INTELLIGENT BUILDING SPECIALISTS

TEMCO
CONTROLS LTD

TEMCO CONTROLS 2000 CATALOG

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Corporate Profile: Temco Controls Ltd.

IIntroduction

T3000 Building Automation System

Temco Controls Ltd. is a manufacturer of control systems for Heating, Ventilating and Air Conditioning (HVAC) applications. Since our start back in 1969, Temco Controls has been active in the Canadian HVAC industry, primarily in the province of British Columbia. Initially, Temco Controls was the local representative for the Robert Shaw products.

With the advent of computerized building automation systems in teh late 1970's, Temco installed some of the first systems in North America. Eventually, Temco became the sole representative for a system manufactured by a small local company called Reliable which we successfully marketed for ten years under the trade name Burke. Termco sold or installed over a 1,000 systems to hospitals, schools, universities, airports, office towers, and other commercial buildings.

T3000 System

In 1995, Temco rolled out our own T3000 Building Automation System. The T3000 can compete with the biggest names in the industry, enabling the complete computerization of the mechanical systems of a building. Systems can be as small as a single air handler, all the wa up to campus style proejcts such as the Veteran's Hospital in Taiwan with over 40 panels controllir some 2000 control points.

The T3000 system is comprised of two main products, the T3000 which is essentially a PC that has bee repackaged and industrialized for embedded HVAC applications. The T3000 controls up to 128 contr points, so this panel is usually reserved for the main mechanical room in larger systems. For small mechancial rooms, we have developed the T3000 Mini Panel, which can be configured from 16 up to 6 universal control points.

In addition to the T3000 products, Temco manufactures many sensors and other end devices used in co junction with the T3000 system.

Marketing Activity

Temco Controls is developing a dealer network throughout Canada, U.S.A., Asia and South America. O head office is in Vancouver Canada. We also work with our affiliate in San Diego, Hot Sun Technoligie who is acting as our representative for the US market. Temco's former partner, Tricom Telecommunic tions of Hong Kong has recently stepped out of the building automation market. Temco is owned 100% b Temco employees.

T3000 System dealers are independent controls contractors who regularly compete with Honeywe Johnson Controls and other major manufacturers. System Dealers are provided training and technic support from Temco, and granted an exclusive territory upon successful completion of the training pr gram.

Temco T3000 System

1. T3000 System Description

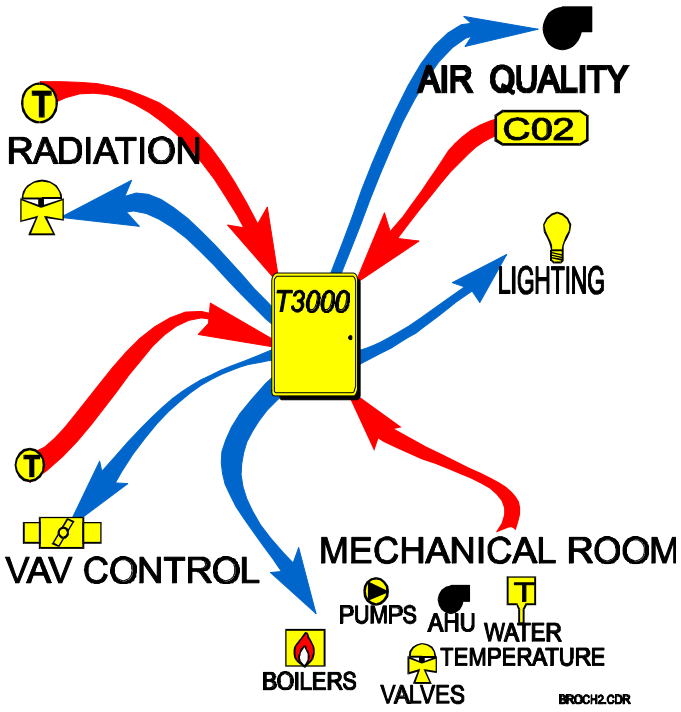
1.1. Introduction

The T3000 system is a complete Energy Management and Control System (EMCS) which is used to control the indoor environment of commercial, institutional and residential buildings. The T3000 measures the physical conditions in the building such as temperature, humidity, pressure, current, voltage, and status. A program residing in the T3000 panel takes these input readings and switches the boilers, fans, lights, pumps, etc in order to maintain the desired indoor climate. The system has built in network capabilities making it possible to scale the system to any size of installation from a single panel up to several thousands of control points distributed over a campus for instance.

The T3000 allows monitoring and control of a number of buildings from one central location. An operator with sufficient password privileges may access the entire system regardless of whether the person is logged on over the modem, via the LAN or locally with a PC.

Graphic displays of floorplans and mechanical diagrams make operation simple for any user. The flexible T3000 hardware and Software makes it easy to configure and re-configure the system throughout the life of the building.

The T3000 system has powerful communications cabilities, supporting simultaneous users through the Ethernet LAN port, the 485 serial network port, the local serial port and remotely over the modem. Printers can also be connected directly to the T3000 panel for the recording of alarms, and the alpha-numeric paging capability can be used to route alarms to maintenance personnel.



1.2. T3000 HIGHLIGHTS

The T3000 system has features which enable it to compete with the biggest names in the industry, yet offers many improvements in ease of use, flexibility and cost. The T3000 control panels can be connected together to form a complete solution to controlling the air conditioning, fire alarm, lighting, access control, and security system requirements of an entire facility.

