SIEMENS

SIMATIC TI505

7MT Channel Controller

User Manual

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7MT Channel Controller

1.1 Overview

This manual describes the SIMATIC® TI505™ 7MT Channel Controller (7MTCC).

The 7MTCC allows a Series 505™ CPU to control 7MT I/O. You can connect one 7MTCC to two 7MT I/O bases, for 128 7MT I/O channels per 7MTCC. You can install as many 7MTCCs in your Series 505 base as the CPU V memory allows. Refer to Figure 1-1 for an example.

References

Before using the 7MTCC, you must be familiar with the documentation needed to use this product. Refer to the manuals listed on page 1-9.

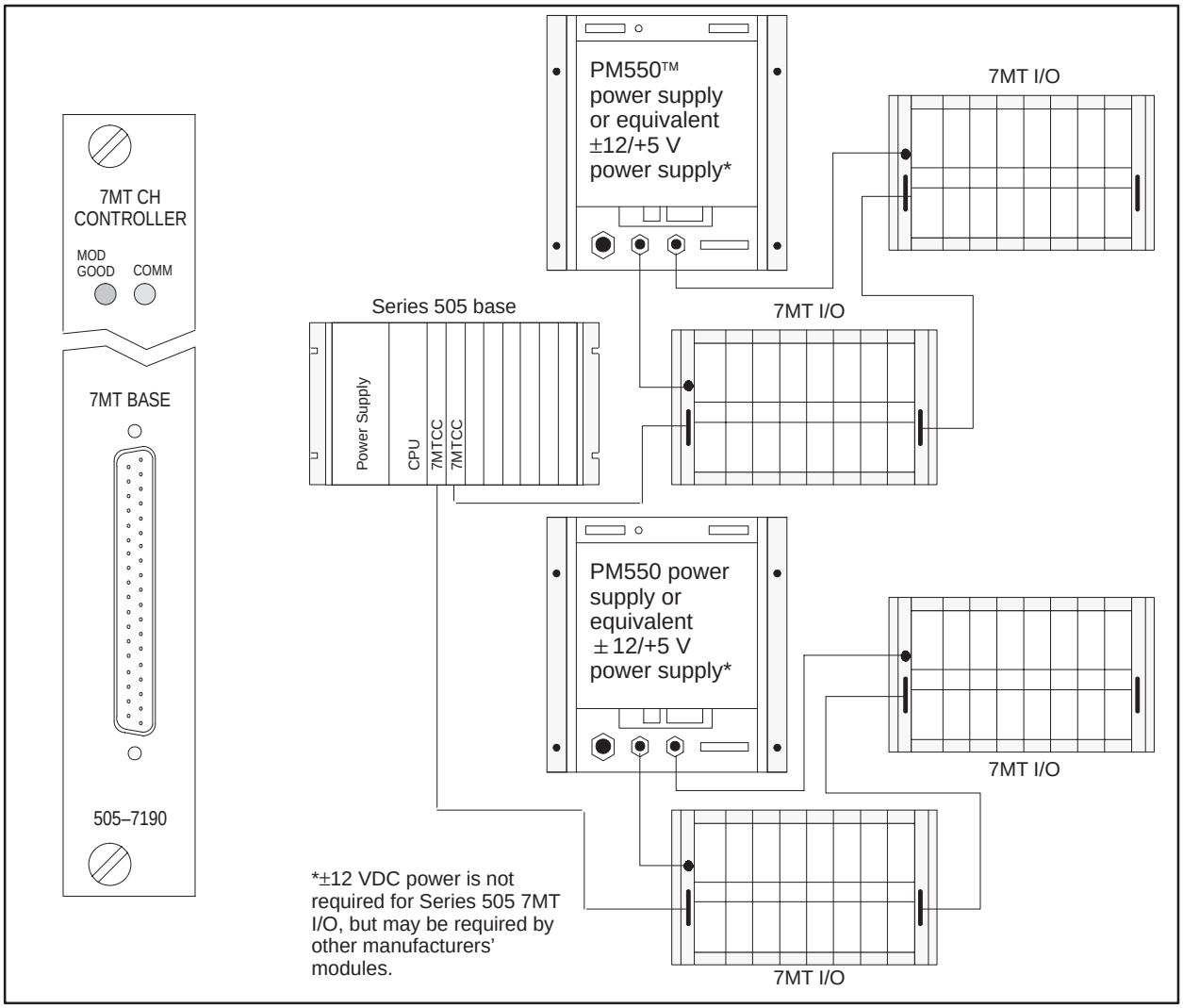


Figure 1-1 7MTCC and System Configuration

⚠ WARNING

To minimize potential electrical shock, turn off power to the base and modules before installing or removing a module, cable, or terminal block. Failure to do so may result in potential injury to personnel or damage to equipment. Be sure to refer to the safety guidelines in your system manuals before installing equipment.

