MANUFACTURER DOCUMENT PACKAGE

Manufacturer's Manual

Amikon cover with selected official Siemens pages

SIMATIC S7-400 PS 405

6ES7405-0DA01-0AA0

DC POWER SUPPLY MODULE

OFFICIAL SOURCES

Siemens S7-400 Module Data A5E00850736-AJ, section 3.12. Selected pages retain their original content, color and aspect ratio.

3.4 Operator controls and indicators

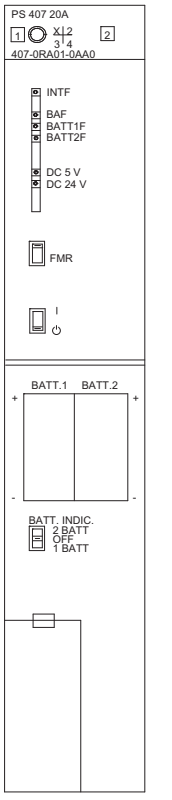
Introduction

The power supply modules of the S7-400 have essentially the same controls and indicators. The main differences are:

- Power supply modules with a backup battery have an LED (BATTF) that indicates an empty, defective, or missing backup battery.
- Power supply modules with two redundant backup batteries have two LEDs (BATT1F and BATT2F) to indicate empty, defective or missing backup battery.

Operator controls and indicators

The figure shows you an example of a power supply module (PS 407 20A) with two (redundant) backup batteries. The LEDs are at the top left of the module front plate.



Mounting screw

LEDs INTF, BAF,
BATT1F, BATT2F, 5 V
DC, 24 V DC

FMR button (Failure Message Reset)

Standby switch (does not cut off mains)

Under cover

Battery compartment

Switch BATT. INDIC,
2 BATT, OFF, 1 BATT

3-pin power connector

Mounting screw

Figure 3-1 Operator controls and indicators on the PS 407 20A power supply module

Meaning of the LEDs

The meaning of the LEDs on the power supply modules is described in the tables below. The following section contains a list of the faults indicated by these LEDs and notes on how to acknowledge the faults.

LEDs INTF, 5 VDC, 24 VDC

Table 3-2 LEDs INTF, 5 VDC, 24 VDC

LED	Color	Meaning
INTF	Red	Lights up in the event of an internal fault
5 VDC	green	Lights up as long as the 5 V voltage is within the tolerance limits
24 VDC	green	Lights up as long as the 24 V voltage is within the tolerance limits

LEDs BAF, BATTF

Power supply modules with a backup battery have the following indicators:

Table 3-3 LEDs BAF, BATTF

LED	Color	Meaning
BAF	Red	Lights up if the battery voltage on the backplane bus is too low and the BATT.INDIC switch is at the BATT position
BATTF	Yellow	Lights up if the battery is empty, if the polarity is reversed, or if the battery is missing, and the BATT.INDIC switch is at the BATT position

LEDs BAF, BATT1F, BATT2F

Power supply modules with two backup batteries have the following indicators:

Table 3-4 LEDs BAF, BATT1F, BATT2F

LED	Color	Meaning
BAF	Red	Lights up if the battery voltage on the backplane bus is too low and the BATT.INDIC switch is at the 1 BATT or 2 BATT position
BATT1F	Yellow	Lights up if battery 1 is empty or if the polarity is reversed or if the battery is missing, and the BATT.INDIC switch is at the 1 BATT or 2 BATT position
BATT2F	Yellow	Lights up if the battery 2 is empty, if the polarity is reversed, or if the battery is missing, and the BATT.INDIC switch is at the 2 BATT position

Backup voltage to the backplane bus

The backup voltage is either supplied by the backup battery or fed externally into the CPU or receiver IM. In its normal state, the level of the backup voltage is between 2.7 V and 3.6 V.

The backup voltage is monitored at the lower limit. Violation of the lower limit is indicated by the BAF LED and reported to the CPU.

BAF lights up if the backup voltage on the backplane bus is too low. Possible causes of this include:

- Battery (batteries) empty or battery polarity has been reversed.
- External supply via CPU or receive IM is defective or supply from secondary power supply module is defective or missing.
- Short-circuit or overload on the battery voltage.

Note

Due to internal capacities, if you remove the battery or switch off the external supply, some time may elapse before BAF, BATT1F, or BATT2F lights up.

