

TM 1703 ACP Terminal Modules

CP-6003/CPC65 Master Control Element

System Functions, Processing and Communication



Master control element with:

- up to 4 communication interfaces via installable SM-25xx serial interface modules: serial (end-end, multi-point, dial-up traffic), LAN/WAN (Ethernet), Profibus-DP
- communication with up to 16 TM 1703 ACP peripheral elements based on PE-640x, via the serial Ax 1703 peripheral bus
- open-/closed-loop control functions, freely definable with CAEx plus, IEC 61131-3 compliant
- local and remote engineering, diagnostic, and test using SAT TOOLBOX II
- data are kept on a Flash Card for Plug&Play module exchange
- function and failure indication via LED
- supply voltage 24VDC .. 60VDC

Application

CP-6003/CPC65 is the master control element of a TM 1703 ACP automation unit. It is deployed in the field of telecontrol and automation.

For process input and output, via the serial Ax 1703 peripheral bus and via up to two CM-6830 modules, up to 16 peripheral elements are connected to the master control element: The following bus interfaces are available:

Type	Designation	Connection	Number of Peripheral Elements
---	Ax-PE 2x USB on CP-6003-A	electrical	up to 2
CM-0843	Bus Interface Ax-PE 4x USB	electrical	up to 16
CM-0842	Bus Interface Ax-PE 4x optical fibre	optical	up to 16
CM-6830 ¹⁾	Bus Interface Ax-PE 7x USB	electrical	up to 14

¹⁾ CM-6830 is listed above for compatibility reasons with "older" configurations. Preferred types are CM-0843 and CM-0842.

Configurations with CM-0843, CM-0842, and CM-6830 can be found in the *TM 1703 ACP System Data Sheet*, in the document *ACP 1703 Platforms Configuration Automation Units and Automation Networks* and/or in the bus interfaces data sheets.

Master Control Element Configuration ^{*)}

Master Control Element Configuration	Designation	
CP-6003/CPC65	Processing & Communication	required
CM-0843 ¹⁾ , CM-0842 ¹⁾ , CM-6830	Bus Interface Ax-PE	optional
SM-2541, SM-2542, SM-2554, SM-2545, SM-2551, SM-2556 SM-2556 with SM-0551	Serial Interface Modules (SIM)	optional

¹⁾ CP-6003-A: Standard Patch Cable RJ45 Cat5 3m max. (e.g. T41-252--)
CP-6003: Ax-Bus Patch Cable DSUB to RJ45 3m Cat5 (TC6-220--)

Permissible **configuration variants** are listed below (supplying power to a time signal receiver or a modem has not been taken into account):

CP-6003-A				
Variant ¹⁾	SIM0	SIM1	Number of CM-6830	Ambient Conditions (Air Temperature)
1	SM-2551		0	-20 .. +70 °C
2	SM-2551	SM-2551	0	-20 .. +70 °C
3	SM-2551	SM-2545	0	-20 .. +70 °C
4	SM-2556		0	-20 .. +70 °C

^{*)} In this document, for easy readability, is named as follows:
CP-6003 [GC6-003--] as CP-6003, CP-6003 [GC6-003-A] as CP-6003-A

5	SM-2556 with SM-0551		0	-20 .. +70 °C
6	SM-2556	SM-2551	0	-20 .. +70 °C
7	SM-2556 with SM-0551	SM-2551	0	-20 .. +70 °C
8	SM-2556	SM-2545	0	-20 .. +70 °C
9	SM-2556 with SM-0551	SM-2545	0	-20 .. +70 °C
10 ²⁾	SM-2556	SM-2556	0	-20 .. +70 °C
11 ²⁾	SM-2556 with SM-0551	SM-2556	0	-20 .. +70 °C
12 ²⁾	SM-2556 with SM-0551	SM-2556 with SM-0551	0	-20 .. +70 °C

1) Configurations not found in this table shall be dealt with according to the table for CP-6003

