SIEMENS

SIMATIC S7

Supplement to

C79000-Z7076-C623-02

Manual Package C7-623/624 (MLFB 6ES7 623-1AE00-8BA0) and
Manual Package C7-626/626 DP (MLFB 6ES7 626-1AG00-8BA0)

Control Systems	**C7-623**	**(MLFB 6ES7 623-1AE01-0AE3)**
	C7-623/A	**(MLFB 6ES7 623-1CE01-0AE3)**
	C7-624	**(MLFB 6ES7 624-1AE01-0AE3)**
	C7-626	**(MLFB 6ES7 626-1AG01-0AE3)**
	C7-626/A	**(MLFB 6ES7 626-1CG01-0AE3)**
	C7-626 DP	**(MLFB 6ES7 626-2AG01-0AE3)**

The control systems listed above have new functions and technical properties which are described in this supplement.

1. Section 1 of the supplement lists the technical properties and data for the special I/Os with which the C7-623/A and C7-626/A control systems are equipped.
2. Section 18 of the supplement is an extract from the manual *System Software for S7-300/400 - System and Standard Functions* (hence the unusual number) and contains a description of the new communication functions for non-configured connections.
3. The execution times are listed in Appendix B of this supplement (an extract from the manual *S7-300 Programmable Controller, Hardware and Installation).* The execution times for the CPU 314 apply to the C7-623/624, and the execution times for the CPU 315/-2 DP apply to the C7-626/626 DP.

This supplement contains **additional information** about the products. If uncertainties arise, this information should be considered more up-to-date than the information in the manuals and catalogs.

Disclaimer of Liability

We have checked the contents of this manual for agreement with the hardware and software described. Since deviations cannot be precluded entirely, we cannot guarantee full agreement. However, the data in this manual are reviewed regularly and any necessary corrections included in subsequent editions. Suggestions for improvement are welcomed.

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Technical data subject to change.

Siemens Aktiengesellschaft

C79000-Z7076-C623
Printed in the Fed. Rep. of Germany

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Contents

1 I/Os of the C7-623/A and C7-626/A Control Systems

1.1 Properties of the I/Os of the C7-623/A and C7-626/A Control Systems

Overview

Chapters 1 to 4 of this addendum describe the differences between the two control systems C7-623/A and C7-626/A and the control systems C7-623 and C7-626. With the exception of the properties of the I/Os, the properties of the control systems described in the manuals of the C7-623 and C7-626 are as described in the manuals.

The following table contains an overview of the I/Os of the control systems.

	C7-623, C7-624, C7-626, C7-626 DP	**C7-623/A, C7-626/A**
Digital I/Os	16 digital inputs, 16 digital outputs	16 digital inputs, 16 digital outputs
Analog I/Os	4 analog inputs, 1 analog output	4 analog inputs, 4 analog outputs
Universal inputs	4 digital universal inputs	None

1.1.1 Digital I/Os of the C7-623/A and C7-626/A

Pinout of the Digital Inputs and Digital Outputs

The pinout of the digital inputs and digital outputs is identical to the pinout of the C7-623 and C7-626 control systems. The digital universal inputs have been removed. The pins that were used on the C7-623 and C7-626 for the digital universal inputs are now used for additional analog outputs.

Technical Data of the Digital Inputs

The following table lists the technical data of the digital inputs.

Data Specific to Digital Inputs	
Number of inputs	16
Cable length	
• Unshielded	600 m
• Shielded	1000 m
Voltages, Currents, Potentials	
Rated load voltage L +	24 V DC
Number of simultaneously controllable inputs	16
Isolation	yes (optocoupler)
• In groups of	16
Dielectric strength	500 V DC
Status, Interrupts, Diagnostics	
Interrupts	no
Diagnostic functions	no

Data for Selecting a Sensor	
Input voltage	
• Rated value	24 V DC
• For Signal “1”	from 15 to 30 V
• For Signal “0”	from -3 to 5 V
Input current	
• For signal “1”	max. 11.5 mA
Input delay time	
• Selectable	no
• From “0” to “1”	typ./max. 3/4.8 ms
• From “1” to “0”	typ./max. 3/4.8 ms
Input characteristic	According to DIN EN 61131–2 (IEC 1131, Part 2)
Type of input according to IEC 1131	Type 2
Connection to 2-wire BEROs	possible
• Permitted zero-signal current	≤ 2 mA

Technical Data of the Digital Outputs

The following table lists the technical data of the digital outputs.

