PERROT

Satellite

Two wire decoder control system

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1. Fields of application

Irrigation control system for irrigation systems

The irrigation control system is particularly suitable for the fully automatic irrigation of e.g. golf courses and large public parks, open air swimming pools, amusement parks but also for irrigation systems in agriculture. The control system Perrot Satellite works as a bus system, on which the decoders are controlled by a two wire decoder cable. The decoders open the connected solenoid valves at the time adjusted in the computer program.
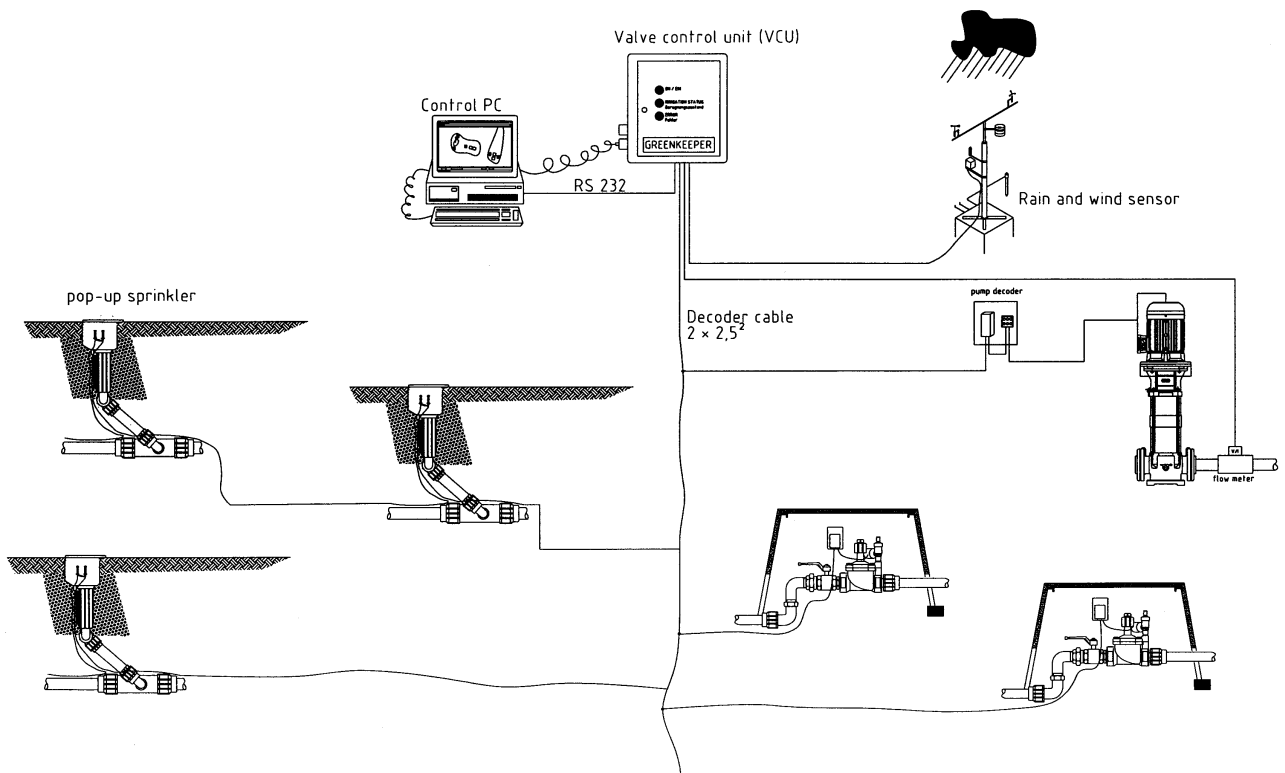
Irrigation control system for several independently working irrigation systems

The control procedures for irrigation are controlled on-line from the PC. The interface (VCU) serves as means of communication for decoders, pumps and sensors for weather and facility values. This program structure allows simultaneous control of 1 or more hydraulic systems with only one valve control unit (VCU), as it is often needed at extensions of a 9-hole course to a 18-hole course.
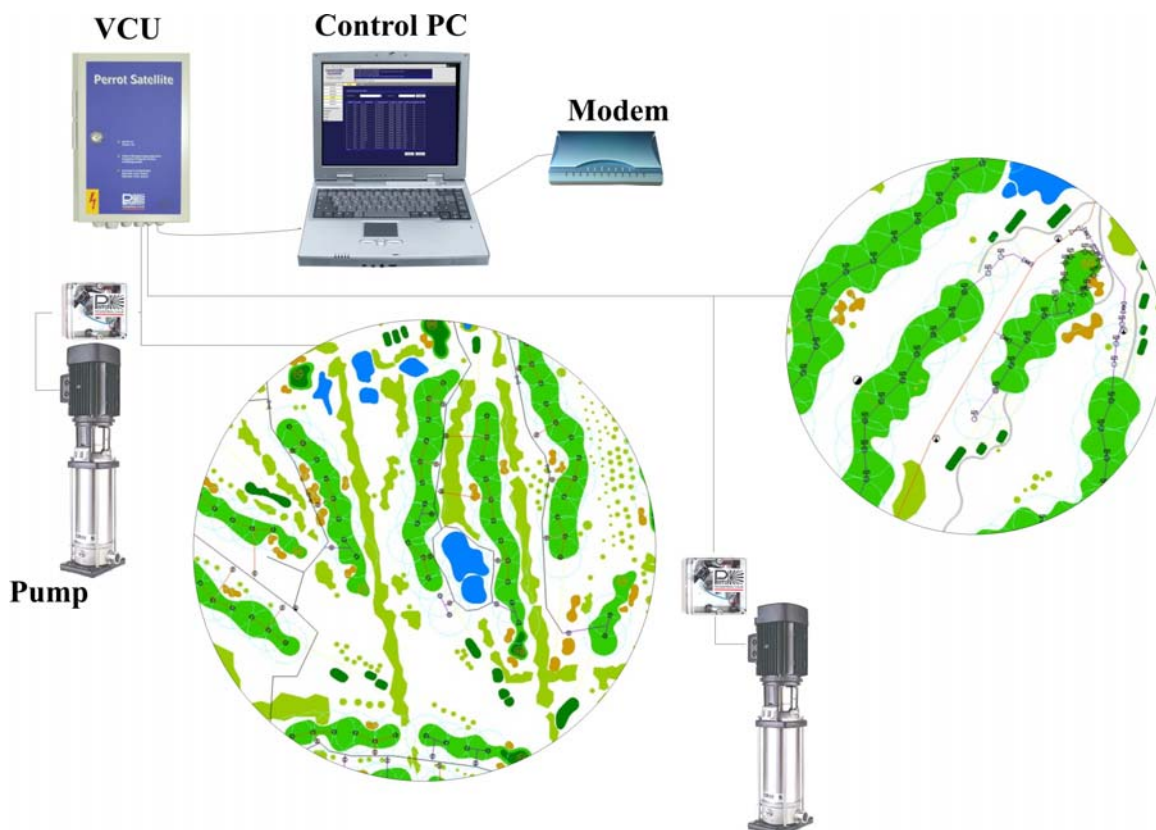
Irrigation control system for several decentralized installations e.g. at municipalities

The Web-based structure of the irrigation program allows the simple operation within a Browser (e.g. Internet Explorer) and consequently an independent access through the Internet is possible. Certainly there is the possibility to access directly by a modem connection. This system is especially suitable for municipalities, which have to control and supervise **several parks** from a central place.