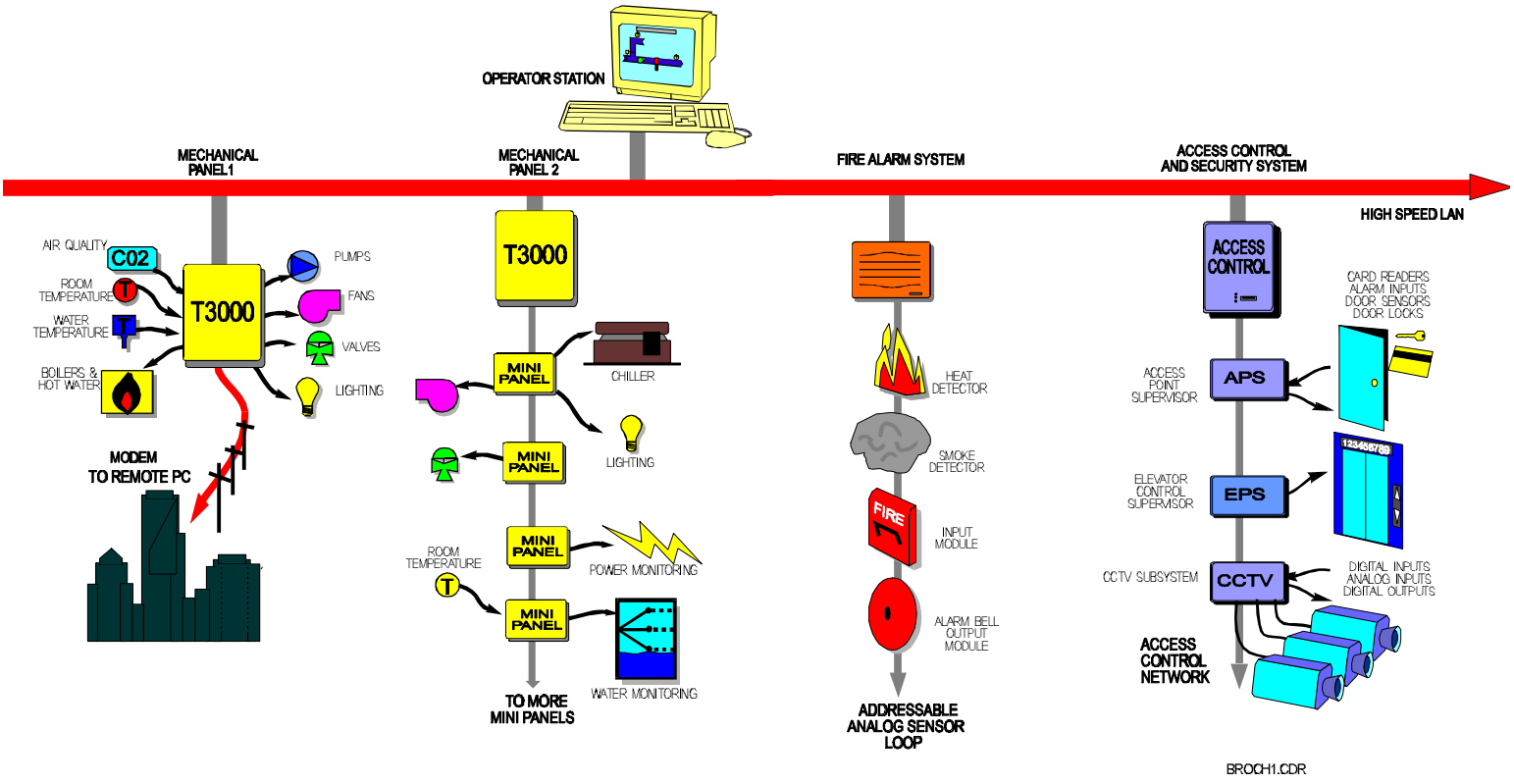
EASY TO WORK WITH

The Software used with the T3000 System is simple to operate, even for novice computer users. Graphics, remote dial in, data archiving and user interface software are standard for all installations, there are no extra software modules to buy. The T3000 Software is not hardware protected, so multiple operators with laptops and home P.C.'s can log on without purchasing extra operator licenses.

PEER-TO-PEER

All panels are “equal”as far as the network is concerned, any panel can access information from the entire network regardless of whether the data originates from a T3000 panel on the high speed Ethernet Network or on a T3000 Mini-Panel. All T3000 panels and Mini-Panels are stand-alone. In the event that any panel goes off line, all other panels will continue to operate independently. There is no MASTER or GATEWAY panel in the system.

T3000 BUILDING AUTOMATION SYSTEM NETWORK ARCHITECTURE



USER PROGRAMMABLE

The T3000 system can be programmed to perform any sequence of operations your process requires. All inputs and outputs are Software driven and can be configured to be either analog or digital.

Industry standard field devices are used, so there are no proprietary sensors or actuators to replace. The T3000 panel can be easily expanded as required by adding more termination cards, there are no hidden costs associated with expanding the system in the future.

EASY TO NETWORK

Additional control panels can be added to the network during the life of the building, simply connect industry standard Ethernet cabling or twisted pair cable between the panels.

The “Network Aware” operating system handles the transfer of information between the panels as required, no special programming is needed.

Use industry standard Ethernet network cards for high speed or RS485 cards for existing twisted pair cabling.

DISTRIBUTED TOPOLOGY

A modem connects the operator to remote sites with the full functionality of an on-site connection. An expert operator in one building can sign on to other buildings and help less experienced operators in the other buildings with a high speed modem connection.

Alarms can be routed to a central dispatch office or to alphanumeric pagers.

LARGE PROJECTS

There is practically no limit to the size of a T3000 system. The main network can be populated with up to 256 of the T3000 panels and each of these panels can be connected to a sub network of 256 Mini-Panels for a maximum of 2.3 million control points. Access to the entire system is transparently provided from anywhere on the main network or the sub network.

SMALL PROJECTS

The standalone capability and modem support of the T3000 Mini-Panel make it a very cost effective solution for small control installations. The Mini-Panel can be configured with a single 8in/8out card for one of the best priced systems around.

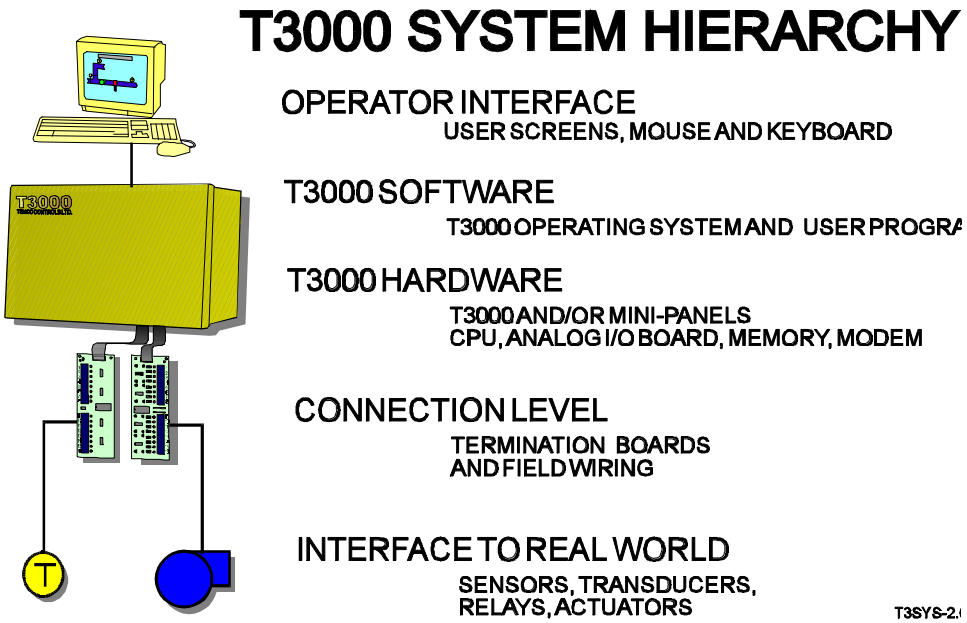
1.3. System Description

The T3000 system provides a complete platform to computerize the mechanical systems in a building. This allows enables maximum comfort while minimizing the energy consumption. The system can be visualized in the following hierarchy starting from the operator interface at the highest level and ending with the actual pumps and fans at the lowest level:

The T3000 and the Mini-Panel can be used together or separately to create a robust and flexible control system. All control decisions are performed directly by the control panels independent of other computers on the network, improving the reliability of the overall system.

The PC based architecture of the T3000 allows the system to be easily enhanced with the addition of standard PC components. For instance, with the addition of an inexpensive hard drive, it is possible to store five years worth of data from the building to perform long term diagnostics.

The powerful T3000 operating system Software allows operators to make changes and perform troubleshooting with a minimum of effort in a very interactive manner. All the Software features of the T3000 system are accessed from the T3000 Software, there are no separate modules to purchase and only one user interface needs to be learned.



