SIEMENS

SIMATIC S5

IP 260
Loop Controller Module

Manual

Order No. 6ES5996-5SE21
Release 02

We have checked the contents of this manual for agreement with the hardware and software described. Since deviations cannot be precluded entirely. we cannot guarantee full agreement. H—, the data In thia manual are reviewed regularly and any necessary corrections included in subsequent editions. Suggestions for improvement are welcomed.

Technical data subject to change.

Siemens Aktiengesellschaft

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Contents

Guidelines for Handling Electrostatically Sensitive Devices (ESD)

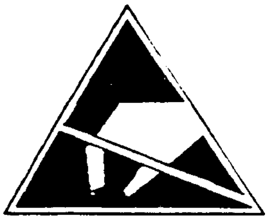
1 What is ESD?

VSLI chips (MOS technology) are used in practically all SIMATIC S5 and TELEPERM M modules. These VLSI components are, by their nature, very sensitive to overvoltages and thus to electrostatic discharge:

They are therefore defined as
"Electrostatically Sensitive Devices"

"ESD" is the abbreviation used internationally.

The following warning label on the cabinets,subracks and packing indicates that electrostatically sensitive components have been used and that the modules concerned are susceptible to touch:



ESDs can be destroyed by voltage and energy levels which are far below the level perceptible to human beings. Such voltages already occur when a component or a module is touched by a person who has not been electrostatically discharged. Components which have been subjected to such overvoltages cannot, in most cases, be immediately detected as faulty; the fault occurs only after a long period in operation.

An electrostatic discharge
of 3500 V can be felt
of 4500 V can be heard
must take place at a minimum of 5000 V to be seen.

But just a fraction of this voltage can already damage or destroy an electronic component.

The typical data of a component can suffer due to damage, overstressing or weakening caused by electrostatic discharge; this can result in temporary fault behavior, e.g. in the case of

- temperature variations,
  mechanical shocks,
  vibrations,
- change of load.

Only the consequent use of protective equipment and careful observance of the precautions for handling such components can effectively prevent functional disturbances and failures of ESD modules.

2 When is a Static Charge Formed?

One can never be sure whether the human body or the material and tools which one is using are not electrostatically charged.

Small charges of 100 V are very common; these can, however, very quickly rise up to 35000 V.

Examples of static charge:

- Walking on a carpet	up to 35000 V
- Walking on a PVC flooring	up to 12000 V
- Sitting on a cushioned chair	up to 18000 V
- Plastic desoldering unit	up to 8000 V
- Plastic coffee cup	up to 5000 V
- Plastic bags	up to 5000 V
- Books, etc. with a plastic binding	up to 8000 V

3 Important Protective Measures against Static Charge

- Most plastic materials are highly susceptible to static charge and must therefore be kept as far away as possible from ESDs.
- Personnel who handle ESDs, the work table and the packing must all be carefully grounded.

4 Handling of ESD Modules

One basic rule to be observed is that electronic modules should be touched by hand only if this is necessary for any work required to be done on them. Do not touch the component pins or the conductors.

Touch components only if

- the person is grounded at all times by means of a wrist strap

or

- the person is wearing special anti-static shoes or shoes with a grounding strip.

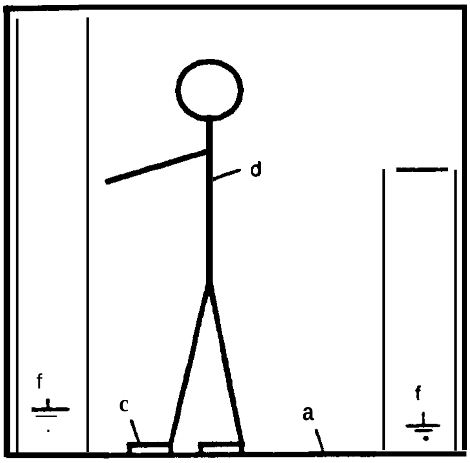
Before touching an electronic module, the person concerned must ensure that (s)he is not carrying any static charge. The simplest way is to touch a conductive, grounded item of equipment (e.g. a blank metallic cabinet part, water pipe, etc.) before touching the module.

Modules should not be brought into contact with insulating materials or materials which take up a static charge, e.g. plastic foil, insulating table tops, synthetic clothing, etc.

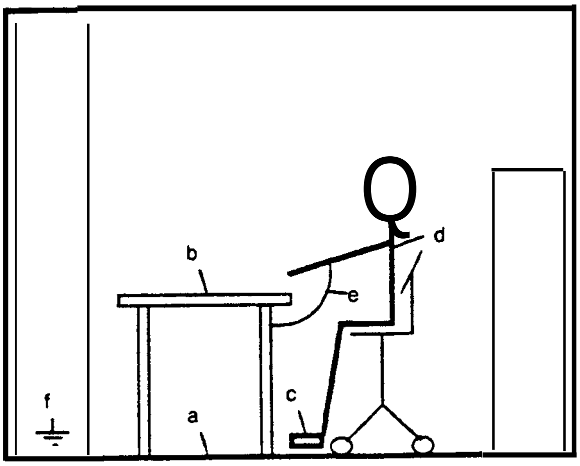
Modules should only be placed on conductive surfaces (table with anti-static table top, conductive foam material, anti-static plastic bag, anti-static transport container).

Modules should not be placed in the vicinity of monitors, TV sets (minimum distance from screen > 10 cm).

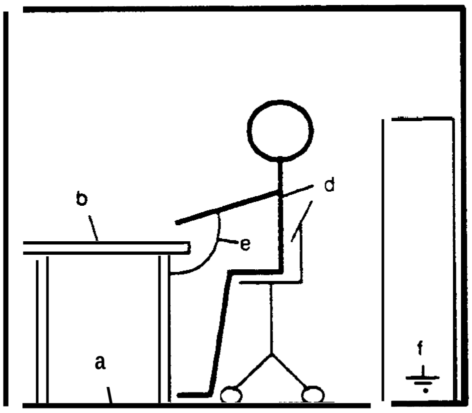
The diagram below shows the required protective measures against electrostatic discharge.



Standing position



Standing/sitting position



Sitting position

a	Conductive flooring
b	Anti-static table
c	Anti-static shoes
d	Anti-static coat
e	Grounding wrist strap
f	Grounding connection of the cabinets

5 Measurements and Modification to ESD Modules

- **Measurements on modules may only be carried out under the following conditions:**

  The measuring equipment is grounded (e.g. via the PE conductor of the power supply system) or

  when electrically isolated measuring equipment is used, the probe must be discharged (e.g. by touching the metallic casing of the equipment) before beginning measurements.

- **Only grounded soldering irons may be used.**

6 Shipping of ESD Modules

Anti-static packing material must always be used for modules and components, e.g. metalized plastic boxes, metal boxes, etc. for storing and dispatch of modules and components.

If the container itself is not conductive, the modules must be wrapped in a conductive material such as conductive foam, anti-static plastic bag, aluminium foil or paper. Normal plastic bags or foils should not be used under any circumstances.

For modules with built-in batteries ensure that the conductive packing does not touch or short-circuit the battery connections; if necessary cover the connections with insulating tape or material.

1 How to Use the Manual

This manual describes the IP 260 controller module, the function block FB 170 and the COM 260 system program.

The controller module with the function block, the COM 260 system program and the manual can be ordered as follows:

IP260 controller module	6ES52604JA11
Function block FB 170	
for S511 5U, S5 115H,	
S5135U, S5150U,	
S5155U and S5155U	
Diskette 5.25" and 3.5"	
for operating system S5-DOS	6ES5848-8PR01
for operating system	
S5-DOS/S5-DOSMT	6ES5848-7PR01
System program COM 260	
Diskette 5.25" and 3.5"	
with manual	
German	6ES5695-5SE11
English	6ES5895-5SE21
French	6ES5895-5SE31
Manual for IP 260,	
FB 170 and COM 260	
German	6ES5996-5SE11
English	6ES5998-5SE21
French	6ES5998-5SE31

Terminology used in this manual compared with other publications:

Closed loop mode	Automatic
Open loop mode	Manual
Manual release	Access from PG (programmer enable)
Manual disable	Access from PLC

Release 2 of the manual describes the following

The IP 260 controller module from version 5, the function block FB 170 from release 2 and the system program COM 260 from release V2.0.

The IP 260 controller module is an “intelligent peripheral module” from the SIMATIC S5 spectrum. It mmprises not only the IP 260 module but also includes the COM 260 software package and the function bbck FB 170. These two components expand the controller module to form a complete system. Careful preparation is necessary to set up the system and to get used to working with it.

To make this preparation easier and to allow you to find information quickly the manual is divided into several parts and each part divided into sections dealing with specific aspects of the controller.

The manual does not, however, explain the basic technical background of control loops. It is also impractical to discuss the wide variety of controlled systems that can be operated in conjunction with the module, since this far exceeds the scope of this manual.

The IP 260 **Operating Instructions** (Part 2) describe the hardware environment required for the controller. Here, you will find the **equipment and connections necessary to operate the module** in an automated system and to connect the controlled system to the module.

The functions of the module in various operating modes and the significance of the parameters are described in **IP 260 Basic Handling and Explanations** (Part 3). This part also explains the control engineering terminology used in this manual.

The COM 260 software package is on the supplied diskette and is described in the COM 260 **Instructions (Part 4). Using** this package, you assign parameters to the module and test its functions. The package is designed so that errors yw might make are detected and an appropriate message displayed. To allow you to “get to grips” with the software, it can be started and certain functions made available without a connection to the module. This package is the most user-friendly tool for setting up and testing the IP 260 controller module.

Following the preparation phase, the module has all its parameters assigned and is wired up and must then be linked into the automation system. The **FB 170 Programming Instructions** (Part 5) contain the information you require for this phase.

The procedure for starting up the module is described in outline in Part **6 Notes on Installation**.

Contents

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1 Technical Description

1.1 Application

The IP 260 controller module IP 260 is a single-channel loop controller belonging to the intelligent peripheral modules of the S5 spectrum. It can be used to control process variables such as temperature, pressure, flow etc. which occur primarily in process engineering.

The IP 260 relieves the CPU of the programmable controller of time-consuming tasks and can also maintain the control function even if the CPU fails. To increase the availability, a second IP 260 controller module can be incorporated on a master/slave basis, so that if one IP 260 fails, the control function can be taken over by the other.

The module can be inserted in the following SIMATIC S5 programmable controllers and expansion units in all peripheral slots.

- S5 115 U with the CPUS 941,942,943 and 944 in the adapter casing
- S511 5H (single-ended or switched mode) with the CPU 942H in the adapter casing
- S5 135 U with the CPU 922 from version 9 and the CPU 928
- S51 50 U (not in central controller)
- S5 155 u
- S5155H (switched mode) with the CPU 946R and the CPU 947R
- S5 EUS in the central controllers listed above that can be connected via fiberoptic cable or parallel coupling

All the process variables required for closed loop control, such as actual value, external setpoint, auxiliary controlled variable and disturbance are acquired via the four analog input channels.

Additional digital information, such as disable controller, preferred mode and limit switches are evaluated via four digital inputs.

The control of the module and the cfosed bop control function are performed by a microprocessor. The controller is implemented as a PID algorithm in the firmware on the module. The following controller types can be selected:

- continuous (K) controller with analog manipulated variable output
- continuous (K) controller with pulse output
- step (S) controller with incremental control signal output.

The output of the calculated manipulated variable to the process is either via two digital controller outputs or via the analog output, depending on the controller type.

There are two further digital outputs to indicate that the controller is ready for operation and to indicate limit value violations.

To assign parameters to the module during installation, there is a serial interface for connecting a programmer.

1.2 Design

The IP 260 controller module is a double Euro-format module in the ES902 packaging system. The module is 1 1/3 standard slots wide (20 mm). A 48-pin backplane connector (XI) serves as the interface to the S5 programmable controller.

On the front panel (see Fig. 2.1), there are three subminiature D connectors for connecting the analog and digital signals, as well as the programmer.

A 3-pin connector is provided to connect the load voltage.
L+ can be supplied via two contacts from two separate sources (e.g. power supply unit and emergency battery) redundantly.
The third contact is used to supply L-.

There are two red and five green LEDs to indicate faults/errors and operating modes.

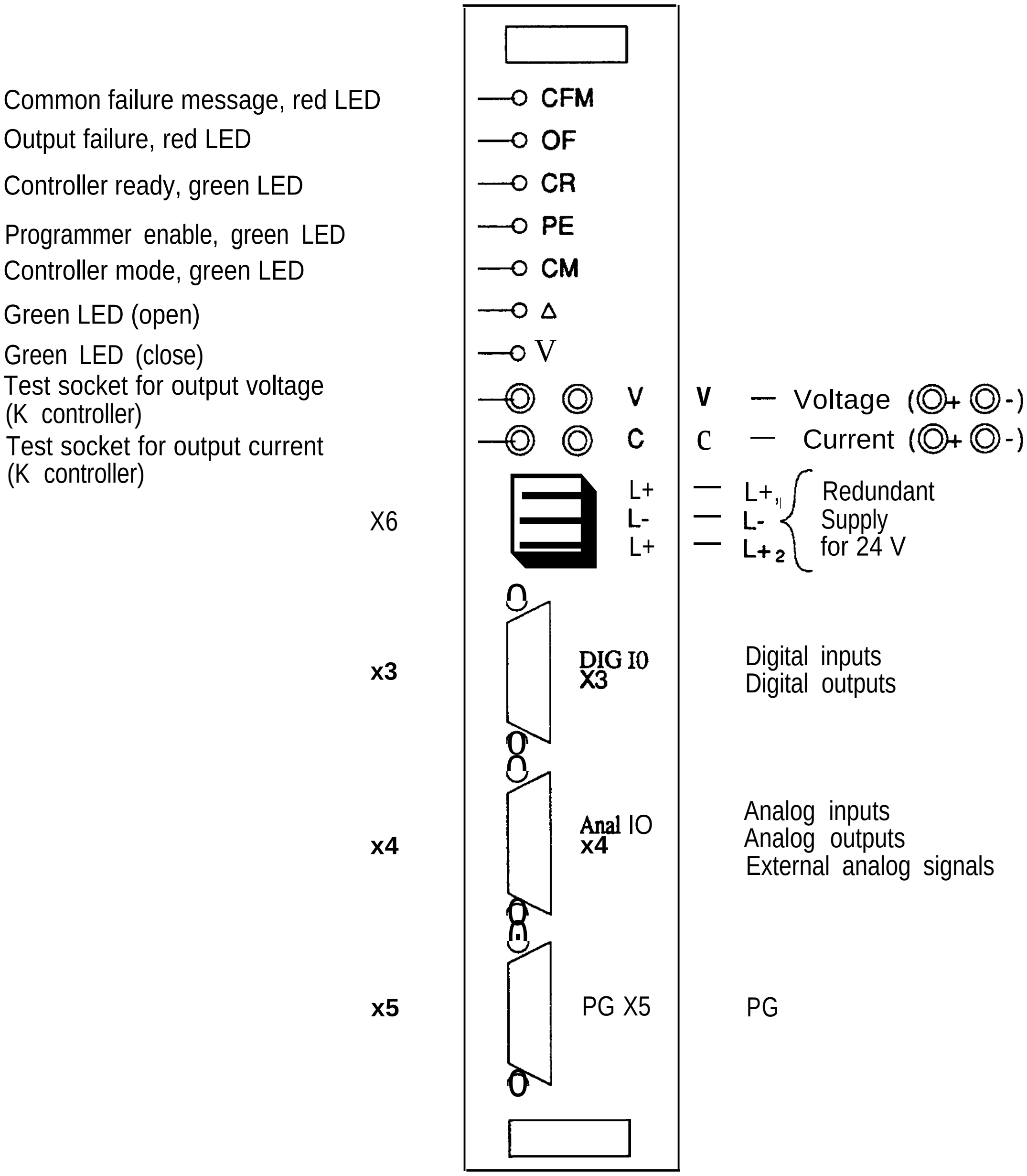


Fig. 1.1 Front panel

1.3 Mode of Operation

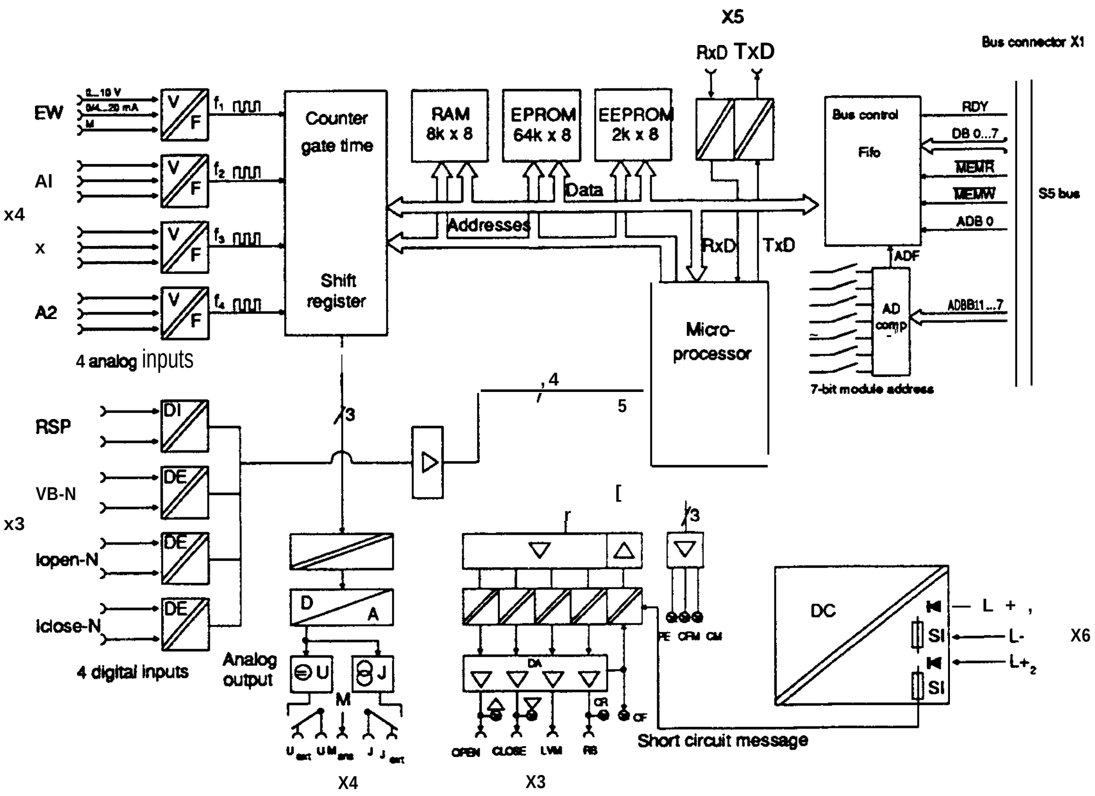


Fig. 1.2 Block diagram of the IP 2S0

Fig. 1.2 shows the Mock diagram of the controller module. The load voltage is supplied via a 3-pin connector (X6). Two independent load voltages can be supplied. The connections L+ I and L+2 are isolated by diodes. The third contact is used to supply L-. No operation is possible without the load voltage and access by the CPU is not acknowledged on the controller module (/RDY).

The analog signals are connected at **connector** *X4.* These are as follows:

• external setpoint/man. variable input	EW
• auxiliary input 1	A 1
• actual value	X
• auxiliary input 2	A 2

Manipulated variable Y and external manipulated variable Y_{ext} with K controller:

• voltage output	U
• current output	J
• ext. voltage input	U_{ext}
. ext. current input	Jext
• ground analog output	M_{ana}

The analog input voltages are converted to proportional frequencies by four voltage frequency converters (VFC). These floating signals are transferred to the counter chip. The inputs are therefore isolated from each other and from the central grounding point (PE conductor or bar).

The analog manipulated variable output Y with the K controller (connector X4) is also floating and can therefore pickup both current and voltage signals. These are accessible at the test sockets on the front panel. A relay at the analog output allows the controller module to be connected to other analog modules or to another controller module via the external manipulated variable connection Y_{ext} to increase availability.

At **connector X3,** there are four digital inputs which are isolated from each other and four digital output stages which are isolated together and have a common potential.

The inputs are used to influence the control function directly as follows:

• disable controller	RSP
• switchoverto preferred mode	VB-N
• limit switch open	lopen-N
• limit switch close	lclose-N

The digital outputs are used to output the following functions:

. controller ready	RB
. message danger limit violated	LVM
• controller signal output	OPEN
. controller signal output	CLOSE

The digital outputs are short circuit-proof. Overload is indicated by the common red LED "OF Output Failure".

Six other LEDs on the front panel signal various operating statuses of the controller module.

For communication with the programmable controller (PLC) a circuit with bus access controller and fifo memory is used.

As an additional interface, there is a serial connection on the front panel. During installation, a programmer can be connected to assign parameters to the controller. Operation and monitoring is possible in the closed loop mode while the process is running.

A microprocessor controls the functions of the controller module according to the firmware stored in a 64 Kbyte EPROM.

The internal power supply for the module is supplied by a switched mode power supply from the load voltage L+, independent of the bus power supply. If the PLC fails, the control function can therefore be maintained.

Insertion and removal of the module in the S5 rack causes no probfems, since the rack power supply does not need to be switched off. Before removing or inserting the controller module, the 24 V load voltage (connector X6) must be disconnected.

Once the bad supply is available again, all the signals required for the correct start-up of the controller module are generated.

The IP 260 starts the closed loop control mode, providing there are controller parameters in the EEPROM, otherwise it waits for parameters to be input.

1.4 Technical Data

Analog inputs:

Number	4 inputs
Isolated	yes, from grounding point and from the other inputs
Measuring ranges	0..+10 V; 50 kΩ input resistor 0..+20 mA; 50 kΩ input resistor 4..+20 mA; 50 kΩ input resistor
Measuring principle	integrating
Conversion time	20 ms at 50 Hz 16 2/3 ms at 60 Hz
Resolution	11 bits with approx. 5% overflow and underflow
Interference voltage suppression	
with common mode interference voltage	> 80 dB at 50 or 60 Hz
with normal mode irrterferenoe voltage	> 40 dB, however, max. 10% of the measuring range related to the peak value of the measuring signal
Permitted potential difference across grounding point and inputs among each other (U_{CM})	75 V d.c. 160 V a.c.
Insulation voltage according to VDE 0160 (U_{CM})	75 V d.c. 160 V a.c. tested with 500 V a.c.
Max. cable length	200 m (shielded)

Analog output:

Number	1 output
Isolated	Yes, from grounding point

Output ranges	0....+10 V 0....+20 mA 4....+20 mA
Resolution	10 bits with approx.10% overflow
Load impedance at output	>3.3 kΩ as voltage output <500 Ω as current output
Permitted potential difference across grounding point	75 V d.c. / 60 V a.c.
Insulation voltage according to VDE 0160 (U_{CM})	75 V d.c. / 60 V a.c. tested with 500 V a.c.

The analog output can be switched off with the digital input RSP via an integrated relay.

Digital inputs:

Number	4 inputs
Isolated	yes, from grounding point and inputs from each other
Rated input voltage	24 V d.c.
Rated input current	8.5 mA for inputs VB-N, IOPEN-N and ICLOSE-N 25 MA for input RSP
Delay time	approx. 3 msec for inputs VB-N, IOPEN-N and ICLOSE-N approx. 5 msec for input RSP
Input voltage	
for signal O	-33 V to + 5 V
for signal 1	+13V to +33V
Permitted potential difference across grounding point and inputs among each other (U_{CM})	75 V d.c. 160 V a.c
Insulation voltage according to VDE 0160 (U_{CM})	75 V d.c. / 60 V a.c. tested with 500 V a.c.

Max. cable length	1000m (shielded) 600m (not shielded)

Digital outputs:

Number	4 outputs
Isolated	yes, from grounding point
Rated output voltage	24 V d.c.
Output current for signal 1	
rated value	200 mA
permitted range	5 mA...2OO mA
Residual current for signal O	max. 20@
Lamp load	max. 2.4 W
Limitation of the voltage induced on circuit interruption	-1 V
Output voltage	
for signal O	max. 3 V
for signal 1	min. L+ -2.5 V
Short circuit protection	electronic
Short circuit indication	red LED “OF and error bit
Coincidence factor	100% without fan
Maximum cable length	1000 m (shielded) 600 m (not shielded)

Power supply:

Supply voltage from system bus	+5 v +/- 5%
Current consumption	max. 100 mA
Power supply L+ (front connector)	
rated value	24 V d.c.
ripple U_{pp}	3.6 V
permitted range including ripple	20...30 v

Current consumption without load from L+ (24 V)	typically 250 mA

safety test:

Impulse voltage test according to IEC 255-4	1 kV
Radio interference voltage test according to IEC 255-4	1 kV

Environmental conditions:

Operating temperature	0...55 "C (+32 to +131 °F), can be operated without fan
Storage and transport temperature	-40...+70"c (-40 to +158 "F)
Relative humidity according to climatogram DIN 50019 Part 3	
operation	85% at23'C (73 °F)
storage and transport	95% at25'C (77 °F)

Mechanical data:

Dimensions W x H x D	193 x 244x 20 mm
Weight	approx. 400 g
Space required	1 slot

2 Installation

2.1 Inserting and Removing the Module

The module must only be inserted or removed from the S5 bus after the load voltage has been disconnected from L+ I and L+2. The module is then no longer under voltage and the data bus driver is at high resistance.

2.2 Connecting the Signal Lines and Power Supply

2.2.1 Analog Inputs

The analog inputs are isolated from each other and from the grounding point (see Fig. 2.1). Between the measuring transducer and grounding point, up to 60 V a.c. / 75 V d.c. insulation voltage (U_{CM}) is permitted.

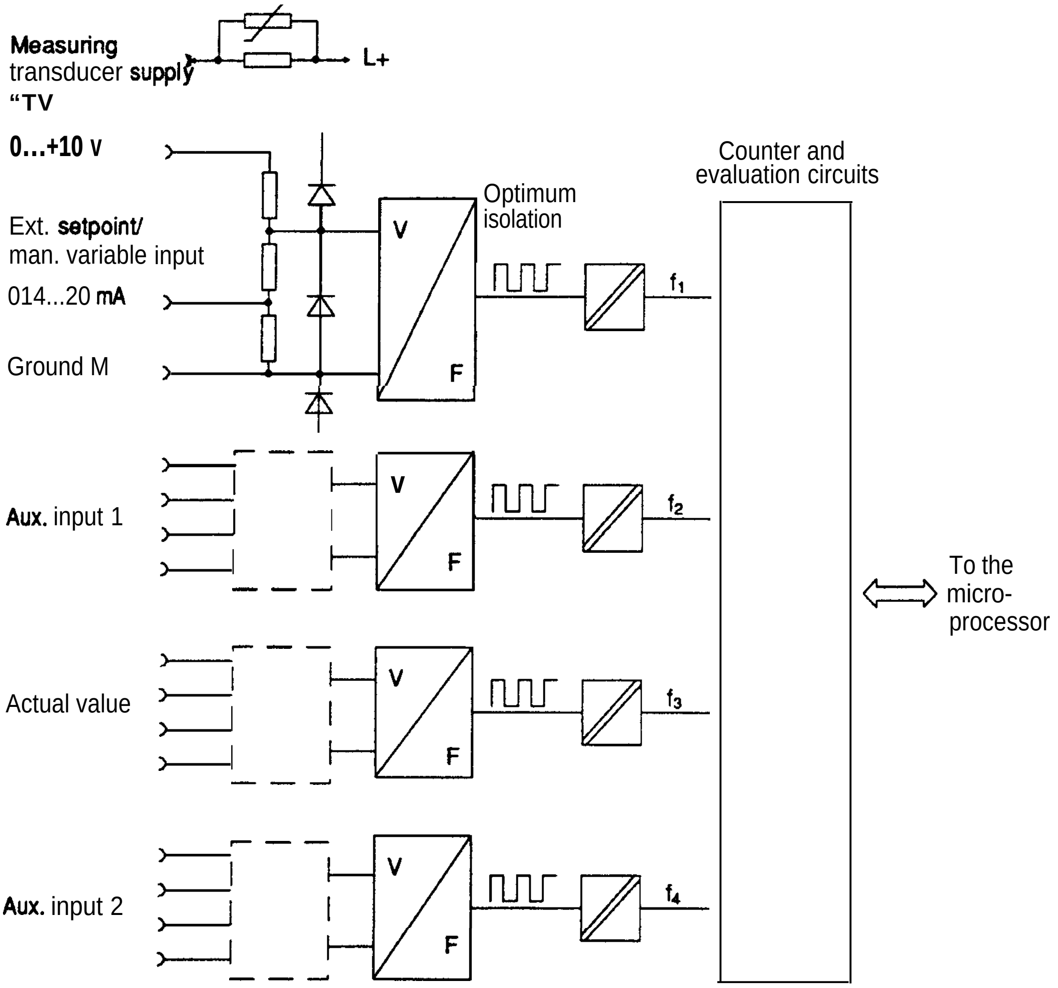


Fig. 2.1 Analog inputs

Each analog **signal** is converted to a frequency proportional to the input value in a **voltage** frequency converter **(VFC)** and transferred via an **optocoupler** to the counter circuit. Both 4 and 2-wire transducers can be connected directly. For 2-wire transducers, power is supplied from the module via connection MU separately for each channel and is short circuit proof.

Correction values for the inputs are stored in the EEPROM as resident data and are taken into account during the digital conversion of the measured frequency values.

Figs. 2.2 to 2.5 show the connection of the various transducers to the IP 260:

S - sensor
T - transducer

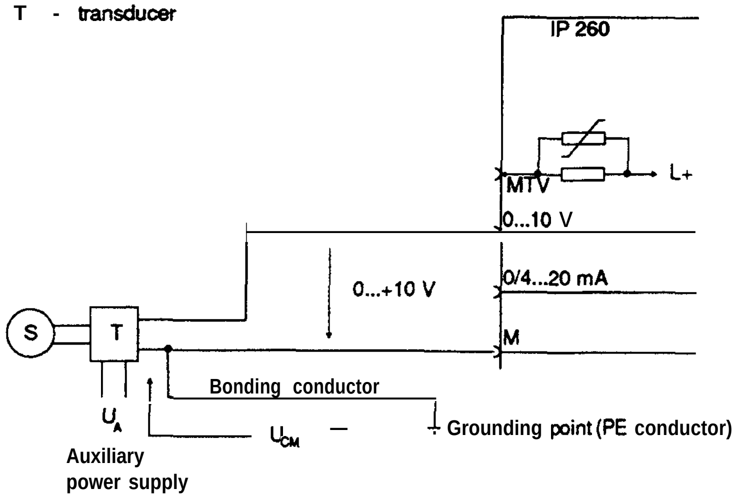


Fig. 2.2 4-wire transducer with 0...+10 V output signal

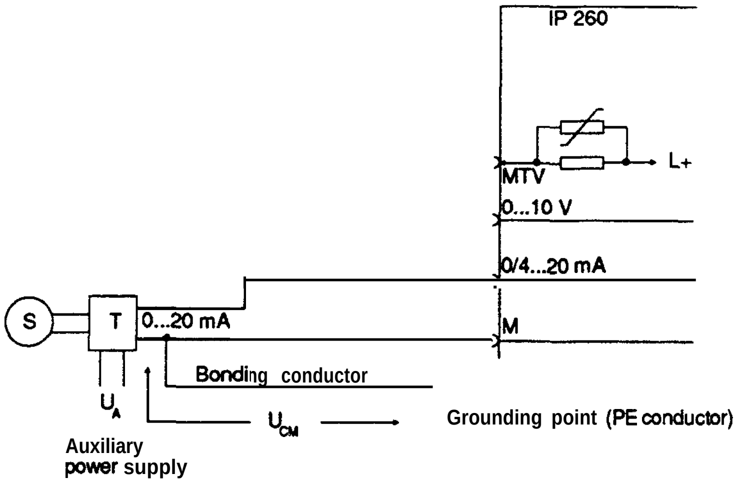


Fig. 2.3 4-wire transducer with 0...+20 mA output signal and separate auxiliary power supply

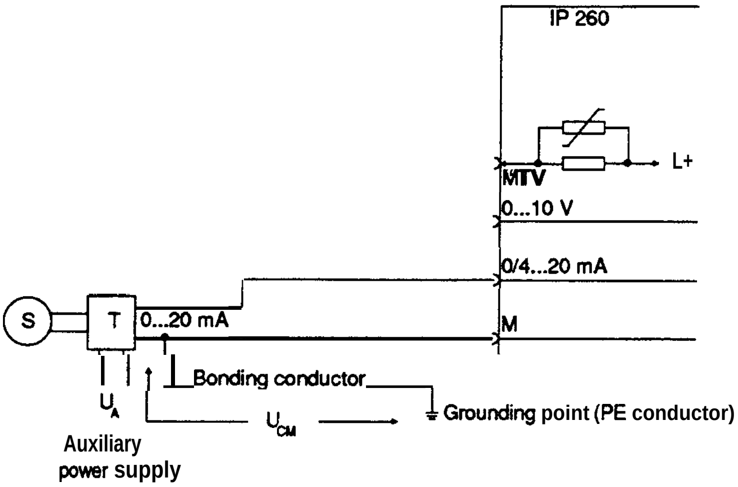


Fig. 2.4 4-wire transducer with 4...20 mA output signal and separate auxiliary power supply

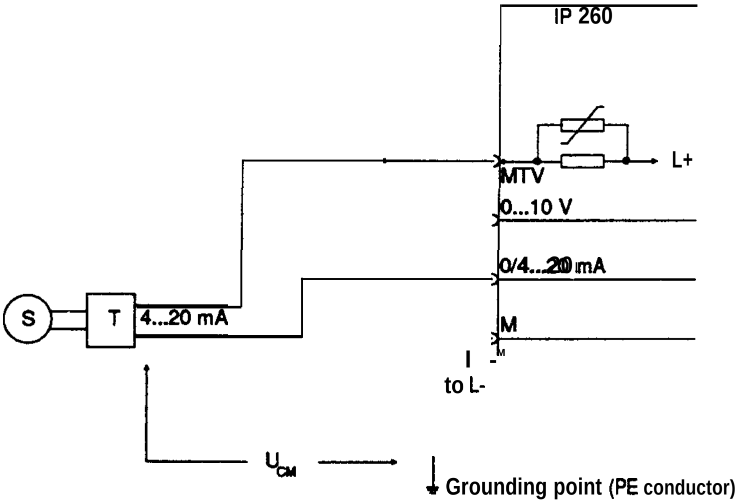


Fig. 2.5 2-wire transducer with 4..20 mA output signal without auxiliary power supply (T supply from module)

2.2.2 Analog Output

For the K controller with analog manipulated variable output, there is an isolated analog output (see Fig. 2.6). Both current and voltage signals can be picked up simultaneously.

The output values are calculated by the microprocessor accordina to the controller Parameters and outout normalized to 0...100%:

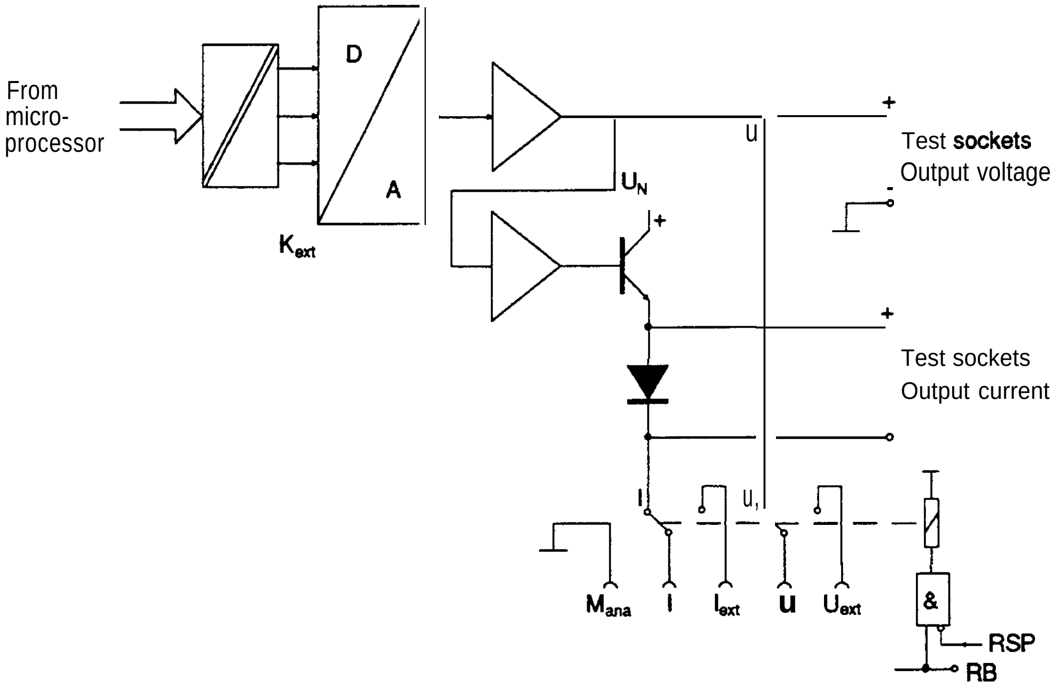


Fig. 2.6 Analog output

To connect the analog outputs, they are led via relay changeover contacts. Depending on the digital input RSP (block controller) and the status of the digital output RB **(controller ready) the current and voltage signals are switched through to the process.** If **the contacts are connected to external analog signals, then analog signals from an analog output or from an IP** 260 **connected** in parallel can be switched through to the process via I_{ext} or U_{ext}.

The connection of actuators or indicators is shown in Fig. 2.7.

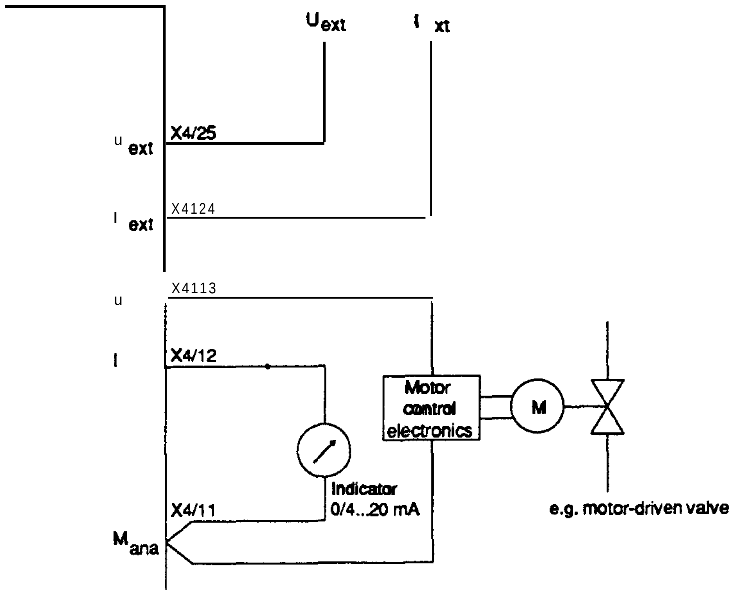


Fig. 2.7 Connecting an actuator to the analog output

2.2.3 Digital Inputs

The four digital inputs (see Fig. 2.8) for 24 V signals are isolated from each other and from the grounding point. The **RSP** input (block controller) also controls the relay for the analog output, (refer to **Section** 2.2.2) and the cut-off logic for the digital outputs “OPEN” and “CLOSE” (refer to Section 2.2.4).

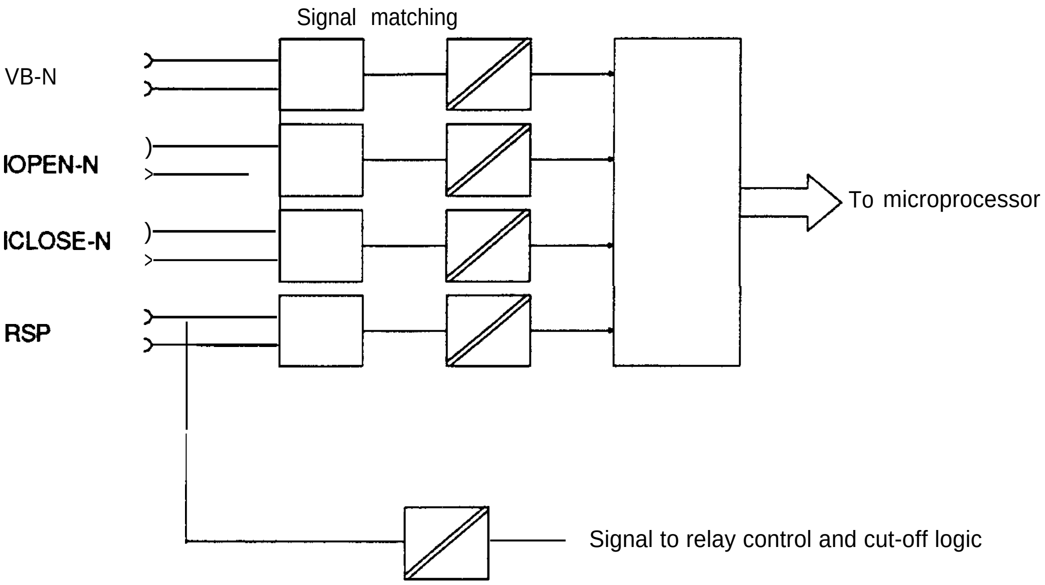


Fig. 2.8 Block diagram of digital inputs

The connections of the digital inputs are shown in Fig. 2.9:

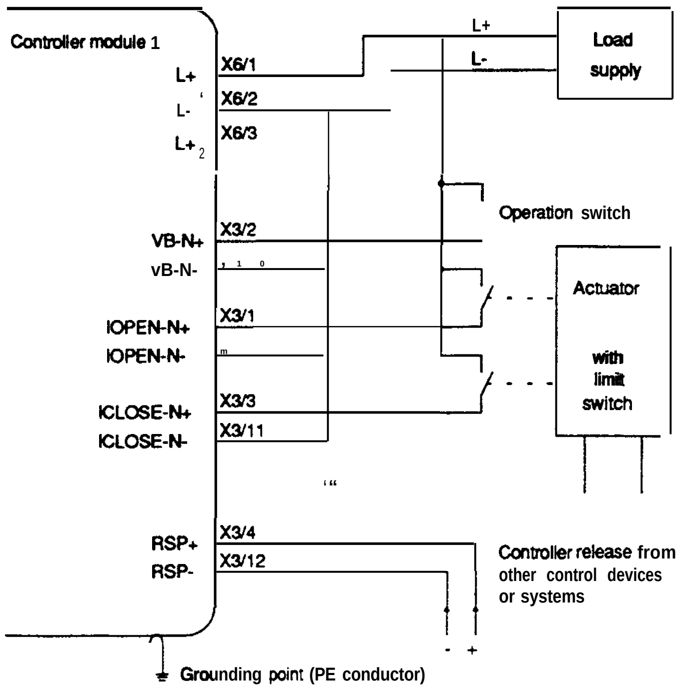


Fig. 2.9 Connecting the digital inputs

2.2.4 Digital Outputs

The four command outputs (see Fig. 2.1 O) of the controller “OPEN”, “CLOSE”, limit value signal output "LVM" and controller ready indicator “RB” are implemented as 24 V P-switches. All outputs are at the same potential, but are isolated from the grounding point. A short circuit on one of the outputs is indicated by the red LED “OF and is written to data word 109, bit 15 by the processor.

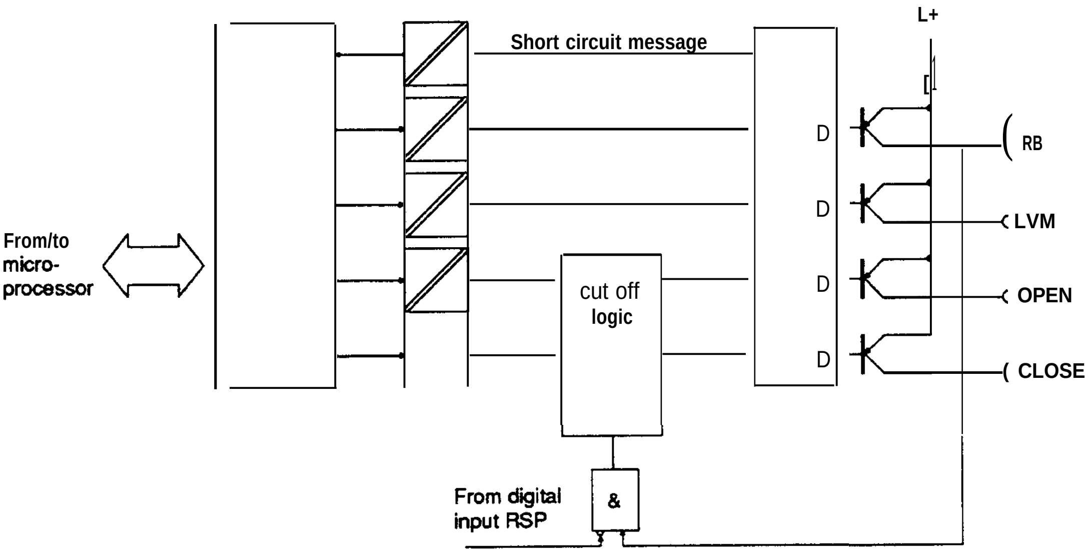


Fig. 2.10 Block diagram of the digital outputs

An example of the connections of the digital outputs is shown in Fig. 2.11.

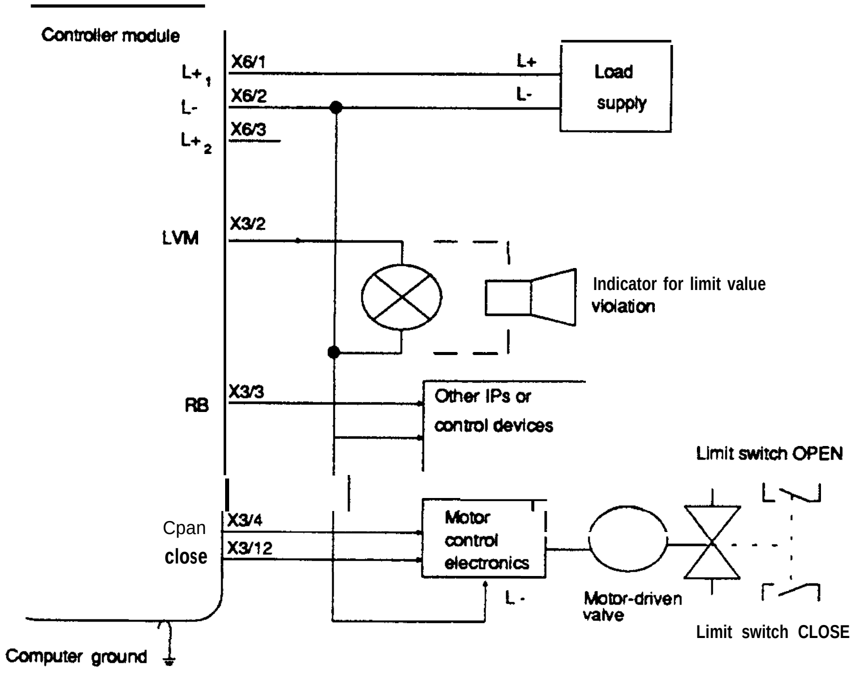


Fig. 2.11 connecting the digital outputs

2.2.5 Connecting the Programmer

The controller module has a serial current-loop interface (TTY) for operation and monitoring and for installation. A programmer is connected via a 15-pin subminiature D socket (X5) on the front panel to program the module. Using the software package COM 260, you can enter the parameters with the keyboard in screen forms and transfer them to the module.

While the process is running, the programmer can be connected to monitor the process, change parameters and setpoints and for manual intervention (see COM 260 Programming Instructions).

The programmers PG 635,675,665,695,730 or 750 can be connected to the IP 260 (X5) using available connecting cables (for ordering data, see catalog).

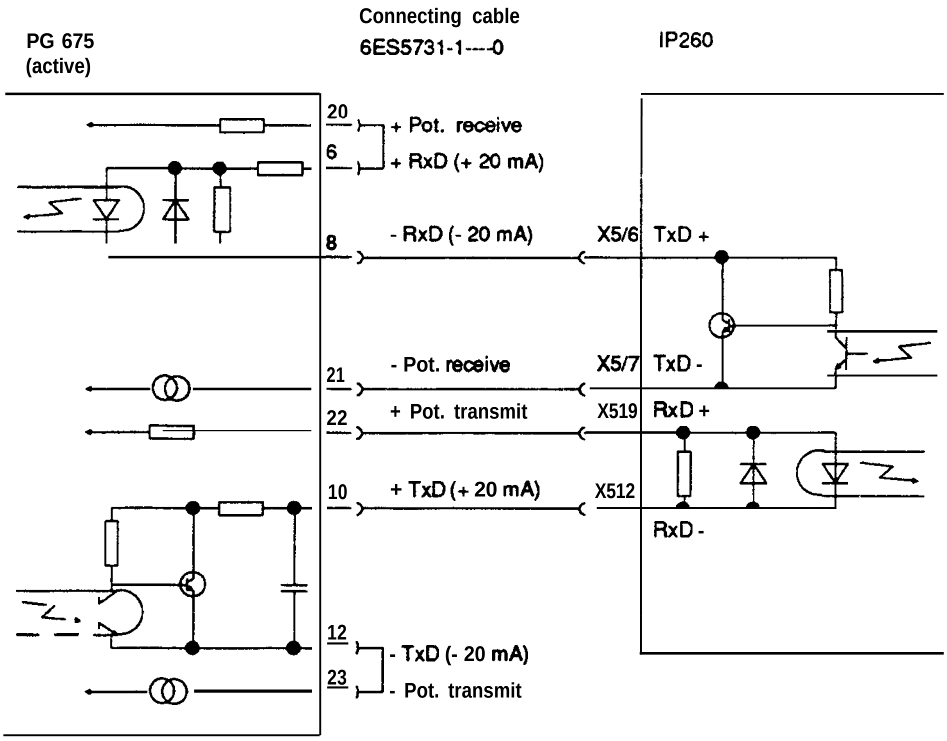


Fig. 2.12 Connecting the programmer PG 675 to the IP 2S0

2.2.6 Configuration for Increased Availability

For processes or plants which require a high degree of availability, for instance chemical plants and power generating mmpanies, the **IP** 260 controller module can be operated redundantly with a second **IP** 260.

A K controller with pulse output cannot be operated redundantly.

Both modules have the same parameter assignment. The first is the master module and the second is the slave. If the master module fails, the slave module automatically continues the control function without the programmable controller intervening. The switch over from module 1 (master) to module 2 (slave) is performed automatically after a maximum of 20 ms.

The wiring required to use two K controllers with anabg manipulated variable output is shown in Fig. 2.16, using the voltage output and in Fig. 2.17 using the current output. The wiring for the S controller is shown in Fig. 2.18.

For simple applications, it is possible to connect analog and digital modules. Remember, however, that the switchover nust then be made by the user program in the programmable controller.

For the power supply there are two connections, isolated by diodes, available for the load voltage (L+I, L+2). The negative connection (L-) is common.

The potential difference (U_{CM}) between the bad current circuit and grounding point can be a maximum 60 V a.c. / 75 V d.c. (according to VDE 0160).

S controller: The controller outputs OPEN and CLOSE of both modules must be isolated by diodes.

