Multipoint heat-tracing control system

The DigiTrace® T2000 is a mulitpoint heat-tracing control system designed to provide the benefits associated with single-point controllers in a multipoint configuration. By taking advantage of innovative modular packaging techniques, singlepoint T2000 controllers are inserted into a rack assembly as circuits are required. Individual circuits can easily be locked out or changed without affecting other circuits. Most importantly, all circuits can be independently monitored simultaneously without scrolling or calling up individual circuit functions.

Isolated wiring configurations allow the controllers to be powered with 90 to 240 Vac, while mechanical contactors or solid-state relays allow circuit switching up to 60 Amps at 600 Vac with single- or three-phase power. Two RTD sensor inputs for each controller make possible a variety of combinations of temperature control, monitoring, and alarming.

The T2000 is available with two output types: an electromechanical relay (EMR) or a solid-state relay (SSR). Systems can be configured for nonhazardous and hazardous locations. Controller interrogation is available both locally and remotely, and configurable with or without DigiTrace Supervisor™ software.

Control

The T2000 measures temperatures with 3-wire, 100-ohm platinum RTDs connected directly to the unit. The controller may be used in line sensing, ambient sensing, proportional ambient sensing, and power limiting modes.

Monitoring

Up to 21 control parameters can be measured including voltage, ground fault, temperature, and current variables to ensure system integrity. The system can be set to periodically check the heating cable for faults, alerting maintenance personnel of a pending heat-tracing problem, and avoid costly downtime.

A dry contact relay can be provided for alarm annunciation back to a Distributed Control System (DCS).

Ground-fault protection

National electrical codes require ground-fault equipment protection on all heat-tracing circuits. Heat-tracing circuits equipped with DigiTrace T2000 controllers do not require additional ground-fault detection equipment, simplifying installation and reducing costs.

Installation

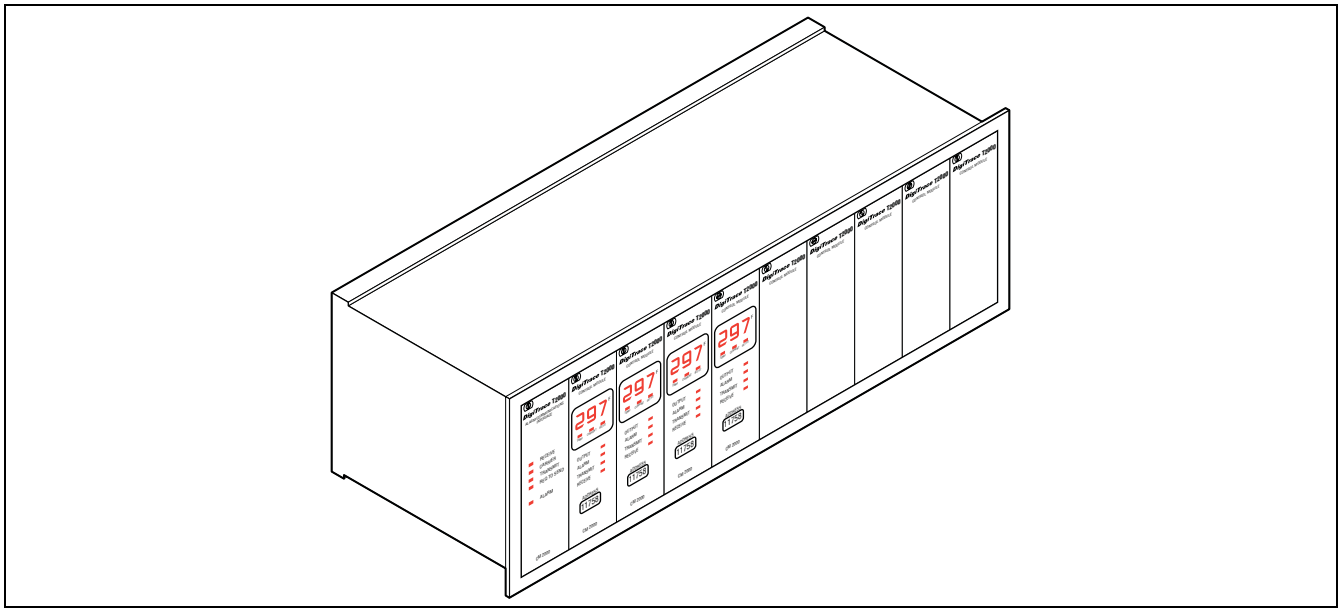
The T2000 controller includes LED displays that make it easy to view alarm conditions and programming settings. Settings are stored in nonvolatile memory in the event of power failure.

