

SIEMENS

SIMATIC S5

Programmable Controller

SIMATIC S5–110A

Timer/counter module

6ES5 383

Instructions

Timer/counter module

Instructions

Order No. GWA 4NEB 807 0524-02a

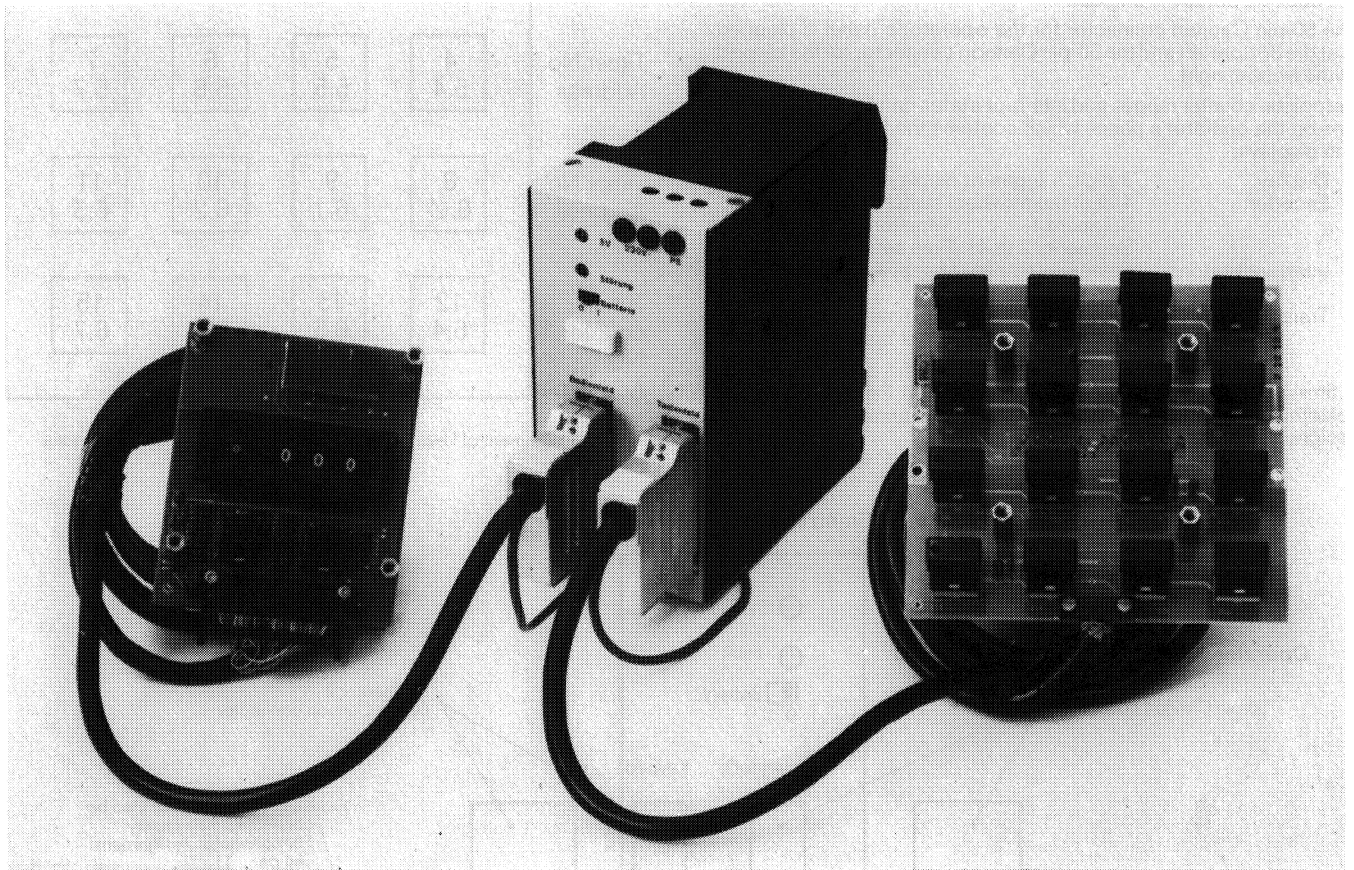


Fig. 1 Timer/counter module

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Application

The timer/counter module is a peripheral module of the S5–110A programmable controller and has a total of 16 timer/counter functions. Up to four event counters can be defined.

The timer can be used for times ranging from 0.01 s to 999 s.

The counter can implement counting functions up to 999. The current counter reading can be displayed.

The assignment of setpoints and interrupt states for the counters/timers are displayed and can be modified both while the PC is stopped and in operation.

1. Description

1.2 Construction

Construction of the module

The complete module consists of the 383 microprocessor-controlled timer/counter module block with its own power supply (220 V, screw terminals) and the various displays and controls. The 383 module block is snapped onto the S5 bus at two adjacent module locations with the same coding (see p. 11, Fig. 14 and p. 3, Fig. 4).

The separate operator's panel and keypad are connected to the 383 block through a 1.50 m long 50-core cable.

The operator's panel and keypad are designed for flush mounting in switchboards etc. Fixing material is supplied with the module.

Under the three-pole terminal block for the power supply connection on the frontplate of the 383 timer/counter module block there are LEDs for "Power supply OK" and "Fault" and a switch for cutting the back-up battery in and out.

The 50-pin Cannon connector for the operator's panel is plugged in at the bottom left and the 50-pin Cannon connector for the keypad at the bottom right.

