# The Tomtech T200

Universal Touch Screen Computer

The T200 is an entirely new concept in horticultural control, designed for climate and irrigation control. T200 features a 10.4 inch, high-brightness, colour touchscreen instead of the usual keypad and display making it extremely easy to use while remaining waterproof. The screen is fully readable in sunlight.

The T200 is easily programmed using clear informative options on the screen, and incorporates a touchscreen so you simply have to press the required options on the screen itself.

Climate and Irrigation Control at Your Fingertips
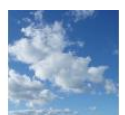
What Will It Control?

The T200 is a truly universal computer. There is no fixed number of inputs and outputs but it has plug in cards - up to 15 cards can be plugged into the T200.

Sensor Card

Each sensor card provides connection for measuring from 10 sensors. Any input can be used with any sensor type including the measurement of:

Air Temperature
Soil, floor or bench temperature
Heating pipe temperature
Relative humidity
Wet/dry humidity
Light
CO_2
pH
Conductivity
Pressure

The T200 is compatible with all Tomtech sensors used with existing equipment allowing simple control upgrading, also is compatible with the Tomtech Digital Weather Station which will monitor wind speed & direction, rain, light, temperature and humidity outside.

Channel card

Each channel card will add five proportional control channels, every one of which has an associated digital input. A proportional channel has two output relays allowing it to be used to control glasshouse equipment such as vents, screens and heating valves. One relay provides open or increase, while the second closes or decreases. In this way the vent etc. can be positioned anywhere between full open and full closed.
Any channel can be used to provide simple on/off control for other systems such as hot air heaters, boilers, CO_2, lighting etc.

Valve Card

Irrigation solenoid valves are controlled by the valve cards. Each card will add outputs for controlling 20 valves. The valves can be 24-volt AC or DC types. Valves can be configured as ordinary distribution valves or as master valves, rinse valves etc. in any combination allowing the system to be easily tailored to match the pipework layout for even the most complicated systems.

Any combination of up to 6 cards can be installed inside the T200. Up to two of these boards can be **FEED5 boards,** each of which provides full feed system control for up to five dosing pumps to add nutrients and acid in a range of different configurations.
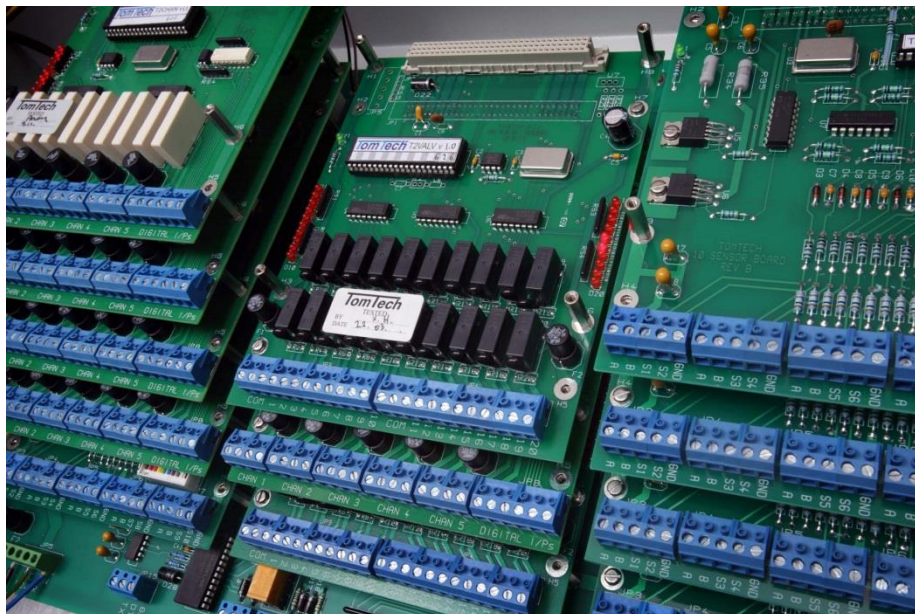
What About the Software?

The T200 is supplied complete with all software for all applications. The system is fully configurable for all applications without additional cost. The standard software includes control programs for all typical glasshouse systems including all types of heating, ventilation, screens, lighting, CO2, misting and irrigation, boilers etc.

The software on the T200 is designed for ease of use, and provides easy programming of the system, as well as providing monitoring and statistics of all measured variables.

