SIEMENS

SIMATIC
S7-1200
Update to the S7-1200 System Manual, edition 09/2016
Product Information

Overview to Documentation Update S7-1200

In spite of efforts to ensure the accuracy and clarity in the product documentation, some of the pages in the *S7-1200 Programmable Controller System Manual* contain information that has been identified as being incomplete, incorrect or misleading.

This document contains the following updates

A5E03929122-AN, 02/2018

- SB 1231 Input impedance (Page 14)
- Default priorities for cyclic interrupt and time delay interrupt OBs (Page 15)

Input transfer areas behave differently upon network loss between controller and I-device

On the controller, the CPU writes zero to the input transfer areas upon network loss. On the I-device, the input transfer areas retain their last values.

You can configure your system to avoid this condition for the general I-device case (non-shared I-device). To do this, clear the input transfer areas for the I-device in a "Rack or Station Failure OB" for a coming event. Follow these steps:

1. Add a "Rack or Station Failure OB" to your project. (This OB defaults to the number OB 86).
2. Add logic to the OB to write the values of the inputs for the I-device to zero when the startup variable of LADDR indicates the value of the I-device hardware ID and the startup variable of Event_Class indicates a "coming" event:
   - You can find the I-device hardware ID in the Default tag table in the "System constants" tab. The hardware ID is a type of "HW_Device", and the name of the tag indicates that it is an I-device (for example, "Local~PROFINET_interface_1~IODevice").
   - A value of "16#39" in the Event_Class indicates a "coming" event. If the "Event_Class" input variable contains the value of "16#39", this indicates that the "Rack or Station Failure OB" is now active (as opposed to being cleared).

Modbus RTU, Modbus_Comm_Load, EN parameter must be held true until Instruction completion

The Modbus RTU, Modbus_Comm_Load instruction uses the read and write data recording function to initialize the PTP module. However, the RDREC/WRREC instruction works asynchronously, which means that it takes several scans for the instruction to complete. Therefore, you must hold the EN parameter of the Modbus_Comm_Load true until completion of the RDREC/WRREC instruction.

Motion control axis configuration encoder modules

In Section 10.3.4.7: "Axis control using the TM Pulse module", in the steps to configure the Axis of Motion with position feedback, "Step 4" directs you to select an encoder. The correct list of encoders consists of the following:

- TM Count module
- TM PosInput module
- High-Speed Counter (HSC)

Possible error with Web server restore operation

When performing a restore operation from the S7-1200 V4.2.0 Web server Online backup page, occasionally the restore operation fails to complete. The Online backup page displays one of the following messages in this case:

- `Error while loading online backup. Error 6: Error while writing the backup file to the CPU.`
- `Error while loading online backup. Error 0: Internal error.`

If a restore fails, reattempt it. If it still fails, reattempt it using Internet Explorer.

The restore operation does not produce this error with the S7-1200 V4.2.1 Web server.

Cause of OB 0 buffer overflow diagnostic events

If you have configured rising or falling edge detection for a digital input in the device configuration of the CPU, but have not configured an OB to be triggered on that edge, you can get OB 0 buffer overflow events in the diagnostic buffer if the input repeatedly triggers a rising/falling edge in rapid succession.

To avoid, don't configure an edge condition in the device configuration for which you do not configure or attach an associated OB. You can create a hardware interrupt OB that corresponds to the edge event or you can use the ATTACH instruction in your program to attach an OB to the edge event.

Additionally, do not program the DETACH instruction to detach an edge condition from the OB you assigned or attached to the edge event. Leaving a rapidly-occurring edge condition unassigned to an OB can cause the OB 0 buffer overflow events.

Correction to topic "Processing of analog values"

Section 5.3, "Processing of analog values" of the *S7-1200 Programmable Controller System Manual* correctly states in the description that 27648 is the upper range for voltage for the raw analog signal. The example, however, including the sample ladder logic incorrectly uses 24768 for the upper range. Use 27648 instead of 24768 in all cases in the example.

Correction to table, Status LEDs for a signal module (SM)

Section 15.1, "Status LEDs", table 15-2 Status LEDs for a signal module (SM) has been updated to show that the LED for "Field-side power is off" is only supported on the analog signal modules.