Advantages of the decoder control system
- less work, as only a two wire cable for up to 240 stations is necessary.
  The two wire cable (decoder cable) is responsible for the electric power supply of the valves as well as for the communication with the decoders.
- System is expandable without any additional earth work, as further stations can be connected at any place of the decoder cable.
- Simple error search as cabling is easy to overlook
- Due to the little cable quantity the danger of a lightning strike is very small.

2. Structure of Decoder Control System Perrot Satellite

for max. 240 stations

- ᕲ Same structure as the proved Greenkeeper Win
- ᕲ The Greenkeeper Win System can be upgraded to a Perrot Satellite
- ᕲ The PC is connected with RS232 interface to the VCU
- ᕲ With one VCU up to 240 stations and 3 pump stations can be controlled. Furthermore signal inputs are processed by weather and plant sensors.

VCU   **Control PC**

Modem

Pump
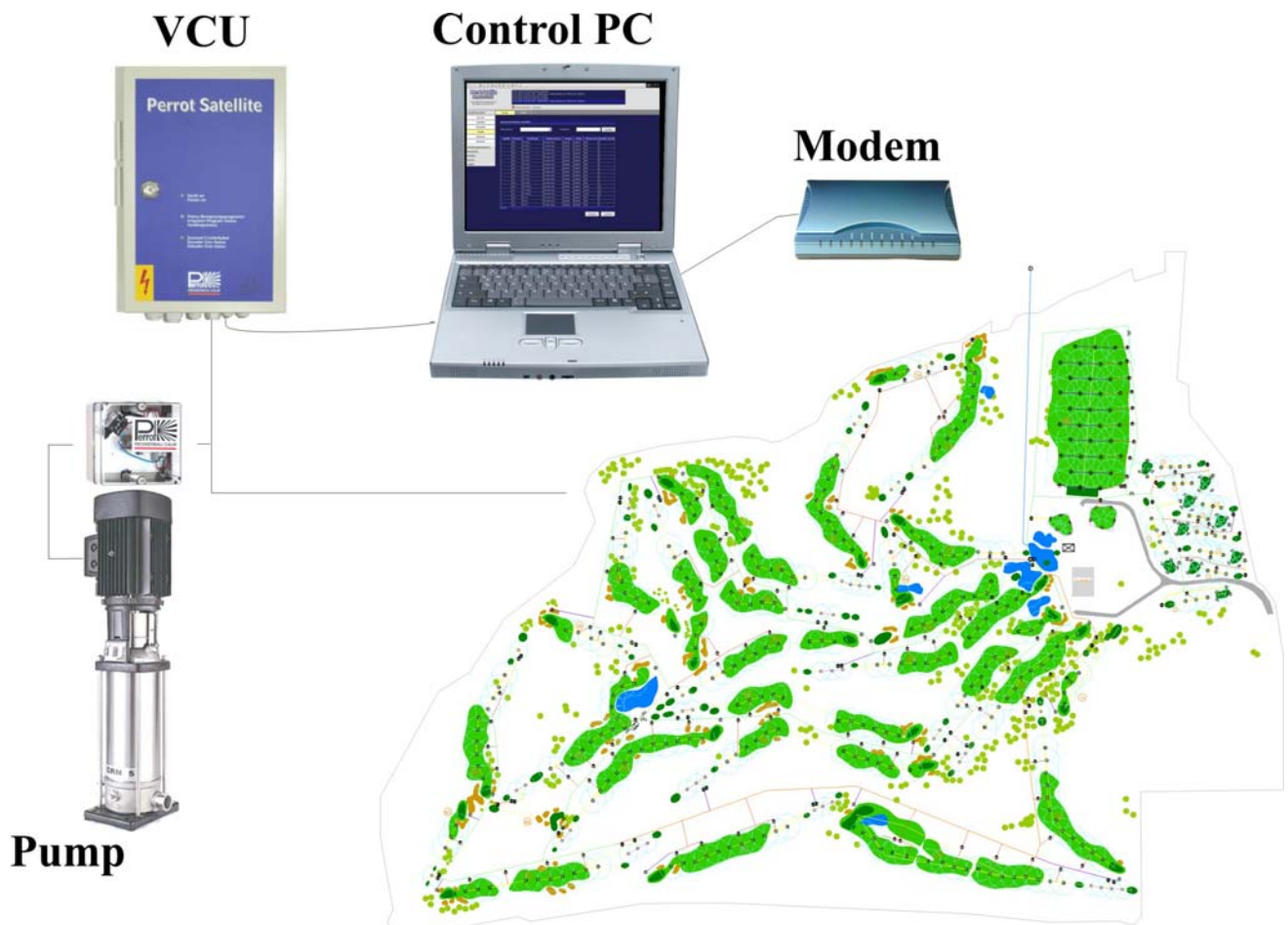
for max. 1920 stations

- ♏ For installation with more than 240 stations further VCU's (up to 8 pieces) can be connected serially. Communication is carried out over RS 485 interface.
- ♏ As indicated, each VCU has the possibility to control 240 stations and to process different signal inputs.
- ♏ Using a screened interface cable with 2x2,5mm² the max. distance between serially connected VCU's should not be more than 1200 meters.
- ♏ The control PC works with Windows XP (professional). The complete irrigation program is installed on the PC. The PC supports the user by writing the programs.
- ♏ The operating irrigation sequence is controlled online from the PC.
- ♏ The valve control unit (VCU) is responsible for the conversion of PC information into switch signals for the decoders.
- ♏ VCU determines the optimal pump efficiency (pump manager) and switches the pumps on and off as required.
- ♏ The decoder cable transports both, the switch signals for the decoders, and the power output for the coils.
- ♏ The decoders select the signals and implement the instruction which are destined for them. The most important instructions are the opening and closing of the connected valves.