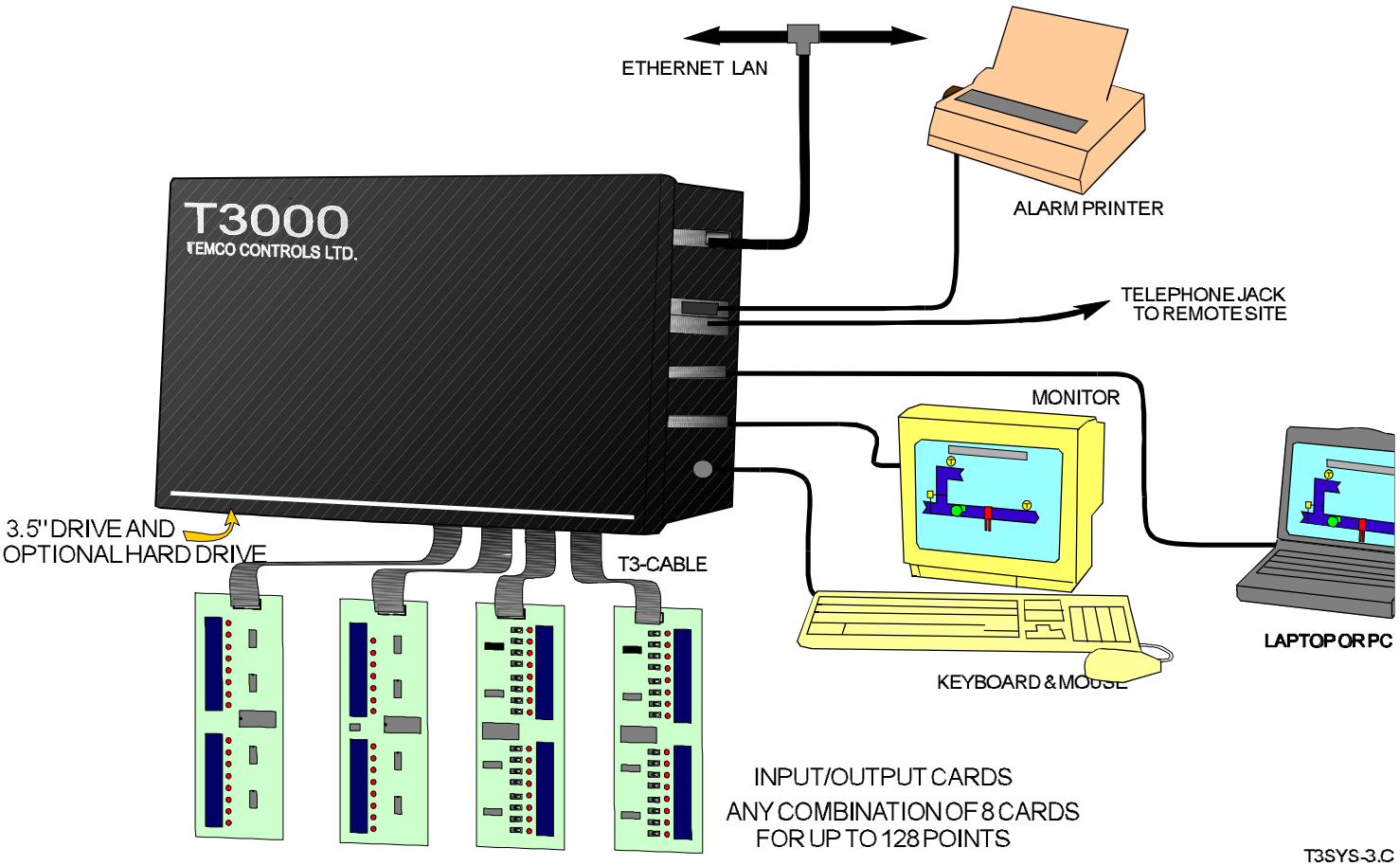
1.4. T3000 Hardware Arrangement

A typical T3000 panel installation is shown below. The T3000 panel is connected to an Ethernet cable which could be run to other T3000's distributed throughout a large building such as an office complex. The wiring from the sensors and other field devices is connected to the Input/Output cards which are mounted within a few feet of the T3000 panel. The T3000 supports up to 128 points in its standard configuration, but can be expanded up 1024 points, well beyond practical wiring practices.

In the diagram below, the T3000 panel is connected directly to a local VGA monitor. This feature is unique to the T3000 system due to the PC based architecture and makes it possible to have a full operator interface right in the mechanical room. This is an advantage in systems where a local operator interface would be useful, but a full stand alone PC is too expensive. The local monitor and keyboard must be located within a few feet of the T3000, although this distance can be extended with off the shelf hardware.

The T3000 supports a second user over the modem with the same functionality of a local connection. A third operator is supported on a laptop or PC through the serial cable. This link operates at up to 38.4 kbaud over a distance of up to 50 feet. A fourth operator can also access the system over the Ethernet cable at a speed of 10Mbaud. Simultaneous operation of all four operator interfaces is supported.

The T3000 is based on standard PC hardware, so many replacement parts can be bought on the local market. In industrial applications, it is possible to build up a very rugged T3000 system with off the shelf hardware such as solid state hard disks, sealed keyboards and a touch screen.



TYPICAL T3000 SYSTEM CONFIGURATION

1.5. T3000 MinPanel Hardware

The following diagram shows a T3000 Mini-Panel installation which would be typical of a mechanical room with perhaps two air handling units and one boiler system. The Mini-Panel is capable of controlling up to 64 control points and uses the same Input/Output termination cards as the T3000 panel. For example, the panel can be equipped with two input cards and two output cards for a 32in/32 out configuration.

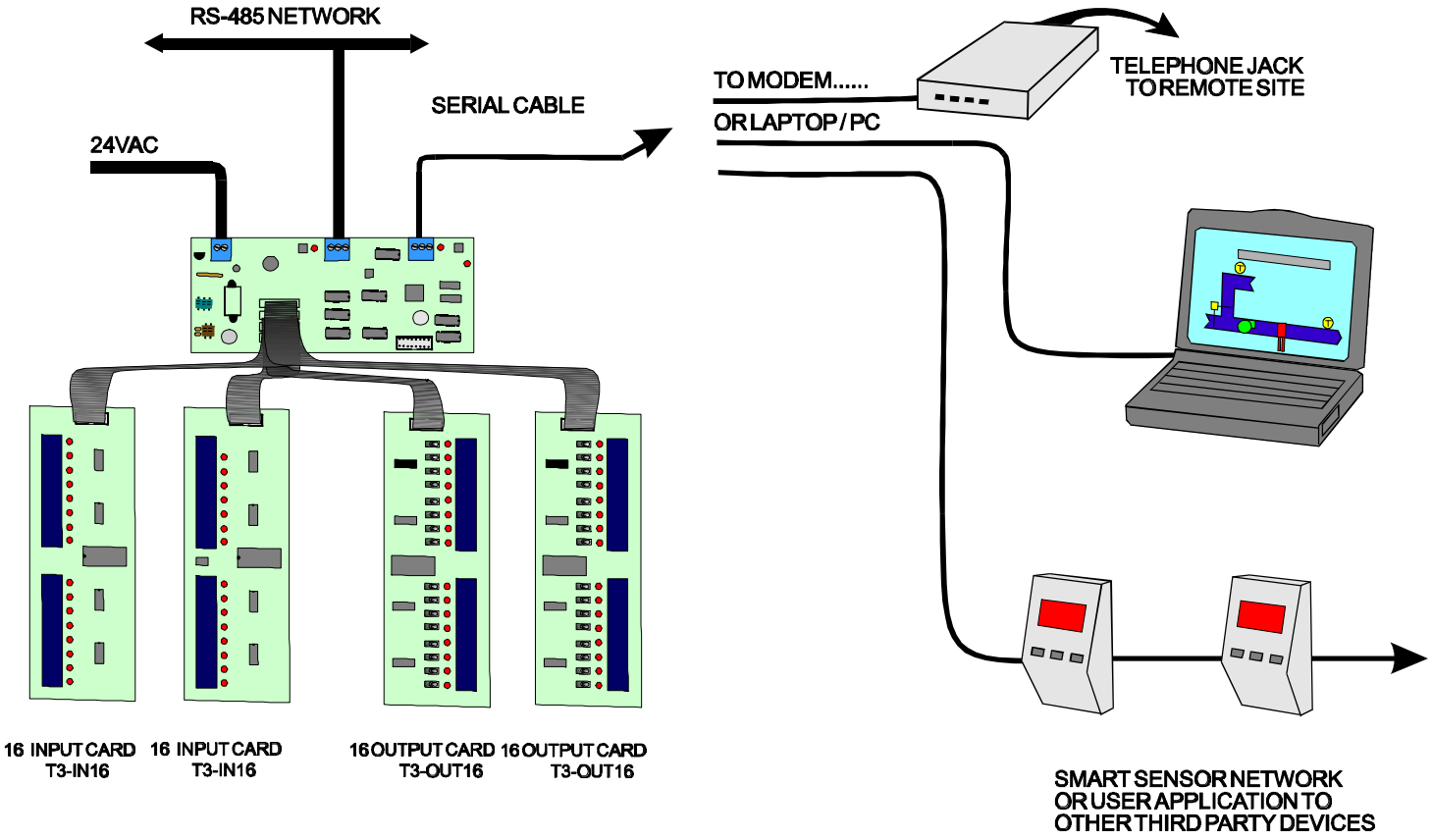
The Mini-Panels are connected to one another using the RS-485 standard which allows for up to 32 panels to be hooked up in a “multi-drop” configuration. Nearly any size network can be constructed using a combination of mini panles on the ‘485 networks and T3000 panels connected using Ethernet and acting as routers for each network of minis.

