OFFICIAL DOCUMENT PACKAGE

Manufacturer's Manual

Amikon cover with selected official Siemens technical pages

SIEMENS SIMATIC S7-1500R/H

6ES7515-2RN03-0AB0

SIMATIC S7-1500R CPU 1515R-2 PN

Selected official pages retain the original technical tables, ratings, notes and pagination.

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Siemens A5E42009914-AE, 01/2024; exact-model Industry Mall

Original pages 18-19, 30-31, 39-48 and dimension drawings 50-51

This technical extract does not replace the complete equipment and system manuals. Check the installed hardware and project before use.

Additional information

You can find an overview of all new functions, improvements and revisions in the respective firmware versions on the Internet (https://support.industry.siemens.com/cs/ww/en/view/109478459).

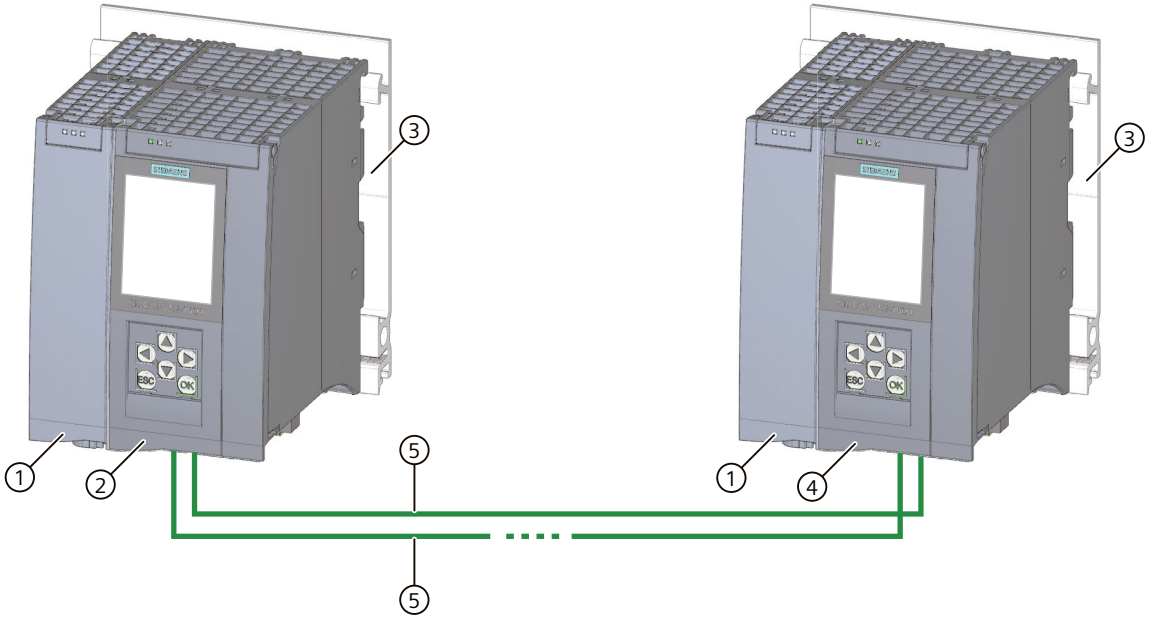
3.2 Configuration and operating principle

Structure

The S7-1500R redundant system consists of the following components:

- Two CPUs of the type CPU 1515R-2 PN
- Two SIMATIC Memory Cards
- PROFINET cable (redundancy connections, PROFINET ring)
- IO devices
- Optional load current supply
- Optional system power supply (only via U-type connector)
- Optional communications processors CP 1543-1 (only via U-type connector)

You mount the CPUs on a common mounting rail or spatially separated on two separate mounting rails. You connect the two CPUs and the IO devices in a PROFINET ring via the PROFINET cable.



① Optional load current supply
② First CPU
③ Mounting rail with integrated DIN rail profile
④ Second CPU
⑤ PROFINET cable (redundancy connections, PROFINET ring)

Figure 3-1 Configuration example for S7-1500R

NOTE

Standard rail adapter

You mount the CPUs on a standardized 35 mm rail using the standard rail adapter.

