages  */

/*--- Sub prgrams ----------------- */

/* --- WaitMS - oerating system independed wait routine
 this subprogramm only has to wait for Time * milliseconds
 the time is not critically, therefore it also could be programmed as sleep(1) */

void WaitMS (lwort Time) /* waits Time milliseconds */
{
int err ;
 Time = ((Time * 256) / 1000) + 0x80000001 ;
 err  = _os9_sleep (&Time) ;
}


/* PutKomm transfers a service command to the PROFIBUS firmware
 try again, if the buffer was not free
 Return value 0  */
byte PutKomm(void)
{
```

```
byte n;
if (((Profi->DPM1Usema) & 1) != ((Profi->DPM1Csema) & 1))
/* the command buffer is not free, if both semephores are different */
 return( 0 );
else
  { /* Buffer is free - copying data into the buffer */
    for (n=0; n<KBuf[7]+8; n++) Profi->DPM1Comand[n] = KBuf[n] ;
    /* set semaphore, buffer is now ready to execute */
    Profi->DPM1Usema ^= 0x01 ; /* switch bit */
    return(1) ;
  }
}

/*---- Read a meassage from the dualport RAM ---------*/

byte GetMeld(void)
{
byte n ;
if (((Profi->DPM1Usema) & 0x02) == ((Profi->DPM1Csema) & 0x02))
/* both semaphores are equal -> no message available */
     return( 0) ;
else
  {
/* Pick up a message from the DPR */
    for (n=0; n<255; n++) MBuf[n] = Profi->DPM1Melde[n] ;
/* than release the mesage buffer */
      Profi->DPM1Usema ^= 0x02 ;
      return(1) ;
  }
}


/* DoKomm transfers a service command to the PROFIBUS firmware and waits
   for the corresponding response message
   Return: result in Mbuf
           status as return value    0 = O.K.
                                   255 = timeout*/

byte DoKomm(void)
{
int TimeOut ;
  printf("Service : %02X", KBuf[0] );
  TimeOut = 50 ;
  while (TimeOut)
    { /* set command */
     if (PutKomm())
        {  /* command transfered */
           TimeOut = 50 ;  printf (": ") ;
           while (TimeOut)
              { /* waiting for the response */
               if (GetMeld())
                  { /* message available */
```

```
                    if (MBuf[0] == ((KBuf[0] & 0x3F) | 0xC0) )
                       { /* message is our reponse -> ready */
                         return(MBuf[2]) ;
                       }
                    else /* another staus message -> not used */
                         printf ("*" ) ;
                  }
               else
                 { /* wait for message */
                   WaitMS (200) ;
                   TimeOut-- ;
                 } ;
              } ;
         }
      else
         { /* wait for correct command transfer */
          WaitMS (200) ;
          TimeOut-- ;
         }
    }
if (TimeOut == 0)
  {
      printf (" - Time Out - ") ;
      return (255) ;
  } ;
}


/* sets the PROFIBUS-DP operating mode (=Betriebsart) for the Master */

byte SetBetriebsart (byte Art)
{
      KBuf[0] = 0x27 ;
      KBuf[3] = Art ;
      KBuf[7] = 4 ;
      return (DoKomm()) ;
}


/* Stop communication processor */
void DpStop (void)
{
 if (SetBetriebsart (0x80)) printf ("  Clear FAIL\n") ; /* Clear */
                       else  printf ("  Clear O.K.\n") ;
 WaitMS (200) ;
 if (SetBetriebsart (0x40)) printf ("  Stop  FAIL\n") ; /* Stop  */
                       else  printf ("  Stop  O.K.\n") ;
 WaitMS (200) ;
 Profi->Pcomand = 0 ; /* Stop firmware */
}
```

```
/* Profi_ReadDaten copies the input data of a slave station from the DPR
   into the memory  (pointer *InDaten)
   The station address must be passed to ensure data consitency.
   Offset is the station's Inputoffset within the DPR
   Anzahl is the input data length / bytes
*/

void Profi_ReadDaten (byte Station, wort Offset, wort Anzahl, byte *InDaten )
{
wort n ;
byte old, lastStation, diff ;