Table 1 Status LEDs for a signal module (SM)

Description	DIAG (Red / Green)	I/O Channel (Red / Green)
Field-side power is off *	Flashing red	Flashing red
Not configured or update in progress	Flashing green	Off
Module configured with no errors	On (green)	On (green)
Error condition	Flashing red	-
I/O error (with diagnostics enabled)	-	Flashing red
I/O error (with diagnostics disabled)	-	On (green)

* Status is only supported on the analog signal modules.

Correction to table, Connector pin locations for SM 1231 AI 8 x TC bit

Appendix A, Table A-168 has been updated to show correct pin locations for X12 and X13.

Table 2 Connector Pin Locations for SM 1231 AI 8 x TC bit (6ES7231-5QF32-0XB0)

Pin	X10 (gold)	X11 (gold)	X12 (gold)	X13 (gold)
1	L+ / 24 V DC	No connection	No connection	No connection
2	M / 24 V DC	No connection	No connection	No connection
3	Functional Earth	No connection	No connection	No connection
4	AI 0+ /TC	AI 2+ /TC	AI 4+ /TC	AI 6+ /TC
5	AI 0- /TC	AI 2- /TC	AI 4- /TC	AI 6- /TC
6	AI 1+ /TC	AI 3+ /TC	AI 5+ /TC	AI 7+ /TC
7	AI 1- /TC	AI 3- /TC	AI 5- /TC	AI 7- /TC

Notes for TINFO and AINFO parameters for the RALRM (Receive interrupt) instruction

TINFO and AINFO are IN_OUT parameters for the RALRM (Receive interrupt) instruction. You can store these parameter structures in a PLC tag table or in a standard (non-optimized) DB. You cannot store them in the local block interface or in an optimized DB. If TINFO or AINFO structures are in the local block interface or in an optimized DB, RALRM does not return correct values in the TINFO or AINFO parameter and the STATUS output is 0.

See the description "Optimized and standard data blocks" in section 7.3.4 of the *S7-1200 Programmable Controller System Manual* for further information on data block access.

See topic 9.3.7 in the *S7-1200 Programmable Controller System Manual* for a description of the RALRM (Receive interrupt) instruction.

Correction to tables, CPU power supply

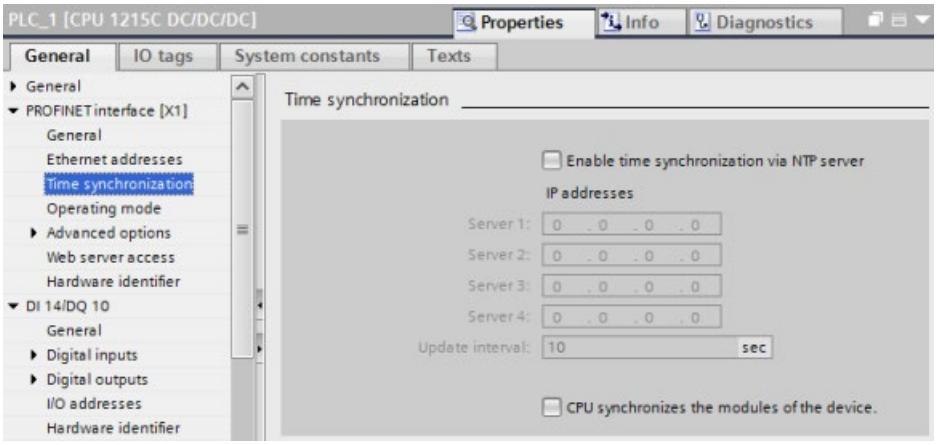
The CPU power supply tables are updated to show the I^2t values. This new row is required below row, "Inrush Current". The S7-1200 CPUs and values are shown below:

- Table A-14, Power Supply (CPU 1211C)
  - CPU 1211C AC/DC/Relay (6ES7211-1BE40-0XB0): 0.8 A^2 s
  - CPU 1211C DC/DC/Relay (6ES7211-1HE40-0XB0): 0.5 A^2 s
  - CPU 1211C DC/DC/DC (6ES7211-1AE40-0XB0): 0.5 A^2 s
- Table A-33, Power Supply (CPU 1212C)
  - CPU 1212C AC/DC/Relay (6ES7212-1BE40-0XB0): 0.8 A^2 s
  - CPU 1212C DC/DC/Relay (6ES7212-1HE40-0XB0): 0.5 A^2 s
  - CPU 1212C DC/DC/DC (6ES7212-1AE40-0XB0): 0.5 A^2 s
- Table A-52, Power Supply (CPU 1214C)
  - CPU 1214C AC/DC/Relay (6ES7214-1BG40-0XB0): 0.8 A^2 s
  - CPU 1214C DC/DC/Relay (6ES7214-1HG40-0XB0): 0.5 A^2 s
  - CPU 1214C DC/DC/DC (6ES7214-1AG40-0XB0): 0.5 A^2 s