Satellite Control
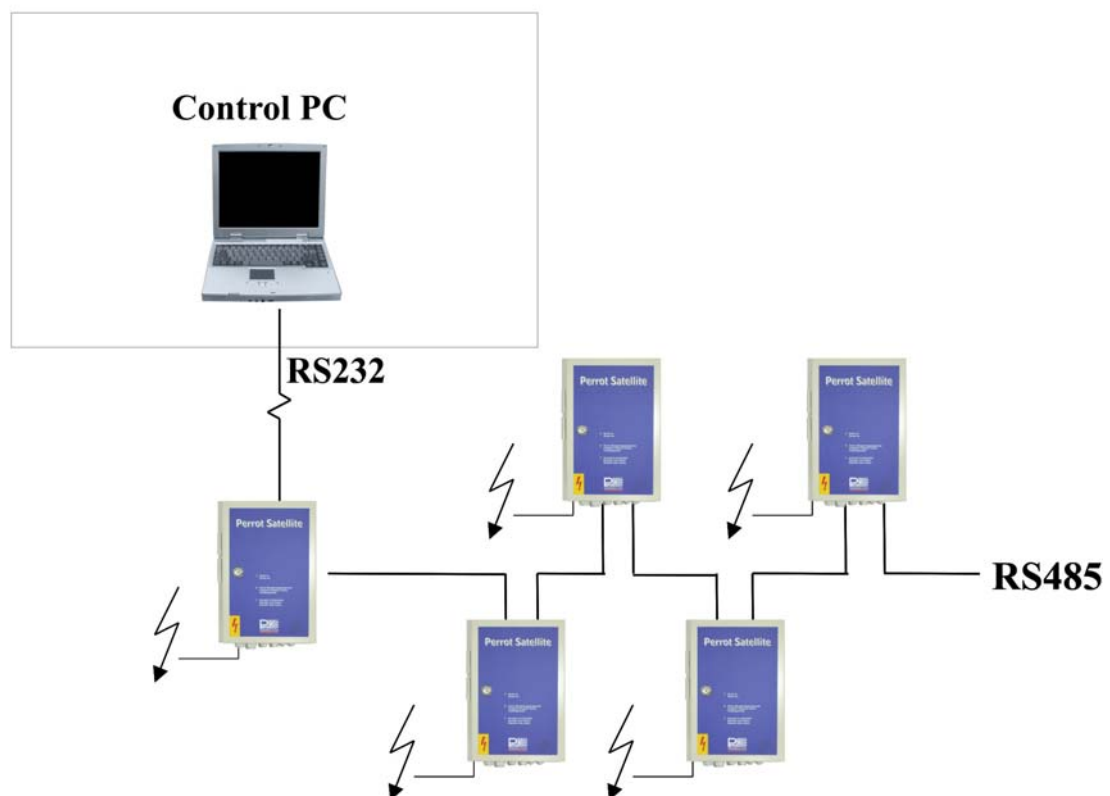
## 3. Ways of communication with Perrot Satellite

Perrot Satellite is the first irrigation program which is based on WEB basis. Due to this program structure a simple operation within a browser (e.g. Internet Explorer) and thus any access from outside is possible (Remote Access). The irrigation program is installed on the control PC, which acts as a server.

The remote control (Remote Access) with a PC (desktop or laptop) can be carried out through:
- Internet with firm IP-address of the control PC or by the help of the service „dyndns.org"
- An analogue modem connection
- A digital modem connection (ISDN)

Remote control (Remote Access) with a PDA can be carried out through:
- A mobile telephone system connection (e.g. GSM) to the control PC
- Internet (e.g. GPRS)
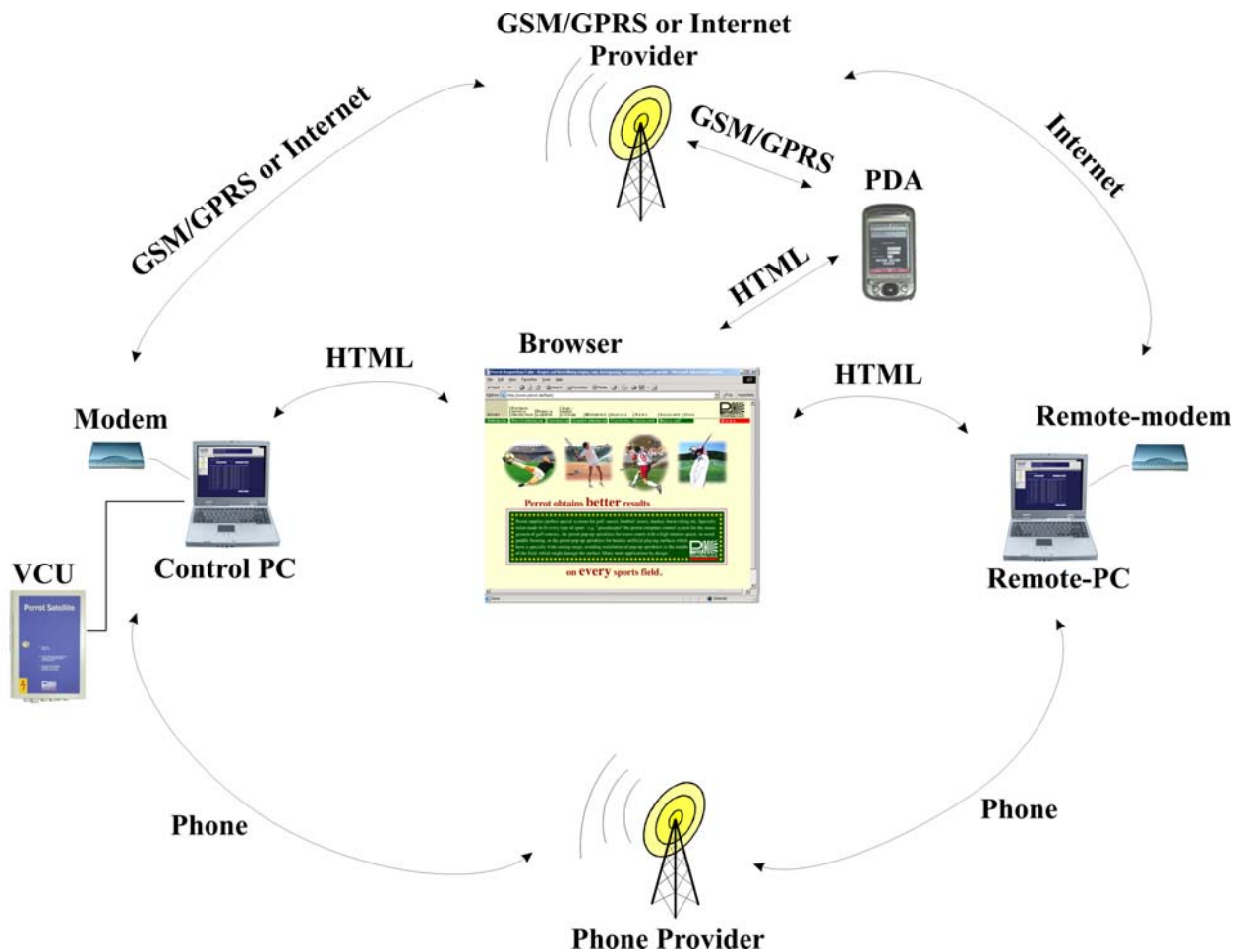
Centralisation