2) Only defined applications

CP-6003				
Variant ¹⁾	SIM0	SIM1	Number of CM-6830	Ambient Conditions (Air Temperature)
1	SM-2541		0 .. 1	-20 .. +65 °C
2	SM-2541		2	-20 .. +50 °C
3	SM-2541	SM-2541	0	-20 .. +55 °C
4	SM-2541	SM-2541	1	-20 .. +50 °C
5	SM-2541	SM-2545	0 .. 1	-20 .. +50 °C
7	SM-2542		0 .. 1	-20 .. +50 °C
8	SM-2542	SM-2541	0 .. 1	-20 .. +50 °C
9	SM-2542	SM-2545	0	-20 .. +45 °C
11	SM-2554		0 .. 1	-20 .. +65 °C
12	SM-2554		2	-20 .. +50 °C
13	SM-2554	SM-2541	0	-20 .. +55 °C
14	SM-2554	SM-2541	0 .. 1	-20 .. +50 °C
15	SM-2554	SM-2545	0 .. 1	-20 .. +50 °C

Peripheral Elements

Peripheral Elements	Designation	
PE-6400/TCIO65	Peripheral Controller for TC 1703 (Ax-PE bus el)	optional
PE-6401/TCIO65	Peripheral Controller for TC 1703 (Ax-PE bus opt)	optional
PE-6400/USIO65	Peripheral Controller (Ax-PE bus el)	optional
PE-6401/USIO65	Peripheriekopplung (Ax-PE Bus opt)	optional
Peripheral Elements	Designation	
DI-1112/BISI15	Binary Signal Input (3x8, 24-60VDC)	optional
DI-1113/BISI15	Binary Signal Input (3x8, 110/220VDC)	optional
AI-1304/TIPP16	Direct Transformer Input (4x220V,3x6A)	optional
MX-1416/USIO15	Signal Input/Output (DI:24-60VDC, I+U, DO:30A)	optional
MX-1417/USIO15	Signal Input/Output (DI:110/220VDC, I+U, DO:30A)	optional

Information on a peripheral element, how I/O modules can be attached to it, and what functionality can be achieved that way can be found in the peripheral element's data sheet (see "[Further Documents](#)").

Protocol Elements

	Designation	
SM-x551/BPPA0	Standard protocol for point-to-point traffic	optional
SM-x551/UMPMA0	Standard protocol for multi-point traffic (M)	optional
SM-x551/UMPSA0	Standard protocol for multi-point traffic (S)	optional
SM-x551/SFBMA1	Standard protocol for field bus (M)	optional
SM-x551/SFBSA1	Standard protocol for field bus (S)	optional
SM-x551/DIAMA0	Standard protocol for dial-up traffic (M)	optional
SM-x551/DIASA0	Standard protocol for dial-up traffic (S)	optional
SM-x551/103MA0	Standard protocol for interfacing of protective devices (M)	optional
SM-2541/BPP00	Standard protocol for point-to-point traffic	optional
SM-2541/UMPM02	Standard protocol for multi-point traffic (M)	optional
SM-2541/UMPS00	Standard protocol for multi-point traffic (S)	optional
SM-2541/UMPM01	Standard protocol for field bus master (M)	optional
SM-2541/UMPS01	Standard protocol for field bus master (S)	optional
SM-2541/DIAM00	Standard protocol for dial-up traffic (M)	optional
SM-2541/DIAS00	Standard protocol for dial-up traffic (S)	optional
SM-2541/103M00	Standard protocol for interfacing of protective devices (M)	optional
SM-2545/DPM00	Standard protocol for Profibus DP	optional
SM-2554/ET02	Standard protocol for Ethernet TCP/IP IEC104	optional
SM-2554/ET03	Standard protocol for Ethernet TCP/IP IEC61850	optional
SM-2556/ET02	Standard protocol for Ethernet TCP/IP IEC104	optional
SM-2556/ET03	Standard protocol for Ethernet TCP/IP IEC61850	optional

(M) ... Master (S) ... Slave

Information on a protocol element can be found in the relevant data sheet (see "[Further Documents](#)").