Loop:
   old = Profi->InDataState ;
   for (n=0;n<Anzahl;n++) InDaten[n] = Profi->DPM1io[Offset+n] ;
   lastStation = Profi->InDataLastWrite ;
   diff = Profi->InDataState - old ;
   if (old & 1)
     { /* ungerade */
      if (diff > 1) goto Loop;
      if (Station == lastStation) goto Loop ;
     }
   else
     { /* gerade */
      if (diff > 2) goto Loop ;
      if ((diff == 1) && (Station == lastStation)) goto Loop ;
     }
}



/* Profi_WriteDaten copies the output data of a slave station from the
   memory (pointer *OutDaten) into the DPR.
   The station address must be passed to ensure data consitency.
   Offset is the station's Outputoffset within the DPR
   Anzahl is the output data length / bytes
                                                                      */

void Profi_WriteDaten (byte Station, wort Offset, wort Anzahl, byte *OutDaten )
{
wort n ;
   Profi->OutDataState ++ ;
   Profi->OutDataLastWrite = Station ;
   for (n=0;n<Anzahl;n++) Profi->DPM1io[Offset+n] = OutDaten[n] ;
   Profi->OutDataState ++ ;
}



/* DP_StationRun shows the status of the slave station
   The station address must be passed.
   Return value: 1 if the slave is present at the bus and data are
```

```
                  transfered (slave is running)
                0 not running                                   */

short DP_StationRun ( byte a )
{
byte n , b ;
   n = a >> 3 ;
   b = 1 << (a & 7) ;
   if (Profi->DPM1Live[n] & b) return 1   ;
                          else  return 0 ;
}

/* DP_StationDia shows the if diagnostic data are available for this slave
   The station address must be passed.
   Return value: 1 diagnostic data available
                 0 no diagnostic data                              */

short DP_StationDia ( byte a )
{
byte n , b ;
   n = a >> 3 ;
   b = 1 << (a & 7) ;
   if (Profi->DPM1Diag[n] & b) return 1   ;
                          else  return 0 ;
}


/* With GetDiagnose a diagnostic message of a slave can be red from
   the DPR.
   Return value: 0, the diagnostic data can be red starting at
   byte 8 from Mbuf. MBuf[7] is the length of the data.            */
byte GetDiagnose (byte Station)
{
  KBuf[0] = 0x21 ;
  KBuf[3] = Station ;
  KBuf[7] = 4 ;
  MBuf[2] = 0 ;
  return (DoKomm()) ;
}


/* With function GlobalControl the PROFIBUS commands SYNC and FREEZE
   can be sent to one or more slaves.
   RemAdr is the slave address 1..126 or 127 for all slave´s
   GroupSel masks that command to all slaves within the selected group (0 = all)
   Command has the following values 0x08  Freeze   - to freeze the inputs
                                     0x04  Unfreeze - inputs normal
                                     0x20  Sync     - to freeze outputs
                                     0x10  Unsync   - outputs normal
   Return value: 0 = O.K.
                                                                   */
```

```
byte GlobalControl (byte RemAdr, byte GroupSel, byte Comand )
{
 KBuf[0] = 0x2E ;
 KBuf[1] = RemAdr ;
 KBuf[3] = Comand ;
 KBuf[4] = GroupSel ;
 KBuf[7] = 5 ;
 MBuf[2] = 0 ;
 return (DoKomm()) ;
}



/* DispSlave reads the configuratin data from memory and shows all
   configurated slaves with the Username, Runflag and Diagnosticflag.
   The pointer to the configuration data in memeory must be passed.
                                                                    */

void DispSlave ( byte*s)
{
byte ln,a,p,c,u,n ;

if (*s == 0x24) s = s + 0x100 ; /* skip the bus-/ master-record */

  while (*s == 0x25) /* slave record */
    {
     ln = s[7] + 1 ;
     a  = s[3] ;
     p  = s[25] - 9 ;
     c  = s[34+p] - 2 ;
     u  = 48 + p + c ;
     printf (" %3d : ",a) ;
     for (n=0;n<20;n++) printf("%c",s[u+n]) ;
     if (DP_StationRun(a)) printf(" Run  ") ;
                      else  printf(" Fail ") ;
     if (DP_StationDia(a)) printf(" ----") ;
                      else  printf(" Diag") ;
     printf ("\n") ;
     s = s + ln ;
    }
}