- ✥ The non-restrictive communication possibilities permit that all decentralised irrigation systems can be controlled from one central place.
- ✥ Of course, all functions can also be implemented locally, e.g. if after fertilizing the irrigation must be activated immediately, or if the staff on site calls for action on field work.
- ✥ As each of these irrigation systems can be operated also as an isolated application; it is left to the operator's own resources to specify the optimal concept for a centralization.
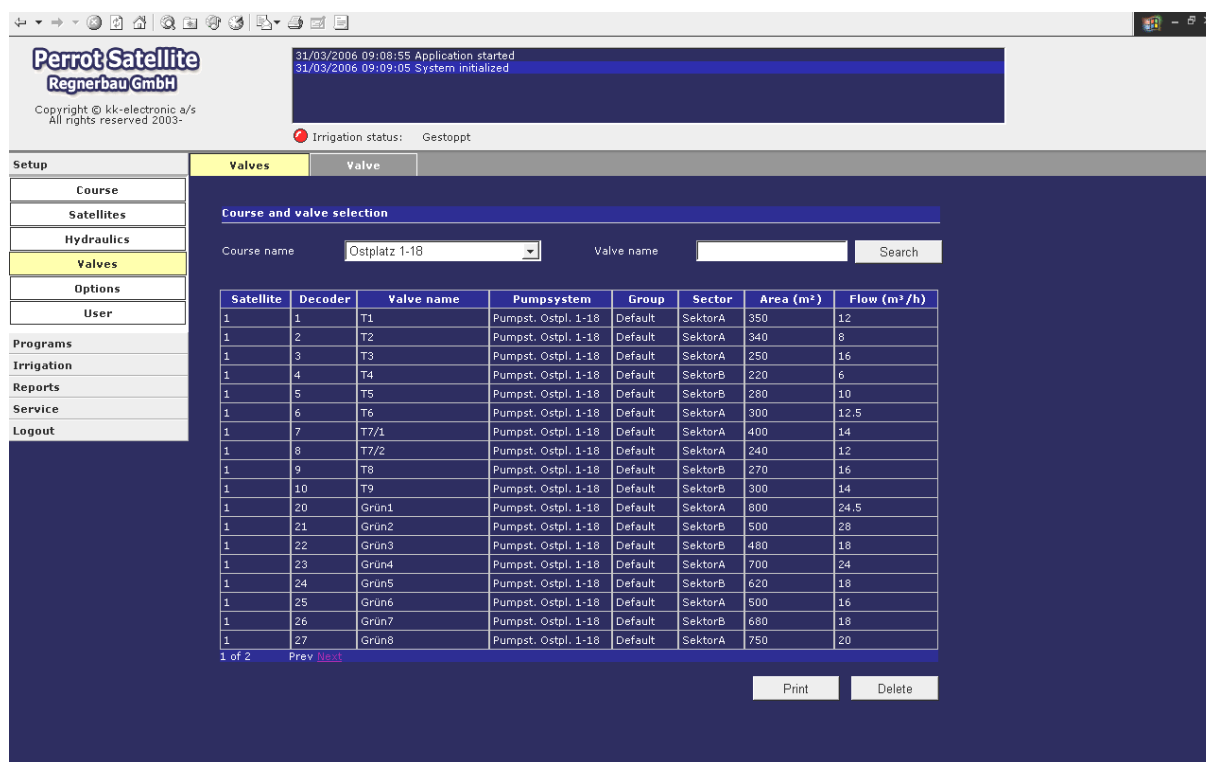

Centralisation
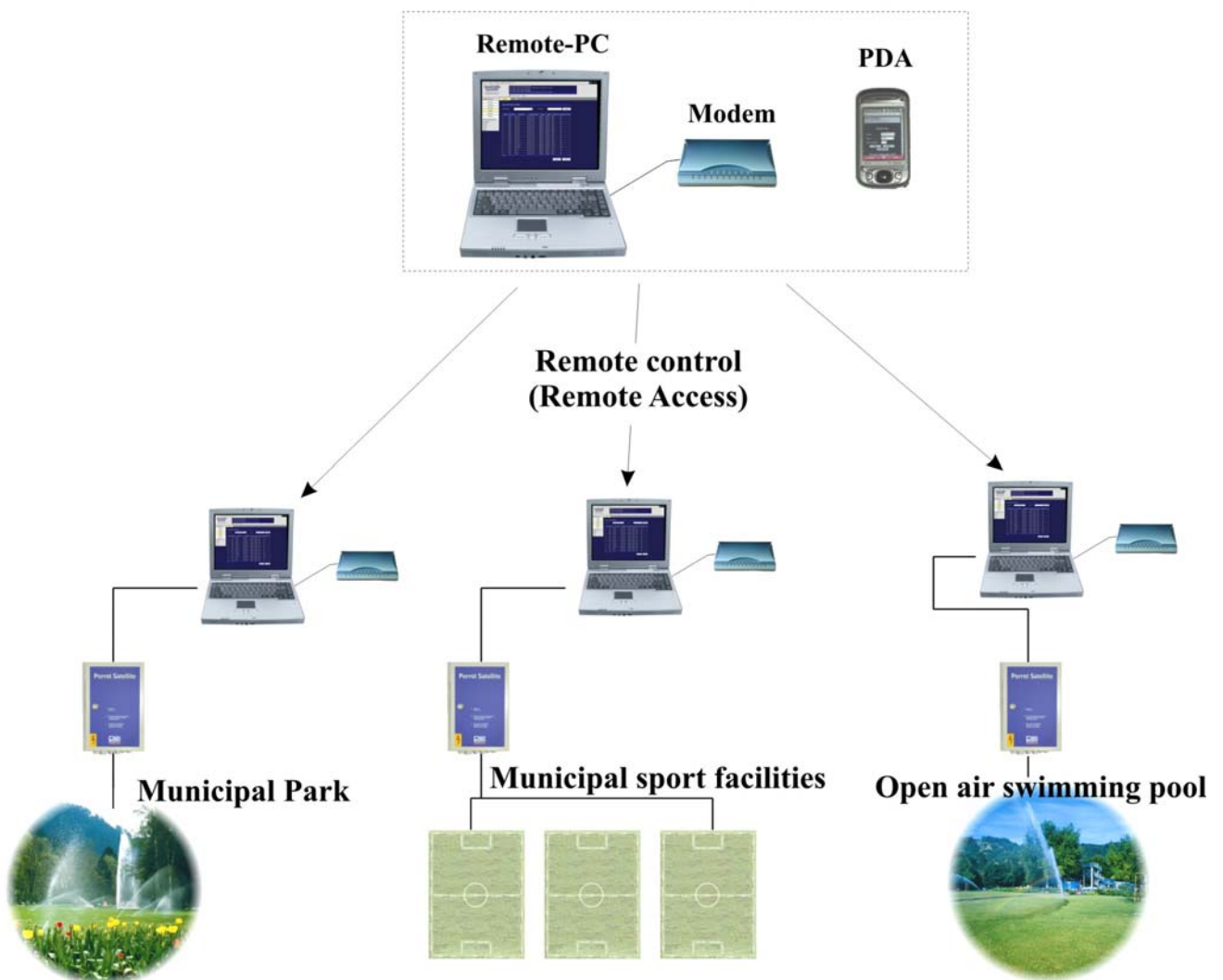
4. Software Features

User friendly program by:

- Self explaining program construction
- Clear arranged menu with tab buttons for submenus
- All menus and functions are mouse supported. Only few key inputs
- All activated valves, pumps and irrigation programs are shown in tabular form.
- Pull down menus for a better overview for programs, valves or pumps which are to be selected.
- Copy function for easier data inputs for irrigation programmes and valve data.
- Avoiding of irrigation-program overlapping
- Dialog input avoids mistakes.
- At the moment Perrot Satellite has a multi language function and is available in seven European languages: German, English, French, Danish, Dutch, Czech and Spanish
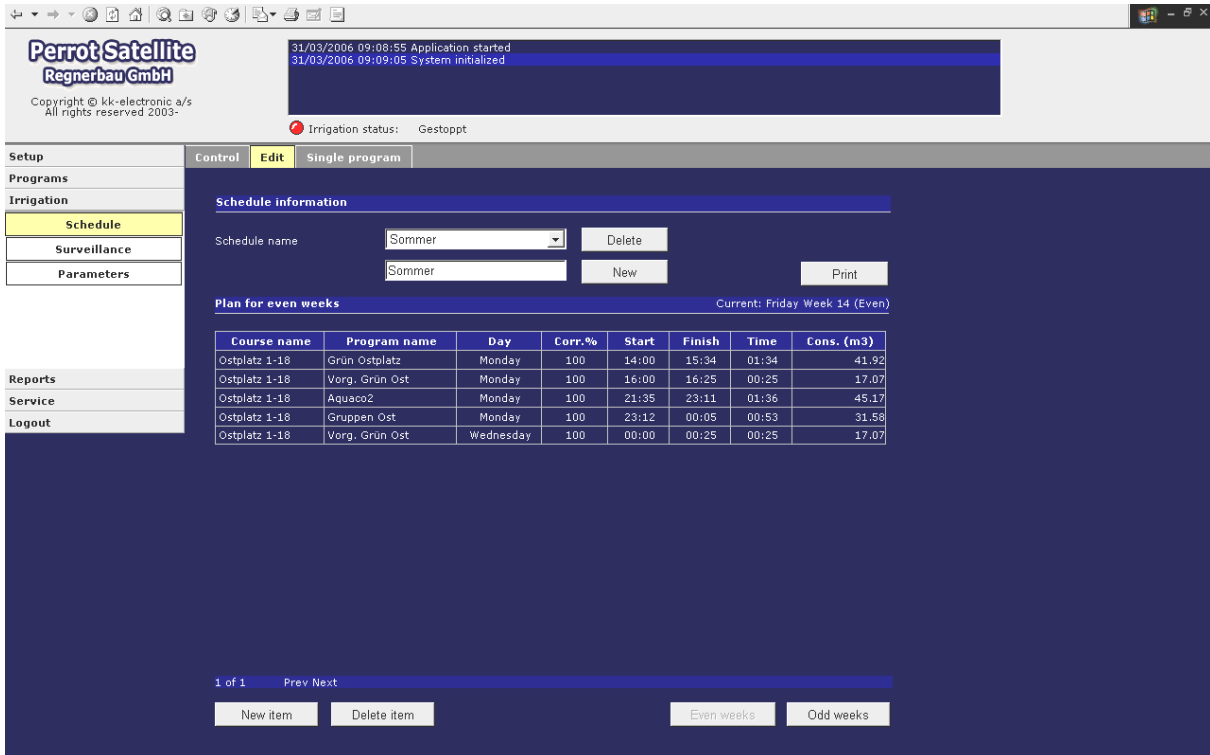
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Performance features of the Irrigation Program

- ⅃ A general log field which is available in all menus, shows all processed functions online as for e.g. starting of pumps, opening of decoders, error notes, program starts etc.
- ⅃ A graphic symbol in the status line shows menu-independently the condition of the control system.
- ⅃ 14 days irrigation list, with automatic repeat.
- ⅃ Unlimited number of program starts and repetitions.
- ⅃ Arbitrary number of irrigation programs
- ⅃ Water budget from 10% to 300%
- ⅃ Simultaneous operation of different irrigation programs at different areas (irrigation systems) are possible.
- ⅃ Classification of system data into several areas (golf courses) is possible and thereby a clearly arranged structuring, also at large number of valves.
- ⅃ Due to the possibility to create different irrigation calendars a simple adoption on weather conditions and season is possible.
- ⅃ Search functions for a fast detection of valves names.
- ⅃ Irrigation program on a web based program structure (can be operated by the Internet)
- ⅃ Protection of all installation data by password.

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Graphics

- ✍ **Full-scale** graphic overview of the golf course with exact location of sprinklers.
- ✍ Valve symbols can be placed by drag and drop function simply at the desired positions.
- ✍ Manual start of valves which can be selected by the interactive symbols of the graphic
- ✍ Opening time for manually opened valves is individually adjustable
- ✍ All activated valves are graphically highlighted
- ✍ Multiple zoom of the graphic possible
- ✍ Display of the water consumption for the selected pumping system
- ✍ For each area a separate graphic can be stored

