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ET 200S distributed I/O
Power module PM-E DC24V/8A RO
(6ES7138-4CA80-0AB0)

Manual

06/2010
A5E02953719-01

Legal information

Warning notice system

This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger.

⚠ DANGER

indicates that death or severe personal injury **will** result if proper precautions are not taken.

⚠ WARNING

indicates that death or severe personal injury **may** result if proper precautions are not taken.

⚠ CAUTION

with a safety alert symbol, indicates that minor personal injury can result if proper precautions are not taken.

CAUTION

without a safety alert symbol, indicates that property damage can result if proper precautions are not taken.

NOTICE

indicates that an unintended result or situation can occur if the corresponding information is not taken into account.

If more than one degree of danger is present, the warning notice representing the highest degree of danger will be used. A notice warning of injury to persons with a safety alert symbol may also include a warning relating to property damage.

Qualified Personnel

The product/system described in this documentation may be operated only by **personnel qualified** for the specific task in accordance with the relevant documentation for the specific task, in particular its warning notices and safety instructions. Qualified personnel are those who, based on their training and experience, are capable of identifying risks and avoiding potential hazards when working with these products/systems.

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We have reviewed the contents of this publication to ensure consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.

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Preface

Purpose of the manual

This manual supplements the *ET 200S Distributed I/O System* Operating Instructions. General functions for the ET 200S are described in the ET 200S Distributed I/O System Operating Instructions (http://support.automation.siemens.com/WW/view/en/1144348).

The information in this document along with the operating instructions enables you to commission the ET 200S.

Basic knowledge requirements

To understand these operating instructions you should have general knowledge of automation engineering.

Scope of the manual

This manual applies to this ET 200S module. It describes the components that are valid at the time of publication.

Recycling and disposal

Thanks to the fact that it is low in contaminants, this ET 200S module is recyclable. For environmentally compliant recycling and disposal of your electronic waste, please contact a company certified for the disposal of electronic waste.

Additional support

If you have any questions relating to the products described in this manual and do not find the answers in this document, please contact your local Siemens representative (http://www.siemens.com/automation/partners).

A guide to the technical documentation for the various SIMATIC products and systems is available on the Internet. (http://www.siemens.com/simatic-docu).

The online catalog and ordering systems are available on the Internet (http://www.siemens.com/automation/mall).

Training center

We offer courses to help you get started with the ET 200S and the SIMATIC S7 automation system. Please contact your regional training center or the central training center in D - 90327, Nuremberg, Germany (http://www.siemens.com/sitrain).

Technical Support

You can contact Technical Support for all Industry Automation products by means of the Internet Web form for the Support Request (http://www.siemens.com/automation/csi_en_WW/support_request).

Additional information about Siemens Technical Support is available on the Internet (http://www.siemens.com/automation/csi_en_WW/service).

Service & Support on the Internet

In addition to our documentation, we offer a comprehensive knowledge base on the Internet (http://www.siemens.com/automation/csi_en_WW/support).

There you will find:

- Our Newsletter, which constantly provides you with the latest information about your products.
- The right documentation for you using our Service & Support search engine.
- The bulletin board, a worldwide knowledge exchange for users and experts.
- Your local contact for Automation & Drives in our contact database.
- Information about on-site services, repairs, spare parts, and lots more.

Table of contents

Properties

1

1.1 Power module PM-E DC24V/8A RO (6ES7138-4CA80-0AB0)

Properties

- The PM-E DC24V/8A RO power module monitors the supply voltage for all electronic modules in the voltage group. The supply voltage is fed in by means of the TM-P terminal module.
- You can use all electronic modules except the 2DI AC120V ST, 2DI AC230V ST, and 2DO AC24..230V/1A in the voltage group of the PM-E DC24V/8A RO power module.
- Reduction of the energy consumption (during operational downtimes) by switching off the encoder and load supply of the voltage group of the power module (see chapter Reduction of energy consumption). (Page 12)
  The voltage group can be switched off
  - by means of PROFIenergy commands on suitable interface modules (see *Requirements for operation*) or
  - via the control byte in the process image output (PIQ).
- The current status of the power module is stored in the status byte in the process input image (PII). The update does not depend on a diagnostics release.
- Extended temperature range from 0 to 55°C with vertical installation.

CAUTION

If you do not adhere to the specified load voltage 24 VDC, you may risk creating dangerous plant conditions.

The consequences may be damages to the ET 200S or minor injuries.