Data Specific to Digital Outputs	
Number outputs	16
Cable length	
• Unshielded	600 m
• Shielded	1000 m
Voltages, Currents, Potentials	
Rated load voltage L +	24 V DC
• Permitted range	20.4 - 28.8 V
Total current of the outputs (per group)	
• up to 20 °C	4 A
• up to 50 °C	2 A
Isolation	yes (optocoupler)
• In groups of	8
Dielectric strength	500 V DC
Status, Interrupts, Diagnostics	
Interrupts	no
Diagnostic functions	no

Data for Selecting an Actuator	
Output voltage	
• For signal “1”	L + (– 0.8 V)
Output voltage	
• For signal “1” Rated value Permitted range	 0.5 A 5 mA..0.5 A
• For signal “0” (residual current)	max. 0.5 mA
Lamp load	max. 5 W
Parallel connection of 2 outputs	
• For logic operation	Possible (only outputs in the same group)
• For increased performance	Not possible
Control of a digital input	yes
Switching frequency, max.	
• With resistive load/lamp load	100 Hz
• With inductive load	0.5 Hz
Limit (internal) of the inductive off voltage to	48 V
Short-circuit protection of the output	Yes, electronically switching
• Switching threshold	Approx. 1 A

1.1.2 Analog I/Os of the C7-623/A and C7-626/A Control Systems

Pinout and Connection Diagram of the Analog Inputs

The following diagram shows the pinouts and the connection diagram of the analog inputs.

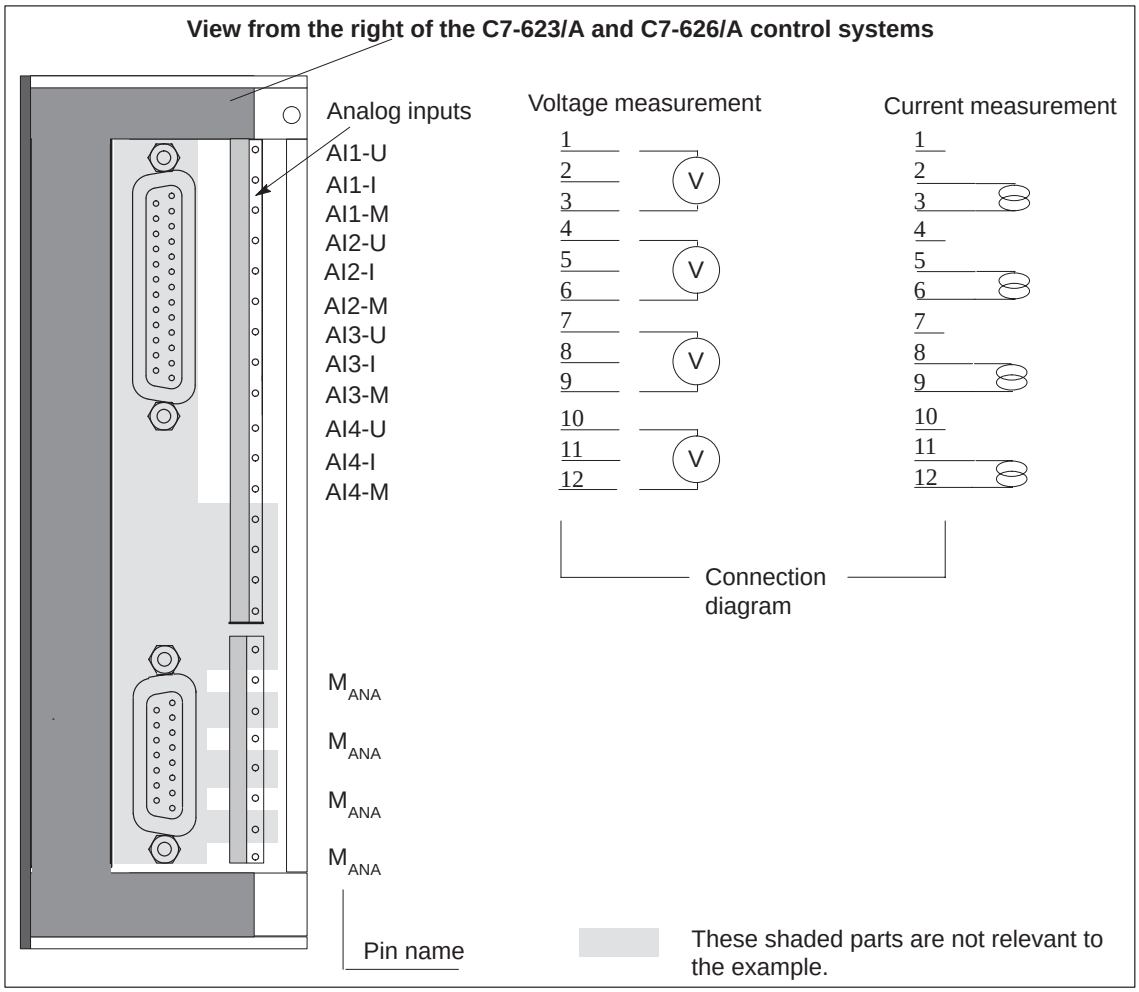

Figure 1 Pinout and Connection Diagram of the Analog Inputs

Technical Data of the Analog Inputs

The following table lists the technical data of the analog inputs.

