M-Bus Central Unit

Signal-processor-controlled M-Bus Central Unit for remote supply and remote readout of up to 250 M-Bus devices with data logger function and display

Content

New:

The Central Unit can immediately be served with our free software FService by the service and modem interface. You can download the software and the appropriate operating instructions from our Internet site www.relay.de .

1 Features

- M-Bus Central Unit (automatic data logger)
- M-Bus remote display (Operation on-site by keypad and LC-display)
- Independent M-Bus master (Standalone operation)
- Exports measuring data of all meters into a PC-database
- Operation of all M-Bus meters according to DIN EN 1434-3
- Operation and service by RS232 or modem interface (internal or external)
- Easy software update by serial Interface or modem
- Based on the digital M-Bus levelconverter
- Versions for 250 devices (DR001) and for 120 devices (DR002)
- Up to 1000 devices possible by use of repeaters (DR007)

The M-Bus Central Unit independently records and manages all measured data in a M-Bus installation. Times and intervals for automatic readout are defined practically at will. The permanently stored data can locally be read at any time with a PC. Also it is possible to receive data from the M-Bus Central at almost any location by an optional internal or external modem. The exported data format is suitable for processing with standard databases and table calculations. The customer or caretaker can request the actual meter readings by the built-in keypad and view them on the display.

Order information

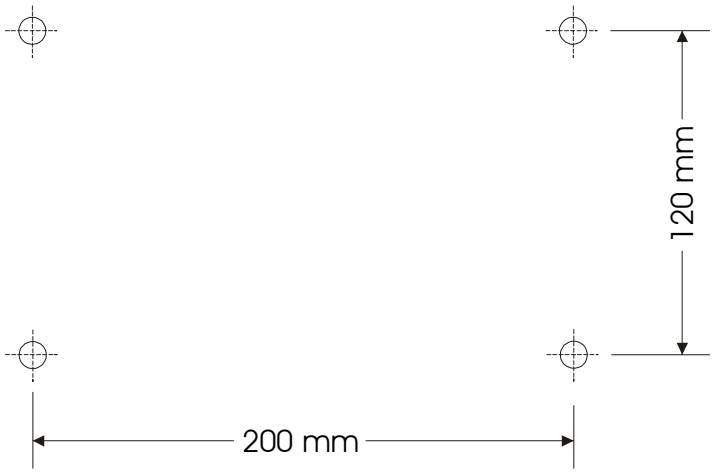
DR001 SNT	M-Bus Central Unit for 250 devices with plug-in power supply
DR002 SNT	M-Bus Central Unit for 120 devices with plug-in power supply
DR001 WNT	M-Bus Central Unit for 250 devices with wall mounted power supply
DR002 WNT	M-Bus Central Unit for 120 devices with wall mounted power supply

MOD004	Internal analog modem (factory installed)
MOD001	External analog modem

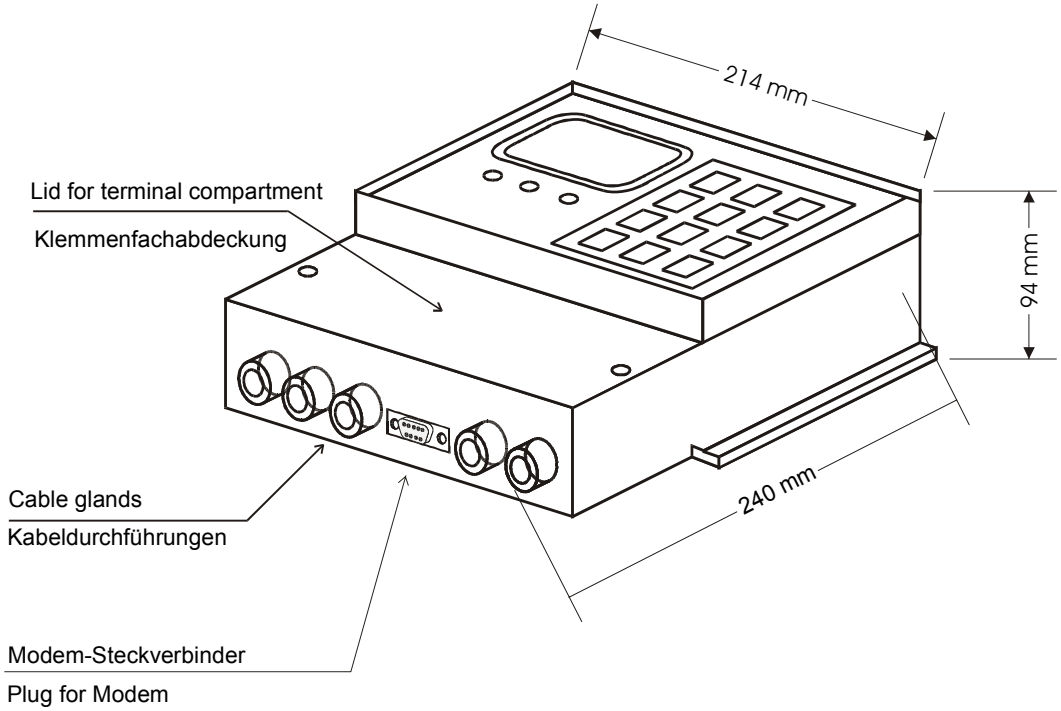
2 Installation

2.1 Mounting

The mounting frame of the levelconverter gets fixed on the wall with 4 screws or is mounted in an enclosure. The following drawing shows where the 5mm wholes have to be drilled:

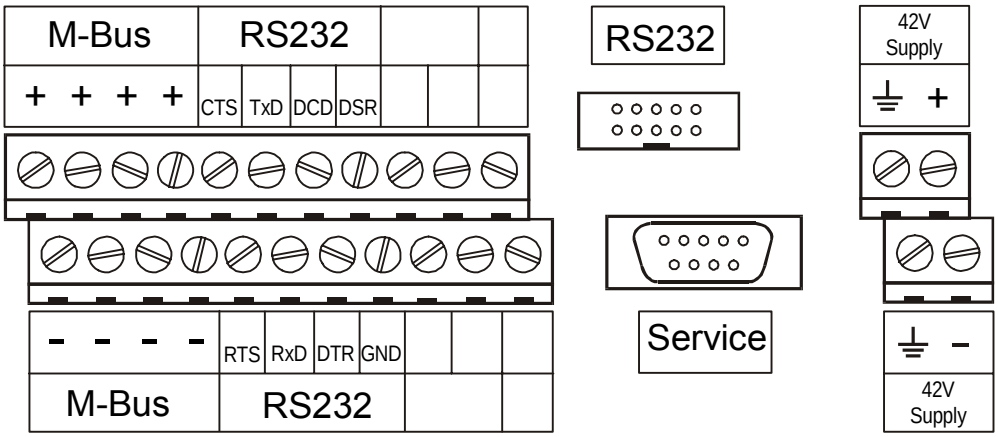


The dimensions of the device can be taken out of the following drawing:



2.2 Connecting

For operation of the device the external power-supply and the M-Bus devices have to be connected according to the following terminal allocation. Additionally the PMZ can be operated and set-up with a Laptop by the service interface. The terminals are reachable when the cover has been removed. All clamps which are not specified here are without function with this level converter. An external modem can be attached either to the interface, inserted outside at the device, or alternatively also firmly to the clamps marked with RS232 (modem).
We recommend the connection to the external interface using the cable delivered with the modem. An external modem first must be configured (see appendix). If factory-installed an internal modem is inserted (order option) only the line has to be put into the analog telephone interface.