  Table A-71, Power Supply (CPU 1215C)
  - CPU 1215C AC/DC/Relay (6ES7215-1BG40-0XB0): 0.8 A^2 s
  - CPU 1215C DC/DC/Relay (6ES7212-1HG40-0XB0): 0.5 A^2 s
  - CPU 1215C DC/DC/DC (6ES7215-1AG40-0XB0): 0.5 A^2 s
- Table A-92, Power Supply (CPU 1217C)
  - CPU 1217C DC/DC/DC (6ES7217-1AG40-0XB0): 0.5 A^2 s

Time source configuration

As described in sections 6.10 "Time Synchronization" and 11.2.6 "Configuring Network Time Protocol (NTP) synchronization" of the *S7-1200 Programmable Controller System Manual*, the S7-1200 CPU can receive its time synchronization from CP modules that support time synchronization and from an NTP server.



However, only configure one time source for the station. Receiving time synchronizations from more than one source (NTP server or CP module, for example) could cause conflicting time updates. Time synchronizations from multiple sources could adversely affect instructions and events based on time of day.

Correction to table, Operating conditions

Table A-6, Operating conditions has been corrected to show that the Atmospheric pressure is: 1139 to 795 hPa (corresponding to an altitude of -1000 to 2000 m).

Table 3 Operating conditions

Environmental conditions - Operating	
Ambient temperature range (Inlet Air 25 mm below unit)	-20 °C to 60 °C horizontal mounting -20 °C to 50 °C vertical mounting 95% non-condensing humidity Unless otherwise specified
Atmospheric pressure	1139 to 795 hPa (corresponding to an altitude of -1000 to 2000 m)
Concentration of contaminants	$S0_2$: < 0.5 ppm; H_2S: < 0.1 ppm; RH < 60% non-condensing
	ISA-S71.04 severity level G1, G2, G3
EN 60068-2-14, Test Nb, temperature change	5 °C to 55 °C, 3 K/minute
EN 60068-2-27 Mechanical shock	15 g, 11 ms pulse, 6 shocks in each of 3 axis
EN 60068-2-6 Sinusoidal vibration	DIN rail mount: 3.5 mm from 5-9 Hz, 1G from 8.4 - 150 Hz Panel Mount: 7.0 mm from 5-8.4 Hz, 2G from 8.4 to 150 Hz 10 sweeps each axis, 1 octave per minute

Correction to tables: Step response, and Sample time and update times for the analog inputs

Table A-157 Step response of the analog inputs has been updated to remove row, Sample time.

Table 4 Step response (ms), 0 to full-scale measured at 95%

Smoothing selection (sample averaging)	Noise reduction/rejection frequency (Integration time selection)			
	400 Hz (2.5 ms)	60 Hz (16.6 ms)	50 Hz (20 ms)	10 Hz (100 ms)
None (1 cycle): No averaging	4 ms	18 ms	22 ms	100 ms
Weak (4 cycles): 4 samples	9 ms	52 ms	63 ms	320 ms
Medium (16 cycles): 16 samples	32 ms	203 ms	241 ms	1200 ms
Strong (32 cycles): 32 samples	61 ms	400 ms	483 ms	2410 ms

Table A-158, Sample time and update times for the analog inputs has been corrected to show the sample and module update times for the 4-channel x 16 bit SM / 400 Hz (2.5ms) as 0.417 ms.

Table 5 Sample and module update times for all channels

Rejection frequency (Integration time)	Sample and module update times for all channels			
	400 Hz (2.5 ms)	60 Hz (16.6 ms)	50 Hz (20 ms)	10 Hz (100 ms)
4-channel x 13 bit SM	0.625 ms	4.17 ms	5 ms	25 ms
8-channel x 13 bit SM	1.25 ms	4.17 ms	5 ms	25 ms
4-channel x 16 bit SM	0.417 ms	0.397 ms	0.400 ms	0.400 ms

Recipe data: editing name field of PLC data type element

This note applies to "Display CSV recipe data in Excel" in Section 9.9.1.2: "Recipe example".

