

SIEMENS

SIMATIC S5-105R

Programmable Controller

Operating Instructions

Order No.: GWA 4NEB 810 0220-02

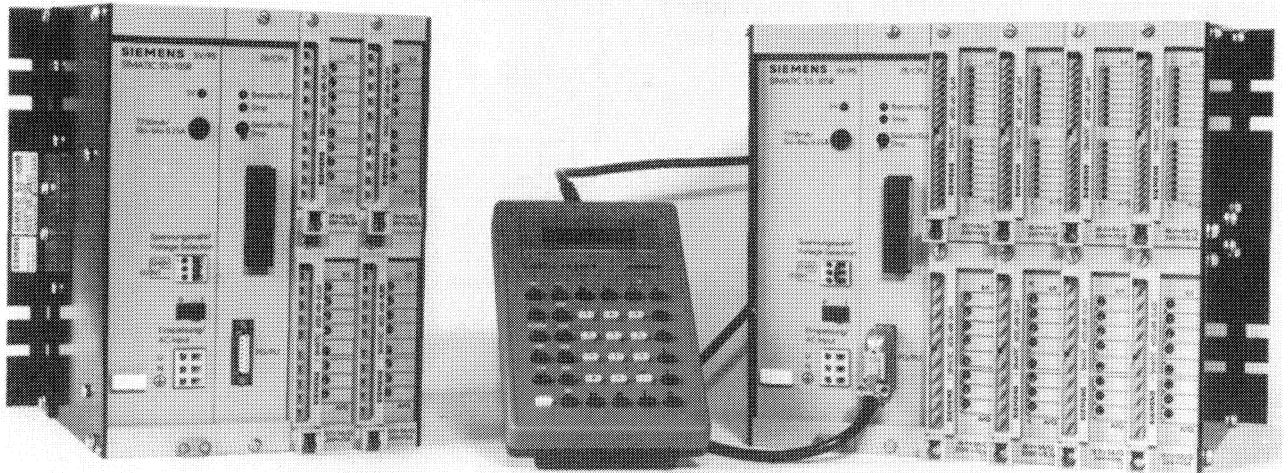


Fig. 1 S5-105R-A/-B Programmable Controller with 605R programmer

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1 Description

1.1 Application

The 105R is a programmable controller (PC) of the SIMATIC S5 System. It was developed for automation tasks in the lower performance range (relay control systems). The scope of application of the unit allows designs extending from logic control systems with timing and counting functions to sequence cascades (drum controllers). The programmable controller is programmed with the hand-held 605R programmer using ladder diagrams (LAD).

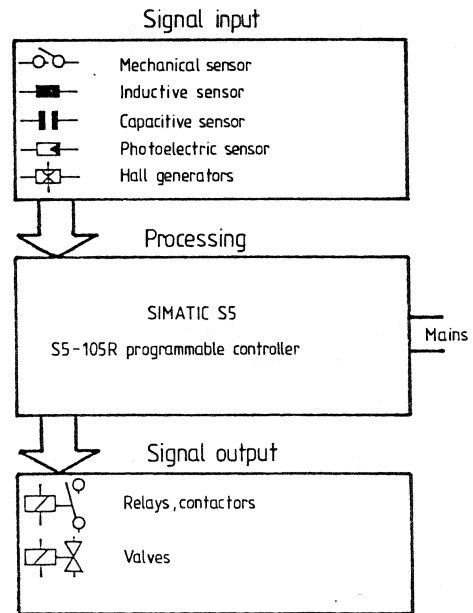


Fig. 2 Application of the 105R programmable controller

1.2 Design

Rugged housing for mounting in a cabinet or on the wall

Power supply module (PS) for 115 V AC or 220 V/240 V AC

Central processing unit (CPU) with micro-processor, program memory and connector for 605R programmer.

Plug-in external memory submodule

Digital input/output modules for
 24V DC
 115V AC
 220V AC

105R/A: 4 module locations
 105R/B: 8 module locations

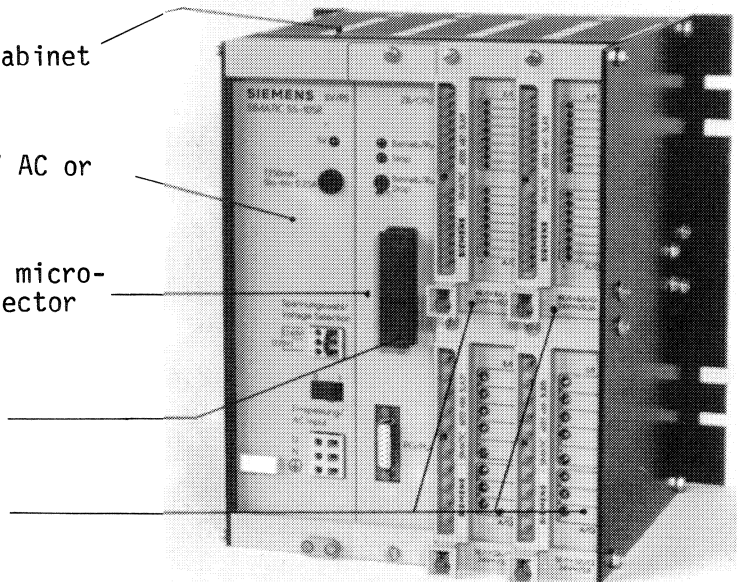


Fig. 3 105R-A programmable controller with full module complement

1.3 Principle of operation

The control functions of the 105R are determined by a program. This is stored in a memory and is processed by the microcomputer.

Program memory

The program can be produced on the 105R by means of the programmer. The program is loaded into the internal program memory where it can be retained for 3 days* even the event of a power failure. For long-term storage, the program can be transferred to external plug-in memory submodules. When the 105R PC is switched on, the contents of the submodule are automatically copied into the internal program memory, where they can then be processed. Programs can thus be easily interchanged.

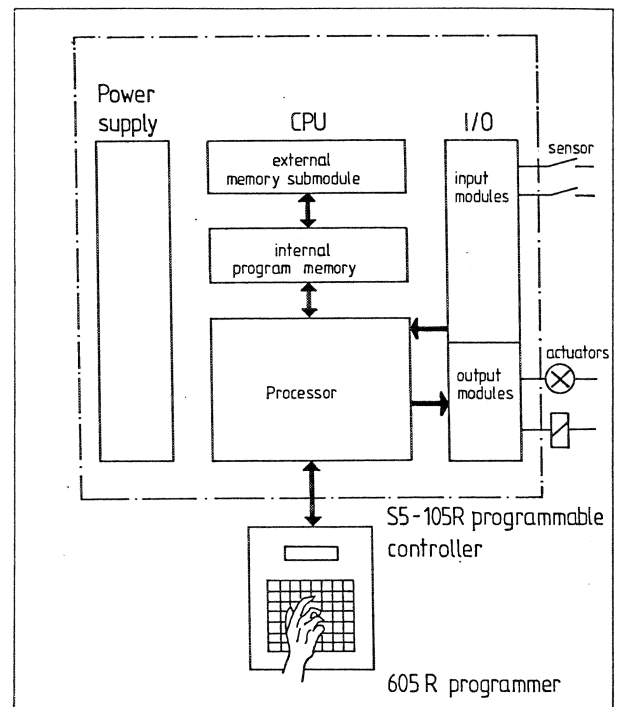


Fig. 4 Block diagram of the 105R programmable controller

Program processing

The program of the 105R PC is stored in the program memory and scanned one program element at a time. When the last element in the program memory has been processed, the processor starts again with the first element. This repetitive processing is referred to as cyclic program scanning.

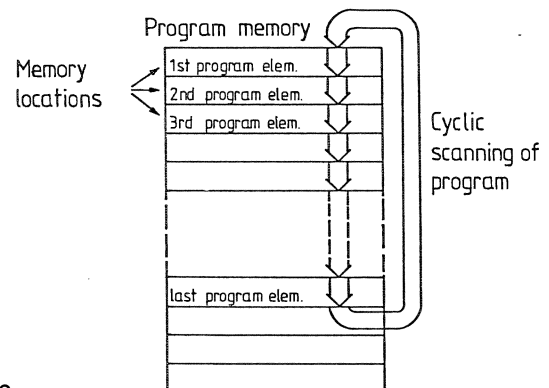


Fig. 5 Program processing

Before each program scan, all the inputs are read in and stored in a process input image (1), which is part of the internal memory. During the scan (2), access is made to this input image only. If outputs (coils) are latched or unlatched during program processing, the statuses of these coils are first assigned to the process output image (3). Once the last program element has been processed, the output image is transferred to the actual outputs or coils.