You will find information on mounting the standard rail adapter in the S7-1500R/H redundant system (https://support.industry.siemens.com/cs/ww/en/view/109754833) System Manual.

Principle of operation

One of the two CPUs in the redundant system takes on the role of CPU for process control (primary CPU). The other CPU takes on the role of the following CPU (backup CPU). The assigned role of the CPUs can change during operation. Synchronization of all relevant data between primary CPU and backup CPU ensures fast switching between CPUs in the event of a primary CPU failure. If the primary CPU fails, the backup CPU retains control of the process as the new primary CPU at the point of interruption.

The redundancy connections are the PROFINET ring with MRP. The CPUs are synchronized via a PROFINET ring.

Additional information

You can find a detailed description of the operation and design of the CPUs in the S7-1500R/H redundant system System Manual.

Connecting

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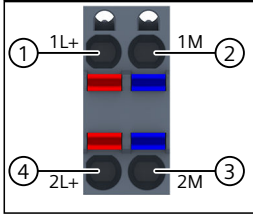
4.1 Terminal assignment

This section provides information on the terminal assignment of the individual interfaces and the block diagram of the CPU 1515R-2 PN.

24 V DC supply voltage (X80)

The connector for the power supply is plugged in when the CPU ships from the factory.
The following table shows the signal names and the descriptions of the pin assignment of the 24 V DC supply voltage.

Table 4-1 Pin assignment 24 V DC supply voltage

View Connector	Signal name [1]		Description
	1	1L+	+ 24 V DC of the supply voltage
	2	1M	Ground of the supply voltage
	3	2M	Ground of the supply voltage for loop-through [2]
	4	2L+	+ 24 V DC of the supply voltage for loop-through [2]

[1] 1L+ and 2L+ as well as 1M and 2M are bridged internally

[2] Maximum 10 A permitted

You can find information on the various supply options in the S7-1500R/H redundant system System Manual.

PROFINET interface X1 with 2-port switch (X1 P1R and X1 P2R)

The assignment corresponds to the Ethernet standard for a RJ45 connector.

- When autonegotiation is deactivated, the RJ45 socket is allocated as a switch (MDI-X).
- When autonegotiation is activated, autocrossing is in effect and the RJ45 socket is allocated either as data terminal equipment (MDI) or a switch (MDI-X).

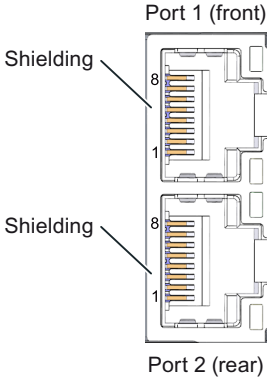


Figure 4-1 PROFINET interface X1 ports

PROFINET interface X2 with 1 port (X2 P1)

The assignment corresponds to the Ethernet standard for a RJ45 connector.

Autocrossing is always active on X2. This means the RJ45 socket is allocated either as data terminal equipment (MDI) or a switch (MDI-X).

Unplugging the PROFINET plug

You need a screwdriver (max. blade width 2.5 mm) to unplug the PROFINET plug.

Removing the display

You can find a description of how to remove and replace the display in the S7-1500R/H redundant system System Manual.

Additional information

You can find more information on the topic of "Connecting the CPU" and on the topic "Accessories/spare parts" in the S7-1500R/H redundant system (https://support.industry.siemens.com/cs/ww/en/view/109754833) System Manual.

Technical specifications

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The following table shows the technical specifications as of 01/2024. You can find a data sheet including daily updated technical specifications on the Internet (https://support.industry.siemens.com/cs/ww/en/pv/6ES7515-2RN03-0AB0/td?dl=en).