Function of the operator controls of the power supply modules

Table 3-5 Function of the operator controls of the power supply modules

Control	Function	
FMR button	For acknowledging and resetting a fault indicator after correcting the fault	
Standby switch	Switches the output voltages (5 V VDC24 VDC) to 0 V by intervening in the control loop (no mains disconnection).	
	• |	Output voltages at nominal value
	• ⏻	Output voltage 0 V
Switches BATT.INDIC	Used for setting LEDs and battery monitoring Where one battery can be used (PS 407 4A, PS 405 4A): • OFF: LEDs and monitor signals inactive • BATT: BAF/BATTF LEDs and monitor signals active Where two batteries can be used (PS 407 10A, PS 407 20A, PS 405 10A, PS 405 20A): • OFF: LEDs and monitor signals inactive • 1 BATT: Only BAF/BATT1F LEDs (for battery 1) active. • 2 BATT: BAF/BATT1F/BATT2F LEDs (for batteries 1 and 2) active.	
Battery compartment	For backup battery (batteries)	
Power connection	3-pin connector for the power main (do not pull and plug under power)	

Cover

The battery compartment, battery selector switch, voltage selector switch and power connection are housed under one cover. The cover must remain closed during operation in order to protect these operator controls and to prevent static electricity from affecting the battery connections.

Discharge your body before you start taking any measurements on a module. Do so by touching grounded metallic parts. Always use grounded measuring instruments.

3.5 Fault/Error messages via LEDs

Introduction

The power supply modules of the S7-400 indicate module faults and backup battery faults via LEDs on the front plate.

Overview of the error messages of the power supply modules

Table 3-6 Error messages of the power supply modules

Type of fault/error	LED
Module error	INTF 5 VDC 24 VDC
Backup battery fault	Power supplies with 1 backup battery: BAF BATTF
	Power supplies with 2 backup battery: BAF BATT1F BATT2F

INTF, 5 VDC, 24 VDC LEDs

The following table shows the faults indicated by the INTF, 5 VDC, and 24 VDC LEDs and lists how to remedy the faults. The status of the BAF, BATTF, BATT1F, and BATT2F LEDs is not relevant here.

Table 3-7 INTF, 5 VDC, 24 VDC LEDs

INTF LED	LED DC5V	LED DC24V	Cause of fault	Remedy
D	D	D	Standby switch in ⏻ position	Set standby switch to the | position
			Line voltage missing	Check line voltage
			Internal fault, power supply module defective	Replace power supply module
			Cutoff after overvoltage on 5 V or non-permissible external supply	Disconnect from mains and reconnect after approximately 3 minutes; if necessary, remove external supply
			Power supply module operated in wrong slot	Install the power supply module in the correct slot (slot 1)
			Short-circuit or overload on 5 V	Switch off the power supply module, remove the source of the short-circuit; after approximately 3 seconds, the power supply module can be switched on with the standby switch or via the power system.*

INTF LED	LED DC5V	LED DC24V	Cause of fault	Remedy
D	H	D	Overvoltage on 24 V	Check if there is an external supply; if not, replace power supply module.
H	D*	D	Short-circuit or overload on 5 V and 24 V and overheating	Check the load on the power supply module. Remove module if necessary. Wait 5 minutes before switching the power supply module again.
H	H	D	If the standby switch is set to the ⏻ position, illegal external supply on 5 V	Remove all modules; determine which module is faulty.
			If the standby switch is set to the | position, short-circuit or overload on 24 V.	Check the load on the power supply module. Remove module if necessary.
D	B	H	Voltage restored after short-circuit or overload on 5 V if faults occur in operation	Press FMR button: Flashing changes to steady light
			Dynamic overload on 5 V	Check load on the power supply module. Possibly remove modules.
D	B	B	Voltage restored after short-circuit or overload on 5 V and 24 V if faults occur in operation	Press FMR button: Flashing changes to steady light
D	B	B	Dynamic overload on 5 V and 24 V	Check load on the power supply module. Possibly remove modules.
D = LED is dark; H = LED lights up; B = LED flashing;				

* If the power supply module does not start up again after a few seconds once the overload has been removed, remove power to the module for 5 minutes and then switch it on again. If the module stills does not start up, you must replace it. This applies to the following power supply modules:

- 6ES7407-0KA01-0AA0, Release 3
- 6ES7407-0KR00-0AA0, Release ≤ 5
- 6ES7407-0KA01-0AA0, Release ≥ 10
- 6ES7405-0DA02-0AA0, 6ES7407-0DA02-0AA0
- 6ES7405-0KA02-0AA0, 6ES7407-0KA02-0AA0
- 6ES7405-0KR02-0AA0, 6ES7407-0KR02-0AA0
- 6ES7405-0RA02-0AA0, 6ES7407-0RA02-0AA0

The same characteristic is displayed by the built-in overtemperature protection is triggered.