Data Specific to Analog Inputs	
Number of inputs	4
Cable length, shielded	200 m
Voltages, Currents, Potentials	
Isolation (analog I/Os to electronics)	yes
Dielectric strength	500 V DC
Permitted potential difference	
• Between reference potential of the inputs AIx-M and M_{ANA} for signal = 0V	U_{CM} = DC 2,5 V
Analog Value Formation	
Measurement principle	Instantaneous value
• Cycle time (all channels) Cycle time (per channel)	2 ms 0.5 ms
• Resolution in bits incl. S (incl. overflow range)	12
Measurement ranges:	Measurement range selected by connection to different pins
Voltage	± 10V
Current	± 20mA, 4 to 20mA
Noise Suppression, Error Limits	
Noise voltage suppression	
• Common mode noise (U_{CM} < 1.0 V)	> 40 dB
Crosstalk between the inputs	> 60 dB
Error limit (in entire temperature range, relative to input range)	
• Voltage	± 0.8 %
• Current	± 0.8 %
Basic error limit (error limit at 25 °C, relative to the input range)	
• Voltage	± 0.6 %
• Current	± 0.6 %
Reproducibility in settled state at 25 °C related to range	0.05 %

Data for Selecting a Sensor		
Input ranges (rated ranges)/input resistance		
• Voltage	± 10 V;	/50 kΩ
• Current	± 20 mA;	/105.5Ω
	4 – 20 mA;	/105.5Ω
Permitted input voltage for voltage input (destruction limit)	Max. 30 V permanent, 38 V for max. 1 s (pulse duty ratio 1:20)	
Permitted input current for current input (destruction limit)	30 mA	
Connection of signal sensors		
• For voltage measurement	Possible	
• For current measurement as 4-wire transducer as 2-wire transducer	 Possible Not directly possible	
Status, Interrupts, Diagnostics		
Interrupts		
• Hardware interrupt as cyclic interrupt as cycle end interrupt	 yes, selectable yes, selectable	
• Diagnostic interrupt	yes, selectable	
Diagnostic functions	yes, selectable	
• Diagnostic information can be read out	yes	
Time intervals	yes, selectable	
Wire break detection	In measuring range 4 to 20mA, selectable	

Pinout and Connection Diagram of the Analog Outputs

The following diagram shows the pinout and the connection diagram of the analog outputs.