/* --DpRun ----------------------------
   starts the PPROFIBUS-DP Master with configuration data from memory.
   The initialization must be finished:
          => VME-PROFI: board enabled
                        set to remote configuration
                        cleared EEPROM data
          => IPE, PCI-40, PCP-DP: Firmware loaded
     Profi pointer initialized to the DPR
```

```
     Access rights from the operating system
                                                          */

int DpRun (byte *fp)
{
byte Status, ln ;
int n ;

printf ("\nPROFIBUS-DP Startup\n");

Status = SetBetriebsart (0x00) ;
if (!Status) printf (" Offline O.K. \n") ;
        else printf (" Offline FAIL \n") ;
WaitMS (300) ;
if (Status) goto Stop  ;

if (*fp == 0x24)
 {
   for (n=0;n<256;n++) { KBuf[n] = *fp++ ; } ;
   Status = DoKomm() ;
   if (!Status) printf ("Load bus- / master-record O.K. \n") ;
           else printf (" FAIL \n") ;
 }
 else
 {
  printf("Missing bus- / master record \n") ;
  Status = 1 ;
 } ;
WaitMS (300) ;
if (Status) goto Stop ;

while (*fp == 0x25)
  {
    KBuf[0] = *fp ;
    ln = fp[7] ;
    if (KBuf[0] == 0x25)
     {
       for (n=0;n<ln+1;n++) { KBuf[n] = *fp++ ; } ;
       printf ("Load slave record   station : %d", KBuf[3]) ;
       Status = DoKomm() ;
       if (!Status) printf (" O.K.\n") ;
              else printf (" FAIL\n") ;
       if (Status) goto Stop  ;
     } ;
   } ;

Status = SetBetriebsart (0x40) ;
if (!Status) printf (" Stop    O.K. \n") ;
        else printf (" Stop    FAIL \n") ;
if (Status) goto Stop ;

Status = SetBetriebsart (0x80) ;
```

```
if (!Status) printf (" Clear   O.K. \n") ;
        else printf (" Clear   FAIL \n") ;
if (Status) goto Stop ;

Status = SetBetriebsart (0xC0) ;
if (!Status) printf (" Operate O.K.\n ") ;
        else printf (" Operate FAIL\n ") ;
if (Status) goto Stop ;

 Profi->Pcomand = 'R' ;
return (0) ;

Stop:
 Profi->Pcomand = 0 ;
 return (Status) ;

} /* END  */
```

1.1.1 PROFM.H

```
/* Profibus DPR ---- Version for VME-PROF-M----------------- */
typedef unsigned char  byte ;  /* 8 Bit */
typedef unsigned short wort ;  /* 16 bit */
typedef unsigned int   lwort ; /* 32 Bit */

typedef struct {
     byte DPM1io[4096] ;        /* 4 KByte IO-data of the Slave´s           */
     byte DPM1Live[16] ;        /* Live flags 1 bit per Slave               */
     byte DPM1Diag[16] ;        /* Diag flags 1 bit per Slave               */
     byte RemoteAccessFlag ;    /* Enable for class 2 master                */
     byte InDataState ;         /* Flag for input consistency, read only    */
     byte InDataLastWrite ;     /* last updated input, read only            */
     byte OutDataState ;        /* Flag for output consistency              */
     byte OutDataLastWrite ;    /* last updated output station              */
     byte DPM1Melde[256] ;      /* Buffer for messages, read only           */
     byte DPM1Comand[256] ;     /* Buffer for commands, write only          */
     byte FMS[4096-512-16-37-6]; /* Reserved for FMS services               */
     byte TriggerFlag;         /*0: freilaufend, 0x10 o. 0x20 :Trigger Single */
     byte TriggerSync;         /*0: freilaufend, 0x11 o. 0x21 Single in work,
                                  0x10 o. 0x20 single done */
     wort ProfiCycle;
     wort ProfiCTime;
     byte kompat[16] ;         /* 16 dummy bytes, only for compatibility with
                                   older firmware versions of the VME-PROFI */
     byte DPM1Usema ;          /* User semafore                            */
     byte UserSema[6] ;        /* Reserved                                 */
     byte Pstatus ;            /* Reserved                                 */
     byte DPM1Csema ;          /* Communication CPU semafore, read only    */
     byte CommSema[6] ;        /* Reserved                                 */
     byte Pcomand ;            /* Flag for firmware */
         } ProfiDPR_Typ ;