The Mini-Panel can be connected directly to either a modem or a P.C. There are no adapters required to convert RS-485 to RS-232, the components are on board the panel and RS232 or RS485 is selected by moving jumpers on the board.

A powerful feature of the mini panel is the support of user programs for the COM ports, enabling the mini panel to act as a “protocol converter” or data gathering point for other systems in the building.

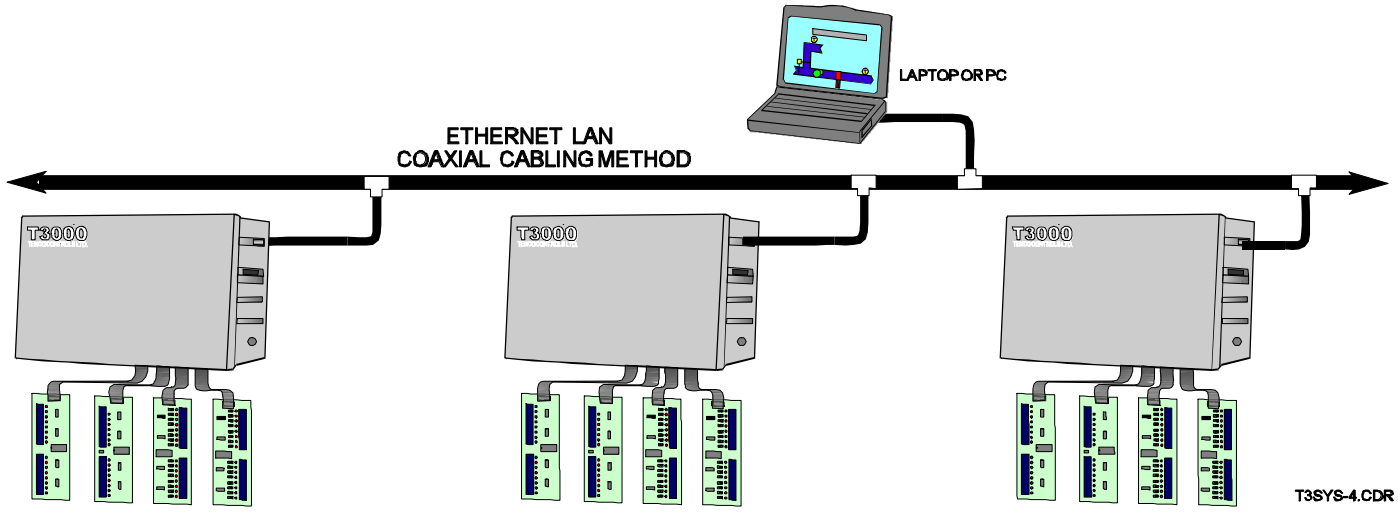
In larger systems, a T3000 panel is connected to the RS-485 network and allows powerful “server” type features such as storing graphics displays of the building for dialup users, or holding several years worth of data from the building. The T3000 is not required though in order to access the building from a modem or PC.

The mini panel software is nearly identical to the T3000 panels, so most programs that work in the mini panle will work unchanged in the T3000 panle and vce-versa. This brings up the question of “why bother with T3000 panels then, they are more expnsive and take up more room.”. The answer is in how you plan to use the system. If a local user interface and the control functions can be combined in to one panel, and if you have enough control points in one location, then use a T3000 panel. If the number of control points is smaller and the operator PC will be in another room, then use the mini panel. Generally, a T3000 panel is a good idea in a large project in the chiller room so all the programming for this room can be on a single panel, and having the operator interface in the room will be helpful for future testing.



Typical T3000 Mini-Panel Setup

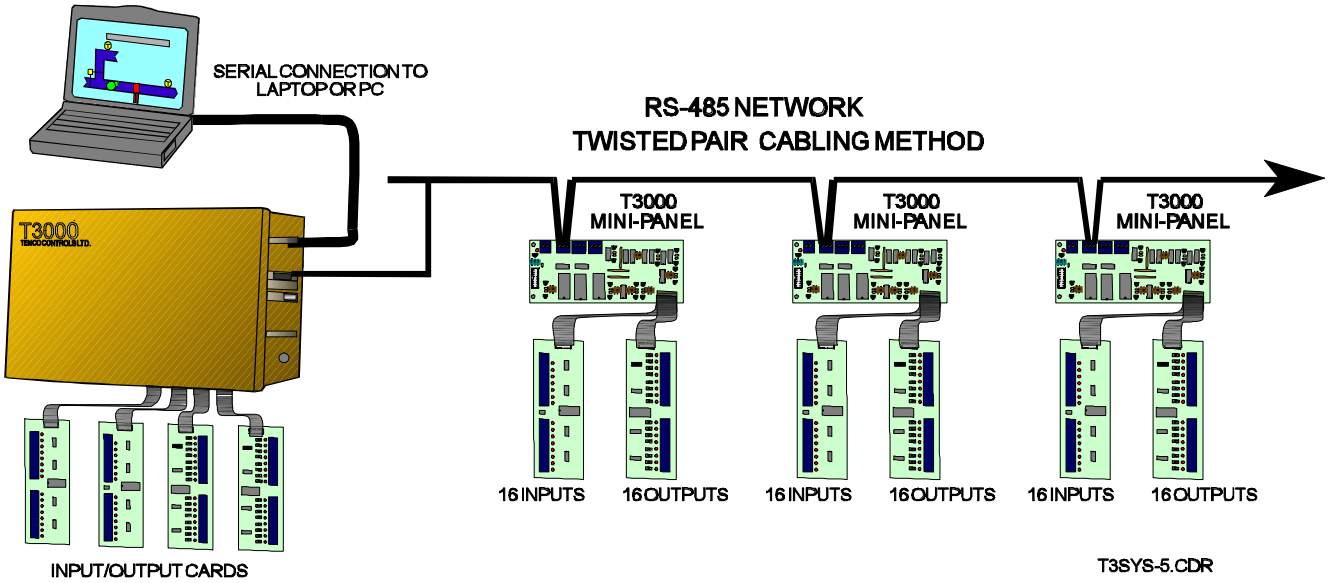
The following diagram shows several T3000 panels joined together on an industry standard Ethernet network. Up to 256 panels can be linked together on this high speed network using industry standard repeaters, routers, and hubs to accommodate nearly any wiring arrangement. Existing twisted pair wiring can also be accommodated, if necessary.



