

## TC Modular Series for BACnet Networks



Figure 1. TC Modular.

### Description

The TC Modular Series for BACnet networks is a high-performance modular Direct Digital Control (DDC) supervisory equipment controller, which is an integral part of the TALON Automation System. It is classified as a BACnet Building Controller (B-BC) and supports BACnet/IP and BACnet MS/TP protocols.

The field panel operates stand-alone or networked to perform complex control, monitoring, and energy management functions without relying on a higher level processor.

- Up to 100 TC Modular field panels communicate on a peer-to-peer network.
- With the addition of TX-I/O modules and a TX-I/O Power Supply on a self-forming bus, the TC Modular can directly control up to 500 points.
- With the addition of an Expansion Module, the TC Modular also provides central monitoring and control for distributed Field Level Network (FLN) devices.

### Features

- BACnet Testing Laboratories (BTL) certified  
 Classified as BACnet Building Controllers (B-BC) using the BACnet/IP protocol and/or BACnet MS/TP.
- Modular hardware components match initial control requirements while providing for future expansion.
- DIN rail mounted device with removable terminal blocks simplifies installation and servicing.
- Proven program sequences to match equipment control applications.
- Built-in energy management applications and DDC programs for complete facility management.
- Comprehensive alarm management, historical data trend collection, operator control, and monitoring functions.
- HMI RS-232 and USB ports, which provide laptop connectivity for local operation and engineering.
- Extended battery backup of Real Time Clock.
- Back-up battery protection eliminating the need for time-consuming program and database re-entry in the event of an extended power failure.
- The TC Modular illuminates a "battery low" status LED and can send an alarm message to selected printers or terminals.

with BACnet® networks.

- The Simple Network Management Protocol (SNMP) Agent allows points in the field panel to communicate with an SNMP manager over Ethernet.

## Hardware

### Modular

- The TC Modular is a microprocessor-based multi-tasking platform for program execution and communication with other field panels. It scans field data, optimizes control parameters, and manages operator requests for data in seconds.
- The program and database information stored in the TC Modular memory is protected with a battery backup. This eliminates the need for time-consuming program and database re-entry in the event of an extended power failure. When battery replacement is necessary, the TC Modular illuminates a “battery low” status LED and can send an alarm message to selected printers or terminals.
- The TC Modular firmware, including the operating system, is stored in non-volatile flash memory.

the right of the controller (see Figure 3) supports up to 500 points through TX-I/O™ modules. Another self-forming bus to the left of the controller (see Figure 5) supports hardware connection to subsystems through Expansion Modules.

### TX-I/O Modules

TX-I/O Modules are modular expansion I/O consisting of an electronics module and terminal base. The electronics modules perform A/D or D/A conversion, signal processing and point monitoring and command output through communication with the TC Modular. The terminal bases provide for termination of field wiring and connection of a self-forming bus. For more information, see the TX-I/O Product Range Technical Specification Sheet (149-476T).

### TX-I/O Power Supply

The TX-I/O Power Supply provides power for TX-I/O modules and peripheral devices. Multiple Power Modules can be used in parallel to meet the power needs of large concentrations of I/O points (see Figure 2 and Figure 3). For more information, see the TX I/O Product Range Technical Specification Sheet (149 476).

Network (FLN) devices.

Using the Expansion Module, the TC Modular supports one BACnet MS/TP network of up to 96 BACnet MS/TP FLN devices.



Figure 4. RS-485 Expansion Module.



Figure 5. RS-485 Expansion Module and Modular.

Level Network devices using the Expansion Module (see Figure 7).



Figure 7. RS-485 Expansion Module and Modular.

Of course, the TC Modular can be used for both direct point monitoring and control and as a system controller for Field Level Network devices (see Figure 8).



Figure 8. RS-485 Expansion Module, Modular, TX-I/O Power Supply, and TX-I/O Modules.

