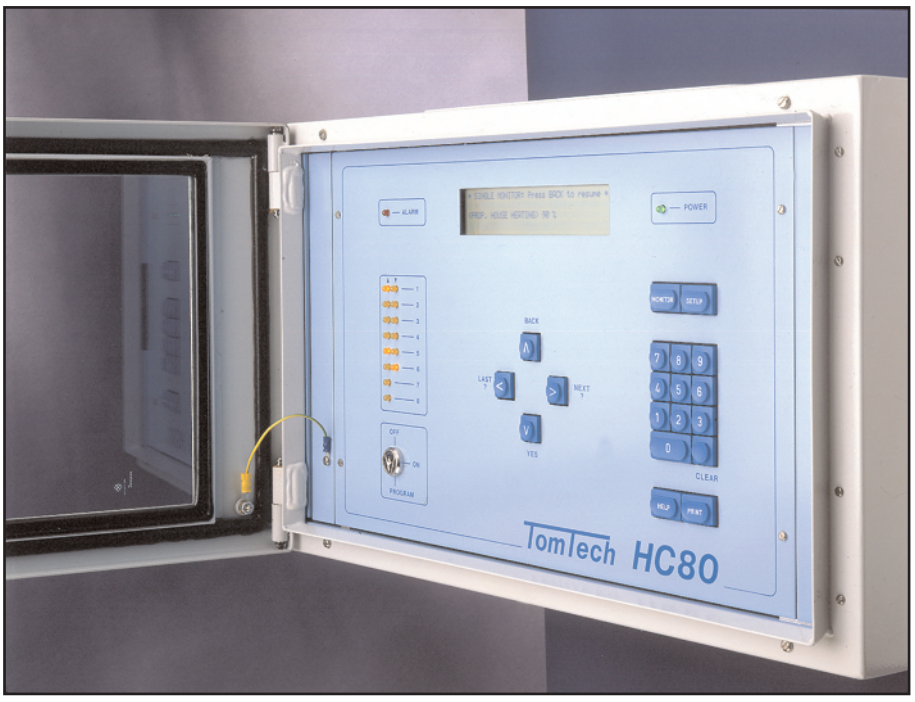
THE

TomTech

HC80 and HC160

HORTICULTURE COMPUTERS



Climate & Irrigation Control at Your Fingertips

TomTech
total control for horticulture

Redmays Farm, Sutton St. Edmund, Spalding, Lincs. PE12 0LR
Tel: 01945 700553 Fax: 01945 700866 E mail: mail@tomtech.co.uk

THE TOMTECH HC80 AND HC160 HORTICULTURE COMPUTERS

The HC80 and HC160 are environmental control computer designed for controlling the climate within one or more glasshouses. They are easily programmed in plain English using the built in screen and keypad. The screen also provides a means of monitoring conditions inside and outside the houses by continuously updating the display of all relevant conditions. keeping you fully informed at all times.

Control is provided by 'control channels', each channel can be individually configured to control heating, ventilation, screens, boilers, etc. Information is obtained by the computer via sensor inputs.These can be configured to measure temperature, humidity, light, CO2, etc. The HC80 is equipped with 8 control channels and 8 sensor inputs, and the HC160 has 16 control channels and 16 sensor inputs. In addition to these measurements inside the glasshouses the computer also looks at conditions outside the glasshouse using a weather station. This measures wind speed and direction, light, rain, temperature and humidity.

Where more inputs and outputs are needed multiple Tomtech computers may be inter-connected to provide a system of the required scale. Information is passed between the computers so that they work as a complete system.

The computer is supplied with a complete suite of sophisticated and flexible programmes for controlling all systems within the glasshouse. In addition Tomtech will provide FREE software updates as new techniques are developed ensuring that your system remains fully up to date.

Fully programmable alarms alert you to any potentially damaging condition before it becomes a problem. Performance statistics for all measured conditions and controlled systems allow easy checking that the best performance is being achieved with the greatest efficiency minimising fuel costs.

A printer and P.C. (Personal Computer) may be connected. The printer will print monitor information and statistics. The P.C. connection allows full remote programming, system monitoring, data analysis, and glasshouse costings by using the 'Tomtech Environment Manager For Windows' software on the P.C.

For maximum reliability and to minimise the installation costs the computer is enclosed in a waterproof and dustproof cabinet with a toughened glass door meeting the IP55 specification. It may therefore be installed directly into the glasshouse minimising cabling costs.

