



Operation and Settings of CPU & Power Modules, series 9440

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Target group:

Trained, qualified staff
(in accordance with ElexV, IEC 79-17)

Subject to change and correction without notice

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IS1 Operation

The LCD display in running operation.

| | | |
|-------------------|------|-----|
| FBA _{dr} | FB | I/O |
| vvvxxx | yyyy | zzz |

| Text | Meaning | Range of Values | |
|------|----------------------|-----------------|---|
| vvv | FB address | --- | No valid address |
| | | vvv | Address 0...127 |
| xxx | Only for Profibus | " " | Primary CPM (no further details for "STAHL redundancy") |
| | | " PS " | CPM is primary slave (for "PNO redundancy") |
| | | " +0 " | CPM is backup and configured with address offset 0 (SR) |
| | | " +1 " | CPM is backup and configured with address offset 1 (FR) |
| | | " +64 " | CPM is backup and configured with address offset 64 (FR) |
| | | " +NA " | CPM is backup and configured with address offset 128 (FR) |
| | | " --- " | Profibus ASIC in reset, no DP communication possible |
| | | " F_ " | Synchronization on internal bus. No DP communication possible |
| | FB state | Off | No activity on the field bus |
| | | baud | Activity on the bus, no data exchange yet |
| yyyy | without redundancy | OK | Field bus OK, with one CPM in operation |
| | with redundancy | OK-A | Field bus OK in redundant operation, CPM active |
| | | OK-I | Field bus OK in redundant operation, CPM inactive |
| zzz | State of the modules | --- | no module data available yet |
| | | OK | All modules OK |
| | | err | Common alarm for I/O modules |

See the operating instructions of the IS1 system for further descriptions concerning the CPM.

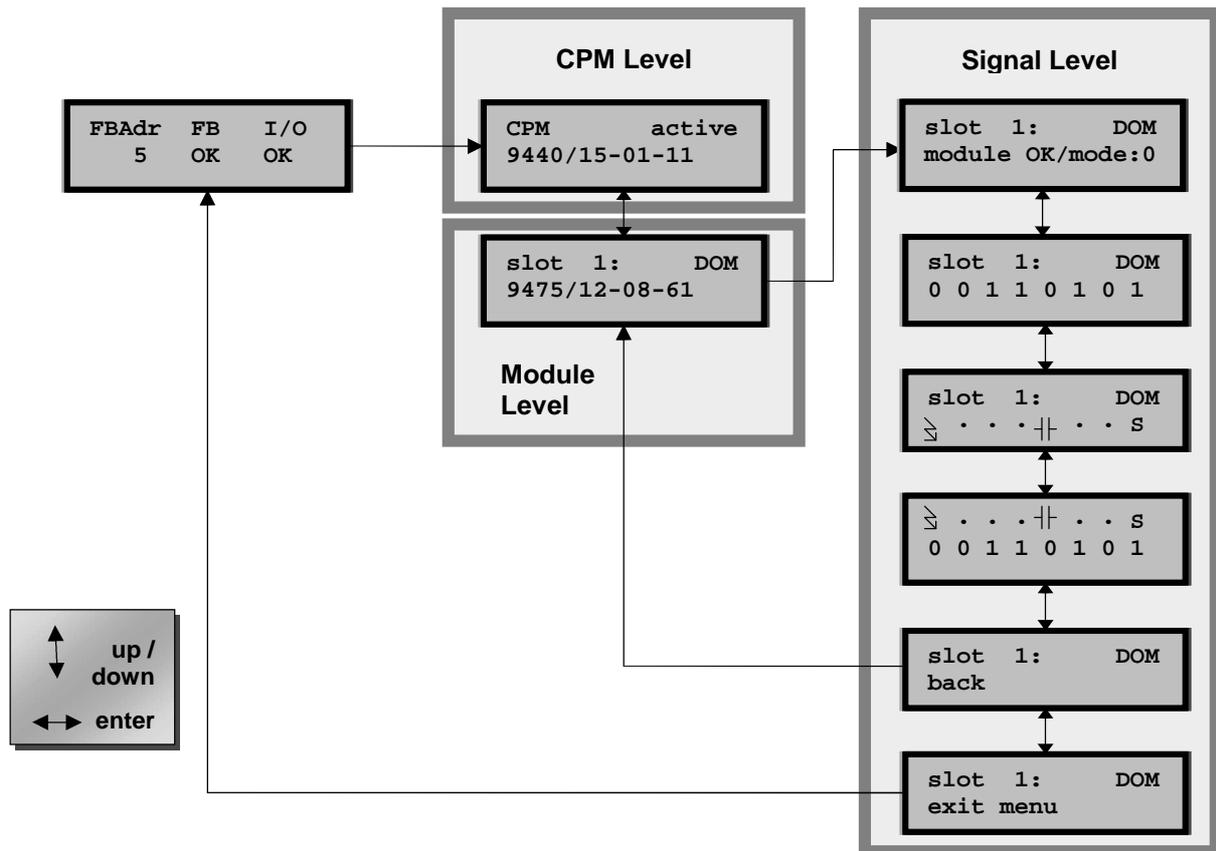
Definitions

- English is the standard language used in the menu.
- When reconfiguration is carried out during normal operation, a message appears that the menu will be closed and reopened if the signal level had been displayed prior to that. The menu is not closed at the module or CPM level.
- Representation of the modules using the actual state of the BusRail. If no configuration has been carried out, only the CPM and module levels are displayed; no signal or line faults are shown.
- If the field bus is not running, the information is called up via the primary CPM. Only data from the CPM and menu levels are displayed.