This means you should only connect the specified load voltage of 24 VDC to the TM-P terminal module of the power module. The connected load voltage must correspond to the supply voltage of the electronic modules in the voltage group.

Requirements for operation

It is possible to operate the PM-E DC24V/8A RO power module only using the following PROFINET interface modules and voltage group, which can be switched off, as of the order numbers specified.

Interface module	as of order number	Firmware version (or higher)	The voltage group can be switched off with	
			PROFIenergy	Control byte
IM 151-3 PN	6ES7151-3AA23-0AB0	V7.0.0		•
IM 151-3 PN FO	6ES7151-3BB23-0AB0	V7.0.0	•	•
IM 151-3 PN HIGH FEATURE	6ES7151-3BA23-0AB0	V7.0.0	•	•
IM 151-3 PN HIGH SPEED	6ES7151-3BA60-0AB0	V3.0.0		•
IM 151-8 PN/DP CPU	6ES7151-8AB01-0AB0	V3.2.0		•
IM 151-8F PN/DP CPU	6ES7151-8FB01-0AB0	V3.2.0		•

Compatibility (spare part replacement for the interface modules listed above)

You can use the PM-E DC24V RO power module as a replacement for the PM-E DC24V and PM-E DC24V HF. The following particularities apply in this case:

- The status byte is only present if you have parameterized the PM-E DC24V or PM-E DC24V HF with the suffix ...S in HW Config.
- The control byte is not available:
  - The PM-E DC24V/8A RO does not occupy any address space in the process image of the outputs.
  - It is not possible to switch off the voltage group of the PM-E DC24V/8A RO in conjunction with the control byte.
- In case of spare part replacement, you can turn off the power module with PROFIenergy commands.
- Maximum current-carrying capacity of the PM-E DC24V/8A RO = 8A

Maximum configuration per voltage group

The number of modules that can be connected depends on the total current of all modules in a voltage group. This total must not exceed the maximum current carrying capacity.

Address space of inputs/outputs

Address space of inputs/outputs by selecting the following as an option (entries in HW-Config):

Options	Address space of the inputs	Address space of the outputs
"PM-E DC24V/8A RO" [1]	---	---
"PM-E DC24V/8A RO S"	1 byte (status byte)	1 byte (control byte)

[1]supports PROFIenergy

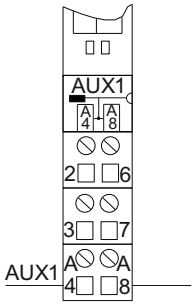
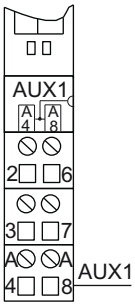
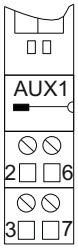
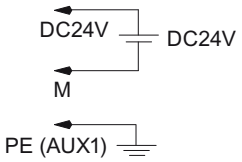
General terminal assignment

Note

Terminals A4 and A8 are only available at specified terminal modules.

Terminal assignment for PM-E DC24V/8A RO (6ES7138-4CA80-0AB0)				
Terminal	**Assignment**	**Terminal**	**Assignment**	**Notes**
2	L+	**6**	L+	• L+: Rated load voltage 24 VDC • M: Chassis ground • AUX1: Protective-conductor terminal or potential bus (freely usable up to 230 VAC)
3	M	**7**	M	
A4	AUX1	**A8**	AUX1	

Usable terminal modules

Usable terminal modules for PM-E DC24V/8A RO (6ES7138-4CA80-0AB0)			
TM-P15C23-A1 (6ES7193-4CC30-0AA0)	TM-P15C23-A0 (6ES7193-4CD30-0AA0)	TM-P15C22-01 (6ES7193-4CE10-0AA0)	← Spring terminal
TM-P15S23-A1 (6ES7193-4CC20-0AA0)	TM-P15S23-A0 (6ES7193-4CD20-0AA0)	TM-P15S22-01 (6ES7193-4CE00-0AA0)	← Screw-type terminal
TM-P15N23-A1 (6ES7193-4CC70-0AA0)	TM-P15N23-A0 (6ES7193-4CD70-0AA0)	TM-P15N22-01 (6ES7193-4CE60-0AA0)	← Fast Connect
			Connection examples 