M-Bus	**+,-**	4 clamp pairs for M-Bus devices, polarity independent
RS232	**TxD**	Transmit pin of the PC
(Modem)	**RxD**	Receive pin of the PC
	GND	Ground
	CTS	Handshake pin of the PC
	RTS	Handshake pin to the PC
	DTR	Data Terminal Ready from the PC
	DSR	Data Set Ready to the PC
	DCD	Data Carrier Detect to the PC (modem online)
Service		Socket for temporary connection of the RS232C of a PC
Erde	**E42V**	Ground of the 42V-power supply
42V	**+,-**	Power supply 42VDC

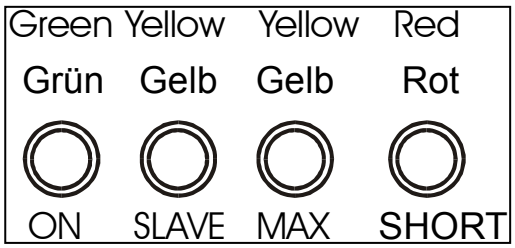
Attention:
We can optionally supply you with a plug-in power supply, or a wall mounted power supply with single wires for fixed connection. The colours of the wires are a little strange:

• Plug-in power supply secundary	braun	brown	42V –
	blau	blue	42V +
	grün / gelb	green / yellow	Erde, Ground
• Wall mounted power supply	braun	brown	42V –
	blau	blue	42V +
	schwarz	black	Erde, Ground

2.3 LED displays

There are 4 light emitting diodes on the plate right beside the screw terminals, which indicate the state of the device and of the M-Bus network:

ON: on → Master sends Mark (1)
off → Master sends Space (0)
SLAVE: on → Slave sends Space (0)
off → Slave sends Mark (1)
MAX: on → regular operating current crossed
SHORT: Flashes with 2 Hz → Over current
on → Bus aus (U_{BUS} = 0V)



2.4 Trouble shooting

- *No LED is on:*
  Check the supply voltage!
- *Red LED (SHORT) flashes:*
  Check the M-Bus wiring for short-circuits between both wires!
- *Yellow LED (MAX) is on:*
  Check the number of connected M-Bus meters!
- *Communication with errors:*
  Check the wiring of the RS232-interface, the wiring of the M-Bus (capacity) and the settings in the software!
- *Single meters can not be readout*
  Check the M-Bus voltage at the meters (min. 24V) and the setup of the software.

3 Technical data

Spannungsversorgung / Power Supply	
Spannung / Voltage	42 V DC (± 5 %)
Strombedarf / Supply Current	max. 630 mA
Leistungsaufnahme / Supply Power	max. 30 W

Geliefertes Netzteil / Power supply incl.	
Eingang / Input	230V~ / 50Hz / 300mA
Ausgang / Output	42VDC / 650mA
Sicherung Steckernetzteil / Fuse plug-in unit	T 630mA
Schutzklasse / Protective class	IP40 (Stecker-Netzteil / plug-in unit) IP30 (Wand-Netzteil / wall-mounted unit)

Gehäuse / Housing	
Abmessungen / Dimensions	H x B x T / H x W x D = (94 x 214 x 240) mm
Schutzart / Protective class	IP 52 nach / according to EN60529
Material / Material	ABS Kunststoff / plastic
Farbe / Colour	anthrazit / anthracite, ähnlich / similar RAL7024
Gewicht komplett / Weight complete	ca. / around 1.4 kg

Umgebungsbedingungen / Environment	
Temperatur Betrieb / Operating temperature	0 .. 55 °C
Temperatur Lagerung / Storage temperature	-20 .. 60°C

EMV-Daten / EMC data	
Störaussendung / Emission	DIN EN 50081-1 EN 55022 Klasse / class B EN 60555
Störeinstrahlung / Immunity	DIN EN 50082-2 ENV50140 ENV50204 EN61000-4-4

RS232-Spezifikationen / Specifications	
Treiberstrom / Driver output current	min. 7mA
Belastung Treiber ohmsch / Resistive load	min. 3kΩ
Belastung Treiber kapazitiv / Capacitive load	max. 2.5nF
Galvanische Trennung / Galvanic isolation	min. 1.0 kV
Spannung / Voltage TX Space (0)	$+5V \leq U_t \leq +15V$
Spannung / Voltage TX Mark (1)	$-5V \leq U_t \leq -15V$
Spannung / Voltage RX Space (0)	$+2.5V \leq U_r \leq +15V$
Spannung / Voltage RX Mark (1)	$-2.5V \leq U_r \leq -15V$

PARAMETER PARAM	DR001			DR002			EINHEIT UNIT
	min.	typ.	max.	min.	typ.	max.	
max. Anzahl Geräte (je 1,5 mA) max. devices (each 1,5 mA)	250			120			
normaler Betriebsbusstrom (Io) normal operating bus current (Io)	0		375	0		180	mA
Anzeige Warnstrom Warning current level	385	410	435	195	210	225	mA
Überstromabschaltung Overcurrent level	470	500	530	235	250	265	mA
Busspannung Mark (Io Bereich) Bus voltage Mark (Io range)	36,0		42,5	39,0		42,5	V
Busspannung Space (Io Bereich) Bus voltage Space (Io range)	24,0		30,0	26,0		31,0	V
Bitschwelle / Bit detection level Slave → Master	5,5	7,0	8,5	5,5	7,0	8,5	mA
Kollisionsschwelle Collision detection level	45	48	51	45	48	51	mA
Max. Gesamte Kabellänge: Max. total cable length: • (9600Bd) (150nF/km) • (2400Bd) (150nF/km) • (300Bd) (150nF/km)	 1000 4000 12000			 750 3000 9000			 m m m
Max. Entfernung zum Slave (alle Slaves am Kabelende) Max. distance to slave (all slaves at end of cable) • JYSTY 1 x 2 x 0.8 mm • NYM 2 x 1,5mm^2	 350 1000			 750 2500			 m m
Max. Kabellänge (Gleichverteilung der Slaves) Max. cable length (slaves are distributed equally) • JYSTY 1 x 2 x 0.8 mm • NYM 2 x 1,5mm^2	 900 2500			 1800 5000			 m m

The maximum distance to the Slave and the entire cable length depend in each individual case on the net topology, the number of attached devices, the cross section of the used cable and the desired transmission rate. Further information on request.

4 Manual

4.1 General information

4.1.1 Switching on

The PadMess M-Bus central (PMZ) can be switched on as follows:

- Press the ON key on the tactile keyboard.
- If an external modem is connected, the unit switches on when a modem-modem connection has been established.
- If an internal PCMCIA modem is fitted, the unit is switched on as soon as a modem-modem connection has been established (DCD).
- The unit switches on at the pre-set readout time (alarm time of the integrated clock).
- If a PC is connected to the service interface, the master station can be switched on by pressing a key on the PC.

4.1.2 Switching off

- If the unit is not used for approximately five minutes (no keystroke on the tactile keypad, or no inputs from the serial interfaces) it switches itself off automatically.
- If the unit is operated by the serial interface, the PMZ may be switched off manually with the menu item “Escape and Switch off”.
- If the unit is not operated remotely and no automatic readout is active, it can also be switched off with the ON key.
- If an established modem connection is interrupted the master station switches itself off automatically

4.1.3 Operation

The PMZ can be operated by the tactile keypad, using the integrated serial service port or an external modem connected to the modem port.

After switching on, the PMZ expects inouts from the tactile keypad. Operation is switched to the input channel in question (or to the relevant interface) depending on whether an input is made to the PMZ through the service interface, from the modem port or from the PCMCIA modem. The tactile keypad is then disabled and the message “Remote control active / Keyboard locked !” appears on the PMZ screen. Inputs cannot be made by the tactile keypad or by another input channel now. To change the input channel the PMZ has to be switched off and switched on again. The input channel by which the first entry was made, is then used for all further inputs; all other input channels are disabled.

By using one of the serial interfaces, the master station can serve as a transparent level converter as well now. The other interface and the readout function of the master station are not impaired. The transparent mode can be activated separately for each interface, however a MODEM that can transmit 11 bits is required for transparent transmission per external MODEM. The baud rate in transparent mode depends on the selected M-Bus baudrate and can be 300, 2400 or 9600 baud. In case of several selected baudrates the central uses 2400 baud for transparent function. In the transparent mode the Central Unit is switched off, after being inactive for approximately four minutes on the service interface and immediately after the connection has been released on the MODEM interface.