Setpoints, counter ranges and interrupt states can be set and modified on the operator's panel, which contains the following controls and displays:

- Display: 3-digit 7-segment display
- Encoder: 4-digit thumbwheel switch
Segment 1 Time range
Segments 2 to 4: Time setpoint
- Interrupt button: Selection/display of supplementary "Interrupt" function
- Transfer key: Storing of the setpoint, time range and interrupt function (if interrupt button depressed) in the encoder.

A timing/counting function can be selected on the keypad. Once selected, all controls and displays of the operator's panel are assigned to the corresponding function.

The keys are arranged in a 4 x 4 matrix. The spacing between the keys is such that symbols can be attached between the keys on the panel.

The keys are spring-loaded and interlocked per software; the logical state is displayed by the LEDs incorporated in the keys.

The example for address range 5.0 – 6.7 in Fig. 2 illustrates how the keys are assigned to the timer/counter numbers and addresses.

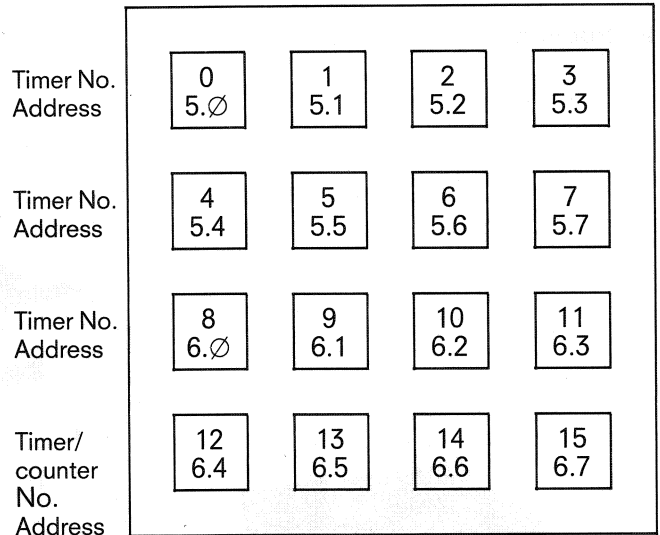
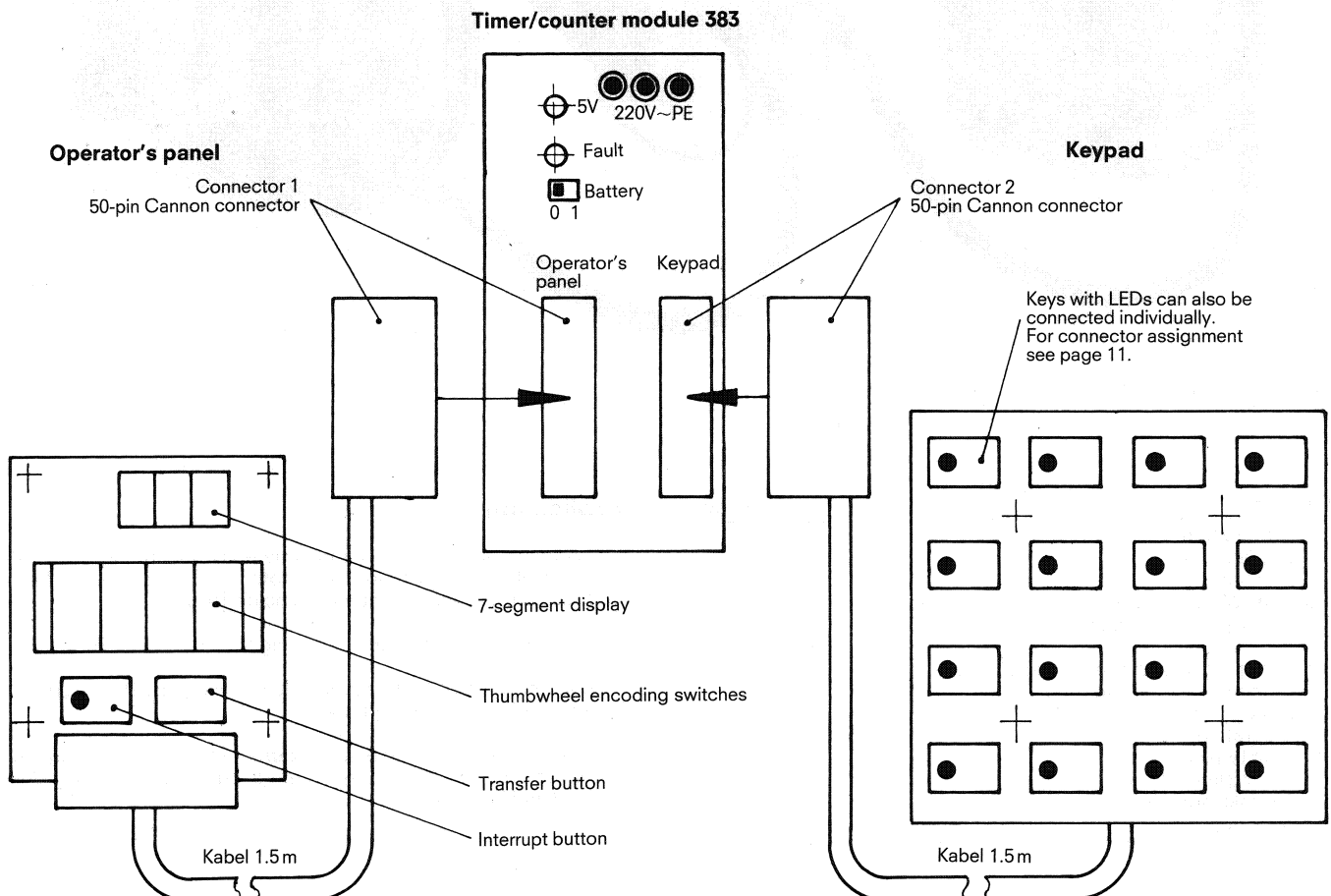


Fig. 2 Assignment of keys to the timer/counter numbers and addresses



Principle of operation

16 digital timer/counter functions can be defined with the 383 module.