The scan time of the 105R is automatically monitored. Before returning to (1), a check is made as to whether program processing has taken place correctly. In the event of an error, the monitor disables all outputs after a maximum of 0.3 s and sets the PC to the 'STOP' state.

*see also 5.3 Technical Specification of CPU

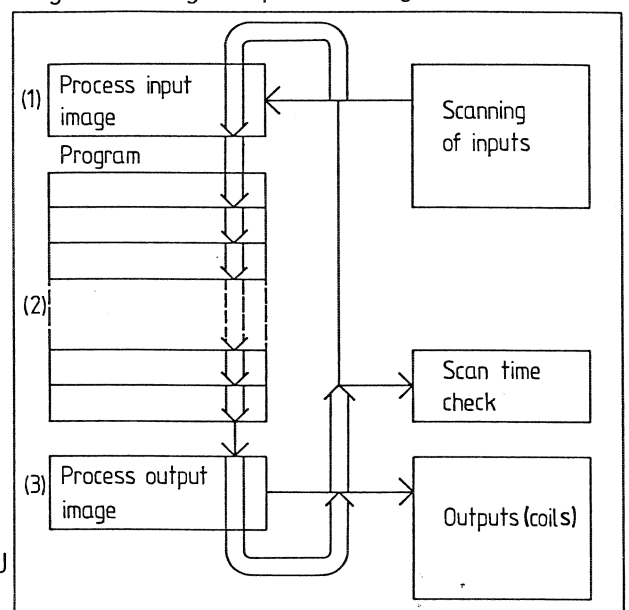


Fig. 6 Principle of operation of the 105R programmable controller 1.3

2 Installation

2.1 Programmable controller (PC)

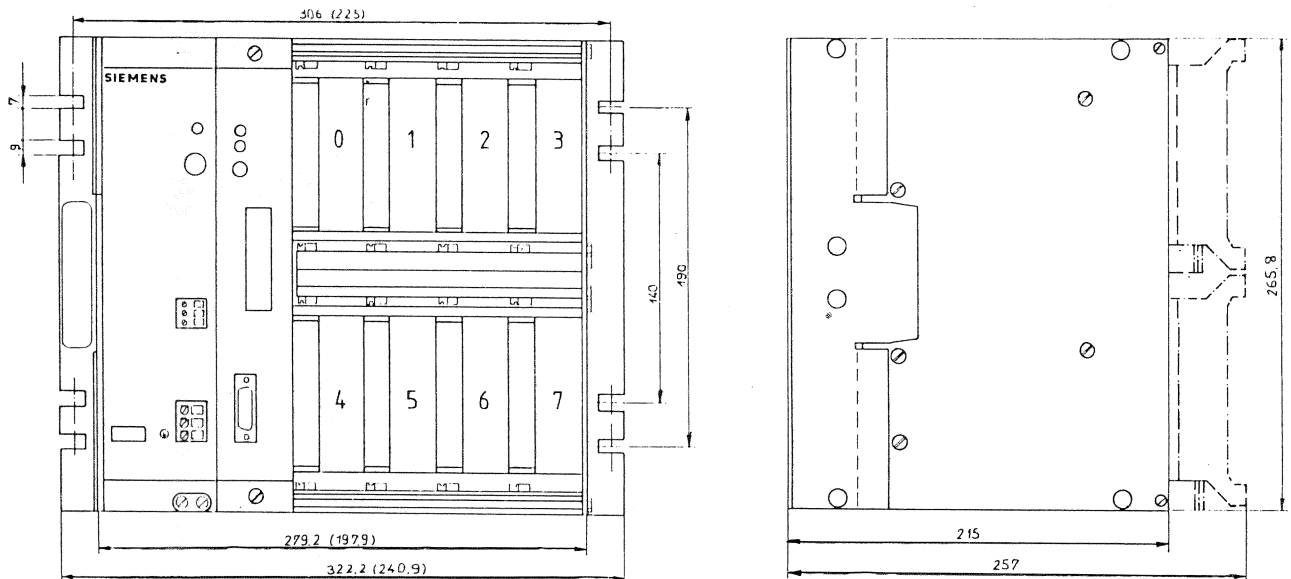


Fig. 7 Dimensions (in mm) of the 105R-B programmable controller (dimensions in brackets apply to the 105R-A PC).

Methods of installation

- in cabinets
- on any vertical mounting surface

The following should be observed to avoid heat accumulation:

- The maximum angle of inclination should not be exceeded.
- When several units are installed one above the other, the minimum spacing between them must be maintained (when several units are installed side-by-side, no spacing is required).

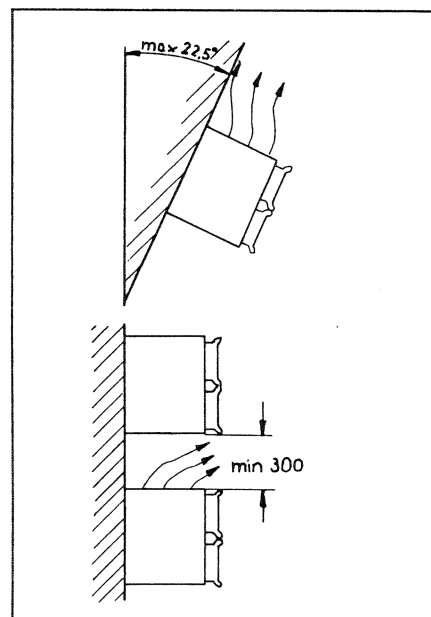


Fig. 8 Methods of installation

2.2 Power supply module (PS)

The supply voltage is connected at the lower terminal block.

Permissible conductor cross-sectional areas:

solid conductors	0.5 to 2.5 mm ² (20 to 13 AWG)
stranded conductors with core-end sleeves	0.5 to 1 mm ² (20 to 17 AWG)

A torque of between 30 and 40 Ncm should be applied to the terminal screws.

Terminal designations

U Line
N Neutral conductor
⊕ Protective earth conductor

Setting the supply voltage

On the 220/240 AC models, the supply voltage can be set by means of a jumper on the upper terminal block.

Fuses

115 V AC : 0.5 A, slow
220/240 V AC: 0.25 A, slow

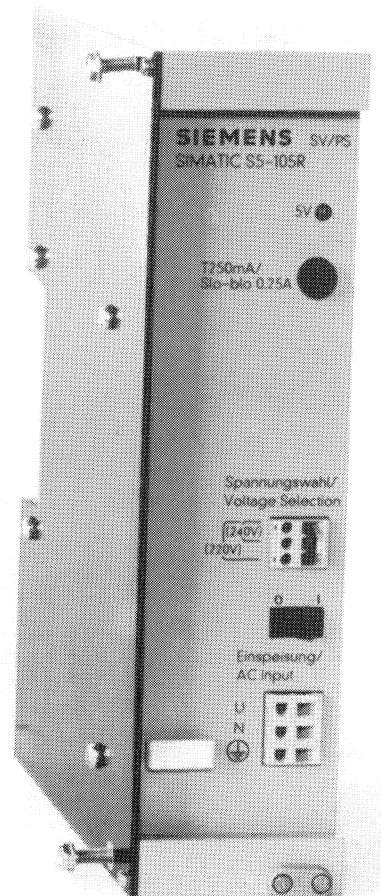


Fig. 9 220/240 V AC power supply module

Removing the power supply module

Disconnect the 105R PC completely from the supply system

- Unscrew the 2 hexagon screws
- Withdraw the CPU and I/O module at the bottom left
- Detach the connector of the power supply from the backplane wiring
- Pull the module forwards and out (caution: the PCB runs in a guide at the bottom)

Replace the module in the opposite sequence.