## Modular Control Panels with Application Flexibility

The TC Modular is a high performance controller with extensive flexibility. It can be customized with the exact hardware and program for the application. As a result, the user only purchases what is needed.

In a stand-alone configuration, the TC Modular can fulfill all requirements of a supervisory network coordinator by managing operation schedules and alarms and communicating for the connected devices.

The control program for each field panel is customized to exactly match the application. Proven Powers Process Control Language (PPCL), a “BASIC” type programming language, provides direct

## Multiple Operator Access

Multiple operators can access the network simultaneously. Multiple operator access ensures that alarms are reported to an alarm printer while an operator accesses information from a local terminal. When using the BACnet/IP ALN option, multiple operators may also access the controller through concurrent Telnet sessions and/or local operator terminal ports, plus optional Web interface using the Web or Web Services option.

## Menu Prompted, English Language Operator Interface

The TC Modular includes a simple, yet powerful, menu-driven English Language Operator Interface that provides, among other things:

- Point monitoring and display
- Point commanding
- Historical trend collection and display for multiple points
- Event scheduling
- Program editing and modification via Powers Process Control Language (PPCL)

the TC Modular:

- Closed Loop Proportional, Integral and Derivative (PID) control.
- Logical sequencing.
- Alarm detection and reporting.
- Reset schedules.

## Built-in Energy Management Applications

The following applications are programmed in the TC Modular Series and require simple parameter input for implementation:

- Automatic Daylight Saving Time switchover
- Duty cycling
- Economizer control
- Event scheduling
- Holiday scheduling
- Night setback control
- Peak Demand Limiting (PDL)
- Temperature-compensated duty cycling
- Temporary schedule override

# Modular Series Specifications

## Dimensions (L x W x D)

TC Modular	7.56" x 3.54" x 2.76"(192 mm x 90 mm x 70 mm)
FLN Expansion Module	1.26" x 3.54" x 2.76" (32 mm x 90 mm x 70 mm)

## Processor, Battery, and Memory

Processor	MPC885 (PowerPC )
Processor Clock Speed	133 MHz
Memory	80 MB (64 MB SDRAM, 16 MB Flash ROM)
Secure Digital Input/Output (SDIO) card (for future use)	Expandable or removable non-volatile memory
Battery backup of SDRAM	30 days (accumulated), AA (LR6) 1.5 Volt Alkaline (non-rechargeable)
Battery backup of Real Time Clock	12 months (accumulated), Coin cell (BR2032) 3 Volt lithium

## Communication

BACnet/IP Automation Level Network (ALN)	10Base-T or 100Base-TX compliant
BACnet MS/TP Automation Level Network	RS-485, 9600 bps to 115.2 Kbps

ancillary smoke control applications only).

### Electrical Rating

Power Requirements	+/-20% input @
Power Consumption (Maximum)	24 VA @ 24 Vac
AC Power	NEC Class 2
Communication	NEC Class 2

### Operating Environment

Ambient operating environment	
Shipping and storage environment	-13°F to 158°F (-25°C to 70°C), 5% to 93% rh, non-condensing
Mounting Surface	Building wall or structural member

### Agency Listings

UL	UL864 UUKL Smoke Control Equipment (except rooftop models) UL864 UUKL7 Smoke Control Equipment (except rooftop models) CAN/ULC-S527-M8 (except rooftop models) UL916 PAZX (all models) UL916 PAZX7 (all models)
CSA	CSA 22.2 No. 205-M1983 SIGNAL EQUIPMENT



## Optional Licenses

Product Number	Description
LSM-FPWEB.T	License to enable BACnet Field Panel Web Server (TC-1000, TC-36) or Web Services (TC-16/24)
LSM-SNMP.T	License to enable SNMP Agent License to enable SNMP Agent
PXF-TXIO.T	License to enable the Island Bus on the TC-1000.

