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Equipment for special machines

# WF 470
# Video Display Module

Description Edition 08.91

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SIEMENS

# WF 470
# Video Display Module

Description


Hardware 2

Operation 3

Service 4

Ordering data and documentation 5

6


up to HW Versioon 6FM1470- ... 25

Edition August 1991

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## Contents


| | | Page |
|---|---|---|
| **1** | **Applications** | 1-1 |
| **2** | **Hardware** | 2-1 |
| **2.1** | **System configuration** | 2-1 |
| **2.2** | **WF 470 hardware** | 2-2 |
| **2.3** | **WF 470 battery back-up buffer** | 2-5 |
| **2.4** | **Linking the WF 470 to the SIMATIC PLC** | 2-6 |
| 2.4.1 | WF 470 configured as a central module | 2-6 |
| 2.4.2 | WF 470 configured as a peripheral module | 2-7 |
| **2.5** | **Module location in the SIMATIC rack** | 2-8 |
| 2.5.1 | SIMATIC S5-130 WB | 2-8 |
| 2.5.2 | SIMATIC S5-150 S | 2-9 |
| 2.5.3 | SIMATIC S5-115 U | 2-10 |
| 2.5.4 | SIMATIC S5-135 U | 2-12 |
| 2.5.5 | SIMATIC S5-150 U | 2-13 |
| 2.5.6 | SIMATIC S5-155 U | 2-14 |
| **2.6** | **Memory addressing** | 2-15 |
| 2.6.1 | SIMATIC S5-130 WB | 2-15 |
| 2.6.2 | SIMATIC S5-150 S | 2-16 |
| 2.6.3 | SIMATIC S5-115 U | 2-17 |
| 2.6.3.1 | S5-115U-CPU941 | 2-17 |
| 2.6.3.2 | S5-115U-CPU942/943/944 | 2-17 |
| 2.6.4 | SIMATIC S5-135 U | 2-18 |
| 2.6.5 | SIMATIC S5-150 U | 2-19 |
| 2.6.6 | SIMATIC S5-155 U | 2-20 |
| **2.7** | **External connections** | 2-21 |
| 2.7.1 | BAS-(RGB) monitor connections X3, X4, X5 | 2-22 |
| 2.7.2 | TTL monitor interface X6 | 2-23 |
| 2.7.3 | Serial interface - base board X7 | 2-25 |
| 2.7.4 | Serial interface - Extension board X9 | 2-26 |
| 2.7.5 | Sockets for memory modules X10, X20, X30 | 2-27 |
| 2.7.6 | Bus connector X 1 | 2-27 |


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**2.8 Connection cables** ..... 2-28

2.8.1 WF 470 BAS monitor connectors X3, X4, X5 ..... 2-28

2.8.2 Connection cable for socket X6 ..... 2-29

2.8.3 Connector X7 - programming unit connection ..... 2-30

2.8.4 Connector X9 - Printer connection ..... 2-31

2.8.5 Colour monitor connection ..... 2-32

2.8.6 WF 470 - TTL monitor (sanyo) ..... 2-33

2.8.7 Connection cable WF 470 - PG 675, PG 685 or PG 750 or WF 470 distribution unit ..... 2-34

2.8.8 WF 470 B/C CABLE FOR PT 88/89 ..... 2-35

2.8.8.1 V24-Interface ..... 2-35

2.8.8.2 TTY-Interface ..... 2-35

**2.9 Peripheral devices** ..... 2-36

2.9.1 Operator's panel ..... 2-36

2.9.2 Report printer ..... 2-38

2.9.2.1 V24 interface SAP-S1 ..... 2-38

2.9.2.2 TTY interface SAP-S2 ..... 2-39

2.9.2.3 Universal interface S22767-B3-A100 - V24 ..... 2-39

2.9.2.4 Universal interface S22767-B3-A100 - TTY ..... 2-40

2.9.3 WF 470 picture construction terminal ..... 2-41

**3 Operation** ..... 3-1

**3.1 SIMATIC standard software** ..... 3-1

3.1.1 Data link WF 470 - S5 ..... 3-2

3.1.1.1 Technical data ..... 3-2

3.1.1.2 Function block parametrisation ..... 3-3

3.1.1.3 Data block "transfer block" ..... 3-4

3.1.2 Keyboard function block WF 470 TAST ..... 3-4

3.1.2.1 Technical data ..... 3-5

3.1.2.2 Function block parameterisation ..... 3-5

3.1.2.3 Keyboard code look-up table DB 201 ..... 3-6

3.1.2.4 Valid key code table ..... 3-10

3.1.3 "DAT-IN" Function block ..... 3-11

3.1.3.1 Technical data ..... 3-11

3.1.3.2 Function block parameterisation ..... 3-12

3.1.4 "BILD LIST" picture select function block ..... 3-13

3.1.4.1 Technical data ..... 3-13

3.1.4.2 Function block parameterisation ..... 3-14


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3.2 SIMATIC S5 Software options ..... 3-17

3.2.1 Service module ..... 3-17

3.2.2 Logging printout & report printout ..... 3-18
3.2.2.1 Data transfer block ..... 3-18
3.2.2.2 Printout operation mask ..... 3-20

3.2.3 Sequence diagnostics ..... 3-21
3.2.3.1 Introduction ..... 3-21
3.2.3.2 Sequence chain control ABL:KORG (FB 172) ..... 3-24
3.2.3.3 Sequence selection KANW:WF (FB 173) ..... 3-28
3.2.3.4 Sequence selection ABL:KRAY / ABL: KRAN (FB 174 / FB 175) ..... 3-31
3.2.3.5 Programmed example ..... 3-34
3.2.3.6 Programming sequence blocks ..... 3-39

3.2.4 Graph 5 sequence diagnostics ..... 3-42
3.2.4.1 "GRAPH 5 diagnostics option" ..... 3-42
3.2.4.2 SIMATIC S5 software ..... 3-42

4 Service ..... 4-1

4.1 Introduction ..... 4-1

4.2 Commissioning ..... 4-1

4.2.1 Initial inspection ..... 4-1

4.2.2 Commissioning sequence ..... 4-1

4.2.3 Visual checks ..... 4-2
4.2.3.1 Checking the controller and module ..... 4-2
4.2.3.2 Earthing ..... 4-2
4.2.3.3 Cable separation / screening ..... 4-2

4.2.4 Hardware checks ..... 4-3
4.2.4.1 Checking the hardware revision level ..... 4-3
4.2.4.2 Checking the firmware revision level ..... 4-3

4.2.5 Bridge and switch positionsWF 470 (6FM1 470-3xx20) ..... 4-4
4.2.5.1 Bridge and switch positions WF 470 (6FM1 470-3xx20) to firmware version V2.0 ..... 4-5
4.2.5.2 Bridge and switch positions extension board (6FM1 470-3xx20) ..... 4-6

4.2.6 WF 470 (6FM1 470-3xx20) as a central module ..... 4-7
4.2.6.1 Factory pre-set address E000 ..... 4-7
4.2.6.2 Address setting ..... 4-8
4.2.6.3 Example settings ..... 4-8

4.2.7 WF 470 (6FM1 470-3xx20) as a peripheral module ..... 4-9

4.2.8 Next steps in the commissioning sequence ..... 4-11

4.2.9 Fault finding ..... 4-11
4.2.9.1 WF 470 error messages ..... 4-11
4.2.9.2 Analysing the DPR ..... 4-12


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5 Appendix ..... 5-1

5.1 Ordering information ..... 5-1

5.1.1 Ordering information WF 470 hardware ..... 5-1

5.1.2 Ordering information WF 470 firmware ..... 5-1

5.1.3 Ordering information WF 470 - SIMATIC software ..... 5-1

5.1.4 Ordering informationWF 470 - option software ..... 5-1

5.1.5 Ordering information WF 470 - PG 675 - picture const. ..... 5-2

5.1.6 Ordering information WF 470 - PG 685 - picture const. ..... 5-2

5.1.7 Ordering information WF 470 - PG 750 - picture const ..... 5-2

5.1.8 Ordering information - cables ..... 5-3

5.2 Bibliography ..... 5-5


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# 1 Application

The automation of manufacturing equipment cannot completely prevent disruption to the process caused by faults and breakdowns. The efficiency and profitability of a plant is heavily dependent on its availability. It is therefore essential that faults are quickly and accurately located and then displayed to the relevant personnel, so that machine down time is kept to a minimum.

The WF 470 is a diagnostics and display system designed for this purpose. It is one part of a range of intelligent peripheral modules which may be used in conjunction with SIMATIC S5 programmable controllers. The WF 470 module is directly connected to its colour monitor. The module has its own "on board" micro-processor and memory, allowing it to construct, to store and to display process pictures.

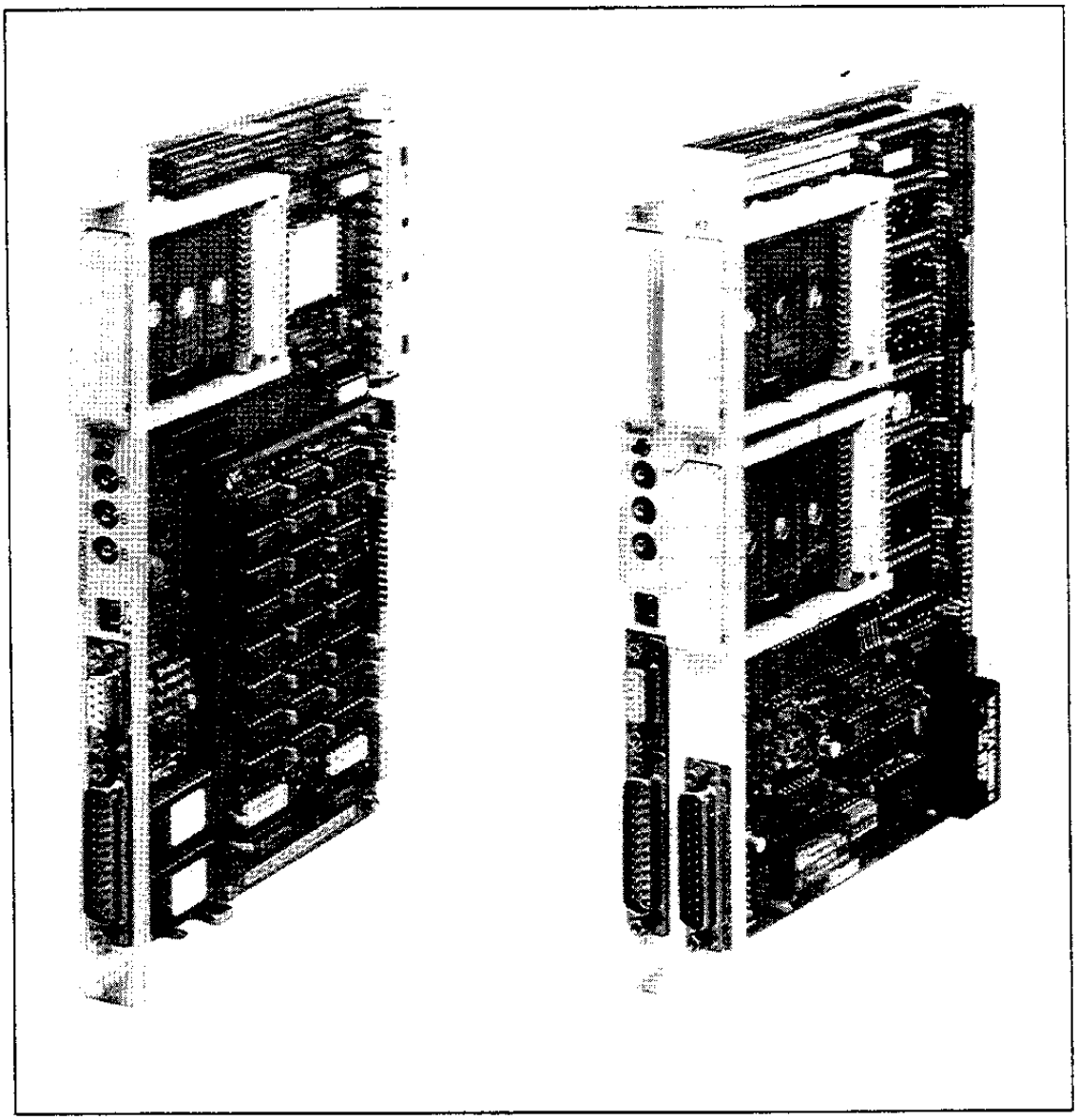


*Fig 1.1 WF 470 A.*

*Fig. 1.2 WF 470B/C Two additional slots for memory submodules, second serial interface port for printer-/computer link)*

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The WF 470 can automatically provide information about the

- Type of fault
- Location of the fault
- Cause of the fault
- Remedy of the fault

The WF 470 has additional options for the display of sequence information and service data. The sequence analyser option is used to monitor and display the condition of the sequence programs' inputs, outputs, and flags etc. in the PLC. The service module allows PLC status information to be displayed without the need to connect a programming unit.

The WF 470 can also simplify the start-up and operation of a machine. The machine start sequence and operating modes can not only be displayed graphically but also in descriptive text. The interaction of the operating personnel with the production machinery is thereby also improved.

Main features of the WF 470:

- The pictures and text fields are constructed using a PG 675, PG 685 or PG 750 programming unit, which provides user-friendly softkey operation with full help texts and prompting.

- The good range of graphical and text functions available permit clear and accurate mimics of the machines and processes to be produced.

- The pictures and texts are stored and controlled by the module, thus releasing the SIMATIC PLC to perform the control task.

- Error messages and status reports can be output directy from the WF 470 module to a printer or supervisory computer.

- Sequence programs running in the PLC can be monitored and their status displayed on the WF 470 screen and printer.

The process mimic pictures and data displays are constructed from the following elements. Each element can be magnified up to a factor of 16 times normal size independently in both the X and Y directions. Eight different fore- and background colours may be used.

- Individual symbols

  - 128 pre-defined symbols
  - 128 further user-definable symbols
  - ASCII character set

- Composite symbols (Any combination of individual symbols)

- Text display windows

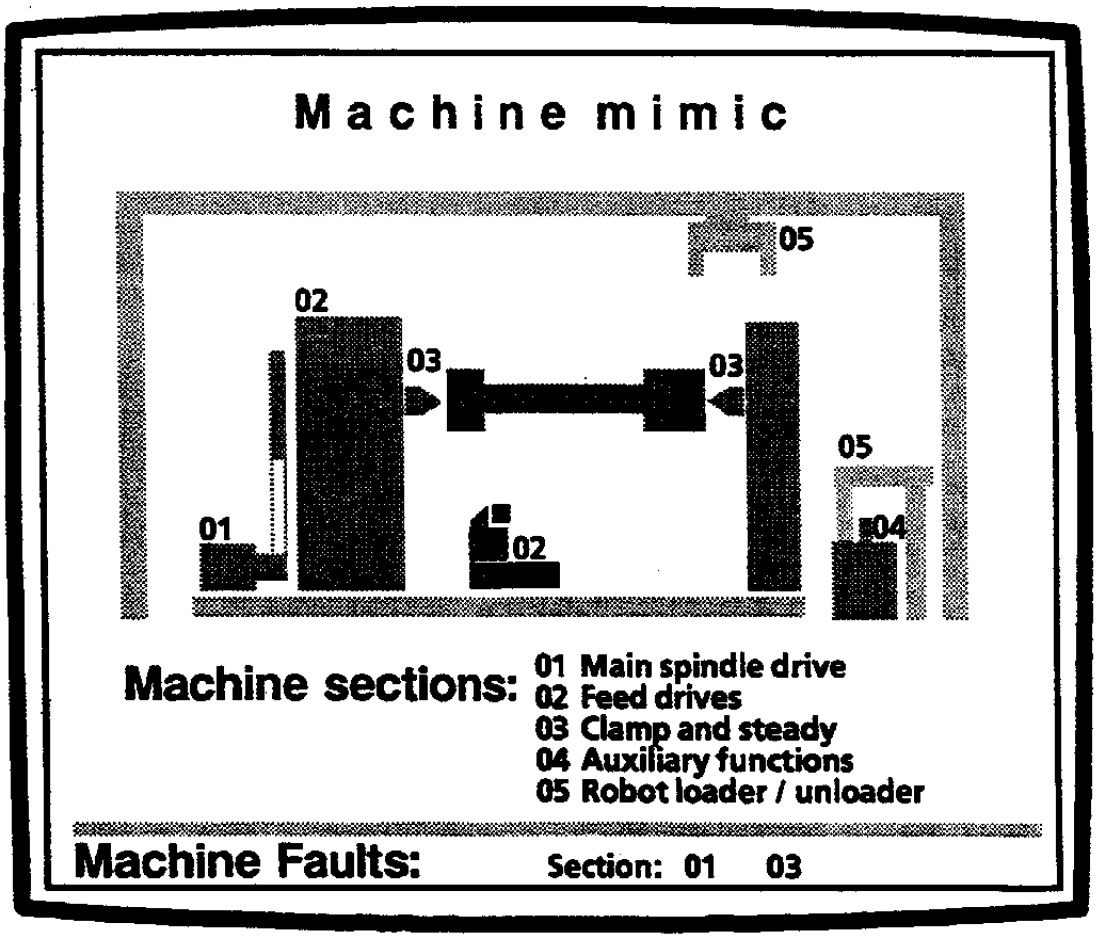
  - Static text, the colour is changed by control bits in the PLC
  - Dynamic text with scroll and push-up, displayed only when the control bits are high.


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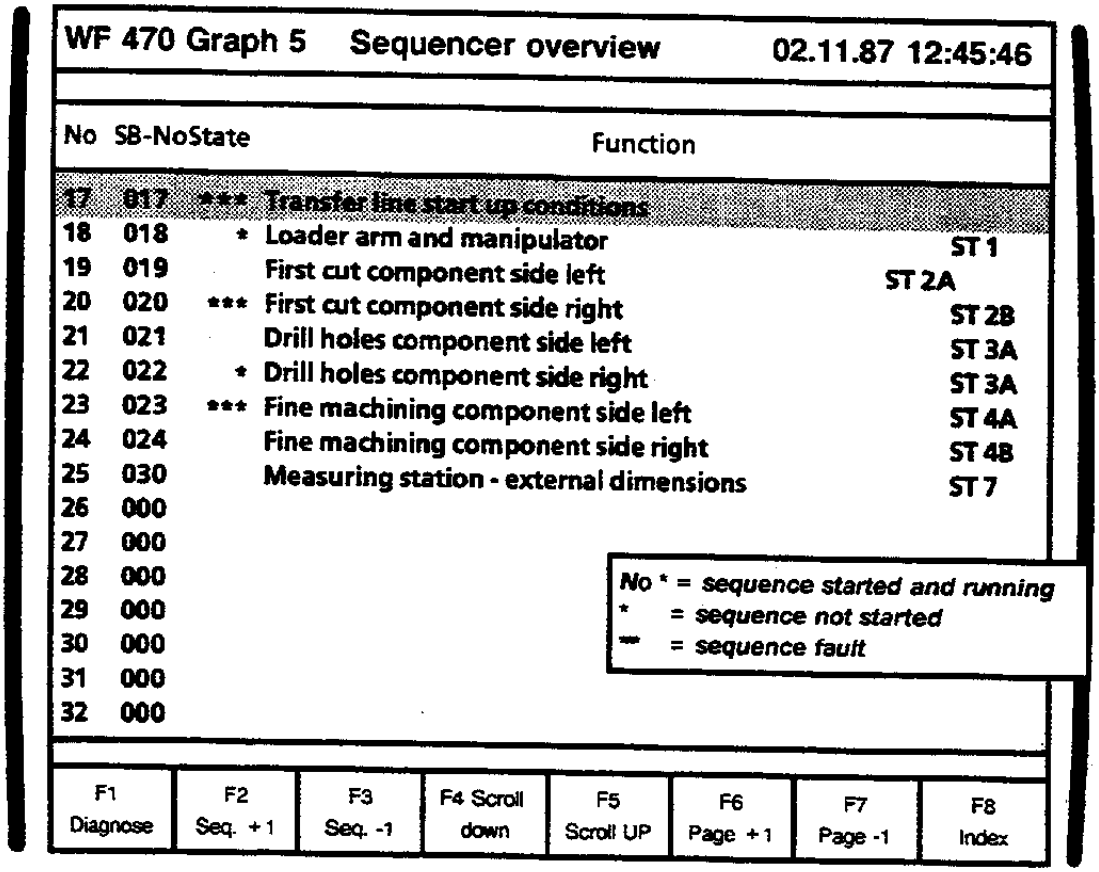
- Variable fields
  - Process data entry
  - Process data entry and display
  - Process data display
  - Comment text
  - date
  - time
- Bar graphs, which allow the following to be defined:
  - size (vertical,horizontal) to pixel resolution
  - Direction of increase
  - Colour zones (up to 8)
  - Width
  - Height

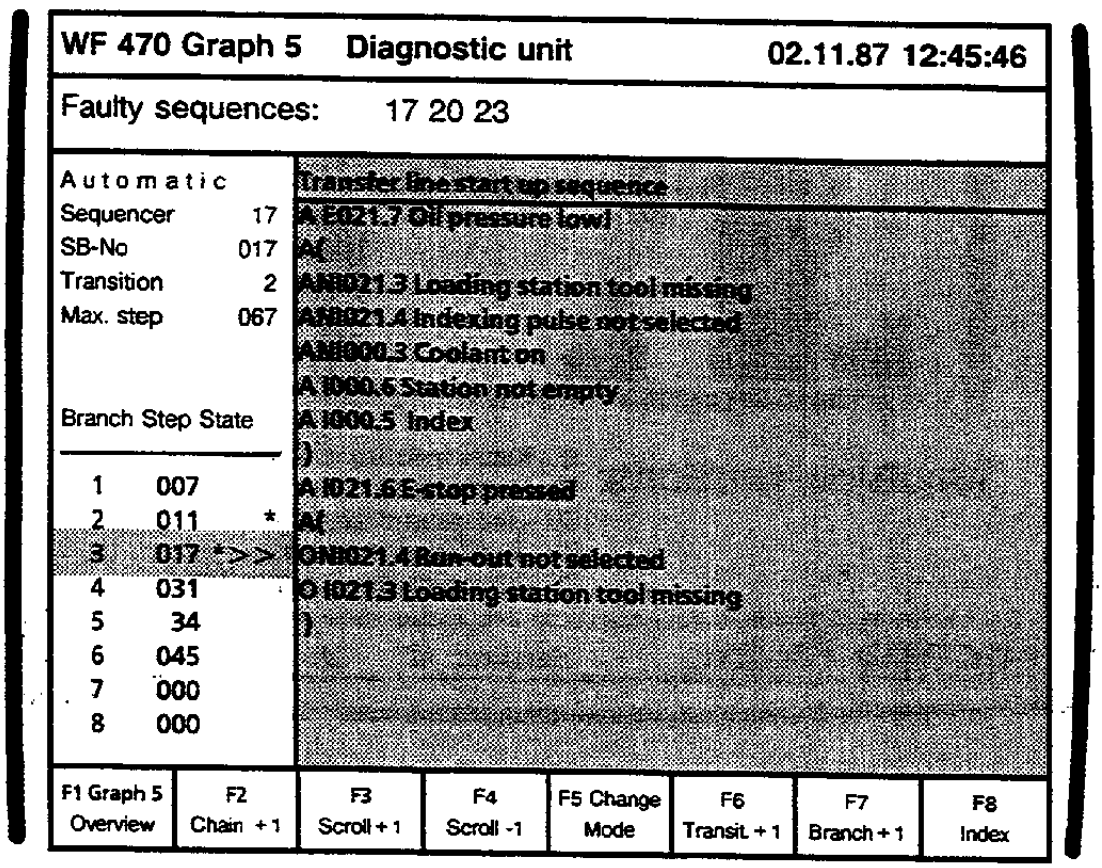
Examples of typical pictures and data displays are produced on the following pages.
The WF 470 Brief Description leaflet contains further colour reproductions of typical WF 470 pictures.




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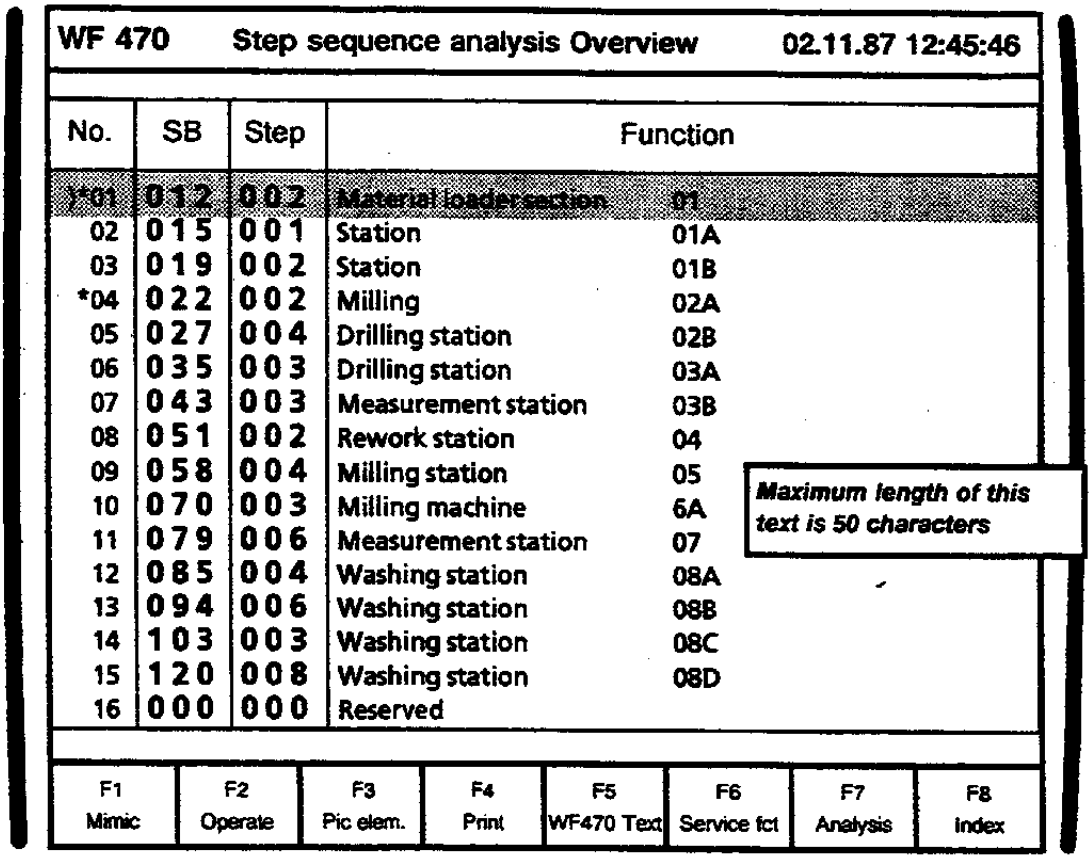






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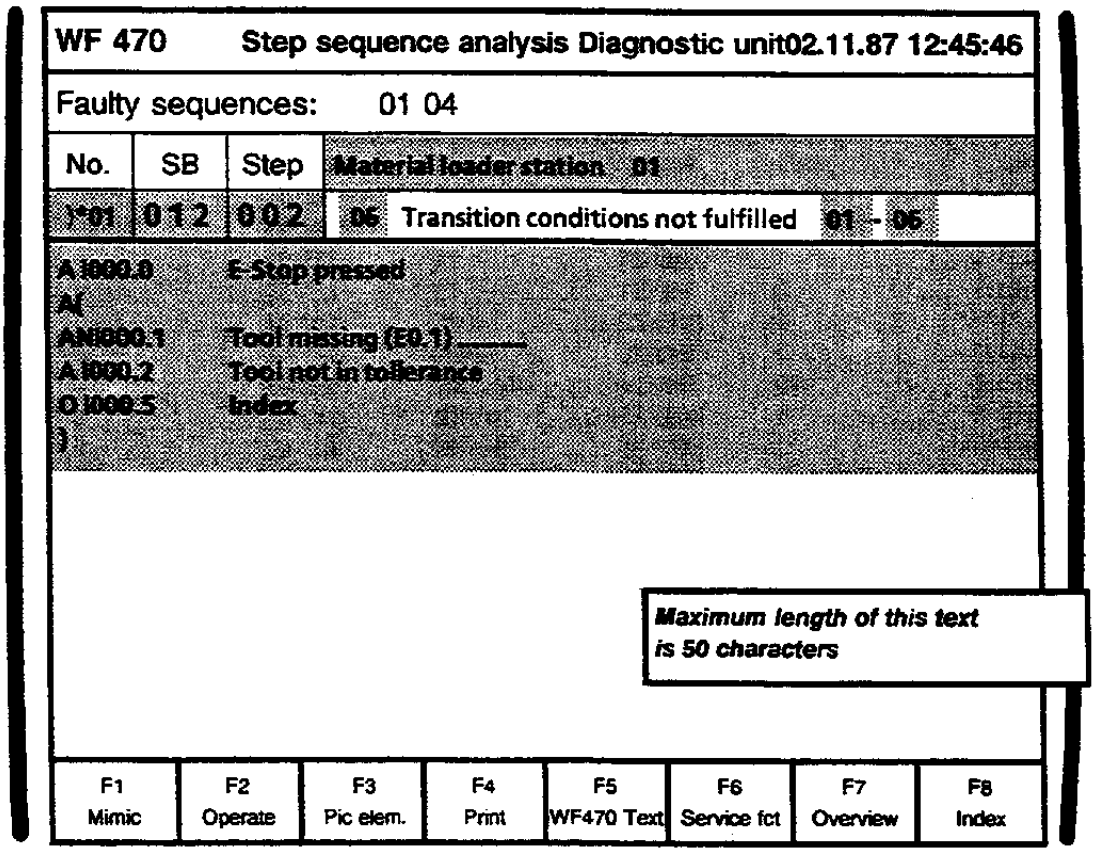


WF 470 Step sequence analysis Overview 02.11.87 12:45:46

| No. | SB | Step | Function | |
|---|---|---|---|---|
| )*01 | 012 | 002 | Material loader section | 01 |
| 02 | 015 | 001 | Station | 01A |
| 03 | 019 | 002 | Station | 01B |
| *04 | 022 | 002 | Milling | 02A |
| 05 | 027 | 004 | Drilling station | 02B |
| 06 | 035 | 003 | Drilling station | 03A |
| 07 | 043 | 003 | Measurement station | 03B |
| 08 | 051 | 002 | Rework station | 04 |
| 09 | 058 | 004 | Milling station | 05 |
| 10 | 070 | 003 | Milling machine | 6A |
| 11 | 079 | 006 | Measurement station | 07 |
| 12 | 085 | 004 | Washing station | 08A |
| 13 | 094 | 006 | Washing station | 08B |
| 14 | 103 | 003 | Washing station | 08C |
| 15 | 120 | 008 | Washing station | 08D |
| 16 | 000 | 000 | Reserved | |

*Maximum length of this text is 50 characters*

F1 Mimic | F2 Operate | F3 Pic elem. | F4 Print | F5 WF470 Text | F6 Service fct | F7 Analysis | F8 Index



WF 470 Step sequence analysis Diagnostic unit02.11.87 12:45:46

Faulty sequences: 01 04

| No. | SB | Step | Material loader station 01 | | |
|---|---|---|---|---|---|
| )*01 | 012 | 002 | 06 | Transition conditions not fulfilled | 01 - 06 |

A I000.0 E-Stop pressed
A(
AN I000.1 Tool missing (E0.1)
A I000.2 Tool not in tollerance
O I000.5 Index
)

*Maximum length of this text is 50 characters*

F1 Mimic | F2 Operate | F3 Pic elem. | F4 Print | F5 WF470 Text | F6 Service fct | F7 Overview | F8 Index

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**WF 470 Service module**

| CONTROL | | n/DL | n+1/DR | HEXA | DEC | |
|---|---|---|---|---|---|---|
| IW | 000 | 0000 0110 | 1100 0000 | 06C0 | 01728 | |
| QW | 000 | 1000 0100 | 1100 0000 | 84C0 | 33984 | |
| FW | 100 | 0000 0001 | 0000 0000 | 0100 | 00256 | |
| C | 005 | 0000 0000 | 0000 0000 | 0000 | 0000 | |
| T | 102 | 0000 0000 | 0000 0000 | 0000 | 0000 | 100ms |
| PW | 129 | 1111 1111 | 1111 1111 | FFFF | 65535 | |
| DB | 030 | | | | | |
| DW | 001 | 0000 0000 | 0000 0001 | 0001 | 00001 | |
| DW | 002 | 0000 0000 | 0000 0101 | 0005 | 00005 | |
| DW | 003 | 0100 1000 | 0010 0000 | 4820 | 18464 | |

*WF 470 service module option*

1=Input word (IW) 2=Output word (OW) 3=Flag word (MW)
4=Counter (C) 5=Timer (T) 6=Periphery (PW)
7=DB number (DB) 8=DW number (D1) 0=Delete

| F1 Mimic | F2 Operate | F3 Pic elem. | F4 Print | F5 Characteris. | F6 Free | F7 Sequence | F8 Index |
|---|---|---|---|---|---|---|---|

**LOAD AXIS (AXIS 1)** — **Machine data**

MACHINE DATA INPUT/OUTPUT — ⇒ Fault ⇐

| | | | | | |
|---|---|---|---|---|---|
| MD 1 .... | 5000 | MD 17 .... | 0 | MD 33 .... | 0.200 |
| MD 2 ..... | 6000 | MD 18 .... | 1 | MD 34 ..... | 2000 |
| MD 3 .. | 30000.00 | MD 19 .... | 1 | MD 35 .... | 0.000 |
| MD 4 ..... | 1 | MD 20 .... | 0 | MD 36 .... | 0 |
| MD 5 ... | 0 | MD 21 .... | 2 | MD 37 .... | 0 |
| MD 6 ..... | 0 | MD 22 ..... | 1.00 | MD 38 .... | 0.00 |
| MD 7 ..... | 1 | MD 23 ..... | 9000 | MD 39 .... | 0.00 |
| MD 8 ..... | 100 | MD 24 .... | 40.000 | MD 40 ..... | 0 |
| MD 9 ..... | 1 | MD 25 .... | 0.100 | MD 41 .... | 0 |
| MD 10... | 0 | MD 26 .... | 26.000 | MD 42 ..... | 0 |
| MD 11... | -1000.000 | MD 27 ..... | 0 | MD 43 ..... | 0 |
| MD 12... | -1100.000 | MD 28 .... | 1.111 | MD 44 ..... | 0 |
| MD 13... | 2100.000 | MD 29 .... | 0 | MD 45 ... | 0.000 |
| MD 14... | 2110.000 | MD 30 ..... | 1 0000 | MD 46 ... | 0.000 |
| MD 15..... | 2 | MD 31 .... | .000 | | |
| MD 16... | 1.000 | MD 32 .... | 0.100 | | |

*WF 726 standard III*

MD 49 ... 1

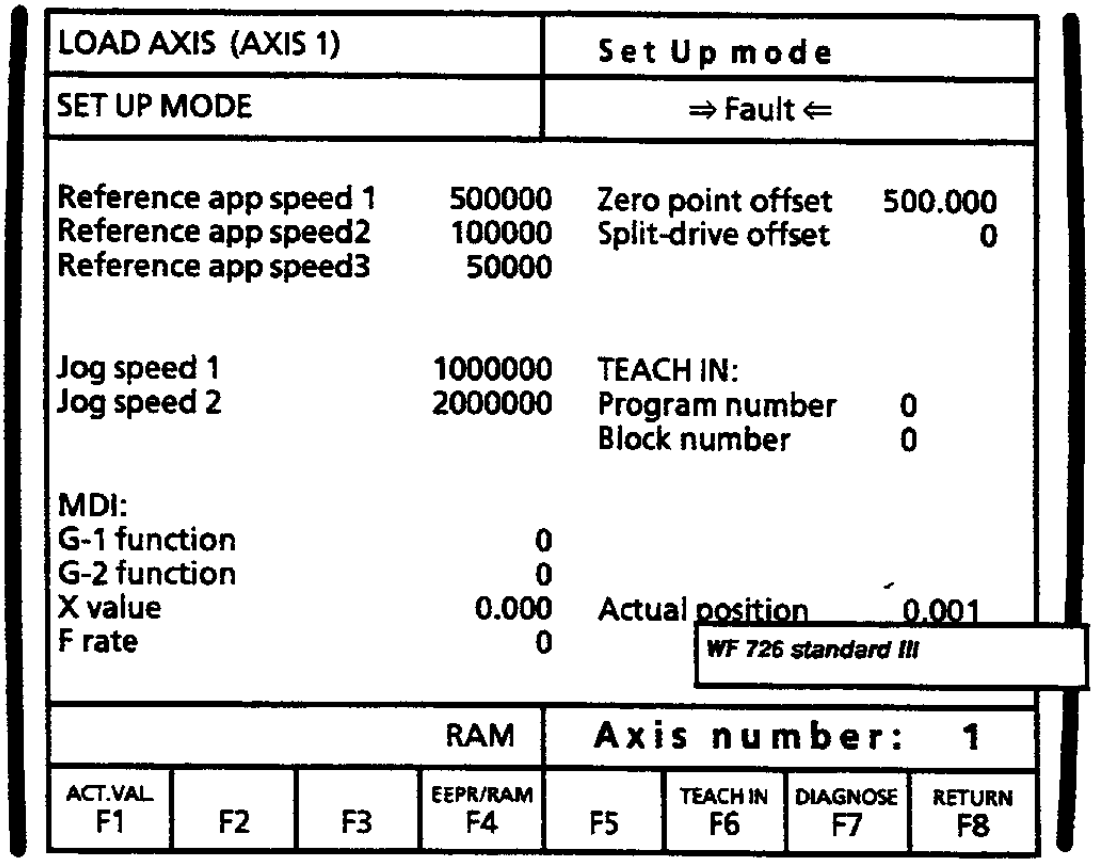
RAM — **Axis number: 1**

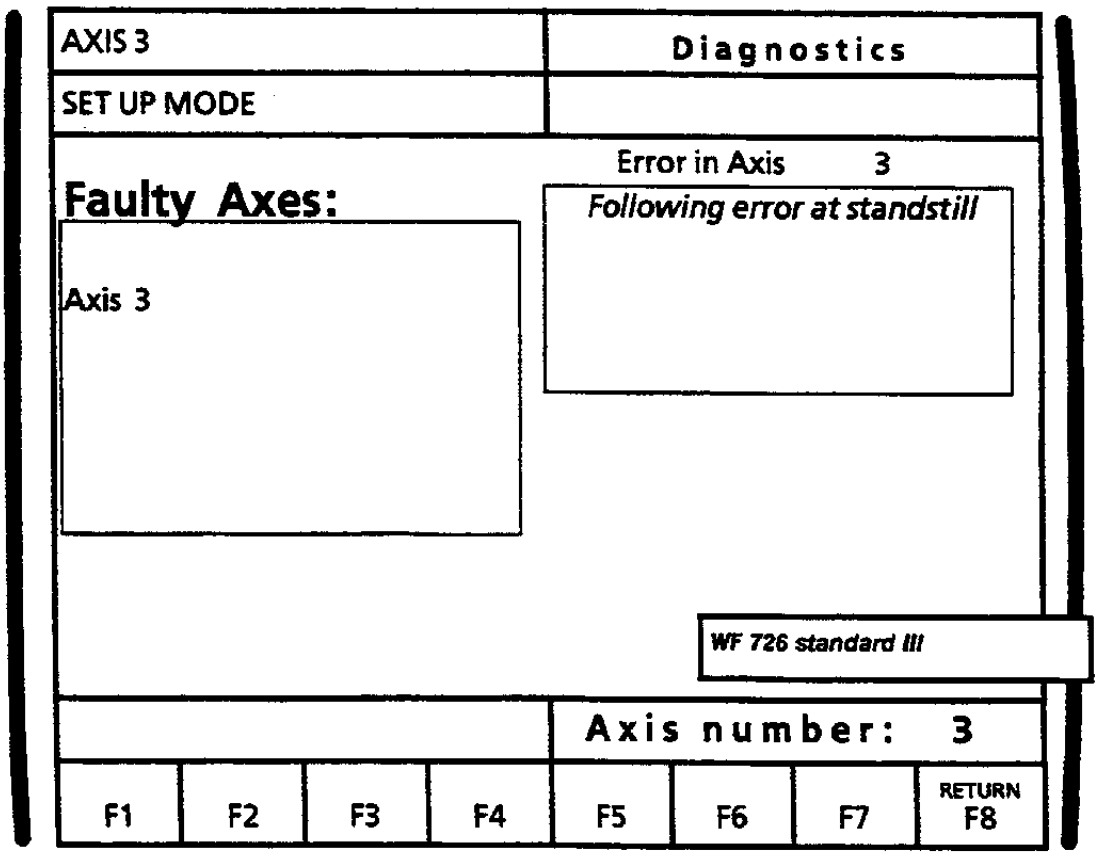
| F1 | F2 | F3 | EEPR/RAM F4 | F5 | F6 | DIAGNOSE F7 | RETURN F8 |
|---|---|---|---|---|---|---|---|



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# 2 Hardware

## 2.1 System configuration

The WF 470 module resides in the SIMATIC programmable controller rack and is bus-coupled to the central processor. The following units are connected directly onto the WF 470 module.