2.3 Central processing unit (CPU) Memory submodule/programming adapter

The following can be plugged into the CPU (1):

- 605R or 655R programmer at (4)
- Submodule (3) with EPROM or EEPROM
- Programming adapter (for program dumping on EPROM submodule only)

Caution:

The memory submodule and programming adapter must not be changed while the power is on.
The programmers can be plugged in and withdrawn in normal operation.

Withdrawing the CPU.

Disconnect the 105R PC completely from the supply.

- Unscrew the two screws (2)
- Pull the module out to the front

The module is replaced in the opposite order.

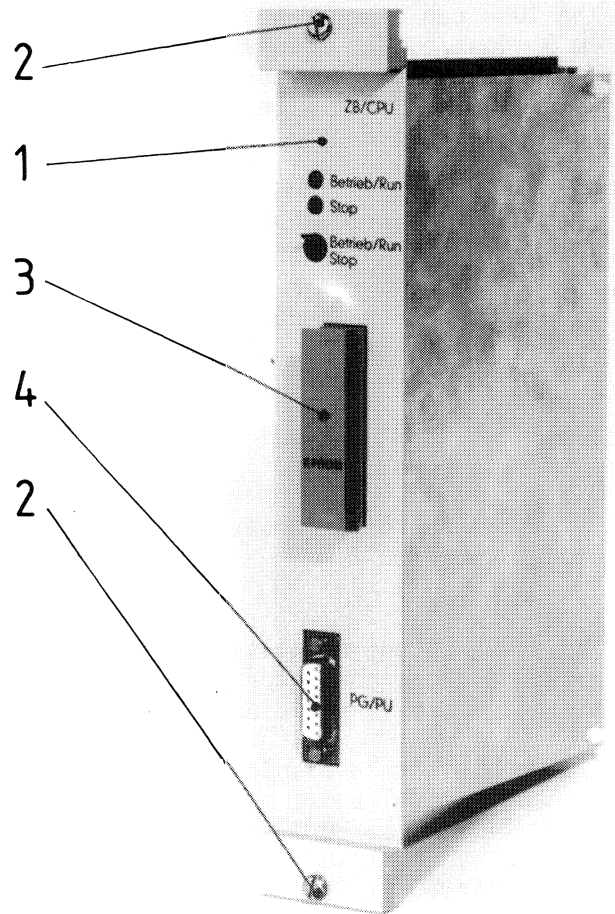


Fig. 10 Central processing unit

2.4 I/O modules (digital input/output modules)

Digital I/O modules

The 105R can be operated with up to 4 or 8 input/output modules. It is advisable to blank off module locations not used with a plastics cover to prevent accidental contact with live parts.

The module locations are numbered (numbers printed on the wiring backplane)

The number of the module location is part of the input or output address in the program*:
e.g.

I 0.5 Input 5 of module in location 0

Q 7.6 Output 6 of module in location 7

The input/output modules are connected up via a front connector which automatically locks in position (Fig. 12)

I/O modules are available for the following control voltages:
220/240V AC 5I/3Q
115V AC 5I/3Q
24V DC 5I/3Q
24V DC 8I/8Q

The input and output circuits are galvanically isolated from the PC; 24 V DC, 115V AC and 220V AC modules can be inserted side by side.

Removing the I/O modules

- Disconnect the 105R PC completely from the supply.
- Detach the front connector (4). For this purpose, depress the red latch (3) on the right
 - Unscrew the two screws (2)
 - Pull the module out to the front

The module is inserted in the opposite order.

*see also the Programming Instructions
5.0 Instruction set of the program elements

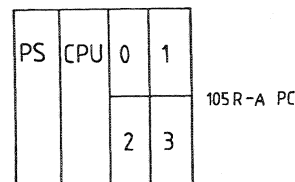
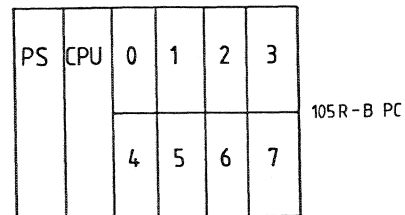


Fig. 11 Module location numbering

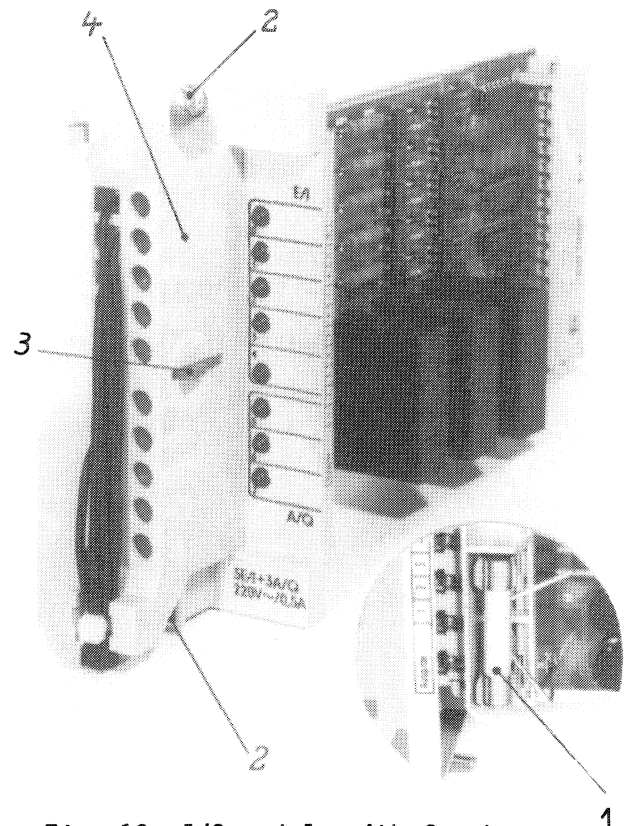


Fig. 12 I/O module with front connector

Front connector for modules with 5 inputs and 3 outputs

Solid conductors with cross-sectional areas of between 1 and 2.5 mm² (17 and 13 AWG) and stranded conductors with areas ranging from 0.75 to 2.5 mm² (18 to 15 AWG) (with core end sleeves) can be connected to each terminal.

13 mm (0.5 in.) of the conductor insulation should be removed
A torque of between 50 and 80 Ncm should be applied to the terminal screws

Front connector for modules with 8 inputs and 8 outputs

A mini spring contact can be crimped to one or more wires (total cross-sectional area 0.5 to 1.5 mm²) per terminal. These contacts are inserted in the connector shell with the locking spring upwards.

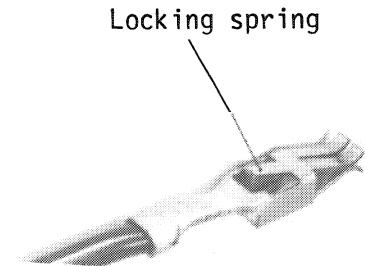
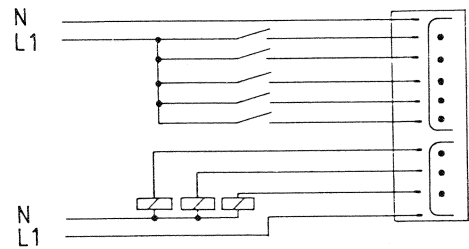


Fig. 13 Mini spring contact

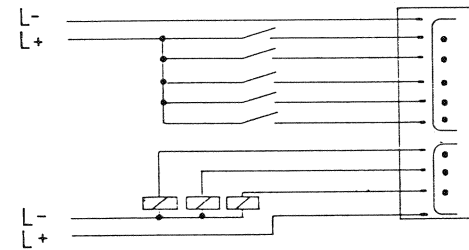
Wiring of I/O modules

115V AC module
220V AC module

Caution:
The load and signal voltages for each module must be taken from the same phase (e.g. L1)



24V DC module
5 inputs/3 outputs



24 V DC module
8 inputs/8 outputs

Note:
The LEDs of the outputs are supplied from the external 24 V DC load power supply.