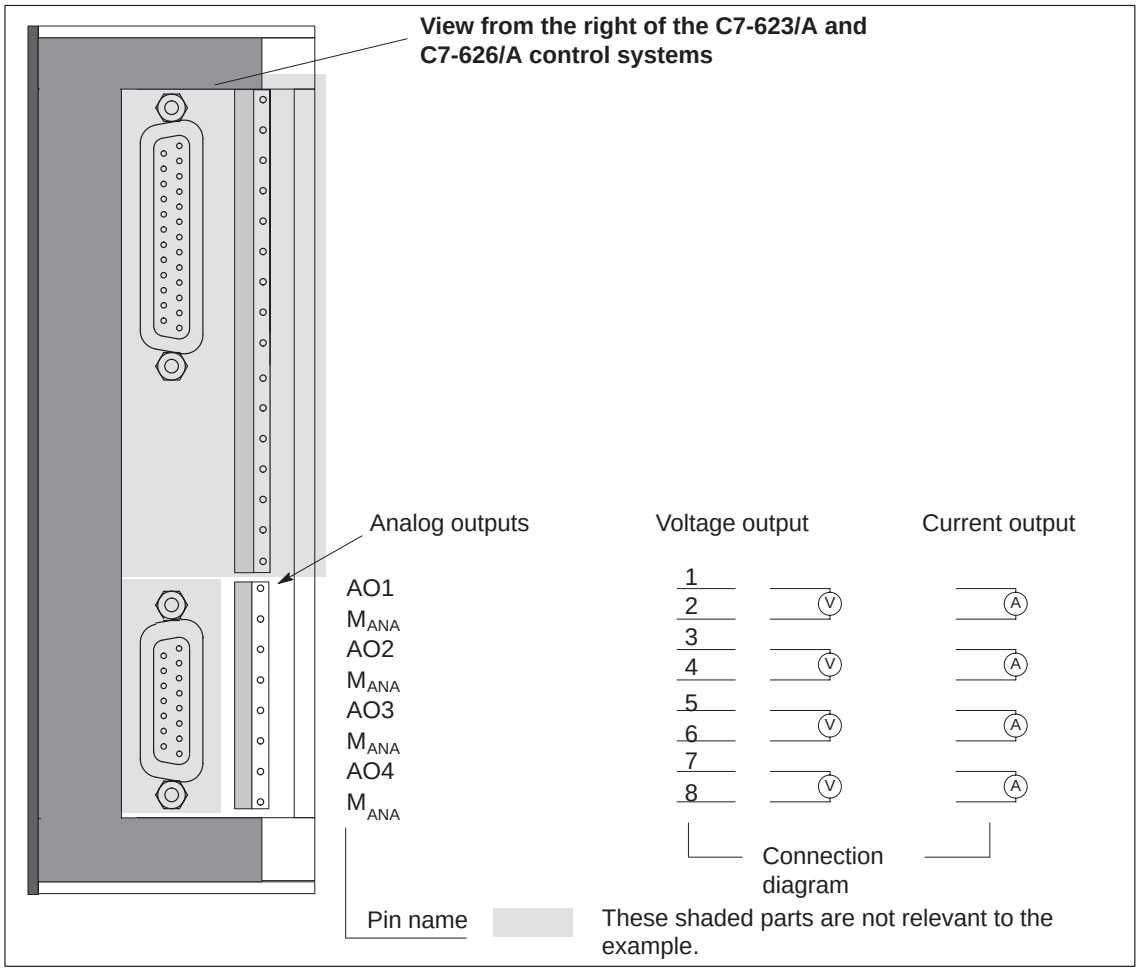

Figure 2 Pinout and Connection Diagram of the Analog Outputs

Technical Data of the Analog Outputs

The following table lists the technical data of the analog outputs.

Data Specific to Analog Outputs	
Number of outputs	4
Cable length, shielded	200 m
Voltages, Currents, Potentials	
Isolation	yes
Dielectric strength	500 V DC
Measurement ranges:	Voltage or current selectable
Voltage	± 10V
Current	± 20mA, 4 to 20mA
Analog Value Formation	
Resolution (incl. overflow range)	
• ± 10 V; × ≥ 20 mA; 4 to 20 mA	12 bits incl. sign
Conversion time (all active channels)	max. 4 ms typ. 2 ms
Settling time	
• For resistive load	0.1 ms
• For capacitive load	3.3 ms
• For inductive load	0.5 ms
Replacement value connectable (one replacement value for all channels)	yes, selectable
Noise Suppression, Limit Values	
Crosstalk attenuation between outputs	> 40 dB
Error limit (in the entire temperature range, relative to the output range)	
• Voltage	± 0.8 %
• Current	± 1 %
Basic error limit (error limit at 25 °C relative to the output range)	
• Voltage	± 0.5 %
• Current	± 0.6 %
Output ripple (relative to the output range)	± 0.05 %
Reproducibility (in settled state at 25 °C relative to the output range)	± 0.06 %

Status, Interrupts, Diagnostics	
Interrupts	
• Diagnostic interrupt	yes, selectable
Diagnostic functions	yes, selectable
• Diagnostic information can be read out	yes, group error
Data for Selecting an Actuator	
Output ranges (rated values)	± 10 V ± 20 mA From 4 to 20 mA
Load resistance	
• For voltage outputs	min. 2 k Ω
• For current outputs	max. 500 Ω
• Capacitive load	max. 1 µF
• Inductive load	max. 1 mH
Voltage output	
• Short-circuit protection	Short-circuit proof yes
• Short-circuit current	approx. 25 mA
Current output	
• Idle voltage	max. ± 15V
Connecting actuators	
• For voltage output 2-wire connection	possible
• For current output 2-wire connection	possible
Destruction limits for voltages/currents applied externally	
• Voltage at the outputs against M_{ANA}	max. DC 20 V
• Current	max. DC 40 mA

1.2 Addressing the I/Os of the C7-623/A and C7-626/A Control Systems

Addressing Digital I/Os

The following table shows the addressing of the digital I/Os.

Digital I/Os	Address
Digital inputs	I0.0 to I1.7
Digital outputs	Q0.0 to Q1.7

Addressing the Analog I/Os

The following table the addressing of the analog I/Os.

Channel	Analog Input Address	Analog Output Address
0	PIW272	PQW272
1	PIW274	PQW274
2	PIW276	PQW276
3	PIW278	PQW278

1.3 Timing of the Analog I/Os of the C7-623/A and C7-626/A Control Systems

Analog Inputs

The timing of the analog inputs depends on the current parameter assignment of the analog I/Os (see Section 1.4). The duration of the measuring cycle depends on the number of activated analog input channels. Deactivated channels reduce the length of the measuring cycle.
The measuring cycle is the sum of the conversion times of the activated analog inputs.