4.1.4 Automatic readout

The M-Bus Central Unit allows to read out the connected M-Bus meters at defined intervals; the meter data can be stored permanently. This data can then be read out together by modem or laptop, using

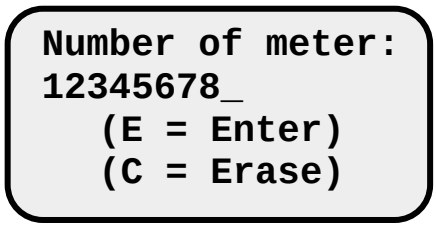
the YMODEM protocol. Read out can be made at ¼ hour, hourly, daily, weekly, monthly and yearly intervals.

Meters can be read automatically by one of two methods. (1) all meters connected at the readout time are searched, (2) meters specified in a list of meters (slave list) are read. The second method is much faster and the meters to be read can be selected manually. The slave list can be created by the master station itself or it can be specified by the operator. If there is no slave list (deleted) the meters are searched.

4.2 Operation by the tactile keypad

4.2.1 Tenant menu

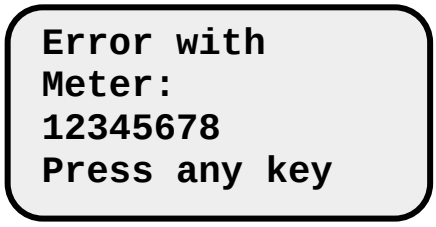
The tenant menu allows every tenant to read out his own meter. Therefore the ID number is used as a passcode for this single meter. After switching on the PMZ expects a meter ID number (secondary address) to be entered. This entry can be made on the tactile keypad (leading zeros need not be entered).



Entering the ID-Nr. (here: 12345678)

Digits entered incorrectliy can be deleted by pressing the “<-” key, the entire entry can be deleted with the “C” key. The input is completed with the „E“ key. After that the PMZ attempts to read the meter with the specified secondary address. If a meter list exists, the central searches for the entered ID-number and uses the primary address for readout if possible. By this also meters which do not support secondary addressing, can be read in the tenant menu. Please refer to „Service menu – Search for meter and meter list“ for the meter list.

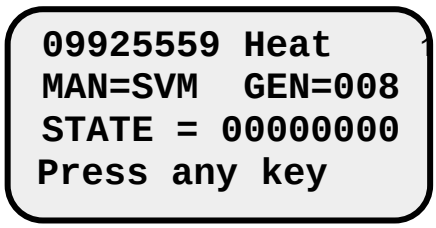
If the meter does not exist or another error occurs, the following error message apears:



Error message at readout (here: 12345678)

Pressing any key returns you to the input request.

After a successfull readout a display page with the following information (ID number, medium, manufacturer´s ID (MAN), version number and M-Bus status (bits)) is shown:



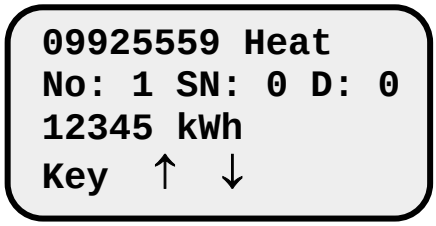
Dipslay after readout of one meter:
Heat meter No. 09925559 of the generation 8
made by SVM, all Statusbits are 0

M-Bus statusbits:

The statusbits are represented binary, what means that every bit position is indicated with 0 or 1. Except of the following three bits, the meaning of the positions depand on the manufacturer and the device:

```
STATE = 0 0 0 1 1 1 0 0
              ↑ ↑ ↑
                  1 = Battery empty
                1 = Permanent error
              1 = Temporary error
```

After pressing a key the first meter reading is shown on the display. If the meter in question puts out a number of meter readings, the individual meter readings can be displayed on the screen with the "↑"- or "↓"-key. What key needs to be pressed to display further meter readings, is shown in the bottom line of the display. By striking any key except "↑" or "↓" the PMZ returns to the initial menu, so the next ID-number can be entered.



Screen after readout of a meter:
Heat meter No. 09925559
Data record No.1, Storage No. 0, Device 0
Meter reading: 12345 kWh

Shortcuts:

No: Number of data record (number of the shown data record)

SN: Storage number (Due-date No., SN = 0: actual value, SP <> 0 : Due-date value)

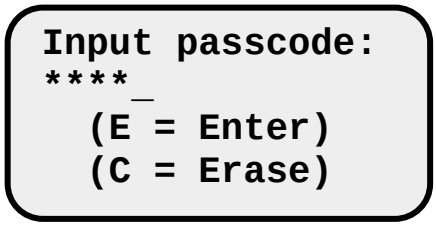
D: Device of the meter only for combi meters (eg. Heatmeters with additional pulse inputs; eg. D = 1 for pulse input 1; D = 0 for main meter)

The master allways shows all data records, which are contained in the M-Bus answer telegram of the meter. Multi telegrams are not supported, so only the first answer telegram is evaluated.

The informations are represented in the same order as you can find them in the M-Bus telegram of the meter. The shown unit of the meter reading depands on manufacturer, device, and configuration of the device and is the same as in the M-Bus telegram.

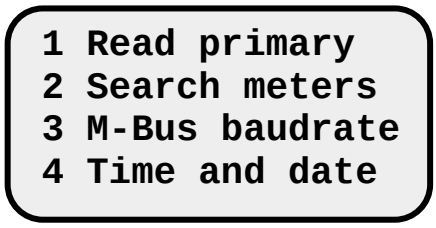
4.2.2 Supervisor Menu

By pressing the “F1”-key you enter the “Supervisor”-menu. To get into it, you first have to enter the passcode (which only can be changed via the serial interface and not by the tactile keypad). The preset passcode is „1767“.



Input of passcode

A wrong passcode creates a short error message and returns you to the input request. If the input is correct, you can select further PMZ functions:



Readout of the meters primary address
Search for connected meters
Submenu to adjust M-Bus baudrate(s)
Submenu to adjust time and due-date

1 Read primary

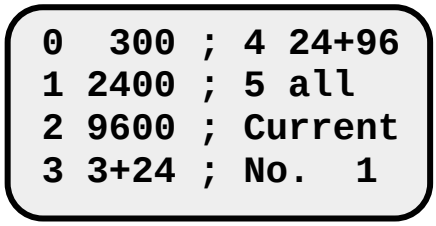
Analog to the readout by the ID number (secondary address), as described above, you can do the readout by the primary address. The operation is exactly the same as described in the tenants menu. In opposite to this, the primary address in the range from 1 to 250 needs to be entered. If only one meter is connected to the PMZ, the global address 254 can be used, else readout by primary address is only possible if the meters are configured with the right primary address. The setup of the primary address has to be done with the tools of the meter manufacturer.

2 Meter search

With this menu item a meter search can be performed. The PMZ searches for all primary addresses from 0 to 250 and displays the meter readings of the found meters on the screen. If there are several meter readings, the individual meter readings can be shown with “↑”- or “↓”-key. If you press any key the search is continued. After the PMZ has reached the primary address 250, or the “C”-key has been pressed, the primary search is finshed and a search for secundary addresses and wildcards is started. The meter readings are then displayed in the same way as at the primary search. When the secondary search has ended or the „C“ key is pressed once more, the search is stopped and the „Supervisor“ menu appears again.

3 M-Bus baudrate

If this option is selected, a further menu, in which the M-Bus readout baudrates can be specified, appears:



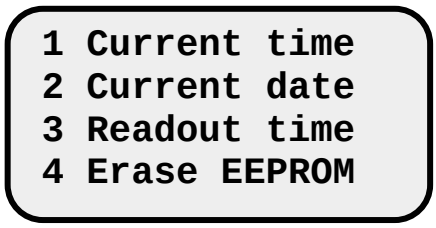
0: 300 baud
1: 2400 baud
2: 9600 baud
3: 300 and 2400 baud
4: 2400 and 9600 baud
5: 300, 2400 and 9600 baud

The current selected option is also displayed (here: No.1: 2400 Baud). By pressing a key from 0 to 5 the baudrate is changed to the selected option. If you have selected an option which is specified with several baudrates, the system attempts to read the meter with the highest baudrate, then the next lower baudrate, and so on until the meter responds. With primary and secondary addressing the baudrate is reduced until the specified meter responds. Generally all baudrates are checked in the meter search, if there is no slave list. By pressing “E” or “C” the supervisor menu appears again. The selected M-Bus baudrates are stored permenently in the PMZ, so that they are not lost if the unit is switched off.