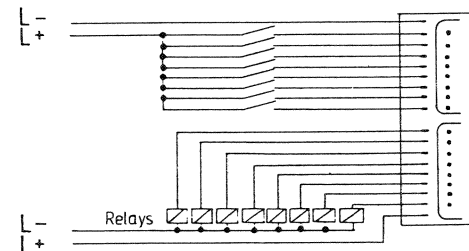


Fig. 14 Wiring of the input/output modules

2.5 Suggested circuit arrangement

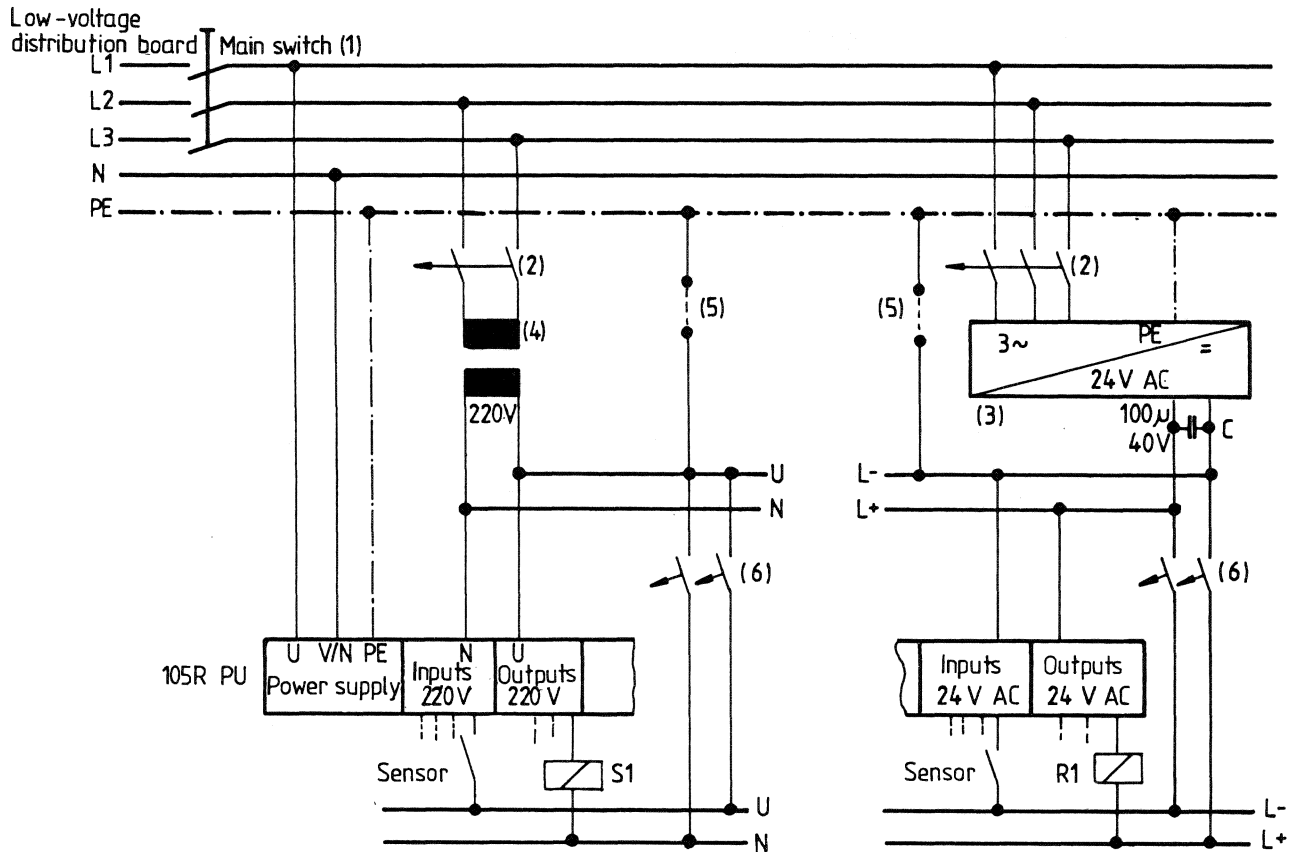


Fig. 15 Suggested circuit arrangement for the 105R programmable controller

When connecting up the 105R, the following points should be observed:

- A main switch (1) or another method of isolation should be provided for the PC, sensors and actuators (this can also be ensured by fuses or MCBs in the low-voltage distribution board).
- The mains connections for the PC and for the control circuits can be made with smaller conductor cross-sections and without additional fusing (2) if the tap lines are not longer than 3 m (10 ft.) and are proof against earth faults and short-circuits.
- A load power pack (3) must be provided for the 24V DC control circuits. 24V DC lines must not be run together with lines of higher voltages in a common cable.
- For control circuits with more than five actuating coils, galvanic isolation by means of a control transformer (4) is recommended.
- Auxiliary circuits should be earthed at one end (actuators and sensors must be arranged appropriately); unearthed auxiliary circuits must be provided with an insulation monitoring system. It is preferable to use an earthed system; in this case, a detachable connection (5) between a secondary line conductor of the supply or rack should be fitted to the power pack or transformer.
- Auxiliary busbars or L+ and L- multipliers are recommended for distribution of the supply voltages.
- Sensor and actuator circuits can be fused in groups (6).

3 Start-up and operation

3.1 Controls and displays

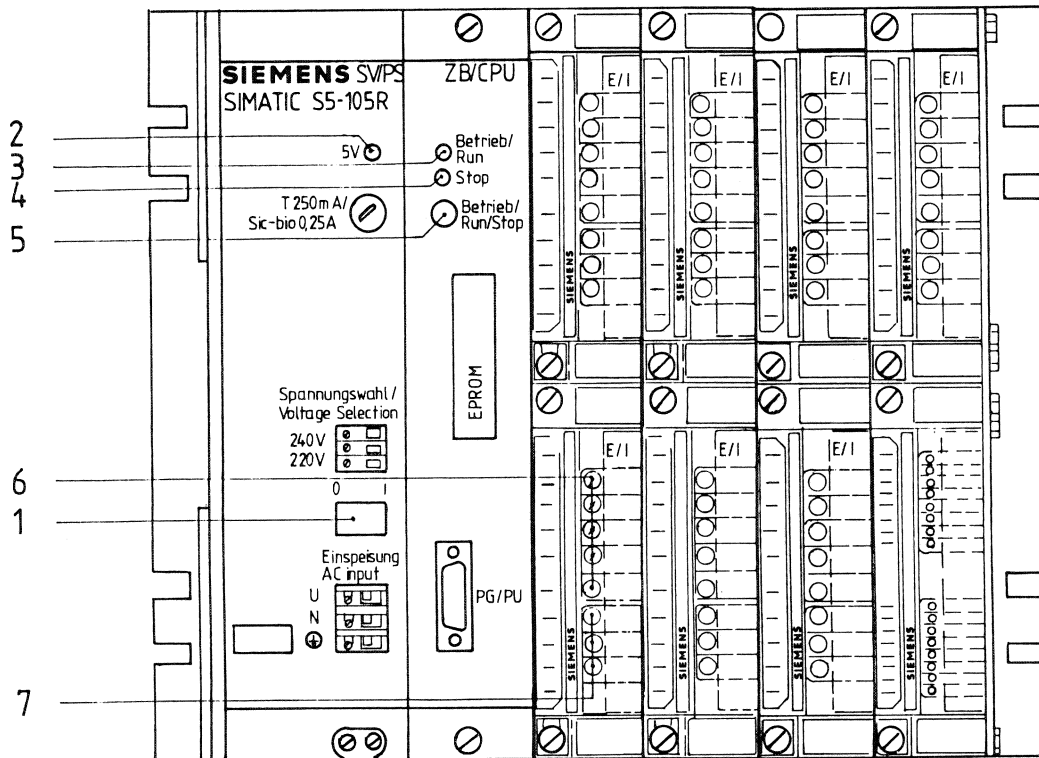





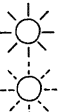


Fig. 16 Controls and displays on the 105R-B programmable controller

- (1) Power switch
- (2) The green LED on the power supply module indicates that the internal supply voltage is available. In the event of a fault, the power supply is automatically disconnected. Once the fault has been eliminated, the power supply can be switched back on after about 5 seconds.
- (3) and (4) The two LEDs indicate the operating states of the CPU

	green LED lit: PC in operation and program being processed		green LED dark
	red LED lit: PC in STOP state		red LED flashing; PC in 'HOLD' state, outputs disabled
			green LED lit, red LED flashing; PC in 'HOLD' state, outputs enabled

- (5) 'STOP' and 'RUN' switch; the 'HOLD' state is only possible when a programmer is connected.
- (6) The LEDs indicate the signal status of the associated inputs.
- (7) The LEDs indicate the signal status of the associated outputs.