## Accessories

Product Number	Description
PXM10S	Controller mounted Operator Display module with point monitor and optional blue backlight
PXM10T	Controller mounted Operator Display module
PXA-HMI.CABLEP5	Serial cable required for PXM10T/S connection to Series controllers.

PXA-ENC19	19" Enclosure (UL Listed NEMA Type 1 Enclosure)
PXA-ENC34	34" Enclosure (UL Listed NEMA Type 1 Enclosure)

## Documentation

Product Number	Description
588-781	TC Modular Series Owner's Manual
588-583	TALON Powers Process Control Language (PPCL) User's Manual

Siemens Industry, Inc.  
Building Technologies Division  
1000 Deerfield Parkway  
Buffalo Grove, IL 60089  
[www.buildingtechnologies.siemens.com/bt/us](http://www.buildingtechnologies.siemens.com/bt/us)

## Product Description

An integral member of the TALON product family, the TC Modular for BACnet Networks is a high performance, modular Direct Digital Control (DDC) supervisory equipment and primary building controller. The TC Modular operates stand-alone or networked to perform complex control, monitoring and energy management functions without relying on a higher-level processor. The TC Modular communicates on a 10/100 MB Ethernet BACnet/IP or BACnet MS/TP network and optionally supervises BACnet MS/TP devices.

## BACnet Standardized Device Profile (Annex L)

Supported	Device Profile
	BACnet Operator Workstation (B-OWS)
•	BACnet Building Controller (B-BC)
	BACnet Advanced Application Controller (B-AAC)

DS-RP-A	Data Sharing-ReadProperty-A		
DS-RP-B	Data Sharing-ReadProperty-B		•
DS-RPM-A	Data Sharing-ReadPropertyMultiple-A	•	
DS-RPM-B	Data Sharing-ReadPropertyMultiple-B		•
DS-WP-A	Data Sharing-WriteProperty-A	•	
DS-WP-B	Data Sharing-WriteProperty-B		•
DS-WPM-B	Data Sharing-WritePropertyMultiple-B		•
DS-COV-A	Data Sharing-COV-A	•	
DS-COV-B	Data Sharing-COV-B		•
DS-COVU-A	Data Sharing-COV-Unsolicited-A	•	
DS-COVU-B	Data Sharing-COV-Unsolicited-B		•

<b>Scheduling</b>			
SCHED-I-B	Scheduling-Internal-B		•
SCHED-E-B	Scheduling-External-B		•

<b>Alarm and Event Management</b>			
AE-N-A	Alarm and Event-Notification-A	•	
AE-N-I-B	Alarm and Event-Notification Internal-B		•

AE-INFO-B	Alarm and Event-Information-B		•
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Trending			
T-VMT-A	Trending-Viewing and Modifying Trends-A	•	
T-VMT-I-B	Trending-Viewing and Modifying Trends- Internal-B		•
T-VMT-E-B	Trending-Viewing and Modifying Trends- External-B		•
T-ATR-B	Trending-Automated Trend Retrieval-B		•

Network Management			
NM-CE-A	Network Management-Connection Establishment-A	•	

Device Management			
DM-DDB-A	Device Management-Dynamic Device Binding-A	•	
DM-DDB-B	Device Management-Dynamic Device Binding-B		•
DM-DOB-A	Device Management-Dynamic Object Binding-A	•	
DM-DOB-B	Device Management-Dynamic Object Binding-B		•
DM-DDC-B	Device Management-		•

DM-BR-B	Device Management-Backup and Restore-B		•
DM-LM-B	Device Management-List Manipulation-B		•
DM-OCD-B	Device Management-Object Creation and Deletion-B		•

## Standard Object Types Supported

Name	Creatable	Deletable
Analog Input		
Analog Output		
Analog Value		
Binary Input		
Binary Output		
Binary Value		
Calendar	•	•
Command	•	•
Device		
Event Enrollment	•	•
File		