Article number	6ES7515-2RN03-0AB0
General information	
Product type designation	CPU 1515R-2 PN
HW functional status	FS04
Firmware version	V3.1
• FW update possible	Yes
Product function	
• I&M data	Yes; I&M0 to I&M3
• Isochronous mode	No
• SysLog	Yes
Engineering with	
• STEP 7 TIA Portal configurable/integrated from version	V19 (FW V3.1) / V18 (FW V3.0); with older TIA Portal versions configurable as 6ES7515-2RM00-0AB0
Display	
Screen diagonal [cm]	6.1 cm
Control elements	
Number of keys	8
Mode buttons	2
Supply voltage	
Rated value (DC)	24 V
permissible range, lower limit (DC)	19.2 V
permissible range, upper limit (DC)	28.8 V
Reverse polarity protection	Yes
Mains buffering	
• Mains/voltage failure stored energy time	5 ms
• Repeat rate, min.	1/s
Input current	
Current consumption (rated value)	0.65 A
Current consumption, max.	0.88 A
Inrush current, max.	1.15 A
I^2t	0.6 $A^2 \cdot s$
Power loss	
Power loss, typ.	3.6 W

Article number	6ES7515-2RN03-0AB0
Memory	
Number of slots for SIMATIC memory card	1
SIMATIC memory card required	Yes
Work memory	
• integrated (for program)	1 Mbyte
• integrated (for data)	4.5 Mbyte
Load memory	
• Plug-in (SIMATIC Memory Card), max.	32 Gbyte
Backup	
• maintenance-free	Yes
CPU processing times	
for bit operations, typ.	20 ns
for word operations, typ.	24 ns
for fixed point arithmetic, typ.	32 ns
for floating point arithmetic, typ.	128 ns
CPU-blocks	
Number of elements (total)	8 000; Blocks (OB, FB, FC, DB) and UDTs
DB	
• Number range	Number range: 1 to 59 999
• Size, max.	4.5 Mbyte; For non-optimized block accesses, the max. size of the DB is 64 KB
FB	
• Number range	0 ... 65 535
• Size, max.	1 Mbyte
FC	
• Number range	0 ... 65 535
• Size, max.	1 Mbyte
OB	
• Size, max.	1 Mbyte
• Number of free cycle OBs	100
• Number of time alarm OBs	20
• Number of delay alarm OBs	20
• Number of cyclic interrupt OBs	20; with minimum OB 3x cycle of 10 ms
• Number of process alarm OBs	50
• Number of DPV1 alarm OBs	3
• Number of startup OBs	100
• Number of asynchronous error OBs	4
• Number of synchronous error OBs	2
• Number of diagnostic alarm OBs	1

Article number	6ES7515-2RN03-0AB0
Nesting depth	
• per priority class	24
Counters, timers and their retentivity	
S7 counter	
• Number	2 048
Retentivity	
– adjustable	Yes
IEC counter	
• Number	Any (only limited by the main memory)
Retentivity	
– adjustable	Yes
S7 times	
• Number	2 048
Retentivity	
– adjustable	Yes
IEC timer	
• Number	Any (only limited by the main memory)
Retentivity	
– adjustable	Yes
Data areas and their retentivity	
Retentive data area (incl. timers, counters, flags), max.	512 kbyte; Available retentive memory for bit memories, timers, counters, DBs, and technology data (axes): 472 KB
Flag	
• Size, max.	16 kbyte
• Number of clock memories	8; 8 clock memory bit, grouped into one clock memory byte
Data blocks	
• Retentivity adjustable	Yes
• Retentivity preset	No
Local data	
• per priority class, max.	64 kbyte; max. 16 KB per block
Address area	
Number of IO modules	4 096; max. number of modules / submodules
I/O address area	
• Inputs	32 kbyte; All inputs are in the process image
• Outputs	32 kbyte; All outputs are in the process image
per integrated IO subsystem	
– Inputs (volume)	8 kbyte
– Outputs (volume)	8 kbyte