Consecutive numbering of the 16 functions from 0 to 15 is recommended. The functions are referenced with the addresses of the module locations occupied by the 383 module (see Fig. 2).

Timers

A number of time ranges can be preselected before entering the time setpoint. This determines the multiplication factor ($\times 1$ s/ $\times 0.1$ s/ $\times 0.01$ s) for the three-digit number set on the thumbwheel switches.

Timer functions are started by output statements in the user program (=QX.Y or SQ X.Y). Scanning operations determine when the times have elapsed. When a timer is reset, it requires a recovery time of at least 5 ms before it can be restarted.

As in the case of the analog timers of the S5-110A PC, the timer functions of the 383 module also produce a "1" signal while the timer is running and a "0" signal when the time has elapsed (for more details please refer to the Programming Instructions GWA 4NEB 807 0520-01).

The scanning of a timer gives rise to plus tolerances corresponding exactly to the cycle duration of the user program. This is particularly the case with short times. This tolerance can be decreased by means of the interrupt function.

Counters

A counter (functions 12 - 15 only) is set by selecting range 4. The counters are up counters which start at 1 and count up to the value preset. When this setpoint has been reached, it remains in the display while the counter output to the S5 bus is switched from "1" to "0".

Counter functions are clocked by output statements in the user program. In this case, the counter input evaluates a pulse edge: each $0 \rightarrow 1$ change triggers the counter if the "1" signal is still applied for at least 5 ms after the change. If input signals are to be counted on the line to input 3.0, for example, the following programming can be used: *Al 3.0 = Q 6.4*. This assumes that the 383 counter module is in module locations 5 and 6 and that function 12 is to be used for counting (see Fig. 2).

A scanning operation determines when the counter has reached its setpoint. When this value is reached, the scanning operation produces a zero signal; in the case of counter readings not equal to the setpoint, a "1" signal is given.

When a timer is running, the time remaining can be displayed. In addition to the selection of the three time ranges and the counting range, the range switch can also be used for setting the "Idling" function. In this position, the multiplication factors of the preselected functions remain valid and the number in the display can be changed. This simplifies matters for the operator when carrying out fine time settings.

The operating state of the timer/counter module is displayed by means of two LEDs on the frontplate:

"5V" (green) = Power OK
 "Fault" (red), steady = Timer malfunction
 "Fault" (red), momentary = Initialising pulse momentarily applied.

The battery must be cut in by means of the battery switch for backup of the time setpoints.

In order to obtain a 24-hour backup, the module must be connected to the power supply for at least 1 hour (battery previously discharged). Backup failure can be detected by checking the setpoints.

Times in all time ranges can be freely assigned to the counter numbers, whereas event counters are only possible for numbers 12 to 15. Wrong entries are ignored.

When a timer is running or an event counter is active, this is indicated by LEDs in the keypad. The key LEDs flash to indicate the timers/counters selected and the state of the timer/counter is indicated by the 7-segment display in the operator's panel. All the other controls of the operator's panel are assigned to this key.

Since the timer/counter module has 16 inputs and outputs, the corresponding locations must be kept free in 4-tier configurations.

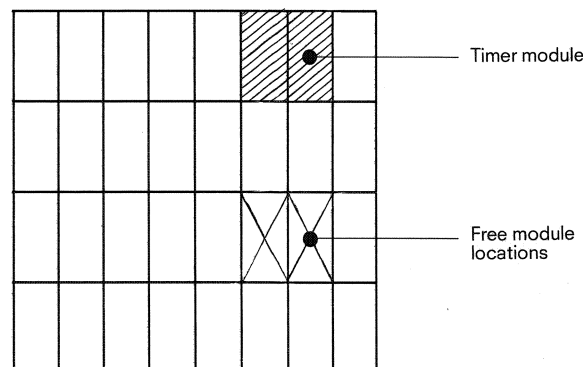


Fig. 4 Arrangement of the timer/counter module in the peripheral I/O rack of the 110 A

	Keypad			Operator's panel
	selected	aktiv	LED	7-segment display
Time (0 ... 15)	—	—	off	—
	—	x	on	—
	x	—	flashes (app. 2Hz)	Setpoint
	x	x	flashes (app. 2Hz)	Current status
Event counter (12 ... 15)	—	—	off	—
	—	x	Displays counting pulses (app. 30ms)	—
	x	—	flashes (app. 2Hz)	Setpoint
	x	x	flashes (app. 2Hz)	Current status

Interrupt button

By depressing the interrupt button before entering a function, the response time of the CPU can be shortened. At the end of a preset time (or on reaching the counter setpoint), an interrupt signal sets the group signal memory on the 900 CPU. By scanning the group signal memory (AF 0.0), the state of the timer or counter can be quickly ascertained.