If either the 5 VDC or 24 VDC LEDs remains dark after switching on, the system has not powered up.

If either of the 5 VDC or 24 VDC LEDs of the PS 407 10AR remains dark for longer than 1 or 2 seconds after it is switched on, the power supply module will not start up.

The following power supply modules will switch off in the event of a short-circuit or overload after 1 to 3 seconds. The module will try to restart after no more than 3 seconds. If the error has been eliminated by then, the module will start up. This applies to the following modules:

Modules	
PS 405 4A (6ES7405-0DA01-0AA0)	PS 407 4A (6ES7407-0DA01-0AA0)
PS 405 4A (6ES7405-0DA02-0AA0)	PS 407 4A (6ES7407-0DA02-0AA0)
PS 405 10A (6ES7405-0KA01-0AA0)	PS 407 10A (6ES7407-0KA01-0AA0), release ≥5
PS 405 10A (6ES7405-0KA02-0AA0)	PS 407 10A (6ES7407-0KA02-0AA0)
PS 405 10A R (6ES7405-0KR00-0AA0)	PS 407 10A R (6ES7407-0KR00-0AA0), release ≥7
PS 405 10A R (6ES7405-0KR02-0AA0)	PS 407 10A R (6ES7407-0KR02-0AA0)
PS 405 20A (6ES7405-0RA01-0AA0)	PS 407 20A (6ES7407-0RA01-0AA0)
PS 405 20A (6ES7405-0RA02-0AA0)	PS 407 20A (6ES7407-0RA02-0AA0)

Overload at 24 V

In the event of overload at 24 V the output current is electronically limited to a value between 100% and 150% of the rated value. If the voltage then goes below the undervoltage threshold of 19.2 V (-0/+ 5% corresponds to 19.2 V to 20.16 V), the modules respond as follows:

- For the power supply modules, the 24 V voltage is disconnected and reconnected at a repeat rate of approx. 0.5 to 1 seconds until there is an output voltage that exceeds the undervoltage threshold.
- For the power supply modules 6ES7407-0KA01-0AA0, 6ES740x-0KR00-0AA0 and 6ES740x-0KR01-0AA0, the voltage reaches the level determined by the load impedance, the module is in the characteristic operating range.

After the overload has been eliminated, the voltage returns to the nominal range and the green 24 V LED flashes. The CPU sets the EXTF LED (external fault) and saves the fault in the diagnostic buffer. You can trigger other responses, such as CPU STOP or a message to a control room, in OB 81 (power supply error). If OB 81 is not configured, the CPU continues as normal.

Overload at 5 V

In the event of an overload at 5 V, the power supply modules with 10 A or 20 A output current can retain an output current of 16 A or 26 A for 300 ms. The power supply modules with 4 A output current can retain an output current of 6 A for 300 ms. The CPU will then go to DEFECT afterwards. If the 5 VDC LED flashes on the power supply and can be reset with the FMR button, you will be able to perform a restart. The CPU will remain in STOP afterwards and will then require a memory reset.

BAF, BATTF

The following table applies to power supply modules with one battery if the BATT.INDIC switch is set to the BATT position. It shows the faults indicated and lists how to remedy the faults.

Table 3-8 BAF, BATTF; BATT.INDIC LEDs on BATT

LED BAF	LED BATF	Cause of fault	Remedy
H	H	Battery empty or missing. No external backup voltage available	Insert new battery. Press FMR button.
D	H	Battery is empty or missing. Battery stored too long. External backup voltage available.	Insert new battery. Press FMR button. Depassivate battery (see *Installation Manual*).
H	D	Battery in order. No backup voltage available (short-circuit)	• Fault after plugging in a module: Plugged-in module defective • Fault after switching on: Remove all modules and plug in individually
D	D	Battery OK. External backup voltage available.	-
D = LED is dark; H = LED lights up;			

BAF, BATT1F, BATT2F

The following table applies to power supply modules with two batteries if the BATT.INDIC switch is set to the 1BATT position. It shows the faults indicated and lists how to remedy the faults.

Nothing is indicated about the condition of any second battery that may be in use.