Tomtech manufacture a full range of sensors for measuring temperature, humidity, light etc. that are compatible with the HC80 and HC160 systems.

PROGRAMMING THE HC80 AND HC160

The computers are programmed by using the built in display screen and keypad. Options are displayed in plain English and may be selected using four cursor keys. If you are not sure how to answer any of the questions asked by the computer then a 'Help' key can be pressed to explain in more detail what is required. Once programmed the system can be locked against unauthorised programme changes by means of a key.

ALARMS

The HC80 and HC160 have programmable alarms with independent high and low thresholds for each of the sensors. Any alarm condition will be shown on the screen, sound the internal bleeper, and operate an external alarm or auto-dialler if fitted. Alarm messages may be automatically printed.

In an expanded system where a P.C. is attached alarm messages will also be displayed by this computer.

STATISTICS

Once the control channels have been programmed then a method of checking that the programmed environment is being maintained is required. This is accomplished by the computer monitoring its own performance. The system can display this performance record as statistics for each of the sensors and control channels.

For each of the sensors the MAXIMUM, MINIMUM 6 hour and 24 hour MEAN levels may be displayed or printed. Graphs and tables of sensor data for the last 24 hours may also be printed at any time.

For each of the control channels the percentage of time that the channel has been 'ON' for is shown as an average over the last 24 hours. Where channels are controlling proportional systems such as heating valves or ridge vents then the percentage use of that system will be calculated.

If the computers are connected to a central computer then more detailed information about sensors and control channels may be stored, displayed as graphs and archived.

CONTINUOUS MONITORING

The screen of the computer has a continuous monitoring mode that displays the time, current readings for all the sensors including the weather station, and the position of the vents, heating valves and screens if appropriate, in a continuous cycle. This enables the user to check, at a glance, that the system is working correctly.

This cycle may be stopped at any point to display an updating display of a single parameter, if required.

EXPANDING THE HC80 AND HC160

The computer's control capability can be easily extended by adding an expansion board. Two types are available, a channel expansion board providing a further eight control channels, and an irrigation expansion board providing full irrigation control for up to 80 solenoid valves.

Where a single computer does not have adequate control capability for the whole nursery, they can be linked to other Tomtech computers to build up a network of computers that operate together. Information is shared between the individual computers allowing them to function as a single system. This has advantages over a single central computer since each computer is checking the others in the network providing the most reliable system possible. Resources such as the printer and weather station can also be shared between the computers. The individual computers may be located where needed around the nursery minimising the amount and cost of cabling required. Adding additional houses at a later date may be easily achieved by adding to the network without costly alterations to the existing system.

CONNECTION TO A PRINTER

A printer may also be connected to the computer. Where a number of computers are interconnected a single printer will serve the complete system. The printer may be used to print a monitor record of current glasshouse conditions at regular intervals which may be selected between 15 minutes and 2 hours. Graphs and tables of statistical information may be printed covering a 24 hour period and setpoints may be printed.

CONNECTION TO A PERSONAL COMPUTER

The Tomtech computers communicate with each other. The control system may also be connected to a PC. The Tomtech Environment Manager software provides central control, remote programming, system monitoring, graphical and statistical analysis and crop costings.

CONTROL PROGRAMMES

The HC80 has 8 control channels, and the HC160 has 16 control channels. Six (HC80) or fourteen (HC160) of these channels may be used to provide proportional control or simple on/off control while the remaining two channels may be used individually to provide on/off control or as a pair to give an extra proportional channel. In addition, an expansion board may be fitted to both the HC80 and HC160 to provide a further 6 proportional and 2 on/off channels.

A proportional channel might be used to control ridge vents, a hot water mixing valve or a thermal screen. In other words any system that needs to be positioned in a number of places between two limits.

Any channel may be used to control a system that needs to be ON or OFF. For example a hot air heater, a CO2 burner, or artificial lighting.

The HC80 and HC160 are not restricted to controlling a fixed number of zones. Each channel may be individually defined as a vent channel or a heating channel etc. The number of zones controlled by each computer will therefore depend on how many things are to be controlled in each zone.

The following summary lists some of the control programmes supplied with the computer.

HEATING CONTROL PROGRAMMES

Four heating programmes 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 maximise crop growth while reducing the heating fuel requirements.