1. Description

1.4 Technical specification

Timer/counter module	6ES5 383–7AA11												
Number of times Number of event counters Counting frequency Time range Input voltage Current consumption on 220 V side Backup for timer/counter setpoints Current consumption on 5 V side Ambient temperature Storage temperature Insulation class Degree of protection Humidity rating Mechanical loading Vibrations Shock Module dimensions (WxHxD) Weight	max. 16 (no counter functions possible) max. 4 (counters 12–15) (only 12 timer functions possible) max. 100 Hz (depending on input module) 10ms – 999s 220 V + 10% – 15%, 47 – 63 Hz approx. 60 mA Lithium battery Order No. 6ES5 980-OAD 41 Back-up time 3 years approx. 1 A 0 to +55°C –40 bis +85°C C IP20 F 10 – 58 Hz, deflection 0.15 mm to DIN 40 046, Part 8 30g, 18ms half sine period to DIN 40 046, Part 1 80 mm x 166 mm x 150 mm 2.23 kg												
Operator's panel	6ES5 384–0AA11												
Thumbwheel switches Current consumption at 5 V Ambient temperature Storage temperature Insulation class Degree of protection Mechanical loading Vibrations Shock Module dimensions (WxHxD) Weight	<table border="0"> <tr> <td>Time range</td> <td>Time</td> </tr> <tr> <td>0</td> <td>Idling</td> </tr> <tr> <td>1</td> <td>0.01s – 9.99s</td> </tr> <tr> <td>2</td> <td>0.1 s – 99.9s</td> </tr> <tr> <td>3</td> <td>1 s – 999s</td> </tr> <tr> <td>4</td> <td>Counter 1 – 999</td> </tr> </table> 280 mA 0 to 55°C –40 to 85°C C IP 00 10 – 58 Hz, deflection 0.15 mm to DIN 40 046, Part 8 30g, 18ms half sine period to DIN 40 046, Part 1 94 mm x 110 mm x 60mm 0.48 kg	Time range	Time	0	Idling	1	0.01s – 9.99s	2	0.1 s – 99.9s	3	1 s – 999s	4	Counter 1 – 999
Time range	Time												
0	Idling												
1	0.01s – 9.99s												
2	0.1 s – 99.9s												
3	1 s – 999s												
4	Counter 1 – 999												
Keypad	6ES5 384–0AA12												
Number of keys Number of LEDs Current consumption Ambient temperature Storage temperature Insulation class Mechanical loading Vibrations Shock Degree of protection Module dimensions (WxHxD) Weight	16 16 200 mA 0 to 55°C –40 to 85°C C 10 – 58 Hz, deflection 0.15 mm to DIN 40046, Part 8 30g, 18ms half sine period to DIN 40046, Part 1 IP 00 141 mm x 139 mm x 42mm 0.44 kg												

2. Installation

2.1 Snapping on and connecting up

Installation

Snapping module onto mounting rack

The module is simply snapped on to the rail of the mounting rack like other peripheral modules.

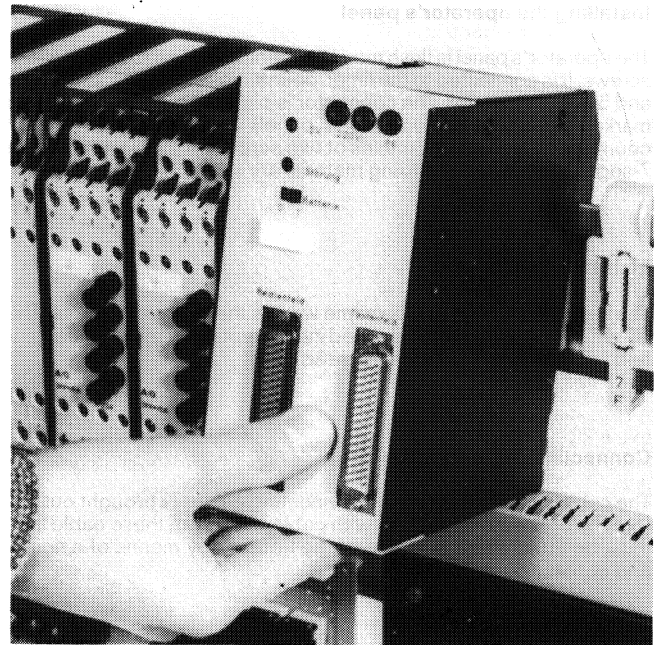


Fig. 5 Snapping the module onto the mounting rack

System connection

The module has its own power supply and must therefore be connected to the 220 V system.

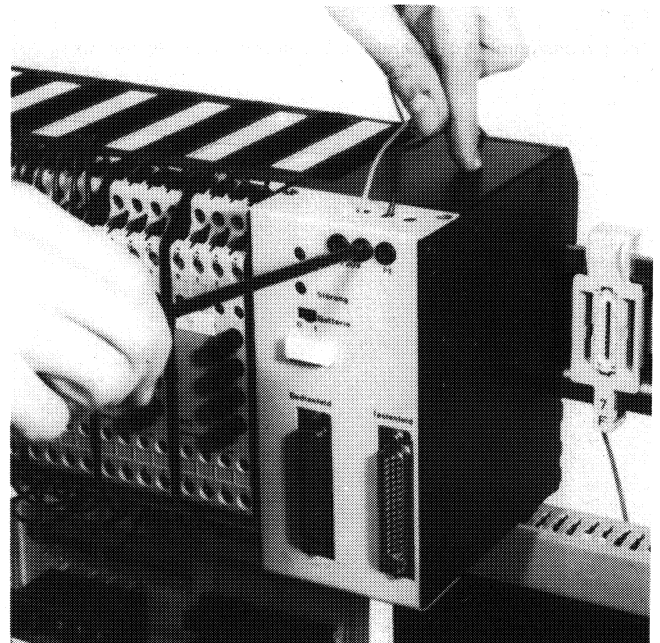


Fig. 6 Making the system connection

2. Installation

2.2 Operator's panel and keypad

Installing the operator's panel

The operator's panel is flush mounted behind a frontplate, using four screws. It is connected to the timer/counter module by a round cable and 50-pin connector. The connector is plugged into the receptacle marked "Bedienfeld" (operator's panel) and fixed to the timer/counter module block by means of two screws. A special lens for the 7-segment displays and fixing material are supplied as accessories.