Continuous Monitoring

The screen of the T200 has a continuous monitoring mode that displays the time, current readings for all the sensors, including the weather station, and the status of all the control channels such as vents, heating valves and screens, in a continuous cycle. This enables the user to check at a glance that the system is operating correctly.

The cycle may be paused at any point to display and updating display of a group of items if required.

Statistics

Once the control channels and sensors have been programmed, then a method of checking that the programmed environment is being maintained is required. This is accomplished by the T200 and up to 7 days of statistics can be stored in the memory of the T200.

The stored statistics can then be displayed on the colour screen in graphical form, along with minimum, maximum and mean levels.

Programming the T200

The T200 is programmed easily and quickly, by simply pressing the relevant options on the screen. Once the system is programmed it can be locked against unauthorized settings changes by means of a key or a password.

A wide range of sensors and channels, as well as irrigation options can be programmed into the T200. The options displayed will be automatically configured for the daughter cards installed. For sensors, the T200 has programmable alarms with multiple independent high and low thresholds. Any alarm condition will be shown on the screen when in monitor mode, as well as operate an internal beeper and an external alarm.

On environmental control, the T200 offers a wide range of control programs, with all information provided on screen in a clear and concise manner.

Any control channel can be configured to provide any type of control. A summary list of the channel control programs follows:

Heating Control Programs

Four heating programs provide 'Constant', 'Day/Night', 'Three Period' and 'Four Period' regimes. Each period has independent settings for temperature and humidity control and if appropriate - maximum, minimum and humidity pipe temperatures. The start of each time period may be independently set and can be set to adjust itself with sunrise or sunset automatically. The set temperatures will automatically ramp between one time period and the next providing a smooth temperature profile. The set points can be automatically adjusted for solar influence.

Influence settings allow these basic settings to be modified according to current light levels, outside temperatures and average glasshouse temperatures to maximize crop growth while reducing the heating fuel requirements.

The standard software includes versions of these programs suitable for use with hot air, hot water on/off, hot water mixing valve and steam heating systems.

Ventilation Control Programs

The T200 has comprehensive control programs for all types of ventilation and cooling systems including ridge vents, windward/leeward ridge vents, and fan systems. For each of these types of ventilation there are four venting programs providing one, two three and four period control of both temperature and humidity so that each day can be divided into an appropriate number of time periods to suit the crop being grown.

Each time period has independent temperature and humidity settings. These basic settings can be influenced by light, outside temperature and glasshouse average temperatures in a similar way to the heating.

For proportional vent systems, additional minimum and humidity vent percentages can be set, while for fan vent systems, the fans can be 'cycled' to provide some air exchange to reduce the humidity without losing too much heat.

The ridge vent programs all have comprehensive limits allowing the maximum and minimum venting under different wind and rain conditions to be defined.

Thermal Screen Programs

The 'Gapped Timed Screen' program is ideal for blackout screens. It opens and closes the screen at fixed times at dawn and dusk.

The 'Gapped Light Screen' program is best suited to thermal and shading screens. It opens and closes the screen as the ambient light level rises and falls at dawn and dusk. At the start of each day the screen will open in two stages, the first stage provides a 'gap' to allow the air above and below the screen to mix at a controlled rate eliminating the temperature shock which can occur if the screen is drawn completely in one step.

Comprehensive shading settings allow the screen to shade in two stages with rising light, rising temperature or falling humidity.

Heating Pump Program
Hot water heating systems use a circulating pump to move the water around the heating pipes. This pump can be controlled so that it is switched off when there is no demand for heating. In addition, once this pump has switched off it may be cycled to ensure that the pipe temperature remains even.

Boiler Control
The T200 has three boiler control programs. The 'Temperature Control' program will adjust the boilers temperature according to the heat demand. The two 'On/Off Boiler' programs can be used with any type of boiler switching the boiler off when there is no imminent need for heat. These programs will then anticipate the need for heat and switch the boilers on in advance so that there is heat immediately available when it is needed in houses being controlled.
These control programs can also control the boilers to provide CO2 if required.
The T200 will also control Bio Mass Boilers and Modulating Boilers.

Transport Control
The heating transport valve and pump can both be controlled with this program to use the heating transport in the most economical way.

Lighting Control Programs
Two supplementary lighting programs the 'Extended Day' and 'Retrospective Lighting' provide comprehensive control options to apply lighting during the day period for day length sensitive plants or at night in response to the previous days natural light to use low cost electricity.