Inserting Module

Insert the 7MTCC into any I/O slot on a local or remote base; the 7MTCC does not operate in a distributed base. Use at least 2.6 inch-pounds (0.3N-m) torque on the bezel screws. The number of 7MTCCs you can install in a base is limited by the size of the CPU V-memory.

Connecting the 7MTCC to the 7MT System

Use cable part number 910–36 to connect the module to the 7MT system.

⚠ CAUTION

To help avoid potential damage to equipment, verify that 7MT power and communications are attached and that power is enabled before using the system.

Providing Power to the 7MT I/O

Each set of two 7MT bases must have a power supply as shown in Figure 1-1. To upgrade your controller from a PM550 to a Series 505 CPU, retain the PM550 power supply and leave it connected to the 7MT I/O base with the same cable. Most 7MT modules require user power; aside from that, no further power connections are needed.

For applications requiring any other type of power supply, call your Siemens Industrial Automation, Inc. distributor for the recommended connection procedure. The procedure requires direction from technical support personnel to help ensure that safety precautions are followed. If you need assistance in contacting your distributor, call (800) 964–4114 to find out the name of your distributor.

Checking Status Indicators

The MOD GOOD LED comes on about two seconds after power-up. If it does not, power-down the system, remove the 7MTCC, and configure I/O again. Reinstall the 7MTCC using appropriate safety precautions; if the LED still fails to light, return the 7MTCC to Siemens for repair.

The COMM LED comes on if the 7MTCC is configured correctly in the I/O table and there is a non-zero value in WY5.

If either LED blinks, refer to Table 1-5 and Table 1-6 for a list of fatal and non-fatal errors.

Configuring the 7MTCC into CPU Memory

The 7MTCC is a 4WX/4WY special function module. Figure 1-2 shows an I/O definition chart with a 7MTCC installed in slot 1 with the first word beginning at WX1. Of course, I/O number can change according to your application program. Refer to your TISOFT™ manual for detailed instructions on selecting the chart.

I/O MODULE DEFINITION FOR: CHANNEL. . . 1 BASE. . . 00

		NUMBER OF BIT AND WORD I/O				
SLOT	I/O ADDRESS	X	Y	WX	WY	SPECIAL FUNCTION
1	0001	00	00	04	04	YES
2	0000	00	00	00	00	NO
3	0000	00	00	00	00	NO
4	0000	00	00	00	00	NO
5	0000	00	00	00	00	NO
6	0000	00	00	00	00	NO
7	0000	00	00	00	00	NO
8	0000	00	00	00	00	NO

Figure 1-2 I/O Definition Chart

1.3 Operating the 7MTCC

Programming Overview

The 7MTCC uses controller V-memory to transfer information between the CPU and the 7MT I/O system. Figure 1-3 gives an overview of the 7MTCC operation.

NOTE: The 7MT I/O addressing scheme described in the *PM550 Programming Manual* does not work with the 7MTCC. The programming method used with the 7MTCC involves V-memory addresses for control blocks.

Transfers of information occur in read and write blocks. Each read and write block transfers all data in one scan. The maximum block size is 512 words for both blocks, although timing estimates are calculated based on 480 words total. If your program is limited to reads *or* writes only, set both the size and address of the other type of block to zero (0).

Be sure to limit your tables to V-memory addresses below 65,536. A configuration error occurs when table addresses exceed 65,535.

Checking 7MTCC and 7MT Status

Table 1-1 shows status words WX1–WX4.

- Word WX1 is the 7MTCC status word. A value of 1 in bit 1 means that the MOD GOOD LED is on; a value of 1 in bit 2 means that the COMM LED is on.
- Words WX2–WX4 contain acknowledge bits from the 7MT tasks as shown in Figure 1-3. A value of 1 means the programmed task has been performed; a value of 0 means the programmed task has not been performed.
- Acknowledge bits are set when a control block exists and the corresponding command bit (Table 1-2) is set. A 7MT I/O module does not have to be in the 7MT base for these bits to be set. The data is transferred, but there is no feedback from the 7MT I/O to verify that the programmed task was actually performed.