Communications

The T2000 units may be networked to a host PC running Windows®-based DigiTrace Supervisor software for central programming, status review, and alarm annunciation. DigiTrace T2000 units support the ModBus® protocol and are available with an RS-485 or 10Base-T Ethernet communication interface.

Packaging

The T2000 is mounted into control racks in prefabricated panels with each control rack designed to hold up to 10 controllers. Multiple racks in panels can accommodate up to 120 circuits. Any unused spaces in a rack are pre-wired for insertion of controllers to allow for expansion of the system.



General

Area of use	Nonhazardous locations (EMR versions) Nonhazardous or Division 2 hazardous locations (SSR versions; EMR with Z-purge)
Approvals	**Controller** **Nonhazardous Locations** (SSR and EMR versions) C SP US FM APPROVED **Hazardous Locations** (SSR versions only) C SP US FM APPROVED Class I, Div. 2, Groups A, B, C, D T-code: T4 **Panels** ETL LISTED 9700701 CONFORMS TO ANSI/UL STD. 508 UL STD. 508A CERTIFIED TO CAN/CSA C22.2 NO. 14 ETL LISTED 9700701 CONFORMS TO ANSI/UL STD. 508 UL STD. 508A CERTIFIED TO CAN/CSA C22.2 NO. 14
Supply voltage	• 100 to 240 Vac, +5%/–10%, 50/60 Hz Common supply for controller and heat-tracing circuit • Up to 600 Vac for heat-tracing circuit when controller is powered from a separate circuit

Enclosure

Protection/materials	NEMA 12 (indoors, painted steel), NEMA 4 (outdoors, painted steel), NEMA 4X (outdoors, stainless steel) (optional Z-purge)
Ambient operating temperature range	–40°F to 104°F (–40°C to 40°C)
Ambient storage temperature range	–40°F to 185°F (–40°C to 85°C)
Relative humidity	0% to 90%, noncondensing

Control

Relay types	3-pole, mechanical (EMR versions) 1-, 2-, or 3-pole solid-state, normally open (SSR versions)
Voltage, maximum	240 Vac nominal, 50/60 Hz (standard), 600 Vac nominal (optional)
Current, maximum per circuit* * Depending on panel size, the maximum current may not be used on all circuits at the same time.	EMR: 30 A @ 104°F (40°C) (standard)60 A @ 104°F (40°C) (optional) SSR: 30 A @ 104°F (40°C) (standard)60 A @ 104°F (40°C) (optional)
Control algorithms	EMR: Line sensing on/off, proportional ambient SSR: Line sensing on/off, proportional, proportional ambient, power limiting, soft start
Control range	–76°F to 1058°F (–60°C to 570°C)

Monitoring

Temperature	Low alarm range High alarm range	–76°F to 1058°F (–60°C to 570°C) or OFF –76°F to 1058°F (–60°C to 570°C) or OFF
Ground fault	Alarm range Trip range	20 mA to 100 mA or OFF 20 mA to 100 mA or OFF
Current	Low alarm range High alarm range Power limit	0.3 Amps to 60 Amps or OFF 0.3 Amps to 60 Amps or OFF 3 W to 60 kW
Voltage	Low alarm range High alarm range	90 V to 280 V or OFF 90 V to 280 V or OFF
Autocycle	Diagnostic test interval adjustable from 1 to 240 minutes or 1 to 240 hours	

Temperature Sensor Inputs

Quantity	Two inputs standard per controller
Types	100 Ω platinum RTD, 3-wire, α = 0.00385 ohms/ohm/°C Can be extended with a 3-conductor shielded cable of 20 Ω maximum per conductor

Alarm Outputs

When using AC 2000+, one NC (normally closed) alarm output and NC warning relay output are available (+12 Vdc @ 100 mA). Outputs open on alarm or loss of power. Each controller may be configured to alarm on high or low temperature, voltage, load current and/or other alarm conditions at user preset levels. The T2000 also monitors the integrity of the RTD sensors and, by means of ground-fault protection, the integrity of the heat-tracing cable and power distribution system. Separate ground-fault alarm and trip points may be set with the ability to display and document actual ground-fault levels. As required by the NEC for EPD devices, both legs are broken by means of a DPST switch for ground fault interruption.