Functions of the master control element

- **System functions**
 - central element, coordinating all system services
 - time management
 - central clock of the automation unit
 - setting and keeping the own clock's time with a resolution of 10ms
 - synchronization via serial communication (with another automation unit), via LAN (NTP server), or local (minute pulse or serial time signal)
 - SAT TOOLBOX II connection
 - storing firmware and parameters on a Flash Card

- **Functions for Telecontrol (Communication)**

- communication via installable protocol elements to any superior or subordinate automation unit
- automatic or selective data flow routing
- priority based data transmission (priority control)
- own circular buffer and process image for each connected station (data keeping)
- redundant communication routes
 - communication with redundant remote stations
 - redundant communication with a remote station (load share operation)
- special application specific functions for dial-up traffic
 - test if stations are reachable
 - an application program may evaluate telephone charges
 - parameter setup allows the telephone line to be used efficiently with respect to connection charges (e.g. command output possible only if a connection exists)

- **Functions for Telecontrol (Process Peripherals)**

- transmission of spontaneous information objects from and to peripheral elements, via the serial Ax 1703 peripheral bus

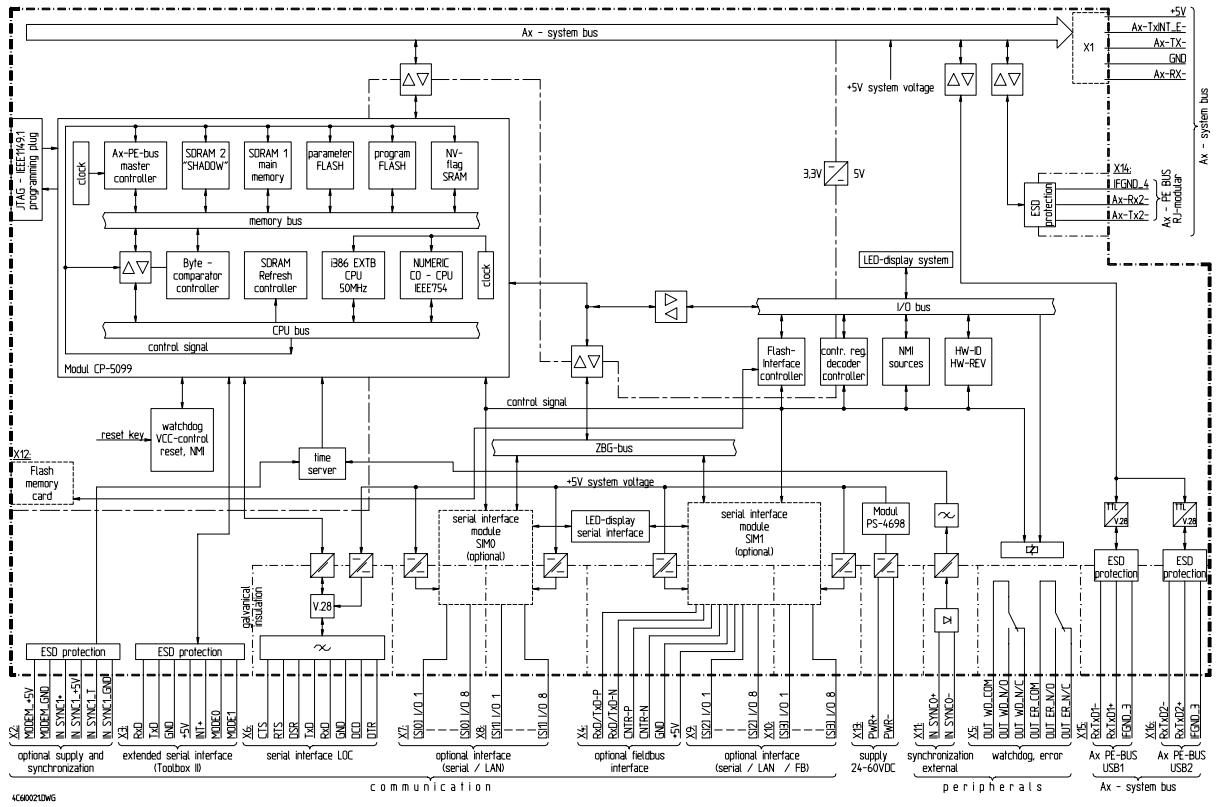
- **Functions for Automation**

- open-/closed-loop control function for the execution of freely definable user programs which are created with CAEX *plus* according to IEC 61131-3, for example using function diagram technology
 - 512 kB for user program
 - approx. 50.000 variables and signals, 2.000 of them retained
 - cycle of 10 ms or a multiple thereof
 - online test
 - loadable without service interruption
- transmission of periodic process information between the open-/closed-loop control function and the peripheral elements, via the serial Ax 1703 peripheral bus

The above mentioned functions and features are described in detail in the document *ACP 1703 Common Functions System and Basic System Elements*.