The Menu Structure - Stage 2

The menu consists of three levels: the CPM level, the module level and the signal level.

| Level | Meaning |
|--------------|---|
| CPM level | Displays all CPM data (Field bus address, data link type, firmware version) |
| Module level | Actual state on the BusRail. All plugged-in I/O modules are displayed. |
| Signal level | Signals, faults and information regarding an I/O module. |



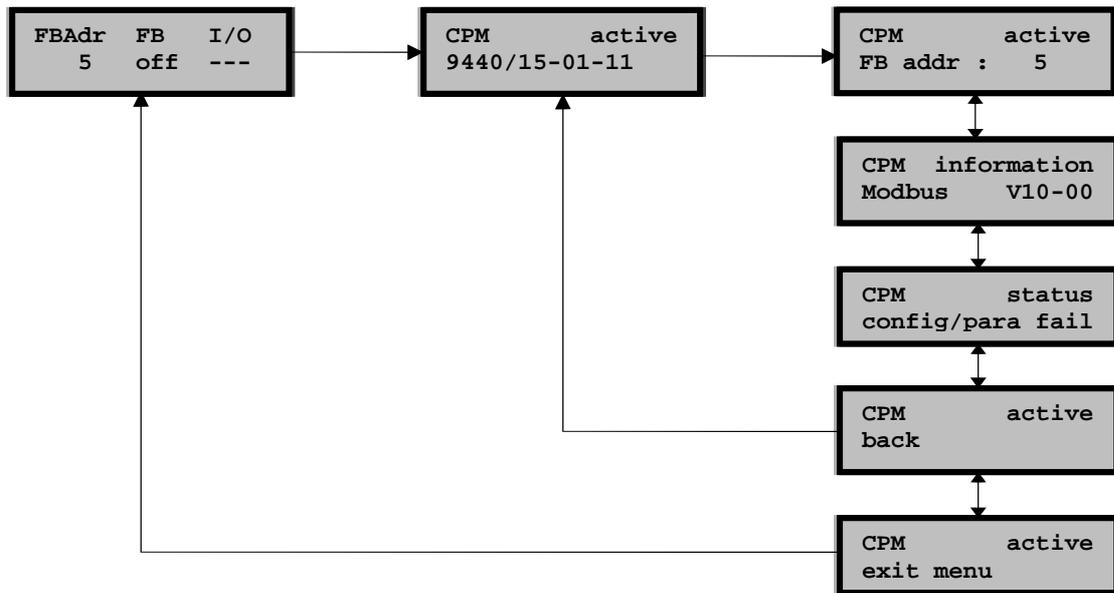
The levels that are visible depend on the parameter set and the number of modules plugged in.

| Level | No parameter set | | Parameter set OK | | Parameter change | |
|---------------|--------------------|--------------------|------------------|--------------------|-------------------|--------------------|
| | Modules | No modules | Modules | No modules | Modules | No modules |
| CPM | All information | All information | All information | All information | No reaction | No reaction |
| Module | Actual state | <i>Not visible</i> | Actual state | <i>Not visible</i> | No reaction | <i>Not visible</i> |
| Signal | <i>Not visible</i> | <i>Not visible</i> | Desired state | <i>Not visible</i> | Close menu | <i>Not visible</i> |

In the case of redundancy, no information is displayed about the other CPM. This information must be called up directly via the respective CPM.

CPM level

All status displays are updated cyclically.



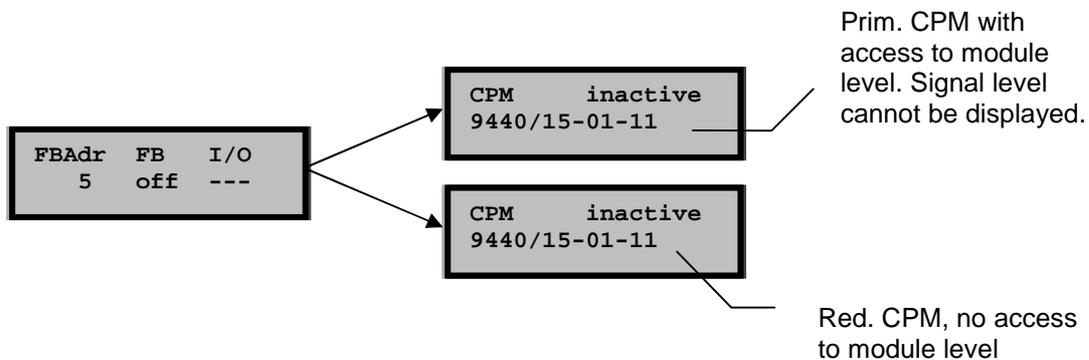
Since the "exit menu" item occurs at the end of each menu, it is not shown explicitly in the diagrams. It is nevertheless present.

The table gives an overview of which level is shown, dependent on the state of the CPM.

| After power-up | | | Parameters loaded | | | Data exchange | | |
|----------------|---|------------|-------------------|---|------------|---------------|---|------------|
| CPM (prim.) | | CPM (red.) | CPM (prim.) | | CPM (red.) | CPM (prim.) | | CPM (red.) |
| Inactive | | Inactive | Active | | Inactive | Active | | Inactive |
| C | M | - | C | M | s | C | - | - |

| Inactive | | | Active | | |
|----------|---|---|--------|---|---|
| C | - | - | C | M | s |

- C CPM level
- M Module level
- s Signal level



Field bus (FB) address

Display of the Field bus address

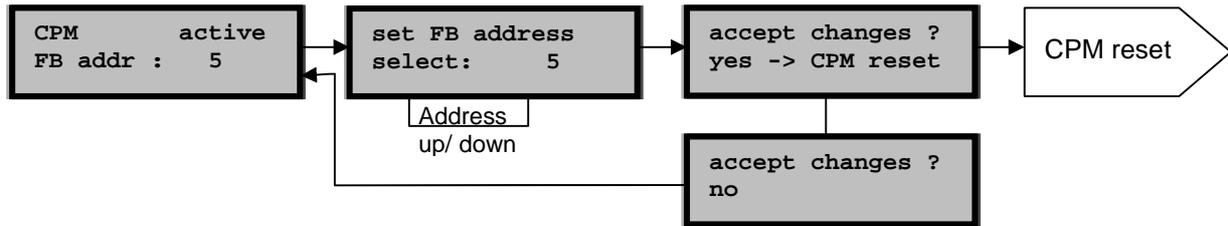
```
CPM      active
FB addr : 5
```

FB address available

```
CPM      active
FB addr : ---
```

FB address not available

Setting the Field bus address



Special cases

```
set FB address
no change
```

When the field bus is active, the FB address cannot be changed.

```
accept changes
yes -> no change
```

Field bus address was not changed, pressing enter returns to previous menu item, the CPM does not carry out a reset.

Information

The Hardware revision is externally visible and is not displayed.

```
CPM information
Profibus V01-19
```

Display of firmware version and data link type.