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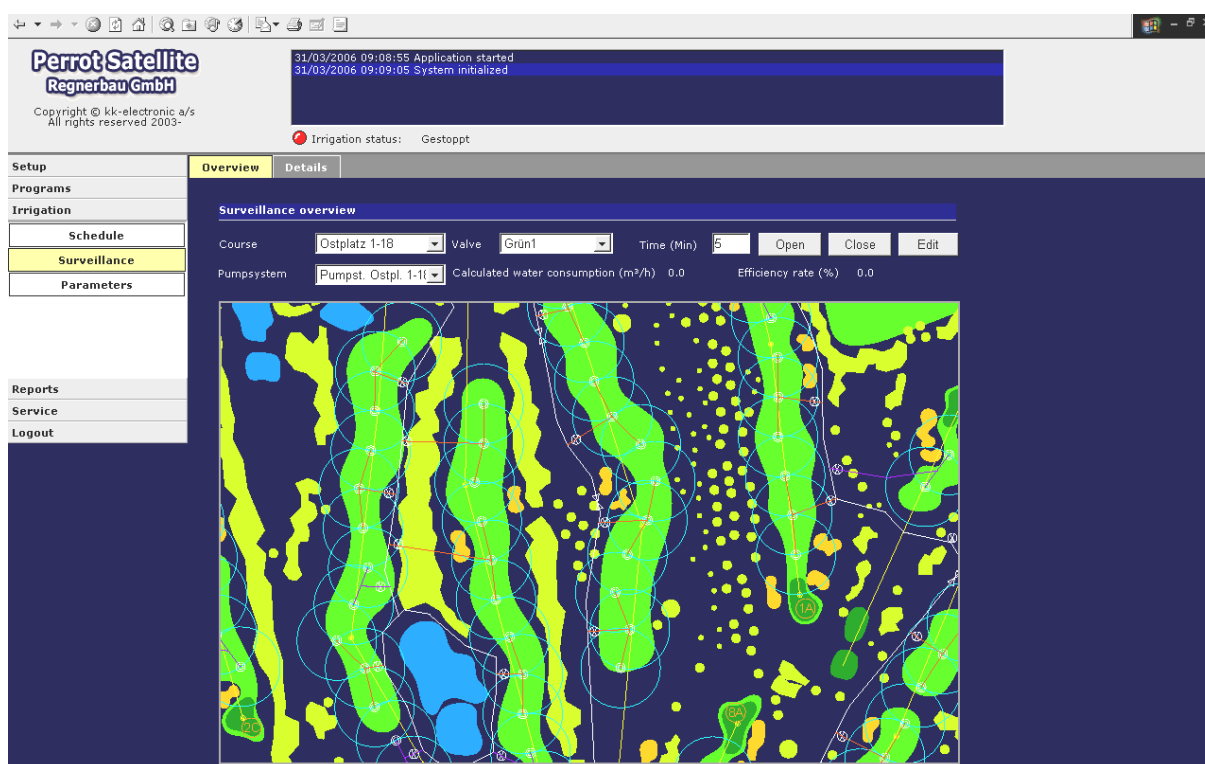
Flexible configuration of the irrigation programs

- ✎ Run time of each decoder in minutes or mm (precipitation density)
- ✎ The flow manager calculates by means of the given irrigation quantities the least possible program running time, without overloading the pumps.
- ✎ Sequential process of the stations is calculated by the PC or by own configuration
- ✎ Irrigation run, without influence of flow manager for individual desires.
  Free choice of pump and valve combinations for each step
- ✎ One-time manual start of irrigation programs without changing the program of irrigation lists.
- ✎ Irrigation programs controlled directly by the PC facilitates simultaneous work of several irrigation plants by Perrot Satellite.

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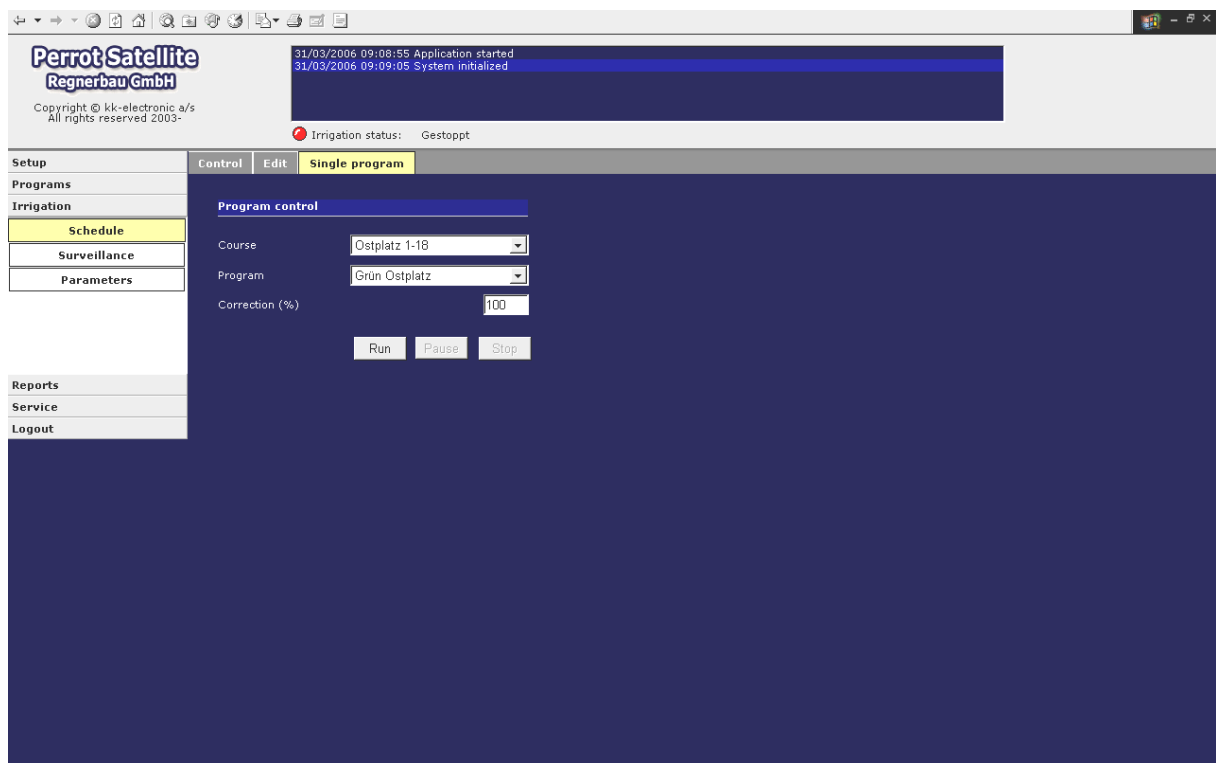
Hydraulic optimisation

- ✤ Minimization of the pipe friction losses by splitting into hydraulic groups and hydraulic sectors.
- ✤ The simulation of the irrigation programs shows:
  - ✖ The running time of irrigation
  - ✖ The sequence of the valve opening and closing times
  - ✖ The pump efficiency rate
- ✤ Flow manager for balancing the system demand at the max. capacity of the pump station.
- ✤ VCU controlled pump management also for several pump stations with arbitrary decoder numbers
- ✤ Adjustable interval times for the valve circuit facilitate a low-wear function of the system.
- ✤ User-defined limit value designation for hydraulic parameters to protect the system.
- ✤ Phone alarm after breakdown of the system.

Irrigation reports

- ✤ Documentation of proceeded irrigation programs as well as program breaks and other disturbances
- ✤ The irrigation period and the irrigation amount is accumulated for each valve for a whole season.