typedef struct { byte dumy0  ;  byte ID1 ;
                 byte IRQSET ;  byte ID2 ;
                 byte IRQEN  ;  byte ID3 ;
                 byte dumy3 ;  byte BoardID ;
                 byte dumy4 ;  byte BoardED ;
                 byte dumy5 ;  byte Mail ;
                 byte dumy6 ;  byte Vector ;
                 byte dumy7 ;  byte Control ;
                 lwort LokalVec[252] ;
                 byte Comand ;
                 byte Error ;
                 wort Prm[6] ;
                 wort Live ;
                 byte ReadBuf[256] ;
                 byte WriteBuf[256] ;
                 wort DataBuf[128] ;    } VS_Typ ;
```

6.2 Example for Berghof VME-S5 CPU

The VME-PROF-M is independent from the used operating system of the VMEbus Main CPU, because no Profibus software must be loaded. Only the VME-PROF-M must be enabled by writing a $08 into the control register.
The following example shows the setup for the S5 compatible VMEbus CPU from Berghof:

1. Create the following file:

```
 0:     KC ='MASKX1';
 3:     KH = 8009;     Grundeinstellungen 9  Worte
 4:     KH = 1001;     Slot1 Arbitermode ein
 5:     KH = 2000;     VMEzugriffe im NonPrivilegd Mode
 6:     KH = 3000;     Serdat nicht verwenden
 7:     KH = 4000;     keine Userdef. Adressmodifier
 8:     KH = 5000;     Semaphoren gesperrt
 9:     KH = 6000;     Sysreset set Stop
10:     KH = 7000;     keine Rueckwand PG-Schnittstelle
11:     KH = 8000;     SysFail nicht beachten
12:     KH = 9000;     Urloeschen erlaubt
13:     KH = 8101;     Interruptverhalten 1 Wort
14:     KH = 1000;     gesperrt
15:     KH = 8210;     VME-Address-Tab 16 Worte
16:     KH = 5000;     P-Bereich ab Eingangsbyte 0
17:     KH = 448F;     VME-Standard 0x8F0000
18:     KH = 1000;     Offset 0x1000
19:     KH = 0180;     Schrittweite 1, Anzahl 128 Byte
20:     KH = 7000;     p-Bereich ab Ausgangsbyte 0
21:     KH = 448F;     VME-Standard 0x8F0000
22:     KH = 1800;     Offset 0x1800
23:     KH = 0180;     Schrittweite 1, Anzahl 128 Byte
24:     KH = 71FF;     q-Bereich Ausgangsbyte 255
25:     KH = 448F;     VME-Standard 0x8F0000
26:     KH = 000F;     VMEProfi Enable Register
27:     KH = 0101;     Schrittweite 1, Anzahl 1 Byte
28:     KH = 51E0;     Q-Bereich Eingangsbyte 224
29:     KH = 448F;     VME-Standard 0x8f0000
30:     KH = 2000;     Stations Status
31:     KH = 0110;     Schrittweite 1, Anzahl 16 Byte
32:     KH = EEEE;     Ende
```

2. Add the following 2 command in the organisation Baustein 20 (OB20)