Fig. 2.13 shows the redundant connection of the power supply:

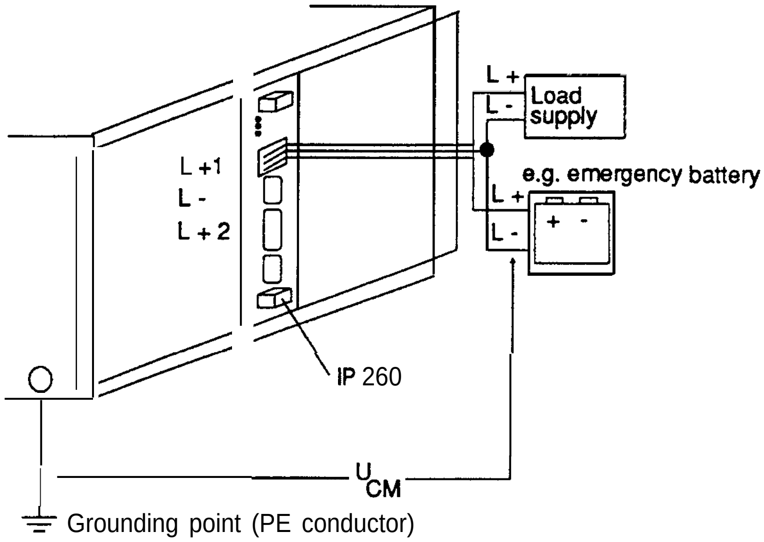


Fig. 2.13 **Connecting the power supply L+**

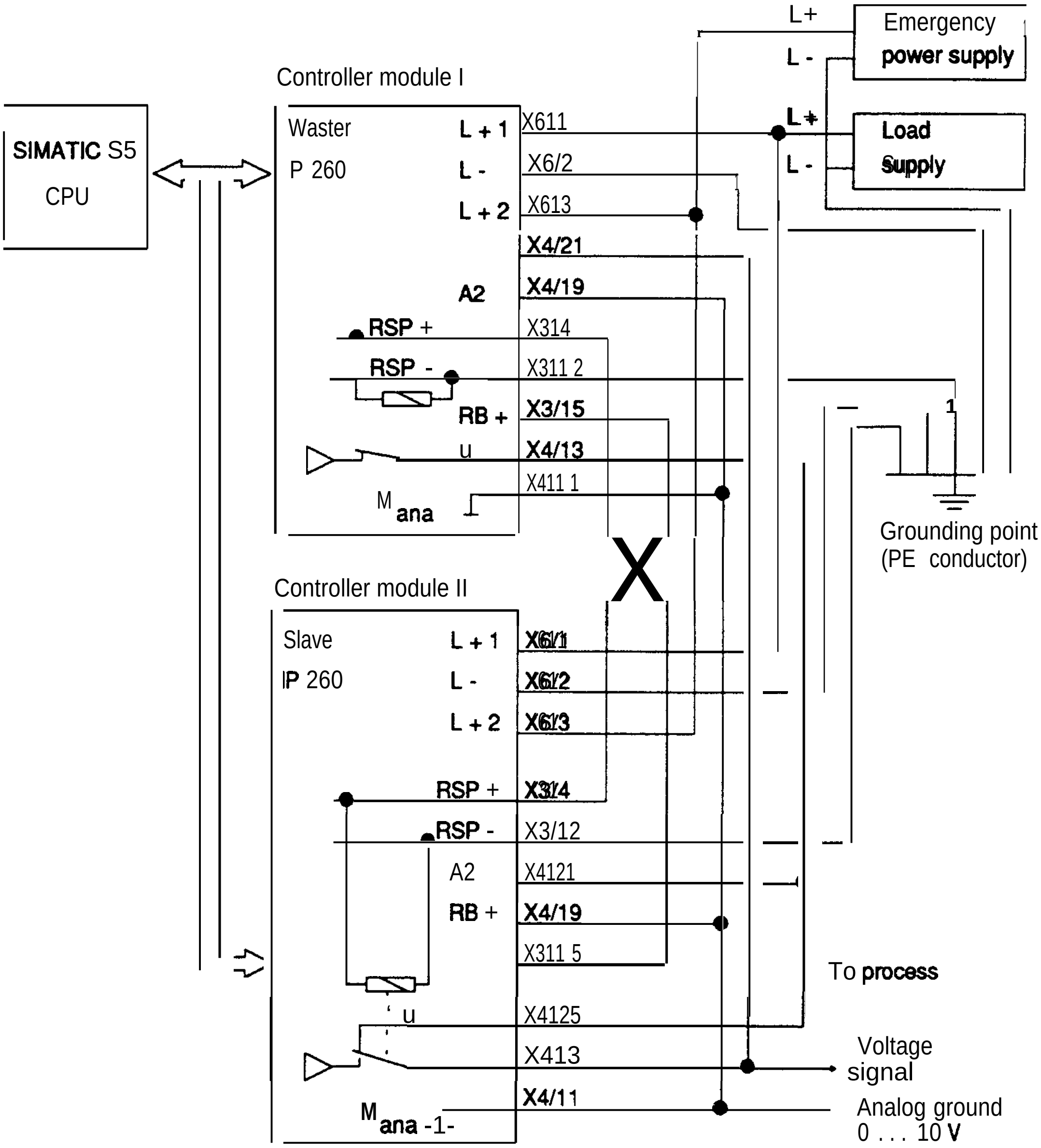


Fig. 2.14 Master/slave wiring for K controller(voltage/analog manipulated variable output)

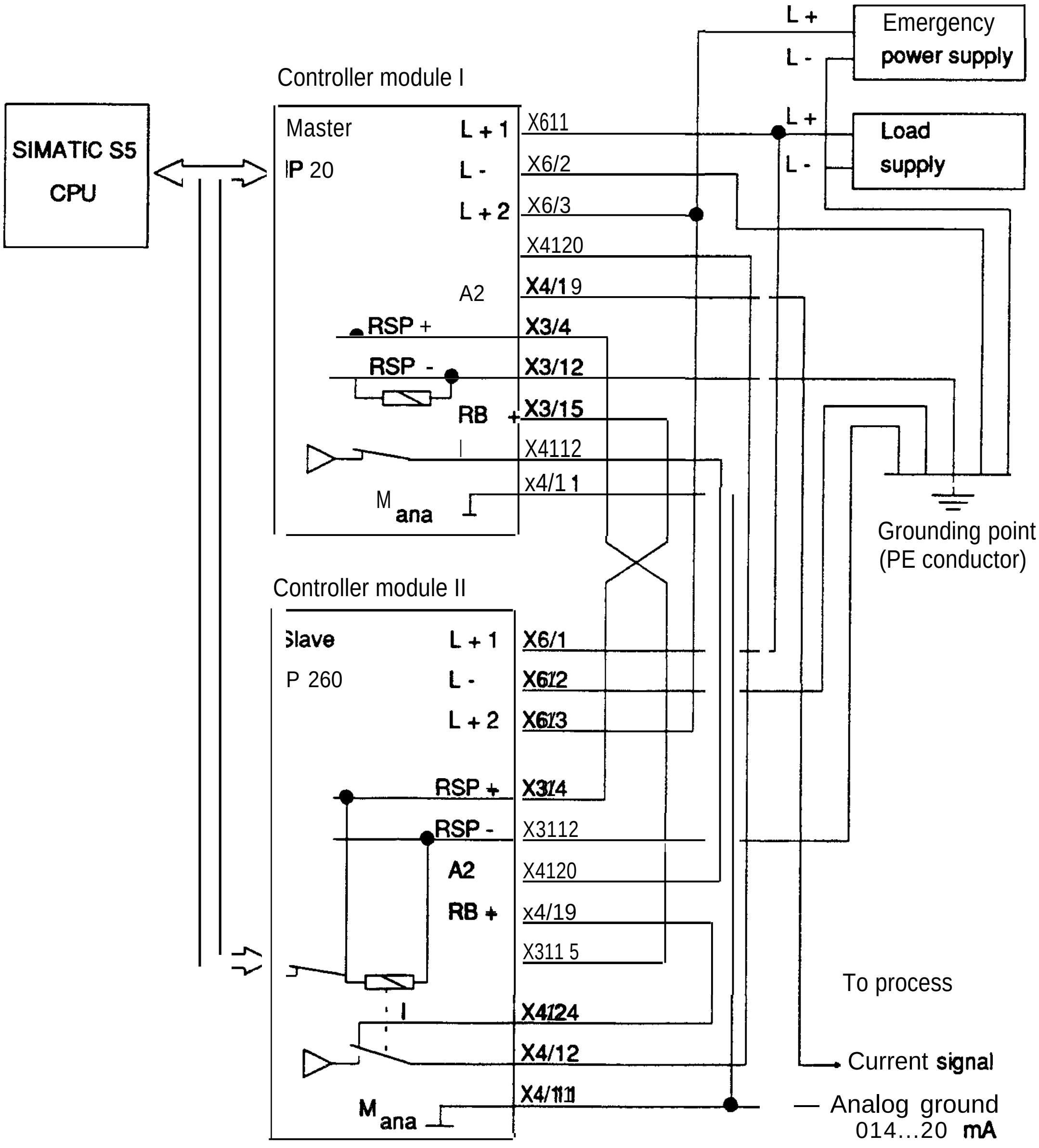


Fig. 2.15 **Master/slave wiring for K controller (current/analog manipulated value output)**

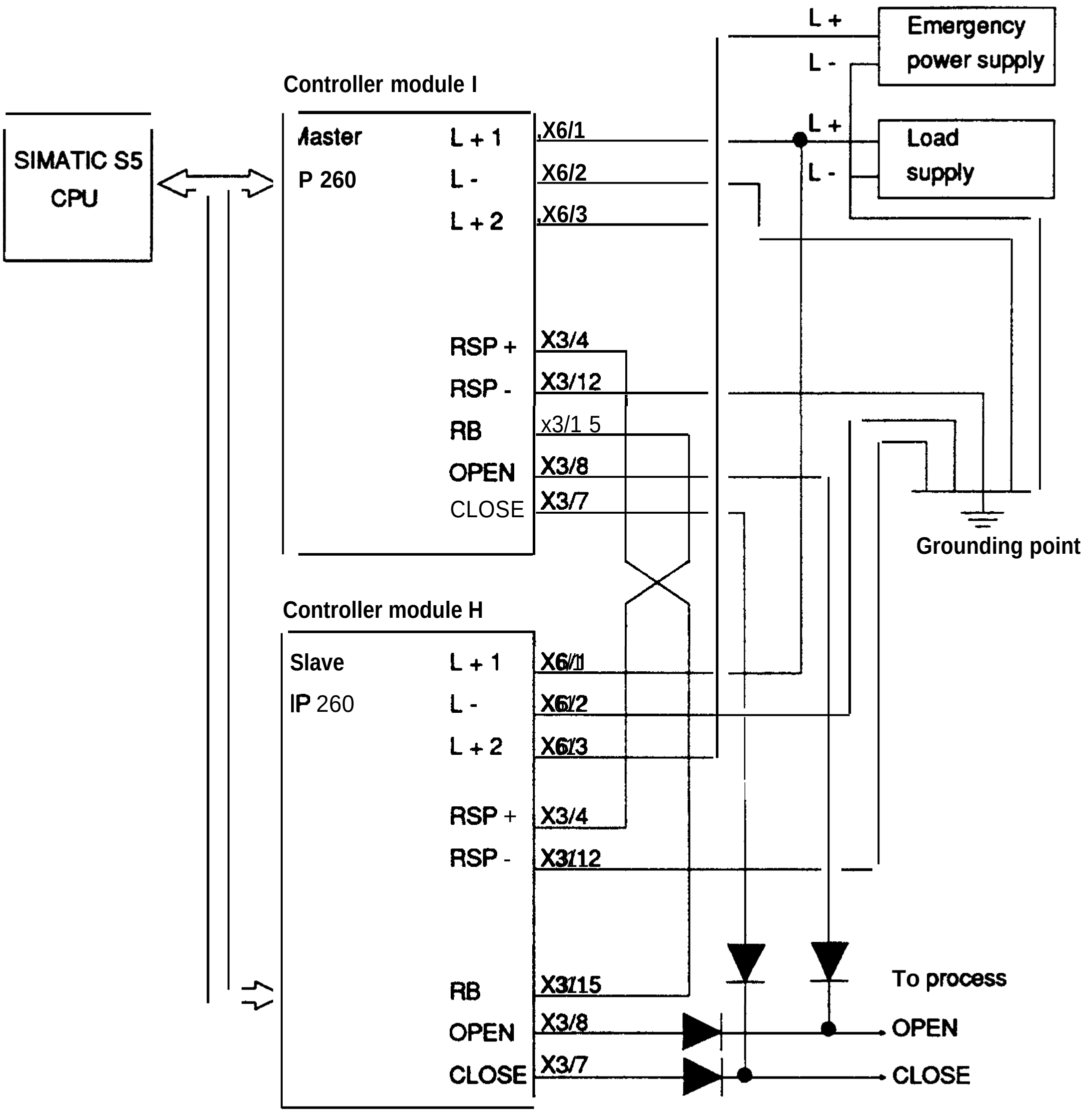


Fig. 2.16 Master/slave wiring for S controller

2.2.7 Pin Assignment

Connector XI: backplane connector

	b	z
2	GROUND	+ 5 VOLTS
4	PESP	
6	ADB0	/CPKL
8	ADB1	/MEMR
10	ADB2	/MEMW
12	ADB3	/RDY
14	ADB4	DB0
16	ADB5	DB1
18	ADB6	DB2
20	ADB7	DB3
22		DB4
24		DB5
26		DB6
28		DB7
30	BASP	
32	GROUND	

From version 2 of the IP 260 onwards, BASP is no longer evaluated.

Connector X3: **15-pin socket connector for digital inputs (1) and digital outputs (A)**

socket	Connection for		
1	Limit switchmen	I	IOPEN-N+
2	Preferred mode	I	VB-N+
3	Limit switch close	I	ICLOSE-N+
4	Disable controller	I	RSP+
5	---		
6	---		
7	Controller output close	Q	CLOSE
8	Controller output close	Q	OPEN
9	Limit switch open	I	IOPEN-N-
10	Preferred mode	I	VB-N-
11	Limit switch close	I	iCLOSE-N-
12	Disable controller	I	RSP-
13	---		
14	Limit value monitor	Q	LVM
15	Controller ready	Q	RB

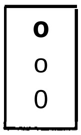
Connector X4: **25-pin socket connector** for analog inputs and analog outputs

Socket	Connection for	
1	Ground M	Chan. O (EW) ext. setpoint/ man. variable input
2	0/4 . . . +20 mA input (EW)	
3	0... +10 v input	
4	Transducer supply MTV	
5	---	
6	Ground M	Chan. 2 (X) Actual value
7	0/4 . . . +20 mA input	
8	0... +10 V input	
9	Transducer supply MTV	
10	---	
11	Analog ground M_{ana}	analog output
12	0/4 . . . +20 mA output	
13	0.. - +10 v output	
14	Ground M	Chan. 1 (AI) aux. input 1
15	0/4 . . . +20 mA input	
16	0... +10 V input	
17	Transducer supply MTV	
18	---	
19	Ground M	Chan. 3 (A2) aux. input 2
20	0/4 . . . +20 mA input	
21	0... +10 v input	
22	Transducer supply MTV	
23	---	
24	External current input I_{ext}	
25	External voltage input U_{ext}	

Connector *X5:* 15-pin socket connector for PG connection

Socket	Connection for
1	Shield
2	RxD-
3	..-
4	24 V L+
5	---
6	TxD+
7	TxD-
8	Shield
9	RxD+
10	Ground L-
11	Ground 20 mA (Tx)
12	---
13	Ground 20 mA (Rx)
14	---
15	---

Connector X6: power supply 3-pin



Pin 1 L+1

Pin 2 L-

Pin 3 L+2

3 Operation

3.1 Position of the Jumpers and Switches

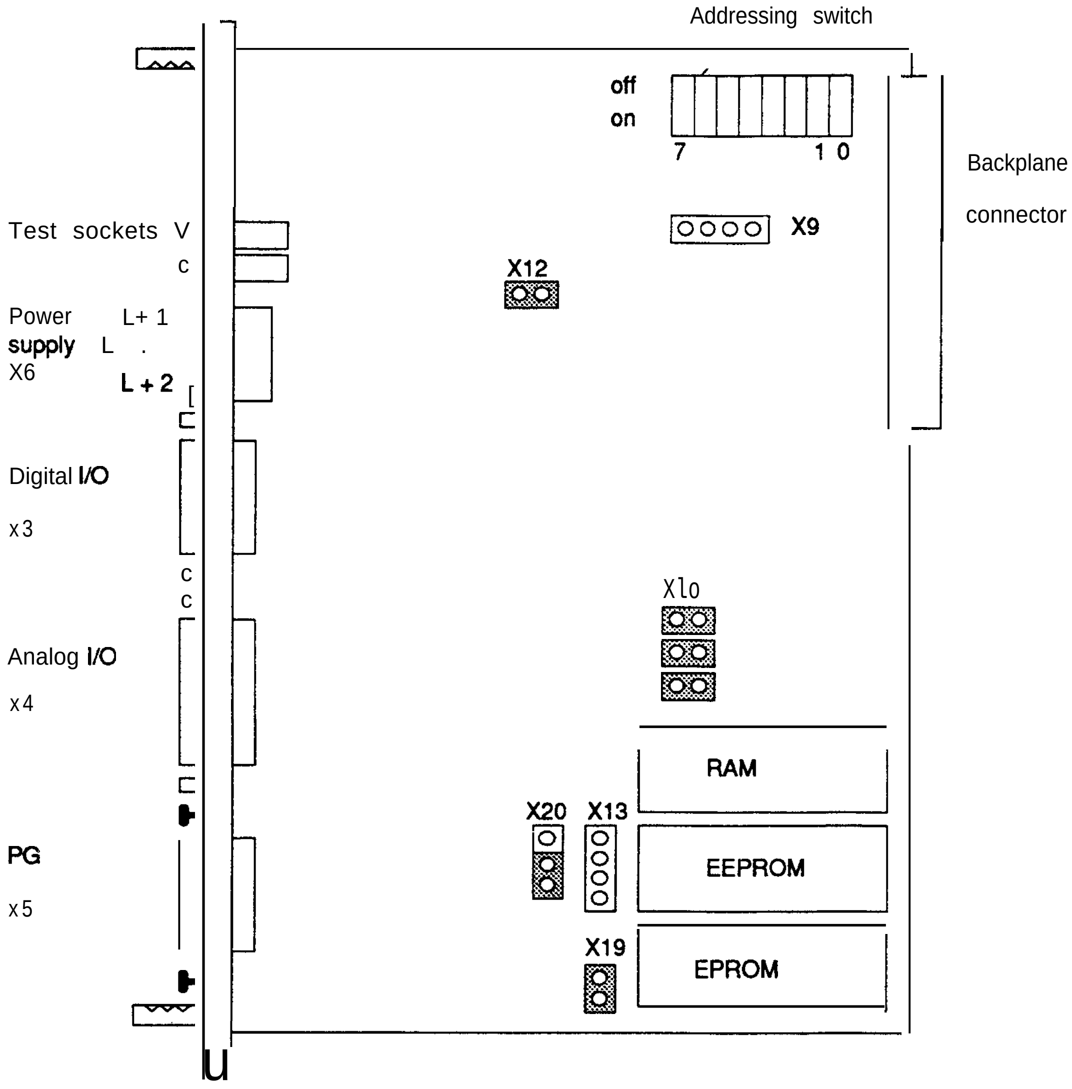


Fig. 3.1 Position of the jumpers and switches

▨ = Jumper inserted

The marked jumpers must always be inserted. They are inserted when the module is supplied.

All jumpers Xl O, X12, X19 and X20 and test points X9 and X13 are used for test purposes.

3.2 Setting the Module Address

The controller module has a word address (two bytes). The first byte address is set on the module with the address switch (see Fig. 3.2). This can be in the P area from 128 to 254 and in the O area (onlyS5135U, S5 150U S5 155U andS5155H) from O to 254. Only one even byte address maybe occupied in the address area, e.g. O, 2,4...254.

Addressing in the process image area is not permitted.

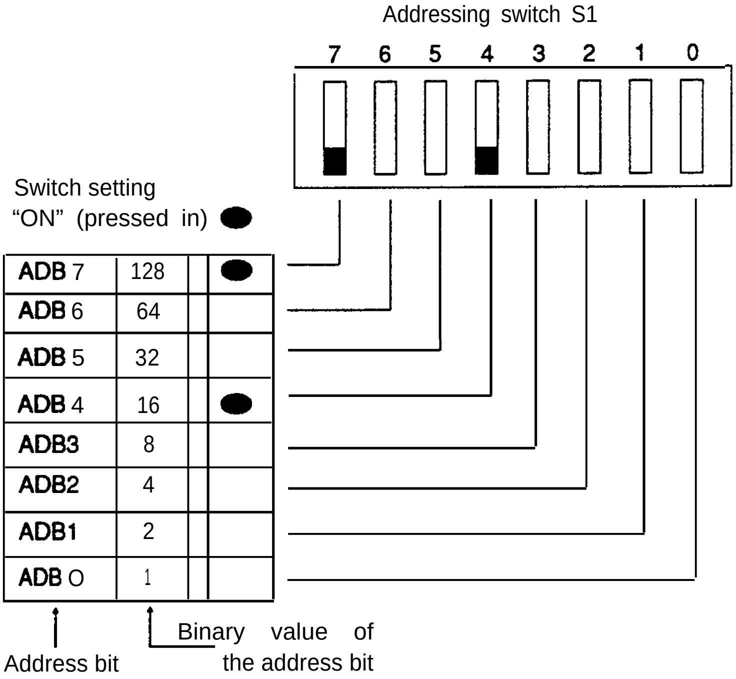
The address signals PESP and ADB 1...ADB 7 are coded.

The address of the module is the sum of the binary values of the switches in the on position (o).

Example: setting the address 144

ADB 4 + ADB 7 have the following values:

$2^4 + 2^7 = 16 + 128 = 144$



ADB 7	128		●
ADB 6	64		
ADB 5	32		
ADB 4	16		●
ADB3	8		
ADB2	4		
ADB1	2		
ADB O	1		

Fig. **3.2** **Addressing switch**

The data transfer between the programmable **controller and the module is made** using the word address. The sequence is fixed in a protocol. On the module, the necessary driver routines are part of the firmware and in the programmable controller they are provided by function block **FB 170 (see Programming Instructions).**

4 Overview: Order Numbers

IP 260 controller module	6ES5 260-4UA11
COM 260 system program	
5.25" and *3.5"* diskettes with manual	
German	6ES5 895-5SE11
English	6ES5 895-5SE21
French	6ES5 895-5SE31
Manual for IP 260, COM 260 and FB 170	
German	
English	6ES5 998-5SE11
French	6ES5 998-5SE21
	6ES5 998-5SE31
Function block FB 170	
fors51 15U...S5155U	
5.25" and 3.5" diskettes	
for S5-DOS operating system	6ES5 848-8PR01
for MSDOS/S5DOSMT operating system	6ES5 848-7PR01
Complete connector set for bad supply (X6)	W79070-U2306-U3
Connecting cable for analog signals max. cable length, see 1.4	6ES5 704-6 . . .
Connecting cable for digital signals max. cable length, see 1.4	6ES5 704-7 . . .
Connecting cable for programmer	6ES5 731-1- ...0

(for length key, refer to the catalog)

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3-t -34	x					
4-1 -4-2	x					
S1 - S2	x					

Contents

List of Figures

1 Fundamentals of Operation

1.1 Introduction

The IP 260 controller module can be used to operate a single control loop. The control loop comprises a controlled system and the controller. The input variable for the controlled system is the manipulated variable (Y), the output variable is the actual value (X). The IP 260 controller module generates the manipulated variable from the setpoint input (W) or the manipulated variable input by the user (Yh).

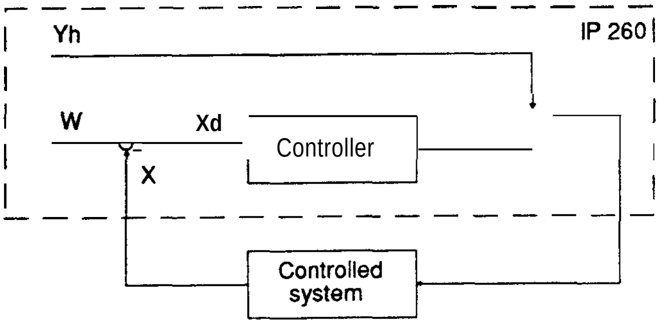


Fig. 1.1 Control loop

The mode of operation of the IP 260 controller module can be influenced by operator input. For this purpose, the module has two interfaces, one to the programmable controller (PLC) and one to the programmer (PG). The module can be operated from either. The PG interface and the PG software (COM 260), allow user-friendly installation and optimization of the control parameters without the programmable controllers. Operation with programmable controllers is via the PLC interface, using the standard function block FB 170.

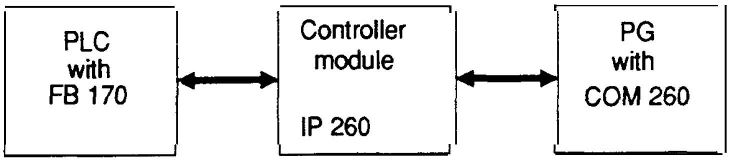


Fig. 1.2 IP 264) with the two interfaces

The designation PLC stands for the programmable controllers S5 115U/H, S5 135U (with CPU 922 from version 9 onwards), S5150WH orS5155U. PG stands for the programmers PG 635, PG 675, PG 665, PG 695, PG 730 or PG 750 with the operating system S5-DOS.

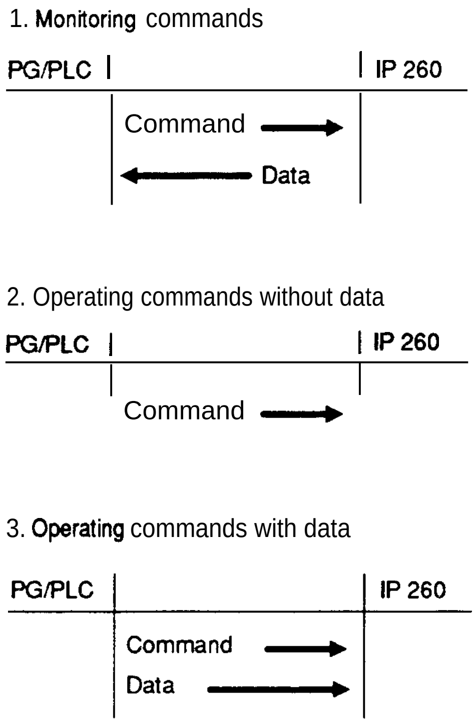
1.2 Commands to the IP 260

The IP 260 controller module is addressed by commands via the PLC and PG interface. A command is a number between O and 255. It is always sent from the PLC or PG to the module and contains the complete information about the contents and number of data following it.

Using monitoring commands, data from the IP 260 are made available to the PLC or PG.

If the module is to be supplied with data from the PLC or PG, operating oommands are necessary.

In total, there are three different interface calls.



1. Monitoring commands

2. Operating commands without data

3. Operating commands with data

Fig. 1.3 The three interface calls

Operating and monitoring commands are processed independently of each other. The data for the monitoring commands are made available immediately, the operating commands, on the other hand, are entered in a queue.

If the command cannot be correctly processed owing to an input error, an error message is generated. The error message remains as an input error until a new command is accepted. With a monitoring command, the input error can be read without having any effect.

The operator errors described in the following sections should be used as an aid to troubleshooting if incorrect inputs are made.

The operator is not responsible for generating the interface call for a command. With the PLC interface, this is carried out by standard function block FB 170. This must simply be supplied with the corresponding command by the user and any required data must be made available.

When operating the module with the PG software COM 260, this generates the correct command, the interface call and prepares the data. This depends on the selected COM 260 software function, the data input or on the function keys pressed on the programmer. The PG software COM 260 is the most user-friendly method of operating the module.

1.3 Operating Statuses and Operating Commands

Some of the operating statuses can be influenced by operating commands and input signals, and some are generated automatically as a result of checks carried out by the module.

Each operating status is valid for itself alone and can be indicated by the values "0 or"1". They are all stored in the operating status word.

Operating **status word** (DW 112):

Bit	status	Function
0	0 1	Mode is "open loop" (see 1.3.2.) Mode is "closed loop"
1	0 1	Test actual value branch off (see 1.3.3.) Test actual value branch on
2	0 1	Test setpoint branch off (see 1.3.3.) Test setpoint branch on
3	0 1	Setpoint ramp higher off (see 1.3.3.) Setpoint ramp higher on
4	0 1	Setpoint ramp lower off (see 1.3.3.) Setpoint ramp lower on
5	0 1	Manipulated variable ramp higher off (see 1.3.3.) Manipulated variable ramp higher on
6	0 1	Manipulated variable ramp lower off (see 1.3.3.) Manipulated variable ramp lower on
7	0 1	Parameter set 2off (see 1 .3.3.) Parameter set 2 on
8	0 1	Interpreter finished Interoreter active
9	0 1	Manual disable (access from PLC) (see 1.5.) Manual release (access from PG)
10	0 1	No DB in RAM DB in RAM
11	0 1	No DB in EEPROM (see 1.7.) DB in EEPROM
12	0 1	Controller not OK Controller OK
13	0 1	Controller not active in process Controller active in process
14	0 1	No PLC failure (see 1.5.) PLC failure
15	0 1	Preferred mode off (see 1.6.) Preferred mode on

Fig. 1.4 Operating status bits

To be able to execute the controller function of the *IP 260* module, certain operating statuses must be valid.

Interpreter finished

All operating commands are processed in a central part of the firmware, the interpreter, regardless of the interface which sent them. The operating status “interpreter active” is set until the operating command is either executed without error, or the corresponding operating status has been set or processing has been interrupted owing to an input error.

DB in RAM

To start up, the module must have all the necessary parameters assigned. All the parameters are located in a data block (DB). If this is in the RAM on the module, the status "DB in RAM” is indicated. Otherwise the status “no DB in RAM” is set.

Controller OK

Once the status "DB in RAM” is set, the module automatically generates the status "controller OK” if all the required process signals are correctly received.

As long as “no DB in RAM” is set, the “controller is not OK”.

Providing the controller is OK, any mode change is permitted. This status is indicated with the LED “CR” on the front panel of the module and can be used for open loop control via the digital output "RB".

In master/slave operation (see Chapter 5) the relationship between the operating status “controller OK” and the digital output "RB" is different.

Controller active

The manipulated variable calculated by the controller can only affect the controlled system when the controller is not disabled (digital input "RSP" = O) and the controller is OK (digital output "RB" =1). The status “controller active” indicates this situation. As soon as one of the signals “RSP = 1“ or "RB = O“ is set, the controller is no longer active in the process and another external signal can be used as the manipulated variable.

⚠ Caution

For reasons of safety, the controller should remain disabled ("RSP" = 1) until the status "controller OK" is reached and the controlled system is at a defined setting.

1.3.1 Utility Commands

The utility commands are available for assigning parameters and entering data. Remember that when assigning parameters for the first time, only the complete data block can be entered. All other utility commands generate the *input error 43H "no DB in RAM".* All the other utility commands can be used to modify particular areas of the data block. The utility command "identification input" is the only one not used to assign parameters to the module. Using this, data of a purely documentary character can be changed at any time.

If the data are valid, the corresponding area in the data block on the module will be overwritten, i.e. the previous data are lost and the new data are accepted at the same time.

Before this happens, each item of data is checked and if an *input error* is detected *(7H to 3DH)* the newly entered data will be discarded. The module then continues to work with the old data. Since the new data block is still present in the programmable controller or in the programmer, the incorrect parameter can be corrected there.

When overwriting a data block with the command "DB input" the currently active operating mode and the operating statuses "test actual value branch" and "test setpoint branch" are retained. In general, however, parameter set 1 is active. The remaining utility commands do not influence any of these operating statuses.

The **following** applies from version 5 **of the IP** 260 **and higher:**
When the data block is overwritten, the currently active parameter set is retained. If this is not selected in the new data block, parameter set 1 is set.

/ Utilitv commands	Interface	DW from DB
DI 1- Data block input	PLC + PG	DW 16-96
DI 2- Control parameter set 1 input	PLC + PG	DW31 -35
DI 3- Control parameter set 2 input	PLC + PG	DW 36-40
DI 4- Module configuration input	PLC + PG	DW 17
DI 5- Test actual value input	PLC + PG	DW 66
DI 6- Identification input	PLC + PG	DW 120

Fig. 1.5 Table of utility commands

1.3.2 Mode Commands

Mode commands are only accepted when the module is in the operating status "controller OK”. If the controller is not OK, the ***input error 40H “controller not OK”*** is set.

The module always operates in one of the modes **“closed loop control” or “open loop control”** and this is indicated as the operating status.

In other SIMATIC S5 controllers, the mode “closed loop’” is known as ***’automatic”** and the mode “open **loop” is** known as **“manual”.**

Closed Imp control means that, depending on the setpoint input (W) and the current actual value (X), a fixed algorithm in conjunction with the control parameter is used to calculate the manipulated variable (Y) which is then output.

In open loop control, a selected manipulated variable (Yh) is output **directly.**
In both operating modes **“open loop"** and **"closed loop"** there is always a value input. With “’closed **loop”,** this is a setpoint and with **“open loop”,** this is a manipulated variable. Depending on the origin of the default value, the following **sources are differentiated:**

the **analog input** EW,
the programmer PG and
the programmable controller PLC.

The value is checked in the interpreter and may possibly be rejected with an error message (*input error* 4DH “selected *setpoint not within range"* or *4EH “selected manipulated variable not within range’)*

The corresponding command is only allowed from the interface from which the value is input (*input error 51H "command not allowed").*

If the module has been assigned the parameters for a step controller, you cannot set a manipulated variable in the "open loop control'* mode, but must access the two controller outputs "open" and "close" directly. Presetting a value via theanalog input EW is therefore not permitted(*input error 51H "command not allowed").*

A further function of the mode command depends on the preferred mode (see Section 1.6). This is exited with each mode command when it is no longer requested by the digital input "VB-N". As bng as it is requested, however, each mode command is rejected with the *input error 41H "preferred mode has priority".*

Mode commands "OL control"	Interface	DW from DB
BS 0- OL ace. to analog input EW	PLC + PG	
BS 1- OL acc. to PLC manip. var.	PLC	DW 97
BS 2- OL ace. to PLC manip. var.	PLC	DW 124
BS 3- OL ace. to PG manip. var.	PG	

Fig. 1.6 Table of "open loop" mode commands

Mode commands "CL control"	Interface	DW from
BR 0- CL acc. to analog input EW	PLC + PG	
BR 1- CL ace. to PLC setpoint	PLC	DW 97
BR 2- CL acc. to PLC setpoint	PLC	DW 123
BR 3- CL acc. to PG setpoint	PG	

Fig. 1.7 Table of "closed loop" mode commands

1.3.3 Controller Operation Commands

Controller operation commands are only executed **when the operating status "controller** OK" is set, otherwise they are rejected with the *input error 40H "controller not OK".*

In the preferred mode (see Section 1.6), they are also rejected and generate the input *error 41H "preferred mode has priority"* or *42H 'preferred mode still active".*

All these commands represent switches with which certain functions can be switched on or off. The switch settings are stored as operating statuses. The set mode "closed toop **control" or "open loop control"** cannot be changed.

If all the conditions for a particular command are fulfilled but the function already has the required status, an error message is generated *(input error 4AH "status already set')*

Controller operation commands	Interface
RB 0 - Switch on parameter set 2	PLC and PG
RB 1 - Switch off parameter set 2	PLC and PG
RB 2 - Switch on test setpoint branch	PLC and PG
RB 3 - Switch off test setpoint branch	PLC and PG
RB 4 - Setpoint ramp higher	PLC and PG
RB 5 - Setpoint ramp lower	PLC and PG
RB 6 - Stop setpoint ramp	PLC and PG
RB 7 - Switch on test actual value branch	PLC and PG
RB 8 - Switch off test actual value branch	PLC and PG
RB 9 - Manipulated variable ramp higher	PLC and PG
RB 10 - Manipulated variable ramp lower	PLC and PG
RB 11 - Stop manipulated variable ramp	PLC and PG

Fig. 1.8 **Table of controller operation commands**

Parameter set 2

Parameter set 2, just as parameter set 1, contains the control parameters R, Kp, TN and TV. Compared with parameter set 1, it is, however, not absolutely necessary for executing the controller function and does not always need to have values assigned. Parameter set 1 is intended for controller operation in the normal working range of the process. To allow special ranges to be controlled with a different system response or different requirements, such as running up or shutting down, the required **controller** response can be selected with parameter set 2. **With** the command "switch on parameter set 2", parameter set 2 will be used to calculate the manipulated variable in the **"'closed** foop control" mode instead of parameter set 1. Parameter set 1 can then be reactivated with the command "switch off parameter set 2".

The currently active parameter set is stored as an operating status.

The command 'switch on parameter set 2" is only allowed when parameter set 2 has had values assigned. Otherwise the ***input error 4CH "parameter set*** 2 ***not selected" is*** set.

After the IP 260 has started up with a data block and after it has had parameters **assigned** for the first time, parameter set 1 is active.

In the preferred mode and when executing the system command "read EEPROM" and the utility command *DB **input"** parameter set **1** is active. Theotheroperating commands do not influence the operating status "parameter set 2 **on/off"**.

The following applies from version 5 of **the IP** 260 and higher:
In the preferred mode, the currently active parameter set is retained. During "read EEPROM" and "DB input" the currently active parameter set is retained if possible.

Test **setpoint branch**

During the installation phase, or for testing, it may be necessary to switch off the **setpoint** branch. The **setpoint** is then taken as O%. This allows the controller response to be tested without the influence of a **setpoint** source. The controller functions in the same way as if there were a **setpoint** change in the "closed loop control" mode. The **setpoint** branch is reactivated with the command "test **setpoint** branch off".

The command "test setpoirrt branch on" is therefore only possible in the "closed loop **control" mode.** In the **"open loop control'* mode,** it is not executed and is rejected with the *input error 49H "test setpoint branch illegal".*

After the IP 260 has started up with a data block and has had parameters assigned for the first time, the test **setpoint** branch is switched off.

In the preferred mode and when there is a change of mode with the mode command "open loop control" it is automatically switched off. The other operating commands do not influence the operating status ‘lest setpoint branch on/off".

Setpoint ramp

The setpoint ramp allows a setpoint to be selected without generating an absolute value. Using the command "setpoint ramp higher" the setpoint rises with a selectable slope towards the upper limit of the working range. If the command "setpoint ramp lower" is executed, the value changes in the opposite direction towards the lower limit of the working range. The setpoint ramp can be stopped with the command “stop setpoint ramp”.

The ramp function is triggered by the optional ramp function generator in the setpoint branch. If this is missing, all three commands generate the *input error* 4&f *“ramp generator not selected”.*

In the **“open foop control” mode,** a change of setpoint is meaningless and the three commands are rejected with the *input error 48H “ramp function illegal in current mode”.* The setpoint can also not be influenced if the setpoint branch test is switched on, once **again** *input error 48H* is set. The ramp function can also not be executed if the setpoint is set via analog input EW since the analog signal is a fixed value generated externally (*input* error 47H *“ramp illegal because of EW selection").*

Following the start-up of the IP 260 with a data block and after the IP 260 has been assigned parameters for the first time, the setpoint ramp is stopped.

In the preferred mode when the test setpoint branch is switched on, when a data block is input, during the read data block from EEPROM function and whenever a mode command is executed, the ramp is stopped automatically to avoid changing the new value. The other operating commands do not influence the operating status "setpoint ramp higher/lower/stopped”.

Test **actual value branch**

During the installation phase or for test purposes, it maybe necessary to switch the actual value branch off. The actual value is then the selectable test value. A jump in the setpoint, triggered for example by the test function of the setpoint branch, then generates a constant error with which the controller’s response to the jump can be recorded at the manipulated variable output. The control loop is then separated and there is no longer a normal controller response with the actual value being fed back. The actual value branch is activated again with the command “test actual value branch off”.

The command "test actual value branch on" is not dependent on the mode currently set.

After the start-up of the IP 260 with a data block and following the assignment of parameters to the IP 260 for the first time, the "test actual value branch" is switched off.

It is switched off automatically in the preferred mode. The other operating commands do not influence the operating status "test actual value branch on/off".

Manipulated variable ramp

The manipulated variable ramp provides the same function in the **"open loop control" mode** as the setpoint ramp in the "closed **loop control" mode.** With "manipulated variable ramp higher" the set manipulated variable increases to a maximum 100%, with "manipulated variable ramp lower" the manipulated variable decreases to 0% or -1 00% and with "stop manipulated variable ramp", the function is stopped.

The following applies from veraion 5 of the IP 260 and higher: the manipulated variable ramp runs up to the maximum selected manipulated variable limit.

The ramp function is triggered by the selectable ramp function generator in the manipulated variable branch. If this is missing, all three commands generate the *input error 4BH "ramp generator not selected".*

A change of manipulated variable in the "closed **foop control"'** mode is meaningless and the three commands are rejected with the *input error 48H "ramp illegal in current mode".*

If the manipulated variable is set via analog input EW, the commands will also be rejected *(input error 47H "ramp illegal because of EW selection").*

Following the IP 260 start-up with a data block and after the IP 260 has had parameters assigned for the first time, the manipulated variable ramp is stopped.

In the preferred mode (see Section 1.6) and whenever a mode command is executed, the ramp is automatically stopped to ensure that the new value remains unchanged. The other operating commands do not influence the mode "manipulated variable ramp higher/lower/stopped".

If the module is operating as a step controller, the manipulated variable branch is not required, since the controller outputs "open" and "close" are accessed directly in the **"open loop control" mode.** The ramp function generator is not selected and each of the three commands for the manipulated variable ramp generates the *input error 4BH.*

1.3.4 System Commands

Two system commands are used to set the access rights (see Section 1.5). Both of these commands are only allowed from the programmable controller. If the right of access is already set, an input error is generated.

With the three system commands, the data block can be saved, read back or deleted in an EEPROM (non-volatile) on the module. An input error is set if there is no data block on the module or in the EEPROM (see Section 1.7).

With the system command ZE, the PLC interface is reset.

System commands	Interface
ES- Write DBto EEPROM	PLC and PG
EL - Read DB from EEPROM	PLC and PG
HF - Manual release (access from PG)	PLC
HS - Manual disable (access from PLC)	PLC
EU - Delete DB in EEPROM	PLC and PG
RE - Reset PLC interface	PLC

Fig. 1.9 Table of system commands

1.4 Monitoring Commands

The monitoring commands allow the programmable controller and programmer to fetch constantly changing variables, all operating statuses, errors and current values. In addition to this, the data block used by the module and other documentary information can be read. Since these commands do not change the controller function, they can be executed at any time from either interface, regardless of the access rights and the other modes.

Providing they exist, the requested data will be made available to the interface immediately. On the PG interface, COM 260 displays a message if the data are not available. In this situation, the programmable controller is informed by *PLC interface error 2.*

Monitoring commands	Interface	DW from DB
BO 1 Data Mock Output	PLC and PG	DW 16-96
BO 2 Control parameter set 1 output	PLC and PG	DW 31 -35
BO 3 Control parameter set 2 output	PLC and m	DW 36 -40
BO 4 Module configuration output	PLC and PG	DW 17
BO 5 Test actual output	PLC and PG	DW 68
BO 6 Identification output	PLC and PG	DW 114- 120
BO 7 Read monitoring points	PLC and PG	DW 98 -108
BO 8 Read status bits	PLC and PG	DW 109- 112
BO 9 Read module directory	PLC and PG	DW 121- 122
BO 10 Read actual values	PLC	DW 99, DW 101- 103 DW11O, 112
BO 11- Read condition codes (from version 5 of the IP 260 and firmware version V1.3 and release 2 of FB 170) Wiih a module with a version no. lower than 5, monitoring command BO 11 sets the PLC interface error (wrong command)	PLC	DW 98 -108, DW 110- 112
BO 15- Read PLC interface rror	PLC	DW113

Fig. 1.10 Table of monitoring commands

On the PG interlace, monitoring commands do not need to be triggered extra. They are used by COM 260 to display messages and data automatically to the user in the various COM 260 functions.

In contrast, all the monitoring commands via the PLC interface must be initiated by the user with FB170. These can only be issued when the command specified previously in FB 170 has been completed. FB170 reading errors automatically, however, guarantees that each module error resulting from incorrect operation and PLC interface errors and any change in the process status are updated immediately. The monitoring commands “read status bits” or “read PLC interface errors” are used.

The following applies from version 5 of the IP 260 and release 2 of FB 170 and higher:
The monitoring command BO 11 cannot be issued automatically by FB 170 (read condition codes automatically).

1.5 Access Rights

The right of access stipulates which of the interfaces can be used to control the module. This is necessary to prevent operation of the IP 260 controller module by the PG during operation with the programmable controller leading to unintentional reactions from the module. For example, a setpoint set by the PLC could be changed by a different setpoint entered at the PG or the whole controller response could be influenced by changing the control parameters. This is particularly critical when the manual intervention (from the control room) is carried out without checking the situation in terms of the programmable controllers.

Access rights: manual release/manual disable

Mode: open/closed loop control

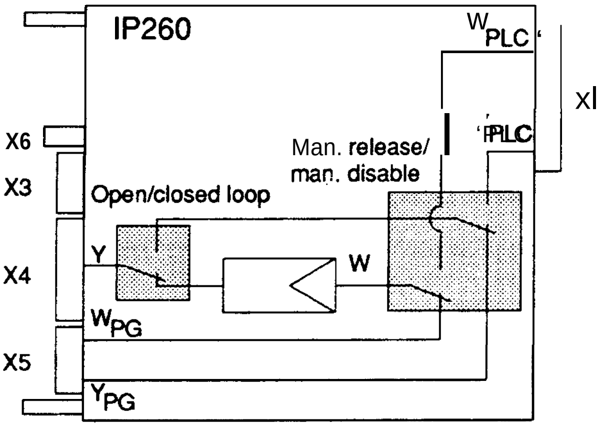


Fig. 1.11 Access rights

Manual release (access from PG)

Manual intervention means a command via the PG interface. This is only allowed when the manual release is active on the module. The operating status "manual release" is indicated by the green LED "PE" on the front panel of the module. This is set with the system command "manual release" which is only allowed from the PLC or is set automatically if the PLC fails. Instructions to the module from the PLC during the manual release are rejected with the *error 45H "access from PLC illegal, except manual disable".*

Manual disable (access from PLC)

With the operating command "manual disable" from the PLC, the manual release is blocked and access is assigned to the PLC (operating status "manual disable"). The green LED "PE" is no longer M. Instructions to the module from the PG during the manual disable are rejected with the *error 46H "access from PG illegal".*

PLC failure

if the programmable controller fails, this is recognized in two ways and the operating status "PLC failure" is set. On the one hand, the module scans the bus signal BASP every 20 ms, if BASP is active, a PLC failure is recognized and the module switches to manual release. On the other hand, the PLC must address the module at least once every 2.5 seconds (approximately), otherwise the module recognizes PLC failure. This is guaranteed if FBI 70 is called at least once per PLC cycle (the PLC cycle must not be longer than 2.5 seconds). If FBI 70 is not incorporated in the user program of the PLC, the module will recognize a PLC failure even though the PLC is operating (BASP not active).

After the IP 260 has started up, the manual release is set. Before the PLC can send instructions to the module, it must change the access rights with the 'manual disable" command.

The processing of all monitoring commands is independent of the access rights. They can be sent to the module by either interface at any time.

From version 2 of the module and release V1.1 of the firmware BASP is no longer evaluated and does not lead to the state "PLC failure" with "manual release".

1.6 Preferred Mode

The preferred mode is "**closed** loop **control"** or **"open loop control"** which can beset independently of the two interfaces and without a command. It is activated by the digital input "**VB-N,** preferred mode". The digital input must be switched to zero. This means that the preferred mode will be set even if there is a wire break or if the digital input is not connected. The preferred mode and the values to be used can be selected in the data block in data words DR 28 and DW 29.

Preferred mode

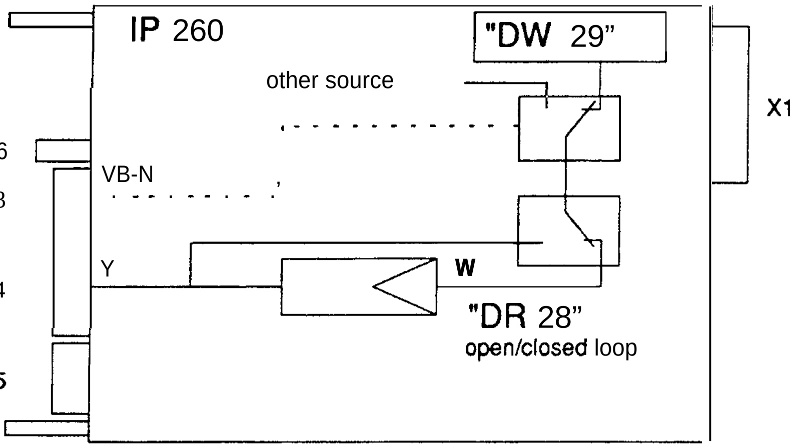


Fig. 1.12 **Preferred mode**

Preferred mode	DR 28 bit 0	Value set in data word DW 29	
		K controller	S controller
Open loop control	**0**	ana.: YLD to YUD **2 pt.: 0** to **10WO** **3 pt.: -100"/0** to **100%**	-32768 to 32768
Closed loop control	1	**Bmin** to **Bmax**	**Bmin** to **Bmax**

Fig. 1.13 **Table of preferred modes**

If an incorrect value is specified in data word DW29, *error 09H "value selected for preferred mode not in range"* will be generated during parameter assignment.

The preferred mode has the highest priority among the operating modes. As long as the digital input "VB-N" is zero, every mode and controller operation command will be rejected with the ***error 41H "preferred mode has priority".*** The set preferred mode can only be exited using a mode command after the digital input "VB-N" is set to 1. Until this occurs, the operating status "preferred mode" is set and all controller operation commands are illegal ***(error 42H "preferred mode still active").***

If the operating status "controller OK" is set, the preferred mode can be executed. In this case, the selected mode "closed loop control" or "open loop control" is set, the setpoint and manipulated variable ramps are stopped, the test modes for the actual value branch and setpoint branch are switched off and parameter set 1 is used. The operating status generated in this way can then no longer be influenced as long as the digital input "VB-N" is zero. The operating statuses for test operation, the ramps and the parameter set do not change when the preferred mode is exited. The operating status set before the preferred mode must be recreated with the corresponding mode and controller operation commands.

The following applies from version 5 of the IP 260 and higher:
The currently active parameter set remains selected.

By changing the setting at digital input "VB-N" it is also possible to switch the current mode of the module to the preferred mode with COM 260 even if the PLC has failed and the programmer is not connected.

⚠ Caution

If digital input "VB-N" is not wired up, no mode command can be executed!

1.7 Data Storage in the EEPROM

The data block in the RAM is lost whenever the power supply is switched off or fails. To avoid having to reassign parameters to the module each time using the utility command "DB input", there is an EEPROM on the module which serves as a non-volatile data memory. Its contents are retained when there is a power failure and can be rewritten by the firmware.

The EEPROM is used to store the data block of the IP 260. The system commands "write DB to EEPROM", "read DB from EEPROM" and "delete DB in EEPROM" allow data transfer with the EEPROM.

Writing to and reading from the EEPROM is always via the data block in the RAM of the IP 260, direct data transfer via one of the interfaces to the EEPROM or from the EEPROM is not possible.

Writing to the EEPROM

It is only possible to store the data block in the EEPROM if there is a valid data block in the RAM of the IP 260 (operating status "DB in RAM"). Otherwise the *error 43H "no DB in RAM"* is set. If the EEPROM is written to without error, there is then a valid data block in the EEPROM (operating status "DB in EEPROM").

Caution

⚠ **If** the EEPROM already contains a data block (operating status "DB in EEPROM") it will be overwriien without any confirmation being requested.

If an error occurs while writing to the EEPROM, this leads to ***error 3DH "EEPROM programming error".*** The operating status "no DB in EEPROM" **is** set and the operating status "DB in RAM" is retained.

Writing a DB to the EEPROM takes approximately 1 second. Since the operating commands are always processed one after the other, the controller function cannot be changed during this time with operating commands. Only activating the preferred mode can influence the controller function.

If the module supply voltage fails while the DB is being written to the EEPROM, the old data block from the EEPROM is no longer valid and the operating status "'no DE in EEPROM" and "no DB in RAM" is set following the next module start-up.

Reading from the EEPROM

Using the system command “read from EEPROM" the contents of the data block in the working memory can be defined again following changes. The operating status "DB in EEPROM" must be set, otherwise the *error 44H ‘no DB in EEPROM"* is set.

When reading out from the EEPROM, the data are checked. If an error is detected *(error 3CH “error in EEPROM")* the contents of the EEPROM are lost (operating status “no DB in EEPROM") and the data block in the RAM is not overwritten.

After switching on the module, this function is executed automatically if there is a data block in the EEPROM. If no errors occur, there is then also a data block in the RAM (operating status "DB in RAM” and "DB in EEPROM") and the module is ready for operation. For this reason, the data block should only be saved in the EEPROM when all the parameters match the process to be controlled. If modifications become necessary in the data block, these must also be saved in the EEPROM.

Deleting the EEPROM

If the module is to be used for a new task, it must have completely new parameters assigned. During this phase, it is more efficient to delete the contents of the EEPROM than to store each parameter modification immediately in the EEPROM. Using the system command “delete EEPROM" and by switching the power supply off, the module can be brought to the original operating status “no DB in RAM” and “no DB in EEPROM", i.e. the status before parameters were assigned. This is the status when the module is delivered.

1.8 Starting Up the IP 260

1.8.1 Start-up Response

When the power supply is switched on, the microprocessor on the module is reset and zero is output at all digital outputs and at the analog output. The manipulated variable output is switched to the external manipulated variable.

The firmware then runs through a check routine involving the following:

checksum code in the EEPROM,

adjustment data for analog inputs and output within the tolerance,

– function of all analog inputs without over and underflow.

During this test, the red LED "CFM" (Common Failure Message) flashes. If the test detects no errors, the "CFM" LED goes off, otherwise it is lit constantly and the module is not ready for operation. It cannot be addressed by either of the interfaces. This status can only be exited by switching on the power supply again. The start-up status is indicated by the LEDs “CM” (Controller Mode) and “PE”(Programmer Enable).

If the start-up was free of errors, the operating status “manual release” is set and the LED “PE” is lit. The “CM” LED is lit or not depending on the start-up mode.

Start-up status	LED "CFM"	LED “CM”	LED “PE”
Start-up ok	off	on/off	on
Wrong adjustment data	on	on	off
Analog inputs under or overflow	on	off	on
Code incorrect	on	on	on

Fig. 1.14 Table of start-up statuses

If the start-up statuses “incorrect adjustment data” and “code incorrect” occur, the module or the EEPROM must be replaced. The error “analog inputs not ready or overflow” can also be caused by incorrect wiring, wire break or a short circuit. If these causes can be discounted, the module must be replaced.

1.8.2 Start-up Mode

This mode is always executed when the module goes to the operating status “controller OK” after the power supply is switched Oil.

It is not executed when the operating status "DB in RAM” is set and the existing data block is overwritten with the command "DI 1, DB input” or “EL, read from EEPROM".

The start-up mode (DR 26) with the corresponding default value (DW 27) is stored in the data block. Here, all the mode commands “open loop control” or “closed loop control" can be entered with a setpoint or a manipulated variable. The mode is executed in the same way as a mode command or in the preferred mode (see Chapter 2).

Start-up mode	DR 26	Value set in data word DW 27	
		K controller	S controller
Open loop control EW	10H	not relevant	not relevant
Open loop control PLC	11H	aria.: YLD to YUD 2 pt.: O to 100% 3 pt.: -100%to 100″/0	-32768 to 32767
Open loop control PG	12H	ana.: YLD to YUD 2 pt.: o to 100%O 31X.: -100%to 100%	-32766 to 32767
Closed loop control EW	20H	not relevant	not relevant
Closed loop control PLC	21H	Bmin to Bmax	Bmin to Bmax
Closed loop control PG	22H	Bmin to Bmax	Bmin to Bmax

Fig. 1.15 Table of start-up modes

If data word DR 26 contains a value not listed here, the *error* 07H *“start-up mode not permissible controller mode”* is set during the parameter assignment.

An incorrect default value generates the *error 08H "value selected for start-up not in range”.*

With the selected start-up mode and the data stored in the EEPROM, the module can immediately execute a particular mode without further operator intervention and therefore output the required manipulated variable as soon as the power supply is switched on.

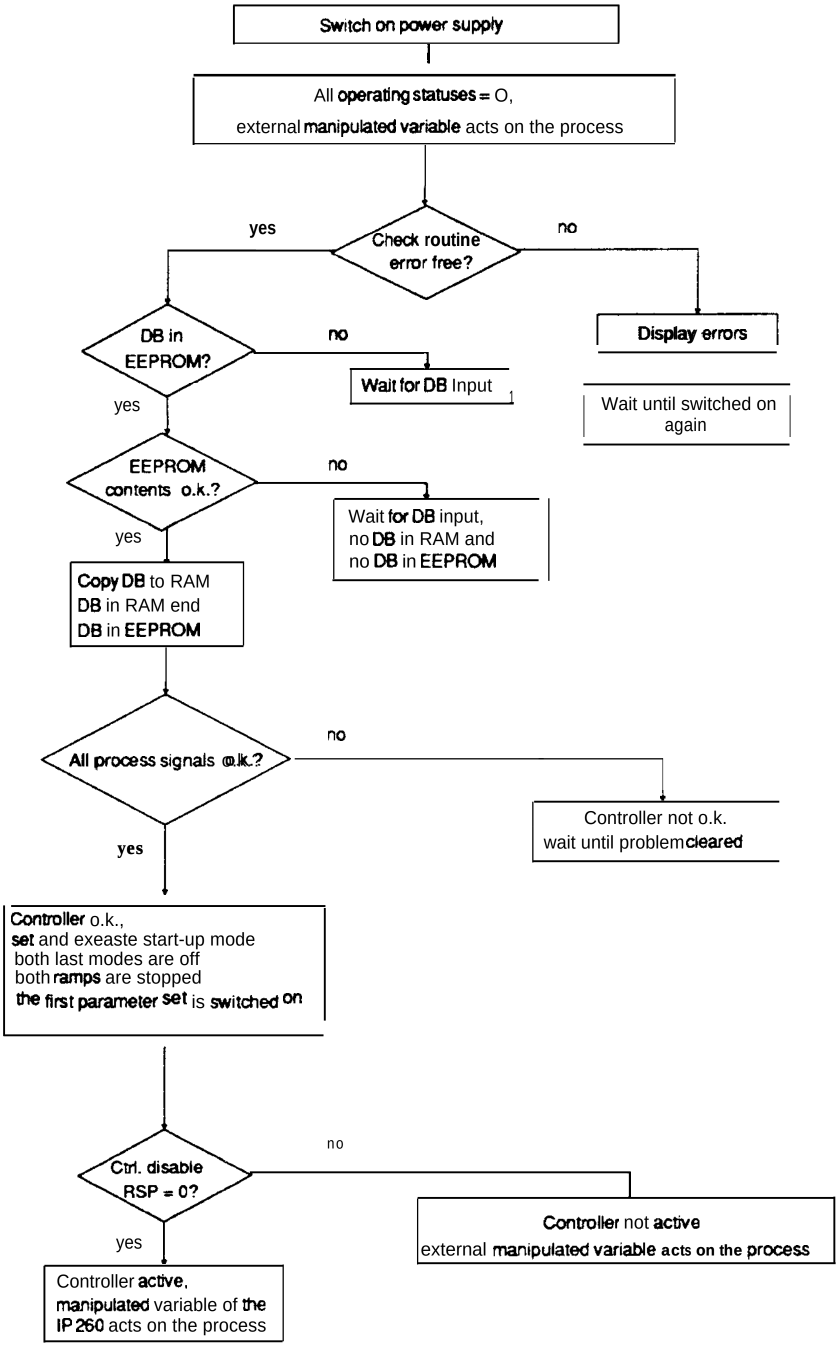


Fig. 1.16 Flowchart of the start-up procedure

2 Controller Function of the IP 260

2.1 General Notes

The controller function can be represented by an overall structure (refer to Part 6 for an overview of the structures) which characterizes the signal flow of the input signals to the output signals. The overall structure contains a section with the minimum function which can be expanded with the aid of structure switches. Depending on the selected structure, certain parameters can be entered in the data block of the IP 260 using utility commands during the parameter assignment phase. The structure of the data block is shown in Chapter 3.

Parts of this structure with a fixed function and a defined signal as input or output variable are known as branches. Within the branches there are individual sections or modules with defined transfer functions as stored in the firmware. Some of these can be influenced with switches.

The structure switches with their parameters are stored in the data block ordered according to branches. All the structure switches of the manipulated variable branch are called YS, the controller branch RS, the actual value branch XS, the setpoint branch WS, the auxiliary branch 1 AIS and auxiliary branch 2 A2S. The individual switches each have a number following the branch identifier (e.g. XS1).

Depending on the setting of the operation and structure switches, the input signals with the mrresponding transfer functions generate the required response. Since the calculation of the transfer functions is not continuous but is carried out at discrete points in time, the controller is described as digital. The interval between the points in time is constant and is known as the sampling time T_a. This means that following each sampling time, all the output variables of the branches are recalculated.

Note: To ensure that the response to these calculations almost corresponds to that of an analog controller, the sampling time must be small compared with the possible changes in the input variables.

2.1.1 Formats

The parameters in the data block must be entered in the following formats:

"Input"	corresponds **to the value to be** input
"Transfer with ID"	corresponds to the entry in the data block for **FB170**

Percentage format

Percentages are in the range from 0.00 to 100.007.. They are fixed point numbers with two decimal places.

The limit value range of the error limit value monitor **(DW** 41 to 44) is an exception. Since the error can assume values between -300.00% and 300.00%, the limit values must be set within this range. A manipulated **varible** in **DW 97 preset** between -100% and 100?40 is, under certain circumstances, also possible. Negative values must be transferred in two's complement. When displaying percentage values, the same range is used.