Engineering is done using SAT TOOLBOX II, including OPM II.

Block Diagram



Technical Specifications

Processor and Memory		CP-6003-A, CP-6003												
Processor	80C386EX, 50 MHz													
Coprocessor	Numeric processor (IIT -3C87Sx-33)													
Program memory	FLASH-PROM 1 MB													
Main memory	SRAM 8 MB, parity-checked													
Parameter memory	FLASH-PROM 1 MB													
Buffer memory	NVSRAM 32kByte													
Flash Card	16 MB													
Inputs for Synchronization		CP-6003-A, CP-6003												
Transmission rate	<ul style="list-style-type: none"> • 2.4 kbps 													
Internal synchronization (serial time signal, minute pulse)	<ul style="list-style-type: none"> • input: TTL level • The circuit is operated by means of an internal voltage. 													
External synchronization (serial time signal or minute pulse, firmware selectable)	<ul style="list-style-type: none"> • Input galvanically insulated by optocoupler • Filter time of the input circuit <table border="0"> <tr> <td>Make time:</td> <td>80µs</td> </tr> <tr> <td>Break time:</td> <td>80µs</td> </tr> <tr> <td>Filter tolerance</td> <td>max. 50µs</td> </tr> </table> • Input 5 .. 24V: <table border="0"> <tr> <td>Voltage range:</td> <td>5V-10% .. 24V+30%</td> </tr> <tr> <td>Level for logic 0:</td> <td>≤ 1.0V</td> </tr> <tr> <td>Level for logic 1:</td> <td>≥ 3.5V (typ. 1.3mA)</td> </tr> </table> 		Make time:	80µs	Break time:	80µs	Filter tolerance	max. 50µs	Voltage range:	5V-10% .. 24V+30%	Level for logic 0:	≤ 1.0V	Level for logic 1:	≥ 3.5V (typ. 1.3mA)
Make time:	80µs													
Break time:	80µs													
Filter tolerance	max. 50µs													
Voltage range:	5V-10% .. 24V+30%													
Level for logic 0:	≤ 1.0V													
Level for logic 1:	≥ 3.5V (typ. 1.3mA)													
Binary Outputs (Relay)		CP-6003-A, CP-6003												
<ul style="list-style-type: none"> • Error • Watchdog 	<ul style="list-style-type: none"> • 2 outputs, potential-free • Galvanical insulation • Voltage between the two outputs max. 60 VDC + 30 % • Change-over contact 													
Maximum continuous current	<ul style="list-style-type: none"> • 2 A / 24 VDC • 1 A / 60 VDC • 0.77 A / 78 VDC 													
Maximum switching voltage	<ul style="list-style-type: none"> • 60 VDC + 30 % 													
Switching cycles	<ul style="list-style-type: none"> • 10⁵ with resistive load and nominal switching capacity • 10⁴ with inductive load (L/R = 7 ms) 													
Switching capacity (resistive load)	<ul style="list-style-type: none"> • min. 1 mW • max. 60 W 													
Nominal switching capacity / nominal switching current	<ul style="list-style-type: none"> • 48 W / 24 VDC / 2.00 A • 60 W / 48 VDC / 1.25 A • 60 W / 60 VDC / 1.00 A 													
Output circuits	18 .. 78 VDC The circuits are operated by means of an external voltage.													

