HOOGENDOORN AUTOMATION

HOOGENDOORN ECONOMIC

save energy with version 11 ……

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Manual: HOOGENDOORN ECONOMIC version 11
Manual number: P1420 version 2 (January 2007)
Program version: 11.10

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EXTRA SECURITY Critical processes must be additionally monitored by the attention of the user himself and/or secured with devices outside the computer. There are many critical processes in a horticultural business, such as watering, smoothing peaks in gas and electricity consumption, CO2 supply, lighting, and so on. Monitoring outside the computer means for example the use of equipment that is not connected to or dependent on the control computer, but also the regular execution of personal (visual) inspections. In addition safety devices outside the computer must also be fitted to prevent damage to installations in case of incorrect or unexpected computer control.

HOOGENDOORN offers solutions for energy problem

Glasshouse horticulture is faced with great challenges. Energy prices have reached mountainous levels and that also has consequences for climate control. HOOGENDOORN AUTOMATION leads the way as regards practical solutions for keeping energy costs under control. The latest version of the ECONOMIC has therefore undergone a number of important improvements and extensions:

1. It is possible to control the climate more accurately per section. Thanks to new settings you can control the heat demand and heat discharge better. Unnecessary heat loss can be prevented. In addition the number of temperature measurements in the tank has been extended, so you can utilise the heat in the tank to the optimum. Extension of the graphs program increases the understanding of energy use in the greenhouse.

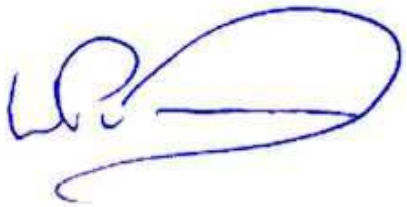
2. The latest version of the software offers various solutions for cluster forming in existing and new situations. By using surplus heat in a nursery with lighting in a nursery without lighting, the total energy costs are reduced.

3. Via the Internet the ECONOMIC has access to an E-Supply Planner. The ECONOMIC is linked as standard to the MeteoScope and as a result controls climate by actual radiation forecast.

4. New modules have been added to the software for the ECONOMIC for conditioned growing. There is a great deal of interest in this growing method because better yields can be achieved with less energy.

Internally HOOGENDOORN is also working hard on quality improvement and know-how development. This has recently resulted in the award of Gold Certified Partner status by Microsoft. HOOGENDOORN is therefore the first firm in the horticultural sector to acquire this status.

The new release of the ECONOMIC makes it possible for you to profit from the expertise that we have built up in recent years. On behalf of all the staff of HOOGENDOORN AUTOMATION I therefore wish you every success with the new version of the ECONOMIC program installed on your climate computer!



W.P. van Duijn
Director of Horticulture HOOGENDOORN

Vlaardingen, 2007

1. Table of Contents

2. Before you start

HOOGENDOORN pays the greatest possible attention to make the ECONOMIC easy to use. When installing the new version there are as few modifications as possible that you have to enter manually. The reinstallation is a good time to check all the settings again and to assure yourself whether the ECONOMIC is still doing exactly what you want. The new program version of the ECONOMIC is very user friendly, but it takes a while to get to know the changes. Choose a quiet time for this and do not wait until it becomes urgent.

As far as possible the software automatically takes over the settings of your previous program. New options here are in principle not activated and you have to set them manually.

In case of an extension or a change in the group layout it is advisable to check the settings. Make sure that all the switches (manual/automatic) are in the right position.

Check that the alarm sensors are switched on again (for example OCTA alarm).

When you use the **heat discharge** program check that the ViPs maximum tank stock for tank and the ViPs deviation heat discharge are set as required.

ECOREMOTE is not exchangeable between versions 10 and 11.

Benelux or export?

Some parts of the ECONOMIC have been specially made for Benelux. Other parts on the other hand have been developed precisely for the foreign market, the opposite also applies. If this is the case you can identify this from the icons below.

Specially or exclusively for Benelux

Specially or exclusively for export versions

3. Introduction

Computer programs are subject to continuous improvement and change. In the course of time minor and major adjustments are necessary. If you have taken out a maintenance contract, each year HOOGENDOORN installs the latest version of the software on your climate computer. So you can benefit over and over again from all the improvements that have been made in the software in the previous twelve months. At a stroke you have at your disposal the most modern control in your business.

Recently a HOOGENDOORN Customer Service assistant installed version 11 of the ECONOMIC on your premises. He discussed all the modifications and improvements with you. We can however imagine that you want to read everything through again quietly. You can do that in this brochure.

- Part 1 describes the most important modifications in the program for each component.
- In part 2 you will find information on the new Internet services that HOOGENDOORN has been offering since the spring of 2006. If you have an Internet connection available you can use these services.
- In part 3 three you will find additional options that HOOGENDOORN can supply to further optimise your business management.
- Part 4 contains useful information for the installer or dealer.

Lost your way?

If there is something you cannot find in this publication you can consult the more comprehensive online-help. This can be found using the **F1 button of your keyboard.** Place the mouse cursor on the setting that you want to know more about and then click on **F1.**

Should you have any further questions the staff on the HOOGENDOORN Helpdesk are available 24 hours a day **on +31 (0)10-4608030**. They have the most modern technology at their disposal and can, if necessary, dial into your ECONOMIC and see remotely what is going on.

PART I

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PROGRAM MODIFICATIONS

4. New in your process computer

A large number of improvements have again been made in the ECONOMIC version 11. Some of these are installed as standard, other modifications or additions are optional. All the modifications are the result of intensive consultation between HOOGENDOORN staff and growers. With the new version we are meeting the wishes of customers that often arise upon increasing their scale and in case of new growing techniques.

The most important improvements in version 11 of the ECONOMIC concern:

- The program now runs under Windows XP. That makes it more user-friendly.
- In the climate control the control of the heating and the control of the curtains are more flexible.
- The control of valves in the water control has been simplified.
- For growers with an Internet connection it is possible to handle energy management more efficiently thanks to the E-Supply Planner.

NB!

All the modifications in this brochure apply from release 11.3. Modifications made later are called subversions and are numbered as 11.4, 11.5 , 11.6 and so on.
If that is the case that is indicated clearly and separately.

5. General modifications

In the latest version of the ECONOMIC a number of modifications have been made to the computer operating system. This has therefore made it more user-friendly and the options have been extended.

5.1 ECONOMIC under Windows XP

An important improvement of the ECONOMIC is that this now runs fully under Windows XP. This has the advantage that the operating system is comparable with the software that runs on most PCs. A reliable operating platform is crucial for a process computer. Up until version 10 the computer therefore ran under Windows NT that was developed for professional use. Now Windows XP is so reliable that we feel the change-over from Windows NT to Windows XP is sensible.

An ECONOMIC running under Windows XP has the following advantages:

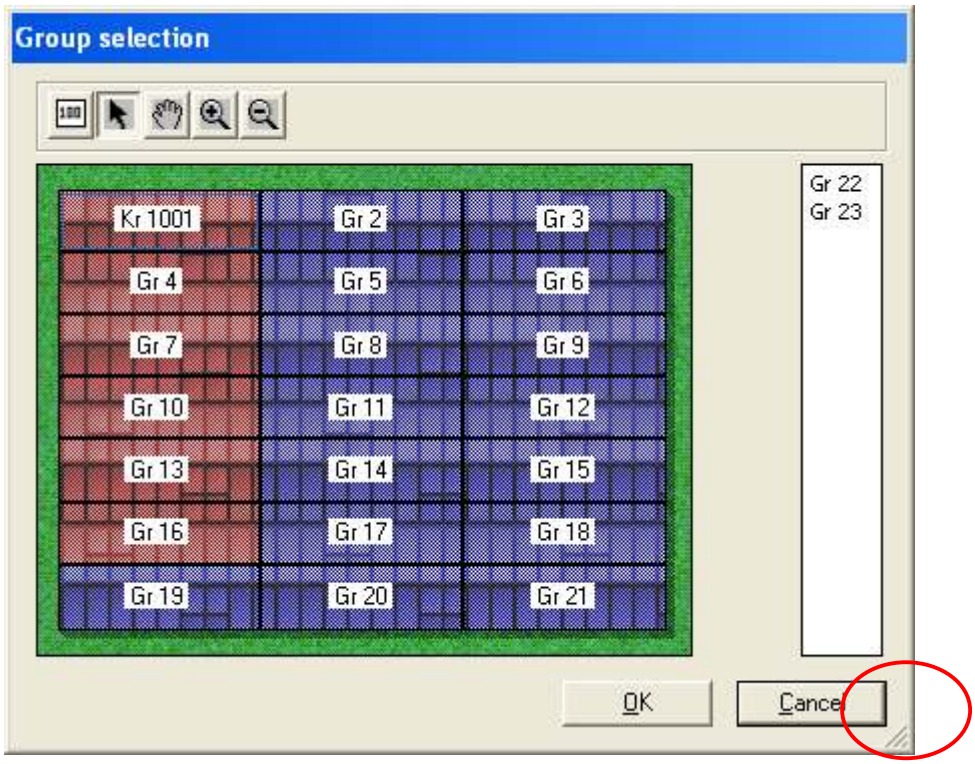
- There are more drivers available for new hardware
- The program supports USB of printers, sticks, and so on
- The facilities of the ECONOMIC have been extended with:
  - Remote Desktop and Remote Help
  - Integrated firewall
  - Cascade in the task bar

5.1.1 Free Windows XP as part of the ECONOMIC contract

The introduction of Windows XP is standard on new operating stations from 1-1-2006. If you have a type 14 operating station (this number can be found behind the small flap on the operating station) the HOOGENDOORN assistant will install the Windows XP operating platform free of charge.
If you have a type 13 operating station the assistant will convert the station. The internal memory of the operating station is then expanded free of charge and Windows XP is installed free of charge.
Operating stations that are older than type 13 (type number lower than 13) are not suitable for Windows XP.

5.2 Group selection screen now scalable

The selection screen for groups previously had a fixed size. That sometimes caused problems when using it. HOOGENDOORN has therefore also made this selection screen scalable, like the setting screens for ViPs. The computer remembers the set size and position for each user. The next time you open the selection screen, it is displayed in the same place and with the same size as the previous time. Because the screen is scalable, you get a better overview of the map, for example the group selection in an actual report.



By placing the mouse on the corner by the red circle you can drag the corner of the figure to make it larger.

5.3 Groups can now be selected in connection report (from 11.10)

From this version it is possible in the group connection report to select the groups to be displayed, in the same way as this is possible for example in an actual report. Via the third button from the left in the task bar (see Figure 1) the map screen is shown in which the groups to be displayed can be selected. To display all the groups again in the “Edit” menu select “Select groups”; it is also possible to delete the selection by not selecting any groups in the map screen.

Figure 1: Task bar connection report

With the fourth button from the left in Figure 1 you can configure connections. Of course you can still also configure connections by pressing the  button in a cell of the report.

5.4 Wider margin in map screen (from 11.10)

The margin in the map screen has from this version be made wider so that the names of the groups that are still in the margin can be read more easily.

5.5 Help with alarms in alarm report (from 11.10)

If you click on an alarm in the alarm report and then press shortcut F1, the alarm help page is shown. This makes the information on the occurrence of the alarm and the solution of the failure available quickly and easily. Instead of shortcut F1 you can also use the  button in the task bar.

5.6 DATAPOINT pulse counter possible (option from 11.10)

With the new DATAPOINT pulse counter channel a modern standard method of measuring pulses is possible. The ECONOMIC uses pulse measurements among other things for measuring water supply and gas absorption.
A GL board with separate fixing, power supply and housing is no longer necessary. Measurements can be made with a maximum pulse frequency up to 1 kHz; this means all the current pulse generators can be connected. For measuring water supply litre counters that emit a high pulse frequency (preferably 1 pulse per litre) are strongly recommended. This means that a much more accurate flow can be computed. The accuracy is then higher than with the current measurement systems.
For the following controls of the ECONOMIC that use pulse measurement, the new pulse counter can now be connected:

- Flow of water supply and flow of clean water
- Drain recording
- Uni-switches
- Controller (gas measurement)

5.7 ECONOMIC Remote adapted

The remote control, the ECONOMIC Remote, can also be used in combination with an ECONOMIC operating station on which an older version is present. For versions higher than or equal to 9.3 there is no longer a warning if the versions of ECONOMIC Remote and the ECONOMIC operating station are not the same.

Since the introduction of the ECONOMIC there have already been a number of new versions of Windows, the last of which is Windows XP. To make optimum use of the technical features of the new Windows versions it is not possible for HOOGENDOORN to go on supporting ECONOMIC Remote on all the previous Windows versions. From ECONOMIC version 10 the following modifications have been made for this:

- It will no longer be possible to install this version of ECONOMIC Remote in Windows 95, Windows 98, Windows ME and Windows NT.
- The more modern (and most used) versions of Windows will of course continue to be supported. These include:
  - Windows XP Professional with Service Pack 1 (preferably SP2);
  - Windows XP Home versions with Service Pack 1 (preferably SP2);
  - Windows 2000 Professional versions with Service Pack 2 (preferably SP 4).

The minimum requirement is 128 MB RAM.

It is expected that in addition to Dutch and English language versions German and French Windows versions as indicated above will also not cause any big problems. It is not known whether this applies for other languages.

6. Control climate

6.1 Simpler layout of the controls

Up until version 10, the Heating circuit 1, 2 and 3 controls were three separate controls. In version 11 these controls have been made the same and there are no further differences between the circuits. In version 10 it was for example possible to design circuit 1 and 2 as steam heating, from version 11 that applies for all three circuits.
This change is also found in the map and the reports. The clarity, flexibility and the user friendliness of the ECONOMIC have improved as a result.

Just like the heating circuits, the controls for curtains, CO_2 and vents are the same for each climate group. There are therefore no longer six different curtain controls for each climate group but only one. Also the CO_2 controls 1 and 2 have been made the same. This is explained further in the CO_2 section. The settings for Vent 1 and 2 have been replaced by one control. This is explained further in the Ventilation paragraph. These adjustments make the program clearer.

6.2 Influence outside temperature in ViP ventilation temperature

You can now set the outside temperature as a ViP-influence for ventilation temperature lee and wind side. In case of a low outside temperature it is therefore possible to ventilate more cautiously.
In the example below the ECONOMIC controls the ventilation depending on the outside temperature on the lee side of the greenhouse. If the outside temperature falls below 8°C the ventilation temperature gradually rises from 23.0 °C. If the outside temperature is 5°C or lower, the ventilation temperature is 25.0°C.

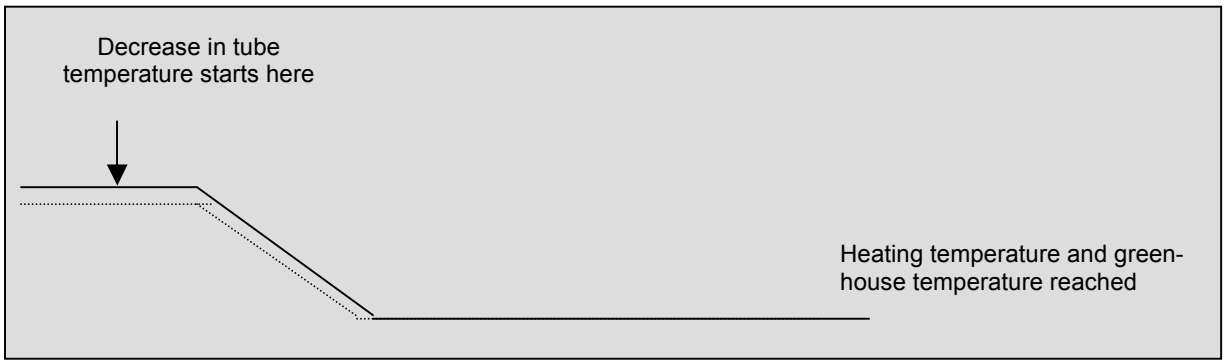
ventilation temperature lee side: ViP									
		Start time	**Relative to**	**Change**	**Value**	Outside temp. - °C		Wind speed - m/s	
						8.0	5.0	2.5	11.5
1	Y	0:30	Sunrise	01:00	23.0	2.0		2.0	

With the influence outside temperature in the ViP ventilation temperature you can therefore control the temperature at which the vents open. You influence the extent to which there is a lot or a little ventilation in case of a cold outside temperature with the existing options:

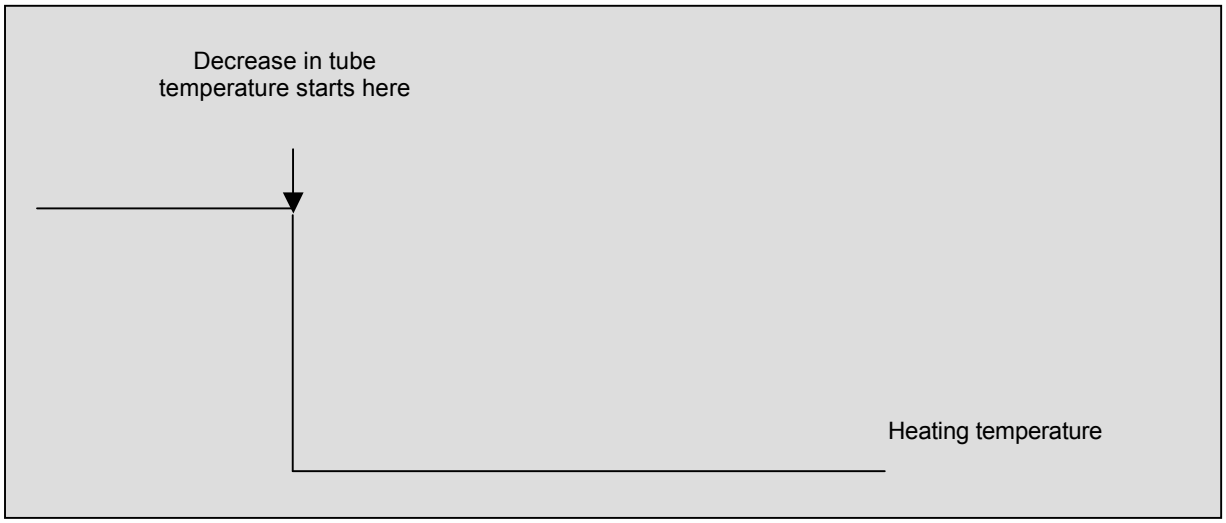
- **leeside / wind side influence moderate – large ventilate: ViP**
  low value is ventilate with small vent positions
- **lee side / wind side P-band: ViP**
  high value is cautiously ventilate

6.3 Reaction time of pipes to change in heating temperature

The heating control in the ECONOMIC aims as far as possible for the set heating temperature. In a greenhouse there is an unavoidable inertia in the heating circuit. To effect a change in the heating temperature at the required time it is necessary to have the computed pipe respond early by heating up or cooling down.