3.2 RUN, STOP and HOLD modes

The 105R operates in three modes: STOP, RUN and HOLD.

In the STOP mode, the program is not processed and the outputs (coils) are disabled. The PC enters the STOP state

- when the PC is switched on without a valid program
- when the mode selector is set to 'STOP'
- when the "PC STOP" function is selected by means of the programmer
- in the event of program errors or faults preventing normal processing of the program.

The STOP state can be left when the 105R has a valid program by

- setting the mode selector to 'RUN'
- selecting the 'PC RUN' function by means of the programmer
- selecting the 'PC HOLD' function by means of the programmer

The program is scanned in the RUN mode. The green LED lights up and the outputs (coils) are enabled.

Note: The RUN mode is also possible if the program memory of the 105R is erased.

The program can be tested in the HOLD mode. A single program scan is initiated by pressing the **SSCM** key on the programmer in the STATUS/SET or PROG. TEST functions. The inputs and output can be initialized in this case by the programmer.

The HOLD state is entered by selecting the 'PC HOLD' function on the programmer

For reasons of safety, the outputs (coils) are disabled when the 'PC HOLD' function is selected. If necessary, they can be enabled by selecting the following programmer functions:

- HOLD O-PER. ON
- HOLD O-PER. OFF

The HOLD state can be left by

- selecting the 'PC RUN' or 'PC STOP' function on the programmer
- setting the mode selector switch to 'STOP'
- disconnecting the cable connecting the programmer to the PC; the PC stops

3.3 Power-up sequence

The 105R programmable controller can be started up without the programmer if the following conditions are satisfied:

- The 105R has the valid program in its internal program memory or in the memory submodule plugged into it
- The mode selector is set to RUN.

An automatic restart takes place if

- the PC has a valid program in its memory
- the mode selector is set to RUN
- the 'AUTOMATIC RESTART' bit is set to '1' in the program

When the power is switched on, the 105R programmable controller remains in the STOP state if at least one of the following conditions applies:

- Mode selector at 'STOP'
- 105R PC was in the 'STOP' or 'HOLD' mode prior to power-down
- Error in the program or wrong memory submodule
- No automatic restart has been set (automatic restart bit = 0)
- An entry* has been made in the internal program memory and a submodule subsequently plugged in.

The reason for the PC entering the STOP state can be displayed on the programmer in plaintext by selecting the 'PC DIAGNOSTIC' function.
See also Section 4.5 "Troubleshooting on the CPU".

*see also Section 3.4 "Using the memory submodule"

3.4 Using the memory submodule

Operation of the 105R is possible

- with internal program memory only, without memory submodule
- with additional EPROM submodule
- with additional EEPROM submodule

After a power failure or power-down, the program in the internal memory of the 105R is retained for three days. Long-term program storage is possible with the memory submodules.

	No submodule plugged in	With EPROM submodule	With EEPROM submodule
Program entry with programmer	yes	no; possible only if submodule withdrawn!	
Saving a program	In the 105R without taking any further measures:	With programming adapter and the STORE PROGRAM programmer function:	With the STORE PROGRAM programmer function:
back-up time	3 days	unlimited	unlimited
Erasing a program	General reset of the 105R	EPROM with the UV lamp	Not necessary; can be overwritten
Retentive flags (relay equivalents) 1)	Stored for 3 days	Not stored	Stored for unlimited period
Time and data registers	Can be set by programmer also in RUN mode	An EPROM must be re-programmed for modification	Can be set by programmer also in RUN mode
105R PC in RUN mode	Scanning of program from internal memory	On startup, the memory submodule was copied into the internal memory; program scanning from the internal memory	

- 1) On power-down or power failure, the CPU "notes" the last state of the retentive flags or relay equivalents. These can then be used on an automatic restart.

Changing the program

A programmer is not necessary for this purpose. Once the 105R has been switched off, a submodule with another program can be plugged in. The new program is transferred to the internal memory on power-up.

Note

If an entry has been made in the internal program memory with the programmer prior to changing the program in the functions

- INPUT/DISPLAY
- ERASE PB
- FLAGS RETENTIVE
- AUTO RESTART
- PROGRAM NO.,

the next step expected by the 105R is the saving of the modified program to a memory submodule.

Consequently, the contents of the next submodule plugged in are not transferred to the internal program memory on power-up. The 105R remains in the STOP state.

The RUN mode is not possible until

- either the 'STORE PROGRAM' function
- or the 'ERASE PROGRAM' function has been successfully completed.

3.5 System start-up

The following sequence must be observed when putting the programmable controller into service.

Precondition	Procedure	Remarks
Plant and 105R PC are dead, i.e. main switch (see Fig. 14) is off.	<ul style="list-style-type: none"> -Correct voltage applied to terminal block (1) and selected by jumper on terminal block (2) (see Fig. 9). The PE conductor must be connected. -All modules inserted firmly screwed to the housing of the PC. -Compare the I/O modules inserted in the PC with the layout diagram (observe specified location coding of I/O modules - see Fig. 11). -With I/O modules, make sure lines with higher voltages (e.g. 220V AC) are not connected to terminals for low voltage (e.g. 24V DC). 	Visual inspection of arrangement.
Disconnect the fuses for sensors and actuators. Switch off the power circuits of the actuators. Turn on the main switch (see Fig. 14)	<ul style="list-style-type: none"> -Set the PC to 'STOP' without memory submodule and connect the programmer to the CPU. -ERASE PROGRAM and then switch the PC to 'RUN'. 	When the main switch has been closed, the green LED on the power supply and the red LED on the CPU light up. The red LED extinguishes and the green LED lights up.
Connect the fuses for the sensors. Fuses for actuators and power circuits remain disconnected (Fig. 14)	-Actuate all sensors one after the other.	If the sensor signals are properly routed through, the corresponding LEDs for the inputs on the module must light up.
Connect the fuses for the actuators. Power circuits of the actuators remain switched off (Fig. 14)	-Each output (coil) of the I/Os can now be activated by means of the 'STATUS/SET' function of the programmer	The LEDs of the selected outputs must light up and the operating states of the corresponding actuators must change.
Power circuits of the actuators remain switched off.	-Set the PC to 'STOP'. Enter the program by means of the 'INPUT/DISPLAY' programmer function	Red LED on the CPU lights up.
	Check out the program, making any necessary corrections	
	If necessary, transfer the program to the memory submodule	PC is at 'STOP'
Close the power circuits of the actuators	-Set the PC to 'RUN'.	The PC processes the program

4 Maintenance and repairs

4.1 Maintenance

The PC does not contain a battery and therefore requires no maintenance

4.2 Troubleshooting on the power supply module

Fault	Cause	Remedy
Green LED on the power supply is dark	Supply voltage at lower terminal block too low. Power switch not "on" For 220/240V AC version only: jumper on upper terminal block not properly inserted. Fuse defective Short-circuit on a plugged-in module	Select the correct voltage Switch it on Insert the jumper and, if necessary, retighten the terminal screws Use only original spares Switch the PC off, withdraw the modules one by one and, after an interval of 5 s in each case, switch the power back on

4.3 Troubleshooting on the 115V AC/220V I/O modules

Fault	Cause	Remedy
Output LEDs illuminated but output signals not routed through	Wiring fault Defective fuse	See under 2.4 "Input/output modules" Use original spares

4.4 Troubleshooting on the 24V DC I/O module

Fault	Cause	Remedy
Output LEDs do not light up (modules with 8 inputs and 8 outputs only)	External 24V DC supply not available	See under 2.4 "Input/output modules"


4.5 Troubleshooting on the CPU

Information on the current state of the PC can be obtained by selecting the "PC DIAGNOSTIC" function on the programmer.