Communication		CP-6003-A
Ax 1703 peripheral bus DSUB (X1)	<ul style="list-style-type: none"> • TTL • Transmission rate 16 Mbps or 4 Mbps • Securing of data, hamming distance D=4 	
Ax 1703 peripheral bus RJ45 (X14)	<ul style="list-style-type: none"> • TTL • Transmission rate 16 Mbps or 4 Mbps • Securing of data, hamming distance D=4 • ESD protection 	
Ax 1703 peripheral bus USB (X15, X16)	<ul style="list-style-type: none"> • RS-485 • Transmission rate 16 Mbps or 4 Mbps • Securing of data, hamming distance D=4 • ESD protection 	
Extended serial interface (TB)	<ul style="list-style-type: none"> • TTL • Transmission rate 38.4 kbps • ESD protection 	
Local serial interface (LOC)	<ul style="list-style-type: none"> • At present, the interface is not used 	
Serial interfaces (SI0, SI1/ET0, SI2/FB, SI3)	<ul style="list-style-type: none"> • The technical specifications depend on which submodules (SM-254x) are mounted as SIM0/SIM1 (see the related data sheet) 	
Power Supply		CP-6003-A
Operating voltage	<ul style="list-style-type: none"> • 18 .. 78 VDC • The voltage is led to the front panel via the terminals. 	
	<p>The internal power supply module provides a nominal power output of $P_{Nsek} = 17.5W$ (5VDC) and, depending on the configuration, supplies:</p> <ul style="list-style-type: none"> • The base unit (power consumption 4.2W typ, 4.4W max) • Two optionally mountable serial interface modules (SM-25xx) (power consumption P_{SIM0} and P_{SIM1} can be found in the appropriate data sheet) • optionally mountable: DCF77 time signal receiver, CE-070x modem • peripheral elements which are externally connected via the system bus (power consumption can be found in the appropriate data sheet) 	
Primary power consumption <ul style="list-style-type: none"> • Base unit only • Base unit incl. expansions 	<ul style="list-style-type: none"> • 5W typ • 20W max 	
Power available on the system bus <ul style="list-style-type: none"> • SIMs not installed • SIMs installed 	<ul style="list-style-type: none"> • $P_{available} = 13.1W$ • $P_{available} = 13.1W - P_{SIM0} - P_{SIM1}$ (if equipped with DCF77 receiver or CE-070x, its power consumption has to be considered) 	
Polarity reversal protection	<ul style="list-style-type: none"> • yes 	
Interruption time	<ul style="list-style-type: none"> • $\leq 20ms$ at P_{Nsek}; $U_I = 18 .. 78V$ 	
Connection current spikes	<ul style="list-style-type: none"> • Class S1 	
Efficiency	<ul style="list-style-type: none"> • 0.87 .. 0.89 	

Mechanics and Connectors		CP-6003-A
Terminals	Removable screw terminals (grid size 5.08)	
Connector(s) for <ul style="list-style-type: none"> • Ax 1703 peripheral bus (TTL) • Ax 1703 peripheral bus (TTL) • Ax 1703 peripheral bus (RS-485) • SAT TOOLBOX II (TB) • Field bus (FB) 	D-SUB 9-pin, female (DIN 41652) (right side of the device) RJ45 8-pin (front) for connecting CAT5 cables, 3m maximum length USB / A series, 4-pin (front) for connecting USB cables (USB / A series, 4 pin), 3m maximum length D-SUB 9-pin, female (DIN 41652) D-SUB 9-pin, female (DIN 41652)	
Connector(s) for serial interfaces (LOC, SI0, SI1/ET0, SI2/FB, SI3)	5 x RJ45 8-pin	
Connector(s) for <ul style="list-style-type: none"> • watchdog • sum error • power supply • external synchronization 	Removable screw terminal strips	
Connector for modem power supply or synchronization	D-SUB 9-pin, female (DIN 41652) (left side of the device)	
Mechanical design Installation dimensions	Compact metal housing with small installation depth, for DIN rail mounting 155 x 306 x 75 mm (H x W x D, dimensions w/o DIN rail)	
Weight	Approx. 1100 g (without serial interface modules)	