The PMZ is preset on 2400 baud. This is the common transmission speed of the most M-Bus meters. If the used meter should only be able to communicate with 300 baud, the baudrate can be set to 300 and 2400 or only 300 baud.

4 Time and date

If this option is selected, an other menu appears in which the current time (1), the current date (2) and the readout time(3), can be set. With item 4 of this menu, all meter readings stored in the flash EPROM can be deleted.



1: Set the internal clock
2: Set date of the internal clock
3: Set readout time and mode
4: Erase all meter readings in the EEPROM

Within the following screen dialogues these special keys can be used:

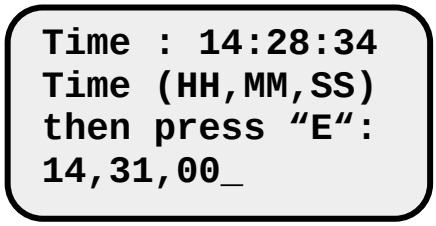
“<-”-key: erase last letter (Backspace)

“C”-key: erase all letters

“E”-key: Input

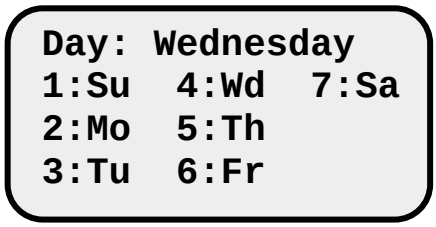
Invalid inputs are ignored. If the input is valid, the selected input is displayed on the screen. Direct pressing of the “E”-key without a previous input confirmes the old settings in the same way as with the “C”-key.

1 Current time



Input of a new time

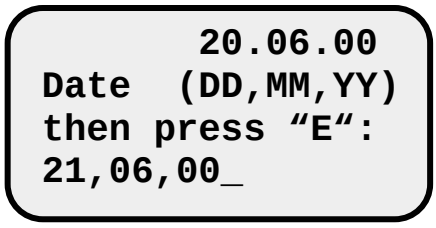
When the actual time has been entered and the „E“-key was pressed for confirmation, the program asks for the day of the week with the following screen:



Input of a new day of the week

The day of the week is selected by pressing the shown key. The actual selection is shown in the first line.

2 Current date:



Input of a new date

3 Readout time

In this menu the time and the mode for automatic readout of all meters is selected. For this first the readout mode (intervall) is requested. The actual chosen mode is displayed in the first line.

Input of a new readout mode

Following intervalls are selectable:

0:	no automatic readout	3:	weekly readout
1:	hourly readout	4:	monthly readout
2:	dayly readout	5:	yearly readout

6: every quarter of an hour (**Note:** This option is hidden because there is not enough place)

Depending on the chosen mode, the PMZ after that asks for the readout time, the day of the week (only for weekly readout), the day (only for monthly readout) or the date (only for yearly readout). Readout always starts five minutes after the selected time.

```
Alarm : 00:00:05
Alarm (HH,MM,SS)
then press “E“:
14,00,00_
```

Input of a new readout time

```
Day: 01
(1..28)

15_
```

Input of a new day for monthly readout

Before: At the 1st of each month

After : At the 15th of each month

```
Day: 31.12
(1..28,1..12)

01,01_
```

Input of a day for yearly readout

Before: At the 31.12 of each year

After : At the 01.01 of each year

4 Erase EPROM

By choosing this item you get the possibility to delete all measuring data stored in the not volatile memory, only the parametrization values and the meter list are not deleted. In order to prevent a delete by oversight the PMZ expects the code „123E“. If this code is not put in correct, the meter data are nor deleted.

```
All meter data
 Will now be
   erased!
“123E“ or “C“
```

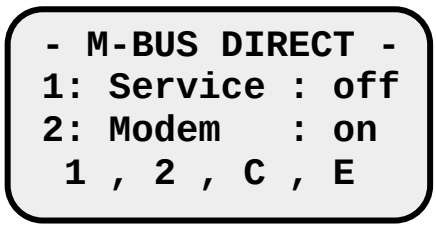
Erasing all meter data!

By pressing the“C”-key in the “Time/date“ menu you can return to the “Supervisor“ menu.

By pressing the“C”-key in the “Supervisor”-menu you can get back to the “Start“- menu (only secondary addressing possible).

5 Transparency function

If you press the “F1“-key in the “Supervisor“-Menu, you enter an other menu, in which the service interface and/or the external modem interface can be switched tranparent (direct). By pressing of the key “1“ the transparent mode for the service interface and with the key “2“ for the modem interface can be switched on or off. The “C“-key aborts the menu without saving the changes. The “E“-key does the same, but with activating the changes.



Menu tranparent function:
Service interface: not transparent
Modem interface: transparent

You can find more description to the transparent-function in chapter 4.1.3 “Operation“. A Central Unit which is switched to the transparent mode can only be read out directly by a M-Bus program. It is not possible to access it with a terminal program until this menu option is deactivated.

IMPORTANT NOTE: You have to be sure that after work in the “Supervisor”-Menu is completed, you have returned into the “Start“-menu by pressing the “C”-key, perhabs several times. Otherwise it is possible that someone not authorized enters the “Supervisor“-menu and might erase all meter data, before the PMZ switches off automatically (5min).

4.3 Operation by serial interface

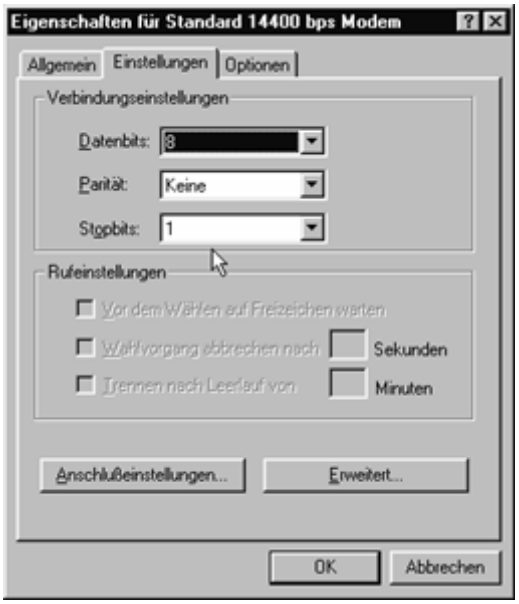
You can download our free software FService on our web site www.relay.de. This software offers you an easy access to all functions of the Central Unit by the serial interface using the local service connector or a remote modem connection. Please refer to the manual of FService.

For operating the Central Unit with a PC, you can also use any terminal program with YMODEM-(Batch) support. Suitable programs are e.g. the HyperTerminal, contained in Windows, or ZOC. of Emtec (WWW.EMTEC.COM). All following screen shots refer to the operation with HyperTerminal.

The settings are 9600 Bd, 8 data bits, no parity, 1 stop bit and ANSI emulation. When the PC is connected directly to the service interface of the M-Bus Central Unit, the handshake option of the software must be switched off (none XON/XOFF, no RTS/CTS = hardware). During the operation by modem, the RTS/CTS handshake (hardware) should be activated.

Interface settings: Service-mode

Connection settings: Service-mode



Interface settings: Modem-mode

Connection settings: Modem-mode

If an entry is made by one of the serial interfaces, the PMZ automatically switches into this entry mode and locks all other entry modes including the keyboard. The following note appears on the LCD:

```
Remote control
   active

Keyboard locked!
```

After the first key-stroke the following screen appears on the PC:

The operation by serial interface is generally protected with a password. After a further key-stroke the Central Unit requests the user to enter the passcode. The preset passcode is 1767.