Input in %	Transfer
-300.00 to *300.00*	*-30000* to *30000*

Dimension format

Dimensional values are **4-digit** fixed point numbers, for which yw must stipulate he number of decimal places once. This number therefore specifies the accuracy of dimensional values. This is then the code number for all dimensional values. **Values are transferred** in two's complement when the number is negative.

Input in dimension	Transfer	code no.
-9999 to 9999	-9999 to 9999	*0*
-999.9 to 999.9	-9999 to 9999	1
-99.99 to 99.99	-9999 to 9999	2
-9.999 to 9.999	-9999 to 9999	3
-.9999 to .9999	-9999 to 9999	4

Time format

All times are entered in units of 1 second (s). The time value is a four-digit number between O and 9999. The time format code number contains the information about the number of decimal places of the **four-digit** number.

Input ins	Transfer	Code no.
0000 to 9999	0000 to 9999	2
000.0 to 999.9	0000 to 9999	3
00.00 to 99.99	0000 to 9999	4
0.000 to 9.999	Oooo to 9999	5

Example sampling time Ta

A sampling time of 80 ms is to be set. The value is converted to units of a second (0.080s) and the corresponding identifier for the required number of decimal places (three decimal places) is found (code number = 5). The value transferred is 80 in data word DW 24 and 5 in data word DR 25. Since final zeros have no function following the conversion to units of a second, the sampling time can also be transferred with data word DW 24 = 8 and data word DR 25 = 4.

Factor format

All factors are dimensionless fixed point numbers with two decimal places. They are four-digit positive values. No code number is required.

Input	Transfer
0 to 99.99	0 to 9999

2.1.2 Operation Switches

The structure can be changed without additional parameters during operation using operation switches (S). These can be influenced by all mode commands and controller operation commands as well as by the digital input "VB-N". The setting of all operation switches is stored in the operation status word.

S1: open loop /closed loop control
1.1: value set by PLC/PG
1.2: value set by EW

This switch can be set directly by all mode commands BS O to BS 3 and BR O to BR 3.

S2: preferred mode on/off

A negative-going signal edge (1 --> O) at the digital input "VB-N" activates this switch and therefore sets the preferred mode.

As long as the signal at digital input "VB-N" is O, the preferred mode cannot be switched off. It can only be switched off after a 1 signal followed by a mode command.

S3: setooint ramp higher

This switch corresponds to the controller operation command RB 4. It is switched off with the controller operation commands RB 5 and RB 6, when the test setpoint branch is switched on (S5) or when the preferred mode (S2) is activated.

S4: setpoint ramp lower

This switch corresponds to the controller operation command RB 5. It is switched off with the controller operation commands RB 4 and RB 6, when the test setpoint branch is switched on (S5) or when the preferred mode (S2) is activated again.

S5: test setpoint branch on/off

The switch is set with the controller operation commands RB 2 and RB 3. It can also be switched off when the preferred mode (S2) is switched on. The setpoint ramp (S3 and S4) is stopped when the test is switched on.

S6 and S7: setpoint ramp higher and lower

The switch settings can be modified as with S3 and S4 with the controller operation commands RB 9, RB 10 and RB 11. When the preferred mode (S2) is switched on, both are switched off.

S8: test actual value branch on/off

The switch is set with the controller operation commands RB 7 and RB 8. It is also switched off when the preferred mode is activated (S2).

S9: parameter set 2 on/off

The parameter set currently in use is selected with the controller operation commands RB O and RB 1. Following data block input with the commands DI 1 and EL and in the preferred mode (S2) the switch is off and parameter set 1 is active.

The following applies from **version 5 of the IP260 and higher:**
H possible the currently active parameter set remains selected.

2.1.3 Acquisition of Analog Values

Some of the input signals are acquired by the four analog inputs and then processed further. Analog value acquisition operates according to the integrating principle, i.e. the analog signal is averaged over 162Y3 ms or 20 ms and is made available as a number of pulses. This value is then free of disturbances caused by the power supply frequency (50 or 60 Hz) and its harmonics. In addition to this, all components with frequencies greater than the mains frequency are filtered by a low-pass filter. To ensure that the useful signal is clearly recognized, its frequency must not be greater than half of the power supply frequency. The firmware for measured value acquisition also generates the mean value of the newly acquired value and the last value used, to further suppress disturbances and to ensure more accurate processing.

If an underflow or overflow greater than 10% occurs during analog value acquisition, the value is incorrect and is restricted to 10%or110Yo until no underflow or overflow is recognized. If this occurs at the analog input for the actual value X, *error 52H "analog input X fault"* is set.

The analog input status (Al status) contains an identifier for underflow or overflow for each of the four analog inputs.

Analog input status (in DR 11 1):

Bit	status	Function
0	1	Underffow analog input EW
1	1	Overflow analog input EW
2	1	Underflow analog input Al
3	1	Overflow analog input Al
4	1	Underflow analog input X
5	1	Overflow analog input X
6	1	Underflow analog input A2
7	1	Overflow analog input A2

Fig. 2.1 Analog input status

2.1.4 Smoothing

The smoothing of analog input signals is carried out by the smoothing element (Gl). This is a first order delay element which suppresses all signal components with frequencies greater than the limit frequency of the smoothing element.

Since the output variable (Q) changes according to an E function if there is a sudden change in the input variable (I), the limit frequency can also be specified with the time constant τ. This corresponds to the selectable smoothing time (TG) with which the analog input signal can be filtered as required. The smoothing element is part of the controller structure wherever analog input signals with superimposed disturbances are acquired. This is the case in the setpoint, actual value and two auxiliary branches.

The algorithm of the smoothing element is calculated once per sampling time (Ta) and is as follows:

$$Q = GK\,(A_{old} - E) + E \text{ where}$$

$$GK = (2\,TG - Ta) / (2\,TG + Ta).$$

The smoothing constant (GK) describes the relationship between the sampling time (Ta) and the smoothing time (TG). The output variable can only change at each sampling instant. A faster action with a smoothing time constant TG less than the sampling time Ta can never be achieved and can therefore not be selected.

The following limits apply to the smoothing time TG:

$$Ta \leq TG \leq 32767{*}Ta$$

Note: The calculation of the algorithm is more accurate, the smaller the relationship TG/Ta is. When TG/Ta = 32 the accuracy is 1.

2.1.5 Ramp Function Generator

The ramp function generator (RFG) modifies the output variable in the shape of a ramp whenever there is a sudden change in the input variable (I). This is continued until the output variable has reached the value of the input variable.

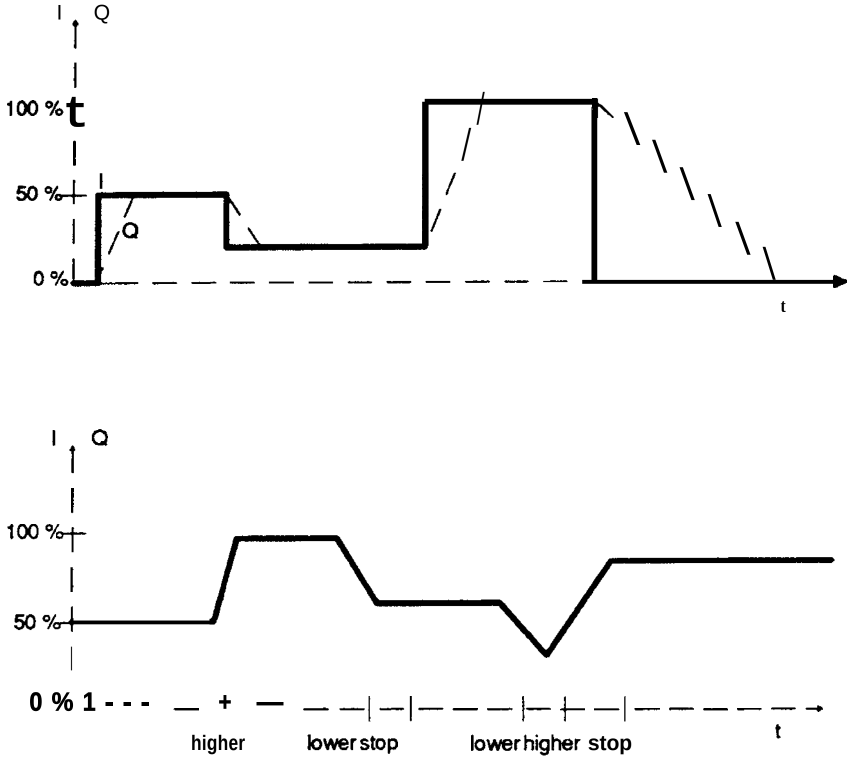


Fig. 2.2 Ramp function generator

The rate of rise of the output variable varies depending on the application. It can be selected with a given time for a change of 100%. The time required for the output variable to change from O to 100% is called the ramp-uptime (TH). The response of the ramp function generator output if there is a negative input change can be selected separately with the ramp-down time (TR).

The ramp-up rate is always used when the input value has increased. If the input value becomes less, the ramp-down rate is used.

Since the ramp function is run through at the same interval as the sampling time (Ta) the output ramp can be generated by adding an increment (INCH, INCR) related to the sampling time. The increments can be calculated as follows:

INCH = 10000• Ta / TH

INCR = - 10000• Ta / TR.

The smallest useful increment is 1, the greatest 10000. This means that the ramp-up or rampdown time must not be less than the sampling time and not greater than 10000 times the sampling time. This rule must be kept to when assigning parameters.

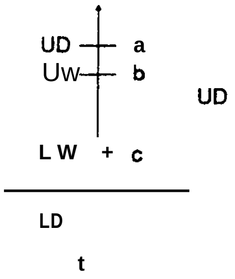
In the controller structure, there is a ramp function generator in the setpoint branch and one in the manipulated variable branch. During operation, the ramp function generator is responsible for converting sudden changes in the setpoint value or manipulated variable value into a ramp with a selectable slope to prevent sudden changes in the manipulated variable. The second function of the ramp function generator is to generate a value with the controller operation commands setpoint ramp or manipulated variable ramp. In this case, the input value of the ramp function generator is set to 100°A for ‘higher and to O°/. for “lower”. The value set then changes with the output variable until 10OO/. or O% is reached or until the controller operation command “stop ramp” is received.

The following applies from version 5 of the IP260 and higher:
The manipulated variable ramp runs up to the maximum selected manipulated variable limit.

2.1.6 Limit Value Monitor

The limit value monitor (LVM) monitors the amplitude of a signal at a fixed point in the controller structure. It does not limit the amplitude of the signal but indicates when limit values are violated or reached. The value of the limits depends on the signal type and signal source. You can select the limits to suit your particular requirements.

A limit value monitor always has two danger limits (LD, UD) and optionally two additional warning limits (LW, UW). Limit values are always in pairs, one upper and one lower value. Each limit value is assigned a bit in the limit value monitor status word. If the signal amplitude is within the valid range, none of the status bits are set. The status bit for an upper limit value is set when the limit value is reached or exceeded and for a lower limit value when the monitored signal reaches or falls below the limit. The status bit for a warning limit is also reset when the corresponding danger limit is violated. The individual limit values do not have any hysteresis.



Limit value monitor status

	UW	LW	UD	LD
Signal	O	0	1	0
Signal	O	0	0	0
Signal	0	1	0	0

Fig. 2.3 Limit value monitor function

When assigning the limit values, the following rules must be remembered:

- the upper and lower limit values must not be the same
- the limit values must increase in the following order: LD, LW, UW, UD.

Within the controller structure there are three limit monitors, one without warning limits in the setpoint branch, one with additional warning limits in the actual value branch and one to monitor the control error with warning limits in the controller block. Digital output "LVM" indicates that a danger limit has been reached by any one of the three limit value monitors, i.e. it can be used as a group signal for an optical or acoustic indicator or for control purposes.

The three limit value monitors are only processed in the "closed loop" mode. In the "open loop" mode the limit value monitor status word and the digital output "LVM" remain unchanged.

Limit value monitor status (in DW 110)

Bit	Status	Function
0	1	actual value lower danger limit XLD
1	1	actual value upper danger limit XUD
2	1	actual value lower warning limit XLW
3	1	actual value upper warning limit XUW
4	1	error lower danger limit XdLD
5	1	error upper danger limit XdUD
6	1	error lower warning limit XdLW
7	1	error upper warning limit XdUW
8	1	setpoint lower danger limit WLD
9	1	setpoint upper danger limit WUD
10	1	manipulated variable lower limit YLD
11	1	manipulated variable upper limit YUD

Fig. 2.4 Limit value monitor status

The following applies from version 5 of the IP260 and higher:
All three limit value monitors have a constant hysteresis of 2.00°A for each limit value. If the difference between the first upper and first lower limit value is less than 2. 00%, this difference is used as the hysteresis. When a status bit for a danger limit is set, the corresponding status bit of the warning limit is not cleared. The limit value monitors are also processed in the **"open loop control" mode.**

2.2 Controller Structure

Fig. 2.5, "Overall structure", shows the signal flow from the value input to the output of the manipulated variable Y to the controlled system in both modes. The branches are shown as blocks. Their function and how to assign parameters is described in Sections 2.2.1 to 2.2.5. All the required parameters are listed by specifying the data word (DW) and the *input error (BFEH). The input error is set when the parameter is transferred to the module if it is incorrect or outside its limits.*

The overall structure shown here has all three selectable controller types. The following controller types are possible:

- continuous (K) controller with analog manipulated variable output,
- continuous (K) controller with pulse output (open and close),
- step controller (S controller) with incremental control signal output (open and close).

Irrespective of the controller type, the output variable which influences the process is always the manipulated variable Y.

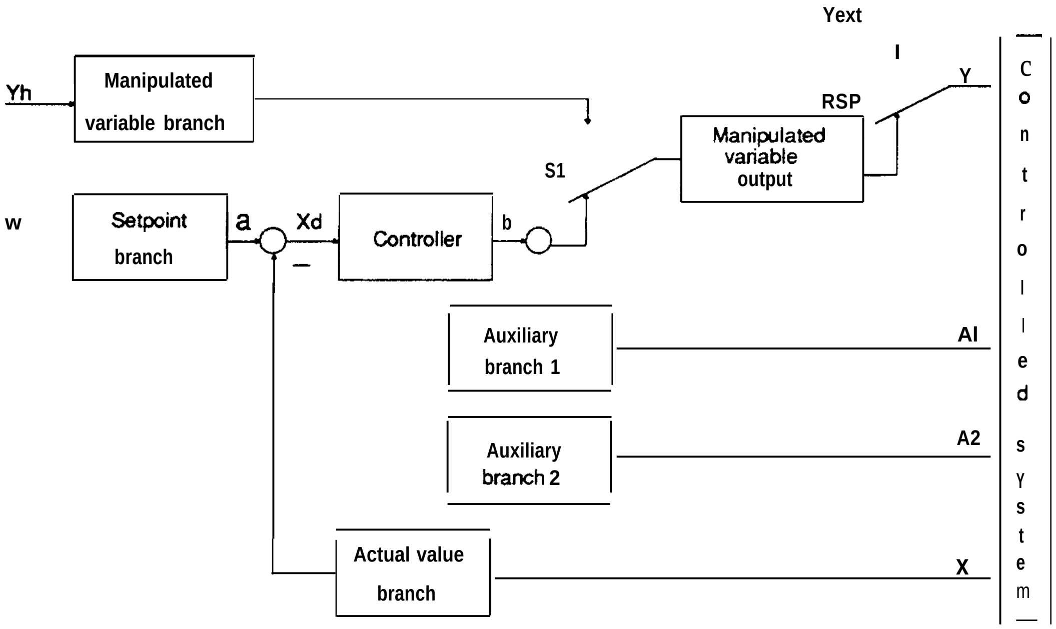


Fig. 2.5 Overall structure

The mode can be changed with operation switch S1.

In the **"open loop"** mode, the manipulated variable Y is generated via the manipulated variable branch and the manipulated variable output. Only the value of the manipulated variable Yh is required.

The fixed minimum structure with one setpoint branch, one actual value branch, the controller block and the manipulated variable output can be expanded by two connectable auxiliary branches. The sign used by the auxiliary branch and the point (a or b) at which it is effective can be selected. The finished structure then operates in the "closed loop" mode.

The controller continues to function without any change even if the programmable controller fails (see Section 1.6).

A cold or warm **restart** at the programmable controller also has no effect on the function of the module. Commands transferred to the **various start-up** blocks of the programmable controllers with the standard function block FB 170 are executed.

Note: Irrespective of operation switch S1, general parameters must be specified in the data block. These are located in data words DW 16 to DW 30. Not all of these influence the function, some of them are used for documentation and indication.

DB number:

DW 16		DB number	*BFEH OIH*

This is only for documentation, but should match the number of the data block used in the programmable controller. Numbers between 1 and 255 are allowed.

Module configuration:

DW 17	Module configuration	*BFEH 02H*

This stipulates the measuring range of each analog input and the output range of the analog output as either O to 10 V, O to 20 mA or 4 to 20 mA. In addition to this, the interference suppression of the integrating analog value acquisition can be selected for interference with frequencies between 50 Hz and its harmonics or 60 Hz and its harmonics.

The processing of the analog input signal is identical in the measuring ranges O to 10 V and O to 20 mA. The processing is different in the range 4 to 20 MA.

If an input or the analog output is not used, the module configuration must nevertheless be specified correctly.

Bit							
7	*6*	*5*	*4*	*1 3*	**2**	**1**	0
Al A2-1	AI A2-0	Al X-1	**AI X-0**	**AI A1-1**	Al A1-0	**AI EW-1**	**AI EW-0**

Bit							
15	14	13	12	**11**	**10**	9	8
50/60	xx	**xx**	**xx**	**xx**	**xx**	AQ -1	AQ -O

Air)-1	**Aln-0**	Meas. **range** of **analog** input n
0	0	0- 10V
0	1	**0 - 20 mA**
1	0	**4 - 20 mA**
1	**1**	**Not** allowed, *input error 02H*

AA-1	AA-0	**Output** range of analog output
0	0	0- 10V
0	1	**0 - 20 mA**
1	0	**4 - 20 mA**
1	1	Not allowed, *input error 02H*

50/60	Interference suppression for:
0	50 Hz interference and its harmonics
1	60 Hz interference and its harmonics

Dimension

DW 18-20	**Selected** dimensbn	I

This is six ASCII characters long and describes the dimension of the controlled variable. The information is not checked and is used for better documentation and display.

Dimension code

DW 21		Dimension code	*BFEH 03H*

The code is a number between O and 4. This specifies how many decimal places all the dimensional values have in the controller structure (see Section 2.1.1 “Dimension format”). This specifies the accuracy of dimensional values.

Range:

DW 22	Range minimum Bmin	*BFEH 05H*
DW 23	Range maximum Bmax	*BFEH04H*

Both parameters are dimensional values. Along with the dimension entered and the dimension code, they define the range of the controlled variable.

All other dimensional parameters and values must be within this range.

Note: The dimensional monitoring points are also displayed with the selected accuracy within the range.

For internal processing of dimensional values and values in percentages, the range is converted to O% to 100.00%, i.e. the range minimum corresponds to the percentage value O°/G and the range maximum to the percentage value 1OO.OO°/.. If the difference between the two range limits is greater than 10000, accuracy is lost in this conversion.

The range maximum can lie between -9999 and 9999. The range minimum must be less than the maximum but not less than -9999.

Sampling time:

DW 24	Sampling time Ta		*BFEH 06H*
DW 25		Ta cede	

The time between one complete controller structure processing cycle to the next is known as the sampling time Ta. The value of the sampling time can only be assigned correctly by taking into account the controlled system and the type of controller being used. The controller must always be able to react quickly to changes in the controlled system. Since the most important parameter for the reaction of the controller is the sampling time, this should be much less than the controlled system delay Ts.

The following can be taken as a rule of thumb:

la <10 Ts.

All other times in the data block should be considered relative to the sampling time, since the particular function will always be carried out at the sampling instant. If the selected sampling time is too short, it is possible, owing to the limited accuracy of the calculations, that the output variables of the individual function will be incorrectly calculated. This is particularly true with regard to the I action in the control algorithm and to the smoothing element.

Each time must always be specified in a defined format (see 2.1.1, Time format). This allows times between 1 ms and 9999 seconds to be specified.

On the module, the sampling time can only be generated as a multiple of 20 ms, i.e. times less than 20 ms or not a multiple of 20 ms are not allowed.

Note: The upper limit of 9999s must not be exceeded.

With the S controller, the smallest specifiable time is 60 ms.

Mode after start-up:

DW 26		Mode after start-up	*BFEH 07H*
DW 27	Default value for mode after start-up		*BFEH 08H*

Here, you specify the mode (DR 26) and, if required, also a default value (DW 27). It is executed just as other mode selections by a mode command or the preferred mode. However, this is only the ease when a data block is transferred to the RAM for the first time after switching on the power supply and when the status **"controller** OK" is set. This relationship and the permitted assignments in data words DR 26 and DW 27 are explained in Section 1.8 "Starting up the IP 260".

Preferred **mode:**

DW 28		**Preferred mode** **M**	
DW 29	Default value for preferred mode		*BFEH 09H*

As with the start-up mode, you must also make two specifications here. With bit O in data word DR 28, yw select the mode (bit O = O means **“open loop”, bit O = 1** means “closed **loop”).** The preferred mode and the permitted range of default values is described in Section 1.6.

Single or master/slave operation:

DW30 bit2		Master/Slave	*BFEH 37H*

The structure switch RS2 corresponds to bit 2 in data word DR 30. The module operates alone or as the master in master/slave operation (if RS2 = O). If the bit is set (RS 2 = 1) the slave module monitors the second module selected as master (see Chapter 5).

Note: With the K controller with pulse output, master/slave operation is not permitted, i.e. RS 2 must be zero.

Disable controller RSP:

With the digital input "RSP", disable controller, the calculated manipulated variable Y is disconnected from the process and an external manipulated variable Yext is fed to the process.

For analog manipulated variable output, the external manipulated variable must be wired to the module (connector X4) since the switchover is implemented by a relay.

When using the controller outputs “open” and “close” the external manipulated variable can be wired directly parallel to these. Make sure that the external manipulated variable is switched off when the RSP function is not active.

The calculated manipulated variable acts on the process when the digital input "RSP" is zero. If the digital input "RSP" is 1, a switchover is made to the external manipulated variable.

If an existing module configuration or controller type is changed, the controller must be disabled. Otherwise the error 3AH is set. Before the new module configuration or controller type is set, the status ‘controller OK” and the digital output “RB” are reset and only set again when:

- the analog input X is not disturbed,
- the digital outputs are not short circuited and
- both limit switches have not responded simultaneously (only with S controller).

When the controller is disabled, the whole controller structure is processed and all operation switches can be changed. Further reactions, however, depend on the controller type:

- S controller and K controller with pulse output:

  In the “closed loop” mode, the last manipulated variable or with the S controller the last setting, is maintained and the controller is corrected according to the current actual value. The “open loop” mode is executed as when RSP = O. When switching over to the calculated manipulated variable (RSP = O), take care that this matches the external manipulated variable to prevent a sudden reaction at the actuator. This is particularly important with the K controller and can be achieved by setting the value of the external manipulated variable in the “open loop” mode.

- K controller with analog manipulated variable output and without feedback:

  The response is as for the S or K controller with pulse output (see above).

- K controller with analog manipulated variable output and with feedback:

  The analog input AZ has been selected for position feedback (see Section 2.2.3). In both modes, the controller is corrected to this manipulated variable and the current actual value. The switchover from the controller disabled status is bumpless without any further measures being required.

Analog input X fault, *error 52H*

As soon as the actual value is acquired with an underflow or overflow greater than 10%, this error is set. It is cleared automatically when the actual value is once again in the permitted range.

Short circuit on digital outputs, *error 53H*

This error is generated by overload or a short circuit on one of the four digital outputs. It is automatically cleared when the cause has been dealt with.

Both limit switches active (S controller), *error 54H*

If both limit switches with the S controller respond simultaneously, this error is set. It is cleared automatically as soon as one of the limit switches is no longer active.

Response to *input errors 52H* to *54H*

During operation the status “controller OK” is not affected. If the controller is not disabled, the calculated manipulated variable controls the process. The set mode **and** the settings of the other operation switches are retained.

In the "closed loop” mode, the last manipulated variable or setting for the S controller is retained and the controller is corrected according to the current actual value. Once the cause of the error has been cleared, the controller continues as normal. The **“open loop” mode is** executed as if there were no error.

A change of mode and all other operation switches can be influenced. The effects of the operation switches are only noticed in the *’closed **loop mode”** when the cause of the error has been eliminated.

If an input error occurs during this state, it maybe overwritten by the *input errors 52H* to *54H.*

With the S controller and *input error 54H* the actuator can no longer be moved in any mode.

After the IP 260 has started up the state “controller OK^{w} is not set if one of the input errors 52H to 54H are active.

The following applies from version 5 of the IP260 and higher:
The response to *input errors 52H to 54H* can be selected using the parameter ‘response to external errors".

Response to **external** errors:

DW30 bit 4		Follow-on/ closed loop	

bit4 = O: follow-on mode, response as described above
= 1: “closed loop control”, despite an error the
controller continues with closed loop control
and after start-up the state “controller OK” is set.

2.2.1 Setpoint Branch

The setpoint branch is illustrated in Fig. 2.6. The defauft setpoint is processed hereto generate the error at point a. The default setpoint is available at monitoring point "MP WI" (DW 98) and the processed setpoint in dimensional values at monitoring point "MP W2" (DW 99). The effect of the setpoint branch on point a is always positive.

The following applies from version 5 of the IP260 and higher:
The monitoring point "MPW 1 "(DW 96) is located after the weighting factor FW.

Data word and bit	status	Structure
DR 55 bit O	0 1	WSO without ramp function gen. WSO with ramp function gen.
DR 55 bit 1	0 1	Without smoothing with smoothing

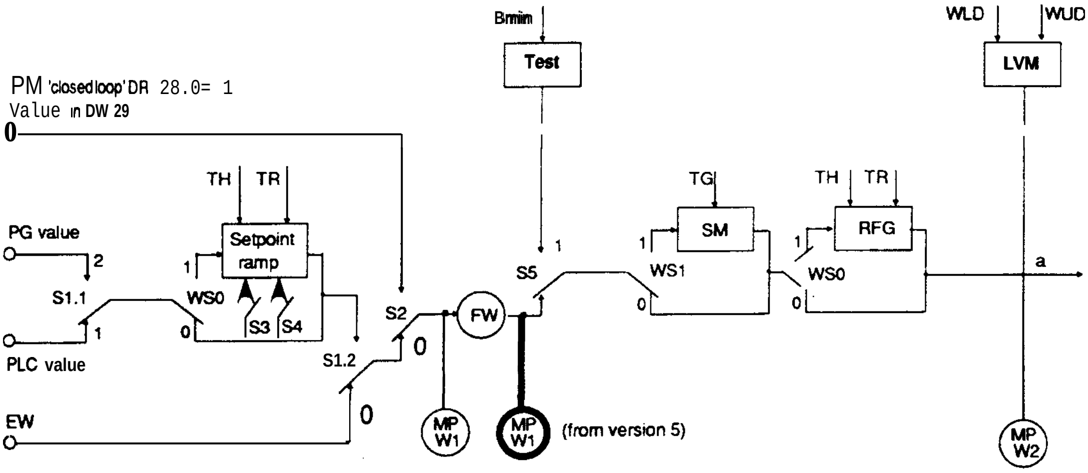


Fig. 2.6 Setpoint branch

Default setpoint, operation switches S1, S2

The generation of the default setpoint ("MP WI") depends on the operation switches S1 and S2. The source of the setpoint is selected in the "closed loop" mode, using operation switches S1 and S2. Possible sources are the analog input EW, the PLC, the PG and the default value for the preferred mode.

Operation switch S1 can be set to its three settings with the mode commands BR O to BR 2. The “closed loop” mode is then always set.

At setting 1 and 2 of operation switch S1 a change in the default **setpoint must** be made with the mode commands **BR 1** or BR 2. Dimensional values between **Bmin** and **Bmax** in data word DW 97 are accepted as a valid **setpoint.** If the values are outside the range, the old value and mode remain set and *error 4DH "selected setpoint not within range”* is set.

If the source is analog input EW (**S1** = O), the value determined by the measured value acquisition is used at each sampling instant. This is between **Bmin** and **Bmax,** providing it was acquired without underflow or overflow.

The preferred mode is switched on with operation switch S2 (**digital** input "VB-N" = O) when “closed **loop”’** has been selected with the data word DR 28.0. It is switched off (digital input "VB-N" = 1) with each of the operating **commands** BR O to BR 2 or BS O to BS 2.

The following applies from version 5 of the IP260 and higher:
Setpoint input from the PLC is also possible with the mode command BR 2 from DW1 23.

Setpoint ramp, operation switches S3 and S4

The **setpoint** ramp is a further method of changing the **setpoint.** It can only be used when the ramp function generator has been selected in the **setpoint** branch *(error 4BH "ramp generator not selected").* The **setpoint** ramp can be generated with operation switches S3 and S4 with the preferred mode switched off (**S2** = O) and the **setpoint** set by the **PLC** (**S1** = 1) or PG (**S1** = 2).

The setting of switches S3 and S4 is as follows:

	S3	S4
Command RB4“setPoint ramp higher"	1	0
.CaTImand RB5“setPoint ramp lower"	o	1
Command RB 6 "stop s etpoint ramp”	0	0

Weighting factor FW:

DW 56	Weighting factor FW	BFEH20H

For interconnecting controllers (e.g. ratio and mixed control) or to weight the setpoint input, there is the factor FW. This is located in data word DW 56 and can be a value in the factor format (see Section 2.1.1) between 0.01 and 99.99.

Test setpoint branch, operation switch S5

Setpoint input can be switched off with the operation switch *S5.* At setting 1, the range minimum is then used as the setpoint. The setting can be changed with the two controller commands RB 2 and RB 3.

Smoothing:

DW 60	Smoothing timeTG		*BFEH 23H*
DW 61		TG code	

The smoothing module in the setpoint branch can be structured with structure switch WS1(DR 55.1). Its function is described in Section 2.1.4. If switch WS1 = 1, the smoothing time TG must be assigned in time format (see Section 2.1.1) in data words DW 60 and DW 61. It must not be less than the sampling time and not greater than 9999 seconds or 32767• sampling time. The assignment is not required if switch WS1 = O.

Ramp function generator:

DW 57	Ramp-up time TH		*BFEH 21H*
DW58	Ramp-down time TR		*BFEH 22H*
DW 59	TH code	TR code	

The ramp function generator in the setpoint branch can be structured with structure switch WS0 (DR 55.0). Its function is described in Section 2.1.5. If switch WS0 = 1, the ramp-up and ramp-down time must be assigned in time format (see Section 2.1 .1) in data words DW 57, DW 58 and DW 59. Both times (TH and TR) must be at least as long as the sampling time and a maximum of 10000 times the sampling time or 9999 seconds. The assignment is not necessary if switch WS0 = O.

Limit value monitors:

DW 62	LVM setpoint WUD	BFEH24H
DW 63	LVM setpoint WLD	BFEH25H

At the end of the setpaint branch, the dimensional **setpoint** indicated at monitoring point "MP W2" is monitored by a two-level limit value monitor. Its function is **described** in Section 2.1.6. The LVM status word (DW 11 O) **contains** the information about limit value violations in bit 8 and bit 9. Both limit values must be within the range **Bmin** and **Bmax,** whereby the upper WUD (DW 62) must always be greater than the lower WLD (DW 63).

The processing of the setpoint branch is always at the sampling instant. In the 'closed loop" mode, the **setpoint** is used to " generate the error at monitoring point "MP W2". This value is **limited within the range limits Bmin and Bmax. The whole setpoint branch, except for the limit value monitor, is also processed in the "open loop" mode.**

The following applies from version 5 of the IP260 and higher:
The limit value monitors are also processed in the "open loop" mode.

2.2.2 Actual Value Branch

In the actual value branch (see Fig. 2.7), the actual value X generated by the **controlled** system is processed to provide the **current** controlled variable. The input to the actual value **branch** is always analog input X. The acquired actual value possibly with the root extracted and weighted is indicated as a dimension at monitoring point "MP XI" (DW 100) and the value used to generate the error at monitoring **point** "MP X2" (DW 101). The actual value branch always acts on point 'a" negatively.

The following applies from version 5 of the IP260 and higher:
The monitoring point "MPX1" (DW1OO) is after the **weighting** factor FX.

Data word and bit	status	**Structure**
DW 64 bit O	**0** 1	**Xso** without root **extractor** XSO with **root** extractor
DW 64 bit 1	**0** 1	**XS1** with smoothing **XS1** without smoothing

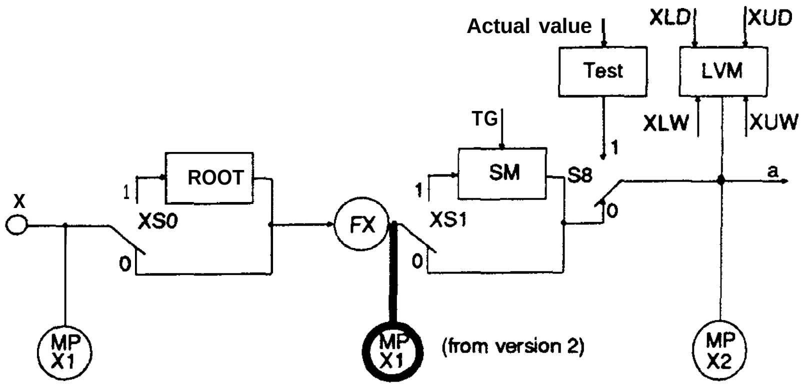


Fig. 2.7 Actual value branch

Root extractor

The structure switch XS0 (DR 64.0) determines whether the root of the acquired actual value (“MP XI”) is extracted (XS0 = 1) or not (XS0 = O). The root extractor is useful when the measured value (M) acquired via analog input X corresponds to the square of the actual controlled variable (X), as follows:

$$M = X^2$$

In the root extractor, the mot of the normalized input signal (M) is extracted and represented in the working range. The measured value can be a value between O% and 100.009’.. In the internal representation, a value X from 0% to 100.00% is obtained according to the following algorithm:

$$X = 100 \cdot \sqrt{M}$$

Between the measuring sensor and the analog input X, there is usually a measuring transducer which generates a normalized signal (e.g. O to 10 V) from the sensor output signal. It must be able to deal with a possible offset of the sensor characteristic and be able to amplify it.

Weighting factor FX:

DW65	Weighting factor FX	*BFEH 26H*

You can weight the actual value with the factor FX, e.g. for mean value control with the aux. branches or for measured value matching. The weighting factor in data word DW 65 can have values in the factor format (see Section 2.1.1) between 0.01 and 99.99.

Smoothing:

DW 66	Smoothing time TG		BFEH27H
DW 67		TG code	

The smoothing module in the actual value branch can be structured with structure switch XS1(DW 64 bit 1). Its function is described in Section 2.1.4. If the switch XS1 = 1, the smoothing time TG must be assigned in time format (see Section 2.1 .1) in data words DW 66 and DR 67. It must not be less than the sampling time and not greater than 9999 seconds or 32767*sampling time. The assignment is not necessary if switch XS1 = O.

Test **actual value branch, operation switch S8**

The two controller operation commands RB 7 and RB 8 affect operation switch S8. This can be used to disconnect the actual value branch for testing, during which a selectable test value is set as the actual value at monitoring point "MP W2".

DW 68	Actual value for test mode	*BFEH28H*

The test value is a dimensional value between Bmin and Bmax.

Limit value monitor

DW 69	LVM actual value XUD	*BFEH 29H*
DW 70	LVM actual value XUW	*BFEH 2AH*
DW71	LVM actual value XLW	*BFEH 2BH*
DW 72	LVM actual value XLD	*BFEH 2CH*

At the end of the actual value branch the dimensional value indicated at monitoring point "MP X2" is monitored by a four level limit value monitor. Its function and parameter assignment are described in Section 2.1.6. The violation of one of the four limits is indicated in the LVM status word (DW 110) in bits O to 3. All limit values must be dimensional values between Bmin and Bmax.

The actual value branch is processed at each sampling instant. In the “closed **loop” mode.** the actual value at monitoring point "MP X2" is used to generate the control error. This value is limited between the range limits Bmin and Bmax. The whole actual value branch apart from the limit value monitors is also processed in the “open loop” mode.

The following applies from version 5 of the IP260 and higher:
The limit value monitors are also processed in the “open loop” mode.

2.2.3 Auxiliary Branches

The fixed controller structure with one setpoint branch and one actual value branch can be expanded with two auxiliary branches. Both auxiliary branches (see Fig. 2.8) have a similar structure, the first is auxiliary branch 1 (Al) and the second auxiliary branch 2 (A2). They are generally referred here as An. They can be used for the following functions:

- feed back YR with disable controller function with auxiliary branch 2,
- feed forward to controller output (point b),
- feed forward to controller input (point a),
- closed loop control with an auxiliary controlled variable (point a),
- closed loop control according to the mean value of max. 3 actual values (point a) etc.

These various functions are made possible by varying the structure of the auxiliary branches.

Data word and bit	status	Structure
DW 73/80 bit O	0 1	AnS0 without auxiliary branch 1 AnS0 with auxiliary branch 1
DW 73/80 bit 1	0 1	AnS1 auxiliary branch affects the controller output AnS1 auxiliary branch affects the summation point
DW 73/80 bit 2	0 1	AnS2 auxiliary branch effective with positive sign AnS2 auxiliary branch effective with negative sign
DW 73/80 bit 3	0 1	AnS3 Without smoothing AnS3 with smoothing
DW 73/80 bit 4	0 1	AnS4 without delayed derivative unit AnS4 with delayed derivative unit
DW 73/80 bit 7	0 1	A2S7 H2 branch not as feedback YR with RSP A2S7 H2 branch as feedback YR with RSP

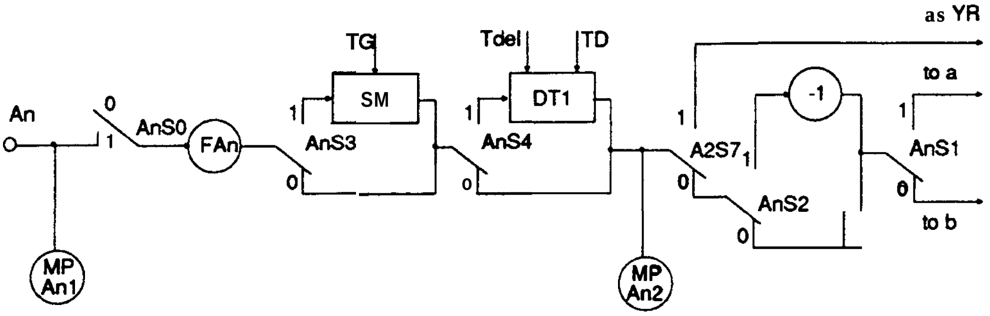


Fig. 2.8 **Auxiliary branches land 2**

The input of the auxiliary branch is the corresponding analog input An. The signal acquired by the measured value acquisition is always indicated at monitoring point "MP An" " as a percentage.

Switch on auxiliary branch, DW 73 bit O = 1 or DW 80 bit O = 1:

Using the structure switch AnS0 = 1, the auxiliary branch can be linked into the controller structure. The correct assignment in data words DW 74 to DW 79 or DW 81 to DW 86 is only necessary when the auxiliary branch is required.

Feedback YR, DW 80 bit 7:

With a K controller type with analog manipulated variable output, auxiliary branch 2 can be used to feed back the manipulated variable. If the controller is disabled (RSP = 1) the value at monitoring point "MP A22" is used as the manipulated value acting currently on the process to correct the controller and to allow a bumpless switchover when RSP is reset.

If the structure switch A2S7 = 1 (DW 80 bit 7 = 1) switches A2S1 and A2S2 (DW 80 bit 1 and DR 80.2) are ignored.

The *error 39H "illegal A2 branch structure"* is set when:
. the structure switch A2S4 = 1 when feeding back,
- when the feedback is switched on (A2S7 = 1) with the controller types S controller or K controller with pulse output.

In master/slave operation with a K controller with analog manipulated variable output, the slave module must have parameters assigned for feedback (A2S0 = 1 and A2S7 = 1), so that it is constantly corrected in the disabled status. The *error* 38H *"master/slave operation without YR illegal"* indicates a different parameter assignment.

Auxiliary branch output, DW 73 bit 1 and DW 73 bit 2 or DW 80 bit 1 and DW 80 bit 2

The effect of the auxiliary branch **output** is determined by the structure switches **AnS1(DW** 73 bit 1 or DW 80 bit 1) and **AnS2** **(DW** 73 bit 2 or DW 80 bit 2).

If switch **AnS1** = O, the auxiliary branch acts on the controller output (point b). If switch **AnS1** = 1, it acts on the controller input (point a) and is used to form the control error.

The effect is positive if the switch**AnS2** = O. The effect is negative if switch **AnS2** = 1.

Regardless of the two structure switches **AnS1** and AnS2, the output variable is available at monitoring point "MP An2" as a percentage between -lOO.OO°/. and 1OO.OO°A.

When controlling according to the mean value of the actual value and auxiliary branches, remember the following:
The display of the actual value **(MPX1** and MPX2) is in a dimension and the display of the auxiliary branch **(MPAn1** and **MPAn2)** is as a percentage. This means that the two displays are not directly comparable.

Weighting factor FAn:

DW 74	Weighting factor FA1	*BFEH 2DH*
DW 81	Weighting factor **FA2**	BFEH31H

Weighting of the input value for e.g. mean value control, is achieved with the **factor FAn**. This is located in data word DW 74 or DW 81 and can be a value in the factor format (see Section 2.1.1) between 0.01 and 99.99.

Smoothing:

DW75	Smoothing time TG		BFEH2EH
DW76		**TG code**	
DW 82	Smoothing time TG		BFEH32H
DW 83		**TG code**	

The smoothing module in the auxiliary branch can be structured with structure switch **AnS3 (DW** 73 bit 3 or DW 80 bit 3). Its function is described in Section 2.1.4. If switch **AnS3** = 1, the smoothing time must be assigned in the time format (see

Section 2.1.1) in data words DW 75 and DW 76 or DW 82 and DW 83. It must not be less than the sampling time and not exceed 9999 seconds or 32767*sampling time. The assignment is not required if switch AnS3 = O.

DT1 module

DW 77	Time constant TD DT1 module AI branch		*BFEH 2FH*
DW78	Delay time Tdel		BFEH30H
DW 79	TD code	Tdel code	
DW 84	Time constant TD DT1 module A2 branch		*BFEH33H*
DW 85	Delay time Tdel		*BFEH34H*
DW 86	TD cede	Tdel code	

The function of the DT1 module corresponds to that of a real derivative action. With this, it is only possible to feed changes in the auxiliary variable (e.g. auxiliary controlled variable or disturbance with the S controller) to the controller. The module is switched on in the auxiliary branch with structure switch AnS4 (DW *73* bit *4* or DW 80 bit *4).*

Note: It is not allowed in auxiliary branch 2*(error 39H)* if the auxiliary branch has parameters assigned for feedback (A2S7 = 1).

The DT1 module is divided into two parts as follows:

- The derivative action which is assigned a time constant TD (DW 77 and DL 79 or DW 84 and DL 86). It amplifies the change in the input variable (1) of the DT1 module relative to the sampling time. The time constant TD in the time format (see Section 2.1.1) must not be less than the sampling time and must not exceed 9999 seconds.
- The delay action, which is assigned the delay time Tdel (DW 78 and DR 79 or DW 85 and DR 86). It is a first order time delay element and delays the decay of the output variable (Q) when the input variable is constant. Its algorithm corresponds to that of the smoothing element (see Section 2.1 .4). The delay action can be disabled by assigning Tdel = O. The delay time Tdel in time format (see Section 2.1.1) must not be less than the sampling time and not exceed 9999 seconds or 32767*sampling time.

The total algorithm for the DT1 module is as follows:

$$Q = DK2\,[Q_{old} - DKI\,(I - I_{old})] + DKI\,(I - kid) \quad \text{where}$$

DK1 = TD /TA and

DK2 = (2 Tdel - Ta) / (2 Tdel + Ta).

The auxiliary branches are processed at each sampling instant. In the “closed loop” mode the value at monitoring point ‘MP An2” is connected to point a or point b. This percentage value is limited between -100.00% and 100. OOl?4O.

2.2.4 K Controller with Manipulated Variable Output

With the **continuous** controller, two different controller types with different manipulated variable output can be implemented. The structure switch **RS0** = O (DW 30 bit O = O) must always be set.

Data word and bit	Status	Structure
DW 30 bit O	0 1	**RS0 K controller** **RS0 S controller**
DW 30 bit 1	0 1	**RS1** without second parameter set **RS1** with **second** parameter set
DW 30 bit 2	0 1	RS21P 260 is master RS21P 260 is slave
DW 30 bit 3	0 1	**RS3 K controller - analog output** **RS3** K controller - pulse output

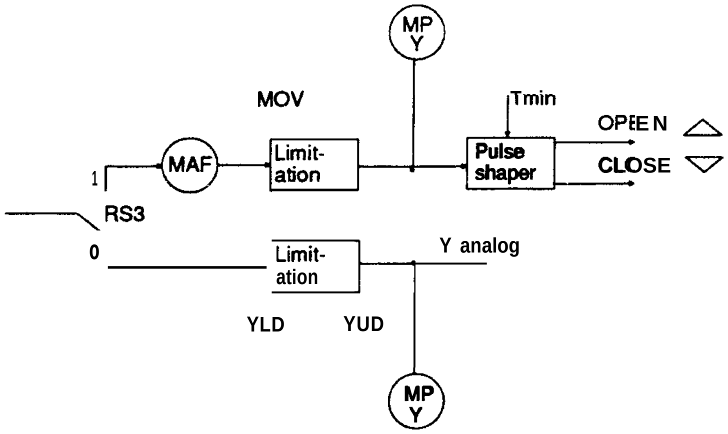


Fig. 2.9 **Manipulated variable output K controller**

In each mode the K controller generates the absolute position of the actuator, i.e. the output manipulated variable corresponds to the setting of the actuator.

To allow the controller to react quickly to changes, the sampling time must be considerably shorter than the total system delay.

The two possible controller types are selected with structure switch RS3 (DW 30 bit 3). IfRS3 = O, the manipulated variable is output via the analog output of the module. The digital outputs "open" and "close" are used when RS3 = 1.

The two digital inputs "limit switch'"Iopen-N" and "Iclose-N" are of no significance for the K controller. They can nevertheless be used if their status is updated every 20 ms on the module. After reading the status bits (monitoring command B08) they are located in data word DW 109 bit 1 (IoPen-N) and DW 109 bit 2 (Iclose-N).

RS3 = O, K controller with analog manipulated variable output

The manipulated variable Y as a percentage is converted directly to the output range of the analog output. The zero point of the output range corresponds to 0?'. and the final value corresponds to 100.00%.

Manipulated variable limitation:

DW 45	Y Imitation YUD	*BFEH 18H*
DW 46	Y limitation YLD	*BFEH 19H*

The two limits are always between O% and 100.00%.YUD must not be less than 0% or greater than 10O.OOO/. and the lower value YLD must always be less than the upper value.

A manipulated variable outside the range is limited. Which of the two limits has been violated can be found in the LVM status word (YLD in DW 110 bit 10 and YUD in DW 110 bit 11). A negative manipulated variable can never be output with this controller type.

The manipulated variable actually output isindicated at monitoring point "MP Y" as a percentage.

RS3 = 1, K controller with pulse output

With this controller type, the manipulated variable Y is converted to a number of pulses which are output during the sampling time. If the manipulated variable is positive, the output is via digital output "open". A negative manipulated variable is output via the digital output "close".

Pulse shaper

As an example, the pulse shaper stage generates a pulse with a length (T) equal to the sampling time when the manipulated variable is 100.007.. The following relationship applies:

T = (Y / 100.OOYO) * Ta

DW 47	minimum pulse duration Tmin		*BFEH 1AH*
DW 49	Tmin code		

The calculated pulse length T is converted to a number of pulses of the length Tmin according to the following equation:

Pulses = T/ Tmin = [Ta / (100.00% .Tmin)].Y.

Pulses are output every Tmin. Pulses with a length less than Tmin are added to the next number of pulses to increase accuracy.

The minimum pulse duration Tmin is located in data words DW 47 and DL 49. This is a time value greater than 20 ms and less than 9999 seconds, but must be a multiple of 20 ms. The accuracy (Ta / Tmin) must be between 1 and 32767.

Matching factor MAF:

DW 51	Matching factor MAF:	*BFEH IDH*

This specifies the response to negative manipulated variables compared with positive manipulated variables. if the factor is zero, the K controller with pulse output has a 2-pint action, otherwise a 3-point action. If MAF = O, the digital output “close” is always switched off.

If the controlled system has different characteristics when running up compared with running down (e.g. heating and cooling in temperature control) this can be corrected with a matching factor not equal to 1. If MAF > 1, a slower response from the system to “close” is corrected by amplifying the controller output. The controller output “close” is attenuated and therefore a faster reaction is compensated when MAF c 1 (see Fig. 2.1 O). The following relationship applies for negative manipulated variables:

$$Y < o: \quad Y = MAF * Y$$

Example:

When controlling a temperature, the temperature rises (output “open”) at a rate of5‘C (9 °F) per minute and falls (output “close”) at a rate of 10‘C (18 °F) per minute. The controlled system is therefore slower when “running up”. With MAF = 0.5, the “close output” is attenuated and the response of the control loop is the same when heating or cooling.

The matching factor is located in data word DW 51 and can be a value in the factor format (see 2.1.1) between O and 99.99.

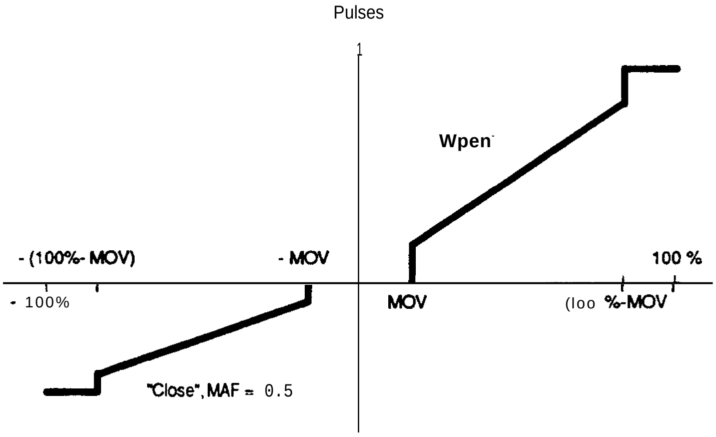


Fig. 2.10 Pulse shaper

Minimum operating value MOV:

DW 50	Minimum operating value MOV:	***BFEH ICH***

The operation of actuators in the lower and upper control range is not always linear. Manipulated variables smaller than the minimum operating value of the actuator have no or only a reduced effect. At the upper end of the range, the actuator cannot distinguish a very large manipulated variable from its final position, i.e. these manipulated variables have the same effect as 100.00%.

The minimum operating value is a percentage between O% and SO%. Manipulated variables less than the minimum operating value are suppressed and added to the next output. Manipulated variables greater than the value 100% - MOV are made up to 100.0094.. The amount added to the output is taken away from the next output. Between these limits the manipulated variable remains unchanged (see Fig. 2.10). The matching factor has no effect on the minimum operating value.

The manipulated variable calculated using the minimum operating value and matching factor is limited within the range -100.00% to 1OO.OO°/.. If either of the limits is violated, the bits are set in the LVM status word (YLD in DW 110 bit 10 and YUD in DW 110 bit 11). A negative manipulated variable can only be output when the matching factor is not zero.

The manipulated variable actually output is indicated at monitoring point “MP Y” as a percentage.

Which of the two outputs is currently active can be found in data word DW 109.10 for “open” and in DW 109.11 for “close”.

Note: In the “open loop” mode, the minimum operating value and the matching factor are ignored. The manipulated variable is converted directly to pulses and output.

2.2.4.1 K Controller “Open Loop” Mode

The manipulated variable branch is represented in Fig. 2.11. In the “open loop” mode, it is processed at the sampling instant. Depending on the type of controller, the input manipulated variable is output directly via the manipulated variable output to the actuator. The resulting position therefore corresponds to the input manipulated variable.

Data word and bit	status	Structure
DW87 bit O	0 1	YSO without ramp generator YSOwith ramp generator

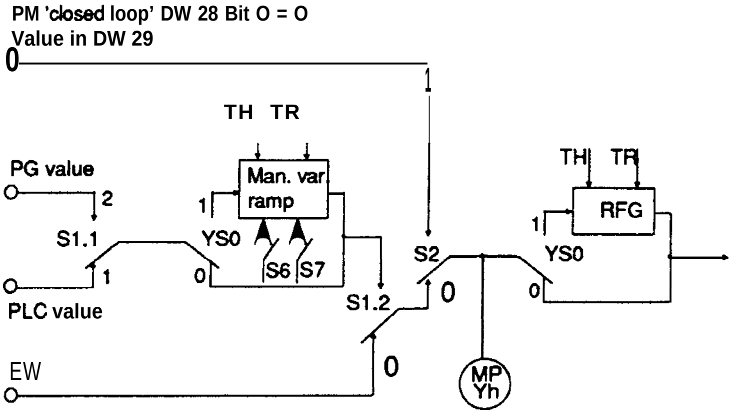


Fig. 2.11 Manipulated variable branch K controller

If the K controller with pulse output has been **selected,** the minimum operating value and the matching factor are ignored.

If the matching factor is not equal to zero, the input manipulated variable can also have negative values between O% **and** -lOO.OO°/& If the matching factor equals zero, it can only be in the range between O% and 100. OOYO.

For a K controller with analog manipulated variable output, the manipulated variable input must be in the range between YLD and YUD.

An input outside these limits is rejected with *error4EH "selected manipulated variable not in range".*

Manipulated variable input, operation switch S1, S2

The generation of the default manipulated variable ("MP Y") **depends on the** operation switches S1 and **S2.** The source is selected in the "open loop" mode with the **operation switches** S1 **and S2.** Possible sources are the analog input EW, **PLC,** the PG or the default value **for the preferred mode.**

The operation switch S1 can be set to its three settings with the mode commands BS O **to** BS 2. The "open loop" mode is always set.

At **setting 1 and** 2 of operation switch **S1,** a change in the manipulated vanable **must take place with mode commands** BS 1 **or** BS **2. If there is an invalid manipulated variable in data word** DW **97, the old input value and mode remain set and the** *error 4EH "selected manipulated variable not in range"* **is set.**

If the source is the analog input EW(S1 = O) the value determined by the measured value acquisition is used at every sampling instant. Providing this was acquired without underflow or overflow it is between 0% and 100%. A negative manipulated variable input is then not possible.

The operation switch S2 (digital input "VB-N" = O) switches on the preferred mode when the **"open loop" mode is selected** in data word DR 28.0. It is switched off with the mode commands BR O to BR 2 or BS O to BS 2 (digital input "VB-N" = 1).

The following applies from version 5 **of the IP260 and higher:**
Manipulated variable input from the PLC is also possible with the mode command BS 2 from **DW 124.**

Manipulated variable ramp, operation switches S6 and S7

Another means of changing the manipulated variable input is the manipulated variable ramp. This can only be used when a ramp function generator is selected in the manipulated variable branch (*error 4BH "ramp generator not selected"*). The manipulated variable ramp can be generated with the operation switches S6 and S7 when the preferred mode is switched off (S2 = O) and the manipulated variable is input from the PLC (S1 =1) or PG (S1 = 2).

The setting of switches S6 and S7 is as follows:

	S6	s 7
.Cornmand RB9"setPoint ramp higher"	1	0
Command RB10"setpo"nt ramp lower"	0	1
Command RB 11 'step setpoint ramp"	0	0

The generated or input manipulated variable is available at monitoring point "MP Yh" (DW 104). Depending on the controller type, it is between 0% and 100.00% or -1 OO.OO?4O and 100.00"7'0.

Ramp function generator:

DW 88	Ramp-up time TH		BFEH35H
DW 89	Ramp-do wn time TR		BFEH36H
DW90	TH code	TR code	

The ramp function generator in the manipulated variable branch can be structured with the structure switch **YSO (DW** *87* bit O). Its function is described in Section 2.1.5. If the switch **YSO** = 1, the ramp-up and rampdown time must be **assigned** in time format (see Section 2.1 .1) in the data words**DW** 88, DW 89 and DW 90. Both times **(TH** and **TR)** must be at least as long as the sampling time and a maximum of 10000 times the sampling time or 9999 seconds. The assignment is not necessary if switch **YSO** = O.

Mode switchover

When switching over the mode from "**closed** loop" to "open loop", the last manipulated variable output (monitoring point "**MP** Y") is taken as the start value for the ramp function generator in the manipulated variable branch. If the generator has been selected, the manipulated variable gradually changes from this start value to the new manipulated variable. This prevents a sudden change at the actuator. Without the ramp function generator, the input manipulated variable is then output directly.