Note

Commas in the name field of the PLC data type element

Do not place commas in the name field of the PLC data type element(s) used in a recipe. If you place commas in the name field, Excel inserts extra columns in the displayed .csv file. These extra columns can introduce errors when you edit the recipe record file start values.

Update to Note: Section 11.5: "S7 communication", Device exchange GET/PUT operation enabling

The Note below describes how to enable a GET/PUT operation in a device exchange process. Section 11.5.1: "GET and PUT (Read and write from a remote CPU)" and Section 11.5.4: "GET/PUT connection parameter assignment" both contain the updated Note.

Note

Device exchange: Replacing an older CPU with a V4.x CPU does not automatically enable a GET/PUT operation in the CPU's program

When you use "Device exchange" to upgrade an existing V3.0 CPU program to a V4.x CPU, the CPU automatically enables the GET/PUT operation to provide consistent behavior with the older CPU version.

However, when you use a "Device exchange" to upgrade an existing V4.x CPU program to a V4.x CPU, the CPU does not automatically enable the GET/PUT operation. You must go to the CPU "Device configuration", inspector window "Properties" tab, "Protection" property to enable GET/PUT access (Section 7.6.1: "Access protection for the CPU").

Update to Notes: Section 9.8.4: "Configuring a pulse channel for PWM or PTO" PWM minimum cycle times

The first and second Notes in Section 9.8.4: "Configuring a pulse channel for PWM or PTO" contain information about PWM minimum cycle times. The first Note contains updated information, and the second Note is new.

Note

The minimum cycle time of each of the CPU and Signal Board outputs is given in the tables above. However, the TIA Portal does not alert you when you configure a PWM pulse generator with a cycle time that falls below the minimum cycle time of the hardware. Problems can result with your application, so always ensure that the cycle time lies within the hardware limits.

Note

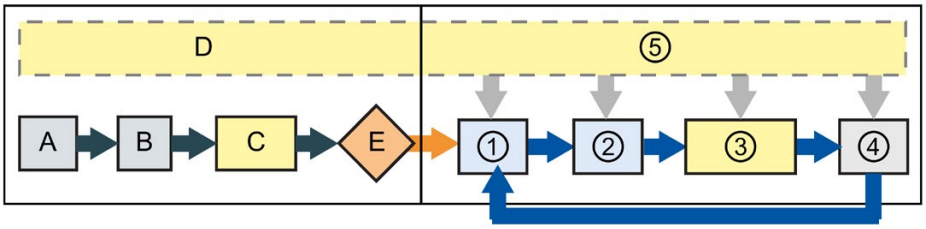
When you set the Pulse duration of a PWM signal, the actual Pulse duration time (time that the pulse is high) must be greater than or equal to 1 millisecond if the Time base is "Milliseconds". If the Time base is "Microseconds", the actual Pulse duration time must be greater than or equal to 1 microsecond. The output turns off if the Pulse duration time is less than 1 "Time base".

For example, a Cycle time of 10 microseconds and a Pulse duration of 5 hundredths produces a Pulse duration time of 0.5 microseconds. Because this is less than 1 microsecond, the PWM signal is off.

CPU behavior in STARTUP and RUN mode

Section 5.1.1, "Operating modes of the CPU" contains incorrect information in the description of the STARTUP behavior.

In STARTUP and RUN modes, the CPU performs the tasks shown in the following figure:



STARTUP

A	Copies the state of the physical inputs to I memory
B	Initializes the Q output (image) memory area with either zero, the last value, or the configured substitute value. Zeroes PB, PN, and AS-i outputs
C	Initializes non-retentive M memory and data blocks to their initial value and enables configured cyclic interrupt and time of day events. Executes the startup OBs.
D	Stores any interrupt events into the queue to be processed after entering RUN mode
E	Enables the writing of Q memory to the physical outputs

RUN

①	Writes Q memory to the physical outputs
②	Copies the state of the physical inputs to I memory
③	Executes the program cycle OBs
④	Performs self-test diagnostics
⑤	Processes interrupts and communications during any part of the scan cycle

LED instruction parameters

You cannot use the LED instruction to read the Link or Tx/Rx LED status. In earlier versions of the S7-1200 CPU, you could set the LED input parameter to 5 to read the Link LED status. You could set the LED input parameter to 6 to read the Tx/RX LED status.

In the current version, if you set the LED input parameter to 5 or 6, the instruction returns 9 (State of the LED is not available) in the RET_VAL parameter.