Status display

```
CPM      status
config/para fail
```

Status of the CPM

Status messages possible:

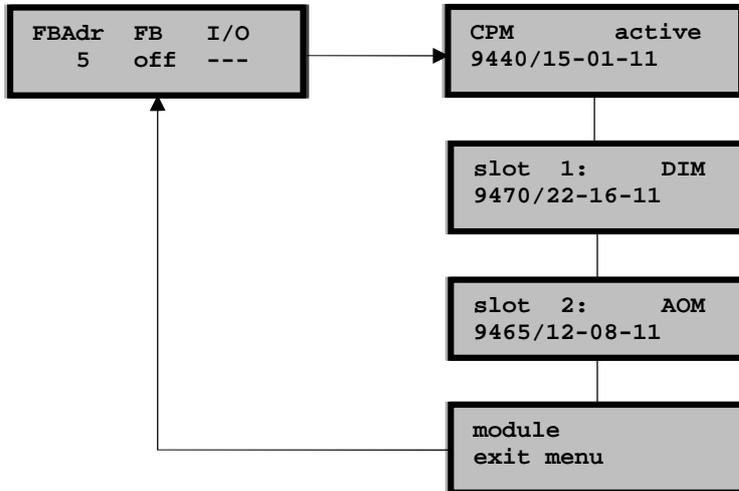
| Text on the LCD | Meaning |
|------------------|---|
| no error | No error |
| hardware fail(1) | Failure |
| hardware fail(2) | Wrong hardware identifier |
| hardware fail(3) | No communication between CPR and IOP (μ P communication interrupted) |
| DataExch AS (2) | Data exchange with automation system, parameterised via IS Wizard |
| no DataExch | No data Exchange |
| config/para fail | Configuration or parameter error |
| quit DataExch | No longer any data exchange |
| DataExch AS (6) | Data exchange with automation system, parameterised via Profibus |

The status messages are updated during normal operation.

Module level

Only the active or primary CPM can display data at the module level.

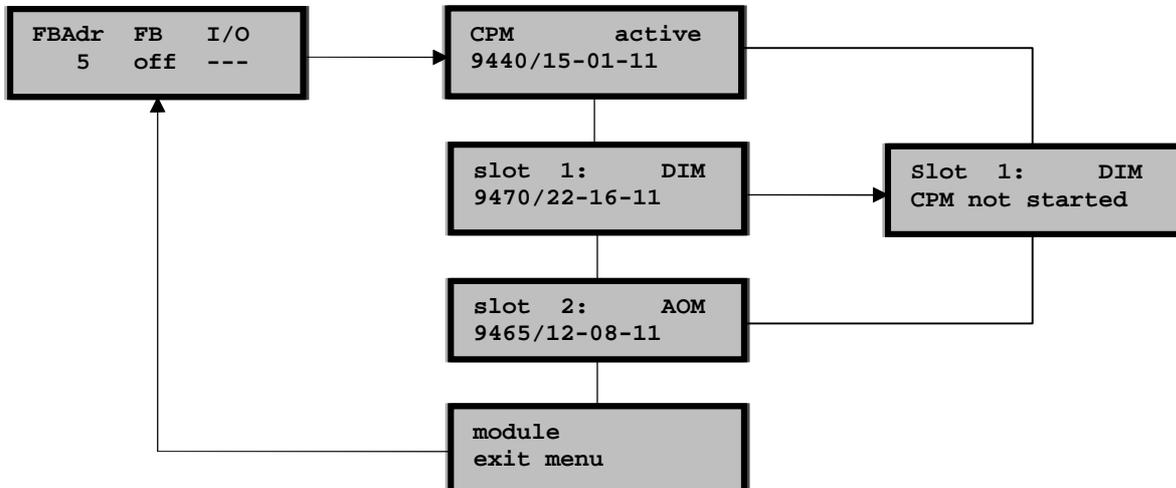
The module level displays the actual state on the BusRail. The module abbreviation consists of the four basic types AIM, AOM, DIM and DOM. The HART modules (9461/ and 9466/) are not marked as AIMH or AOMH.



The number of items in the menu is variable and dependent on the configuration. A menu item is created for each module on the BusRail. The module whose details are to be displayed is selected using the *up / down* keys.

If the CPM has not been started, branching from the module level to the signal level cannot take place.

The following message appears:



```

slot 3:  ---
IOM no response
  
```

Empty modules and modules that give no reply to the CPM are shown in the module level (actual state) as unknown modules.

```

slot 3:  ---
hardware failure
  
```

Modules that respond with a hardware failure are shown as unknown modules.

Signal level

Only the data of the active or primary CPM can be displayed on the signal level.

Module status

| Text on the LCD | Meaning | Prio |
|------------------|--|------|
| IOM no response | Communication with the module is not possible. Module is defective, not inserted or both BusRails data lines are faulty. | 1 |
| hardware failure | Module indicates a hardware failure | 2 |
| conf unequal mod | Configuration error or incorrect module inserted | 3 |
| HW disable outp. | Outputs switched off by external switch (plant STOP). This function is only possible with the DOM 9475/2. The state is only displayed when the module is in data exchange. | 4 |
| prim Rail fail | No communication primary BusRail | 5 |
| red Rail fail | No communication redundant BusRail | 5 |
| module OK/mode:x | Module is OK. No module fault. Signal errors can, however, still be present. The operating mode (<i>mode:x</i>) is also shown. With the current modules, only the DIM has several operating modes. | 6 |
| (reserved) | For extensions | - |

Only one module state can be shown at any one time. In the case of more than one fault, the priority determines which fault shall be displayed. If the displayed fault is cleared, the next is shown till all faults are cleared.

Signal data can be displayed, even when a module fault is present. These are displayed exactly as the CPM reports the data to the PC (substitute values...).

If a configuration error exists, the data of the configured module are displayed.



In this case, a DOM has been inserted. When the signal level is called up, a **conf unequal mod** is displayed because a DIM has been configured. The display of the signals and faults corresponds to the configured module.

Configured empty modules are indicated by "empty module".

```
slot 3: ---
empty module
```

This display only appears at the signal level. At the module level, the module is displayed with the message "IOM no response".

Signal display

The actual value is displayed for the input modules; the desired value in the case of the output modules. Those data present in the CPM are displayed and in the form as they are reported to the PC.

Display for digital modules:

On Off

1 0

⇒ ASCII chars. "One" and "Zero"

Display for analogue modules: Bar chart with 8 bars

0%  100%

For the digital modules, the LSB (the bit for input/output 0) is shown at the far right in the display. For the analogue modules, the procedure is the same: the display of input/output 0 is shown at the far

right in the display. In addition, for the analogue modules, the channels are represented using the numbers '0' to '7' are shown.