Note: in the "closed **loop"** mode, a remainder of the manipulated variable which is not output or which is added owing to the minimum operation value is not effective.

2.2.4.2 K Controller, "Closed Loop" Mode

Fig. 2.12 illustrates the structure processed at each sampling instant in the "closed loop" mode. All input **signals** at **point** a produce the control error **Xd**. The actual value is always subtracted from the **setpoint** and if necessary the **auxiliary** branches with their sgns are added.

$$Xd = W - X + Al + A2$$

To ensure that all the variables are in the same unit, the dimensional values (actual value and **setpoint)** are first converted to percentages O to 100.00%. The error Xd is then calculated as a percentage.

From the error the manipulated variable Y is calculated with the **PID** algorithm. The value of the error is indicated at monitoring **point "MP Xd" (DW** 102) as a percentage between -300.00?/. **and** 300.0070."

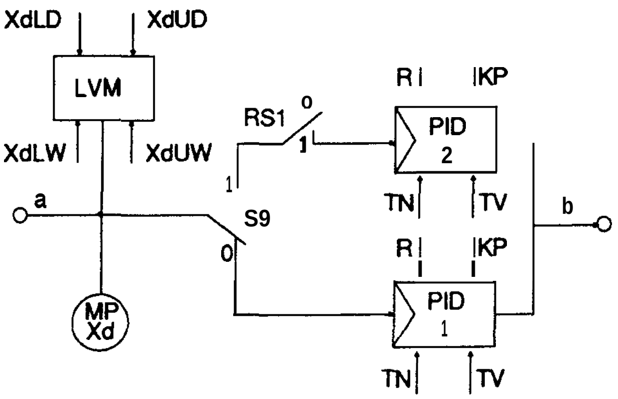


Fig. 2.12 K controller

Limit value monitors

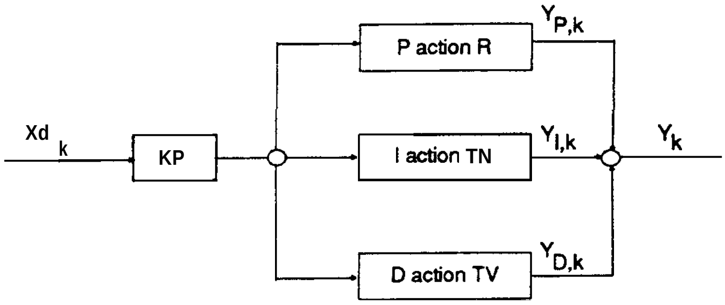
DW 41	LVM control error XdUD	*BFEH 14H*
DW 42	LVM control error XdUW	*BFEH 15H*
DW 43	LVM control error XdLW	*BFEH 16H*
DW44	LVM control error XdLD	*BFEH 17H*

The error is monitored at monitoring point "MP **Xd"** with the four-level limit monitor. Its function and parameter assignment are described in Section 2.1.6. In the LVM status word (DW 11 O) bits 4 to 7 are reserved to indicate limit value violations. The **four limit values must be within the range -300.00% to** 300.00%

PID algorithm

DW 31	R, P action	*BFEH* **OBH**
DW32	**Total gain** KP	*BFEH OAH*
DW 33	Reset **time TN, I action**	*BFEH 0CH*
DW34	Derivative **action timeTV,** D action	*BFEHODH*
DW35	TN code TV code	

Depending on the current control error Xd_k, this algorithm **calculates a position Y_k based on the control parameters KP, R, TN and** V. The three actions P, I and D are parallel. The P action is set with the parameter R, the I action with the parameter reset time TN and the D action with the parameter derivative action time TV. All actions are also weighted with the total gain KP. This results in the following structure and algorithm.



$$Y_k = Y_{P,k} + Y_{I,k} + Y_{D,k}$$

$$Y_{P,k} = KP \cdot R \cdot Xd_k$$

$$Y_{I,k} = 1/2 * KP \cdot Ta/TN * (Xd_k + Xd_{k-1}) + Y_{I,k-1}$$

$$Y_{D.k} = 2/3 \cdot KP \cdot TV/Ta \cdot (Xd_k - Xd_{k-1}) + 1/3 * Y_{D,k-1}$$

Fig. 2.13 PID algorithm

The effect of the D action is delayed by a time equal to the sampling time, providing a real D action.

A particular controller type (e.g. P controller) is set by switching off the actions not required. To do this, the corresponding parameters, R, TN or TV are set to zero. Since not all possible combinations of actions result in a workable controller, controller types D and ID as well as the parameter assignments R = O, TN = O and TV = O are rejected with the *error OEH "wrong controller type in parameter set 1".*

The gain R of the P action can be assigned the values zero or one in data word DR 31. If R = O, the P action is switched off, if R = 1, the total gain of the P action is equal to KP. All other values are illegal.

The I action is assigned with the reset time TN in data words DW 33 and DL 35. Since the reset time cannot be faster than the sampling time, the lower limit is the sampling time and the upper limit is 9999 seconds.

The derivative action time of the D action is located in data words DW 34 and DR 35. Its limits areas follows:

$Ta \leq TV \leq 9999s$ or
$Ta \leq TV \leq 150\, Ta / KP$

The parameter total gain KP is specified in data word DW 32. It is a factor (see Section 2.1.1) with the range of values -99.99 to 99.99. The value zero and all other values wtside this range are illegal. A negative total gain must be entered in two's complement in data word DW 32 (e.g. KP = -1.00 ---100-- FF9CH). This causes a reversal of the controller action, i.e. a positive control error produces a negative change in the manipulated variable. To reduce the control error, the controlled system must convert a negative change in the manipulated variable to a positive change in the actual value (e.g. level control with a solenoid valve in the outflow).

Second parameter set

DW 36		R, P action	*BFEH* 10H
DW 37	Total gain KP		*BFEH 0FH*
DW 38	Reset time TN, I action		*BFEH 1* IH
DW 39	Derivative action timeTV, D action		*BFEH 12H*
DW40	*TNcode*	TV code	

A second parameter set with different control parameters KP, R, TN and TV can be entered in data words DR 36 to DW 40. The structure switch RS 1 = 1 (DW 30 bit 1 = 1) must also be set. If this is the case, the parameters will be checked as in the first parameter set (DR 31 to DW 35). An incorrect controller type generates the *error 13H "wrong controller type in parameter set 2".*

The operation switch S9 switches over between the two parameter sets. With the setting O, the first parameter set is used and with the setting 1, the second parameter set. The operation switch is activated with the controller operation commands RB O and RB 1. The exception is in the preferred mode (S2 = 1), in this case, O is set automatically. If the complete data block is entered during operation (commands DI 1 or EL), O is once again set automatically since the new data block does not necessarily contain a second parameter set.

The following applies from version 5 of the IP260 and higher:
In the preferred mode, the currently active parameter set remains selected. When a data block is input, the currently active parameter set remains selected, if possible.

The manipulated variable Y calculated by the PID algorithm is overlaid at point b by the output values of the auxiliary branches when these are switched on and act on the controller output.

If the controller is disabled ("RSP" = 1), the reaction of the actual value and, if applicable, the auxiliary branches, need not be related to the calculated manipulated variable Y. In this case, there is a permanent control error which will lead to the manipulated variable reaching one of the two limits in a controller with an 1 action. If the controller is released("RSP" = O) the calculated manipulated variable at "MP Y“ never corresponds to **the** external manipulated variable and the actuator will be subjected to a sudden change. This can be prevented by specifying the value of the external manipulated variable before switching over with the “open loop” mode. In this case, the calculated and external manipulated value are then the same.

Mode switchover

When switching over the mode from “open loop” to “closed loop”, the last output manipulated variable Y is output again.

Controller with I action:

The setpoint at monitoring point "MP W2° is set to the current actual value "MP X2” plus the auxiliary branch *MP An2” if this is active. The control error Xd and therefore the P action Y_P and D action Y_D are then initally zero. To retain the last manipulated variable, the I action Y_I has this value as a default. The effects of the auxiliary branches are taken into account.

Controller without I action:

The last manipulated variable is now generated by the P action Y_P. The D action Y_D is zero. A setpoint ("MP W2") is calculated according to the following relationship

$$W_k = (1 / KP) \cdot Y_{k-1} + X_k$$

If the auxiliary branches are switched on, they will be taken into account.

If a ramp function generator has been structured in the setpoint branch (WSO = 1) the new setpoint input will be approached gradually from the value at "MP W2". Otherwise, the setpoint input at the next sampling instant is completely effective and the manipulated variable could suddenly undergo a large change.

A mode switchover in the “closed loop mode also occurs if the control parameters have been changed. This is the case when the commands DI 1, DI 2 (with S9 = 1), DI 3 (with S9 = 1) and EL are executed, when the operation switch S9 is activated, or the “parameter set 2 on/off" and S2, “preferred mode on”. If there is a sudden change in the actual value caused by the operation switch S6 (test actual value on/off), a mode switchover is also detected. In this case, the switchover or change should only be executed when the control loop is in a stable state.

The following applies from version 5 of the IP260 and higher:
If the control parameters are changed, there is no mode change.

If the controller is disabled (RSP = 1) or the errors 52H to 54H are active (see page 4-6), the controller is corrected as it is during a mode switchover.

2.2.5 S Controller with Manipulated Variable Output

This controller type, step controller with incremental control signal output open and close is selected with the structure switch RS0 = 1 (DR 30.0= 1).

Data word and bit	Status	Structure
DW 30 bit O	0 1	RS0 K controller RS0 S controller
DW 30 bit 1	0 1	RS1 without second parameter set RS1 with second parameter set
DW 30 bit 2	0 1	RS2 IP 260 is master RS2 IP 260 is slave
DW 30 bit 3	0 1	RS3 K controller with analog output RS3 K controller with pulse outpu

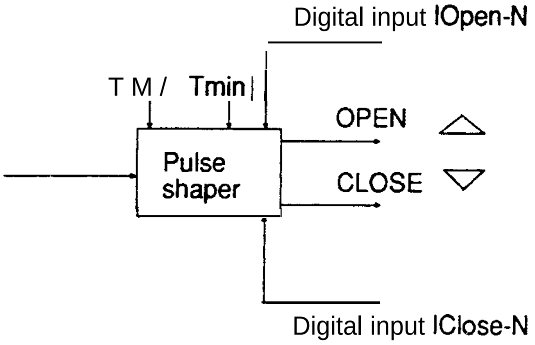


Fig. 2.14 Manipulate variable output S controller

The function of the S **controller** is implemented in such a way that it can only operate with one **motor-driven** actuator (e.g. **motor-driven** valve). It generates and outputs the changed setting for the motor-driven actuator. For the manipulated variable **output** (see Fig. 2.14) a digital **output** signal with a mrresponding length is formed from the sign and the value of the changed setting. A positive change is output via digital output “open” (e.g. open valve), a negative change via the digital output “close” (e.g. close valve). The longer one of these **digital** outputs is set, the more the actuator changes its setting.

Both limit settings of the actuator can be monitored with limit switches connected to digital inputs. Remember that the digital inputs **"Iclose-N"** and **"Iopen-N"** are low active, i.e. a zero means that the limit switch has responded. This means there is also a response in the case of a wire break.

⚠ Caution:

If the digital inputs are not wired up, neither of the controller outputs is set. If both limit switches are active, the status “controller OK” will not be set after the module is switched on. During operation, the controller is stopped. The *error 54H “both limit switches* active” always indicates this status.

L

Pulse shaper

DW 48	Actuator operating timeTM		*BFEH IBH*
DW 49		TM *code*	

The time which the actuator requires to move from one of the limit positions to the other is known as the actuator operating time TM. If it is not included in the specifications of the actuator, it must be determined in the “open loop” mode. If you enter this in data words DW 48 and DR 49, it is possible to calculate the time T for any change dY as a percentage. The following equation results:

$$T = (dY / 100.00\%) \cdot TM$$

TM must not be less than 60 ms, must be a multiple of 20 ms and must not exceed 9999 seconds.

DW 47	minimum pulse duration Tmin		BFEH *1AH*
DW49	Tmin code		

Since the response time of the actuators is not always fast, changes could be lost according to the equation above. To prevent this, you can assign the minimum pulse duration Tmin in data words DW 47 and DL 49. This specifies the shortest time within which the actuator recognizes that it should change its position. Using this, the calculated time T for a change dY can be converted into a number of pulses with the length Tmin.

Pulses = T/ Tmin = [TM / (100.00% * Tmin)].dY

The manipulated variable output is processed at intervals of Tmin and outputs a maximum of one pulse. The remainder is added to the newly calculated pulse each sampling time. For a maximum change of 100.00%, the pulse number

max. pulses = TIM / Tmin

is required. The maximum number of pulses also correspond to the accuracy of the pulse output, i.e. if for example an output accurate to 1°A is required, TM must equal 100 . Tmin.

The minimum pulse time must beat least 60 ms, a multiple of 20 ms and must not exceed 9999 seconds. It must also not exceed the actuator operating time TM and must not be greater than the sampling time. The number of pulses must also not exceed 32767.

Caution:

To protect the actuator, the minimum pulse time must not be selected too low.

If the actuator has been stopped, or following a change in direction, a delay of at least Tmin is guaranteed. In addition to this, the corresponding control output is switched off if more than the maximum number of pulses are output consecutively in one direction or if the limit switch responds. In this case, the calculation of further pulses in this direction is suppressed.

Which controller output is currently active can be recognized in data word DW 109 bit 10 for “open” and in DW 109 bit 11 for “close”. The states of the limit switches are also written to data word 109 with limit switch open "lopen-N" in DW 109.1 and limit switch close "lclose-N" in DW 109 bit 2.

2.2.5.1 S Controller, “Open Loop” Mode

The manipulated variable branch is represented in Fig. 2.15. This is processed whenever the “open loop” mode is set.

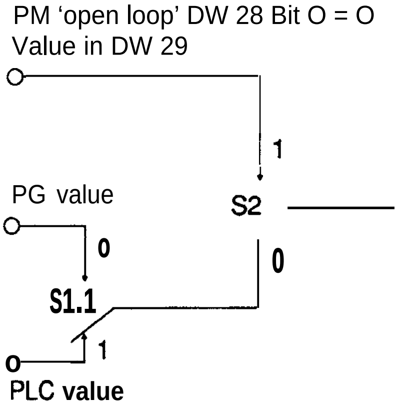


Fig. 2.15 Manipulated variable branch S controller

In the “open loop” mode the motor-driven actuator can be moved in both directions or stopped by inputting the required value.

Both control outputs are switched off if zero is input, if the maximum number of pulses have been output or if the limit switch in the direction of movement responds.

Manipulated value input, operation switches S1 and S2

The operation switches S1 and S2 determine the source. The sources are the PLC, the PG and the default value of the preferred mode.

Operation switch **S1** can be set to its two settings, 1 and 2 by the mode commands BS 1 and BS 2. In this case, the **“open loop”** mode is always set. The preset **value in data word** DW 97 **is not checked,**

If neither of the limit switches is reached, then with a positive preset value between 1 and 32767 (7FFFH), the control output “open” is set and the control output “close” is switched off.

If a negative value is specified between -1 (FFFFH) and -32768 (8000H) the output “close” is set and the output “open” is switched off.

If the value specified is O, both control outputs are switched off.

The error 4EH "selected manipulated variable not in range" is set when the limit switch is reached in the set direction.

The preferred mode is switched on with the operation switch S2 (digital input "VB-N" = O) if **"open loop"** is **assigned** as the mode in data word DR 28.0. It is switched off with the mode commands BR O to BR 2 or BS 1 to BS 2 (digital input "VB-N" = 1).

The following applies from version 5 of the IP260 and higher:
The value can be input by the PLC with the mode command BS 2 from DW124.

Checking the correct wiring of the limit switches

The actuator only moves in the direction "open" when the digital input "lopen-N" is 1. If the limit switch is deliberately activated, the control output must switch off. The same applies to the control output "close" with the limit switch "lclose-N".

If both limit switches are activated simultaneously, the error *54H "both limit switches active"* must be set. This error is set to zero again when at least one of the limit switches ceases to be active.

Mode switchover

When the mode is switched from "closed loop" to "open loop" the new pulse count is accepted immediately. Any "remainder" is ignored.

2.2.5.2 S Controller, "Closed Loop" Mode

In the "closed loop" mode, the structure shown in Fig. 2.16 is run through at each sampling instant. All input signals at point a produce the error Xd. The actual value is always subtracted from the setpoint **and, if** applicable, the auxiliary branches are added according to their signs.

$$Xd = W - X + Al + A2$$

To ensure that all the values are in the same unit, the dimensional values (actual value and setpoint value) are first converted to percentages between O and 100.00%0. The difference Xd is then calculated as a percentage.

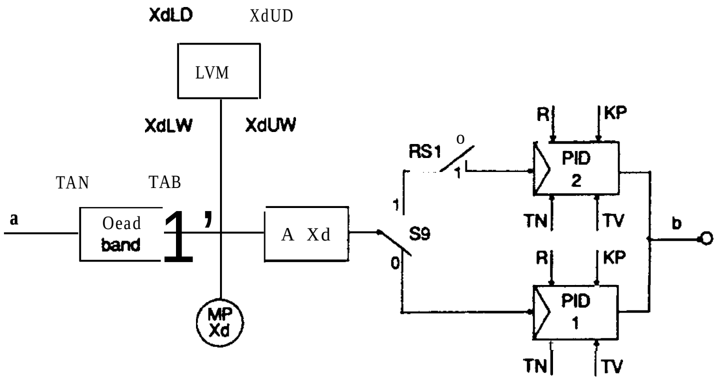


Fig. 2.16 **S controller**

Dead band

DW 53	On threshold Xd of the dead bandTAN	*BFEH IEH*
DW 54	On threshold Xd of the dead bandTAB	*BFEH 1FH*

The dead band masks out the control error in a certain range. The control error only becomes effective when it leaves the range of the dead band. This reduces the switching frequency and helps protect the actuator. The controller can never correct this control error, so that its accuracy is somewhat restricted.

The dead band has a hysteresis which can be specified with the two parameters off threshold of the dead band **TAB in data word DW 54** and on threshold of the dead band TAN in data word DW 53. Both must be between O°/. and 1OO.OO°A. The off **threshold** TAB must never be higher than the on threshold TAN.

With the on threshold, the dead band is fixed symmetrically arwnd the zero point for negative and positive **control** error values. If there is no dead band, the on threshold and off threshold must be zero. The hysteresis **can be** selected with the off threshold. If both thresholds are the same, the hysteresis is zero.

The dead band has the following function:

. Dead band has not yet responded
Xd ≤ TAB --> Xd = O, dead band responds
Xd > TAB -->Xd is not suppressed

. Dead band has responded
XD ≤ TAN --> Xd = O, dead band remains effective
XD c TAN --> Xd is not suppressed, the dead band is exited

From the control error, the setting change dY is calculated with the PID differential algorithm. The value of the error is indicated at monitoring point "MP Xd" (DW 102) as a percentage between -300.00% and 300.00%.

Limit value monitor

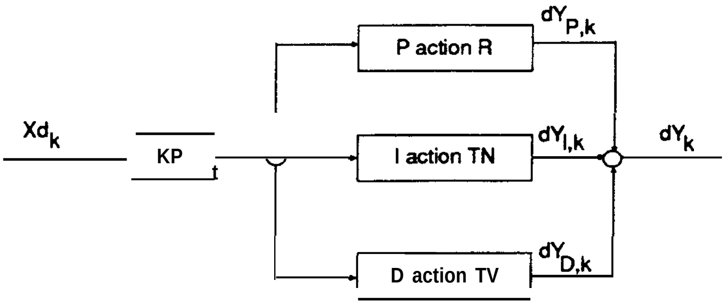
DW 41	LVM control error XdUD	*BFEH 14H*
DW 42	LVM control error XdOW	*BFEH 15H*
DW 43	LVM control error XdUW	*BFEH 16H*
DW 44	LVM control error XdUG	*BFEH 17H*

The control error is monitored at monitoring point "MP Xd" with the four-level limit monitor. Its function and parameter assignment are described in Section 2.1.6. In the LVM status word (DW 11 O) bits 4 to 7 are reserved to indicate limit value violations. The four limit values must be within the range -300.00% to 300.00%.

PID velocity algorithm

DW 31		R, P action	*BFEHOBH*
DW 32	Total @n KP		*BFEHOAH*
DW 33	Reset time TN, I action		*BFEH 0CH*
DW 34	Derivative action time TV, D action		*BFEH* ODH
DW 35	TN code	TV code	

Depending on the current control error **Xd_k**, this algorithm **calculates** a position change **dY_k** based on the control parameters **KP**, R, TN and V. The three actions P, I and D are parallel. The P action is set with the parameter R, the I action with the parameter reset time TN and the D action with the parameter derivative action time TV. All actions are also **weighted** with the total gain **KP**. This results in the following structure and algorithm.



$$dY_k = dY_{P,k} + dY_{I,k} + dY_{D,k}$$

$$dY_{P,k} = KP \bullet R\,(Xd_k - Xd_{k-1})$$

$$dY_{I,k} = 1/2 \bullet KP \bullet Ta/TN \bullet (Xd_k + Xd_{k-1})$$

$$dY_{D,k} = 2/3 * KP * TV/Ta \bullet [(Xd_k - Xd_{k-1}) - (Xd_{k-1} - Xd_{k-2})] + 1/3 \bullet dY_{D,k-1}$$

Fig. 2.17 PID algorithm

The effect of the D action is delayed by a time equal to the sampling time, providing a real D action.

A particular controller type (e.g. P controller) is set by switching off the actions not required. To do this, the corresponding parameters, R, TN or TV are set to zero. Since not all possible combinations of actions result in a workable controller, controller types D and ID as well as the parameter assignments R = O, TN = O and TV = O are rejected with the ***error OEH "wrong controller type in parameter set 1".***

The gain R of the P action can be assigned the values zero or one in data word **DR** 31. If R = O, the P action is switched off, if R = 1, the total gain of the P action is equal to **KP**. All other values are illegal.

The I action is assigned with the reset time TN in data words DW 33 and DL 35. Since the reset time cannot be faster than the sampling time, the lower limit is the sampling time and the upper limit is 9999 seconds.

The derivative action time of the D action is located in data words DW 34 and DR 35. Its limits are as follows:

$Ta \leq$ TVs 9999s or

$Ta \leq TV \leq 150\ Ta / KP$

The parameter total gain KP is specified in data word DW 32. It is a factor (see Section 2.1.6) with the range of values -99.99 to 99.99. The value zero and all other values outside this range are illegal. A negative total gain must be entered in two's complement in data word DW 32 (e.g. KP = -1.00 ---100-- FF9CH). This causes a reversal of the controller action, i.e. a positive control error produces a negative change in the manipulated variable. To reduce the control error, the controlled system must convert a negative change in the manipulated variable to a positive change in the actual value (e.g. level control with a solenoid valve in the outflow).

Second parameter set

DW 36		R, P action	*BFEH* 10H
DW 37	Total @n KP		*BFEH 0FH*
DW 38	Reset time TN, I action		*BFEH 11H*
DW 39	Derivative action time TV, D action		*BFEH12DH*
DW40	**TN code**	**TV code**	

A second parameter set with different control parameters KP, R, TN and TV can be entered in data words DR 36 to DW 40. The structure switch RS 1 = 1 (DW 30 bit 1 =1) must also be set. If this is the case, the parameters will be checked as in the first parameter set (DR 31 to DW 35). An incorrect controller type generates the error *13H 'wrong controller type in parameter set 2".*

The operation switch S9 switches over between the two parameter sets. With the setting O, the first parameter set is used and with the setting 1, the second parameter set. The operation switch is activated with the controller operation commands RB O and RB 1. The exception is in the preferred mode (S2 = 1), where O is set automatically. If the complete data block is entered during operation (commands DI 1 or EL), O is once again set automatically since the new data block does not necessarily contain a second parameter set.

The following applies from version 5 of the IP260 and higher:
In the preferred mode, the currently active parameter set remains selected. **When a data block is input, the currently active parameter** set remains selected, **if possible.**

The position change dY calculated by the PID algorithm is overlaid at point b by the output values of the auxiliary branches when these are switched on and act on the controller output. The auxiliary branches should then be assigned the DTI element, so that only a change produces the output signal. If the output signal was constant, the controller would permanently output a position change and move the actuator continuously.

Mode switchover

When changing from “open loop” to “closed loop” pulses not yet output are lost. In addition to this, the setpoint at monitoring point *MP W2" is set to the current actual value "MP X2” plus the effective auxiliary branches "MP An2° if active. The control error is then zero and the actuator is stopped initially. If a ramp function generator has been structured in the setpoint branch (WS0 = 1) the new setpoint input will be approached gradually from the value at "MP W2". Otherwise, the setpoint input at the next sampling instant is completely effective and the manipulated variable could suddenly undergo a large change.

A mode switchover in the “closed Imp” mode also occurs if the control parameters have been changed. This is the case when the commands DI 1, DI 2 (with S9 = O), DI 3 (with S9 = 1) and EL are executed, when the operation switch S9 is activated, “parameter set 2 on/off” and S2, “preferred mode on”. If there is a sudden change in the actual value caused by the operation switch S6 (test actual value on/off), a mode switchover is also detected. In this case, the switchover or change should only be executed when the control loop is in a stable state.

The following applies from version 5 of **the IP260 and higher:**
If the control parameters are charged, there isno mode change.

If the controller is disabled (RSP = 1) or the errors 52H to 54H (see page 4-6) are active, the controller is corrected as it is during a mode switchover.

3 Structure of the Data Block

The data block of the IP 260 controller module contains all the data required to operate the module. The total data from data word DW O to DW 122 can be separated into three parts with different functions.

The first part, data word DW O to DW 15 contains the data used by function block FB 170 for operation with the programmable controller (see Programming Instructions).

All the parameters required to define and startup the IP 260 can be found in data words DW 16 to DW 96. Each parameter has an error number which is set if the parameter assignment is incorrect. The significance, function and errors of the individual parameters in the controller structure are described in Sections 2.1 to 2.2.5.

The third section, data words DW 97 to DW 122, contains data for operation. **The major part (data word DW 98 to DW 122) can only be monitored. On the other hand, data**word DW 97 can only be written to.

The following pages list the data words DW 16 to DW 122. Their format or content is described following the list.

The **following applies from release 02 of** FB **170 and higher:** When using the commands BS,2 and BR,2, the block must be **extended by data words** DW 123 and DW 124. Both data words can be used for inputting a value

DW I Content		Format
	General	
16	DB number	
17	Module configuration with BO 4or DI 4	
18	Dimension specified in ASCII	
19	"	
	Operating range	
21	Dimension code	
22	Range minimum Bmin	Dimension
23	Range maximum Bmax	Dimension

DW	Content		Format
	Sampling time		
24	Sampling time Ta		Time
25		Ta cede	
	Start-up mode		
26		Start-up mode	
27	Default value for start-up mode		Dimension/ percent
	Preferred mode		
28		Preferred mode VB	
29	Default value for preferred mode		Dimension/ Percent
	Controller structure		
30		Controller struc. RS	
31		R, P action on/off	Oor 1
	Parameter set 1 with BO *2* or DI *2*		
32	Total gain KP		Factor
33	Reset time TN, I action		Time
34	Derivative action time TV, D action		Time
35	TN code	TV code	
	Parameter set 2 with B03 or **DI** 3		
36		R, P action on/off	Oorl
37	Total gain KP		Factor
38	Reset time TN, I action		Time
39	Derivative action time TV, D action		Time
40	TN code	TV code	
	Limit value monitor Xd		
41	LVM control error XdUD		Percent
42	LVM control error XdUW		Percent
43	LVM control error XdLW		Percent
44	LVM control error XdLD		Percent
	Manipulated variable limitation		
45	Y limitation YUD, K controller with analog outPut		Percent
46	Y limitation YLD, K controller with analog output		Percent

DW	Content		Format
	Actuator Parameters		
47	Min. pulse duration Tmin, K and S controller		Time
48	Actuator operating time TM, S controller		Time
49	Tmin code	TM code	
50	Minimum operating value MOV, K controller with pulse output		Percent
51	Matching factor MAF, K controller with pulse output		Factor
52	Occupied		
	Dead band S controller		
53	On threshold Xd of the dead band TAN, S controller		Percent
54	Off threshold Xd of the dead band TAB, S controller		Percent
	Setpoint branch structure		
55		W branch structure WS	
	Weighting factor W branch		
56	Weighting factor setpoint FW		Factor
	Ramp generator W branch		
57	Ramp-up time TH, RFG in W branch		Time
56	Ramp-down time TR, RFG in W branch		Time
59	TH code		
	Smoothing W branch		
60	Smoothing time TG, G1 in W branch		Time
61		TG code	
	Limit value monitor W		
62	LVM setpoint WUD		Dimension
63	LVM setpoint WLD		Dimension
	Actual value branch structure		
64		X branch structure XS	
	Weighting factor X branch		
65	Weighting factor actual value FX		Factor
	Smoothing X branch		
66	Smoothing time TG, G1 in X branch		Time
67		TG code	
	Actual test value for BO 5 or DI 5		
66	Actual value for test mode in Xbranch		Dimension

DW	Content		Format
	Limit value monitor X		
69	LVM actual value XUD		Dimension
70	LVM actual value XUW		Dimension
71	LVM actual value XLW		Dimension
72	LVM actual value XLD		Dimension .
	Structure of auxiliary branch 1		
73		Al branch structure AIS	
	Weighting factor Al branch		
74	Weighting factor auxiliary branch 1 FA1		Factor
	Smoothing Al branch		
75	Smoothing time TG, G1 in A1 branch		Time
76		TG code	
	DT1 element Al branch		
77	Time constant TD, DT1 in A1 branch		Time
78	Delay time Tdel, DT1 in Al branch		Time
79	TD code	Tdel code	
	Structure of auxiliary branch 2		
80		A2 branch structure A2S	
	Weighting factor A2 branch		
81	Weighting factor auxiliary branch 2 FA2		Factor
	Smoothing A2 branch		
82	Smoothing time TG, G1 in A2 branch		Time
83		TG code	
	DT1 element A2 branch		
84	Time constant TD, DT1 in A2 branch		Time
85	Delay time Tdel, DT1 in A2 branch		Time
86	TDcode		
	Structure of Y branch		
87		Y branch structure YS	
	Ramp function generator branch		
88	Ramp-up time TH, RFG in Y branch		Time
89	Ramp-down time TR, HG m Y branch		Time
90	TH cede	TR code	

DW	Content		Format
Occupied data words			
91	Occupied		
92	Occupied		
93	Occupied		
94	Occupied		
95	Occupied		
96	Occupied		
Value input: setpoint for BR 1, manipulated variable for BS 1			
97	Input setpoint/manipulated variable		Dimension/ Percent
Monitoring point for BO7			
98	Monitoring point MP-W1		Dimension
99	Monitoring point MP-W2		Dimension
100	Monitoring point MP-X1		Dimension
101	Monitoring point MP-X2		Dimension
102	Monitoring point MP-Xd		Percent
103	Monitoring point MP-Y		Percent
104	Monitoring point MP-Yh		Percent
105	Monitoring point MP-A11		Percent
106	Monitoring point MP-A12		Percent
107	Monitoring point MP-A21		Percent
108	Monitoring point MP-A22		Percent
Status bits for BO 8			
109	Statuses of DI and DQ		
110	LVM status		
111	Input error	AI status	
112	Operating status code		
PLC interface error for BO 15			
113	PLC interface error		
Identification for BO 6 or DI 6			
114	Type "IP 260"		
116	"		
117	Version number "Vx.xx"		
118	"		
120	Loop number	Controller number	

DW	Content		Format
	Module directory for BO 9		
121	Identifier	DB number RAM	
122	Identifier	DB number EEPROM	
	Setpoint input for BR 2		
123	Setpoint input		[Dimension
	Manipulated variable input for 9S2		
124	Manipulated variable input		I Percent

DW 97, **value input**

The value input contains the manipulated variable with the mode **command** 0S 1, open loop **control** according to **PLC** manipulated variable and **BR** 1, closed loop control according to **PLC setpoint.** With all other commands, no further entry is necessary in this data word.

Mode command	Value input in data word DW 97	
	K controller	S controller
BS 1 open loop ace. to PLC	ana.: YLD to YUD 2pt.: 0% to 100% 3 pt.: -100% to 100%	-32768 to 32767
BR 1 closed loop ace. to PLC	Bmin to Bmax	Bmin to Bmax

The following applies from release 2 of FB 170 and higher:

DW 123, setpoint input
With the mode command **BR** 2, a **setpoint** is input by the **PLC** within the same limits as for **BR** 1.

DW 124, manipulated variable input
With the mode command 0S **2,** a manipulated variable is input by the **PLC** within the same limits as for 0S 1.

DW 98 to DW 108, monitoring points

The current values at the monitoring points are **written** to these data words, when the monitoring command 007 is executed.

DW 109 to DW 112, status bits

With the monitoring command BO 8, the status bits can be updated. These are assigned as follows:

DW 109, status of the digital inputs and digital outputs

Bit	Meaning
	Digital inputs
0	VB-N, preferred mode
1	Iopen-N, limit switch "open "reached
2	Iclose-N, limit switch "closed" reached
3	RSP, disable controller
	Digital outputs
8	RB, controller ready
9	LVM, a danger limit has been exceeded
10	OPEN, step controller output "open"
11	CLOSE, step controller output "close"
15	Short circuit signal from digital outputs

DW 110, limit value monitor status

Bit	Meaning
o	Actual value lower danger limit XLD
1	Actual value upper danger limit XUD
2	Actual value lower warning limit XLW
3	Actual value upper warning limit XUW
4	Control error lower danger limit XdLD
5	control error upper danger limit XdUD
6	Control error lower warning limit XdLW
7	Control error upper warning limit XdUW
8	SetPoint lower danger limit WLD
9	Setpoint Upper danger limit WUD
10	Manipulated variable lower limit YLD
11	Manipulated variable upper limit YUD
12	not used
13	not used

Bit 15	Bit 14	Last source of input value
o	0	EW
o	1	PLC
1	0	PG
1	**1**	**PM**

DL111, Input errors

The list of possible error numbers can be found in Section 4.1.

DR 111, analog input status

Bit	Meaning
o	Underflow analog input EW
1	Overflow analog input EW
2	Underflow analog input Al
3	Overflow analog input Al
4	Underflow analog input X
5	Overflow analog input X
6	Underflow analog input A2
7	Overflow analog input A2

DW 112, operating status bits

Bit	status	Meaning
0	0	Mode is "open loop"
	1	Mode is "closed loop"
1	0	Test actual value branch off
	1	Test actual value branch on
2	0	Test setpoint branch off
	1	Test setpoint branch on
3	0	Setpoint ramp higher off
	1	Setpoint ramp higher on
4	0	Setpoint ramp lower off
	1	Setpoint ramp lower on
5	0	Manipulated variable ramp higher off
	1	Manipulated variable ramp higher on
6	0	Manipulated variable ramp lower off
	1	Manipulated variable ramp lower on
7	0	Parameter set 2 off
	1	Parameter set 2 on
8	0	Interpreter finished
	1	Interpreter active
9	0	Manual disable (access from PLC)
	1	Manual release (access from PG)
10	0	No DB in RAM
	1	DB in RAM
11	0	No DB im EEPROM
	1	DB in EEPROM
12	0	Controller not OK
	1	Controller OK
13	0	Controller not active in process
	1	Controller active in process
14	0	No PLC failure
	1	PLC failure
15	0	Preferred mode off
	1	Preferred mode on

DW 113, PLC interface error

The error numbers O to 6 are possible. The monitoring command BO 15 reads the error number into data word DW 113.

0: no error
1: general transfer error
2: requested data not available
3: no memory space forthe data block
4: wrong command
5: utility command DI 1 or monitoring command BO 1 not yet completed, new command not yet acceptable
6: job list full, command cannot be executed, it is discarded

DW 114 to DW 120, identification

Type:
"IP260" as ASCII string, cannot be overwritten (DW 114 to DW 116).

Version:
version of the firmware "Vx.xx", cannot be overwritten (DW 117 to DW 119).

Loop number:
0-99, only used for documentation (DL 120).

Controller no.:
0-99, only used for documentation (DR 120).

Using the monitoring command BO 6, identification output, these data words are updated. With the identification input (utility command DI 6) only the data word DW 120 (loop and controller number) is transferred. This input is stored with an existing data block in the EEPROM if the system command ES (write to EEPROM) is executed. Otherwise, the loop and controller number have the default O when the IP 260 is switched on.

DW 121 to DW 122, module directory

The module directory is read into these data words with the monitoring command BO 9. The code in DL 121 and in DL 122 indicates whether or not a data block is available in the RAM or in the EEPROM (code = O or code = FFH). If the code is zero, the corresponding data block number will be located in DR 121 and in DR 122.

4 Status Condition Codes

4.1 Errors and Possible Causes

An error is detected by the firmware each time a command or information is input. If the last command or information was free of errors, the error number is O and a previous error is cleared. The four errors 52H to 55H are not generated by a command or information but automatically by the firmware during controller operation.

The error is located in data word 111 left(DL111) and is updated with the monitoring command 608.

During operation with the automation system using FB 170, it is possible to simplify the error output. The bit DFEH (data error) in FB 170 is 1 when an error occurs, i.e. the error has changed and must be updated. The monitoring command 608 is then sent automatically by FB 170. This must therefore have a value equal to O when called in data word DR 7 (see Programming Instructions).

The following applies from version 5 of the IP260 and release 2 of FB 170 **and higher:**
The input error can also be read with monitoring command BO 11, This is executed automatically if the value 11 is entered in data word DR 7.

The error numbers O to 3DH are parameter and data errors. They occur when incorrect data are entered with a utility command. In the error list the message is followed by the permitted range for a particular parameter and the data word in which the parameter is located.

OOH: error free

OIH: wrong DB number (DB number: 1 to 255), DR 16

02H: wrong module configuration, DW 17

03H: too many decimal places for the dimensional values (code: O to 4), DW 21

04H: Bmax wtsidethe permitted limits (Bmax: -9999 to 9999),DW 23

05H: Bmin outside the permitted limits (Bmin: -9999 to Bmax -l), DW 22

06H: sampling time not in the limits (Ta: 20 ms or 60 msto 9999s, or not multiple of 20 ms) DW 24 and 25

07H: start up, controller mode not allowed (see mode commands BS and BR, with the S controller BS O is also illegal), DR 26

08H: default value for start up not in range, DW 27 valid setpoint W: Bmin to Bmax valid manipulated variable Y:

- K controller with analog output: YLD to YUD
- K controller point (AMF = O) : Oto 100.00%
- K controller 3 point (AMF #0) : -100.00% to 100.OO'YO
- S controller : -32768 to 32767

09H: default value for preferred mode not in range, DW 29 as for error 08H

OAH: KP1 not in the limits (KP: 0.01 to 99.99 or -0.01 to -99.99), DW 32

OBH: RI not within the limits (R: O or 1), DW 31

OCH: TN1 not within the limits (TN: Tato 9999 s), DW 33 and 35

ODH: TV1 not within the limits (TV: Ta to 150 Ta/Kp), DW 34 and 35

OEH: wrong controller type in parameter set 1 (P, PI, 1, PD, PID), DW 31 to DW 35

OFH: KP2 not within the limits (KP: 0.01 to 99.99 or -0.01 to -99.99), DW 37

10H: R2 not within the limits (R: O or 1), DW 36

11H: TN2 not within the limits (TN: Tato 9999 s), DW 38 and 40

12H: TV2 not within the limits (TV: Ta to 150 Ta/Kp or TV> 9999 seconds), DW 39 and 40

13H: wrong controller type in parameter set 2 (as for error 0EH), DW 36 to DW 40

14H: XdUD not within the limits (XdUD: -300.000/. to 300.000/0), DW 41

15H: **XdUW** not within the limits
(**XdUW**: -300.00% to **XdUD** - 1), DW 42

16H: **XdLW** not within the limits
(**XdLW**: -300.00% to **XdUW** - 1), DW 43

17H: **XdLD** not within the limits
(**XdLD**: -300.00% to **XdLW** - 1), DW 44

18H: **YUD** not within the limits (**YUD**: O to 1OO.OO°/.), DW 45

19H: **YLD** not within the limits (**YLD**: O to **YUD** - 1), DW 46

I AH: **Tmin** not within the limits (**Tmin**: 20 ms or 60 ms to 9999
seconds, or not a multiple of 20 rns, or for
K **contr.** with pulse output: Ta / 32767 to Ta
S **contr.** : TM / 32767 to TM, DW 47 and DL 49)

IBH: TM not within the limits (as for error **06H**),
DW 48 and **DR** 49

ICH: minimum operating value not within the limits (**MOV**: O to
50.00%), DW 50

1DH: matching factor not within the limits (**MAF**: O to 99.99),
DW 51

1 EH: on threshold of dead band not within the limits
(TAN: O to 100. OO%), DW 53

1 FH: on threshold of dead band not within the limits
(TAB: O to TAN), DW 54

20H: weighting factor in W branch not within the limits
(FW: 0.01 to 99.99), DW 56

21H: ramp-uptime in W branch not within the limits
(TH: Ta to 10000 Ta or 9999 seconds), DW 57 and DL 59

22H: ramp-downtime in W branch not within the limits
(TR: Ta to 10000 Ta or 9999 **seconds)**, DW 58 and **DR** 59

23H: smoothinq time for **Gl** in W branch not within the limits
(TG: **Ta to 9999 seconds or Ta ≤ TG ≤** 32767*TG),
DW 60 and **DR** 61

24H: WUD not in working range (**WUD**: Bmin to **Bmax)**, DW 62

25H: **WLD not** in working range (**WLD**: Bmin to WUD - 1),
DW 63

26H: factor in X branch not within the limits (FX: 0.01 to
99.99), DW 65

27H: smoothing time in X branch not within the limits (TG: Ta to 9999 seconds or Ta ≤ TG ≤ 32767'TG), DW 66 and DR 67

28H: actual value for test mode in X branch not within the limits (X-test: O to 100. OO"A), DW 68

29H: XUD not in range (XUD: Bmin to Bmax), DW 69

2AH: XUW not in range (XUW: Bmin to XUD - 1), DW 70

2BH: XLW not in range (XLW: Bmin to XUW - 1), DW 71

2CH: XLD not in range (XLD: Bmin to XLW - 1), DW 72

2DH: weighting factor in Al branch not within the limits (FA1 : 0.01 to 99.99), DW 74

2EH: smoothing time for Gl in Al branch not within the limits (TG: Ta to 9999 seconds or Ta ≤ TG ≤ 32767*TG), DW 75 and DR 76

2FH: time constant D action for DT1 element in Al branch not within the limits (TD: Ta to 9999 seconds), DW 77 and DL 79

30H: delay time for DT1 element in Al branch not within the limits (Tdel: Ta to 9999 seconds or Tdel ≤ Ta ≤ 32767*Tdel), DW 78 and DR 79

31H: weighting factor in A2 branch not within the limits (FA2: 0.01 to 99.99), DW 81

32H: smoothing time for Gl in A2 branch not within the limits (TG: Ta to 9999s or Ta ≤ TG ≤ 32767*TG), DW 82 and DR 83

33H: time constant D action for DT1 element in A2 branch not within the limits (TD: Ta to 9999s), DW 84 and DL 86

34H: delay time for DT1 element in A2 branch not within the limits (Tdel: Ta to 9999 seconds or Tdel ≤ Ta ≤ 32767*Tdel), DW 85 and DR 86

35H: ramp-up time for RFG in Y branch not within the limits (TH: Ta to 10000 Ta or 9999 seconds), DW 88 and DL 90

36H: ramp-down time for RFG in Y branch not within the limits (TR: Ta to 10000 Ta or 9999 seconds), DW 89 and DR 90

37H: master/slave mode illegal

38H: master/slave mode illegal without YR

39H: illegal A2 branch structure

3AH: modifying the module configuration (DW 17) or the controller type (bit O orbit 3 in DR 30) without controller disable "RSP" illegal

3BH: wrong loop or controller number (no.: O to 99), with utility command DI 5

3CH: EEPROM content is incorrect, with system command EL or starting up the module with DB in the EEPROM

3DH: EEPROM programming error, with system command ES

The error numbers 40H to 55H describe errors during operation. They are generated either when interpreting commands or automatically during operation.

40H: controller not OK, mode and controller operation commands not allowed

41H: digital input VB-N = O, i.e. preferred mode has priority, no mode or controller operation commands are allowed

42H: preferred mode still active, no controller operation commands allowed

43H: no DB in RAM

44H: no DB in EEPROM

45H: access from PLC illegal, except manual block

46H: access from PG illegal

47H: ramp function illegal, value input from EW

48H: ramp function illegal in current mode

49H: test setpoint branch illegal

4AH: required status is already set

4BH: ramp generator not selected

4CH: parameter set 2 not selected

4DH: selected setpoint not within range, see error 08H

4EH: selected manipulated variable not in range, see error 08H

4FH: PG job list full, wait until interpreter is finished

50H: PC job list full, wait until interpreter is finished

51H: command not allowed

52H: problem with analog output X

53H: short circuit on digital output

54H: both limit switches active

55H: master failure detected

4.2 Process Statuses

The process statuses cover the actual values of the four digital inputs and four digital outputs, any short circuit message from the digital outputs, the limit value monitor status, the analog input status and the operating statuses.

The process statuses and the errors (DL111) are all read with the monitoring command BO 8.

Some of the process statuses indicate errors on the process side. When one of these process statuses changes the process error is set.

The process status consists of the following:

- the analog input status (DR 111)
- the limit monitor status (DW 110 bit O to bit 11)
- the short-circuit signal of the digital outputs (DW 109 bit 15) and
- the limit switch monitoring for the S controller(DW 109 bits 1 and 2)

The response of the module varies. The violation of a limit value only leads to a bit being set in the limit value monitor status word. On the other hand, the module is not operable if the analog inputs are not acquired without errors during the module start-up.

During operation the module responds to an error in the actual value acquisition, the short circuit signal from the digital outputs and with the S controller the message that both limit switches are active by stopping the controller in the “closed loop” mode and to continuing to correct its settings.

The following applies from version 5 of the IP260 and higher:
The response to one of these errors can be programmed (see **page 2-1 1**).

When operating within the automation system, the bit PFEH (process error) in FB 170 indicates whether one of these four statuses has changed. If this bit is set, the current process status should be read with the monitoring command BO 8. After reading all the status bits, the bit PFEH is reset. The monitoring command BO 8 can also be sent automatically by FB 170. When called, this must have a value equal to zero in data word DR 7 (see Programming Instructions).

Chapter 3 describes the structure of process statuses.

The following applies from version 5 of the module and firmware version VI.3 and release 2 of FB 170:
Reading the process status and acknowledging the process error is also possible with the monitoring command 6011. The monitoring command BO 11 is executed automatically by FB 170 when data word DR 7 is equal to 11 (see Programming Instructions).

5 Master/Slave Operation

5.1 Principle

Two modules are required for master/slave operation. One must be defined as the master (RS2 = O, DR 30.2= O) and the other as slave (RS2 = 1, DR 30.2= 1).

Both modules must have identical parameters, except for structure switch RS2. Commands to set new modes and input new values by function block FB 170 must be identical for both blocks, one immediately after the other. Each module must have its own data block in the programmable controller.

Master/slave operation is not possible with the K controller with pulse output. If this controller type is selected, the *error 37H "master/slave mode illegal"* is set.

The master module operates without any knowledge of the slave module just as in single operation. Its digital output "RB" blocks the slave module. If the master module is no longer operational, i.e. the status "controller not OK" is set and therefore digital output "RB" = O, the slave takes over the controller functions.

The module is no longer operational when:

- its 24 V load voltage fails
- a hardware fault causes failure of the internally generated voltage or
- the watchdog timer of the microprocessor elapses.

Despite the status "controller OK", the slave suppresses the digital output signal "RB" as long as its digital input "RSP" is active. It only sets its digital output "RB" = 1 when the master fails. The slave signals the failure of the master with the *error 55H "master failure detected".* The next time a command is sent to the slave module or when the master restarts, this error is cleared.

Depending on the controller type, special wiring of the digital input "RSP" and the digital output "RB" and the manipulated variable outputs is required on both modules.

5.2 K Controller with Analog Manipulated Variable Output

The slave module reads the manipulated variable output by the master via auxiliary branch 2, which serves as a feedback branch and then updates its algorithm. This means that the manipulated variable calculated by both modules is always the same. When assigning parameters to the slave module, auxiliary branch 2 must be switched on as feedback (*error 39H "illegal A2 branch structure"*).

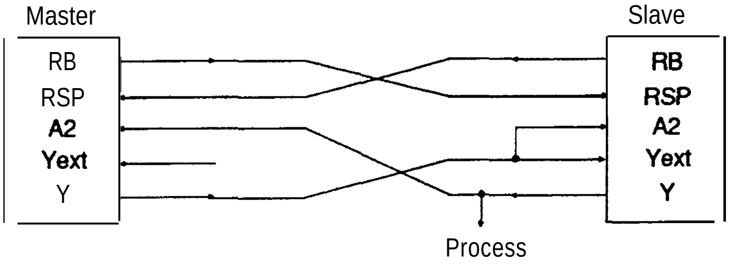


Fig. 5.1 Master/slave wiring - K controller

The manipulated variable applied to the output Y of the slave module acts on the process.

Failure and replacement of the master module

If the master module is no longer operational, its digital output "RB" = O is set to zero and it switches over to the external manipulated variable. This releases the slave with "RSP" = O and the slave sets its digital output "RB" = 1 after a maximum of 20 ms. The slave module then becomes active and continues to function in the selected mode.

Caution:

⚠ within the switchover time of maximum 20 MS, the manipulated variable is open. The actuator must latch for at least this length of time.

After switching off its power supply, the failed master module can be removed and replaced by another. Insert the new module, then connect the module to the process and switch on the power supply.

Caution:

when using the current signals 0/4 to 20 mA, the auxiliary input *2* of the master module must be **jumpered** before the process connector is removed (connection connector X4/19 to X4/20).

During the module start up, the manipulated variable of the master module is updated via auxiliary input 2. Following a correct start-up, the master signals **"RB" = 1** and therefore disables the slave. After a maximum of 20 ms, the slave sets **"RB"** = O **and** therefore releases the master. The master/slave operation continues in the same way as before the master failed.

Caution:

following its **start-up,** the master executes the start-up mode, this must be the same as the mode currently running in the slave.

If the new module does not have a data block in the EEPROM, it will be assigned the corresponding start up mode following the start-up. Once the master has then taken over operation, the start-up mode can be changed and the data block saved in the EEPROM.

If the new module does contain a data block, it must be deleted or modified before the link is established.

Failure and replacement of the slave module

The slave module has failed when the status “controller not OK” is set. The master does not **recognize** a slave failure, since **"RB"** remains O.

Caution:

before the failed module can be removed, its power supply must be switched off and the manipulated variable **looped** through to the process using a bridge between the manipulated variable outputs Y of the master and slave modules (connection master connector X4/12 or 13 to slave **connector** X4/1 2 or 13). After the new module has been inserted, the jumper can be removed immediately.

The new module must have the same parameters assigned as the **failed** module. Following start-up, its mode must be the same as the mode currently set on the master.

5.3 S Controller

The manipulated variable outputs of the two modules are connected directly with each other. With the controller block "RSP" = 1, the outputs of the slave are switched off, although it is operating parallel to the master module in the same mode.

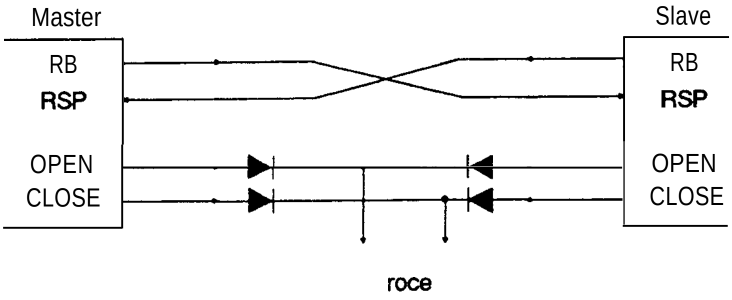


Fig. 5.2 Master/slave-wiring - S controller

Failure **and replacement of the master module**

If the master module is no longer operational, its digital output "RB" will be set to zero and it will switch over to the external manipulated variable. "RSP" = O releases the slave and the slave sets its digital output "RB" = 1 after a maximum of 20 ms. The slave module then becomes active and continues to function in the selected mode.

After switching off its power supply, the failed master module can be removed and replaced by another. Insert the new module, then connect the module to the process and switch on the power supply. Following a correct start-up, the master signals "RB" = 1 and therefore disables the slave. After a maximum of 20 ms, the slave sets "RB" = O and therefore releases the master. The master/slave operation continues in the same way as before the master failed.

Caution:

following its start-up, the master executes the start-up mode, this must be the same as the mode currently set in the slave.

If the new module does not have a data block in the EEPROM, **it will be** assigned the corresponding start up mode following the start-up. Once the master has taken over operation, the start-up mode can be changed and the data block saved in the EEPROM.

If the new module does contain a data block, it must be deleted or modified before the link is established.

Failure and replacement of the slave module

The slave module has failed when the status “controller not OK” is set. The master does not recognize a slave failure, since "RB" remains O.

Before the failed module can be removed, its power supply must be switched off. The new module must have the same parameters assigned as the failed module. Following start-up, its mode must be the same as the mode currently set on the master.

5.4 Starting Up the Master/Slave Combination

Both modules must be inserted in the frame, following which the suitably wired process is connected to the connectors of each module. Make sure that all the analog and digital signals not required for the combination are wired identically.

To prevent the slave module recognizing a master failure although the master is still starting up or is still switched off, the slave **waits** until the master signals it is ready for operation. If this does not happen within approximately 2 seconds, the slave module recognizes the master failure.

This is also prevented by switching on the power supply and assigning parameters to the master first. Once the master has signalled "RB" = 1, the slave module can be switched on and parameters assigned.

Page Overview

Page	Release **02**					
Title Page						
0-1-04	x					
1-1-1-24	x					
2-1-2-50	x					
3-1-3-10	x					
4-1- 4-a	x					
5-1 -5-6	x					
S1 - S2	x					

Contents

List of Figures

1 Introduction

The program package **COM** 260 which runs on the PG, provides you with user-friendly support for installing, starting and programming the **IP** 260. All the functions are executed by making entries in interactive screen forms (input fields) and using function keys.

When you create data blocks for the **IP** 260, you can transfer the data to the module or to a floppy or hard disk.

You start **COM** 260 by selecting the package from the **Komi** (command interpreter). At the **Komi** level, a brief description of **COM** 260 can be output with **<F3>.** Load **COM** 260 by pressing **<F1>** and the first screen form with the logo of **COM** 260 is then displayed. Starting **from** this screen form, **<F1>** (START) brings you to the presetting screen form.

In the presetting screen form, you set the mode with **<F2> (ONLINE/OFFLINE).** If there is already a connection to the **IP** 260, it is no longer necessary to switch to online. If, however, you require the offline mode, you can switch over with **<F2> (ONLINE/OFFLINE).**

You can enter the loop and controller number to distinguish the modules here. If there is no mrrect data block on the module, you can set the loop number and **controller** number. In this screen form, you also select the drive in which the data blocks will be stored and you also select the name of the file for these data blocks.

If you are creating a file for the first time, the plant designation and name of the operator will also be required. This information is also included in the file. In addition to this, the date is read in from the internal clock.

If yw press function key **<F1>** (ENTER) yw branch to the main menu. The identification of the module is always displayed in this screen form.

Using the function keys, you can input, **output,** modify, delete or transfer **controller** data blocks. Test **functions** are available with function key **<F3>** (TEST).

The screen forms are, as far as possible, self-explanatory. It is, however, advisable to use the instructions while getting to know the screen forms. The descriptions in the instructions show the screen forms and explain the input and **output fields.** The function keys for each screen form are also explained.

The output fields in the screen forms are used to display COM 260 statuses and parameters and are marked in the following description by

⬚

Complete the input fields of the screen forms using the alphanumeric keyboard or function keys (help function). These fields are displayed inversefy on the screen and are represented in this description by

▒

Press the RETURN key to jump to the next input field. You can also edit within the input fields using the arrow keys. Error messages and COM 260 status displays are always displayed in the last line before the menu. The error messages are displayed preceded by the error code.

Example:

F54 data block does not exist.

These instructions describe COM 260 version V2.0.
Version V2.0 has been adapted to the functional modifications of the IP 260 from Version 5 and higher.

These include: structure of the actual value branch,
structure of the setpoint branch and
programmable response to external errors.

2 Definition of Terms

PLC: programmable controller for **SIMATIC** S5

Operating system: **COM** 260 runs under the operating system **S5-DOS.** Remember that **S5-DOS** comprises the operating system **PCP/M-86** and the functions from the ZEFU diskettes. These functions are started with “S5”. If it is not already available, this operating system must be ordered separately.

COM 260: programming package for user-friendly operation of the intelligent peripheral module **IP** 260 using a programmer.