Perrot Satellite supports service technicians

- ✤ Test program examines consumption of electricity for selected decoders.
- ✤ Detailed reports give valuable information for error tracing
- ✤ Detailed problem report with dates

5. Hardware

PC specification

- ⤷ AMD Athlon 64 or Intel Pentium 4, min. 1GHz
- ⤷ min. 512MB RAM, approx. 40GB memory capacity on fixed disk
- ⤷ Operating system Windows XP Professional SP2 with Net Framework and IIS
- ⤷ Microsoft Internet Explorer 6.0.28 or newer
- ⤷ Serial interface RS 232 (COM1) for connection of valve control unit
- ⤷ min. 1 USB Port for modem operation
- ⤷ Network interface card: Ethernet 100Mbit
- ⤷ For modem operation a Hayes modem or a Hayes compatible modem is necessary. (analogue data signalling rate min. 56 KBit/s)
- ⤷ VGA colour monitor, resolution 1024 x 768

Valve control unit (VCU)

- ✤ Housing in IP 55 design
- ✤ Box size 300 x 400 x 200 (b x h x l)
- ✤ Power supplied with 240V / 50Hz
- ✤ 2 plugs connectors with power supply for the PC with 240V / 50Hz
- ✤ Overload protection for short circuits in the decoder cable
- ✤ Output voltage 48V AC.
- ✤ All Inputs/Outputs of the VCU are overvoltage resistant up to 8 V min.
- ✤ The unit is EMC checked.
- ✤ Connection of up to 240 decoders per valve control unit is possible
- ✤ Following status information is shown by LED:
    - ✘ POWER SUPPLY ON/OFF
    - ✘ IRRIGATION ACTIVE/PASSIV/WAITING
    - ✘ STATUS OF THE DECODER LINE

- ✤ There is the possibility to connect external sensors like:
    - ✘ 4 digital inputs, e.g. for a rain gauge
    - ✘ 4 analogue inputs, e.g. for a flow meter, wind sensor or a pressure sensor.

The measured data is used for the limit value designation.

Decoder

- ✍ The address of the decoder is **arbitrarily programmable.**
- ✍ Holding and pull-in current delivered by the decoder are to be defined for each decoder individually.
- ✍ Each decoder can drive max. 2 solenoid valves
- ✍ Multi-station decoder for the control of 4 or 6 stations
- ✍ **Overvoltage resistance** up to 2KV.
- ✍ Each station has a LED – display which shows following status information:
  - ✖ decoder is off
  - ✖ decoder is power supplied
  - ✖ decoder received a control signal
  - ✖ decoder received a new address
  - ✖ decoder has accepted the new address

- ✍ **Automatic short circuit protection** for possible decoder failures
- ✍ **Waterproof** encapsulation in IP 66.

Wireless remote control per mobile phone
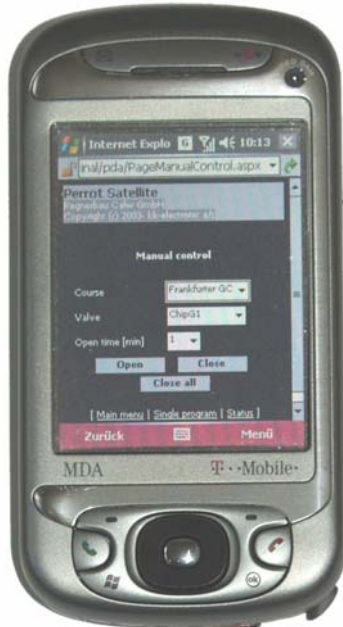
🍄 Wireless remote control of Perrot Satellite with the communicator PDA (Personal Digital Assistant) as e.g. MDA Vario II from T-Mobile
🍄 PDA must support at least Microsoft Windows Mobile 2003
🍄 PDA is a multifunctional device for:
    ✖ Telephone
    ✖ Data - transmission
    ✖ Windows Programs

🍄 Size of the MDA Vario II: (l x w x d) 112,4 x 58 x 21,95
🍄 Weight: 176g
🍄 Password protected

🍄 Following functions of the Perrot Satellite can be activated with the PDA :
    ✖ Manual start of any irrigation program
    ✖ Activating / deactivating of single valves for adjustable terms
    ✖ Controlling of running irrigation programs
    ✖ Creation / changes of irrigation list
    ✖ Status display of:
        • Operating status of VCU
        • Decoder line status

Transmitter

- ✤ The transmitter is connected by a field connector (see page 19) with a 2 wire decoder cable.
- ✤ By automatic download of the station names, the transmitter can be used with all satellites.
- ✤ Size: (l x b x h) 140 x 90 x 30.
- ✤ Weight: 350g
- ✤ Liquid – crystal – display with 2 lines and 32 signs
- ✤ Clear identification by text indicator of the valve name
  e.g. 18 - green 9
- ✤ After setting the valve opening time the transmitter can be disconnected from the field connection.
- ✤ Information are given on:
  - ✖ Irrigation status
  - ✖ Status of each decoder (opened/closed)
- ✤ Emergency stop function – to switch off all irrigation activities

Field connection
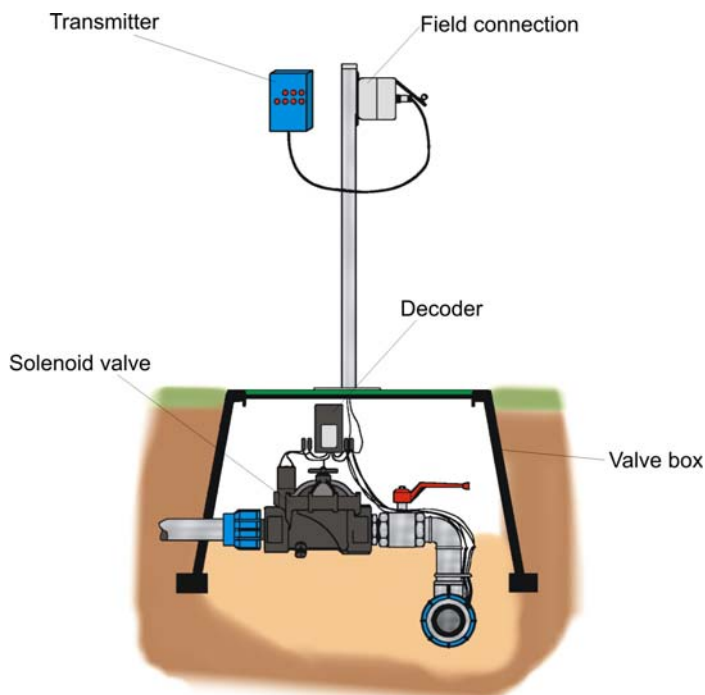
- Installation of the field connector preferably on the valve box.
- Stand pipe for plug housing is made of V4A
- Power outlet in IP 66 as at the transmitter.
- Power outlet is installed in a lockable housing.
- Optionally the transmitter can be connected only over a "cable with plug" to the decoder cable.