```
:L  KH 0008
:T  QB 255
```

3. At startup of the VME-S5 the two commands in OB20 are executed which enables the VME-PROF-M. Now the decentralized I/O can be accessed through the PLC P/p range.

6.3 Example for an Adept system

The following example shows, how the VME-PROF-M could be integrated in an ADEPT system:

```
PROGRAM a.profi()
; Test Program to integrate DMS Profi Board into AdeptMV Controller
; IMPORTANT: Before you are able to enable the robot power you have to run
; this program in a task other than 0. Only if the DMS board is enable SYSFAIL
; is deasserted
      CALL pr.init()            ; Initialize addresses
      CALL pr.def.dio()         ; Map Adept Signals to DMS Board
      CALL pr.check.board()     ; Check if DMS board is present
      CALL pr.enable()          ; Enable DMS board
.END


.PROGRAM pr.check.board()
; Reads the ID section of the DMS board. If it does not contain specific
; information at a certain address it is assumed the board is not available.
      $id = $CHR(IOGETB(pr.id1.adr,1))
      $id = $id+$CHR(IOGETB(pr.id2.adr,1))
      $id = $id+$CHR(IOGETB(pr.id3.adr,1))
      pr.id = IOGETB(pr.id4.adr,1)
      IF ($id <> "DMS") OR (pr.id <> ^HB) THEN
          TYPE "No DMS board found"
          HALT
      ELSE
          TYPE "DMS VME-Profi found at ", /H6, pr.base.adr
      END
.END

.PROGRAM pr.def.dio()
; Map V+ input and output signals to DMS VME Profi board
      LOCAL io.offset, io.sig

; Map input signals do DMS board
      io.offset = 0                         ; Start at offset 0
      FOR io.sig = 1017 TO 1505 STEP 8            ; Map the input signals
                                                  ; you want to redirect
                                                  ; to the input section
                                                  ; of the DMS board
          DEF.DIO io.sig = pr.in.adr+io.offset, 1 ; Map 8 signals
                                                  ; starting at signal
                                                  ; io.sig to VME address
          io.offset = io.offset+1                 ; Increase VME address by 1 Byte
      END

; Map output signals do DMS board
      io.offset = 0                         ; Start at offset 0
      FOR io.sig = 17 TO 505 STEP 8               ; Map the ouput signals
                                                  ; you want to redirect
                                                  ; to the output section
```

```
                                                    ; of the DMS board
            DEF.DIO io.sig = pr.out.adr+io.offset, 1; Map 8 signals
                                                    ; starting at signal
                                                    ; io.sig to VME address
            io.offset = io.offset+1                 ; Increase VME address by 1 Byte
        END
        RETURN

.END
```

```
.PROGRAM pr.enable()
; Enable DMS VME Profi
      IOPUTB pr.control.adr, 1 = ^H8          ; Write $08 to control register
      RETURN
.END



.PROGRAM pr.init()
; Initialize addresses for communication with DMS VME Profi board
      pr.base.adr = ^H130000           ; VME Profi base address
;
;     S21 = 1
;     S20 = 0
;
; Attention ! V+ allows access only up to address $7FFFFF so A23 must be
; closed ('0'). Valid addresses are therfore $x30000 with 1<=x<=7.
; If AdeptVision is installed inside an AdeptMV cotnroller the valid addresses
; are in the range of $0 - $3FFFFF
; If a  Dual Vision System is used there is no space left for 3rd party boards
; at all.

      pr.id1.adr = pr.base.adr+^H1            ; Contains "D"
      pr.id2.adr = pr.base.adr+^H3            ; Contains "M"
      pr.id3.adr = pr.base.adr+^H5            ; Contains "S"
      pr.id4.adr = pr.base.adr+^H7            ; Contains $0B

      pr.control.adr = pr.base.adr+^HF ; $08 -> Enable Profibus

      pr.alive.adr = pr.base.adr+^H40E ; Board Alive section
      pr.in.adr = pr.base.adr+^H1000          ; Digital Input section
      pr.out.adr = pr.base.adr+^H1800         ; Digital Output section
      RETURN

.END
```