- Colour monitor
- Logging printer
- Picture construction system (PG 675/PG 685/PG 750 and printer; only required during picture construction and editing)

The operator keyboard can be connected normally via SIMATIC inputs and outputs and/or serially directly onto the WF 470. The complete configuration is shown below:

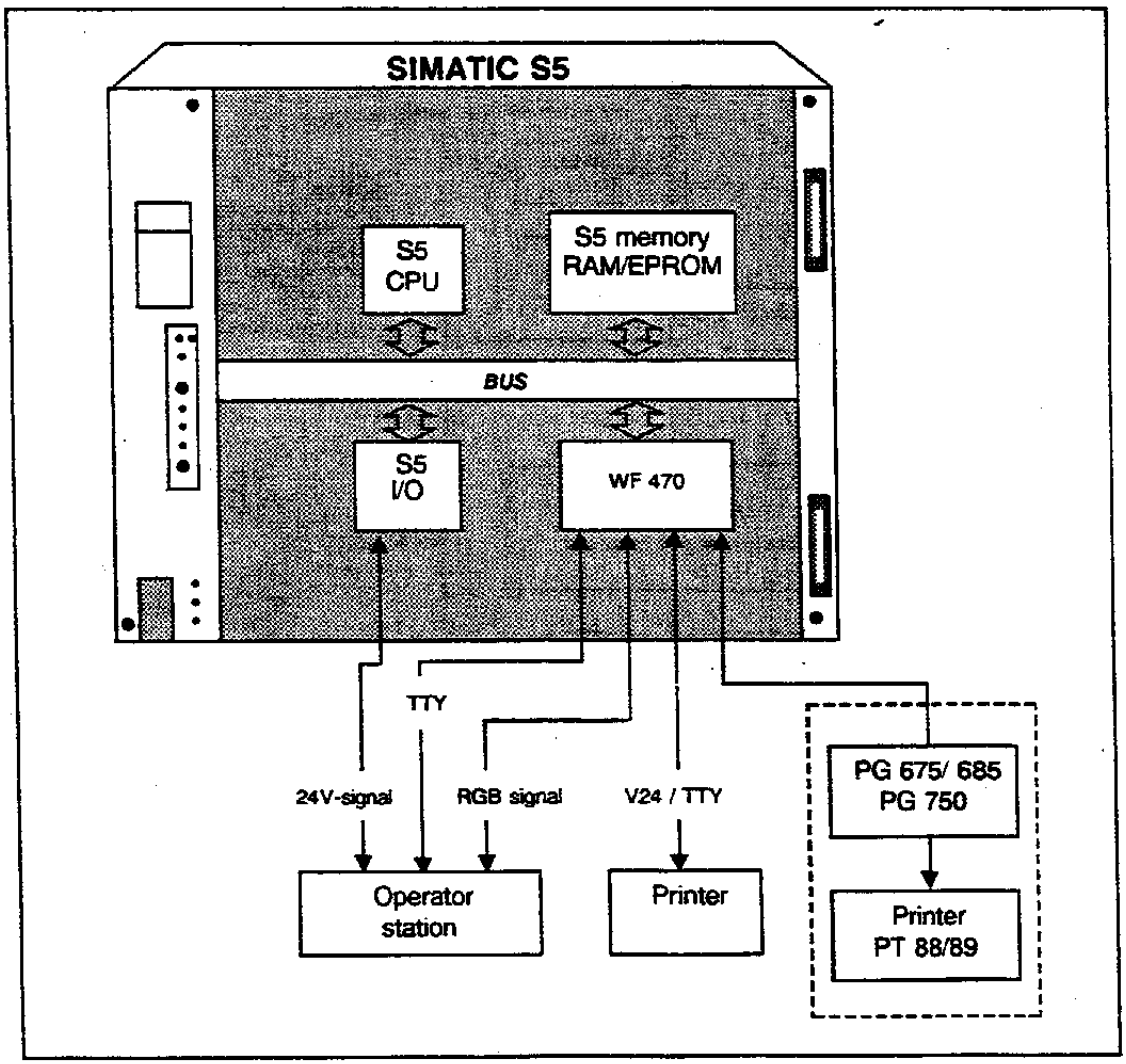



*Fig. 2.1 WF 470 system configuration.*

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## 2.2 WF 470 hardware

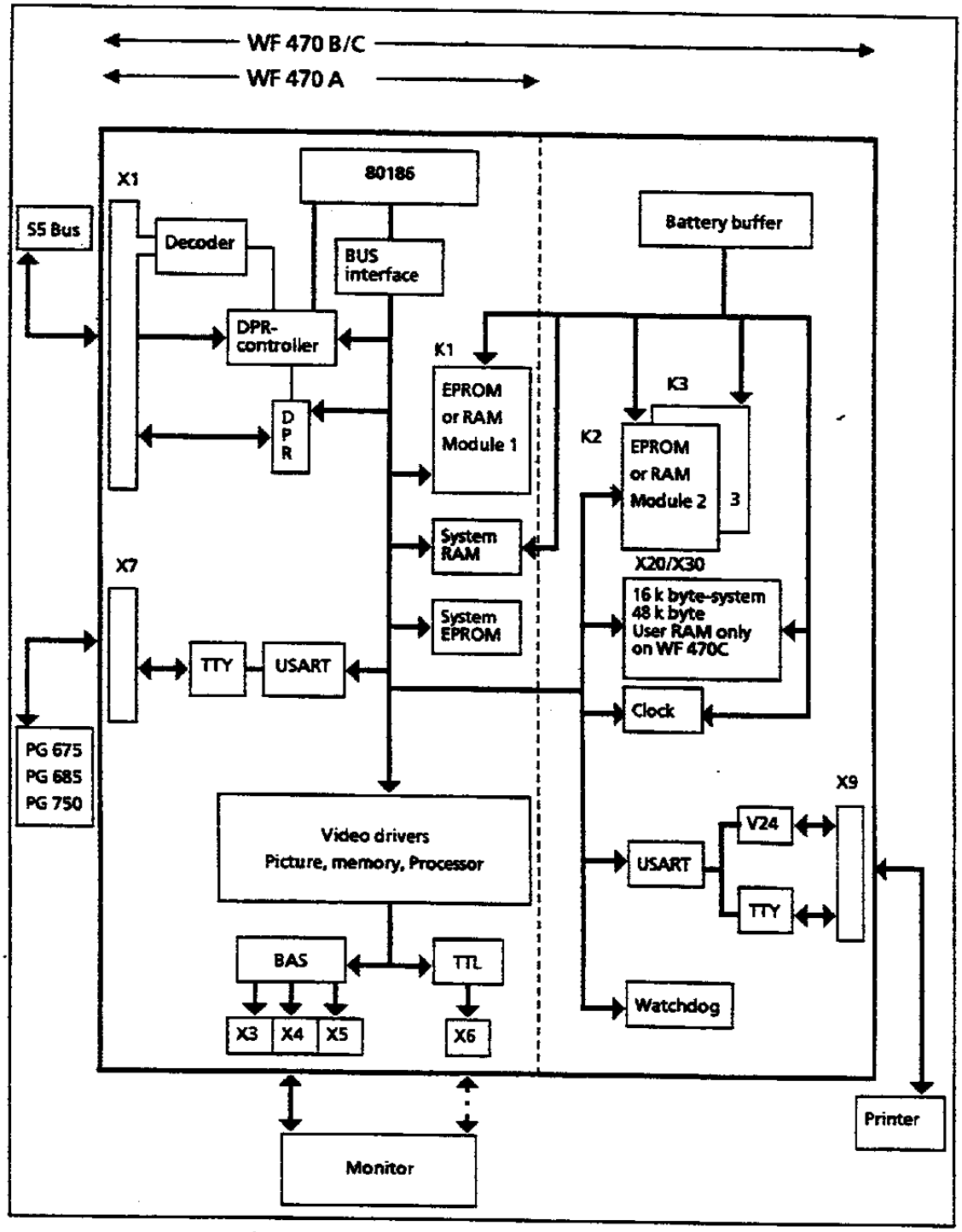



*Fig 2.2 WF470 A, WF470 B, WF470 C Hardware block diagram.*

When using a WF 470 B, a RAM module should be plugged into the third slot K3. Of this RAM, there will then be 8 Kbyte used by the system. This RAM is not necessary when the WF 470 pictures are simple and do not display a large amount of data, and when the printer function is not going to be used.



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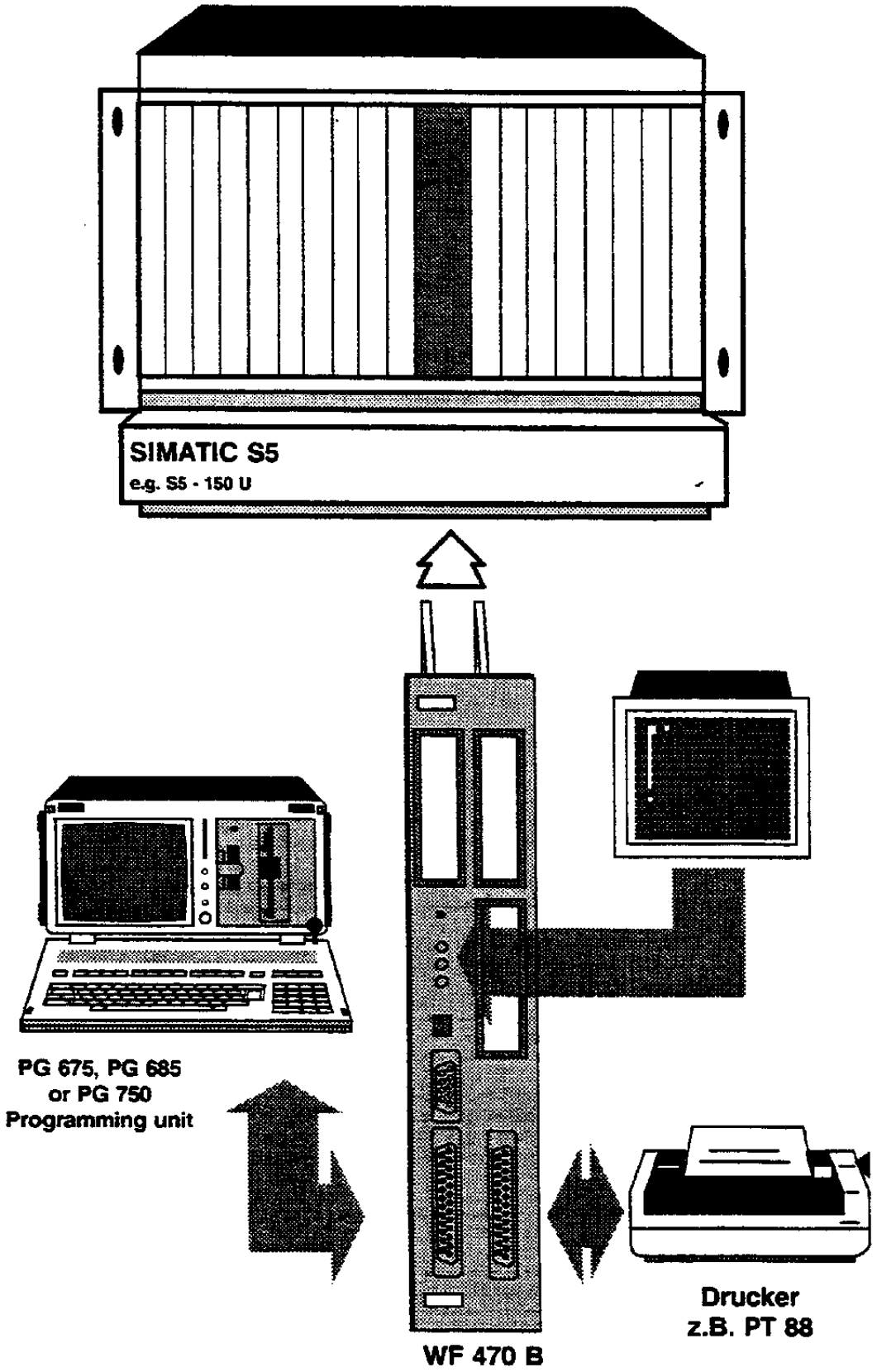



*Fig. 2.3 Hardware configuration.*

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## Technical Data

| | WF 470 A Monochrome | WF 470 A Colour |
|---|---|---|
| **Microprocessor** | For picture construction, data processing, hardware interface control | |
| **Operating System** | RMOS real time operating system | |
| **Operating System Memory** | 2 × EPROM 27512 (128 K byte) 16 K byte RAM as internal workspace | |
| **User Memory RAM- or EPROM Module** | 1 slot<br>memory capacity<br>max. 128 K byte | 1 slot<br>memory capacity<br>max. 128 K byte |
| **Time Generation** | Software clock | Software clock |
| **Interfaces**<br>- **link to SIMATIC S5**<br>- **BAS Outputs**<br>- **TTL Monitor** | Via Dual Port RAM, 256 byte<br>RGB, frame and line sychronisation; Theoretical maximum cable length: 400 m<br>maximum cable length: 2,5 m | |
| **Serial Interface for PG 675, PG 685 and PG 750** | X | X |
| **Serial Interface for printer** | - | - |
| **SIMATIC S5 PLC's** | 115U, 135U, 150U, 155 U, 130W(B) | |
| **Power Supply** | Via SIMATIC S5-bus; Power supply 5 V DC | |
| **Current Requirement** | 2.5 A | 2.5 A |
| **Dimensions** | Single slot width | Single slot width |

| | WF 470 B Monochrome | WF 470 B Colour | WF 470 C Colour |
|---|---|---|---|
| **Microprocessor** | For picture construction, data processing, hardware interface control | | |
| **Operating System** | RMOS real time operating system | | |
| **Operating System Memory** | 2 × EPROM 27512 (128 Kbyte) 16 Kbyte RAM used as internal workspace | | |
| **User Memory RAM- or EPROM-Module** | 3 slots<br>memory capacity<br>max. 3x128 K byte | 3 slots<br>memory capacity<br>max. 3x128 K byte | 3 slots<br>memory capacity<br>max. 3x128 K byte<br>and 48 K byte RAM<br>on the module |
| **Time Generation** | Hardware clock | Hardware clock | Hardware clock |
| **Interfaces**<br>- **link to SIMATIC S5**<br>- **BAS-Output**<br>- **TTL-Monitor** | Via Dual Port RAM, 256 byte<br>RGB, Theoretical maximum cable length:400 m<br>Maximum cable length: 2.5 m | | |
| **Serial Interface for PG 675, PG 685 and PG 750** | X | X | X |
| **Serial Interface for printer** | X | X | X |
| **SIMATIC S5 PLC's** | 115U, 135U, 150U, 155 U, 130W(B) | | |
| **Power Supply** | Via SIMATIC S5-bus; supply voltage 5 V DC | | |
| **Current Requirement** | 3.0 A | 3.0 A | 3.0 A |
| **Dimension** | Double slot width | Double slot width | Double slot width |



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## 2.3 WF 470 Battery back-up buffer

The WF 470 A uses the SIMATIC S5 battery to provide the battery back up. The WF 470 B/C allows the user to select how the unit will be buffered (Fig. 2.4):

- Buffered via S5: (S2.1 closed, T-S open)
- Buffered via S5 and self-buffered (mixed): (S2.1 open, T-S closed)
- Buffered via S5 and self-buffered (joint): (S2.1 closed, T-S closed)
  This is the setting used in normal applications.

***The T-S link is left OPEN when the unit is delivered from the factory, to prevent the battery from being discharged. It must be soldered in before the WF 470 is inserted in the SIMATIC rack.***

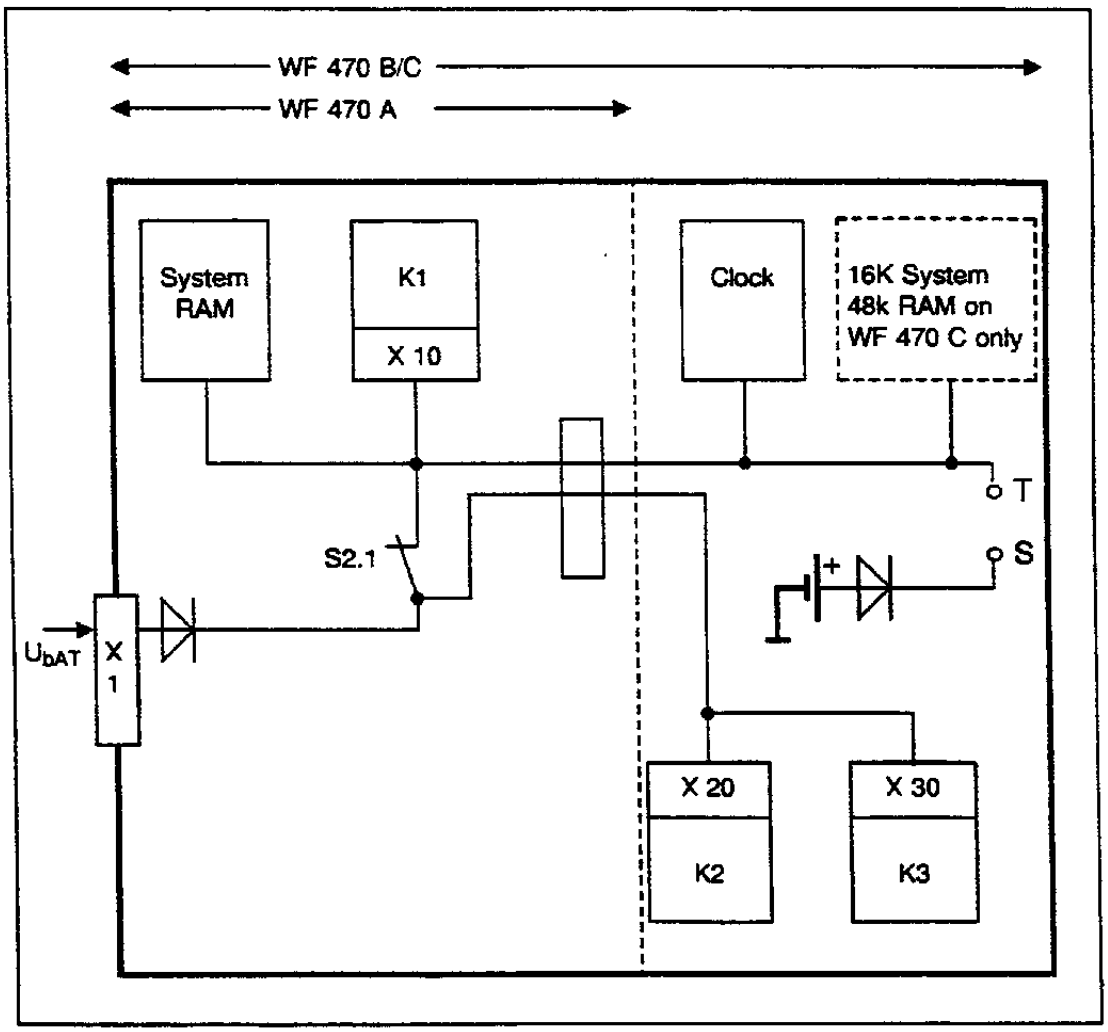



*Fig 2.4 Battery back-up WF 470 A and WF 470 B/C.*

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## 2.4 Linking the WF 470 to the SIMATIC PLC

The WF 470 can operate as a

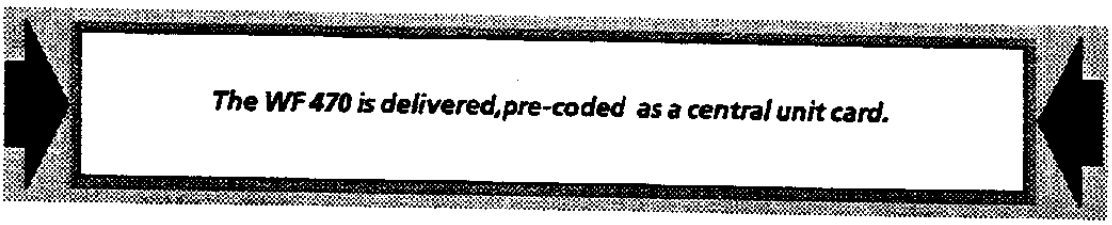
- Central unit module
- Peripheral module

The data exchange between the S5 and the WF 470 takes place via a Dual Port Ram on the WF 470 board. The Dual Port Ram acts as a memory which can be accessed from two sides, from the S5 and from the WF 470. The DPR therefore allows both partners to read from and write into the interface memory. A data transfer data block is also created in the PLC to receive data from the WF470 clock for the various option packages (sequence analyser, printer etc.).

The SIMATIC S5 Hardware treats the WF 470 like a memory module, for which the start address and size must be coded.

The module is pre-set with the following memory address and size:

- DPR Address : E000 ($56 \times 2^{10}$)
- DPR Size: 256 byte




### 2.4.1 WF 470 configured as a central unit module

When set to this mode, the WF 470 can be installed in the central rack or the extension rack. The extension rack offers the connections for the communication modules (CP connections, according to the SIMATIC catalogue). Prerequisite for this is the coupling of the extension racks via the connections AS304 - AS314.

The locations in the central rack which may be used are described in this manual in section 2.5 .

- DPR - start address: 0 to FF00 ($63.75 \times 2^{10}$, see section 2.6) selectable in 256 byte steps
- DPR - size: 256 byte (fixed setting)



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## 2.4.2 WF 470 configured as a peripheral module

This mode permits the module to be inserted into any peripheral slot in the central rack (see section 2.5). It can also be used in an extension rack, provided it is connected to the central rack in one of the following configurations:

| CU | | EU | | EU | |
|---|---|---|---|---|---|
| 300 | → | 312 | → | 312 | (Centralised configuration) |
| 301 | → | 312 | → | 312 | (Centralised configuration) |
| 301 | → | 310 | → | 310 | (de-centralised configuration) |
| | | 300 | → | 312 | |

***Expansion units which are linked via a 302-311 link cannot be used by the WF 470. The expansion unit must be fitted with a fan. The current consumption of the modules in the rack should be checked.***

**Provided that the above conditions are met, the WF 470 can be installed in any location in the extension unit.**

The Dual Port Ram may then be coded into the analogue peripheral area (peripheral bytes 128-255) or in the expanded peripheral area (Q-bytes 0-256).

- DPR - start address: PY 128-255 (analogue section)
  OY 0-255 - (Q section)
  in steps of the DPR size
- DPR - size: 32/64/128/256 byte

***The WF 470 cannot make use of the SIMATIC back-up battery when configured as a peripheral module (The WF 470B / C has its own battery - see section 2.3).***

By reducing the size of the DPR, the data transfer time between the S5 and the WF 470 is increased. It is therefore recommended to set the DPR size as large as possible.

***The WF 470 is normally configured as a central module.***

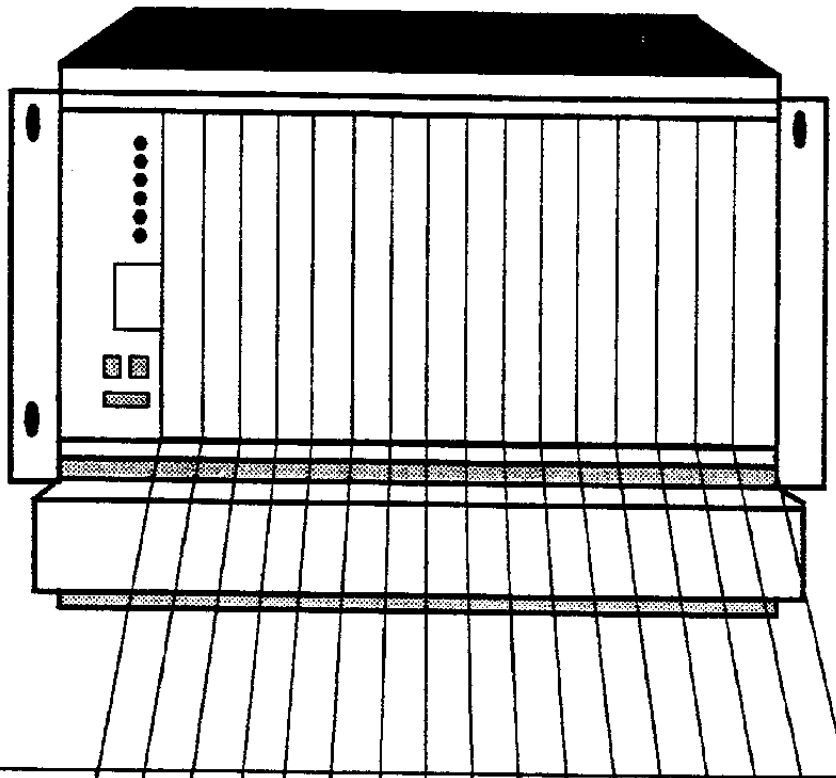
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## 2.5 Module location in the SIMATIC rack.

### 2.5.1 SIMATIC S5-130 WB

Power supply: 18 A



| Slot number | 27 | 35 | 43 | 51 | 69 | 79 | 89 | 97 | 105 | 113 | 121 | 129 | 137 | 145 | 153 | 163 | current consumption (A)/ module |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CPU | | | | | | | | | | | | | | | | | 5.0 A |
| Memory 340 | | | | | | | | | | | | | | | | | 1.2 A |
| Memory 350 | | | | | | | | | | | | | | | | | 1.8 A |
| IF 511 | | | | | | | | | | | | | | | | | 1.7 A |
| I/Q | | | | | | | | | | | | | | | | | |
| WF 460 | | | | | | | | | | | | | | | | | 2.5 A |
| WF 463 S | | | | | | | | | | | | | | | | | 2.0 A |
| WF 470 A | | | | | | | | | | | | | | | | | 2.5 A |
| WF 470 B | | | | | | | | | | | | | | | | | 3.0 A |
| WF 470 C | | | | | | | | | | | | | | | | | 3.0 A |

16 bit wide address bus

8 bit wide address bus- the WF 470 can only used as a peripheral module here.

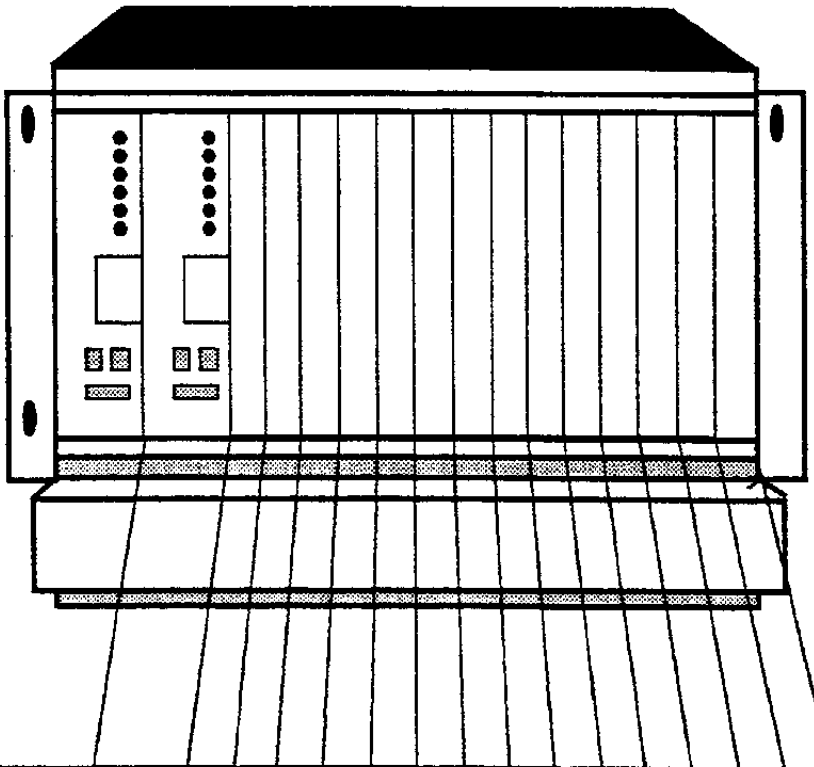


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## 2.5.2 SIMATIC S5-150 S

Power Supply: 2 × 18 A



| Slot number | | | 51 | 59 | 67 | 75 | 85 | 93 | 101 | 109 | 117 | 127 | 137 | 145 | 153 | 161 | current consumption (A)/ module |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CPU | | | | | | | | | | | | | | | | | 5.0 A |
| Memory 340 | | | | | | | | | | | | | | | | | 1.2 A |
| Memory 350 | | | | | | | | | | | | | | | | | 1.8 A |
| IF 511 | | | | | | | | | | | | | | | | | 1.7 A |
| WF 460 | | | | | | | | | | | | | | | | | 2.5 A |
| WF 463 S | | | | | | | | | | | | | | | | | 2.0 A |
| WF 470 A | | | | | | | | | | | | | | | | | 2.5 A |
| WF 470 B | | | | | | | | | | | | | | | | | 3.0 A |
| WF 470 C | | | | | | | | | | | | | | | | | 3.0 A |

These slots are not buffered via the S5 bus.

*The WF 470 MUST NOT be used in the central extension rack!*

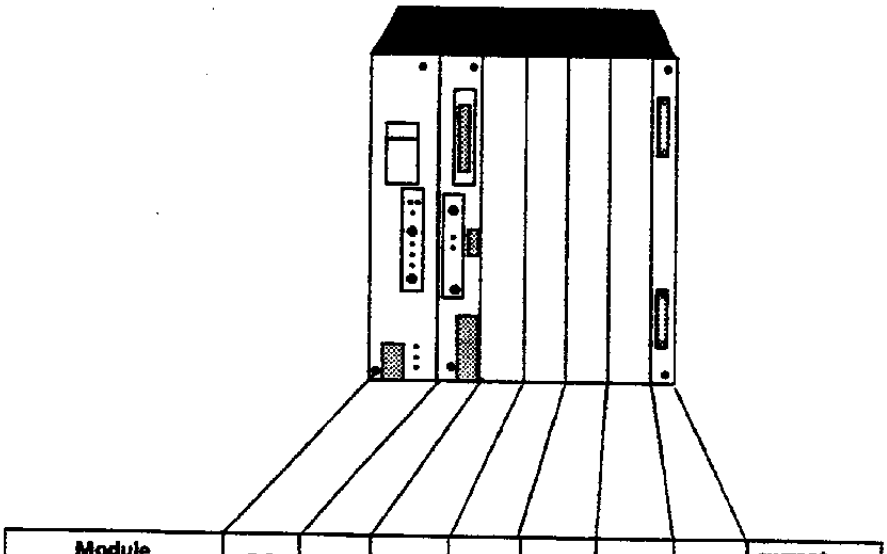
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## 2.5.3 SIMATIC S5-115 U

The WF 470 can only be used under the following conditions:

- CPU 941/942/943/944
- 15 A Power supply fitted
- Fan tray fitted



| Module code | PS | CPU | 0 | 1 | 2 | 3 | IM | current consumption (A)/ module |
|---|---|---|---|---|---|---|---|---|

**Central rack CR 700-0**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Communications processor | | | | | | | | |
| I/Q analogue/digital | | | | | | | | |
| WF 460 | | | | | | | | 2.5 A |
| WF 463 S | | | | | | | | 2.0 A |
| WF 470 A | | | | | | | | 2.5 A |
| WF 470 B +. C | | | | | | | | 3.0 A |

5V current consumption:

| | | |
|---|---|---|
| CPU | 941 | 1.2 A |
| | 942 | 0.9 A |
| | 943 | 0.5 A |
| | 944 | |



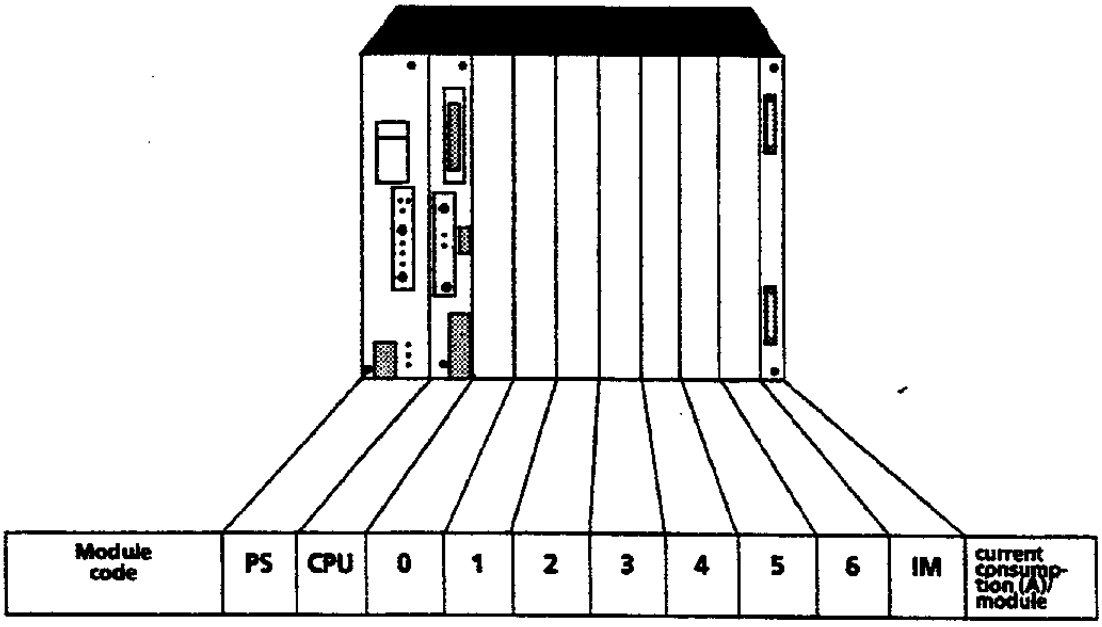
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The WF 470 can only be used under the following conditions:

- CPU 941/942/943/944
- 15 A Power supply fitted
- Fan tray fitted



| Module code | PS | CPU | 0 | 1 | 2 | 3 | 4 | 5 | 6 | IM | current consumption (A)/ module |
|---|---|---|---|---|---|---|---|---|---|---|---|

## Central rack CR 700-1

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Communications processor | | | | | | | | | | | |
| I/Q analogue/digital | | | | | | | | | | | |
| WF 460 | | | | | | | | | | | 2.5 A |
| WF 463 S | | | | | | | | | | | 2.0 A |
| WF 470 A | | | | | | | | | | | 2.5 A |
| WF 470 B u. C | | | | | | | | | | | 3.0 A |

## Central rack CR 700-2

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Communications processor | | | | | | | | | | | |
| I/Q analogue/digital | | | | | | | | | | | |
| WF 460 | | | | | | | | | | | 2.5 A |
| WF 463 S | | | | | | | | | | | 2.0 A |
| WF 470 A | | | | | | | | | | | 2.5 A |
| WF 470 B +. C | | | | | | | | | | | 3.0 A |

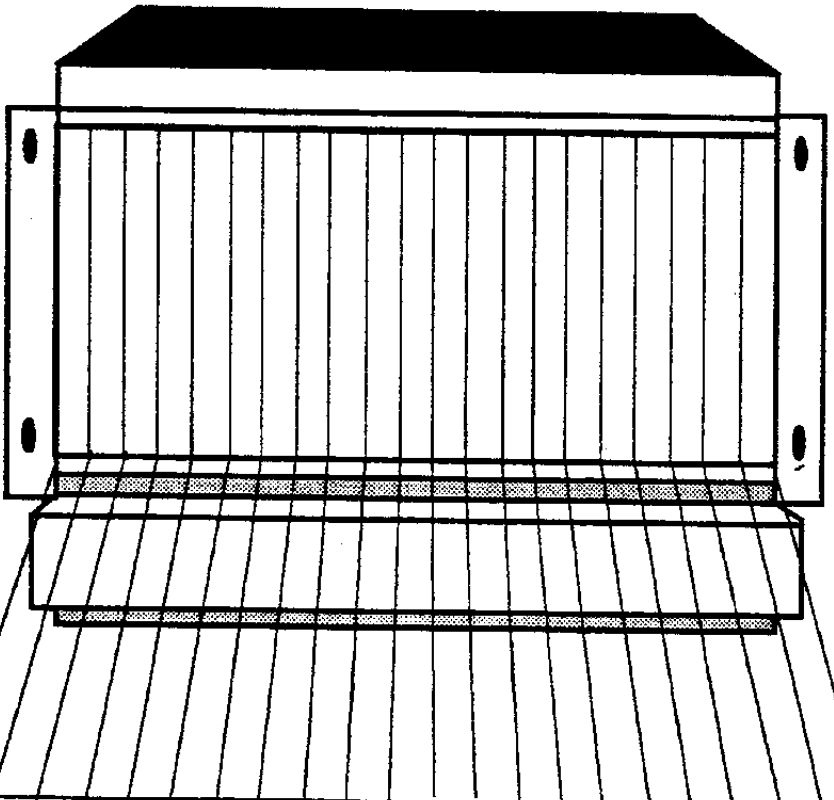
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## 2.5.4 SIMATIC S5-135 U

The WF 470 can be used with a CPU 921, 922, or 928.

Power supply: 18A.



| Module code | 3 | 11 | 19 | 27 | 35 | 43 | 51 | 59 | 67 | 75 | 83 | 91 | 99 | 107 | 115 | 123 | 131 | 139 | 147 | 155 | 163 | * |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Co-ordinat. 923 A | | | | | | | | | | | | | | | | | | | | | | |
| CPU | | | | | | | | | | | | | | | | | | | | | | |
| Communic. processor | | | | | | | | | | | | | | | | | | | | | | |
| I/Q | | | | | | | | | | | | | | | | | | | | | | |
| WF 460 | | | | | | | | | | | | | | | | | | | | | | 2.5 A |
| WF 463 S | | | | | | | | | | | | | | | | | | | | | | 2.0 A |
| WF 470 A | | | | | | | | | | | | | | | | | | | | | | 2.5 A |
| WF 470 B | | | | | | | | | | | | | | | | | | | | | | 3.0 A |
| WF 470 C | | | | | | | | | | | | | | | | | | | | | | 3.0 A |

* Current consumption (A)/ module

16 bit wide addres bus

8 bit wide address bus- the WF 470 can only used as a peripheral module here.



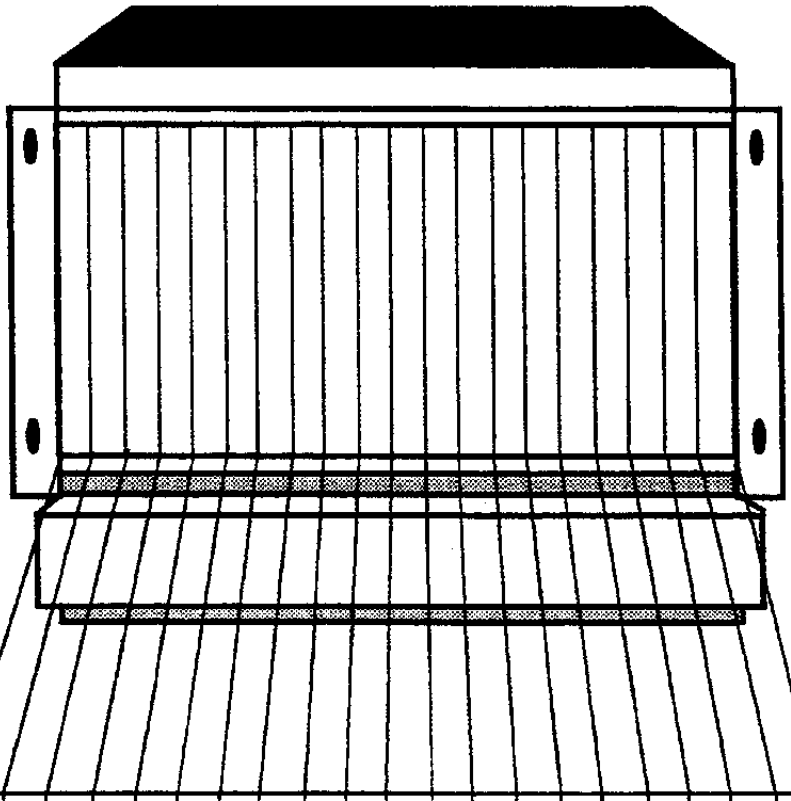
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## 2.5.5 SIMATIC S5-150 U

Power Supply: 40 A



| Slot code | 3 | 11 | 19 | 27 | 35 | 43 | 51 | 59 | 69 | 79 | 89 | 99 | 107 | 115 | 123 | 131 | 139 | 147 | 155 | 163 | * |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CPU | | | | | ■ | ■ | ■ | ■ | | | | | | | | | | | | | 12.7A |
| Jumpering module 756 | | | | ■ | | | | | | | | | | | | | | | | | |
| Memory 340/350 | | | | | | | | | | ■ | ■ | ■ | | | | | | | | | 0.5/2 |
| Parity module | ■ | | | | | | | | | | | ■ | | | | | | | | | 1.5 A |
| I/F 511 | | | | | | | | | ■ | ■ | | | | | | | | | | | 1.7 A |
| Communic. processor | ▨ | ▨ | ▨ | | | | | | | | | | ■ | ■ | ■ | ■ | | | | | |
| WF 460 | ▨ | ▨ | ▨ | | | | | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | | | 2.5 A |
| WF 463 S | ▨ | ▨ | ▨ | | | | | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | | | 2.0 A |
| WF 470 A | ▨ | ▨ | ▨ | | | | | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | | | 2.5 A |
| WF 470 B | ▨ | ▨ | | | | | | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | | | 3.0 A |
| WF 470 C | ▨ | ▨ | | | | | | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | | | 3.0 A |

* Current requirement for each module

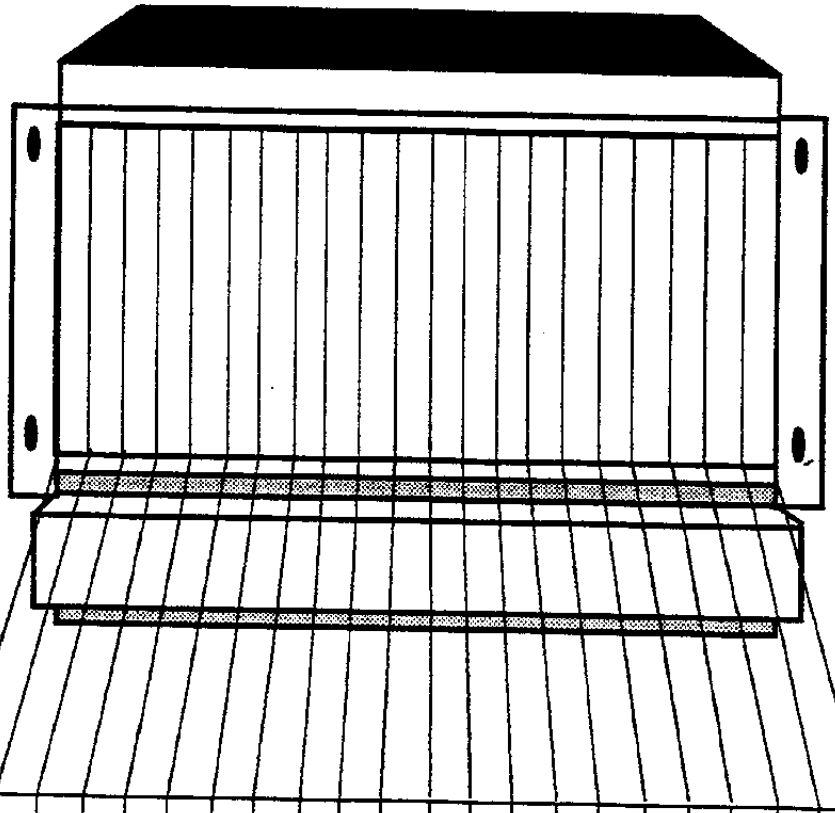
▨ Only possible when the jumper module 756 is still fitted.