**R** indicates that the property is required to be present and readable using BACnet services.

**Yes** indicates that the property is required to be present, readable, and writable using BACnet services.

<b>Analog Input Object Type</b>			
<b>Property_Identifier</b>	<b>Supported</b>	<b>Writable</b>	<b>Required \ Optional</b>
Object_Identifier	Yes		R
Object_Name	Yes		R
Object_Type	Yes		R
Present_Value	Yes	Yes	R
Description	Yes	Yes	O
Device_Type	Yes		O
Status_Flags	Yes		R
Event_State	Yes		R
Reliability	Yes		O
Out_Of_Service	Yes	Yes	R
Units	Yes	Yes	R

Event_Enable	Yes - Alarm	Yes	O
Acked_Transitions	Yes - Alarm		O
Notify_Type	Yes - Alarm		O
Event_Time_Stamps	Yes - Alarm		O
<b>Analog Output Object Type</b>			
<b>Property_Identifier</b>	<b>Supported</b>	<b>Writable</b>	<b>Required \ Optional</b>
Object_Identifier	Yes		R
Object_Name	Yes		R
Object_Type	Yes		R
Present_Value	Yes	Yes	W
Description	Yes	Yes	O
Device_Type	Yes		O
Status_Flags	Yes		R
Event_State	Yes		R
Reliability	Yes		O
Out_Of_Service	Yes		R
Units	Yes		R

High_Limit	Yes - Alarm	Yes	O
Low_Limit	Yes - Alarm	Yes	O
Deadband	Yes - Alarm		O
Limit_Enable	Yes - Alarm		O
Event_Enable	Yes - Alarm	Yes	O
Acked_Transitions	Yes - Alarm		O
Notify_Type	Yes - Alarm		O
Event_Time_Stamps	Yes - Alarm		O
<b>Analog Value Object Type</b>			
<b>Property_Identifier</b>	<b>Supported</b>	<b>Writable</b>	<b>Required \</b> <b>Optional</b>
Object_Identifier	Yes		R
Object_Name	Yes		R
Object_Type	Yes		R
Present_Value	Yes	Yes	R
Description	Yes	Yes	O
Status_Flags	Yes		R
Event_State	Yes		R

High_Limit	Yes - Alarm	Yes	O
Low_Limit	Yes - Alarm	Yes	O
Deadband	Yes - Alarm		O
Limit_Enable	Yes - Alarm		O
Event_Enable	Yes - Alarm	Yes	O
Acked_Transitions	Yes - Alarm		O
Notify_Type	Yes - Alarm		O
Event_Time_Stamps	Yes - Alarm		O
<b>Binary Input Object Type</b>			
<b>Property_Identifier</b>	<b>Supported</b>	<b>Writable</b>	<b>Required \</b> <b>Optional</b>
Object_Identifier	Yes		R
Object_Name	Yes		R
Object_Type	Yes		R
Present_Value	Yes	Yes	R
Description	Yes	Yes	O
Device_Type	Yes		O
Status_Flags	Yes		R

Time_Delay	Yes - Alarm		O
Notification Class	Yes - Alarm	Yes	O
Alarm_Value	Yes - Alarm		O
Event_Enable	Yes - Alarm	Yes	O
Acked_Transitions	Yes - Alarm		O
Notify_Type	Yes - Alarm		O
Event_Time_Stamps	Yes - Alarm		O
<b>Binary Output Object Type</b>			
<b>Property_Identifier</b>	<b>Supported</b>	<b>Writable</b>	<b>Required \</b> <b>Optional</b>
Object_Identifier	Yes		R
Object_Name	Yes		R
Object_Type	Yes		R
Present_Value	Yes	Yes	W
Description	Yes	Yes	O
Device_Type	Yes		O
Status_Flags	Yes		R
Event_State	Yes		R