The situation sketched above is sufficient in most cases. To control the plant in a more generative way growers often want to set a large direct reduction in the ViP heating temperature. From version 11 it is therefore possible to allow the computed pipe temperature only to decrease at the set time, so not early. In this way you have more control over the regulation.



If a period change time of 0h00 is set in the ViP heating temperature the down control of the computed pipe starts at the time set for the decrease.
For any value greater than 0h00 in the change time the computed pipe is adjusted earlier, so that the greenhouse temperature approaches the set heating temperature as closely as possible.

6.4 PAR measurement

PAR is the abbreviation of Photosynthetically Active Radiation. This involves those wavelengths in the spectrum of the overall radiation that can be utilised by plants for photosynthesis. The official unit of PAR is µmol/m^2/s.
For the growth and production of your crop the quantity of PAR is therefore a very important factor and it is therefore important to know how much PAR reaches your crop. The problem is that the quantity of PAR cannot simply be derived in the light of the quantity of overall radiation measured with your solarimeter.

The overall radiation consists of roughly 45% PAR. The ratio is not however constant, but depends very much among other things on the cloudiness and the position of the sun. In addition to the cloudiness the type of greenhouse roof, lime wash or dirt on the greenhouse roof and the use of curtains also influence the quantity of PAR that reaches the plant in the greenhouse. The only way to therefore know how much PAR the plant receives in the greenhouse is to measure the quantity of PAR in the crop with a special PAR sensor.

6.4.1 Use of influence PAR weather for curtain

A PAR sensor has been added to the weather configuration. You do not need to buy a special module for this. It is now no longer necessary to work with conversion factors and uni-switches. If your service technician indicates the PAR sensor in the configuration, that is enough to be able to use this. You can set up the PAR weather sensor outside, as well as in the greenhouse (for example above the curtain).
It is not possible to share the PAR sensor via shared weather.

The measurements of the PAR weather sensor are added and recorded per day, night and 24 hour period. These measurements can be added to week and period reports. The measurement and undelayed measurement are actually recorded and you can set these out in a graph. At a glance you can then see how great the quantity of overall radiation and PAR light are. The actual measurements of the PAR sensor are shown in µmol/s/m^2 and the sum in the unit 0.01 Mol/ m^2.

You can use the PAR measurement as “influence PAR weather” in a number of curtain settings. By means of settings for maximum rise and fall speed you can adjust the response speed of the measurement as required.

You can use the influence PAR weather in the following curtain ViP settings:

- **curtain: ViP crack**
- **curtain: ViP curtain position**
- **curtain: ViP close on radiation**
- **curtain: ViP open on radiation difference**

6.4.2 PAR in the greenhouse (option from 11.10)

For each climate section it is possible to connect two PAR sensors. In a similar way as for the aspirators a choice can then be made whether one must work with the highest, the lowest or average value of the selected sensors. When selecting average it is also still possible to set a weighting factor for both sensors.
The quantity of PAR is added and recorded per day, night and 24 hour period. The values can be viewed in weekly and period reports. It is possible to put the actual PAR sum and the actual PAR measurement per climate group in a graph.

6.4.3 Influence of PAR crop (option from 11.10)

Based on the measured quantity of PAR in the greenhouse four curtains can influence ViPs and the lighting ViP. This is done with the ViP influence “PAR crop”.

The influence can be used in the curtain ViPs:

- **curtain: ViP crack**
- **curtain: ViP curtain position**
- **curtain: ViP close on radiation**
- **curtain: ViP open on radiation difference**

and in the lighting ViP:

- **lighting: ViP on (100=on; 0=off)**

The influence is computed based on the undelayed PAR measurement. The speed of rise and fall can be set so that it is possible to indicate oneself how quickly one can respond to a changing quantity of PAR.
For the curtains the influence from the climate group to which the curtains are connected is used. For lighting it is possible to make a choice for each lighting section of the climate group from which the influence must be used.
This can be done using a new connection in the lighting section :

- **influences: coupling lighting section - greenhouse climate**

6.4.4 Alarm on PAR level too high (option from 11.10)

Too high a PAR level in the greenhouse may have harmful consequences for the crop. Normally such too high a level is prevented for example with lime wash on the roof or for example by closing a curtain. The level in the greenhouse could still however become too high. The curtain can for example be manually operated or a lot of lime washed off of the roof. To signal this it is possible to use the “climate: PAR crop too high” alarm. The alarm limit for each climate group can be set together with a delay time for the incoming alarm. The alarm is cancelled with a setting:

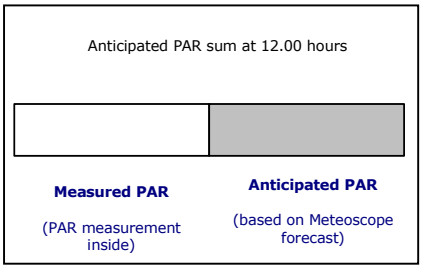
- **PAR crop too high: difference alarm off**

This alarm gives you extra safety to prevent crop damage due to too much (PAR) radiation in the greenhouse.

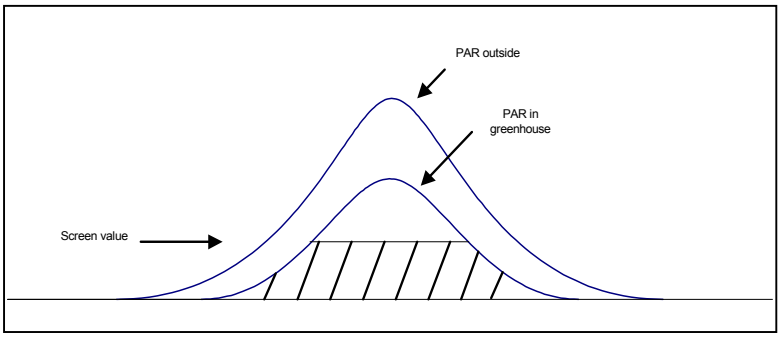
6.4.5 Influence PAR sum crop (option from 11.10)

The influence “PAR sum crop” is a measure of the anticipated quantity of PAR in the greenhouse during a day. The PAR sum crop consists of 2 components. The first part is the measured PAR sum in the greenhouse up to the time of computation. The second part is the anticipated PAR sum that is expected to be measured during the coming hours in the greenhouse. The further on in the day, the greater the share of the measured radiation.

In the example below the sum runs from 0.00 hours to 23.59 hours.



The anticipated quantity of PAR outside for the part of the 24 hour period still to run is among other things computed on the basis of MeteoScope data. In order to be able to use the influence “PAR sum crop” a weather forecast (MeteoScope) and a PAR measurement is necessary in the greenhouse.



For the conversion of the anticipated PAR outside to the anticipated PAR inside two settings are used.
In the first you state how much PAR is retained by greenhouse roof, lime wash and so on.

In a second setting you indicate how much PAR you expect as a maximum in the greenhouse as a result of the use of a curtain.

With the knowledge of the anticipated quantity of PAR during the coming day you can for a (too) high PAR forecast at the start of the day already ensure that screening is carried out faster. In case of a low quantity of PAR screening can be carried out later or additional lighting can be provided.

The influence “PAR sum crop” can be used in the curtain ViPs:

- **curtain: ViP crack**
- **curtain: ViP curtain position**
- **curtain: ViP close on radiation**
- **curtain: ViP open on radiation difference**

and in the lighting ViP:

- **lighting: ViP on (100=on; 0=off)**

6.5 Actual energy demand per climate group

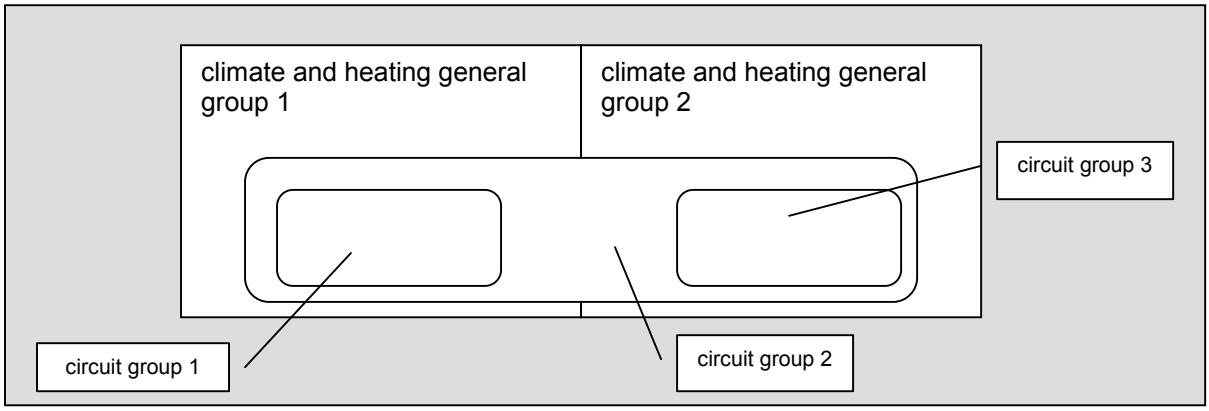
An idea of the energy demand per climate group is an important tool in optimising energy consumption. By comparing different climate sections or by looking through the energy consumption in a section at different times you get a better understanding of the effects of different climate measures on the required quantity of energy. In the new version of the ECONOMIC, in addition to the energy demand per transport group and per energy manifold, you can therefore now also call up a computed energy demand per climate group.

The energy demand is set out in W/m^2 greenhouse area. As a result it is easier to compare the energy demand of sections with different areas. To obtain a better idea you can also set out the energy demand in a graph.
In addition to the actual energy demand an addition of the energy demand is added. This is shown in MJ/m^2 and can serve to follow the energy demand over a longer period. The added energy demand can be added to weekly and period reports.

The computation of the energy demand per climate section is carried out based on the energy demand of all the circuit and soil heating groups located in a climate group. At the time when a circuit runs through two or more sections, the energy demand of the circuit is divided over those sections based on the area of the sections. The area of a section is obtained from the area entered in the greenhouse and crop group via:

- **climate: connected greenhouse and crop**

Example:



The total energy demand of circuit 1 and half of the energy demand of circuit 2 are in this case added together and converted from kW to W/m^2. Circuit 2 is after all connected to circuit 3. In this example the climate groups 1 and 2 are of the same size. The computed demand is the actual energy demand for climate group 1. For climate group 2 the same happens for the energy demand of circuit 3 and half of circuit 2. Should one or more groups of soil heating still be present in a climate group the energy demand of this is divided in the same way and added to the actual energy demand.

6.6 Influence energy demand greenhouse

You can save a great deal of energy by using the curtain as an energy screen. However in some cases a 'dead' climate occurs with little air movement under the curtain.
In the earlier version of the ECONOMIC there were setting options to prevent this, for example not closing the curtain in case of a relatively high outside temperature or a cloudy sky. Its setting was however sometimes very onerous.
HOOGENDOORN has therefore now added a new facility with the influence **energy demand greenhouse**. With this you may or may not link the closing of the curtain with the required energy supply in the greenhouse. This has resulted from the thought that the risk of a 'dead' climate is the greatest if there is little energy supply to the greenhouse, therefore in case of very low pipe temperatures and closed curtains and vents.

The influence **energy demand greenhouse** is a measure of the quantity of energy that is required in a climate section. The influence is computed on the basis of the energy demand of all the circuits and the soil heating in a greenhouse climate section.

The influence can be used in the following ViP settings:

- **curtain: ViP curtain position**
- **curtain: ViP crack**
- **curtain: ViP interval open**
- **curtain: ViP delay time close**
- **curtain: ViP outside temperature close**

- **fans on influences: ViP (100=on)**

With the addition of the influence energy demand greenhouse it is easier to control the curtain and/or the fans to prevent a 'dead' climate.

6.7 Minimum CO_2 ViP

The CO_2 control has been made clearer and has more options due to two adjustments:

Firstly the setting for ViP **minimum CO_2: ViP** has been moved from **Control climate, greenhouse climate** to **Control climate, CO_2, CO_2 control**. Both CO_2 control 1 and CO_2 control 2 now have their own ViP. The **minimum CO_2: deviation minimum** setting with which in version 10 a correction could be made if a different minimum was required in control 1 and control 2 is hence deleted. Also the **absolute minimum** setting is no longer necessary and therefore deleted.

Secondly the **minimum CO_2: ViP** and **maximum CO_2: ViP** can be displayed together in a setting screen.

6.8 Heat delivery strings assimilation lighting

From version 11 the heat delivery of strings is now only set for the strings themselves. The setting for the Greenhouse climate that was in version 10 is hence deleted.
The heat delivery is used by both the heating control and Econaut.

6.9 Curtains

6.9.1 Control curtain dispensed with

In version 11 there is no longer a control curtain and duplicate setting is no longer necessary. A control curtain was a curtain control in a climate group where there is no separate controllable curtain. Because the computer had to take into account the curtain that is in the relevant group, a curtain was always started up first in this group. Then you had to set this identically to the group in which control was actually carried out. In the new version this is no longer necessary. Via the group connection record an indication is given of which climate groups a curtain is connected to. The ECONOMIC can as a result take this curtain into account.

6.10 Fans

From version 11 in the ViP **fans on influences: ViP (100=on)** in addition to the already present influences the influence uni-influence can also be used.

6.11 Maximum setting limit ViP influences wind speed increased

The vents are at present less sensitive to strong wind. The maximum value of the setting limit of ViP-influence **wind speed** may therefore rise. In version 10 the upper limit of this setting is therefore increased from 12 m/s to 20 m/s.
From version 11 this also applies for the ViP-influences **wind speed cold, wind speed warm, wind speed humid** and **wind speed dry**.

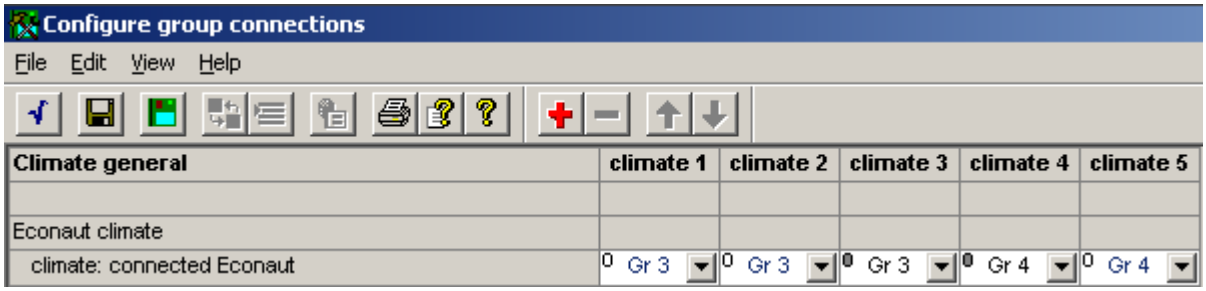
6.12 Econaut

From version 11 the difference between Econaut 24 hour period Integration and Econaut Multi-day Integration (CTI) ceases to exist.

6.12.1 Use of the same optimum temperature in several climate groups

In version 10 for each climate group with heating Econaut computed its own optimum temperature (ecoline). In addition a special situation was possible of two climate groups with a separate ventilation control, but joint heating. Both ventilation groups then used the same optimum temperature, computed for the climate group in which this heating had started up.

Version 11 offers much freer use of the optimum temperature. You can have this computed by Econaut for a representative climate group. For this group the program uses the settings for minimum and maximum heating temperature, the measured greenhouse temperature and the anticipated curtain positions and hence it computes a new optimum temperature. If necessary you can have this optimum temperature reached in several climate groups. This offers useful options for connected groups with the same crop. A separate optimum temperature computation for each of these groups can lead to small, but unwanted deviations in computed heating temperature and ventilation temperature. The new version of Econaut can prevent such deviations. Curtains that are closed with ViP influence **deviation heating temperature** will close together.



In this example the computer computes an optimum temperature for Econaut group Gr 3 with the data of climate 3. This connection with Gr 3 can be identified by a black bullet. Also in Econaut group Gr 4 an optimum temperature is computed, there with the data of climate 4. The optimum temperature of Econaut Gr 3 is reached in the groups climate 1, 2 and 3 (groups marked with a white bullet are connected to another climate setting, as are groups with a black bullet). The optimum temperature computed for Econaut Gr 4 is reached in climate groups 4 and 5.