Communication		CP-6003
Ax 1703 peripheral bus	<ul style="list-style-type: none"> • TTL • Transmission rate 16 Mbps or 4 Mbps • Securing of data, hamming distance D=4 	
Extended serial interface (TB)	<ul style="list-style-type: none"> • TTL • Transmission rate 38.4 kbps • ESD protection 	
Local serial interface (LOC)	<ul style="list-style-type: none"> • At present, the interface is not used 	
Serial interfaces (SI0, SI1/ET0, SI2/FB, SI3)	<ul style="list-style-type: none"> • The technical specifications depend on which submodules (SM-254x) are mounted as SIM0/SIM1 (see the related data sheet) 	
Power Supply		CP-6003
Operating voltage	<ul style="list-style-type: none"> • 18 .. 78 VDC • The voltage is led to the front panel via the terminals. 	
	<p>The internal power supply module provides a nominal power output of $P_{Nsek} = 11W$ (5VDC) and, depending on the configuration, supplies:</p> <ul style="list-style-type: none"> • The base unit (power consumption approx. 2.5 W) • Two optionally mountable serial interface modules (SM-25xx) (power consumption P_{SIM0} and P_{SIM1} can be found in the appropriate data sheet) • optionally mountable: DCF77 time signal receiver, CE-070x modem • CM-6830 modules which are externally connected via the system bus (power consumption can be found in the appropriate data sheet) 	
Primary power consumption <ul style="list-style-type: none"> • Base unit only • Base unit incl. expansions • For nominal load P_{Nsek} 	<ul style="list-style-type: none"> • 3.6W typ • 16.8W max • 15.5W at $U_I=78V$ • 16.8W at $U_I=18V$ 	
Power available on the system bus <ul style="list-style-type: none"> • SIMs not installed • SIMs installed 	<ul style="list-style-type: none"> • $P_{available} = 8.5W$ • $P_{available} = 8.5W - P_{SIM0} - P_{SIM1}$ (if equipped with DCF77 receiver or CE-070x, its power consumption has to be considered) 	
Polarity reversal protection	<ul style="list-style-type: none"> • yes 	
Interruption time	<ul style="list-style-type: none"> • $\leq 2.5ms$ at P_{Nsek}; $U_I = 24V (+30\% / -20\%)$ • $\leq 20ms$ at P_{Nsek}; $U_I = 60V (+30\% / -20\%)$ 	

Mechanics and Connectors		CP-6003
Terminals	Removable screw terminals (grid size 5.08)	
Connector(s) for <ul style="list-style-type: none"> • Ax 1703 peripheral bus (for CM-6830) • SAT TOOLBOX II (TB) • Field bus (FB) 	D-SUB 9-pin, female (DIN 41652) (right side of the device) D-SUB 9-pin, female (DIN 41652) D-SUB 9-pin, female (DIN 41652)	
Connector(s) for serial interfaces (LOC, SI0, SI1/ET0, SI2/FB, SI3)	5 x RJ45 8-pin	
Connector(s) for <ul style="list-style-type: none"> • watchdog • sum error • power supply • external synchronization 	Removable screw terminal strips	
Connector for modem power supply or synchronization	D-SUB 9-pin, female (DIN 41652) (left side of the device)	
Mechanical design Installation dimensions	Compact metal housing with small installation depth, for DIN rail mounting 155 x 306 x 75 mm (H x W x D, dimensions w/o DIN rail)	
Weight	Approx. 1050 g (without serial interface modules)	

Further Documents

Folder TM 1703 ACP	MC6-003-1
System Data Sheet TM 1703 ACP	MC6-007-1
ACP 1703 Common Functions System and Basic System Elements	DC0-015-1
ACP 1703 Platforms Configuration Automation Units and Automation Networks	DC0-021-1
Data Sheet SM-2541/PROTOCOL	MC0-001-1
Data Sheet SM-x551/PROTOCOL	MC0-003-1
Data Sheet SM-25x6/PROTOCOL	MC0-029-1
Data Sheet SM-25x4/ET02	MC0-005-1
Data Sheet SM-2545/DPM00	MC0-007-1
Data Sheet SM-2542/ET01	MA0-049-1
Data Sheet CM-6830	MC6-019-1
Data Sheet CM-0842	MC0-021-1
Data Sheet CM-0843	MC0-022-1
Data Sheet PE-640x/TCIO65	MC6-015-1
Data Sheet PE-640x/USIO65	MC6-023-1
Data Sheet DI-111_/BISI15	MA1-121-1
Data Sheet AI-1304/TIPP16	MA1-125-1
Data Sheet MX-141_/USIO15	MA1-123-1