Installing the keypad

The keypad is installed in the same way as the operator's panel. The 50-pin connector must be plugged into receptacle 2 marked "Tastefeld" (keypad) and fixed with screws.

Connecting the cable shielding

The cable shielding on the two connecting cables is brought out before the connector and fitted with cable lugs. Both these cable lugs must be attached to the base of the housing by means of a screw and contact washer.

Connecting up the individual keys

Individual keys and LEDs can be connected instead of the keypad. The following constraints should be noted in this connection: The keys to be connected must be spring-loaded and have NO contacts.

The current input from the timer for the LEDs must not exceed 8 mA pro LED (a 390 ohm series resistor is already installed per LED in the digital timer module).

The lines to the keys and LEDs must not be run in parallel with cables carrying more than 24 V or through which large inductive loads are switched. If this cannot be ensured or if the timer/counter module is subjected to disturbances in operation, the cables to the keys and LEDs must be shielded and the shielding connected to that of the operator's panel. The keys and LEDs must be wired as shown in Fig. 9.

The pin assignment of connector 2 is shown in the Appendix.

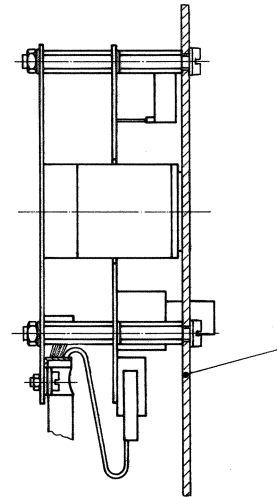


Fig. 7 Installing the operator's panel

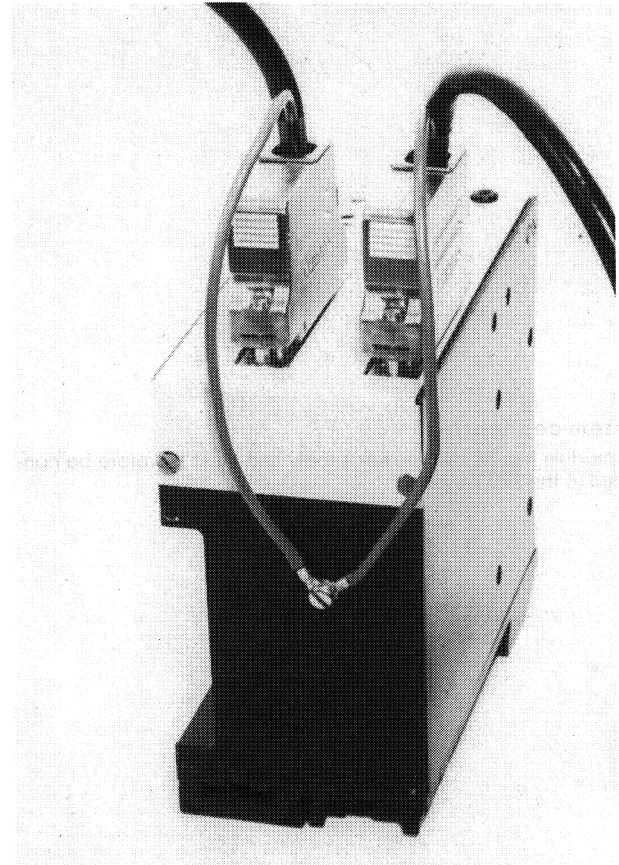


Fig. 8 Connecting the cable shielding

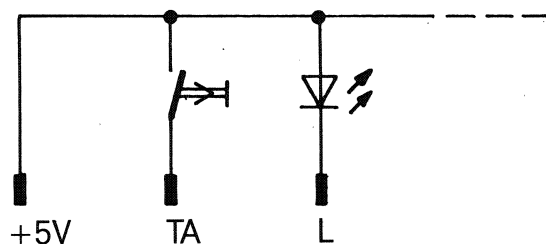


Fig. 9 Keypad connections

2. Installation

2.3 Dimensions

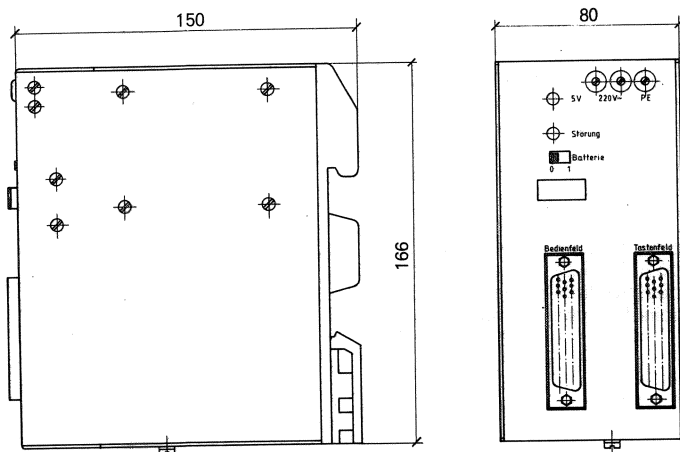


Fig. 10 Timer/counter module

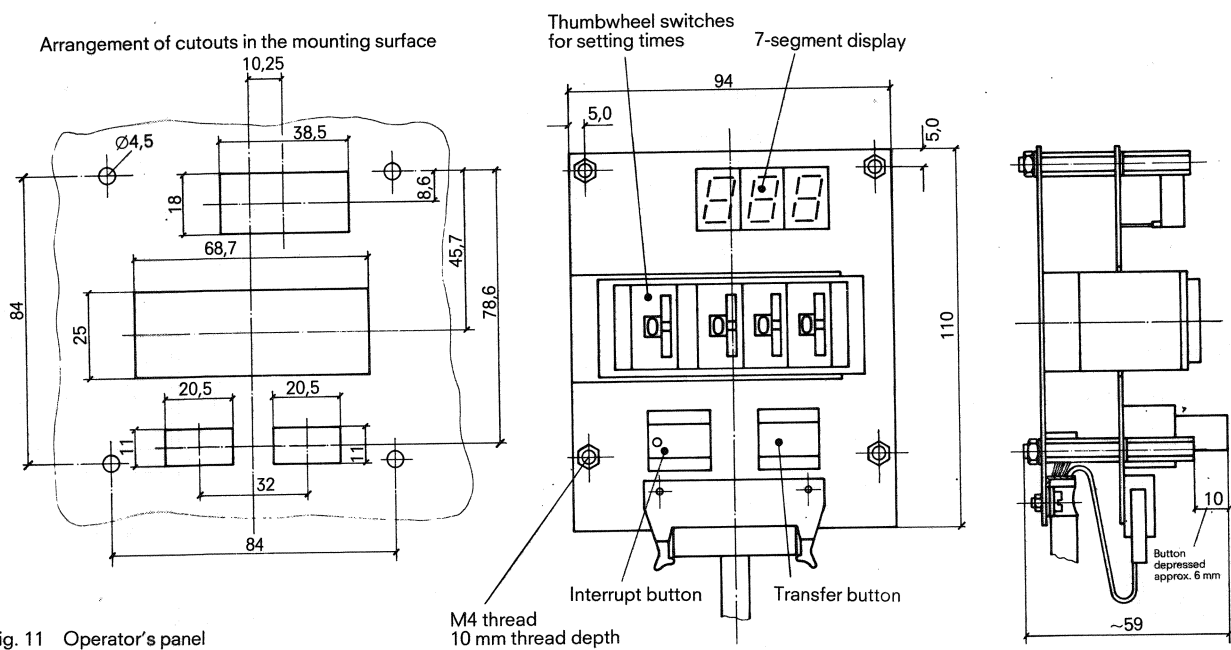


Fig. 11 Operator's panel

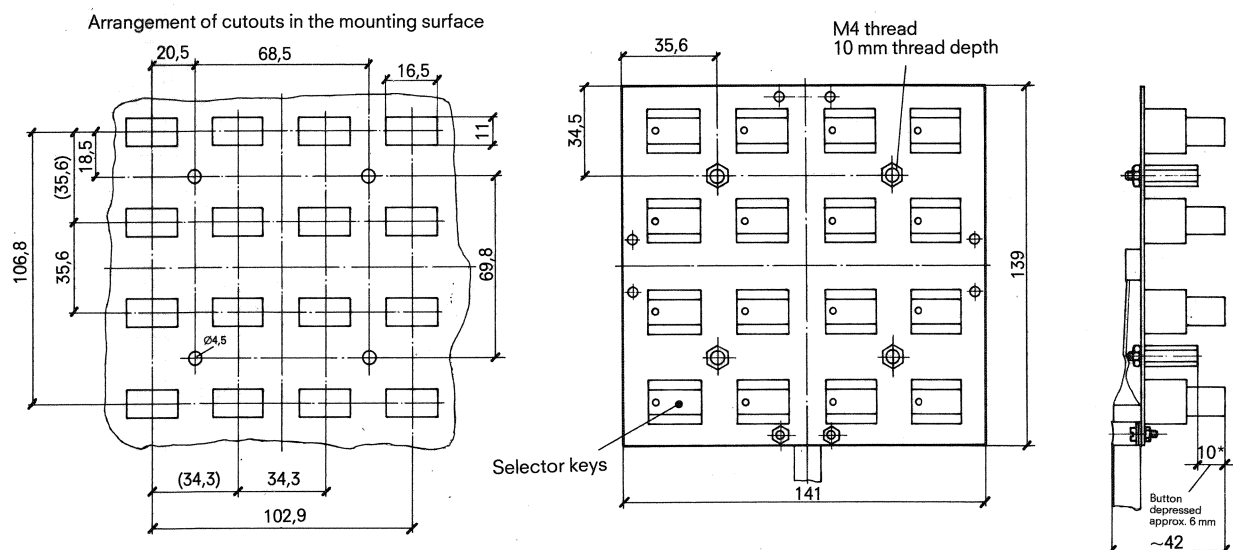
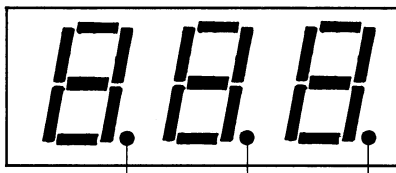


Fig. 12 Keypad

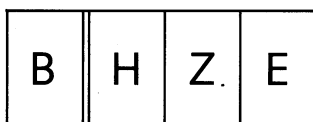
3. Operation

Display format:



Decimal point for time range III (1 s)
 Decimal point for time range II (100 ms)
 Decimal point for time range I (10 ms)
 without decimal point for event counter

Thumbwheel switches



Numerical setters (units, tens, hundreds)
 Time range switch
 0 Idling
 1 Range I 0.01 ... 9.99 s
 2 Range II 0.1 ... 99.9 s
 3 Range III 1 ... 999 s
 4 Event counter

Operator procedures

Resetting the timer/counter

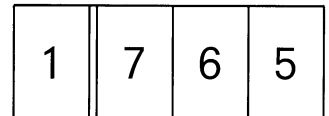
Operator procedure	System reaction
- Select timer/counter to be reset	- Key LED flashes
- Set setpoint to	- Current value or setpoint is displayed
(Time range insignificant) (Interrupt button insignificant)	
- Press the transfer key	- Timer/counter is reset - LED goes out

Entering a time/count

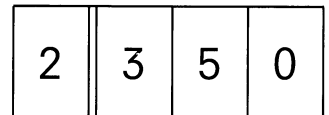
Operator procedure	System reaction
- Select the desired timer/counter on the keypad	- Key LED flashes - Current value is displayed or LED goes out
- Set the time range on the thumbwheel switches	
- Set the timer/counter setpoint to the desired value	
- Select/deselect interrupt	- Interrupt LED (in interrupt button) indicates current state.
- Press the transfer button	- Brief dimming of LED, - then display of new value

Examples

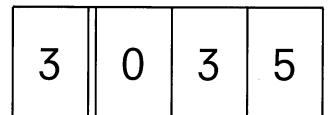
Setting
7.65 s in range I



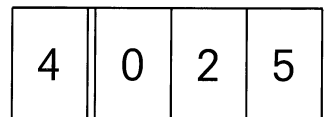
35 s in range II



35 s in range III

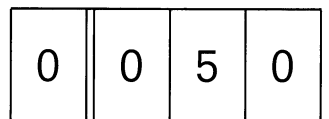


Counter setpoint 25



Changing of the time setpoint, time range and interrupt state is as when entering a time.

If only a setpoint is to be changed, and the interrupt state and time range are to remain as they are, time range 0 can be set, e.g. new setpoint in range III now 50 s instead of 35 s.



Checking the wiring

Disconnect the module from the power supply and check the wiring.

Switching on

Before the power supply of the S5–110A is switched on, the power supply of the module must be switched on or both can be switched on together by applying the system voltage.

If the switch on the CPU is set to "Stop", the red LED lights up briefly, i.e. the timer/counter module is reset. Although the CPU now gives a continuous initialising signal, the timer/counter module continues to run and can be accessed by the operator. If the switch on the CPU is set to "Cycle", the controller is activated.

The battery switch on the timer must be set to "1" in order to retain the timer/counter setpoints entered even after the power supply is switched off.

Caution: The connectors of the operator's panel and keypad may only be withdrawn when the PC is stopped.

Maintenance

The timer/counter module requires practically no maintenance. The lithium battery must be replaced every three years.

Changing the lithium battery

1. Switch off the S5–110 power supply
2. Switch off the timer/counter module power supply
3. Disconnect the system leads on the timer/counter module
4. Remove the connectors for the keypad and operator's panel
5. Remove the front cover of the timer/counter module
6. Disconnect the battery and take it out
7. Insert a new battery and connect it up
8. Screw cover back on and reconnect power supply.

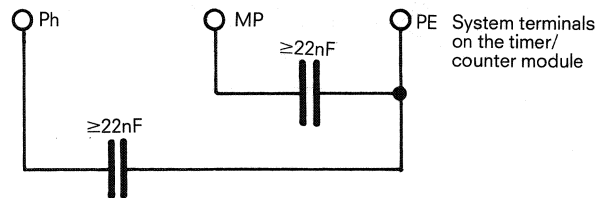
Only the lithium battery specified may be used.

Noise suppression

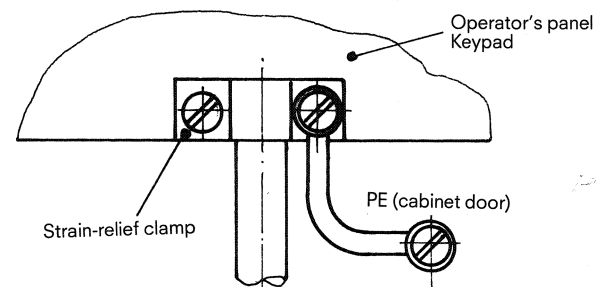
The noise suppression measures described in connection with the S5–110 A PC apply (see Operating Instructions of the S5–110A).

Should disturbances occur despite this, the following extra measures should be taken:

- a) Connect the power supplies of the programmable controller and timer/counter module to the same system terminal (keeping the leads as short as possible).
- b) Connect capacitors to Ph, MP and PE as shown below.



- c) Connect the shielding of the two connecting cables to PE at the strain relief clamp on the keypad and operator's panel, using a short lead.