Programming unit

- Programming unit is connected to the VCU
- LED with function display for decoder

6. Perrot Feedback Decoder

Description

Perrot Satellite can be equipped with feedback decoders instead of the standard decoders (see page 16). Thereby the user is informed reliably whether the equipped station with the feedback decoder works trouble-free. A flow sensor which is installed into each valve group or valve-in-head sprinkler, is periodically queried by the decoder system whether water flows or not.

The Greenkeeper control system compares the nominal and actual value. In case of divergence an error message appears in the program.

Signal transmission (conventional)

Signal transmission (bidirectional)
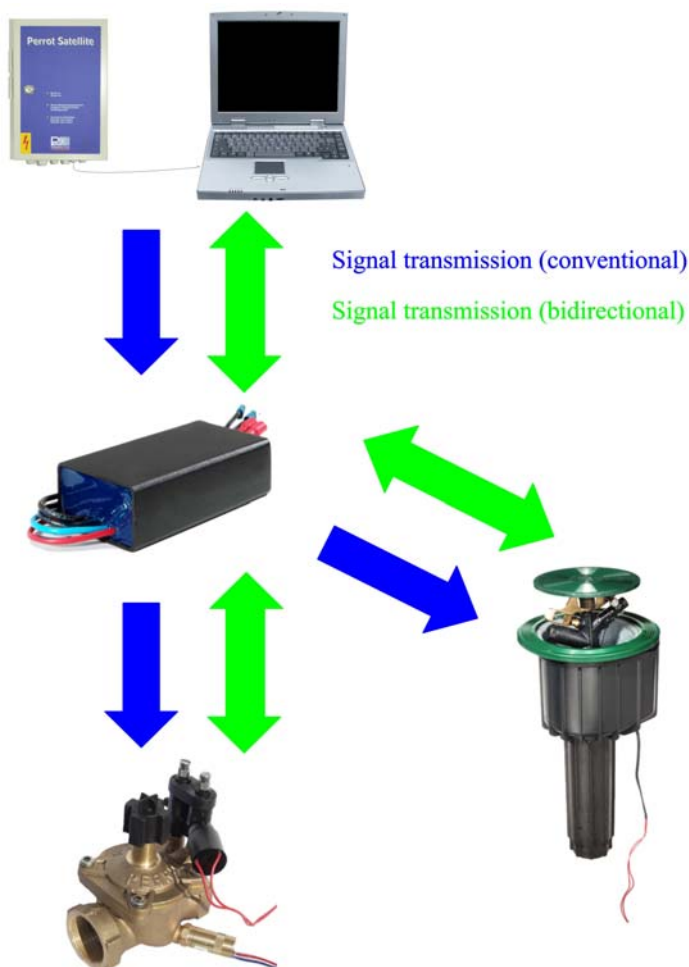
In addition to the information **if water flows or not,** the **feedback** decoder can report further state diagnostics to the central office:

- Valve coil short circuits
- No coil connection
- No answer from decoder
- Supply voltage for decoders is too low.

What to do when-options

↳ Program break off at exceeding a certain numbers of error messages
↳ Program break off at pump error message
↳ Phone alarm at program break off
↳ Phone alarm at pump malfunction

Also for these additional performance characteristics only a 2-core decoder cable is needed. The feedback decoders are only as an one station decoder available
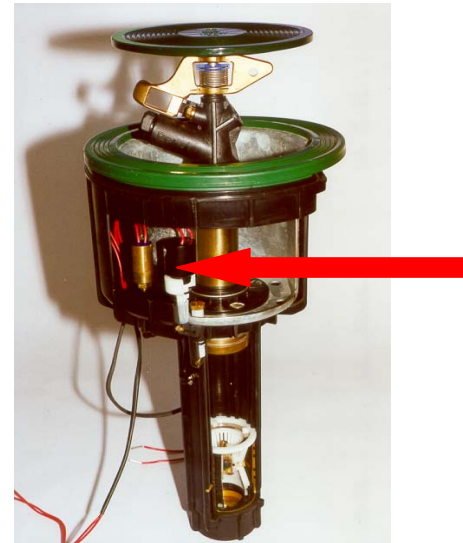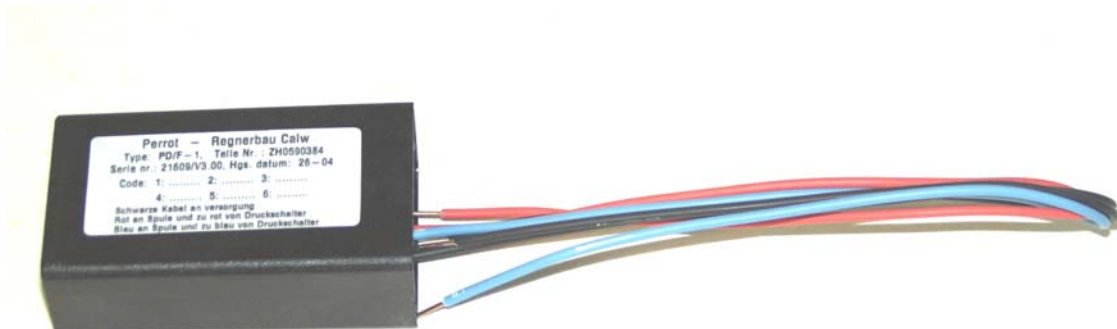
Hardware

Pressure sensor
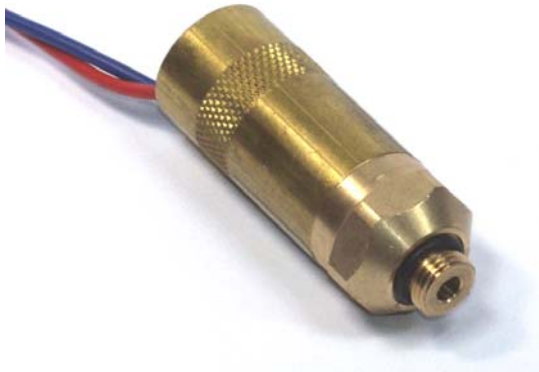
The pressure sensor gives the information to the decoder, whether there is enough pressure at the sprinkler. The pressure threshold is adjusted to 2,5 bar. This is the minimum required pressure for the reliable operation of the sprinkler.

Pressure sensor is integrated in the valve or valve-in-head sprinkler

Feedback Decoder

The feedback decoder communicates with the control centre in both directions.
It can receive information and implement the associated instructions.
On the other hand it sends information over the actual condition of the station back to the VCU.
It is to be noted that <u>standard and feedback decoders</u> can be mixed in one system.

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Notes

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