Block diagram

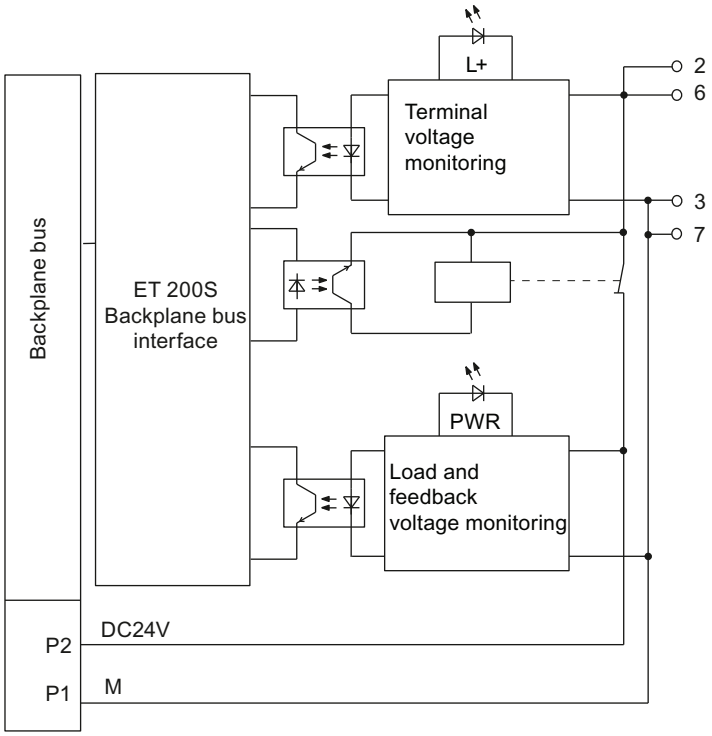


Figure 1-1 Block diagram of the PM-E DC24V/8A RO power module

Technical data of PM-E DC24V/8A RO (6ES7138-4CA80-0AB0)

Dimensions and weight	
Dimension B (mm)	15
Weight	Approx. 40 g
Voltages, currents, potentials	
Rated load voltage	24 VDC
• Overvoltage protection	No
Protection with automatic circuit breakers	Yes, tripping characteristic B, C
Max. current-carrying capacity	8 A
Minimum load current	
• Short-circuit protection	No
Electrical isolation	
• Between rated load voltage and backplane bus	Yes
• Between the power modules	Yes
Insulation test voltage	500 VDC
Current consumption	
• From the load voltage L+ (no load)	Max. 30 mA [1]
Power dissipation of the module	typ. 600 mW [1]
Parameter length	3 bytes
Status, interrupts, diagnostics	
Diagnostic function	Yes
• Group error	Red "SF" LED
• Terminal voltage monitoring	Green LED "L+"
• Load voltage monitoring	Green "PWR" LED
• Diagnostic information readable	Yes

[1] internal relay switched

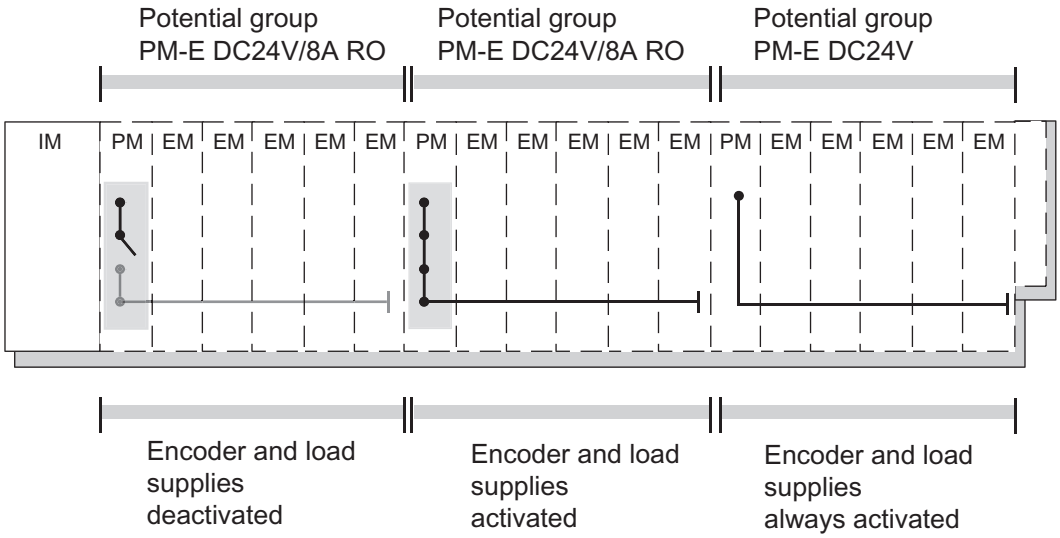
Additional information on the internal relay