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## 2.5.6 SIMATIC S5-155 U

Power Supply: 40 A



| Slot code | 3 | 11 | 19 | 27 | 35 | 43 | 51 | 59 | 67 | 75 | 83 | 91 | 99 | 107 | 115 | 123 | 131 | 139 | 147 | 155 | 163 | * |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CPU 946 | | ■ | ■ | | | | | | | | | | | | | | | | | | | |
| CPU 947 | | | | ■ | | | | | | | | | | | | | | | | | | |
| Memory 355 | | | | | ■ | ■ | | | | | | | | | | | | | | | | |
| Communic. processor | | | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | | | | |
| WF 460 | | | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | | | | 2,5 A |
| WF 463 S | | | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | | | | 2,0 A |
| WF 470 A | | | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | | | | 2,5 A |
| WF 470 B | | | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | | | | 3,0 A |
| WF 470 C | | | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | | | | 3,0 A |

* Current requirement for each module

■ 16 bit wide addres bus



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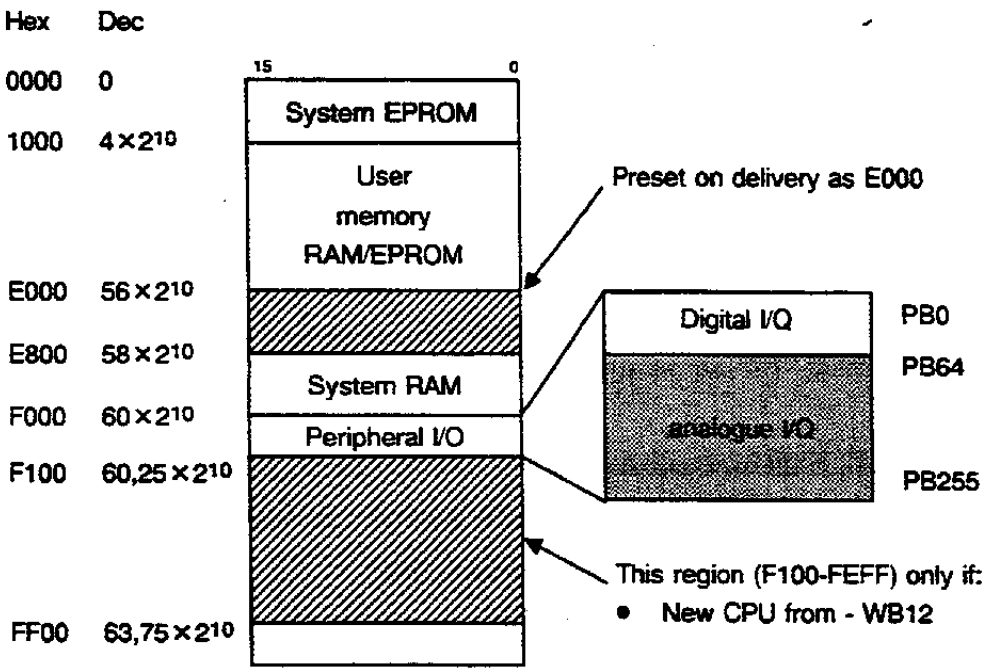
## 2.6 Memory addressing in the SIMATIC S5

Permitted addressing range when central module

Permitted addressing range when peripheral module

The memory region selected must not be occupied by any other card. The WF range of cards is NOT page addressed.

### 2.6.1 SIMATIC S5-130 WB

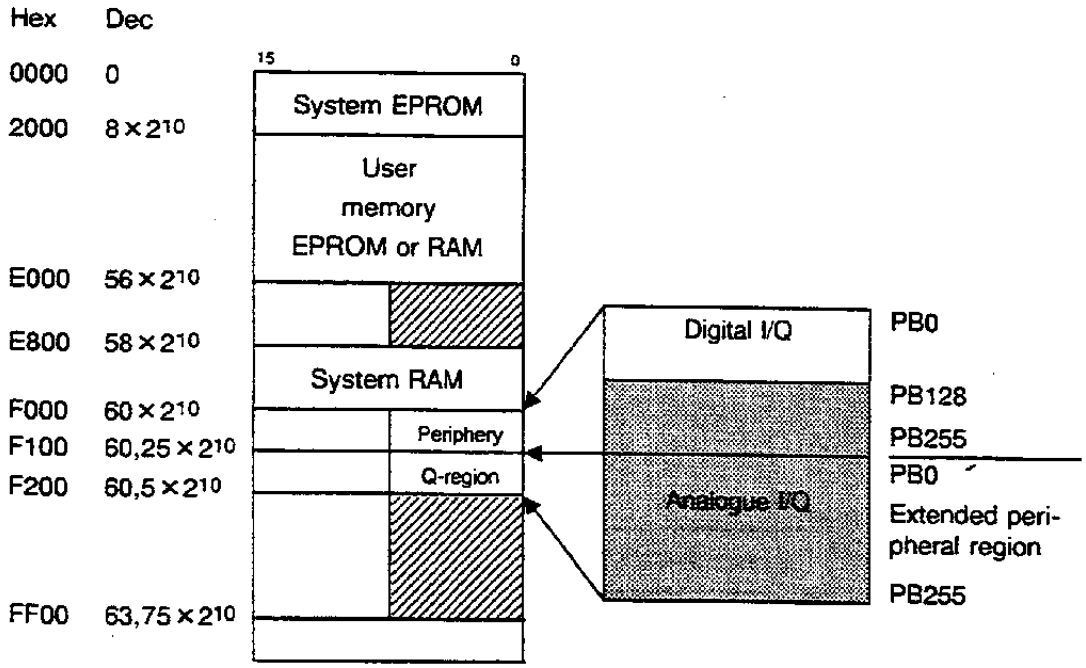



***The WF 470 module is normally used with its delivery pre-set address of E000.***

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## 2.6.2 SIMATIC S5-150 S




The extended peripheral region is only available for use in an extension rack which is connected to the central rack via a separate ER interface.

***The WF 470 module is normally used with its delivery pre-set address of E000.***

If the extended peripheral region is not used, the addressing space between F100 and FIFF can be used for the WF 470 configured as a central module.



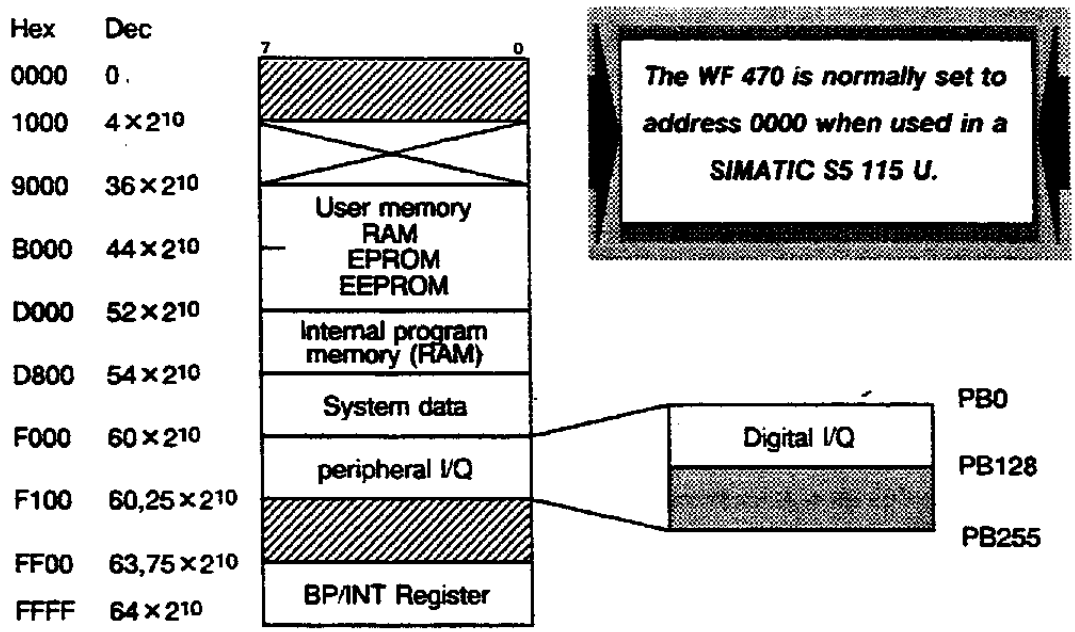
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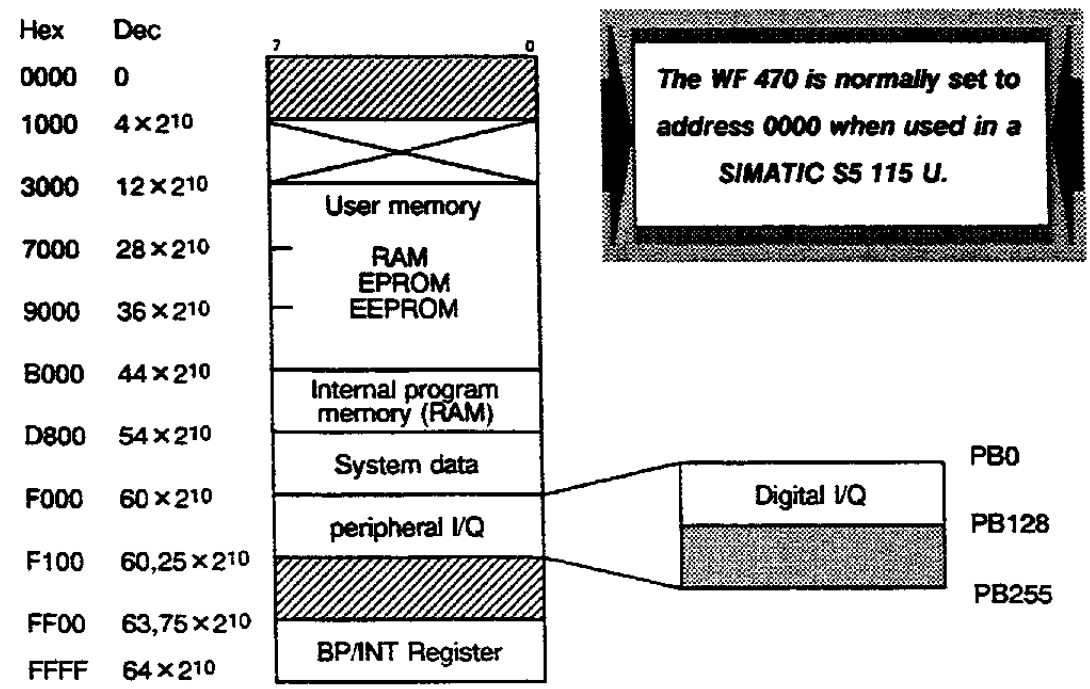
## 2.6.3 SIMATIC S5-115 U

### 2.6.3.1 S5-115U-CPU941




The WF 470 would normally be used with the SIMATIC S5 115U CPUs 942, 943 or 944 because of their faster cycle times.

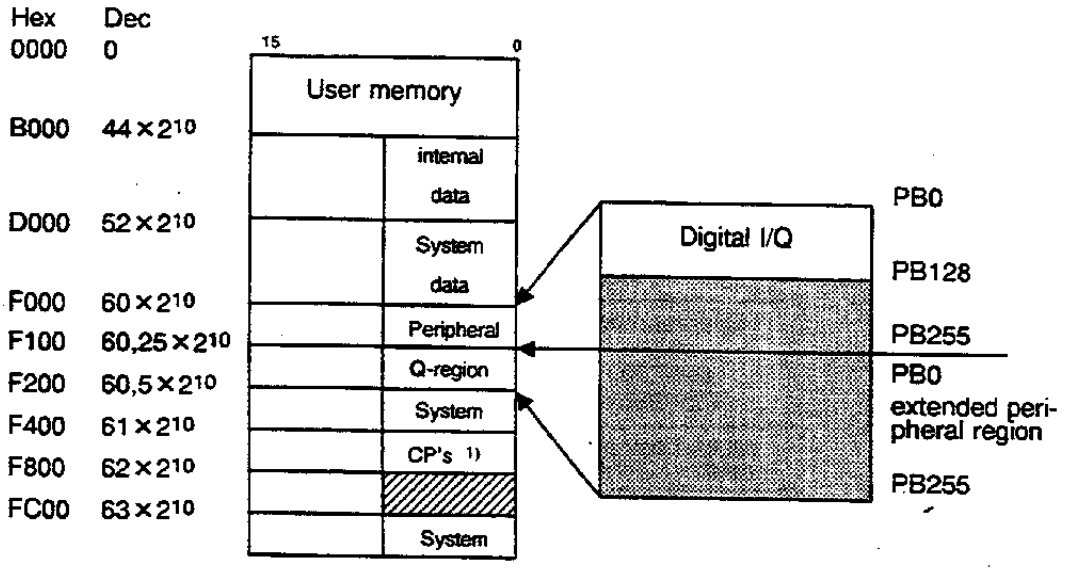
### 2.6.3.2 S5-115U-CPU942/943/944




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## 2.6.4 SIMATIC S5-135 U




1) If no CP's are being used, this addressing region could also be used by the WF470.

The extended peripheral region is only available for use in an extension rack which is connected to the central rack via a separate ER interface.

If the extended peripheral range is selected, no peripheral modules can be installed in the central rack.

If no extended peripheral region is used, the addressing space between F100 and FIFF can be used for the WF 470 configured as a central module.

***The WF 470 module is normally set to address F800.***

***The WF 470 may only be interfaced in software to ONE of the CPU's if the S5 135U is being used in multiprocessing mode.***

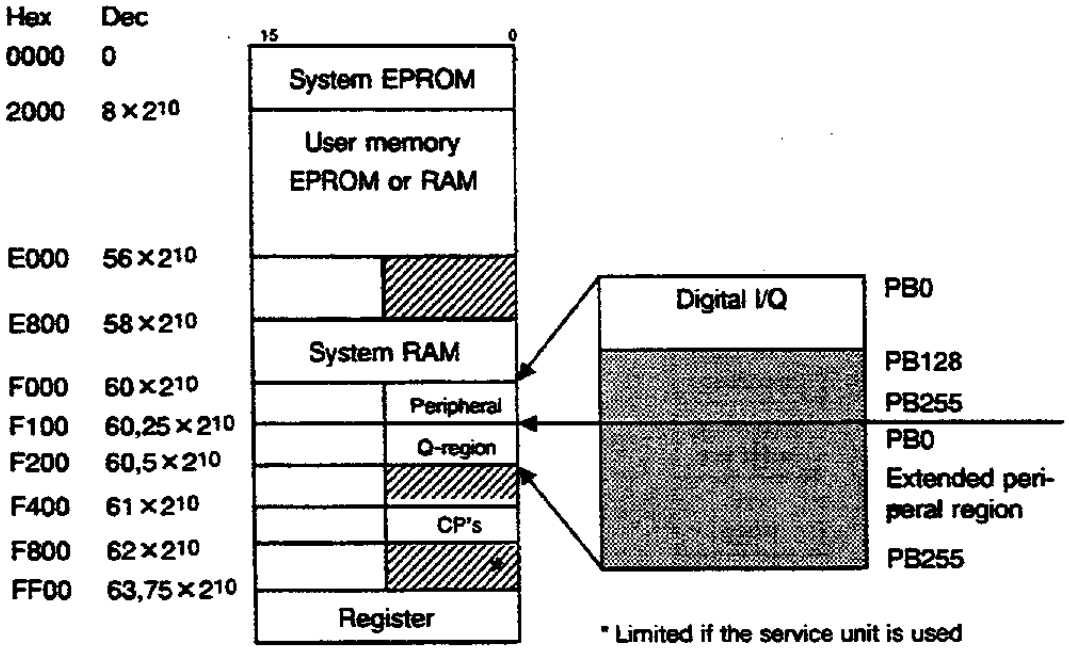


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## 2.6.5 SIMATIC S5-150 U




The extended peripheral region is only available for use in an extension rack which is connected to the central rack via a separate ER interface.

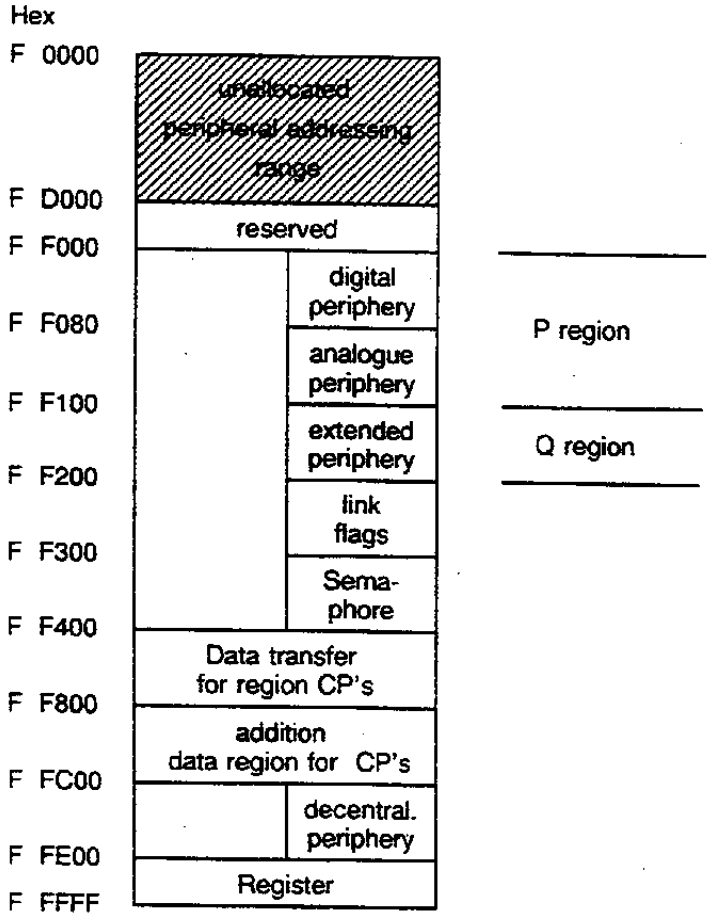
If no extended peripheral region is used, the addressing space between F100 and FIFF can be used for the WF 470 configured as a central module.

***The WF 470 module is normally used with its delivery pre-set address of E000.***

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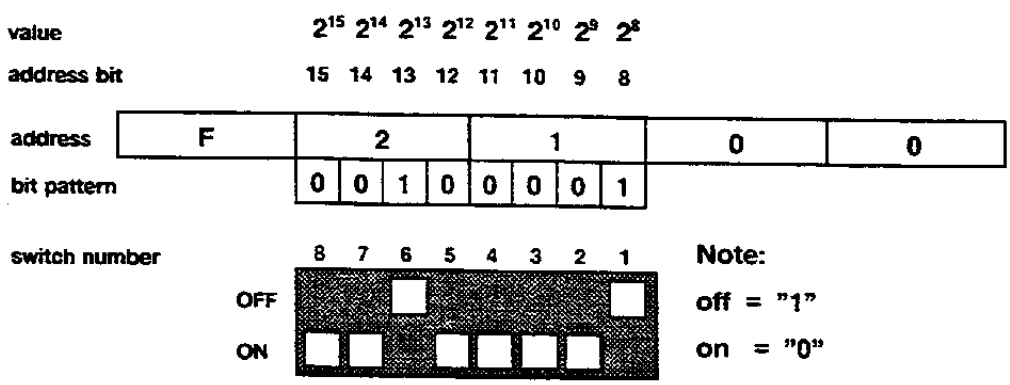
## 2.6.6 SIMATIC S5-155 U




There is an unallocated addressing range of 52 K available for the WF 470. This addressing area shown above extends from F 0000 Hex to F CF00 Hex.

The addresses are in 256 byte steps, corresponding to 100 Hex. The address is set in a similar manner to other SIMATIC S5 controllers, e.g. only the 3rd and 4th digit of the Hex address is set. With the 155U, the 5th digit is automatically set to F. Examples of other address settings can be found in section 4.2.6.2.

**Example setting: F 2100**






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## 2.7 WF 470 External Connections

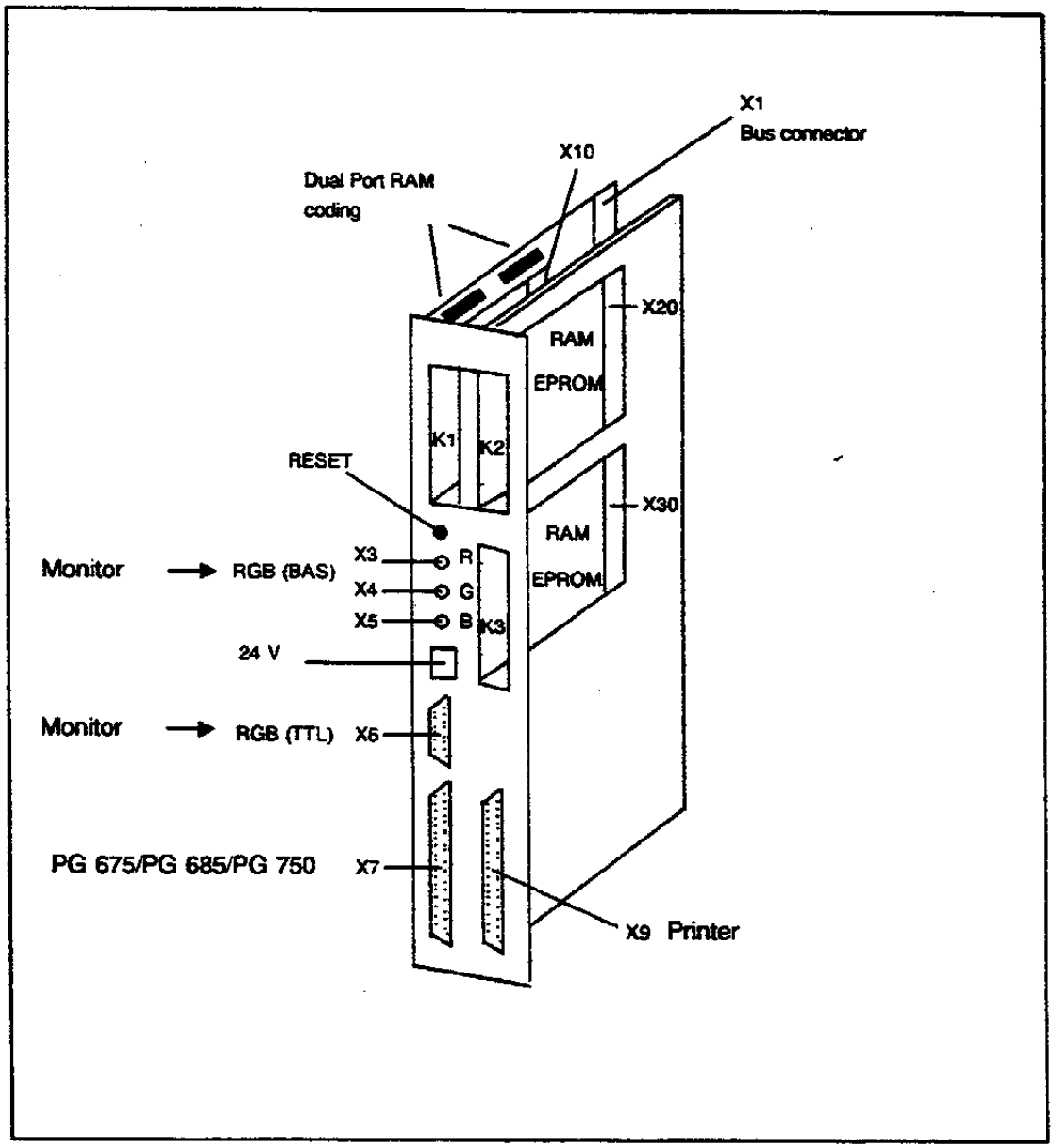



*Fig 2.5 WF 470 external connections.*

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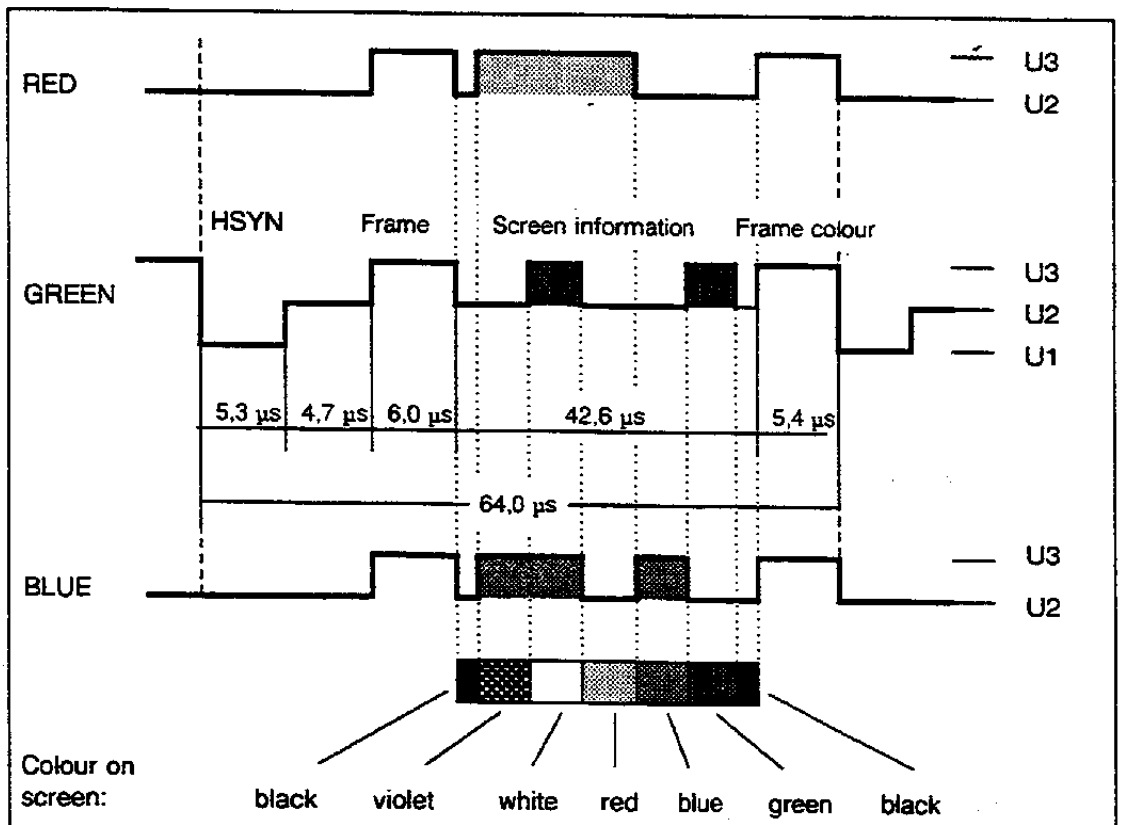
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## 2.7.1 BAS (RGB) Monitor Connections X3, X4, X5

The modulated signal interfaces X3, X4, X5 allow monitors with the following specification to be connected.

- 3 x RGB/BAS signals (1 Vpp/75 Ohm) red, green, blue
- Synchronising signal VSYNC and HSYNC on the green channel
  (Vertical frequency 50Hz, Horizontal frequency 15,625 Hz)

In order to minimise interference pick-up, the cable length should be kept as short as possible. If cables of greater than 60m length are used, care should be taken in the cable routing to avoid potential sources of interference. By feeding in +5V from an external power supply to the TTL monitor D type connector, the picture quality and black level can be improved. It is also important to ensure that the central unit or expansion unit where the WF470 is installed is on the same phase as the monitor.




Voltage level:

| | with monitor connected | | without monitor connected | |
|---|---|---|---|---|
| | without -5V on X6 | with -5V on X 6 | without -5V on X6 | with -5V on X6 |
| U1/V | 1.2 V | – 0.6 V | 2.4 V | –1.0 V |
| U2/V | 1.4 V | – 0.1 V | 2.8 V | – 0.2 V |
| U3/V | 2.0 V | + 1.0 V | 3.9 V | + 2.0 V |

*Fig 2.6 RGB/BAS Signal levels.*



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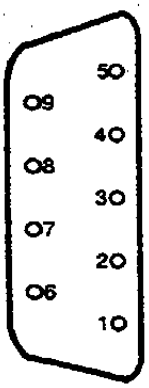


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## 2.7.2 TTL monitor interface X6

The parallel monitor interface X6 provides signals at the TTL level for "PC" type data monitors.

X6 RGB/TTL 9 pol. D-sub miniature, sockets:




| | Signal name | Description | Switching |
|---|---|---|---|
| 9 | | | |
| 8 | +5V | 5V for EL display connection | |
| 7 | CLK | 12 MHz pixel pulse for EL display | |
| 6 | HSYNC | Horizontal synchron Line synchronisation | open collector 1 kOhm pull up |
| 5 | VSYNC | Vertical synchron Frame synchronisation | open collector 1 kOhm pull up |
| 4 | BLUE | Blue channel | open collector 150 Ohm pullup |
| 3 | GREEN | Green channel | open collector 150 Ohm pull up |
| 2 | RED | Red channel | open collector 150 Ohm pull up |
| 1 | 0V | 0V for TTL-Logik | |

***The maximum cable length of 2 meters must not be exceeded.***
***The standard colours cannot be changed if a TTL monitor is used.***
***With a monochrome monitor, shading and flashing cannot be used.***

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## DC/DC converter 24 V / 5 V for the WF 470

Order number: 6FM1 490 8BA00

***This additional feeding is no longer necessary for the new WF 470 modules (with the last digit of 21 in the order number).***

By feeding in -5V on to socket X6 pin 9, the picture contrast and black level can be im-proved. The cable screen should only be earthed at one end. The length of the cable between the DC/DC converter and the WF 470 must not exceed 2 meters.

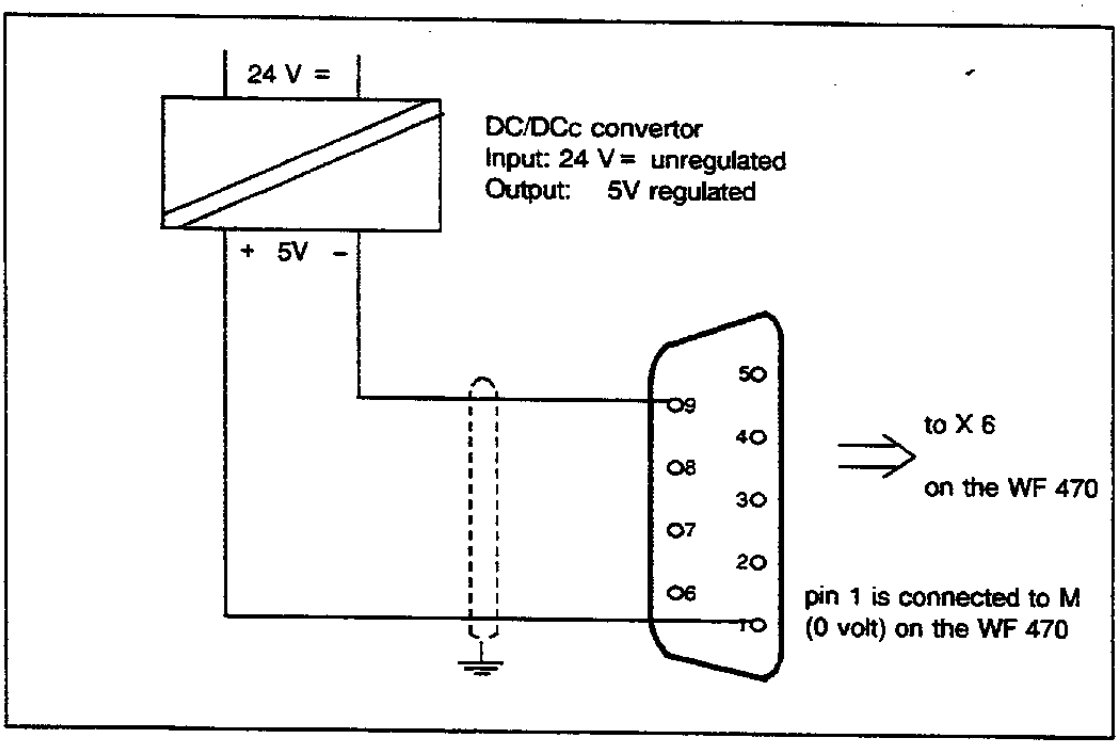



*Fig. 2.7 Connection diagram DC/DC converter to WF 470.*



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## 2.7.3 Serial Interface - Base Board X7

This is used to connect the PG 675/PG 685/PG 750 for picture construction, or to connect the WS 495/496 operator panel.

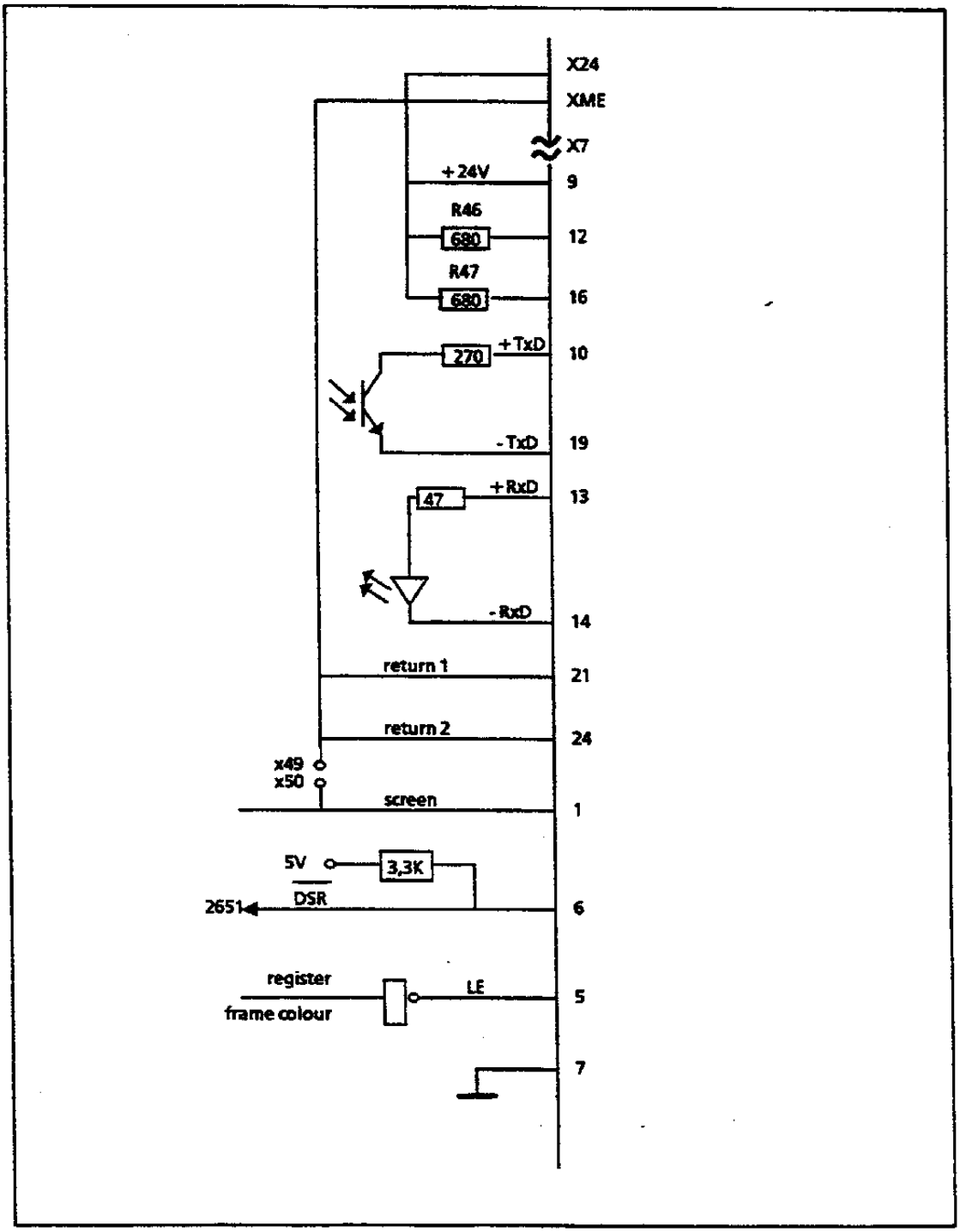



*Fig 2.8 Interface X7 (25 pole Cannon, male).*

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## 2.7.4 Serial Interface Extension Board X9

This is used to connect the (TTY/V24) printer, I.E. PT88.

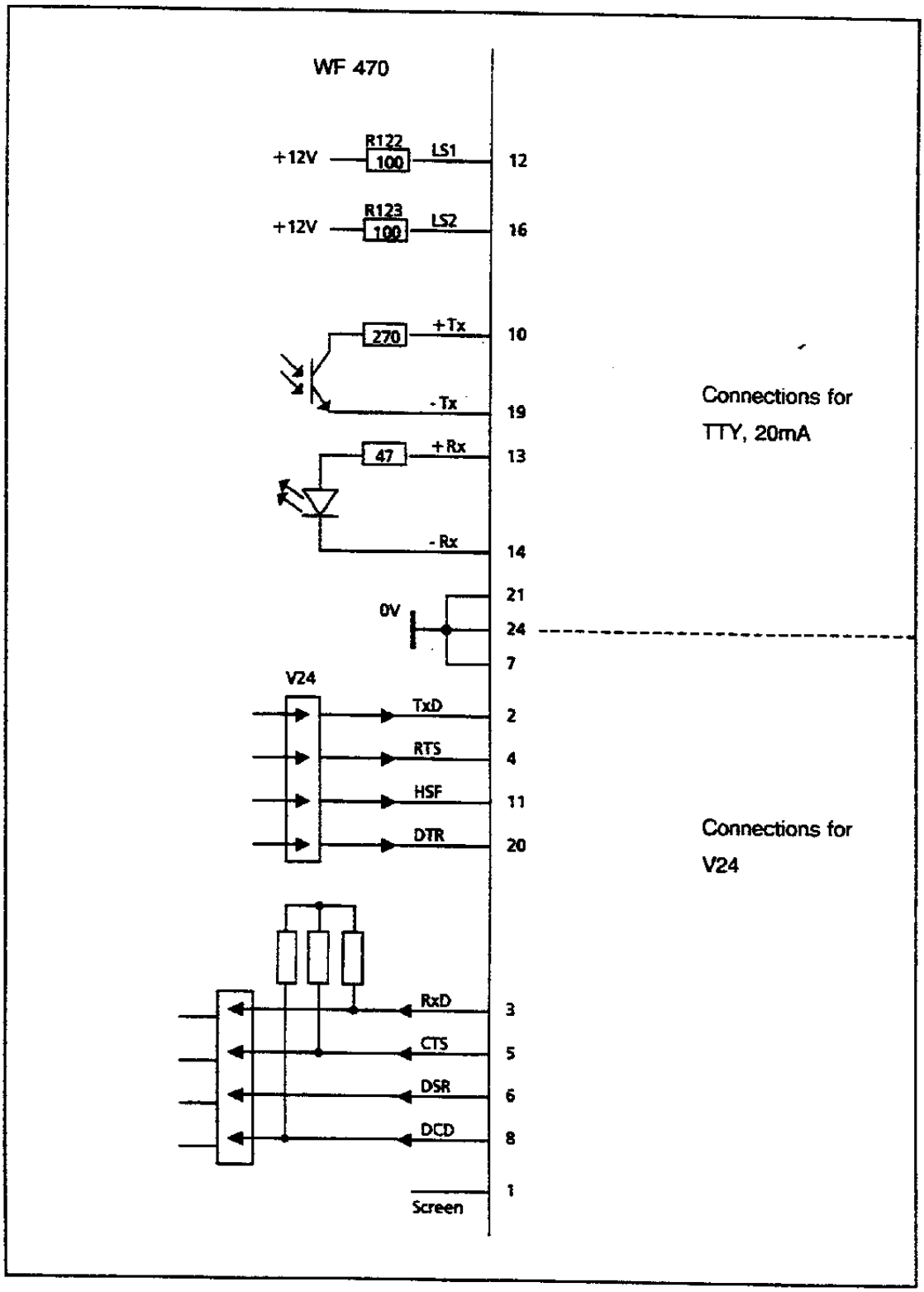



*Fig 2.9 Connector X9 (25 pin cannon D type).*



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## 2.7.5 Sockets for memory modules X10, X20, X30

The following modules can be plugged into the memory sockets:

| | | | | |
|---|---|---|---|---|
| RAM | 32 | kByte | 6ES5 | 377-0AB21 |
| | 64 | kByte | 6ES5 | 377-0AB31 |
| | 128 | kByte | 6ES5 | 377-0AB41 |
| EPROM | 32 | kByte | 6ES5 | 373-0AA41 |
| | 64 | kByte | 6ES5 | 373-0AA61 |
| | 128 | kByte | 6ES5 | 373-0AA81 |

These memory modules will contain the pictures, text etc.

***Whilst commissioning at least one RAM module will be required.***

***(RAM is already present on the WF 470 C.)***

## 2.7.6 Bus Connector X1

Pin layout:

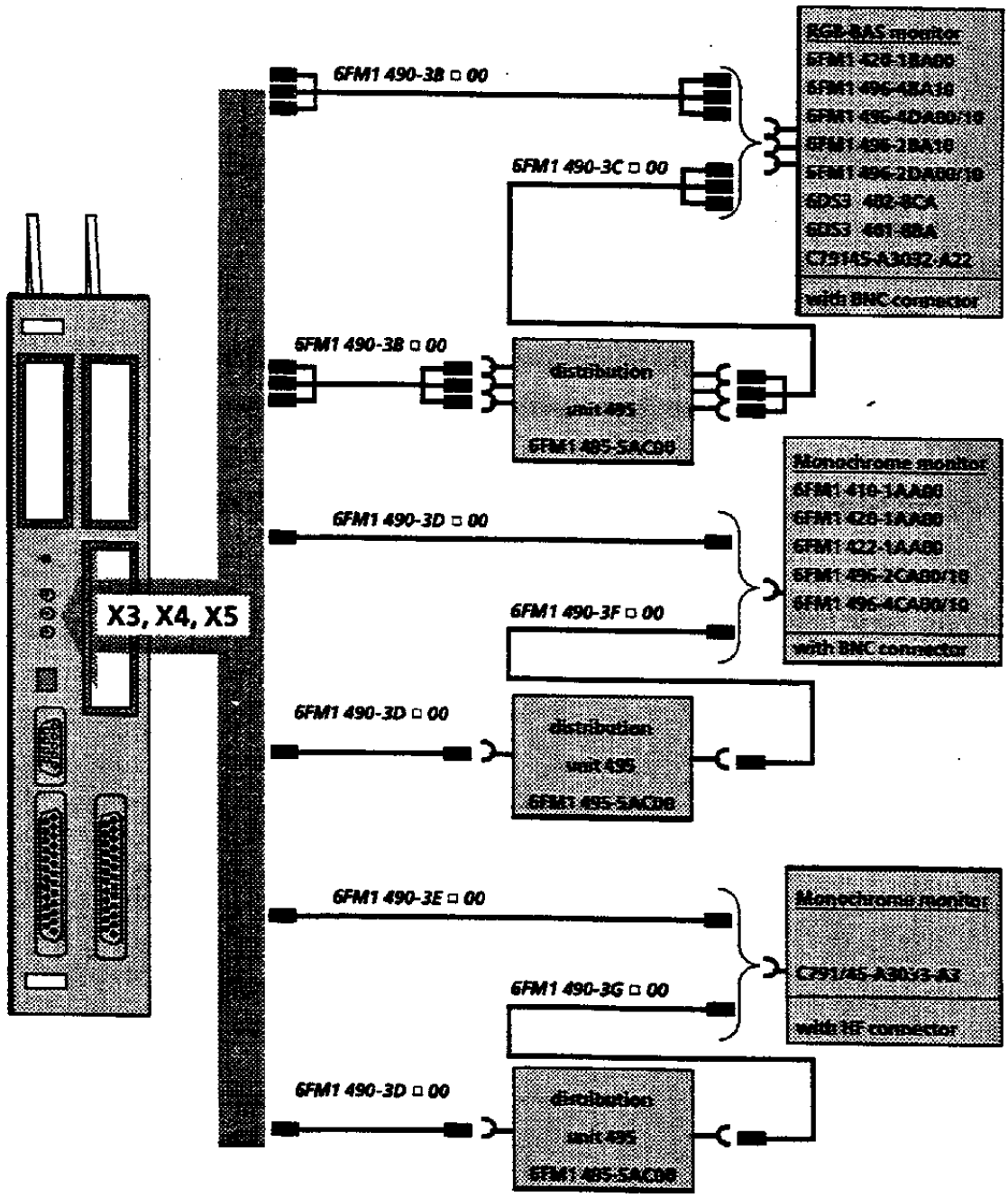
| | d | b | z |
|---|---|---|---|
| 2 | | 0V | 5 V |
| 4 | UBAT | PESP | |
| 6 | AB12 | AB0 | CPKL |
| 8 | AB13 | AB1 | MEMR |
| 10 | AB14 | AB2 | MEMW |
| 12 | AB15 | AB3 | RDY |
| 14 | | | |
| 16 | | AB5 | DB1 |
| 18 | | AB6 | DB2 |
| 20 | | AB7 | DB3 |
| 22 | | AB8 | DB4 |
| 24 | | AB9 | DB5 |
| 26 | | AB10 | DB6 |
| 28 | DSI | AB11 | DB7 |
| 30 | | BASP | |
| 32 | | 0V | |

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## 2.8 Connection cables

### 2.8.1 Connection cables to sockets X3, X4, X5 - monitor connection




The distribution unit may be used, for example, to connect up to 3 WF 470 modules onto one monitor. Additional information about this unit may be found in the WS 495/496 operator system manual.