T3000's Connected On A High Spped Ethernet Lan

The T3000 system also supports an arbitrary mixture of T3000 and Mini-Panels on an RS-485 network. The architecture is therefore very flexible and allows installers to choose the architecture which is the most economical for the installation.

T3000 and Mini Panels on an RS485 twisted pair network



1.6. THE T3000 PANEL

The T3000 Controller is a multi-user, stand alone DDC panel with full communications capabilities. The T3000 can be used either stand alone, or in a multiple network system. Multiple communication ports allow the T3000 to simultaneously operate on a network, host sub networks, and to communicate to local and remote operators. Up to 128 Input/Output points may be controlled directly by the T3000 through the use of Input and Output Cards. The T3000 can be expanded in groups of 128 points to a maximum of 512 points on each panel. The number of points on a T3000 is normally limited to 128 and occasionally to 256 points due to the fact that wiring such a large number of points to one location is impractical.

T3000 Controller

HARDWARE

Input/Output Cards

8 cards, each of which accommodates a 16 Input or 16 Output card for a total of 128 control points

- Communication Speed

  Ethernet speed of 100 MBaud between panels

  Serial communication up to 57.6 Kbaud between to PC or modem

- Communication Ports

  2 COM Ports (RS-232 and/or RS-485)

  1 Ethernet Port for the Main Network (optional)

  1 Port for a Parallel Printer

- Optional Ports

  Use standard add-in cards for more serial ports allow interfacing with smart sensors, chiller control panels, boiler controllers, 3rd part control systems, etc.

- VGA Display

  Each T3000 can directly drive a VGA monitor and keyboard for local operation.

- Memory

  4 Megs minimum, expandable to 64 Megabytes

- Real Time Clock provides one second accuracy per day
- Watchdog Timer provides Automatic restart in the event of a computer crash
- PC compatible hard disks provide trend log and graphic file storage
- Status LED's display panel and individual port operation
- Single 120 or 220 VAC power input

Software

- 32 Control Basic programs, expandable to 128
- 128 points per controller, expandable to 512
- 128 Variables, expandable
- 48 Controllers, expandable to 128
- 32 Trend logs, expandable
- Runtime totalizers and event logs
- 32 User screens, expandable to 128
- 16 Weekly schedules, expandable to 32
- 8 Annual schedules, expandable to 32
- 16 Variable arrays, expandable to 32
- 10 User defined passwords, expandable to 32

- 5 Custom tables
- 8 Custom digital engineering units
- Digital/Analog alarms
- Full screen programming editor
- Graphical user screen editor
- Icon representation of items on displays
- TIFF file format supported

The input and output signals have the following characteristics:

All inputs and outputs can be Software configured to be either analog or digital

Analog Inputs have a range of 0 to 5 VDC

Analog Outputs have a range of 0 to 10 VDC at 100 mA

Digital Inputs detect open or short circuit condition

Digital Outputs are 0 - 12 VDC, limited to 100 mA

A T3000 system can be comprised of as many T3000 panels and/or Mini-Panels required for the installation. Each panel has transparent access to every point in the system via the System Network. Each T3000 panel supports two communication ports and an Ethernet port so several users can be simultaneously signed onto each panel of the network.

1.6.1. INPUT AND OUTPUT CARDS

Input and Output termination cards are required for terminating the input and output control wiring. They are made in three types: the 16 input card, 16 output card and the 8in/8out card. The T3000 supports 8 cards for a total of 128 control points, the mini supports 4 cards, or 64 control points. The cards are connected to the controller with a ribbon cable, usually a meter or less in length.

All input and output points have an LED which are particularly useful during testing or casual inspection.

All cards can be software configured for analog or digital operation, there are no extra modules to buy for analog points.

INPUT CARDS

Thermistors, dry contacts 4 - 20 mA transmittersand potentiometers can be directly connectd to the input terminal strip. The inputs are protected against overrvoltage conditions with a 100K input resistor. Also on board are precision 250 ohm resistors so the card can accept 4-20ma signals without having to add an external resistor as some controllers on the market require.

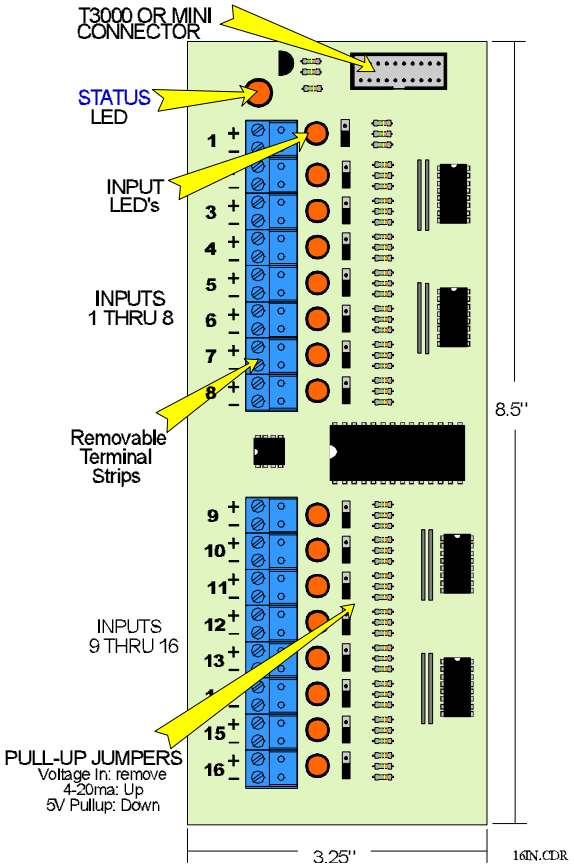
OUTPUT CARDS

Output signals are 0 to10 VDC, up to 75ma on each output. Each output can be configured in software to operate as either anaolg or digital. Manual Switches on each putput allow the operator to override the DDC during testing.

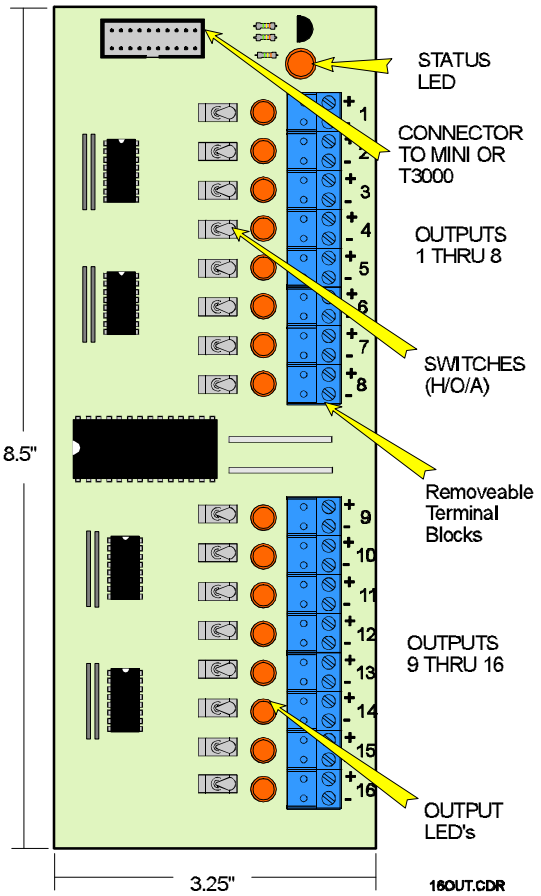
Each output is protected by a current limiting resistor and a self resetting fuse. Short circuits and w iring mistakes of all types are protected to 24VAC.