Table 1-1 Status Word and Acknowledge Bits

MOD GOOD LED
COMM LED

WX1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Status Bits
WX2	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Acknowledge Bits
WX3	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	
WX4	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	
	MSB															LSB	

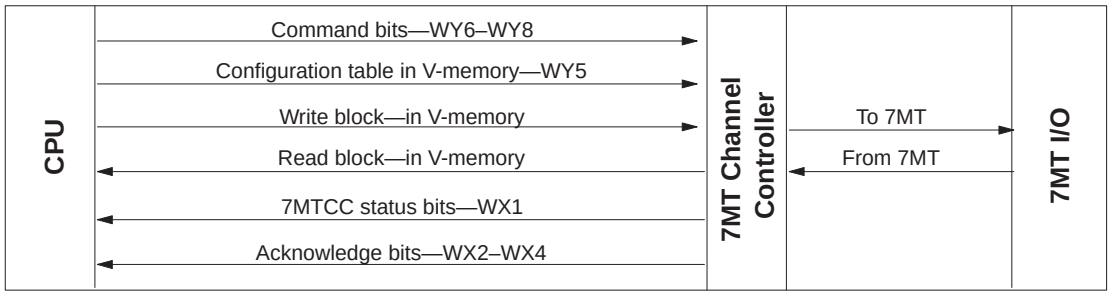


Figure 1-3 7MTCC Operation

Control Words

Word WY5 must contain the integer value of the beginning V-memory address of the configuration table. See Table 1-2. The 7MTCC does not begin operation until WY5 contains a non-zero number. The first four consecutive V-memory locations within the configuration table, beginning with the address defined in WY5, contain the following information in the order listed:

- WRITE BLOCK is the beginning V-memory address.
- WRITE BLOCK size is the number of V-memory locations required by the I/O.
- READ BLOCK is the beginning V-memory address.
- READ BLOCK size is the number of V-memory locations required by the I/O.

READ and WRITE BLOCK sizes may exceed the actual required but should be defined as small as the 7MT I/O allows to enable the 7MTCC to operated more efficiently. Once the WRITE BLOCK V-memory boundaries have been defined, the appropriate V-memory locations within the WRITE BLOCK must be loaded with the correct data depending upon the type of 7MT I/O installed. Upon operation, the data in the WRITE BLOCK is transferred to the appropriate 7MT I/O module in the manner defined by the corresponding control block.

Words WY6–WY8 contain the 7MTCC command bits. Each command bit corresponds to a control block. For example, setting bit 32 (LSB of WY7) to value of 1 causes the operation defined in the 32nd control block in the configuration table to be performed. The transition from 0 to 1 initiates the operation. Once the 7MTCC is configured, its operation can be controlled through two methods:

- All transfers of data from the PLC to 7MT I/O can be started or stopped simultaneously by changing the value in WY5 (a value of 0 halts operation and the integer value of the beginning address of the configuration table starts/continues operation).
- Transfers of data to individual 7MT I/O modules may be controlled by setting the corresponding command bit(s) to the desired value.

Table 1-2 Control Word and Command Bits

WY5	Configuration Table V-Memory Starting Address																
WY6	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Command Bits
WY7	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	
WY8	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	
	MSB															LSB	

Control Blocks

The 7MTCC is programmed to communicate with the 7MT I/O through the use of control blocks in the configuration table. Up to 48 control blocks may be defined. Each control block contains four elements of variable information. These are described below:

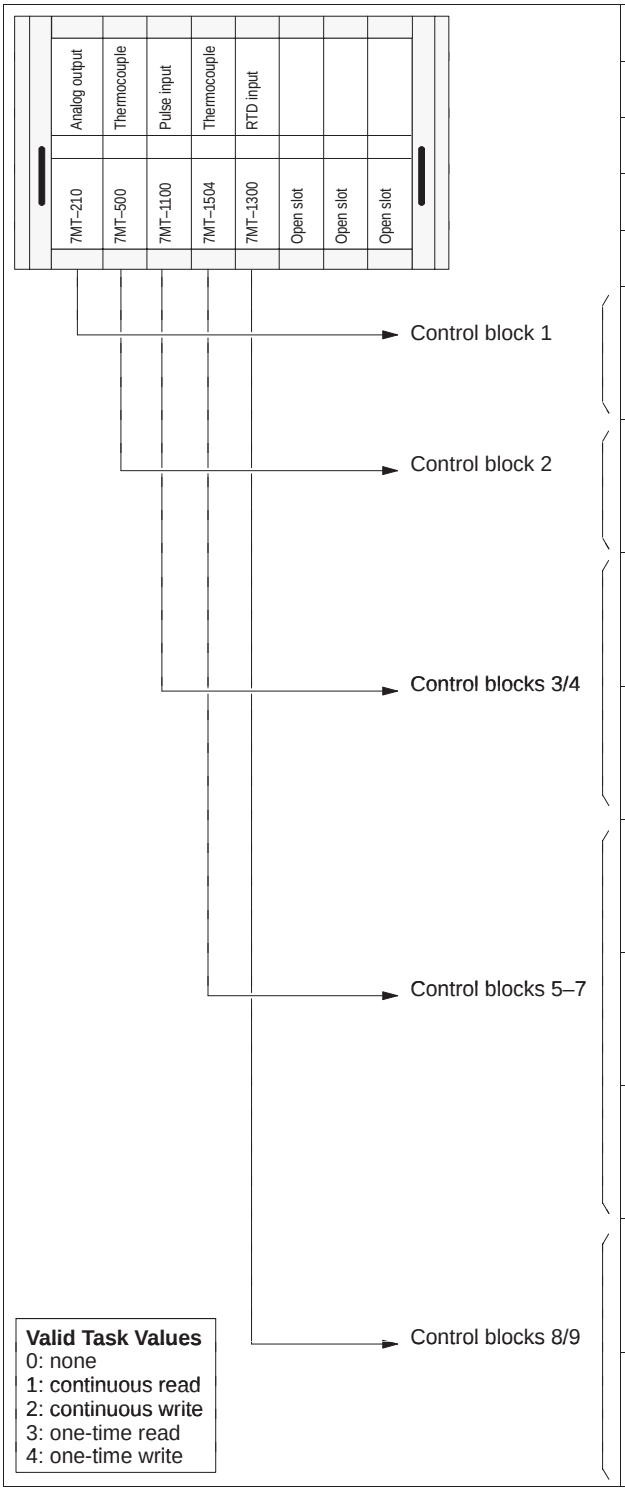
- TASK is a value of 0–4 that defines which type of data operation to perform. See *Valid Task Values* in Figure 1-4.
- 7MT ADDRESS is the value of actual AIM address to be accessed. This is determined by the 7MT I/O modules physical location in the 7MT base and word address within the I/O module. Starting boundary address for each module are 000–700 for the first base, and 800–1500 for the second base, with a possible 32 locations at each boundary, depending upon the type of module used.
- NUMBER OF WORDS refers to the integer value of the number of data words (READ or WRITE) determined by the type of 7MT module installed.
- V-MEMORY OFFSET refers to the integer value of the V-memory offset from the V-memory READ or WRITE block beginning address. This value determines the actual V-memory location where a given 7MT I/O modules data resides within the READ or WRITE blocks.

All 7MT modules require at least one control block to operate. Other modules, especially those that are configured through software rather than jumper selection, may require as many as three control blocks. Figure 1-4 shows an example 7MT base and its associated control blocks with the configuration table V-memory beginning address at V2000. Note that for every configuration table defined, the minimum configuration size is 196 words. The configuration table beginning address and the next 195 consecutive addresses must only be used for valid configuration table information.

Changing the Configuration Table

To change the 7MTCC configuration table, follow these steps:

1. Write a value of 0 to WY5. Bit 2 of WX1 goes to 0. The 7MTCC operation ceases.
2. Edit V-memory to change the configuration table.
3. Perform a Write operation. Bit 2 of WX1 remains 0.
4. Write the configuration table beginning address value to WY5. Bit 2 of WX1 goes to 1. The module resumes operation.



Address	Contents	Description
V2000	1001	V-memory write block address
V2001	80	Write block size in words
V2002	1101	V-memory read block address
V2003	80	Read block size
V2004	2	Task (continuous WRITE)
V2005	000	AIM address
V2006	4	Number of words
V2007	0	V-memory offset from write block address
V2008	1	Task (continuous READ)
V2009	100	AIM address
V2010	4	Number of words
V2011	0	V-memory offset from read block address
V2012	4	Task (one-time WRITE)
V2013	200	AIM address
V2014	32	Number of words
V2015	4	V-memory offset from write block address
V2016	1	Task (continuous READ)
V2017	200	AIM address
V2018	32	Number of words
V2019	4	V-memory offset from read block address
V2020	1	Task (continuous READ)
V2021	300	AIM address
V2022	4	Number of words
V2023	36	V-memory offset from read block address
V2024	4	Task (one-time WRITE)
V2025	304	AIM address
V2026	2	Number of words
V2027	36	V-memory offset from write block address
V2028	4	Task (one-time WRITE)
V2029	310	AIM address
V2030	1	Number of words
V2031	42	V-memory offset from write block address
V2032	4	Task (one-time WRITE)
V2033	400	AIM address
V2034	32	Number of words
V2035	43	V-memory offset from write block address
V2036	1	Task (continuous READ)
V2037	400	AIM address
V2038	32	Number of words
V2039	40	V-memory offset from read block address

Figure 1-4 Configuration Example

1.4 Scan Times and Error Codes

Update Times

7MT and PLC update times are different. Be sure to refer to all appropriate user manuals to determine the update times of all components of your system.