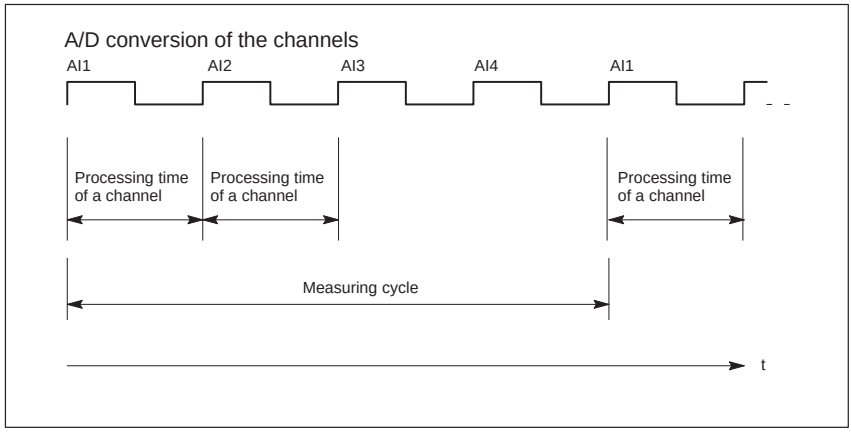

Figure 3 Measuring Cycle when All Analog Input Channels are Activated

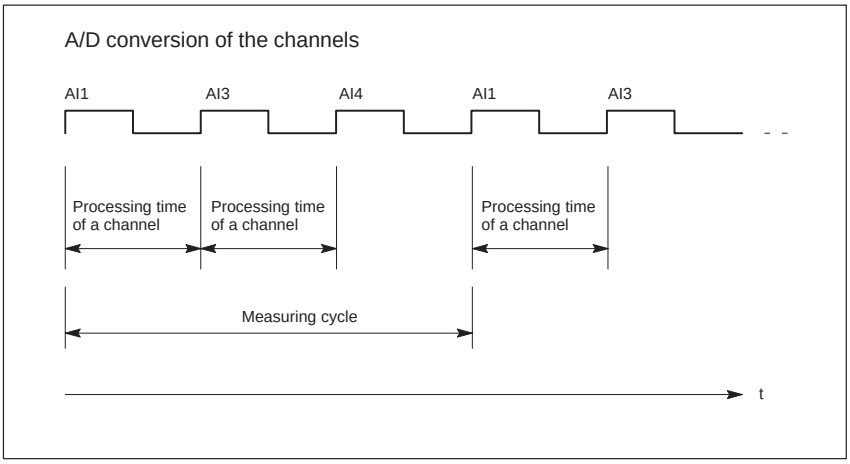

Figure 4 Measuring Cycle when Analog Input Channel 2 is Deactivated

Analog Outputs

The duration of the output cycle does **not** depend on the number of activated analog output channels. This is always constant and deactivated channels do not reduce the output cycle.

$t_{output\ cycle} = 4 \times t_{conversion\ time\ of\ a\ channel} = const.$

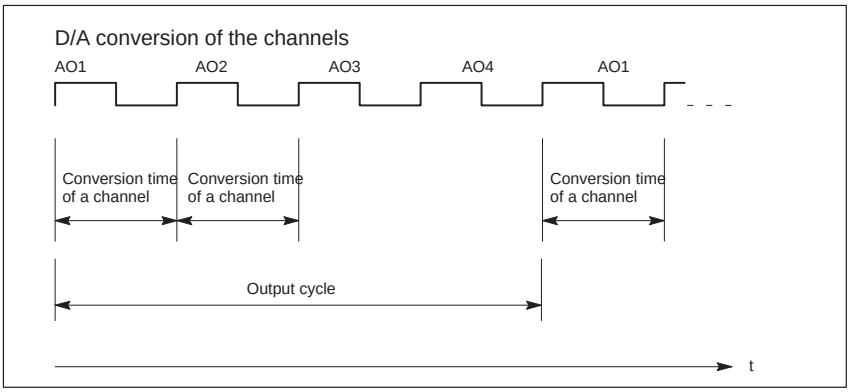

Figure 5 Output Cycle when All Analog Output Channels are Activated

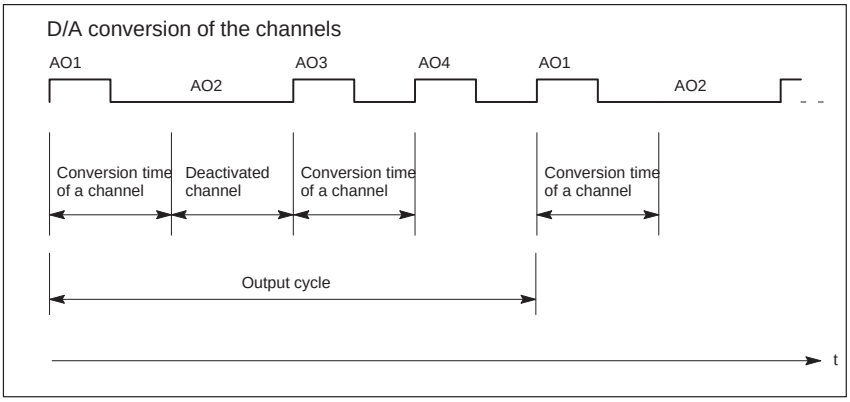

Figure 6 Output Cycle when Analog Output Channel 2 is Deactivated

1.4 Assigning Parameters to the Analog I/Os of the C7-623/A and C7-626/A Control Systems

Configuration

You configure your setup with STEP 7 V3.1.
You can extend the hardware catalog by reinstalling with an expansion diskette. Later versions of STEP 7 already contain these device types.

Hardware Interrupt

You can operate the inputs of the analog I/Os in three ways:

- Without hardware interrupt

  A free measuring cycle of all activated channels without generating hardware interrupts.