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

VENTILATION CONTROL PROGRAMMES

The HC80 and HC160 computers have comprehensive control programmes 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 programmes 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 programmes all have comprehensive limits allowing the maximum and minimum venting under different wind and rain conditions to be defined.

THERMAL SCREEN PROGRAMMES

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

The 'Gapped Light Screen' programme 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 PROGRAMME

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 computer has three boiler control programmes. The 'Temperature Control' programme will adjust the boilers temperature according to the heat demand. The two On/Off Boiler programmes can be used with any type of boiler switching the boiler off when there is no imminent need for heat. These programme 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 programmes can also control the boilers to provide CO2 if required.

TRANSPORT CONTROL

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

LIGHTING CONTROL PROGRAMMES

Two supplementary lighting programmes the 'Extended Day' and 'Retrospective Lighting' programmes 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' programme 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 PROGRAMMES

The 'Temperature and Humidity Mist' programme 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' programme 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' programme may be used for misting or irrigation applications. It varies the interval between waterings 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' programme provides one, two, three or four timed irrigation starts each day and is ideal for repetitive irrigation control.

CO2 CONTROL PROGRAMMES

The 'Light Related CO2' programme uses measured CO2 levels from an infra red analyser or the CM80 multiplexer and controls the supplementary CO2 system to maintain a target CO2 level calculated for the light intensity, time and also vent position.

The high cost of a CO2 analyser is often difficult to justify. The 'Best Guess CO2' programme does not use a sensor, but allows the supplementary CO2 system to be controlled based on estimating the CO2 consumption of the crop according to light intensity and vent position. This technique, while not as accurate as actually measuring the CO2 concentration can come very close to providing the performance of a CO2 sensor at no cost.

FEED DOSING CONTROL PROGRAMMES

Where an N.F.T. system is used the computer can control the addition of both acid and nutrients for plant feeding by using two dosing control programmes.

The pH control programme will use measured pH information to control the addition of acid. The feed control programme will use measured conductivity information to control the addition of nutrients. The nutrient concentration may be adjusted with light intensity if required.

IRRIGATION CONTROL

An irrigation expansion board can be fitted into the HC80 and HC160 computers adding full irrigation control for up to 8 'groups'. A 'group' is any selection of solenoid valves together with relevant irrigation times, starting parameters, pump selection etc. Any valve can be selected in any group, the same valve can be in multiple groups. This allows complete irrigation flexibility with each group a separate irrigation job.

Irrigation control programmes include 'Time Of Day', 'Day Of Month', 'Light Sum' and 'Link Start'. For propogation applications misting/fogging programmes include 'Temperature And Humidity', and 'Mist By Time'.

The irrigation expansion board will control two water supply pumps and up to 80 solenoid valves.

Full details about the irrigation control options are included in the separate irrigation control leaflet.

HC80 AND HC160 SPECIFICATIONS

Computer Housing:	Stainless steel enclosure finished in epoxy-powder paint with a 6mm. thick safety glass door.
Mains power:	120 or 240 volt AC 50 or 60 Hz. +/-10%
Analogue Inputs:	8 *(HC80)* or 16 *(HC160)* analogue inputs each configurable for measuring temperature, humidity, light, CO2, pH or conductivity.
Weather Station Inputs:	Special purpose inputs for wind speed, wind direction, light, rain, outside temperature and humidity.
CO2 Input:	Special purpose input for use with the CM80 CO2 multiplexer to measure CO2 concentration in up to 8 zones or with a single CO2 infra red analyser.
Digital Inputs:	8 *(HC80)* or 16 *(HC160)* inputs, one associated with each of the control channels. Digital inputs are low voltage through opto-isolators.
Control Channel Outputs:	8 *(HC80)* or 16 *(HC160)* control channels, 6 *(HC80)* or 14 *(HC160)* of which may be used for proportional control. An additional 8 channels may be fitted by plugging in an expansion board. Control channel outputs are all relay isolated. Relays have changeover contacts rated 240v AC 8 amps.
Irrigation Control	As an alternative to the channel expansion board an irrigation expansion board can be fitted providing outputs for up to 80 solenoid valves and control for two water pumps.
Alarm output:	Relay isolated, with changeover contacts rated 240 v AC 8 amps.
Display:	4 lines of 40 characters LCD supertwist reflective display.
Printer:	Serial printer output for an Epson compatible printer.
Communications:	RS422 communication port for connection to other Tomtech computers and to a P.C.