The topic "LED (Read LED status)" at section 9.7.3 of the *S7-1200 Programmable Logic Controller System Manual* incorrectly documents LED identifiers 5 and 6 for the LED parameter. This topic also incorrectly lists RET_VAL states 7 and 8 for the Tx/RX LED. These input parameter values and return values are not valid.

CPU response to a time error

Sections 5.1.3.6, 5.1.4 and 8.8.6 of the *S7-1200 Programmable Logic Controller System Manual* describe the response of the S7-1200 CPU to a time error. Sections 5.1.3.6 and 5.1.4 have outdated and incorrect information about the operating mode of the CPU following a time error when no time error OB exists. Those sections also imply that the operating mode following a time error is configurable. It is not. The correct description of the CPU response to a time error is as follows:

All time error events trigger the execution of the time error interrupt OB if it exists. In this case, the CPU remains in RUN mode after the first time error event occurs. The CPU goes to STOP mode after a second occurrence of a time error event.

If the time error interrupt OB does not exist, then the CPU behavior depends on the following conditions:

Condition	Behavior
The following sequence of actions occurred: 1. The program executing in the CPU formerly included a time error interrupt OB. 2. A time error interrupt OB was removed from the STEP 7 program. 3. A program with no time error interrupt OB was down-loaded to the CPU with no intervening reset to factory defaults.	The CPU goes to STOP mode and logs a diagnostic buffer entry after the first time error event
Either of the following conditions: • The program executing in the CPU never included a time error interrupt OB. • The program executing in the CPU formerly included a time error interrupt OB. The CPU was reset to factory defaults. The current program executing in the CPU does not include a time error interrupt OB.	The CPU remains in RUN mode after the first time error event. The CPU goes to STOP mode and logs a diagnostic buffer entry after the second time error event.

Update to tables: Transport and Storage, and Operating conditions

Tables A-5, Transport and Storage, and A-7 Operating conditions have been updated to show atmospheric pressure as:

- Table A-5 Atmospheric pressure: 1139 to 660 hPa (corresponding to an altitude of -1000 to 3500 m)
- Table A-6 atmospheric pressure: 1139 to 795 hPa (corresponding to an altitude of -1000 to 2000 m)

Table 6 A-5 Transport and storage

Environmental conditions - Transport and storage	
EN 60068-2-2, Test Bb, Dry heat and EN 60068-2-1, Test Ab, Cold	-40 °C to +70 °C
EN 60068-2-30, Test Db, Damp heat	25 °C to 55 °C, 95% humidity
EN 60068-2-14, Test Na, temperature shock	-40 °C to +70 °C, dwell time 3 hours, 2 cycles
EN 60068-2-32, Free fall	0.3 m, 5 times, product packaging
Atmospheric pressure	1139 to 660 hPa (corresponding to an altitude of -1000 to 3500 m)

Table 7 A-6 Operating and climatic

Environmental conditions - Operating and climatic	
The S7-1200 automation system is suitable for use in weather-proof, fixed locations. The operating conditions are based on requirements according to DIN IEC 60721-3-3: • Class 3M3 (mechanical requirements) • Class 3K3 (climatic requirements)	
Ambient temperature range (Inlet Air 25 mm below unit)	-20 °C to 60 °C horizontal mounting -20 °C to 50 °C vertical mounting 95% non-condensing humidity Unless otherwise specified
Atmospheric pressure	1139 to 795 hPa (corresponding to an altitude of -1000 to 2000 m)
Concentration of contaminants	$S0_2$: < 0.5 ppm; H_2S: < 0.1 ppm; RH < 60% non-condensing
	ISA-S71.04 severity level G1, G2, G3
EN 60068-2-14, Test Nb, temperature change	5 °C to 55 °C, 3 K/minute
EN 60068-2-27 Mechanical shock	15 g, 11 ms pulse, 6 shocks in each of 3 axis
EN 60068-2-6 Sinusoidal vibration	DIN rail mount: 3.5 mm from 5-9 Hz, 1G from 8.4 - 150 Hz Panel Mount: 7.0 mm from 5-8.4 Hz, 2G from 8.4 to 150 Hz 10 sweeps each axis, 1 octave per minute

CM modules that support communications over distributed I/O

Section 13.3.1 lists the CM modules that support communications over distributed I/O. Some of the article numbers in the table are incorrect. The corrected table with the correct article numbers is as follows:

Station	Module	Article number	Interface
ET 200MP	CM PtP RS232 BA	6ES7540-1AD00-0AA0	RS232
	CM PtP RS232 HF	6ES7541-1AD00-0AB0	RS232
	CM PtP RS422/485 BA	6ES7540-1AB00-0AA0	RS422/RS485
	CM PtP RS422/485 HF	6ES7541-1AB00-0AB0	RS422/RS485
ET 200SP	CM PtP	6ES7137-6AA00-0BA0	RS232 and RS422/RS485

Inclusion of local time in data logs

You can set the TIMESTAMP parameter of the DataLogCreate instruction to 2 to cause the local time to be included in data log entries.