When this function is selected, the programmer displays the following message:

```
24 PC DIAGNOSTIC
105R PC V2.0
```


V2.0 refers to the software development state.

After the  key is depressed, one of the following PC status messages appears:

- PC RUN
- STOP PC
- STOP PG
- HOLD O-PER. ON
- HOLD O-PER. OFF

The PC has automatically entered the 'STOP' status, or if it cannot be brought into the 'RUN' state by actuating the mode selector, the programmer displays the cause of the STOP state instead of the status message (see also Table on p. 4.3), PG:

```
24 PC DIAGNOSTIC
STOP POWER DOWN
```

If the  key is pressed again, the space occupied in the internal program memory is displayed, e.g.:

```
M 34/628 USED
```

that is, of the 628 possible memory locations, 34 are used.

Memory locations are allocated as follows:

- | | | |
|-----------------------------|-----|------------------|
| -one contact element | 1 | memory location |
| -a complex function | 2-3 | memory locations |
| -opening of a program block | 2 | memory locations |

Fault	Programmer function PC DIAGNOSTIC	Cause of STOP status	Remedy
Red LED on	F0	Fault in connection between PC and programmer or CPU fault	Check cable and connector Actuate the power switch
	STOP PC	Mode selector at 'STOP' or was at 'STOP' on 'POWER-DOWN'	Set mode selector to 'RUN'
	PG STOP	'PC STOP' programmer function executed or programmer cable disconnected during 'PC HOLD' function	or Execute 'PC RUN' programmer function
	STOP POWER DOWN	A power failure has occurred and the current PC program is not set for an automatic restart	
	STOP WATCH DOG	Endless loop in program	Correct program; see also Programming Instructions, Section 1.3.4
	JUMP ERROR PBx	Jump not made to specified program block	Enter jump destination PBx in program
	CODE ERROR PBx	Error in PBx or no error detectable; overflow of internal memory areas	Correct PBx or erase PBx and reload Optimize program: fewer PBs and fewer nodes
	DRx TOO LARGE	Contents of a data register too large	Enter permissible data; cf. Programming Instructions
	FLAGS RETENTIVE?	EPROM memory module plugged in has 'FLAGS RETENTIVE' bit set to '1'; this is illegal.	Erase EPROM and reprogram it with 'FLAGS RETENTIVE' bit set to '0'
	RAM SUBMODULE	Submodule plugged in empty or invalid or wrong operator sequence	Replace submodule cf. 3.4 'node'
F1: SUBMODULE ERROR* or PROGRAM DEFECTIVE	With memory submodule plugged in: submodule does not contain a valid program or without memory submodule: PC contains no valid program (back-up time exceeded)	Erase submodule (EPROM) or overwrite it (EEPROM) ERASE PROGRAM	

* With 605R programmer only, software version 1.0

4.6 Interface assignment

Signal name	I/O module locations									
	PS	CPU	∅	1	2	3	4 ¹⁾	5 ¹⁾	6 ¹⁾	7 ¹⁾
P	4	z32	z32	z32	z32	z32	z32	z32	z32	z32
	5	z4	z4*	z4*	z4*	z4*	z4	z4	z4	z4
	7	z2	z2**	z2**	z2**	z2**				
M	1	b32	b32	b32	b32	b32	b32	b32	b32	b32
		z30								
	2	b2	b2	b2	b2	b2	b2	b2	b2	b2
		b28								
	3	b24								
		b20								
VPP	8	b26								
VPG	6	b22								
NAU	9	z8								
RESET	10	z6								
BASP		b30	b30	b30	b30	b30	b30	b30	b30	b30
D ∅		z14	z14	z14	z14	z14	z14	z14	z14	z14
D 1		z16	z16	z16	z16	z16	z16	z16	z16	z16
D 2		z18	z18	z18	z18	z18	z18	z18	z18	z18
D 3		z20	z20	z20	z20	z20	z20	z20	z20	z20
D 4		z22	z22	z22	z22	z22	z22	z22	z22	z22
D 5		z24	z24	z24	z24	z24	z24	z24	z24	z24
D 6		z26	z26	z26	z26	z26	z26	z26	z26	z26
D 7		z28	z28	z28	z28	z28	z28	z28	z28	z28
PRD∅		b6	z10							
PWR∅		b4	z8							
PRD1		b10	z10							
PWR1		b8	z8							
PRD2		b14	z10							
PWR2		b12	z8							
PRD3		b18	z10							
PWR3		b16	z8							
PRD4*		d6	z10							
PWR4*		d4	z8							
PRD5*		d10	z10							
PWR5*		d8	z8							
PRD6*		d14	z10							
PWR6*		d12	z8							
PRD7*		d18	z10							
PWR7*		d16	z8							

Fig. 17 Interface assignments on the wiring backplane

* Not for 105R-A

** Not for 105R-B

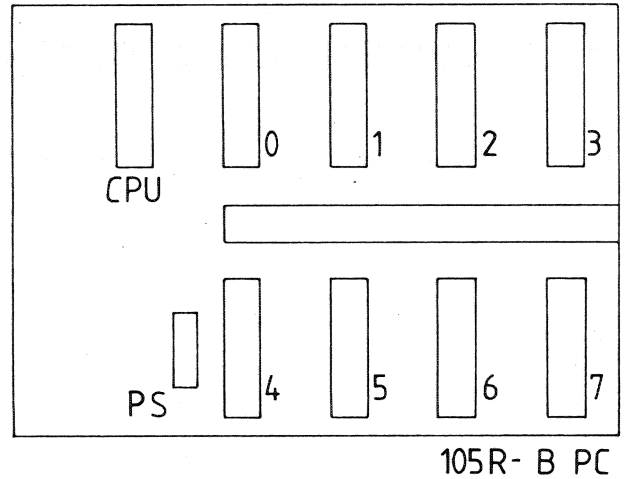
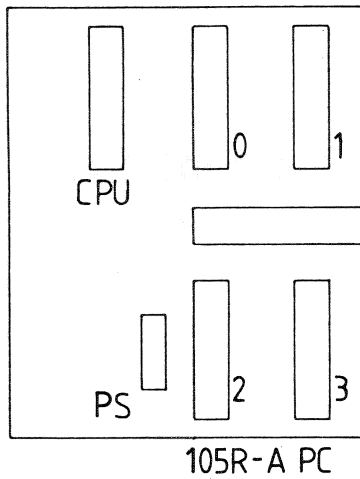


Fig. 18 Arrangement of connectors on the wiring backplane

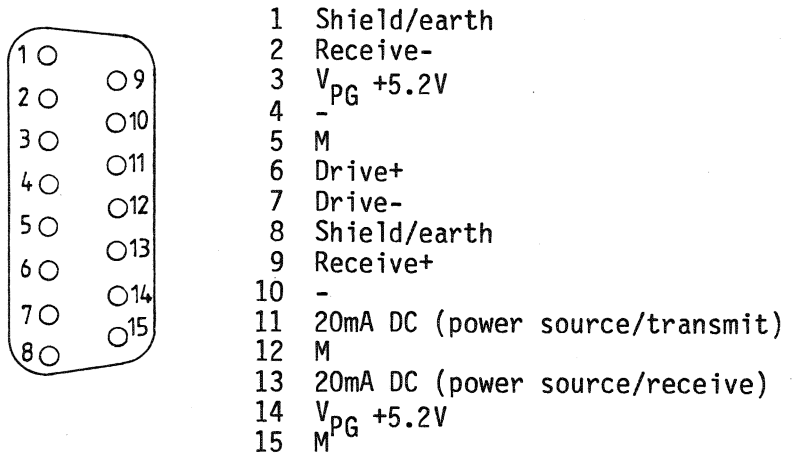


Fig. 19 Interface assignments for the 605R programmer

	c	b	a
1	AD12	M	VCC
2	AD0	AD1	AD2
3	AD3	AD4	AD5
4	AD6	AD7	AD8
5	AD9	AD10	AD11
6	AD13*	AD14*	RDI
7	WRK	AD15*	
8	URAM*		Reset
9	PROG	PGM	
10	DB0	DB1	DB2
11	DB3	DB4	DB5
12	DB6	DB7	
13	CSK1	CSK0	
14	CSK2	TEST*	
15	VPP1=21,5V	BUSY	K4
16	VPP2= 5 V	RDI	K5

Fig. 20 Interface assignments for the memory submodule

* not for CPU 6ES5 905-3RA11

5 Technical specification

5.1 General data of the 105R programmable controller

Input voltage:

- a) 220V/240V (+10%, -15%)
- b) 115V (+10%, -15%)

Ambient temperature:

The temperature of the incoming air may be 0 to 55°C (32 to 131°F) to SN 26556B

Storage temperature -40 to +70°C (-40 to 158°F)

Humidity rating:

F to DIN 40050 (95% relative atmospheric humidity at 25°C or 77°F)

Degree of protection:

IP 20 to DIN 40050

Vibration test:

Frequency range	Constant amplitude of deflection acceleration	
10 to 58	0.15 mm (0.006 in.)	
over 58 up to 500		2g

Shock test:

15g/11ms semi-sinusoidal to DIN 40046

Clearances in air and creepage paths to VDE 0160.