6.13 Recording soil temperature standard

In the new version a standard recording of the soil temperature is carried out. In older versions this was an option.

6.14 Ventilation and the spraying program

A few counters have been added to the ECONOMIC program for spraying. This makes it possible to open or close the vents for a particular period.
This involves the counters:

- **spraying: counter time vents lee side open**
- **spraying: counter time vents lee side closed**

For the wind side the same counters and settings apply. If the **vents closed** counter is active that means if this is greater than 0, then the computed vent position is 0%. In this case the setting **spraying: minimum vent position after spraying** is taken into account. The counters are automatically filled in by the spraying program, but you can also adjust this manually for example to quickly keep a vent closed for a short time.

6.15 Agronaut deleted

An extensive investigation has been carried out into the use of the Agronaut program. Among other things due to the arrival of various plant sensors the program is in practice no longer used. This program has therefore been deleted in version 11.

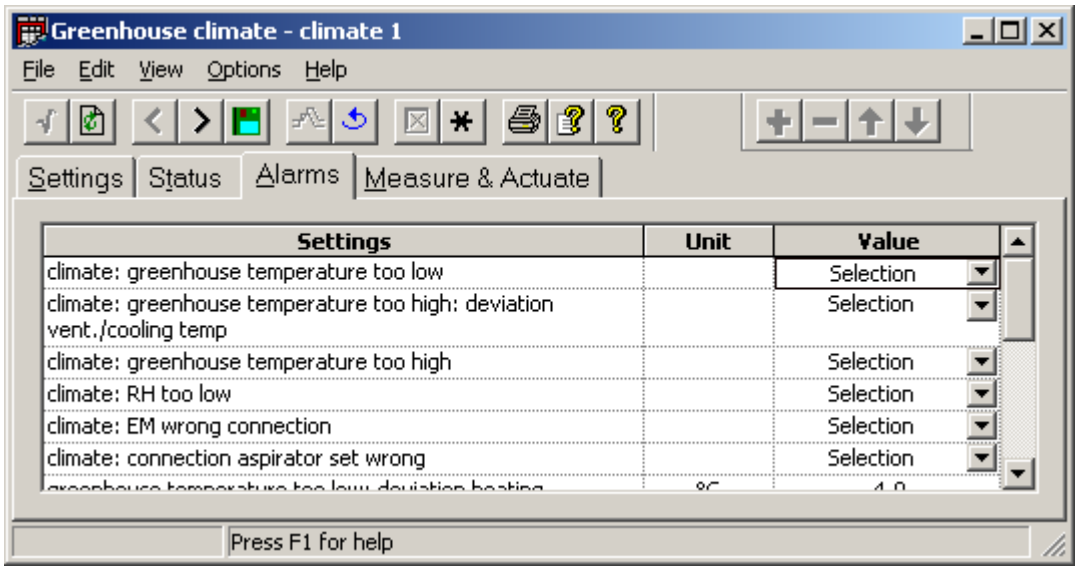
6.16 Alarms moved

A number of alarms have been moved to the controls to which they actually belong, this gives greater clarity. Below is a list of which alarms have been moved:

Alarm	Moved to:
Curtain position error	Curtains
Roof washer failure	Roof washer
Crop condensation output error	Crop condensation
Deviation measurement vent position	Ventilation
No communication Econaut	Econaut
CO_2: no communication selector	CO_2 general
CO_2: too high	CO_2 control
RH measurement error / wet bulb dry	Aspirator

6.16.1 Alarms added and extended

In version 10 there were two settings to give an alarm: one to indicate for which alarm a signal actuation (for example horn or radio telephone) had to be given and one setting to indicate what signals (up to a maximum of 5) had to be sent.



In version 11 for each alarm it must be determined individually which signal has been actuated. Furthermore the alarms have been moved from **greenhouse climate** to the controls to which they belong. A couple of alarms have also been added.

6.16.2 Alarms aspirators moved

The alarm setting for a dry wet bulb has been moved from the Climate group to the aspirator. As a result an unconnected aspirator will now give an alarm for a dry wet bulb. In version 10 that was not so.

6.16.3 Each CO_2 control has its own high CO_2 alarm

From version 11 each CO_2 control has its own high CO_2 alarm. As a result it is possible to see in case of an alarm exactly which CO_2 control within a climate group is responsible for the alarm. In version 10 there was only one alarm per climate group for the CO_2 controls connected.

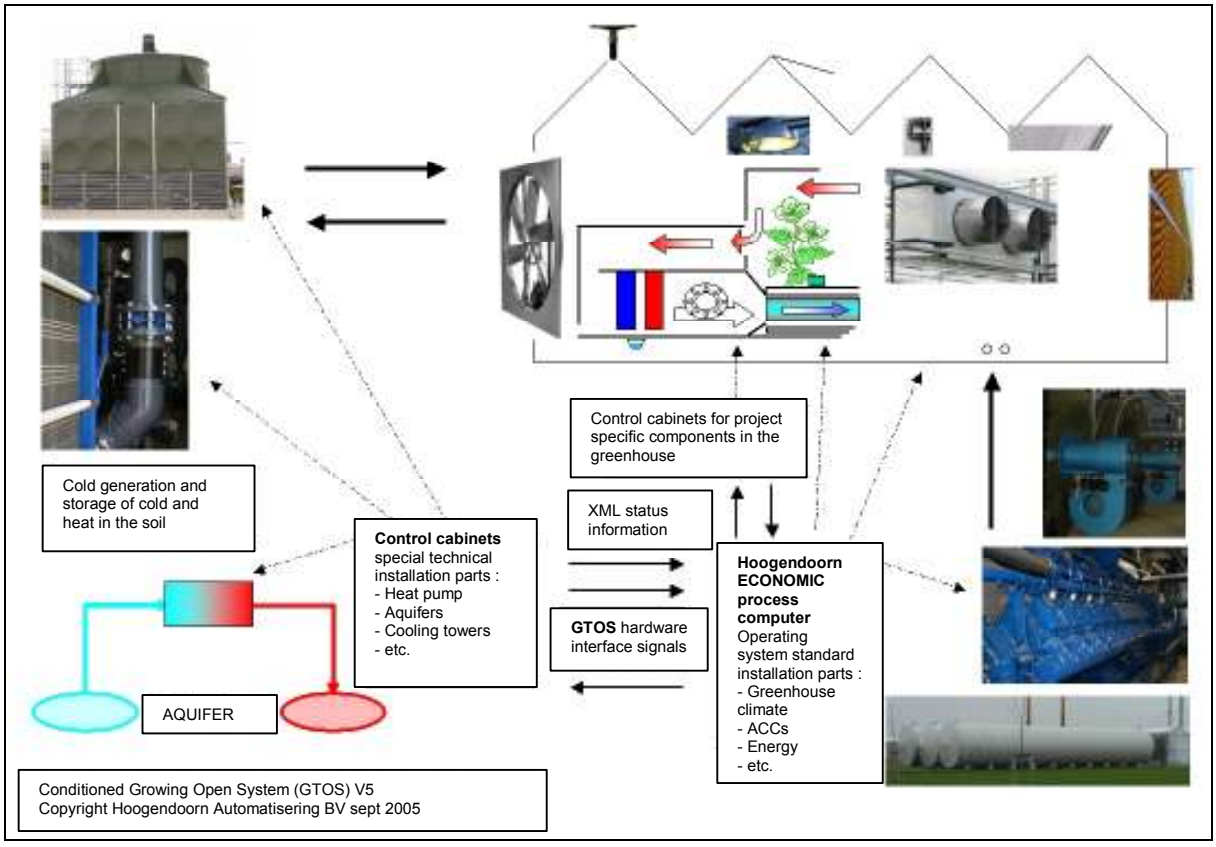
6.16.4 Alarm per curtain

In version 10 there was one alarm per six curtains, from version 11 there is an alarm setting for each curtain. As a result one can see exactly which curtain gives an alarm.

6.17 Air conditioning

In ECONOMIC version 11.4 the new 'Air conditioning' module is installed.
This module is specially aimed at automating conditioned growing in (semi) closed greenhouses, and has originated from existing controls which have already been present in the ECONOMIC for a long time, supplemented with new advanced functions which respond to the latest developments.
Hoogendoorn anticipates that these developments are far from over, as conditioned growing is a new concept within horticulture.
A grower who is busy building a pilot greenhouse for conditioned growing stated quite rightly in early 2006 in a specialist journal article: "In a year's time we may think quite differently about this." By this he meant that they could only build the pilot greenhouse as well as possible in accordance with the current knowledge and understanding but that during the use of the greenhouse they might actually come to quite a different understanding.

The Air conditioning module is therefore set up as flexibly as possible so that a wide range of systems and installations can hence be automated with it. The control of the different instruments in the (semi) closed greenhouse can be carried out directly from the ECONOMIC, but it is also possible to make connections with other (sub) systems that have their own control cabinets. Hoogendoorn calls this the "Open System Concept"



6.17.1 Learning process focussing on the plant

New facilities for climate control must primarily lead to higher production and quality in order to be profitable. Of course things like energy saving and limitation of CO2 emission are also important. To achieve the objectives the growing method must also change. Conditioned growing therefore requires a learning process for all the parties in the years to come, and Hoogendoorn focuses here on the plant and the crop yield. In this learning process research and practical experience must go hand in hand. Hoogendoorn helps here not only with hypermodern process software, but certainly also with expertise in the area of climate control, with plant sensors and Internet services. Via these Internet services the crop advisor can also be involved effectively in the learning process.

6.17.2 ECONOMIC Air conditioning module

The 'Air conditioning' module as stated is partly based on existing controls in the ECONOMIC. Cooling in greenhouses is after all in itself not new for Hoogendoorn.
In the "Cooling" program functions already occur such as cooling in several stages and dehumidification in several stages. A new feature in the Air conditioning module is that all sorts of different "units" can be connected to these several stages to control the climate conditions in the greenhouse. Units here may be:

- Air conditioning cabinets (ACCs) with fans, cooling and possibly heating,
- Roof sprinklers
- Cooling spraying or crop spraying
- Path&fan systems
- Forced air movement
- Integrated dehumidification systems
- etc.

6.17.3 Control options per Unit

For each unit the control can compute the desired capacity, the desired temperature or both based on outside conditions and greenhouse conditions. As a basis for the computations the known ViPs are used. This means as user you can program the controls yourself as you wish. In these ViPs among other things the following influences can be set:

- **Radiation - W/m^2**
- **Outside temperature**
- **Wind speed**
- **Uni-influences (two groups uni-switch in one ViP)**
- **Deviation cooling temperature**
- **Difference RH/deficit**

For an ACC the capacity can then for example be used to control the fan speed and the temperature can be used to control the cooling water temperature.
For switching the units on or off the ViP periods are used in combination with the step activations of the cooling program. As a result the option occurs, for example by day in case of moderate radiation, to switch on first cooling spraying or roof sprinklers and only upon higher radiation and a greater temperature deviation to also switch on the ACCs. At night on the other hand the air vents can be given priority for the temperature control and dehumidification. With Air conditioning virtually any feasible combination can be freely programmed.

6.17.4 Air conditioning manifold

For the units that use a central facility such as cold source or a cooling machine the required capacity of the connected units must be added, and the lowest value of the cooling water temperature required must be determined to be able to control this central source properly. Therefore in the module one or more ‘Air conditioning manifolds’ is also possible. For each manifold the added capacity mentioned and lowest water temperature required are determined, and are used as the target value for control circuits.

6.17.5 The open system concept

All the controls mentioned can be controlled directly from the ECONOMIC.
Thanks to the Hoogendoorn Open System Concept it is however also possible to make a combination of analog outputs and digital controls an interface to control cabinets of other suppliers. The big advantage is that our customers are not bound to particular suppliers and/or to a particular control concept, and that a rapid response can be made to innovations with other parties.
In all cases in this way custom work can therefore be provided without special software developments being necessary.

6.17.6 Integrated operating system, recording and graphs

The Air conditioning module is fully integrated in the ECONOMIC operating system with a separate setting folder, and the normal graphs and reports.
As a result the setting and monitoring of the new controls is actually just as simple and clear as that of the other ECONOMIC control functions.

6.18 Movement detection vent (from 11.10)

The vent position control has been expanded with a movement detection. The movement detection offers you extra safety against incorrectly carried out vent positions caused by errors in the measurement system such as a faulty vent position sensor. Your crop and greenhouse are better protected.

Example:
A computed vent position of 4% is required. The measured vent position is 0%. The vent is opened. The measurement is faulty and remains on 0. The actuation continues. There is the risk that the vent will open completely. The already existing alarm responds to this with a delay. In cold winter weather this may be too late to prevent damage via manual intervention. The new alarm ensures a more rapid response. You are quickly given an alarm and in critical situations the vent is automatically closed again.

The movement detection controls whether the vents move correctly to the required position. This is done by verifying the movement of the vent with the actuation carried out. If the movement is not right a “movement detection: incorrect vent movement” alarm follows. The actual vent position may then be different to the measurement. The alarm makes you aware of this so that you can control the actual vent position and prevent damage to the crop.

If the actuation goes wrong on opening and a small computed vent position then arises, there is a situation of increased risk. It may be very cold outside, it may rain or there may be a storm... To avoid the vent opening fully in case of a faulty measurement, the program will close the vent again. The right vent position is unknown and therefore for safety's sake is continuously closed. This is notified via the "movement detection: actuation closed after wrong vent movement" alarm.

Always have the vents controlled via the ECONOMIC and do not actuate them manually to prevent an incorrect alarm.

6.19 Alarm Ridder LogicLink® (from 11.10)

An alarm is given if a protection or a failure occurs. This is indicated by an intelligent motor (Ridder LogicLink). The condition for this is that the required signals of the intelligent motor are well connected to the ECONOMIC software. This can rectify failures to your curtain or vent motors more quickly.

6.20 Influence change outside temperature

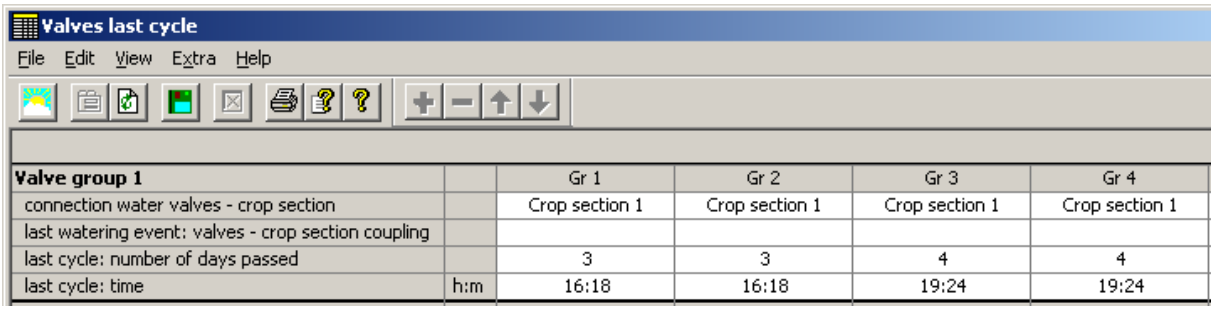
In the setting "roof sprinkling influence off: ViP (100=off)" the influence "change outside temperature" is replaced by "deviation outside temperature". This influence was already used in several processes. The meaning of "deviation outside temperature" differs for each process.
For heating this is "greenhouse temperature heating - outside temperature".
For ventilation this is "ventilation temperature - outside temperature".
And for humidification this is "actual outside temperature - outside temperature on starting". Nothing changes in the way the control functions. Only a different name is used for the influence.

7. Water control

7.1 Crop section last cycle

In the new version of the ECONOMIC you can set group connections all in the same way. That improves clarity. The settings for **connection water valves – crop section** have also been made the same. The setting **valve connected to crop section** (yes/no) and the corresponding **automatically delete crop section connection** have therefore been deleted. You can disconnect valves of a crop section by deleting these in the group connection report again.

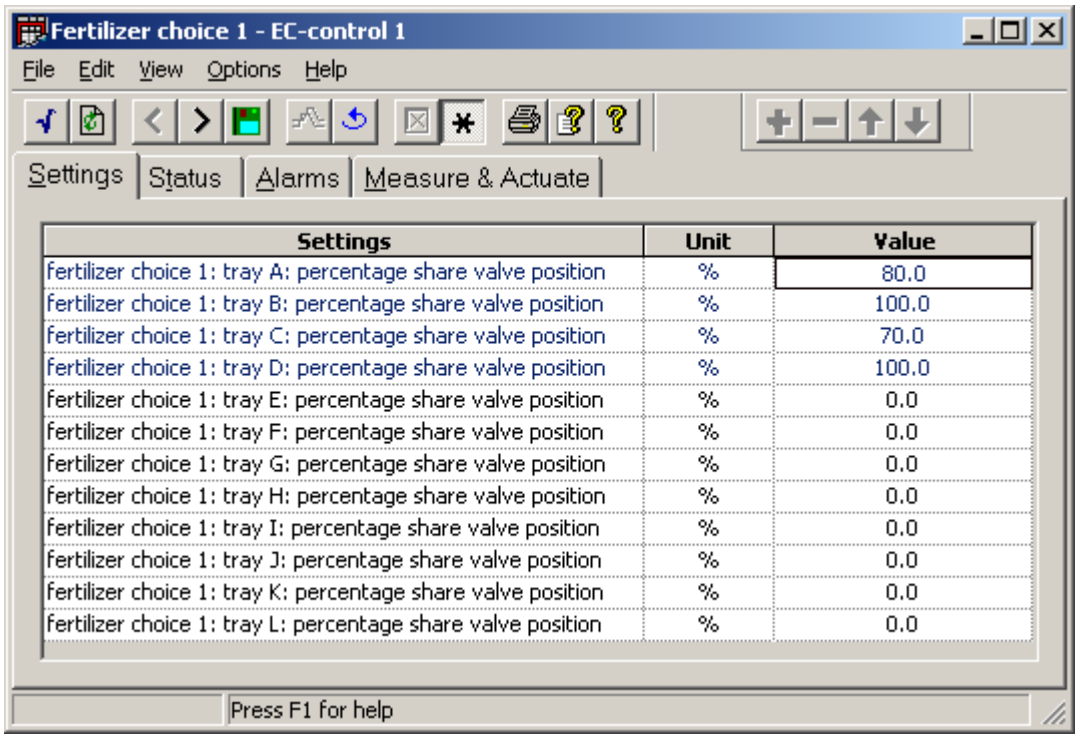
If you regularly disconnect valves, but would still like to work again for a valve with the same crop section as for a previous cycle, a setting **last watering event: cycle: valves - crop section coupling** is added to the valves. The program saves information on the earlier cycles there. This setting can be found in the new report **Valves last cycle**.