Relinquish_default	Yes		R
Time_Delay	Yes - Alarm		O
Notification Class	Yes - Alarm	Yes	O
Feedback_Value	Yes - Alarm		O
Event_Enable	Yes - Alarm	Yes	O
Acked_Transitions	Yes - Alarm		O
Notify_Type	Yes - Alarm		O
Event_Time_Stamps	Yes - Alarm		O
<b>Binary Value Object Type</b>			
<b>Property_Identifier</b>	<b>Supported</b>	<b>Writable</b>	<b>Required \</b> <b>Optional</b>
Object_Identifier	Yes		R
Object_Name	Yes		R
Object_Type	Yes		R
Present_Value	Yes	Yes	R
Description	Yes	Yes	O
Status_Flags	Yes		R
Event_State	Yes		R

Time_Delay	Yes - Alarm		O
Notification Class	Yes - Alarm	Yes	O
Alarm_Value	Yes - Alarm		O
Event_Enable	Yes - Alarm	Yes	O
Acked_Transitions	Yes - Alarm		O
Notify_Type	Yes - Alarm		O
Event_Time_Stamps	Yes - Alarm		O
<b>Calendar Object Type</b>			
<b>Property_Identifier</b>	<b>Supported</b>	<b>Writable</b>	<b>Required \</b> <b>Optional</b>
Object_Identifier	Yes		R
Object_Name	Yes		R
Object_Type	Yes		R
Description	Yes	Yes	O
Present_Value	Yes		R
Date_List	Yes	Yes	R
<b>Command Object Type</b>			
<b>Property_Identifier</b>	<b>Supported</b>	<b>Writable</b>	<b>Required \</b>

Action	Yes	Yes	R
Action_Text	Yes	Yes	O
<b>Device Object Type</b>			
<b>Property_Identifier</b>	<b>Supported</b>	<b>Writable</b>	<b>Required \</b> <b>Optional</b>
Object_Identifier	Yes		R
Object_Name	Yes		R
Object_Type	Yes		R
System_Status	Yes		R
Vendor_Name	Yes		R
Vendor_Identifier	Yes		R
Model_Name	Yes		R
Firmware_Revision	Yes		R
Application_Software_Version	Yes		R
Location	Yes		O
Description	Yes		O
Protocol_Version	Yes		R
Protocol_Revision	Yes		R

Daylight_Savings_Status	Yes		O
APDU_Segment_Timeout	Yes		O
APDU_Timeout	Yes		R
Number_Of_APDU_Retries	Yes		R
Device_Address_Binding	Yes		R
Database_Revision	Yes		R
Configuration_Files	Yes		O
Last_Restore_Time	Yes		O
Backup_Failure_Timeout	Yes	Yes	O
Active_COV_Subscriptions	Yes		O
<b>Event Enrollment Object Type</b>			
<b>Property_Identifier</b>	<b>Supported</b>	<b>Writable</b>	<b>Required \</b> <b>Optional</b>
Object_Identifier	Yes		R
Object_Name	Yes		R
Object_Type	Yes		R
Description	Yes	Yes	O
Event_Type	Yes		R

<b>File Object Type</b>			
<b>Property_Identifier</b>	<b>Supported</b>	<b>Writable</b>	<b>Required \ Optional</b>
Object_Identifier	Yes		R
Object_Name	Yes		R
Object_Type	Yes		R
Description	Yes		O
File_Type	Yes		R
File_Size	Yes	Yes	R
Modification_Date	Yes		R
Archive	Yes	Yes	W
Read_only	Yes		R
File_Access_Method	Yes		R
<b>Multi-state Output Object Type</b>			
<b>Property_Identifier</b>	<b>Supported</b>	<b>Writable</b>	<b>Required \ Optional</b>
Object_Identifier	Yes		R
Object_Name	Yes		R