4. Maintenance

4.2 Troubleshooting

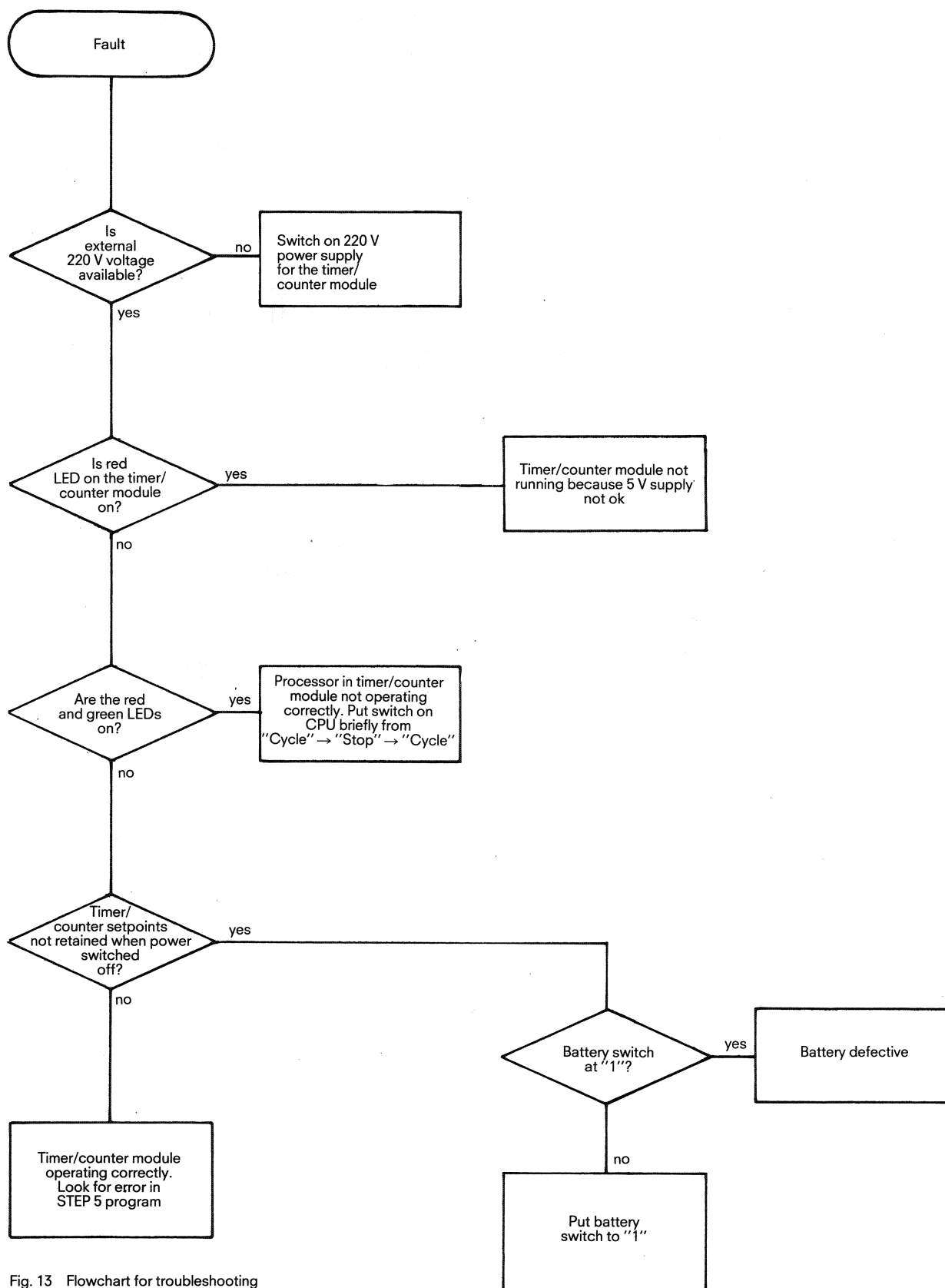


Fig. 13 Flowchart for troubleshooting

Pin assignment of connector 2 "Tastenfeld" (keypad)

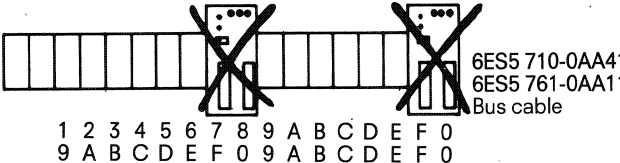
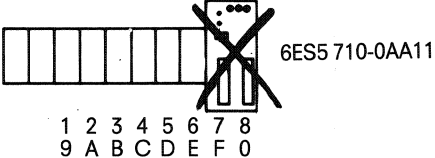
1	M	27	M
2	L3	28	M
3	L2	29	M
4	M	30	M
5	L1	31	L11
6	L6	32	L9
7	L7	33	L15
8	L0	34	TA0
9	L5	35	TA1
10	M	36	TA2
11	M	37	TA3
12	M	38	TA4
13	L13	39	TA5
14	L12	40	TA6
15	L10	41	TA7
16	L14	42	TA8
17	L8	43	TA9
18	+5V	44	TA10
19	+5V	45	TA11
20	+5V	46	TA12
21	+5V	47	TA13
22	+5V	48	TA14
23	+5V	49	TA15
24	+5V	50	M
25	+5V		
26	L4		

e.g.
 L0 ≙ LED for time 0
 TA0 ≙ Key for time 0

Constraints with regard to module locations on the various mounting racks

The 383 timer/counter module may only be plugged into two adjacent locations with the same row coding. This results in the following constraints:

Mounting rack for S5-110A



Mounting rack for S5-110S

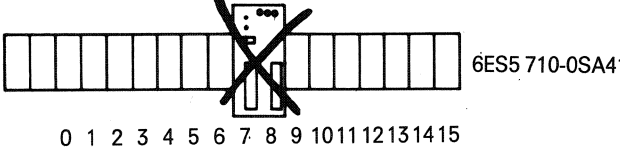


Fig. 14 Locating the module on the various mounting racks

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