Valve group 1		Gr 1	Gr 2	Gr 3	Gr 4
connection water valves - crop section		Crop section 1	Crop section 1	Crop section 1	Crop section 1
last watering event: valves - crop section coupling					
last cycle: number of days passed		3	3	4	4
last cycle: time	h:m	16:18	16:18	19:24	19:24

7.2 Percentage EC supply with ABCD trays

The EC control was until now mainly geared to the A/B fertilizer trays system, where the same quantity of fertilizer is added from both trays. It is also possible to work with more trays or pipes and a variable quantity of fertilizer. Up to twelve valves or pumps can be connected, that at the same time supply fertilizer in a particular ratio to one another.
The control computes a virtual basic valve position EC. The other valves are actuated in a set ratio with respect to this basic valve position. The highest value is preferably set at 100%. For each fertilizer choice a separate recipe of percentage values for the twelve valves can be set. There are sixteen possible fertilizer choices per EC control.



Settings	Unit	Value
fertilizer choice 1: tray A: percentage share valve position	%	80.0
fertilizer choice 1: tray B: percentage share valve position	%	100.0
fertilizer choice 1: tray C: percentage share valve position	%	70.0
fertilizer choice 1: tray D: percentage share valve position	%	100.0
fertilizer choice 1: tray E: percentage share valve position	%	0.0
fertilizer choice 1: tray F: percentage share valve position	%	0.0
fertilizer choice 1: tray G: percentage share valve position	%	0.0
fertilizer choice 1: tray H: percentage share valve position	%	0.0
fertilizer choice 1: tray I: percentage share valve position	%	0.0
fertilizer choice 1: tray J: percentage share valve position	%	0.0
fertilizer choice 1: tray K: percentage share valve position	%	0.0
fertilizer choice 1: tray L: percentage share valve position	%	0.0

7.2.1 ABCD controller (option from 11.10)

With the ABCD controller EC actuations are made of which the pulse length may vary up to a millisecond. The ABCD controller consists of ECONOMIC software and a special DATAPOINT module. Own measurements and actuations are used for the module.
In the control the ABCD controller uses the settings EC percentage supply.

7.3 A/B simultaneous running control

For fertilizer supply with A/B trays both trays have to be empty at the same time. In practice this is not always the case as a result of mechanical and water side properties of the system. In case of big differences inspection of the installation with the possible fitting of better valves is the solution.
In case of smaller deviations a simultaneous running control may offer a solution. In this version a new simultaneous running control is made for the EC control. This works without the intervention of uni-switches. This increases the user-friendliness.

To be able to use the simultaneous running control, the EC valve of A and B tray separate actuation is carried out from the ECONOMIC. They may not be actuated in parallel.

In case of several A/B sets the fertilizer choice is used. There is no requirement for the simultaneous running control itself for the fertilizer choice actuation to also actually be assigned in the I/O. The right fertilizer choice must however be set in the crop section.

If you already have a simultaneous running control that uses uni-switches, consult your service technician if you wish to use the new control.

7.3.1 Control manual simultaneous running with percentage supply

If the same tray always becomes empty more quickly, manual adjustment may sometimes be sufficient. This can be done with the new settings of percentage supply.
Example:

- **fertilizer choice 1: tray A: percentage share valve position % 100**
- **fertilizer choice 1: tray B: percentage share valve position % 98**

You set the tray that empties most slowly at 100 %. You set the tray that empties faster at a lower percentage, for example 98 %. This means a valve position of tray B = 0.98 % of the computed valve position EC.

There are separate setting screens for each fertilizer choice. If you have only 1 A/B set, you set 1 by fertilizer choice.

7.3.2 Level measurement

For the level measurement in the A and the B tray uni-switches are no longer necessary.

- **fertilizer choice 1: tray A: level measurement %**
- **fertilizer choice 1: tray B: level measurement %**

The measurements can be put in a graph, so that you can clearly see any differences between them and can take action with this information. If the difference between both levels is too great an alarm is possible.

- **level deviation tray A and B: alarm limit**
- **level deviation tray A and B: delay time alarm**
- **EC: fertilizer choice 1: level deviation tray A and B too big**

You will find the alarm limit and delay time in the alarms tab in the EC control. The alarm signals can be set separately for each fertilizer choice.

With **level deviation tray A and B: delay time alarm** you give the control the chance to first adjust for the difference and you can prevent an unwanted alarm in case of short term measurement failure. The delay time is only counted if the EC supply is actually busy with the relevant fertilizer choice. The counter stops if the pump stops for a break or alarm.

7.3.3 Automatic simultaneous running control

These settings are used for the automatic simultaneous running control. The simultaneous running control computes a % adjustment of the percentage supply via a P-control.

- **fertilizer choice 1: tray A: level measurement %**
- **fertilizer choice 1: tray B: level measurement %**

Service settings:

- **level difference: adjustment percentage supply: P-factor %/%**
- **level difference: max. adjustment percentage supply %**

Usually **fertilizer choice x: tray A: percentage share valve position** and **fertilizer choice x: tray B: percentage share valve position** are also set to 100 %. But a combination of adjustment with settings percentage supply and automatic simultaneous running control is also possible. Examples are worked out in the help for the settings for making the adjustment.

- **tray A: computed percentage share valve position %**
- **tray B: computed percentage share valve position %**

In these settings you see the actual result of manual and/or automatic simultaneous running control. You will also find this in the HOOGENDOORN report **pump percentage supply actual**.

8. Energy management

High gas and electricity prices make efficient energy management (EM) in the greenhouse necessary. With version 11 of the ECONOMIC the energy use can be further optimised.

8.1 Up to 25 tank temperature measurements possible

It is now possible to connect up to 25 tank temperature measurements to the ECONOMIC. The condition is however that sufficient analog inputs are available in the licence. Previously the maximum was 9 tank sensors.
Thanks to the larger number of tank temperature measurements it is possible to determine the average tank temperature more accurately. The control can follow the tank curve more precisely when filling or in case of heat discharge, both when controlling on average tank temperature and when controlling on number of layers.
The importance of a lot of tank sensors depends on the installation and the use that you make of the tank. In case of a large tank a single tank layer means a large quantity of heat. Particularly in case of heat discharge it is important to be able to discharge sufficient, but also not too much heat. Sufficient space for storage of heat is important to be able to produce sufficient CO_2 or to be able to produce electricity. The latter is especially important if the electricity is sold with a delivery obligation. Too much heat discharge is throwing away energy and therefore costs money.

8.2 Sophisticated heat discharge

A new feature of the ECONOMIC is the maximum curve for controlled heat discharge. The improved heat discharge program works more evenly and that makes the greenhouse climate more regular. This gives extra control of energy management, so that excess heat production can be absorbed better. By increasing the number of tank sensors finer control is also possible.

8.2.1 Heat discharge with tank curve

Heat discharge from the tank can now be carried out with its own ViP, independently of the filling curves for CO_2 or tank stock. You can select a ViP in tank layers or in average tank temperature. You will find the following new settings for the tank:

- **maximum tank stock: average tank temperature: ViP**
- **maximum tank stock: number layers: ViP**
- **type of control**
  - max. stock: average temp.
  - maximum contect: number of layers

You can also combine control on average tank temperature with control on number of layers. For this you set the following:

- the desired average tank temperature
- the number of layers out of the total number of layers. This gives the certainty that heat is always discharged when the tank is full.

During discharge of the heat for the tank ViPs the following deviation is also added up (can be found in heat discharge setting list).

- **max. tank stock: tank temp: discharge heat deviation: ViP**
- **max. tank stock: layers: discharge heat deviation: ViP**

Always set these ViPs on 0, unless you are working with several heat discharge groups for the same tank. In that case these settings offer the possibility of having the groups discharge heat at different levels.

You can find the resulting target value for heat discharge in the heat discharge groups:

- **maximum tank stock: computed average tank temp.**
- **maximum tank stock: computed number of layers**

These values can also be seen in the Hoogendoorn report **Tank actual measurements**. Because the tank for the heat discharge control has its own curve in the new version, you can set the desired level more easily, independently of the ViPs for CO_2 supply or for tank stock filling. The setting of which tank space must be reserved or released to be able to buffer heat in periods to come is therefore simpler.

The ViPs include six periods. If you use the CHPs to supply electricity to the circuit, you have flexibility to set when and how much tank space you want to reserve to store the heat. The ViPs are provided with various influences. For example by setting the outside temperature and radiation sum MeteoScope sensibly, you can avoid the tank being emptied too far on days with a greater energy requirement.

For preference use influences that do not fluctuate too much to obtain a stable heat discharge set point.

Heat discharge with tank curve **maximum stock** is only used if in **heat discharge: type control: status** one of the following choices is configured:

- **climate: maximum tank stock**
- **actuation: maximum tank stock**

In addition to the control on maximum tank stock, control on a fixed tank layer or on measured cooling water temperature is also possible. Your service technician can activate and adjust the control most suitable for your installation.

8.2.2 Examples heat discharge with tank curve

In the following figures the setting screens can be seen for examples where the heat discharge is optimised.

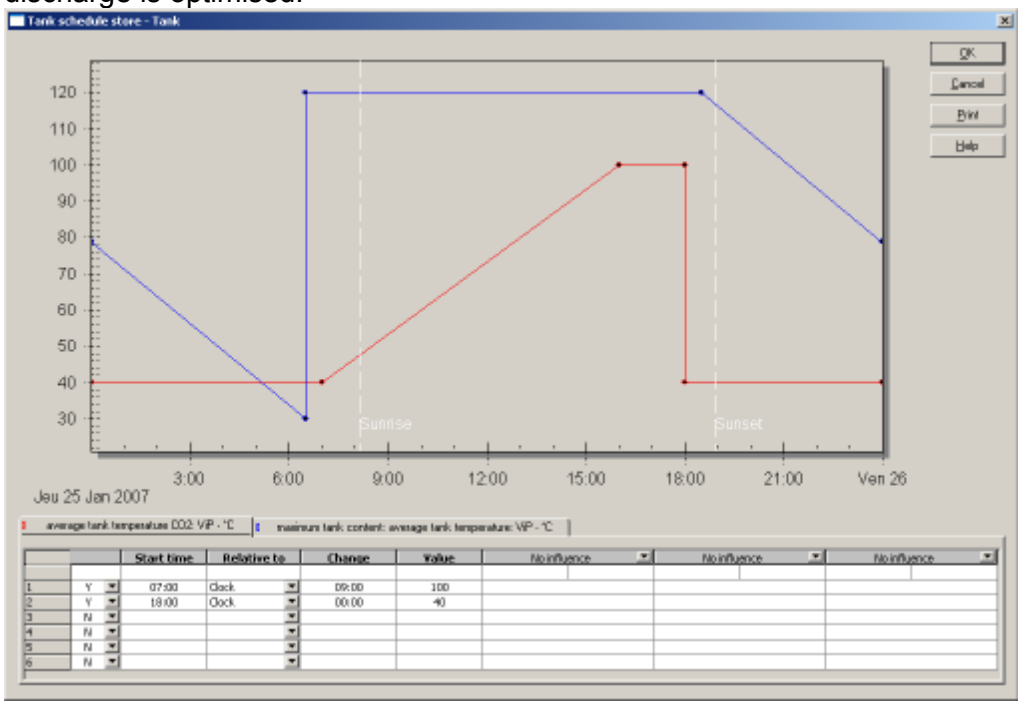


Figure 2: Empty tank at night to be able to supply CO_2 by day

In Figure 2: Empty tank at night to be able to supply CO_2 by day you can see that the curve maximum tank stock and the ViPs for tank filling are combined in one setting screen.

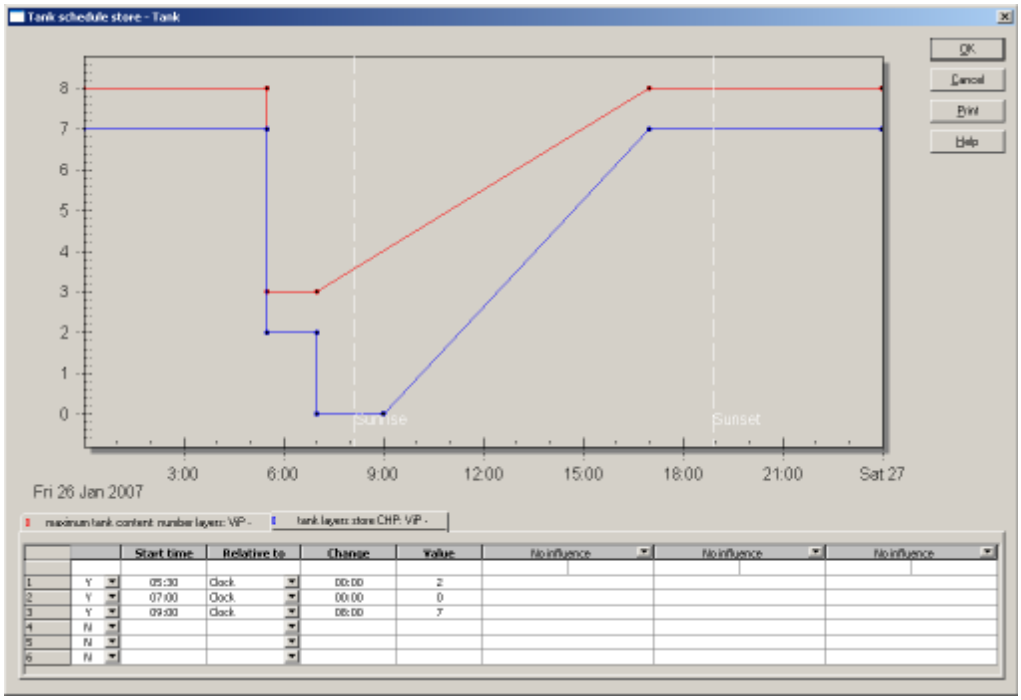


Figure 3: Neighbour supply via heat discharge if there is excess tank stock

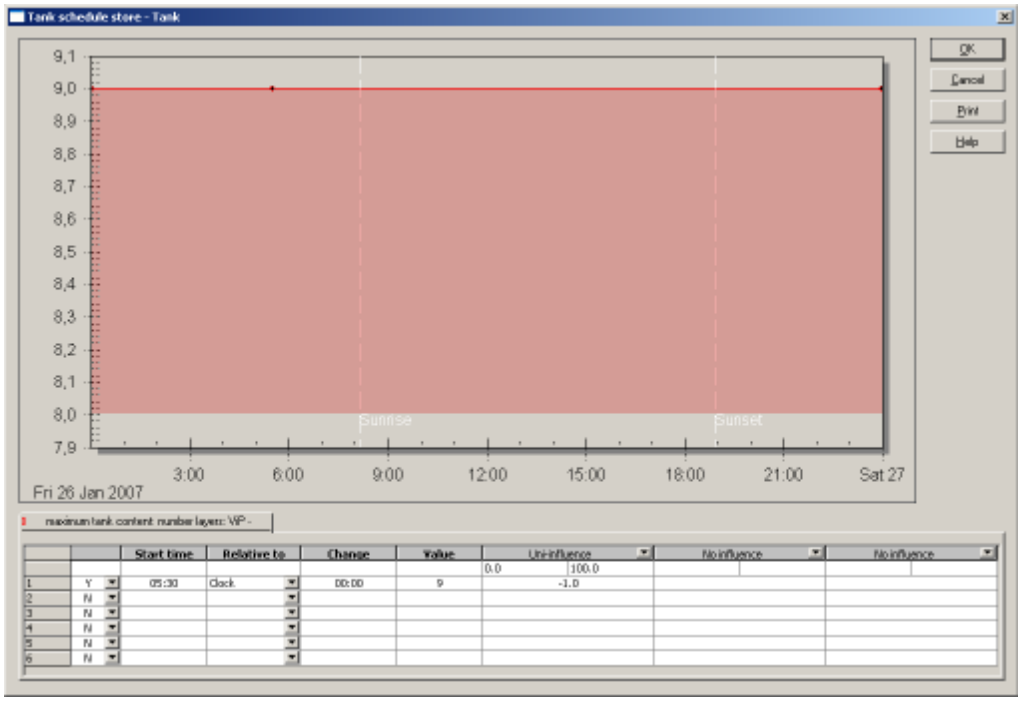


Figure 4: Heat discharge if tank is full

If the TE is on for lighting, the uni-influence is activated and heat is discharged sooner. A suitable uni-switch must however be connected for this application.