*6FM1 790-1G □ 00*

↑

**Specify cable length here**

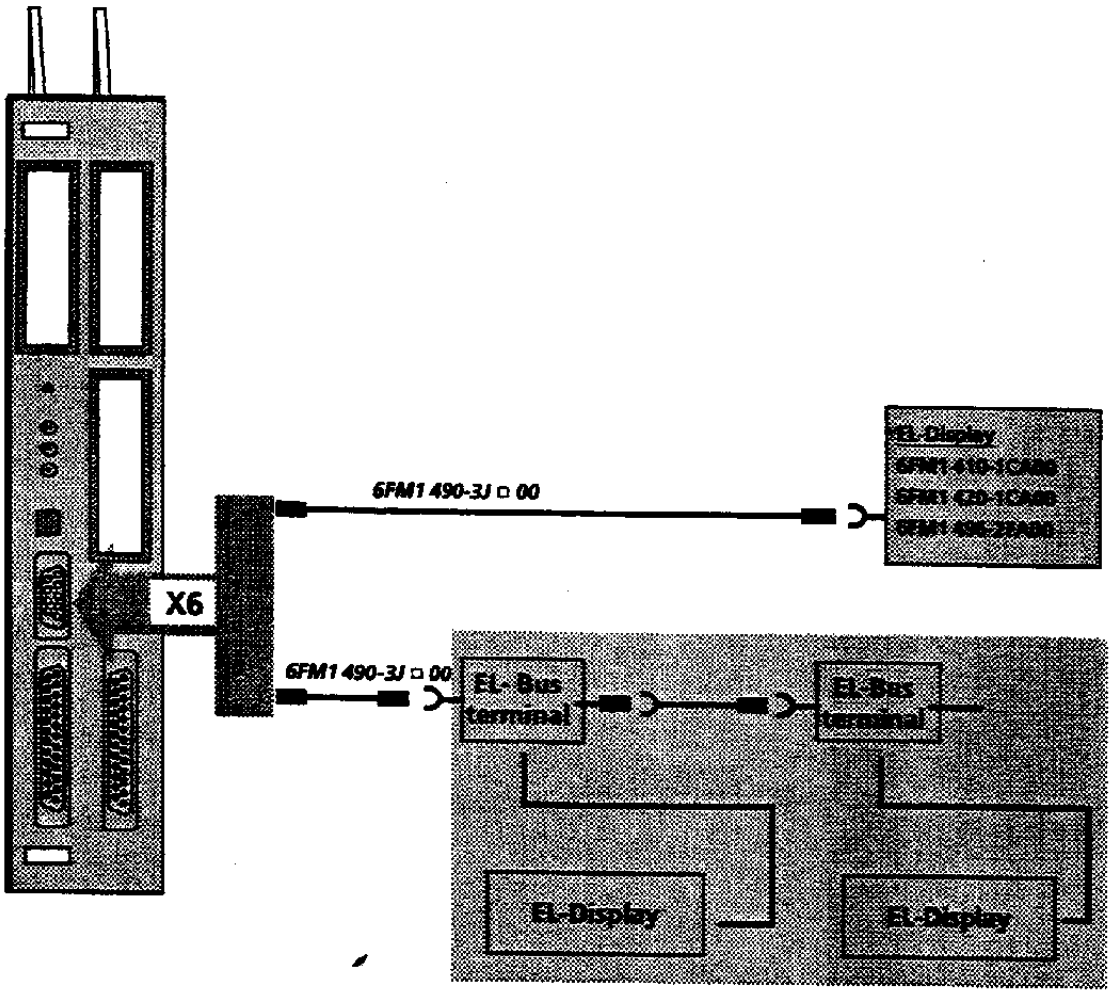


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## 2.8.2 Connection cable for socket X6




*6FM1 790-1G □ 00*

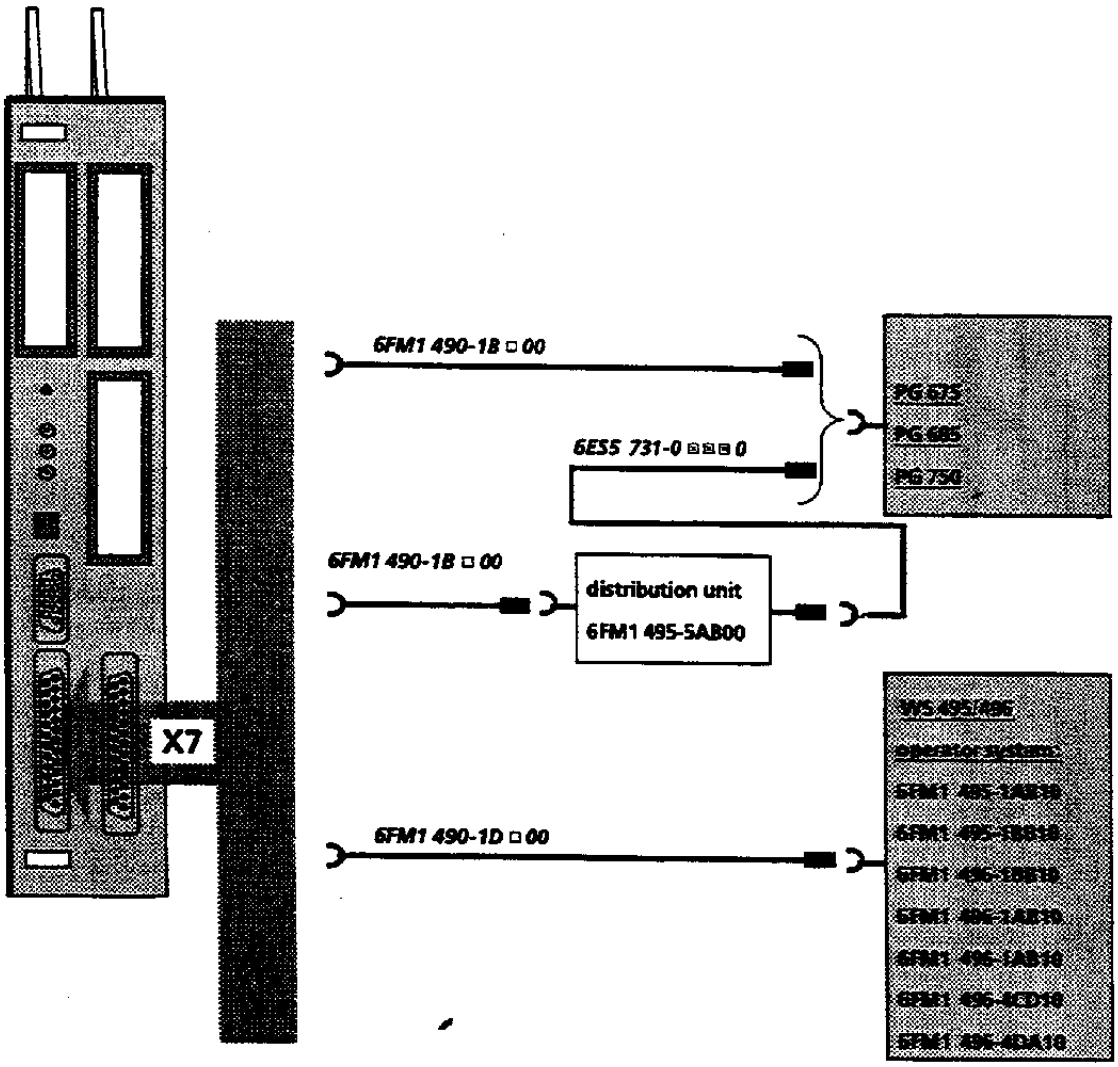
↑

**Specify cable length here**

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## 2.8.3 Connection cable for socket X7 - programming unit interface

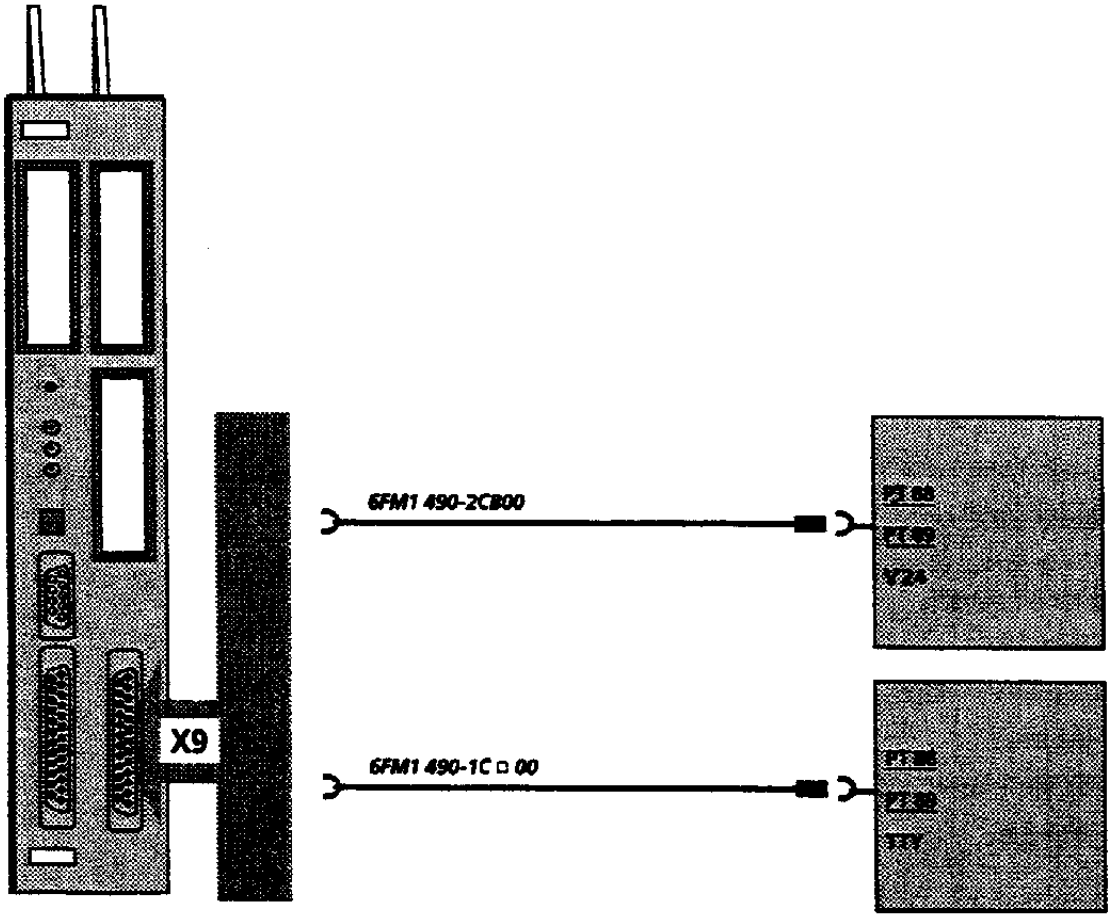



6FM1 790-1G □ 00
↑
Specify cable length here


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## 2.8.4 Connection cable for socket X9 - printer interface

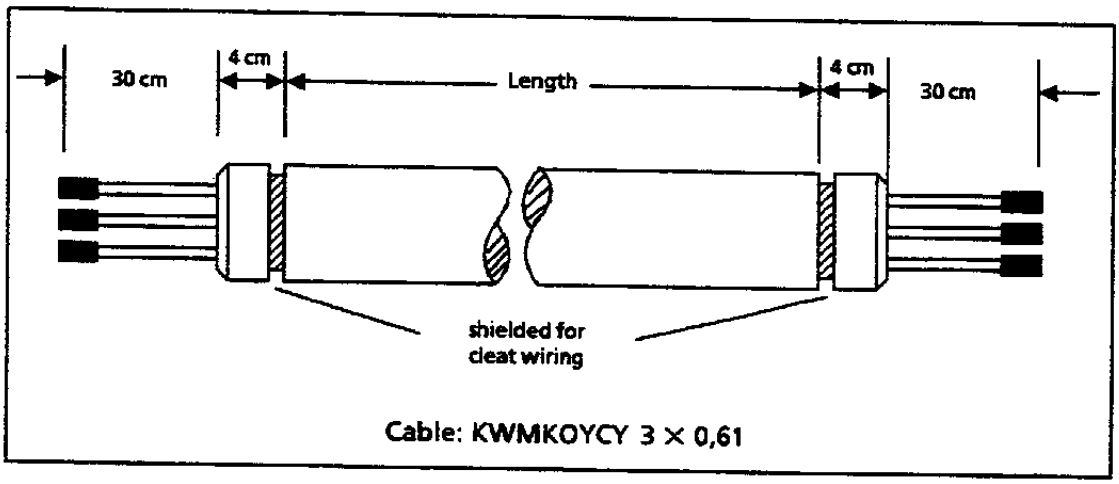



*6FM1 790-1G□00*
↑
**Specify cable length here**

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## 2.8.5 Connection Cable WF470 - BAS-colour monitor




**Cable specification:**

3 × individual coaxial cables with pvc sheath encased in a polyurethane sheath, with an additional screen

| | |
|---|---|
| Connector | HF connector or BNC connector |
| Temperature range: | - 40° C to 90° C |
| Protection: | Against oil and contaminant to VDE 472/804 |
| Minimum bending radius: | 150mm |
| Impedance: | 20 MHz 6.1 dB/100m<br>100 MHz 10.8 dB/100m<br>200 MHz 21 dB/100m<br>500 MHz 34.2 dB/100m<br>1 GHz 48.1 dB/100m |

For cable lengths greater than 60m additional measures must be taken to protect against interference. This may include earthing the cable screen at both ends.

The monitor and SIMATIC S5 must be on the same supply phase and at the same earth potential.

It is most important to check that the installation has been performed correctly, since failure to carry out these measures can lead to long term system unreliability.

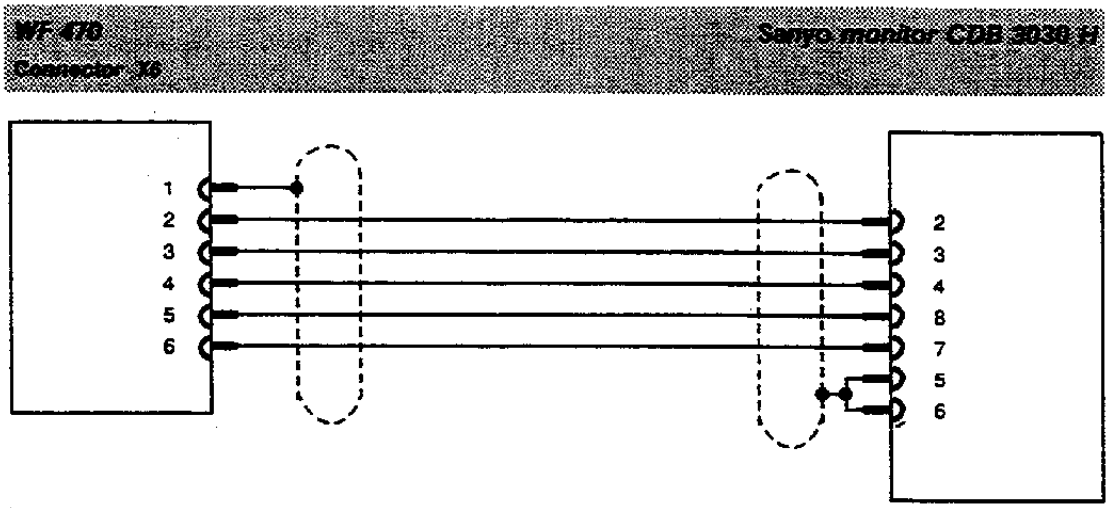


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## 2.8.6 Connection Cable WF470-TTL Monitor (Sanyo)

Order number: 6FM1 490-3AA00
Cable length: 2m



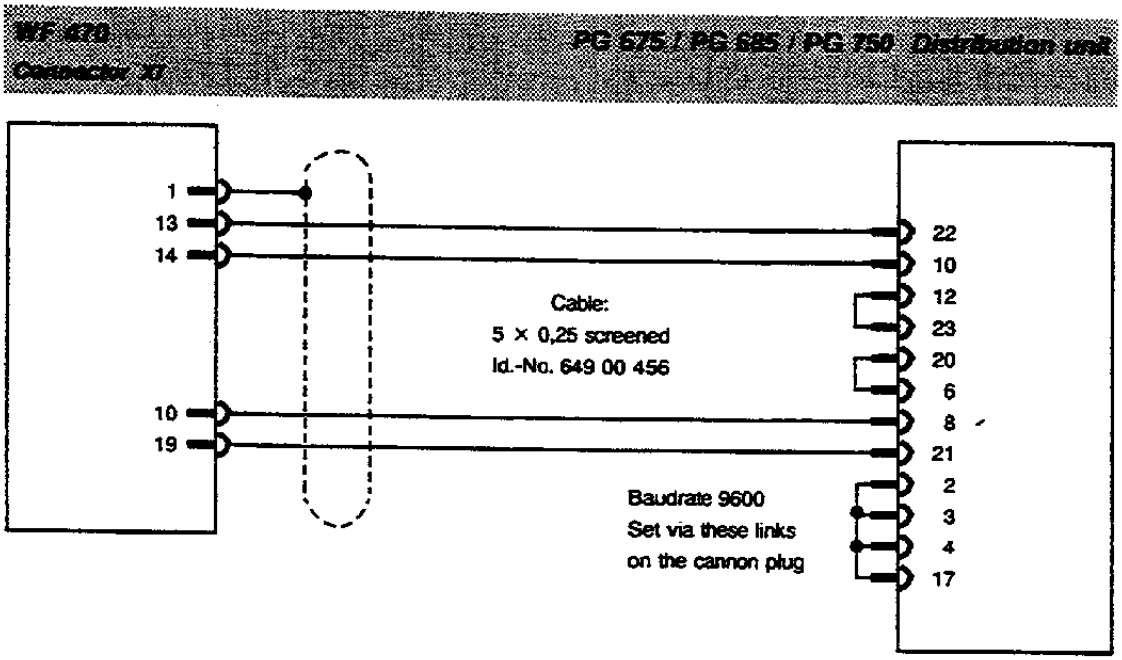

| WF 470 | Sanyo monitor CDB 3030 H |
|---|---|
| Cannon plug | Sanyo WAKW Connector |
| 9 pole male | 8 pole male |
| Plug type : Id.-No. 400 220 35 | Type CDO 3030 H |
| Cover: Id.-No. 400 329 52 | |

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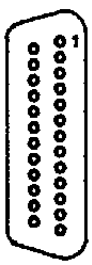

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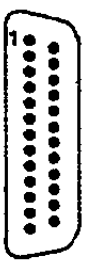
## 2.8.7 Connection cable WF 470 - PG 675 / PG 685 or PG 750 WF 470 distribution unit

Cable order number: 6FM1 490-1B . 00




**Cannon connector**
25pole female
Plug type:
Id.-No. 40022251
Cover:
ID.-No. 40091587
***connection side***




**Cannon connector**
25pole male
Plug type:
Id.-No. 40022273
Cover:
ID.-No. 40023443
Clip:
Id.-No. 40023445
***connection side***



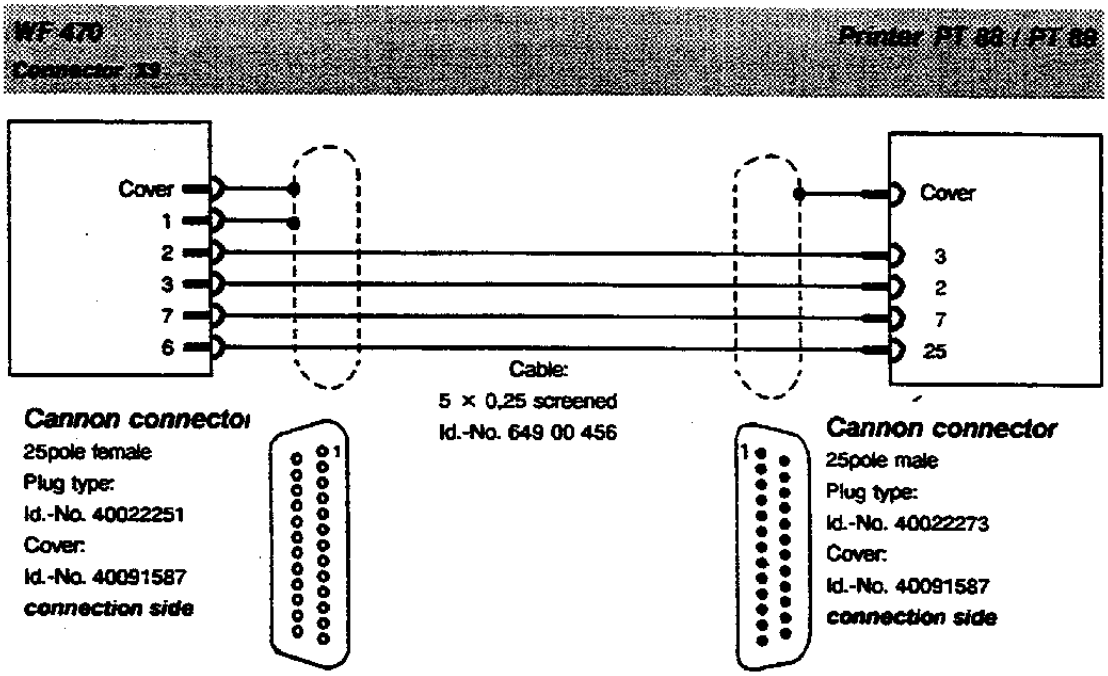
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## 2.8.8 Cable connection for WF 470 B/C - printer PT88/89

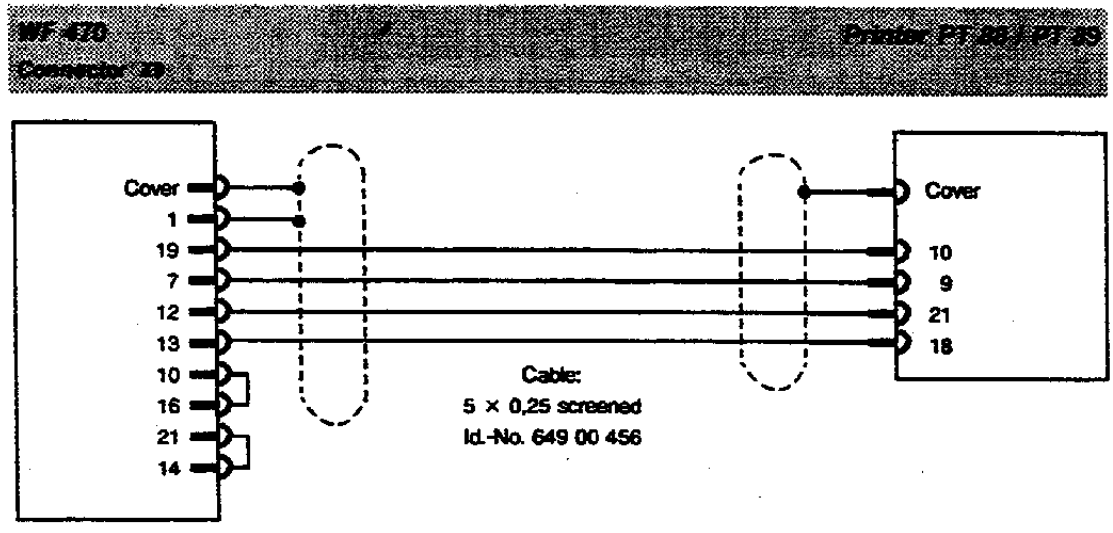
### 2.8.8.1 V24 Interface

Cable order number: 6FM1 490-2CB00




### 2.8.8.2 TTY Interface

Cable order number: 6FM1 490-1C . 00




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# 2.9 Peripheral devices

## 2.9.1 Operator Interface System

### 2.9.1.1 Operator panel WS 496

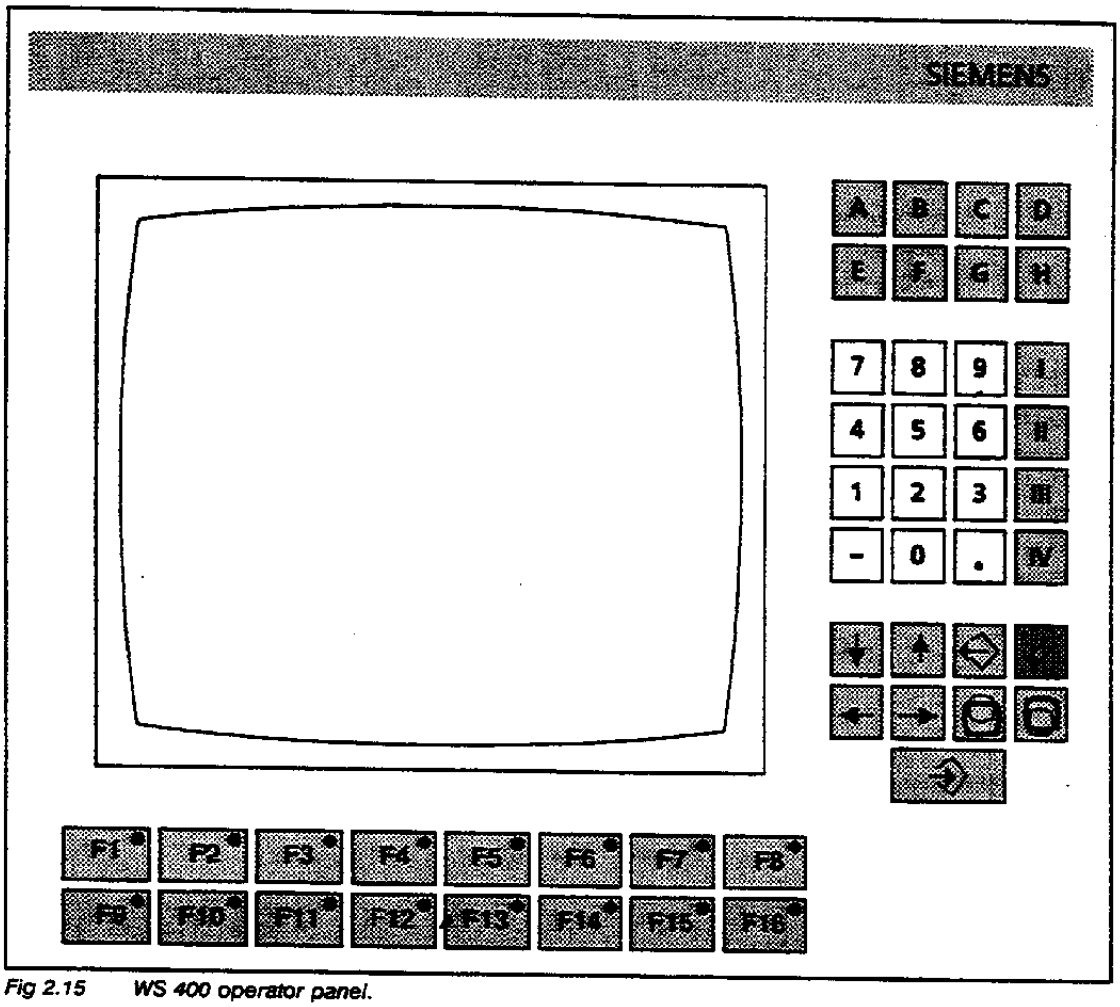



*Fig 2.15 WS 400 operator panel.*

The operator panel consists of a monitor (either a 14" - colour monitor or a 12" - monochrome monitor) and a surrounding keyboard. The keyboard has the following keys:

- 2 X 8 Function keys (F1 - F16).
- Each function key incorporates a red LED. These are powered by outputs in the PLC and controlled by the application software.
- Alpha keys labled A to H.
- A complete numeric key pad including decimal point and minus sign.
- Four additional "dedicated function" keys labled I to IV (for cursor positioning, SW-Reset, Scroll, data input).

**Alternatively to the compact operator panel, individual monitors can be used which have the WS 495/ WS 496 keyboard.**

Further details can be found in the description "WS 495/ WS 496 Operator system".



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## 2.9.1.2 Operator panels WS 400-10, WS 400-20 and WS 400-22

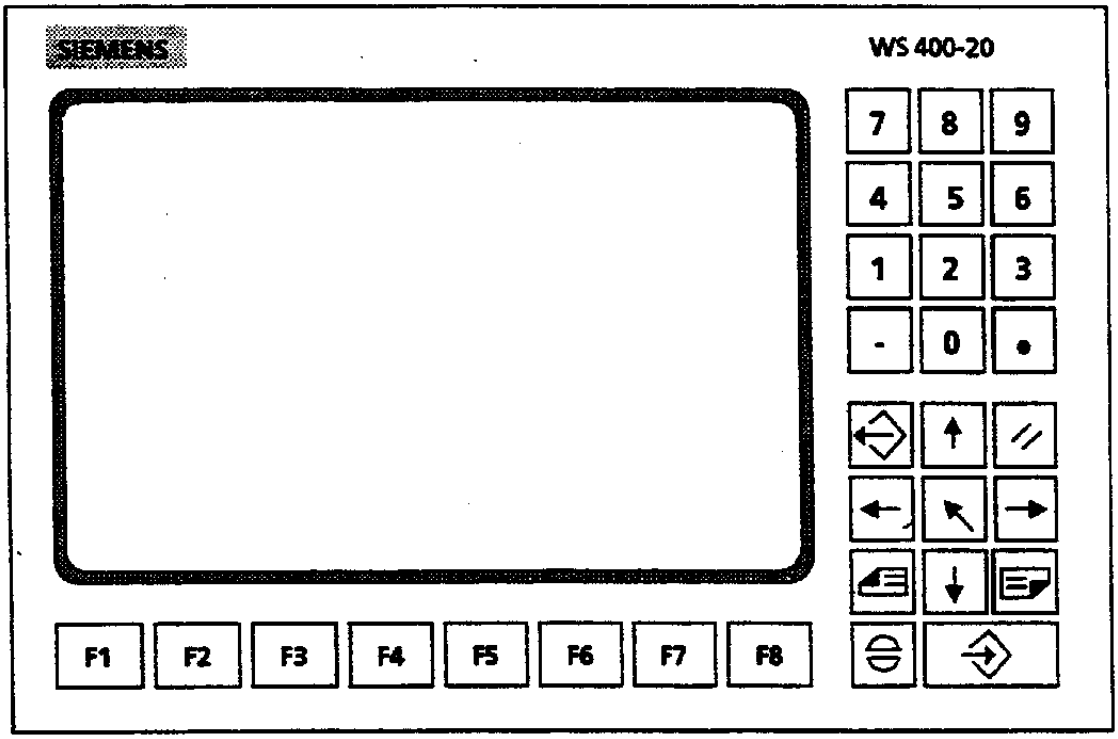



*Fig. 2.16 Operator panel WS 400-20*

The operator panels have 8 (WS 400-10 und WS 400-20) or 16 (WS 400-22) function keys, a complete numerical field (not for WS 400-10) with decimal point, minus sign and special keys (not for WS 400-10) for cursor positioning, data input, output of the overview mask, delete function, scroll and acknowledgement of faults.

The operator panel WS 400-10 is available with a 9"-Monochrome-Monitor or EL-Display, the WS 400-20 is available with a 09"- Farb- or Monochrome-Monitor or EL-Display, and the WS 400-22 is available with a 9"-Monochrome-Monitor.

Further information can be found in the description for the operator panels.

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## 2.9.2 PT 88 Printer

The WF 470 B/C version 3.0 and above, can be connected to any standard printer with a V 24 or a TTY interface. The printer parameters can be set on the WF 470 using a PG (page 2 of the system data list).

The following settings and cable details are for a PT 88 printer.

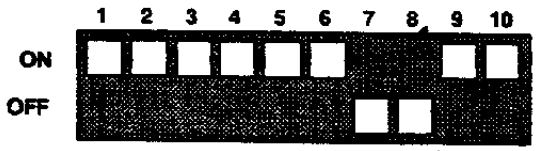
| Permitted Versions | Order Number |
|---|---|
| Ink Jet Printer - TTY Interface (20mA with mains cable | S22761-A88-A048 |
| Ink Jet Printer Interface CCI/TT V24/V28 (RS 232 C) with mains cable | S22761-A88-A029 |
| Needle Printer, TTY Interface 20mA with mains cable | S22761-A88-A047 |
| Needle Printer Interface CCI/TT V24/V28 (RS 232 C) with mains cable | S22761-A88-A049 |

Technical details are available in the printer manual, order number A22761-A88-A11-1-7635.

If the PT88 is to be used in conjunction with the WF 470 B/C, the switches must be set as follows:

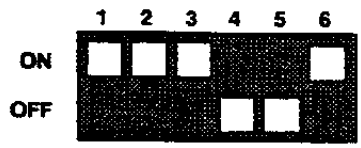
### 2.9.2.1 V24 interface SAP-S1

**DIL switch below the printer head**



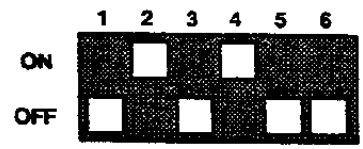

The position of the slide switch is shown in white

**Switch S1:**




The position of the slide switch is shown in white

**Switch S2:**




The position of the slide switch is shown in white



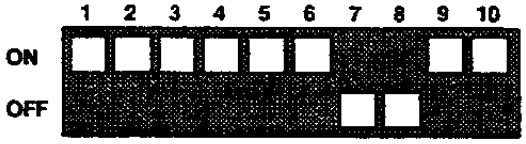
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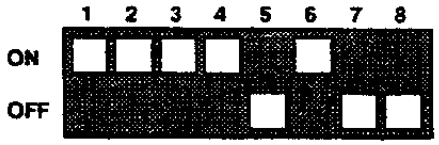
## 2.9.2.2 TTY Interface SAP-S2

**DIL switch below the printer head**



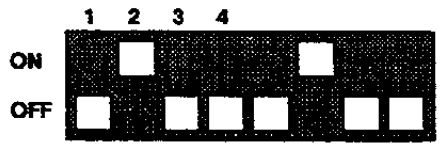

The position of the slide switch is shown in white

**Switch S1:**




The position of the slide switch is shown in white

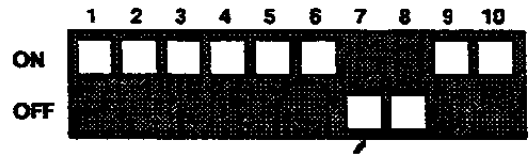
**Switch S2:**




The position of the slide switch is shown in white

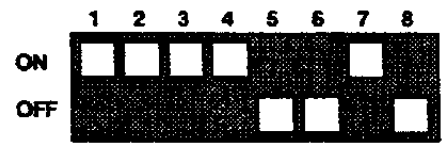
## 2.9.2.3 Universal Interface S22767-B3-A100 - V24

**DIL switch below the printer head**




The position of the slide switch is shown in white

**Switch S1:**




The position of the slide switch is shown in white

**Switch S4:**




The position of the slide switch is shown in white

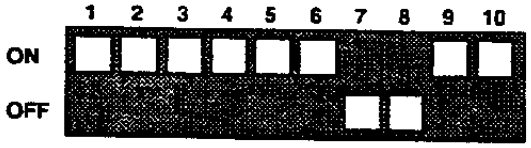
**Switches S2 and S3 are only used for the TTY interface-see section 2.9.2.4.**

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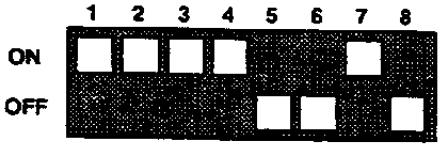
## 2.9.2.4 Universal Interface S22767-B3-A100 - TTY

**DIL switch below the printer head**



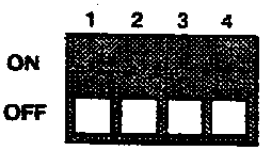

The position of the slide switch is shown in white

**Switch S1:**



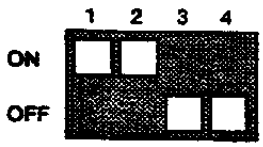

The position of the slide switch is shown in white

**Switch S2:**




The position of the slide switch is shown in white

**Switch S3:**




The position of the slide switch is shown in white

**Switch S4:**




The position of the slide switch is shown in white



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## 2.9.3 WF470 Picture Construction Terminal

The picture construction terminal takes the form of a PG 675 / PG 685 / PG 750 with a specially developed picture construction software package.
This package requires:

- CP/M-86 Operating system 6ES5 875-0CA11
- WF 470 Picture construction software 6FM1 470-8B□20*)

} for PG 675

- PCP/M Operating system (contained in S5-DOS)
- WF 470 Picture construction software 6FM1 470-C□20 *)

} for PG 685

- PCP/M Operating system (contained in S5-DOS)
- WF 470 Picture construction software 6FM1 470-D□20 *)

} for PG 750

*) The letter at the location □ is specifies the language :

A = German
E = English
F = French
R = Russian

The PG 675 / PG 685 / PG 750 is connected to the WF 470 via a special cable described in section 2.8.3. which is plugged into the PG programming port.

If required, a PT 88 printer connected to the PG printer interface can be used to document the pictures and texts.

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# 3 Operation

## 3.1 SIMATIC standard software

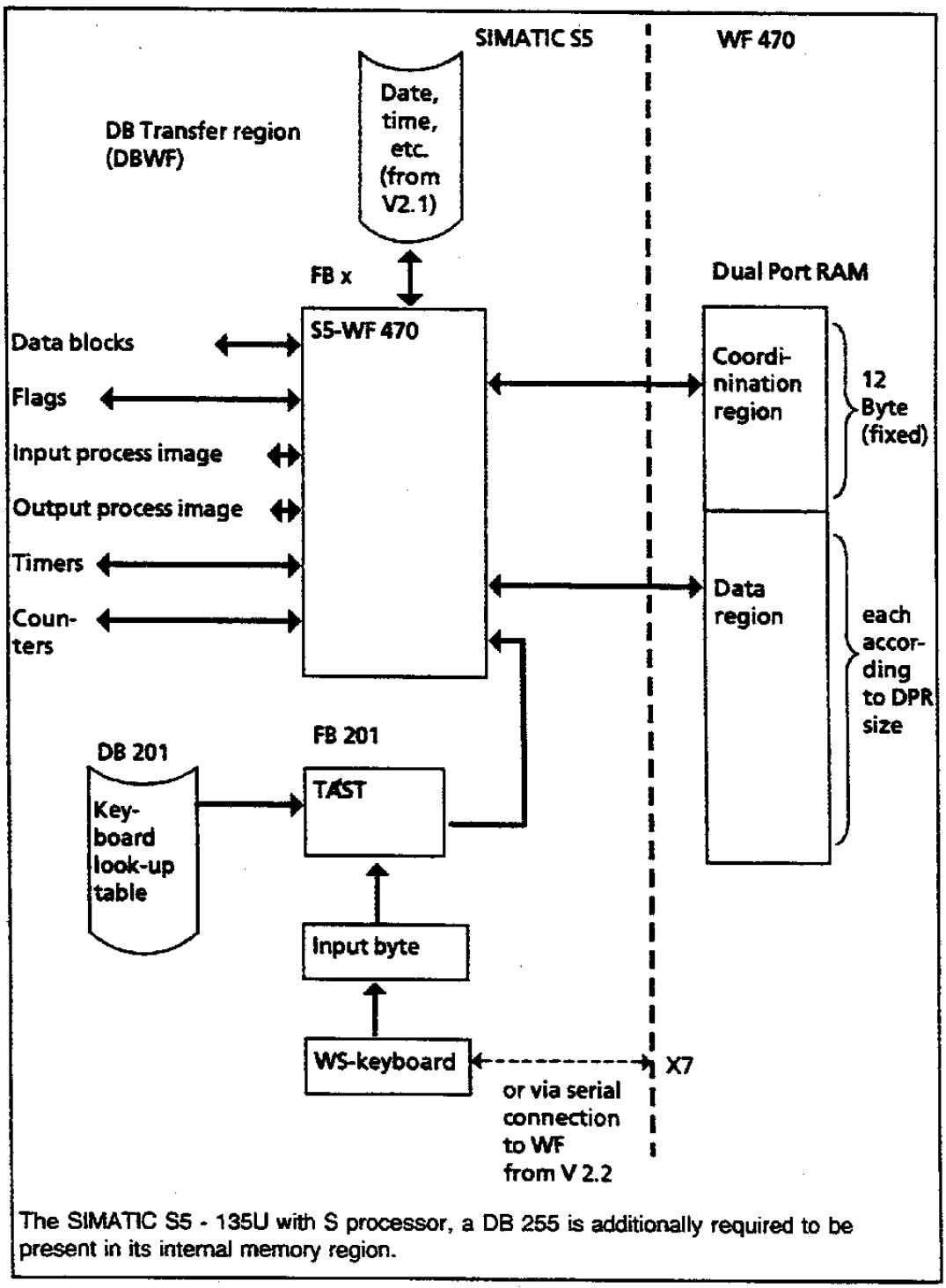



*Fig 3.1 S5 standard software*

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### 3.1.1 Data Link WF470-S5

The data exchange between the WF 470 and the S5 takes place in a DUAL PORT RAM situated on the WF 470 module.
Communication at the S5 end of the dual port ram is handled by a standard function block. It has access to all data blocks, flags etc. and to the dual port ram.
The WF 470 is in charge of all data exchanges between the 470 and the PLC, and places data requests in the dual port ram in the form of a series of commands. The standard FB recognises these commands, carries them out and responds by returning the requested data or by sending an error number.