After input and confirmation of the pascode with < Enter > the program starts in one of the following operatings mode. The mode which is entered depends on the passcode. The Central Unit offers several access options:

4.3.1 Command menu

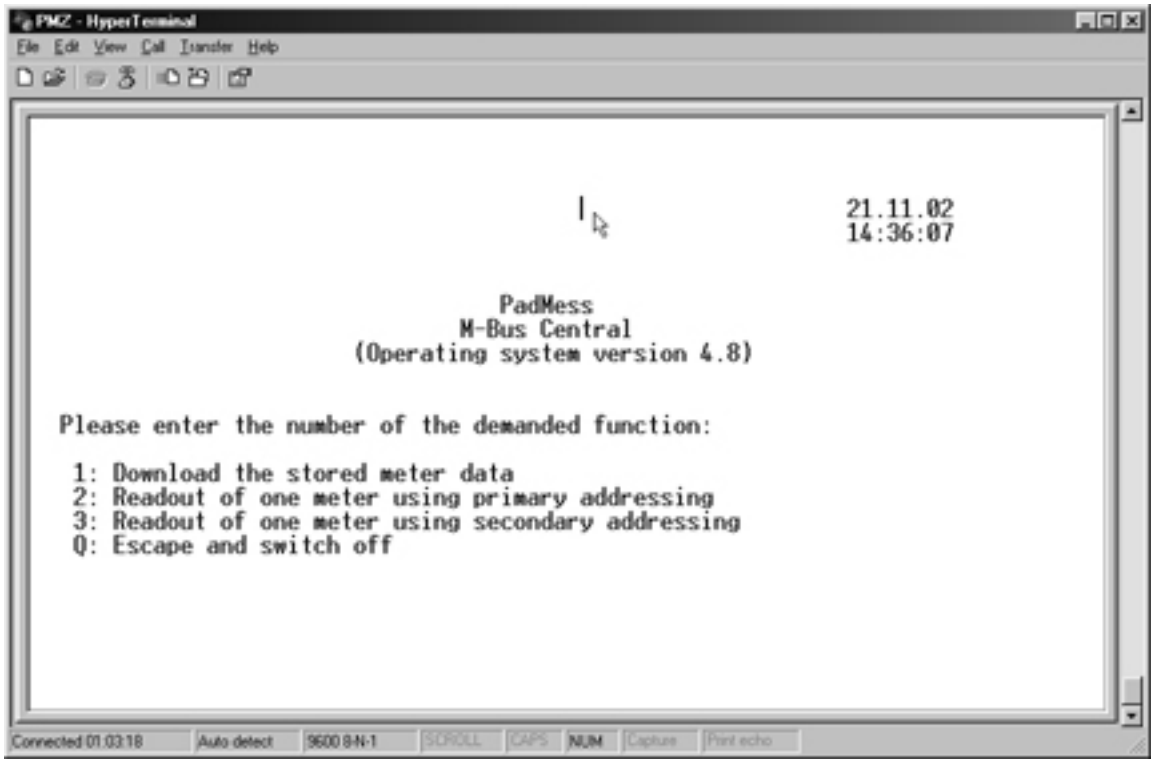
In this operating mode the operation takes place with the help of so called ESC sequences by a customized program. In the following we give no further information to this menu, but we want to reffer on the documentation PMZCOMvv.DOC. (vv = version No., e.g.. 12 for version 1.2).

4.3.2 Reader menu

This menu is automatically started after input of the Readers passcode. Here the user can only readout the stored data, readout individual meters primary or secondary and switch the center off again. Thus the equipment is protected in relation to faulty operation, or manipulation by the reader. The Readers passcode can be adjusted only in the service menu.

Menu options:
1: Readout the stored meter data
2: Readout of one meter using primary addressing
3: Readout of one meter using secondary addressing
Q: Escape and switch off

You can find further information to this options in chapter 4.3.3 Service menu.
(1.1: Readout the stored meter data / 2: Readout of one meter using primary addressing / 3: Readout of one meter using secondary addressing / Q: Escape and switch off).



Readers menu

You can select the appropriate menu option by pressing the placed in front key (here: 1, 2, 3, or Q).

4.3.3 Service menu

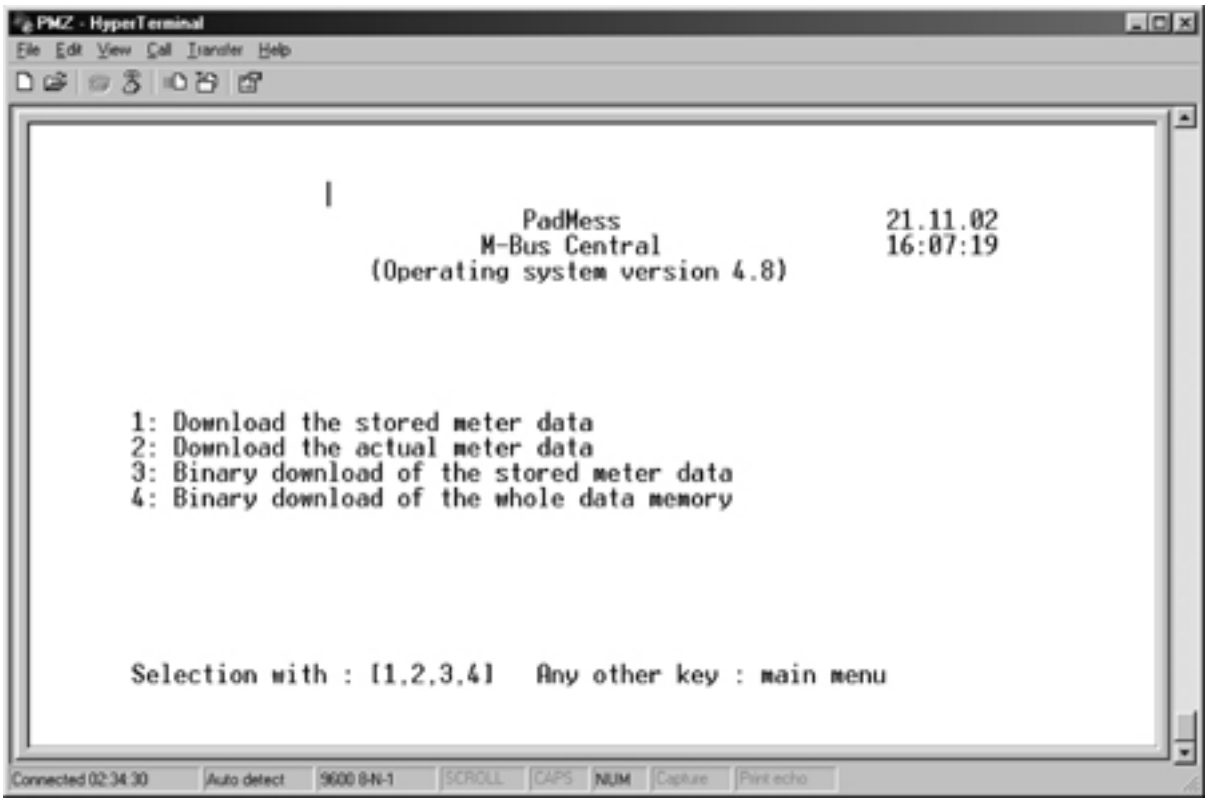
This menu is automatically started after input of the service passcode. The adjustable passcode is identically to the passcode, which must be entered on the tactile keyboard, in order to get into the Supervisor menu (s.o.). In the following the service menu is described:

Service menu

The appropriate menu option is selected by pressing the key which is placed in front of it.

Menu option 1: Read out of all meter data

If this option is selected a further menu appears:



Menu option 1.1: Download the stored meter data

With this menu option all meter data readings in the Flash EPROM of the PMZ can be read out to the terminal computer by YMODEM (Batch). After selection of this menu option only the Download by YMODEM must be activated on the terminal computer. If you use HyperTerminal you can start receiving by selecting the menu option “Transmission-file receive”. In addition to this see the illustration on the next side.

If no meter readings are stored in the Flash EPROM, no file is sent. The meter readings are put out sorted according to media and the files OTHER.XLS, ELECTRIC.XLS, GAS.XLS, HEAT.XLS, STEAM.XLS, HOTWATER.XLS, WATER.XLS, HKV.XLS, RESERVERD.XLS OIL.XLS, AIR.XLS, BUS.XLS, COOLING.XLS, HEATCOOL.XLS, COLD_WTR.XLS, DUAL_WTR.XLS, PRESSURE.XLS, AD_CONV.XLS and ERROR.XLS are eventually sent. If no meter reading of a certain medium is stored in the Flash EPROM, the appropriate file is not sent. The file ERROR.XLS contains the meter data, which announced an error in the m-bus-status at the readout time.