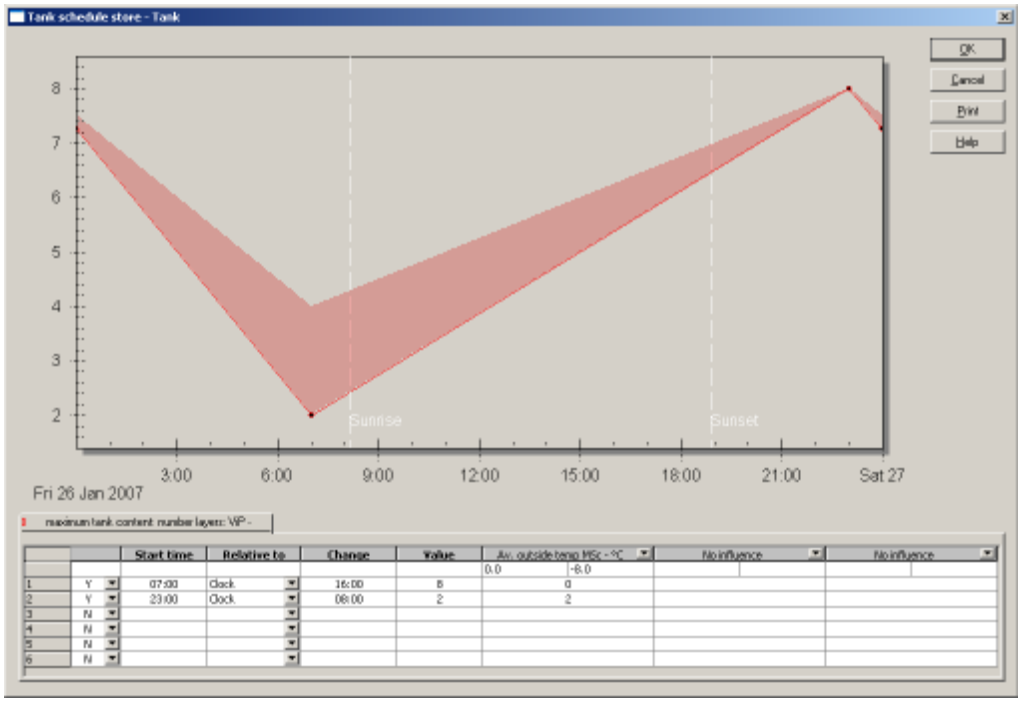


Figure 5: Space in the tank for heat storage during electricity production

If you want to supply electricity you will often have to enter into a certain delivery obligation for this. To avoid penalties it is then very important that you can actually supply. If the CHP cannot run because there is no space in the tank to cool it and there are no facilities for heat destruction or absorption of the cooling requirement, there is then a big problem.

In this example electricity is sold from 7 hours to 23 hours. The tank must in this period offer sufficient space to be able to cool the CHPs. That can be done by emptying the tank sufficiently at night and by discharging heat by day if the tank fills too quickly.

8.2.3 Heat discharge with fixed tank layer

It is still possible to discharge heat with a fixed tank layer number. This option is used if in **heat discharge: type control: status** one of the following choices is configured:

- **climate: selected tank layer**
- **actuation: selected tank layer**

Consult your service technician if you think that this control is more suitable for you and is not activated. With this option you can set the desired tank layer heat discharge for the group heat discharge: **heat discharge: number tank layer**.

8.3 Activate frequency regulated transport pump based on energy demand

The actuation of a frequency regulated pump works using a ViP **transport pump: capacity: ViP - %** including the influence energy demand and a number of weather influences. Thanks to the actuation of the pump based on capacity in % it is easier to see at how many percent of the maximum capacity the pump is running.

You must handle the possible weather influences radiation W/m2, outside temperature, wind speed and rain in the ViP **transport pump capacity** with caution. When computing the energy demand various weather factors have in fact already been taken into account. If you add this again as an influence then it is doubled.

8.4 Heat demand via Analog output signal

It is possible to actuate the value of **transport pipe: computed** as Analog output signal with the setting **transport pipe: computed (I/O)**

8.5 Tank monitoring optimised

Increasing use is being made of CHPs to produce electricity. This does however influence the filling of the tank.
CHPs produce less hot water than a boiler with 1 m^3 gas. If CHPs run to produce electricity for own assimilation lighting, then part of the heat delivery of the lamps goes into the greenhouse. That is not the case if no assimilation lamps are on and the CHPs are used for electricity supply to the circuit.
The gas contract usually offers insufficient scope to allow CHPs and boilers to run at full power at the same time. If it is very cold, or if the tank has been insufficiently filled prior to a heating period, an open buffer may almost empty. It is then important to reduce the heat discharge to the greenhouse or to allow the energy production to increase to avoid the tank emptying completely.

The best thing is to maintain sufficient stock with the ViPs for tank stock filling with boiler and/or CHP. It may however be that for some reason a deficit threatens to occur. With this the tank is protected against emptying.
An alarm can be generated, after which you can take manual action for example by giving CHPs a lower priority than boilers. In addition automatic actions are also possible, for example to cut back the tube temperature.

8.5.1 Setting tank monitoring

For the tank monitoring you set **minimum tank stock: number layers: ViP**. This is a ViP with 6 periods. It contains the same ViP-influences as the ViP maximum tank stock. If fewer layers than set are warm in the minimum tank stock the tank monitoring is activated.
If the number of layers filled again becomes higher, the tank monitoring is still maintained during **tank monitoring: time monitoring active** to prevent too irregular a control.

8.5.2 Actions in case of tank monitoring

8.5.2.1 Alarm tank monitoring

If the tank stock is still too low after **tank monitoring: time monitoring active**, a “tank monitoring: tank stock too low” alarm is generated.
After the appearance of this alarm you can take manual action and so prevent the tank actually getting (too) empty. You can for example turn off a CHP. The boilers, that obtain more heat from 1 m^3 of gas, are then assigned more gas by the Controller.

8.5.2.2 Influence tank monitoring

During tank monitoring the ViP-influence tank monitoring can be used. With this you limit the energy absorption by the climate control. The influence can be used in the following ViPs:

- **maximum pipe**
- **lighting: ViP on**
- **curtain ViP crack**
- **curtain: ViP curtain position**
- **curtain: ViP close on radiation**
- **curtain: ViP open on radiation deviation**
- **curtain: ViP outside temperature close**

The ViP-influence tank monitoring is of the “yes/no” type. You can also use the tank monitoring for EM in cluster configurations.

With the tank monitoring you have important new functionality at your disposal to take action manually or automatically as required to prevent the tank becoming empty.

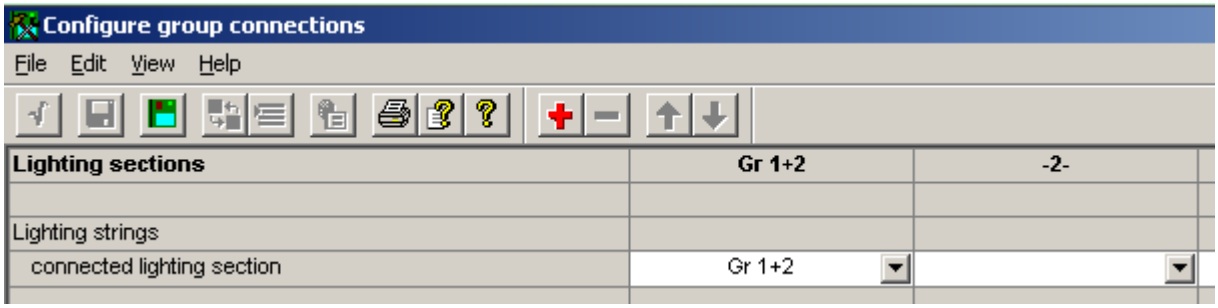
9. Connections climate control

The configuration of the ECONOMIC is carried out entirely on the ECONOMIC from version 11. Together with your service technician you can make the desired adjustments to the configuration. Interrelations between the different controls on the computer in fact no longer have to be set from the HOOGENDOORN AUTOMATION configuration system. The flexibility and the facilities for setting up the system as you wish increase considerably. From version 11 HOOGENDOORN also supplies many extra options in the ECONOMIC at no extra cost, such as uni-switches, heating circuits and soil heating.

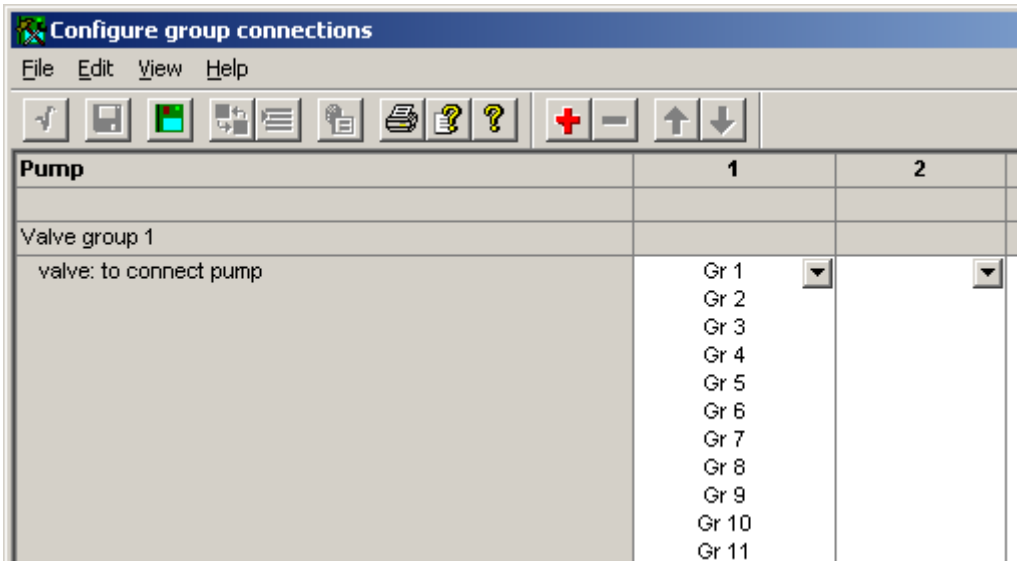
From versions 9 and 10 it was already possible on the ECONOMIC to connect the water and energy management controls to one another. From version 11 that also applies for all the climate controls. The interrelations between controls are laid via the **group connections report**. In version 9 and 10 that was still done for water and energy controls with individual settings in setting lists. You can put this group connections report together yourself and as a result you have the facility to produce a clear and configuration-specific layout.

The interrelations between controls are also shown in the reports. The report program will display the set relations between controls by sorting the columns under one another. By putting the settings of different controls together in one report and sorting them logically the options of the reports program increase.

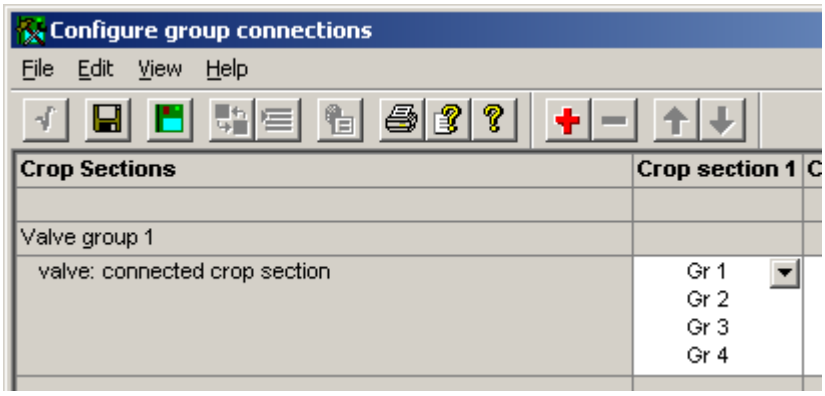
In the general help of the ECONOMIC under F1 is a description of how exactly the connection works. Here you will find the reports with the climate connections, water connections and energy connections.



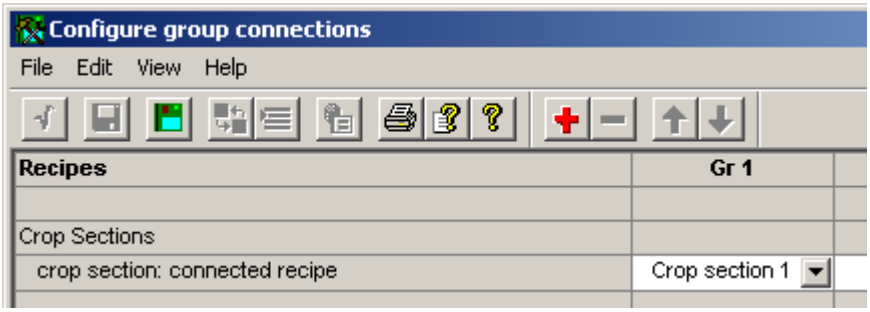
connection lighting strings



valves connected to a pump



valves connected to a crop section

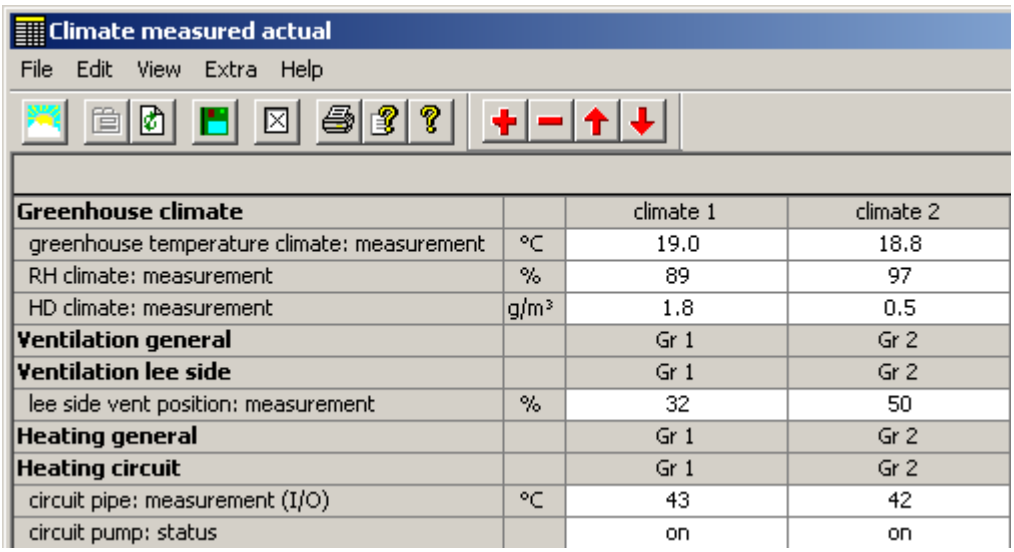


connect crop section to recipe

9.1 Greenhouse climate

Within the climate controls the settings under **Greenhouse climate** form the umbrella process. A **Greenhouse climate** group represents a group or section in a greenhouse. Your service technician can connect other controls to a group Greenhouse climate. For example a heating control and the ventilation control group can be connected to a **Greenhouse climate** group. In version 10 the connections were fixed on the basis of the group number. From version 11 the controls can be connected individually. As a result this gives more freedom to put together the configuration.

The ECONOMIC builds up reports using the set connections. In addition the controls connected are put in columns under the **Greenhouse climate** groups to which they are connected.



Greenhouse climate		climate 1	climate 2
greenhouse temperature climate: measurement	°C	19.0	18.8
RH climate: measurement	%	89	97
HD climate: measurement	g/m³	1.8	0.5
Ventilation general		Gr 1	Gr 2
Ventilation lee side		Gr 1	Gr 2
lee side vent position: measurement	%	32	50
Heating general		Gr 1	Gr 2
Heating circuit		Gr 1	Gr 2
circuit pipe: measurement (I/O)	°C	43	42
circuit pump: status		on	on

In the **Help under F1** of the ECONOMIC is a description of how exactly this works.

9.2 Heating

The heating control was in version 11 divided into:

- **Heating general:** for each **Greenhouse climate** group one Heating general group is connected. In this Heating general group the data from the different heating controls are brought together.

- **Heating circuit:** for each **Heating general** group a maximum of three Heating circuit groups can be connected, these then function as Circuits 1, 2 and 3.
  It is no longer necessary in a Heating general group to connect a Circuit 1 group before a Circuit 2 or 3 is connected.

- **Heating hot air:** for each **Heating general** group one Heating hot air group can be connected. In the case of hot air heating via a setting one can choose between hot air control / throttle valve control. If a two-stage hot air heater is connected and assigned the control automatically uses the second stage.

The soil heating is a loose control that is connected directly to a climate group. The circuits and hot air groups are shown in a report in the columns under the Heating general groups to which they are connected.

9.2.1 Connected lighting strings

From version 11 four strings of lighting can be connected per climate group. The heating control also takes into account four strings instead of two in version 10.

9.3 Econaut

The connections between Econaut and greenhouse and crop group have been moved from **Econaut** to **Climate general**. The latter is more logical because data from greenhouse and crop (among other things areas of the greenhouse) can also be used by other controls in the ECONOMIC. The same data do not have to be entered in several places.
The connections are automatically entered upon an update from version 10 to 11.5 or higher. In case of an update from a lower version 11 the connections must be entered manually.
However always check that both the connection of climate to greenhouse and crop and the settings in greenhouse and crop have been entered correctly. In addition to Econaut among other things the calculation of the actual energy demand also uses the data from greenhouse and crop.

9.3.1 Connected lighting strings

From version 11 Econaut takes into account four connected strings of lighting per Econaut group instead of one in version 10. This results in a better computation of the Ecoline.

9.4 Soil heating

Soil heating requires a connection to a climate group. Several climate groups can be connected to the same soil heating. A maximum of one soil heating can be connected to a climate group. If a two-stage circulation pump is connected and assigned this is used automatically.