Article number	6ES7515-2RN03-0AB0
Subprocess images	
• Number of subprocess images, max.	31
Hardware configuration	
Number of distributed IO systems	16; A distributed I/O system is characterized not only by the integration of distributed I/O via PROFINET, but also by the connection of I/O via IE/PB-Links.
Number of IO Controllers	
• integrated	1
Rack	
• Modules per rack, max.	5; CPU + 2 PS + 2 CP
Time of day	
Clock	
• Type	Hardware clock
• Backup time	6 wk; At 40 °C ambient temperature, typically
• Deviation per day, max.	10 s; Typ.: 2 s
Operating hours counter	
• Number	16
Clock synchronization	
• supported	Yes
• on Ethernet via NTP	Yes
Interfaces	
Number of PROFINET interfaces	2
1. Interface	
Interface types	
• RJ 45 (Ethernet)	Yes; X1
• Number of ports	2
• integrated switch	Yes
Protocols	
• IP protocol	Yes; IPv4
• PROFINET IO Controller	Yes
• PROFINET IO Device	No
• SIMATIC communication	Yes; Only Server
• Open IE communication	Yes; Optionally also encrypted
• Web server	Yes
• Media redundancy	Yes

Article number	6ES7515-2RN03-0AB0
PROFINET IO Controller	
Services	
– Isochronous mode	No
– IRT	No
– PROFIenergy	Yes; per user program
– Number of connectable IO Devices, max.	64
– Updating times	The minimum value of the update time also depends on communication share set for PROFINET IO, on the number of IO devices, and on the quantity of configured user data
– PROFINET Security Class	1
Update time for RT	
– for send cycle of 1 ms	1 ms to 512 ms
2. Interface	
Interface types	
• RJ 45 (Ethernet)	Yes; X2
• Number of ports	1
• integrated switch	No
Protocols	
• IP protocol	Yes; IPv4
• PROFINET IO Controller	No
• PROFINET IO Device	No
• SIMATIC communication	Yes; Only Server
• Open IE communication	Yes; Optionally also encrypted
• Web server	Yes
• Media redundancy	No
Interface types	
RJ 45 (Ethernet)	
• 100 Mbps	Yes
• Autonegotiation	Yes
• Autocrossing	Yes
• Industrial Ethernet status LED	Yes
Protocols	
PROFIsafe	No

Article number	6ES7515-2RN03-0AB0
Number of connections	
• Number of connections, max.	256; via integrated interfaces of the CPU and connected CPs
• Number of connections reserved for ES/HMI/web	10
• Number of connections via integrated interfaces	128
• Number of S7 routing paths	16
Redundancy mode	
• PROFINET system redundancy (S2)	Yes
• PROFINET system redundancy (R1)	No
Media redundancy	
– MRP	Yes; MRP Automanager according to IEC 62439-2 Edition 2.0
– MRP interconnection, supported	Yes; as MRP ring node according to IEC 62439-2 Edition 3.0
– MRPD	No
– Switchover time on line break, typ.	200 ms; PROFINET MRP
– Number of stations in the ring, max.	50; Only 16 are recommended, however
SIMATIC communication	
• PG/OP communication	Yes; encryption with TLS V1.3 pre-selected
• S7 routing	Yes
• S7 communication, as server	Yes
• S7 communication, as client	No
Open IE communication	
• TCP/IP	Yes
– Data length, max.	64 kbyte
– several passive connections per port, supported	Yes
• ISO-on-TCP (RFC1006)	Yes
– Data length, max.	64 kbyte
• UDP	Yes
– Data length, max.	2 kbyte; 1 472 bytes for UDP broadcast
– UDP multicast	Yes; max. 118 multicast circuits
• DHCP	No
• DNS	Yes
• SNMP	Yes
• DCP	Yes
• LLDP	Yes
• Encryption	Yes; Optional