If the output module is in the safety position, no signal is shown.

```
slot 3:    AOM
s7s s s s s s s0
```

For an AOM, the safety position for each channel is indicated by an **s**. This is overwritten when a value is output.

```
slot 3: single
I/O 1:safety pos
```

When outputting a single channel (**single I/O**), only the message is shown. Line faults are not displayed.

```
slot 3:    DOM
safety position
```

A message is displayed instead of the digital signals. This message disappears as soon as a value is written to the outputs.

This message disappears as soon as a value is output on this channel. The output value (with error) is then displayed.

If a module is in the safety position and line faults exist, these are shown. Exception: In the case of the AOM, no fault can be displayed for a single output value (**single I/O**) for space reasons.

I/O errors

As an agreed-upon convention, special characters have been assigned to certain states. Other messages are represented by error codes.

| Error code | | Representation | | Meaning |
|------------|-------------|----------------|------------|-----------------------------------|
| Decimal | Hex | Overview | Single I/O | |
| 0 | 0x00 | 0 | · | No error |
| 1 | 0x01 | ⚡ | ⚡ | Short-circuit (special character) |
| 2...5 | 0x02...0x05 | 2...5 | 2...5 | |
| 6 | 0x06 | ⏏ | ⏏ | Open-circuit (special character) |
| 7...15 | 0x07...0x0F | 7...F | 7...F | |
| 16...47 | 0x10...0x2F | x | 10...2F | |

The error codes are defined in the descriptions for the individual modules.

```
slot 3:    AIM
. . 7 . . . x .
```

In the overview, the error codes < 16 appear with the code in a hexadecimal form; the codes >=16 with an **x**, as there is only one character available.

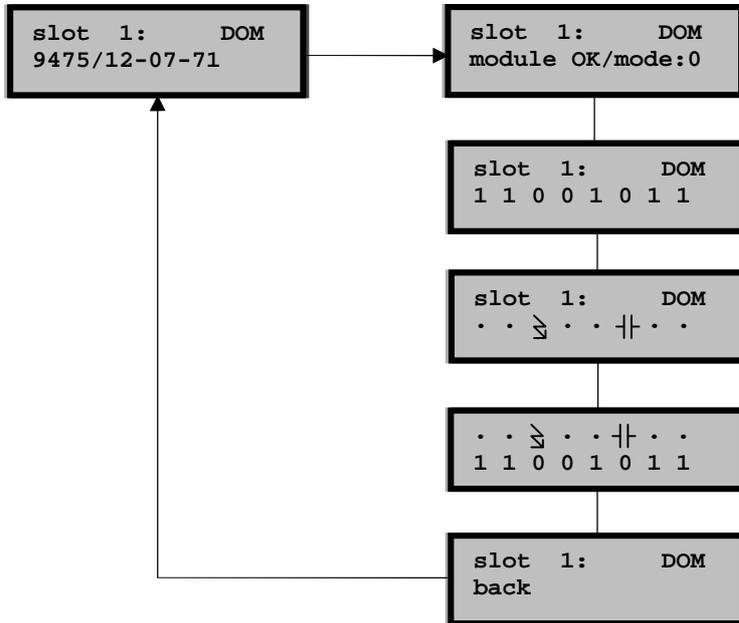
```
slot 3: single
I/O 1:10 -32752
```

When displaying a single channel (**single I/O**), the complete error code is shown.

If a module fault is also present, then this is shown instead of the line faults. Exception: If the primary or redundant BusRail is faulty, the line faults will continue to be displayed.

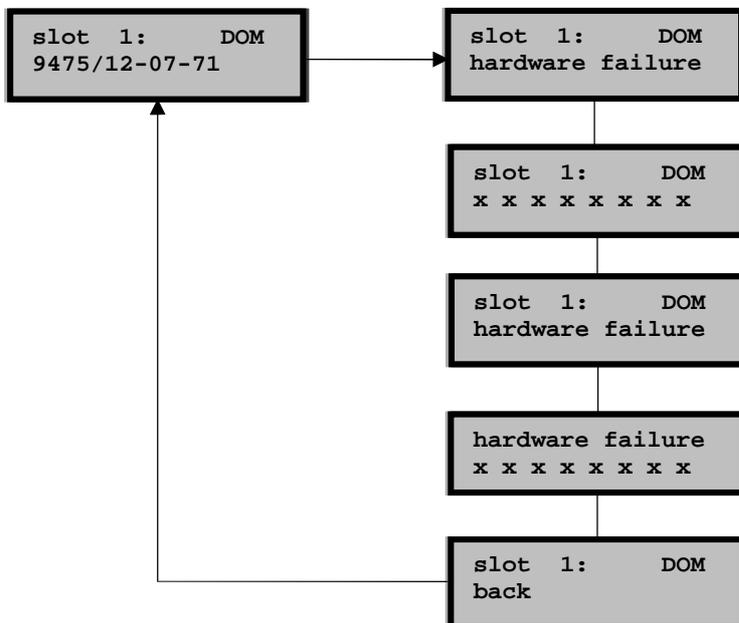
Individual Module Displays

Digital I/O modules



For a DOM with 7 outputs, 8 signals are shown – where the last bit is fixed.

Display showing module failures:



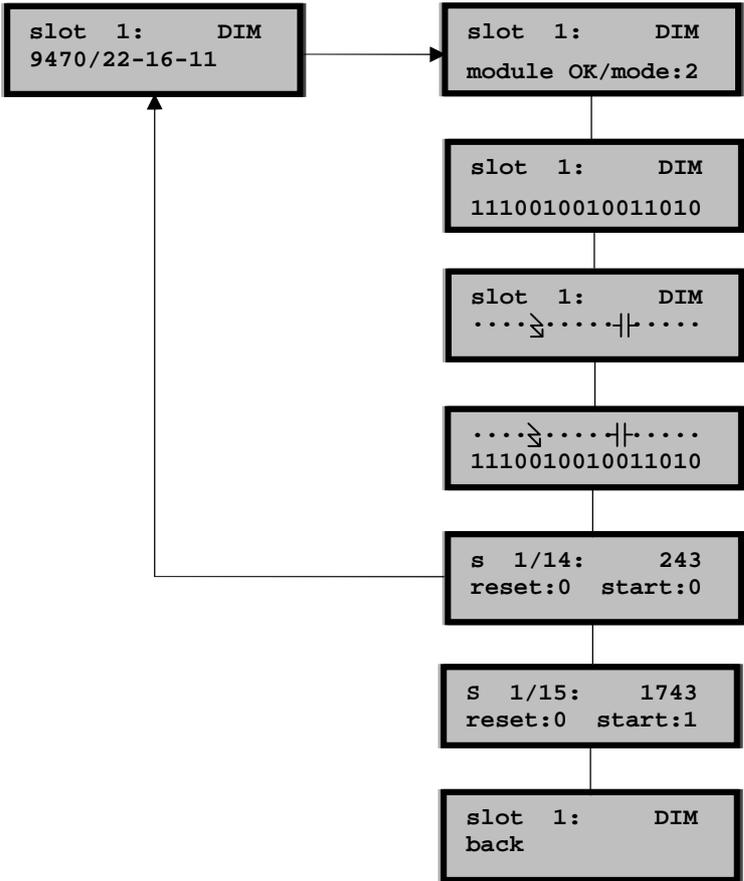
The displayed 'x' indicates how signals are represented in a failure case. In the menu system, the adjusted value is used for the representation in the fault case.