Number_Of_States	Yes		R
State_Text	Yes		O
Priority_Array	Yes		R
Relinquish_default	Yes		R
Time_Delay	Yes - Alarm		O
Notification Class	Yes - Alarm	Yes	O
Feedback_Value	Yes - Alarm		O
Event_Enable	Yes - Alarm	Yes	O
Acked_Transitions	Yes - Alarm		O
Notify_Type	Yes - Alarm		O
Event_Time_Stamps	Yes - Alarm		O
<b>Multi-state Value Object Type</b>			
<b>Property_Identifier</b>	<b>Supported</b>	<b>Writable</b>	<b>Required \</b> <b>Optional</b>
Object_Identifier	Yes		R
Object_Name	Yes		R
Object_Type	Yes		R
Present_Value	Yes	Yes	R

Relinquish_default	Yes		O
Time_Delay	Yes - Alarm		O
Notification Class	Yes - Alarm	Yes	O
Alarm_Values	Yes - Alarm		O
Fault_Values	Yes - Alarm		O
Event_Enable	Yes - Alarm	Yes	O
Acked_Transitions	Yes - Alarm		O
Notify_Type	Yes - Alarm		O
Event_Time_Stamps	Yes - Alarm		O
<b>Notification Class Object Type</b>			
<b>Property_Identifier</b>	<b>Supported</b>	<b>Writable</b>	<b>Required \ Optional</b>
Object_Identifier	Yes		R
Object_Name	Yes		R
Object_Type	Yes		R
Description	Yes	Yes	O
Notification_Class	Yes		R
Priority	Yes	Yes	R

Present_Value	Yes	Yes	R
Description	Yes	Yes	O
Effective_Period	Yes	Yes	R
Weekly_Schedule	Yes	Yes	O
Exception_Schedule	Yes	Yes	O
Schedule_Default	Yes	Yes	R
List_Of_Object_Property_References	Yes	Yes	R
Priority_For_Writing	Yes	Yes	R
Status_Flags	Yes		R
Reliability	Yes		R
Out_Of_Service	Yes	Yes	R
<b>Trend Log Object Type</b>			
<b>Property_Identifier</b>	<b>Supported</b>	<b>Writable</b>	<b>Required \</b> <b>Optional</b>
Object_Identifier	Yes		R
Object_Name	Yes		R
Object_Type	Yes		R
Description	Yes	Yes	O

Log_Buffer	Yes		R
Record_Count	Yes	Yes	W
Total_Record_Count	Yes		R
Notification_Threshold	Yes - Alarm	Yes	O
Records_Since_Notification	Yes - Alarm		O
Last_Notify_Record	Yes - Alarm		O
Event_State	Yes - Alarm		R
Notification_Class	Yes - Alarm	Yes	O
Event_Enable	Yes - Alarm		O
Acked_Transitions	Yes - Alarm		O
Notify_Type	Yes - Alarm		O
Event_Time_Stamps	Yes - Alarm		O

### Data Link Layer Options

•	BACnet IP, (Annex J)
•	BACnet IP, (Annex J), Foreign Device
	ISO 8802-3, Ethernet (Clause 7)

## Segmentation Capability

Able to transmit segmented messages	Yes	Window Size: 32
Able to receive segmented messages	Yes	Window Size: 32

## Device Address Binding

Is Static Device Binding supported?	Yes
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## Networking Options

•	Router, Clause 6 BACnet/IP (Annex J) to BACnet MS/TP
	Annex H.3, BACnet Tunneling Router over UDP/IP
•	BACnet/IP Broadcast Management Device (BBMD)
Yes	Does the BBMD support registrations by Foreign Devices?

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**Siemens Industry, Inc.**  
Building Technologies Division  
1000 Deerfield Parkway  
Buffalo Grove, IL 60089-4513  
USA  
Tel. 1 + 847-215-1000

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comments about this document, please send them to  
[SBT\\_technical.editor.us.sbt@siemens.com](mailto:SBT_technical.editor.us.sbt@siemens.com)

Document No. 588-783  
Printed in the USA  
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