Article number	6ES7515-2RN03-0AB0
Web server	
• HTTP	No
• HTTPS	Yes; only via Web API
• web API	Yes
– Number of sessions, max.	100
– number of simultaneous HTTP calls, max.	4
– HTTP request body, max.	131 072 byte
OPC UA	
• Runtime license required	Yes
• OPC UA Client	No
• OPC UA Server	Yes; Data access (read, write, subscribe), method call, custom address space
– Application authentication	Yes
– Security policies	available security policies: None, Basic128Rsa15, Basic256Rsa15, Basic256Sha256, Aes128Sha256RsaOaep, Aes256Sha256RsaPss
– User authentication	"anonymous" or by user name & password
– GDS support (certificate management)	No
– Number of sessions, max.	24
– Number of subscriptions per session, max.	25
– Sampling interval, min.	250 ms
– Publishing interval, min.	250 ms
– Number of server methods, max.	50
– Number of inputs/outputs per server method, max.	20
– Number of monitored items, recommended max.	2 000; for 1 s sampling interval and 1 s send interval
– Number of server interfaces, max.	10 of each "Server interfaces" / "Companion specification" type and 20 of the type "Reference namespace"
– Number of nodes for user-defined server interfaces, max.	30 000
• Alarms and Conditions	No
Further protocols	
• MODBUS	Yes; MODBUS TCP

Article number	6ES7515-2RN03-0AB0
S7 message functions	
Number of login stations for message functions, max.	64
number of subscriptions, max.	500
number of tags/attributes for subscriptions, max.	8 000
Program alarms	Yes
Number of configurable program messages, max.	10 000; Program messages are generated by the "Program_Alarm" block, ProDiag or GRAPH
Number of loadable program messages in RUN, max.	10 000
Number of simultaneously active program alarms	
• Number of program alarms	1 000
• Number of alarms for system diagnostics	200
Test commissioning functions	
Joint commission (Team Engineering)	No
Status block	Yes; up to 8 simultaneously
Single step	No
Number of breakpoints	8; Breakpoints are only supported in RUN-Solo status
Status/control	
• Status/control variable	Yes
• Variables	Inputs/outputs, memory bits, DBs, distributed I/Os, timers, counters
• Number of variables, max.	
– of which status variables, max.	200; per job
– of which control variables, max.	200; per job
Forcing	
• Forcing	Yes
• Forcing, variables	Peripheral inputs/outputs
• Number of variables, max.	200
Diagnostic buffer	
• present	Yes
• Number of entries, max.	3 200
– of which powerfail-proof	500
Traces	
• Number of configurable Traces	4
• Memory size per trace, max.	512 kbyte

Article number	6ES7515-2RN03-0AB0
Interrupts/diagnostics/status information	
Diagnostics indication LED	
• RUN/STOP LED	Yes
• ERROR LED	Yes
• MAINT LED	Yes
• STOP ACTIVE LED	Yes
• Connection display LINK TX/RX	Yes
Supported technology objects	
Motion Control	No
Controller	
• PID_Compact	Yes; Universal PID controller with integrated optimization
• PID_3Step	Yes; PID controller with integrated optimization for valves
• PID-Temp	Yes; PID controller with integrated optimization for temperature
Counting and measuring	Yes
Standards, approvals, certificates	
Suitable for safety functions	No
Ambient conditions	
Ambient temperature during operation	
• horizontal installation, min.	-30 °C; No condensation
• horizontal installation, max.	60 °C; Display: 50 °C, at an operating temperature of typically 50 °C, the display is switched off
• vertical installation, min.	-30 °C; No condensation
• vertical installation, max.	40 °C; Display: 40 °C, at an operating temperature of typically 40 °C, the display is switched off
Ambient temperature during storage/transportation	
• min.	-40 °C
• max.	70 °C
Altitude during operation relating to sea level	
• Installation altitude above sea level, max.	5 000 m; Restrictions for installation altitudes > 2 000 m, see manual
configuration / header	
configuration / programming / header	

Article number	6ES7515-2RN03-0AB0
Programming language	
– LAD	Yes
– FBD	Yes
– STL	Yes
– SCL	Yes
– CFC	No
– GRAPH	Yes
Know-how protection	
• User program protection/password protection	Yes
• Copy protection	No
• Block protection	Yes
Access protection	
• protection of confidential configuration data	Yes
• Password for display	Yes
• Protection level: Write protection	Yes
• Protection level: Read/write protection	Yes
• Protection level: Write protection for Failsafe	No
• Protection level: Complete protection	Yes
• User administration	Yes
programming / cycle time monitoring / header	
• lower limit	adjustable minimum cycle time
• upper limit	adjustable maximum cycle time
Dimensions	
Width	70 mm
Height	147 mm
Depth	129 mm
Weights	
Weight, approx.	456 g

General technical specifications

You can find information on the general technical specifications, such as standards and approvals, electromagnetic compatibility, protection class, etc. in the S7-1500R/H redundant system System Manual.