A “plant STOP” is provided for the DO 9475/2. The outputs can be switched off with the help of an external switch. This is shown in the display as a module message. For this, the module must be in data exchange.

9470 DIM16 + CF

The display for DIM in operating mode 2 is identical to that for a purely digital module. The menu has two further entries for the display of counter or frequency values. The reset and start bits are, in addition, displayed.

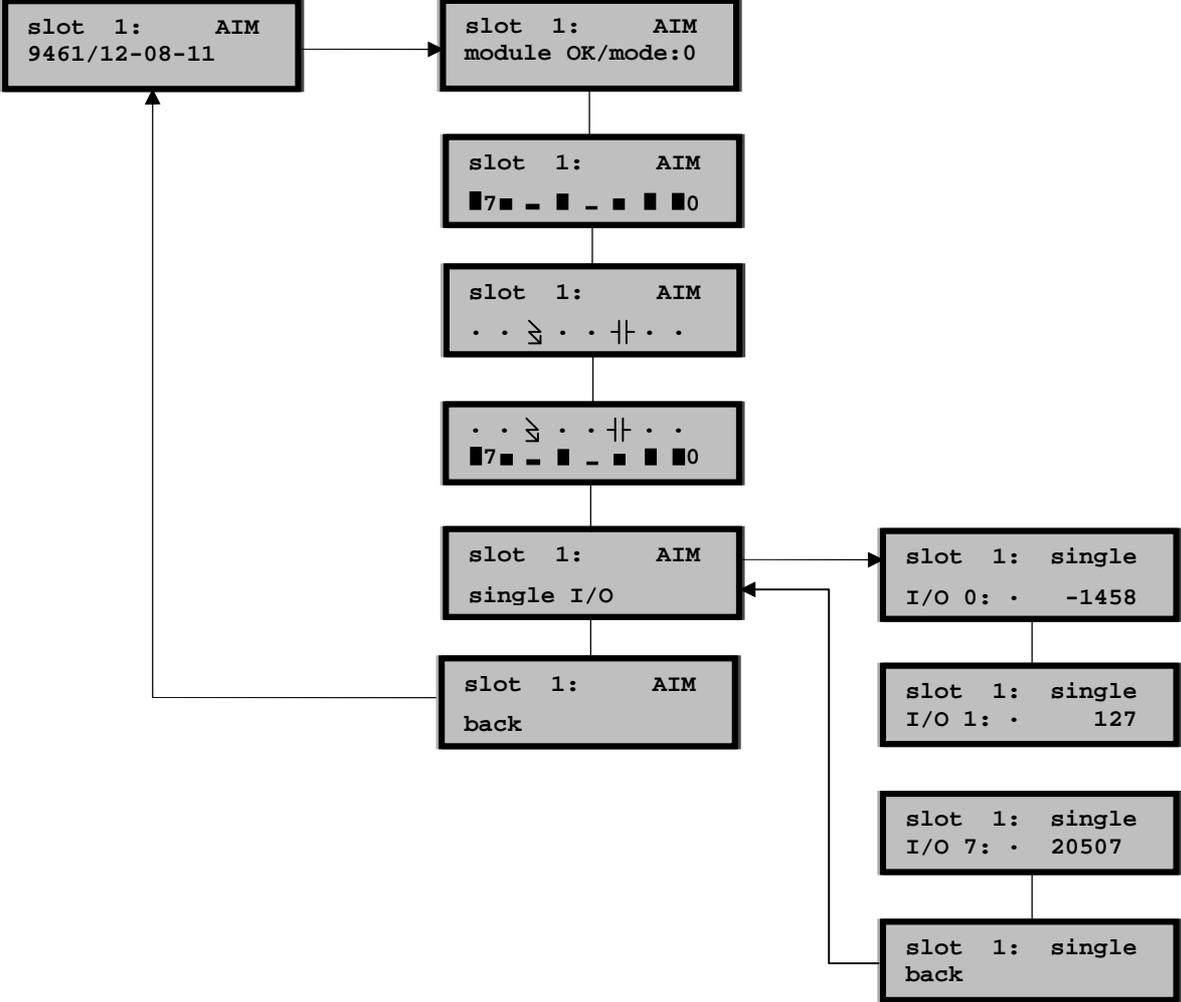
For the counter and frequency inputs, the value is shown as an unsigned decimal number.



If the DIM is parameterised as a pure DIM (operating mode 0) or as a DIM with status (operating mode 1), then the windows for the display of the counter/frequency values do not appear.