Function key: in terms of the **COM** 260 programming package, function keys are the eght keys **labelled** cF1 **>...<F8>situated** immediately below the screen on the keyboard.

IP 260: intelligent peripheral module belonging to the **SIMATIC** S5 spectrum. This module can be used to implement a single control loop.

Menu: the function keys are displayed inversely as rectangles with the key labels **<F1>...<F8>** and a text explaining the current function of the key.

PG: programmer for **SIMATIC** S5 (e.g. PG 635, PG 675, PG 685).

Screen form: the form displayed on the screen for entering and displaying data.

The following conventions have been used in these instructions for all commands to the programmer:

- The equality **sign** (=) at the beginning of a line indicates the beginning of a new activity.
- The greater than character **(>)** at the beginning of a line indicates a keyboard input.
- In this description, inputs are preceded by the character displayed by the particular program as a system prompt. The characters to be entered are then printed in upper-case characters in **bold** face.

- <CR> stands for the <retum key> key.
- cF1 > ... <F8> stand for the function keysF1 . . F8.

3 Installation

3.1 Consignment

The manual for the COM 260 package includes these instructions and a diskette with the file:

S5PEC11X.CMD

COM 260 runs under the operating system S5-DOS which, if not available, must be ordered separately. To start COM 260, the following program package and in some cases S5-DOS must also be available, depending on the programmer:

- PG 635: **6ES5835-2SA21**
- PG 675: **6ES5875-2SA21**
- PG 665: **6ES5885-2SA21**
- PG 695: **6ES5895-2SA21**
- PG 730: %-DOS installed on the hard disk
- PG 730: S5-DOS installed on the hard disk

3.2 Setting the Configuration Register

If the operating system S5-DOS has not yet run on ywr PG, you must set the configuration register of the PG using the test diskette. The configuration register includes the memory capacity, the drive configuration and other PG characteristics necessary to inform various programs (e.g. S5-DOS) of the hardware configuration. To set the configuration register insert the test diskette supplied with the PG in drive A: and startup the PG either with “power on” or using the key switch. Reply to the prompt “MODIFY CONFIGURATION?” with “Y” and then mark the appropriate information with "+" and the non-relevant information with “-”. After replying to all the prompts, you can remove the test diskette and then continue following a cold restart with PCP/M. The contents of the configuration register are non-volatile.

3.3 Working Copy of the COM 260 Diskette

Before you use the original COM 260 diskette, you should create a working copy and put the original away for safe keeping. To do this, use the PCP/M utility "DSKMAINT" with which you can check, format and copy diskettes.

3.3.1 Programmers with One Floppy Disk Drive (PG 665/695)

```
=    PCP/M system diskette"1 of n“ in drive A:
=    Start the PG with the power switch or key switch
>    A>DSKMAINT<CR>
=    New diskette in drive A:
>    <F5> <F1> Y <F8>
=    COM 260 diskette in drive A:
>    <F3> <F1>
=    Formatted diskette in drive A:
>    <F1> Y
=    Insert the diskettes required by DSKMAINT in
     drive A:. The COM 260 diskette is the source
     diskette and the newly formatted diskette is
     the destination.
>    <F8B>
```

3.3.2 Programmers with Two Floppy Disk Drives (PG 675/635)

```
=    PCP/M system diskette"1 of n“ in drive A:
=    Start the PG with the power switch or key switch
>    A>DSKMAINT <CR>
=    New diskette in drive A:
>    <F5> <F1> Y <F8>
=    COM 260 diskette in drive B:
>    <F3> <F3> <F1> Y
>    <F8> <F8>
```

3.4 Configuring the System

3.4.1 Programmers without a Hard Disk (PG 675/635)

To work efficiently with **COM** 260, it is advisable to generate a system diskette containing all the required programs, i.e. programs from the software package **"PCP/M"** must be **copied** to a **diskette**:

```
=    PCP/M system diskette"1 of n“ in drive A:
=    Start the PG with the power switch or key switch
>    A>DSKMAINT<CR>
=    New diskette in drive B:
>    <F5> <F3> Y <F8> <F8>
>    &PIP &R>
>    ● BAXWM.SYS[R V]<CR>
>    ● B:=CCP.CMD[R V] <CR>
```

Depending on the S5-00S version you are using, various packages must now be copied onto this diskette. The names of the individual parts (see product information, SIMATIC S5 Basic Package) are as follows:

Tools **and drivers**

- Drivers
- S5-TOOLS
- CP-SPTOOLS
- ES-SPTOOLS
- MI/TE-SPTOOLS
- SF-SPTOOLS

S5 command interpreter

- S5-KOMI
- S5-KOMI-UPS

S5 utilities and overlays

- PRINTER - PARAMET
- S5DEZF37.VER

For S5-DOS stage 3 and ZEFU VI.0 or higher, this would then be as follows:

```
=    ZEFU diskette(s) with the required files in drive A:
>    *B:=S5WX000H.CMD[R V]<CR>
>    *B:=S5WX100X.CMD[R V]<CR>
>    ● B:=S5WX2WX.CMD[R V]<CR>
>    *B:=S5WX201X.CMD[R V]<CR>
>    ● B:=S5WX2WX.CMD[R V]<CR>
>    ● B:45WX204X.CMD[R  V]<CR>
>    ● B:S50XS02X.CMD[R  V]<CR>
>    ● B:=S50ES02X.DAT[R  V]<CR>
>    *B:=S5KXS02X.CMD[R V]<CR>
>    ● B:=S5KES92X.DAT[R  V]<CR>
>    ● B:=S5DEZF37.VER[R  V]<CR>
>    ● B:=S5.CMD[R V]<CR>
>    ● BS5KES01X.DAT[R V]<CR>
>     ● <CR>
```

This diskette now contains the operating system and all the S5-DOS programs required to work with COM 260. If this system diskette functions correctly, it should be physically write-protected, since the diskette will only be read when working with COM *260.* To avoid havinq to regenerate a system diskette if the diskette is damaged or lost, make a copy of this diskette and put it away for safe keeping.

Apart from the system diskette, you also require the COM 260 diskette on which you will later store the controller data blocks. This diskette is generated by formatting an empty diskette (DSKMAINT) and then copying the COM package to this diskette.

```
=    PCP/M system diskette"1 of n" in drive A:
>     A>PIP <CR>
=    newly formatted diskette in drive B:
=    COM 260 diskette in drive A:
>    ● B:=S5PEC11X.CMD
>     * <CR>
```

3.4.2 Programmers with a Hard Disk (PG 685/695)

Programmers with a hard disk have a greater storage capacity, so that almost all programs and data are directly accessible. This means that several SIMATIC program packages can be located on the same disk.

3.4.2.1 Installing PCP/M

If your programmer is new and PCP/M is not yet installed, you must first format the hard disk with the PCP/M utility "HDFORM6" (see PCP/M instructions).

Note

from version 1.0/5 (1.0/6 for the PG 695) HDFORM6 is replaced by HDPARTY. Refer to the relevant section of the manual.

Caution

when you format the hard disk, all programs and data on it are bst!

= **PCP/M** system diskette”1 of n“ in drive A:
= start the PG with the power switch or key switch
> **A>** HDFORM6 <CR>
· enter the capacity of the hard disk, for example 12 Mbytes
> 12
> **Y**

1

Note

if your programmer has one floppy disk drive, the hard disk has the logical name **"B:"**. The operating system prompt is then “B”.

The programs on the **PCP/M** diskette must now be copied to the hard disk.

= **PCP/M** system diskette”1 of n“ in drive A:
= start the PG with the power switch or key switch
> **A>** PIP <CR>
> ● B:=*.* <CR>

If **PCP/M** was supplied on more than one diskette, the programs from the other diskettes should also be copied onto the hard disk.

= next **PCP/M** system diskette in drive A:
> ● B:=*.* <CR>

After the last diskette has been copied, press <CR> to terminate the copying program “PIP”. Since all the **PCP/M** system programs are now on the hard disk, this can now be selected as the preset drive:

> **A> B:<CR>**

The operating system then searches for all programs on the hard disk, unless a floppy disk drive is explicitly specified. To avoid the programs being accidentally deleted and to allow them to be used in all user areas, yw should assign the attributes “read **only"** (RO) and “system” **(SYS)** using the utility SET.

> B> SET **B:*.*[RO** SYS] <CR>

3.4.2.2 Installing COM 260

The following description assumes that **S5-DOS** is installed on ywr PG. If this is not the case, refer to the **section** "Installing **PCP/M".**

To install **COM** 260 on the hard disk, **simply** copy the file **S5PEC11X.CMD** from the **COM** 260 diskette supplied to the hard disk and assign the attributes "RO" and **"SYS"**.

= start the PG with the power switch or key switch without diskettes in the floppy disk drive

. **COM** 260 diskette in drive A:

> B> **PIP B:=A:S5PEC11X.CMD** <CR>

> BSET **B:S5PEC11X.CMD[RO,SYS]** <CR>

4 Starting COM 260

The following description assumes that the preparations outlined in the section “Configuring the system” (generating a system diskette or installing COM 260 on the hard disk) have been carried out.

= **With PGs** without a hard disk, the prepared system diskette is inserted **in drive** A: **and the data diskette in drive** B:

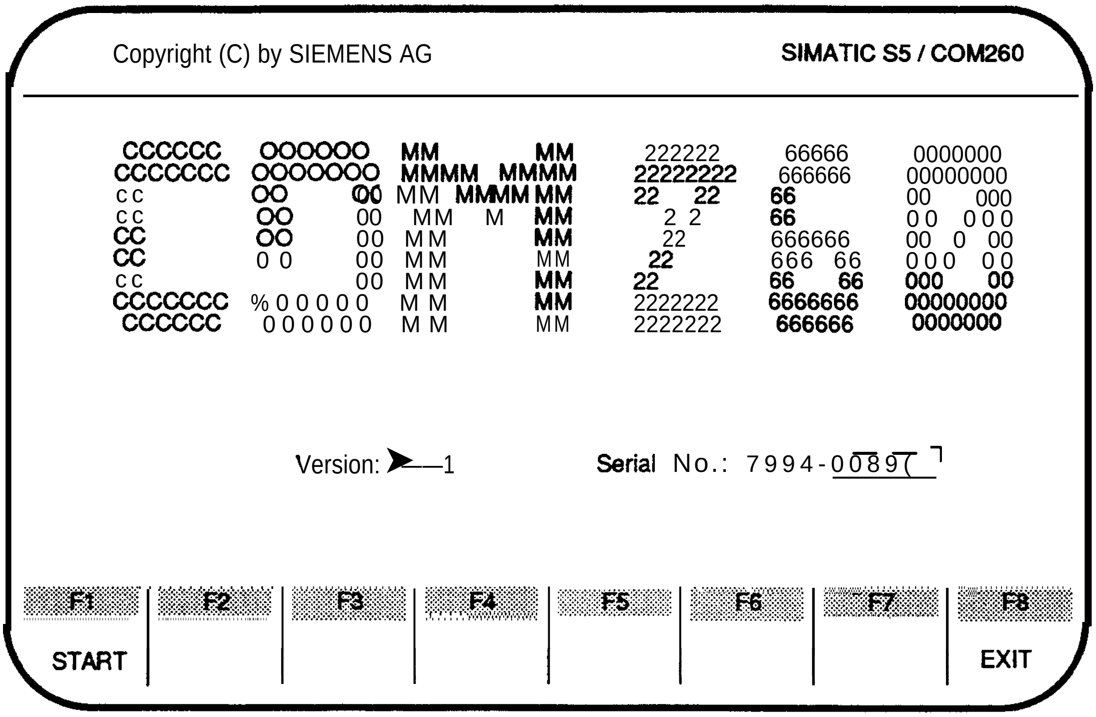
= **With PGs** with a hard disk, drive A: must not have a diskette **inserted**

= Start the PG with the power switch or key switch

Enter S5 to bad the **KOMI** in the working memory of the PG. While **S5-DOS** is being loaded, the **KOMI** screen form appears as shown below:

SIMATIC S5 : S5 - KOMI	
Serial-No.: xxxx-yyyy-zzzzzz	**All** rights resewed
Copyright **(C) 1986**	**SIEMENS AG**

Following this, you can select the required program in the “PACKAGE SELECTION” screen form, in this case **COM** 260, by moving the cursor with the arrow keys. By pressing function key **<F1>** (PACKAGE) the program is loaded from disk. Once this is **complete,** the first **COM** 260 screen form is displayed, the logo screen form.



Copyright (C) by SIEMENS AG SIMATIC S5 / COM260

```
 CCCCCC   OOOOOO   MM        MM    222222     66666     0000000
CCCCCCC  OOOOOOO   MMMM  MMMM    22222222    666666    00000000
cc       OO      OO MM  MMMMMM   22    22    66        00    000
cc       OO      00  MM   M  MM     2 2      66        00  000
CC       OO      00 MM       MM     22       666666    00  0  00
CC       0 0     00 MM       MM   22         666  66   000   00
cc               00 MM       MM  22          66    66  000    00
CCCCCCC  %00000  MM          MM  2222222     6666666   00000000
 CCCCCC   000000 MM          MM  2222222     666666    0000000
```

Version: ➤—1 Serial No.: 7994-0089

F1	F2	F3	F4	F5	F6	F7	F8
START							EXIT

▨ = Input field ⌐_ _┘ = Output field

Fig. 4.1 Logo screen form

This screen form shows the logo of the COM 260 package, the version and the serial number.

Description of the output fields:

Version: this field indicates the COM 260 version.

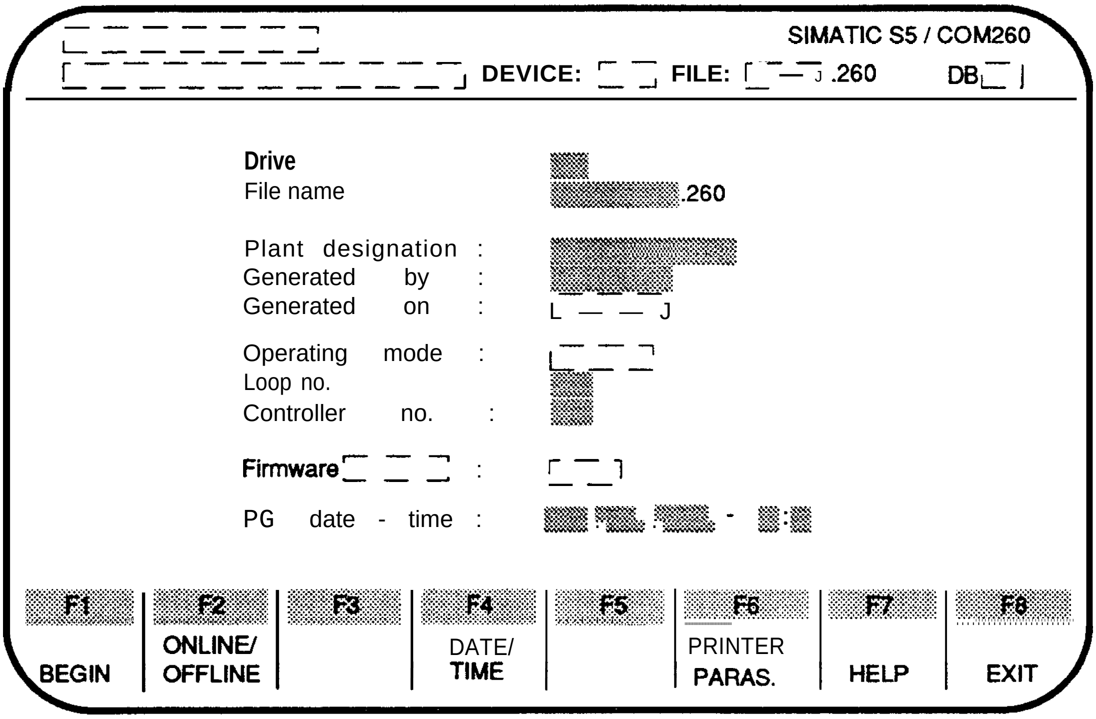
Serial no.: each diskette has a serial number which is displayed **in this field.**

Significance of the function keys:

<F1>: **<F1> branches to the next screen form, the presetting screen form.**

<F8>: you can exit COM. The program prompts yw to confirm your intention.

If yw press <F1> (START), you branch to the presetting screen form. Before displaying the presetting screen form,COM 260 checks whether it can establish an ONLINE connection to the IP 280. If this is possible, the program switches to ONLINE, the identifier of the module is read and entered in the presets screen form. From version 2 and higher the input fields for loop and controller number are displayed in non-inverse wtput fields if a manual disable is active.



SIMATIC S5 / COM260

DEVICE: FILE: .260 DB

Drive

File name .260

Plant designation :

Generated by :

Generated on :

Operating mode :

Loop no.

Controller no. :

Firmware :

PG date - time : - :

▨ Input = field [ ] = Output field

Fig. 4.2 Presetting screen form

Description of the output fields:

PRESETTING is entered in output field 2 of the header. All other output fields remain empty.

Generated on: this field shows the date on which the selected file was generated if the file already exists. If a file is being created for the first time, the current date is read in from the internal clock.

Operating mode: the mode selected with <F2> (ONLINE or OFFLINE) is displayed.

Firmware: immediately after "firmware", the type of "1P 260" module is displayed. In the next output field the version of this firmware is displayed. This is displayed in ONLINE operation. All the data of this screen form are then displayed.

Description of the input fields:

Each module has certain characteristics, some of which you cannot change and some which you can specify. There are also characteristics which must be assigned, such as the module number whereas others are optional. The optional information is mainly of documentary character and is not checked.

Drive: here, you can specify the drive in which the user data diskette will beinserted. With PGs with a hard disk, the data can, ofcourse, also be stored on the hard disk. In this case, "B" or 'C" must be selected.

File name: the file name identifies the file in which the data blocks are stored. This allows different files to be set up for different projects or systems. If you press the HELP key, a window is displayed in which you can select a file from the existing files using thecursor keys. If there are more than 10 files, you can page forwards with <F4> or backwards with <F5>. The selected file is entered with <F1>. In addition to this, the plant designation, name of the person who generated the file and the date on which the file was generated are updated.

Plant designation: this field allows you to enter the designation of the plant for which the data blocks are intended. This designation is written in the file header. This field must be completed, otherwise the error message ‘illegal input" is generated.

Generated by: in the same way as in the field for plant designation, you can enter the name of the person who generated the file. This field must also be completed.

Controller no.: this is a number between O and 99 which you assign to distinguish between controller modules. (Only possible ONLINE and when manual release is active). The number is transferred to the IP 260 when you press <F1> (BEGIN) and can be saved by transferring it from the RAM to the EEPROM.

Loop no.: here, you can assign any number between O and 99. The number is only of documentary character. (Only possible online). The number is transferred to the IP 260 when yw press cF1 > (BEGIN) and can be saved by transferring it from the RAM to the EEPROM.

PG date - time: here, the internal PG date and the time are displayed. If yw change anything in these fields, the program will assume that the date and time are being corrected and the hardware clock of the PG is set with these values.

Yw can also output the screen form as hardcopy on the printer.

Significance of the function keys:

<Fl>: **the BEGIN key branches to further processing and the presetting are written into the header. These are as follows: ONLINE the device isIP 260, otherwise FD. The selected fife containing the controller data** blocks or in which the data **blocks** will be stored. The loop number and control **number** are also transferred ONLINE to **the module providing the IP 260** manual release is active. If these two values are to be **stored** in the **EEPROM,** you must transfer them from the RAM to the **EEPROM**.

<F2>: this key switches over from OFFLINE to ONLINE and vice-versa. If you switch to ONLINE, the values on the module ("loop numbed, "control nun&r" and "firmware **version") are read and displayed in** the screen form. Otherwise, these fields are deleted.

<F4>: with this key you can enter the time and date. When the screen form is called, the values of the PG internal clock are entered.

<F6>: this key branches to the screen **form in which you enter the parameters** for different printers (see Section 6.5.1).

<F7>: using the HELP key in the drive **field,** you can select between the various drives providing they are not deselected at the KOMI level. In the file name field, a window is displayed with the existing files containing data blocks for the IP 260. With the cursor keys, YOU can select a file which is entered in the file name field by pressing function key **<F1>.** If yw press **<F8>,** the processing of the window is abandoned. If there are more than 10 files in the drive, **you** can page forwards with **<F4>** and backwards with **<F5>**.

<F8>: the EXIT key brings yw back to the fogo screen form.

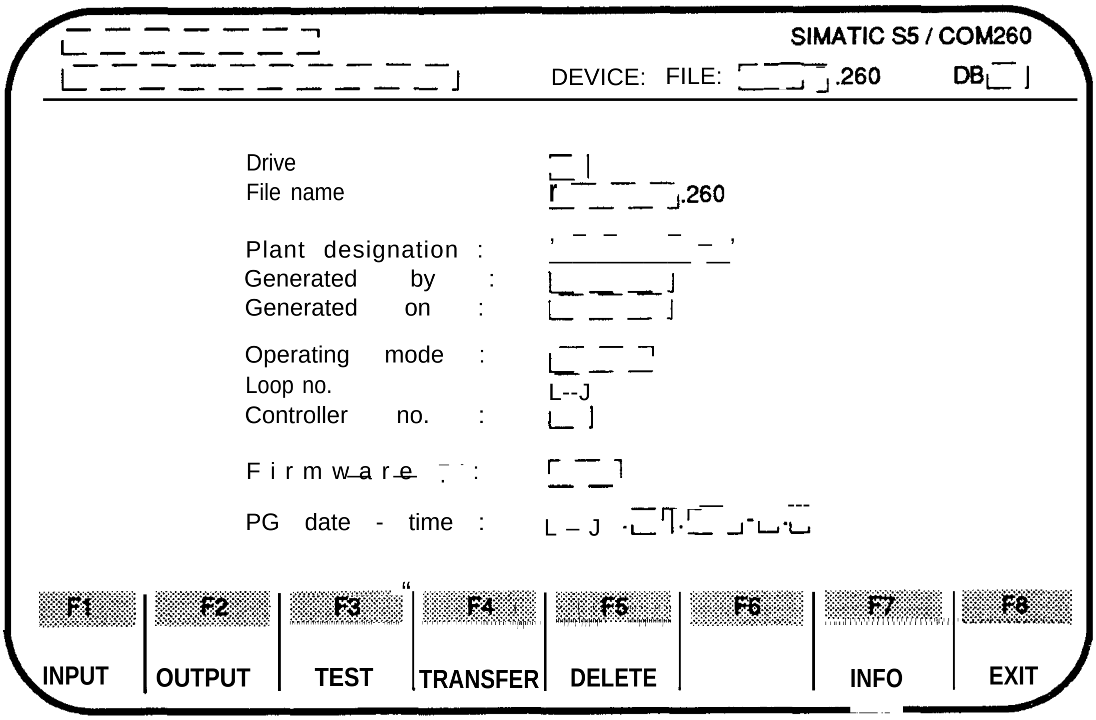
5 Function Selection

Selecting the screen form

Press <F1> (BEGIN) in the presetting screen form to obtain the main menu.

Here, the presetting is displayed once again. The fields are, however, output fields, i.e. you can no longer change the displayed values.

From this screen form you can branch to the individual functions.



▨ = Input field   [ ] = output field

Fig. 5.1 Main **menu**

Significance of the function keys:

<Fl>: branches to the input of a controller data block.

<F2>: branches to the output of a controller data block.

<F3>: branches to the test mode.

<F4>: branches to the transfer of a controller data block between the different media.

<F5>: branches to delete data blocks on the individual media.

<w>: branches to the information screen form. The controller and data blocks on the individual media are displayed.

<F8>: exits the screen form and returns to the presetting screen form.

6 Input

6.1 General Notes

in this program branch, you can generate a complete new controller data block by entering all the required data in the screen forms and transferring it to the IP 260 or saving it on a data drive.

in all the fields where numbers with decimal places are required, you do not need to enter all the decimal places. The exceptions are the fields with dimensional values where the number of decimal places must be entered as in the general screen form.

Example:

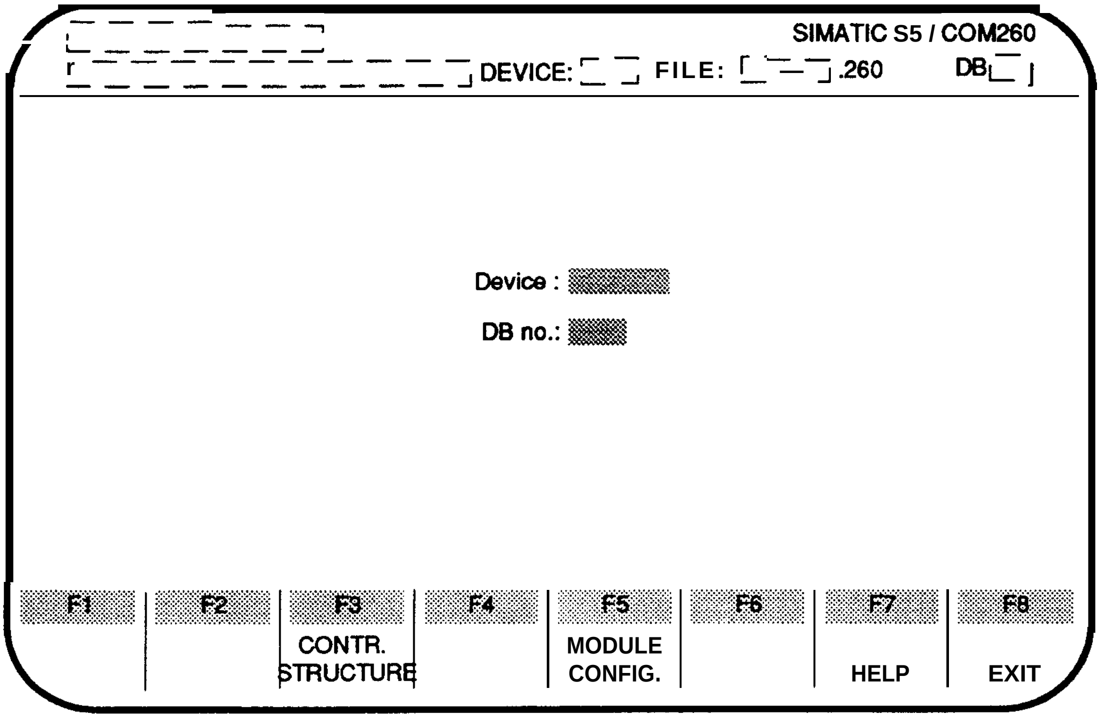
Percentage 30.00% : valid inputs -> 30
30.
30.0
30.00

In the individual screen forms, you can activate or deactivate certain functions using “switches”. “Switch” means the input field above the left top corner of the field in each screen form (e.g. the root extractor in the actual value branch), or the input field in the left bottom comer in the screen form for auxiliary branches. This is only possible with the function key <F7> (HELP). The signal flow is displayed again and the active input fields are displayed inversefy and the deactivated fields are displayed normally. To make an entry within an active field, press the RETURN key. You can skip fields with the cursor keys.

6.2 Block Selection

Selecting the screen form:

From the main menu, <F1> (INPUT) brings you to the block selection screen form.



SIMATIC S5 / COM260

DEVICE: FILE: .260 DB

Device :

DB no.:

▨ = Input field [ ] = Output field

Fig. 6.1 Block selection form with menu 1

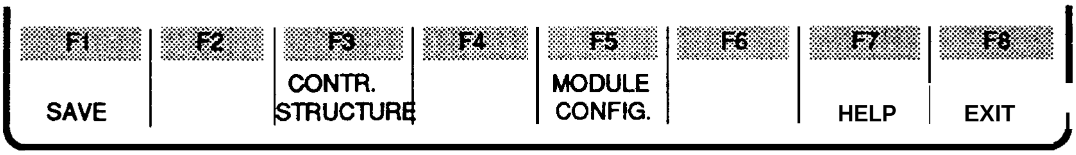


Fig. 6.2 Menu 2 for Mock selection form

Description of the output fields:

MAIN MENU is displayed in output field 1 of the header and INPUT in field 2. The other output fields remain as after the presetting screen form.

Description of the input fields:

Device: preselects which unit will be used to store the generated data block. ONLINE, IP 260 is entered automatically, otherwise FD. You can manipulate this selection with the function key <F7> (HELP). When you exit the field, the selected device is entered in the header.

DB no.: here, you select the data block number in which the generated data will be stored. The DB no. can have values between 1 and 255. With the function key <F7> (HELP) a window is displayed listing the existing data blocks. Using the cursor keys up/down, you can select one of these files. The number of the selected file is entered in the DB no. field with <F1>. If there are more than 10 data blocks available, you can page forwards with cF4> and backwards with < F5>.
When you exit the field, the DB no. is entered in the header.

Significance of the function keys:

<F1>: if you have entered the two possible branches CONTROLLER STRUCTURE <F3> and MODULE CONFIGURATION cF5> and completed them with <F1> (ENTER), menu 2 is displayed with the option <F1>. The generated data block is then stored on the selected device with the DB number entered and the program branches back to the main menu.

<F3>: branches to controller structure input.

<F5>: branches to module configuration input.

<F7>: using the HELP key in the “device” field, you enter the text "FD" or "IP 260”. In the DB no. field, a window is displayed with the existing controller data blocks (see above).

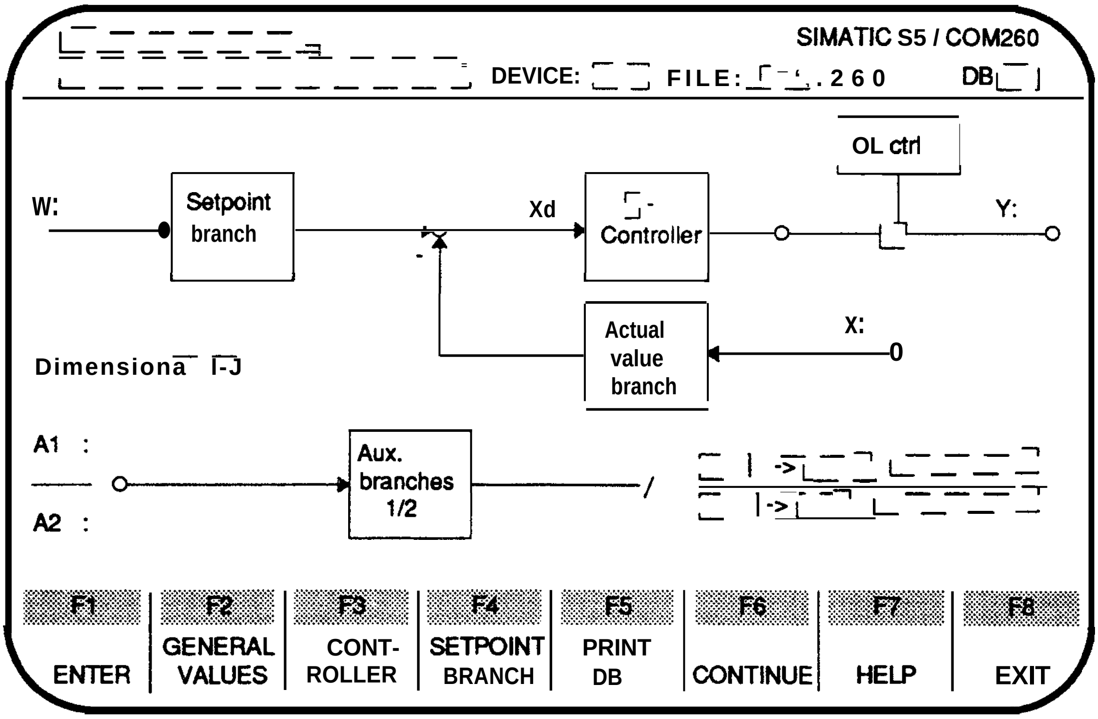
<F8>: the exit key returns yw to the main menu; any data block which may have been created is not saved.

6.3 Controller Structure

6.3.1 Overview

Selecting the soreen form:

If you press <F3> in the data block selection screen form, the overview screen form is dispfayed.



▨ = field [ ] = Output field

Fig. 6.3 Overview with menu 1

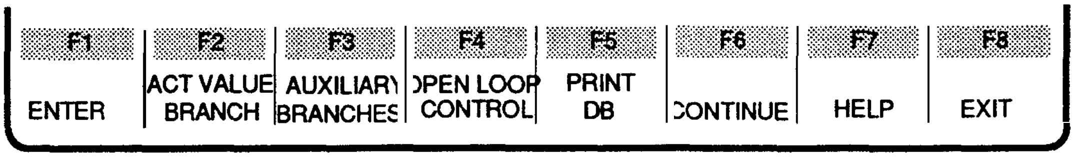


Fig. 6.4 Menu 2 for overview

Description of the output fields:

INPUT is displayed in output field 1 of the header and OVERVIEW in output field 2. In the output field DEVICE, the previously selected device is entered and the DB number is displayed in theDB field.

There are also various inputs from other screen forms to provide more information. These are as follows:

. The controller field shows the controller type, K or S controller. The entry here depends on the specified controller type in the general screen form. When this screen form is first output, K controller is the default.

- In the next output field, the startup mode (closed loop control xx or open loop *control xx is* displayed as entered in the general screen form.
- The dimension is entered according to the specification in the general screen form.

. Following the aux. branches 1/2 field, the current status of the parameter assignment is entered for each of the auxiliary branches The information given is as follows: whether it is switched on or off, and if switched on, active in which direction (positive/negative) as well as the summation point (before/after the controller) to which the auxiliary branch is connected.

Description of the input fields:

There are no input fields in this screen form. An overview of the fields to which yw can branch with the function keys is displayed. Since there are more functions than function keys, you can use <F6> to call the second menu.

Significance of the function keys (menu 1):

<F1>: enters the data input in all screen forms and returns to block selection.

<F%: branches to the screen form for the input of general controller data.

<F3>: branches to the screen form for inputting data for the controller. The controller type is taken from the general screen form. The default is the K controller with analog output.

<F4>: branches to the screen form for inputting the setpoint branch.

<F5>: generates a printout of the data input to the controller data block currently being processed. See Section 6.5.

<F6>: calls menu 2.

<F7>: HELP key (not necessary here).

<F8>: returns to block selection without saving the data input.

Significance of the function keys (menu 2):

<F1>: enters the input data of all screen forms and returns to block selection.

<F2>: branches to the screen form for inputting the actual value branch.

<F3>: branches to the screen form for inputting the auxiliary branch.

<F4>: branches to the screen form for inputting the open loop branch (only with K controller).

<F5>: generates a printout of the data input for the controller data block currently being processed (see Section 6.5).

<F6>: returns to menu 1.

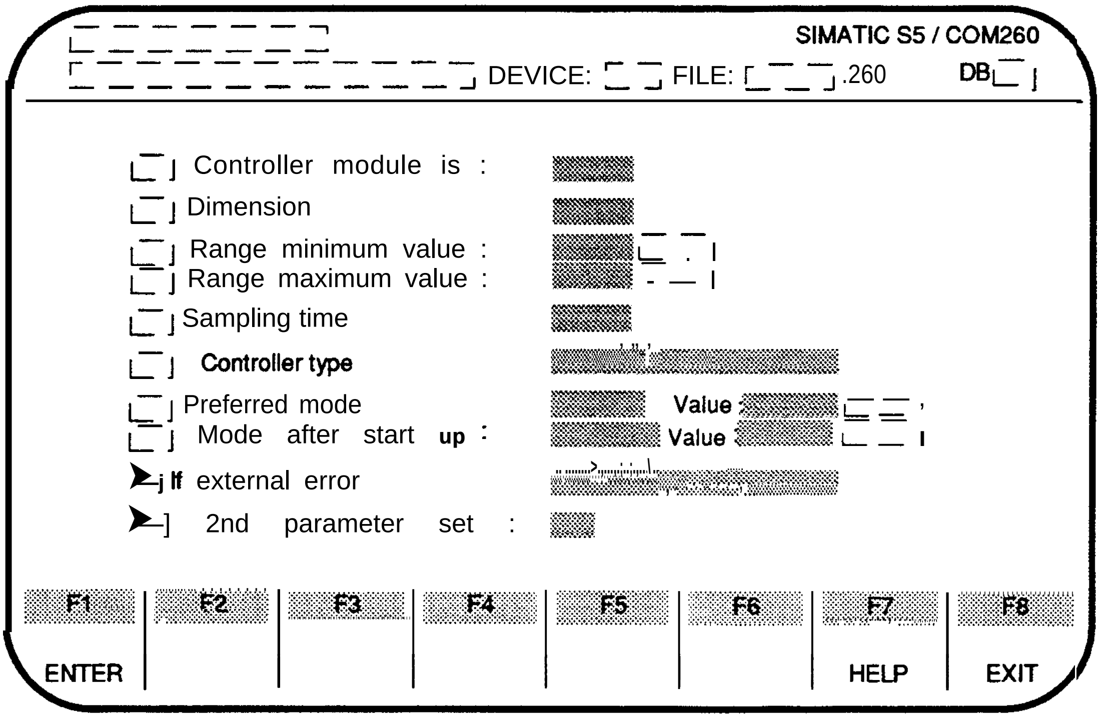
<F7>: HELP key (not required here).

<F8>: returns to block selection without entering the data input.

6.3.1.1 General Values

Selecting the screen form:

If yw press <F2> (GENERAL VALUES) in the overview screen form, the general values screen form is displayed.



SIMATIC S5 / COM260

DEVICE: FILE: .260 DB

Controller module is :

Dimension

Range minimum value :

Range maximum value :

Sampling time

Controller type

Preferred mode Value

Mode after start up : Value

If external error

2nd parameter set :

$!&& = Input field [1 = Output field

Fig. 6.5 General values screen form

Description **of the output fields:**

G E N E R A L is displayed in output field 2 of the header. Otherwise the contents are unchanged.

Description of the input fields

Controller module is:

"MASTER" or "SLAVE". Can afso be selected using the function key <F7> (HELP).

Dimension:

You oan enter a maximum of 6 ASCII characters to indicate a dimension. An entry must be made.

Range minimum/maximum value:

Dimensional values in the range -9999 to 9999. Incorrect entries such as minimum> maximum cause an error message and must be corrected. The resolution of the range (number of decimal places) must be the same for both values and for dimensional values in all screen forms. A maximum of four decimal places is possible.

Sampling time (Ta):

Range of values: 20 ms ≤ Ta (K controller) ≤ 9999s
60 ms ≤ Ta (S controller) ≤ 9999s.
The value must also be a multiple of 20 ms.

Controller type:

Here, you enter the controller type. Possible entries are:

'K CONTR. (AQ with YR)', 'K CONTR. (AQ without YR)',
'K CONTR. (2 point)', 'K CONTR. (3 point)',
'S CONTR. '

The entry made here determines the ranges for the default value in the preferred mode and start-up mode, as well as the permitted start-up mode.

Preferred mode:

Here, yw enter the mode which is switched on when a switchover is made to the preferred mode. Possible entries are as follows: 'CL CTRL' and 'OL CTRL'. These entries can also be made with the function key <F7> (HELP). See also the firmware description in Section 1.6.

Value for preferred mode:

Depending on whether OPEN LOOP or CLOSED LOOP control is entered as the preferred mode and depending on the controller type, you must enter a dimensional value (CLOSED LOOP CONTROL) or a percentage (OPEN LOOP CONTROL). The number of decimal places must not be forgotten with dimensional values.

Mode after start up:

Here, you enter the mode to be executed when the power supply is first switched on. Possible entries are the mode commands 'CL CTRL PC', 'CL CTRL PG', 'CL CTRL EW', 'OL CTRL PC', 'OL CTRL PG' and 'OL CTRL EW'. 'OL CTRL EW' is not allowed with the S controller. These entries can also be made with the function key <F7> (HELP). See also the firmware description in Section 1.8.2.

Default value for the start-up mode:

Depending on the start-up mode selected, CL CTRL xx or OL CTRL xx and the type of controller, you must enter a dimensional value (CL CTRL) or a percentage. The number of decimal places should not be forgotten with dimensional values.

If external error:

Here, you specify the controller reaction to error messages FC2, FC3 and FC4. Possible entries are 'Controller xxxx' and 'retain mode'. You can also make these entries with the function key <F7> (HELP). Refer also to the firmware description in Section 2.2.

2nd parameter set:

Here, you specify whether a second parameter set should be input or not. Possible entries are "ON" or "OFF. These can also be made with function key <F7> (HELP). If the second parameter set is "ON" the return key branches to the screen form for entry of the second parameter set (Section 6.3.1 .2).

Significance of the function keys:

<F1 >: enters the data input in the controller data block and returns to the overview.

<F7>: HELP key in the permitted fields.

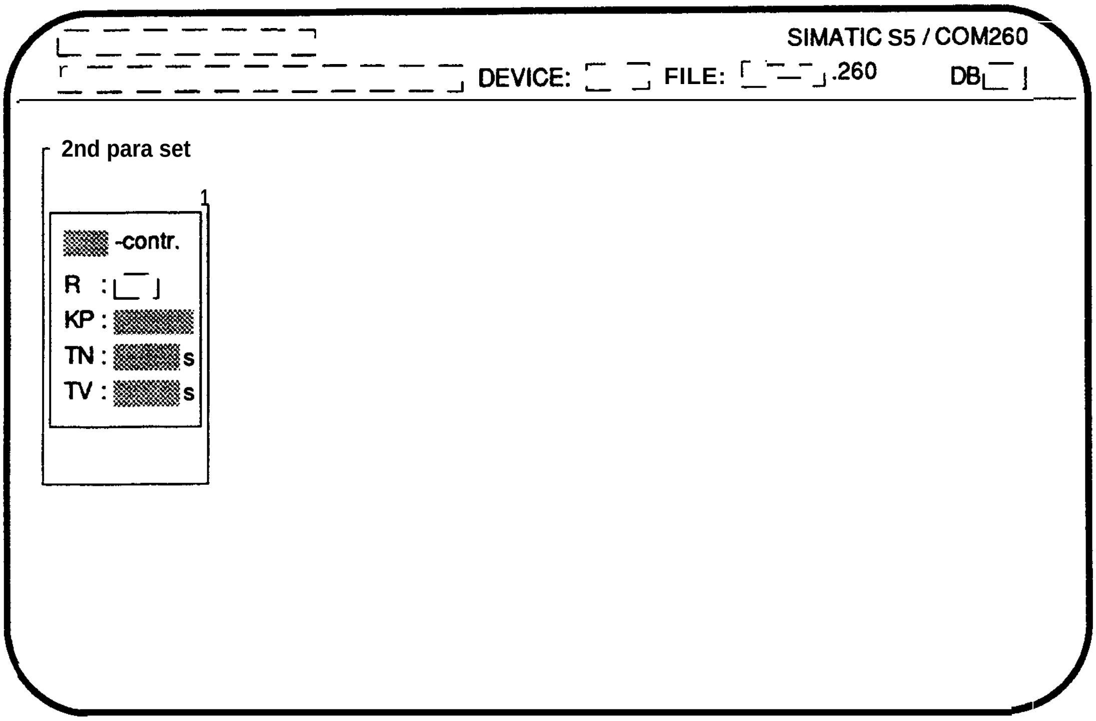
<F8>: jumps back to the overview without the data being saved in the controller data block.

You can output the screen form on the printer as a hardcopy.

6.3.1.2 Second Parameter Set

Selecting the screen form

If you completed the input field for the second parameter set with “ON” in the general screen form, press the return key to display the window for the entry of the second parameter set.



SIMATIC S5 / COM260

DEVICE: FILE: .260 DB

2nd para set

1

▨ -contr.

R :

KP : ▨

TN : ▨ s

TV : ▨ s

▨ = Input field [‾‾‾] = Output field

Fig. 6.6 Window 2- parameter set

The screen form for input of the second parameter set is in the form of a window on the left of the screen, superimposed over the general screen form.

Description of the input fields:

Controller type field:

Here, you enter the oontrollertype. Possible entries are ‘P ‘, ’PI ’, ’PID’, ’I ‘ and ’PD ’. These can also be selected using the function key <F7> (HELP). When you exit the field, the fields of the parameters R, KP, TN and TV are run through depending on the controller type.

Controller parameter R:

Depending on the selected controller type, this is automatically switched on or off. No entry is necessary.

Controller parameter KP:

Entry as a factor.
Range of values $-99.99 \leq KP < 0$ and
$99.99 < KP > 0$.

Controller parameters TN and TV:

Range of values: $Ta \leq TN \leq 9999$ s
$Ta \leq TV s\ 150 \cdot Ta/KP$

Significance of the function keys:

<Fl >: enters the data input in the controller data block and returns to processing in the general screen form.

<F7>: HELP key in the permitted fields.

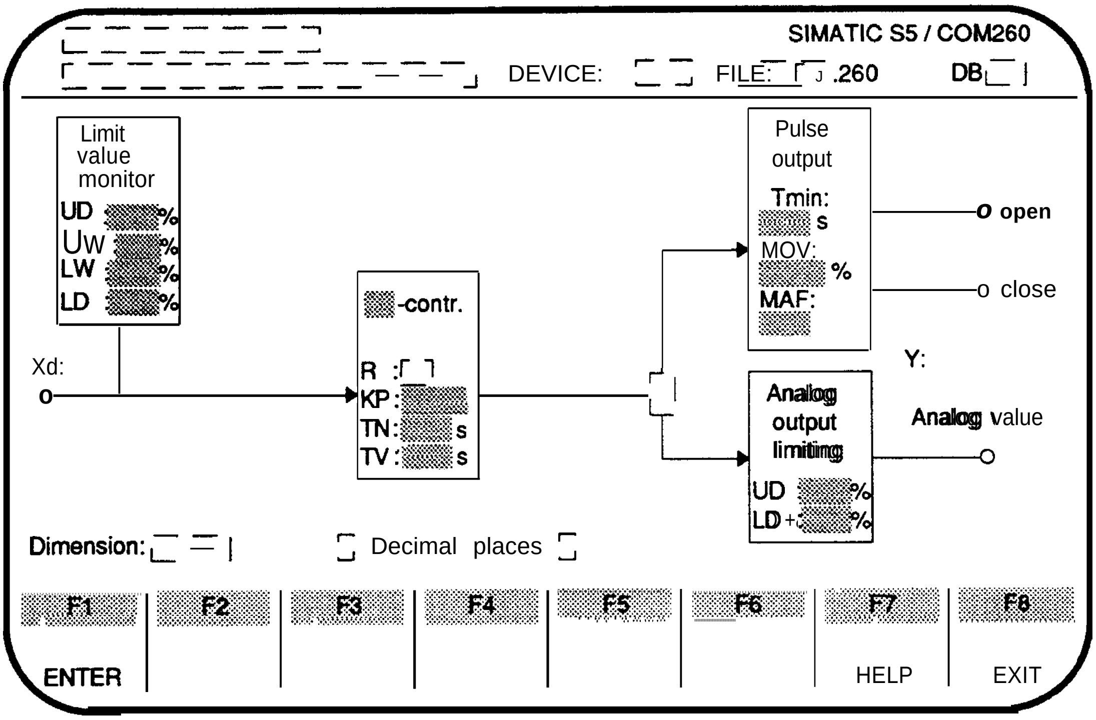
<F8>: jumps back to the general screen form without saving the data in the controller data block.

You can output the screen form on the printer as a hardcopy.

6.3.1.3 K Controller

Selecting the screen form:

If you entered K controller with analog output, 2 point or 3 point pulse output as the controller type and exited the screen form with ENTER, or if the controller type K controller is already entered in the overview, then press the function key <F3> (CONTROLLER) in the main menu, to display the K controller screen form.



▨ = Input field ⌐ ⌐ = Output field

Fig. 6.7 K controller screen form

Description of the output fields:

K-CONTROLLER is entered in output field 2 in the header. Otherwise the contents remain unchanged.

The screen form is displayed according to whether the analog output or the pulse output is required.

Description of the input fields:

Error limit value monitor:

Here, you enter the parameters for the limit value monitor for the error as percentages.

Range of values

Upper danger limit(XDUD):
-300.00% < XDUD < 300.00%
Upper warning limit(XDUW):
XDUD > XDUW > XDLW
Lower warning limit(XDLW):
XDUW > XDLW > XDLD
Lower danger limit(XDLD):
-300% < XDLD < XDUW

Controller type field:

Here, you enter the controller type. Possible inputs are as follows: 'P ', 'PI ', 'PID', 'I ' and 'PD '. The selection can also be made with the function key <F7> (HELP). When you exit the field, the fields for the parameters R, KP, TN and TV are run through depending on the controller type or occupied in the case of R.

Controller parameter R:

Depending on the selected controller type, this is automatically switched on or off. No entry is necessary.

Controller parameter KP:

Entry as a factor.
Range of values: -99.99 ≤ KP <0 and
99.99 ≤ KP >0.

Controller parameters TN and IV:

Range of values: Ta ≤ TN ≤ 9999s
Ta ≤ TV ≤ 150 • Ta/KP

Controller with analog output:

Analog output limiter:
upper limit(YUD) : percentage
range of values O < YUD ≤ 100.OOYO
lower limit (YLD) : percentage
range of values O ≤ YLD < YUD

Controller with pulse output:

Tmin:	range of values Ta/32767 < Tmin ≤ Ta multiple of 20 ms
Min. op. value MOV:	percentage range of values 0% < MOV ≤ 50.00%
Matching factor MAF:	factor range of values O < MAF ≤ 99.99 If the matching factor is O it is a 2 point controller.

Significance of the function keys:

<Fl>: enters the data input in the controller data block and returns to the overview.

<F7>: HELP key in the permitted fields.

<F8>: jumps back to the overview without the data in the controller data block being entered.

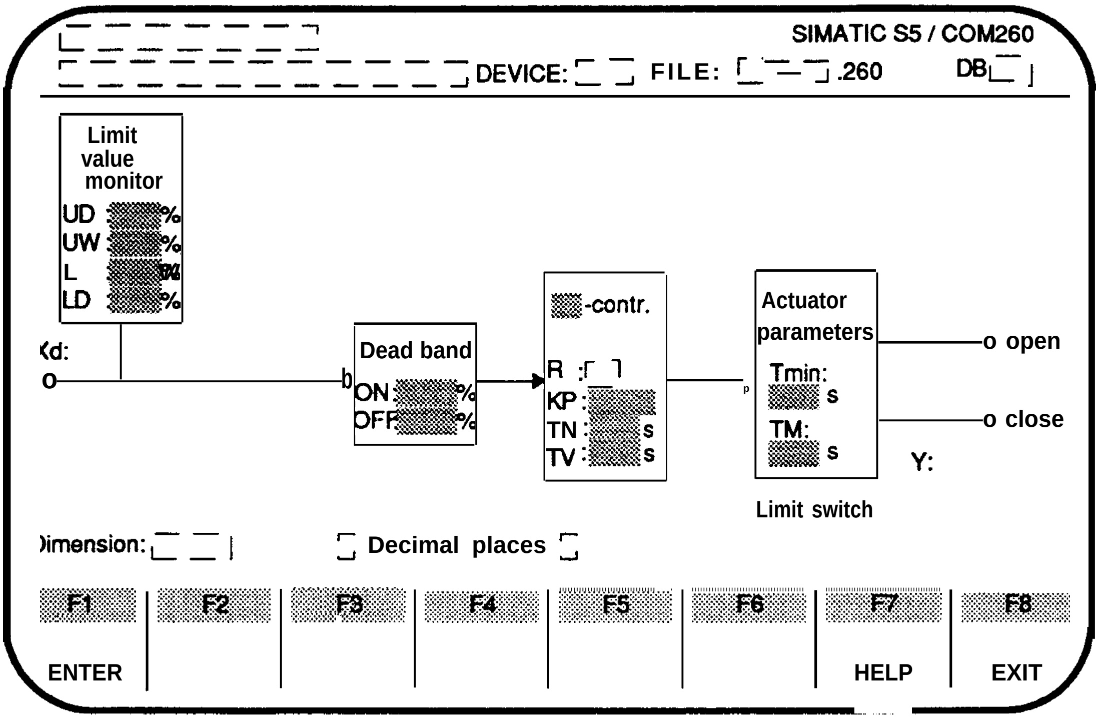
You can output the screen form on the printer as a hardcopy.

For more detailed information on the K controller with manipulated variable output, see Part 3 (Basic Handling and Explanations) Section 2.2.4.

6.3.1.4 S Controller

Selecting the screen form:

If you entered S controller as the controller type in the general screen form and vw exited the screen form with ENTER, or if the controller type S controller is already entered in the overview, then press function key <F3> (CONTROLLER) in the main menu to display the S controller screen form.



▨ = Input field   [_ _] = Output field

Fig. 6.8 S controller screen form

Description of the output fields:

S-CONTROLLER is entered in output field 2 in the header. Otherwise the contents remain unchanged.

Description of the input fields:

Error limit value monitor:

Here, you enter the parameters for the limit value monitor for the error as percentages.

Range of values:

Upper danger limit (XDUD):
-300.00% < XDUD < 300.00%
Upper warning limit (XDUW):
XDUD > XDUW > XDLW
Lower warning limit (XDLW):
XDUW > XDLW > XDLD
Lower danger limit (XDLD):
-300% < XDLD < XDUW

Switch on threshold of the dead band (TAN):

Percentage, range of values: 0% c TAN ≤ 100.00%

Switch off threshold of the dead band (TAB):

Percentage, range of values: 0% c TAB < TAN

Controller type field:

Here, you enter the controller type. Possible inputs are as follows: “P “, “Pi”, "PID", "I “ and “PD”. The selection can also be made with the function key <F7> (HELP). When you exit the field, the fields for the parameters R, KP, TN and TV are run through depending on the controller type or occupied in the ease of R.

Controller parameter R:

Depending on the selected controller type, this is automatically switched on or off. No entry is necessary.

Controller parameter KP:

Entry as a factor, range of values: -99.99< KP < 0
99.992 KP > 0.

Controller parameters TN and TV:

Timer values, range of values: Ta ≤ TN ≤ 9999s
Ta ≤ TV ≤ 150 * Ta/KP

Actuator parameters:

Tmin: range of values	TM/32767 < Tmin ≤ TM
TM: range of values	20 ms < TM ≤ 9999s and multiples of 20 ms

Significance of the function keys:

<FI >: enters the data input in the controller data block and returns to the overview.

<F7>: HELP key in the permitted fields.

<F8>: jumps back to the overview without the data in the controller data block being entered.

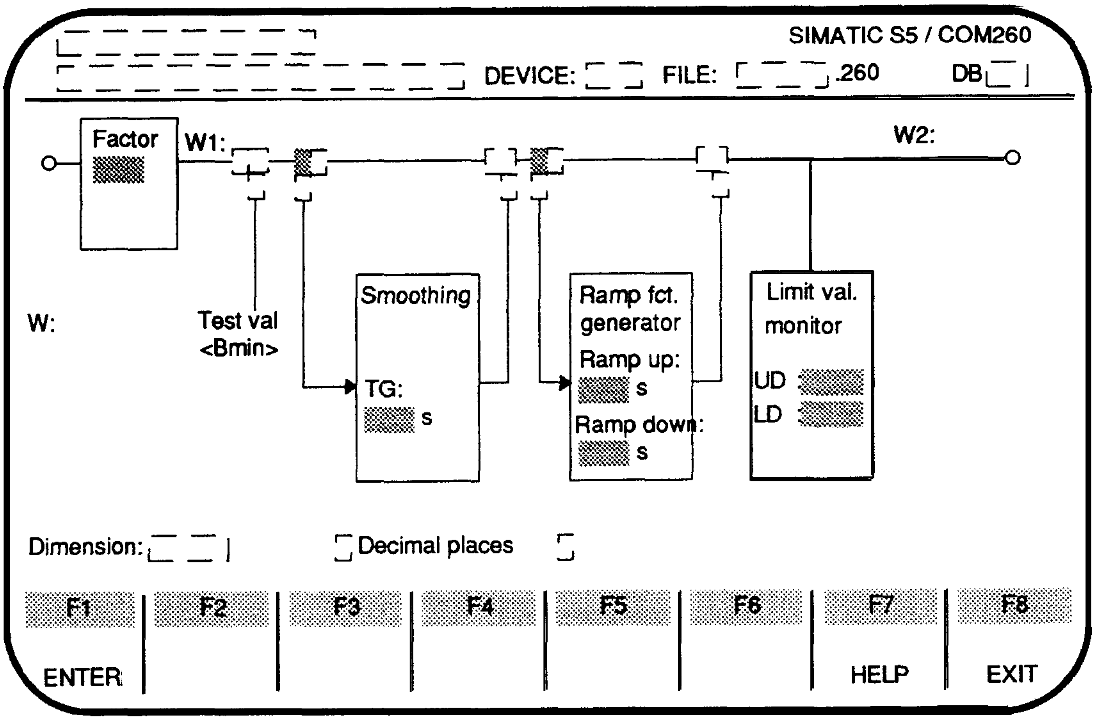
You can output the screen form on the printer as a hardcopy.

For more detailed information on the S controller with manipulated variable output, see Part 3 (Basic Handling and Explanations) Section 2.2.5.