INPUT/OUTPUT CARD

A combination card with 8 Inputs and 8 Outputs is also available for use with both the T3000 and Mini-Panel.



16 INPUT CARD



16 OUTPUT CARD

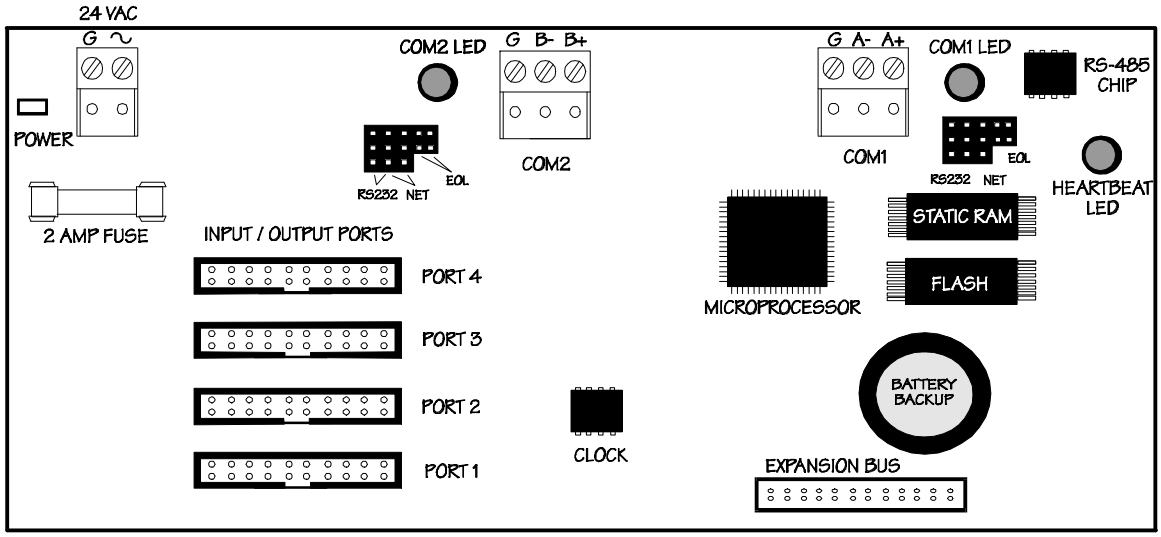
1.7. The T3000 Mini-Panels

Like the T3000, the T3000 Mini-Panel is also a multi-user, stand alone DDC panel with full communications capabilities. The Mini-Panel can be used either stand alone, or in a multiple network system. They provide 99% of the functionality of the T3000 panel, most programs created for a T3000 can be used in the mini panel and vice-versa.

Setup and programming is done on a PC without the need to be connected to live hardware as is the case with many systems. When the program is ready for on-site testing, connect to a live panel and download the mini panel program. Programming can be done remotely over the network and modem connections as well.

:Software	Hardware
Interactive dynamic color graphics	Highly Configurable: any combination of input/output cards totalling up to 64 points
Industry standard Bacnet compatible	
Transparent network operation	- Drives solid state or mechanical relays New version 06/2000 supports relay cards 5A 220VAC
5 Custom tables	- Diagnostic LEDs
16 Control Basic programs	- 256K Flash operating system memory
16 User screen displays	- 128K Static RAM
8 Weekly routines, 4 annual routines	- 2 Serial ports for netowrk, PC or modem connection
64 User variables	- Removable terminal strips
16 PID controllers	- 485 port for simple twisted pair networking
8 passwords or users	-Clock backup for 7 days
0 Trend logs and totalizers	-Flash user programs backed up indefinitely

1.7.1. Mini-Panel Diagram



T3MINI2.CDR

1.8. T3000 System Software

An operator interacts with the T3000 panels and Mini-Panels through the T3000 Software . All Software is included with each project, there are no special licenses or add-on modules to purchase. The Software runs on any IBM compatible personal computer (PC) running MS-DOS. The front end Software for the T3000 system is fully "Menu-Driven". Mouse support is also provided for all menu selections. The T3000 Software is characterized by ease of use and provides extreme flexibility in configuring and updating of the system by the end user.

1.8.1. Editing Tables

Most of the system configuration is performed in a series of tables which the user can navigate and edit like an ordinary spreadsheet. The tables are updated dynamically with real-time information even as the tables are being edited. Navigating the program can be done through the drop down menus, with the mouse, with Hot Key combinations, and for the experienced user, there is a command line which is brought up by pressing the space bar.

1.8.2. Alarms

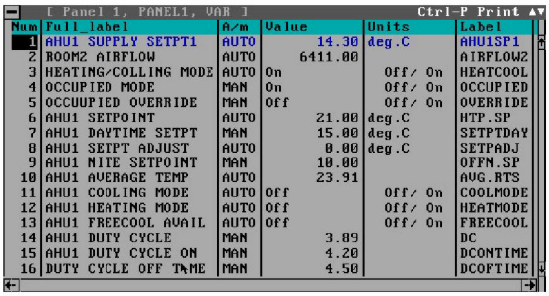
Alarms announce problem conditions in the system and are generated by the ALARM and DALARM statements in Control Basic. There is also an ALARM table which is simpler to edit and has the same effect as the ALARM and DALARM statements. These statements allow for a custom alarm message which can contain a maximum of 70 characters.

When an alarm occurs, an alarm symbol is displayed at the top right of the screen. Clicking on this symbol brings up the alarm log where the user can choose to acknowledge and/or clear the alarm. The alarm message is sent to the printer including the panel number from which the alarm originated, the date, time and alarm priority.