Timing Estimates

The timing estimates in this section are based on a total of 480 words. Although it is possible to increase the total to 512 words per block, this has the effect of adding one scan to each number of scans listed in Table 1-3 and Table 1-4.

Fatal Errors

Fatal errors are reported by the MOD GOOD LED; it blinks a specific number of times depending on which type of error occurs. Refer to Table 1-5.

When a fatal error occurs, the 7MTCC halts operation and the 7MT I/O are held in their last valid state.

Non-fatal Errors

The COMM LED blinks a specific sequence of times depending on which type of error occurs. Refer to Table 1-6.

Table 1-3 One-time Read/write

Command	Request Response		Acknowledge Response	
	Typical	Max	Typical	Max
Read	2 scans	3 scans	1 scan	1 scan
Write	1 scan	2 scans	1 scan	1 scan

Table 1-4 Continuous Read/write

Command	Update	
	Typical	Maximum
Read	1 scan	2 scans
Write	1 scan	2 scans

Table 1-5 Fatal Errors

Blinks	Type of Error
2	Watchdog time-out
3	RAM
4	ROM
5	SFIC
6	Other

Table 1-6 Non-fatal Errors

Blinks	Error Type	WX1 Contents															
2	Invalid configuration table address in WY5	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
3	Invalid write block address or size	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
4	Invalid read block address or size	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
5	Invalid control block information	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
6	Overlapping V-memory read/write tables	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0

Using Ladder Logic

The 7MTCC can be configured and controlled entirely through the use of ladder logic. Any conventional programming method that reads or writes V, WX, or WY memory locations can be used. Since V-memory is used for the transfer of data, the actual I/O data is readily available and easily accessed by ladder logic programs.

1.5 Specifications and References

Maximum power required from Series 505 backplane	4.0 W of +5 V power; 0 W of –5 V power
Operating temperature	0 to 60°C (32 to 140°F)
Storage temperature	–40 to +70°C (–40 to 158°F)
Relative humidity	5% to 95% noncondensing
Pollution degree	2, IEC 664, 664 A
Vibration	Sinusoidal IEC 68-2-6, Test Fc 0.15 mm peak-to-peak, 10–57 Hz; 1.0 g, 57–150 Hz Random IEC 68-2-34, Test Fdc, equivalent to NAVMAT P–9492 0.04 g^2/ Hz, 80–350 Hz
Electrostatic discharge	IEC 801, Part 2, Level 4, (15 kV)
Shock	IEC 68-2-27; Test Ea
Noise immunity, radiated	IEC 801, Part 3, Level 3, MIL STD 461B RS01, and RS02
Corrosion protection	All parts of corrosion-resistant material or plated or painted as corrosion protection
Agency Approvals	UL® Listed (UL508 industrial control equipment) CSA Certified (CSA142 process control equipment) FM Approved (Class I, Div. 2, Haz. Location) Verband Deutscher Elektrotechniker (VDE) 0160 Clearance/Creepage for Electrical Equipment (Self-Compliance) Series 505 products have been developed with consideration of the draft standard of the International Electrotechnical Commission Committee proposed standard (IEC–65A/WG6) for programmable controllers.
References	• *Model 7MT–1504 Thermocouple Input Module User Manual* (PPX:7MT–8114) • *Model 7MT–1300 RTD Module Reference Guide* (2483770–0005) • *Model 7MT–100 Analog Input Module User Manual* (PPX:7MT–8101) • *Model 7MT–700 8-Channel High-speed Analog Input Module User Manual* (2493770–0007) • *Model 7MT–1100 Pulse Input Module User Manual* (PPX:7MT–8111) • *Model 7MT–600 High-speed Analog Output Module User Manual* (2493770–0009) • *Series 505 Hardware/Installation Manual* (PPX:505–8103) • *Series 505 Programming Reference Manual* (PPX:505–8104) • *PM550 Programming Manual* (PPX:550–8101) • *User Manual* for your TISOFT™ release