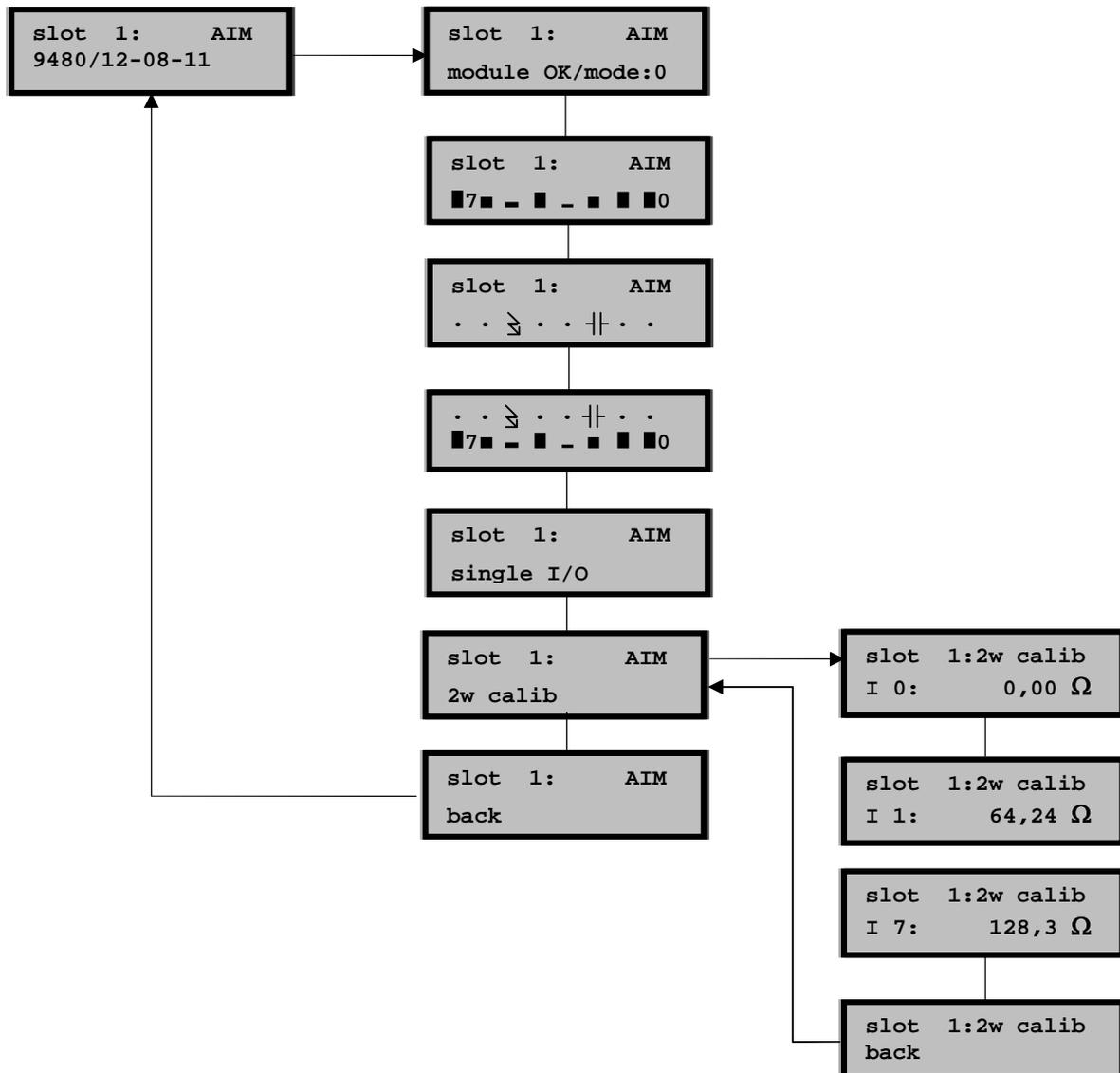
Analogue I/O modules

There are four menu items here, just as with the digital I/O modules. Additionally for the analogue modules, an individual input/output can be shown as a signed decimal value. This is additionally displayed because only rough estimates can be discerned from the bar graph increments. Each bar represents about 15% of the analogue signal.



9480 Temperature module

With these modules, the item for the two-wire compensation is part of the menu. The two-wire compensation can also take place during running operation; it is checked in the module for plausibility.



After selecting the input to be calibrated, the calibration is started by pressing Enter.



A key press returns to the selection. The display of the currently stored conductor resistance in Ohm (Ω) allows a plausibility check of the compensation presently being viewed.

| Text on the LCD | Meaning |
|------------------------|--|
| I 7: calib OK | Calibration successful |
| I 0: module busy | Waiting for reply from module; telegram being processed |
| I 1: wrong value | Value read is out of range; is rejected by the module |
| I 3: no 2w mode | Input is not in two-wire operating mode |
| I 5:no implement | Command not available (old module) |
| I 4:wrong module | Wrong module in the slot |
| I 2: no response | Module does not reply to telegram; bus faulty or no module in slot |

Module abbreviations

| Module description (13 chars.) | Module text |
|---------------------------------------|--------------------|
| 9440 / .. - .. - .. | CPM |

| Module description (13 chars.) | Module text |
|---------------------------------------|--------------------|
| 9460 / .. - .. - .. | AIM |
| 9461 / .. - .. - .. | AIM |
| 9462 / .. - .. - .. | AIM |
| 9465 / .. - .. - .. | AOM |
| 9466 / .. - .. - .. | AOM |
| 9470 / .. - .. - .. | DIM |
| 9471 / .. - .. - .. | DIM |
| 9475 / .. - .. - .. | DOM |
| 9477 / .. - .. - .. | DOM |
| 9480 / .. - .. - .. | AIM |
| 9481 / .. - .. - .. | AIM |
| Empty module | --- |