6.3.1.5 Setpoint Branch

Selecting the screen form:

If you pressed the function key **<F4>** (SETPOINT BRANCH) in the overview, the **setpoint** branch screen form is displayed.



SIMATIC S5 / COM260

DEVICE: ▭ FILE: ▭.260 DB▭

Factor ▨

W1: ▭ ▨ ▭ ▨ ▭

W2:

W:

Test val <Bmin>

Smoothing
TG: ▨ s

Ramp fct. generator
Ramp up: ▨ s
Ramp down: ▨ s

Limit val. monitor
UD ▨
LD ▨

Dimension: ▭

▭ Decimal places ▭

F1	F2	F3	F4	F5	F6	F7	F8
ENTER						HELP	EXIT

▨ Input field ▭ = Output field

Fig. 6.9 **Setpoint branch screen form**

Description of the output fields:

SETPOINTBRANCH is entered in output field 2 in the header. Otherwise the contents remain unchanged.

Description of the input fields:

Factor in the setpoint branch:

Range of values 0.01-99.99.

Ramp function generator switch:

The ramp function generator in the setpoint branch can be switched on or off with this switch. An entry is only possible with the function key <F7> (HELP).

Ramp-up time:

Here, yw enter the ramp-uptime for the ramp function generator in seconds. Range of values: Ta ≤ ramp-up times 9999 seconds.

Ramp-down time:

Here, yw enter the ramp-down time of the ramp function generator in seconds. Range of values: Ta ≤ ramp-down time ≤ 9999 seconds.

Smoothing switch:

The smoothing element in thesetpoint branch can be switched on or off with this switch. An entry is only possible with the function key <F7> (HELP).

Smoothing time(TG):

Range of values: Ta ≤ TG ≤ 9999 seconds.

Limit value monitor:

The parameters of the limit value monitor in the setpoint branch are dimensional values. The range of values and the resolution (number of decimal places) of the entry depends on the value entered in thegeneral screen form. Yw should enter this first. The number of decimal places is displayed at the bottom of the screen form.

Range of values:

upper limit (WUD):	Bmin ≤ WUD ≤ Bmax
lower limit(WLD) :	Bmin ≤ WLD < WUD

Significance of the function keys:

<FI>: enters the data input in the controller data block and returns to the overview.

<F7>: HELP key in the permitted fields.

<F8>: jumps back to the overview without the data in the controller data block being entered.

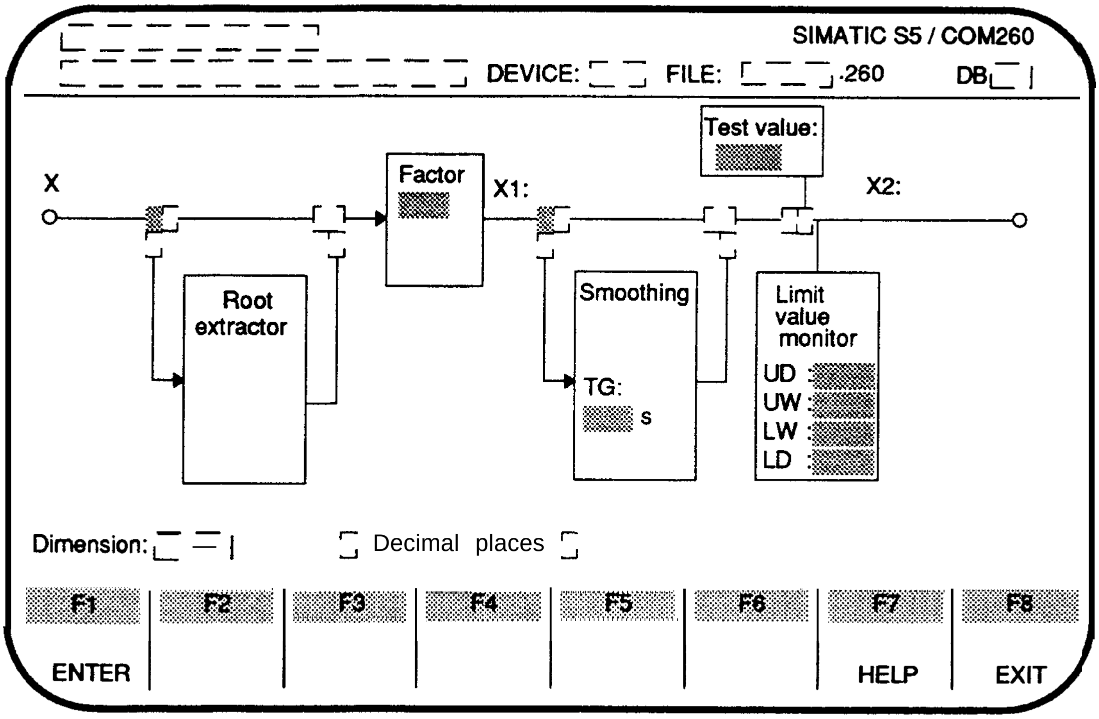
You can output the screen form on the printer as a hardcopy.

For more detailed information on the setpoint branch see Part 3 (Basic Handling and Explanations) Section 2.2.1.

6.3.1.6 Actual Value Branch

Selecting the screen form:

If you pressed <F6> (CONTINUE) **and then <F2>** (ACT VALUE BRANCH) **in the overview, the actual value branch is displayed.**



▨ = Input field ⌐ — — ⌐ = Output field

Fig. 6.10 Actual value branch screen form

Description of the output fields:

A CT. V A L U E B R A N C H is entered in output field 2 **in the header. Otherwise the contents remain unchanged.**

Description of the input fields:

Test value:

Here, you enter an actual value for testing after installation. The value is dimensional. The range of values and the resolution (number of decimal places) of the entry depends on the value entered in the general screen form. Yw should enter this first. The number of decimal places is displayed at the bottom of the screen form.

Factor in the actual value branch:

Range of values 0.01-99.99.

Switch for root extractor:

The root extractor in the actual value branch can be switched on or off with this switch. The entry is only possible using the function key <F7> (HELP).

Smoothing element switch:

The smoothing element in the setpoint branch can be switched on or off with this switch. An entry is only possible with the function key <F7> (HELP).

Smoothing time (TG):

Range of values: $Ta \leq TG \leq 9999s$.

Limit value monitor:

The parameters of the limit value monitor in the setpoint branch are dimensional values. The range of values and the resolution (number of decimal places) of the entry depends on the value entered in the general screen form. You should enter this first. The number of decimal places is displayed at the bottom of the screen form.

Range of values:

upper danger limit (XUD):	**Bmin ≤ XUD ≤ Bmax**
upper warning limit(XUW):	**Bmin ≤ XUW < XUD**
lower **warning limit (XLW):**	**Bmin ≤ XLW < XUW**
lower **danger limit(XLD):**	**Bmin ≤** WUD **c** XLW

Significance of the function keys:

<FI >: enters the data input in the controller data block and returns to the overview.

<F7>: HELP key in the permitted fields.

<F8>: jumps back to the overview without the data in the controller data block being entered.

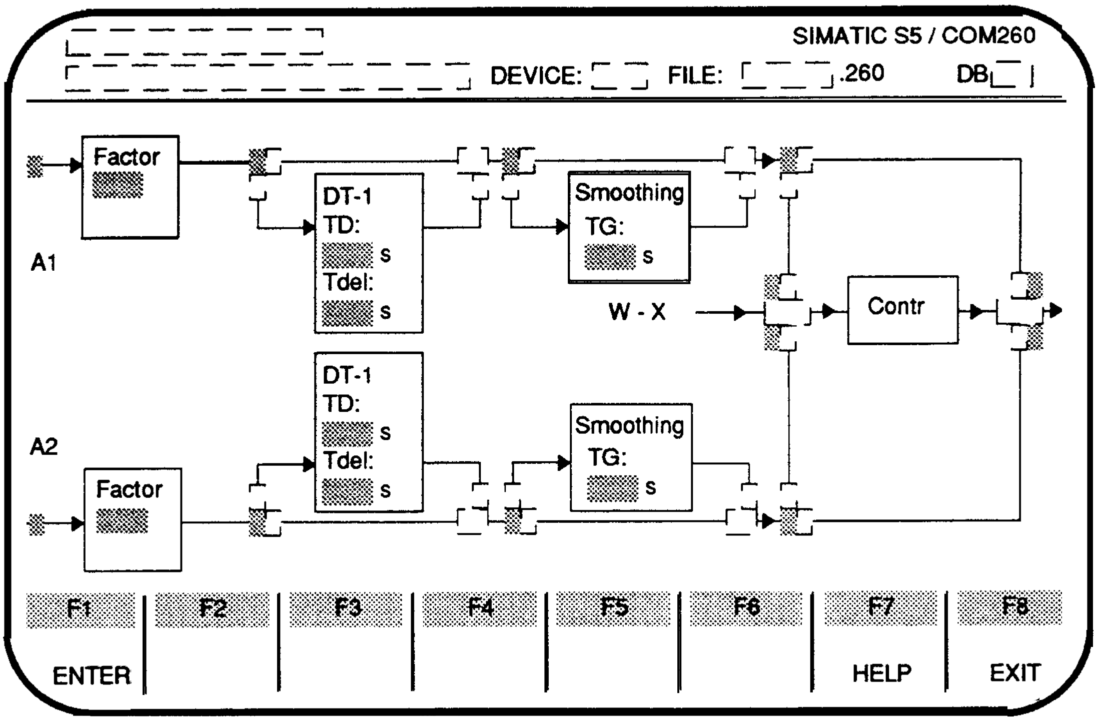
You can output the screen form on the printer as a hardcopy.

For more detailed information on the actual value branch see Part 3 (Basic Handling and Explanations) Section 2.2.2.

6.3.1.7 Auxiliary Branches

Selecting the screen form:

If you pressed <F6> (CONTINUE) and then <F3> (AUXILIARY BRANCHES) in the overview, the auxiliary branches screen form is output.



▨ = Input field ⌐ ‾ ‾ ¬ = Output field

Fig. 6.11 Auxiliary branches screen form

Description of the output fields:

AUXILIARYBRANCHES is entered in output field 2 in the header. Otherwise the contents remain unchanged.

Description of the input fields:

The description of the following input fields applies to both auxiliary branches owing to the symmetrical design of the screen form.

On/off switch for auxiliary branches:

The **auxiliary** branch can be switched on or off with this switch. When the auxiliary branch is switched on, other entries become necessary. All the fields in which entries are necessary are displayed inversely. You can enter the **switchover** with function key **<F7>** (HELP). If you selected a K controller with analog output and **YR** (position feedback) in the general screen form, auxiliary branch **A2** must be switched on.

Factor in auxiliary branch:

Range of values 0.01-99.99.

Switch for the **DT-1** element:

On/off switch for the **DT-1** element. The **switchover** can only be made with the **function** key **<F7>** (HELP). **If** you selected a K controller with analog output **YR** (position feedback) in the general screen form, no **DT-1** element can be selected.

Derivative action time of the **DT-1** element **(TD):**

Entry only possible if the **DT-1** element is switched on. Range of values: **Ta ≤ TD ≤** 9999 seconds.

Delay time of the **DT-1** element **(Tdel):**

Input only possible when the **DT-1** element is switched on. Range of values: **Ta ≤ Tdel ≤** 9999 seconds or Tdel = O.

Switch for the smoothing element:

On/off switch for the smoothing element. The **switchover** can only be made with the function key **<F7>** (HELP).

Smoothing time **(TG):**

Entry can only be made when the smoothing element is switched on.
Range of values: **Ta ≤ TG ≤** 9999 seconds.

Selection whether the auxiliary branch is effective before or after the controller:

You can decide whether the auxiliary branch is effective before or after the controller. This entry can only be made with the function key <F7> (HELP). If you entered a K controller with analog output and YR (position feedback) in the general screen form, the auxiliary branch A2 stops here.

Sign of the auxiliary branch at the selected summation point:

Yw can select the sign with which the auxiliary branch is effective at the summation point. Enter either "+" or "-". This entry can also be made with the function key <F7> (HELP).

Significance of the function keys:

<Fl>: enters the data input in the controller data block and returns to the overview.

<F7>: HELP key in the permittedfields.

<F8>: jumps back to the overview without the data in the controller data block being entered.

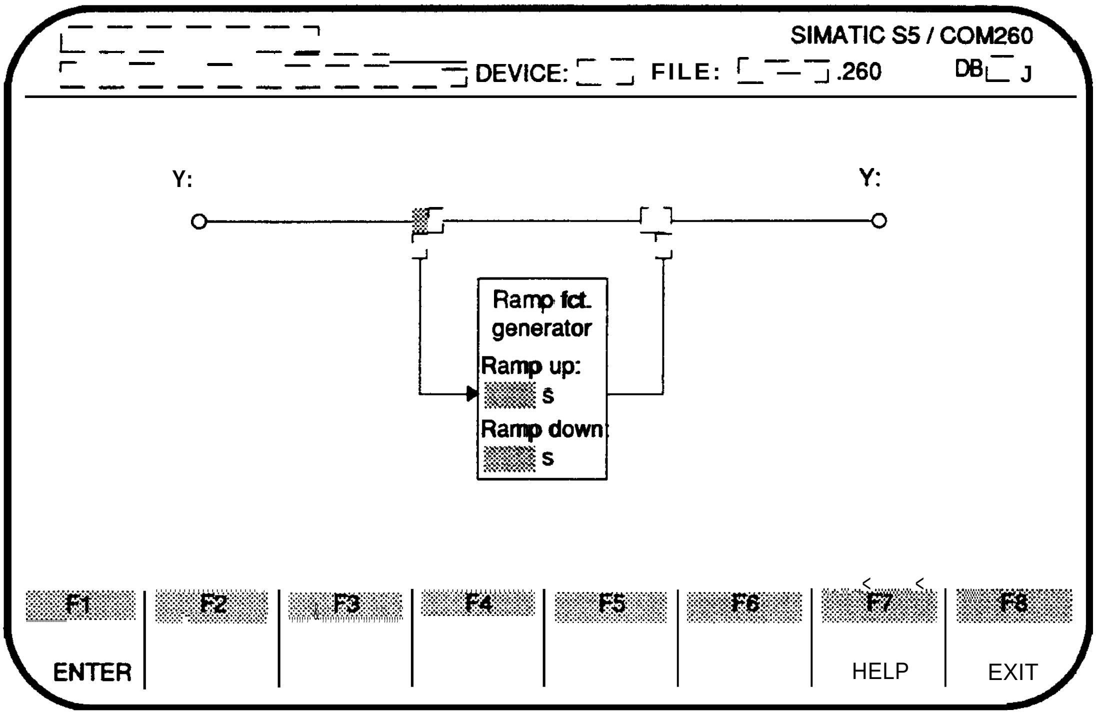
You can output the screen form on the printer as a hardcopy.

For more detailed information on the auxiliary branches see Part 3 (Basic Handling and Explanations) Section 2.2.3.

6.3.1.8 Open Loop Control (K Controller)

Selecting **the screen form:**

If yw pressed <F& (CONTINUE) and then <F4> (OPEN LOOP CONTROL) in the overview, the open loop control screen form of the K controller is output.



▨ = Input field   [1 = Output field

Fig. 6.12 Open loop control screen form

Description of the output fields:

0 P E N L 00 P C O N T R O L is entered in output field 2 in the header. Otherwise the contents remain unchanged.

Description of the input fields:

Ramp function generator switch:

The ramp function generator in the open loop branch can be switched on or off with this switch. Entry is only possible with the function key **<F7>** (HELP).

Ramp-up time:

Here, yw enter the ramp-uptime of the ramp function generator in **seconds.** Range of values: **Ta** ≤ ramp-up time ≤ 9999s.

Ramp-down time:

Here, yw enter the ramp-downtime of the ramp function generator in seconds. Range of values: **Ta** ≤ rampdown time ≤ 9999s.

Significance of the function keys:

<F1>: enters the data input in the controller data block and returns to the overview.

<F7>: HELP key in the permitted fields,

<F8>: jumps back to the overview without the data in the controller data block being entered.

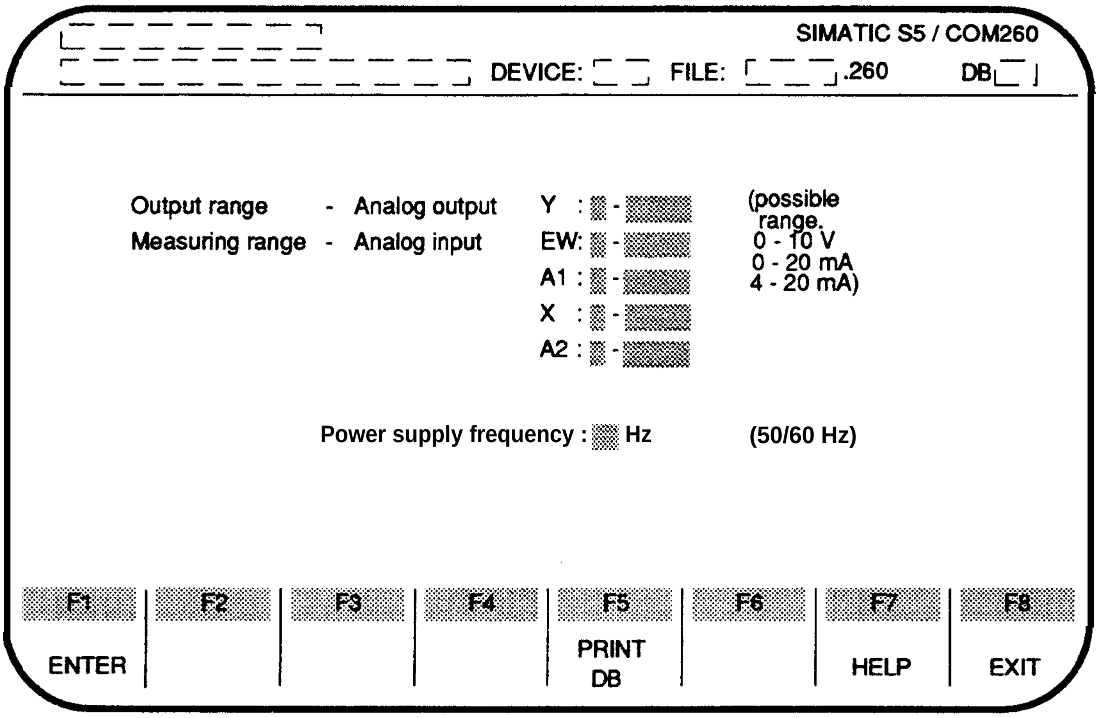
You can **output** the screen form on the printer as a hardcopy.

For more detailed information on the manipulated variable branch see Part 3 (Basic Handling and Explanations) Section 2.2.4.1.

6.4 Module Configuration

Selecting the screen form:

If you pressed <F5> (MODULE CONFIG) in the data block selection screen form, the module configuration screen form is displayed.



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DEVICE: FILE: .260 DB

Output range - Analog output Y : ▨ - ▨

Measuring range - Analog input EW: ▨ - ▨

A1 : ▨ - ▨

X : ▨ - ▨

A2 : ▨ - ▨

(possible range.
0 - 10 V
0 - 20 mA
4 - 20 mA)

Power supply frequency : ▨ Hz (50/60 Hz)

F1	F2	F3	F4	F5	F6	F7	F8
ENTER				PRINT DB		HELP	EXIT

▨ Input = field ⌐ ⌐ = Output field

Fig. 6.13 Module cofiguration screen form

Description of the output fields:

MODULECONFIG. is entered in output fiefd 2 in the header. Otherwise the contents remain unchanged.

Description of the input fields:

You can set the following ranges both for the analog output and the four analog inputs:

0-10 V
0-20 mA
4-20 mA

Enter either 50 Hz or 60 Hz as the power supply frequency.

You can also make all entries using the function key <F7> (HELP).

Significance of the function keys:

<F1>: enters the data input in the controller data block and returns to the overview.

<F5>: selects printout of the data input to the controller data block currently being processed. See Section 6.5.

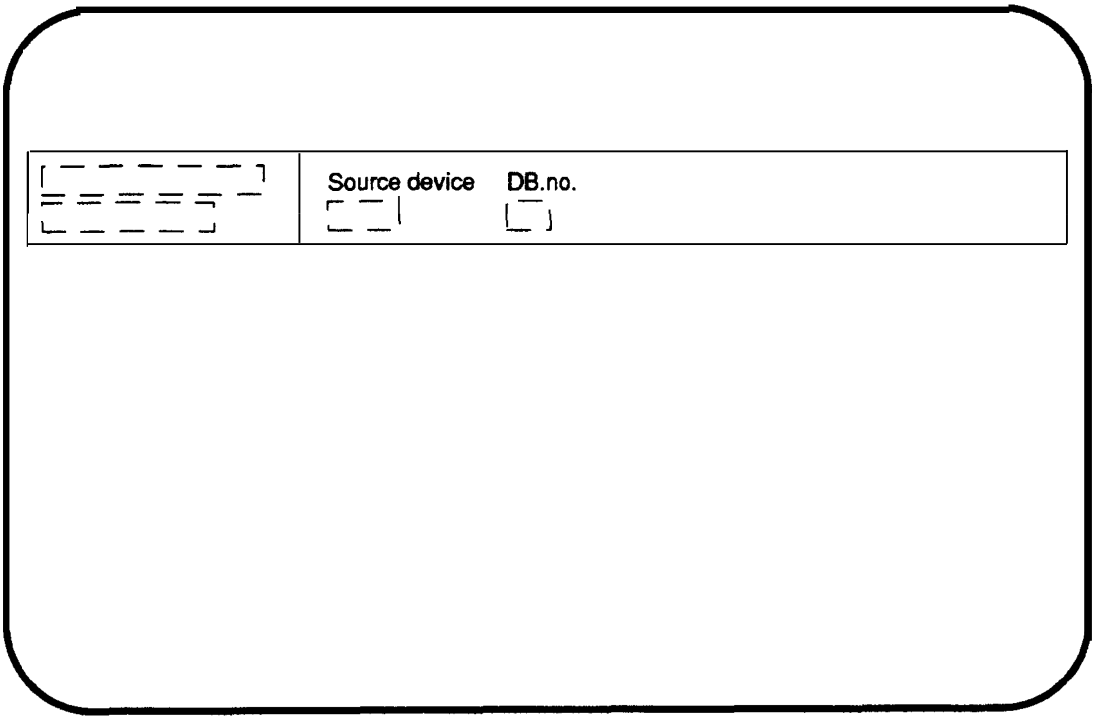
<F7>: HELP key.

<F8>: jumps back to the overview without the data in the controller data block being entered.

You can output the screen form on the printer as a hardcopy.

6.5 Print Controller Data Block

You can print out the controller data input (DB.no.) by pressing <F5>. The data can be printed out within a fixed framework, the header and the footer. The header states that these are controller data, from which source device they were read and the DB no.



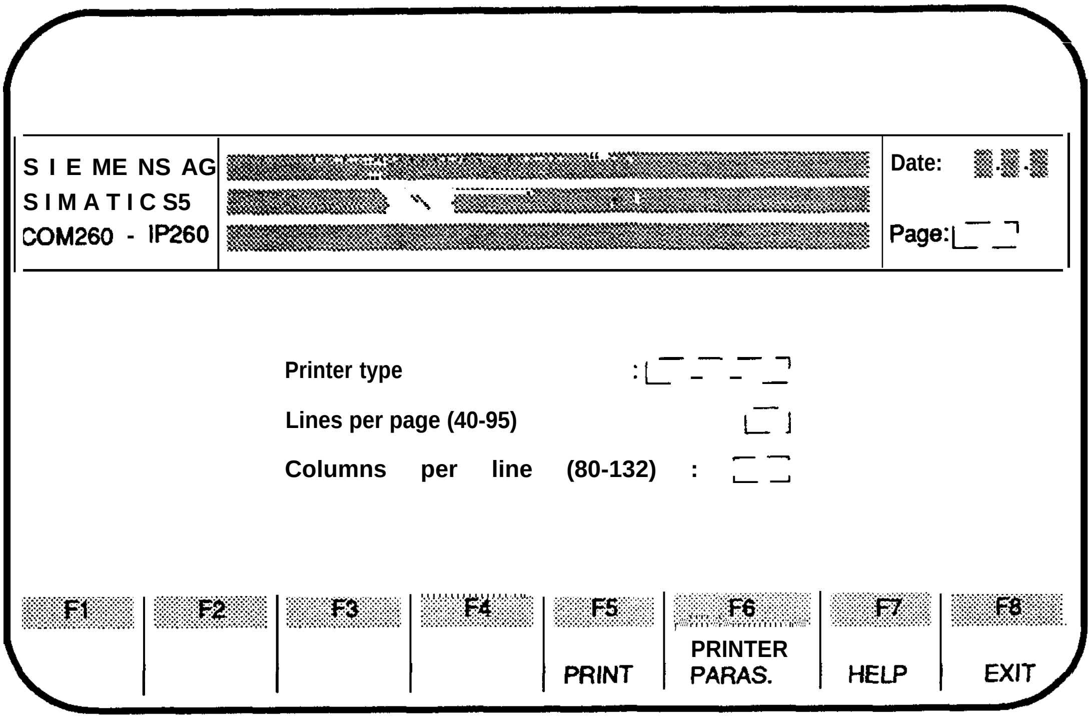
Source device DB.no.

▒ = Input field [ ] = Output field

Fig. 6.14 Printout header screen form

This screen form is not displayed on the screen. It is output as the header of each printed page.

In the footer, there are three lines in which you can add information to the controller data, e.g. the plant to which the data belong etc. You can also add the date. The page number is incremented automatically for each new page.



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SIMATIC S5
COM260 - IP260

Date:
Page:

Printer type :
Lines per page (40-95)
Columns per line (80-132) :

▨ = Input field [ ] = Output field

Fig. 6.15 Footer screen form

Description of the output field:

Page: the number of the page is printed here. This is incremented by one for each new page.

The fields printer type, lines per page and columns per line are as described for the printer parameters screen form.

Description of the input fields:

Comment: three lines are available for a comment relating to the data to be printed out. This comment is entered in the footer of each page.

Date: you can enter the date of generation in these three input fields. The date is also printed out in the footer of each page.

Significance of the function keys:

<F5>: the print function is started with this function key.

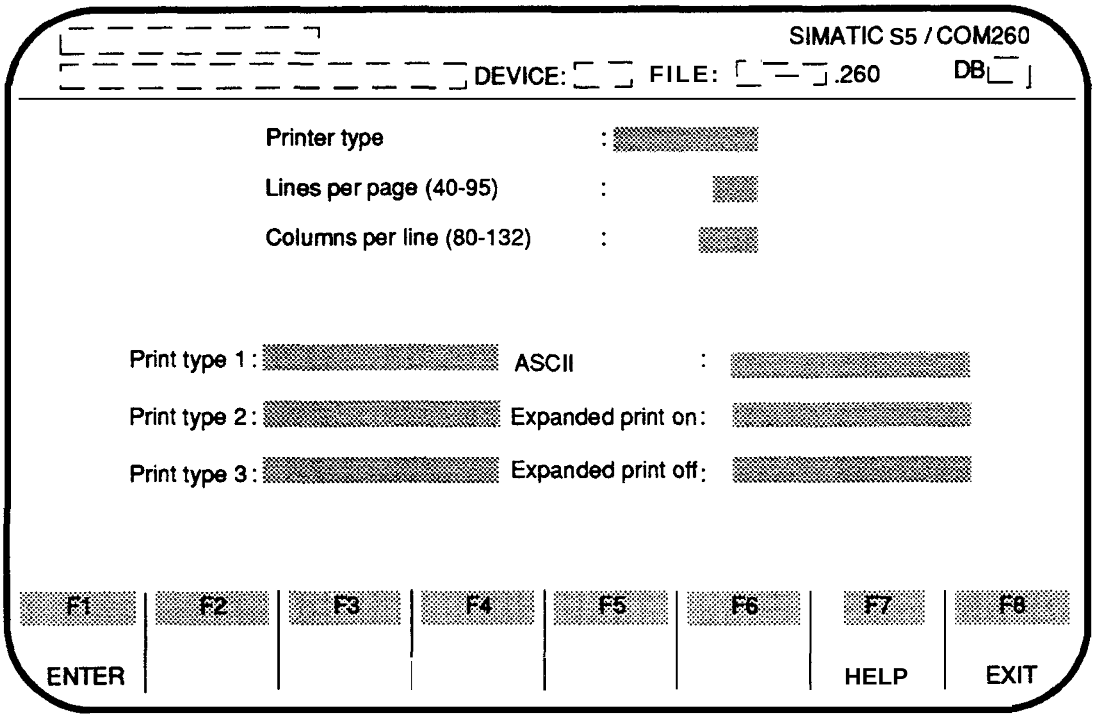
<F6>: branches to the printer parameter screen form (see Section 6.5.1).

<F8>: exits the print option without a printout being made.

6.5.1 Printer Parameters and Initialization

Selecting the screen form:

If you press function key<F6> (PRINTER PARAS.) in the printout footer screen form or in the presetting screen form, the soreen form for printer parameters and initialization of the printer is displayed. This screen form must always be selected if the *error message "FF2 printer not yet initialize'* appears.



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DEVICE: FILE: .260 DB

Printer type :

Lines per page (40-95) :

Columns per line (80-132) :

Print type 1 : ASCII :

Print type 2 : Expanded print on:

Print type 3 : Expanded print off:

Input field = ' - - - {- J = Output field

Fig. 6.16 Printer parameters screen form

Description of the output fields:

PRINTERPARAS *is* entered in output field 2 in the header. Otherwise the contents remain unchanged.

Description of the input fields:

Printer type:

you can select one of the various printer types. The Siemens printers PT88, PT89 are fully supported.

Line per page:

in this field you oan specify the number of lines per page. Remember that the header and footer must also be included. The possible entries range from 40...95 lines per page. The default value is 68.

Columns per page:

here, you specify the maximum number of columns per line. The possible entries range from 80 to 132columns per line. The default value is 80.

In the fields for the various types of print, the ASCII character set and expanded print on/off entries must be made to suit the escape sequences of the printer being used. TheSiemens types PT88 and PT89 are the defaults. If the selection OTHER is made, the values forPT88S connected to the PC 16-20 are entered as defaults. See also the description of the relevant printer.

At present, only the parameters of print type 2 are used.

Significance of the function keys

<F1>: the initialization string is sent to the printer and you exit the screen form.

<F7>: you can select various printers using the HELP key. The possible selections are "PT88", "PT89" and 'OTHER".

<F8>: exits the printer parameter screen form without initializing the printer. If the printer has not yet been initialized, the *error* message FF2"prinfer *not yet initialized!"* appears if a printout is attempted.

7 output

7.1 General Notes

In this program branch, existing controller data blocks can be read from the module (ONLINE) or from the data drive. They can then be processed and wriien back to the required device (see also Section 6.1).

7.2 Block Selection

Selecting the screen forms:

Press function key <F2> in the main menu to obtain the block selection screen form (see Figs. 6-1 and 6-2).

Description of the output fields:

> MAIN MENU is displayed in output field 1 of the header and O U T P U T is displayed in output field 2. Press one of the function keys <F3> or <F5> to enter the selected device and the DB number in the header. The field for file remains as in the presetting.

Description of the input fields and function keys:

> See Section 6.2.
>
> Exception: you can save the generated data block after entering and exiting only one of the two branches controller structure <F3> or module configuration <F5>.

7.3 Controller Structure

The description as for input (see 6.3) applies here, the only difference is that O U T P U T is entered in output field 1 in the header.

7.4 Module Configuration

The description as for input (see 6.4) applies here, the only difference is that OUTPUT is entered in output field 1 in the header.

8 Test

In this program section you can test the function of the IP 280, along with the controlled system. The programmer must be ONLINE. There must be a data block on the module and the module must be correctly wired up.

8.1 General Notes

In the individual test screen forms, the input and output values of the selected branch are updated. The values are updated cyclically by reading the monitoring points and the mode status code from the module.

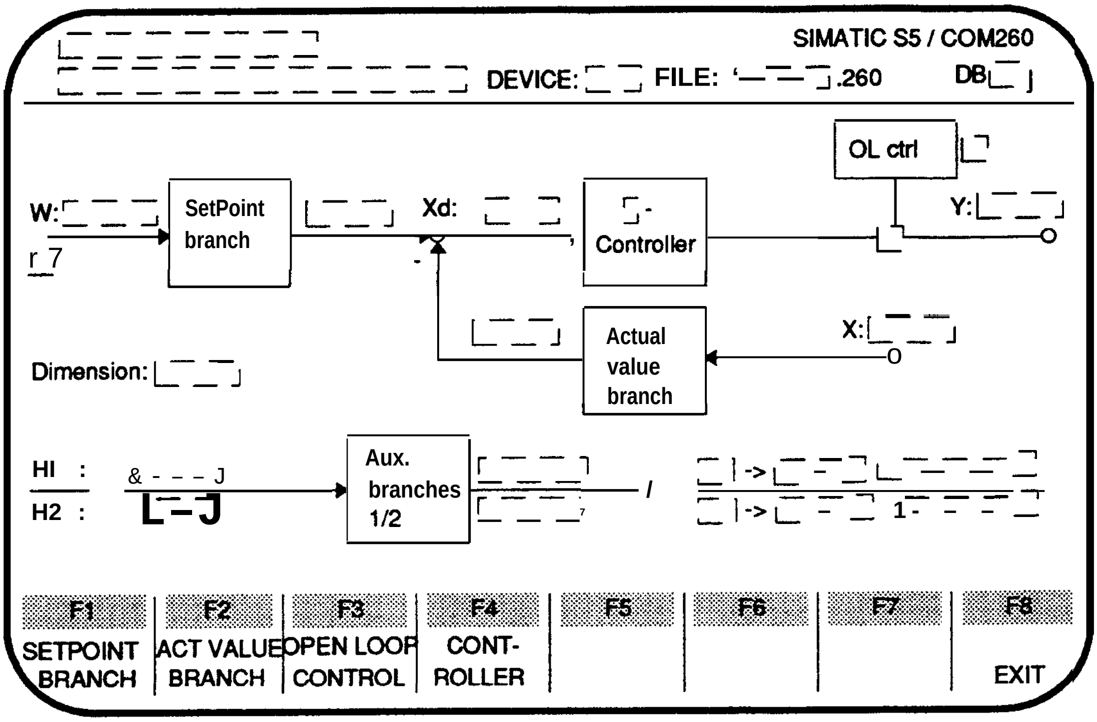
The following applies from Version 2.0 and higher.
If the access rights are assigned to the PLC with the operating command manual disable, the individual branches of COM can only be monitored, i.e. apart from in the overview, from which you can jump to the various branches, only function key <F8> (EXIT) is available. The controller data block is also read cyclically by the IP 280 and the currently displayed screen form is updated.

Directly below the header are two status lines. The first status line indicates whether or not the manual release is active, whether or not the PLC is processing the module (PLC on or PLC off), whether the preferred mode is switched on or off (PM on/off) and whether the current manipulated variable is being output by the 1P 280 (Y from IP) or from the external circuitry (Y from ext.). In the lower status line, the current mode (closed loop or open loop control) is displayed. This is only displayed in the screen forms in which the mode cannot be recognized from the screen form itself. The error message line 22 always shows the current error as signalled by the IP 280. All error numbers have an offset of 70H (except for no error which remains F00).

8.2 Starting the Test Mode

If you press **<F3>** (TEST) in the main menu, the test overview screen form is displayed.

In all the screen forms of the test mode, you can obtain a hardcopy of the screen with the hardcopy key.



Input field   = Output field

Fig. 8.1 Test overview semen form

Description of the output fields:

MAIN MENU is displayed in output field 1 in the header and T E S T in output field 2. "IP 260" is entered **in the device field** and the number of the controller data bbck currently on the IP is entered in the **DB** field.

The contents of the data block currently on the IP 260 are entered in the screen form. These areas **follows**: controller type (IUS), status of the **auxiliary** branches **(on/off** etc.), dimension, current mode (closed loop/open loop), the source of the value input for the operating mode as well as the current input and output values for the setpoint and actual value branch, the current control error, the manipulated variable and the input/output of the two auxiliary branches.

With the function keys <F1 >... <F4> you can branch further within individual branches.

Significance of the function keys:

<F1>: selects the test screen form for the setpoint branch.

<F2>: selects the test screen form for the actual value branch.

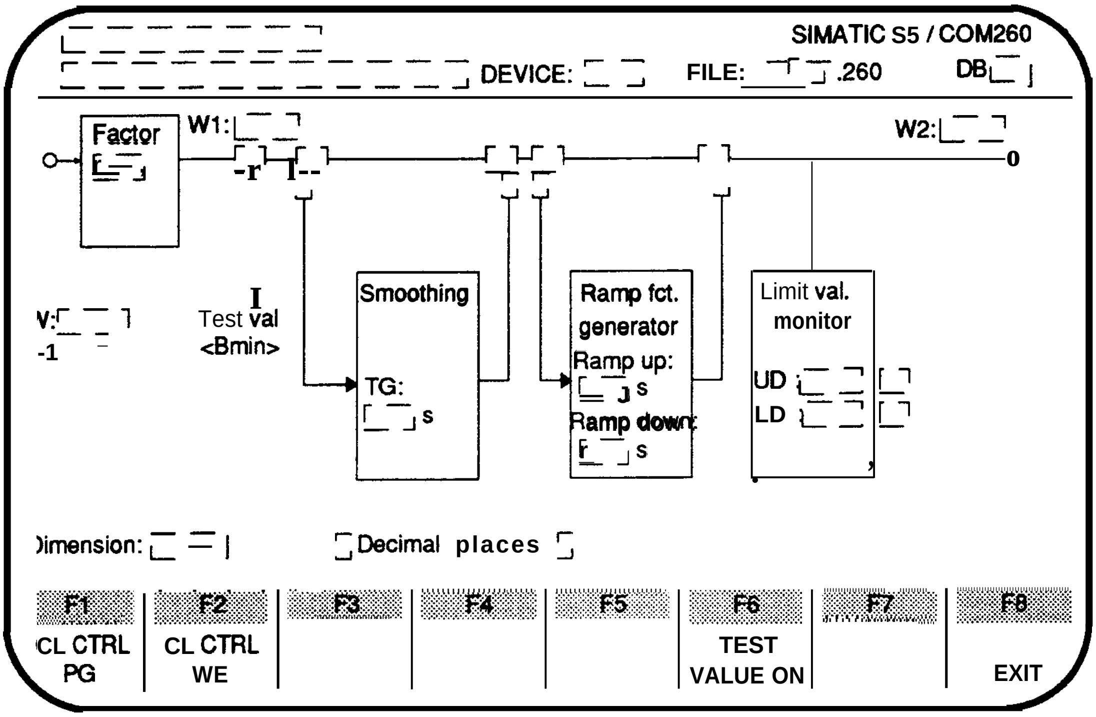
<F3>: selects the test screen form for the open loop control branch (screen form dependent on the controller type IUS controller).

<F4>: selects the test screen form for the closed loop controller (screen form dependent on the controller type K/S controller).

8.2.1 Setpoint Branch

Selecting the screen form:

If you press <F1> (SETPOINT BRANCH) in the test ovewiew, the test setpoint branch screen form is displayed.



▨ = Input field [ ] = Output field

Fig. 82 Test setpoint branch form with menu 1

Description of the output fields:

TEST is displayed in output field 1 in the header and SETPOINTBRANCH in output field 2. All of the other fields remain unchanged.

The screen form is displayed asshown above with menu 1 if no ramp function generator has been selected in the setpoint branch. If a ramp function generator has been selected, then menu 2, 3 or 4 will be displayed depending on the operational status.

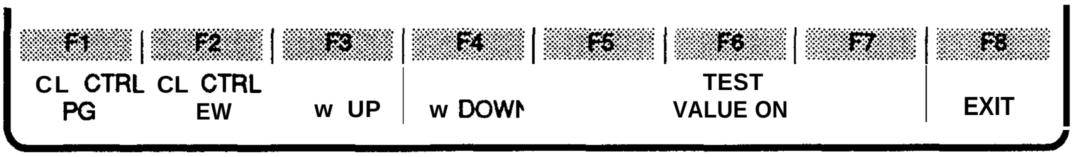


Fig. 8.3 Menu 2 test setpoint branch

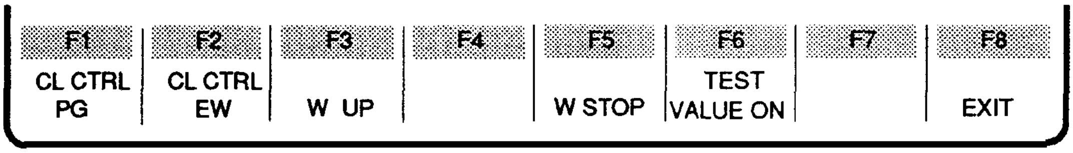


Fig. 8.4 Menu 3 test setpoint branch

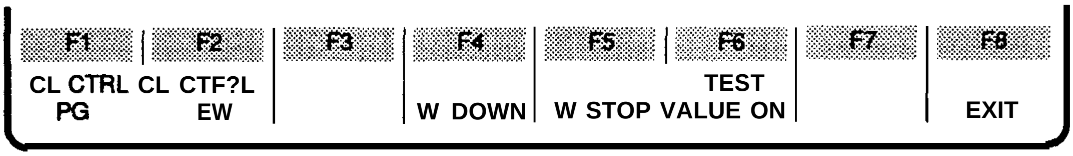


Fig. 8.5 Menu 4 test setpoint branch

If the test value is switched on in the setpoint branch, menu 5 is output. The ramp function generator can then no longer be activated. You can, however, change the mode again.

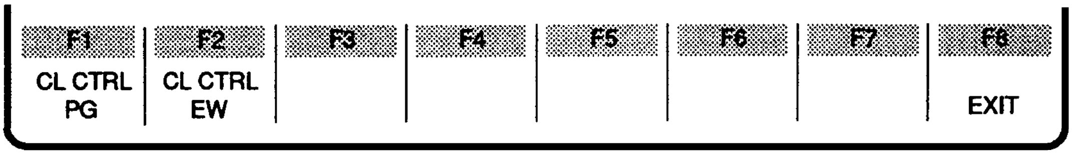


Fig. 8.6 Menu 5 test setpoint branch

If the limit value monitor responds an arrow is displayed beside the relevant limit.

Significance of the function keys:

<FI>: switches over the operating mode to closed loop control with the value supplied by the PG. The field for the new setpoint is switched over to an input field. You can enter the value with the function key <F1>, i.e. the command closed loop control PG and the value is sent to the module. You can also exit the function with <F8>.

<F2>: sends the command closed loop control EW to the module. The default value is then expected at analog input EW.

<F3>: only possible when the ramp function generator is switched on. Causes continuous increase in the setpoint until the range maximum is reached. Menu 4 is output.

<F4>: only possible when the ramp function generator is switched on. Causes a continuous decrease in the setpoint until the range minimum is reached. Menu 3 is output.

<F5>: only possible when the ramp-up or ramp-down function is active. Stops the ramp function generator at the current value. Menu 2 is output.

<F6>: the setpoint is fixed at the test value. This is the selected range minimum. Menu 5 is displayed.

<F8>: returns to the test overview screen form.

8.2.2 Actual Value Screen Form

Selecting **the screen form:**

If you press <F2> (ACT VALUE BRANCH) **in the test overview screen form, the actual value branch is displayed.**

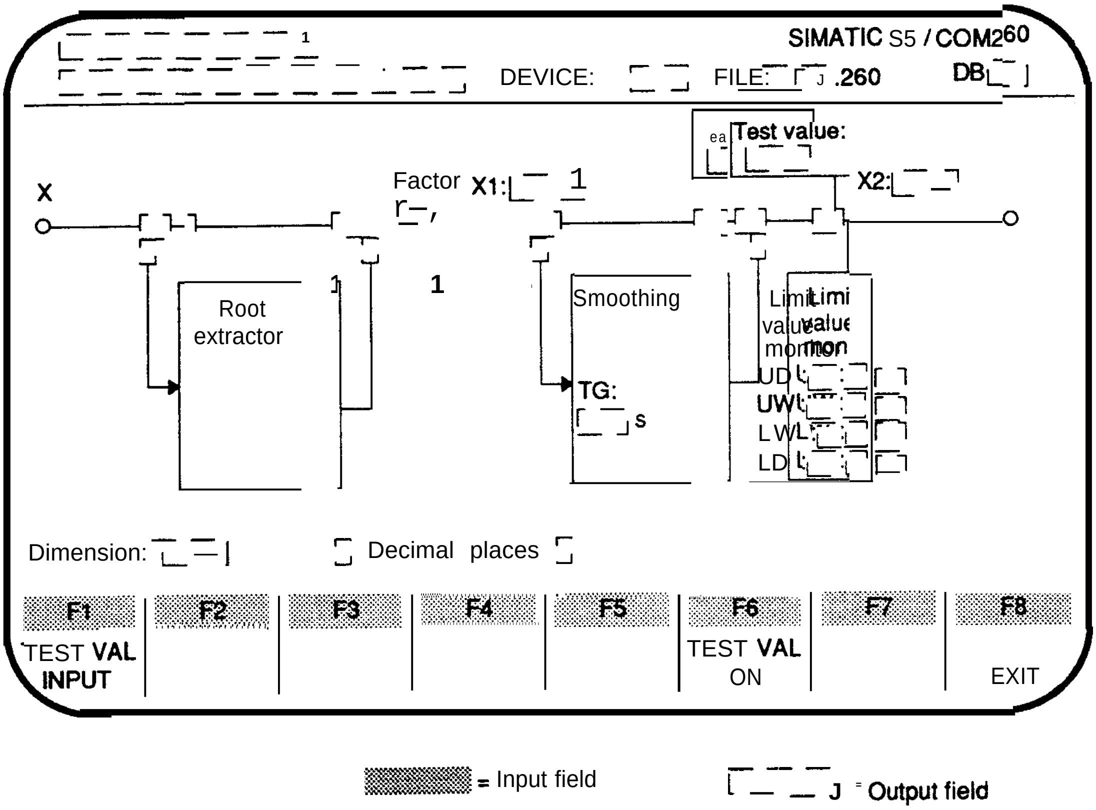


Fig. 8.7 Test actual value branch screen form

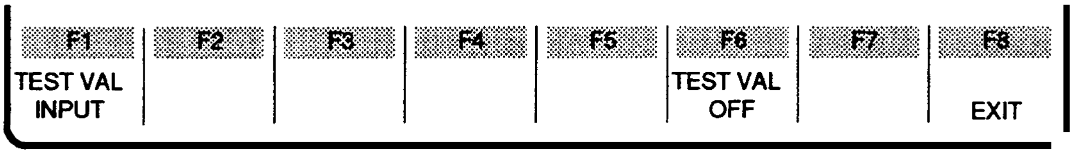


Fig. 8.8 Test actual value branch menu 2

If the limit value monitor responds, this is indicated by an anew beside the relevant danger or warning limit.

Significance of the function keys:

<Fl >: you can change the test value. The value must be within the range and must have the same number of decimal places. The field for the new test value is switched over to being an input field. You can enter the value in the controller data block with <F1>. Exit the function with <F8>.

<F6>: the test value is switched on or off. This can be selected within the range. Depending on the status of the switch, menu 1 or 2 is output.

<F8>: returns to the test overview screen form.

8.2.3 Open Loop Control

Selecting the screen form:

If you press <F3> (OPEN LOOP CONTROL) in the test overview screen form, the test open loop control branch is displayed. The screen form depends on the active controller type (K/S).

Open loop control K controller:

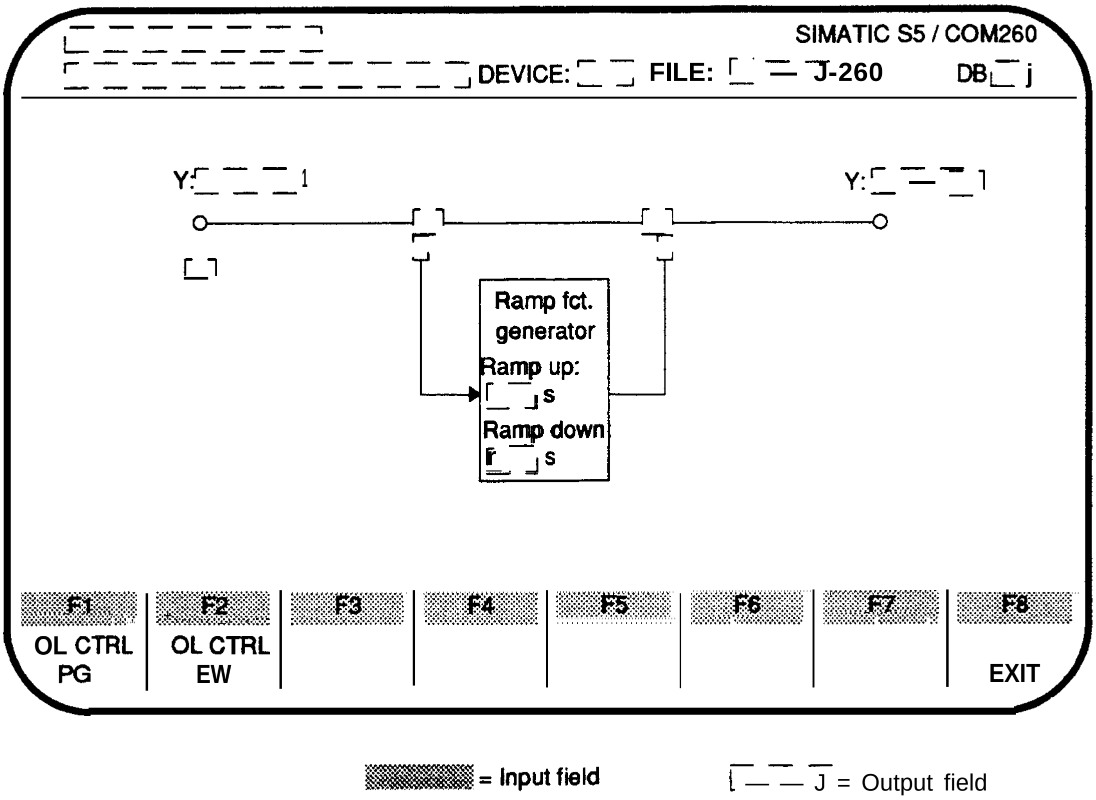


Fig. 8.9 Test open loop control (K controller) screen form

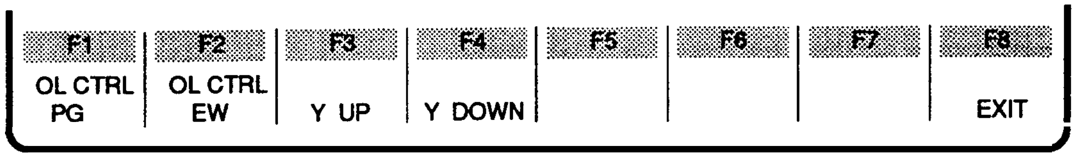


Fig. 8.10 Test open loop control (K controller) menu 2

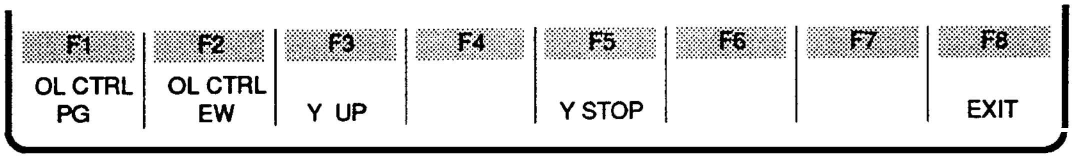


Fig. 8.11 Test open loop control (K controller) menu 3

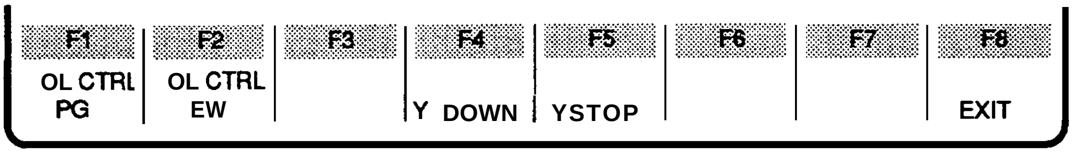


Fig. 8.12 Test open loop control (K controller) menu 4

Significance of the function keys:

<Fl >: switches over the mode to open loop control with the value input from the PG. The field for the new manipulated variable is switched over to being an input field. The range of values depends on the exact definition of the K controller:
K controller with analog output:
lower to upper manipulated variable limitation (YLD to YUD)
K controller with 2 point pulse output:
0- 100.00%.
K controller with 3 point pulse output
-1 00.00"/0 -1 00.00°/0
You can enter the value with the function key <F1>,

i.e. the command open loop control PG and the selected value are sent to the module. You can also exit the function with <F8>.

<F2>: sends the command open loop control EW to the module. The value is input at the analog input EW.

<F3>: only possible when the ramp function generator is switched on. Causes continuous increase in the manipulated variable up to the maximum value. Menu 4 is output.

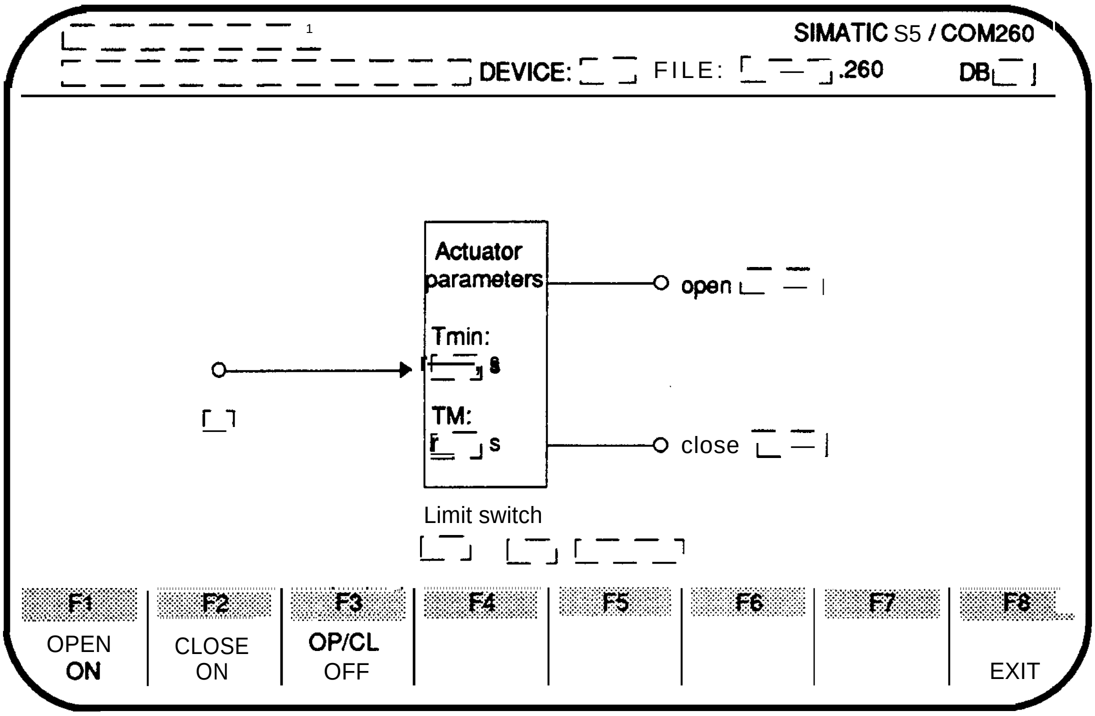
<F4>: only possible when the ramp function generator is switched on. Causes a continuous decrease in the manipulated variable down to the minimum value. Menu 3 is output.

<F5>: only possible when the ramp-up or rampdown function is active. Stops the ramp function generator at the current value. Menu 2 is output.

<F8>: returns to the test overview screen form.

Open loop control S controller:

Selection of the screen form as for the K controller.



▨ = Input field [ ] = Output field

Fig. 8.13 Test open loop control branch (S controller) screen form

Significance of the function keys:

<FI >: switches over the mode to open loop control PG. This activates the digital output ‘open”.

<F2>: switches over the mode to open loop control PG. This activates the digital output “dose”.

<F3>: switches off the currently active digital output.

<F8>: returns to the test overview screen form.

8.2.4 Closed Loop Controller

Selecting the screen form:

If you press <F4> (CONTROLLER) in the test overview, the test closed foop controller branch is displayed. The screen form depends on the active controller type (IOS).