Data readout by Ymodem (Batch)

Menu option 1.2: Download the actual meter data

With this menu option all meter readings, which were found with a manual meter search (see point 4) can be put out by YMODEM (Batch) protocol to the terminal computer. These meter readings are also sent, sorted according to media with the ending XLS, to the terminal computer. Meter-readings found by manual meter search are only stored in the main storage of the PMZ and so they are lost when the Central Unit is switched of. If no manual meter search was made before selecting this menu option, an error message is shown.

Menu option 1.3: Binary download of the stored meter data

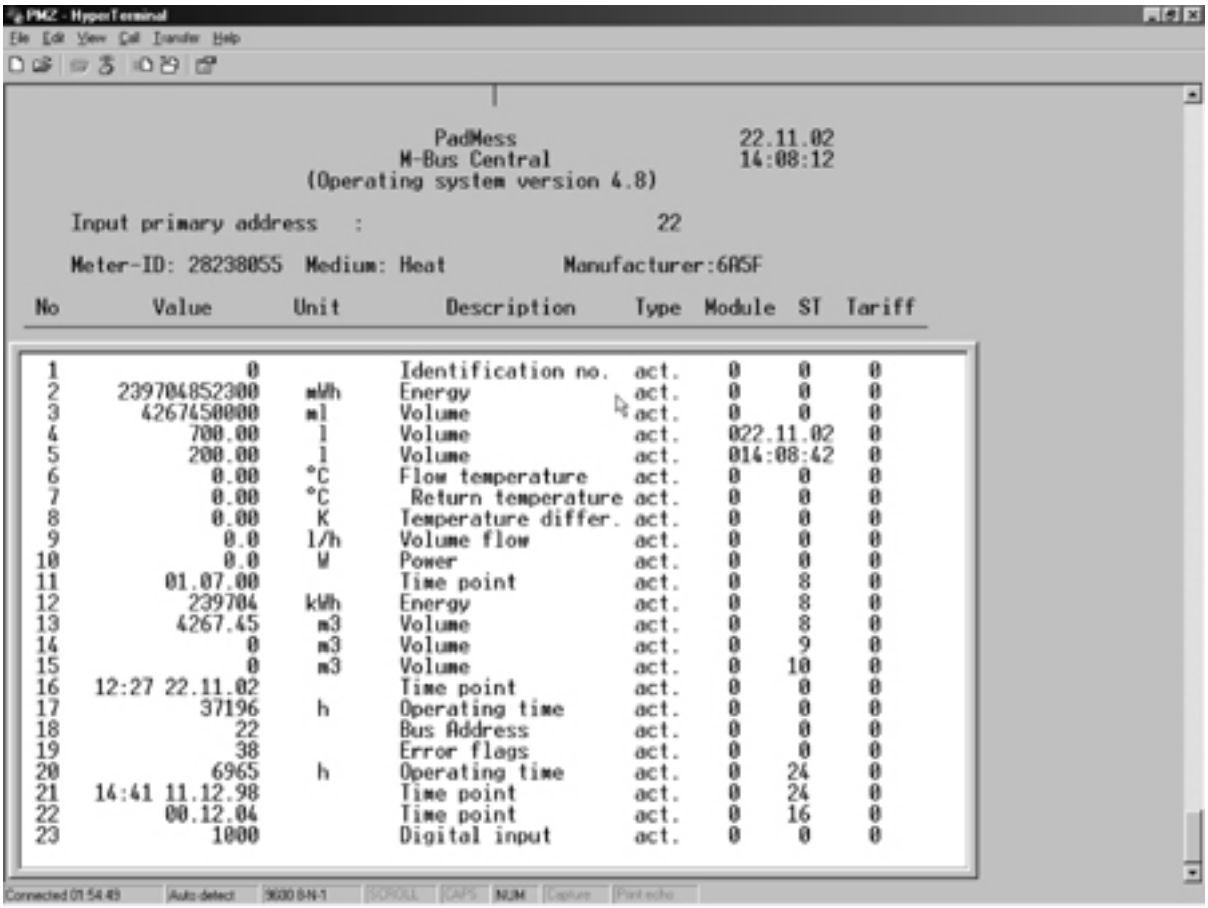
With this menu option the used content of the Flash EPROM (meter readings) is sent unsorted binary by YMODEM (Batch) protocol to the terminal computer. The file ZENTRALE.BIN is generated. The difference of this menu option to point 4 is, that only the storage areas really occupied with data will be transfered.

Menu option 1.4: Binary download of the whole data memory

With this menu option all content of the Flash EPROM (meter readings) is sent unsorted binary by YMODEM (Batch) protocol to the terminal computer. The file ZENTRALE.BIN is generated. This option was implemented only for test purposes and can possibly be used in emergencies, if sorted output of the meter readings does not work correctly. Out of the binary file the meter readings can possibly be reconstructed and/or the error cause be confirmed.

Menu option 2: Readout of one meter using primary addressing

After input of a primary address 0..250 or 254 (only one meter connected) the meter readings are displayed. By striking of RETURN, without entry of a primary address, you get back to the main menu.



```
                                PadMess                    22.11.02
                            M-Bus Central                  14:08:12
                        (Operating system version 4.8)

    Input primary address   :                      22

    Meter-ID: 28238055  Medium: Heat          Manufacturer:GRSF

 No       Value       Unit        Description     Type  Module  ST  Tariff

  1           0                   Identification no.  act.    0     0     0
  2   239704852300    mWh         Energy              act.    0     0     0
  3    4267450000     ml          Volume              act.    0     0     0
  4        700.00      l          Volume              act.    022.11.02     0
  5        200.00      l          Volume              act.    014:08:42     0
  6          0.00     °C          Flow temperature    act.    0     0     0
  7          0.00     °C           Return temperature act.    0     0     0
  8          0.00      K          Temperature differ. act.    0     0     0
  9           0.0    l/h          Volume flow         act.    0     0     0
 10           0.0      W          Power               act.    0     0     0
 11      01.07.00                 Time point          act.    0     8     0
 12        239704    kWh         Energy              act.    0     8     0
 13       4267.45     m3          Volume              act.    0     8     0
 14             0     m3          Volume              act.    0     9     0
 15             0     m3          Volume              act.    0    10     0
 16   12:27 22.11.02               Time point          act.    0     0     0
 17         37196      h          Operating time      act.    0     0     0
 18            22                 Bus Address         act.    0     0     0
 19            38                 Error flags         act.    0     0     0
 20          6965      h          Operating time      act.    0    24     0
 21   14:41 11.12.98               Time point          act.    0    24     0
 22      00.12.04                 Time point          act.    0    16     0
 23          1000                 Digital input       act.    0     0     0
```

Representation of the data of one meter

Menu option 3: Readout of one meter using secondarry addressing

The meter readings of the meter with the indicated secondary address (identification number) are put out. By striking of RETURN, without entry of a secondary address, you get back to the main menu. After successful readout the data are displayed exactly as in menu option 2 on the screen. Note: Not all m-bus meters can be readout by secondary addressing.

Menu option 4: search for meter and meter list

If this option is selected another menu appears.

Menu option 4.1: Search for meter without generating a meter list

With this menu option first a search for primary addresses of connected meters is accomplished. If the address 250 is reached, a secondary address search is accomplished. By striking a key, both the primary as well as the secondary search, can be aborted (note: The abort may be late effected, if at present a metersearch is going on. Espacialy with 300 Baud this can last up to 3 seconds). If search is done with several M-Bus baud rates, you can change to the next baud rate by pressing a key.
All found meter readings will be displayed and additionally stored in main memory (even if meters were found during the primary and the secondary search, they are stored only once). The meter readings existing in main memory can be sent with the menu option 1 (readout of current meter readings) by YMODEM (Batch)-protocol to the terminal computer. All meter readings existing in main memory are deleted, if a new search for connected meters is started. This search does not generate a meter list.