For each data exchange, the FB must be processed twice. The maximum amount of data exchanged each time is determined by the size of the dual port ram. The function block must be called unconditionally (JU FB) once every S5 cycle.

#### 3.1.1.1 Technical Data

| | S5-130 WB S5-150 K + cent unit | S5-150 K with Peripheral module | S5-150 S S5-150 U | S5-155 U | S5-115 U + CPU 941, 942, 943, 944 | S5-135 U + CPU 921 | S5-135 U + CPU 922, 928 |
|---|---|---|---|---|---|---|---|
| Block number | FB 255 | FB 254 | FB 253 | FB 248 | FB 251 * | FB 252 | FB 249 |
| Lib number | E88530-B4132 B | E88530 B4132-B | E88530 B4132-D | E88530 B4136-D | E88530 B4132-A | E88530 B4132-C | E88530 B4132-C |
| Block name | S5-WF 470 | S5-WF 470 | S5-WF 470 | S5-WF 470 | S5-WF 470 | S5-WF 470 | S5-WF 470 |
| Block size | 299 words | 294 words | 299 words | 303 words | 256 words | 369 words | 273 words |
| Call length | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
| Processing time for 122 DW | 0.5 to 2.6ms | 0.38 to 15.64ms | 0.32 to 11.89ms | 0.2 to 1.5ms | 5.1 to 32ms<br>1.5 to 20.1ms<br>0.32 to 11.89ms | 1.6 to 1.5ms | 1.1 to 3.9ms |
| Nesting depth | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Block calls | none | none | none | none | none | none | none |
| System data | BS 253 | BS 253 | BS 243 | BS 60 | none | none | none |
| Flags used (scratch pad) | FY 236-255 | FY 236-255 | FY 240-255 | FY 234-255 | FY 234-255 | FY 234-255 | FY 234-255 |
| Timers | none | none | none | none | none | none | none |
| Counters | none | none | none | none | none | none | none |
| Data blocks | none | none | none | none | none | DB 255 in internal region | none |

* The function block number for the SIMATIC S5 115 U must be changed from its standard number of FB251 to another number when it is transferred into the PLC, since FB251 has now been allocated as an integrated function block.

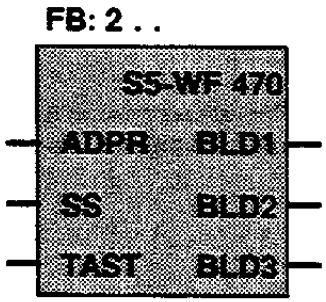


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***All function and data blocks have standard numbers. They can be changed if required and any unallocated block number used.***

## 3.1.1.2 Function Block Parametrisation




| Parameter | Function | Comment | Type | Form | Valid value |
|---|---|---|---|---|---|
| ADPR | Start address Dual Port RAM | Hexadecimal coded | D | KH | see Section 4.2 |
| SS | Key switch | | I | BI | I 0.0-127.7<br>F 0.0-199.7<br>Q0.0-127.7 |
| TAST | Keyboard byte | From program or FB TAST... | I | BY | FY 0-199 |
| BLD1<br>BLD2<br>BLD3 | Pic sel 1<br>Pic sel 2<br>Pic sel 3 | Select picture and picture selected | Q | BY | FY 0-199<br>QB 0 -127 |

**Please note:**

- The TAST-byte must only be written in for one S5 cycle.
  The WF 470 acknowledges that the code has been accepted and the function block S5-WF 470 erases the code entered into the byte by writing the value 00 into the TAST byte.
- BLD 1-3 must only be written in for one S5 cycle to select the picture or report printout.
  The WF 470 sends the picture code number of the actual picture being displayed back to the PC as an acknowledgement and this is written into BLD 1-3.
- The BLD1-3 can be used to initiate a print out.

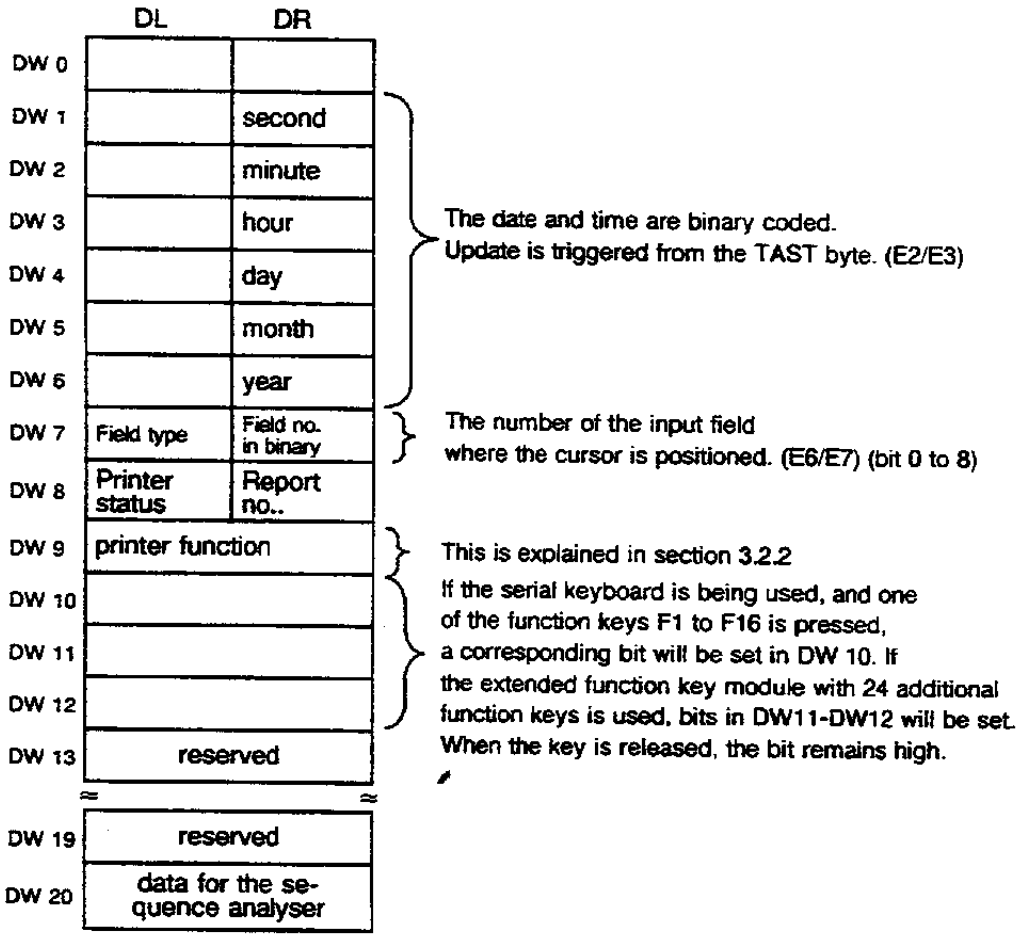
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### 3.1.1.3 Data Block "Transfer block (DBWF)"

From firmware version V2.1, the first 20 data words of this block are reserved and hold the information described below. Data words > = 20 contain the data for the sequence analyser function if it is being used. (See section 3.2.3.3).

The data block number is specified in the system data list which is programmed using the picture construction system on the PG 675 / PG 685 / PG 750.




## 3.1.2 Keyboard function block WF 470 TAST

If the keyboard is connected to the SIMATIC S5 via an 8 way 24 volt input module, the keyboard evaluation is performed by a separate function block (FB-TAST) and a keyboard code look-up table. The FB-TAST should be called unconditionally (JU FB TAST ) once every PLC cycle.



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If the serial keyboard connection is used, FB TAST and DB 201 are not required. The function keys are shown in data word 10 of the DBWF. Attention should be paid to assigning F1-F16 to the bits 0-15 in the data word 10. The bit should not be reset when the key is no longer pressed. Therefore, the function keys cannot be used for the "Jog-mode". When the FB 220 (Bildlist) is used, the DW 10 can be transferred to the parameter FKTS. Example: If FKTS is MW 100, the following must be programmed:

```
A   DB ... Call DBWF
L   DL 101   }
T   MB 101   }  DW 10 to parameter FKTS
L   DR 10    }
T   MB 100   }
L   KB 0     }  DW 10 set back
T   DW 10    }
```

### 3.1.2.1 Technical data

| | S5-130 WB S5-150 K + cent unit | S5-150 S S5-150 U | S5-155 U | S5-115 U + CPU 941, 942, 943, 944 | S5-135 U + CPU 921, 922, 928 |
|---|---|---|---|---|---|
| Block number | FB 201 (202) | FB 201 (202) | FB 201 (202) | FB 201 (202) | FB 201 (202) |
| Lib number | E88530-B4132 B | E88530 B4132-D | E88530 B4136-D | E88530 B4132-A | E88530 B4132-C |
| Blockname | TAST-130 | TAST-150S | TAST-150S | TAST-115 | TAST-135 |
| Block length | 106 (120) words | 106 (120) words | 91 words | 100 (112) words | 106 (120) words |
| Block size | 8 | 8 | 8 | 8 | 8 |
| Nesting depth | 0 | 0 | 0 | 0 | 0 |
| Block calls | none | none | none | none | none |
| System data | BS 253 | none | none | none | none |
| Flags used (scratchpad) | FY 248-255 (FY 245-255) | FY 248-255 (FY 245-255) | FY 248-255 (FY 245-255) | FY 248-255 (FY 245-255) | FY 248-255 (FY 245-255) |
| Timers | none | none | none | none | none |
| Counters | none | none | none | none | none |
| Data blocks | see parameter EBDB | see parameter EBDB | see parameter EBDB | see parameter EBDB | see parameter EBDB |

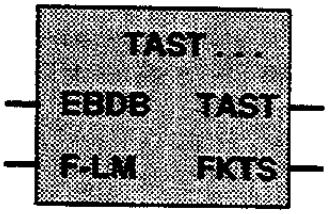
***All function and data blocks have standard numbers. They can be changed if required and any unallocated block number used.***

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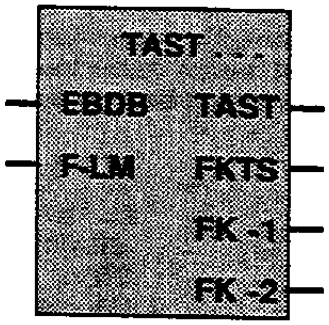
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### 3.1.2.2 Parameters

**FB: 201**




**FB: 202**




| Parameter | Function | Comment | Type | Form | Valid value |
|---|---|---|---|---|---|
| EBDB | EB: input byte<br>DB: DBnumber<br>keycode list | EB > 127:<br>no evaluation<br>DB = 0:<br>no evaluation | D | KY | KY = EB, DB<br>IB = 0 - 127<br>DB = 1 - 255 |
| F-LM | Pulse flag | unused flag<br>or output | I | BI | F 0.0...199.7<br>Q 0.0...127.7 |
| TAST | Key code | see code<br>look-up table | Q | W | FW 0 - 199<br>QW 0 - 127 |
| FKTS | Function keys | Each F-key<br>= 1 bit | Q | W | FW 0 - 198<br>QW 0 - 126 |
| FK -1 | Key code<br>extension | only with FB 202 | Q | W | FW 0 - 198<br>QW 0 - 126 |
| FK -2 | Key code<br>extension | only with FB 202 | Q | BY | FY 0 - 199<br>QB 0 - 127 |

The WS 496 operating panel can also have an additional 24 function key user-dedicated custom keyboard. If this custom keyboard is required, FB202 should be used instead of FB201 and the last two parameters on the list specified for the 24 additional function keys. The other parameters are the same as FB 201. If the "Alpha block" keyboard is connected to the panel instead of the custom keyboard, FB201 can be used.

### 3.1.2.3 Keyboard look-up table - DB 201

The standard keyboard function block FB 201 operates in conjunction with a data block. This data block, DB 201, is a look-up table which contains a data word for each key on the keyboard. The allocation of individual keys to data words comes from each keys' unique code.

When a key on the operator panel is pressed, its key code will be output. This key code signal is connected to the input byte in the PLC, which is specified in the EBDB parameter in the call to FB 201.

For instance, pressing function key F16 starts output of key code 18 Hex (which is 24 in decimal). Data Word 24 in the DB 201 look-up table contains the special code for this key (97F9). In the PLC'S MC5 language this code (97F9) means "S F 249.7". The keyboard function block FB 201 processes this instruction to set the flag, and hence sets the corresponding bit in the flag word allocated to parameter FKTS to indicate which function key has been pressed.



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The A key has a key code 22 Hex or 34 decimal. Data word 34 contains the Hex number (0041). The keyboard function block will therefore pass the code 41 to the flag byte allocated to the parameter "TAST". Hex 41 is the ASCII coding for the letter A.

You can easily change the function of any key on the keyboard, by changing the contents of the data word in the look-up table to the required code. The contents of the left byte of the data word tells the function block if it is to output the code to the TAST byte, or set a flag in the FKTS word.
If 00 is in data word left (DL), the right hand part of the data word (DR) is output to the TAST byte.

If the left hand byte (DL) is not 00, the code is processed as a function key or a function key from the customer keyboard. Each of these keys has an auxiliary flag associated with it. Flags F245. 0 to 247.7 are used by the user dedicated module and flags F248.0 to F249.7 are for the function keys. The whole data word is then processed as an instruction (in MC-5 code). Only instructions in the range S F 245.0 to S F 249.7 are valid.

**Allocation: Keycode - Data word no - contents of word - key**

| Key code | DW No. | Contents (hex) DL DR | Function | Comment | | |
|---|---|---|---|---|---|---|
| 00 | 00 | | | | | |
| 01 | 01 | 90 F8 | F1 | Flag | FKTS.0 | (AF 248.0) |
| 02 | 02 | 91 F8 | F2 | Flag | FKTS.1 | (AF 248.1) |
| 03 | 03 | 92 F8 | F3 | Flag | FKTS.2 | (AF 248.2) |
| 04 | 04 | 93 F8 | F4 | Flag | FKTS.3 | (AF 248.3) |
| 05 | 05 | 94 F8 | F5 | Flag | FKTS.4 | (AF 248.4) |
| 06 | 06 | 95 F8 | F6 | Flag | FKTS.5 | (AF 248.5) |
| 07 | 07 | 96 F8 | F7 | Flag | FKTS.6 | (AF 248.6) |
| 08 | 08 | 97 F8 | F8 | Flag | FKTS.7 | (AF 248.7) |
| 09 | 09 | 90 F7 | customer module | Flag | FK - 2.0 | (AF 247.0) |
| 0A | 10 | 91 F7 | customer module | Flag | FK - 2.1 | (AF 247.1) |
| 0B | 11 | 92 F7 | customer module | Flag | FK - 2.2 | (AF 247.2) |
| 0C | 12 | 93 F7 | customer module | Flag | FK - 2.3 | (AF 247.3) |
| 0D | 13 | 94 F7 | customer module | Flag | FK - 2.4 | (AF 247.4) |
| 0E | 14 | 95 F7 | customer module | Flag | FK - 2.5 | (AF 247.5) |
| 0F | 15 | 96 F7 | customer module | Flag | FK - 2.6 | (AF 247.6) |
| 10 | 16 | 00 00 | unused | | | |
| 11 | 17 | 90 F9 | F9 | Flag | FKTS-1.0 | (AF 249.0) |
| 12 | 18 | 91 F9 | F10 | Flag | FKTS-1.1 | (AF 249.1) |
| 13 | 19 | 92 F9 | F11 | Flag | FKTS-1.2 | (AF 249.2) |
| 14 | 20 | 93 F9 | F12 | Flag | FKTS-1.3 | (AF 249.3) |
| 15 | 21 | 94 F9 | F13 | Flag | FKTS-1.4 | (AF 249.4) |
| 16 | 22 | 95 F9 | F14 | Flag | FKTS-1.5 | (AF 249.5) |
| 17 | 23 | 96 F9 | F15 | Flag | FKTS-1.6 | (AF 249.6) |
| 18 | 24 | 97 F9 | F16 | Flag | FKTS-1.7 | (AF 249.7) |
| 19 | 25 | 97 F7 | customer module | Flag | FK - 2.7 | (AF 247.7) |
| 1A | 26 | 00 00 | unused | | | |
| 1B | 27 | 00 00 | unused | | | |
| 1C | 28 | 00 00 | unused | | | |
| 1D | 29 | 00 00 | unused | | | |
| 1E | 30 | 00 00 | unused | | | |
| 1F | 31 | 00 00 | unused | | | |

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| Key code | DW No. | Contents (hex) DL DR | Function | Comment |
|---|---|---|---|---|
| 20 | 32 | 00 00 | unused | |
| 21 | 33 | 00 25 | % | |
| 22 | 34 | 00 41 | A | |
| 23 | 35 | 00 42 | B | |
| 24 | 36 | 00 43 | C | |
| 25 | 37 | 00 44 | D | |
| 26 | 38 | 00 45 | E | |
| 27 | 39 | 00 46 | F | |
| 28 | 40 | 00 00 | | |
| 29 | 41 | 00 37 | 7 | |
| 2A | 42 | 00 38 | 8 | |
| 2B | 43 | 00 39 | 9 | |
| 2C | 44 | 00 14 | ◈ | Selection function mask (CTRL T) |
| 2D | 45 | 00 11 | // | Software reset (CTRL K) |
| 2E | 46 | 00 00 | | |
| 2F | 47 | 00 00 | | |
| 30 | 48 | | | |
| 31 | 49 | 00 47 | G | |
| 32 | 50 | 00 48 | H | |
| 33 | 51 | 00 49 | I | |
| 34 | 52 | 00 4A | J | |
| 35 | 53 | 00 4B | K | |
| 36 | 54 | 00 4C | L | |
| 37 | 55 | 00 4D | M | |
| 38 | 56 | 00 00 | | |
| 39 | 57 | 00 34 | 4 | |
| 3A | 58 | 00 35 | 5 | |
| 3B | 59 | 00 36 | 6 | |
| 3C | 60 | 00 90 | ↓ | Cursor down |
| 3D | 61 | 00 8F | ↑ | Cursor up |
| 3E | 62 | 00 00 | | |
| 3F | 63 | 00 00 | | |
| 40 | 64 | 00 00 | | |
| 41 | 65 | 00 4E | N | |
| 42 | 66 | 00 4F | O | |
| 43 | 67 | 00 50 | P | |
| 44 | 68 | 00 51 | Q | |
| 45 | 69 | 00 52 | R | |
| 46 | 70 | 00 53 | S | |
| 47 | 71 | 00 54 | T | |
| 48 | 72 | 00 40 | @ | Select report printout code |
| 49 | 73 | 00 31 | 1 | |
| 4A | 74 | 00 32 | 2 | |
| 4B | 75 | 00 33 | 3 | |
| 4C | 76 | 00 92 | ← | Cursor left |
| 4D | 77 | 00 91 | → | Cursor right |
| 4E | 78 | 00 00 | | |
| 4F | 79 | 00 00 | | |



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| Key code | DW No. | Contents (hex) DL DR | Function | Comment |
|---|---|---|---|---|
| 50 | 80 | 00 00 | | |
| 51 | 81 | 00 55 | U | |
| 52 | 82 | 00 56 | V | |
| 53 | 83 | 00 57 | W | |
| 54 | 84 | 00 58 | X | |
| 55 | 85 | 00 59 | Y | |
| 56 | 86 | 00 5A | Z | |
| 57 | 87 | 00 2B | + | |
| 58 | 88 | 00 23 | # | Standard picture code |
| 59 | 89 | 00 2D | - | |
| 5A | 90 | 00 30 | Ø | |
| 5B | 91 | 00 2E | | |
| 5C | 92 | 00 8D | ⛁ | Scroll up |
| 5D | 93 | 00 8C | ⛁ | Scroll down |
| 5E | 94 | 00 00 | | |
| 5F | 95 | 00 00 | | |
| 60 | 96 | 00 00 | | |
| 61 | 97 | 00 2F | / | |
| 62 | 98 | 00 3A | : | |
| 63 | 99 | 00 3D | = | |
| 64 | 100 | 00 28 | ( | |
| 65 | 101 | 00 29 | ) | |
| 66 | 102 | 00 3F | ? | |
| 67 | 103 | 00 2C | , | |
| 68 | 104 | 00 20 | | SPACE |
| 69 | 105 | 00 86 | I | Toggle cursor Text/ V-field |
| 6A | 106 | 00 85 | II | Next Variable field |
| 6B | 107 | 00 84 | III | Previous Variable field |
| 6C | 108 | 00 04 | IV | Erase error message |
| 6D | 109 | 00 0A | ⏎ | Line feed |
| 6E | 110 | 00 00 | | |
| 6F | 111 | 00 00 | | |
| 70 | 112 | 90 F5 | customer module | Flag FK-1.0 (AF 245.0) |
| 71 | 113 | | customer module | Flag FK-1.1 (AF245.1) |
| 72 | 114 | | customer module | Flag FK-1.2 (AF 245.2) |
| 73 | 115 | | customer module | Flag FK-1.3 (AF 245.3) |
| 74 | 116 | | customer module | Flag FK-1.4 (AF 245.4) |
| 75 | 117 | | customer module | Flag FK-1.5 (AF 245.5) |
| 76 | 118 | | customer module | Flag FK-1.6 (AF 245.6) |
| 77 | 119 | | customer module | Flag FK-1.7 (AF245.7) |
| 78 | 120 | | customer module | Flag FK - 1 + 1.0 (AF 246.0) |
| 79 | 121 | | customer module | Flag FK - 1 + 1.1 (AF 246.1) |
| 7A | 122 | | customer module | Flag FK - 1 + 1.2 (AF 246.2) |
| 7B | 123 | | customer module | Flag FK - 1 + 1.3 (AF 246.3) |
| 7C | 124 | | customer module | Flag FK - 1 + 1.4 (AF 246.4) |
| 7D | 125 | | customer module | Flag FK - 1 + 1.5 (AF 246.5) |
| 7E | 126 | | customer module | Flag FK - 1 + 1.6 (AF 246.6) |
| 7F | 127 | | customer module | Flag FK - 1 + 1.7 (AF 246.7) |

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### 3.1.2.4 Valid keyboard codes for the contents of data word right

| Code (Hex) | Description |
|---|---|
| 00 | no key code |
| 01 | CTRL A : Process picture directory |
| 02 | CTRL B : Interrupt field input |
| 04 | CTRL D : Acknowledge error message in mask |
| 0A | LF : Terminate entry |
| 11 | CTRL K : SW Reset |
| 14 | CTRL T: Select function mask |
| 20 . 7F | Full ASCII character set including rub-out |
| 84 | Previous field in list |
| 85 | Next field in list |
| 86 | Toggle between text window - V field |
| 8C | Directory scroll up |
| 8D | Directory scroll up |
| 8F | Cursor up/Text window scroll up |
| 90 | Cursor down/Text window scroll up |
| 91 | Cursor right |
| 92 | Cursor left |
| AF | Cursor to next field left |
| B0 | Cursor to next field right |
| DF | Force screen bright |
| E0 | Force screen dark |
| E1 | Special function (must not be used) |
| E2 | READ CLOCK (time / data from WF into DB) from V2.1 |
| E3 | SET CLOCK (time / data from DB to WF) from V2.1 |
| E4 | Start printer function (from V 2.2) |
| E5 | Stop printer function (from V 3.0) |
| E6 | Read cursor position in DB (from V 2.2) |
| E7 | Read cursor position in DB (from V 2.2) |
| E8 | Activate transfer function in DW 9 (from V 3.0) |
| E9 | Activate input field cursor positioning (from V 3.0) |
| F0 . . FF | Error 100 … Error 115: Error text in the message line on the screen which can be initiated by the application program |



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### 3.1.3 "DAT-IN" Function block

The DAT-IN function block can be used to tell the applications program that data has been entered from the WF 470. The program is informed that a data entry has been made, and the destination of the data (Data block, Data word) is passed to the application program for processing.This information is present for one S5 cycle.

The function block should be called unconditionally (JU FB) once per cycle, if possible after the S5 - WF 470 function block.

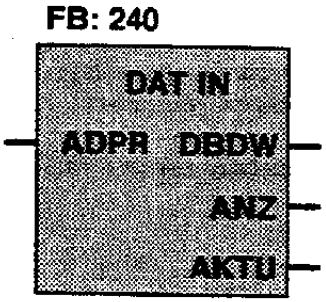
#### 3.1.3.1 Technical data

| | S5-130 WB S5-150 K + cent unit | S5-150 S S5-150 U | S5-155 U | S5-115 U + CPU 941, 942, 943, 944 | S5-135 U + CPU 921, 922, 928 |
|---|---|---|---|---|---|
| Block number | FB 240 | FB 240 | FB 240 | FB 240 | FB 240 |
| Lib number | E88530-B4132 B | E88530 B4132-D | E88530 B4136-D | E88530 B4132-A | E88530 B4132-C |
| Block name | DAT-IN | DAT-IN | DAT-IN | DAT-IN | DAT-IN |
| Block size | 42 words | 42 words | 48 words | 42 words | 47 words |
| Call length | 7 | 7 | 7 | 7 | 7 |
| Nesting depth | 0 | 0 | 0 | 0 | 0 |
| Block calls | none | none | none | none | none |
| System data | none | none | none | none | none |
| Flags used (schratchpad) | FY 240-255 | FY 240-255 | FY 240-255 | FY 240-255 | FY 240-255 |
| Timers | none | none | none | none | none |
| Counters | none | none | none | none | none |
| Data blocks | none | none | none | none | none |

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### 3.1.3.2 Parameterisation




| Parameter | Function | Comment | Type | Form | Valid value |
|---|---|---|---|---|---|
| ADPR | Start address Dual Port RAM | hexadecimal coded | D | KH | see section 4.1.3 |
| DBDW | Data block Data word | destination of data | Q | W | FW 0 - 198 QW 0 - 126 |
| ANZ | Number | Number of words transferred | Q | BY | FY 0 - 199 QB 0 - 127 |
| AKTU | New data available | | Q | BI | F 0.0 - 199.7 Q 0.0 - 127.7 |

The AKTU bit will remain high for at least 1 S5 cycle.

The values in parameters DBDW and ANZ are changed each time a new value is transferred from the WF 470 to the PLC.



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## 3.1.4 Picture selection function block Bildlist.

FB 220 Bildlist is designed to perform:

- Picture selection from function keys, of up to 169 pictures
- Calling of different function blocks according to which picture is currently displayed
- Transfer to the WF 470 of special key codes via the TAST byte
- Transfer of signals via flags to the picture specific function block

### 3.1.4.1 Technical data

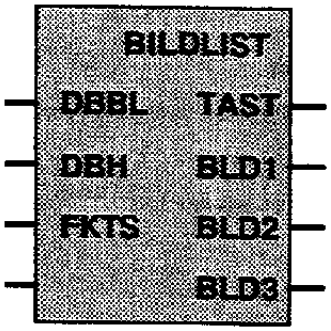
| | S5-130 WB<br>S5-150 K<br>+ cent unit | S5-150 S<br>S5-150 U | S5-155 U | S5-115 U +<br>CPU 941, 942,<br>943, 944 | S5-135 U +<br>CPU 921 | S5-135 U +<br>CPU 922, 928 |
|---|---|---|---|---|---|---|
| Block number | FB 220 | FB 220 | FB 220 | FB 220 | FB 220 | FB 221 |
| Lib number | E88530-B4132 B | E88530 B4132-D | E88530 B4136-D | E88530 B4132-A | E88530 B4132-C | E88530 B4132-C |
| Block name | BILDLIST | BILDLIST | BILDLIST | BILDLIST | BILDLIST | BILDLIST |
| Block size | 391 words | 376 words | 385 words | 435 words | 377 words | 378 words |
| Call length | 10 | 10 | 10 | 10 | 10 | 10 |
| Nesting depth | 1 | 1 | 1 | 1 | 1 | 1 |
| System data | none | none | none | none | none | none |
| Flags used | FY 240-255 | FY 240-255 | FY 240-255 | FY 240-255 | FY 240-255 | FY 240-255 |
| Blocks called | FB in pic list | FB in pic list | FB in pic list | FB in pic list | FB in pic list | FB in pic list |
| Timers | none | none | none | none | none | none |
| Counters | none | none | none | none | none | none |
| Data blocks | see parameter | see parameter | see parameter | see parameter | see parameter | see parameter |

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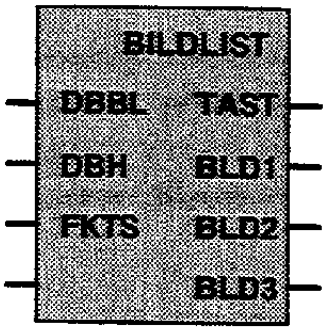
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## 3.1.4.2 Function block parameterisation

FB: 220




FB: 221




| Parameter | Function | Comment | Type | Form | Valid value |
|---|---|---|---|---|---|
| DBBL | Picture list data block number | DBBL can be stored in EPROM Each picture requires 12 data words | B | - | DB No.2 - 255 |
| DBH | Scratchpad data block | Must be in RAM Data words 0-14 are used by FB 220 | B | - | DB No.2 - 255 |
| FKTS | Binary codes from the function keys (from FB "TAST") | Must be the same word that is specified in the FB TAST parameter | I | - | FW 0 ... 198 |
| BLD1<br>BLD2<br>BLD3 | Picture code 1<br>Picture code 2<br>Picture code 3 | Parameter to select WF 470 picutre number. Must be the same as FB S5 - WF 470 parameters | Q | BY | FY 0 ... 199 |
| TAST | Key code to the WF 470 | Must be the same as parameter TAST on FB S5 - WF 470 and FB TAST | Q | BY | FY 0 ... FY 199 |

Function block FB 220 operates in conjunction with the data block DBBL. This data block must be created and set up by the user. The data block number is freely selectable and is specified via the parameter DBBL.

The maximum length of data blocks is limited by the programming unit to approx. 2000 words or sufficient for 169 pictures.

The control information required by FB 220, for each picture which can be selected, occupies 12 data words.



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The layout of this control information in the data block is shown below. Each "block" of information must start at a data word number which can be divided by 12, for instance:

Block 0 = DW 0 to DW 11
Block 1 = DW 12 to DW 23
etc.

| DW-No | | | Data Format |
|---|---|---|---|
| 0 | free | BLD1 | KS |
| 1 | BLD2 | BLD3 | KS |
| 2 | | Pic. Spec. FB No. | KY |
| 3 | Specify pic. selection or TAST code | | KM |
| 4 | F1 pic. No./Tast code | F2 pic. No./Tast code | KY |
| 5 | F3 pic. No./Tast code | F4 pic. No./Tast code | KY |
| 6 | F5 pic. No./Tast code | F6 pic. No./Tast code | KY |
| 7 | F7 pic. No./Tast code | F8 pic. No./Tast code | KY |
| 8 | F9 pic. No./Tast code | F10 pic. No./Tast code | KY |
| 9 | F11 pic. No./Tast code | F12 pic. No./Tast code | KY |
| 10 | F13 pic. No./Tast code | F14 pic. No./Tast code | KY |
| 11 | F15 pic. No./Tast code | F16 pic. No./Tast code | KY |

**DW 0 and DW 1:**

These data words specify the picture number to which the control information belongs.

**DW 2:**

This data word contains the number of the function block which is to be called when this picture is on the screen. If it contains 0, no function block will be called. (The function block called cannot have parameters.)

**DW 3:**

The 16 bits in DW 3 are allocated to the 16 function keys. Bit 0 belongs to F1, Bit 1 - F2 etc. If bit 1 in DW 3 is high, then the value contained in the corresponding data byte will be output as a TAST code. For instance if the data byte contained "E4 Hex", then pressing F1 would start the printer function.

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**DW 4 to DW 11:**

These data bytes are used to specify which picture is called when one of the function keys F1 to F16 is pressed. This is done by entering the block number of the required picture in the corresponding byte.

If a function key is not used, a dummy value of 255, or its own block number can be entered.

If a value of 254 is entered, when the function key is pressed, the previously displayed picture will be automatically re-selected.

**Flags - Passed to the picture specific FB.**

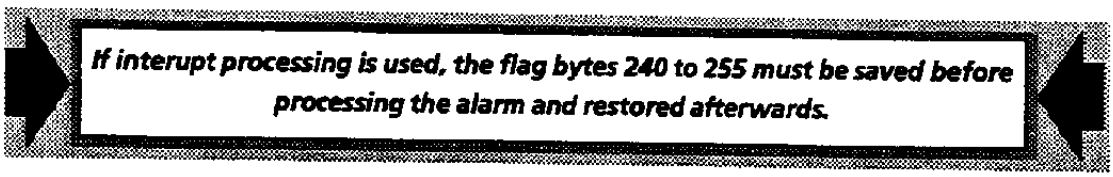
FB 220 passes flags to the function block called when a particular picture is on the screen. These are as follows:

F 247.1 - Pulse flag - on picture change, for one FB scan

F 247.3 - Pulse flag - on picture change, on the last FB scan

F 247.7 - If flag 247.7 is set to 1 by the picture specific FB, then picture change by FB 220 will be inhibited.

FW 250 The function key bits are set as pulse flags in this flag word, and can be evaluated by the picture specific FB. F 251.0 = F1, F250.7 = F16 etc.




**Auxiliary data block DBH:**

The auxiliary data block DBH should be created by the user. It is used by FB 220 for scratchpad data, and must therefore be in RAM.

If a specific picture is required to be displayed on start-up (warm restart or cold restart of the PLC), a program should be called from OB20-22 which overwrites DW 2 to 7 and DW 10 to 14 with KH 0000, and DW 1 with KH 0001. The picture number which is specified in block 0 will then be automatically called. DW 8 and 9 are used by the standard III software for the WF 725/WF 726.

**Search**

If a picture is not selected by FB 220 but called directly from the WF 470 picture selection mask or from another FB, the function block searches for the picture number in the DBBL data block and then behaves as normal.

If the selected picture number does not appear in DBBL, the first picture block is selected, and the function key allocation in this block will be used.



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## 3.2 S5 Software Options

The software options (service module, printer, graph 5 and sequence diagnostics) are supplied on a separate disk. With picture construction versions up to V 2.1, the required options must be transferred to the picture construction disk FD0 using PIP, and then loaded into the WF 470 memory. When using a PG 675 with picture construction software versions V 2.3 and above, the option software should be transfered to the picture data disk.

When using a PG 685, the option should be transferred to the hard disk. Each option is self-contained, and operates independently.

The standard pictures used by these options can have softkey legends allocated to them by entering the required texts into the special text group # SK.
Each option picture has a specific text list:

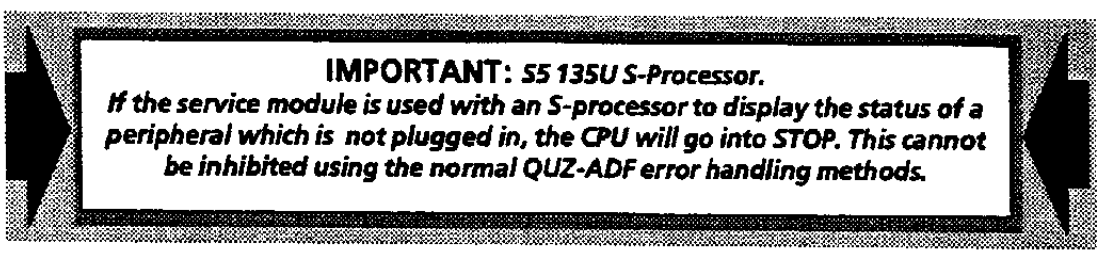
**TG Code: T#SK TG Name: softkey text**
**Code: Name**

| | | | |
|---|---|---|---|
| **N000** | **Softkeytext** | **Schrittketten** | **= Sequence analyser text** |
| **N001** | **Softkeytext** | **Service module** | **= Service module text** |
| **N002** | **Softkeytext** | **Graph5 Bild 1** | **= Graph5 picture 1** |
| **N003** | **Softkeytext** | **Graph5 Bild 2** | **= Graph5 picture 2** |
| **N004** | **Softkeytext** | **SchrKett Bild 1** | **= Sequence analyser pic. 1** |
| **N005** | **Softkeytext** | **SchrKett Bild 2** | **= Sequence analyser pic. 2** |
| **N006** | **S5-Meldetext** | | **= S5 error texts.** |

The text group is supplied with the picture contruction software disk and should be transferred to the application data disk. The COPY TG function *MUST* be used to do this, and *NOT* the CPM PIP command.
The structure of these lists must not be changed. The existing text can be overwritten with the required text for each function key. Lists which are not required may be erased. The field "DB No." in the list is not used in this context, the data block number entered here need not be present in the PLC.

### 3.2.1 Service module

The service module is a firmware option which can be loaded into the WF 470, no additional software is required in the SIMATIC S5 for its operation.
The service module allows the operator to display the status of inputs, outputs, flags, peripheral and data words together with timer and counter values. These are displayed in three formats; as a bit pattern, as a hexadecimal and as a decimal number. An example display is shown at the top of page 1-6.
Values can also be changed or 'forced' when the keyswitch parameter bit S5 in the S5 - WF 470 function block is set to "1".
The service module is displayed in the WF 470 as a normal picture. When loaded, it appears in the picture directory with the special code number #02.




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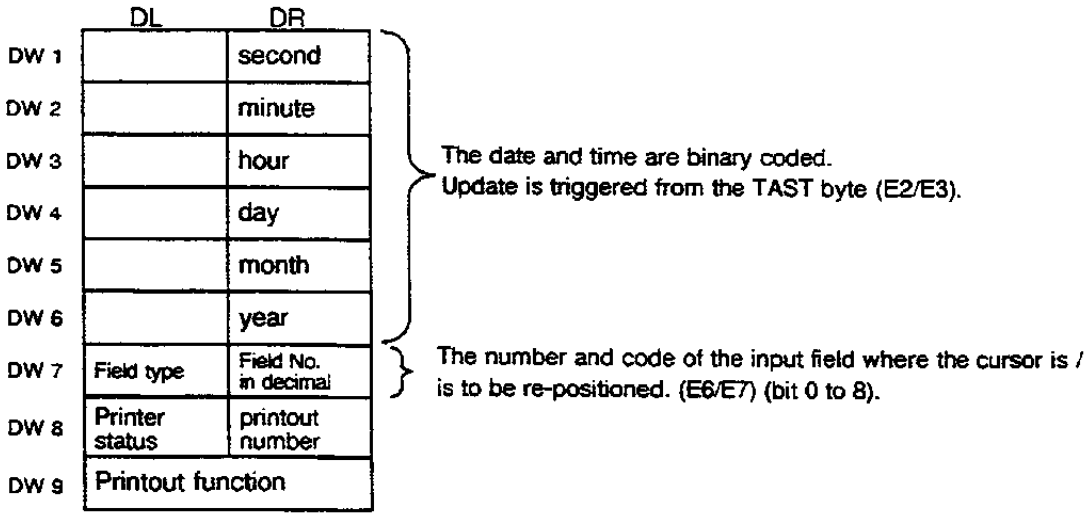
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## 3.2.2 Printer function

This firmware option enables the WF 470 printer port to be used. No additional S5 software is required for its operation. Report pages which have been generated and loaded into the WF 470 will be displayed in the printout directory. A printout is initiated in the same way as a picture selected, e.g. by writing the printout number into the S5 - WF 470 function block's BLD1, 2, 3 bytes.

### 3.2.2.1 "Transfer block" data block

The first twenty words of the transfer block data block are used to hold the information described below: (from WF 470 V2.1).
The data block number is specified using the PG 675/685 in picture construction mode via the "system data list".




**Data word 8 - printer function status**

| | |
|---|---|
| bit 00 to 05 | Number of the report being printed |
| bit 08 | Output to printer active |
| bit 09 | Requested printout not present |
| bit 10 | Printer not connected (bit is set after 20 sec wait) |
| bit 11 | not used |
| bit 12 | event log not activated |
| bit 13 | Printer function not started |
| bit 14 | Printer function not loaded into WF 470 |
| bit 15 | Event message buffer has room for less than 50 messages. |

When the status is present, the associated bit will be high.


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**Data word 9 - printer control word**

Data word 9 in the data transfer data block contains the following control information:

Bit 00 to 07 Number of the report to be printed out (in binary)
Bit 8 + 9 binary coded output mode:
0 + 0 No printer output
1 + 0 Output of the report printout and event log
1 + 1 Output of only the event log
0 + 1 Output of only the report printouts

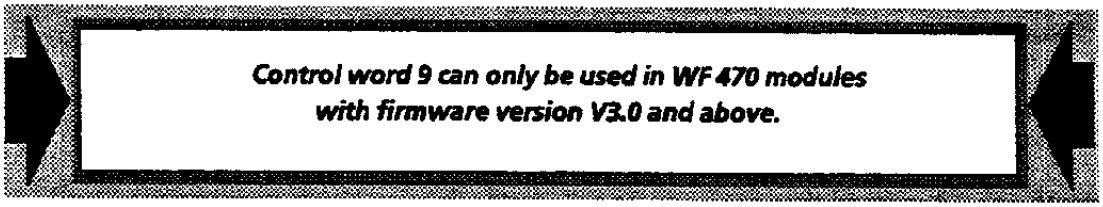
Bit 10 Not used
Bit 11 Not used
Bit 12 Inhibit error message output
Bit 13 Stop the printer function
Bit 14 Not used
Bit 15 Erase the event log buffer memory

These functions only become effective after code E8 Hex is entered in the TAST byte.

The above functions are carried out when the control bits are high. The opposite function is carried out when the bit is low.For instance, if bit 13 is low "0", and E8 Hex is entered in the TAST byte, the printer function will be switched OFF.

The normal printer control functions still operate if control word 9 is also being used, i.e. a report can still be intiated via the BLD 1, 2, 3 bytes and the printer control mask will still function, etc.