Programming and Setting

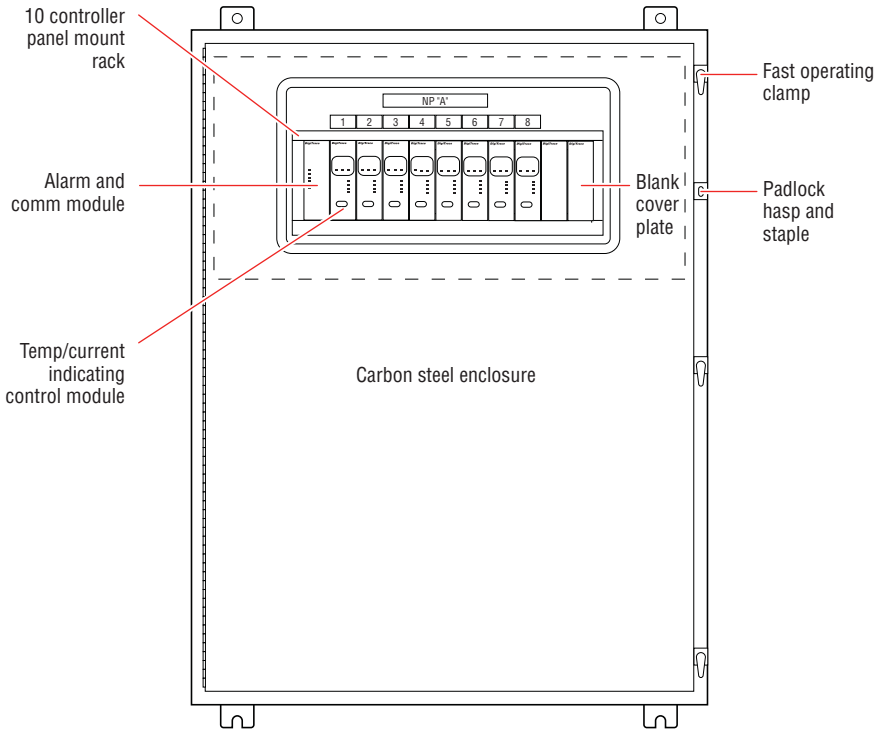
Method	Via communications interface
Units	°F or °C
Digital display	Actual temperature, control temperature, heater current
LEDs	Heater on, alarm conditions, receive/transmit data, °F or °C
Memory	Nonvolatile, restored after power loss, checksum data checking
Stored parameters (measured)	Minimum and maximum process temperature, power accumulator, contactor cycle count, time in use
Alarm conditions	Low/high temperature, low/high current, low/high voltage, ground-fault alarm and trip, RTD failure, loss of programmed values, SSR or EMR failure

Connection Terminals

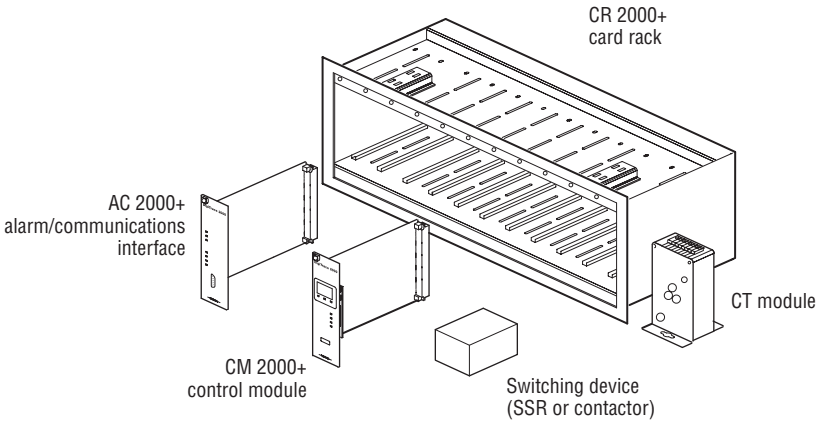
Heating cable output	Screw terminals, 16–6 AWG (30 A versions), 14–6 AWG (60 A versions)
Ground	14–4 AWG ground bar
RTD/alarm/communications	28–12 AWG spring clamp terminals