9.5 Ventilation

The ventilation control in version 11 is divided into:

- **Ventilation general:** for each **Greenhouse climate** group one Ventilation general group is connected. In this ventilation general group the data from the different ventilation controls are brought together.

- **Ventilation lee side:** for each **Ventilation general** group one Ventilation lee side group is connected.

- **Ventilation wind side:** for each **Ventilation general** group one Ventilation wind side group is connected.

- **Ventilation vent:** for each **Ventilation general** group one or two vents are connected depending whether front or back air is used.

9.6 Assimilation lighting

The assimilation lighting in version 11 is divided into:

- **Sections**: a Section is used to connect one or more Strings.
  A Section can also be connected for recording purposes to a Greenhouse climate group.

- **Strings:** a String is connected to a Section. In addition Strings are connected to a Greenhouse climate group.

For the correct operation of the lighting precisely 1 lighting general group is necessary in the configuration and at least 1 lighting sections group and 1 lighting strings group.
If this is not the case the **lighting error in configuration** alarm follows and the lighting control is not carried out.

From version 11 four lighting strings groups can be connected to a Greenhouse climate group instead of two in version 10.

9.7 Aspirators

Different controls use one or several aspirators. This is set on the different controls themselves.

9.8 CO2

In **CO_2 general** the following connections are defined:

- connected climate group
- connected CO_2 control 1
- connected CO_2 control 2
- connected CO_2 sensor
- channel number CO_2 measuring

In **CO_2 control** the following connections are defined:

- connected CO_2 general
- connected CO_2 unit

In **CO_2 measuring** the following connection is defined:

- channel number outside CO_2

9.9 Humidification

A **humidification** group is connected to a climate group.

10. Greenhouse and crop continue to require attention

HOOGENDOORN pays a lot of attention to the safety and reliability of the equipment and software supplied. Our staff have tested the software extensively before it is installed on your climate computer. Failures can however always occur and are always unexpected.

HOOGENDOORN therefore offers a maintenance contract. A Customer Service assistant visits your business annually to check the critical points of your computer and at the same time then installs a new release on your ECONOMIC. You are assured that you always have the most modern and efficient control in your business.

During the growing season you can also take a couple of important measures to increase the reliability of the control even further and so to prevent unpleasant surprises. HOOGENDOORN advises you to regularly go through the following:

1. Check the alarm limit monitoring. Causes from outside, such as lightning strike or a human error, may play havoc with the computer.

2. Do previous safety measures still comply with the current procedure and any innovations in the installation?

3. Do all the safety devices function properly? A rusted alarm clock for example may cause a failure with all the consequences of this. Important points for attention are:
   - The protection of the water and the power supply
   - Monitoring the greenhouse temperature
   - The maximum gas consumption

4. Finally: safety of the people who work in your business is of the very greatest importance. For example steam forming in vertical tanks for heat storage is no joke! Also check your business regularly for all the points where hazardous situations may occur and avoid any risk for you and your staff.

PART II

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INTERNET SERVICES

11. Internet services

In 2006 HOOGENDOORN will start the introduction of various Internet services, where data from the ECONOMIC are used. The HOOGENDOORN central computer pool in Vlaardingen is connected via the Internet to the ECONOMICs of customers who choose certain Internet services. On the central computers extensive programs run in order to provide this service. The ECONOMICs supply the process data and provide the operating system and display part of the Internet service. By combining existing data new practical information can be generated. The controls in the ECONOMIC do after all go on running independently. Meanwhile a start has been made on the practical application of the Internet service E-Supply Planner. With this a grower can take better decisions among other things about the degree of filling of the heat buffer, the use of lighting, avoiding exceeding the gas contract and supplying electricity back.

ECONOMIC remains necessary
The Internet offers new features, but also in the further future a process computer will remain necessary in your greenhouse. That has to do with time critical processes. The annual update of the software will not be carried out from the central HOOGENDOORN computer, but just as you are used to, in your nursery. It is however probable that the size of the software in the ECONOMIC is limited because an increasing number of functions are carried out centrally via HOOGENDOORN Internet services. The program change in the nursery will take less time and as a result disrupt the control processes less. Interim modifications will in many cases be changed centrally. Customers can therefore profit from improvements in the software more quickly.

Greater business security
By connecting the ECONOMIC to the Internet via a fixed connection benefits can also be obtained without further HOOGENDOORN Internet services. The connection is more secure and more user friendly than a modem connection. In addition the most up-to-date weather report or storm radar can be requested frequently at no extra cost. If the equipment that provides the Internet connection is equipped with VPN, remote operation via the Internet is possible with Ecoremote.

11.1 Why connect your ECONOMIC to the Internet?

A fixed connection of the ECONOMIC to the Internet is more valuable than it seems at first sight, and these benefits will only increase further in the future. In the first place this connection is necessary if you use the Hoogendoorn Internet services in combination with your ECONOMIC. Furthermore this connection offers many more attractive benefits such as:

- The Hoogendoorn website and the Login portal are made accessible on the ECONOMIC so that you do not need a separate PC for this.
- The connection with the Internet makes the connection of a modem and the laying of a separate telephone line superfluous. In addition to the saving on telephone costs a fixed Internet connection is also much more secure and also much faster. Via this connection you can:
    - Download the weather report from Meteo Consult
    - Download Meteoradar data from Meteo Consult (in case of turbulent weather every ten minutes!)
    - Obtain remote service from the Hoogendoorn Helpdesk (a NetScreen firewall is necessary for this)
    - Time synchronisation with an external atomic clock
    - Keep the virus scanner up-to-date
- Further benefits can easily be obtained in addition such as remote control via VPN and connections between several sites.

Safety of first importance
The ECONOMIC must in the first place control the climate in the greenhouse, therefore the security of this system is of first importance. To guarantee this the connection with the Internet must be made in a safe way. For this purpose we can install a NetScreen firewall which means:

- that the ECONOMIC can only communicate with the necessary servers, at the moment these are the Hoogendoorn Server, Meteo Consult and the Time server
- that exclusively incoming traffic from the Hoogendoorn Server and the Hoogendoorn Remote Service system is allowed through to the ECONOMIC
- that all the incoming traffic is checked for invalid and undesired code

What do you need?
There is a high chance that you already have a fixed Internet connection, usually via ADSL. Many business ADSL connections are suitable for this purpose, but consumer products are often not. Internet connections via cable are also not usually suitable. If you have chosen safety you have probably connected a good firewall to this connection. Carefully read through the conditions under 11.2 to decide whether your connection and firewall are suitable for this application.

If you have a suitable connection and a good firewall you can make preparations or have them made by your IT supplier to make this connection ready for connecting to the ECONOMIC. By using a checklist you can have the required settings made. This checklist can be obtained from the HOOGENDOORN helpdesk.

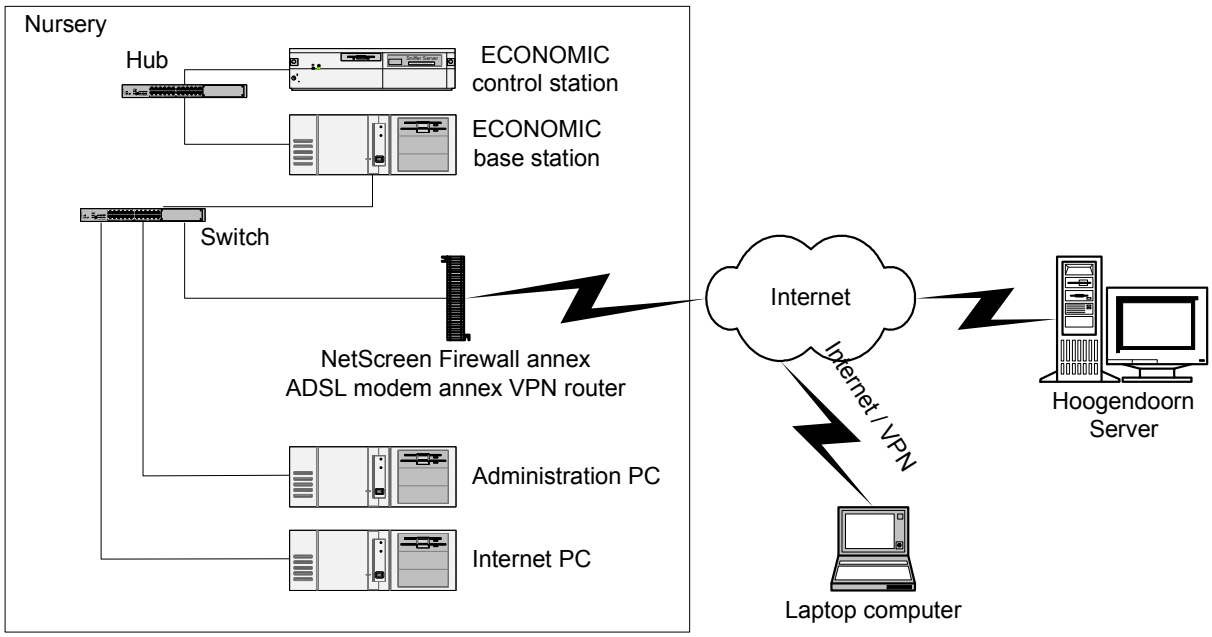
If you do have a suitable ADSL connection but this is not protected with a suitable firewall we can supply a NetScreen firewall for this. Also if the connection itself is not suitable or if you do not have a fixed Internet connection we can advise you on this and also help you obtain one.

Additional features

Without doubt when reading this you will think: can this connection and the firewall then only be used for the ECONOMIC? No, certainly not: there are almost always additional wishes relating to the Internet connection which we can meet. The commonest additions are these:

- Virus scanner in the firewall: by buying an additional VirusScan module (and the annual maintenance on this) all traffic is checked for viruses again before it enters the network.
- ADSL application: if no line is yet available this must be provided. Within the Netherlands Hoogendoorn can deal with the application for ADSL (you as customer do however enter into the contract yourself).
- VPN dial up connections: by purchasing a VPN clients package you can connect from a PC or laptop at home or elsewhere with the firewall and operate the ECONOMIC in this way.
- VPN connections: if you have several business sites you can connect the networks together with the NetScreen firewall so as for example to operate the ECONOMICs on the other sites from any site.
- Connection of extra PCs: the firewall is extremely suitable for connecting more PCs so that these PCs can also benefit from the safety that the firewall offers. Up to a maximum of 10 systems (incl. ECONOMIC, CHP installations, cameras, etc.) can be connected free of charge, if this number is exceeded an extension to the firewall is necessary.

The drawing below shows schematically an example of a network with a few of these additional options.



11.2 Conditions for the connection of ECONOMIC to the Internet

In order to use the Hoogendoorn Internet services a number of conditions are laid down for the Internet connection and your firewall and/or the modem.

Internet connection
The conditions for your Internet connection are:

- The connection between the Internet and the business is generally continuously available. Specific measures for high availability such as fall-back connections are not necessary.
- The outgoing speed of this connection (the so-called upload speed) is at least 256 Kbps. The incoming speed is less relevant for the Internet services, however a minimum band width of 256 Kbps is recommended.
- If other applications or systems make intensive use of this connection it must be ensured with reasonable security that at least 128 Kbps is available both outgoing and incoming for the connection between ECONOMIC and the Internet.
- The business can be accessed from the Internet by means of a fixed IP address.
- The ECONOMIC is permanently connected by means of a UTP connection in a safe manner to the Internet connection. Specifically safe is understood to mean that all the traffic is already blocked before the ECONOMIC except for traffic for the above-mentioned services, and that the permitted traffic is free of viruses and other faults.

Firewall and/or broadband modem
Your firewall and/or broadband modem must meet these conditions:

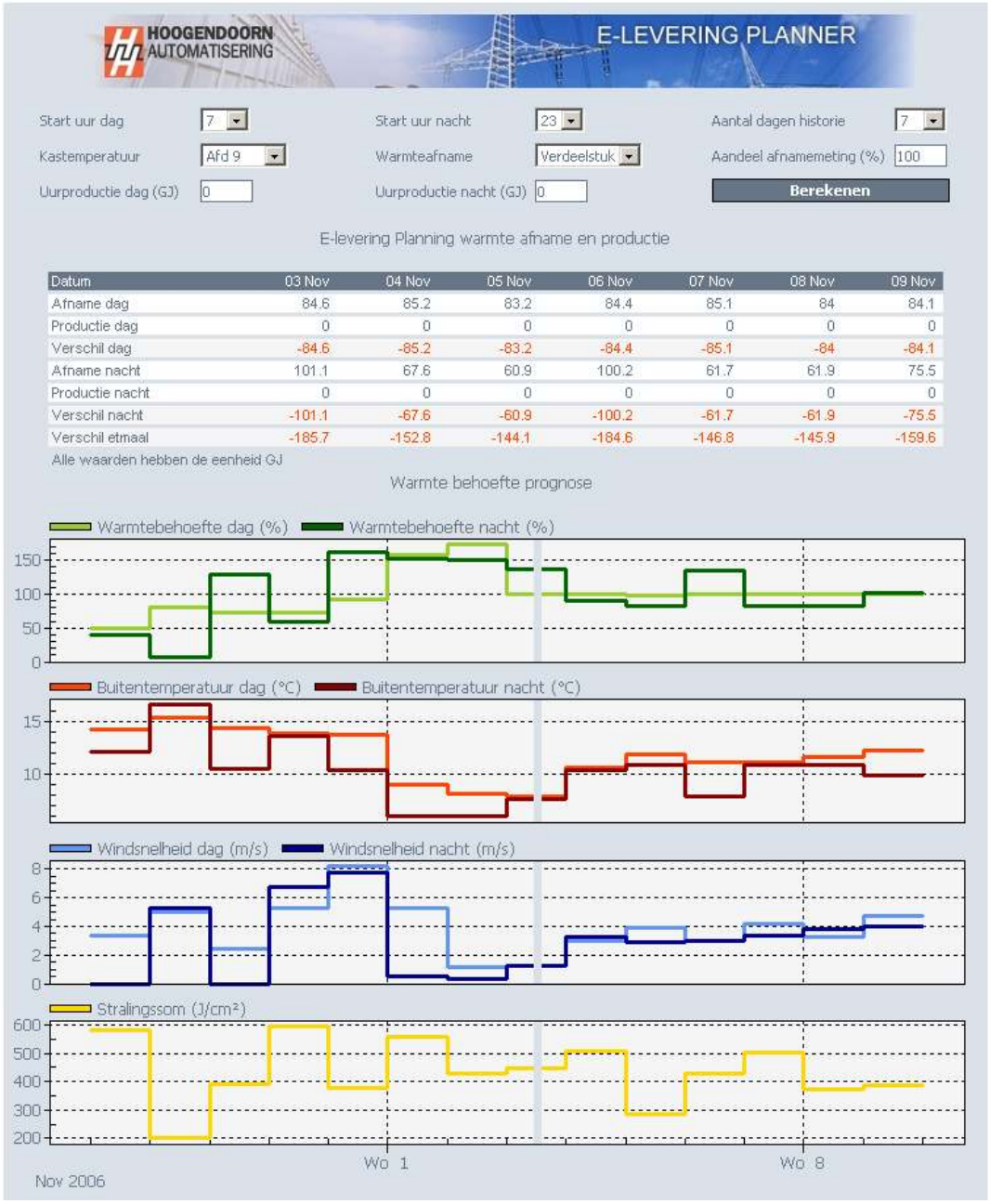
- The firewall and/or the broadband modem that are included in this connection provide the option to forward incoming traffic from individual IP addresses or DNS names, on individual port numbers to the ECONOMIC connected after it (port forwarding). This can be set for at least two port numbers.
- One of these items of equipment (firewall and/or broadband modem) also provides the option to forward incoming traffic on a particular port number to an underlying system via a different port number (port translation).
- If several ECONOMIC systems are connected after one connection, the intermediate equipment provides facilities for port forwarding and port translation for at least two port numbers per ECONOMIC system.
- If remote service is also provided by Hoogendoorn via the Internet a NetScreen firewall is necessary; for service purposes to the ECONOMIC a VPN connection is configured in this.

ECONOMIC
For Hoogendoorn Internet services the ECONOMIC itself must also meet a few conditions:

- The basic station is equipped with Windows XP Professional with ServicePack 2 or higher.
- The basic station is fitted with two network cards: the first for communication with the process computer and the second for communication with the Internet and if necessary your own office network.
- The ECONOMIC works with at least version 11.5.