5.2 Power supply module

This module supplies the operating voltages for the 105R-A/-B programmable controllers. The system and operating voltages are galvanically isolated from each other. The PE conductor \oplus and M_{int} potential are connected to the PC housing.

	6ES5935-3LA12	6ES5935-3LA22
Input voltage	220V/240V AC, jumper-selectable	115V AC
Current consumption at rated load	190 mA	380 mA
Fusing	250 mA, slow*	500 mA, slow**
System voltage tolerance	+10%, -15%	
Permissible system frequency	48 to 63 Hz	
Output voltages	5V DC $\pm 2\%$ 1.3 A 5.2V DC $\pm 2\%$ 650 mA 21.5V DC $\pm 2\%$ 100 mA	Power supply disconnected on short-circuit, can be switched back on again about 5 s after power failure Current-limited, $I_L \leq 750$ mA Current-limited, $I_L \leq 120$ mA
Indications	Reset, \overline{NAU}	
Dimensions (HxWxD) in mm (in.)	266 x 68 x 175 (10.5 x 2.7 x 6.9)	
Weight	2.3 kg (5 lbs)	

* Wickmann No. 19343/250 mA

** Wickmann No. 19343/500 mA

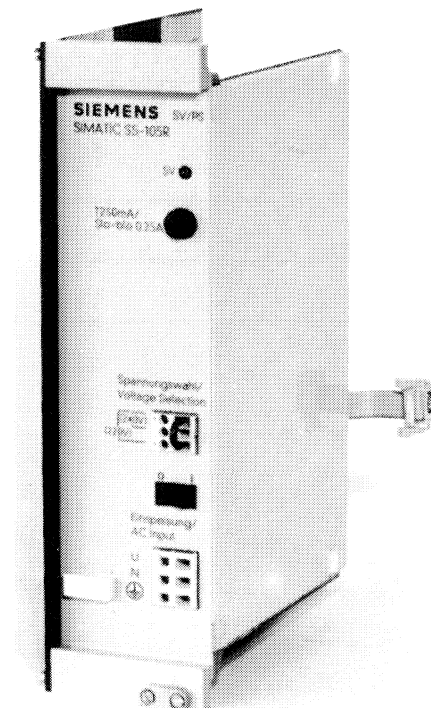


Fig. 21 220V AC//240V AC power supply module

5.3 Central processing unit/memory submodule/programming adapter

CPU	6ES5905-3RB11	6ES905-3RB21
Operating voltages	5.0V 700 mA for CPU 5.2V 600 mA for 605R programmer 21.5V 80 mA for memory submodules/programmer interface	
Internal memory	500 contacts	1000 contacts
External memory	EPROM memory submodule EEPROM memory submodule	
Operation set	Binary logic operations Conditional and unconditional jumps 16 counters (from 0 to 32767) 32 timers (from 10 ms to 999 min.) 16 impulse relays (transition-sensitive pulse) 4 sequence cascades (drum sequencers) 48 flags (relay equivalents), 16 retentive 24 data registers 24 time registers	
Addressing capability	64 inputs (max.) 64 outputs (max.) Module locations 0 to 7	
Scanning time -for one binary operation -per 500 contacts	$6 \mu\text{s}$ 3 ms	$6 \mu\text{s}$ 6 ms
Self-monitoring in the event of faults	CPU stops after max. 0.3 s; outputs (coils) disabled	
Saving of program after power-down	Back-up time after approx. 15 min. operation: Ts type 72h at amb. temp. = 25°C Ts type 48h at amb. temp. = 55°C	
Weight	approx. 500 g (1 lb)	
Dimensions HxWxD	266mm x 46mm x 185mm (10.5 in. x 1.8 in. x 7.5 in.)	

Memory submodules

	6ES5375-0LA11	6ES5375-0LB11	6ES5375-0LB21
Memory type	EPROM	EEPROM	EEPROM
Supply	5V/150 mA and 21.5V/20 mA		5V/150 mA
Storage capacity	500/1000 contacts	500 contacts	1000 contacts
FLAGS RETENTIVE function permitted	no	yes	yes

Programming adapter

Only used for 'STORE PROGRAM' function on EPROM submodule. The adapter is plugged in between the PC and the submodule.

DC power supply 5 V 230 mA (typical)
21.5V 40 mA (typical)

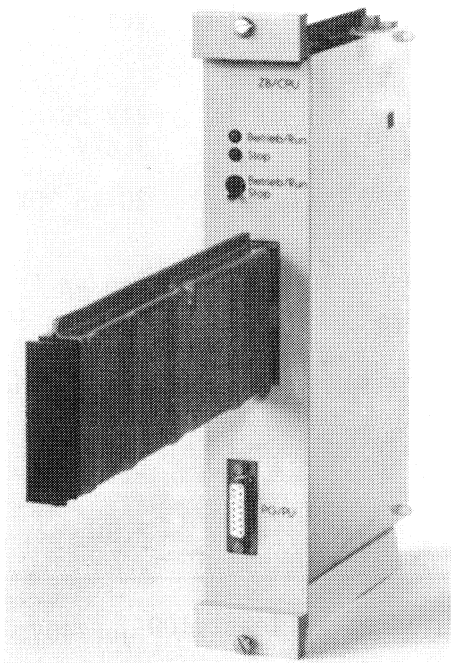


Fig. 22 CPU with programming adapter and memory submodule plugged in

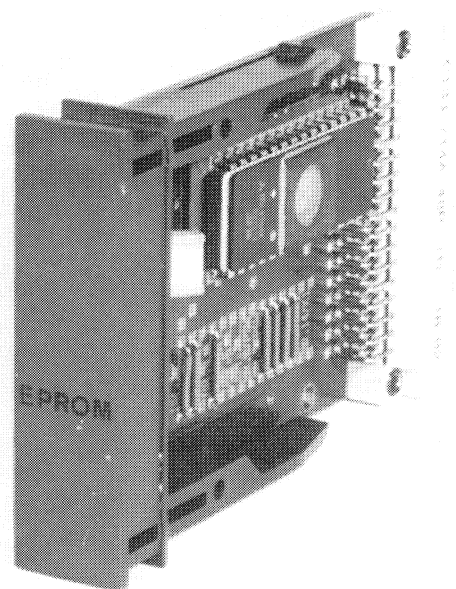


Fig. 23 EPROM submodule

5.4 24V DC digital input/output modules

Input/output module	6ES5488-3LA31	6ES5487-3LA11
Inputs:		
Number of inputs	5	8
Galvanic isolation	yes	yes
Input voltage (nominal value)	24V DC	24V DC
Input voltage for "0" signal	-35 to +5V	-35 to +5V
Input voltage for "1" signal	+13 to +33V	+13 to +33V
Input current at "1" signal typical	8.5 mA	8.5 mA
Delay time:		
- On-delay typical	3 ms	3 ms
- Off-delay typical	3 ms	6 ms
Length of cable max.	100 m (330 ft.)	100 m (330 ft.)
Outputs (coils):		
Number of outputs	3	8
Galvanic isolation	yes	yes
Supply voltage 1)		
-Nominal value U_N	24V DC	24V DC
-Ripple U_{pp} max.	3.6 V	3.6 V
-Permissible range (including ripple)	20 to 30V	20 to 30V
Output current at "1" signal		
-Nominal value	2A	120 mA
-Permissible range	10 mA to 2 A	5 mA to 150 mA
Short-circuit protection	electronic	electronic
Voltage induced on circuit interruption limited to	-15V	-1V ²⁾
Lamp load max.	10W	2.5W

- 1) If an external power pack is used, a capacitor rated at at least 100 μ F/40V must be fitted; see Fig. 15.
- 2) Suitable for relays only.