K controller:

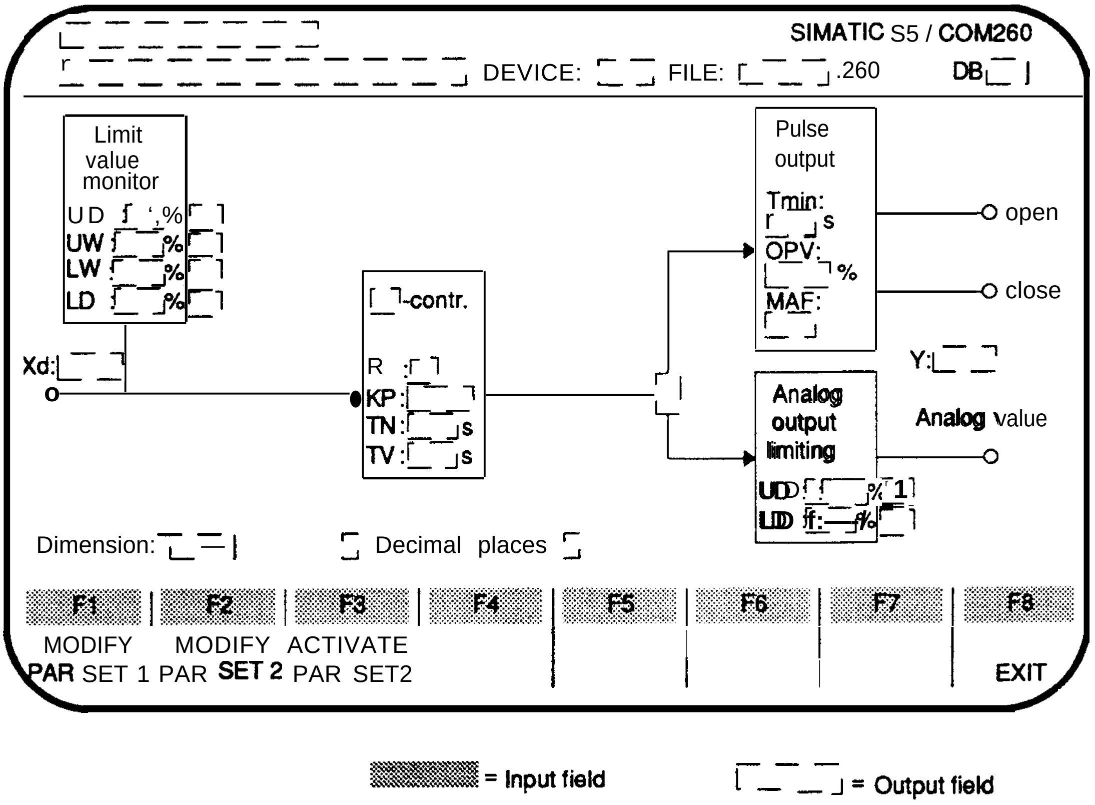


Fig. 8.14 Test K controller screen form

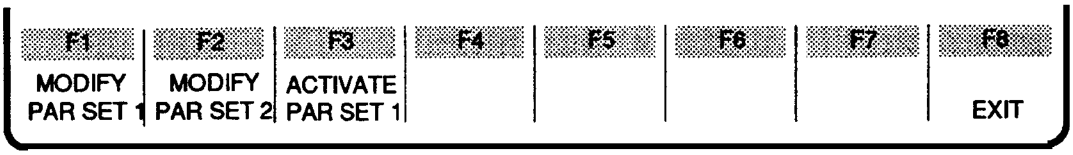


Fig. 8.15 Test K controller menu 2

If the limit value monitor for the control error responds, an arrow is displayed beside the appropriate danger or warning limit.

In the output field for the manipulated variable, the active digital output is displayed. If no output is active, the field remains empty.

Significance of the function keys:

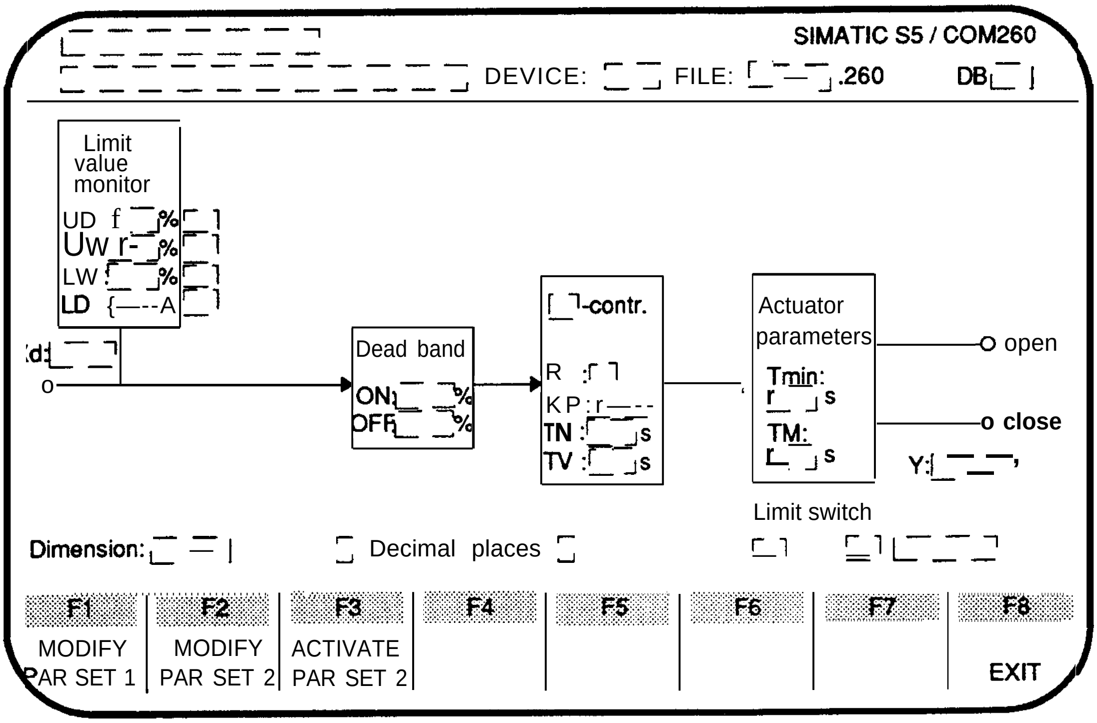
<F1 >: you can change parameter set 1 (even if the second parameter set is currently active). To do this, the fields required for the particular controller type are converted to input fields and you can change both the controller type and the required controller parameters (also possible with function key cF7> (HELP). If you press function key <F1> (ENTER), the data input is entered in the controller data block. The program then returns to the test mode and the active parameter set is written back into the screen form. If you press <F8>, the processing is abandoned without the data being stored.

<F2>: same as <F1> for the second parameter set.

<F3>: switches over the parameter sets. Depending on the active parameter set, menu 1 or 2 is output.

<F8>: returns to the test overview screen form.

S controller:



▒ = Input field [ ] = Output field

Fig. 8.16 Test S controller screen form

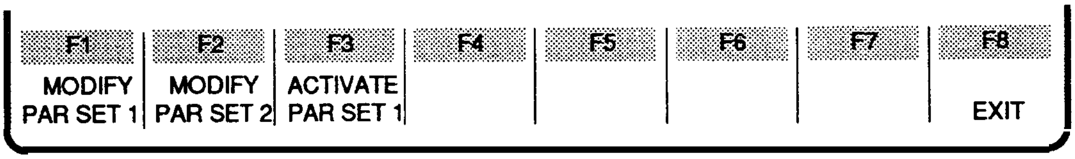


Fig. 8.17 Test S controller menu 2

If the limit value monitor for the control error responds, an arrow is displayed beside the corresponding danger or warning limit.

The significance of the function keys is the same as for the K controller.

9 Transfer

In this program branch, you can transfer controller data blocks from one device to another.

If yw press cF4> (TRANSFER) in the main menu, the transfer branch is displayed.

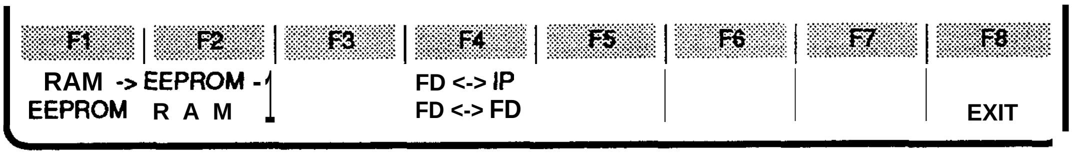


Fig. 9.1 Transfer menu 1

Initially, the current display is retained and only a new menu output. The exited screen form (MAIN MENU) is entered in field 1 in the header and TRANSFER is displayed in field 2. The device and file remain as entered in the presetting screen form.

You are prompted to decide whether a transfer involving the EEPROM on the module is required. This is of course only possible ONLINE.

Significance of the function keys:

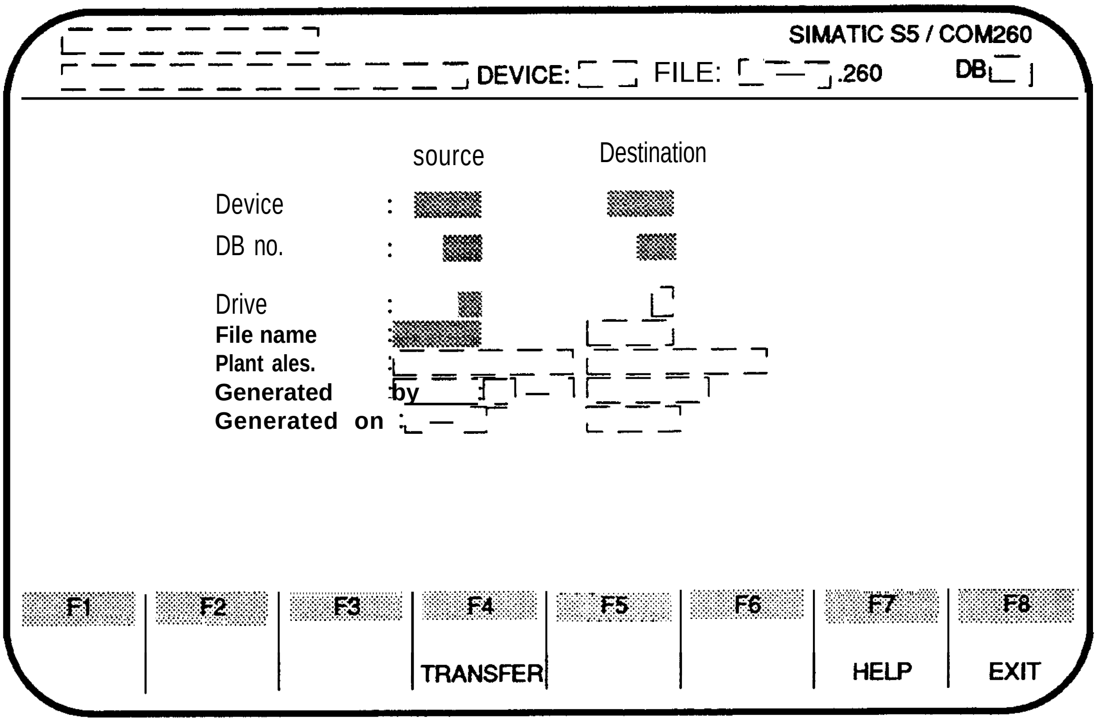
<FI>: transfers the controller data block from the IP 260 (controller data block in the RAM of the IP 260) to the EEPROM. If there is already a controller data block in the EEPROM, the program enquires whether yw want to overwrite the existing block.

<F&: transfers the controller data block from the EEPROM to the IP 260 (RAM of the IP 260). If there is already a controller data block on thelP, the program enquires whether you want to overwrite the existing data block.

<F4>: branches to the transfer screen form for data transfer IP <-> FD and FD <-> FD.

<F8>: abandons the transfer function and returns to the main menu.

If you press function key <F4>, the program branches to the transfer screen form.



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DEVICE: FILE: .260 DB

	source	Destination
Device	: ▨	▨
DB no.	: ▨	▨
Drive	: ▨	
File name	: ▨	
Plant ales.	:	
Generated	: by	
Generated on	:	

F1	F2	F3	F4	F5	F6	F7	F8
			TRANSFER			HELP	EXIT

▨ = Input field [ ] = Output field

Fig. 9.2 Transfer screen form

The output fields are as described above.

Description of the input fields:

Device: with <F7> (HELP) you can select the source or destination device. The options are the module (IP 260) or the data drive (FD). If the device selected for the source is FD, the drive and the file name can also be changed. If the destination is FD, the drive and file according to the presetting are used.

DB no.: for the source, enter the number of the block to be transferred. For the destination, specify the number under which the block will be stored on the selected device. The range of values in each case is 1...255.

Drive: if the selected device for the source is FD, you can select the drive in which the diskette with the file and data block to be transferred is found. The entry can also be made with the function key <F7> (HELP).

File name: if the selected device for the source is FD, you can select the file name. If you press function key <F7> (HELP), a window is displayed with all the files on the drive. After selecting a file with the cursor keys, enter the file name with cF1> (ENTER). If the destination device is a drive, the file name is the file name selected in the presetting screen form. The presetting data are also entered in the fields “plant ales.”, “generated by” and “generated on”. You cannot change the file name and drive in this situation.

Significance of the function keys:

<F4>: initiates the transfer. If the error"*FFB* do *not transfer incorrect* D/3 " occurs, check the contents of the data block with the output function and save the data block on the device "IP 260”.

<F7>: providing the source is a drive, press the help key to select the drive and file name in the fields “device” and "DB no." of both source and destination.

<F8>: abandons the transfer function and returns to the main menu.

10 Delete

In this program branch, you can delete existing controller data blocks from a device.

If you press function key <F5> (DELETE) in the main menu, the delete branch is displayed.

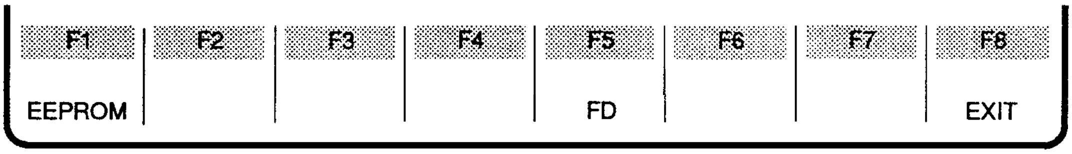


Fig. 10.1 Delete menu 1

Initially the current display is retained and only a new menu is displayed. The exited screen form (MAIN MENU) is displayed in field 1 in the header and DELETE in field 2. The device and file remain as entered in the presetting screen form.

The program enquires whether you want to delete a block on a drive or on the EEPROM of the IP 260 (only possible ONLINE).

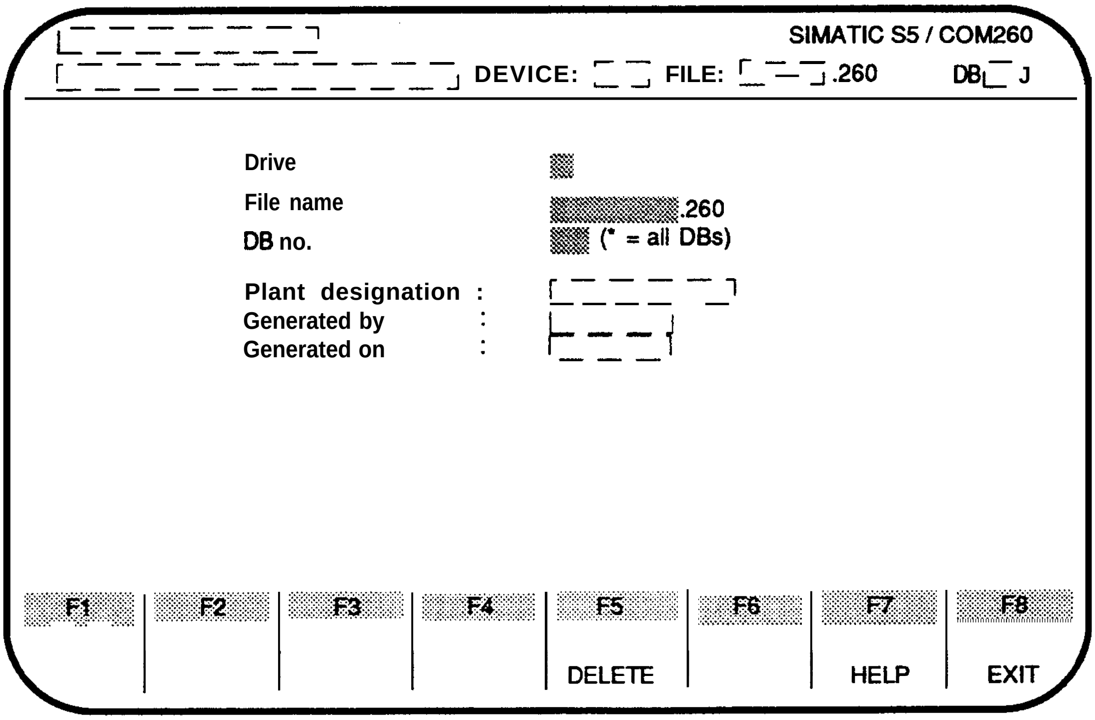
Significance of the function keys:

<F1>: deletes the controller data block in the EEPROM of the IP 260. If there is a controller data block on the EEPROM, the program enquires whether you really want to delete the existing block.

<F5>: branches further in the delete screen form.

<F8>: abandons the delete function and returns to the main menu.

If yw press <F5>, the program branches to the delete screen form.



SIMATIC S5 / COM260

DEVICE: FILE: .260 DB

Drive

File name .260

DB no. (* = all DBs)

Plant designation :

Generated by :

Generated on :

Input = field [‾‾]= Output field

Fig. 10.2 Delete screen form

The output fields remain as described above.

Description of the input fields:

Drive: you can select the drive on which the data block is to be deleted with the function key<F7> (HELP).

File name: here, enter the file name under which the DB to be deleted is located. <F7> (HELP) displays the existing files in a window which allows you to select the required file with the cursor keys. Enter the selected file name in the inputfield with <F1>.

DB no.: here, enter the number of the block to be deleted. The range of values is 1 to 255. If you type in a “*”, all DBs on the selected device will be deleted in the set file. Function key <F7> (HELP) displays the existing data blocks in a window and yw can select them using the cursor keys. <F1> enters the selected DB number in the input field.

Significance of the function keys:

<F5>: initiates the delete function. The program enquires whether you want to delete the DB(s).

<F7>: the help key allows you to select alternatives in the “drive”, “file name” and "DB no.” fields. For “file name” and "DB no.” a window is onoe again displayed with the existing files or DBs.

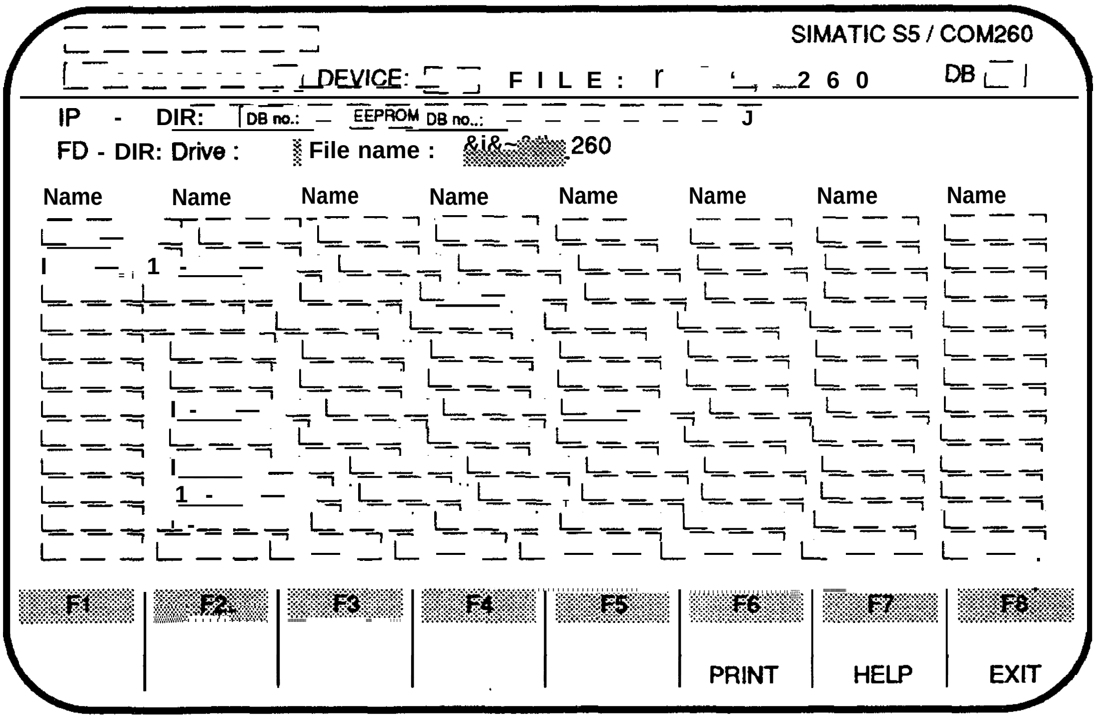
<F8>: abandons the delete function and returns to the main menu.

11 Information

This program branch provides an overviewv of the controller data blocks on the IP 260 and *in* the preset file. This information is also displayed on the screen.

Selecting the screen form:

if you press <F7> (INFO) in the main menu, the information screen form is displayed.



SIMATIC S5 / COM260

DEVICE: FILE: 260 DB

IP - DIR: DB no.: EEPROM DB no..:

FD - DIR: Drive : File name : 260

Name Name Name Name Name Name Name Name

▒ = Input value [ ] = Output field

Fig. 11.1 Information screen form

Description of the output fields:

The exited screen form (MAIN MENU) is displayed in field 1 of the header and I N F O R M A T 10 N in field 2. The device and file remain as contained in the presetting.

Description of the input **fields:**

Drive: you can specify the drive on which the file to be displayed is located. You can also make the entry with the function key **<F7>** (HELP).

File name: here, enter the file to be displayed. Using the function key **<F7>** (HELP) you can display the existing files in a window where they can be selected with the cursor keys. **<F1** > enters the name in the input field and <RETURN> initiates the display.

Significance of the function keys:

<F6>: prints out the data blocks on the **IP** 260 and in the selected file.

<F7>: HELP key to select drive and file name.

<F8> : exits the **information** function again and returns to the main menu.

If there are more than 96 entries in the file, a new menu is displayed. You can then page forwards and backwards with the function keys **<F4>** and **<F5>**.

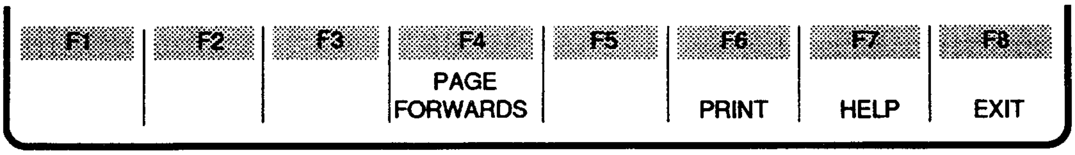


Fig. 11.2 Information menu 1 for paging

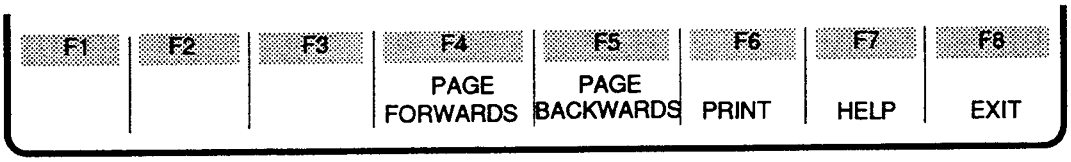


Fig. 11.3 Information menu 2 for paging

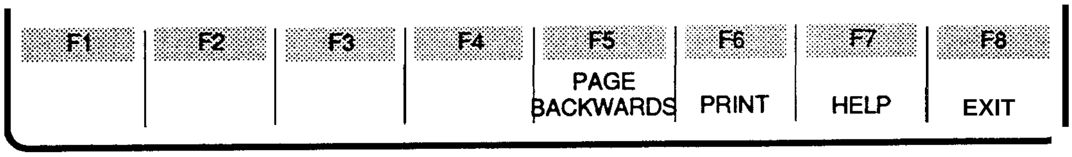


Fig. 11.4 Information menu 3 for paging

Significance of the function keys:

<F4>: displays next page.

<F5>: displays previous page.

<F6>: prints the data blocks on the IP 260 and in the selected file.

<w>: HELP key to select drive and file name.

<F8>: exits the information function and returns to the main menu.

You can print out the screen form as a hardcopy.

12 Error Messages

F00	
F01	Module error occurred!
F10	Illegal input
F11	Memory area exceeded
F15	Field cannot be exited
F16	Abandon processing ?
F17	Abandon processing ?
F1A	Entry not allowed after last function
FIB	Value outside permitted range
F1 D	inserting not allowed
F1 E	Saving not possible --> data record incomplete
FI F	Output not possible --> DB no. not identical
F20	Illegal input
F22	RFG already higher !
F23	RFG already lower!
F24	RFG already stopped!
F25	CL control EW active !
F26	OL control EW active!
F31	Drive not defined
F32	External memory fault
F33	Element directory does not exist
F34	Data block does not exist
F35	DB or file already exists
F36	File type not defined
F37	Identification headers not identical
F38	External memory read only
F39	File read only
F3A	Buffer not long enough
F3B	Too many permitted elements
F3C	File does not exist
F3D	Directory full
F3E	Diskette full
F3F	File cannot be interpreted
F40	Syntax error /name wrong
F41	Not allowed
F42	Data block does not exist
F43	Overwrite DB ?
F44	Data block does not exist
F45	Delete DB ?
F46	Do you want to delete all DBs ?
F47	Delete DB in the EEPROM ?
F48	Illegal value
F4C	Problem with connection PG-IP260
F52	Not enough memory on the module
F53	Module timeout
F54	Data block does not exist
F55	Error in transfer
F56	Transfer error
F58	Module not responding
F5A	Wrong transmission rate

F5B	BREAK received
F5D	Parity error
F5E	Overflow error
F5F	Frame error
F60	Manual operation from PG not allowed
F61	DB exists on IP ! Overwrite?
F62	Transfer from IP to IP pointless!
F63	DB exists in EEPROM! Overwrite ?
F64	No DB on module (in RAM)
F65	Error writing to EEPROM
F66	Error reading from EEPROM
F67	No DB in EEPROM !
F71	Wrong DB number
F72	Wrong module configuration
F73	Too many decimal places for dimensional values
F74	Bmax not in range -9999 to 9999
F75	Bmin < -9999 or ≥ Bmax
F76	Ta not within limits or not multiple of 20ms
F77	Start-up mode not permissible controller mode
F78	Value selected for start-up not in range
F79	Value selected for preferred mode not in range
F7A	KP1 not within the limits
F7B	RI not within the limits
F7C	TN1 not within the limits
F7D	TV1 not within the limits
F7E	Wrong controller type in parameter set 1
F7F	KP2 not within the limits
F80	R2 not within the limits
F81	TN2 not within the limits
F82	TV2 not within the limits
F83	Wrong controller type in parameter set 2
F84	XdUD not within the limits
F85	XdUW not within the limits
F86	XdLW not within the limits
F87	XdLD not within the limits
F88	YUD < O or > 100.009’.
F89	YLD < O or ≥ YUD
F8A	Tmin not within the limits
F8B	TM not within the limits
F8C	Operating value O% or 50.00%
F8D	Matching factor not within the limits
F8E	TAN c O or > 100.00?4.
F8F	TAB c O or > TAN
F90	Factor in W branch not within the limits
F91	Ramp-up time in W branch not within the limits
F92	Ramp-down time in W branch not within the limits
F93	Smoothing time in W branch not within the limits
F94	WUD c Bmin or > Bmax
F95	WLD < Bmin or ≥ WUD
F96	Factor in X branch not within the limits
F97	Smoothing time in X branch not within the limits
F98	Test actual value not within the limits
F99	XUD not within the limits

F9A	XUW not within the limits
F9B	XLW not within the limits
F9C	XLD not within the limits
F9D	Factor in Al branch not within the limits
F9E	Smoothing time in Al branch not within the limits
F9F	TD in Al branch not within the limits
FA0	Tdel in Al branch not within the limits
FA1	Factor in A2 branch not within the limits
FA2	Smoothing time in A2 branch not within the limits
FA3	TD in A2 branch not within the limits
FA4	Tdel in A2 branch not within the limits
FA5	Ramp-up time in Y branch not within the limits
FA6	Ramp-down time in Y branch not within the limits
FA7	Master/slave mode illegal
FA8	Master/slave mode illegal without YR !
FA9	Illegal A2 branch structure
FAA	Changing mod. config. or controller type without disabling contr. illegal
FAB	Wrong loop or controller number
FAC	Error reading EEPROM
FAD	Error writing to EEPROM
FB0	Problem with controller
FBI	Preferred mode has priority
FB2	Preferred mode still active
FB3	No valid DB in RAM
FB4	No valid DB in EEPROM
FB5	Access from PC illegal, except manual block
FB6	Access from PG illegal
FB7	Ramp illegal because of EW selection
FB8	Ramp illegal because of wrong mode
FB9	Test setpoint branch illegal
FBA	Required status is already set
FBB	Ramp generator not selected
FBC	Parameter set 2 not selected
FBD	Selected setpoint not within range
FBE	Selected manipulated variable not in range
FBF	PG job list full
FC0	PC job list full
FC1	Command not allowed
FC2	Problem with analog input X
FC3	Short circuit on digital output
FC4	Both limit switches active
FC5	Master failure detected
FCD	Time must be ≥ Ta or O
FCE	Time must be ≤ Ta !
FCF	Time must be ≤ TM !
FD0	Value entered range maximum
FD1	Time must be> Ta !
FD2	Time must be a multiple of 20ms !
FD3	Sampling time not yet entered
FD4	Exit test function ?
FD5	Number of decimal places or range limits exceeded!

FD6	Different resolution of range limits
FD7	No negative values allowed
FD8	Incorrect configuration in DB
FD9	Invalid number of decimal places
FDA	Incorrect structuring in setpoint branoh
FDB	Incorrect structuring in actual value branch
FDC	Incorrect structuring in OL control branch
FDD	Resolution and/or range limits not yet entered
FDE	Range limits exceeded
FDF	Range minimum > range maximum
FE0	Range maximum < range minimum
FE1	Value entered c range minimum
FE2	Parameter set 2 already activated!
FE3	Parameter set 1 already activated!
FE4	Parameter set 2 not selected !
FE5	Bmin = Bmax
FE6	Wrong configuration
FF1	No parameters required for OL control with S controller
FF2	Switch on printer!
FF4	Discard old DB ?
FF5	Abandon printing ?
FF6	Programmer is off-line
FF7	Wrong time entered
FF8	No plant designation entered
FF9	No file name entered
FFA	Transfer DB
FFB	DB not transferred, contains error !
FFC	Illegal key
FFD	HELP key not allowed here
FFE	Exit COM260 ?

Page Overview

Page	Release 02					
Title page						
0-1-04	x					
1-1 -1-2	x					
2-1 -2-2	x					
3-1 -3-6	x					
4-1 -4-6	x					
5-1 -5-2	x					
6-1-6-36	x					
7-1 -7-2	x					
8-1-8-16	x					
9-1-94	x					
10-1-104	x					
11-1-114	x					
12-1-124	x					
S1 - S2	x					

Contents

1 Summary

These programming instructions describe the function block

FB 170 **(PER:REG)** "Parameter assignment, operation and monitoring of the controller module"

The function block is used in the following programmable controllers

- S5115U with CPU 941, CPU 942, CPU 943 and CPU 944
- S5 115Hwith CPU942H
- S5135U with CPU 922 from version 9 and CPU 926
- S5150U
- S5155U
- S5155H with CPU 946R and CPU 947R

in conjunction with the **IP** 260 controller module.

The programming instructions contain a functional description with the call, parameters and technical data of the function block and an example.

All the remarks made in the following sections regarding the S5 115U also apply to the S5 115H.

All the remarks made in the following sections regarding the S5 155U also apply to the S5155H.

2 Function Block FB 170- PER:REG

2.1 Functional Description

The function block handles the data exchange between the user program and the IP 260 controller module. Your instructions are converted to a command for the module.

The data to be transferred are contained in a data block which must include the required parameters before it is called. The data transfer is made via a word peripheral address (P/O parameter area).

Note The function block must be called in the cyclic program once for each module. It must not be called more than once even when idling.

Calls in interrupt OBS are **not** permitted.

The function block “parameter assignment, operation and monitoring of the controller module” transfers the parameters in the data block and values to the IP 260 module.

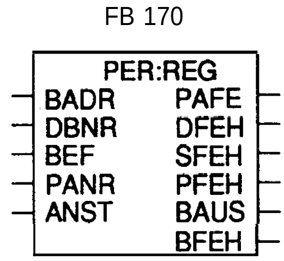
The function block also monitors the process by reading the current data and statuses from the module.

2.2 Calling the Function Block

In STL (statement list)

```
      :JU FB170
NAME  :PER:REG
BADR  :
DBNR  :
BEF   :
PANR  :
ANST  :
PAFE  :
DFEH  :
SFEH  :
PFEH  :
BAUS  :
BFEH  :
```

In LAD/CSF (ladder diagram or control system flowchart)



2.3 Explanation of the Parameters

Name	Para type	Data type	Function
BADR	D	KY	Specifies the I/o area (not for the S5 115U) and the module address
DBNR	D	KY	Specifies the data block type, DBorDX(ontyfortheS5135U and S5155U) andthedata block number
BEF	D	KS	Specifies the command
PANR	I	BY	Specifies the parameter number
ANST	I	BI	Triggers command execution with direct parameter assignment
PAFE	Q	BI	Parameter assignment error
DFEH	Q	BI	Data error
SFEH	Q	BI	PLC interface error
PFEH	Q	BI	Process error
BAUS	Q	BI	Module failure
BFEH	Q	BY	Outputs operator (input) errors

2.4 Parameter Values

BADR : D, KY = x,y

x = I/O area (with *S511* 5U no significance)
x = O: normal I/O area (P)
x = 1: extended I/O area (0)

y = module address
128< y ≤ 254 if x = O: P area

for S5135U, S5 150U andS5155U also
0 ≤ y ≤ 254 if x . 1: O area

DBNR : D, KY = x,y

x = selection of DB type forS5135U and S5 155U
x = O: DB area
x = 1: extended DB area (DX blocks)

For S5 115U andS5150U, x has no significance,

Y = data block number
3< y ≤ 255 if x = 0

for S5135U and S5155U also
1≤ y ≤ 255 if x = 1

y = O: the input parameters of the function block are read from the open data block (working area of the function block - indirect parameter assignment).

BEF : D, KS = x

x= BO: monitor
x = DI : utility commands
x= Bs: "open loop" mode
x= BR: "closed loop" mode
x= RB: controller operation command

Commands without parameter numbers (command is valid alone), the parameter PANR must nevertheless have a feasible value specified.
x = ES: writeto EEPROM
x= EL: read EEPROM
x = EU: EEPROM invalid
x= HF: manual release (access from PG)
x= HS: manual disable (access from PLC)
x = RE: Reset PLC interface

PANR :1, BY= X

The parameter number is dependent on the parameter BEF:

BEF = BO	- Monitor
x · 1	Data block output
x= 2	Controller parameter set 1 output
x= 3	Controller parameter set 2 output
x= 4	Module configuration output
x= 5	Test actual value output
X= 6	Identification output
x = 7	Monitoring points output
x = 8	status bit output
x= 9	Module directory output
x=10	Read current values
x=11	Read condition codes **(from release 2ofthe FB 170 and Version 5 Of the IP 260)**
x= *15*	PLC interface error output

BEF = DI	- Utility commands
x= 1	Data block input
x = 2	Controller parameter set 1 input
x = 3	Controller parameter set 2 input
x= 4	Module configuration input
x= 5	Test actual value input
X= 6	Identification input

BEF = BS	-“Open bop” mode
x= o	OL control ace. to anabg input EW
x= 1	OL control acc. to PLC input from DW97
x= 2	OL control acc. to PLC input from DW 124 **(from release 2 of FB 170)**

BEF = BR	- "Closed loop" mode
X = o	CL control ace. to anabg input EW
x = 1	CL control ace. to PLC input from DW97
x = 2	CL control ace. to PLC input from DW 123 **(from release 2 of FB 170)**

BEF= RB - controller operation commands

x= 0	Switch on parameter set 2
x= 1	Switch off parameter set 2
x= 2	Test setpoint branch on
x= 3	Test setpoint branch off
x= 4	Setpoint ramp higher
x= 5	Setpoint ramp lower
x= 6	stop setpoint ramp
x= 7	Test actual value branch on
x= 8	Test actual value branch off
x= 9	Manipulated variable ramp higher
x= 10	Manipulated variable ramp lower
x= 11	Stop manipulated variable ramp

ANST :1, BI

When the signal for the **ANST** parameter changes from O to 1, the command pending will be executed (only when parameter assignment is via block parameters). You set the parameter yourself. If the command has been executed, the parameter is reset by function block FB 170 (acknowledged).

PAFE : Q, BI

The signal of the **PAFE** parameter is 1 if an illegal parameter is assigned. The error involved can be identified by the assignment of the flag byte **FY255** as follows:

F 255.0	Module address not permitted or not multiple of “2”
F 255.1	Wrong I/O area, occupied by neither “P” nor “O” (not relevant for S5115U)
F 255.2	Wrong DB number or DX block selected with ***S5155U***
F 255.3,	DB does not exist or too short
F 255.4	Wrong command (BEF)
F 255.5	Acknowledgement reset S5 interface wrong
F 255.6	Parameter number outside permitted range

F *255.7* P/O address area or address wrong or load voltage failure on the **IP** 260. **PLC** does not stop despite timeout **(QVZ); no QVZ code** on the CPU module (not relevant for the *S5* **115U** - this **PLC** does stop with a timeout)

DFEH : Q, **BI**

Data error set by the **IP** 260 module. Once the error has been read with the command "**BO** 8" the error bit is reset by the function block (acknowledged). The error number is output at the parameter BFEH and stored in data byte **DL111 (PLC** data block). An exact coding of the error numbers can be found in **Part** 3 of the manual.
From release 2 of FB170 and veraion 5 of the IP 260 the **error** can also be read with command "**BO** 11".

SFEH : Q, **BI**

PLC interface error set by the **IP** 260 module. Once the error has been read with the command "**BO** 15" or the command "RE" reset **PLC** interface has been sent, the error bit is reset by the function block (acknowledged). The error number is stored in data word DW 113 (**PLC** data block). An exact coding of the error numbers can be found in **Part** 3 of the manual.

PFEH : Q, **BI**

Process error set by the **IP** 260 module. Once the error has been read with the command "**BO** 8" the error bit is reset by the function block (acknowledged). The current process status and possible errors are stored in data words DW 109 toDW112 (**PLC** data block). An exact coding of the error numbers can be found in Part *3* of the manual.
From release 2 of FB170 and version 5 of the IP 260 the process error can also be acknowledged with command "**BO** 11".

BAUS : Q, **BI**

The parameter **BAUS** has the signal status "1" when the module monitoring has responded. The error bit is only acknowledged (cleared) when the **IP** 260 module signals it is operational again with the **WATCHDOG** bit. The recognition of module failure lasts 255 **PLC** cycles.

BFEH : Q, BY

Output of the read input error. For more details see parameter DFEH.

The designations PANR: 1, BY and BFEH: Q, BY must not be occupied by the following parameter types:

- scratchpad flags used by the function block FB170 (see techical data),
- when specifying data bytes: total length of the "controller DB" from data byte DL/DR O to 122. From release 2 of FB 170, from data byte DL/DR O to 124.

If a data byte is specified for the parameter PANR, the parameter is supplied from the data block opened before the FB 170 function block call.

If a data byte is specified for the parameter BFEH the assigned data block is valid.

The parameters PAFE, DFEH, SFEH, PFEH and BAUS must not be occupied by the used scratchpad flags.

2.4.1 Notes on Error Processing

The function block FB 170 must be called once per PLC cycle for each IP 260 module. This is necessary to be able to signal a module failure quickly. If a module failure is recognized, the parameter BAUS has the signal status “l”. As soon as the IP module is ready for operation again, the parameter BAUS is reset. While the module is not ready for operation, no command is accepted or processed. - “

With the data byte DR 7 of the “controller DB" you can enable or disable automatic error reading.

Errors are read automatically if data byte DR 7 = KH00. Otherwise (DR 7 not equal to KH00) you must program the error reading (command “608” or “6019).

If an error is recognized, the corresponding parameter (DFEH = data error, SFEH = PLC interface error or PFEH = process error) is set to signal status”1”. After the error has been read and updated in the "controller DB", the error bit is reset.

If the error byte *(FY 255) is* to be evaluated, it must be saved in a different data area immediately following the call of the function bbck FB 170 with the rising edge of the PAFE parameter signal. Reason: scratchpad area from flag byte FY 200 to FY 255.

From release 2 of FB170 and version 5 of the IP 260 a data or process error can also be acknowledged with read condition code automatically (DR 7=11). If DR 7 is not O and not 11 a data error or process error can be read with the command **“60 11”.**

⚠ Caution

With all modules with a version numberless than 5, check whether the value 11 is entered in DR 7. Alter this entry (e.g. to 255) before you bad a new version of FB 170.

2.4.2 Commands Permitted if Errors Occur

If process errors (PFEH) or PLC interface errors (SFEH) occur, the following commands are still permitted.

	Command
Monitor	BO 6 to BO 10, BO 15
Manual disable	HS
Manual release	HF
Reset PLCinterface	RE

If data errors occur (DFEH) the following commands are still permitted:

	Command
Monitor	BO 6 to BO 10, BO 15
Reset PLC interface	RE

This restriction of the commands is intended to protect the parameter data in the RAM of the PLC. If a data error occurs, the commands “HS” and “HF are not permitted, since with a manual release the error entered could be corrupted by the PG.

From release 2 of FB170 there is no command interlock if errors occur.

2.5 Assignment of the Data Area

The function block operates with a data block (see also Part 3, Section 3, Structure of the data block).

The data block can be divided into two areas:

- the working area of the standard function block **FB 170 PER: REG** from data word DW O to DW 15,
- the data area for the controller module **IP 260** from data word DW 16 to DW 122.

Note The data block must be created up to and including data word DW 122.

From **release** 2 of FB170 and when using the commands BS 2 and BR2, the data block must be created up to and including DW 124.

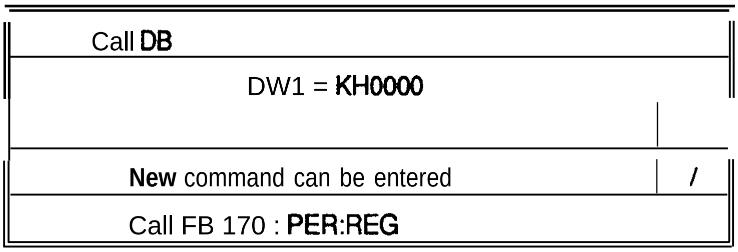
2.5.1 Working Area of the Function Block

DW			Recommended data format
0	assiqned		KH
1	Command (parameter BEF)		KS
2	**Parameter** number **(parameter PANR)**		KF
3	assiqned		KH
4	DB **type** '2) assigned for S5115U and S5150U	DB number *2)	KY
5	assigned		KH
6	Addressing type **P or** O **assigned for** S5115U	Module address	KY
7	0	**Select** and deselect read errors automatically ● 1)	KY
8	**assigned**		KH
9	**assigned**		KH
10	**assigned**		KH
11	**assigned**		KH
12	**assigned**		KH
13	assigned		KH
14	assigned		KH
15	**assiqned**		KH

Yw should **supply** the data words shown in bold face with values if **indirect** parameter assignment is selected (parameter DBNR = KY 0,0) before function block FB 170 is called.

Following its execution, the **command** entered in data word DW 1 is set to the value **KH0000** by function block FB 170. A new command can now be entered (acknowledgement to the user program).

Structure for indirect parameter assignment:



Call **DB**

DW1 = **KH0000**

New command can be entered /

Call FB 170 : **PER:REG**

*1) If the contents of data byte **DR** 7 equal zero, when errors are recognized (data errors, PLC interface errors and process errors) they are automatically read by function block FB 170 and updated in the data block. If an error is permanently active, an error will be read each second FB 170 call. If several errors are active simultaneously, a different error will be read at each second FB 170 call. In this way, the function block gives you the opportunity to transfer a command to the **IP** 260 module with each second FB 170 call.

If the contents of the data byte **DR** 7 do not equal zero, then the errors will only be read as a result of the parameter-assignment and the data block updated. You can therefore **decide** when and in which order the errors should be read.

From release 2 of FB170 and veraion 5 of the IP 260 the **automatic** read rendition code function is possible. If the content of **DR** 7 is 11, the command **"BO** 11“ is generated automatically by **FB170** and the current values entered in the data block. If there is currently a data or process error this is acknowledged at the same time. The function block also gives you the opportunity of transferring a command to the module every second **FB170** call.

If **DR** 7 is not O and not 11, automatic error reading and rendition code reading is not possible.

DR7= O: automatic error reading (BO 8 orBO 15)
11: automatic condition oode reading (BO 11)

● 2) The DB number entered in data block DR 4 must match the actual data block number.

e.g. DB 170:	DW0 : KH0000
	DW1 : KS
	DW2 : KF
	DW3 : KH0000
	DW4 : KYx,170

x = data block type **withS5135U andS5155U**
x = O: DB area
x. 1: extended DB area (DX area)

2.5.2 Assignment of the Controller Data Block

The transfer of the wholemntrollerDB(DW16 to DW96) is triggered with the following parameter assignment:

Read data:	BEF = BO and PANR : KF+ 1
Wriie data:	BEF = DI and PANR : KF+ 1

Module configuration and **general parameters:**

The transfer of the parameters “module configuration” (data word DW17) is triggered with the following parameter **assignment:**

Read data:	BEF = BO and PANR : KF+ 4
Write data:	BEF = DI and PANR : KF+ 4

DW		Recommended data format	
16		DB number on the IP 260	KY
17	Module configuration		KM
18	Six ASCII characters specifying dimension		KS
19	*Six* ASCII characters specifying dimension		KS
20	Six ASCII characters specifying dimension		KS
21		Dimension code	KY
22	RanoeminimumBmin		KF
23	Range maximum Bmax		KF
24	Sampling time Ta		KF
25		Ta code	KY
26		Start-uo mode	KH
27	Value for start-uo mode		KF
28		Preferred mode PM	KM
29	Value for preferred mode		KF
30		Structure of controller RS	KM

Controller

Controller parameter set 1:

The data transfer for “controller parameter set 1“ is triggered with the following parameter assignment:

Read data:	BEF = BO and PANR : **KF+** 2
Write data:	BEF = DI and PANR : **KF+** 2

DW		Recommended data format	
31		R. P action @Off	KM
32	Total gain KP		KF
33	Reset time TN, I action		KF
34	Derivative action time IV, D action		KF
35	TN code	TV code	KY

Controller parameter set *2:*

The data transfer for “controller parameter set 2“ is triggered with the following parameter assignment:

Read data: **BEF** = **BO** and **PANR : KF+ 3**

Write data: **BEF = DI** and **PANR** : **KF+** 3

D W			**Recommen**ded data format
36		R, P action **on/off**	KM
37	**Total** gain KP		KF
38	Reset time TN, I action		KF
39	Derivative action time TV. D **action**		KF
40	**TN code**	**TV code**	**KY**

Parameter for the controller block, the setpoint and actual value branch:

DW			Recommended data format
41	LVM control error XdUD		KF
42	LVM control error XdUW		KF
43	LVM control error XdLW		KF
44	LVM control error XdLD		KF
45	Y limitation YUD, K controller with analog output		KF
46	Y limitation YLD, K controller with analog output		KF
47	min. pulse duration Tmin, Kand S controller		KF
48	ActuatorOperating time TM, S controller		KF
49	Tmin code	TM code	KY
50	Min. op. value MOV, K controller with pulse output		KF
51	Matching factor MAF, K controller with pulse output		KF
52	assigned		KH
53	On threshold of the dead band TAN, S controller		KF
54	Off threshold of the dead band TAB, S controller		KF
55		Struct. of W branch WS	KM
56	Weighting factor setpoint FW		KF
57	Ramp-uptime TH, HG in W branch		KF
56	Ramp-down time TR, HG in W branch		KF
59	TH code	TR code	KY
60	Smoothing time TG, G1 in W branch		KF
61		TG code	KY
62	LVM setpoint WUD		KF
63	LVM setpoint WLD		KF
64		Structure of X branch XS	KM
65	Weighting factor actual value FX		KF
66	Smoothing time TG, G1 in X branch		KF
67		TG code	KY

Actual value for teat mode:

The transfer of the parameter “actual value for test mode” (data word DW 68) is triggered with the **following** parameter assignment:

Read data:	BEF = BO and **PANR** : **KF+ 5**
Write data:	BEF = **DI** and **PANR** : **KF+ 5**

DW		Recommended data format	
68	Actual value for test mode of the X branch		KF

LVM actual value and auxiliary branches

DW		**Recommended** data formal	
69	**LVM** actual value **XUD**		KF
70	**LVM** actual value **XUW**		KF
71	**LVM** actual value **XLW**		KF
72	**LVM actual value XLD**		KF
73		**Struct.** of AI branch **A1S**	KM
74	Weighting **factor aux.** branch 1 **FA1**		KF
75	Srnoothingtirne TG, **G1 in** AI branch		KF
76		TG code	KY
77	**Time constant** TD, DT1 in AI branch		KF
78	Delay time **Tdel,** DT1 in AI branch		KF
79	**TD code**	Tdel coda	KY
80		**Struct.** of **A2 branch A1S**	KM
81	Weighting **factor aux.** branch 2 **FA2**		KF
82	**Smoothing time TG,** G1 in **A2 branch**		KF
83		TG code	KY
84	Time **constant** TD, DT1 **in A2 branch**		KF
85	Delay time **Tdel**, DT1 in **A2 branch**		KF
86	**TD code**	Tdel coda	KY

Manipulated variable branch:

DW			Recommended data format
87		Structure of Y branch YS	KM
88	Ramp-up time TH, HG in Y branch		KF
89	Ramp-down time TR, HG m Y branch		KF
90	TH code	TR code	KY
91	assigned		KH
92	assigned		KH
93	assigned		KH
94	assigned		KH
95	assigned		KH
96	assigned		KH

Setpoint or manipulated variable input:

The data transfer for the parameter “value input” (data word DW 97) is triggered with the following parameter assignment:

Write data: **BEF = 6S and PANR : KF+1 (manipulated variable)**

or: BEF = **BR** and PANR : **KF+1 (setpoint)**

DW		Recommended data format
97	Setpoint or manipulated variable input	KF

Monitoring points:

The transfer of the monitoring points is triggered with the following parameter assignment:

Read data: **BEF = BO and PANR : KF+7**

DW		Recommended data forma
98	Monitoring point MP- WI	KF
99	Monitorfngpoint MP- W2	KF
100	Monitoring point MP- Xl	KF
101	Monitoring point MP- X2	KF
102	Monitoring paint MP- Xd	KF
103	Monitoring point MP- Y	KF
104	Monitoring point MP- Yh	KF
105	Monitoring point MP- AI 1	KF
106	Monitoring point MP- A12	KF
107	Monitoring point MP- A21	KF
108	Monitoring point MP- A22	KF

Status condition codewords:

The transfer of the status condition codewords is triggered with the following parameter assignment:

Read data: **BEF = BO and PANR : KF+8**

DW			Recommended data format
109	Statuses of the DI and DQ		KM
110	**LVM status**		KM
111	**Input error**	**AI status**	**KH**
112	**Operating status codeword**		**KM**

Resd current values

The transfer of the monitoring points **MP-W2,** MP-X2, BP-Xd and **MP-** Y, along with the status condition **codewords LVM status and operating status codewords (data words in bald** face) is triggered with the **following** parameter assignment:

Read data: BEF = **BO** and PANR : **KF+10**

Read status condition codewords (from release 2 of FB 170)

The transfer of all monitoring points (DW 98 to DW 108, the LVM status (DW109), the input error (DL 111), the Al status (DR1 11) and the operating status codeword (DW1 12) is triggered by the following parameter assignment:

Read data: BEF = BO and PANR :KF+11

PLC interface errors

The transfer of the PLC interface error is triggered with the following parameter assignment:

Read data: BEF = BO and PANR : KF+15

DW		Recommended data format
113	PLC interface error	KH

Module identification

The transfer of the module identification is triggered with the following parameter assignment:

Read data: BEF = BO and PANR : KF+6

Write data: BEF = DI and PANR : KF+6

When **reading the module identification** the IP type, version number, loop number and controller number are always read (DW 114 to DW 120).

When **writing the module identification** only the foop number and controller number are written to the IP 260 module.

DW			Recommended data format
114	Identification IP type 'P260'		KS
115	Identification IP type 'IP260'		KS
116	Identification IP type 'P260'		KS
117	Identification version number 'VX.xx		KS
118	Identification version number 'Vx.xx '		KS
119	Identification version number 'Vx.xx '		KS
120	Loop number	controller number	KY

Module directory

The transfer of the module directory is triggered with the following parameter assignment:

Read data: BEF = **BO** and PANR : **KF+9**

DW		Recommended data format	
121	Module directory code	DB number IP RAM	KY
122	Module directory code	DB number IP EEPROM	KY

The following applies from release 2 of FB 170 and higher.

Setpoint input

The setpoint is transferred with the following parameter assignment:

Wriie data: BEF = BR and PANR : **KF+2**

DW		Recommended data format
123	Setpoint input	KF

Manipulated **varible** input

The manipulated variable is transferred with the following parameter assignment:

Write data: BEF = **BS** and PANR : **KF+2**

DW		Recommended data format
124	Manipulated variable input	KF

2.6 Technical Data

Module number	170	
Block name	PER:REG	
Library number	S51 15U	:P71200-S5170-A-1
	S5135U	: P71200-S9170-A-1
	S5150U	: P71200-S4170-A-1
	S5155U	: P71200-S6170-B-1
Call length	13 words	
Block length	S5115U	:81 8 words
	S5135U	: 832 words
	, S5150U	: 804 words
	S5155U	: 832 words
Nesting depth	S5135U	: 1
	other PLCS	: 0
Secondary blocks	none	
Assignment in data area	assigned in DB from DW O to DW 122	
Assignment in flag area	FY 200 to FY 235, FY 255	
Assignment in operating system data area	S5115U	: none
	S5135U/R	: RS60 to RS63
	S5150U	: yes
	S5155U	: yes
System instructions	yes	
Miscellaneous	S5135U	: special functions call
	S5155U	: disables interrupt processing for approx. 0.05 ms

The following applies for Release 2 of FB170:

Library number	S51 15U	: P71200-S5170-A-2
	S5135U	: P71200-S9170-A-2
	S515(XJ	: P71200-S4170-A-2
	S5155U	: P71200-S6170-B-2
Block length	S51 15U	: 913 words
	S5135U	: 917 words
	S5150U	: 888 words
	S5155U	: 918 words

Occupation of data area	selectable DB from DW O to DW 124 when using commands BS 2 or BR 2
Assignment in flag area	FY 200 to FY 255

2.6.1 Runtimes

The specified times refer to the listed CPUS when the function block is called with indirect **parameter assignment.**

commands with parameter number	S5115U CPU 941 Time in ms	S5115U CPU 942 Time in ms	S5 115U CPU 943 Time in ms	S5115U CPU 944 Time in ma	S5135U R proc. Time in ms	S5135U CPU 928 Time in ms	S5 150U Time in ms	S5 155U Time in ms
BEF = BO Data request PANR = 1 PANR = 2to 10,15	24.9 59.7 31 .2to 54.2	8.2 34.0 15.9 to 31.7	4.0 19.1 7.3to 18.1	0.29 1.76 0.95 to 1.73	6.3 15.3 8.7to 14.0	3.0 9.1 4.5to 8.3	0.8 2.4 1 .5to 2.3	0.31 1.48 0.90 to 1.39
BEF = DI PANR = 1 PANR = 2t06	56.7 41.1 to 50.2	30.4 17.7 to 24.3	16.9 8.7to 12.8	1.31 0.56 to 0.57	15.0 10.9 to 12.4	8.9 5.4to 7.0	2.2 1 .3to 1.6	1.10 0.50 to 0.54
BEF = BS, BR, RB, ES, EL, EU, HF, HS, RE	31.5 to 40.5	14.4 to 17.5	7.3to 8.1	0.60 to 0.65	7.0 to 10.4	4.0 to 5.4	1 .0to 1.3	O.#to 0.52
Idling indirect param. ass.	13.8	6.5	3.1	0.51	4.1	1.5	0.8	0.46
Idling direct param. ass.	15.7	6.9	4.0	0.54	4.4	1.7	0.9	0.51

With all BEF = BO commands the data must be requested, the time required can be found in the table.

The commands BEF = BO with PANR : KF+1 and BEF = DI with PANR : KF+1 require at least seven S5 cycles for their processing.

The commands BEF = BO with PANR : KF+2 to KF+1O, KF+15 require at least two S5 cycles for their processing.

The specifications for all the commands are the average times per S5 cycle.