Internal relay	
Minimum load current	8 mA
Switching frequency	max. 0.3 Hz
Mechanical service life	50 million switching cycles
Electrical service life at the 24 VDC rated voltage	0.08 million switching cycles at 8 A
	0.1 million switching cycles at 7 A
	0.15 million switching cycles at 5 A
	0.175 million switching cycles at 4 A
	0.3 million switching cycles at 2 A
	1.1 million switching cycles at 0.5 A
Maximum switching capacity	240 W with ohmic load (power factor = 1)
	170 W with inductive load (power factor = 0.4 L/R = 7 ms)

1.2 Reduction of power consumption

Properties

The PM-E DC24V/8A RO power module enables the voltage group to be switched off by an internal relay. All encoder and load supplies of the following electronic modules will be switched off in the voltage group. This step results in a reduction of the power consumption during operational downtimes.



Principle of operation

The procedure and behavior when switching on/off the voltage group of the PM-E DC24V/8A RO is described in the following:

Procedure	Voltage group (encoder and load supplies)	Input module	Output module	Energy saving
1	activated	Measuring	Data output	No
2	deactivated	Encoder supply switched off Inputs zero current/voltage	Load supply switched off Outputs zero current/voltage	Yes
3	activated	Measuring	Data output	No

The voltage group of the PM-E DC24V/8A RO power module can be switched off using two methods:

- via PROFIenergy
- or via the user program in the process image output (PIQ) with the control byte.

Note

To prevent undesired switching states of the encoder and load supply, you should not additionally switch off the terminal voltage when the voltage group is switched off.

PROFIenergy commands

- Properties
  The voltage group of the power module is switched on and off with PROFIenergy commands. The procedure for using PROFIenergy commands is explained using an example application. You can download this example from the Internet under Service & Support.
- Prerequisites
  - Interface module (see Requirements for operation)
  - PM-E DC24V/8A RO power module
  - Configuration in HW Config with the entry "PM-E DC24V/8A RO"
  - Optionally: Application example of PROFIenergy
- For further information
  - PROFIenergy: See PROFINET System Description (http://support.automation.siemens.com/WW/view/en/19292127)
  - Application example of PROFIenergy See Service & Support in the Internet (http://support.automation.siemens.com/WW/view/en/41986454).

Control byte in the process image of outputs (PIQ)

- Properties
  The voltage group of the power module is switched on and off via bit 0 in the control byte of the PIQ (see chapter Configuration (Page 19)). For this step you have to program the respective access in your user program.
- Requirements
  - Interface module (see Requirements for operation)
  - PM-E DC24V/8A RO power module
  - Configuration in HW Config with the entry "PM-E DC24V/8A RO S"
  - User program
- Example
  In the following example the voltage group is switched on and off in the control byte (PIQ) with the user program:

STL	Explanation
// switch off voltage group	
SET	RLO=1
S A0.0	Set bit 0 of the control byte to 1

STL	Explanation
// switch off voltage group	
SET	RLO=1
R A0.0	Set bit 0 of the control byte to 0

Configuring instructions

- The entire voltage group of the PM-E DC24V/8A RO power module is always switched off using the PROFIenergy commands or the control byte. Recommendation: Configure all ET 200S electronic modules whose encoder and load supplies are to be switched off in the voltage group of the PM-E DC24V/8A RO.
- Program the required states of the inputs and outputs for all electronic modules in the switched off voltage group with a user program.
- Place all I/O modules whose encoder and load supplies may not be switched off behind a different ET 200S power module, for example, PM-E DC24V.

Parameters 2

2.1 Parameters for PM-E DC24V/8A RO

Parameters

The following table lists the power module parameters.

Table 2- 1 Parameters for power modules

PM-E DC24V/8A RO	Range of values	Default setting	Applicability
Diagnostics: Terminal voltage (L+) missing	Disable/enable	Disable	Power module
Diagnostics: No load voltage (PWR)	Disable/enable	Disable	Power module

The parameters are explained below.

Diagnostics: Terminal voltage (L+) missing

This parameter triggers a diagnostic message if there is no encoder and load supply at the voltage group (root).

If there is no terminal voltage (L+ < 15V), only the diagnostic message of the affected power module will be sent to the IO controller. The SF error LEDs of all modules in the relevant voltage group light up.

Diagnostics: No load voltage (PWR)

This parameter is used to release a diagnostic message if there is no rated load voltage 24 VDC at the power module or if the voltage group was switched off.