Dimension drawing

A

This section contains the dimensional drawing of the module on the mounting rail, as well as a dimensional drawing with the front panel open. Keep to the dimensions when installing in cabinets, control rooms, etc.

Dimension drawings of the CPU 1515R-2 PN

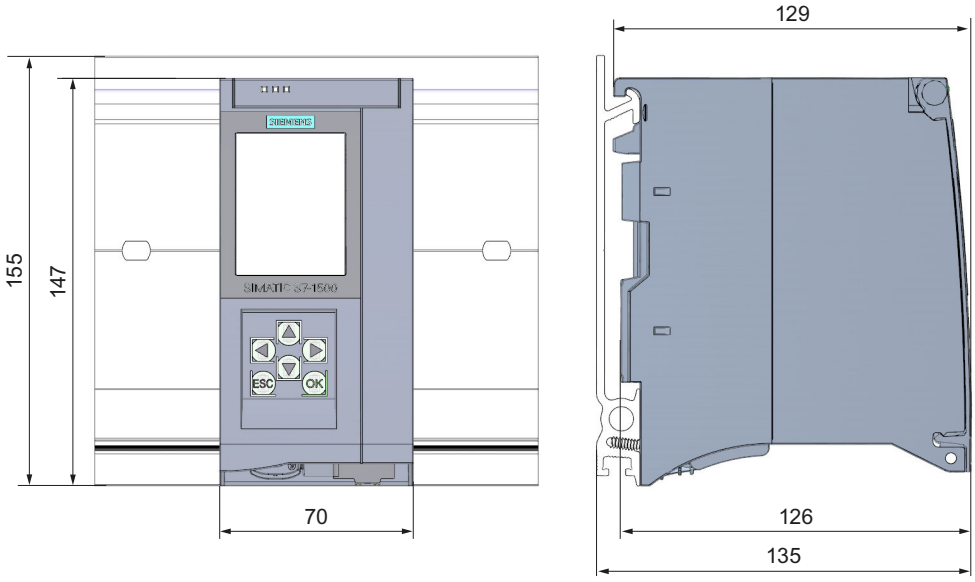

Figure A-1 Dimension drawing of CPU 1515R-2 PN, front and side views

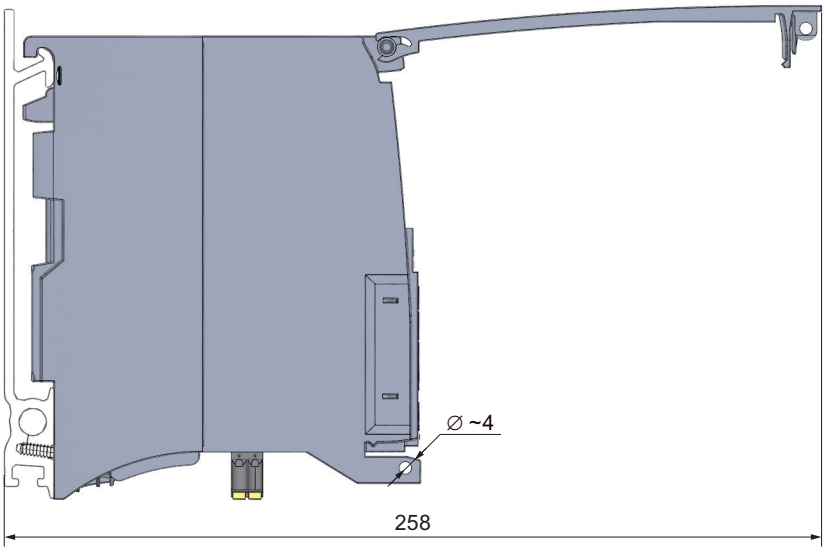

Figure A-2 Dimension drawing CPU 1515R-2 PN, side view with open front panel