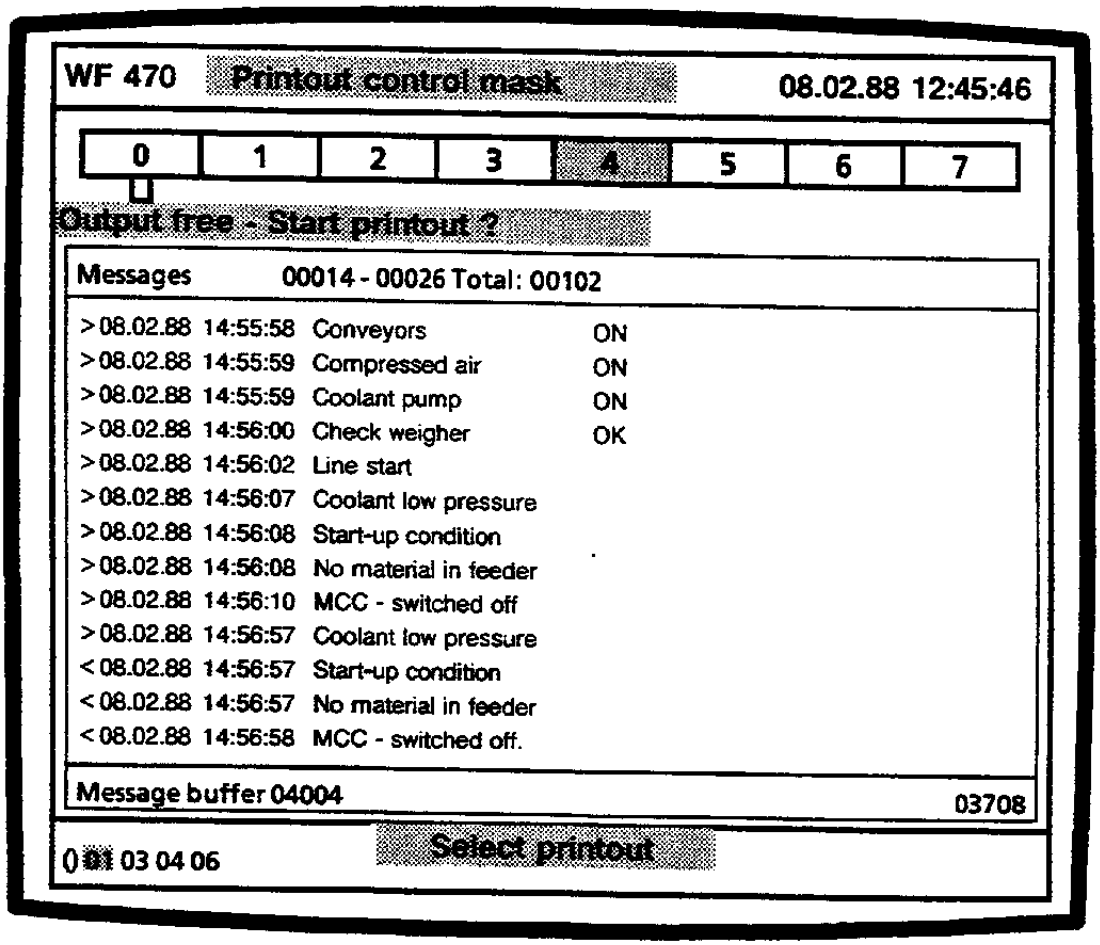
The only exception to this is erasing and resetting the message buffer using RESET.




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## 3.2.2.2 WF 470 Printout control mask.




The printout control mask shown above is selected from the overview mask, or it can be called directly using its picture code #9A.

The display at the top of the page shows the condition of the 8 printer status bits. If the status bit number is entered on the operator keyboard, the text for this status bit will be displayed.

The enter key can be used to start the selected report printout.

The line shown at the bottom of the screen displays a list of the report printouts which are present on the WF 470. The cursor right/left key can be used to select a particular report number. The display field in the center of the picture will then display any messages which are awaiting printout with this report number. The number of messages awaiting printout is shown numerically and as a bar graph.

A report printout can be initiated from this page. To do this, select the report number using the left/right cursor keys, enter the number 0 to select the "printer output free" status text, and then press the ENTER key.



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### 3.2.3 Sequence diagnostics

The sequence diagnostics option version 3.0 and above is supplied as two pictures, one showing an overview of the sequences, and the second providing detailed fault diagnostics. (An example picture is shown on page 1-5). This now means that the sequence step texts and error texts can be up to 50 characters in length.

The overview page has the code #05, and the diagnostics the code #06. The picture directory does **NOT** show these picture numbers, but shows picture #01 to be in line with previous versions.

Softkey legends for these pages can be entered in the text group #SK, text list 004 and 005.

#### 3.2.3.1 Introduction

**The sequence diagnostic package can be used in the following PLC'S:**

SIMATIC S5 - 130 W(B)
SIMATIC S5 - 135U with 928 processor
SIMATIC S5 - 150S
SIMATIC S5 - 150U
SIMATIC S5 - 115, CPU 942/943/944
SIMATIC S5 - 155U

**The sequence diagnostics cannot be used with:**

SIMATIC S5 - 135U - with S or R processor
SIMATIC S5 - 115, CPU 941

A sequence control cascade is a control scheme with a chain of individual steps which are activated one after another. The change over from one step in the chain to another is controlled by the transition conditions. These could be for example the operation of a limit switch or the completion of a delay time.

The individual steps in a sequence are programmed in the SIMATIC S5 controller in sequence blocks (SB) or in program blocks (PB). Each step in the sequence requires an individual SB or PB. In any one program cycle, only one sequence/program block per sequence chain will be activated. The processing of this block will be terminated and processing of the next block in the chain will be started when the transition conditions have been met (see Fig 3.2).

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Monitor timers with different time values can be programmed in FB 72 for each SB or PB. As the transition conditions are met for a particular step, the timer is re-triggered. If a transition is not made to the next step in the sequence before this timer has expired, the function block flags an error and this is annunciated on the WF470 screen. The sequence can be re-star-ted when the fault is corrected.

Function block FB172 (sequence control) monitors the mode of operation of the sequence and hence controls the correct processing of the sequence. Information for each sequence chain (sequence block numbers, step numbers etc.) is held in a buffer data block called the "INTERFACE" DB. Up to 16 sequence chains can be linked to a sequence group, and a total of 4 sequence groups is permitted (16 x 4 = 64 sequence chains).

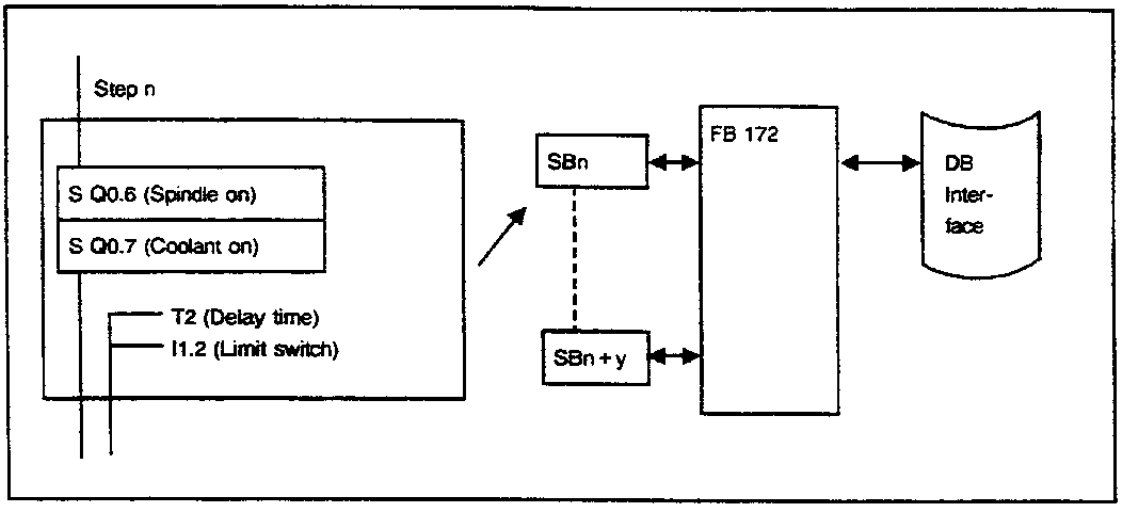



*Fig 3.2 Sequence step example.*

If a transition condition is not fulfilled, the "criterion analysis", "sequence chain selector" and "S5-WF470" function blocks operate to display the error in the sequence analysis picture.

- The criterion analysor (FB174 and FB175) determine which transition condition has not been fulilled in the current sequence block. The unfulfilled condition is transferred, in bit form with its corresponding MC5 code, to the "Criterion analyser" data block.
- This information and the data from the "INTERFACE" data block are transferred to the data block "sequence data" by the "sequence chain selection" function block (FB 173).
- The "S5-WF470" function block transfers this data to the WF 470 where it is displayed together with the corresponding error text.


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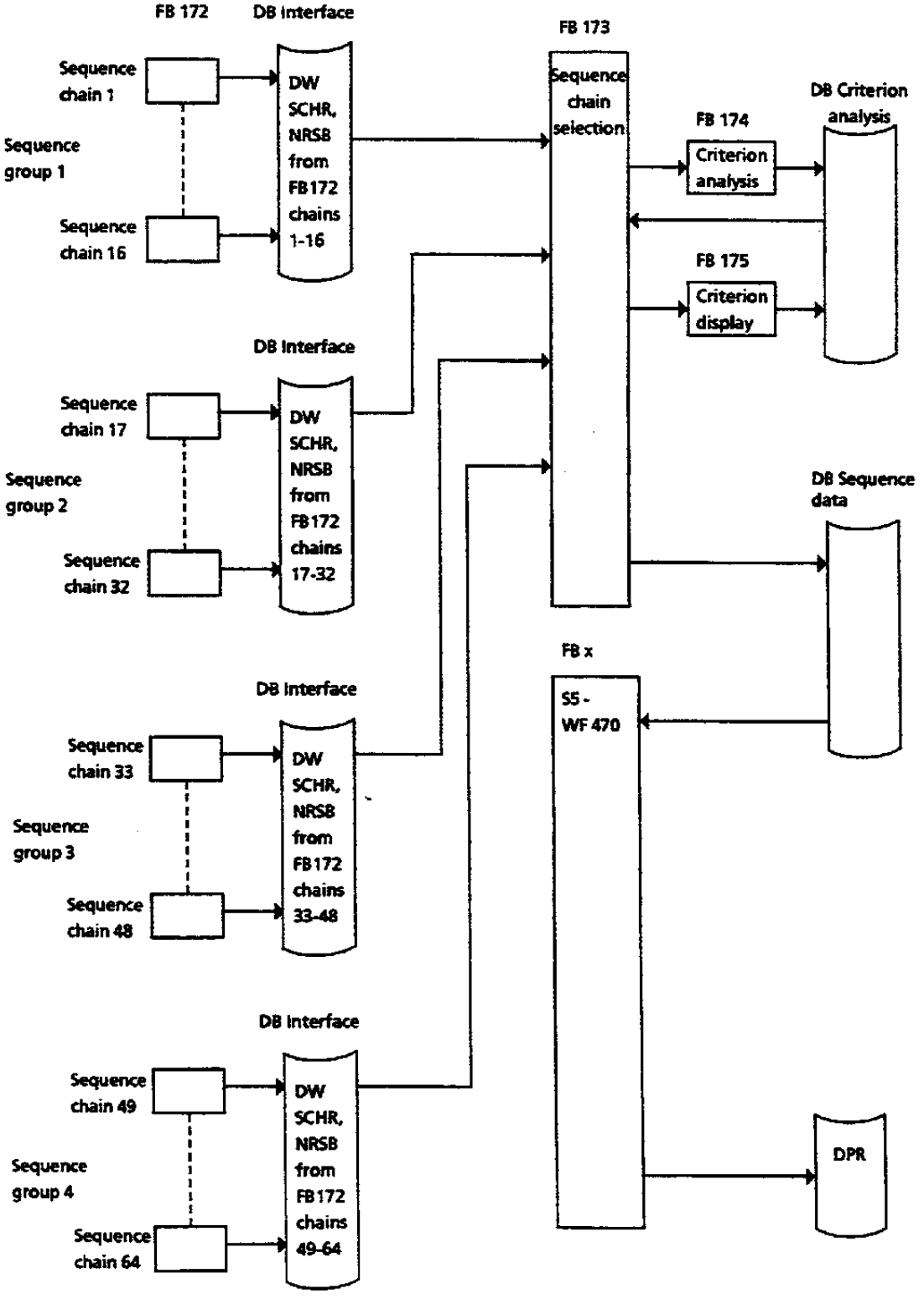



*Fig 3.3 Sequence diagnostics*

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## 3.2.3.2 Sequence chain control "ABL:KORG"(FB172)

The ABL:KORG function block (FB 172) controls the processing of a sequence chain. Each chain can consist of a maximum of 255 steps (=255 SB/PB's). Each sequence group requires an associated data block to be programmed. In order for the sequence to operate correctly, the program/sequence blocks must be programmed in a specific format (see 3.2.3.6).

### Technical data

| | S5-130 WB<br>S5-150 K<br>+ cent unit | S5-150 S<br>S5-150 U | S5-155 U | S5-115 U +<br>CPU 942, 943 and 944 | S5-135 U +<br>CPU 928 |
|---|---|---|---|---|---|
| Block number | FB 172 | FB 172 | FB 172 | FB 172 | FB 172 |
| Lib number | E88530-B4132 B | E88530 B4132-D | E88530 B4136-D | E88530 B4132-A | E88530 B4132-C |
| Block name | ABL:KORG | ABL:KORG | ABL:KORG | ABL:KORG | ABL:KORG |
| Block size | 223 words | 225 words | 225 words | 244 words | 225 words |
| Processing time | app. 1 ms | app. 1 ms | app. 1 ms | app. 1 ms | app. 1 ms |
| Call length | 19 | 19 | 19 | 19 | 19 |
| Nesting depth | 1 | 1 | 1 | 1 | 1 |
| System data | none | none | none | none | none |
| Flags used | FY 240-255 | FY 240-255 | FY 240-255 | FY 240-255 | FY 240-255 |
| Block called | Associated SB or PB | Associated SB or PB | Associated SB or PB | Associated SB or PB | Associated SB or PB |
| Timers | none | none | none | none | none |
| Counters | none | none | none | none | none |
| Data block interface for parameter SCHR, NRSB, KDAT | DB must be called before the FB call | DB must be called before the FB call | DB must be called before the FB call | DB must be called before the FB call | DB must be called before the FB call |



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## Explanation of input/ output parameters:

| Parameter | Function | Comment | Type | Form | Valid value |
|---|---|---|---|---|---|
| BETR | Operation mode selection Automatic / Manual | "1" = Automatic "0" = Manual | I | BI | I 0.0 - 127.7 F 0.0 - 199.7 |
| STRT | Start sequence in Auto and Man ; Increment forward in Man (signal change from "0" to "1") | | I | BI | I 0.0 - 127.7 F 0.0 - 199.7 |
| TIPP | Inching mode, step enabling with STRT (signal change from "0" to "1") | | I | BI | I 0.0 - 127.7 F 0.0 - 199.7 |
| EINR | Set up mode | Command output Only selected step is processed | I | BI | I 0.0 - 127.7 F 0.0 - 199.7 |
| SCHD | Pre-selection of a step number | A step can be selected both in automatic and manual mode | I | BY | IB 0 - 127 FY 0 - 199 |
| SCHS | selected step number | | I | BI | I 0.0 - 127.7 F 0.0 - 199.7 |
| RSET | Resetting the sequencer | | I | BI | I 0.0 - 127.7 F 0.0 - 199.7 |
| PBSB | Selection of sequence blocks or program blocks | Either SBs or PBs can be used for a sequencer | D | KC | KC = PB or SB |
| SBAE | Number of the first and last sequence/ programm block | | D | KY | KY = 1, 2 - 254, 255 |
| TWA | Specify the delay timer | TWA can be started and interrogated as required in the SB | T | – | T 1 - 127 |
| TUE | Specify the monitoring timer | TUE is automatically started on transition from one step to the next. The time set applies to each step in the sequencer | T | – | T 1 - 127 |
| KUE | Time value for TUE | | D | KT | KT = 0.0 - 999.3 |
| SCHR | Current step number output | SCHR is Binary coded | Q | BY DR | S DB Interface DR |
| NRSB | Current sequence block number output | | Q | BY | S DB Interface DL |
| STO | Fault | Continuous signal | Q | BI | Q 0.0 - 127.7 F 0.0 - 199.7 |
| ISTO | Fault | dynamic (Pulse for 1 cycle) | Q | BI | Q 0.0 - 127.7 F 0.0 - 199.7 |
| KDAT | Sequence data | | Q | W | S-DB Interface |



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## "Interface DB "

The values placed in the SCHR, NRSB and KDAT parameters by FB172 are required by the WF 470 to produce the error display picture. Therefore these parameters must be entered accordingly to a pre-defined format which the WF 470 is expecting. Each block has 32 data words allocated to it.

This data block is parameterised via the QKBx parameter in FB KANW: WF (FB 173).

***The data block must be called before the call to FB 172***
***The data region shown as Y must be continuous.***

| DW | | | |
|---|---|---|---|
| y | NRSB /FB 172 | SCHR / FB 172 | chain 1 from sequence group |
| y+1 | NRSB /FB 172 | SCHR / FB 172 | chain 2 from sequence group |
| y+2 | NRSB /FB 172 | SCHR / FB 172 | chain 3 from sequence group |
| y+3 | NRSB /FB 172 | SCHR / FB 172 | chain 4 from sequence group |
| y+4 | NRSB /FB 172 | SCHR / FB 172 | chain 5 from sequence group |
| y+5 | NRSB /FB 172 | SCHR / FB 172 | chain 6 from sequence group |
| y+6 | NRSB /FB 172 | SCHR / FB 172 | chain 7 from sequence group |
| y+7 | NRSB /FB 172 | SCHR / FB 172 | chain 8 from sequence group |
| y+8 | NRSB /FB 172 | SCHR / FB 172 | chain 9 from sequence group |
| y+9 | NRSB /FB 172 | SCHR / FB 172 | chain 10 from sequence group |
| y+10 | NRSB /FB 172 | SCHR / FB 172 | chain 11 from sequence group |
| y+11 | NRSB /FB 172 | SCHR / FB 172 | chain 12 from sequence group |
| y+12 | NRSB /FB 172 | SCHR / FB 172 | chain 13 from sequence group |
| y+13 | NRSB /FB 172 | SCHR / FB 172 | chain 14 from sequence group |
| y+14 | NRSB /FB 172 | SCHR / FB 172 | chain 15 from sequence group |
| y+15 | NRSB /FB 172 | SCHR / FB 172 | chain 16 from sequence group |
| y+16 | Parameter | KDAT | chain 1 from sequence group |
| y+17 | Parameter | KDAT | chain 2 from sequence group |
| y+18 | Parameter | KDAT | chain 3 from sequence group |
| y+19 | Parameter | KDAT | chain 4 from sequence group |
| y+20 | Parameter | KDAT | chain 5 from sequence group |
| y+21 | Parameter | KDAT | chain 6 from sequence group |
| y+22 | Parameter | KDAT | chain 7 from sequence group |
| y+23 | Parameter | KDAT | chain 8 from sequence group |
| y+24 | Parameter | KDAT | chain 9 from sequence group |
| y+25 | Parameter | KDAT | chain 10 from sequence group |
| y+26 | Parameter | KDAT | chain 11 from sequence group |
| y+27 | Parameter | KDAT | chain 12 from sequence group |
| y+28 | Parameter | KDAT | chain 13 from sequence group |
| y+29 | Parameter | KDAT | chain 14 from sequence group |
| y+30 | Parameter | KDAT | chain 15 from sequence group |
| y+31 | Parameter | KDAT | chain 16 from sequence group |

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### 3.2.3.3 Sequence chain selection for the WF470 "KANW: WF" (FB 173 of FB 183)

The function block "KANW: WF" administers a maximum of 4 sequence chain groups each containing up to 16 sequence chains, to produce a diagnostic display on the WF 470. The control of the sequences themselves is performed by FB172.
The link between the individual steps and the FB KANW"WF is formed by up to 4 "INTERFACE" data blocks parameterised at QKBx. The FB KAN: The first chain which has an error detected in it is caused by the WF 470 to be automaticaliy displayed on the screen. If no error exists the first 16 sequence chains are displayed on the screen.

**Technical data**

| | S5-130 WB<br>S5-150 K<br>+ cent unit | S5-150 S<br>S5-150 U * | S5-155 U | S5-115 U +<br>CPU 942, 943<br>and 944 | S5-135 U +<br>CPU 928 |
|---|---|---|---|---|---|
| Block number | FB 173 | FB 173 / FB 183 | FB 183 | FB 173 | FB 183 in prep. |
| Lib number | E88530-B4132 B | E88530 B4132-D | E88530 B4136-D | E88530 B4132-A | E88530 B4132-C |
| Block name | KANW:WF | KANW:WF | KANW:WF | KANW:WF | KANW:WF |
| Block size | 265 words | 258 words | 288 words | 267 words | 250 words |
| Processing time | app. 2 - 10 ms | app. 1 - 5 ms | app. 1 - 5 ms | app. 2 - 10 ms.<br>app. 1 - 5 ms | app. 2 - 10 ms |
| Time call | 20 | 20 | 20 | 20 | 20 |
| Nesting depth | 1 | 1 | 1 | 1 | 1 |
| System data | SD 253 | none | none | none | none |
| Flags used | FY 240-255 | FY 240-255 | FY 240-255 | FY 240-255 | FY 240-255 |
| Blocks called | none | none | none | none | none |
| Timers | none | none | none | none | none |
| Counters | none | none | none | none | none |
| Data blocks | see parameter | see parameter | see parameter | see parameter | see parameter |

* The SIMATIC S5 150U program can be expanded to handle a total of 64 criteria by using FB 183, 184 and 185. These function blocks are used in place of FB 173, 174 and 175. This is only possible using sequence diagnostics package version 3.0 and above.

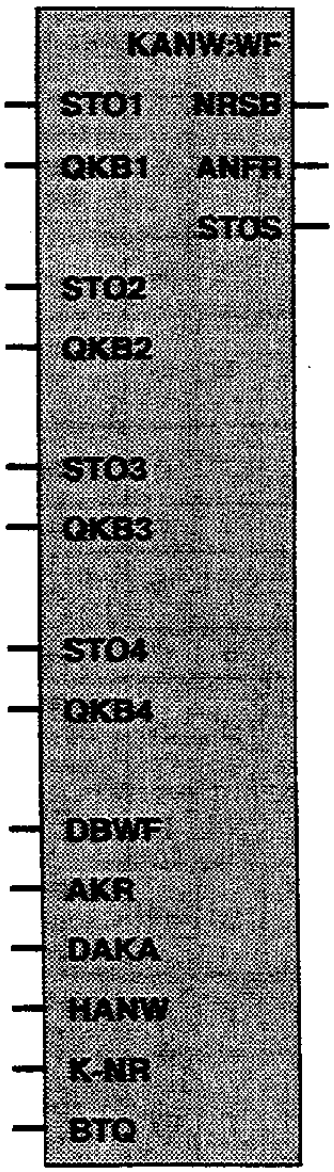
The SIMATIC S5 155U is only supplied with FB 183, FB 184 and FB 185.


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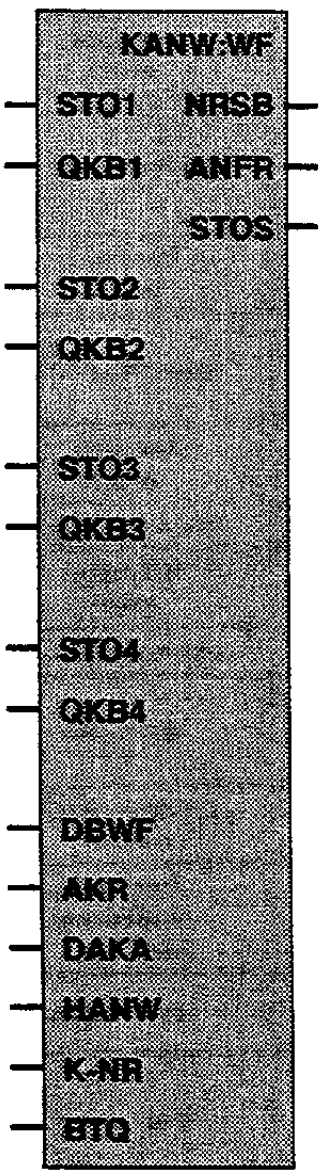

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**Parameter**

FB: 173




FB: 183




If the number of sequence chains is not longer than 16, then only one data block is required for the interface. This data block is specified via the parameter QKB1. In this case the parameters QKB2 and QKB3 can be parameterised with 0,0. This code informs the function block that sequence chains 16 to 64 are not present.

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## Explanation of input and output parameters:

| Parameter | Function | Comment | Type | Form | Valid value |
|---|---|---|---|---|---|
| STO1 | Error output group 1 | Bit 0 = STO for chain 1<br>Bit 15 = STO for chain 16 | I | W | FW 0-198 QW 0-127<br>DW 1-255 |
| QKB1 | Source seq. group 1 | left byte DB No. interface<br>right byte DW No.<br>Seq. Block QKB1 must be pressent | D | KY | KY = DB no., DW no.<br>DB no. 1-255<br>DW no. 1-239 |
| STO2 | Error output group 2 | see STO1<br>(Chains 17-32) | I | W | see STO1 |
| QKB2 | Source seq. group 2 | left byte DB No. interface<br>right byte DW No.<br>no DB present: KY = 0,0 | D | KY | see QKB1 |
| STO3 | Error output group 3 | see STO1<br>(Chains 33-48) | I | W | see STO1 |
| QKB3 | Source seq. group 3 | see QKB2 | D | KY | see QKB1 |
| STO4 | Error output group 4 | see STO1<br>(Chains 49-64) | I | W | see STO1 |
| QKB4 | Source seq. group 4 | see QKB2 | D | KY | see QKB1 |
| DBWF | DB Seq. data | left byte DB No.<br>right byte DW No<br>56 words used | D | KY | KY = DB no., DW no.<br>DB no. 1-255<br>DW no. 20-199 |
| AKR | Current criteria in DB KA | | I | BI | I/Q 0.0-127.7<br>F 0.0-199.7 |
| DBKA | Data block criteria analysis and display | Parameterisation of DB Criteria display | D | KY | KY = DB no., DW no.<br>DB no. 1-255<br>DW no. 8 |
| HANW | Manual selection | HANW = 1 man sel ON<br>HANW = 0 man sel OFF | I | BI | I/Q 0.0 - 127.7<br>F 0.0 - 199.7 |
| K-NR | Chain number | HANW chain number in binary | I | BY | IB/QB 0 -127<br>FY 0 - 199 |
| BTQ | Error acknowledge | | I | BI | I/Q 0.0 - 127.7<br>F 0.0 - 199.7 |
| NRSB | No. SB/PB for analysis | SB No. and internal information for FB 174 | Q | W | FW 0 - 198<br>DW 1 - 255 |
| ANFR | Enable bit criteria analysis | | Q | BI | Q 0.0 - 127.7<br>F 0.0 - 199.7 |
| STOS | Error output collective signal | group error | Q | BI | F 0.0 - 199.7 |

If the sequence blocks are being used (and therefore the DB interface is not present) the parameter QKBX should be parameterised as KY = 0,0. The parameters STOX can then be parameterised with a flag word number >200.



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**DBWF (Sequence Data ):**

The "sequence data" in this data block is used to store the data for the function block KAW:WF (FB173 of FB 183) for sequence data display. This data is 56 words long and must be entered in a pre-determined sequence (see below). The last two data words are reserved for internal use by FB 173/183. KANW:WF.

The DB number can be freely selected, but must correspond to the value parameterised in FB KAN:WF (FB 173/183) under parameter DBWF. The "SEQUENCE DATA" data block must be loaded in RAM and if desired, can be part of another data block.

**FB 173 - FB 175**

| DW | | | |
|---|---|---|---|
| n+0 | SB/PB-number | Step number | chain 1 |
| | | | |
| n+15 | SB/PB-number | Step number | chain 16 |
| n+16 | Interrupted chain | (1 = interrupt) | |
| n+17 | | | |
| n+18 | Bit 0 = chain 1, Bit 15 = chain 16 | | |
| n+19 | (4 words for 4 × 16 chains) | | |
| n+20 | Code SB/PB | Seq. chain -No. | |
| n+21 | unfulfilled | | |
| n+22 | step on conditions | | |
| n+23 | MC5 - code for the unfulfilled | | |
| to | condition (maximum 32) | | |
| n+54 | | | |
| n+55 | internal use | | |
| n+56 | | | |

**FB 183 - FB 185**

| DW | | |
|---|---|---|
| n+0 | SB/PB-number | Step number |
| | | |
| n+15 | SB/PB-number | Step number |
| n+16 | Interrupted chain | (1 = interrupt) |
| n+17 | | |
| n+18 | Bit 0 = chain 1, Bit 15 = chain 16 | |
| | | |
| | | |
| | | |
| | | |

## 3.2.3.4 Criteria analysis "ABL:KRAY", "ABL:KRAN" (FB 174, FB 175 or FB184/FB185)

The ABL:KRAY function block finds the transition conditions in a program/sequence block. The block where the transition conditions are checked is determined by the value placed in KANW:WF (FB 173/183) parameter NRSB/ANFR.
The following instructions are recognised as transition conditions.

AI, AQ, AF, AT, AC, A(, O(, )
UNI, UNQ, UNF, UNT, UNC
OI, OQ, OF, OT, OC, O
ONI, ONQ, ONF, ONT, ONC

The transition conditions are transferred into Data block KA, and each unfulfilled condition is indicated by setting a bit in the output of ABL:KRAN parameter KR1 and KR2.
Up to 32 or 64 transition conditions can be checked per sequence.

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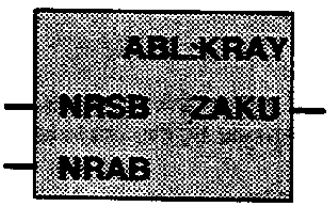
## Technical data

| | S5-130 WB<br>S5-150 K<br>+ cent unit | S5-150 S<br>S5-150 U* | S5-155 U | S5-115 U +<br>CPU 942, 943<br>and 944 | S5-135 U +<br>CPU 928 |
|---|---|---|---|---|---|
| Block number | FB 174 | FB 174 / FB 184 | FB 184 | FB 174 | FB 184 i.V. |
| Lib number | E88530 B4132 B | E88530 B4132-D | E88530 B4136-D | E88530 B4132-A | E88530 B4132-C |
| Block name | ABL:KRAY | ABL:KRAY | ABL:KRAY | ABL:KRAY | ABL:KRAY |
| Block size | 354 words | 350 / 392 words | 410 words | 357 words | 350 words |
| Processing time | app. 6 - 15 ms | app. 1 - 10 ms | app. 1 - 5 ms | app. 6 - 15 ms<br>app. 1 - 10 ms | app. 2 - 12 ms |
| Call length | 6 | 6 | 6 | 6 | 6 |
| Nesting depth | 1 | 1 | 1 | 1 | 1 |
| System data | none | none | none | none | none |
| Flags used | FY 238-255 | FY 238-255 | FY 238-255 | FY 238-255 | FY 238-255 |
| Blocks called | none | none | none | none | none |
| Timers | none | none | none | none | none |
| Counters | none | none | none | none | none |
| Data blocks | DB KA,<br>DW 0 - 72 | DB KA,<br>DW 0 - 72 / 106 | DB KA,<br>DW 0 -106 | DB KA,<br>DW 0 - 72 | DB KA,<br>DW 0 - 106 |

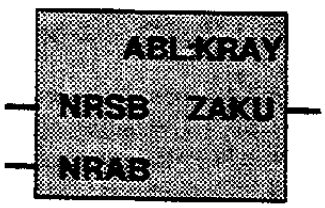
* The SIMATIC S5 150 U can be expanded to 64 criteria using FB183 to FB 185. This requires WF 470 version 3.0 firmware.

## Parameterisation

**FB: 174**




**FB: 184**




## Explanation of input and ouput parameters:

| Parameter | Function | Comment | Type | Form | Valid value |
|---|---|---|---|---|---|
| NRSB | Seq. group number<br>(or PB number) | Block to be<br>investigated | I | W | FW 0 - 254 |
| NRAB | Criteria display block | N°. of the FB ABL:KRAN<br>is set as parameter | D | KY | KF + 175 or<br>KF + 185 |
| ZAKU | Number of criteria exceeded | more than<br>32 criteria in step | Q | BI | F 0.0 - 199.7<br>Q 0.0 - 127.7 |



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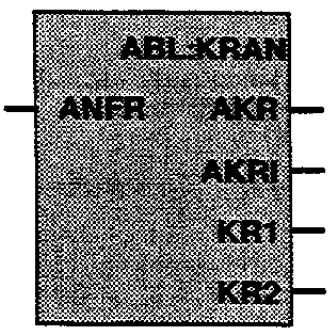
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## Technical data

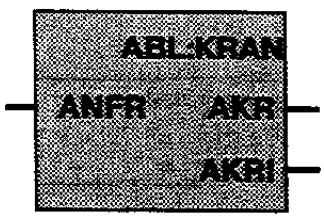
| | S5-130 WB<br>S5-150 K<br>+ cent unit | S5-150 S<br>S5-150 U* | S5-155 U | S5-115 U +<br>CPU 942, 943<br>and 944 | S5-135 U +<br>CPU 928 |
|---|---|---|---|---|---|
| Block number | FB 175 | FB 175 / FB 185 | FB 185 | FB 175 | FB 185 i.P. |
| Lib number | E88530-B4132 B | E88530 B4132-D | E88530 B4136-D | E88530 B4132-A | E88530 B4132-C |
| Block name | ABL:KRAN | ABL:KRAN | ABL:KRAN | ABL:KRAN | ABL:KRAN |
| Block size | 207 words | 207 / 324 words | 324 words | 207 words | 324 words |
| Call length | 7 | 7 | 7 | 7 | 7 |
| Nesting depth | 1 | 1 | 1 | 1 | 1 |
| Processing time | app. 3 ms | app. 1.5 ms | app. 1 ms | app. 3 ms<br>app. 1.5 ms | app. 2.5 ms |
| Flags used | FY 248-255 | FY 248-255 | FY 248-255 | FY 248-255 | FY 248-255 |
| Blocks called | none | none | none | none | none |
| Timers | none | none | none | none | none |
| Counters | none | none | none | none | none |
| Data blocks | DB KA | DB KA | DB KA | DB KA | DB KA |

## Parameterisation

**FB: 175**




**FB: 185**




## Explanation of input and output parameters:

| Parameter | Function | Comment | Type | Form | Valid value |
|---|---|---|---|---|---|
| ANFR | Criteria outputs for display and eval. enabled | Signal comes from FB KANW:WF (FB 172) | I | BI | F 0.0 - 199.7<br>Q 0.0 - 127.7 |
| AKR | The actual criteria are in DB and enabled | Continuous enable signal | Q | BI | F 0.0 - 255.7<br>Q 0.0 - 127.7 |
| AKRI | As AKR exept pulse | Impuse enable signal | Q | BI | as AKR |
| KR1* | Criteria output 1 | Unfulfilled transition conditions 1 - 16 | Q | W | DW 8 |
| KR2* | Criteria output 2 | Unfulfilled transition conditions 17 - 32 | Q | W | DW 9 |

* = The parameters KR1 and KR2 are missing for the FB 185.

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The parameter AKRI is not used by the WF 470 and so can be parameterised with an unused flag, i.e. F 255.7.

***The unfulfilled transition conditions are transferred into the function block ABL:KRA itself. For this reason this function block must be loaded in RAM.***

**DB KA (Criteria analysis):**

Function blocks "criteria analysis" and "criteria display" (FB174/175) or (FB184/185)place the MC5 code for the unfulfilled conditions in data block KA. The information is then transferred to the sequence data block by the function block KANW:WF (FB173/FB183).

**FB 175**

| DW | |
|---|---|
| 0 | Register for FB 174/175 |
| 1 | For internal data from FB 174/175 |
| 7 | |
| 8 | Unfulfilled transition condistions |
| 10 | MC5-code for the found transition code |
| 41 | |
| | Internal data for FB 174/175 |
| 72 | |

**FB 185**

| DW | |
|---|---|
| 0 | Register for FB 184/185 |
| 1 | For internal data from FB 1184/185 |
| 7 | |
| 8 | Unfulfilled transition condistions |
| 11 | MC5-code for the found transition code |
| 65 | |
| | Internal data for FB 184/185 |
| 106 | |

## 3.2.3.5 Programmed Example

In the following example the sequence blocks themselves are not programmed. This example shows how the diagnostic function blocks are to be programmed and when the corresponding data blocks should be called.

The calls to FB 172 in the following example are for the fourth and seventh sequence chains. The parameters STO1 and QKB1 in FB 173 and the parameters SCHR, NRSB, STO and KOAT in FB 172 are interdependent.

In the example, STO1 in FB 173 is parameterised as FW 110. STO in FB 172 uses the flags F 110.3 and 110.6, ie. the fourth and seventh bits of FW 110. FB 173 - QKB1 is parameterised as 110,10 (DB 110, DW 10). This is the start of the data block for NRSB, SCHR and KDAT. By setting DL/DR 13 and DL/DR 16 in the NRSB/SCHR parameter of FB 172, the forth and seventh data words in this block are addressed.