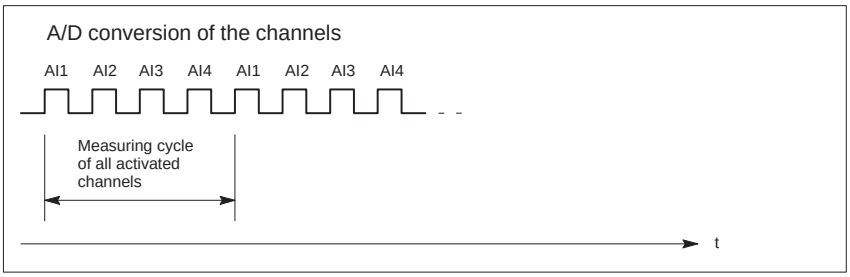

Figure 7 Sequence of the Measurement with Four Analog Input Channels without Generating Hardware Interrupts

- Hardware interrupt as a cyclic interrupt

  Free measuring cycle of all activated channels with generation of a non measuring cycle-dependent hardware interrupt as a time interrupt with a selectable interrupt time.

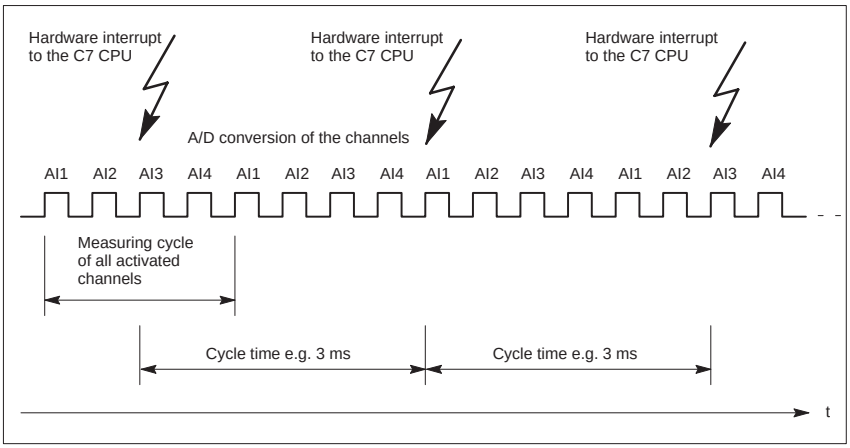

Figure 8 Sequence of the Measurement with Four Analog Input Channels and Generation of Hardware Interrupts as Cyclic Interrupts

- Hardware interrupt as cycle end interrupt

  A measuring cycle with a selectable cycle time and generation of a hardware interrupt as a cycle end interrupt.

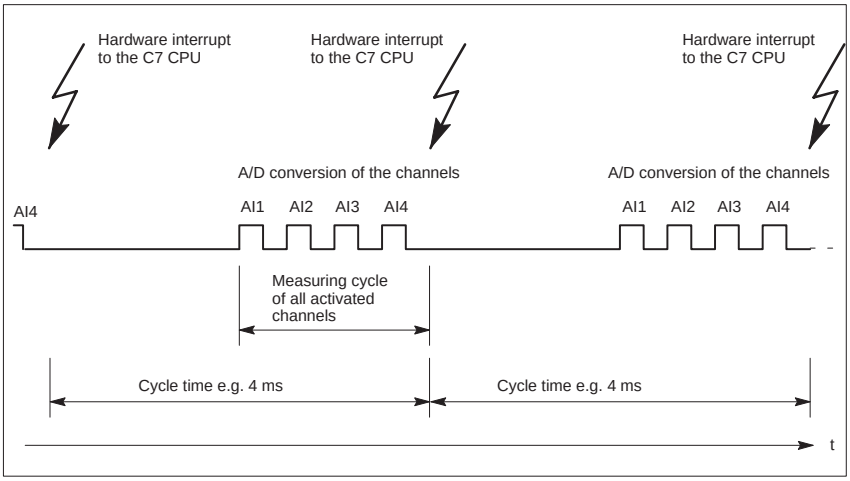

Figure 9 Sequence of the Measurement with Four Analog Input Channels with Generation of Hardware Interrupts as Cycle End Interrupts

A hardware interrupt from the I/Os triggers the start of OB40 (hardware interrupt OB) on the C7 CPU. In this case, the process variable OB40_POINT_ADDR supplies the value DW#16#FFFFFFFF.

Structure of the Parameter Data Records

If you want to reassign parameters during operation, you must check the validity and interdependency of the individual parameters in your program.

Incorrect value ranges for the parameters can lead to incorrect responses from the I/Os. The following table shows the structure of the parameter data records.