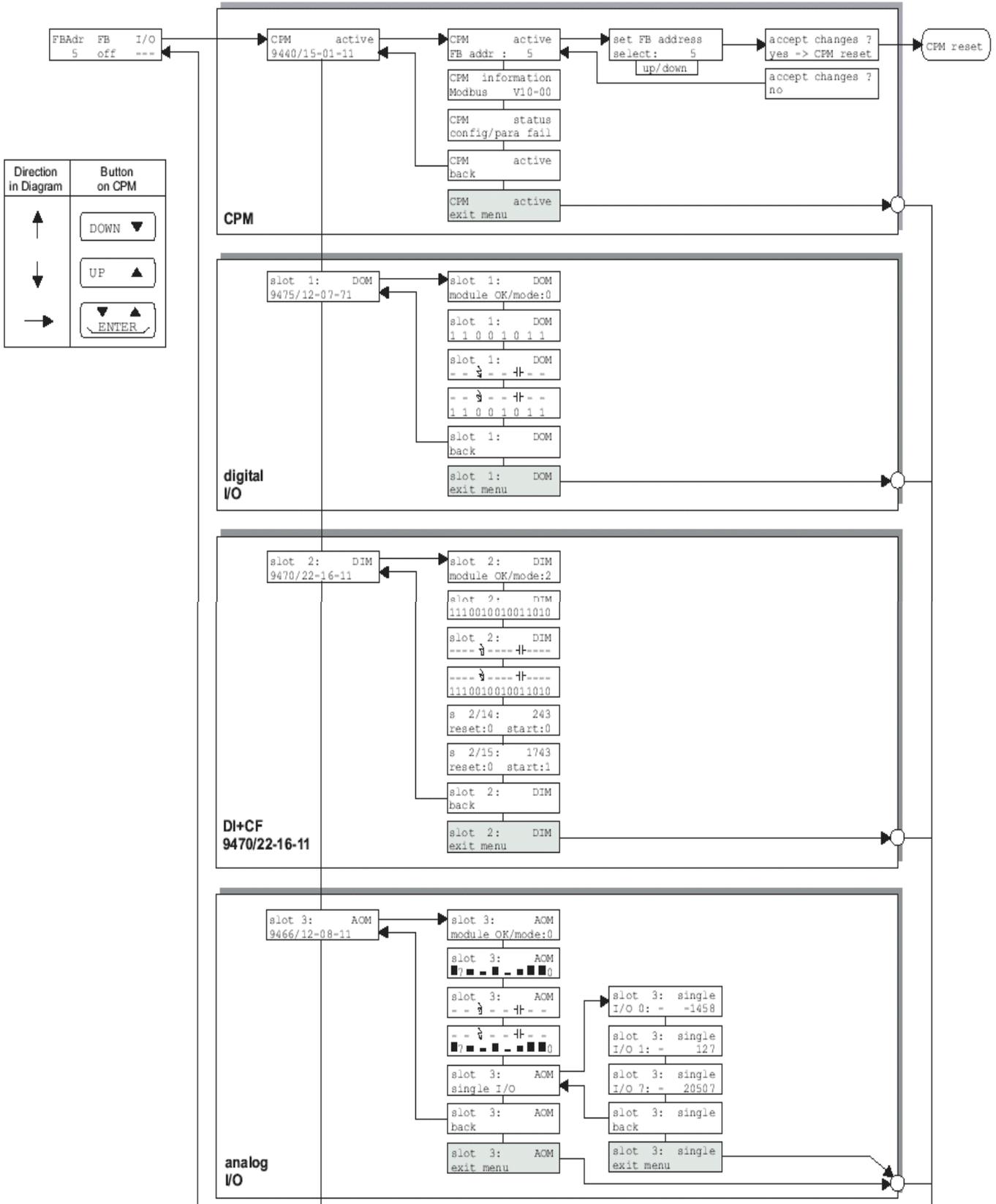
| "old" modules without hardware designation | |
|---|-----|
| 9460/ | AIM |
| 9465/ | AOM |
| 9470/ | DIM |
| 9475/ | DOM |

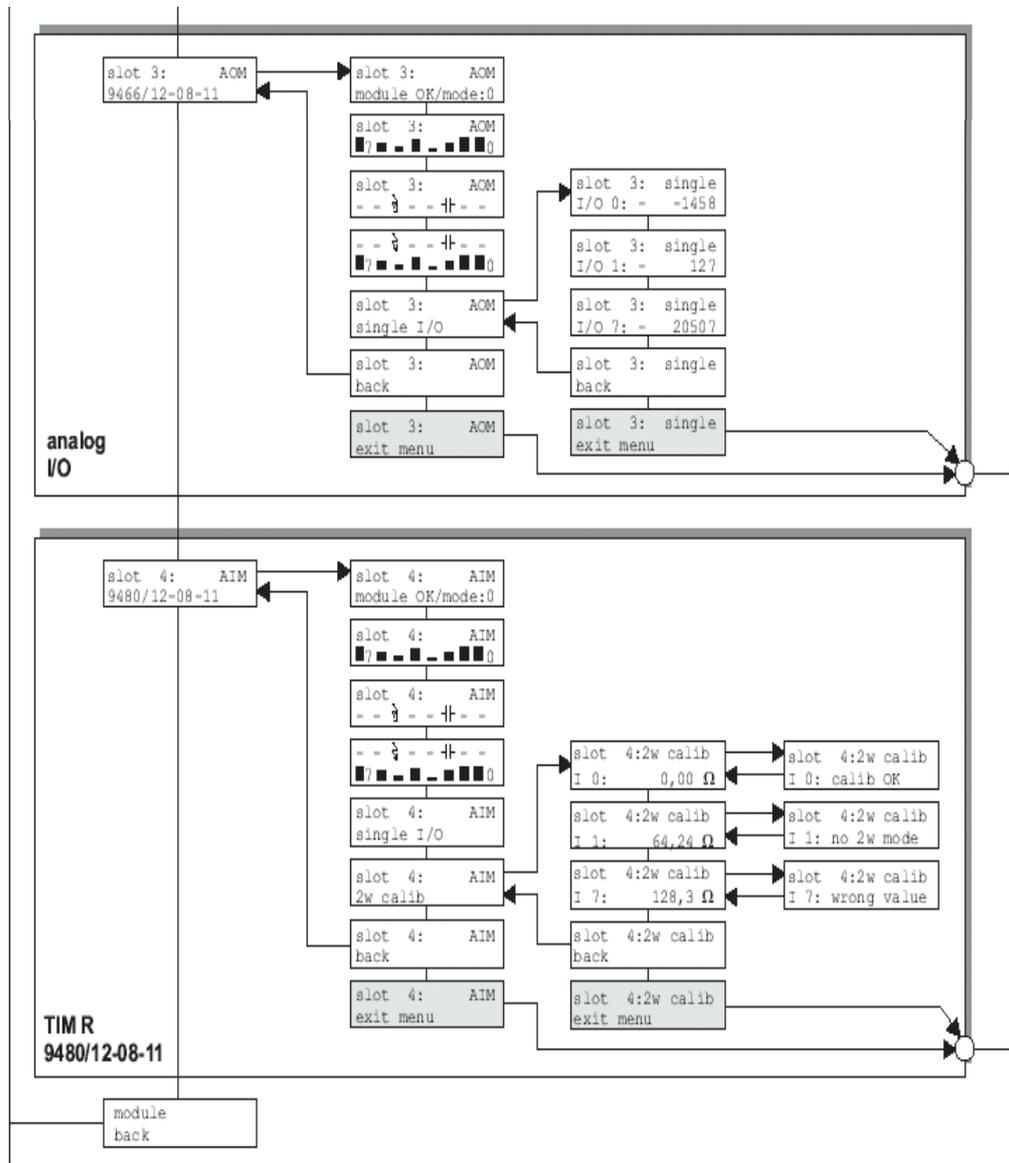
The detailed abbreviations contained in the Profibus description (e.g. AOM 8, DI+CF...) are not used.