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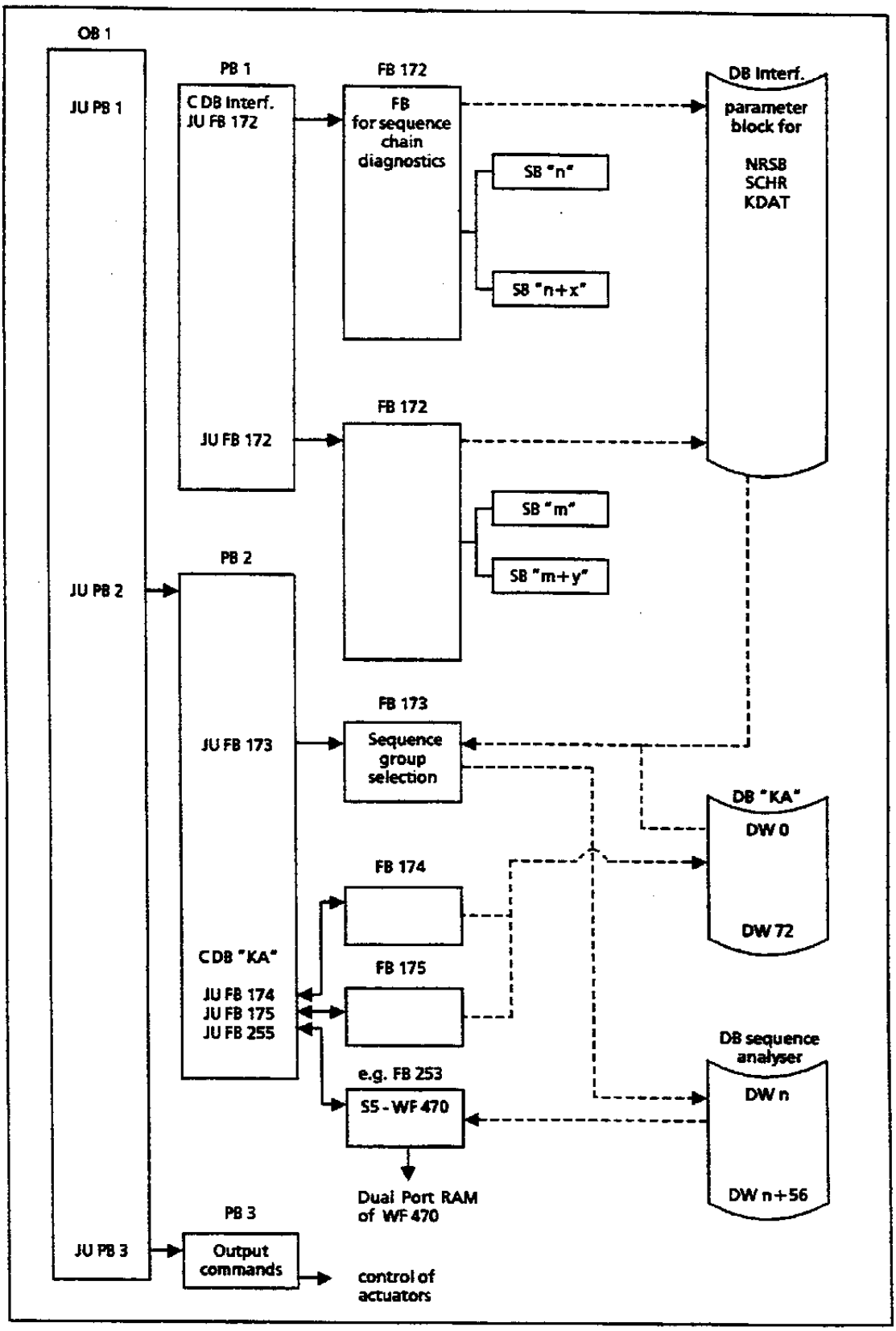



*Fig. 3.4 Program structure*

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```
PB 1
Segment 1
          : C    DB 101  ..............................  Call DB "interface"
          : ***
Segment 2
          :
          :
          :
          :
          :
          :
          :
          :
          :
          :
          :
          :
          :
          :
Segment 3
          :
          :
          :
          :
          :
          :
          :
          :
          :
          :
          :
          :
Segment 4
          :BE
```

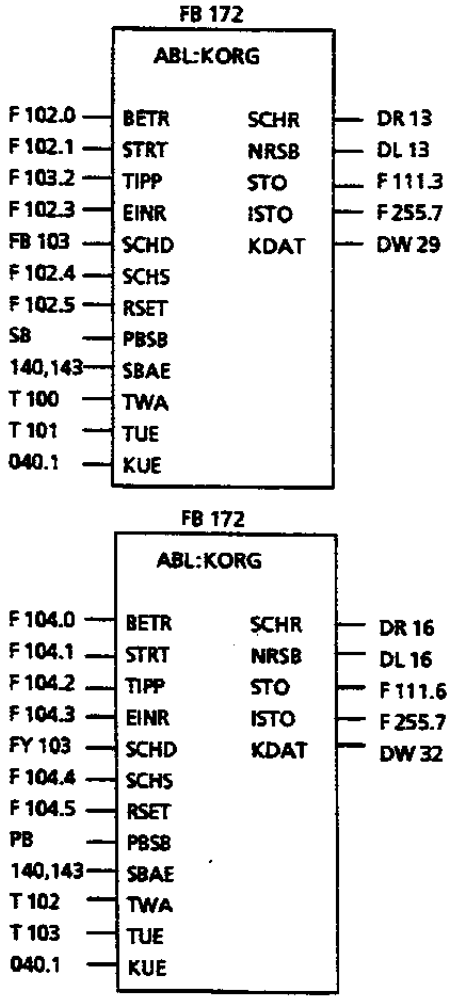



*Fig 3.5 Call and parameterisation of FB 172.*


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PB 2
Segment 1
:
:

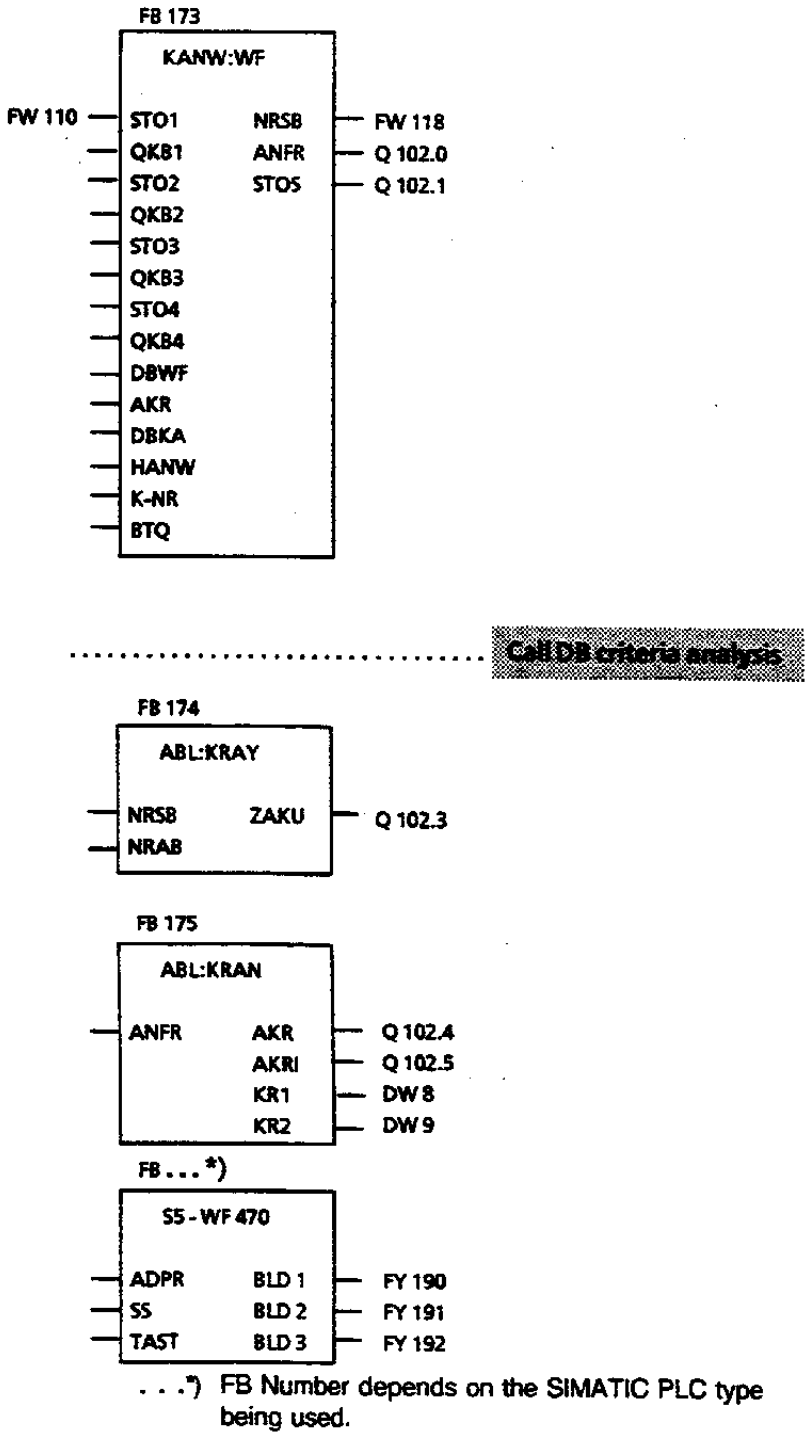



*Fig. 3.6 Call and parameterisation of FB 173, FB 174, FB 175 and FB 255.*

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```
PB 3
Segment 1
      : C    DB 101  ..........  Call DB interface
      : L    DR 29   ..........  Right byte of "KOAT"
      : T    FY 255  ..........  Transfer to FY255
      : ***
Segment 2
:     DR 13
:
:     KB 0
:
Segment 3
:     DR 13
:
:     KB 1
:
Segment 4
:     DR 13
:
:     KB 2
:
Segment 5
:     DR 13
:
:     KB 3
:
Segment 6
:     DR 16
:
:     KB 0
:
Segment 7
:     DR 16
:
:     KB 1
:
Segment 8
:     DR 16
:
:     KB 2
:
Segment 9
:     DR 16
:
:     KB 3
:
Segment 10
      : BE
```

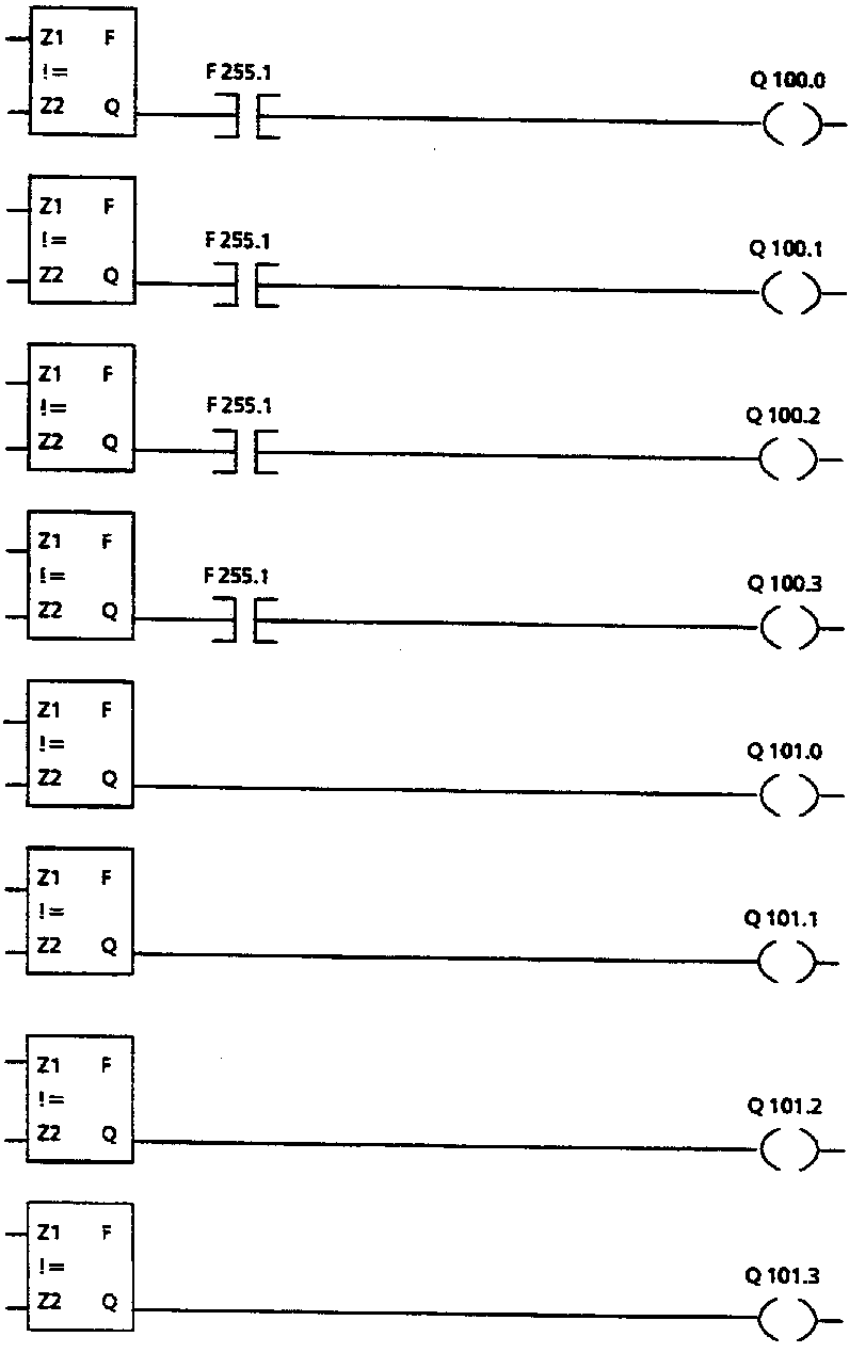



*Fig 3.7 Output commands.*



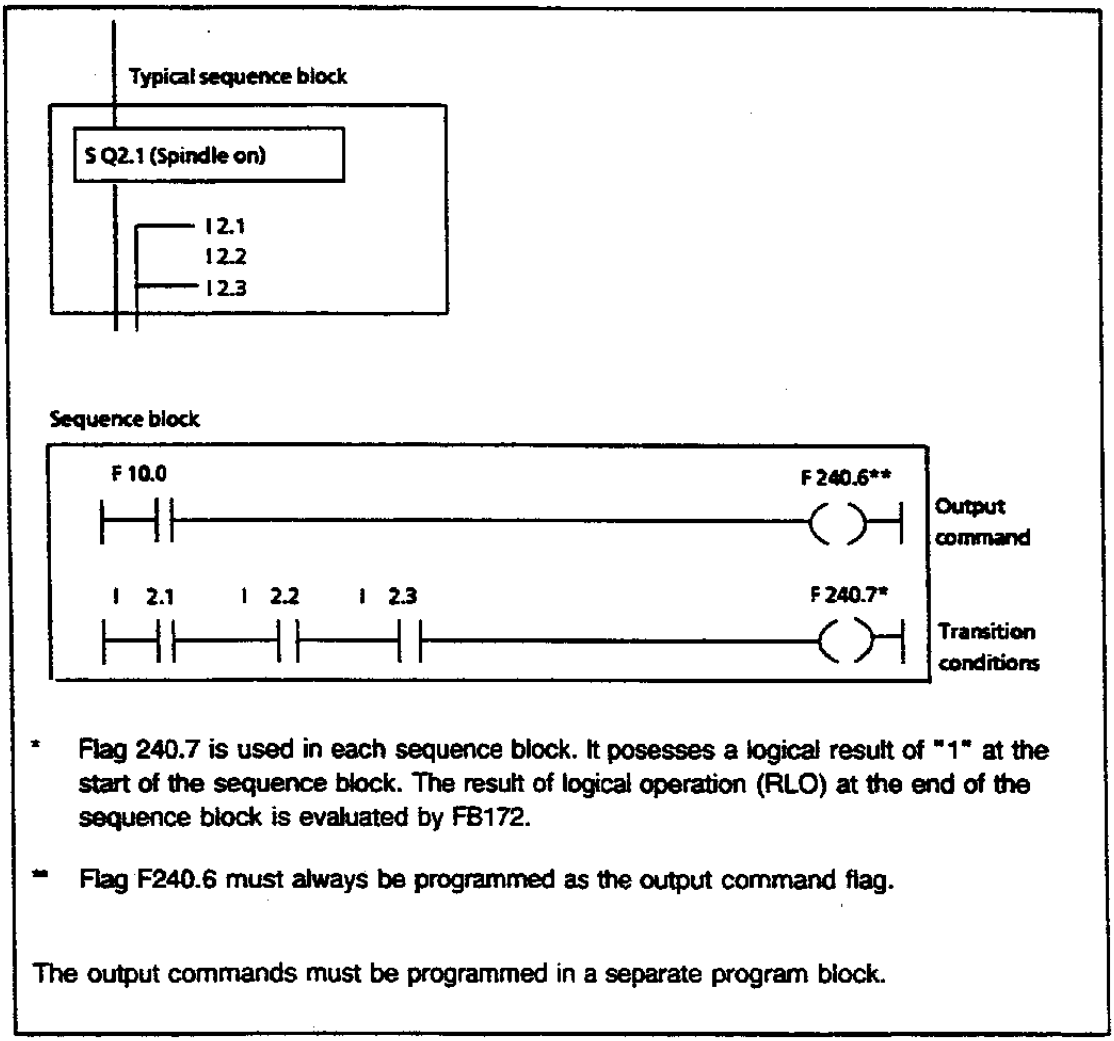
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## 3.2.3.6 Programming Sequence Blocks

Sequence blocks can be programmed with the logic for both the automatic and manual (Hand) modes of operation. In both cases any faults will be annunicated on the WF 470 screen. The manual modes use flags F240.4, F240.5. The automatic and increment modes use flags F240.6, F240.7.

These flags are used by the sequence control function block (FB172). This function block processes the code in the sequence blocks differently according to which mode has been selected. The FB controls the transition from one sequence block to the next and operates the diagnostics if an error occurs.




* Flag 240.7 is used in each sequence block. It posesses a logical result of "1" at the start of the sequence block. The result of logical operation (RLO) at the end of the sequence block is evaluated by FB172.

** Flag F240.6 must always be programmed as the output command flag.

The output commands must be programmed in a separate program block.

*Fig. 3.8 Example 1 : Sequence utilising AUTOMATIC mode only*

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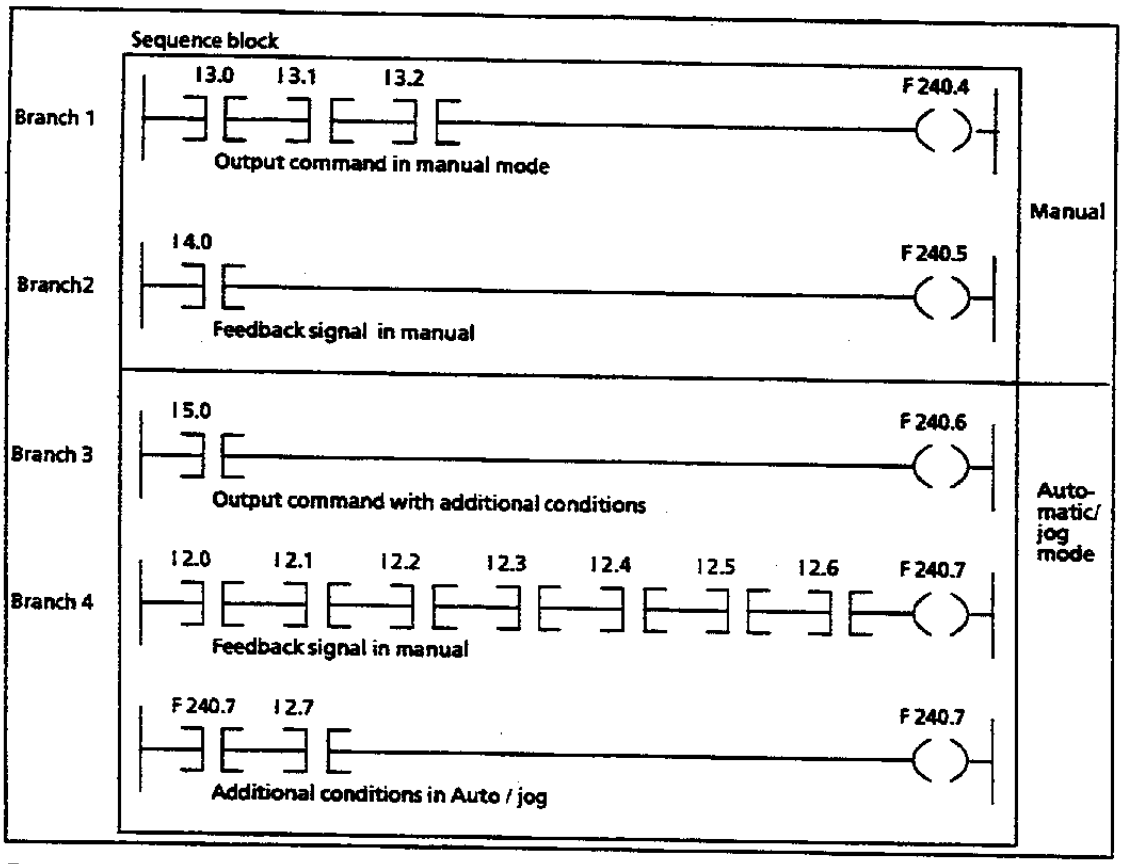



*Fig. 3.9 Example 2: Sequence chain for automatic/increment and manual operation*

- Up to 32 or 64 conditions can be programmed in each branch. Since ladder diagram representation only allows 7 contacts in a rung, the additional conditions must be entered in a separate rung, preceeded by a continuation flag (see the example in branch 4). For OR-combinations, the nestings are used like conditions.The diagnosis blocks can only process one nesting level.

- If there are no conditions in a particular branch e.g. F240.6, F240.7 will be evaluated. This flag always has the condition "1" at the start of a sequence block except during the first scan of the sequence block.

- If a delay time is required, this timer should be started at the start of the sequence block with F240.7 (switch on supply). The evaluation of the timer can take place in the following branches (e.g. branch F240.7).

- Each step is monitored by a monitor timer. The length of this monitor time and the timer is programmed as a parameter in the function block. Every time a transition occurs and a new block is processed, this timer is automatically re-triggered.The time value is entered in FB 172 parameter KUE, and is the same for all steps.

It is however possible to change the monitor time during the sequence. To do this, the new time value should be loaded into the timer parameterised as TUE at the start of the sequence block. If the timer is called in the step with an RLO = 0, then the monitor timer will be switched off for this step.

- Branches for flags F 240.6 and F 240.7 must be present. Branches 1 and 2 need only be programmed if manual mode is to be used.



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- The output commands must be programmed in a separate block. The current step number should be compared with the required step number, and if equal, the appropriate outputs should be switched (see example in fig. 3.7).

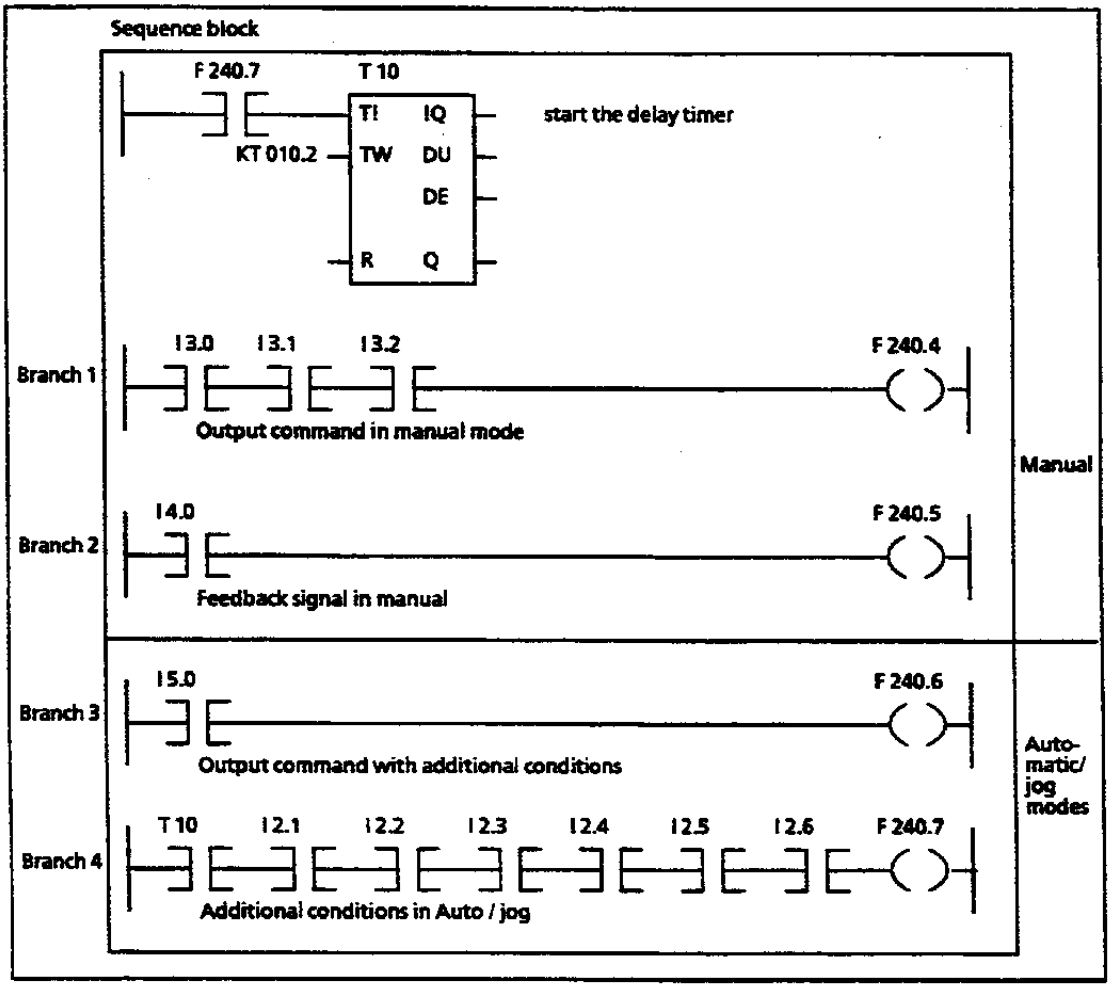



*Fig.3.10 Example 3 Step with delay timer*

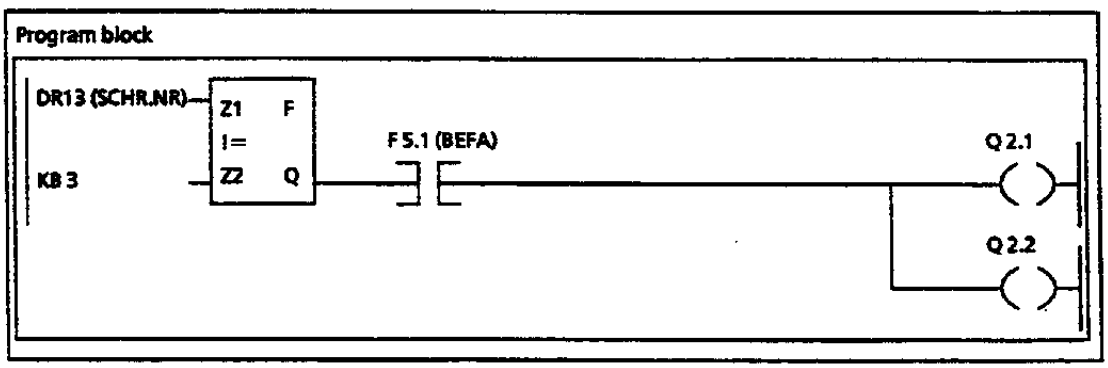



*Fig 3.11 Example 4 Output command*

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## 3.2.4 WF 470 Sequence diagnostics using GRAPH5

### 3.2.4.1 GRAPH5 sequence diagnostics option

The GRAPH5 diagnostics option, order No. 6FM1470 7EA30, can be loaded into the WF 470 using a PG. The picture construction software must be V2.3 or above for the PG 675 and V3.0 or above for the PG 685.

The option should be loaded onto the hard disk with the command PIP B:=A:CGR5.SYS, or if PG 675 is used, it should be loaded onto the application data disk.
The option consists of two pictures:

The main picture shows an overview of the sequences, and the status of the steps.
a) sequence running : green text, no attribute
b) sequence switched off : yellow text, attribute *
c) sequence with fault : white text, attribute "
d) sequence selected for diagnostics : line highlighted in blue.

The second picture is used for the sequence diagnostics. The unfulfilled step-on-conditions, the number of the sequence being diagnosed, and if used, the parallel branch are displayed.

The fault texts are entered in a similar manner to the standard sequence diagnostics, by entering the function mask and the number of the sequence to be diagnosed.

These two pictures can be selected using their picture codes #03 and #04. (The picture directory will only contain code #03.)

### 3.2.4.2 SIMATIC S5 software

The SIMATIC software disk 6FM1 470 6AD10 Version V1.3 from 11/87 contains several additional blocks i.e. SB0, SB2, SB3, FB 76, FB 77, FB 79.

The GRAPH5 software for the programming unit, and the sequence function block FB 70 and FB 71 must be ordered separately.

The new blocks are for the diagnostics of the GRAPH5 program. The GRAPH5 program software contains sequence blocks SB0, SB2 and SB3. These should be replaced by those supplied with the WF 470 function block as they contain additional functions required for the diagnostics program. In addition, the user should generate three data blocks, the data block numbers can be freely selected:

**Data block DBKA:**

This data block must be generated to at least DW 120 (minimum length:125), and should be called before FB 76 and FB 77.

**Data block DBWF:**

This block must be the same block which has been specified in the WF 470 system data mask. All of the information required by the WF 470 for the GRAPH5 diagnostics is placed in this data block by FB 79.

The block must be generated to a least DW 146 inclusive, if DW 20 is parameterised as the first word to be used.

**Technical data**



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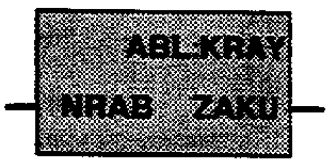


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| | S5-130 WB<br>S5-150 K<br>+ cent unit | S5-150 U | S5-155 U | S5-115 U +<br>CPU 943 and 944 | S5-135 U +<br>CPU 928 |
|---|---|---|---|---|---|
| Block number | not available | FB 76 | FB 76 | FB 76 | FB 76 |
| Block name | | ABL:KRAY | ABL:KRAY | ABL:KRAY | ABL:KRAY |
| Block size | | 375 words | 375 words | 375 words | 375 words |
| Call length | | 5 | 5 | 5 | 5 |
| Processing time | | 1 - 5 ms | 1 - 5 ms | 1 - 5 ms | 1 - 5 ms |
| Blocks called | | none | none | none | none |
| Flags used | | FY 200-254 | FY 200-254 | FY 200-254 | FY 200-254 |
| Timers | | none | none | none | none |
| counters | | none | none | none | none |
| Data blocks | | none | none | none | none |

## Parameterisation

**FB: 76**




| Parameter | Function | Comment | Type | Form | Valid value |
|---|---|---|---|---|---|
| NRAB | Criteria display block | No. of FB77 | I | D | KF + 77 |
| ZAKU | Number of criteria exceeded | Set to 1 if more than 64 criteria | Q | BI | F.0.0-F199.7<br>Q.0.0-Q127.7 |

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## Technical data

| | S5-130 WB<br>S5-150 K<br>+ cent unit | S5-150 U | S5-155 U | S5-115 U +<br>CPU 943 and 944 | S5-135 U +<br>CPU 928 |
|---|---|---|---|---|---|
| Block number | not available | FB 77 | FB 77 | FB 77 | FB 77 |
| Block name | | ABL:KRAN | ABL:KRAN | ABL:KRAN | ABL:KRAN |
| Block size | | 318 words | 318 words | 318 words | 318 words |
| Call length | | 3 | 3 | 3 | 3 |
| Processing time | | app. 2 ms | app. 2 ms | app. 2 ms | app. 2 ms |
| Blocks called | | none | none | none | none |
| Flags used | | FY 200-254 | FY 200-254 | FY 200-254 | FY 200-254 |
| Timers | | none | none | none | none |
| Counters | | none | none | none | none |
| Data blocks | | none | none | none | none |

## Parameterisation

**FB: 77**

**ABL:KRAN**

***FB 77 must be loaded in RAM***

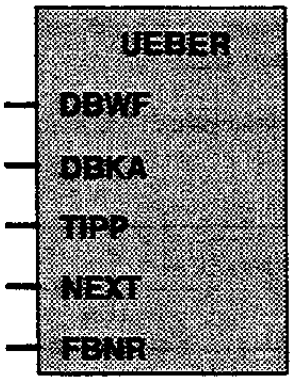
## Technical data

| | S5-130 WB<br>S5-150 K<br>+ cent unit | S5-150 U | S5-155 U | S5-115 U +<br>CPU 943 and 944 | S5-135 U +<br>CPU 928 |
|---|---|---|---|---|---|
| Block number | not available | FB 79 | FB 79 | FB 79 | FB 79 |
| Block name | | UEBER | UEBER | UEBER | UEBER |
| Block size | | 1298 words | 1298 words | 1298 words | 1298 words |
| Call length | | 8 | 8 | 8 | 8 |
| Processing time | | 1 - 5 ms | 1 - 5 ms | 1 - 5 ms | 1 - 5 ms |
| Blocks called | | none | none | none | none |
| Flags used | | FY 200-254 | FY 200-254 | FY 200-254 | FY 200-254 |
| Timers | | none | none | none | none |
| Counters | | none | none | none | none |
| Data blocks | | none | none | none | none |


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**FB: 79**




| Parameter | Function | Comment | Type | Form | Valid value |
|---|---|---|---|---|---|
| DBWF | WF 470 interface | DB no., DW no. for Data block DBWF | D | KY | 001, 020 to 255, 100 |
| DBKA | DB for criteria analysis | | B | | DB001 to DB255 |
| TIPP | Next alternative branch | Next alternative branch for diagnostics, on positive edge | I | BI | I 0.0 - 127.7<br>F 0.0 - 199.7<br>Q 0.0-127.7 |
| NEXT | Next parallel branch | Next parallel branch for diagnostics, on positive edge | I | BI | I 0.0 - 127.7<br>F 0.0 - 199.7<br>Q 0.0-127.7 |
| FBNR | | A1 if using FB70-FB71<br>A2 if using FB72-FB73 | D | KC | A1, A2 |

**Example of block calls:**

Segment 1

```
0000      : C   DB100
0001      : JU FB76
0002 NAME  : ABL: KRAY
0003 NRAB  :     KF + 77
0004 ZAKU  :     F 100.0
0005      :
0006      : JU FB77
0007 NAME  : ABL: KRAN
0008      :
0009      : JU FB79
000A NAME  : UEBER
000B DBWF  :     KY101,20
000C DBKA  :     DB100
000D TIPP  :    F 100.1
000E NEXT  :     F 100.2
000F FBNR  :     KS A1
0010      :
0011      : BE
```

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## Data block DBWF

The data block number for DBWF is specified in the WF 470 system data list. The first 20 data words of this block are reserved for other data.

The GRAPH5 data can start from DW 20 onwards. The first word chosen is indicated by the letter n:

| DW No | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| n + 0 | 16 | | | | | | | | | | | | | | | | | | | | | | 1 | 1 = sequence running<br>0 = sequence stopped |
| n + 1 | 32 | | | | | | | | | | | | | | | | | | | | | | 17 | |
| n + 2 | 48 | | | | | | | | | | | | | | | | | | | | | | 33 | |
| n + 3 | 64 | | | | | | | | | | | | | | | | | | | | | | 49 | |
| n + 4 | 16 | | | | | | | | | | | | | | | | | | | | | | 1 | 1 = sequence running<br>0 = sequence stopped |
| n + 5 | 32 | | | | | | | | | | | | | | | | | | | | | | 17 | |
| n + 6 | 48 | | | | | | | | | | | | | | | | | | | | | | 33 | |
| n + 7 | 64 | | | | | | | | | | | | | | | | | | | | | | 49 | |
| n + 8 | SB-No. | | | | | | | | | | | | | | | | | | | | Chain- No. | | | Sequence block number running sequence no. |
| n + 9 | FF = Auto; 00 = Man. | | | | | | | | | | | | | | | | | | | | | | | FF = valid/FF = Auto. Auto. 0 = manual |
| n + 10 | Branch No. | | | | | | | | | | | | | | | | | | | | Step No. | | | Display branch |
| n + 11 | Total Number of steps | | | | | | | | | | | | | | | | | | | | AKT/TRAN | | | 0 = error in an action<br>1- 8 = Transition |
| n + 12 | Branch No. 1 | | | | | | | | | | | | | | | | | | | | Branch No. 2 | | | Current step number for branch 1-8 of displayed chain for simultaneous branches |
| n + 13 | Branch No. 3 | | | | | | | | | | | | | | | | | | | | Branch No. 4 | | | |
| n + 14 | Branch No. 5 | | | | | | | | | | | | | | | | | | | | Branch No. 6 | | | |
| n + 15 | Branch No. 7 | | | | | | | | | | | | | | | | | | | | Branch No. 8 | | | |
| n + 16 | Branch No. 1 | | | | | | | | | | | | | | | | | | | | Branch No. 2 | | | Number of the step in error for branches 1-8 in the displayed chain |
| n + 17 | Branch No. 3 | | | | | | | | | | | | | | | | | | | | Branch No. 4 | | | |
| n + 18 | Branch No. 5 | | | | | | | | | | | | | | | | | | | | Branch No. 6 | | | |
| n + 19 | Branch No. 7 | | | | | | | | | | | | | | | | | | | | Branch No. 8 | | | |
| n + 20 | 16 | | | | | | | | | | | | | | | | | | | | | | 1 | Bit-coded status for the 64 possible step on conditions<br>1 = condition missing |
| n + 21 | 32 | | | | | | | | | | | | | | | | | | | | | | 17 | |
| n + 22 | 48 | | | | | | | | | | | | | | | | | | | | | | 33 | |
| n + 23 | 64 | | | | | | | | | | | | | | | | | | | | | | 49 | |



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| DW-No | |
|---|---|
| n + 24 | MC5-Code |
| bis | |
| n + 87 | MC5-Code |
| n + 88 | Reserved |
| n + 89 | Branch No. / OLD step number |
| n + 90 | Sequence block No. 1 / Sequence block No. 33 |
| n + 91 | Sequence block No. 2 / Sequence block No. 34 |
| n + 92 | Sequence block No. 3 / Sequence block No. 35 |
| n + 93 | Sequence block No. 4 / Sequence block No. 36 |
| n + 94 | Sequence block No. 5 / Sequence block No. 37 |
| bis | |
| n + 119 | Sequence block No. 30 / Sequence block No. 62 |
| n + 120 | Sequence block No. 31 / Sequence block No. 63 |
| n + 121 | Sequence block No. 32 / Sequence block No. 64 |
| n + 122 | Reserved |
| n + 123 | Pointer to SB list |
| n + 124 | DW n + 0 / DW n + 4 |
| n + 125 | bit pointer |
| n + 126 | page flag |

Data words n + 0 to n + 7, n + 10 to n + 87 are written to by FB 79.

Data words n + 8, n + 90 to n + 121 are written to by the WF 470.

DW n + 8 tells the WF 470 which sequence blocks are to be diagnosed. In the automatic mode, only sequence blocks which are stopped due to an error can be selected for diagnostics.

A sequence is determined to be stopped in error when no step on has taken place after the monitor time has expired. If no monitor time has been programmed, no diagnostics will be performed on that step.
Transition T1 cannot be displayed in automatic mode because it is not possible to program a monitor time in step 0.

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Automatic mode is indicated by the code KH 00FF in DW n + 9. This data word should be set by the application program. If DW n + 9 contains KH 0000, any sequence can be selected for diagnostics display. Any missing step-on conditions or operations in the sequence part of the program can be monitored during normal operation. This enables the user to monitor the progress of the sequence and check its operation.

The WF 470 writes the first 32 sequence block numbers in the data words n + 90 to n + 121 (to the left, and all other numbers to the right). Data words n + 122 to 126 are used as scratchpad for FB 79.

## To summarise - what does the user need to program?

1) Write the control program in GRAPH5.
2) Call and parameterise function blocks FB 76, FB 77 and FB 79, generate data blocks DBKA and DBWF, replace the existing SB0, SB2, SB3 with the WF 470 versions.
3) Enter KH 0000 or KH 00FF in DW 9 for manual or automatic mode.
4) Install the CGR5 option in the WF 470.
5) Enter the DBWF data block and data word number in the WF 470 system data list.
6) Enter the function text for the sequence.
7) Program the picture selection for the GRAPH5 pictures #03 and #04 either in the applications program or via FB 220.
8) The pictures can then be operated from the keys on the operator keyboard.

### Key codes

| | | |
|---|---|---|
| next line up | 8F | Hex cursor up |
| next line down | 90 | Hex cursor down |
| scroll up | 8D | He scroll up |
| scroll down | 8C | Hex scroll down |
| next sequence | 91 | Hex cursor right |
| previous sequence | 92 | Hex cursor left |

Picture 2 can be selected by pressing the letter B, and picture 1 can be re-selected by pressing A.

## Limitations

1) Diagnostics can be performed on a maximum of 64 sequences.
2) For each action/transition, a maximum of 8 bracketed instructions can be programmed in each individual bracket level.
3) For each action/transition, one result with 64 criteria (i.e. control conditions for the action program, transition conditions for the transition program) can be diagnosed. The result must be generated at the end of the conditions. This means for example, that an "intermediate result" in the chain of logic cannot be used to turn outputs on and off. It is permitted to use an auxiliary flag to transmit the result of logic operation from one branch to the next, in order to break a long chain into shorter segments.
4) The code in the action and transition programs can contain any instruction from the basic instruction set, with the following limitations:
   The following are INVALID:S5115U STS, TAK JR, STP
   S5150U/S STS, TAK, JR, STP, STW,UBE,LKG,JOS
   SIM, LIM, ON Dxy.3 (xy = 10 to 17)


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# 4 Service

## 4.1 Introduction

Details of the hardware settings for early versions of the WF 470 are not contained in this manual. The settings shown here are for hardware versions with the order numbers 6FM1 470 3XX20.

Details of early versions with the order number 3XX10 can be found in the old WF 470 manual order No. E80850-J62-X-A2-7600.

## 4.2 Commisioning

### 4.2.1 Visual inspection

***Before touching the conductors or components on the board, ensure you are free of any static charge by touching a good earth.***

Articles manufactured from plastic generate very high static fields. This applies especially to nylon carpets and plastic soled shoes. The integrated circuits and other devices used in these modules are sensitive to static discharge. It is important that anti-static precautions are observed when dealing with electronic devices.

***The memory modules, monitor cable, power connections and the module itself must only be connected and disconnected when the power is switched off.***

### 4.2.2 Starting Commissioning

- The following will be required:

  - WF470 module
  - Ram memory module 377 (not required for the WF 470 C)
  - Monitor
  - Operator keyboard
  - PG 675 / PG 685 / PG 750
  - The corresponding connection cables for the above units
  - Software disks for the PG (CCP/M or PCP/M, picture construction software)
  - The SIMATIC S5 function blocks
  - Any optional software required

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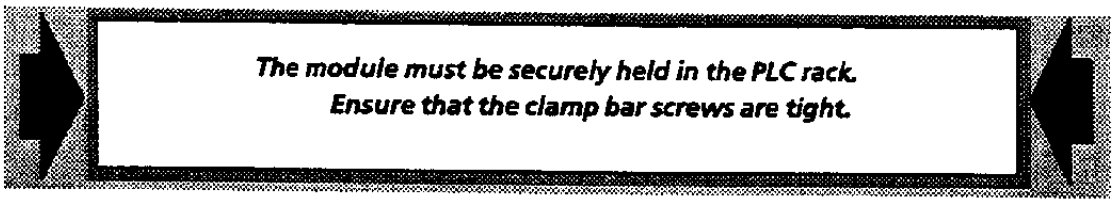
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- The PLC must be wired up and tested
- The WF 470 must be connected to the peripheral units
- The earthing of the PLC must be correct

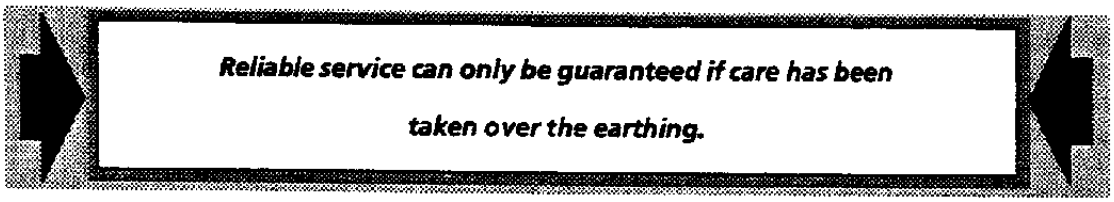
### 4.2.3 Visual inspection:

#### 4.2.3.1 Checking the hardware

- Check the unit for transport damage
- Check that the printed circuit boards are the current hardware and firmware level
- Check that all the integrated circuits are firmly in their holders
- Check that all cable connections are correctly made

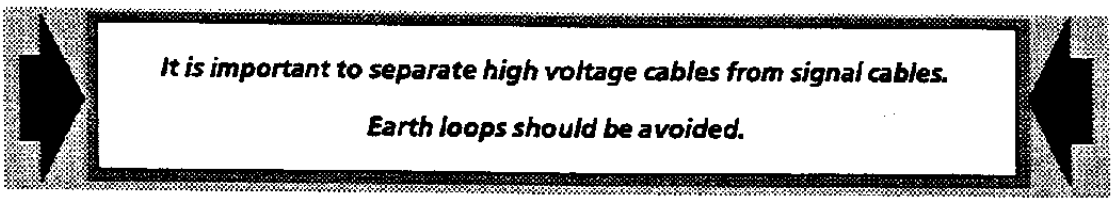



#### 4.2.3.2 Earthing




The earth cable must be correctly installed and be of adequate cross sectional area.

#### 4.2.3.3 Cable separation/screening




Unscreened or inadequately earthed cables result in interference signals being generated in the cables. It is important to ensure that video cables are run separately from other cables. The monitor must be supplied from the same phase as the central/extension unit housing the WF 470 module.

The outer screen of all cables connected to the WF 470 should be connected to the Mext 0 Volt connection on the control cubicle.



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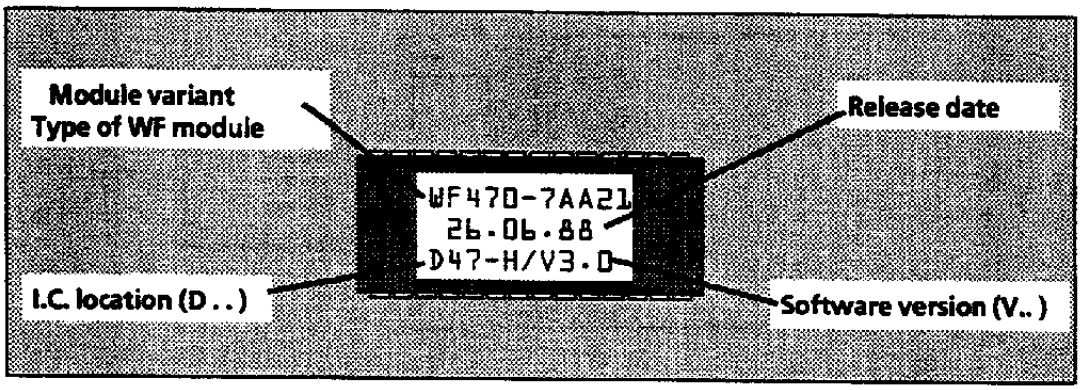
## 4.2.4 Hardware Checks

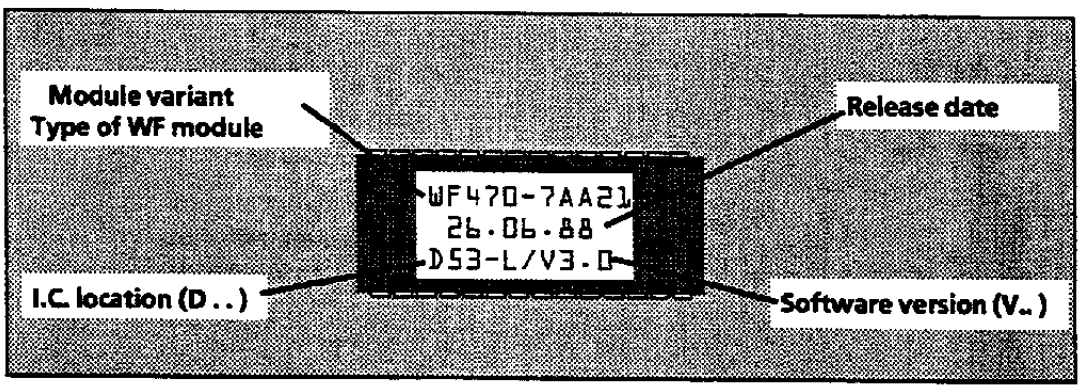
### 4.2.4.1 Checking the hardware revision level

This is shown on the sticker beside the backplane connector. The actual version level is indicated by the last cross.