1.8.3. Man-Machine Interface

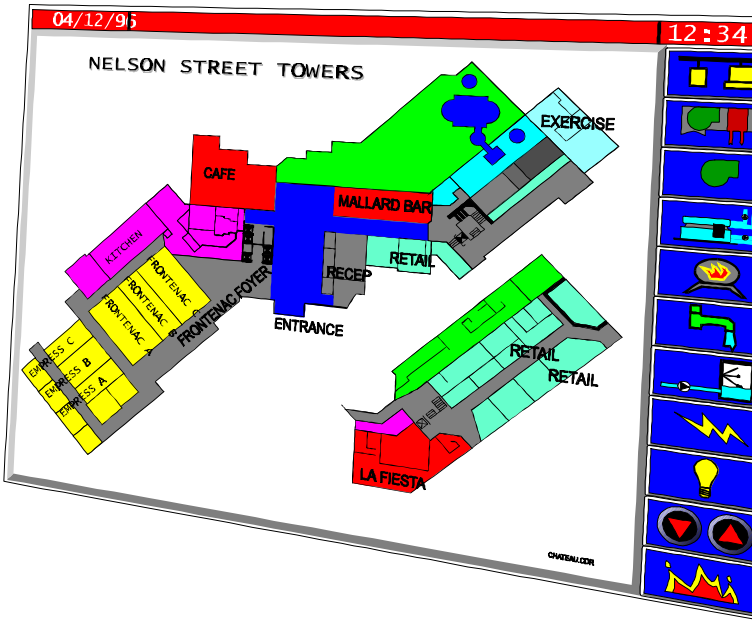
The T3000 operating system includes a graphics drawing package which can be used to draw floor plans and mechanical diagrams of the building. These pictures can also be captured from other drawing packages such as Autocad, Corel Draw, Paint Show and any program that supports the popular TIF file format. This enables you to utilize existing CAD drawings for the T3000 displays and to use the graphics program of your choice

Once the graphics screens are prepared, all the control points associated with that system can then be super-imposed over the graphics image to present a live visual display of the particular system. These graphics screens can be be nested infinitely, enabling an operator to navigate through the entire building via a network of linked graphic images and real time data. Icons pointing to the trend logs, programming, and any associated item can also be placed and moved around on the screen while on-line, providing a very flexible man-machine interface.



[Panel 1, PANEL1, VAR] Ctrl-P Print

Num	Full_label	A/m	Value	Units	Label
1	AHU1 SUPPLY SETPT1	AUTO	14.30	deg.C	AHU1SP1
2	ROOM2 AIRFLOW	AUTO	6411.00		AIRFLOW2
3	HEATING/COLLING MODE	AUTO	On	Off/ On	HEATCOOL
4	OCCUPIED MODE	MAN	On	Off/ On	OCCUPIED
5	OCCUUPIED OVERRIDE	MAN	Off	Off/ On	OVERRIDE
6	AHU1 SETPOINT	AUTO	21.00	deg.C	HTP.SP
7	AHU1 DAYTIME SETPT	MAN	15.00	deg.C	SETPTDAY
8	AHU1 SEIPT ADJUST	AUTO	0.00	deg.C	SETPADJ
9	AHU1 NITE SETPOINT	MAN	10.00		OFFN.SP
10	AHU1 AVERAGE TEMP	AUTO	23.91		AVG.RTS
11	AHU1 COOLING MODE	AUTO	Off	Off/ On	COOLMODE
12	AHU1 HEATING MODE	AUTO	Off	Off/ On	HEATMODE
13	AHU1 FREECOOL AVAIL	AUTO	Off	Off/ On	FREECOOL
14	AHU1 DUTY CYCLE	MAN	3.89		DC
15	AHU1 DUTY CYCLE ON	MAN	4.20		DCONTIME
16	DUTY CYCLE OFF TIME	MAN	4.50		DCOFTIME



1.8.4. Control BASIC

Control Basic is the programming language used for the user programs. Some people assume the mini panel and T3000 firmware are internally programmed in the basic programming language, however this is not the case, only the USER's programs are in Basic. The T3000 and mini panels contain interpreters that allow the user to program in CONTROL BASIC which are very easy to read and maintain. A sample of the programming is as follows:

```
10 IF SCHEDULE THEN START FAN101
20 IF TEMP1 < SETPOINT1 THEN START HEAT1
30 IF TEMP1 > SETPOINT1 + 1 THEN STOP HEAT1
```

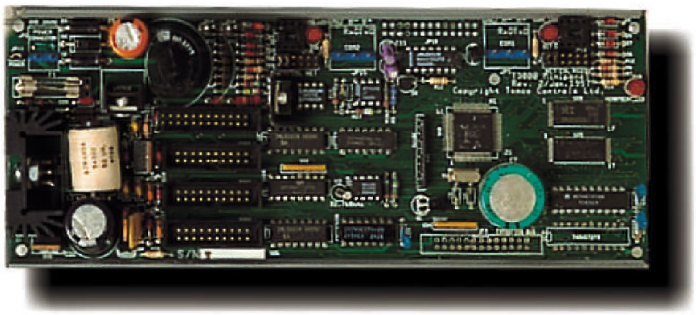
The programming is stored in non volatile memory, so power outages do not affect the operation of the controllers. The programming can be changed while the building is operating, even over the modem, so it is simple to update the logic as required.

GOTO	COMMAND	Unconditionally branches program execution to another line
HANGUP	COMMAND	Ends a phone call in progress
IF	COMMAND	Logical decision, IF HEATMODE THEN START OUT1
IF+	COMMAND	Executes the program line only once when the condition goes from FALSE to TRUE
IF-	COMMAND	Opposite of IF+, executes the line only when a condition becomes FALSE
INT	FUNCTION	Returns the integer part of an expression
INTERVAL	FUNCTION	IF INTERVAL(0:01:00) executes the following programming once every minute
LET	COMMAND	Assignment operator, LET B = 20, has the same effect as B = 20
LN	FUNCTION	Natural logarithm of the argument
LN-1	FUNCTION	Inverse logarithm of the argument
MAX	FUNCTION	Maximum of a list of arguments enclosed in brackets following the statement
MIN	FUNCTION	Minimum of a list of arguments enclosed in brackets following the statement
NEXT	COMMAND	Used in conjunction with the FOR statement to increment the loop counter
ON	COMMAND	ON VAR1 GOTO 100 , 200 , 300 , controls program path depending on VAR1
ON-ALARM	COMMAND	Evaluates to TRUE whenever there is an alarm in the system.
ON-ERROR	COMMAND	Used with PHONE, REMOTE-GET, REMOTE-SET, and RUN-SYSTEM
OPEN	COMMAND	Sets an item to 1, OPEN OUT1 is the same as START OUT1
PHONE	COMMAND	Phones a number, allows T3000 to dial with a modem for numeric paging
POWER -LOSS	FUNCTION	Looks for loss of power, 1 the first time the function i s evaluated, o afterwards
PRINT	COMMAND	Print strings at a printer connected to the panel
PRINT-AT	COMMAND	Print strigns at a printer connected to another panel on hte network
REM	COMMAND	Remark, used to add comments to a program
REMOTE-GET	COMMAND	10 REMOTE-GET VAR1 = 2IN1, gets a reading from another site via modem
REMOTE-SET	COMMAND	Sets a variable at a remote site via modem.
RETURN	COMMAND	Causes program execution to return from a subroutine
RUN-MACRO	COMMAND	Causes a macro command or series of keystrokes to be run
SCANS	FUNCTION	The number of scans a panel is performing in one second
SET-PRINTER	COMMAND	Tells a T3000 system there is a printer at a particular panel
SQR	FUNCTION	Returns the square root of the argument
START	COMMAND	Sets the value of an items to 1, same as OUT1 = 1 or OPEN OUT1
STATUS	FUNCTION	Status of a panel on the network, 0 = No Comm, 1 =OK, 2 = no program
STOP	COMMAND	Sets the value of an items to 0, same as OUT1 = 0 or CLOSE OUT1
TBL	FUNCTION	Looks up a value in a table
TIME	FUNCTION	Finds the current time
TIME-OFF	FUNCTION	Finds the time variable has been false
TIME-ON	FUNCTION	Finds the time variable has been true
WAIT	COMMAND	Pauses program execution
WR-ON	FUNCTION	Finds when a weekly routine is set to come on
WR-OFF	FUNCTION	Finds when a weekly routine is set to go off
UNACK	FUNCTION	Determines if there are unacknowledged alarms in system
USER-A	FUNCTION	Finds the user logged on to the local port
USER-B	FUNCTION	Finds the user logged on to the remote port

T3000 Mini-Panel Controller

The **T3000 Mini-Panel Controller** is a computerized standalone panel with extensive software and communications capabilities. An IBM compatible PC is used for viewing and programming the control system. The **Mini-Panel** is ideal for controlling HVAC and Industrial control systems such as Air Handling Units, or Variable Air Volume Terminals. The controller works either alone, or in tandem with the **T3000** panel which allows flexability in laying out building control networks.