DR	Byte	Bit	Default	What Can be Assigned	Meaning of the Bits
0	0	0	0	Enable diagnostics AI1	0=no 1=yes
		1	0	Enable diagnostics AI2	0=no 1=yes
		2	0	Enable diagnostics AI3	0=no 1=yes
		3	0	Enable diagnostics AI4	0=no 1=yes
		4	0	Enable diagnostics AO1	0=no 1=yes
		5	0	Enable diagnostics AO2	0=no 1=yes
		6	0	Enable diagnostics AO3	0=no 1=yes
		7	0	Enable diagnostics AO4	0=no 1=yes
	1	0	0	Enable diagnostics wire break AI1	0=no, 1=yes (only for measuring range 4 to 20mA)
		1	0	Enable diagnostics wire break AI2	0=no, 1=yes (only for measuring range 4 to 20mA)
		2	0	Enable diagnostics wire break AI3	0=no, 1=yes (only for measuring range 4 to 20mA)
		3	0	Enable diagnostics wire break AI4	0=no, 1=yes (only for measuring range 4 to 20mA)
		4 – 7	0H	reserved	
	2		00H	reserved	

DR	Byte	Bit	Default	What Can be Assigned	Meaning of the Bits
	3		00H	reserved	
1	0	0	0	Enable diagnostic interrupt for module	0=no, 1=yes
		1..2	00	Enable hardware interrupt	00= no 01= as cyclic interrupt (only when byte 5 <> 01H) 10= as cycle end interrupt (only when byte 5 <> 01H)
		3..7	00000	reserved	
	1	0..3	9	AI1 measuring range	0=channel deactivated 3=4 to 20 mA (only if meas. type=current) 4= ± 20 mA (only if meas. type=current) 9= ± 10 V (only if meas. type=voltage)
		4..5	01	AI1 measurement type	00=channel deactivated, 01=voltage, 10=current
		6..7	00	reserved	
	2	0..3	9	AI2 measuring range	0=channel deactivated 3=4 to 20 mA (only if meas. type=current) 4= ± 20 mA (only if meas. type=current) 9= ± 10 V (only if meas. type=voltage)
		4..5	01	AI2 measurement type	00=channel deactivated, 01=voltage, 10=current
		6..7	00	reserved	
	3	0..3	9	AI3 measuring range	0=channel deactivated 3=4 to 20 mA (only if meas. type=current) 4= ± 20 mA (only if meas. type=current) 9= ± 10 V (only if meas. type=voltage)
		4..5	01	AI3 measurement type	00=channel deactivated, 01=voltage, 10=current
		6..7	00	reserved	
	4	0..3	9	AI4 measuring range	0=channel deactivated 3=4 to 20 mA (only if meas. type=current) 4= ± 20 mA (only if meas. type=current) 9= ± 10 V (only if meas. type=voltage)
		4..5	01	AI4 measurement type	00=channel deactivated, 01=voltage, 10=current
		6..7	00	reserved	
	5		00H	Cycle time	00H=16ms, 01H=free (approx. 2ms), 06H=3ms, 07H=3.5 ms, 08H= 4 ms, to 1FH=15.5 ms
	6	0..3	9	AO1 output range	0=channel deactivated 3=4 to 20 mA (only if output type=current) 4= ± 20 mA (only if output type=current) 9= ± 10 V (only if output type=voltage)
		4..5	01	AO1 output type	00=channel deactivated, 01=voltage, 10=current
		6..7	00	AO1 reaction to CPU STOP	00=switch to no voltage/current 01=retain last value 10=set replacement value (bytes 10, 11)

DR	Byte	Bit	Default	What Can be Assigned	Meaning of the Bits
	7	0..3	9	AO2 output range	0=channel deactivated 3=4 to 20 mA (only if output type=current) 4= ± 20 mA (only if output type=current) 9= ± 10 V (only if output type=voltage)
		4..5	01	AO2 output type	00=channel deactivated, 01=voltage, 10=current
		6..7	00	AO2 reaction to CPU STOP	00=switch to no voltage/current 01=retain last value 10=set replacement value (bytes 10, 11)
	8	0..3	9	AO3 output range	0=channel deactivated 3=4 to 20 mA (only if output type=current) 4= ± 20 mA (only if output type=current) 9= ± 10 V (only if output type=voltage)
		4..5	01	AO3 output type	00=channel deactivated, 01=voltage, 10=current
		6..7	00	AO3 reaction to CPU STOP	00=switch to no voltage/current 01=retain last value 10=set replacement value (bytes 10, 11)
	9	0..3	9	AO4 output range	0=channel deactivated 3=4 to 20 mA (only if output type=current) 4= ± 20 mA (only if output type=current) 9= ± 10 V (only if output type=voltage)
		4..5	01	AO4 output type	00=channel deactivated, 01=voltage, 10=current
		6..7	00	AO4 reaction to CPU STOP	00=switch to no voltage/current 01=retain last value 10=set replacement value (bytes 10, 11)
	10,11		0000H	Replacement value for AO1, AO2, AO3 and AO4 (only effective if the bits 6 to 7 have the value 10 in bytes 6, 7, 8 and 9)	

1.5 Diagnostic Data of the Analog I/Os C7-623/A and C7-626/A Control Systems

Structure of the Diagnostic Area

The diagnostic area consists of the following:

- Data record 0: standard diagnostic bytes (bytes 0 to 3)
- Data record 1: channel-specific diagnostic bytes (when diagnostics is enabled)
  - Bytes 4 to 7 channel information, bytes 8 to 11 channel-specific diagnostic information of the analog inputs
  - Bytes 12 to 15: Channel information of the analog outputs

The following table shows the structure of the diagnostic area and the meaning of the individual entries.