With direct parameter assignment, the runtime per command is extended by the difference between the idle time for direct parameter assignment and the idle time for indirect parameter assignment as shown in the table.

The following applies from release 2 of FB 170 **and higher:**

The runtime for the command BEF = BO with PANR : KF+11 is made up of the data request plus the time for one S5 cycle of the command BEF = BO with PANR : KF+1. The command BEF = BO with PANR : KF+11 requires at least two S5 cycles for processing.

The commands BEF = BS or BEF = BR with PANR : KF+2 are identical to the commands BEF = BS or BEF = BR with PANR : KF+1 in terms of processing and runtimes.

2.7 Application of the Function Block

In cyclic operation, it is illegal to trigger a module with both indirect and direct parameter assignment.

Before calling the function block FB 170, a data block must be set up for it. This data block contains the working data for the function block, the setpoints and the parameter data for the IP 260 controller module. The data block must be created up to and including DW 122. From release 2 of FB 170 up to and including DW 124.

The data block is available on the diskette supplied and has plausible setpoints and parameters assigned as defaults. The data block can be transferred to the RAM of the programmable controller.

To transfer the block to the RAM of the controller module, the "manual block" (command "HS") must first be transferred to the IP 260 module. The "PE" LED for manual release goes off.

Following this, the data block is transferred to the IP 260 with the command "DI 1" (BEF = DI and PANR : KF+1). This command is only executed when the data block is located in the PLC RAM without errors. If the module recognizes incorrect parameters, the data block is not accepted in the IP RAM. The parameter DFEH is set by the IP 260 and you can read the corresponding input error (DL1 11) with command "BO 8". You can also check the acceptance of the data block with the command "BO 1" (data block output IP -> PLC). If the data block was not accepted or has not yet been transferred, the module will set the PLC interface error. The message *KH02 (DR1 13) "no DBin RAM"* is output.

The exact coding of the status bits and the **PLC** interface error can be found in **Part** *3* of this manual.

If no interface error and no input error have occurred, the module is ready for operation.

The IP *260 controller* module has no **interrupt-driven** processing.

With the manual release (**BEF** = HF, LED **"PE"** for manual release is lit) only monitoring commands (**BEF** = BO), the manual block command (**BEF** = HS, LED **"PE"** for manual release goes off) and the reset **PLC** interface command (**BEF** = RE) are permitted.

Data and further commands **from** the programmable **controller** to the **IP** 260 module are only possible with "manual disable".

With indirect parameter **assignment,** the current controller data block must be opened and supplied with values before the function block FB 170 is called. If the function block has processed the command, it will set the data word DW 1 to the value **KH0000.** Only then is it in a position to process a new command.

With direct parameter **assignment** via block parameters, the command is only executed when you have set the parameter **ANST**. You must ensure that the parameter assignment does not change as long as the parameter **ANST** still has the signal value "1". If the function block has processed the command, it will reset the parameter **ANST.** A new command can now be triggered.

After the function block has sent the command, the **IP processes** this command (bit no. 8 in DW 112 is set). Only after the **IP** has processed the command (bit no. 8 in DW 112 is reset), can it perform an error **evaluation.**
With direct parameter **assignment** using block parameters, it is therefore **useful** to use formal **operands** for **error** evaluation each time the **FB** is called.

if a data block is stored in the EEPROM of the **IP** 260, this will be copied to the working DB during module startup and the module is immediately ready for operation.

2.7.1 Interrupting the User Program

S5115U

The user program is always interrupted by time or process interrupts at command boundaries.

Caution

A

⚠ if interrupt OBs are programmed in the user program in which the scratchpad flag area (flag byte FY 200 to FY 255) is used, make sure that this flag area is is saved and loaded again before the interrupt OBs are exited.

S5135U

An interruption of the user program by time or process interrupts takes place at the block boundaries, or if data block DXO has appropriate parameters assigned, at the command boundaries.

The function block FB 170 is designed for both interrupts at block boundaries as well as for interrupts at command boundaries.

Caution

A

⚠ if interrupt OBs are programmed in the user program in which the scratchpad flag area (flag byte FY 200 to FY 255) or the free operating system data area (RS60 to RS63) is used, make sure that this flag area is saved and loaded again before the interrupt OBs are exited.

S515(M

The user program is always interrupted by time or process interrupts at block boundaries.

Caution

if interrupt OBs are programmed in the user program in which the scratchpad flag area (flag byte FY 200 to FY 255) is used, make sure that this flag area is saved and loaded again before the interrupt OBs are exited.

S5 155U

An interruption of the user program by time or process interrupts takes place at the block boundaries, or if data block DXO has appropriate parameters assigned, at the command boundaries.

The function block FB 170 is designed for both interrupts at block boundaries as well as for interrupts at command boundaries.

Caution

if interrupt OBs are programmed in the user program in which the scratchpad flag area (flag byte FY 200 to FY 255) is used, make sure that this flag area is saved and loaded again before the interrupt OBs are exited.

If the interrupts are blocked before FB 170 is called, they will be released again while FB 170 is being processed.

2.7.2 Start-up Procedure

S5 115U

The cyclic program execution following "cold restart" (OB 21) and after "automatic warm restart" (OB 22) begins at the start of OB 1.

Caution

in the "cold restart branch" (OB 21) the function block FB 170 PER:REG must be called with the command "RE" (reset PLC interface).

The function block FB 170 is not called in the warm restart OB (OB 22).

S5135U

Cyclic program execution following “cold restart” (OB 20) begins at the start of OB 1.

Caution

in the “cold restart branch” (OB 20) the function block FB 170 PER:REG must be called with the command “RE” (reset PLC interface).

With the “warm restart modes” OB 21 (manual warm restart) or OB 22 (automatic warm restart) the program is continued at the point where the interrupt occurred, following the processing of the start-up OBs.

The function bbck FB 170 is not called in the warm restart OBs (OB 21 and OB 22).

Caution

if blocks which use the “scratchpad flag area” (flag byte FY 200 to FY 255) or the free operating system data area (RS60 to RS63), you must make sure that these flags or operating system data are saved and loaded again before the start-up OBs are exited.

S515(IU

Cyclic program execution following “cold restart” (OB 20) begins at the start of OB 1.

Caution

in the "cold restart branch” (OB 20) the function block FB 170 PER:REG must be called with the command ‘RE” (reset PLC interface).

With the “warm restart modes” OB *21* (manual warm restart) or OB 22 (automatic warm **restart)** the program is **continued** at the point where the interrupt occurred, following the processing of the start-up OBs.

The function block FB 170 is not called in the warm restart OBs (OB 21 and OB 22).

Caution

if blocks which use the “scratchpad flag area” (flag byte FY 200 to FY 255) are called in the start-up OBs OB 21 and OB 22, you must make sure that these flags or operating system data are saved and loaded again before the **start-up** OBs are exited.

S5 155U

Cyclic program execution following “cold restart’(OB 20) begins at the **start** of OB 1.

Caution

in the “cold restart branch” (OB 20) the function block FB 170 PER:REG must be called with the command "RE" (reset PLC interface).

With the “warm restart modes” OB 21 (manual warm restart) or OB 22 (automatic warm restart) the program is continued at the point where the interrupt occurred, following the processing of the start-up OBs.

The function block FB 170 is not called in the warm restart OBs (OB 21 and OB 22).

Caution

if blocks which use the “scratchpad flag area” (flag byte FY 200 to FY 255) are called in the start-up OBs OB 21 and OB 22, it is absolutely necessary that these flags or operating system data are saved and **loaded** again before the start-up OBs are exited.

Cold **restart** on **all PLCs**

ACM restart can be synchronized with the IP 260 startup by repeating the command BEF = RE in the **cold** restart branch until it is no longer acknowledged by PAFE with F255.5.

Warm restart on ***all*** PLCS

A warm restart (manual or automatic) is only possible as long as the 24 V load voltage of the IP 260 did not fail. If the PLC power supply and the 24 V load voltage of the IP 260 both fail at the same time, a **cold** restart is necessary.

3 Example

The example described below can be found on the diskette supplied and can be loaded completely in the PLC memory to test the module.

All the necessary blocks are on the diskette which also provides a complete “program framework” which you can adapt to your own needs.

Depending on the PLC, one of the following files must be used:

S5135U: S5PR22ST.S5D
S5150U: S5PR40ST.S5D
S5115U: S5PR15ST.S5D
S5155U: S5PR60ST.S5D

In the example, the function block FB 170 is used in conjunction with the function blocks FB 253 and FB 254 and with the data blocks DB 60 and DB 80.

For the S5135U and S5 155U, there is also the function block FB 255 and the data blocks DX 60 and DX 80.

The function blocks FB 38 and FB 39 are also required with the S5155U.

The data blocks DB 60, DB 80 or DX 60, DX 80 are suitable to read the data written, e.g. by DB 60 to DB 80.

If data blocks DX 60 or DX 80 are used in the S5 135U or S5 155U, the call for function block FB254 must be replaced by the call for FB255. This requires the following modification in PB 170:

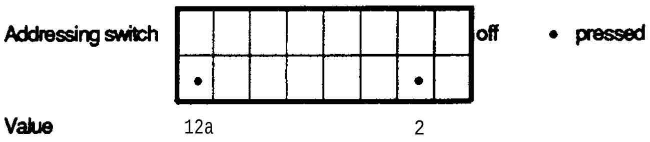
```
         AN 14.0                        AN 14.0
         JC FB 254   ---------------    JC FB 255
Name:    IP 260               Name:     IP 260
STRT:      IW 4               STRT:       IW 4
AUSW:      IW 6               AUSW:       IW 6

(DB 60/DB 80 valid)                (DX 60/DX 80 valid)
```

In the following description, when using theS5135U or S5 155U, replace function block FB 254 by FB 255 and the data blocks DB 60 and DB 80 by data blocks DX 60 and DX 80.

The following hardware is required for this example:

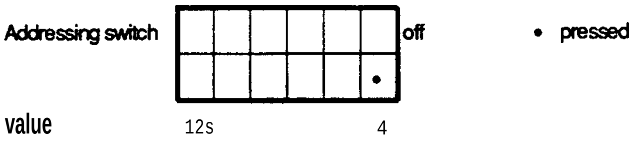
S5115U:

- one digital input module 6ES5420-.... (fixed slot addressing) inserted in slot 1 in the central controller (IB4)
- one digital output module 6ES5441-.... (fixed slot addressing) inserted in slot 2 in the central controller (QB8)
- one IP 260 controller module coded as PY130 inserted in the central controller of the S5115U programmable controller.

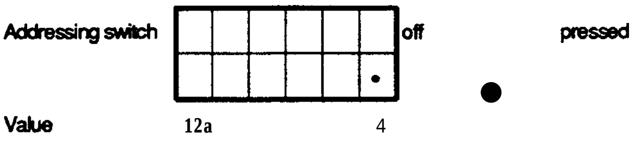


S5135U:

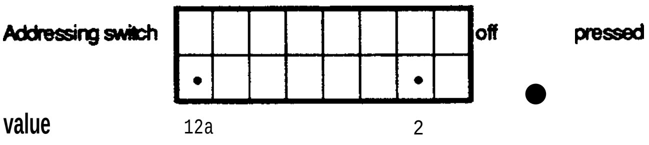
- one digital input module 6ES5420-.... coded as IB4



- one digital output module 6ES5441-.... coded as QB4



- one IP 260 controller module coded as PY130

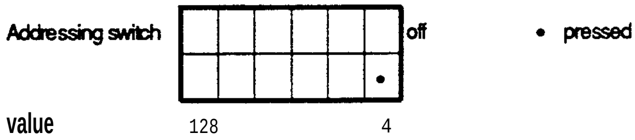


inserted in the central controller or expansion unit of the S5 135U programmable controller with the CPU 922 (R processor) or CPU 926.

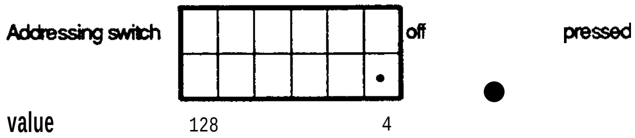
In the central controller, no distinction can be made between the types of addressing P/O(PY126=OY126).

S5150U:

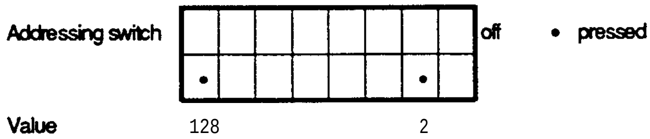
•one digital input module 6ES5420-.... coded as IB4



. onedgital output module 6ES5441-.... coded as QB4



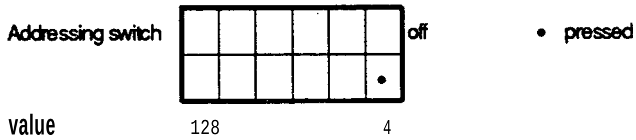
•one IP 260 controller module coded as PY130



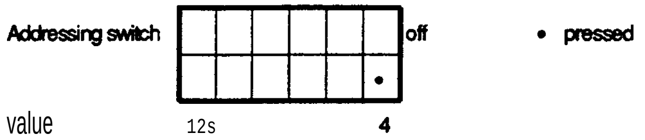
inserted in the expansion unit of the S5 150U programmable controller.

S5155U:

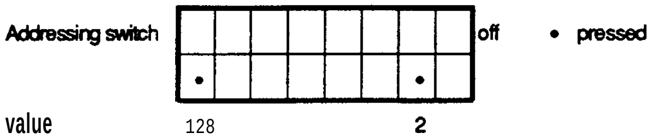
. one digital input module 6ES5420-.... coded as IB4



.one digital ouptut module 6ES5441-.... coded as QB4



. one IP 260 controller module coded as PY130



inserted in the central controller or expansion unit **of the S5 155U programmable controller.**

In the central controller, the types of addressing **P/O cannot be** distinguished **(PY128 = OY128**).

Assignments for the test **program**

Digital inputs

Commands are executed on a rising edge at the input

I 4.0	Command RE: reset module
I 4.1	Command 60: monitor
14.2	Command DI: utility command
I 4.3	Command 6S: “open loop” mode
I 4.4	Command BR: “closed loop” mode
I 4.5	Command RB: controller operation commands
14.6	Command ES: write to EEPROM
I 4.7	Command EL: read EEPROM
I 5.0	Command HF: manual release
I 5.1	Command HS: manual disable
15.2	Command EU: EEPROM invalid
15.3	Command XY: wrong command

Parameter numbers from KF+0 to KF+1 5 selectable:

I 5.4	Parameter number 2°
I 5.5	Parameter number 2’
15.6	Parameter number 2^2
I 5.7	Parameter number 2^3
16.0	“O” = DB 60 or DX 60 / “1” = DB 80 or DX 80 DB for FB254, DX for FB255
16.1	Direct (FB253, ”1” signal)/ indirect (FB254 or FB255, “O” signal) parameter assignment
16.2	Background processing on/off “O” signal no background processing “1” signal with background processing
16.3	Reset the latching error messages

The following applies from release 2 of FB 170

16.4	Type of background processing when 16.2= 1 “O” signal: automatic error reading “1” signal: automatic condition code reading

Digital outputs with the S5135U, S5159U and S5155U:

Q 4.0	=PAFE, parameter assignment error
Q 4.1	=DFEH, data error
Q 4.2	=SFEH, PLC interface error
Q 4.3	=PFEH, process error
Q 4.4	=BAUS, module failure
Q 4.5	not used
Q 4.6	=PFEH, latching
Q 4.7	=BAUS, latching
QB5	=BFEH, data error (DL1 11)
Q 6.0	=PAFE, latching
Q 6.1	=DFEH, latching
Q 6.2	=SFEH, latching
Q 6.3	not used

Digital outputs with the S5115U:

Q 8.0	=PAFE, parameter assignment error
Q 8.1	=DFEH, data error
Q 8.2	=SFEH, PLC interface error
Q 8.3	=PFEH, process error
Q 8.4	=BAUS, module failure
Q 8.5	not used
Q8.6	=PFEH, latching
Q 8.7	=BAUS, latching
QB9	=BFEH, data error (DL1 11)
Q 10.0	=PAFE, latching
Q 10.1	=DFEH, latching
Q 10.2	=SFEH, latching
Q 10.3	not used

Assignment of the data area:

Data words DW 123 and DW 124 are occupied in the data block called.

DW 123	:Parameter **assignment** error
DW 124	:Condition code of the last command

From release 2 of FB 170 and higher data words DW 125 (instead of DW 123) and DW 126 (instead of DW 124) are **occupied.**

In addition to this, the **following** data blocks are also **occupied** depending on the PLC:

S5115U:	**DB 151**	**DW O to DW 26**
	DB 152	**DW O to DW 26**
S5135U:	**DB** 150	DW O to DW 32
	DB 151	**DW O to DW 32**
	DB 152	**DW O to** DW 32
S5150U:	**DB** 150	DW O to DW 26
	DB 151	DW O to DW 26
	DB 152	DW O to DW 26
S5 155U:	**DB** 255	DW O to DW 26

These data blocks are used to save the scratchpad flag area and the free operating system data (only with the S5135U).

Assignment of the ffag area:

F 0.0	"**RLO** O" -flag
F 0.1	"**RLO** 1" **-flag**
F 0.2	Trigger flag for "RE"inOB20(withS5135U, S5 150U and S5155U) or in OB21 (S5115U)
FY190	Specifies the parameter number **(PANR)**

F 192.0 -
F 192.1 -

F 192.2 -
F 192.3 -

F 192.4	**0-1 edge DB switchover**
F 192.5	**1-0 edge DB switchover**
F 192.6	-
F 192.7	-
FW 194	**Edge flag** for IW4 in FB254
FW 196	Edge flag for IW4 in FB253
FW 198	Trigger flag for commands when using direct parameter assignment
FY 200 to FY 255	Scratchpad flag area

Diagrams representing the organization blocks “program framework”:

OB1

Call PB 170 for cyclic program execution

OB20 or OB21 (S5115U)

F 0.0= RLO “O”

F 0.1 = RLO “1”
F 0.2 = RLO “1” Trigger flag for command execution

Call the function block
with direct parameter assignment

```
        FB 170
NAME:PER:  REG
BADR:      KY0,130
DBNR:      KY0.60 or KY0,80
BEF :      KCRE
PANR:      FY 190
ANST       F  0.2
PAFE:      Q  4.0  or  Q  8.0  (S5 115U)
DFEH:      Q  4.1  or  Q  8.1  (S5 115U)
SFEH:      Q  4.2  or  Q  8.2  (S5 115U)
PFEH:      Q  4.3  or  Q  8.3  (S5 115U)
BAUS:      Q  4.4  or  Q  8.4  (S5 115U)
BFEH:      QB 5    or  QB 9    (S5 115U)
```

User program for cold restart

OB21/0B22orOB22(S5115U)

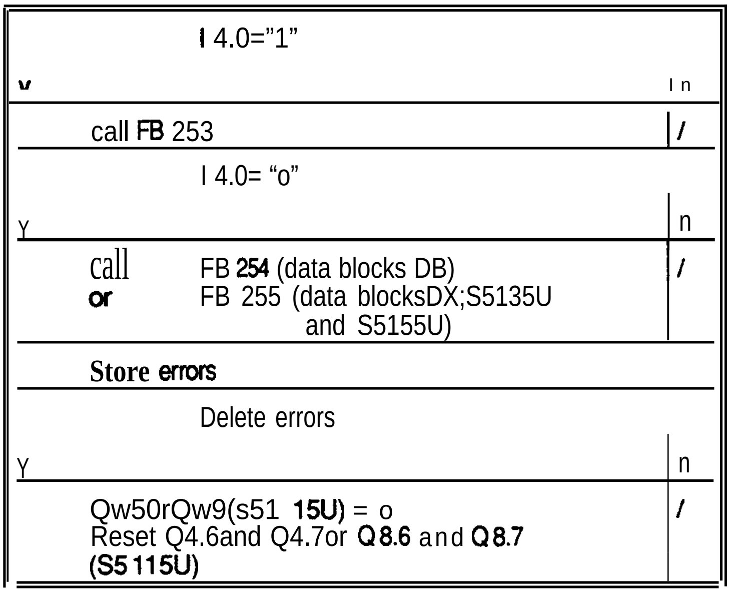
F 0.0= RLO “O”
FO.1 =RLO “1”
Save flags **FY 200 to FY 255 in DB** 150 or in **DB** 255 with FB 38 (for the S5 **155U)**
Call **FB 251: save operating system data (RS 60 to RS 63)** in **DB** 150(onlyforS5135U)
User **program** for warm **restart**
Call FB 252: load operating system **data (DB** 150 → **RS** 60to **RS** 63 (only for **S5 135U)**
Load flags **DB** 150 → **FY 200 to FY 255 (not for S5 115U) or** from **DB 255 with** FB39 **(for the S5 155U)**

Interrupt OBs

Process **interrupt** 06s and time interrupt 06s
Save flags **FY** 200 to **FY** 255 in **DB 151/DB** 152 or in **DB 255 with** FB38 **(for the** S5 **155U)**
Call **FB 251**: saveoperatingsystemdata (BS **60 to BS 63**) in **DB 151/DB** 152 **(onlv** forS5135U)
User **program for** intern@
Call FB 252: load operating system data (DB 151/ **DB 152)** → 6S 60 to **BS** 63 **(only** for **S5 135U)**
Load flags **DB 151/DB** 152 → **FY 200 to FY 255** **or from DB** 255 withFB39(fortheS5155LN

The program block **PB170** contains the instructions for cyclic program execution.

structural diagram of PB170


I 4.0="1"
v
n
call FB 253
/
I 4.0= "o"
Y
n
call FB 254 (data blocks DB)
or FB 255 (data blocksDX;S5135U and S5155U)
/
Store errors
Delete errors
Y
n
Qw50rQw9(s51 15U) = o
Reset Q4.6and Q4.7or Q8.6 and Q8.7 (S5 115U)
/

The function block FB253 indicates the application of the function block FBI 70 with **direct parameter assignment** by means of the block parameters. FB170 must be called once for each command and the data transfer coordinated using the parameter ANST.

Structural **diagram FB253**

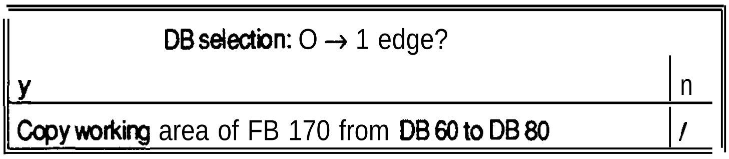
Segment 2

Load formal operands in scratchpad area
Edge evaluation: DB selection (DB 60 or DB 80)

Segment 3

Load Parameter number in flag byte FY 190

Segment 4



DB selection: O → 1 edge?

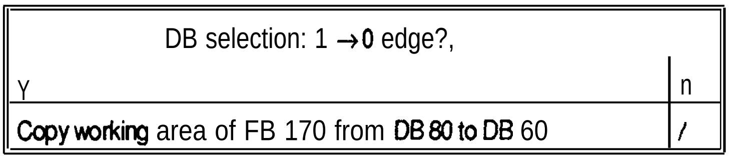
y

n

Copy working area of FB 170 from DB 60 to DB 80

/

Segment 5



DB selection: 1 →0 edge?,

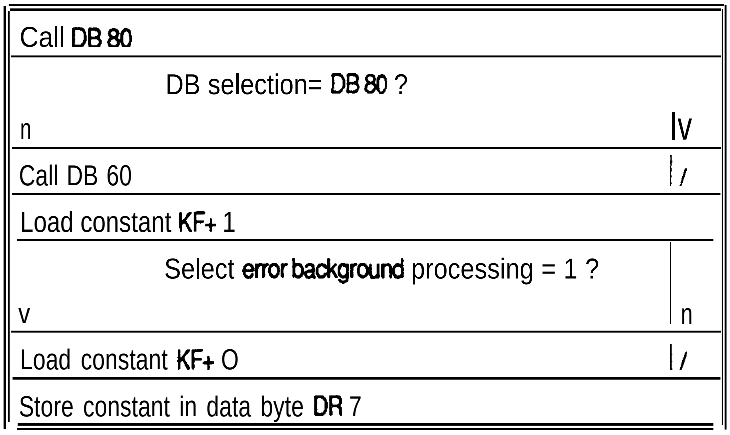
Y

n

Copy working area of FB 170 from DB 80 to DB 60

/

Segment 6



Call DB 80

DB selection= DB 80 ?

n

lV

Call DB 60

/

Load constant KF+ 1

Select error background processing = 1 ?

v

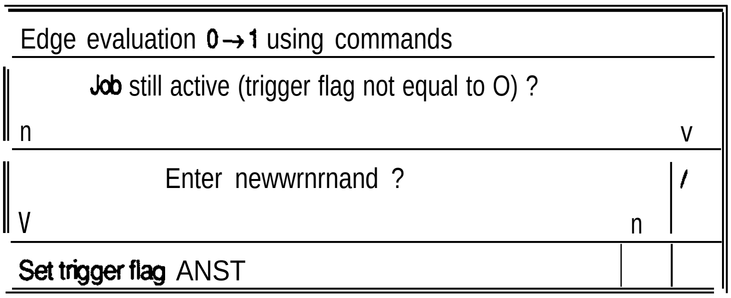
n

Load constant KF+ O

/

Store constant in data byte DR 7

Segment 7



Edge evaluation 0→1 using commands

Job still active (trigger flag not equal to O) ?

n

v

Enter newwrnrnand ?

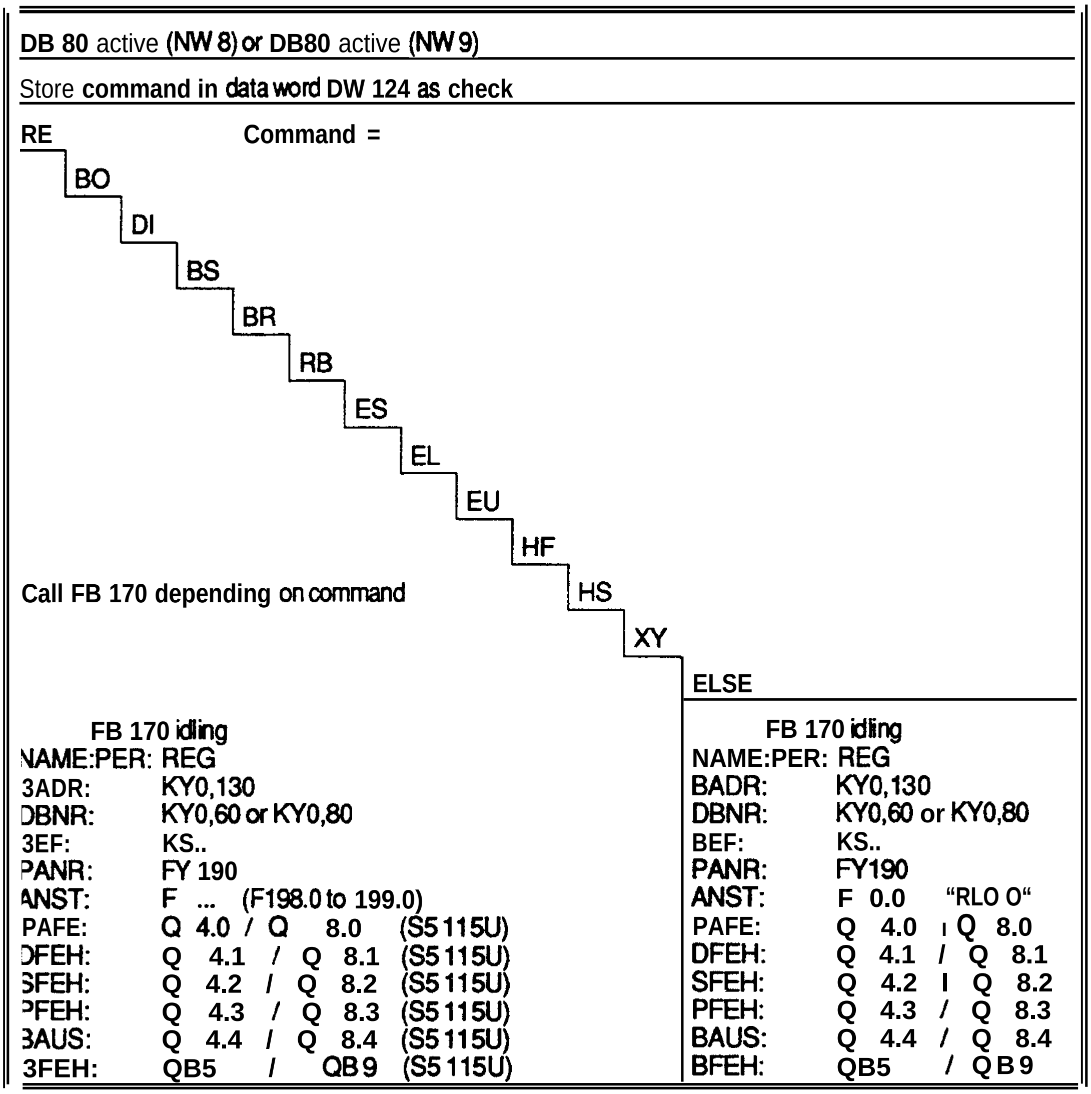
/

V

n

Set trigger flag ANST

Segment 8 or Segment 9:



DB 80 active (NW 8) or DB80 active (NW 9)

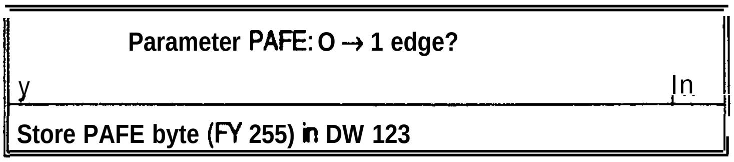
Store command in data word DW 124 as check

Call FB 170 depending on command

FB 170 idling	
NAME:PER:	REG
BADR:	KY0,130
DBNR:	KY0,60 or KY0,80
BEF:	KS..
PANR:	FY 190
ANST:	F ... (F198.0 to 199.0)
PAFE:	Q 4.0 / Q 8.0 (S5 115U)
DFEH:	Q 4.1 / Q 8.1 (S5 115U)
SFEH:	Q 4.2 / Q 8.2 (S5 115U)
PFEH:	Q 4.3 / Q 8.3 (S5 115U)
BAUS:	Q 4.4 / Q 8.4 (S5 115U)
BFEH:	QB5 / QB9 (S5 115U)

FB 170 idling	
NAME:PER:	REG
BADR:	KY0,130
DBNR:	KY0,60 or KY0,80
BEF:	KS..
PANR:	FY190
ANST:	F 0.0 "RLO 0"
PAFE:	Q 4.0 / Q 8.0
DFEH:	Q 4.1 / Q 8.1
SFEH:	Q 4.2 / Q 8.2
PFEH:	Q 4.3 / Q 8.3
BAUS:	Q 4.4 / Q 8.4
BFEH:	QB5 / QB9

Segment 10:



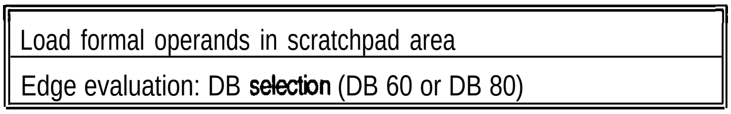
Parameter PAFE: 0 → 1 edge?

Store PAFE byte (FY 255) in DW 123

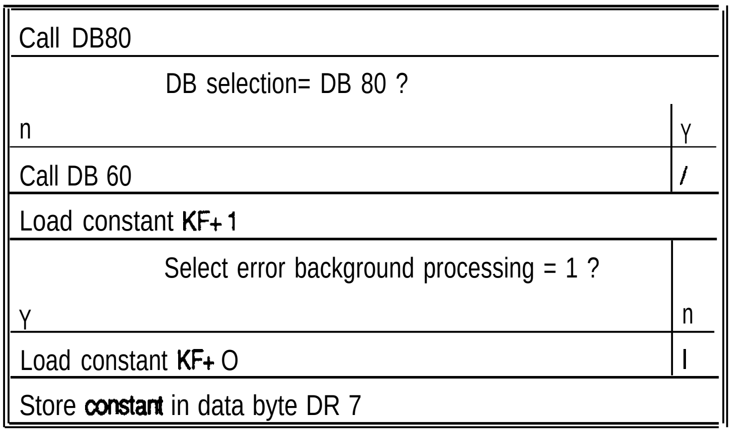
The function blocks FB254 and FB255 show the application of the function block FBI 70 with indirect **parameter assignment** by means of data blocks DB 60, DB 80 or DX 60, DX 80. The command is entered in data word DW 1 in the KS format and the parameter number in the KF format in data word DW 2 in the working area of the function block FBI 70.

Structural diagram FB254 or FB255

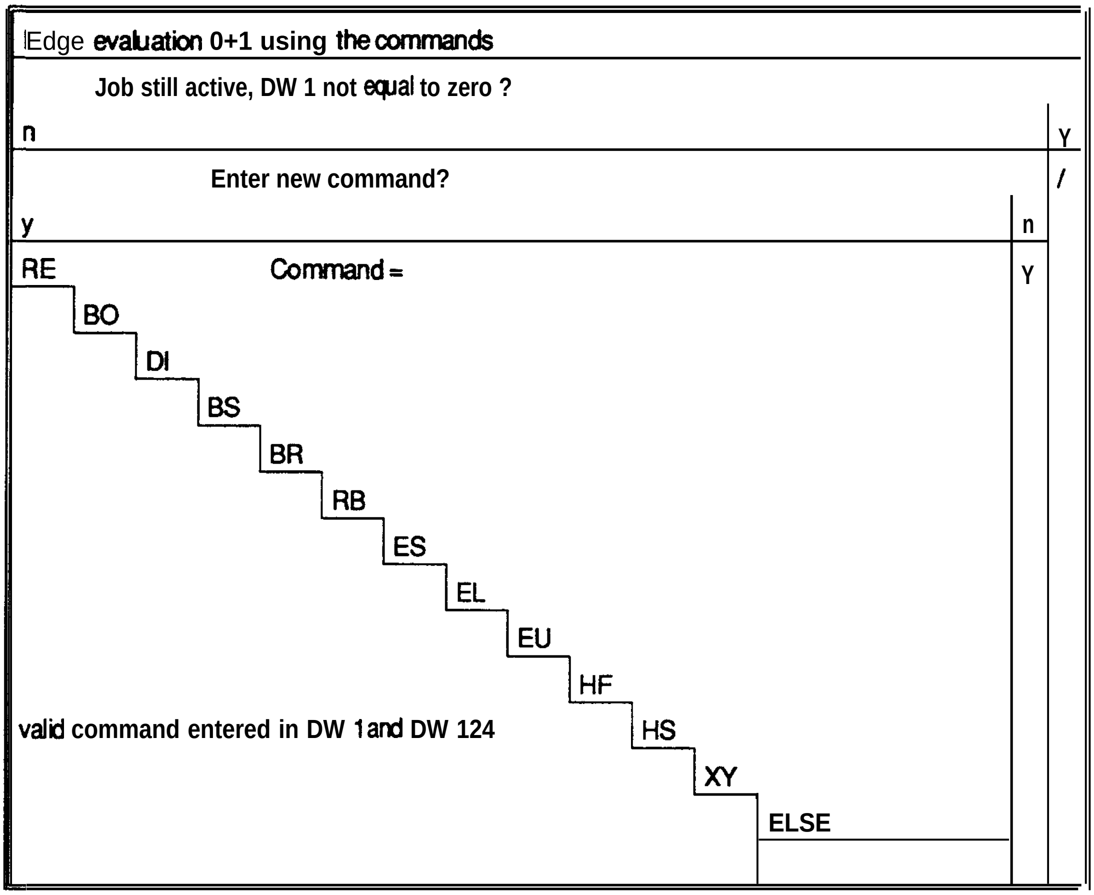
Segment 2


Load formal operands in scratchpad area
Edge evaluation: DB selection (DB 60 or DB 80)

Segment 3



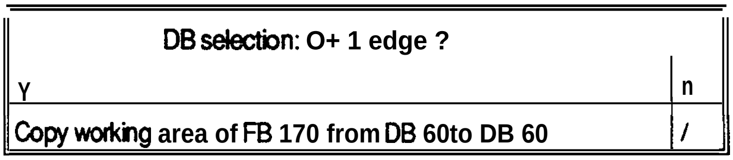
Segment 4


Edge evaluation 0+1 using the commands
Job still active, DW 1 not equal to zero ?
n
Y
/
Enter new command?
y
n
Y
RE
Command =
BO
DI
BS
BR
RB
ES
EL
EU
HF
valid command entered in DW 1 and DW 124
HS
XY
ELSE

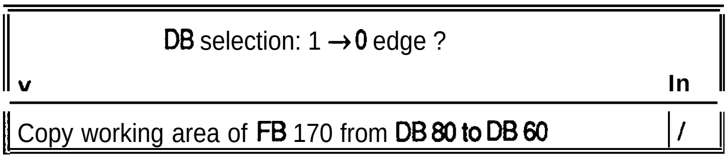
Segment 5

Enter parameter number in data word DW2

Segment 6


DB selection: O+ 1 edge ?
Y
n
Copy working area of FB 170 from DB 60to DB 60
/

Segment 7



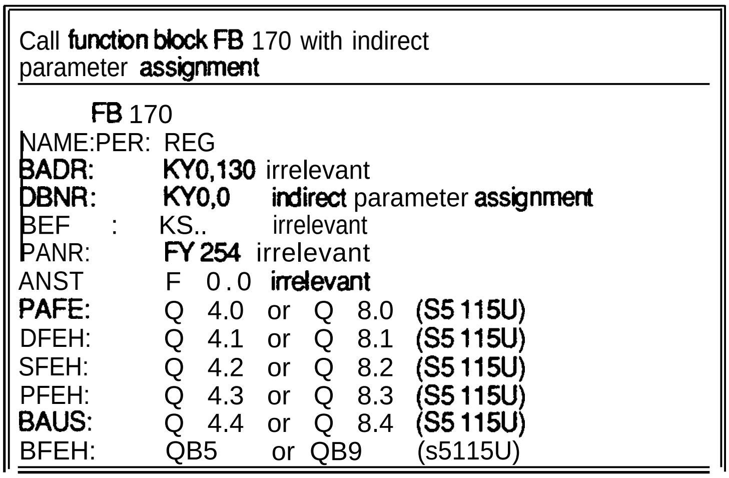
DB selection: 1 → 0 edge ?

v In

Copy working area of FB 170 from DB 80 to DB 60

/

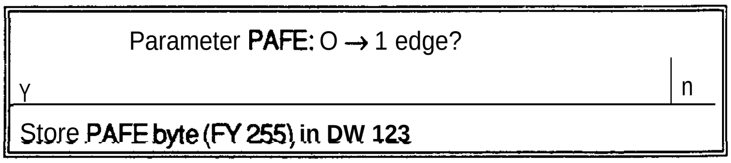
Segment 8



Call function block FB 170 with indirect parameter assignment

```
        FB 170
NAME:PER:  REG
BADR:      KY0,130 irrelevant
DBNR:      KY0,0     indirect parameter assignment
BEF    :   KS..      irrelevant
PANR:      FY 254  irrelevant
ANST       F  0.0  irrelevant
PAFE:      Q  4.0  or  Q  8.0  (S5 115U)
DFEH:      Q  4.1  or  Q  8.1  (S5 115U)
SFEH:      Q  4.2  or  Q  8.2  (S5 115U)
PFEH:      Q  4.3  or  Q  8.3  (S5 115U)
BAUS:      Q  4.4  or  Q  8.4  (S5 115U)
BFEH:      QB5      or  QB9      (s5115U)
```

Segment 9



Parameter PAFE: O → 1 edge?

Y n

Store PAFE byte (FY 255) in DW 123

Page Overview

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Title page						
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1-1 -1-2	x					
2-1-2-30	x					
3-1-3-16	x					
S1 - S2	x					

Contents

1 Instructions for Installation

Requirements

The programmable controller has been installed as normal. The power supply is connected **correctly** (see programmable controller manual).

The following is required for installation:

- IP 260 controller module
- Programmer PG 635, PG 675, PG 685 or PG 695 with the **S5-DOS** operating system
- Programmer software **COM** 260 forthe corresponding PG.

Preparing the IP 260 controller module

- Address setting, if the module is to be **controlled** by the CPU (see the IP 260 Operating Instructions)
- Connection of the four analog inputs and the analog output (see the Operating Instructions) connector X4
- Connection of the four digital inputs and the four **digital** outputs (see the Operating Instructions) connector X3
- Connection of the power supply (seethe Operating Instructions) connector X6
- Connection of the programmer, connector X5
- For safety reasons, all connectors must be secured by screws
- **Apply signal level** "1" to the digital input **"RSP"**, the controller **is disabled**
- Switch on the power **supply**, the red LED **"CFM"** flashes **briefly**, if it **then** lights up **permanently**, there is a **module** fault, otherwise the green LED "PE" will light up.

Preparing the programmer

- Switch on the programmer and load the programming software **COM** 260 under **S5-DOS** (see the **COM** 260 Instructions)
- The **connection** to the module is established in **the online** mode, the release of the firmware is displayed on the PG
- Enter **the controller** structure and module **configuration** on the controller module IP 260 or transfer a prepared data block from diskette to the module

- The **module** is then ready for operation andthetest mode (function key **F3)** can be switched on
- Release **the controller (digital** input **"RSP"** = O), **"Y from IP"** must appear on the PG screen
- In the "open **loop control"** mode (function key **F3)** create a sudden change in the controlled system and record the response to the sudden change with the actual value
- From the controlled system's response to the sudden change, select the setting for the control parameters and change the existing parameters with "controlled' (function key **F4)**
- With "setPoint branch" (function key Fl) select the "closed loop" mode and optimize the control parameters
- Once all the parameters **for the** controlled system are correctly set, exit the test mode and save the data block in the EEPROM (transfer, function key **F4).**

Linking the IP 260 into the user program of the CPU

- For each module, setup a data block with 122 DWS
- Load the standard function block FB 170 **for the** corresponding CPU
- Call FB 170 **with the command** "RE" in **OB** 20 orOB 21 depending on the CPU (seethe FB 170 Programming Instructions)
- Call FB 170 with the **command "BO,1" to transfer the** data block from the module to the PLC.

2 Notes on Wiring

Before the module can be put into operation with the controlled system, the wiring must be completed. This means that all analog and digital signals required for the system must be wired.

Remember that the three digital inputs "VB-N", "lopen-N" and "Iclose-N" are low active. They must, therefore, be activated by an NC contact. A wire break or open input therefore activates the input.

The analog input signals are monitored during measured value acquisition for underflow or overflow. This must not exceed 10% otherwise the input signal is incorrect and is then limited. If this occurs at analog input X, the controller is no longer processed and is “not OK”. From **version 5 of the module and firmware release VI.3 this response can be selected.**

Using the digital input "RSP, disable controller” the controller output is switched off during start-up. This protects the controlled system and the actuator from accidental or undesired controller reactions.

COM 260 displays error messages as an aid to troubleshooting (see Notes on Installation, Chapter 12). When being operated via the PLC help is provided by the status bits (see Programming Instructions, Chapter 4).

3 Command List

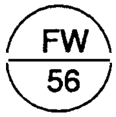
Utility commands	Interface DW from DB	
DI 1 - data block input	PLC and PG	DW 16-96
DI 2 -control parameter set 1 input	PLC and PG	DW 31-35
DI 3 - control parameter set 2 input	PLC and PG	DW 36-40
DI 4 - module configuration input	PLC and PG	DW 17
DI 5 -test actual value input	PLC and PG	DW 68
DI 6 - identification input	PLC and PG	DW 120
Mode commands **open loop”		
BS O -control ace. to analog input EW	PLC and PG	
BS 1 -control ace. to PLC manipulated var.	PLC	DW 97
BS 2 -control ace. to PLC manipulated var.	PLC	DW 124
Mode commands “closed loop”		
BR O - control ace. to analog input EW	PLC and PG	
BR 1 - control ace. to PLC setpoint	PLC	DW 97
BR 2 - control ace. to PLC setpoint	PLC	DW 123
Controller operation commands		
RB O - switch on parameter set 2	PLC and PG	
RB 1 - switch off parameter set 2	PLC and PG	
RB 2 - switch on test setpoint branch	PLC and PG	
RB 3 - switch off test setpoint branch	PLC and PG	
RB 4 - setpoint ramp higher	PLC and PG	
RB 5 - setpoint ramp lower	PLC and PG	
RB 6 - stop setpoint ramp	PLC and PG	
RB 7 - switch on test actual value branch	PLC and PG	
RB 8 -switch off test actual value branch	PLC and PG	
RB 9 - manipulated variable ramp higher	PLC and PG	
RB 10-manipulated variable ramp lower	PLC and PG	
RB 11- stop manipulated variable ramp	PLC and PG	
System commands		
ES - wriie DB in EEPROM	PLC and PG	
EL - read DB from EEPROM	PLC and PG	
HF - manual release (access from PG)	PLC	
HS - manual disable (access from PLC)	PLC	
EU - delete DB in EEPROM	PLC and PG	
RE - reset PLC interface	PLC	

Monitoring commands

BO 1 - data block output	PLC and PG	DW 16-96
BO 2- control para set 1 output	PLC and PG	DW 31-35
BO 3- control para set 2 output	PLC and PG	DW 36-40
BO 4- module config. output	PLC and PG	DW 17
BO 5 - test actual value output	PLC and PG	DW 68
BO 6 - identification output	PLC and PG	DW 114-120
BO 7- read monitoring points	PLC and PG	DW 98-108
BO 8 - read status bits	PLC and PG	DW 109-112
BO 9 - read module directory	PLC and PG	DW 121-122
BO 10- read current values	PLC	DW 99, DW 101-103 DW 110,112
BO 11- Read condition codes (from version 5 of the module and firmware release V1.3 and release 2 of FB 170)	PLC	DW 98-108, DW 110 - 112
BO 15- read PLC interface error	PLC	DW 113

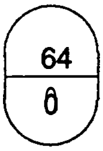
Key

Parameters



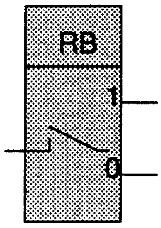
Parameters with name and information about the data area
e.g. **weighting** factor **FW** in DW 56

Bit variables (structure switches)



Bit variables with their DW
e.g. bit O in DW 84

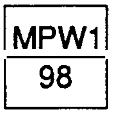
Commands (operation switches)



Commands and the command abbreviation with parameter number

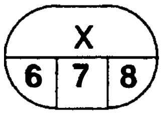
e.g.			
e.g.	RB	=	closed loop mode command
	0	=	switch on parameter set 2
	1	=	switch off parameter set 2

Status bits



Status bit values with abbreviation and DW
e.g. monitoring point 1 MPW1 in DW 98

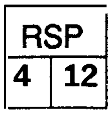
Analog inputs/outputs



Analog **inputs/outputs** with name and pin **assignment** at connector X4

e.g.	X	=	analog input for actual value
	pin 6	=	ground connection
	pin 7	=	current connection (0/4 to **20mA)**
	pin 8	=	voltage connection (O to 1 OV)

Digital inputs/outputs



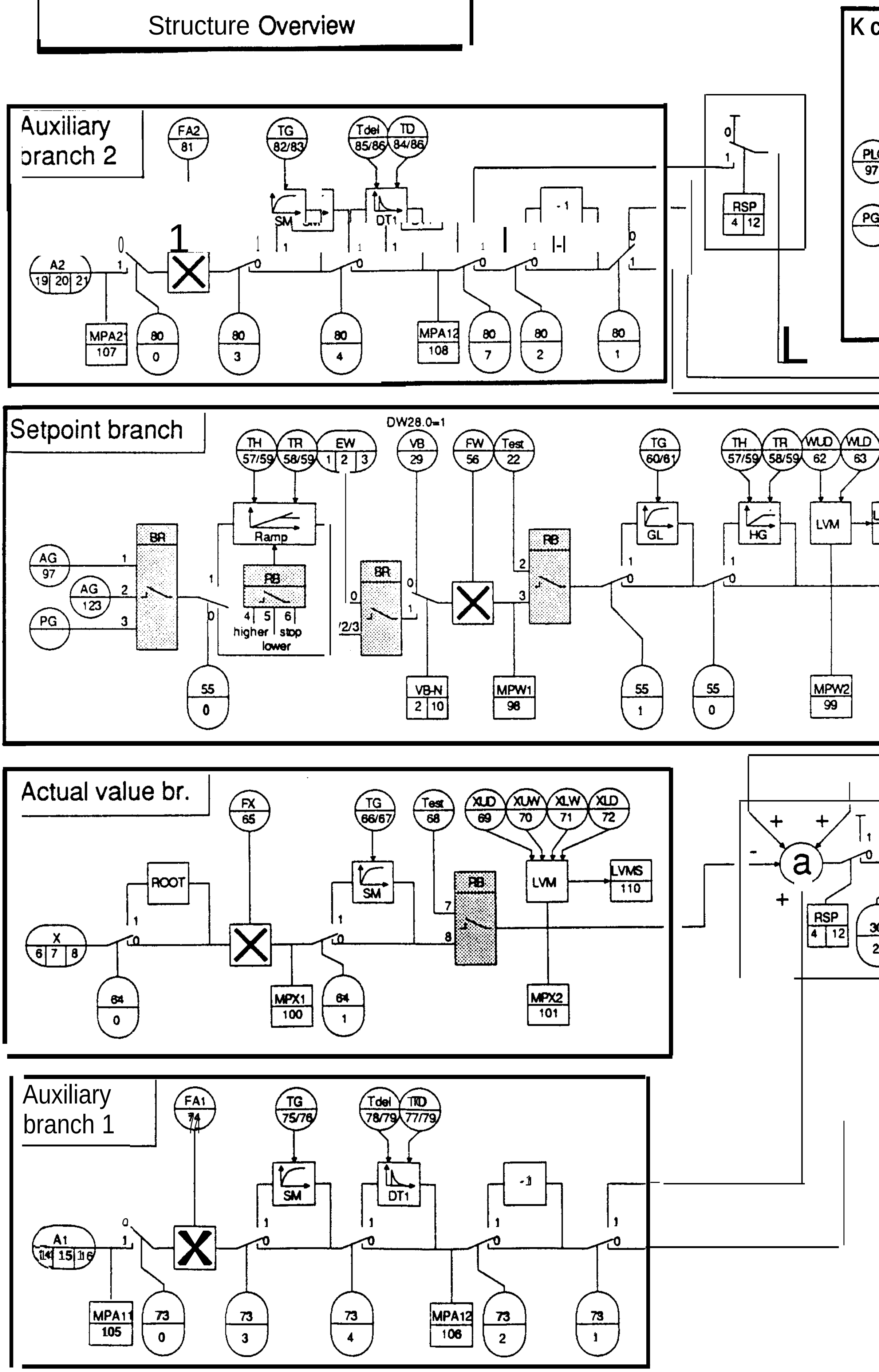
Digital inputs/outputs with name and pin **assignment** at connector X3

e.g.	**RSP**	=	disable controller
	pin 4	=	positive connection
	pin 12	=	negative connection

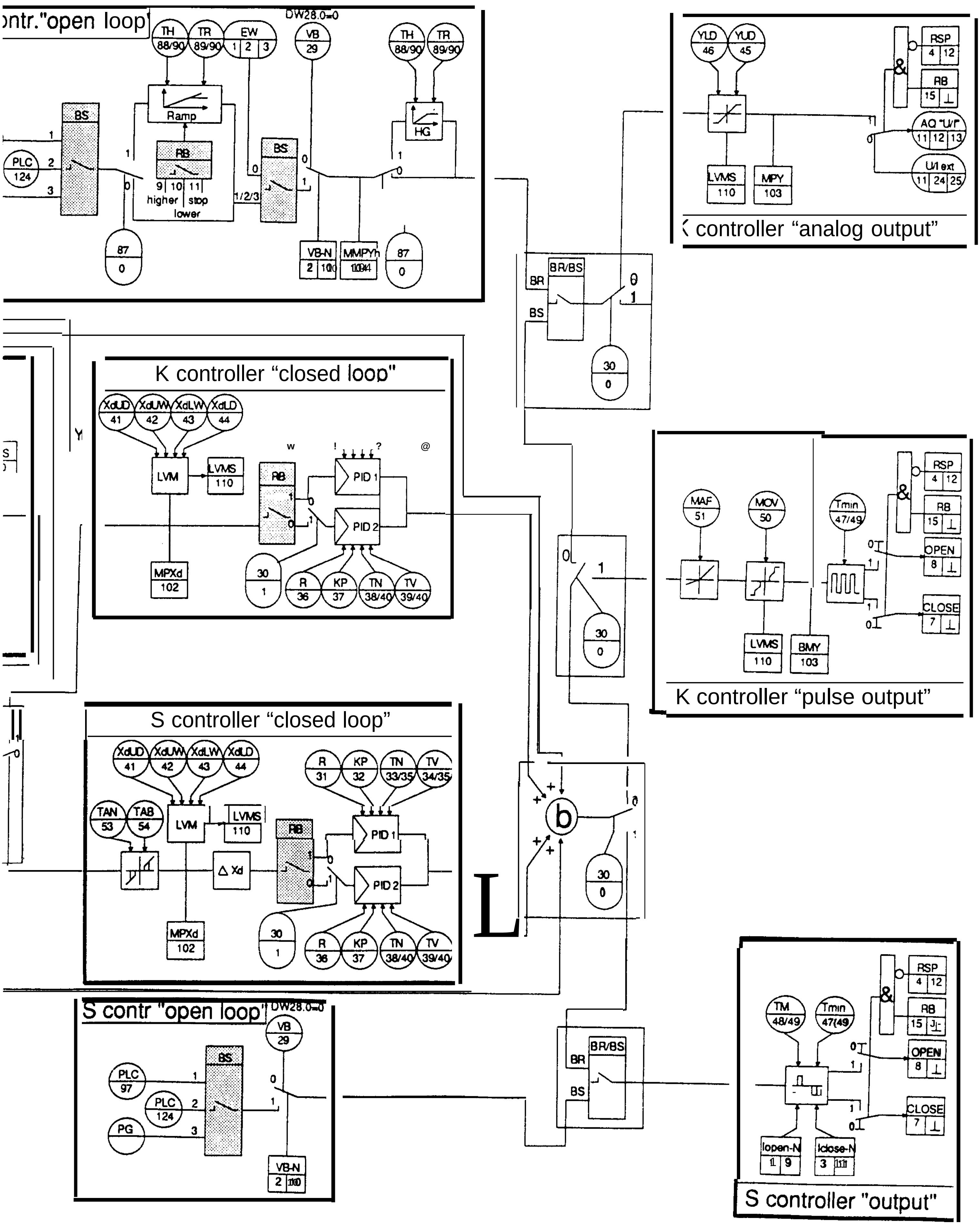
Page Overview

Page	Release 02					
Title page						
0-1 -0-2	x					
1-1 -1-2	x					
2-1 -2-2	x					
3-1 -3-2	x					
4-1 -4-2	x					
Structure Overview	**X**					
s-1 - s-2	x					

IP260 Controller Module
Structure Overview



©Si AG 1991 C79000-B8576-C503-02


ntr."open loop"
TH 88/90
TR 89/90
EW 1 2 3
DW28.0=0
VB 29
TH 88/90
TR 89/90
BS
Ramp
RB
9 10 11
higher stop
lower
BS
1/2/3
HG
PLC 124
1
2
3
87 0
VB-N 2 100
MMPYh 104
87 0
YLD 46
YUD 45
RSP 4 12
&
RB 15 ⊥
AQ "U/I" 11 12 13
U/I ext 11 24 25
LVMS 110
MPY 103
K controller "analog output"
BR/BS
BR
BS
0
1
30 0
K controller "closed loop"
XdUD 41
XdUW 42
XdLW 43
XdLD 44
LVM
LVMS 110
RB
PID 1
PID 2
MPXd 102
30 1
R 36
KP 37
TN 38/40
TV 39/40
0
1
30 0
MAF 51
MOV 50
Tmin 47/49
RSP 4 12
&
RB 15 ⊥
OPEN 8 ⊥
CLOSE 7 ⊥
LVMS 110
BMY 103
K controller "pulse output"
S controller "closed loop"
XdUD 41
XdUW 42
XdLW 43
XdLD 44
TAN 53
TAB 54
LVM
LVMS 110
Δ Xd
RB
R 31
KP 32
TN 33/35
TV 34/35
PID 1
PID 2
MPXd 102
30 1
R 36
KP 37
TN 38/40
TV 39/40
b
30 0
S contr "open loop"
DW28.0=0
VB 29
BS
PLC 97
PLC 124
PG
1
2
3
VB-N 2 100
BR/BS
BR
BS
TM 48/49
Tmin 47/49
RSP 4 12
&
RB 15 ⊥
OPEN 8 ⊥
CLOSE 7 ⊥
Iopen-N 1 9
Iclose-N 3 11
S controller "output"