The Mini-Panel can have from 8 inputs, 8 outputs up to 64 points, and uses the same 16 Input, 16Output cards as the T3000 panel. The Mini-Panel uses the industry standard BacNet



System Communications

The **Mini-Panel** can communicate on a peer to peer basis with up to 32 other **Mini-Panels** or **T3000** panels on the Main Network. If the installation is large, up to 32 **Mini-Panels** can communicate on one of two Sub-networks off of each **T3000** for a total of over 2 million points per network.

For smaller installations, **Mini-Panels** can be used independently of the **T3000** with nearly the same functionality as a **T3000** installation.

If the entire network is composed of **Mini-Panels**, the first panel should be a **MP3001**, which has an on-board clock. The **MP3001** will communicate the time to any MP3002 panels in the network.

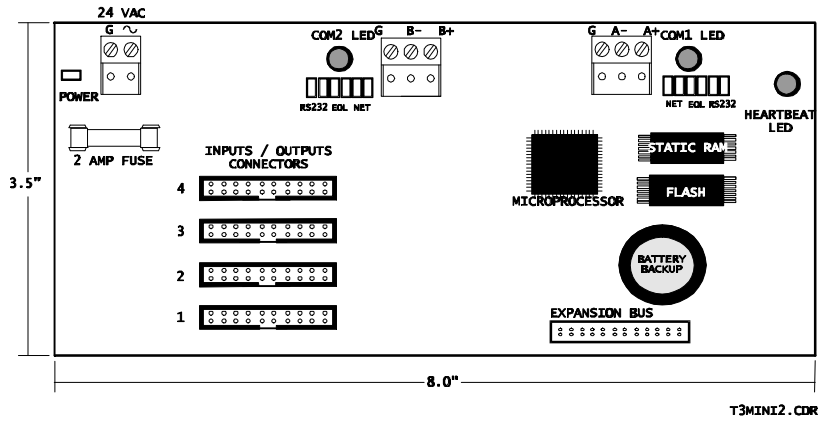
The Mini-Panel has a serial port for direct connection to either a modem or PC. Access to the entire network from any **Mini-Panel** is available

Specifications

Power Requirements	20VA @ 24VAC
Operating Temp. Range	-10°C to 65°C
Operating Humidity Range	10% to 90%
Analog Output Range	0 to 10VDC +/-0.1%
Digital Output Range	0 to 12VDC
Input Voltage Range	0 to 5 VDC +/-2mV
Input Impedance	10 K ohm
Input Protection	120VAC
Weight	8 Ounces
Screw Terminal Connections	12-30 AWG
Mounting	Standard Snaptrack
Dimensions	3.25" W x 8 "L x 0.75" H
Com LED	Flashes when card is

Wiring Diagram

Mini panel with 2 I/O cards and transformer

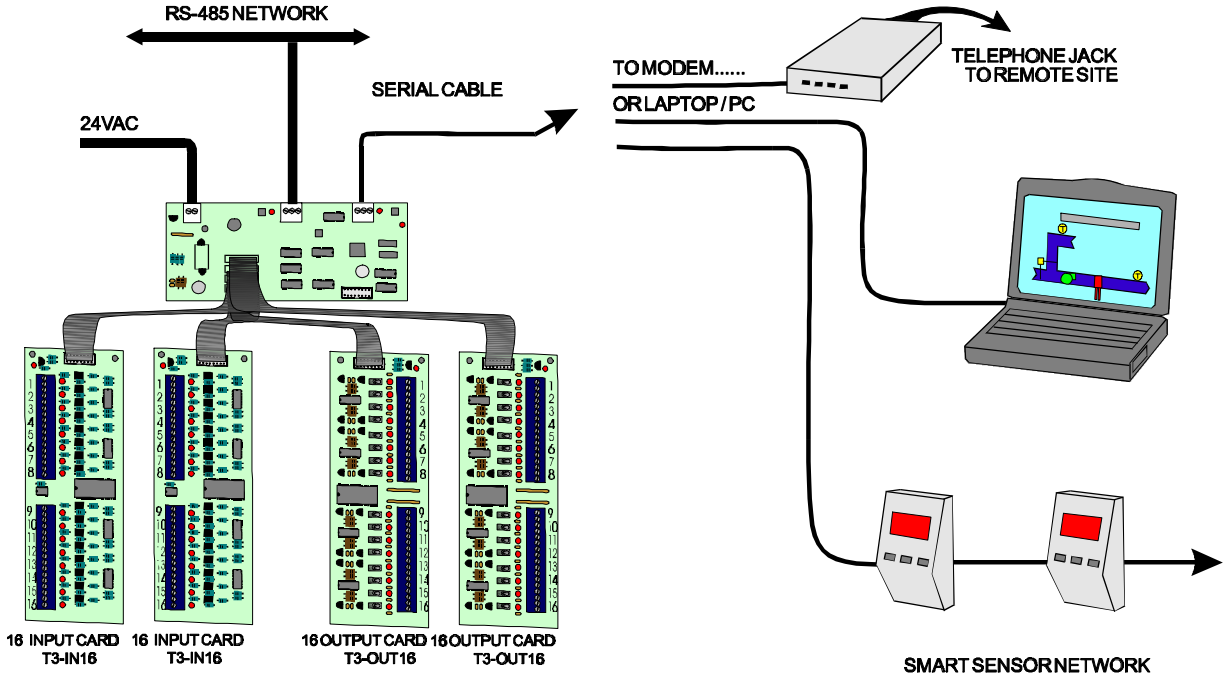


Mini-Panel System Specifications

Hardware
16 Inputs are software configurable to be either Analog or Digital for sensing:
Thermistor
0-5VDC
4-20ma signals
Resistors, Pots, Dry Contacts
16 Outputs Software configuarble to be either:
0 to 10V DC Analog or
0 - 12V DC digital output
Direct drive to solid state or mechanical relay
Diagnostic LEDS
256K Total board memory
Serial port at each Mini-Panel for PC or modem communications

Software
Use one software module for all T3000 family products, no separate interfaces to learn.
Interactive Dynamic Colour Graphics Display
Analog and Digital Monitors for all points and variables
64 Variables for setpoints, calculations, etc
4 Weekly routines, 2 Annual routines
16 User defined Control Basic Programs
16 Operator Screens, completely user configurable
8 Weekly Routines, 2 Annual Routines
5 Custom Tables for scaling custom sensors, etc
16 Controllers for PID loops
128K Flash EPROM for user programs, variables, etc ,Flash operating system (no eproms to upgrade, no battery backup required) 128K Static RAM

Typical Setup For A T3000 Mini-Panel Installation



Ordering Information

Specify:

MP3001 *MINI-PANEL CONTROLLER c/w Clock*

MP3002 *MINI-PANEL CONTROLLER*

T3-OUT16 *16 CHANNEL OUTPUT CARD*

T3-IN16 *16 CHANNEL INPUT CARD*

Accessories:

MPREPEAT *RS-485NETWORK REPEATER*