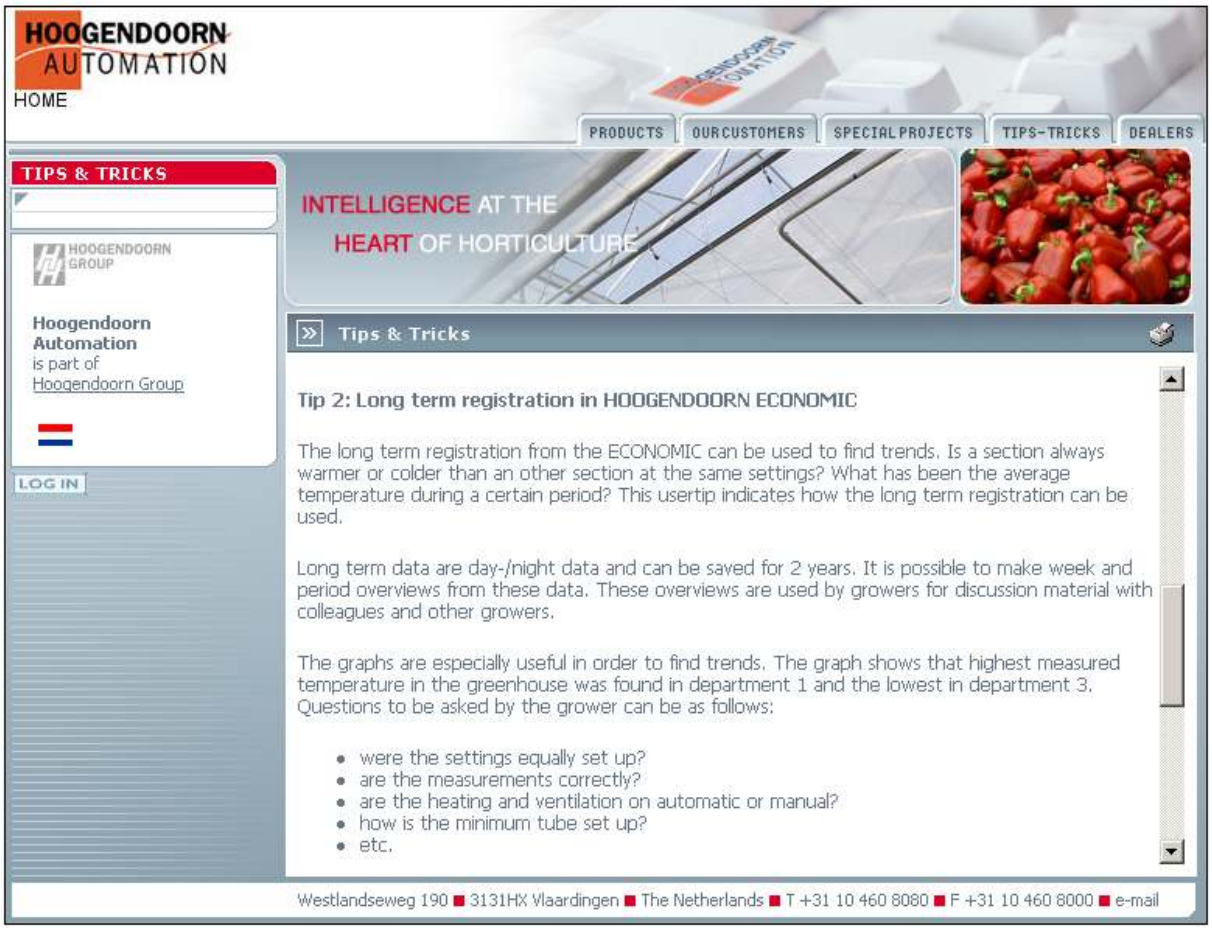
11.3 E-Supply Planner

The weather conditions largely determine the energy management in a horticultural business. HOOGENDOORN has developed an E-Supply Planner that in the light of a weather forecast computes what the energy requirement will be in the coming days. ECONOMIC users with MeteoScope have available the reliable weather forecast of Meteo Consult and can use this E-Supply Planner. They therefore have a better idea of the anticipated course of their business's energy requirement.
The E-Supply Planner displays a number of interesting data in compact graphs for the past week and for the coming week. For example the course of the outside temperature, wind speed and radiation sum can be viewed next to one another at a glance. In addition the graphs show the course of the business's heat requirement.



11.4 Hoogendoorn website including user tips

The Hoogendoorn website can be accessed via www.hoogendoornautomation.com.
Here you will find some practical user tips under the TIPS-TRICKS tab.



PART III

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OPTIONS AND ADDITIONS

12. HOOGENDOORN plant sensors

Until now plant measurements could only be made independently of the ECONOMIC. You then had to adjust the controls of the computer manually on the basis of these measurements. HOOGENDOORN has developed a number of sensors that can be connected to the ECONOMIC. The measurement signals are then read in automatically. These sensors are marketed under the collective name GROWLAB. A number of basic packages have been put together that consist of different sensors and a supporting software package. Using the GROWLAB the ECONOMIC can gear the climate control more accurately to the situation directly by the plant and to the requirements of the crop.

12.1 GROWLAB WET sensor

The water supply remains a difficult process to control. You often have to 'feel' the plant or pot to see if cycling is needed. HOOGENDOORN has developed a sensor that gives an idea of the amount of water in the soil. This measurement instrument at the same time determines the **W**ater, the **E**C and the **T**emperature in the soil and is called the WET sensor. This sensor can be connected to the GROWLAB or can be used on a stand-alone basis. The sensor measures electronically the moisture content of the soil in a volume of at least 500 cc. The moisture content is determined between 0 and 100% and the reduction in the moisture content in the soil is also established. The sensor can be used in different soil types: potting compost, mineral greenhouse soil, coir, rock wool and peat.

The GROWLAB wet sensor can be used in different soil types: potting compost, mineral greenhouse soil, coir, rock wool and peat

12.2 GROWLAB Plant temperature camera

It is not the room temperature but the plant temperature that is responsible for the net production of assimilates during photosynthesis. The GROWLAB Plant temperature camera measures the temperature of the plant using infrared.

Plant temperature and room temperature seem to respond differently to different situations. When the sun comes through the clouds the room temperature will rise less quickly than the plant temperature, while in case of long term high radiation the plant will in fact be cooler than the surroundings thanks to leaf evaporation. Control on plant temperature can mean a saving in energy consumption. Thus for example it may not be necessary to increase the minimum pipe because the plant is not yet too cold, while on the basis of the room temperature you would find it desirable to heat.

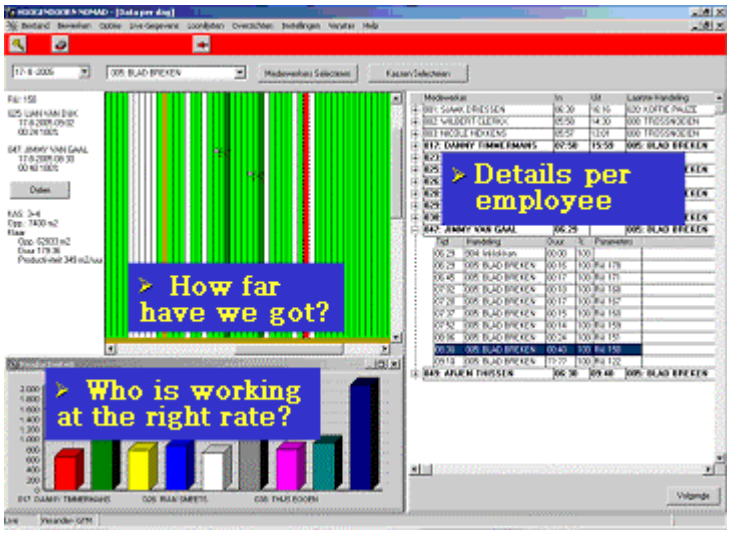
The Plant temperature camera has a special coated lens that is extremely resistant to crop protection products or other attacks. The lens can measure both a small and a large area. The camera can be connected to the ECONOMIC and can be used in pot plants, cut flowers and vegetable growing. You get a better idea of the plant conditions and so you can gear the climate control better to the requirements of the crop.

The GROWLAB Plant temperature camera measures the temperature of the plant using infrared.

13. NOMAD Path recording

Labour is one of the biggest cost items within horticulture, and labour costs will go on rising. To take the right action good labour records are needed. With the right figures well-founded decisions can be taken. NOMAD can give savings of 10% to 15% on your labour costs.

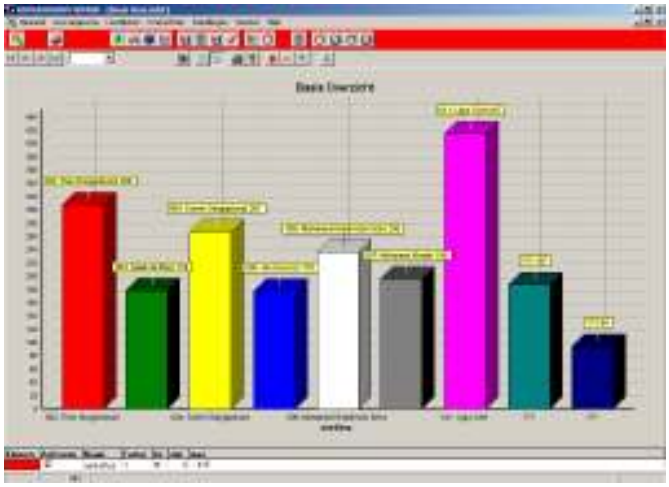
NOMAD path recording is a unique HOOGENDOORN product. It is a product that we are proud of. It is the only system that continuously processes the data wirelessly. As a result you can view the current state of affairs on your PC at any time of the day. All the information is updated the whole day. You can see what has been done, by whom, how much time was taken for this and what everyone is doing at the moment. All the activities and the progress of the work are clear at a glance.



Your staff are all given a wireless input keypad. We call these our NOMAD keys. On the key all the operations and detections can be entered. The data are transmitted directly and wirelessly from this key to your computer. The employee can see what he has entered on the key display which reduces the chance of errors.

A new feature is the barcode scanner on the key. All the keys have a barcode scanner. This gives the user the choice of using input via bar codes in addition to numeric input.

On your computer you can very easily compile your own reports. These may for example be productivity records, time records, wage lists or reports on diseases and pests. In NOMAD you can display the data in table form, graph form or via a graphic display.



In addition to time records NOMAD offers a lot more. You can keep track of your diseases and pests, fertilizer records, crop protection records and payroll records in the program. These modules form a standard part of NOMAD. This enables you to print out a payroll list or the requested reports for PT, MPS, UMR or EUREPGAP.
HOOGENDOORN also offers you the option to extend the system with a NOMAD weighing interface. In this way the kilos weighed are recorded within the program.

Advantages of NOMAD

A summary of the advantages of NOMAD for you:

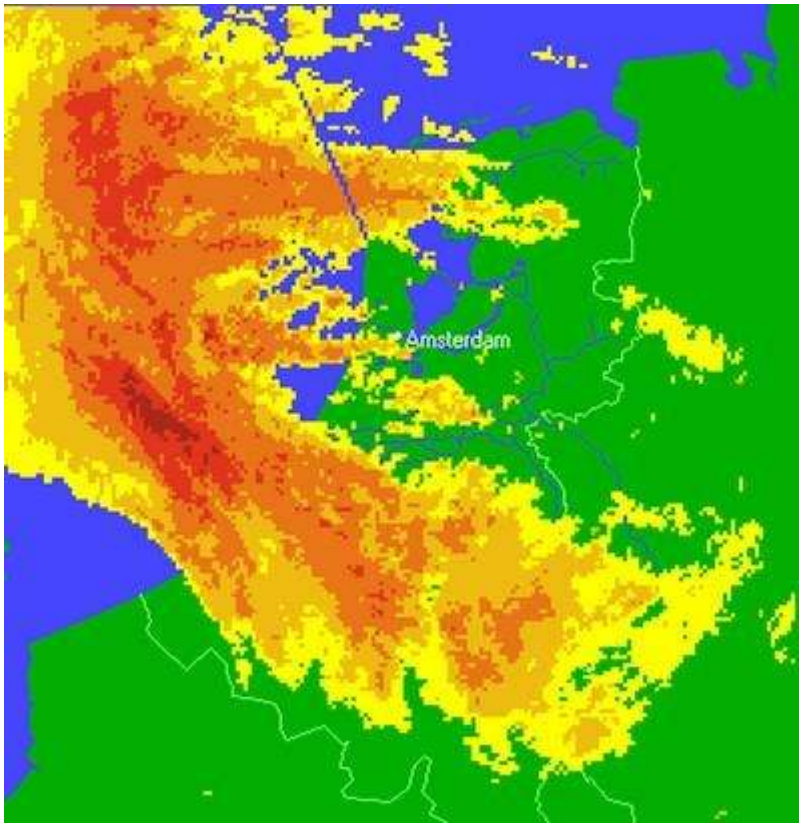
- Wireless entry everywhere and always
- Few errors on entry due to the large display
- Accurate labour data
- High flexibility
- Option for barcode scanning
- Simple to produce reports and graphs
- The time records are easy to connect to a NOMAD weighing unit
- 10-15% saving of labour costs

HOOGENDOORN has a CD-ROM on which you can view the operation of NOMAD. This can be requested from HOOGENDOORN.

14. ECONOMIC Meteoradar,

can you see the storm coming?

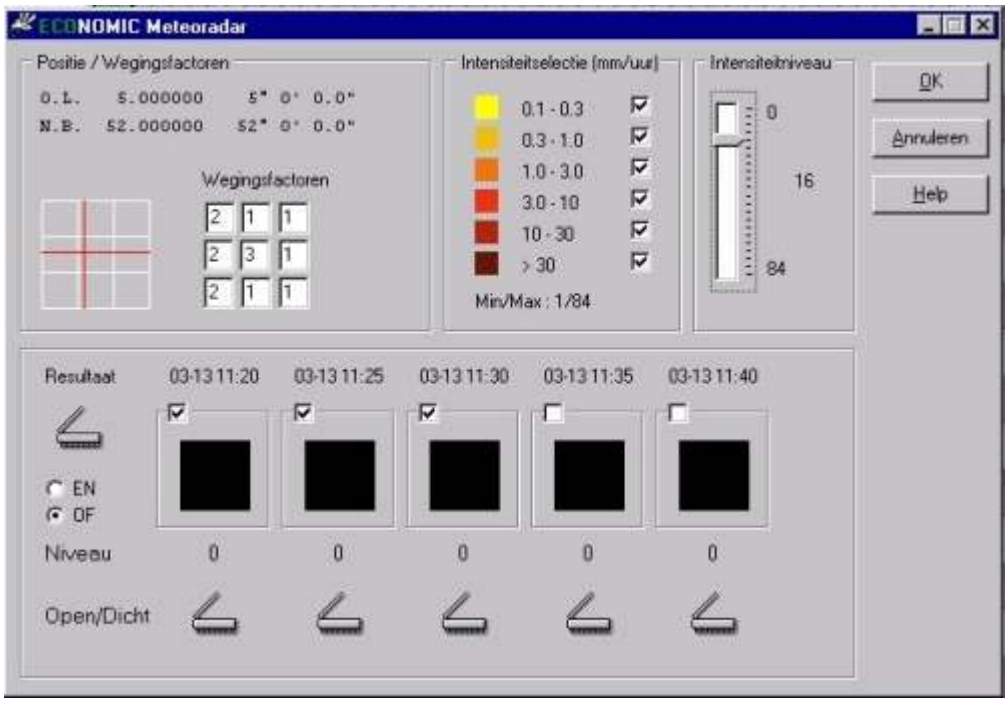
For some forty years already growers have been trying to prevent rain entering with a rain sensor. Usually this works well, but the equipment has a certain inertia and in case of a sudden rain or hail storm sometimes the vents do close too late.
The Hoogendoorn Meteoradar makes it possible to close the vents in time even in such situations. The Meteoradar detects a rain or hail storm at an early stage, determines the intensity of the storm and computes very accurately when the storm will reach the greenhouse. This system was developed by Hoogendoorn Automation together with the weather specialists of Meteo Consult.



The advantage of promptly closing the vents as rain approaches is to prevent climate shocks.
If the ventilation is only closed when the traditional rain sensors detect precipitation the greenhouse climate has already been upset because of the cold air that passes over the greenhouse before the storm. The greenhouse temperature suffers a considerable reduction, and the heating must compensate for this. That has an adverse effect on the plant and also on energy costs. And this happens on average a few hundred times a year in Dutch conditions.

Another additional advantage is a considerable reduction in fungal attack, Phytophtora and Botrytis, as a result of which a lot less crop damage occurs and savings can also be made on environmentally unfriendly crop protection products.

How does Meteoradar work?
The operation of Meteoradar is ingeniously simple. A software module on the ECONOMIC process computer makes it possible to regularly download images of the storm radar from Meteo Consult. In fact, this information consists of a series of 5 images that show respectively the anticipated storm pattern for 5, 10, 15, 20, and 25 minutes time. By comparing (matching) the image points (pixels) from each of these images with the location of the greenhouse and the surrounding area, it is possible to determine whether rain is expected within the next 25 minutes. The location of the greenhouse can be entered very accurately in the coordinates. The intervals at which the radar images are downloaded vary between 10 and 120 minutes, and are automatically shorter the higher the storm activity in the vicinity.



The user can set the operation of the storm detection at his own discretion by checking a number of options.
For example it is possible to give storms coming from a westerly direction a higher weighting factor than storms from an easterly direction.
Also the threshold value can be set at which the storm warning must be activated and you can also select a time horizon between 5 and 25 minutes.

Each user can in this way adapt the operation of Meteoradar to his own circumstances and preferences. These may of course also vary per season and crop phase.

If Meteoradar detects an “approaching storm” warning in accordance with the set conditions, this is then passed on to the ECONOMIC process control and this can be used here to influence the control of the vent positions, but also of other things. The unique graphic ECONOMIC ViP settings make it possible to freely program this influence. It is for example possible to make the degree to which the vent position is reduced in case of approaching storms dependent on wind speed, outside temperature and so on.