Valid values for the TIMESTAMP input parameter are as follows:

Table 8 TIMESTAMP parameter for the DataLogCreate instruction

Parameter and type		Data type	Description
TIMESTAMP	IN	UInt	Data time stamp format: Column headers for date and time fields are optional. The time stamp can use either the system time (Coordinated Universal Time - UTC) or the local time. • 0 - No time stamp • 1 - Date and time stamp, system time (Default value) • 2 - Date and time stamp, local time

Prevention and recovery of STEP 7 user program loss

S7-1200 V4.2 firmware can cause loss of the STEP 7 user program under the following conditions:

- You have performed a firmware update from V4.x to V4.2 by one of the following methods without resetting the CPU to factory defaults afterwards:
  - Online and Diagnostics in the TIA Portal
  - S7-1200 Web Server
  - SIMATIC Automation Tool
- You are not using a SIMATIC memory card in the S7-1200 CPU as external load memory.
- The STEP 7 User Program or TIA Portal is writing to internal load memory. For example, a program that is writing data logs, recipes, or data blocks is writing to internal load memory. When you download hardware configuration or software to an S7-1200 CPU with no memory card, the download is writing to internal load memory.

Preventing program loss

If you need to perform a firmware update to V4.2, you have two options to prevent loss of your STEP 7 user program:

- Create a firmware update memory card and use this card to update the firmware. See the *S7-1200 Programmable Controller System Manual* for additional information.
- If you do not use a memory card to update the firmware, reset the CPU to factory defaults after updating the firmware. After the reset, download the STEP 7 user program to the CPU.

Recovering from a program loss

If you have already experienced the loss of your program, reset the CPU to factory defaults. After the reset, download the STEP 7 user program to the CPU.

Addition of function code 23 documentation in Modbus TCP MB_SERVER instruction, MB_HOLD_REG parameters

The function code 23 documentation below updates information in the Modbus "TCP MB_SERVER" instruction, MB_HOLD_REG parameters:

- In Section 13.5.2.3: "Modbus TCP instructions", "MB_SERVER (Communicate using PROFINET as Modbus TCP server) instruction", on page 1179, in Table 13-63: "Data types for the parameters", "MB_HOLD_REG" row, in the "Description" column, added "and 23 (write/read)" to the last sentence so that the sentence now reads as follows: "This memory area is used to hold the data a Modbus client is allowed to access using Modbus register functions 3 (read), 6 (write), 16 (write), and 23 (write/read)."
- In Section 13.5.2.3: "Modbus TCP instructions", "MB_SERVER (Communicate using PROFINET as Modbus TCP server) instruction", on page 1179, after the Note following Table 13-63: "Data types for the parameters", added a new NOTE that reads as follows: "Using Function 23 with the MB_SERVER instruction: The MB_SERVER instruction supports the use of function code 23 for writing to and reading from a holding register in a single request; however, the MB_CLIENT instruction does NOT support this function and returns an error code. You should also note that while the request contains both the read and write, the instruction processes the write before the read.

The table and Notes below show how these changes will look in the manual:

Table 9 Data types for the parameters

Parameter and type		Data type	Description
DISCONNECT	IN	Bool	MB_SERVER attempts to make a "passive" connection with a partner device. This means that the server is passively listening for a TCP connection request from any requesting IP address. If DISCONNECT = 0 and a connection does not exist, then a passive connection can be initiated. If DISCONNECT = 1 and a connection exists, then a disconnect operation is initiated. This parameter allows your program to control when a connection is accepted. Whenever this input is enabled, no other operation will be attempted.
CONNECT	IN	Variant	Reference to a Data block structure that contains connection parameters in the system data type "TCON_IP_v4".
MB_HOLD_REG	IN_OUT	Variant	Pointer to the MB_SERVER Modbus holding register: The holding register must either be a non-optimized global DB or an M memory address. This memory area is used to hold the data a Modbus client is allowed to access using Modbus register functions 3 (read), 6 (write), 16 (write), and 23 (write/read).
NDR	OUT	Bool	New Data Ready: 0 = No new data, 1 = Indicates that new data has been written by a Modbus client
DR	OUT	Bool	Data Read: 0 = No data read, 1 = Indicates that data has been read by a Modbus client.
ERROR	OUT	Bool	The ERROR bit is TRUE for one scan, after MB_SERVER execution ended with an error. The error code at the STATUS parameter is valid only during the single cycle where ERROR = TRUE.
STATUS	OUT	Word	Execution condition code

Note

CPU firmware version requirement

The Modbus TCP instructions described in this section of the manual require firmware release V4.1 or later.

Note

Using Function 23 with the MB_SERVER instruction

The MB_SERVER instruction supports the use of function code 23 for writing to and reading from a holding register in a single request; however, the MB_CLIENT instruction does NOT support this function and returns an error code. You should also note that while the request contains both the read and write, the instruction processes the write before the read.

PID_Compact "OverwriteInitialOutputValue" parameter execution error

Reason for error

These two scenarios show the use of the "OverwriteInitialOutputValue" parameter and how the execution error occurs:

- Scenario 1: When the controller changes from inactive (State = 0) to automatic mode (State = 3) and "IntegralResetMode" = 3, then the controller internally modifies "PIDCtrl.IntegralSum" to set the "Output" equal to "OverwriteInitialOutputValue" in the last controller algorithm execution. The controller initializes further calculation from this value. (As long as there is a control deviation, "Output" is not 100% equal to "OverwriteInitialOutputValue" after the first execution in automatic mode because the control deviation immediately changes the integral portion of "PIDCtrl.IntegralSum".)
- Scenario 2: When the controller is already in automatic mode, you can initialize without a mode change by setting "PIDCtrl.PIDInit" = TRUE. This is useful, for example, for override controllers as described in the STEP 7 Information System).

When the control logic is inverted, the CPU does not process the sign of "OverwriteInitialOutputValue" correctly. The problem occurs for both scenarios, but only when the control logic is inverted ("Config.InvertControl" = TRUE). This problem only concerns PID_Compact because PID_3Step has no "IntegralResetMode" or "PIDCtrl.PIDInit" tags and PID_Temp has no control logic inversion.

Example

An "Output" value of approximately -40 results (given that the output lower limit allows negative values, but this is not the default setting) if either of the following conditions occurs:

- If "OverwriteInitialOutputValue" = 40 and the controller state changes from inactive to automatic (while "IntegralResetMode" = 3)
- If "OverwriteInitialOutputValue" = 40 and "PIDCtrl.PIDInit" is set to TRUE (while the controller is in automatic mode)

If you use the default setting for output lower limit, which is 0.0, then "Output" is 0 because it is limited to the output lower limit. The sign of the output value, therefore, is incorrect when control logic inversion is active.

Workaround

A workaround is to switch the sign of the "OverwriteInitialOutputValue" parameter when control logic inversion is active. In the example above, an "OverwriteInitialOutputValue" parameter value of -40 results in the desired "Output" value of approximately 40.0.

Corrections to wiring diagrams: SM 1232 and SM 1234

The wiring diagram and connector pin locations for the following analog signal modules have been corrected:

- SM 1232 AQ 4 x 14 bit (6ES7232-4HD32-0XB0)
- SM 1234 AI 1234 AI 4 x 13 bit/AQ2 x 14 bit (6ES7234-4HE32-0XB0)

Table 10 Wiring diagram for the SM 1232 AQ 4 x 14 bit (6ES7232-4HD32-0XB0)

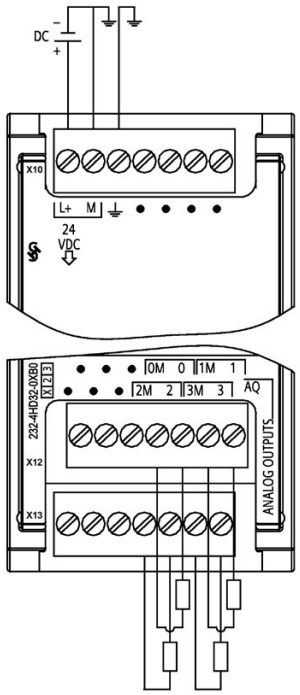
SM 1232 AQ 4 x 14 bit (6ES7232-4HD32-0XB0)	
	
Note: Connectors must be gold. See S7-1200 System Manual, Appendix C, Spare Parts for article number.	