The 'Night Break Lighting' program may be used to change the day length/night length ratio by shortening the night period. Light may be cycled to reduce running costs, and lighting day length can be automatically varied to track with natural day length changes.

Misting, Fogging and Watering Control Program
The T200 can provide irrigation or misting start signal using individual control channels as follows:
The 'Temperature and Humidity Mist' program is ideal for glasshouse cooling and propagation applications with day/night targets it will provide cyclic misting control for rising temperature or falling humidity.
The 'Mist By Time' program provides simple day/night cyclic control for mist systems and provides a simple solution to mist control for propagation and weaning applications.
The 'Light Sum' program may be used for misting or irrigation applications. It varies the interval between watering according to the light energy received by the plants, watering more often when it is sunny. By setting a small light sum value misting can be triggered at intervals of a few minutes. Larger values may be used to provide irrigation intervals in days.
The 'Daily Irrigation' program provides up to four timed irrigation starts each day and is ideal for repetitive irrigation control.

CO2 Control Programs
The 'Light Related CO2' program uses measured CO_2 levels from an infra-red analyzer and controls the supplementary CO_2 system to maintain a target CO_2 level calculated for the light intensity, time and also vent position.
The high cost of a CO_2 analyzer is often difficult to justify. The 'Best Guess CO2' program does not use a sensor but allows the supplementary CO_2 system to be controlled based on estimating the CO_2 consumption of the crop according to light intensity and vent position. This technique, while not as accurate as actually measuring the CO_2 concentration, can come very close to providing the performance of a CO_2 sensor at no cost.

Feed Dosing Control Programs
Where an N.F.T. system is used the T200 can control the addition of both acid and nutrients for plant feeding by using two dosing control programs. The pH control mode will use measured pH information to control the addition of acid. The feed control program will use measured conductivity information to control the addition of nutrients. The nutrient concentration may be adjusted with light intensity if required.

Irrigation Control with the T200
The T200 can provide comprehensive and wide-ranging irrigation control by installing valve cards, each card controlling up to 20 solenoid valves. It is able to handle all aspects of irrigation including any or all of the following:
All types of irrigation for protected crops
All types of outdoor irrigation
All types of misting and fogging systems

How the T200 Controls Irrigation
The T200 will control the irrigation for the entire nursery which might be in many glasshouses and outside areas. Each area will have individual requirements; this is achieved by using 'GROUPS'. Each group is a totally independent irrigation 'job'. Up to 20 separate groups may be defined containing any selection of valves.

A full suite of programs is supplied with the standard software to control all types of water application both in the glasshouse and for outdoor applications. Each 'Group' of valves is independently programmed with its own requirements, the irrigation requirements of all 20 groups is being checked all of the time so that the computer can be carrying out 20 different watering jobs at once.

For larger water distribution systems master valves may be defined. The master valve will be opened while that group is irrigating. Master valves may be used to automate feeding when using a Dosatron type diluter by using one master valve to direct water through the diluter and another to bypass the diluter. Since the master valve may be defined for each group some groups can have feed applied, while others receive plain water.

A rinse valve may also be used with each group to prime the irrigation pipework system prior to opening the distribution valves. For water supply the T200 will control four separate pump systems, either pump or no pump at all may be selected for each group.

The appropriate pump will then be switched on when irrigation is taking place.

A selection of different trigger conditions may be selected for each individual group.

Each irrigation group may be controlled by 'Time of Day' with up to 8 starts each day. For applications where watering is not required every day the 'Day of Month' program allows the irrigation to be programmed to occur on particular dates allowing a full month to be pre-set in advance. The 'Light Sum' program will trigger irrigation according to the light energy received by the plants, light energy values equivalent to values from one bright sunny minute up to 9999 bright sunny minutes may be used.

For propagating and cooling applications, the 'Temperature & Humidity' program will control misting or fogging systems to maintain an elevated humidity and/or reduce the air temperature by providing day and night temperature and humidity thresholds while the 'Mist By Time' program may be used where frequent water application is needed with day and night time intervals of up to 99 minutes between applications.

Software Updates
As with all other Tomtech systems there is no ongoing software cost. Software updates are **free of charge.**

Will it connect to other Tomtech Computers?
Yes. It is fully compatible with the T100, HC160, HC120, HC80 and IC20 computers. It will communicate with them to share weather station, heat demand etc. to allow all of the computers to operate as a single system.

The T200 is also fully compatible with the 'Tomtech Environment Manager' software providing full data archiving and analysis, centralized programming etc.