If there is no load voltage (PWR < 15V), only the diagnostic message of the affected power module will be sent to the IO controller. The SF error LEDs of all modules in the relevant voltage group light up.

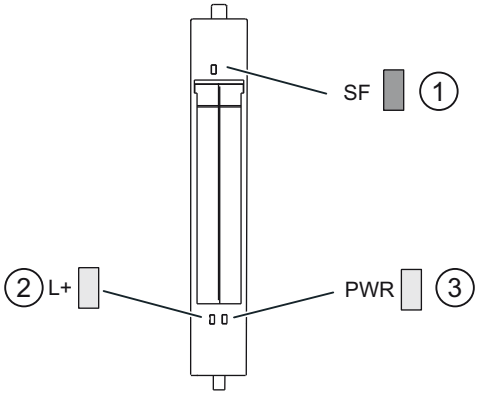
Diagnostics

3

3.1 Diagnostics using LED display

Power module

LED displays on the power module:



① Batch error (red)

② Terminal voltage (green)

③ Load voltage (green)

Status and error displays by means of LEDs on power modules

The table below shows the status and error displays on the power module.

Event (LEDs)			Cause	Remedy
SF	L+	PWR		
On			A diagnostic message is pending. No parameter assignment or incorrect module plugged in.	Evaluate the diagnostics. Check the parameter assignment.
	Off	Off	There is no terminal voltage at the power module.	Check the applied terminal voltage of 24 VDC.
	On	Off	Voltage group (encoder and load supplies) switched off.	Switch on the voltage group with a PROFIenergy command or control byte.

3.2 Error types

Power module error types

The diagnostic message is reported on channel 0 and applies to the entire module.

The table below shows the types of errors in power modules

Table 3- 1 Power module error types

Error type		Meaning	Remedy
17_D	10001: Encoder or load voltage missing	Terminal voltage not present or too low.	Correct the process wiring. Check the rated load voltage.
24_D	11000: Actuator disconnection	Terminal voltage not present or too low	
		Voltage group switched off (The encoder and load supply of the connected sensors and actuators are switched off)	Switch on the voltage group with the PROFIenergy command or the control byte.

Configuring 4

4.1 Configuring the address space

Address area for control and status byte

You can switch off the voltage group via the control byte and evaluate the status byte of the power module using the control (PIO) and feedback interface (PII).

The address range of the control (PIO) and feedback interface (PII) depends on how the corresponding entry in the configuration software is configured, or which entry has been selected.

This table shows the PII feedback interface and the PIO control interface for different entries.

Table 4- 1 PII feedback interface and PIO control interface

With STEP 7, HW Config or COM PROFIBUS or other configuration software	PII feedback interface		PIO control interface	
"PM-E DC24V/8A RO"	---		---	
"PM-E DC24V/8A RO S"	EB x	Status byte	AB x	Control byte

Status byte for power modules

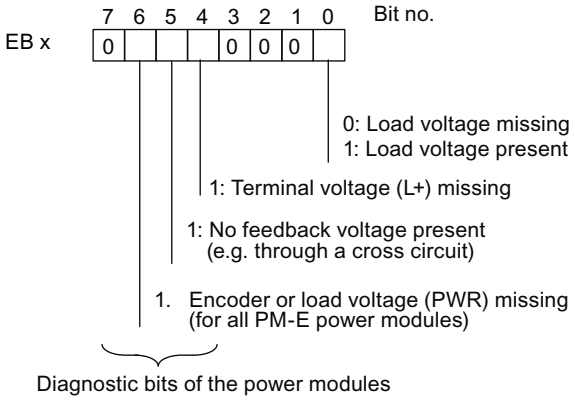


Figure 4-1 Assignment of status byte for power modules

Note

The bit 0 = "0" (load voltage missing), if

- bit 4 = "1" (terminal voltage missing),
- bit 5 = "1" (feedback voltage missing) or
- bit 6 = "1" (encoder or load voltage missing)

Control byte for power modules

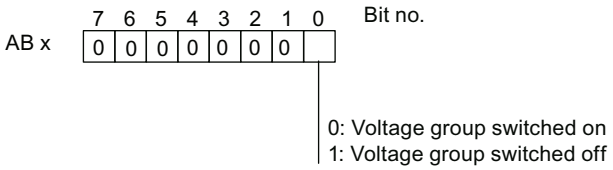


Figure 4-2 Assignment of control byte for power modules