Menu option 4.2: Search for meter including the generation of a meter list

Similar to the previous menu option a search for meters can be accomplished with this menu option. The difference to the other menu is that the found meters are registered into the meter list used with the automatic readout. This meter list is stored permanently.

Menu option 4.3: Readout of meter list

This menu option starts the readout of the list of slaves by YMODEM (Batch) protocol. The file SLAVELIST.PMZ is produced on the PC

Menu option 4.4: Upload and storage of meter list

With this menu option the list of slaves can be transferred from the PC into the Central Unit and be stored there. An already existing list of slaves is deleted after transmission. Thus the supervisor e.g. can exclude individual meters from the readout, by removing them from the lst of slaves selected before. The list of slaves must be compressed with the support program COMPSL.EXE before being transmitted into the Central Unit. See appendix.

Menu option 4.5: Erase the meter list

This option deletes the Slaveliste in the Central Unit and thereby activates the search during the automatic readout.

Menu option 5: Changing the M-Bus baudrates

If this option is selected, a menu in which the Baud rates for M-Bus readout are specified, appears: 0: 300 Baud; 1: 2400 Baud; 2: 9600 Baud; 3: 300 and 2400 Baud; 4: 2400 and 9600 Baud; 5: 300, 2400 and 9600 Baud. The current selected option is likewise represented. By striking of one of the keys from 0 to 5 the M-Bus Baud rate can be changed. If an option is selected, for which several Baud rates are indicated, it is first tried to readout the meter with the highest Baud rate, after that with the next lower, until the meter answers the request. During the primary or secondary addressing the Baud rate is only degraded until the indicated meter announces itself. During the meter search without Slavelist all Baud rates are generally tried out. By striking of another key one turns back into the main menue. The selected M-Bus Baud rates are permanently stored in the PMZ, so that they are not lost when switching off.

Menu option 6: Changing time and date

With this option the time and the date can be set. The format (e.g. HH:MM:SS) must accurately be kept. A wrong input is rejected. During a correct input the time and/or the date is set immediately again. By pressing RETURN without input no change of the time or of the date is done. Additionally the day of the week (Sunday until Saturday) is required by the Central Unit.

Menu option 7: Changing automatical readout time

With this option a new readout time and a new readout mode can be set for the automatic readout of all meters and storing them into the Flash EPROM. After input of the readout mode (deactivated, every quarter of an hour, hourly, daily, weekly, monthly or yearly) the Central Unit asks for the necessary data (time, weekday, day in the month or day + month). Note: After the PMZ has “woken up“ at the readout time, the automatic meter readout is not done immediately, but only after the PMZ is not used for approx. 5 minutes. That means that the readout only takes place before regular switching the PMZ off.

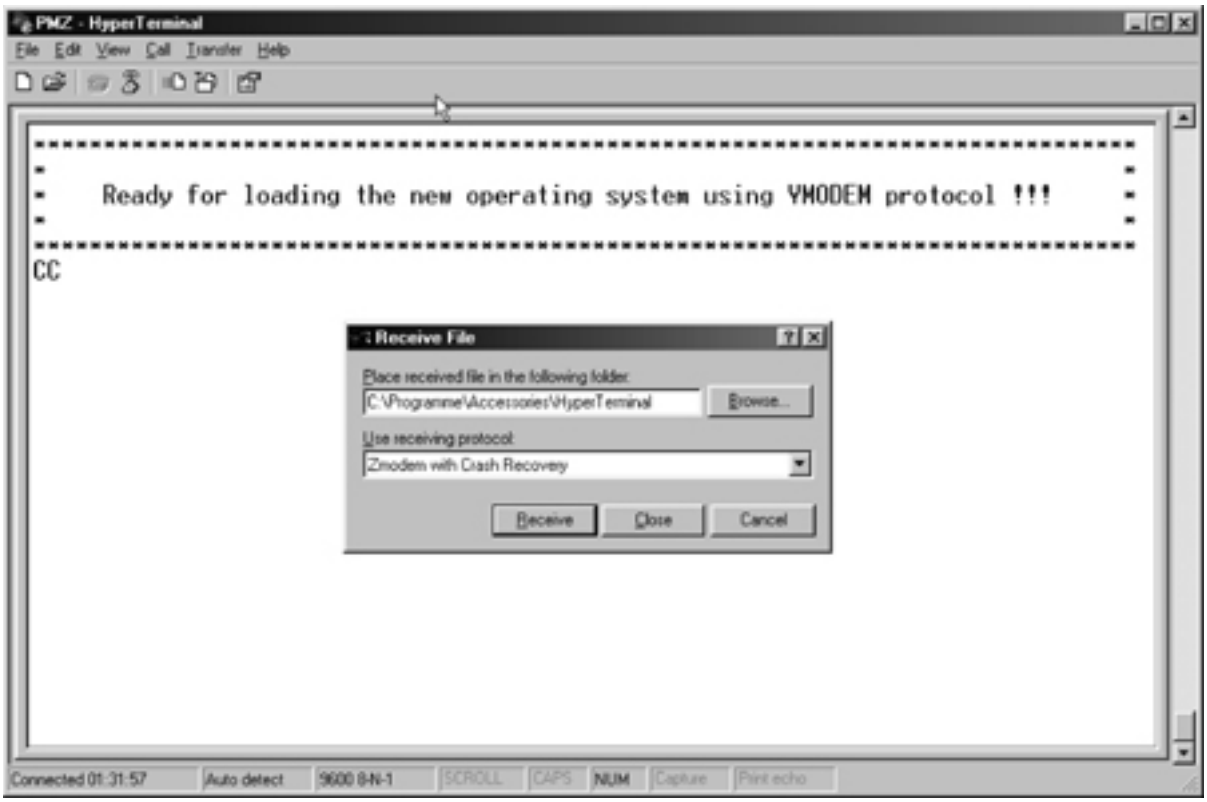
When delivered the automatic readout is deactivated.

Menu option 8: Changing the terminal baudrate

Hereby the interface speed of the service interface can be setup (note: Baud rates above 19200 in general only can be used with terminal computers with buffered serial interfaces). The Baud rate is stored not permanent and sets itself back again on 9600 Bd after a RESET. The interface speed for the external and internal modem is fixed on 9600 Baud and cannot not be changed with this menu option.

Menu option 9: Updating the operating system

With this option the operating system in the Flash EPROM can be renewed. This can be done either directly, locally with a laptop or by remote transmission with a modem. Therefore the appropriate binary file with the new operating system has to be transmitted by YMODEM (Batch) protocol to the PMZ (note: While the Flash EPROM is programmed with the new operating system, the supply voltage may not be switched off, otherwise the PMZ is no longer operable and the Flash EPROM has to be re-written with an EPROM programmer. The programming of the Flash EPROMS begins however only if the operating system file was transmitted correctly. An abort during the transmission of the files is not tragic). The size of the file is 192 kByte



Update of the operating system

The operating system is available in different languages. The name of the file that has to be transmitted is constructed as follows:

PADMvvss.SYS

vv = Version v.v (e.g.. vv= 40 means Version 4.0)
ss = Language (D: GEMAN, E:ENGLISH, F: FRENCH, I:ITALIAN, SL:SLOVANIAN, FI:FINNISH)

You can get the actual program versions by email from AP@RELAY.DE .

After programming the Central Unit switches itself off and terminates a possibly existing modem connection. By pressing a key and/or a new readout by the modem, the Central Unit then starts with the new operating system.

Menu option 0: Configuration of the central

At this menu option the user gets more information about the hardware -, software-Versions, the installed MODEMS, can change various parameters and configure a possibly existing internal (PCMCIA -) MODEM. The following parameters can be adjusted: Service passcode, Readers passcode, Address and the options Hydrometer DYLINE-E / Sontex meters. These parameters are stored permanently and are not lost when switching the central off. If RETURN is pressed without input, existing contents are not changed.
The Service Passcode serves as access code for the Service and Supervisor menu and can cover maximally six numbers. The readers passcode allows the entrance to the Readers menu and can cover max. 4 numbers. The address is free selectable with max. 32 digits and is transmitted in the header of the files with the meter readings (s.o.).
An option specifies whether the automatic summer/winter time conversion is activated. The conversion winter time - > summer time of the inserted real-time clock incorrectly takes place on first Sunday in April instead of the last Sunday in March. For this it is possible to alternatively switch this function completely off.
A further option defines whether Neovac SX700 heatcost allocators / Sontex Supercal heat meters or Sontex IF645 pulse meters are attached. If one of these is attached, the maximally allowed reply time for the slaves at 2400Baud is increased to round about half a second. Is this menu option activated, read out of devices in the bus system will slow down. The options “Service interface transparent” and “MODEM interface transparent” can likewise be set here and are then activated after the next restart.