Outputs (cont.)

Input/output module	6ES5488-3LA31	6ES5487-3LA11
Switching frequency for		
- resistive loads	max. 10 Hz	10 Hz
- lamps	max. 8 Hz	8 Hz
- inductive loads (at rated load; higher values permitted at lower loads.)	max. 2 Hz	2 Hz
Total load capability at 55°C (130 °F)	100%	100%
Residual current at "0" signal	max. 1 mA	1 mA
Signal level of outputs		
- for "0" signal (at U_N)	max. 2.5V	2.5V
- for "1" signal	min. $U_N - 3V$	$U_N - 3V$
Length of connecting cable	max. 100 m (330 ft.)	100 m (330 ft.)
Insulation voltage external connection to housing		
- to VDE 0160	36V DC	36V DC
- tested at	500V AC	
Weight	approx. 0.3 kg (0.7 lbs)	0.3 kg (0.7 lbs)
Dimensions (HxWxD) in mm (in.)	133x41x185 (5.2x1.6x7.3)	133x41x185 (5.2x1.6x7.3)

5.5 115V AC/220V AC digital input/output modules

Input/output modules	6ES5488-3LA11	6ES5488-3LA21
Inputs:		
Number of inputs	5	5
Galvanic isolation	yes	yes
Input voltage (nominal value)	220V AC	115V AC
Input voltage for "0" signal	0 to 70V AC	0 to 40V AC
Input voltage for "1" signal	170 to 264V AC	85 to 132V AC
Input current at "1" signal typical	15 mA	10 mA
Delay time:		
- On-delay typical	8 ms	8 ms
- Off-delay typical	22 ms	18 ms
Length of cable max.	100 m (330 ft.)	100 m (330 ft.)
Outputs (coils):		
Number of outputs	3	3
Galvanic isolation	yes	yes
Supply voltage		
-Nominal value UN	220V AC (50 Hz)	115V AC (60 Hz)
-Permissible range (including ripple)	176 to 264V AC	89 to 132V AC
Output current at "1" signal		
-Nominal value	0.5 A	0.5 A
-Permissible range	50 mA to 0.5 A	50 mA to 0.5 A
Short-circuit protection	1 fuse for 3 outputs 1)	1 fuse for 3 outputs 1)
Limitation of voltage induced on circuit interruption	None: circuit inter- rupted at $I_L = 0$	None: circuit interrupted at $I_L = 0$
Lamp load max.	50 W	25 W

1) Wickmann No. 19231/10A

Outputs (cont.)

Input/output module	6ES5488-3LA11	6ES5488-3LA21
<p>Switching frequency for</p> <p>- resistive loads max.</p> <p>- lamps max.</p> <p>- inductive loads (at rated load; max.</p> <p> higher values permitted at lower </p> <p> loads.)</p> <p>Total load capability at 55°C (130 °F)</p> <p>Residual current at "0" signal max.</p> <p>Signal level of outputs</p> <p>- for "0" signal (at UN) max.</p> <p>- for "1" signal min.</p> <p>Length of connecting cable max.</p> <p>Permissible contactor size</p>	<p>10 Hz</p> <p>8 Hz</p> <p>2 Hz</p> <p>100%</p> <p>5 mA</p> <p>22V</p> <p>U - 7V</p> <p>100 m.</p> <p>0...10</p>	<p>10 Hz</p> <p>8 Hz</p> <p>2 Hz</p> <p>100%</p> <p>2.5 mA</p> <p>6V</p> <p>U - 7V</p> <p>100 m</p> <p>0...4</p>
<p>Insulation voltage</p> <p>external connection to housing</p> <p>- to VDE 0160</p> <p>- tested at</p> <p>Weight approx.</p> <p>Dimensions (HxWxD) in mm (in.)</p>	<p>250V AC</p> <p>2000V AC</p> <p>0.3 kg (0.7 lbs)</p> <p>133x41x185 (5.2x1.6x7.3)</p>	

6 Spare parts

	Order No.	Weight
105R-B central controller/housing with power supply module and CPU 500 contacts with 220/240V AC power supply with 115V AC power supply	6ES5 105-3RB11 6ES5 105-3RB21	approx. 5.8 kg (12.8 lbs) approx. 5.8 kg (12.8 lbs)
Housing (8 locations for digital I/O modules)	6ES5 981-0LB11	approx. 3.0 kg (6.6 lbs)
105R-A central controller/housing with power supply module and CPU with 220/240V AC power supply with 115V AC power supply	6ES5 105-3RA11 6ES5 105-3RA21	
Housing (4 locations for digital I/O modules)	6ES5 981-0LA11	2.4 kg (6 lbs)
115V AC power supply module	6ES5 935-3LA22	5.25 kg (11.6 lbs)
220/240V AC power supply module	6ES5 935-3LA12	5.25 kg (11.6 lbs)
CPU, 500 contacts	6ES5 905-3RB11	0.45 kg (1 lb)
CPU, 1000 contacts	6ES5 905-3RB21	0.45 kg (1 lb)
Memory submodule with EPROM, 500 contacts	6ES5 375-0LA11	0.04 kg (1.4 oz.)
EEPROM, 500 contacts	6ES5 375-0LB11	0.05 kg (1.8 oz.)
Memory submodule with EPROM, 1000 contacts	6ES5 375-0LA11	0.04 kg (1.4 oz.)
EEPROM, 1000 contacts	6ES5 375-0LB21	0.05 kg (1.8 oz.)
EPROM programming adapter	6ES5 345-0LA11	0.12 kg (4.2 oz.)
UV erasing facility	6ES5 985-0AA11	
Digital I/O modules with 5 inputs and 3 outputs		
24V DC	6ES5 488-3LA31	0.21 kg (7.4 oz.)
115V AC	6ES5 488-3LA21	0.29 kg (10.2 oz.)
220V AC	6ES5 488-3LA11	0.29 kg (10.2 oz.)
Front connector	6ES5 766-0LA11	0.11 kg (3.9 oz.)
Digital I/O modules with 8 inputs and 8 outputs		
24V DC	6ES5 487-3LA11	0.17 kg (6 oz.)
Front connector	6ES5 766-0LB11	0.05 kg (1.8 oz.)
Mini spring contacts	6XX3 070	
3 covers for free module locations	6ES5 981-0RA11	

		Order No.	Weight
10 fuse-links for: 115V AC power supply 220/240V AC power supply 220V AC I/O module 115V AC I/O module	500 mA, slow 250 mA, slow 10A, extra fast	4F990 0636-02 4F990 0636-01 000 000 261 333	
105R PC Instruction Manual	German English French	6ES5 988-ORD12 6ES5 998-ORD22 6ES5 998-ORD32	
655R programmer	German English	6ES5 655-ORA11 6ES5 655-ORB11	
Carrying case			
605R programmer	German English French Italian Spanish Swedish Danish Finnish Dutch	6ES5 605-ORA11 6ES5 605-ORB11 6ES5 605-ORC11 6ES5 605-ORD11 6ES5 605-ORE11 6ES5 605-ORF11 6ES5 605-ORG11 6ES5 605-ORH11 6ES5 605-ORH11	
Carrying case		6ES5 605-OLA11	
Programming forms, German		6ES5 892-ORA11	
Programming stencil		6ES5 992-ORB11	
670R documentation set Adapter for 670 programmer		6ES5 993-ORA11 6ES5 984-ORA11	
655R Programmer Instruction Manual	German English		
605R Programmer Operating Instructions	German English French	6ES5 998-ORP12 6ES5 998-ORP22 6ES5 998-ORP32	
Simulator for I/Os		6ES5 788-OLA12	