Table 11 Connector pin locations for SM 1232 AQ 4 x 14 bit (6ES7232-4HD32-0XB0)

Pin	X10 (gold)	X12 (gold)	X13 (gold)
1	L+ / 24 V DC	No connection	No connection
2	M / 24 V DC	No connection	No connection
3	Functional Earth	No connection	No connection
4	No connection	AQ 0M	AQ 2M
5	No connection	AQ 0	AQ 2
6	No connection	AQ 1M	AQ 3M
7	No connection	AQ 1	AIQ 3

Table 12 Wiring diagram for the SM 1234 AI 4 x 13 bit / AQ 2 x 14 bit (6ES7234-4HE32-0XB0)

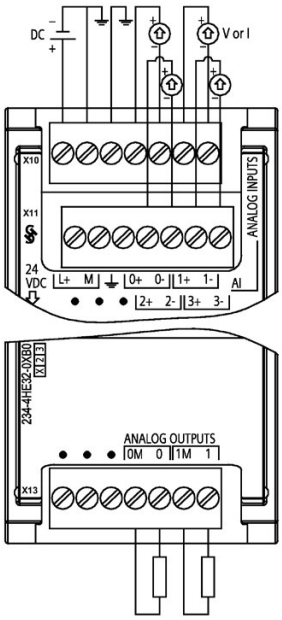
SM 1234 AI 4 x 13 bit / AQ 2 x 14 bit (6ES7234-4HE32-0XB0)	
	
Note: Connectors must be gold. See S7-1200 System Manual, Appendix C, Spare Parts for article number.	

Table 13 Connector pin locations for SM 1234 AI 4 x 13 bit / AQ 2 x 14 bit (6ES7234-4HE32-0XB0)

Pin	X10 (gold)	X11 (gold)	X13 (gold)
1	L+ / 24 V DC	No connection	No connection
2	M / 24 V DC	No connection	No connection
3	Functional Earth	No connection	No connection
4	AI 0+	AI 2+	AQ 0M
5	AI 0-	AI 2-	AQ 0
6	AI 1+	AI 3+	AQ 1M
7	AI 1-	AI 3-	AQ 1

Communications connections

The S7-1200 CPU supports the following maximum number of simultaneous asynchronous communications. Tables A-13, A-32, A-51, A-70, and A-91 have been updated to show the Connections as:

- 8 connections for Open User Communication (active or passive): TSEND_C, TRCV_C, TCON, TDISCON, TSEND, and TRC
- 8 CPU-to-CPU connections (client or server) for GET/PUT data
- 6 connections for dynamic allocation to either GET/PUT or Open User Communication

SB 1231 Input impedance

Table A-207, Analog inputs for the SB 1231 AI 1x12 bit has been updated to show:

Input Impedance: Voltage: >150 kΩ; Current 250 Ω

MODE parameter of the GET_DIAG instruction

You use the "GET_DIAG" instruction to read the diagnostic information of a hardware device.The MODE input parameter of the GET_DIAG instruction specifies the type of diagnostic data to retrieve. The LADDR parameter is the hardware ID of the device. When the MODE = 0, the CPU returns all supported diagnostic information for a module. When MODE = 0, the S7-1200 CPU ignores the LADDR input parameter.

Default priorities for cyclic interrupt and time delay interrupt OBs

When you add cyclic interrupt OBs and time delay interrupt OBs, the CPU sets a default priority for each OB that you create. The default priority varies based on the OB number.

Table 5-16 of the *S7-1200 Programmable Controller System Manual, edition 09/2016* was misleading. It only listed the default priority of the first automatic OB that you created of each type

Cyclic interrupt OBs

The default priorities for Cyclic interrupt OBs are as follows:

Cyclic interrupt OB	Default priority
OB 30	8
OB 31	9
OB 32	10
OB 33	11
OB 34	12
OB 35	13
OB 36	14
OB 37	16
OB 38	17
OB 123 to OB 32767	7

Time delay interrupt OBs

The default priorities for Time delay interrupt OBs are as follows:

Time delay interrupt OB	Default priority
OB 20	3
OB 21	4
OB 22	5
OB 23	6
OB 123 to OB 32767	3

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