Overall View of the Menu Structure - Stage 2



CPM - MENUE - SYSTEM





Display on Power-Up

On power-up, the monitor program checks:

- Whether the hardware is functioning correctly
- Whether a demand for a firmware download is present

If one of the tests ends with a negative result, the monitor program remains in the so-called download mode. Further information on this is contained in the documentation "IS1 Firmware Download e.doc".

If all test results are positive, the loaded firmware is started.

Power Up Sequence

The power up sequences depend on the version of the monitor program.

Monitor program V02

```
+++ Start Up +++  
> Prog : check
```

Checking the program memory

```
+++ CPM Test +++  
> Slot : prim 0
```

Display of the slot of the CPM

Possible output values:

```
prim 0    primary / slot 0  
red 1     redundant / slot 1  
prim 2    primary / slot 2  
red 3     redundant / slot 3
```

```
+++ CPM Test +++  
> Supply: check
```

Power supply check

```
+++ CPM Test +++  
> Supply: OK
```

Power supply OK

```
+++ CPM Test +++  
Modbus V11-03
```

Display of data link type and firmware version

```
FBAdr  FB   I/O  
vvv xx yyyy zzz
```

CPM is ready for IS1 operation.

Monitor program V03 and V04

| | | |
|-------------|--------|---|
| V 03 | change | Adjustment to new address detection, compatible to old hardware |
| | change | Unification of menu texts |
| | change | Display version of monitor program. |
| | change | Check of compatibility for firmware and hardware |

| | | |
|-------------|------------|--|
| V 04 | Bug | red LED is switched off in monitor program |
| | Bugfix | Correction of firmware download, only internal relevance |

```
+++ CPM Test +++
> FW      : check
```

Check program memory

```
+++ CPM Test +++
>Monitor: V03-00
```

Display version of monitor program (V03 oder V04)

This information is required to check for compatibility. The second number ("00") indicates the firmware compatible to the hardware.

```
+++ CPM Test +++
>FW / HW: OK
```

Compatibility check was OK, correct firmware loaded

```
+++ CPM Test +++
> slot   : prim 0
```

Display of the slot of the CPM

Possible output values:

| | |
|--------|--------------------|
| prim 0 | primary / slot 0 |
| red 1 | redundant / slot 1 |
| prim 2 | primary / slot 2 |
| red 3 | redundant / slot 3 |

```
+++ CPM Test +++
> Supply: check
```

Power supply check

```
+++ CPM Test +++
> Supply: OK
```

Power supply OK

```
+++ CPM Test +++
Modbus V11-03
```

Display of data link type and firmware version

```
FBAdr  FB    I/O
vvv xx yyyy zzz
```

CPM is ready for IS1 operation.

Monitor program V05

| | | |
|-------------|--------|---|
| V 05 | Bugfix | In very rare situations, the monitor program displayed a wrong slot address. But correct operation in the main In main program. |
| | Bugfix | red LED stays on in monitor program |
| | Change | Faster start with shorter display indication |
| | Change | RAM Test |

The RAM test is carried out at the start. In this moment the LCD is not yet initialized so that no messages can be displayed. The result of the RAM test is displayed only in case of failures.

```
+++ CPM Test +++
> Supply: check
```

Power supply check in first step

```
+++ CPM Test +++
> Supply: OK
```

Power supply OK

```
+++ CPM Test +++
> FW      : check
```

Check program memory

```
+++ CPM Test +++
>Monitor: V05-00
```

Display version of monitor program

This information is required to check for compatibility. The second number ("00") indicates the firmware compatible to the hardware

```
+++ CPM Test +++  
>FW / HW: OK
```

Compatibility check was OK, correct firmware loaded

```
+++ CPM Test +++  
> Slot : prim 0
```

Display of the slot of the CPM

Possible output values:

```
prim 0      primary / slot 0  
red 1       redundant / slot 1  
prim 2      primary / slot 2  
red 3       redundant / slot 3
```

```
+++ CPM Test +++  
Modbus V11-03
```

Display of data link type and firmware version

```
FBAdr  FB    I/O  
vvv xx  yyyy zzz
```

CPM is ready for IS1 operation.

Error messages

Monitor program V02

```
## FDL Error ##  
> Prog : wait
```

CPM is waiting on download, previous download was aborted.

```
## FDL Error ##  
> Prog : fail
```

Program error in one or both flash memories

```
## FDL Error ##  
> CPR : erase
```

Error in erasing the CPR flash

```
## FDL Error ##  
> IOP : erase
```

Error in erasing the IOP Flash

```
## FDL Error ##  
> Global : ----
```

No particular state can be assigned to this error. Can occur at any position.

```
## FDL Error ##  
> Com : fail
```

Interruption in data transfer or FDL aborted by user..

Monitor program from V03

```
+++ CPM Test +++  
> HW : fail
```

Error in hardware detection of CPM

```
+++ CPM Test +++  
> Slot : fail
```

Error in CPM slot reading

```
+++ CPM Test +++  
> Supply: fail
```

Error power supply

```
## FDL Error ##  
>FW / HW: fail
```

Loaded firmware is not compatible with the existing Hardware

```
## FDL Error ##  
> FW : wait
```

CPM is waiting on download, previous download was aborted.

| | |
|-----------------------------------|---|
| ## FDL Error ## > CPR : fail | Program error in CPR Flash |
| ## FDL Error ## > IOP : fail | Program error in IOP Flash |
| ## FDL Error ## >CPR/IOP: fail | Program error in both Flash memories |
| ## FDL Error ## > CPR : erase | Error erasing the CPR Flash |
| ## FDL Error ## > IOP : erase | Error erasing the IOP Flash |
| ## FDL Error ## > Global: ---- | No particular state can be assigned to this error. Can occur at any position. |
| ## FDL Error ## > Com : fail | Interruption in data transfer or FDL aborted by user. |

Monitor program from V05

With monitor program V05 new messages for the RAM test have been added. In case a RAM error is detected the CPU displays the error for a few seconds and the reboots.

| | |
|------------------------------------|--------------------------------|
| ## CPM Error ## > CPR : X-RAM | CPR processor has RAM error |
| ## CPM Error ## > IOP : X-RAM | IOP processor has RAM error |
| ## CPM Error ## >CPR/IOP: X-RAM | Both processors have RAM error |