Table 3-9 BAF, BATT1F, BATT2F, BATT.INDIC LEDs on 1BATT

LED BAF	LED BATT1F	LED BATT2F	Cause of fault	Remedy
H	H	D	Battery 1 empty or missing No external backup voltage available.	Insert new battery in compartment 1. Press FMR button.
D	H	D	Battery 1 empty or missing External backup voltage available.	Insert new battery in compartment 1. Press FMR button.
			Battery stored too long. External backup voltage available.	Depassivate battery (see *Installation Manual*)
H	D	D	Battery 1 OK. No external backup voltage available (short-circuit)	• Fault after plugging in a module: Plugged-in module defective • Fault after switching on: Remove all modules and plug in individually
D	D	D	Battery 1 OK. External backup voltage available.	-
D = LED is dark; H = LED lights up;				

BAF, BATT1F, BATT2F

The following table applies to power supply modules with two batteries if the BATT.INDIC switch is set to the 2BATT position. It shows the faults indicated and lists how to remedy the faults.

Table 3-10 BAF, BATT1F, BATT2F, BATT.INDIC LEDs on 2BATT

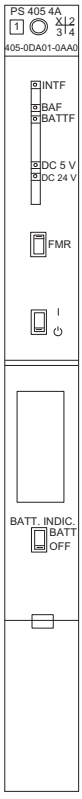
LED BAF	LED BATT1F	LED BATT2F	Cause of fault	Remedy
H	H	H	Both batteries are empty or missing. No external backup voltage available	Insert new batteries in compartments 1 and 2 Press FMR button.
D	H	H	Both batteries are empty or missing. External backup voltage available	Insert new batteries in compartments 1 and 2 Press FMR button.
H	H	D	Battery 1 empty or missing No external backup voltage available (short-circuit or overload)	Insert new battery in compartment 1. Press FMR button. • Fault after plugging in a module: Plugged-in module defective • Fault after switching on: Remove all modules and plug in individually
D	H	D	Battery 1 empty or missing	Insert new batteries in compartments 1 and 2 Press FMR button.
			Battery has been stored for too long External backup voltage available	Depassivate battery (see *Installation Manual*).
H	D	H	Battery 2 empty or missing No external backup voltage available (short-circuit or overload)	Insert new battery in compartment 2. Press FMR button. • Fault after plugging in a module: Plugged-in module defective • Fault after switching on: Remove all modules and plug in individually
D	D	H	Battery 2 empty or missing	Insert new batteries in compartments 1 and 2 Press FMR button.
			Battery has been stored for too long External backup voltage available	Depassivate battery (see *Installation Manual*).
H	D	D	Both batteries in order. No external backup voltage available (short-circuit)	• Fault after plugging in a module: Plugged-in module defective • Fault after switching on: Remove all modules and plug in individually

3.12 Power supply module PS 405 4A (6ES7405-0DA01-0AA0)

Function

The PS 405 4A power supply module is designed for connection to a DC line voltage of 19.2 to 72 VDC and supplies 5 VDC/4 A and 24 VDC/0.5 A on the secondary side.

Operator controls and indicators on the PS 405 4A



Mounting screw

LEDs INTF, BAF,
BATTF,
5 V DC, 24 V DC

FMR button (Failure Message Reset)

Standby switch (does not cut off mains)

Under cover

Battery compartment

Switch BATT. INDIC,
BATT, OFF

3-pin power connector

Mounting screw

Figure 3-8 Operator controls and indicators on the PS 405 4A

Specifications of the PS 405 4A

Dimensions, weight, and cable cross-sections	
Dimensions W x H x D (mm)	25x290x217
Weight	0.76 kg
Cable cross-section	3 x 1.5 mm^2 (litz wire with wire end ferrule, use component conductor or flexible sheath cable)
Cable diameter	3 to 9 mm
Input parameters	
Input voltage	
• Nominal value	24 VDC / 48 V / 60 V

• Permissible range	Static: 19.2 to 72 VDC Dynamic: 18.5 to 75.5 VDC
Nominal input current	2/1/0.8 A
Overvoltage resistance	In accordance with DIN VDE 0160, curve B2
Output parameters	
Output voltages	
• Nominal values	5.1 / 24 VDC
Output currents	
Nominal values	5 VDC: 4 A 24 VDC: 0.5 A
Electrical parameters	
Protection class in accordance with IEC 60536	I, with protective conductor
Overvoltage category	II
Pollution degree	2
Nominal voltage U_e $0 < U_e \leq 50$ V 150 V $< U_e \leq 300$ V	Test voltage 700 VDC (secondary <-> PE) 2200 VDC (primary <-> secondary/PE)
Buffering of power failures	>20 ms at a repeat rate of 1 s, complies with the NAMUR recommendation NE 21
Power consumption (24 VDC)	48 W
Power loss	16 W
Backup current	Max. 100 µA at power off
Backup battery (option)	1 x Lithium AA, 3.6 V/2.3 Ah
Protective separation to IEC 61131-2	Yes