Byte	Bit	Meaning	Explanation	Range of Values
0	0	Module fault	1 = Error occurred, 0 = all OK	0 | 1
	1	Internal error	1 = Watchdog, EPROM or RAM error	0 | 1
	2	External error	1 = External auxiliary voltage outage or fault at an analog output or analog output	0 | 1
	3	Channel error	At least one of the two channel vectors (bytes 7, 15) <> 0	0 | 1
	4	Reserved		0
	5	Reserved		0
	6	Parameters not assigned to module	Initial status (parameters have the default values) and not a module fault (bit 0.0 = 0)	0 | 1
	7	Incorrect parameters	1 = Channel-specific parameter assignment error (bit 8.0 or bit 9.0 or bit 10.0 or bit 11.0 set or byte 15 <> 0) or module-specific parameter assignment error	0 | 1
1	0..3	Module class	SM type class	5H
	4	Channel-specific diagnostic information conforming with the system	Yes	1
	5..7	Reserved		000
2	0..2	Reserved		000
	3	Watchdog responded	With bit 0.1 *) **)	0 | 1
	4..7	Reserved		0H
3	0	Reserved		0
	1	Reserved		0
	2	EEPROM error	Serial check EEPROM, with bit 0.1 *) **)	0 | 1
	3	RAM error		0 | 1
	4..7	Reserved		0H
Channel-specific diagnostic entries				
4		Channel type AI of the following channel-specific diagnostic information		71H
5		Number of analog inputs on the module		4
6		Number of diagnostic bits per channel		8
7		Channel vector for AI channel group		
	0	At least one diagnostic entry for AI1	0 = no, 1 = yes	0 | 1
	1	At least one diagnostic entry for AI2	0 = no, 1 = yes	0 | 1
	2	At least one diagnostic entry for AI3	0 = no, 1 = yes	0 | 1
	3	At least one diagnostic entry for AI4	0 = no, 1 = yes	0 | 1
	4..7	Reserved		0H
8		Channel-specific diagnostic byte AI1		
	0	Parameter error in parameters for channel	0 = no, 1 = yes *)	0 | 1
	1..3	Reserved		000
	4	Software “wire break”	0 = no, 1 = yes (only with 4 to 20mA)	0 | 1
	5	Reserved		0
	6	Below measuring range	0 = no, 1 = yes (underflow)	0 | 1
	7	Above measuring range	0 = no, 1 = yes (overflow)	0 | 1

Byte	Bit	Meaning	Explanation	Range of Values
9		Channel-specific diagnostic byte AI2		
	0	Parameter error in parameters for channel	0 = no, 1 = yes *)	0 | 1
	1..3	Reserved		000
	4	Software “wire break”	0 = no, 1 = yes (only with 4 to 20mA)	0 | 1
	5	Reserved		0
	6	Below measuring range	0 = no, 1 = yes (underflow)	0 | 1
	7	Above measuring range	0 = no, 1 = yes (overflow)	0 | 1
10		Channel-specific diagnostic byte AI3		
	0	Parameter error in parameters for channel	0 = no, 1 = yes *)	0 | 1
	1..3	Reserved		000
	4	Software “wire break”	0 = no, 1 = yes (only with 4 to 20mA)	0 | 1
	5	Reserved		0
	6	Below measuring range	0 = no, 1 = yes (underflow)	0 | 1
	7	Above measuring range	0 = no, 1 = yes (overflow)	0 | 1
11		Channel-specific diagnostic byte AI4		
	0	Parameter error in parameters for channel	0 = no, 1 = yes *)	0 | 1
	1..3	Reserved		000
	4	Software “wire break”	0 = no, 1 = yes (only with 4 to 20mA)	0 | 1
	5	Reserved		0
	6	Below measuring range	0 = no, 1 = yes (underflow)	0 | 1
	7	Above measuring range	0 = no, 1 = yes (overflow)	0 | 1
12		Channel type AO of the following channel-specific diagnostic information		73H
13		Number of analog outputs on the module		4
14		Number of diagnostic bits per channel		0
15		Channel vector for channel group AO		
	0	Group error in AO1	0 = no, 1 = yes	0 | 1
	1	Group error in AO2	0 = no, 1 = yes	0 | 1
	2	Group error in AO3	0 = no, 1 = yes	0 | 1
	3	Group error in AO4	0 = no, 1 = yes	0 | 1
	4..7	Reserved		0H

*) Analog inputs are reset until the module or channel is functional again (exception: when a wire break check is selected with the measurement type <> 4 to 20mA) AI = 7FFFH.

**) Analog output is reset until the module or channel is functional again. AO = 0V | 0mA