### 4.2.4.2 Checking the software version level

***WF 470***




- The firmware version is shown on the labels attached to the EPROMS.

The EPROM module locations D47 and D53 are shown in fig. 4.1 and 4.2.

The software revision level is also shown on the WF 470 system mask, and the WF 470 B/C shows the software level on a sticker on the side of the unit.

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## 4.2.5 Bridge and Switch Positions WF 470 (6FM1 470-3xx20)

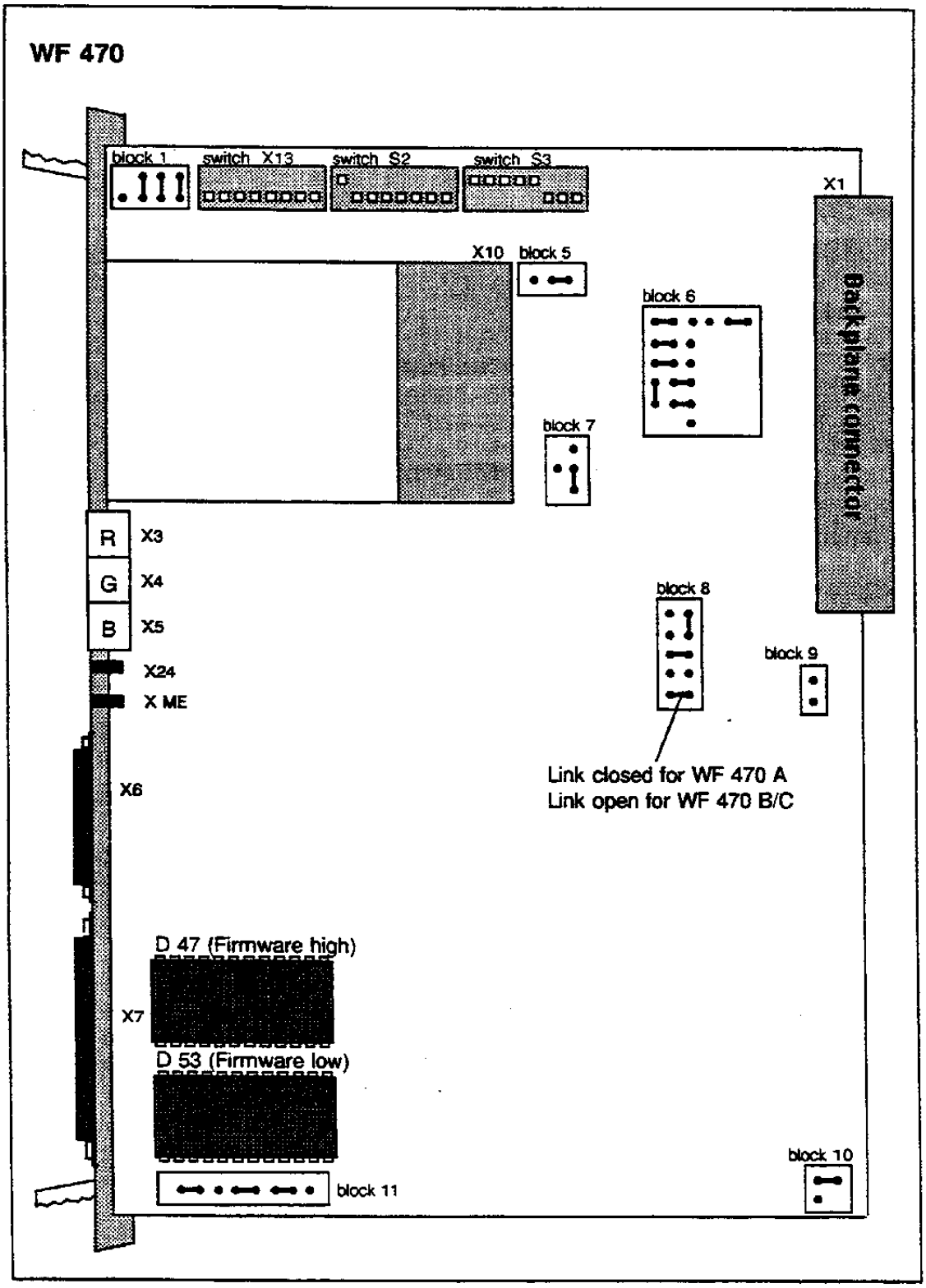



*Fig. 4.1 Bridge and Switch positions for the WF 470 base board*


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**Functions (see fig 4.1) :**

| | | |
|---|---|---|
| Switch X 13 | : | Start address DPR when peripheral module enable of the DPR |
| Switch S 2.1 | : | S5 buffer supply (fixed setting) |
| Switch S 2.2 - 2.8 | : | memory segment address (fixed setting) |
| S S 3 | : | Start address DPR when central module |
| X1 | : | Bus connector |
| X3-X5 | : | RGB-BAS monitor connector |
| X6 | : | RGB-TTL monitor connector |
| X7 | : | serial interface for PG |
| X10 | : | Memory module socket |
| X24, XME | : | Connections for voltage supply for active interfaces |
| Link block 1 | : | DPR size when WF 470 is a peripheral module |
| Link block 5 | : | enable memory segment addressing (Fixed setting) |
| Link block 6 | : | DPR size for memory segment addressing segment addressing (ON/OFF) |
| Link block 7 | : | addressing type (S5/MMC216)(Fixed setting) |
| Link block 8 | : | mode (central module/peripheral)<br>hardware acknowledge (signal RDY) (Fixed)<br>picture format (Fixed setting)<br>module type (WF470 A or WF 470 B/C) |
| Link block 9 | : | Fixed setting |
| Link block 10 | : | Picture format (Fixed setting) |
| Link block 11 | : | EPROM type (Fixed setting)<br>DPR size (Fixed setting) |

### 4.2.5.1 Bridge and switch positions WF 470 (6FM1 470-3xx20), Up to firmware version V2.0

In order to incorporate additional features on the WF 470, the size of the EPROM modules has been increased. From V 2.1, two EPROMs type 27512 are now used. The setting of the links on link block 11 shown in Fig 4.2 is for these new EPROMs.
If versions V2.0 or below are to be used, the link block must be set as shown below:



Link block 11

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## 4.2.5.2 Function of the bridging links on the WF 470 extension board (6FM1 470-3xx20)

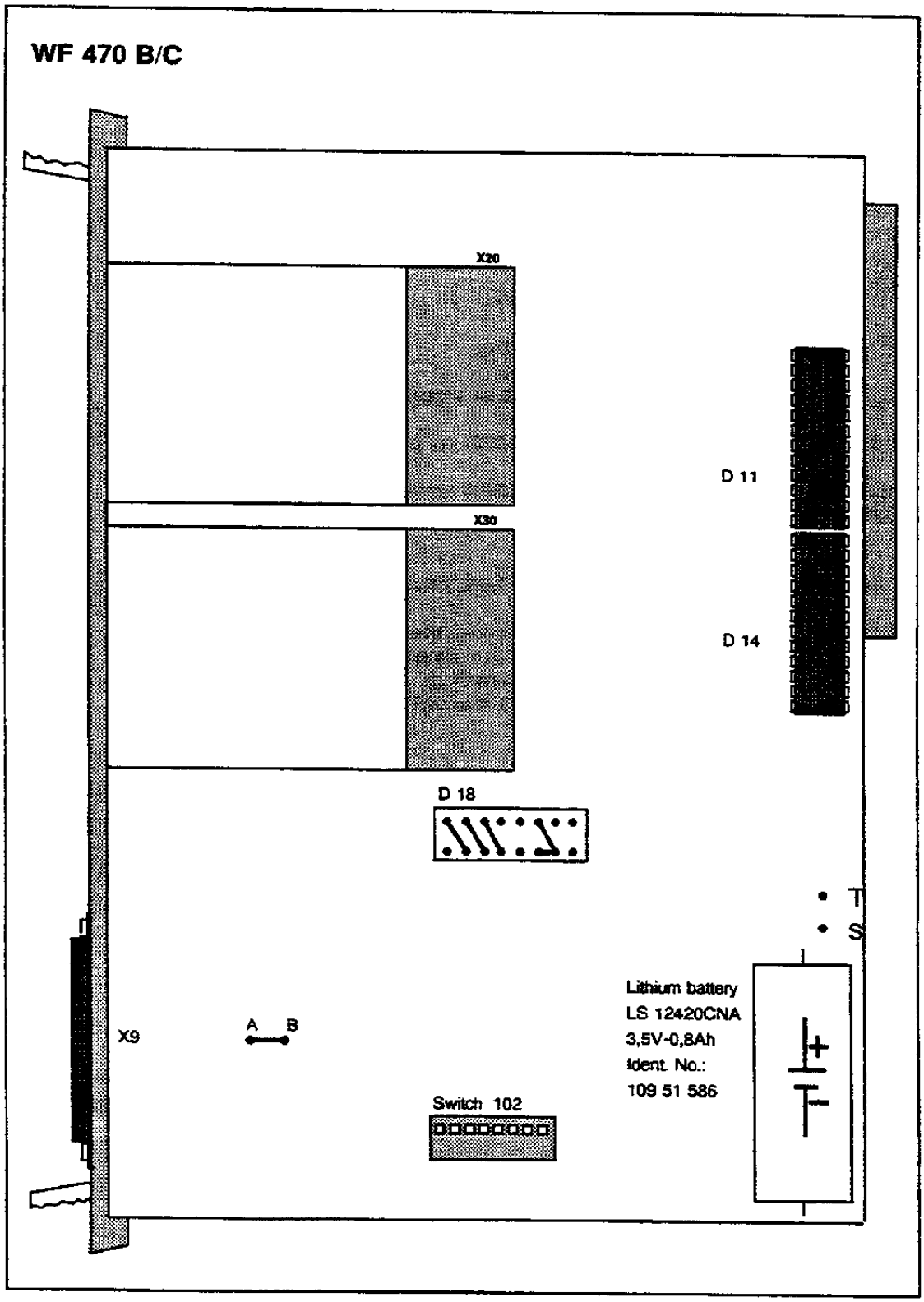



*Fig. 4.2 Switch settings on the WF 470 B/C extension board.*



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**Details of settings for fig 4.2:**

| | | |
|---|---|---|
| D 18 | : | RAM coding (fixed setting) |
| S102 | : | Switch currently not used (all switches OFF) |
| X5V | : | +5V supply (test point) |
| X0V | : | 0V supply (test point) |
| X9 | : | Serial interface |
| X20, X30 | : | Sockets for memory modules |
| T-S | : | Battery buffer on (bridge inserted) |
| A-B | : | Watchdog active |

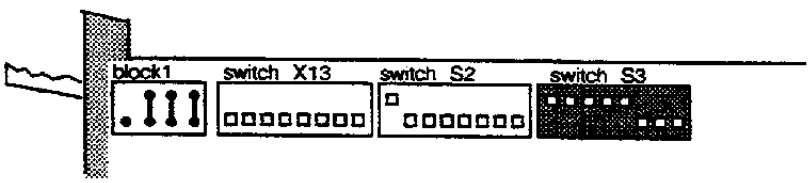
*) PAL = Programmable array logic
This is a type of PROM used for address setting.
PAL D 11 controls the module slot X 20
PAL D 14 controls the module slot X 30

## 4.2.6 WF 470 (6FM1 470-3xx20) configured as central module

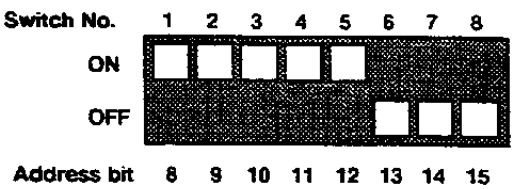
If the WF 470 is to be used as a central module, it must be fitted in one of the locations described in section 2.5.

The Dual Port Ram size is fixed as 256 byte. Its factory pre-set coding is set on link block 1 and 6.

The start address of the dual port ram depends on the type of central processor unit being used (see section 2.6). If the factory pre-settings cannot be used, the start address can be changed in steps of 256 byte. This is done by altering the settings on switch S3 on the base board.




### 4.2.6.1 Factory pre-set address: E000




**Note:**
**on = "0"**
**off = "1"**

The actual position of the plastic switch lever is shown in white.

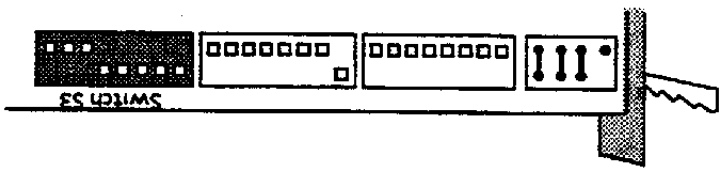
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## 4.2.6.2 Setting the address

The setting of the address switch is easier to understand when the board is turned upside-down so that the switches are at the bottom of the board as shown:

When the switch is up (off) this sets a 1 condition.
When the switch is down (on) this sets a 0 condition.




| Value | $2^{15}$ | $2^{14}$ | $2^{13}$ | $2^{12}$ | $2^{11}$ | $2^{10}$ | $2^{9}$ | $2^{8}$ |
|---|---|---|---|---|---|---|---|---|
| Address bit | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 |
| Address | E | | | | 0 | | | |
| Bit pattern | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 |

| Switch No. | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 |
|---|---|---|---|---|---|---|---|---|
| OFF | | | | | | | | |
| ON | | | | | | | | |

**Note:**
off = "1"
on = "0"

The actual position of the plastic switch lever is shown in white

## 4.2.6.3 Example settings:

| E | | | | 1 | | | |
|---|---|---|---|---|---|---|---|
| 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 |

| Switch No. | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 |
|---|---|---|---|---|---|---|---|---|
| OFF | | | | | | | | |
| ON | | | | | | | | |

| F | | | | 2 | | | |
|---|---|---|---|---|---|---|---|
| 1 | 1 | 1 | 1 | 0 | 0 | 1 | 0 |

| Switch No. | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 |
|---|---|---|---|---|---|---|---|---|
| OFF | | | | | | | | |
| ON | | | | | | | | |

All switches not shown remain in their as delivered settings, see fig. 4.1 and 4.2.

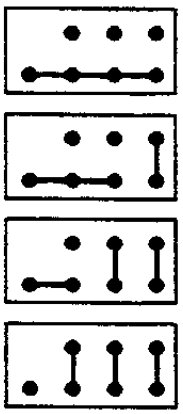

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## 4.2.7 WF 470 (6FM1 470-3xx20) configured as a peripheral module

If the WF 470 is to be used as a peripheral module it must be fitted in one of the locations described in section 2.4.2 or 2.5. The WF 470 module is *NOT* usually configured as a peripheral module since this limits the number of analogue cards which can be used, and the data transfer operates more slowly. The WF 470 should only be used in this mode if it is not possible to use it as a central module.
The Dual Port Ram size must be set on link block 1 to 32, 64, 128 or 256 byte.

**Link block 1:**



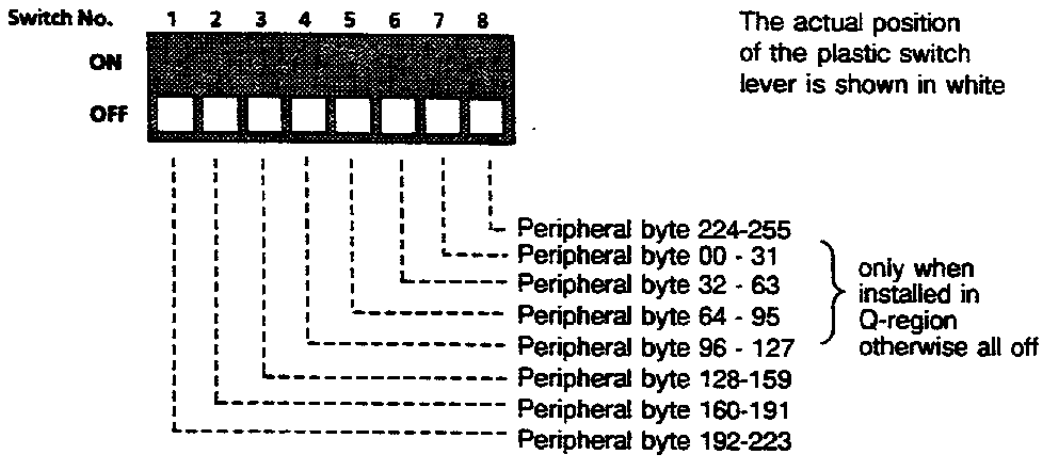
**32** Byte

**64** Byte

**128** Byte

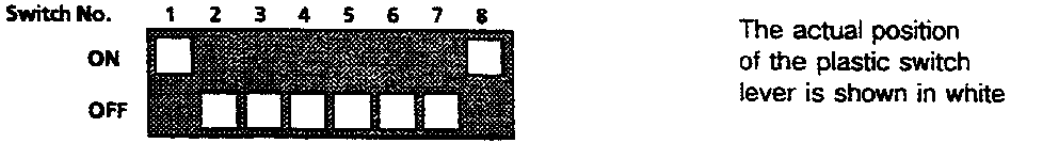
**256** Byte (Not permitted in the normal peripheral region)

The switch X13 is used to set the start address of the peripheral region and to enable the DPR.




**For example:**

DPR from PB 192 to PB 255 (DPR size: 64 byte, DPR-start address F0C0)

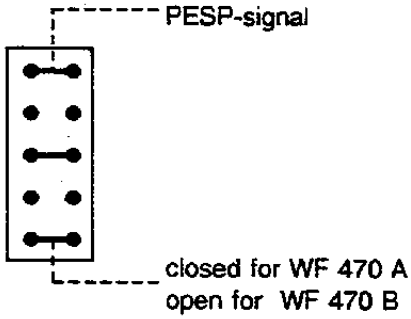



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Link block 8 must be used to switch the PESP signal onto the board.

**Link block 8:**




All other bridges and switches links should be in the factory pre-set condition.

**WARNING:**

- The selected DPR region must not be in the peripheral region with process image.
- The dual port ram start address can only be set in steps of the DPR size (link block 1)

The DPR addresses can have the following settings:

| Start address | | DPR Size | | | | Comment |
|---|---|---|---|---|---|---|
| PB | Absolute | 256 | 128 | 64 | 32 | |
| 0 | F000 | x | x | x | x | Only in extended peripheral region |
| 32 | F020 | | | | x | |
| 64 | F040 | | | x | x | Only S5-130WB |
| 96 | F060 | | | | x | |
| 128 | F080 | | x | x | x | All controllers (analogue region) |
| 160 | F0A0 | | | | x | |
| 192 | F0C0 | | | x | x | |
| 224 | F0E0 | | | | x | |


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## 4.2.8 Powering up the SIMATIC and Commissioning Sequence

- Fit the WF 470 in the correct location with the power switched off.
- Fit a RAM module into location K1 in the WF 470 (only necessary for the WF 470 A and B).
- Connect the peripheral units
- Switch on the controller, monitor and programming unit
- Erase the controller memory
- Load the standard software into the PC
- Call the standard software from OB1 and parameterise according to section 3.1
- Press the RESET button on the front of the WF 470 and set the time and date via the keyboard
- Connect the PG 675/85 to the WF 470 using the correct cable.
- Load the operating system and start the picture construction software
- Load the completed pictures or commence picture construction (see programming instructions)

## 4.2.9 Fault Finding

The majority of errors are picked up by the WF 470 and displayed as an error number and text at the bottom of the WF 470 screen. Should an error occur and the checks detailed in the commissioning instructions have been made, the information in the following pages should enable the fault to be located.
The first step in the fault location sequence is to determine if the fault lies on the side of the SIMATIC or the side of the WF 470. This can be determined by analysing the dual port ram, which is the interface between the SIMATIC and the WF 470 (Refer to section 4.2.2).
However, before this it should be checked that the module is correctly addressed for the PLC to which it is connected. The standard software must be correctly parameterised and called. The PC must be in run-operation in order for the dual port ram to function correctly. The best check that everything is functioning is to press a key on the operator keyboard (e.g. the reset key) and check that the WF 470 responds correctly.
If the WF 470 does not respond correctly or the PLC goes into stop, the module addressing or the parameterisation or version of the standard software must be incorrect.

### 4.2.9.1 WF 470 error messages

| Error No. | Cause |
|---|---|
| 01 | Superfluous control information |
| 02 | Control information missing |
| 03 | Direct and indirect symbol control programmed |
| 04 | System RAM too small |
| 06 | Invalid memory sector specified |
| 07 | Invalid data request via DPR (DB missing) |
| 08 | Acknowledgement delay from S5 (S5 not processing the DPR) |
| 09 | Symbol list missing |
| 10 | Selected picture missing |
| 11 | Symbol positioned outside picture boundary |
| 12 | Composite symbol outside picture boundary |
| 13 | Text group mising for selected picture |
| 14 | System data list missing |
| 15 | Printer option not loaded |
| 16 | Print element not present |
| 17 | Printer message triggered from more than 3 DBs |

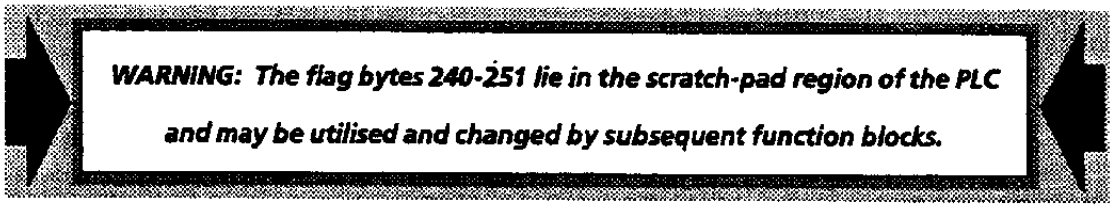
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| | |
|---|---|
| 18 | RAM memory too small |
| 20 | System RAM acquisition error → Try erasing the RAM in slot 3 |
| 21 | System RAM response error → Try erasing the RAM in slot 3 |
| 22 | Hardware configuration error |
| 23 | Sequence analyser option not loaded |
| 24 | Service module not loaded |
| 25 | Printer output |
| 100 to 115 | Error messages from the application program |

### 4.2.9.2 Analysing the DPR

The data exchange between the S5 and WF 470 is controlled by the co-ordination section of the dual port ram (byte 0-11). The standard software (FB S5 - WF470) produces an image of the co-ordination section of the DPR in the scratch pad flags 240-251. The flags can be checked in status, if the instructions L FW 240 - L FW 250 are written in segment 4 after the TNW 5 instruction in the case of the S5 150U, or the TNB 5 instruction in the S5 135 U and 115U.




**Configuration of the DUAL PORT RAM:**

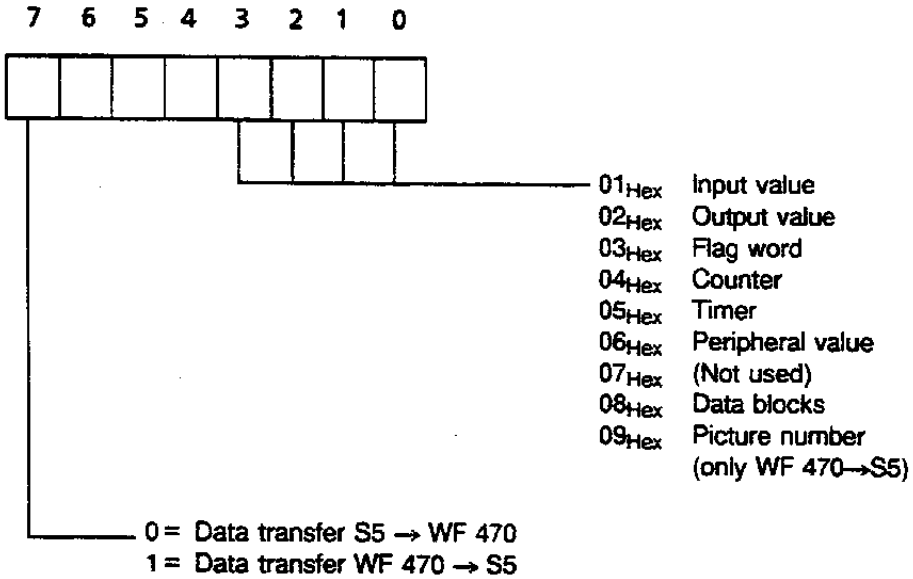
| | | | | |
|---|---|---|---|---|
| **FW 240** | Data code | DB Number | 0 / 1 | DPR bytes |
| **FW 242** | Start parameter | | 2 / 3 | |
| **FW 244** | Data quantity/region | Keyboard byte | 4 / 5 | |
| **FW 246** | S5 acknowledgement | WF acknowledgement | 6 /7 | |
| **FW 248** | Picture No. 1 | Picture No. 2 | 8 / 9 | |
| **FW 250** | Picture No. 3 | Status byte | 10 / 11 | |


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**Functions:**

- Data code (DPR byte 0 / FB 240):




- **Data block number (DPR byte 1 / FB 241):**

  Valid in connection with data codes 08 Hex to 88Hex (transfer of data blocks). Value range 1 .. 255.

- **Start parameter (DPR byte 2 + 3 / FW 242):**

  Provides the address from which the data is to be transferred (i.e. for a DB or from which DW).
  The interpretation depends on the DPR byte 0/FB240.

- **Amount of data (DPR byte 4 / FB244 ):**

  This information depends on:
  - The effective length of the DPR
  - The permitted size (see DPR byte 1/2)

- **Keyboard byte (DPR byte 5 / FW 245 / Parameter TAST in FB)::**

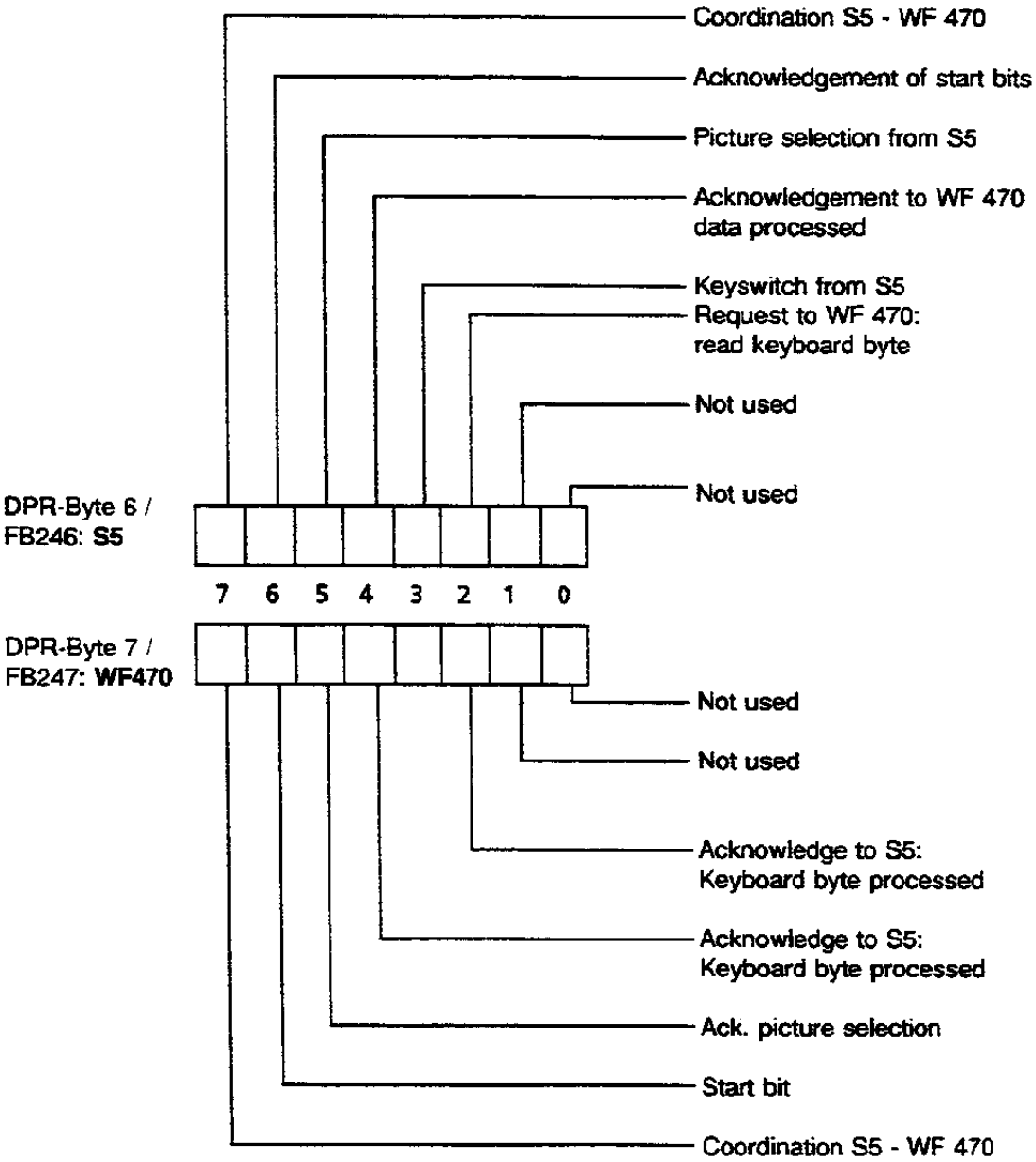
  This byte transfers characters from the keyboard.

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- **Coordination byte (DPR byte 6and7 / FW246):**

These bytes control the request and acknowledgement of the transferred data. Each bit in one byte has a corresponding bit in the other. One partner (SIMATIC S5 / WF 470) may only access its corresponding bit, the other may then only read the data (exception: reset during operation via the WF 470). When one partner recognises that the state of a bit has been changed by the other partner, it acknowledges this by changing its corresponding bit to the same state.




| | |
|---|---|
| Coordination bits x.7 | Coordination and start up bit. Set by WF 470 on power up; acknowledged in byte 6 by the S5. |
| Picture selection bit x.5 | In conjunction with Byte 8 to 10, this bit is used for direct picture selection from the SIMATIC S5. |


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- **Picture number (DPR 8 to 10, FB 248 to 250)**

  This corresponds to the parameter BLD 1-3 in the S5 WF 470 function block. Direct picture selection from the S5, or returning the picture number.

- **Status (DPR byte 11 / FB 251)**

  A transfer request bit must be sent before an acknowledgement (and in all cases by the slave).

| Status | Function | |
|---|---|---|
| 0 | Transfer without display complete | |
| | For a send task: | Data valid |
| | For a receive task: | Data accepted |
| $0FE_{Hex}$ | Data request invalid<br>Data not available | |
| $0FD_{Hex}$ | Invalid location request | |
| $0FC_{Hex}$ | Invalid picture number<br>(Picture number request from S5) | |

The initiative for the data exchange between the WF 470 and the SIMATIC S5 normally comes from the WF 470. For example, a data block is required, so the module places the code 08 Hex in Byte 0 in the dual part ram, and the number of the data block required in byte 1, the start data word number in bytes 2 and 3, and the number of words in byte 4. Bit 4 in byte 7 is then set to 1.

On receipt of this request, the S5 - WF 470 function block in the PLC then writes the contents of the required data block in the DPR starting from byte 12, and acknowledges this by setting bit 4 in byte 6 to 1. The data is then loaded into the WF 470 which acknowledges by setting the request bit in byte 7 back to 0.

The SIMATIC S5 acknowledges from its side by resetting bit 4 in byte 6 to 0. The WF 470 can now enter a new data request.

The SIMATIC S5 only has the initiative in a data exchange in picture selection or when data is entered in the TAST byte.

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# 5 Appendix

## 5.1 Ordering information

### 5.1.1 Ordering information for the WF 470 hardware

| WF 470 Hardware | Order Number |
|---|---|
| WF 470 A colour graphics | 6FM1 470-3AA21 |
| WF 470 B colour graphics | 6FM1 470-3BA21 |
| WF 470 C colour graphics | 6FM1 470-3CA21 |
| WF 470 A monochrome graphics | 6FM1 470-4AA21 |
| WF 470 B monochrome graphics | 6FM1 470-4BA21 |

The WF 470 module is only delivered in "low-power" versions now. It is compatible to the earlier version in all respects.

### 5.1.2 Ordering information for WF 470 firmware upgrade

| WF 470 Firmware | Order Number |
|---|---|
| 1 Set EPROM 2×27512 | 6FM1 470-7AA21 |

### 5.1.3 Ordering information for WF 470 - SIMATIC software

| WF 470 - SIMATIC Software | Order Number | |
|---|---|---|
| | 5¼" floppy disk | 3½" floppy disk |
| FB 130 W WF 470 | 6FM1 470-6AB10 | — |
| FB 150S/U WF 470 | 6FM1 470-6AD10 | 6FM1 470-6AD50 |
| FB 115 U WF 470 | 6FM1 470-6UA10 | 6FM1 470-6UA50 |
| FB 135 U WF 470 | 6FM1 470-6UB10 | 6FM1 470-6UB50 |
| FB 155 U WF 470 | 6FM1 470-6UC10 | 6FM1 470-6UC50 |

### 5.1.4 Ordering information for WF 470 option software

| WF 470 - Option Software | Order Number | |
|---|---|---|
| | 5¼" floppy disk | 3½" floppy disk |
| Service module for WF 470 | 6FM1 470-7EA10 | 6FM1 470-7EA50 |
| Sequence diagnostics for WF 470 DIMOS | 6FM1 470-7EA20 | 6FM1 470-7EB50 |
| Sequence diagnostics for WF 470 Graph 5 | 6FM1 470-7EA30 | 6FM1 470-7EC50 |
| B/C Printer report and event log system for WF 470 | 6FM1 470-7EA40 | 6FM1 470-7ED50 |

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## 5.1.5 Ordering information for WF 470 - PG 675 picture construction

| WF 470 - PG 675<br>Picture Constr.-software | Order Number |
|---|---|
| PG 675 WF 470 German | 6FM1 470-8BA20 |
| PG 675 WF 470 English | 6FM1 470-8BE20 |
| PG 675 WF 470 French | 6FM1 470-8BF20 |
| PG 675 WF 470 Cyrilic | 6FM1 470-8BR20 |

## 5.1.6 Ordering information for WF 470 - PG 685 picture construction

| WF 470 - PG 685<br>Picture Constr.-software - | Order Number |
|---|---|
| PG 685 WF 470 German | 6FM1 470-8CA20 |
| PG 685 WF 470 English | 6FM1 470-8CE20 |
| PG 685 WF 470 French | 6FM1 470-8CF20 |
| PG 685 WF 470 Cyrilic | 6FM1 470-8CR20 |
| PG 685 ZULI WF<br>Conversation program:<br>Allocation list ⇒ sequence list | 6FM1 470-8CU00 |

## 5.1.7 Ordering information for WF 470 - PG 750 picture construction

| WF 470 - PG 750<br>Picture Constr.-software - | Order Number | |
|---|---|---|
| | 5¼" floppy disk | 3½" floppy disk |
| PG 750 WF 470 German | 6FM1 470-8DA20 | 6FM1 470-8DA50 |
| PG 750 WF 470 English | 6FM1 470-8DE20 | 6FM1 470-8DE50 |
| PG 750 WF 470 French | 6FM1 470-8DF20 | 6FM1 470-8DF50 |

The PG 750 software can be run on a PC 16-20 or PC 32-05 from version V4.4. There is no general release for AT-compatible PC's!


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## 5.1.8 Ordering information for cables

| Connection cable | max. Standard length | Order Number |
|---|---|---|
| **From WF 470 X3, X4, X5**<br>**to RGB-BAS colour monitor or**<br>**to distribution unit** | 60 m | |
| length 2 m | | 6FM1 490-3BA00 |
| length 5 m | | 6FM1 490-3BB00 |
| length 10 m | | 6FM1 490-3BC00 |
| length 18 m | | 6FM1 490-3BD00 |
| length 25 m | | 6FM1 490-3BE00 |
| length 35 m | | 6FM1 490-3BF00 |
| length 50 m | | 6FM1 490-3BG00 |
| length 60 m | | 6FM1 490-3BH00 |
| Special lengths (specify length) | | 6FM1 490-3BZ00 |
| **From distribution unit**<br>**to RGB-BAS colour monitor** | 35m | |
| length 2 m | | 6FM1 490-3CA00 |
| length 5 m | | 6FM1 490-3CB00 |
| length 10 m | | 6FM1 490-3CC00 |
| length 18 m | | 6FM1 490-3CD00 |
| length 25 m | | 6FM1 490-3CE00 |
| length 35 m | | 6FM1 490-3CF00 |
| Special lengths (specify length) | | 6FM1 490-3CZ00 |
| **From WF 470 X4**<br>**to Monochrome monitor or**<br>**to distribution unit** | 60 m | |
| length 2 m | | 6FM1 490-3DA00 |
| length 5 m | | 6FM1 490-3DB00 |
| length 10 m | | 6FM1 490-3DC00 |
| length 18 m | | 6FM1 490-3DD00 |
| length 25 m | | 6FM1 490-3DE00 |
| length 35 m | | 6FM1 490-3DF00 |
| length 50 m | | 6FM1 490-3DG00 |
| length 60 m | | 6FM1 490-3DH00 |
| Special lengths (specify length) | | 6FM1 490-3DZ00 |
| **From WF 470 X4**<br>**to desk monitor C79**<br>**145-A3033-A3** | 60 m | |
| length 2 m | | 6FM1 490-3EA00 |
| length 5 m | | 6FM1 490-3EB00 |
| length 10 m | | 6FM1 490-3EC00 |
| length 18 m | | 6FM1 490-3ED00 |
| length 25 m | | 6FM1 490-3EE00 |
| length 35 m | | 6FM1 490-3EG00 |
| length 50 m | | 6FM1 490-3EH00 |
| length 60 m | | 6FM1 490-3EZ00 |
| Special lengths (specify length) | | |

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| Connection cable | max. Standard length | Order Number |
|---|---|---|
| **From distribution unit**<br>**to Monochrome monitor** | 60 m | |
| length 2 m | | 6FM1 490-3FA00 |
| length 5 m | | 6FM1 490-3FB00 |
| length 10 m | | 6FM1 490-3FC00 |
| length 18 m | | 6FM1 490-3FD00 |
| length 25 m | | 6FM1 490-3FE00 |
| length 35 m | | 6FM1 490-3FF00 |
| length 50 m | | 6FM1 490-3FG00 |
| length 60 m | | 6FM1 490-3FH00 |
| Special lengths (specify length) | | 6FM1 490-3FZ00 |
| **From distribution unit**<br>**to desk monitor C79 145-A3033-A3** | 60 m | |
| length 2 m | | 6FM1 490-3GA00 |
| length 5 m | | 6FM1 490-3GB00 |
| length 10 m | | 6FM1 490-3GC00 |
| length 18 m | | 6FM1 490-3GD00 |
| length 25 m | | 6FM1 490-3GE00 |
| length 35 m | | 6FM1 490-3GF00 |
| length 50 m | | 6FM1 490-3GG00 |
| length 60 m | | 6FM1 490-3GH00 |
| Special lengths (specify length) | | 6FM1 490-3GZ00 |
| **From WF 470 X6**<br>**to RGB-TTL monitor** | 2 m | |
| length 2 m | | 6FM1 490-3AA00 |
| **From WF 470 X7**<br>**to PG 675 / PG 685 or**<br>**to distribution unit** | 35 m | |
| length 2 m | | 6FM1 490-1BA00 |
| length 5 m | | 6FM1 490-1BB00 |
| length 10 m | | 6FM1 490-1BC00 |
| length 18 m | | 6FM1 490-1BD00 |
| length 25 m | | 6FM1 490-1BE00 |
| length 35 m | | 6FM1 490-1BF00 |
| Special lengths (specify length) | | 6FM1 490-1BZ00 |
| **From distribution unit**<br>**to PG 675 / PG 685 / PG 750** | | 6ESS5 731-0 . . . 0<br>see catalogue ST 54.1 |



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| Connection cable | max. Standard length | Order Number |
|---|---|---|
| **From WF 470 X7**<br>**to compact operator station or**<br>**to operation keyboard WS 495/ 496** | 60 m | |
| length 2 m | | 6FM1 490-1DA00 |
| length 5 m | | 6FM1 490-1DB00 |
| length 10 m | | 6FM1 490-1DC00 |
| length 18 m | | 6FM1 490-1DD00 |
| length 25 m | | 6FM1 490-1DE00 |
| length 35 m | | 6FM1 490-1DF00 |
| length 50 m | | 6FM1 490-1DG00 |
| length 60 m | | 6FM1 490-1DH00 |
| Special lengths (specify length) | | 6FM1 490-1DZ00 |
| **From WF 470 X9**<br>**to PT 88 / PT 89 TTY** | 35 m | |
| length 2 m | | 6FM1 490-1CA00 |
| length 5 m | | 6FM1 490-1CB00 |
| length 10 m | | 6FM1 490-1CC00 |
| length 18 m | | 6FM1 490-1CD00 |
| length 25 m | | 6FM1 490-1CE00 |
| length 35 m | | 6FM1 490-1CF00 |
| Special lengths (specify length) | | 6FM1 490-1CZ00 |
| **From WF 470 X9**<br>**to PT 88 / PT 89 V24** | 5 m | |
| length 5 m | | 6FM1 490-2CB00 |

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## 5.2 Bibliography


| | | |
|---|---|---|
| /1/ | WF 470 Video display module<br>**Short description** | Order Number 6ZB5 440-0FV02-0BA0 |
| /2/ | WF 470 Video display module<br>**Short description** | Order Number 6ZB5 440-0FH02-0AA0 |
| /3/ | WF 495/WS 496 op station<br>**Description** | Order Number E80850-J160-X-A2-7600 |
| /4/ | WS 463 S External data memory<br>**Short Description** | Order Number E80850-J115-X-A2-7600 |
| /5/ | WF 463 S External data memory<br>**Description** | Order Number 6ZB5 440-0JG02-0BA0 |
| /6/ | WS 400-10/WS 400-20 Operator panels<br>**Short description**<br>(in preperation) | Order Number 6ZB5 440-0AK02-0BA0 |
| /7/ | WS 400-10/WS 400-20 Operator panels<br>**Description** | Order Number 6ZB5 440-0AR02-0BA1 |




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**Suggestions**

**Corrections**

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Display Module

Description

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# Equipment for Special Machines

## WF 470

# Manual

Siemens AG
Automation Group
Automation Systems
for Machine Tools, Robots
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P.O. Box 3180, D-91050 Erlangen
Federal Republic of Germany

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