Typical Panel Layout

T2000-EMR-10/8-12-120/208-24-10/1P(30)-100-0



Components



Component Details

Model code	Model description	Detailed description
CM 2000+	T2000 control module with advanced feature set	Plug-in control module, with firmware V3.14 and up, that provides all heat-tracing control and monitoring functions. Plugs into all types of CR 2000 card racks and interfaces with all types of CT 2000 and AC 2000 modules.
AC 2000+	Alarm/communications interface card with GCC functionality	Plug-in module that provides RS-232, RS-485, or Ethernet interfacing between CM 2000/ CM 2000+ control modules and a PC or an external upstream programming device. Includes two relay output drivers for remote alarm and warning indication.
CR 2000+	Isolated power card rack supporting AC 2000+ features	Panel mount rack provides mechanical protection and electrical connections for the CM 2000/ CM 2000+ control modules as well as the AC 2000+ module. All control modules are individually powered.
CR 2000-CPS+	Card rack with common power supply supporting AC 2000+ features	Panel mount rack provides mechanical protection and electrical connections for the CM 2000/CM 2000+ control modules as well as the AC 2000+ module. All control modules utilize a common power source.
CT 2000	CT module for use with electromechanical contactors	Current transformer and switching module. Load current conductors pass through this module to provide accurate load current and ground-fault current measurements. Internal relay switches an external controller. Interfaces with the CM 2000/CM 2000+ control modules.
CT 2000-HAZ	CT module for use with solid-state relay modules approved for hazardous locations	Current transformer module and switching module. Load current conductors pass through this module to provide accurate load current and ground-fault current measurements. Internal circuitry drives an external solid-state relay. Interfaces with the CM 2000/CM 2000+ control modules.
BC 2000-1	Blank cover	Blank cover plate to occupy empty or unused slots in all types or CR 2000 card racks.

Ordering Details

T2000 - Output - Module Capacity/Control Modules - Enclosure - Voltage - Panelboard - Breaker or SSR or EMR - MCB - Options

T2000-XXX-XX/XX-XXX-XXX/XXX-XX-XX/XX (XX)-XXX-X

Output
EMR = Electro-mechanical relay
SSR = Solid-state relay

Control module capacity
10, 20, 30, 40

No. of control modules
1–40

Enclosure
12 = NEMA 12 (indoors; painted steel)
4 = NEMA 4 (outdoors; painted steel)
4X = NEMA 4X (outdoors;stainless steel)

Voltage
120/208
120/240*
277/480

Panelboard
0 = none required

Control module capacity	120/208	120/240	277/480
10	24	20	18/30
20	30/42	30/42	30/42
30	42/**	42/**	42/**
40	42/**	42/**	42/**

* Single phase
** Consult factory for this con guration

Example: T2000-EMR-w/o Panelboard
T2000-EMR-10/10-4-120/208-0-10(30)-0-0

Example: T2000-EMR-w/ Panelboard
T2000-EMR-10/10-4-120/208-24-10/1P(30)-100-0

Example: T2000-SSR
T2000-SSR-10/10-4-120/208-0-10/1P(30)-0-0

Options
0 = None
Z = Z purge
E = Environmental purge
SP = Special

Main circuit breaker
0 = none required (choose if no panelboard required)

Panelboard size	120/208	120/240	277/480
18	–	–	30, 50, 70, 125
20	–	50, 60, 80, 100	–
24	50, 100	–	–
30	50, 100, 150, 200, 225	50, 60, 80, 150, 175, 200, 225	50, 70, 125, 175, 225
42	50, 100, 150, 200, 225	50, 60, 80, 150, 175, 200, 225	50, 70, 125, 175, 225

Breaker or SSR or EMR

Breaker

No. of C.B./No. of poles (rating)

# of control pts.	*Panel size*	120 V (1P)	208 V (2P)	240 V (2P)	277 V (1P)
1–10	18	–	–	–	10
	20	10	–	9	–
	24	10	10	–	–
11–20	30	20	14	14	20
	42	20	20	20	20
21–30	42	30	20	20	30
31–40	42	40	20	20	40

SSR without panelboard
Select no. of output devices (SSRs)/ no. of poles/amperage
Output devices: 1–40
Poles: 1P or 2P
Amperage: 30, 50

EMR without panelboard
Select no. of output devices (EMRs)/ amperage
Output devices: 1–40
Amperage: 30, 50

Note: The total number of C.B.; EMR or SSR selected must be equal to selected control module capacity. (Consult factory for 2P SSR above 20)