Advantages of Meteoradar

A summary of the advantages:

- automatic response of the air vents in case of approaching rain storms and other precipitation that is detected by the radar
- considerable reduction in the chance of rain entering and wetting the crop (this happens in the Netherlands on average tens of times a year)
- as a result much lower chance of fungal attack, Phytophtora and Botrytis,
- and therefore fewer crop protection products needed
- for this reason Meteoradar is recognised by the Ministry of Housing, Spatial Planning and the Environment (VROM) as a tool that is eligible for the VAMIL/MIA environmental investment scheme, which can mean a discount of up to 40% on the purchase price
- no disruption of harvesting work or crop treatment due to rain coming in
- prompt closure of the air vents upon approaching storms prevents climate shocks (this occurs in the Netherlands on average a few hundred times a year)
- as a result prevention of plant stress due to sudden changes in greenhouse temperature and RH
- as a result also reduction in energy costs
- fully integrated in the HOOGENDOORN ECONOMIC process computer
- as a result further applications also possible such as postponement of cycles in case of approaching rain storms etc.
- data communication over the Internet possible if permanent Internet connection present, as a result low costs
- in combination with MeteoScope very favourable subscription price for Meteo Consult

14.1 Easier use of Meteoradar to limit vent position (from 11.10)

Uni-influences are no longer used at maximum vent position to reduce the vent position in case of chance of rain. Instead of this, on the lee and wind side the following ViPs are added:

- **lee side: maximum vent position Meteoradar: ViP %**
- **wind side: maximum vent position Meteoradar: ViP %**

This ViPs are activated if Meteoradar indicates a chance of rain.

14.2 New ViP-influence Meteoradar (from 11.10)

There is a new ViP-influence “Meteoradar”.
“Meteoradar” indicates how great the rain intensity is. If the rain intensity is 0, there is no rain. At 100 the maximum rain intensity is computed. If there is no chance of rain “Meteoradar” remains on 0.
To determine the rain intensity and chance of rain see Section 14.

You can put the rain intensity for Meteoradar in a graph.

You can set this influence in the following ViPs:

ventilation
- **lee side vent position maximum rain: ViP**
- **lee side vent position maximum Meteoradar: ViP**
- **wind side vent position maximum rain: ViP**
- **wind side vent position maximum Meteoradar: ViP**

cooling
- **temperature cooling: ViP**

air conditioning
- **unit: capacity: ViP**
- **unit: temperature: ViP**

uni-switch
- **period 1: influences ViP (100=on; 0=off)**
- **period 2: influences ViP (100=on; 0=off)**
- **period 3: influences ViP (100=on; 0=off)**

The influence can also be used if it is already raining to respond to the rain intensity.

Example:

lee side: vent position maximum rain: ViP							
		Start time	**Relative to**	**Change**	**Value**	Meteoradar - %	
						25	75
1	Y	0:30	Sunrise	00:30	25	-15	

If you already use Meteoradar, set lee and wind side maximum vent position Meteoradar as you wish. If you used Meteoradar with a uni-influence for maximum vent position, you must delete this.

PART IV

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SERVICE

15. Service

15.1 Shared weather station and EM clusters

A cluster with several ECONOMICs with shared weather station is possible with the latest versions. The following combinations are possible:

ECONOMIC 11.x with 10.x
ECONOMIC 11.x with 11.x

It does not matter which is the master and which is the slave or in what order the computers are switched. For combinations where cluster exchange between horticulture and EM is also used the same applies. Because of this property it is possible for different ECONOMICs that use the same weather station or exchange EM data, to change over at a different time from version 10 to 11.

15.2 Influence energy demand greenhouse

To prevent unwanted oscillation behaviour upon closing a curtain the influence is always computed as if no curtain is present. Also the change of the influence can be limited upwards and downwards with the service settings:

- **climate: influence energy demand greenhouse; max increase**
- **climate: influence energy demand greenhouse; max decrease**

The influence responds as required faster or slower to modifications in the energy demand.

15.3 Uni-switches

All sorts of measurements can be connected to a uni-switch, such as for example greenhouse temperature, RH or tube temperature. This measurement can be used to actuate a pump or a valve via the uni-switch.

15.3.1 Control circuit with Analog output signal (Aout)

When using a uni control circuit it is possible to use Aout via the DATAPOINT. For this assign the Aout setting **Uni-switch target value** (I/O) and then select **uni-switch: type of switch: control circuit**. If this I/O is assigned via **assign I/O** the computer writes the computed value of the ViP uni-switch: **target value as output** to the Aout setting when using the control circuit. The service technician can set the right scaling of the output via the adjustment screen.

15.3.2 Extra functionality

In version 10 a uni-switch always had a pre-determined functionality, either uni-switch or control. From version 11 this difference has been abolished. All the uni-switches purchased have been given the complete functionality.
Also the existing uni-switches have at no extra cost from version 11 been given all the options. You can activate the desired functionality by assigning measurements and actuations. However sufficient I/O must be present in the configuration for this.

15.4 Connection for energy management in a cluster

More and more growers are choosing an energy cluster. HOOGENDOORN has therefore made an adjustment in the software for energy management (EM) in a cluster. As a result different ECONOMICs are easier to connect. For setting an EM cluster connection you must give the configuration number of the other ECONOMIC to which you want to connect. You can set this in the setting menus under the service tab. If the connection does not work you get an alarm. The ‘status communication’ settings under the status tab give information if the communication is not successful. If you want to connect to EM controls on your own ECONOMIC the connections are set via the group connection report.

15.4.1 External input for the Meteoradar

A functionality has been added to the uni-switches program with which other controls can write a value in the uni-switch. This value can then be used in turn as a uni-influence. This new functionality is for example used for Meteoradar.

To use this external input the **type of uni-influence** setting must be set on **external input**. The other control enters this value under the **external input** service setting and is copied from this to the **computed uni-influence** setting. If the **external input** setting is not entered for more than 30 minutes the value of the **computed uni-influence** setting is put on invalid. This corresponds to no influence on the ViP.
The **external input: time since last input** service setting updates how many seconds have passed since the value was entered. The uni-switch that is used as a uni-influence for Meteoradar must be set differently.

15.5 Curtains

15.5.1 Starting value large crack

The curtain must where possible upon closure be actuated immediately to the desired position. At the start of closing a check is made whether a crack is desirable and if so, how big this crack must be. If the desired crack is greater than **curtain crack: starting value large crack** the curtain is actuated directly to the desired position. If the crack is smaller, the curtain is first fully closed.
This extra actuation is carried out because without feedback of the curtain position in case of a small crack there is a high chance that the difference in the position achieved is too large if one wants to actuate to the desired position in one go.
The value of the **curtain crack: starting value large crack** setting was previously as standard on 5%. This setting can now been freely set by the service technician between 0 and 100%.

15.5.2 Sensor curtain closed and position sensors

From version 11 all the curtains have standard **sensor curtain closed** and **position sensors**. In version 10 these were options. **Sensor curtain closed** can for example be used in combination with lighting: when the lighting goes on, the curtain must close. To use the sensors they must be assigned via **Assign I/O**.

15.5.3 Emergency start curtains

In version 11 a **curtain: emergency start curtains** setting is added. You can select this as a sign that for example an (old) back-up has been reset. After this the ECONOMIC carries out a number of special actions to ensure a correct restart of the curtain control.
You can find more about this under the Help (**F1 button)** for the setting.

15.6 Anti rust program

In the summer when everything is shut down valves and so on may be jammed. It is therefore important to go through everything. This can be done with the anti rust program. Under Energy control there was already a simplified anti rust program available in version 10. This program is now also used for circuit and soil heating. In the morning the program turns on in turn the circulation pumps of the different circuit and soil heating groups for a few minutes. This only happens if the pump has not been on for the past 24 hour period. If the anti rust program in a particular group is unwanted, this can be turned off with a service setting:

- **circuit: anti rust** **yes/no**
- **soil: anti rust** **yes/no**

15.7 Standard high speed pump in heating circuits

In version 10 a heating circuit with a high speed pump was an option. This is now a standard part of the program and can be activated by the service technician in your greenhouse at no extra cost. There must however be sufficient I/O in the configuration for this.

15.8 CO_2 control

15.8.1 Split

The control CO_2 is split into:

- **CO_2 general** : connections with other controls and recording
- **CO_2 measurement** : measurement CO_2 concentration and measurement channel selector
- **CO_2 control** : control, actuation
- **CO_2 unit** : supply unit control, connection CO_2 modulation

15.8.2 Selector

The setting for the monitoring on the communication of the selector, namely **delay time CO_2 selector alarm** has been moved from the **Control climate: greenhouse climate** menu to the **Control climate: CO_2, CO_2 general** menu.

15.8.3 Extra measurement for CO_2 measurement per climate group

In CO_2 general an extra measurement is included, namely **CO_2 sensor: measurement**. This measurement has the purpose of making a CO_2 measurement directly available per climate group for simple installations with a linear CO_2 sensor. It is in that case no longer necessary to specially configure a CO_2 measurement group. If a connection has been entered in the **connected CO_2 sensor** setting and the measurement is assigned in that connected CO_2 sensor group, this takes precedence however.

15.9 Switch on delay cooling

The **universal cooling: switch on delay** setting has been moved from climate to cooling. This setting occurred in only one group in climate. In case of cooling this setting occurs in each cooling group. The cooling program does however only look to the value of this setting in cooling group 1. The cooling program ignores the values of this setting in other cooling groups.

15.10 Actuate frequency regulated transport pump based on energy demand

Two options have been added to actuate the desired capacity of a frequency regulated transport pump:

- Via analog output
- Via digital output

The actuation of a frequency regulated pump works using a ViP **transport pump: desired capacity: ViP - %** including the influence energy demand and a number of weather influences. Thanks to the actuation of the pump based on capacity in % it is easier to see at how many percent of the maximum capacity the pump is running.

The service technician can via the adjustment screen for the Aout or Dout make the translation to the actual frequency of the pump. Actuation is carried out based on the assigned I/O. If the analog output setting **transport pump: desired capacity (I/O)** is assigned, actuation is carried out via the analog actuation method. Assignment of both **frequency regulated transport pump: measurement** and **frequency regulated transport pump: actuations** ensures actuation via Dout.
What actuation method is used can be seen in the setting **transport: present I/O** where the bits **frequency regulated capacity Aout** and **frequency regulated capacity Dout** have been added. It is possible to activate both actuations at the same time, but this is not recommended.

You must handle with caution the possible weather-influences radiation W/m^2, outside temperature, wind speed and rain in the ViP **desired capacity transport pump - %**. When computing the energy demand allowance has in fact already been made for different weather factors. If you add this again as an influence then that is double.

15.11 Heat demand via Analog output signal

It is possible to actuate the value of **transport pipe: computed** as Analog output signal (Aout) with the **transport pipe: computed (I/O)** setting

When this I/O is assigned via **Assign I/O** the computed value of **transport pipe: computed** will be written as output to the Aout setting. You can then use this Aout setting by external equipment as set point to be adjusted.

15.12 Heat discharge from the tank

Upon heat discharge from the tank from ECONOMIC 11.5 even for heating general the heat discharge must be regulated again. This is important to obtain the smoothest possible control of heat discharge. Set out below is a description of the settings with a recommended setting for the values.
The control heat discharge is being further optimised by Hoogendoorn. This has consequences for the recommended setting values.

- **cooling water temperature threshold: discharge**
- **heat discharge: range control**
- **heat discharge: deviation monitoring**

These settings are used for program heat discharge.
If the cooling water temperature is higher than the threshold, the tube temperature is increased from 'circuit pump: tube temperature on' to maximum 'circuit: pipe maximum heat discharge'. As a result the surplus heat is discharged to the greenhouse.
If the cooling water temperature becomes higher than the threshold plus the range, then (with a delay) the 'circuit: pipe maximum heat discharge' is fully used.
If the cooling water temperature becomes higher than the threshold plus the 'heat discharge: deviation monitoring' heat is discharged faster.

EXAMPLE:

cooling water temperature threshold: discharge	60
heat discharge: range control	5

Control Climate, Greenhouse heating, Circuit 1

circuit: pipe maximum heat discharge	60
circuit pump: tube temperature on	5

If the cooling water rises higher than 60 °C, the minimum pipe is increased with a delay from 25 °C to 40 °C.

In case of heat discharge based on cooling water temperature TE (Total Energy) the minimum pipe is regulated based on the measured cooling water temperature TE. Regulate the settings so that the return water temperature is always low enough to cool the TE. Example: threshold 60 °C, range 5 °C, deviation monitoring 10 °C. The cooling water temperature is then regulated between 60 and 70 °C.
In case of heat discharge based on average tank temperature or number of layers in the tank, the meaning of the 'cooling water temperature' varies. It may be the temperature of a particular tank layer. It may be a fictitious temperature. Heat discharge EM will send a very high temperature to encourage an accelerated heat discharge, or a very low one to reduce the heat discharge. Follow the recommended values given to you by Hoogendoorn to obtain the smoothest possible control.

Configuration at which heat discharge with running CHP and full tank is NOT necessary:
Heating general:
Set the threshold at 70 °C, range at 20 °C and deviation monitoring at 50 °C.
Tank:
If it is desirable for heat always to be discharged if the tank is full and the user controls on 'maximum tank stock: average tank temperature: ViP': also activate 'maximum tank stock: number of layers: ViP' in the selection and set on the bottom tank layer. This gives certainty that heat is always discharged if the tank is full.

Configuration at which heat discharge with running CHP and full tank IS necessary:
One has to work with safer values to ensure that the CHP always gets sufficient cold return water to cool.

Option 1:
Tank:
Do not let the tank become fuller than the last tank layer but one. Activate 'maximum tank stock: number of layers: ViP' in the selection and set on the last tank layer but one (it may also be lower).
Heating general:
Set the threshold at 70 °C, range at 20 °C and deviation monitoring at 20 °C.
Option 1 gives a smoother heat discharge than option 2.

Option 2:
Tank:
Do not let the tank become fuller than the last tank layer. Activate 'maximum tank stock: number of layers: ViP' in the selection and set on the last tank layer (it may also be lower).
Heating general:
Set the threshold at 60 °C, range at 10 °C and deviation monitoring at 12 °C.

Hoogendoorn is still working on an improved heat discharge version with additional protection for cooling CHPs with an almost full tank. The different control methods for heat discharge from the tank will then no longer be necessary.

15.12.1 Smoother heat discharge from the tank (from 11.10)

From ECONOMIC 11.7 heat is discharged sooner when the bottom tank sensor becomes warm and the CHP is running. If necessary monitoring TE also comes on.

The threshold heat discharge has been moved to service access. The layout between user and service settings is now as follows:

- The user sets heat discharge for tank and heat discharge of Energy Management. In addition the user sets the maximum pipe heat discharge.
- All the settings relating to setting speed heat discharge are now under service access.

The ECONOMIC help is given recommended set values aimed at the different situations of heat discharge based on cooling water temperature TE or based on tank curve. Is the previous version older than 11.7.4.0? Be sure to adjust the existing settings in accordance with the recommendations if heat is discharged from the tank. The control will as a result discharge heat more smoothly than in the past.

From 11.10 a new setting has been added to the circuits with which the adjustment delay of minimum pipe heat discharge can be influenced:

- **circuit: pipe heat discharge inertia °C/min**

Via this setting the discharge of the heat from the tank can run more smoothly.

15.13 Emergency power

15.13.1 Cyclic lighting

For blocking emergency power no special **emergency power: actuation groups cyclic lighting** setting is used any longer. Instead of this the delay time applicable for all groups **emergency power: delay release groups** from the Emergency power general process is used.

15.13.2 Assimilation lighting

Assimilation lighting uses the emergency power general process including one general start up delay for the groups of all the processes.
Because the lighting is a heavy power user, an option has been added to keep the lighting completely off during emergency power.
Enter **no** under the **assimilation lighting: lighting on for emergency power?** setting.

15.13.3 Cooling

In case of cooling it was possible to set different stages for warm and cold weather for emergency power. This is no longer possible. Now the number of stages in case of emergency power can be limited via the **maximum number of stages in case of emergency power** setting. If the value of this setting is on zero, the cooling remains completely off in case of emergency power.
If you do not want this, turn on the setting manually.

15.14 Movement detection vent (from 11.10)

In the **movement detection: limit computed vent position: close** service setting is the value of the computed vent position under which closure is necessary is after detection of an incorrect vent measurement. The fitter sets this value after consultation with the user. Make sure you do not select too small a value. The value may never be less than **vent position storm**!

In special cases, for example when adjusting the vent, the movement detection can be turned off via the **movement detection: on/off** service setting. Consult the help of this setting for the right use.

15.15 Meteoradar (from 11.10)

From ECONOMIC 11.10 a uni-switch is no longer used for Meteoradar. For users who were already using Meteoradar this uni-switch therefore becomes free.

15.16 Adjust vents (from 11.10)

The vent adjustment options have been extended because of the actuation with intelligent motors (Ridder LogicLink). As a result with a computed vent position of 0% the vents can be drawn completely into the rubber seals for maximum insulation and small vent positions are used from the 'on the line position', for maximum accuracy.

In addition to the conventional adjustment method there is a new method. For the latter, with a vent position of 0% the vent is fully closed (vents in the rubber seals / system mechanically unloaded). By means of an offset the position is indicated at which the vent circuit opens (the vent is 'on the line').

In the help for the ventilation (vent position execution component) both adjustment procedures are described.

ANNEX - Terminology

In order to make optimum use of the information in this brochure it is important to distinguish between the following terminology.

Release
The whole of all the new, modified or existing program components made available at a point in time for operation.

Version
HOOGENDOORN numbers the releases and calls each successive release a version. The release for 2006 is version 11.0, in the course of 2007 version 11.1,11.2 and so on will become available.

Subversion
Modification to a release during the year, a component of an existing version (see above).

Module
A completed part of computer software that controls a particular process, for example HOOGENDOORN METEORADAR.

Option
A possible addition to the computerised control of your business. Options are not incorporated as standard in the ECONOMIC process computer and you can therefore select these. Examples are the control of the vents with a METEORADAR and temperature measurement of the plant with the GROWLAB camera.

NOTES