Menu option L: Delete all stored meter readings

With this menu option all meter data stored in the Flash EPROM of the central can be deleted. This option should be called only once with the installation of the central, in order to have a correct starting point for the storage of the meter data. Otherwise this option is to be used only in emergencies, if for any reasons serious errors in the selected meter data files arise. The central requests the user for the avoidance of an inadvertent deletion of the data to enter the letter sequence "123E". Only after correct input the data are deleted. The parametrization data and the meter list remain in any case.

Menu option Q: Quit and switch off

Hereby the PMZ is switched off and the terminal connection is separated. In order to return the PMZ into the starting situation, this option should always be called for the end of a terminal session. If the connection is cut without call of "Quit and switching off", the PMZ still remains for approx.. 5 minutes (up to automatic switching off) on and can be attained only by means of the service interface. If an internal or external modem is attached to the PMZ, it is initialized new.

5 Appendix

5.1 Information for storage of the meter data in the Flash-Eprom

For storage of meter data a 256 kByte large range in the Flash EPROM of the PMZ is reserved. The complete M-bus-telegram for each read out and each meter is stored with date and time of the read out. The storage area is written circuitly, i.e. if the range is full, the oldest data will be overwritten. However it has to be noted, that then blocks of 64 kByte in each are deleted. The number of the storable data records therefore strongly depends on the number of the attached meters and their M-bus telegram length. The number of storable readouts N, for the concrete installation, results from the following calculation:

N = 262144 / Sum of all meter data of one readout

The length of the stored report results from the m-bus telegram length + 12 indications for date and time.

5.2 Information for start-up with modem

The optional, internal (PCMCIA -) MODEM is installed and configured by the manufacturer. In this case only the telephone cable and the terminals marked with S1A and S1B have to be attached. An external MODEM is delivered (including the cable) and configured by the manufacturer on demand. This MODEM can either be attached to the terminals CTS, TXD, DSR, DCD, RTS, RXD, DTR and GND with a 8-line cable, or to the 10-pin tub marked with RS232 using a special cable. If it is desired, this connection can also be led out of the housing as a DB9-plug. Then a standard interface cable, which is supplied with the most modems, can there be attached and locked with thumb screws.
A customer provided external MODEM should be configured with the PC software INITMODM.EXE. This program initializes the MODEM with AT commands, which are loaded from a ASCII file definable as parameters. For this the MODEM is attached to a serial interface of the PC (COM1 or COM2), the power supply of the MODEM is switched on and the program e.g. with the following parameters is started:

INITMODM 1 TRUST14.PMZ : initializes the MODEM on COM1 with AT-commands out of TRUST14.PMZ

The following settings are meaningfull for most MODEM´s:

AT	* for Baud rate detection
AT&F	* loading factory settings
ATL0M0	* loudspeaker quiet / off
AT&C1	* CD signal, if carrier of the remote modem is available
AT&D3	* after DTR signal “dropp” the modem accomplishes a reset
AT&S0	* DSR always on
ATS0=2	* the modem answers the call after the second ring (Auto-Answer)
AT&W0	* saving the configuration in the non-volatile memory 0

After configuration the MODEM can be attached to the Central Unit.

5.3 Basic settings

When delivered, the following settings are active:

-Automatic read out is deactivated	-Meter list deleted	-Data deleted
-M-Bus Baudrate 2400 Bd	-Passcode 1767	-Readers passcode 1234
-conversion winter-/summer time activated	-Sontex deactivated	-Interfaces not direct

5.4 Slave lists

Input of the slave list:

You can use any editor – e.g. Turbo Pascal - , if you follow these rules:

- In the first line of the file it is possible to write anything. Text lines are ignored by the program.
- At the beginning of each slave list line, the three digit primary address has to be located. Zeros, placed in front can be replaced with blanks, represented by `.` in the example.
- Two blanks follow.
- After that the eight digit secondary address has to be placed.
- At least one more blank.

These defaults must at least be fullfilled, to create a search entry in the Flash. Th efollowing data do not have to be given, to read out a meter with the search list. Even if available they are considered at the search.

Example file:

```
Adr........ID..Manufac..Version..Medium..MBusBaud
..4..00000040......PAD........5.......2.........0
101..50000004......SLB........1.......4.........3
..0..51300385......TCH.......37.......4.........5
..0..12345678.....FFFF......255.....255.........0

(1..3)   (6........13)          (19..22)          (29..31)       (37..39)
(49)
Cursorpositions
```

Notes:

- With addr = 0 is secondary addressed with ID manufact, version, medium
- Wildcards: Manufact = FFFF, Version = 255, Medium = 255
- MBusBaud: 0 → 300 Bd, 1 → 600 Bd, 2 → 1200 Bd, 3 → 2400 Bd, 4 → 4800 Bd, 5 → 9600 Bd

The slavelist, edited according to the example above, has to be compressed with the PC program COMPSL.EXE. Aftre that it can be transferred and saved to the Central Unit using the menu option “Search for meter and meter list” and the submenu “Upload and storage of meter list”.

5.6 XLS-files

The meter readings are read out in the XLS format, which might be imported to nearly any database or spread-sheet calculation. The columns are seperated by tabulators and new lines are generated by a CR (#13#10).

An example file:

Heat.xls		**Stettiner Str. 38**										
Datum	**Zeit**	**Adr**	**ID-Nr.**	**HST**	**Nr.**	**Wert**	**Einheit**	**Beschreibung**	**Art**	**Modul**	**SP-Nr**	**Tarif**
13.08.02	10:41	0	208959	KST	1	1.1	kWh	Energie	akt.	0	0	0
					2	300	l	Volumen	akt.	0	0	0
					3	01.01.02		Zeitpunkt	akt.	0	1	0
					4	0	kWh	Energie	akt.	0	1	0
					5	0	l/h	Durchfluß	akt.	0	0	0
					6	0.00	kW	Leistung	akt.	0	0	0
					7	26482	m°C	Vorlauftemperatur	akt.	0	0	0
					8	26104	m°C	Rücklauftemperatur	akt.	0	0	0
					9	378	mK	Temperaturdifferenz	akt.	0	0	0
					10	208959		Fabrikations-Nr.	akt.	0	0	0
13.08.02	10:41	0	208963	KST	1	1.1	kWh	Energie	akt.	0	0	0
					2	265	l	Volumen	akt.	0	0	0
					3	01.01.02		Zeitpunkt	akt.	0	1	0
					4	0	kWh	Energie	akt.	0	1	0
					5	0	l/h	Durchfluß	akt.	0	0	0
					6	0.00	kW	Leistung	akt.	0	0	0
					7	27182	m°C	Vorlauftemperatur	akt.	0	0	0
					8	26949	m°C	Rücklauftemperatur	akt.	0	0	0
					9	233	mK	Temperaturdifferenz	akt.	0	0	0
					10	208963		Fabrikations-Nr.	akt.	0	0	0
13.08.02	10:41	0	208968	KST	1	1.2	kWh	Energie	akt.	0	0	0
					2	307	l	Volumen	akt.	0	0	0
					3	01.01.02		Zeitpunkt	akt.	0	1	0
					4	0	kWh	Energie	akt.	0	1	0
					5	0	l/h	Durchfluß	akt.	0	0	0
					6	0.00	kW	Leistung	akt.	0	0	0
					7	25679	m°C	Vorlauftemperatur	akt.	0	0	0
					8	25822	m°C	Rücklauftemperatur	akt.	0	0	0
					9	143	mK	Temperaturdifferenz	akt.	0	0	0
					10	208968		Fabrikations-Nr.	akt.	0	0	0